Update of the Czech National Plan of the Republics in the field of energy and climate

October 2023

Executive summary

Process of preparation

The draft update of the Czech Republic's National Energy and Climate Plan (NECP) is based on the requirement of Regulation (EU) 2018/1999 of the European Parliament and of the Council on the Governance of the Energy Union and Climate Action and includes objectives and policies in all five dimensions of the Energy Union for the period 2021-2030 with a 2050 perspective. The central part of the national plan is the setting of the Czech Republic's contribution to the EU's climate and energy targets for reducing emissions, increasing the share of renewable energy sources and increasing energy efficiency. The structure and formalities of the national plan shall respect the above-mentioned Regulation.

The first national plan under the above-mentioned Regulation was approved by the Czech Government on 13 January 2020, it was a revised version of the draft National Plan, which was taken into account by the Czech Government on 28 January 2019 and which was submitted to the European Commission on 30 January 2019. The national plan is based on two main strategic documents, the State Energy Concept, approved in 2015 and the Climate Protection Policies approved in 2017. The present document is then a proposal to update the national plan of the Czech Republic. The submission of the final version of this document is planned in accordance with the Regulation by 30 June 2024 after the iterative process with the European Commission.

For the preparation of the final version, the technical, public and political debate will continue on the draft update of the National Plan. The proposal will also serve as a basis for updating the State Energy Concept (SEC) and Climate Policy (CCP), the final versions of which will also be reflected in the National Plan. This process will also involve a broad public consultation. However, it should be noted that the preparation of the national plan is complicated by the fact that not all relevant Fit-for-55 legislation is yet to be adopted at EU level.

Updates input

The substance of the draft update of the National Plan responds in particular to the ongoing climate emergency, the projected impacts of which are updated in the Sixth Assessment Report of the United Nations Intergovernmental Panel on Climate Change and the related increase in ambition of the European targets in the Fit-for-55 package by 2030. The second major driver is the experience of the energy security and energy-price crisis created by Russia's invasion of Ukraine. The Government then approved the basis for updating the SEC and the related strategy papers by Resolution No 257/2023 on 12 April 2023. The most important input for this NKEP update proposal is the scientific modelling outputs ofthe SEEPIA research consortium. The WAM3 scenario was chosen as the baseline for this update, the outputs of which are described in the text. Discussions and consultations within the Commission and the Energy and Climate Strategy Platform, which met four times between May and August 2023 (and in the meantime their thematic working groups) were equally important. The petitioner has also carried out a broad public consultation on inputs to update the NECPs, the outcomes of which were taken into account in the preparation.

Emission reduction targets

In the area of greenhouse gas emission reductions, Regulation No 2021/1119 establishing the framework for achieving climate neutrality sets an EU-wide target of at least 55 % reduction in greenhouse gas emissions by 2030 compared to 1990 and climate neutrality by 2050. In the sectors covered by the Emissions Trading System (EU ETS), under Directive 2003/87/EC as amended (Directive 2023/959), emissions should be reduced by 62 % compared to 2005 and in the non-ETS sectors under the revised Regulation (EU) 2018/842 as amended (Effort sharing regulation) (as amended by 2023/857) by 40 % and 26 % respectively at the level of the Czech Republic.

The Czech Republic's objective is to achieve emission reductions in line with the commitments under the Fit for 55 package and to contribute to achieving EU climate neutrality by 2050. The Czech Republic's strategic objective is to reduce the share of fossil fuels (used without capture technology) in primary energy consumption to 50 % by 2030 and 0 % by 2050 and to completely reduce the use of coal for electricity and heat generation by 2033. The modelled scenario shows the feasibility of meeting these objectives, but when setting ambitious policies and measures. Total emissions will fall by 63 % by 2030 compared to 1990, 68 % compared to 2005 and outside the ESR sectors by 32 % compared to 2005. The model is moving towards an emission value of 6.3 Mt in 2050, but further reductions are expected from LULUCF and waste sectors that are not modelled in sufficient detail. The scenario also confirms the assumption of a complete phase-out of coal for heat and power generation by 2033, with a significant decrease already between 2025 and 2030.

Renewable development objectives

The revised Directive 2018/2001 on the promotion of the use of energy from renewable sources, the formal approval and entry into force of which is expected by the end of the year, sets an overall EU 2030 target of 42.5 % RES use in gross final energy consumption and a further voluntary increase of 2.5 pps at EU level. Furthermore, the revised Directive sets a number of sub-targets for RES, in particular in the sectors of industry, transport, heating and cooling and buildings.

For the overall national target, the WAM3 scenario shows the achievable share of RES in final consumption of 30 % by 2030 as a contribution to the EU-wide target (up from 17.7 % in 2021). In transport, the binding target of 14.5 % reduction in greenhouse gas emissions achieved by increasing the share of renewables by 2030 is met. For some sub-objectives, it shows that they are difficult to achieve (and some do not model).

Energy efficiency targets

The revised Energy Efficiency Directive 2012/27/EU sets overall targets for increasing energy efficiency and reducing final and primary energy consumption by 11.7 % compared to the PRIMES 2020 reference scenario. In addition, it also includes sub-targets, e.g. securing new energy savings and specifically in the public sector. Other objectives, and in particular specific measures, will then be set out in the currently revised Energy Performance of Buildings Directive.

For Czechia, the quantification of the overall end-use energy savings target implies a decrease from 1 064 PJ (latest 2021 data) to 846 PJ in 2030. This is the target set by Czechia, but the modelled scenario shows the problem of achieving it. Even with the adoption of ambitious policies and measures, including the implementation of a progressive building renovation scenario, the evolution of final consumption leads to 945 PJ by 2030. While this is a very significant reduction of consumption of about 120 PJ, the target is not reached, and consumption is reduced by only 1 % compared to the reference scenario.

Energy security

Since the second half of 2021, Europe has been facing a situation where Russia is strategically abusing its energy supply as a means of coercion. This situation was exacerbated after 24 February 2022 after Russia's full invasion of Ukraine. Thus, the EU's objective, as defined in the EU REPower Plan published in May 2022, is to phase out Russian fossil fuel imports completely by the end of 2027.

The baseline modelled scenario clearly shows a shift in cross-border energy management: Czechia will move away from imports of fossil fuels from geopolitically unstable or problematic areas, while increasing imports of clean energy (renewable electricity and green hydrogen). In the WAM3 scenario, electricity consumption increases as a result of the onset of electrification and will need to be produced from domestic sources or to secure the conditions for its imports. It is also necessary to adapt the electricity network to this end, providing more storage capabilities and other flexibility management elements.

Internal market

For a small open economy such as Czechia, access to the single internal market is an essential asset of EU membership. This is also largely true in the energy sector. In view of the internal energy market dimension, the achievement of the interconnection target of 15 % by 2030 can be seen as essential. The Czech Republic aims to maintain import and export capacity of the transmission system for 2030, inter alia, in proportion to the maximum load of at least 30 % and 35 % respectively, which corresponds to the 15 % target in terms of installed capacity. The Czech Republic's interconnectivity is already close to

30 % and the Czech Republic therefore does not consider it necessary to introduce further specific policies in this area. Energy market integration and infrastructure development are already significantly harmonised at EU level. Further harmonisation is clearly laid down in European legislation, which also enshrines most information, reporting and planning obligations, such as the obligation to prepare so-called ten-year transmission network development plans. The national plan describes the state of play and the expected development of market integration and energy infrastructure development.

Research, development and innovation

The fifth dimension of the Energy Union is a research, innovation and competition dimension. In this respect, the Czech Republic does not have specific quantifiable public R & D & I targets specifically linked to the Energy Union. However, research, development and innovation in the field of sustainable energy is one of the priority areas of key strategic documents, such as the National Research and Innovation Strategy for Smart Specialisation of the Czech Republic and the National Priorities for Oriented Research, Experimental Development and Innovation. The Czech Republic also seeks to take into account priorities at EU level when setting priorities in this area, in particular the priorities of the European Strategic Energy Technology Plan. It is not possible for the Czech Republic to quantify the exact level of public R & D & I funding for low-carbon technologies. However, the national plan provides an estimate of the public finances allocated to the energy sector.

Selected areas of action

Among the basic measures for achieving the objectives of the NECPs, the following are considered:

1) A pan-European emission allowance market providing a price signal for carbon emissions is an essential market-based instrument for decarbonisation. In the modelled scenario, the emission allowance price rises to EUR 400/tonne over three decades. The correct implementation of this pan-European instrument is therefore important (both the existing ETS1 and the incoming ETS2). The use of revenues back to mitigation and adaptation measures makes it possible to finance the transition to emission neutrality.

2) As a result of strong electrification, renewable electricity generation in particular will need to be developed. The development of photovoltaic power plants is on the rise. Basic efforts should therefore be concentrated on the development of wind energy in line with the requirements to speed up the permit-granting process. This will be complemented by communication to the local public. By 2030, the model considers the installed capacity of 10.1 GW of photovoltaic power plants involved in the grid and 1.5 GW of wind farms.[1]

3) In addition to the construction of new renewables, there will be a need to strengthen the grid's ability to manage flexibility and to explore and implement the various elements of flexibility. Natural gas will also temporarily play an enhanced role.

4) Czechia is characterised by a large share of heat production in central supply systems. These systems have the potential to become an efficient and decarbonised heat source for buildings and industry. Their decarbonisation plan must be based on local strategic planning and take into account future decreases in heat consumption in buildings and fully explore the potential of renewable and ambient energy.

1It should be stressed that the resulting share of RES must be seen as a minimum commitment and a higher share will be sought.

5) The baseline modelled scenario takes into account the progressive scenario of building renovation. It will gradually increase the annual rate of quality building renovation to 3 % between 2025 and 2030. This is a significant increase, but within realistic limits. In 2050, this scenario leaves 5 % of buildings without renovation and another 8 % of buildings will only undergo shallow renovation (e.g. monument protected objects).

6) The development of nuclear energy is an important element of the decarbonisation strategy. The share of nuclear energy in energy consumption will increase, which will be achieved through the construction of large nuclear reactors and small and medium modular rectors (SMRs). Priority will be given to the construction of additional units on the existing nuclear sites of Dukovany and Temelín, aiming, inter alia, at the partial replacement of existing nuclear resources. In addition, the construction of small and medium-sized reactors is envisaged, with a view to operationalising the first SMR in the mid30s.

7) Another important tool for achieving the decarbonisation objectives is the use of biomethane and hydrogen (and other low-emission gases). The national plan is developed in parallel with the update of the hydrogen strategy of the Czech Republic, which is why the different objectives are interlinked. In particular, replacing part of fossil hydrogen in industry with low-emission and renewable hydrogen is important for the 2030 targets. The hydrogen strategy also puts emphasis on future imports of renewable hydrogen. Hydrogen production in the Czech Republic can help with the regulation of the electricity system by making efficient use of the surplus of energy generated.

8) Finally, “last mile” will be needed, especially for heavily decarbonised sectors, the use of carbon storage technology and use. By 2050, the scenario envisages a total volume of 18 Mt. Whether it is about storage in Czechia or joining Europe-wide activities remains a question to be explored so far.

Costs and benefits of decarbonisation

The total additional costs (total annualised costs) of the fully decarbonised scenario i, which targets emissions at 6.3 Mt in 2050, are estimated to be more than CZK 1200 billion (cumulative costs up to 2050) higher than those with already existing measures. Part of these additional costs can then be covered by various sources of public funds (revenue from emissions trading, European fund and financial instruments). In addition to the costs, decarbonisation also brings multiple benefits in terms of greater resilience, improved indoor environment in buildings, etc.

As decarbonisation investments will be enormous, there is a need to create a predictable environment for investors in all areas, to simplify and shorten the authorisation of investments and to communicate in a comprehensible way to all groups of the public about the objectives and instruments contained in the plan.

Content

Introduction

The Czech Republic's National Energy and Climate Plan (NCP) was drawn up on the basis of the requirement of Regulation (EU) 2018/1999 of the European Parliament and of the Council on the Governance of the Energy Union and Climate Action2, a proposal for which was presented as part of the 'Clean Energy for All Europeans' legislative package published by the European Commission on 30 November 2016. The first national plan under the above-mentioned Regulation was approved by the Czech Government on 13 January 2020, it was a revised version of the draft National Plan, which was taken into account by the Czech Government on 28 January 2019 and which was submitted to the European Commission on 30 January 2019. This document is a proposal to update the Czech Republic's national plan. Following an iterative process with the European Commission, the final version of this document will be submitted by 30 June 2024. Unfortunately, the fact that not all relevant legislation is adopted at EU level, in particular legislation under the Fit-for-55 legislative package, complicates the preparation of the draft National Plan.

The obligation to prepare the Czech Republic's National Energy and Climate Plan follows from Article 3 of the above-mentioned Regulation. This document is the final version of the National Energy and Climate Plan by the Czech Republic pursuant to Article 3 of the Regulation. The structure of the national plan is precisely laid down in the annexes (namely Annex I) to this Regulation.3 Pursuant to Article 14, by 30 June 2023, thereafter by 1 January 2033, and every 10 years thereafter, each Member State shall send to the Commission a draft update of the latest notified integrated national energy and climate plan or provide the Commission with a drain on the absence of the need to update the plan.

The stated objectives (or the purpose) of the National Energy and Climate Plan (NECP) and the overall governance system of the Energy Union are the following objectives: (i) preparing and implementing policies and measures to meet the objectives of the Energy Union and long-term commitments to reduce greenhouse gas emissions, in particular with regard to the European Union's 2030 energy and climate targets; (II) stimulating cooperation between Member States; (III) increased regulatory and investment certainty resulting from the coverage of all five fundamental dimensions of the Energy Union, supported by planning documents and a robust and comprehensive analytical framework; (IV) effective opportunities for public participation; (v) a structured, transparent and iterative process between the Commission and the Member States; (VI) strengthening cooperation between energy and climate policy makers4.

2The full title of the Regulation is as follows: Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council;

3The Annex to the Regulation prescribes the headings of the first, second, third (and, exceptionally, the fourth order), but also the sub-parts introduced by Roman numerals. The headings of the fourth order are not based (except for exceptions) on the requirements of Annex I and have been added to better structure the text.

4The above objectives have been formulated on the basis of information provided by the European Commission.

Section A: National plan

1 Overview and procedure for drawing up the plan

1.1 Summary

1. Political, economic, environmental, and social context of the plan

1.1.1.1 Political context

The Czech Republic is a stable democratic state, a member of the UN, the OECD, the EU and NATO and other international organisations. The Czech Republic has a directly elected President and a bicameral Parliament, composed of the Senate and the Chamber of Deputies.

As part of a self-governing arrangement, the Czech Republic is divided into 14 self-governing regions, 76 counties and more than 6200 municipalities.5 Municipalities and regions are managed by elected councils. The counties are headed by the governors, head of the statutory cities and mayors at the head of other cities and small municipalities. Prague, which is also a region, a statutory city and a capital city, has a special status.

On 13 January 2022, the confidence of the 16th government (since 1993) was expressed in the leadership of President Prof. PhDr. Petr Fiala, Ph.D., LL.M., for ODS. The Government is composed of two coalition parties to SPOL (ODS, KDU- ČSL, TOP 09) and Pirate and Starsta (STAN and Pirate). Petra Fialy's government approved on 6 January 2022 the Programme Statement of the Government of the Czech Republic. It was approved by the Cabinet at the meeting on 1 March 2023 (reference). The programme statement contains explicit commitments in the fields of energy and nuclear energy (in the section on

5In the case of districts, this is a territorial rather than a self-governing division.

industry and trade) and environment (separate part). On 12 April 2023, the Government of the Czech Republic approved updates to the Czech Republic's State Energy Concept and related strategic documents, which guide the drafting of relative strategic documents (link).

1.1.1.2 Economic context

In recent years, the Czech Republic has been undergoing a phase of economic downturn. The COVID-19 pandemic in 2020 and subsequent developments in 2021 suggested that the global economic situation would not be favourable. The post-pandemic recovery itself has not been as smooth as initially foreseen. The strong growth in demand, the slow recovery on the supply side and mismatches in supply-purchasing chains have led to a shortage of some production inputs and the consequent gradual rise in commodity prices, in particular energy. Russia's subsequent aggression against Ukraine has exacerbated these adverse effects. European and global sanctions against the Russian Federation have caused shortages of selected raw materials and commodities, leading to further price increases and led to inflation peaks in a number of countries (including the Czech Republic) in the last few decades.

Domestic economic output recorded a year-on-year decline in the first half of 2023. The decline was driven by persistent high inflation, which worsened the financial situation of both firms and households, thereby limiting their investment and consumption. The unfavourable situation is also reflected in consumer and business confidence indices, which are below their long-term averages. On the contrary, government expenditure in support of the economy in the energy crisis showed growth, and foreign trade also contributed positively, with exports of goods in particular. From a sectoral point of view, the industry has contributed most significantly to real gross value added growth, but was driven by high growth in a few sectors, in particular in the automotive sector. On the contrary, construction and a group of business, transport, accommodation and hospitality sectors have had a negative impact.

& t r IV i O • 1 "" "" "" *1 1 • R r VI stood at 15.1 % on average year-on-year in 2022, while high dynamics were also carried forward to 2023. This was due to both inflationary pressures from abroad and from the domestic economy. Rising housing costs and rising food and transport prices were the biggest driver of growth, given the weight in the consumer basket, where high energy prices were particularly reflected. Inflation has thus become a significant macroeconomic problem, which the Czech National Bank (ČNB) has embarked on by increasing rates in the first half of last year. In summer 2022, the Banking Council raised the two-week repo rate to 7 %, the highest level since April 1999.

The sharper domestic rate growth was positively reflected in the koruna rate, which appreciated against the euro at its strongest level since July 2008 in April 2023. The strong krona was also due to the better situation in the gas market and the generally better sentiment in markets that expected the recession to be very low this year. The strong koruna is also favourable to the CNB as it helps to dampen imported inflation. However, a strong domestic currency weakens the price competitiveness of domestic firms abroad.

Another obstacle to economic growth in recent years has been the mismatch in the Czech labour market, which is reflected in a higher number of job vacancies since 2018 than jobseekers. The lack of workers in the technical and labour professions, in services, but also with low skills and barriers, is also an inappropriate professional structure. The Czech Republic has reached the lowest unemployment rate from the European Union (EU) countries in recent years. The labour market situation is putting upward pressure on wages, which recorded annual nominal growth in both 2022 and the first half of 2023, but have actually declined after taking into account the impact of inflation.

The lack of staff and their inappropriate structure hampers the growth of domestic production and incentivises domestic businesses to digitise and robotise. In the short term, labour shortages can be partly mitigated by the involvement of so-called "disrupted persons" (inactive but willing to work) or by facilitating the conditions of employment of non-EU nationals. In the medium and long term, in terms of economic growth, it will be important to ensure that the education system better equips graduates with the competences and skills needed to perform certain professions in the context of the digitalisation and robotisation of the economy, including those that are yet to emerge. On the demand side of the labour market, production and other processes will need to be modernised to mitigate the necessary intensity of labour force participation.

Public finances have also been a major challenge in recent years and served as a tool to support firms and households during the pandemic and subsequently during the energy crisis. Governments around the world have tried to mitigate the effects of the energy crisis, even at the cost of higher indebtedness. This has also led to significant State budget deficits and a rise in sovereign debt in the Czech Republic, which, although smaller in the EU, is unfavourable to its growth dynamics. The consolidation of public finances will thus be crucial for the future direction of the Czech economy.

In terms of external macroeconomic balance, the current account of the balance of payments was positive from 2014 to 2020. The surplus balances of goods and services exceeded the primary income deficit, which is most affected by the outflow of foreign direct investment income in the form of dividends and reinvested earnings. However, there was a significant fall in the trade in goods balance in 2021 and 2022. The high prices of energy commodities, for which the Czech Republic is a net importer, translated into a significant deficit in the balance of goods in 2022. The balance of goods and services has been negative for the first time since the accession of the Czech Republic to the EU, and the current account has recorded the highest historical deficit in the era of a separate Czech Republic.

Real Gross Domestic Product (GDP) is expected to stagnation in 2023 with a gradual recovery in the coming years. Households' final consumption expenditure will be negatively affected this year by the continued decline in real disposable income and the restrictive monetary policy stance. However, the future growth of the economy should already be driven by a recovery in household consumption and investment by firms that delayed their spending in periods of high inflation and high interest rates. Inflation is expected to reach the CNB's 2 % inflation target over the next two years. However, there are a number of risks, such as a slower decline in inflation expectations in the domestic economy or a stronger recovery in consumer demand[6][1] which is pro-inflationary and may jeopardise the recovery of the domestic economy.

The crises of recent years have reversed the convergence of the Czech economy towards more advanced countries. While the Czech GDP per capita in PPS (purchasing power standard) grew to 93 % of the EU average by 2019, the pandemic and the subsequent energy crisis caused the indicator to fall to 91 % in 2022. The expected stagnation or possible slight contraction of the domestic economy in 2023 compared to moderate growth in the EU will cause a further decline in convergence.

Table 1: *Economic context*

		2018	2019	2020	2021	2022	2023 *PRE*	2024 *cu*
Nominal gross domestic product	*billion CZK,*	**5 411**	**5 791**	**5 709**	**6 109**	**6 786**	**7 384**	**7 751**
	growth in %,	5,9	7,0	—1,4	7,0	11,1	8,8	5,0
Real gross domestic product	*growth in %,*	**3,2**	**3,0**	**—5,5**	**3,6**	**2,4**	**—0,2**	**2,3**
Household consumption	*growth in %,*	3,5	2,7	—7,2	4,1	—0,7	—3,4	3,9
General government consumption	*growth in %,*	3,9	2,5	4,2	1,4	0,6	2,4	1,8
Gross fixed capital formation	*growth in %,*	10,0	5,9	—6,0	0,8	3,0	0,8	0,7

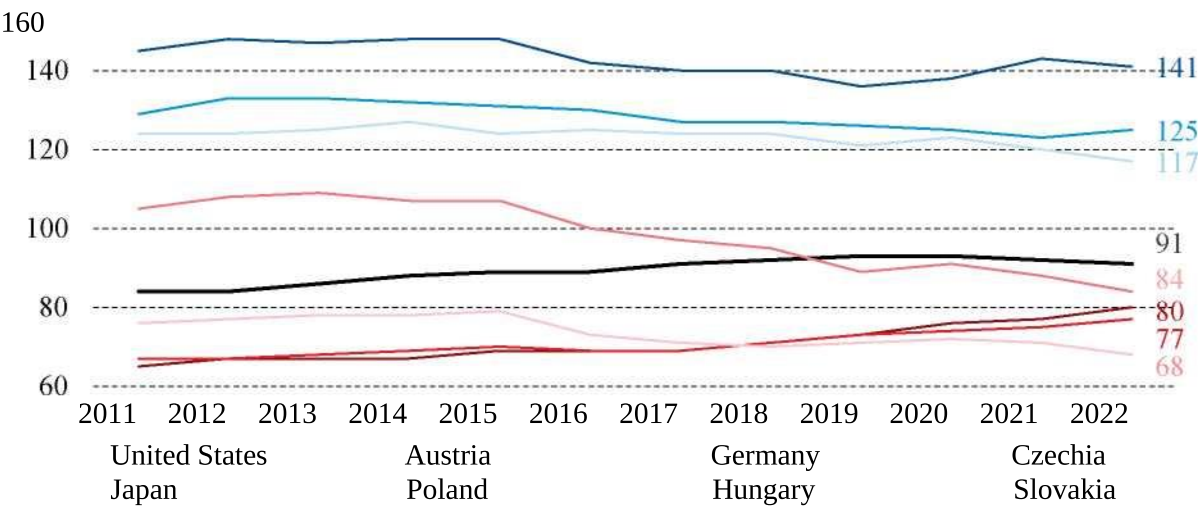
Contribution of net exports to GDP	pps, p.c.	—1,2	0,0	—0,4	—3,6	0,9	2,4	1,3
Contribution of changes in inventories to	pps, p.c.	—0,5	—0.3	—0,9	4,8	0,9	—1,7	—1,3
GDP deflator	*growth in %*	**2,6**	**3,9**	**4,3**	**3,3**	**8,5**	**9,0**	**2,6**
Consumer price inflation rate	*average %*	**2,1**	**2,8**	**3,2**	**3,8**	**15,1**	**10,9**	**2,8**
Employment *(VŠPS)*	*growth in %*	**1,4**	**0,2**	**—1,3**	**—0,4**	**—0.8**	**1,0**	**0,7**
Unemployment rate *(VŠPS)*	*average %*	**2,2**	**2,0**	**2,6**	**2,8**	**2,3**	**2,8**	**2,7**
Volume of wages and salaries *(domain*	*growth in %,*	**9,6**	**7,8**	**0,1**	**5,9**	**9,3**	**8,4**	**6,1**
Current account balance	*% OF GDP*	**0,4**	**0,3**	**2,0**	**—2.8**	**—6.1**	**—1,7**	**—0,6**
General government balance	*% OF GDP*	**0,9**	**0,3**	**—5,8**	**—5,1**	**—3,2**	**—3,6**	**.**
General government debt	*% OF GDP*	**32,1**	**30,0**	**37,7**	**42,0**	**44,2**	**44,7**	**.**
Assumptions:								
Exchange rate CZK/EUR		**25,6**	**25,7**	**26,4**	**25,6**	**24,6**	**23,8**	**23,9**
Long-term interest rates	*% p.a.*	**2,0**	**1,5**	**1,1**	**1,9**	**4,3**	**4,3**	**3,9**
Brent oil	*USD/barrel*	**71**	**64**	**42**	**71**	**101**	**80**	**77**
Euro area GDP	*growth in %,*	**1,8**	**1,6**	**—6.2**	**5,4**	**3,4**	**0,7**	**1,2**

Source: Ministry of Finance of the Czech Republic, Macroeconomic predictions – August 2023

The OECD Economic Survey was also published on 30 April 2023,which provides more detailed information on the evolution ofthe Czech economy and the structural changes taking place therein.

[6] It is based on the scenarios ofthe CNB's Monetary Policy Report.

Figure 1: *Comparison of GDP per capita in PPS (Purchasing Power Standard) (EU 27 = 100)*



Data source: Eurostat; figure: MINISTRY OF INDUSTRY AND TRADE

Environmental context

The state of the environment has improved significantly over the last 30 years in terms of emissions of airborne dust and sulphur oxides and nitrogen from large and medium combustion sources. However, it is still inadequate, particularly in terms of air quality and health-risk substances, and poses serious risks to human health and ecosystems in the affected areas, as well as premature deaths and other economic damage. The situation is unsatisfactory in many municipalities in the Czech Republic due to emissions from domestic coal-fired plants and in intensive transport cities due to emissions from diesel and petrol engines.

The main risks to maintaining or further improving the state of the environment are the changes in the landscape linked to the development of settlements (enlargement of buildings, changes in functional use of the land) and developing road infrastructure, increased traffic intensity, intensive management practices in the countryside and, not least, the consumption of households and individuals (heating, consumption of natural resources, etc.). Developments in pressures on the environment will be highly dependent on developments in economic performance over the next 10 years, while the measured burden per unit of economic output will continue to decline gradually. An important aspect for improving household consumption behaviour is to promote increased consumer awareness of the issues of sustainable consumption and production and of the impacts of the population’s high consumption behaviour, regardless of the exhaustibility of resources.

The evolution of anthropogenic pressures and the state of environmental compartments may be affected by a changing climate and a consequent change in the temperature and rainfall regime. It can be assumed that this mechanism will affect the sum of emissions from the production of electricity and heat, the dispersion of pollutants and air quality, the quality and quantity of surface water and groundwater, biodiversity and the condition of forest stands, soil quality, the spread of harmful organisms in agriculture and the associated consumption of agrochemicals. Overall, the so-called climate extremity is likely to increase by increasing the incidence of hazardous hydrological and weather phenomena such as floods, droughts, strong winds, temperature fluctuations, etc.

Model simulations expect a continuous gradual increase in the annual average temperature of 0.3 °C over a decade. Overall annual rainfall will not change significantly, but there will be an increase in the variation of precipitation, both between years and within the year, as well as the uneven distribution of rainfall in our territory. Changes in land use can lead to higher risk of aquatic and wind erosion and a reduction in the retention capacity of the landscape, making it more prone to floods due to expected more frequent rainfall. Similarly, more frequent droughts are expected, due both to a lack of precipitation (so-called weather drought) and increased vapour due to high temperatures (so-called agricultural drought).

Greenhouse gas emissions decreased by 40.7 % between 1990 and 2021, including net emissions from the land use and forestry sector (LULUCF) by only 33.7 %. However, the Czech Republic has higher specific greenhouse gas emissions per capita compared to the EU average (12.1 t CO2eq/ v. vs 7.3 t CO_2 eq. in the EU). On the other hand, in the European context, the Czech Republic has a below-average share of total greenhouse gas emissions, which currently stands at around 16 %, but a gradual increase can be expected. The emission intensity, i.e. the emission intensity of GDP generation, is higher in the Czech Republic compared to the EU average, given the higher contribution of industry to GDP generation and the fuel mix, in which lignite still has a significant place.

The Czech Republic’s main problem at present is pollution of ambient air by benzo[a]pyrene, suspended particulate matter of PM_{10} and $PM_{2.5}$ and ground-level ozone. At traffic-loaded sites, it is also nitrogen dioxide. While most of the emission characteristics show a decreasing trend over the period 2010-2021, the concentrations of the above-mentioned pollutants with serious impacts on human health still exceed the established emission limits on a number of sites in the Czech Republic. In 2021, areas with exceedances without the inclusion of ground-level ozone accounted for 6.1 % of the Czech Republic’s territory, where around 20 % of the population lives. The delimitation of these areas is largely due to the exceedance of the annual emission limit for benzo[a]pyrene. The most heavily affected area in the Czech Republic has long been the agglomeration of Ostrava/Karviná/Frýdek – Místek.

Directive (EU) 2016/2284 of the European Parliament and of the Council on the reduction of national emissions of certain atmospheric pollutants requires Member States to reduce emissions of selected pollutants (NO_x, NMVOC, SO_2, NH_3 and $PM_{2.5}$). These obligations are imposed as so-called 'national emission reduction commitments' and are set by that directive for 2020, 2025 and 2030 as a percentage reduction in emissions of these pollutants to the 2005 base year. The commitments for the Czech Republic are set out in the table below. Similarly to the graph below, the table shows that the Czech Republic has met the national emission reduction commitments set for 2020.

Table No 2: *Values of the national emission reduction commitments for 2020, 2025 and 2030 (kt)*

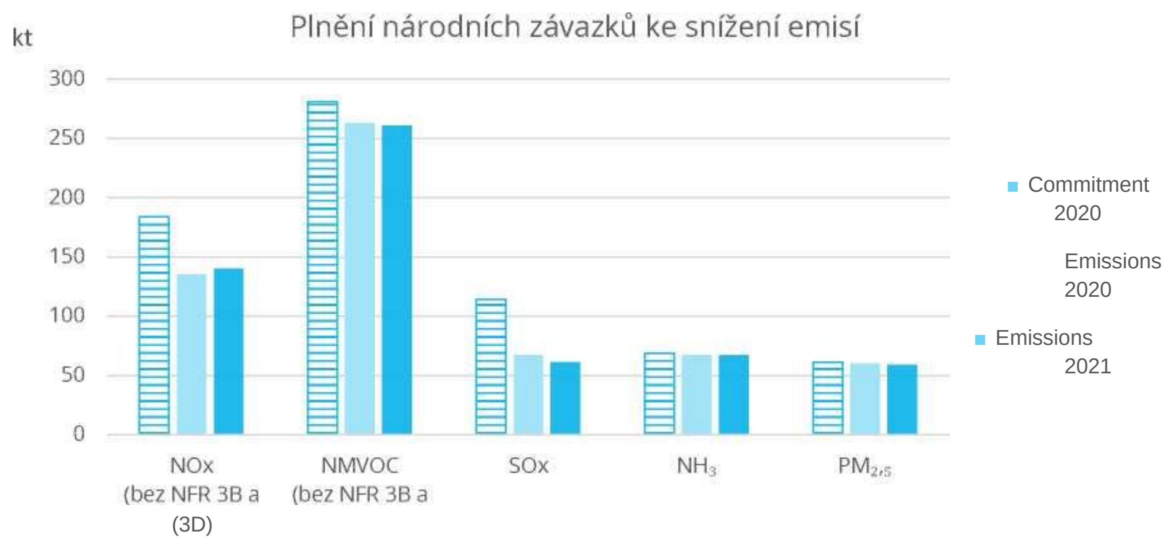
	NOx	**VOC**	**SO_2**	**NH_3**	**$PM_{2,5}$**
Emissions in base year 2005 (kt)6	300 (283)*	378 (343)*	208	74	74
Emissions in 2020 (kt)	154 (135)*	301 (263)*	67	67	60
Emissions in 2021 (kt)	158 (140)*	298 (261)*	61	67	59
2020 emission reduction commitment (% versus 2005)	35 %	18 %	45 %	7 %	17 %

6 National Emission Inventory data as of 20. 9. 2023, https://cdr.eionet.europa.eu/cz/eu/nec_revised/inventories/envzqqyng/

2025 emission reduction commitment (% versus 2005)	49 %	34 %	55 %	14 %	38 %
2030 emission reduction commitment (% versus 2005)	64 %	50 %	66 %	22 %	60 %

******In accordance with Article 3(d), NOx and NMVOC emissions from NFR 3B and 3D (agriculture) sectors shall not be taken into account for the fulfilment of national commitments. The total pollutant emissions without NFR 3B and NFR 3D are thus indicated in brackets.*

Chart 2: *National emission reduction commitments 2020, compliance*

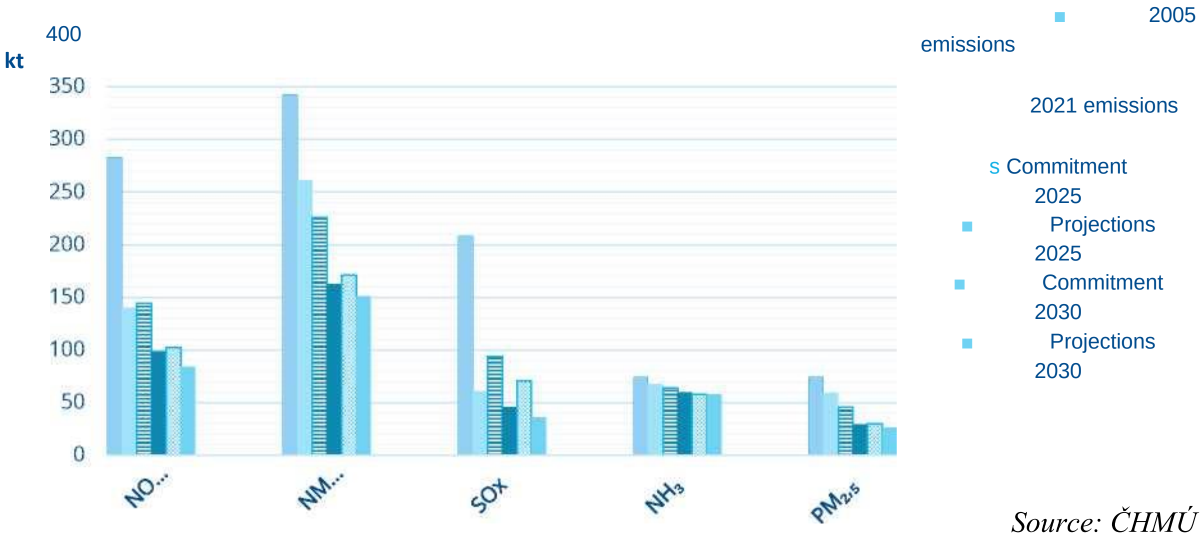


Source: ČHMÚ

In 2023, the national emission projections were updated to predict the evolution of emissions of pollutants for which national emission reduction commitments are set in subsequent years. This projection is the basic analytical basis for updating the Czech Republic's National Emissions Reduction Programme, the basic concept for air protection, which the Ministry of the Environment draws up on the basis of the obligation imposed by Act No 201/2012 on environmental protection, as amended, and on the basis of the obligation laid down in Directive 2016/2284 (EU).

The national emissions projection, the preparation of which has been coordinated with that of greenhouse gas emissions, predicts compliance with the national emission reduction commitments also for 2025 and 2030. As shown in Figure 3 below, although the national emission projections do not indicate non-compliance with the national emission commitments, for the pollutants NH_3 and $PM_{2.5}$, the result of the projection and the level of the commitment are almost identical. The risks of changing and increasing the production of these pollutants cannot be ignored.

Chart 3: *Comparison of emission projections for 2025 and 2030 and national emission reduction commitments*



Source: ČHMÚ

Water quality in watercourses is gradually improving, mainly due to a decrease in the amount of pollution discharged from point sources. A significant factor affecting water quality is the share of the population connected to sewers that are completed by a waste water treatment plant; their number has almost doubled since 1990, in particular the expansion of tertiary-level waste water treatment plants (disposal of P and N) and significantly smaller municipalities are also being addressed in this way. The requirements of Council Directive 91/271/EEC concerning urban waste water treatment, which require that the municipalities producing pollution are connected to the equivalent of 2000 inhabitants or more (population equivalent) to waste water treatment plants, are not met only in the case of a small proportion of these municipalities. In 2021, 87.4 % of the Czech population was connected to the public sewerage system. However, so-called rain shedding on single collecting networks remains a major problem. In the long term, it has been very difficult to reduce the level of widespread pollution, mainly due to agricultural activity (the use of mineral fertilisers), which in turn leads to eutrophication of watercourses and reservoirs. An equally important component in assessing the status of water bodies is not only their chemical status, but also their ecological value. In this regard, migration permeability and morphological conditions in watercourses should be improved, where appropriate and appropriate. The Urban Waste Water Treatment Directive (UWWTD) is currently under revision, which also targets other specific substances (so-called micropollutants) that enter the aquatic environment in the long term. This includes, for example, pharmaceuticals, substances and personal care products (PPCPs) and microplastics that pass through sewage into water reservoirs and streams, where they have a negative impact not only on aquatic organisms but also on human health.

Due to changes in landscape use and climate change, the resilience of ecosystems is declining, reflected in the adverse condition of ecosystems, many wildlife (including European-relevant species of flora and fauna) and by reducing the ability to eliminate or absorb external influences, including the spread of non-native species and pests. The main reasons for the decline in ecosystem resilience are the continuing consequences of intensification of farming, in particular since the second half of the 20th century, accompanied by the unification of the landscape thus exploited, the persistence of a significant proportion of forest stands with unbalanced species, age and spatial composition, persistent degradation of forest soils affected by immissions, the regulation and fragmentation of watercourses, and the ever faster continuation of the construction and fragmentation of the landscape (both transport and construction). These reasons have led to a long-term reduction in the ecological stability of the landscape, a decline in the volume and quality of ecosystem services provided to human society, the loss of rare species and a reduction in the abundance and vitality of populations of common species, the disruption of migratory routes and increased stress on both plants and animals, and the spread of unwanted (non-native and invasive) species.

The social context

Inequality and poverty have been low in the last decade compared to other OECD countries. There are large regional disparities in poverty rates, with high poverty rates in the North-West and Moravian-Silesian regions, while at the same time relatively low poverty rates prevail, reflecting high wage spreads due to differences in skills and productivity between sectors. The largest economic inequality is in Prague, with low-income people in Prague being relatively ‘better’ compared to those from ‘peripheral’ regions. In the north-west, the higher poverty rate is due to the low wage/income of the majority of workers.

ii. Overarching strategy covering the five dimensions of the Energy Union

The Czech Republic 2030 Strategic Framework can be identified as an overarching strategy covering all five dimensions of the Energy Union. This document defines the headline targets for the development of the Czech Republic. The strategic framework brings together two key concepts: sustainable development and quality of life. The Czech Republic 2030 provides a long-term framework for strategic planning in the state administration and will allow transparent communication of the long-term objectives of the state administration, both professional and general. The Strategic Framework is the implementation of the 2030 Agenda and the 17 Sustainable Development Goals in the Czech Republic. A report on quality of life and its sustainability is being prepared every three years. The specific measures are then developed in the implementation plan.[8]

In this respect, it should be noted that the Strategic Framework of the Czech Republic 2030 has a significantly broader definition of the Energy Union can only be seen as one of the parts of this overall definition. Table ***3*** lists other major high-level strategic documents, both of an overarching and sectoral nature (including the Czech Republic’s 2030 Strategic Framework mentioned above). However, this is not an overall list, but only the most important documents. Key energy and climate strategies are set out in sub-chapters 1.2.1.1 and 1.2.1.2 below.

Table 3: *High-level strategy papers*

Strategy paper	Short description
Strategic Framework Czech Republic 2030	A top-up document defining the headline targets for the development of the Czech Republic. The document is the Czech response to the adoption of the Global Development Agenda 2030 by the UN General Assembly in New York in September 2015, transferring 17 Sustainable Development Goals (SDGs) domestically. Out of a total of 6 key areas in the Czech Republic, energy is mainly devoted to the economic model and the Municipality and regions. The 4 strategic objectives defined for these two areas address energy in relation to increasing the energy and material efficiency of the economy, the decentralisation of resources and the development of community energy, the need to differentiate energy sources and improve the energy performance of buildings. In addition, the Czech

[8] More information and relevant material are available on the website www.cr2030.cz.

	stresses the need to ensure a resilient, competitive and low-carbon energy mix that goes hand in hand with dual transit.0.
Czech Regional Development Strategy 2014-2020 (CRR)	A basic concept paper in the field of regional development. The Czech Republic's regional development strategy is an instrument for implementing regional policy and coordinating the impact of other public policies on regional development. The Czech Republic's regional development strategy links sectoral aspects (topics and priorities) to territorial aspects. In terms of time, it is a medium-term document containing a long-term view of the Czech Republic's regional development (long-term vision) and short-term implementation steps. The Regional Development Strategy has been updated and approved by Government Resolution No 775 of 4 November 2019 on Regional Development Strategy 2021+
Transport policy of the Czech Republic for 2021-2027 with a view to 2050	The transport sector is one of the very important areas of the national economy, affecting virtually all areas of public and private life and business. This is a sector which is a necessary condition for improving the competitiveness of the Czech Republic. The document identifies the main problems in the sector and proposes solutions.
The Czech Republic's international competitiveness strategy for 2012-2020	The strategy defines measures the implementation of which should move the Czech Republic among the 20 most competitive economies in the world. The means of achieving this ambition include, in particular, maintaining long-term balance in public budgets, improving the quality and efficiency of public administration, modernising transport, energy and ICT infrastructure, creating a financially sustainable public health model, optimising the education system and the entire national innovation system as the main pillars of developing the knowledge society and economy, increasing labour market flexibility or creating favourable conditions for the development of business and business activities.
National R & D & I Policy of the Czech Republic 2016-2020 and its update for 2019-2020	The Czech Republic's national R & D & I policy for 2016-2020 is a fundamental strategic document at national level, setting out the guidelines in the field of R & D & I and covering other related strategic documents of the Czech Republic. More emphasis on supporting applied research for the needs of

	economies and government, and identifies the key disciplines and research themes on which applied research should focus. National policy also proposes changes in science governance and funding to generate more scientific excellence and to involve companies more in R & D. The document replaced the document from the National Research, Development and Innovation Policy of the Czech Republic for the years 2009 to 2015. In the course of 2018, an evaluation report on the implementation of the Czech Republic’s National Research, Development and Innovation Policy 2016-2020, approved by the Czech Government in February 2019, was drawn up. This report includes an update of the Czech Republic’s National R & D & I Policy 2016-2020 for the period 2019-2020, which was prepared in the context of the proposed adjustments to the measures described in that
National research, experimental development and innovation priorities	By its Resolution of 19 July 2012 No 552, the Government approved the National Priorities for Oriented Research, Experimental Development and Innovation. The national priorities for oriented research, experimental development and innovation are valid for the period up to 2030, with gradual implementation. Within the defined 6 priority areas, there are 24 sub-areas with a total of 170 specific objectives. The paper provides a description of the different priority areas and sub-areas, lists the links between the different areas and defines several systemic measures. The document also contains a statement on the assumption of the allocation of R & D & I expenditure from the national budget to the different areas and defines the period during which performance evaluations and updates of priorities will be carried out.
National Research and Innovation Strategies for Smart Specialisation of the Czech Republic (RIS3 strategy)	The purpose of the National RIS3 Strategy is to effectively target funds – European, national, regional and private – towards priority innovative specialisations in order to fully exploit the Czech Republic’s knowledge potential.
National Industry 4.0 initiative	The document aims to mobilise key industrial departments and representatives to draw up detailed action plans in the fields of political, economic and social life. Reducing the energy and raw material intensity of production, increasing productivity in production, optimising logistics routes, technological solutions for decentralised production and distribution systems

	energy or smart urban infrastructure are the main benefits of Industry 4.0.
Raw materials policy on minerals and their resources	The raw materials policy was updated in 2017. The document responds to the transformation of the raw materials industry, in particular in terms of the range of raw materials that the modern industry is interested in. In particular, there is a big shift towards modern high-tech raw materials used in electronics and other modern industries. The document reflects the principles of the European integrated Raw Materials Initiative, which has emerged following the increase in the importance of EU Member States' raw materials security in a pan-European context.
Czech State Energy Concept (SEK)	High-level strategy paper for the energy sector. Approved in May 2015. The current SEK has a horizon up to 2040. An assessment of the implementation of the Czech Republic's State Energy Concept was prepared at the end of 2020 and 2021. This evaluation was submitted to the Czech Government in April 2021. The Czech Government approved the Czech Republic's assessment of the implementation of the State Energy Concept by Resolution No 260 of 8 March and instructed the Minister for Industry and Trade to submit to the government for approval by 31 December 2023 a draft update of the Framework in accordance with the conclusions contained in the material. On 12 April 2023, the Government of the Czech Republic approved updates to the Czech Republic's State Energy Concept and related strategic documents, which guide the drafting of
Czech Republic's State Environment Policy 2030 – with a 2050 perspective	The Czech Republic's state environmental policy 2030 with a view to 2050 is an overarching strategic document which defines the implementation of effective environmental protection in the Czech Republic. The main objectives are to ensure a healthy and high-quality environment for citizens living in the Czech Republic, to contribute to the efficient use of all resources and to minimise negative impacts of human activity on the environment, including transboundary impacts, thus contributing to improving the quality of life in Europe and globally.
Innovation Strategy of the Czech Republic 2019-2030	The Czech Republic's Innovation Strategy 2019-2030 was approved by Government Resolution No 104 of 4 February 2019. It is a strategic framework plan that sets out government R & D & I policy to help the Czech Republic move among Europe's most innovative countries over 12 years.

	The innovation strategy consists of nine interlinked pillars with backgrounds, key strategic objectives and the tools to achieve them. These are areas: R & D funding and evaluation, Innovation and Research Centres, National Start-up and Spin-off Environments, Polytechnic Education, Digitalisation, Mobility and Building Environment, Intellectual Property Protection, Frequent Investment and Chyter Marketing.
The Czech Republic's territorial development policy	At the time when the draft update of the Czech Republic's national plan was drawn up, the Spatial Development Policy as amended by Updates Nos 1 to 6 is in force. Most recently completed Update No 6 was approved by Government Resolution 542/2023 of 19 July 2023 and is effective since 1 September 2023. A national strategy paper and a land-use planning instrument binding on the acquisition and publication of regional and local planning documents and for decision-making in the territory. Its main purpose is to coordinate the territorial planning activities of the regions and/or municipalities and sectoral policies, strategies and documents with a territorial projection. This document, inter alia, sets out regional planning priorities and, in particular, defines development plans (areas and corridors) of transport and technical infrastructure of international and republic interest, or which, by their importance, extend beyond the territory of one region.
Hydrogen strategy	The hydrogen strategy of the Czech Republic is being developed in the context of the Hydrogen Strategy for a climate-neutral Europe, which reflects the objective of the European Green Deal – achieving EU climate neutrality by 2050. In 2023, it is the subject of the update. It sets national targets for the hydrogen economy.
Climate policy	Climate policy in the Czech Republic presents a 2030 climate strategy and, at the same time, a roadmap for the development of a low-emission economy by 2050. It focuses on measures to reduce greenhouse gas emissions and is therefore complementary to the approved Strategy for Adaptation to Climate Change in the Czech Republic (2015), which focuses on adaptation to climate change. The implementation of the Climate Policy in the Czech Republic was evaluated in 2021 and is planned to be updated by the end of 2023.

Source: Self-processing of the Ministry of Industry and Trade from publicly available information

iii. Overview table showing the plan's main objectives, policies and measures

Table 4 provides an overview table of greenhouse gas emission reductions. Table 5 shows the renewable energy targets. Table 6 then presents the energy efficiency targets. The main objectives in the other dimensions of the Energy Union (i.e. energy security, the internal energy market and research, innovation and competitiveness) and the policies and measures in all dimensions of the Energy Union are clearly described in the various parts of this document and it is not possible simply to create an overview table of "reasonable scope" with this information.

Table 4: *Overview table of greenhouse gas emission reduction targets*

2030	**2050**
A 26 % reduction in greenhouse gas emissions in non-EU ETS sectors compared to 2005. Reducing the share of fossil fuels (used without capture technology) in primary energy consumption to 50 % by 2030.	Contributing to EU climate neutrality and reducing the share of fossil fuels (used without capture technology) in primary energy consumption to 0 %.

Source: Proposal to update Climate Policy in the Czech Republic, SEC Update

Table 5: *Overview table of RES targets (RES share in gross final consumption)*

	2020	**2030 -** Roadmap adopted in 2020	**2030 -** Roadmap adopted in 2023
Share of RES	13.0 %	22.0 %	30 %

Source: Self-processing of the Ministry of Industry and Trade for the purposes of the National Plan

Table 6: *Overview table of energy efficiency targets*

	2020	**2030**
Article 3 (non-binding target)	Final energy consumption: 1 060 PJ Primary energy consumption: 1 855 PJ	Final energy consumption: 846 PJ[7] Primary energy consumption: 1 206 PJ
Article 5 (binding target)	148.6 I.E.	124,0 I.E.
Article 7 (binding target)	Annual energy savings: 51.1 PJ Accumulated savings: 204.39 PJ	Annual energy savings: 145 PJ Accumulated savings: 669 PJ

Source: Self-processing of the Ministry of Industry and Trade for the purposes of the National Plan

7This is the final consumption in EUROSTAT methodology, not the so-called 'final consumption 2020-2030'.

Table 7 *Overview table of targets for the replacement of fossil hydrogen with renewable hydrogen as required by the Renewable Energy Directive (RED III)*

	2023	2035
Hydrogen substitution in industry	Under Article 22a of the Renewable Energy Directive, Member States must ensure that industry uses 42 % RFNBOs for final energy and non-energy purposes. The numerator is the Energy value of RFNBOs consumed in the industrial sector for both final energy and non-energy purposes minus RFNBOs used for the production of conventional fuels. The denominator is the energy value of hydrogen consumed in the industrial sector for both final energy and non-energy purposes, with the exception of hydrogen used for the production of conventional fuels (as an intermediate product) and hydrogen used for the production of biofuels and two other exemptions. According to preliminary calculations, this would be about 8000 tonnes per year for the Czech Republic.	Under Article 22a of the Renewable Energy Directive, Member States must ensure that industry uses 60 % RFNBOs for final energy and non-energy purposes under the same conditions as in 2030. According to preliminary calculations, this would be around 12000 tonnes per year for the Czech Republic.
Reducing emissions in transport	Fuel suppliers must either achieve a 14.5 % reduction in greenhouse gas emissions from the production of their fuels or must achieve at least a 29 % share of renewable energy in the production of their fuels. No**R counts on the use of an emission pathway, in accordance with Article 25(a)(ii).** The minimum share of RFNBOs in transport fuel consumption shall be at least 1 %. According to preliminary calculations, this would be around 13600 tonnes per year for the Czech Republic.	The Directive does not yet set an additional stricter target for 2035. However, an increasing number of low-emission vehicles can be expected to lead fuel suppliers to increase the share of RFNBOs at the expense of the “greening” of conventional fuel production.

Source: 2021 proposal for a Directive of the European Parliament and of the Council amending Directive (EU) 2018/2001 of the European Parliament and of the Council

Overview of the current political situation

i. National and EU energy system and policy context of the national plan

The political context of the national plan is described in chapter 1.1.1.1. The description of the European energy system and policy context at EU level goes beyond this document and is addressed in other dedicated documents.

ii. Current energy and climate practices and measures on the five dimensions of energy Union

1.2.1.1 The Czech Republic’s State Energy Concept and other strategic documents in the field of energy

The key strategic document containing policies and measures in the field of energy, and thus across all five dimensions of the Energy Union, is the Czech Republic’s State Energy Concept (hereinafter also the

SEK CR). Territorial energy concepts are also developed, which must be in line with the State Energy Concept. These concept documents are enshrined in Act No 406/2000 on energy management, as amended ('Act No 406/2000'). The State Energy Concept is adopted for a period of 25 years and is binding on the exercise of state administration in the field of energy management. The processor is the Ministry of Industry and Trade, which assesses it at least once every 5 years and informs the government of the evaluation. An assessment of the implementation of the Czech Republic's State Energy Concept was prepared for the end of 2020 and 2021 and submitted to the Czech Government in April 2021. The Czech Government approved the Czech Republic's assessment of the implementation of the State Energy Concept by Resolution No 260 of 8 March and instructed the Minister for Industry and Trade to submit to the government for approval by 31 December 2023 a draft update of the Framework in accordance with the conclusions contained in the material.8 The implementation of the update by 31 December 2023 is also enshrined in the Czech Government's programme statement. In addition, by 31 December each year, it submits to the Government an assessment of the fulfilment of the objectives and measures laid down in the SEK of the Czech Republic9. The current State Energy Concept of the Czech Republic was approved by the Government on 16 May 2015 and has a horizon of 2040. On 12 April 2023, the Government of the Czech Republic approved updates to the Czech Republic's State Energy Concept and related strategic documents, which guide the drafting of relative strategic documents.10

The long-term vision of the Czech Republic's energy sector is a reliable, affordable and sustainable supply of households and the energy economy in the long term. The vision thus defined is summarised in the three top strategic energy objectives of the Czech Republic, which are security – competitiveness – sustainability.

The Czech SEC contains strategic energy priorities, i.e. (i) a balanced energy mix/transformation of the energy industry; (II) energy savings and energy efficiency improvements; (III) infrastructure development; (IV) energy and industrial research, human resources; (v) energy security.

There is also a concept for the development of important energy and related areas, which include the following important areas: electricity; gas; petroleum processing; heating; transport; energy efficiency; research, development, innovation and education; energy engineering; external energy policy.

Table 8: *Strategic objectives and indicators in the field of security*

Strategic objective	**Pointer**
Maintain or increase contingency reserves	Standby stocks of primary energy sources
Reduce and maintain diversification beyond 0.25	Breakdown of primary energy sources

8 An evaluation of the implementation of the Czech Republic's National Energy Policy is published on the following link.
9 Reports on the implementation of the instruments of the Czech Republic's State Energy Concept are published on the following link.
10 The background to the update of the Czech Republic's State Energy Concept and the related strategic documents are published on the following link.

Reduce and maintain diversification of gross electricity production below 0.35	Breakdown of gross electricity production
Reduce and keep the diversification of imports below 0.30	Breakdown of imports
Maintain import dependency of no more than 65 % by 2030 and 70 % by 2040 (nuclear fuel as an import source).	Import dependency (share of net imports to primary energy sources)
Ensure compliance with the 'N-1' criterion in the operation of the electricity and gas system	Security of operation of electricity and gas infrastructure
Ensure sufficient resources in the electricity sector commensurate with the expected availability of electricity imports.	Self-sufficiency in electricity supply
Ensure sufficient resource adequacy	Resource adequacy of the electricity system
Strengthen energy self-sufficiency of households, municipalities and firms	Number of applications supported by RES installations

Source: Background to the update of the Czech Republic's State Energy Concept and related Strategy Papers (2023)

Table 9 *Strategic competitiveness objectives and indicators*

Strategic objective	Pointer
Reduce the energy intensity of gross value added to the EU27 average	Energy intensity of gross value added
Reduce the electricity intensity of HPH and keep it below EU27	Electricity intensity of gross value added
Maintain import and export capacity of the transmission system relative to maximum load at at least 30 % and 35 % respectively by 2030 and, where appropriate, to further increase this capacity after 2030	Degree of integration into international networks (available transmission capacities in the export and import direction)
Reach and maintain final electricity and gas prices below the EU average	Final electricity and natural gas prices for industry and households
Achieve and keep the share of energy expenditure in total household expenditure as low as possible below 10 %	Share of energy expenditure in total household expenditure
Optimise the contribution of the energy sector to gross value added	Share of the energy sector in gross value added

Optimise the contribution of energy to public spending on science and research	Share of energy in public spending on science and research
Broaden the concept of community energy and energy sharing	Number of energy communities, Number of entities benefiting from the active customer institute
Strengthen grid capacity to connect RES and accelerate the connection process	Share of rejected connection requests due to network capacity Average length of the process of connecting the source to the grid
Ensuring digitalisation and market opening for energy support services	The existence and functioning of aggregation and flexibility services by small resources in practice; Conduct and exchange of electricity meters for smart implementation of the new tariff structure taking into account the location of production/consumption and price differences over time
Removing administrative barriers to the development of RES	Average length of administrative procedures for authorising new RES

Source: Background to the update of the Czech Republic's State Energy Concept and related Strategy Papers (2023)

Table 10: *Strategic sustainability objectives and indicators*

Strategic objective	Pointer
Reducing greenhouse gas emissions to a level consistent with the objectives of the Fit for 55 package and achieving climate neutrality in the Czech Republic by 2050 and continuously reducing pollutant emissions in accordance with the National Emission Reduction Programme	Pollutant and greenhouse gas emissions
Emissions intensity of the economy	Emission intensity of gross value added
Reduce per capita greenhouse gas emissions	Greenhouse gas emissions per capita
Reduce the share of fossil fuels (used without capture technology) in primary energy consumption to 50 % by 2030 and 0 % by 2050, and to completely phase out the use of coal for electricity and heat generation by 2033	Share of fossil fuels in primary energy consumption
Achieve the share of RES in the gross final level corresponding to the EU 2030 target and increase it further by 2050 in line with the achievement of climate neutrality	Share of renewable energy sources in gross final consumption

Keep electricity consumption per capita persistently below the EU average	Energy and electricity consumption per capita
Decarbonise the heating sector	Share of heat from renewable energy sources in heat sold
Increase efficiency in the heating sector	Share of heat from cogeneration in heat sold
Decarbonise transport and reduce dependence on fossil fuels in transport	Number of H2 recharging and refuelling points Number of battery and hydrogen cars Number of passengers transported in bulk and free cargo

Source: Background to the update of the Czech Republic's State Energy Concept and related Strategy Papers (2023)

The Czech State Energy Concept indicates the intended energy mix using the relative corridors for primary energy sources and gross electricity production.

Hydrogen was not considered as an energy gas in the development of the State Energy Concept in 2015, but its role will gradually increase and will be an alternative to fossil fuels and electricity generation in the future. Imported renewable hydrogen is part of gaseous fuels (at the level of primary energy sources).

Table 11: *Share of individual fuels in total primary energy sources (excluding electricity)*

	Situation in 2016	**Target situation in 2040**
Coal and other solid non-renewable fuels	40 %	11-17 %
Oil and petroleum products	20 %	14-17 %
Gaseous fuels	16 %	18-25 %
Nuclear	15 %	25-33 %
Renewable and secondary energy sources	10 %	17-22 %

Source: Czech State Energy Concept (2015)

Table 12: *Share of individual fuels in gross electricity production*

	Situation in 2016	**Target situation in 2040**
Coal and other solid non-renewable fuels	50 %	11-21 %
Nuclear	29 %	46-58 %
Natural gas	8 %	5-15 %
Renewable and secondary energy sources	13 %	18-25 %

Source: Czech State Energy Concept (2015)

Table 13: *Key Strategy Papers in the field of energy*[13]

Strategy paper	Short description
Czech State Energy Concept (SEK)	High-level strategy paper for the energy sector. Approved in May 2015. The current SEK has a horizon up to 2040. An assessment of the implementation of the Czech Republic's State Energy Concept was prepared at the end of 2020 and 2021. This evaluation was submitted to the Czech Government in April 2021. The Czech Government approved the Czech Republic's assessment of the implementation of the State Energy Concept by Resolution No 260 of 8 March and instructed the Minister for Industry and Trade to submit to the government for approval by 31 December 2023 a draft update of the Framework in accordance with the conclusions contained in the material. On 12 April 2023, the Government of the Czech Republic approved updates to the Czech Republic's State Energy Concept and related strategic documents, which guide the drafting of
National Smart Network Action Plan (NAP SG)	It was approved by the Czech Government on 4 March 2015. It focuses in particular on the concept of developing network infrastructure to ensure reliable and safe operation in the required development of distributed generation. The update of the NAP SG for the period 2019-2030 was approved by the Czech Government on 16 September 2019.
National Clean Mobility Action Plan (NAP CM)	It is based on the requirements approved by Regulation 2023/1804 of the European Parliament and of the Council on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU of the European Parliament and of the Council (the so-called AFIR).
National Action Plan for the Development of Nuclear Energy in the Czech Republic (NAP JE)	Approved by the Czech Government in June 2015. The document aims at fulfilling the objectives of the SEK for the further development of nuclear energy.
Czech Republic's national renewable energy action plan (NAP RES)	The last NAP RES would be approved by the government on 25 January 2016. This material specifies measures and instruments in the field of RES. NAP RES has been replaced by a national plan and related reporting.
National Energy Efficiency Action Plan (NAP EE)	The National Energy Efficiency Action Plan shall describe the planned measures aimed at improving energy efficiency and the expected or achieved energy savings, including savings in:

[13] In addition to the strategic documents, voluntary commitments by cities and regions (e.g. under the Covenant of Mayors) in achieving energy and climate objectives should also be mentioned. The implementation of smart strategies and smart projects at municipal and city level can also be expected to assume greater responsibility for the achievement of climate objectives by local authorities.

	the supply, transmission and distribution of energy, as well as in the end-use of energy. NAP EE1 was replaced by the National Plan and the related reporting.
National emission reduction programme of the Czech Republic	This is an essential design material for improving air quality and reducing emissions from sources of air pollution. The current National Emissions Reduction Programme of the Czech Republic was approved by Government Resolution No 917 of 16 12. 2019 on the update of the NPSE. A further update of this document is ongoing and will be finalised by December 2023.
Raw materials policy on minerals and their resources	On 14 June 2017, the Government of the Czech Republic discussed and approved by its Resolution No 441 of 14 June 2017 a document entitled 'Rurovine policy of the Czech Republic on minerals and their resources'. This led to the completion of the process of updating the Czech state raw material policy, which has been carried out continuously since 2012, with the actual approval process taking almost one and a half
Hydrogen strategy	The hydrogen strategy of the Czech Republic is being developed in the context of the Hydrogen Strategy for a climate-neutral Europe, which reflects the objective of the European Green Deal – achieving EU climate neutrality by 2050. In 2023, it is the subject of the update. It sets national targets for the hydrogen economy.

Source: Self-processing of the Ministry of Industry and Trade from publicly available information

1.2.1.2 Climate policy and other climate strategy papers

Climate policy in the Czech Republic is both a 2030 strategy and a roadmap for the development of a low-emission economy by 2050. It focuses on measures to reduce greenhouse gas emissions and is therefore complementary to the approved Strategy for Adaptation to Climate Change in the Czech Republic, which focuses on adaptation to climate change. Climate protection policy builds on the Czech Republic's State Energy Concept and takes up and further develops a number of its energy measures. It is based on the so-called optimised SEK scenario. However, it also contains a number of new policies and measures targeting non-ETS sectors.

Climate policy in the Czech Republic sets the main targets for reducing greenhouse gas emissions and sets long-term indicative targets (see Table 14).

The target of reducing the Czech Republic's emissions by at least 32 $Mt_{CO2e}$by 2020, i.e. by 20 % compared to 2005, was achieved. An update of the Climate Policy in the Czech Republic is currently under preparation and is expected to be submitted to the government by the end of 2023.

Table 14: *Summary of the objectives of climate policy in the Czech Republic*

Horizon Objectives	TargetDescription
2030 headline target	Achieve emission reductions in line with the commitments of the Fit for 55 package, i.e. mainly to reduce greenhouse gas emissions in non-ETS sectors by 26 % by 2030 compared to 2005.
Headline target for 2050	Contribute to the EU's climate neutrality by 2050 and reduce the share of fossil fuels (used without capture technology) in primary energy consumption to 0 %.

Source: Proposal to update climate protection policy in the Czech Republic

The updated climate policy will include a new reduction target for 2030 in line with the Czech Republic's commitments under the Fit for 55 package and the objective of contributing to achieving EU climate neutrality by 2050 in line with the European Climate Law.

Table 15 lists other important climate policy documents.

Table 15: *Key strategic documents on climate protection and reducing pollutant emissions*

Strategy paper	Short description
Climate policy in the Czech Republic (POK)	Climate policy in the Czech Republic presents a 2030 climate strategy and, at the same time, a roadmap for the development of a low-emission economy by 2050.
Strategic Framework Czech Republic 2030	A top-up document defining the headline targets for the development of the Czech Republic. The document replaces the 2010 Strategic Framework for Sustainable Development.
Czech Republic's State Environment Policy 2030 with a 2050 perspective	State policy monitoring plan environment 2030 it covers environmental protection in its entirety and sets the strategic direction, i.e. targets, by 2030. The document sets out visions of the ideal state of play for 2050.
Climate change adaptation strategies in the Czech Republic	Overarching national climate change adaptation strategies to reduce vulnerability and increase the resilience of human society and ecosystems to climate change and thus reduce its negative impacts. Approved in October 2015, updated in September 2021; its implementation document is the National Action Plan for Adaptation to Climate Change. The strategy focuses on addressing all major climate change events in Czechia and covers the main sectors/impact areas
	climate change in the Czech Republic, including industry and energy.

National Action Plan on Adaptation to Climate Change	It follows the 2021 update of the Climate Change Adaptation Strategy in the Czech Republic; it contains specific measures for implementation, including the responsibilities of the different departments and the deadlines for the performance of the proposed tasks.
National emission reduction programme of the Czech Republic	This is an essential design material for improving air quality and reducing emissions from sources of air pollution. The current National Emissions Reduction Programme of the Czech Republic was approved by Government Resolution No 917 of 16 12. 2019 on the update of the NPSE. A further update of this document is ongoing and will be finalised by December 2023.

Source: Self-processing of the Ministry of Industry and Trade from publicly available information

iii. Key issues of cross-border relevance

The main issues of cross-border relevance in general include (i) major strategic documents that are subject to the international environmental impact assessment process (SEA); (II) major infrastructure projects, in particular cross-border interconnections in the fields of electricity transmission, gas transmission and transport of oil and petroleum products, as well as large-scale construction of significant production resources, or resources located close to the border with a neighbouring state (these projects are subject to the vast majority of the international EIA process); (III) transnational cooperation in science and research; (IV) other activities that may have an impact on another member country.

iv. Governance structure for the implementation of national energy and climate policies

The Ministry of Industry and Trade, which is the central body of the state administration in the field of climate policy, has an important role to play as regards the administrative complication of the implementation of national energy and climate policies, and the Ministry of the Environment, which is the central government body in the field of climate policy. The Czech Republic’s relations with neighbouring countries are also under the responsibility of the Ministry of Foreign Affairs by preparing the thesis and negotiation of common themes. These ministries are responsible for the preparation of legislation in the areas mentioned above, as well as non-legislative strategic material. Measures of a legislative or non-legislative nature are listed in the so-called legislative or non-legislative plan of the Government of the Czech Republic. Legislative measures and policies undergo a standard legislative process involving the Czech Government, the Chamber of Exchanges, the Senate and the President of the Czech Republic. Non-legislative documents are approved by the Government of the Czech Republic, which adopts the relevant resolutions, specifying the tasks resulting from the resolution. In the vast majority of cases, the preparation of high-level strategic documents, their content and their binding nature are enshrined in legislation. For example, the obligation of preparation, formalities and binding force of the State energy concept is laid down in Act No 406/2000 on energy management.

Consultation and involvement of national and Union actors and their outcome

On 12 April 2023, the Government of the Czech Republic approved the updates of the Czech Republic’s State Energy Concept and the related strategic documents. In this document, the creation of the Commission or the Platform for Energy and Climate Strategy, where relevant departments and other relevant bodies are represented, namely the Chamber of Commerce, the Union of Industry and Transport, the Green Circle, the Union of Cities and Municipalities of the Czech Republic and the Association of Regions of the Czech Republic. The preparation of the draft update of the National Plan of the Czech Republic was discussed at this salary. The document was further discussed at other relevant salaries.

The public consultation on the draft update of the Czech National Plan took place between 15 May 2023 and 4 June 2023 using a structured online questionnaire. The public consultation received responses to the following six structured questions.

1) What specific information or specific topics mentioned in the current national plan of the Czech Republic is no longer relevant and should be revised/updated?
2) In your opinion, what specific topics or topics are missing in the current national plan of the Czech Republic and should be added?
3) How should the national targets be revised to match those defined at EU level?
4) What specific policies and measures are missing in each of the five dimensions (carbon reduction, energy efficiency, energy security, internal energy market and research, innovation and competitiveness) and should be complemented?
5) What changes should be reflected in the state of play and estimates based on existing policies and measures?
6) Is the assessment of the impacts of the planned policies and measures sufficient and what should be specifically revised/addressed in this section?

In total, 164 responses were obtained and evaluated from respondents. The evaluated public consultation is published on the website of the Ministry of Industry and Trade (on the following link). A comprehensive text of the update proposals was not yet available in May/June 2023, when the public consultation was ongoing. Therefore, a follow-up public consultation on the actual text of the update proposal is planned to take place in parallel with the iteration process with the European Commission.

i. Consultation of other Member States

In accordance with Article 12 of Regulation (EU) 2018/1999, the draft update of the national plan of the Czech Republic was consulted regionally as follows. On Thursday 27 April 2023, a consultation took place at Visegrád Four (V4) level, representing the Czech Republic, Slovakia, Poland and Hungary. Ongoing work was discussed on the proposals for updates of the Vntirostan plans, with a specific focus on renewable energy and energy efficiency. The Czech Republic also discussed parts of the Czech Republic's national plan and its proposal on relevant bilateral and multilateral platforms. Under the V4 Presidency, the Czech Republic plans to organise a follow-up regional consultation aimed at finalising and implementing the national plans. Consultations with other Member States were also carried out in the context of platforms initiated by the European Commission and the European Council respectively.

ii. Iterative process with the European Commission

The iterative process will take place in the second half of 2023 and the outputs of this process will then be set out in the final version of the Czech Republic's National Energy and Climate Plan.

Regional cooperation for the preparation of the plan

i. Elements subject to joint or coordinated planning with other Member States

The national plan does not contain any parts that would be prepared at regional level. Unfortunately, joint programming, at least in sub-sections/topics, was not possible due to the timing of the preparation and the fact that this is the first ever preparation of national plans. Despite this, it can of course be concluded that coordinated planning is already taking place in a number of aspects, such as infrastructure, operation of transmission systems, etc. However, the Czech Republic would like to initiate joint preparation of selected parts/topics with neighbouring or other Member States when drawing up this document for the next period or when it is updated. In this regard, there is a common preparation on energy security and possibly on the internal energy market, but of course on other parts/topics.

ii. Explanation of how regional cooperation is considered in the plan

The Czech Republic prefers a ‘bottom-up’ approach to regional cooperation. The Czech Republic actively cooperates with other Member States on various multilateral and possibly bilateral platforms, depending on the issues involved – electricity, gas, research, development and innovation, etc.

The Czech Republic does not consider it appropriate to initiate a specific regional cooperation platform aimed at discussing the national plan as a whole, also in view of the fact that the regional dimension is different for different topics. For example, in the field of electricity, a different cooperation platform is important for the Czech Republic compared to, for example, the gas sector.

However, this year, the Czech Republic reached out to selected Member States with whom it already had established bilateral or multilateral cooperation and discussed the National Plan. More information is provided in Chapter 1.3, specifically in section i.

2 National targets

2.1 Dimension “Carbon Emission Reduction”

2.1.1 GHG emissions and removals [11]

i. The elements set out in paragraph 4 of Article 4. 1 (a)

In the area of EU climate and energy policy, the main objectives are set by the European Climate Law (Regulation (EU) 2021/1119 of the European Parliament and of the Council). It legally enshrined an EU-level emission reduction target of at least 55 % by 2030 compared to 1990 and the objective of achieving EU climate neutrality by 2050. At the same time, these targets build on the broader ‘European Green Deal’ initiative, which also includes targets in other areas of environment, including the zero pollution ambition by 2050.

The Fit for 55 legislative package should ensure that the EU’s 2030 target is met. This is a set of revised EU legislation that was part of the previous 2030 Climate and Energy Framework and several new legislative initiatives. The EU greenhouse gas emissions trading target (EU ETS) has been increased to 62 % compared to the initial 43 % target for 2030 compared to 2005. At the same time, a new emissions trading system has been introduced for other emission sectors, covering mainly road transport and buildings, and a new carbon border adjustment mechanism is being introduced to protect the EU’s competitiveness. The Innovation and Modernisation Fund is also being strengthened, and in particular the Modernisation Fund, together with the proceeds from the auctioning of emission allowances, should play a crucial role in the Czech Republic’s decarbonisation and green transition.

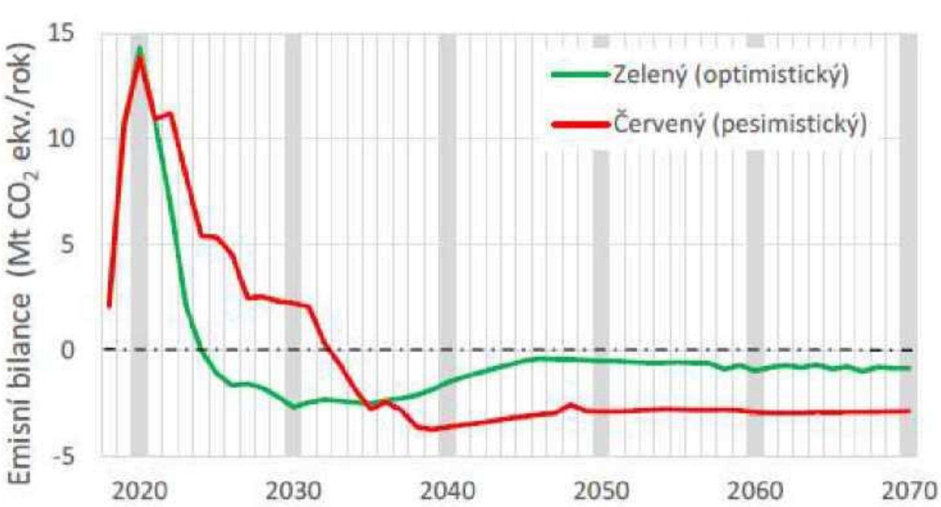
The revision of Regulation (EU) 2018/842 of the European Parliament and of the Council on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 sets a 26 % reduction target for the Czech Republic between 2005 and 2030. This is a significant increase from the initial 14 % target for 2030. The overall target for these sectors at EU level has been increased from 30 % to 40 %.

Regulation 2023/839 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2018/841 sets an EU-level target of 310 million tCO2 sinks in 2030 from the land use and

11Consistency to be ensured with long-term strategies pursuant to Article 15.

forestry sector (LULUCF), while setting national targets for 2030. The Czech Republic's objective is to increase net sinks by 827 thousand tonnes of CO_2 compared to the average for 2016, 2017 and 2018, i.e. to achieve sinks of around 1228 thousand t CO_2 based on emission inventory data from 2020. The achievement of this objective will depend primarily on the rate of decline of bark beetle and the rate of forest regeneration. According to a more optimistic 'green scenario', the 2030 target can be reached, but in other scenarios the Czech Republic will still report a certain level of emissions from the LULUCF sector in 2030, as shown in the graph below.

Graph 4: *Prediction of the evolution of the forestry sector's emission balance*



For the period 2021-2025, the obligation remains that emissions from all land use categories, taking into account the flexibilities, do not exceed greenhouse gas sinks ('no-debit rule').For the managed forest land category, a specific accounting method is established on the basis of the forest reference level set for the Czech Republic at -6 137,19k t CO_2. On the basis of a comparison of this benchmark with the emissions projections for the LULUCF sector, it is clear that the Czech Republic will have significant problems in complying with the "no-debit rule" and its commitments in this period. According to preliminary calculations, for 2021 alone, the Czech Republic should account for almost 15 million t CO2 emissions from the LULUCF sector. In the following years, accounted emissions should decrease following the evolution of the bark beetle and the fall in accidental mining. In relation to the LULUCF sector and carbon neutrality, it should therefore be pointed out that the role of forestry in the Czech Republic has changed in terms of CO_2 sinks due to accidental harvesting related to the destruction of bark beetle. As a result, managed forests have temporarily become a significant source of CO_2. In reducing greenhouse gas emissions, the reduction of health-risk emissions into the atmosphere will also be addressed as a matter of priority and consistency, which includes the urgent reduction and closure of local coal-fired furnaces and stones in households burning coal, and by increasing the energy efficiency of buildings, the reduction of emissions of health-risk substances (PAHs) from the combustion of wet wood, which are very often above limits in the Czech Republic.

In transport, priority will also be given to reducing emissions of health-related substances, along with greenhouse gas emissions, by phasing out both obsolete and energy-efficient diesel and petrol engines, where external damage to health and property significantly exceeds external climate damage.

ii. Where appropriate, other national objectives and targets consistent with the Paris Agreement and existing

long-term strategies. Where applicable for the contribution to the overall Union commitment of reducing the GHG emissions, other objectives and targets, including sector targets and adaptation goals, if available

In March 2017, the Government of the Czech Republic adopted the Climate Policy in the Czech Republic, which presents a long-term strategy for the transition to a low-carbon economy and the Czech Republic's contribution to the objectives of the Paris Agreement. As a long-term low-emission development strategy in accordance with Article 4 of the Paris Agreement, it was sent to the Secretariat of the United Nations Framework Convention on Climate Change on 15 January 2018.

It is therefore a 2030 climate strategy with a long-term perspective for the transition to a sustainable low-emission economy by 2050. It defines the main climate protection objectives and actions at national level to ensure that greenhouse gas emission reduction targets are met following the obligations under international agreements (UN Framework Convention on Climate Change and its Kyoto Protocol, the Paris Agreement and obligations under European Union legislation).

An evaluation of climate protection policy in the Czech Republic was carried out in 2021. The 2020 targets have been met and most measures have been implemented at least partially. An update is currently ongoing and will be submitted to the government by the end of 2023 and will be incorporated into the final version of this document.

The national climate change adaptation targets are set out in the Strategy for Adaptation to Climate Change in the Czech Republic, the first update of which was approved by the Government of the Czech Republic in September 2021. The strategic objective of adaptation is to increase the Czech Republic's preparedness for climate change – reducing vulnerability and increasing the resiliency of human society and ecosystems to climate change, thus reducing its negative impacts.

The strategy further formulates 5 specific objectives:

SC1 Ensure ecological stability and the provision of ecosystem services in agricultural landscapes, with an emphasis on reducing both degradation and land take and strengthening the natural water regime.

SC2 The ecological stability and the provision of forest ecosystem services are ensured, with an emphasis on preventing soil degradation and strengthening the natural water regime.

SC3 The ecological stability and the provision of ecosystem services of water and water-bound ecosystems shall be ensured, with an emphasis on strengthening the natural water regime of the landscape and with a view to ensuring the needs of human society and sustainable use of water.

SC4 The resilience of human settlements, including their public and green infrastructure, is significantly enhanced, with an emphasis on the protection of human health.

SC5 A high efficiency of the early warning system and responsible response by the population is achieved.

In July 2021, the Government of the Czech Republic approved the Hydrogen Strategy of the Czech Republic. Hydrogen and hydrogen technologies are one of the main tools for achieving the greenhouse gas emission reduction targets as set out in the European Green Deal. Its strategic objectives include reducing greenhouse gas emissions and promoting economic growth. The strategy further analyses the different options for hydrogen production and use and identifies priority areas for further development in the 2050 time horizon linked to the strategic horizon of the European Green Deal.

One tool for reducing emissions in electricity generation and through electrification in other sectors, and heat generation, is the use of nuclear power, whose share is to be increased in the long term through the construction of new nuclear sources and the expansion of the use of nuclear energy for heating.

Table 16: *Main objectives and long-term indicative objectives of climate policy in the Czech Republic*

Horizon Objectives	TargetDescription
2030 headline target	Achieve emission reductions in line with the commitments of the Fit for 55 package, i.e. mainly to reduce greenhouse gas emissions in non-ETS sectors by 26 % by 2030 compared to 2005.
Headline target for 2050	Contribute to the EU's climate neutrality by 2050 and reduce the share of fossil fuels (used without capture technology) in primary energy consumption to 0 %.

Source: Proposal to update climate protection policy in the Czech Republic

On 12 April 2023, the Government of the Czech Republic approved the update of the Czech Republic's State Energy Concept and related strategic documents (Climate Protection Policy and National Energy and Climate Plan of the Czech Republic), which confirmed the strategic objectives for reducing greenhouse gas emissions:

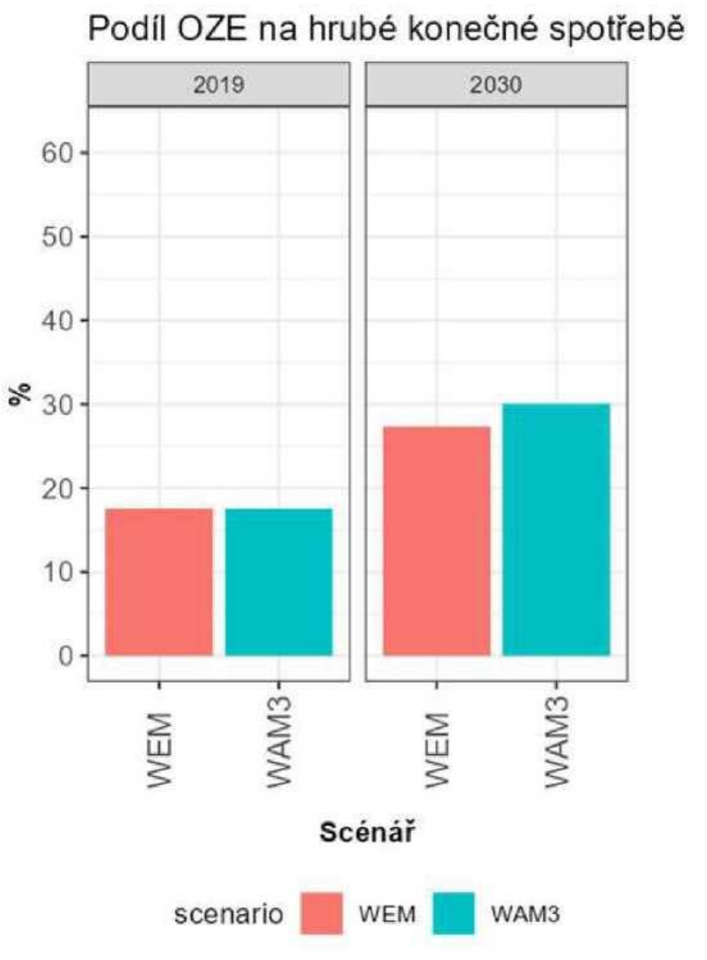
1) Reducing greenhouse gas emissions to levels consistent with the objectives of the Fit for 55 package and contributing to achieving EU climate neutrality by 2050 and continuously reducing pollutant emissions in line with the National Emissions Reduction Programme
2) Reduce per capita greenhouse gas emissions
3) Reduce the share of fossil fuels (used without capture technology) in primary energy consumption to 50 % by 2030 and 0 % by 2050, and to completely phase out the use of coal for electricity and heat generation by 2033

2.1.2 Renewable energy (2030 Framework Goal)

i. Elements set out in point (a) of Article 4(2)

In the 2019 National Plan and 2020 respectively, the Czech Republic has set a target of 22 % for the share of renewable energy sources in gross final consumption by 2030, corresponding to an increase of 9 percentage points compared to the national target of 13.0 % for 2020. As a result of recent developments and the introduction of additional measures, the Czech Republic is increasing its contribution to the EU target of 32 % resulting from the EU legislation currently in force to 30 % of the original 22 %. The Czech Republic reflects the ongoing increase of the EU target for the share of RES in final consumption of 42.5 % by 2030, but the relevant legislation is not yet finally adopted and can therefore only be reflected in the finalisation of the update of the national plan.

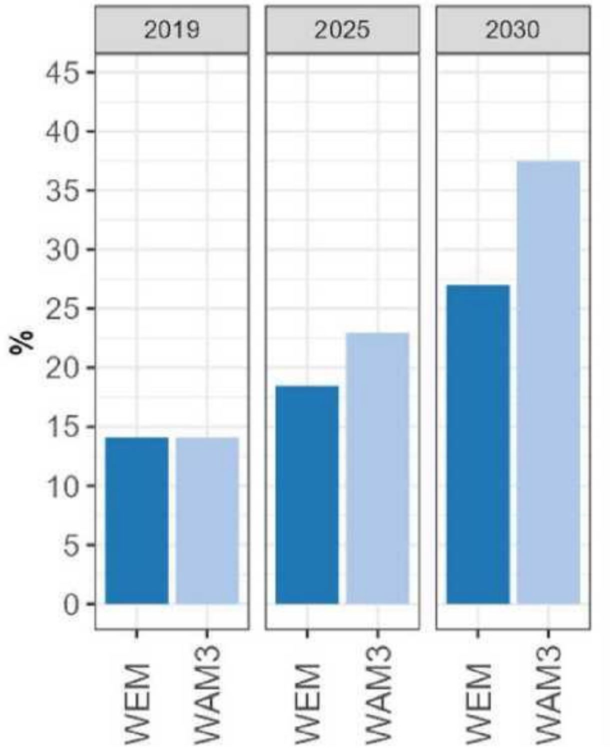
Graph 5: *Expected RES share by 2030*



Source: SEEPIA outputs

ii. Estimated trajectories for the sectoral share of energy from renewable sources in final energy consumption from 2021 to 2030 in the electricity sector; heating and cooling and transport

Figure 6: *Share of RES in gross final consumption in electricity sector*

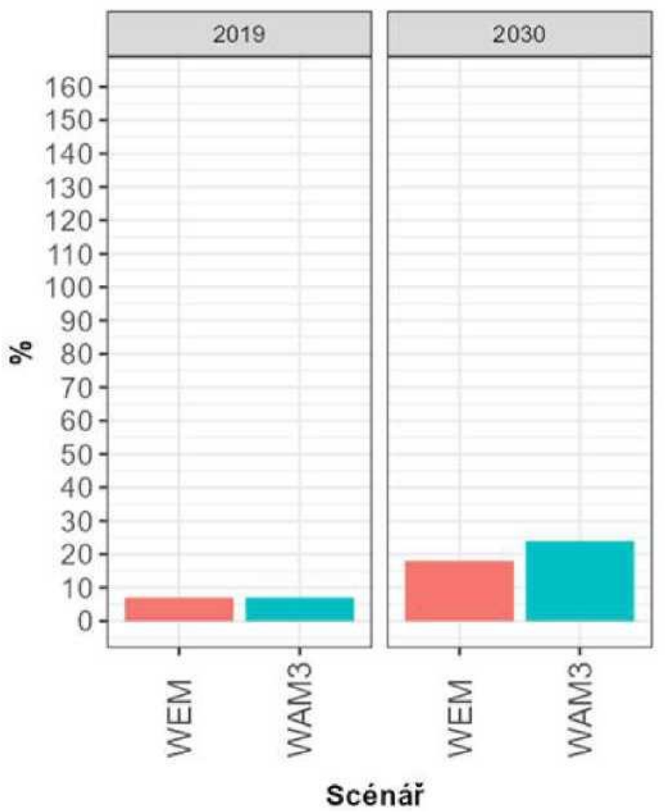


| wem WAM3 SCENARIO

Source: SEEPIA outputs

The share of RES in transport is already reflected in the EU Renewable Energy Directive, which is not yet approved, and assumes greenhouse gas emission savings of 14.5 % and 13.7 % respectively in 2030 (using the deductions allowed by the Directive).

Graph 7: *Share of RES in transport (taking into account multipliers)*

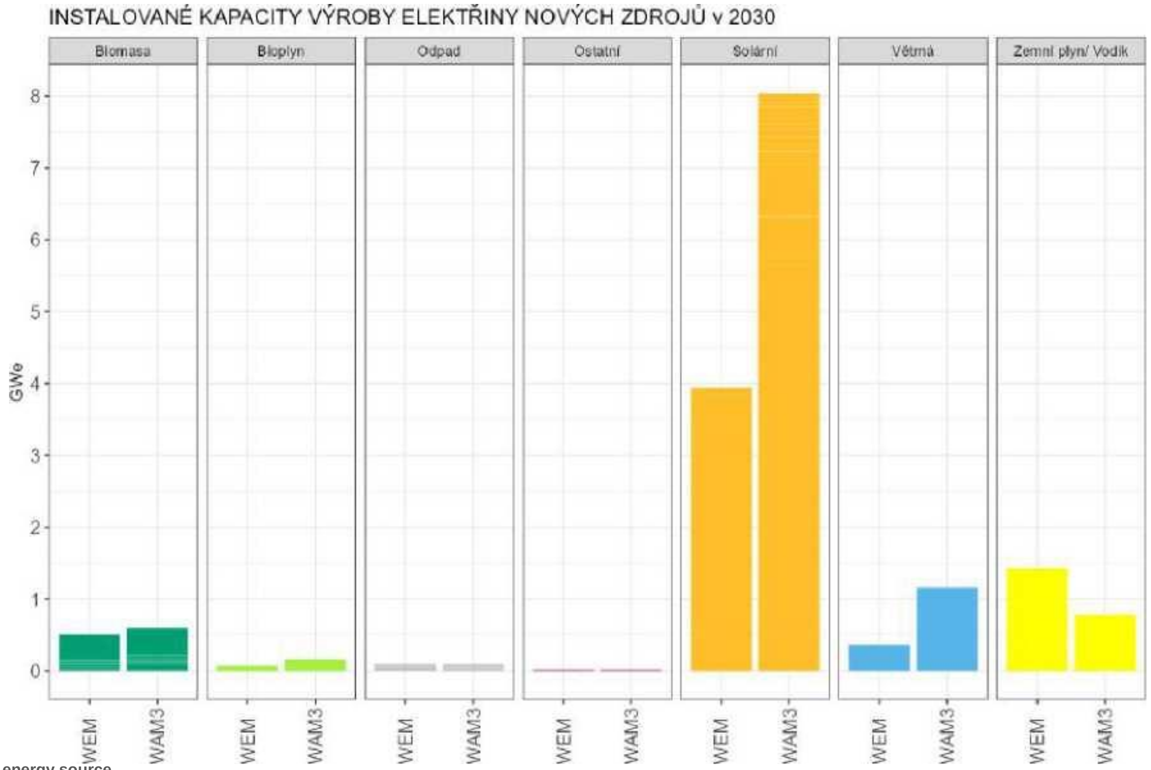


scenario | WEM | WAM3

Source: SEEPIA outputs

iii. Estimated trajectories by renewable energy technology that the Member State projects to use to achieve the overall and sectoral trajectories for renewable energy from 2021 to 2030, including expected total gross final energy consumption per technology and sector in Mtoe and total planned installed capacity (divided by new capacity and repowering) per technology and sector in MW

Graph 8: *Installed electricity generation capacity of new sources in 2030*



| biomass Waste Sololar Natural gas/Hydrogen energy source

Biogas H Other İ Wind

Source: SEEPIA outputs

The 2030 targets for renewable hydrogen production are defined by requirements to replace fossil hydrogen in industry and fossil fuels in transport based on the revised Directive 2018/2001 on the promotion of the use of energy from renewable energy sources of June 2023. Only a limited amount of renewable hydrogen is likely to be imported by 2030, so most of the renewable hydrogen needed in 2030 will have to be produced within the Czech Republic. The estimated installed electrolyser capacity to produce the required quantity of 19333 tonnes of renewable hydrogen per year is set out in the table below. The total amount of 19333 tonnes of renewable hydrogen consists of hydrogen needed to cover RED requirements in industry (57 333 t) and transport (136 000 t).

In the context of the new mandatory targets of the revised Directive 2018/2001 on the promotion of the use of energy from renewable energy sources of June 2023 for the development of renewable fuels of non-biological origin, which includes renewable hydrogen, the construction of electrolysers for the production of renewable hydrogen (i.e. electrolysis of water using renewable electricity, known as RFNBO) should also be envisaged. The predicted required amount of 19333 tonnes of RFNBO would require installed electrolyser capacity at the level of at least 400 MW (following an assumed utilisation factor of 30 %). The main drivers of the shift towards the production of hydrogen from renewable energy sources are primarily international commitments on climate change, pressures from the global financial community for systemic decarbonisation and adaptation of economies, and new and significant strengthening of energy security (resilience).

By 2030 at the latest, two hydrogen pipelines will be available to be built by the conversion of existing pipelines of the transmission system. One between Lanžhot and Waidhaus border points to import hydrogen from areas in North Africa, Ukraine and South East Europe. The second between Brandov and Waidhaus border points to import hydrogen from Scandinavia and the Baltic and North Sea areas, building on the planned Kernnetz hydrogen infrastructure in Germany. Each of these pipelines will have an initial import capacity of around 1.5 million tonnes of hydrogen/year (50 TWh/year). This capacity is more than sufficient to cover the expected consumption in the Czech Republic and can be further increased if necessary. Therefore, in case of demand, significant amounts of renewable hydrogen can be imported from these sites, even beyond the required minimum quantity based on the revised Directive (EU) 2018/2001.

Table 17: *Expected installed capacity of renewable hydrogen electrolysers (electric)*

Installed power (MWe)	***2016***	***2020***	***2021***	***2022***	***2023***	***2024***	***2025***	***2026***	***2027***	***2028***	***2029***	***2030***
Electrolysers	*0*	*0*	*0*	*0*	*0*	*2*	*10*	*60*	*160*	*240*	*320*	*400*

Source: Updated Hydrogen Strategy of the Czech Republic

In the context of the new mandatory targets of the revised Directive 2018/2001 on the promotion of the use of energy from renewable energy sources of June 2023 for the development of renewable fuels of non-biological origin, which includes renewable hydrogen, the construction of electrolysers for the production of renewable hydrogen (i.e. electrolysis of water using renewable electricity, known as RFNBO) should also be envisaged. The predicted required amount of 21600 tonnes of RFNBO would require installed electrolyser capacity at the level of at least 300 MW (following an assumed utilisation factor of 50 %). The main drivers of the shift towards the production of hydrogen from renewable energy sources are primarily international commitments on climate change, pressures from the global financial community for systemic decarbonisation and adaptation of economies, and new and significant strengthening of energy security (resilience).

iv. Estimated trajectories on bioenergy demand, disaggregated between heat, electricity and transport, and on biomass supply by feedstocks and origin (distinguishing between domestic production and imports). For forest biomass, an assessment of its source and impact on the LULUCF sink

Based on the Council Implementing Decision on the approval of the assessment of the recovery and resilience plan for Czechia and is one of the milestones for the absorption of funds from the Czech Republic’s recovery and resilience plan, a document entitled: ‘Assessment of the trajectories for the sustainable use of bioenergy in the Czech Republic’ (reference).

The above-mentioned document contains a quantification and/or a qualified description of the demand for bioenergy and its resources, with an emphasis on their sustainability, so as to objectively demonstrate the sufficiency of sustainable biomass resources by 2030 to meet demand. It also describes impacts on land use, land use change, forest carbon sinks, biodiversity and air quality.

v. Where applicable, other national trajectories and objectives, including long-term and sectoral trajectories and targets

(e.g. share of renewable energy in district heating, use of this energy in buildings, renewable energy produced by cities, renewable energy communities and self-consumers, energy from sludge from wastewater treatment)

The Czech Republic’s State Energy Concept, approved in 2015, sets the target of covering at least 20 % of the heat supply from renewable energy supply systems by 2040. Statistically, the expression of the quantity of thermal energy supplied within the heat supply systems is relatively problematic, also because of the definition of the heat supply system, but it is generally possible to generalise that heat to the category of heat sold or gross heat production in the energy balance.

Particular emphasis will be placed on renewable energy communities (community energy), which are behind the economic, environmental and social benefits at local and national level. The participation of citizens and local authorities (e.g. municipalities) in community energy projects creates significant added value in terms of local acceptance of renewables and access to private capital. Its development is accompanied by local investment, increased consumer choice and increased participation of citizens in the energy transition. Above all, participation by citizens and local authorities in community energy is linked to the desired increase in renewable energy production and an emphasis on energy savings. Community energy can thus become an important element in achieving the Czech Republic’s objectives in individual areas.

2.1.3 Estimated trajectories for renewable and low-carbon hydrogen demand

Renewable and low-carbon hydrogen is an important energy carrier that can contribute to reducing greenhouse gas emissions and decarbonising transport, industry, services, energy, households, agriculture and other sectors. In addition to clean electricity, hydrogen will partially replace some fossil fuels after their gradual decline towards 2050. In this endeavour, the Czech Republic coordinates its action within the European Union.

From the point of view of SEK, hydrogen is a new energy carrier because, at the time of its creation, it had only begun to appear in energy applications and was therefore not mentioned in the SEK. On the basis of the hydrogen strategy of the Czech Republic, a gradual increase in hydrogen consumption is foreseen, depending on its price. As part of the hydrogen strategy of the Czech Republic, we aim to ensure that hydrogen and hydrogen technologies play a major role in the process of decarbonising the economy and transforming Czech industry. The hydrogen strategy also reflects the specificities of the Czech Republic, which is one of Europe's most industrialised countries and is a landlocked state, without access to the sea and with limited renewable energy sources.

The main role of hydrogen in decarbonising the economy is in the following areas:

- carrier and energy storage, including seasonal energy storage;
- chemical raw material;
- development and production of hydrogen technologies.

When decarbonising the economy, hydrogen will be used as a substitute for fossil fuels because its combustion does not generate CO2 emissions, but only water vapour and nitrogen oxides, and is therefore – if produced using renewable sources – a carbon-free alternative to fossil fuels. Today, however, hydrogen is more expensive as a heat source. For hydrogen to gradually replace natural gas, its price would now have to fall to around EUR 2/kg. This is expected only after 2040, when the price of natural gas will also rise due to rising emissions allowance prices. Currently, the high price of hydrogen prevents full economic use in all segments of industry. In the meantime, we need to use hydrogen where it is the most economically appropriate, where the overall cost ratio is best. The first area of deployment is the chemical industry. Here, the amount of renewable hydrogen we need to produce is mainly defined by the revised Directive 2018/2001 on the promotion of the use of energy from renewable energy sources of June 2023. We also plan to use transport, where hydrogen is expected to be used in bus, train and long-distance freight transport. The Czech hydrogen strategy prioritises the use of renewable and low-carbon hydrogen by 2030 mainly in the transport and chemical industry.

The advantage of hydrogen in transport is that hydrogen can be produced in a different time than it will be refuelled, for example when we have surpluses of renewable electricity and it is cheap. Both electric and hydrogen vehicles are more expensive than current standard petrol or diesel vehicles. Their operation can only be made cheaper by increasing their distillation.

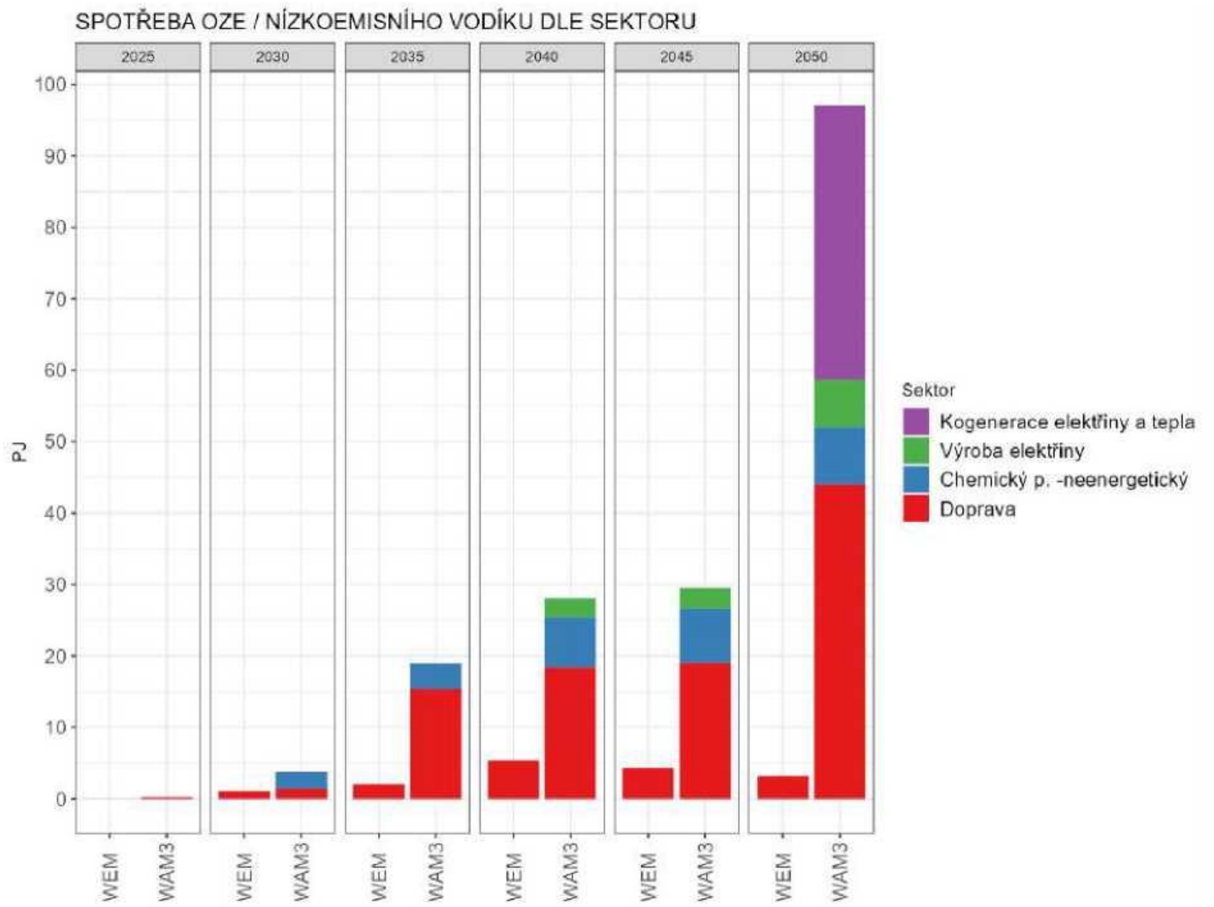
This is already successfully used in hydrogen-powered handling techniques (highlift trucks). The use of hydrogen in transport is foreseen in particular for long-distance and freight transport, while e-mobility appears to be predominant for passenger cars.

Hydrogen will be used to generate heat in applications, depending on which applications will be able to absorb its higher price or when the local price of hydrogen is low due to the excess of RES production. As the seasonality of heat production and the partial seasonality of RES production do not entirely overlap, we do not assume that the use of hydrogen in heat production would be a priority area.

Given the expected price, we see the role of hydrogen in the heating sector in peak heating plants, possibly with limited co-generation in the winter months. For local heating, the role of hydrogen is assumed to be small.

Many production processes seek to reduce their carbon footprint. It is in these areas that hydrogen could be deployed first.

Graf č. 9: *Spotřeba nizkoemisního vodíku dle sektoru*



Ofpowder: SEEPIA outputs

2.1.4 Greenhouse gas emissions, capture, utilisation and storage

Another low-carbon technology to reduce emissions is capture, utilisation or storage (CCUS) CCS and CCU). In order to optimise the decarbonisation process, the European Commission adopted in 2020 an EU strategy for energy system integration15 confirming the importance of CCUS, noting that even a fully integrated energy system cannot fully eliminate CO2 emissions in all sectors of the economy. While reducing emissions through the development of renewable energy sources and increasing energy efficiency remains the top priority of EU climate policies, the CCUS will be, together with other technologies such as solar photovoltaic and solar thermal technologies, onshore and offshore renewable energy technologies, battery/storage technologies, heat pumps and geothermal technologies;

[15] COM(2020) 299 final electrolysers and fuel cells, or sustainable biogas/biomethane, play a key role

in achieving climate neutrality and will require significant targeted support over the next decade.[16]

CCS is a coherent set of technologies that allow CO2 to be captured instead of being released into the atmosphere. The captured CO2 is then compressed and transported to a site suitable for permanent storage. There are four basic options for transporting CO2: pipeline, water, rail and road transport. For the Czech Republic, given the existing and highly robust gas transport infrastructure, it seems cost-optimal to use pipeline transport. Not all captured CO2 will be permanently stored. The potential of CCU technology, which offers the possibility of using captured CO2 as feedstock for the production of chemicals, plastics and synthetic fuels, will also have to be exploited on the path towards climate neutrality. The revision of the Directive on the promotion of the use of energy from renewable sources will promote the production of fuels produced through the CCU. The Aviation Fuel Initiative, ReFuelEU Aviation, will progressively increase the share of sustainable fuels (especially synthetic fuels) on aviation fuel suppliers.

Low-carbon CCUS technologies offer the possibility to decarbonise in hard-to-decarbonise sectors (e.g. industrial processes) or electricity and heat generation. The already mentioned EU strategy for energy system integration recognises the role of CCS and CCU technologies especially in these hard-to-decarbonise industries. CCUS technology therefore has great potential for decarbonising the emission-intensive Czech industry. Another option to mitigate emissions is the capture of CO2 directly from the atmosphere, so-called Direct Air Carbon Capture and Storage (DACCS), or from the combustion or fermentation of biogenic carbon, also referred to as Bioenergy with Carbon Capture and Storage (BECCS).

The 2023 proposal for a regulation establishing a framework of measures for strengthening Europe's net-zero technology product manufacturing ecosystem (Net-Zero Industry Act)[17] identified CCUS as one of the key technologies for achieving the EU's climate neutrality objectives. The Net-Zero Industry Act sets out the regulatory environment for investments in CCS, including an annual target for the operation of permanent CO2 storage sites in the EU by 2030. The objective is to achieve an annual operational injection capacity of 50 million tonnes of CO_2 by 2030. A significant potential for storage of billions of tonnes of CO_2 is expected in offshore sites offering depleted oil and natural gas deposits or in deep-sea saltwater storage facilities (salinic aquifers). The European Commission estimates that the EU could need to capture up to 550 million tonnes of CO_2 per year by 2050 to reach the net-zero target.

However, the necessary infrastructure is not developing quickly enough, despite the introduction of a legal framework for the storage of CO_2 in geological formations in the European Economic Area,[18] laying down rules for the environmentally safe storage of CO_2 or the Emissions Trading System (EU ETS), according[19] to which CO_2 captured and stored is not considered to be emitted. Despite the incentive of rising CO2 prices, industry faces the risk of not having access to a permitted geological storage site. There is still a lack of regulatory environment for dedicated CO2 transport and storage infrastructure in the EU, e.g. infrastructure access rules, CO2 quality standards, regulatory oversight or planning. In view of these shortcomings, the Commission plans to propose an EU strategy for the creation of an industrial carbon market by 2030, primarily aimed at decarbonising industries. In the upcoming strategy, the Commission envisages the possibility of including targets for storage infrastructure for 2040 and 2050 and identifying

16 COM(2021) 800 final; COM(2023) 161 final
17 COM(2023) 161 final
18 2009/31/EC
19 (EU) 2018/410

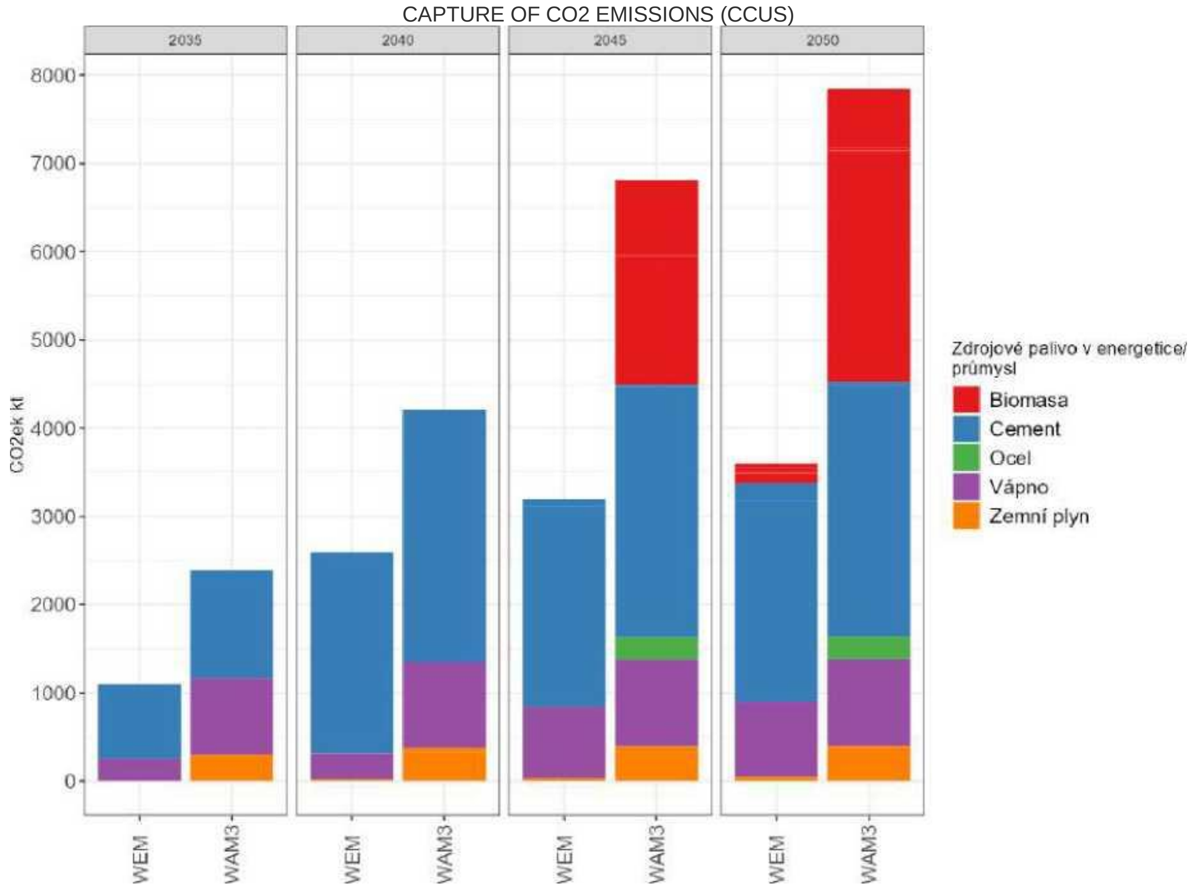
regulatory needs for developing CO2 transport and storageinfrastructure.

The Czech Republic does not have a strategy document dedicated specifically to CCS/CCUS technoligia, but under the project Building momentum for the long-term CCS degasment in the CEE region" developed a national roadmap for CCS technology (reference). This roadmap contains, inter alia, recommendations for policy setting in this area, but it should be pointed out that these are not materials approved in this form at the level of the Czech Government.

According to the expected evolution of the energy mix in the Czech Republic (see SEEPIA scenario), it will be necessary to ensure the annual capture and storage (or use) of 8.1 million tonnes of CO 2/year(or this capacity is modelly assumed to be the maximum over the 2035-2050 horizon; the use of this technology is not modelled before 2035). Given the limited storage capacity of CO_2 in rock structures in the Czech Republic, which[20]are currently estimated in the order of thousands of tonnes of CO_2 per year, a significant amount of captured CO_2 emissions will have to be transported to sites outside the Czech Republic. Sites with significant storage potential forcaptured CO2 include the North Sea area. As already mentioned in the introduction to the chapter, the cost-optimal transport option will be transport through dedicated pipeline infrastructure resulting from the conversion of existing gas infrastructure and the partial construction of a new one.

20 E.g. MND project to store CO2 in rock structures in southern Moravia (https://www.mnd.eu/projekt/ukladani-co2-do-horninovych-struktur/)

Graph 10: *Expected captured CO2 emissions from CCS/CCUS*



Ofpowder: SEEPIA outputs

Dimension ‘Energy efficiency’

i. Elements set out in point (b) of Article 4

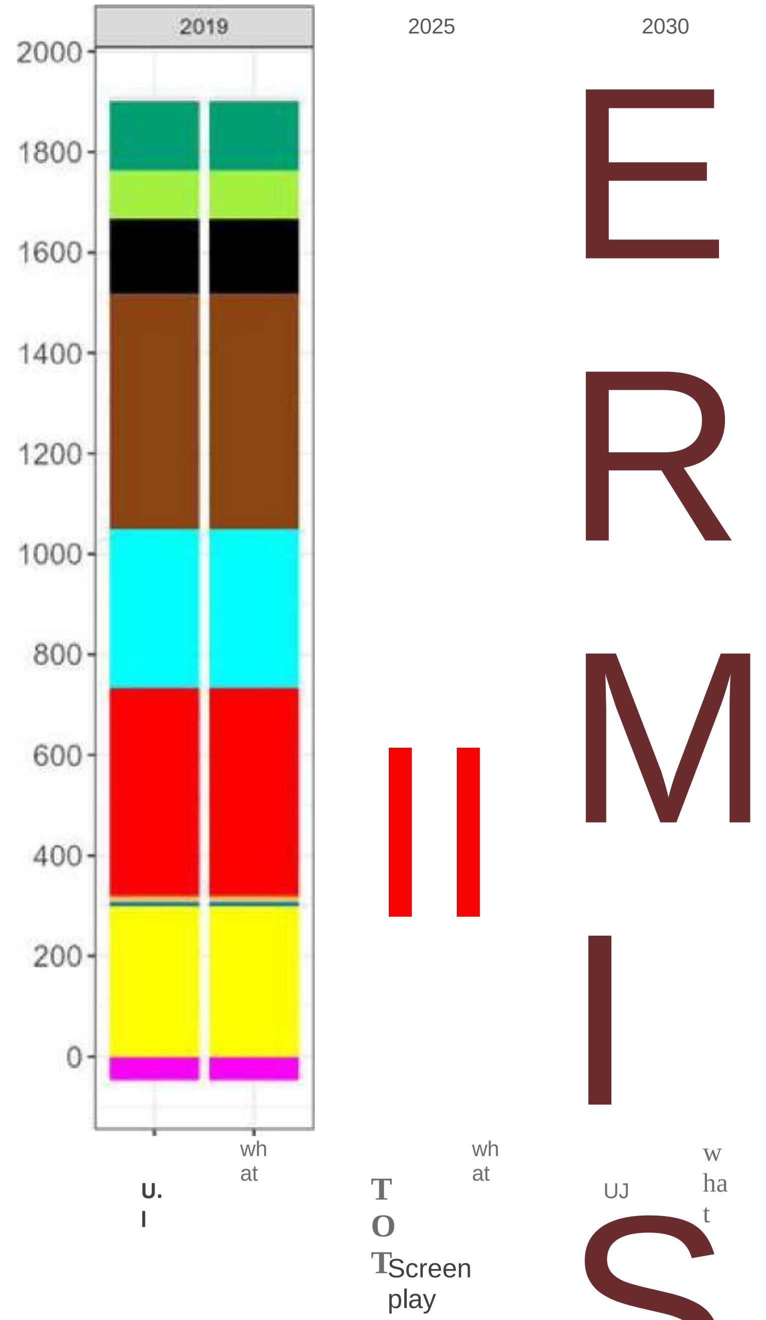
2.2.1.1 National energy efficiency target Article 4 EED

The Directive of the European Parliament and of the Council on energy efficiency establishes a framework of measures to promote energy efficiency improvements across the EU to ensure the EU’s 2030 energy efficiency target. The Directive allows each Member State to set an indicative national contribution towards meeting the EU targets by reducing final and primary energy consumption. However, when setting their contributions, Member States must respect the EU’s 2030 energy efficiency target of 763 Mtoe (31 945 PJ) of final energy consumption and binding at EU level. For primary energy consumption, the target is set at 992.5 Mtoe (41 554 PJ) and is indicative at EU level. The set values correspond to a decrease of 11.7 % in consumption compared to the reference scenario.

The Czech Republic’s contribution to the non-binding EU 2030 target

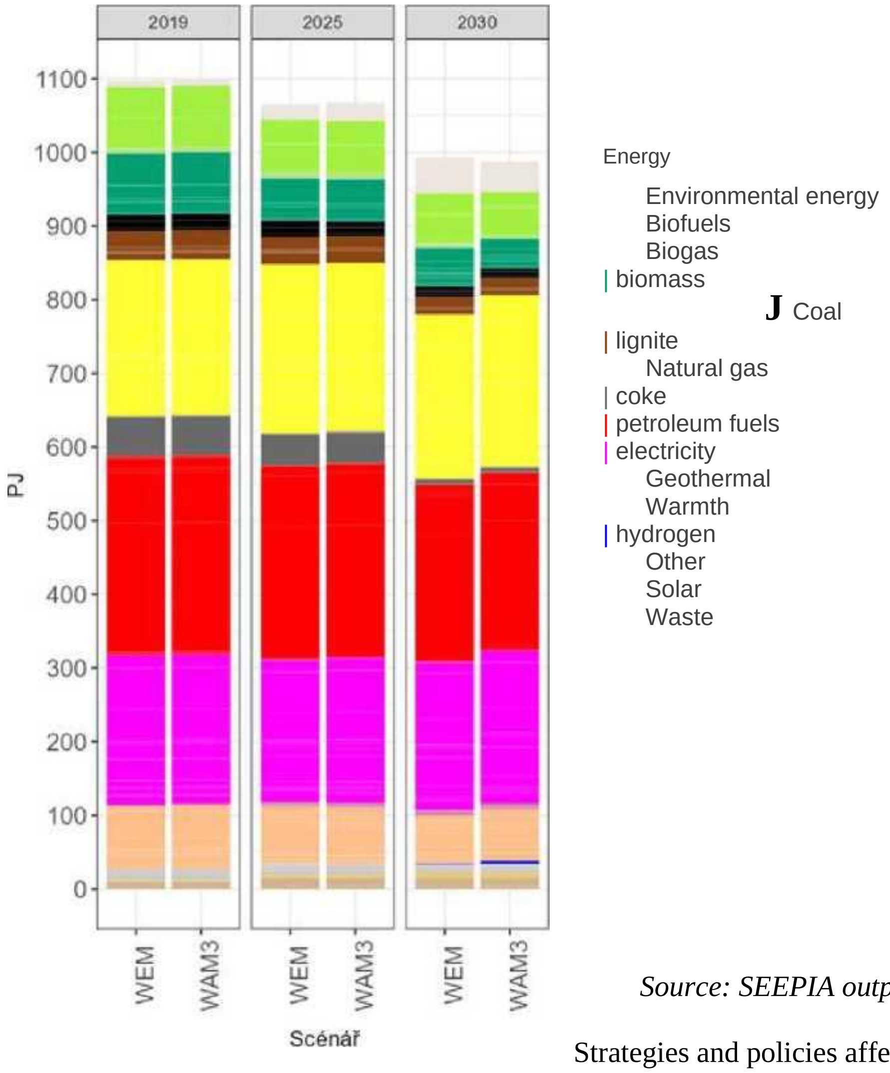
For the purpose of setting the national contribution, Member States may use the formula in Annex I to the new Energy Efficiency Directive, where for the period 2030 the Czech Republic considers it most appropriate to set contributions in accordance with this calculation The indicative contribution to the binding EU target for final energy consumption is calculated at 846 PJ. The indicative contribution to the non-binding primary consumption target is calculated at 1 206 PJ.

Graph 11: *Outlook for the development of primary energy sources*



Source: SEEPIA outputs

Graph 12: *Outlook for the evolution of final energy consumption*



Source: SEEPIA outputs

Strategies and policies affecting the level of final energy consumption include in particular:

– Long-term building renovation strategy under Article 2a of the EPBD;
– obligation under Article 5 of the Energy Efficiency Directive
– obligation under Article 7 of the Energy Efficiency Directive
– legislative and regulatory measures as a result of transposition and implementation of national and EU legislation
– fiscal instruments
– strategies and policies in other areas covering, inter alia, the transport sector and expressed in the following conceptual materials:
    - on the Czech Republic's State Energy Concept
    - on the National Reform Programme of the Czech Republic (NRP)
    - on State Environmental Policy
    - on Climate Policy in the Czech Republic
    - oStrategic framework for sustainable development of the Czech Republic
    - o National Clean Mobility Action Plan
    - on the Transport Policy of the Czech Republic for 2021-2027 with a 2050 perspective

2.2.1.2 Cumulative energy savings target under Article 8 of the Energy Efficiency Directive for the period 2021-2030

The new Energy Efficiency Directive (EED) sets an obligation for 2021-2030 to achieve cumulative energy savings through new energy savings for the period 2021-2030, in line with the accounting limits set by the Directive.

In accordance with the wording of the Directive and the commitment rules, the Czech Republic has set a target of 145 PJ of new energy savings for the period 2021-2030, i.e. a total of 669 PJ of cumulated energy savings by 2030**.** The amount of the commitment shall respect the requirement to gradually increase the minimum level of annual energy savings from 0.8 % to 1.9 % of final energy consumption in accordance with Article 8(1)(b).

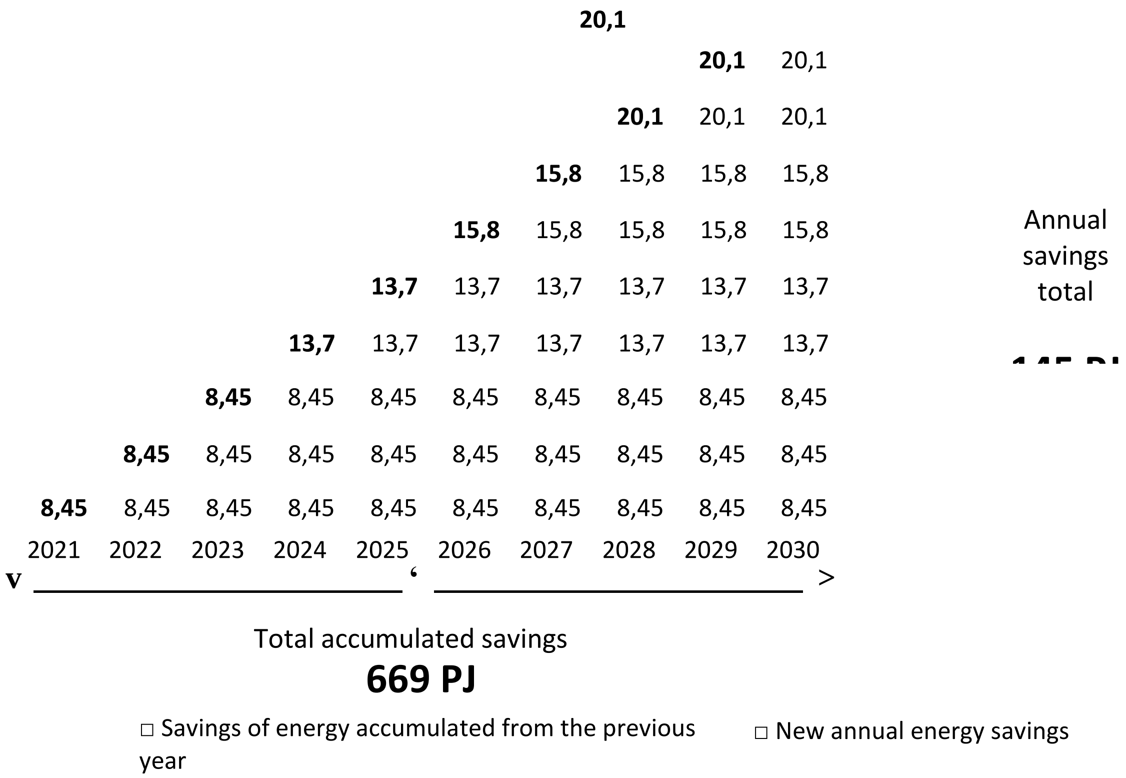
The benchmark for calculating the target is final energy consumption from 2016-2018 according to Eurostat – Final Energy Consumption Europe 2020-2030. In the period 2021-2030, the Czech Republic does not make use of the possibility of another baseline deduction or accounting for additional savings under the so-called exemption system in accordance with Article 8(6) to (94).

Figure 18: *Calculation of the energy savings obligation for 2021-2030*

Average final consumption 2016-2018	1 055.9 PJ	
Annual amount of the commitment		
2021-2023	0.8 %	8.5 PJ
2024-2025	1.3 %	PJ
2026-2027	1.5 %	PJ
2028-2030	1.9 %	20.1 PJ
Annual savings obligation	**145 PJ**	
Cumulative savings obligation	**669 PJ**	

Source: Self-processing of the Ministry of Industry and Trade for the purposes of the National Plan

Graph 13: *Establishment of the cumulative commitment of the Czech Republic under Article 7 for the period 2021-2030 (in PJ)*



Source: Self-processing of the Ministry of Industry and Trade for the purposes of the National Plan

2.2.1.3 Exemplary role of public bodies' buildings under Article 5 of Directive 2012/27/EU

In view of the need to prepare a data base, this passage will not be updated under the new Energy Efficiency Directive for the purpose of the draft. Article 5 of the Directive provides that a Member State is to ensure that, from 1 January 2014, at least 3 % of the total area of buildings with an energy reference area over 250 m^2 which are owned and occupied by central institutions and which do not currently meet the energy performance requirements for buildings are class C-saving. These minimum requirements are set by each Member State on the basis of Article 4 of Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings.

Based on the assumed energy performance class of the partially renovated building stock of central institutions, as a result of the fulfilment of this obligation already in the current period 2014-2020 according to the 'Update of the Rehabilitation Plan within the scope of Article 5 of Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency'21, under the renovation commitment under Article 5 of Directive 2012/27/EU in 2021, for buildings not complying with the

21 Documentary references: https://www.mpo.cz/cz/energetika/energeticka-ucinnost/strategicke-dokumenty/plan- Renovation-Building-ustrednich-Institution-dle-cl-5-Directive-2012-27-eu-o-energy-ucinency- 236718/

minimum energy performance class requirements, a minimum energy saving has been set to achieve an annual renovation rate of 3 % of the energy reference area of non-compliant buildings. This approach is in line with the requirements of Article 5 of the Energy Efficiency Directive.

Setting an annual energy saving obligation of 12.4 TJ foresees the implementation of all planned actions approved under the "Update of the Rehabilitation Plan within the scope of Article 5 of Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency"22 23

ii. Milestones for 2030, 2040 and 2050, measurable progress indicators set by each Member States, an evidence-based estimate of expected energy savings and other benefits and their contribution to the achievement of the Union's energy efficiency targets as set out in the roadmaps included in the long-term renovation strategies of the national stock of residential and non-residential buildings, both public and private, in accordance with Article 2a of Directive 2010/31/EU

Indicative milestones for the long-term building renovation strategy

The developed strategy analyses the renovation scenario of the building stock, its costs and benefits, and proposes policy, legislative and economic instruments to implement it. The energy and economic impacts of each scenario up to 2020, 2030, 2040 and 2050 have been assessed based on the outputs of the different parts (building stock overview, savings potential in the building stock, investment costs for renovations, definition of individual renovation scenarios). However, it is more complex in terms of e.g. policy design requirements reflecting identified building renovation barriers, market failures, etc. It aims to support the cost-effective transformation of existing buildings by setting up adequate financing mechanisms to mobilise private investment.

The long-term strategy delivers a proposal for a cost-effective renovation scenario for the Czech Republic's building stock, comprising residential, public and private sectors, with measurable progress indicators with relevant policies, as a result of which the milestones and targets for the renovation of the building stock in the Czech Republic will be achieved.

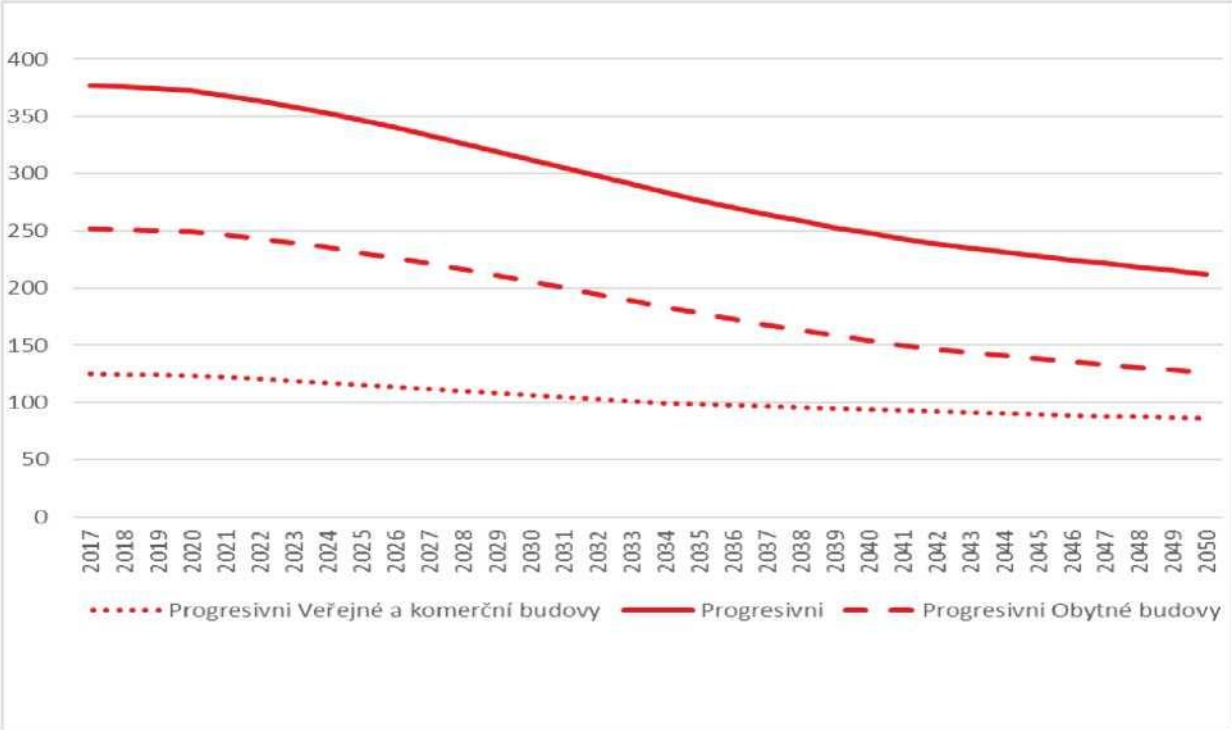
In the period 2021-2050, the Czech Republic expects developments in the area of building renovation under the so-called 'progressive scenario'[23] [which is the ideal scenario built on rapid and deep renovations of the building stock. Input data used to calculate the long-term strategy scenario model is based on SLDB 2011, which provides the most detailed information on the building stock (number of apartments, ownership structures, age of buildings, floor area in m² and more). Data from the SLDB 2011 was used to map the building stock in the residential sector. For the non-residential sector, the survey "Buildings 1-99 Investigation of non-residential buildings and selected residential buildings" was used and supplemented by data from the Register of Territorial Identification, Address and Real Estates and Building Offices.

The main modelling output can be seen in the following graphs. Evolution of energy consumption in the building sector for the types of consumption considered in the assessment of the energy performance of buildings in accordance with the Energy Management Act (i.e. excluding appliances). The starting point is 378 PJ. The residential sector is 253 PJ and 125 PJ for the non-residential sector.

Graph 14: *Model final energy consumption in buildings – progressive scenario[PJ]*

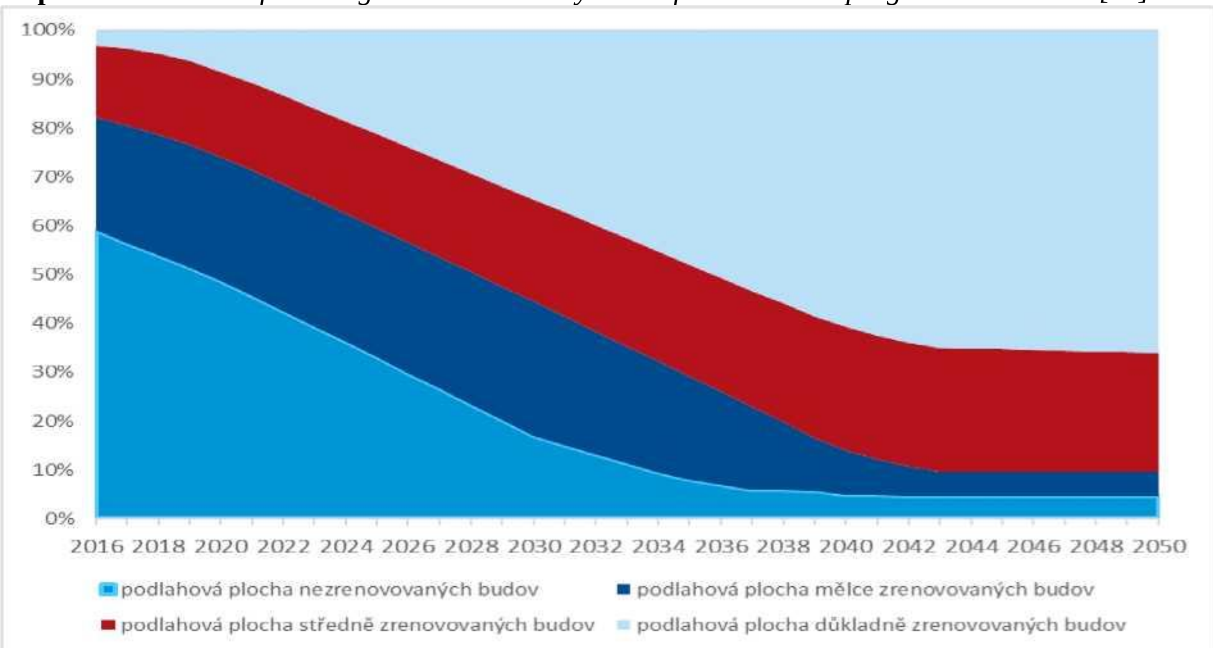
22The value is an estimate based on the current building renovation plan of central institutions. The level of the commitment will be revised on the basis of the current dates in 2020 after the planned renovations have been carried out.

The forward-23 looking scenario corresponds to the counterfactual scenario of the last Long-Term Building Renovation Strategy



Source: Long-term building renovation strategy

Graph 15: *Evolution of building stock structure by level of renovation – progressive scenario [m²]*



Source: Long-term building renovation strategy

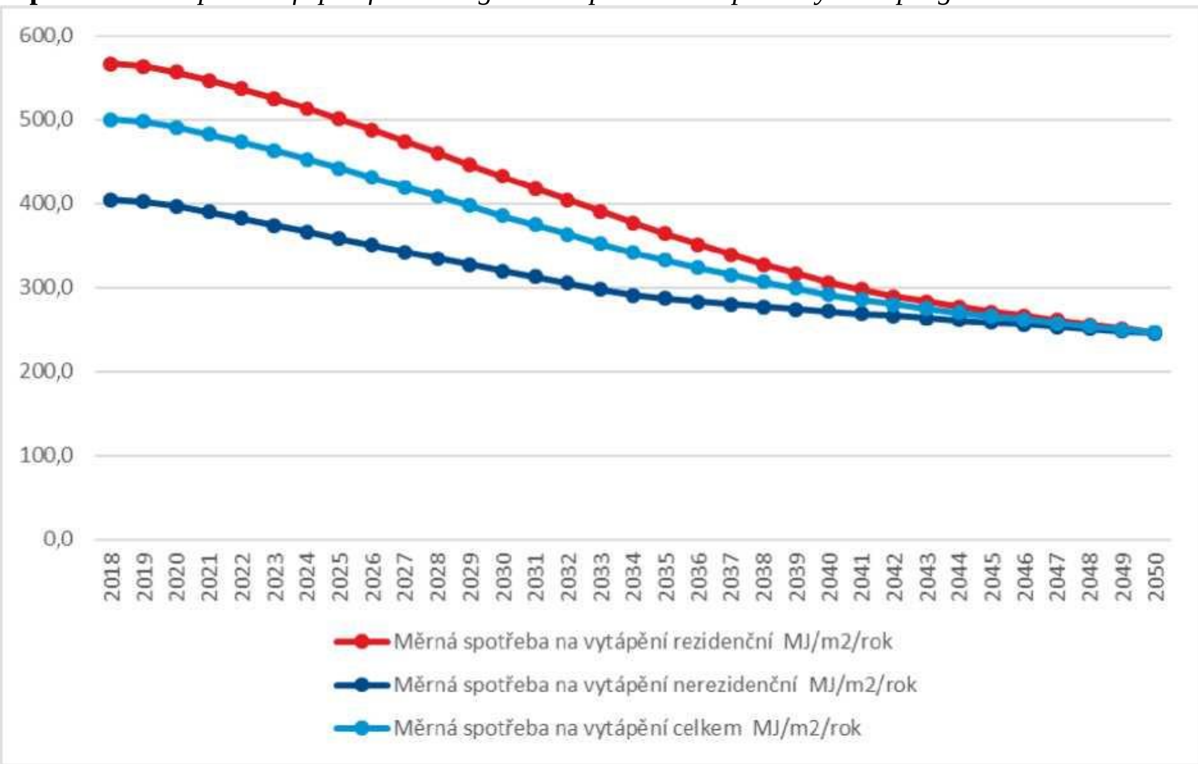
A progressive scenario assumes that the vast majority of buildings (85 %) will be renovated deep as of 2025 and 2030 respectively, only buildings where this is not technically possible will remain for shallow or medium renovations. This requires significant State intervention. In addition, the renovation rate is expected to increase to about double, which would mean renovation of each building in less than 30 years. This increase in both depth and renovation rates will lead to a reduction in energy consumption of 166 PJ (44 %) by 2050.

Table 19: *Table of basic data*

Progressive	2020	2030	2040	2050
final energy consumption in a given year [PJ]	372	312	248	212
family houses	*161*	*130*	*94*	*76*
multi-family buildings	*88*	*76*	*60*	*50*
public and commercial buildings	124	107	94	86
energy savings compared to baseline 378 PJ [PJ]	—6	—66	—130	—166
Specific heating demand [MJ/(m².year)]	**491**	**386**	**292**	**246**

Source: Long-term building renovation strategy

Graph 16: *Development of specific heating consumption in MJ per m²/year – progressive scenario*



Source: Long-term building renovation strategy

In order to report on the impact and/or the implementation of the long-term renovation strategy for buildings, an indicator of the specific heat demand for heating in MJ per m^{2}per year was chosen for each sector. This indicator was chosen taking into account the availability of data (annual reporting of final consumption in households, namely in the heating segment, knowledge of the size of the total floor area of the building stock (annual update of the Czech Statistical Office's new construction data)). The variable, which is identified and does not have a detailed number of updates, is the degree of demolition. For this reason, the aggregation of people, homes and apartments will provide accurate information every 10 years, which can be used to refine the input data of the model.

Figure 20: *Indicative milestones for a forward-looking scenario of the 2030 Building Renovation Strategy, 2040 and 2050*

[MJ/(m^2.year)]	2030	2040	2050
Specific heating demand	386	292	246
Residential sector	433	306	246
Non-residential sector	320	272	246

Source: Long-term building renovation strategy

Contribution of the optimal scenario to the reduction of greenhouse gas emissions

The adaptation model is taken from the Building Renovation Strategy prepared in 2016. It is recalculated for the aggregated outputs of the current model, i.e. there is no split by type of building owner, but gives a good picture of the extent of possible carbon dioxide emission reductions under different scenarios according to the degree and depth of building renovation.

Apart from an adaptation measure, energy renovation of buildings is also a mitigation measure, i.e. such a measure that reduces greenhouse gas emissions. These are due to the operation of buildings and their contribution to total anthropogenic emissions is not at all negligible.

As part of the project to prepare a national strategy for the adaptation of buildings to climate change, a study “The Czech Republic’s greenhouse gas emission saving potential through the renovation[24]of buildings” was therefore carried out to quantify this potential. The following text is based on this study unless otherwise stated.

According to the National Greenhouse Gas Inventory, in 202 196.67 Mt CO_2 was produced in the Czech Republic without accounting for the LULUCF sector and 105,01 including net emissions from the LULUCF sector.

In order to obtain the input values, the output table from the complex model created by the chance for buildings in the current version was used. For each year, the values of final energy consumption resulting from the forecast of the Czech building stock are quantified, as well as the values of final energy savings for heating and the increase in final energy consumption for cooling are available. In addition, the energy mix had to be attributed to these final consumption values. Its development was modelled on a year-by-year basis, separately for residential and non-residential buildings. The current energy mixes were taken as a baseline and another point was predicted energy mixes in 2060, both of which are based on studies of the residential[25] and non-residential stock surveys[26]. In terms of clarity, simplification was applied, with values interpolated linearly by year-by-year discrete values in 2060. Given the high uncertainties of the further forecast for this study, the energy mix remains constant in 2060.

In order to quantify the energy saved for CO_2 emissions, the emission factors from Decree No 140/2021, which are used for the purpose of energy audits, were subsequently used:

As there is no forecast of future developments in emission factors in the Czech Republic, these factors have been considered constant in the light of the calculation as a whole (it is foreseeable to reduce the emission factors of individual fuels with the arrival of new technologies and a significant reduction in the emission factor of electricity with an increasing share of RES, cogeneration or nuclear energy in the distribution network).

This simplification will therefore lead to higher calculated emission output values than will actually be the case. In order to switch energy consumption to cooling, electricity was considered as an energy source.

24Lupsk, Antonín. 2016. The*Czech Republic’s greenhouse gas emission saving potential through the renovation of buildings*. ČVÚT UCEEB.

25Survey of housing stock and savings in the Czech Republic, Šance for buildings for the Ministry of Industry and Trade, December 2016

26Survey of the non-residential building stock in the Czech Republic and the potential for savings there, Šance for buildings for the Ministry of Industry and Trade, December 2016

On the basis of the calculations carried out, it can therefore be concluded that **the operation of buildings with 44.57 Mt CO_2 accounts for approximately 44 % of the Czech Republic's total emissions**.

Contributions to the energy efficiency targets of Directive 2012/27/EU in accordance with Article 2a of Directive 2010/31/EU

The long-term strategy for the renovation of the national stock of residential and non-residential buildings, both public and private, is one of the tools to achieve a sustainable, competitive, safe and decarbonised system focused on the building sector, which is still responsible for 40 % of the EU's final energy consumption, despite policies and investments already in place to improve the energy performance of buildings. Building a coherent framework should increase the number and complexity of renovations, thereby helping to transform the building stock into a highly energy efficient building stock. Buildings in the Czech Republic represent one of the sectors with significant energy saving potential, mainly due to the substantial share of energy consumption in the residential sector.

The strategy contributes to the objectives of Directive 2012/27/EU, which is reflected over three articles, namely Article 4, Article 6 and Article 8.

Article 6 deals with the annual renovation to nearly zero-energy building standard of 3 % of the total floor area of heated and/or cooled buildings owned by the public administration.

Article 8 mainly uses fiscal measures (support programmes for both investment and soft measures) to support the implementation of the optimal building scenario. At the same time, fiscal measures are a state tool to deliver on the energy efficiency commitment of Directive 2012/27/EU. However, it is not possible to identify precisely the contribution of this Czech Republic's commitment, which is set at 673 PJ of cumulative final energy savings in the period 2021-2030, since Article 8 of Directive 2012/27/EU is calculated energy savings, whereas the material works with the real development of final energy consumption, which is influenced by many factors.

Last but not least, the strategy contributes to the objectives of Article 4, which deals with the reduction of final consumption of the economy. Through renovations, it contributes to reducing the final consumption of buildings in sectors such as households, services and industry, thereby contributing to the Union's 2030 headline targets for energy efficiency.

iii. Where applicable, other national objectives, including long term targets or strategies and sectoral targets, and national objectives in areas such as energy efficiency in the transport sector and with regard to heating and cooling

In that regard, the target in relation to the heating and cooling sector, which results from the approved State Energy Concept, can be mentioned. This is the target of 60 % of the supply of combined heat and power supply systems by 2040. This objective is currently being met, but its

27 Based on 2014 data.

28 Certification of WELL's healthy indoor environment. *Healthy building* [online]. 2020. Available from: http://www.zdravabudova.cz/cs/certifikace

future performance depends, inter alia, on the promotion of cogeneration. More information on post-2020 CHP support can be found in chapter 3.1.2.

29 3 Dimension 'Energy security'

I. Elements set out in point (c) of Article 4

2.3.1.1 Cross-cutting objectives

Diversification objectives are summarised in the target corridors of the Czech Republic's State Energy Concept. However, it should be stressed that the State Energy Concept was approved in 2015 and is currently being updated.

Table 21: *Share of individual fuels in total primary energy sources (excluding electricity)*

	Situation in 2016	Target situation in 2040
Coal and other solid non-renewable fuels	40 %	11-17 %
Oil and petroleum products	20 %	14-17 %
Gaseous fuels	16 %	18-25 %
Nuclear	15 %	25-33 %
Renewable and secondary energy sources	10 %	17-22 %

Source: Czech State Energy Concept (2015)

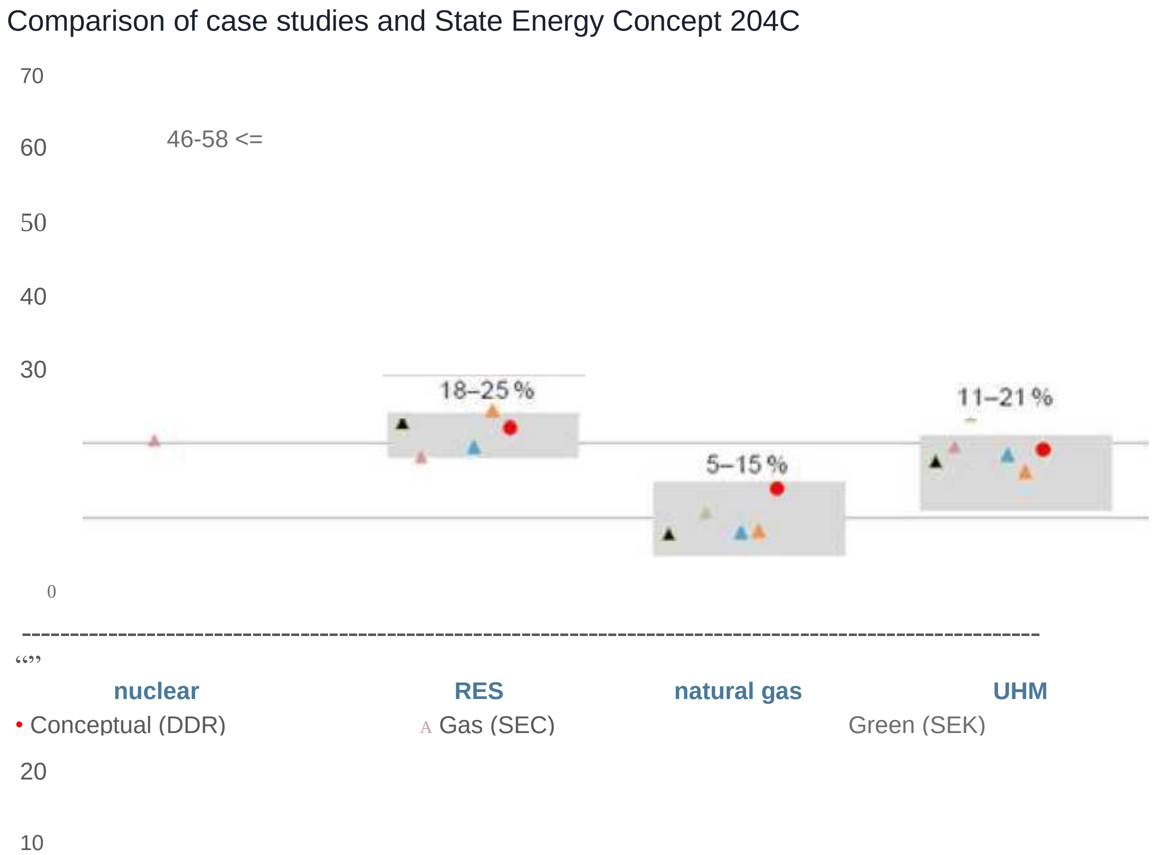
Table 22: *Share of individual fuels in gross electricity production*

	Situation in 2016	Target situation in 2040
Coal and other solid non-renewable fuels	50 %	11-21 %
Nuclear	29 %	46-58 %
Natural gas	8 %	5-15 %
Renewable and secondary energy sources	13 %	18-25 %

Source: Czech State Energy Concept (2015)

The evolution of the energy sector towards the target corridors is assessed on an annual basis in the framework of the expected balance, which further analyses marginal scenarios on a periodic basis.

Graph 17: *Comparison of the case studies of the Czech Republic's State Energy Concept for 2040*



Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

The import dependency target is to maintain import dependency of no more than 65 % by 2030 and 70 % by 204027.

2.3.1.2 Electricity

In the field of electricity, the following can be considered as the main headline targets of the Czech Republic:

– A major development of wind farms to complement the ongoing development of photovoltaic power plants.
– The development of flexibility management elements, including various forms of storage, or demand side response, to ensure the stability of the electricity system.
– Maintaining a high quality of energy supply and meeting generation adequacy parameters.
– A gradual decline in electricity exports and keeping the balance within ± 10 % of domestic consumption in line with internal market conditions.28
– Maintaining a positive electricity performance balance and ensuring adequacy of capacity reserves and balancing performances (provision of necessary ancillary services) and ensuring capacity adequacy in the range of -5 to + 15 % of the maximum electricity system load (fast capacity according to ENTSO-E methodology).
– Ensure that circular flows of electricity and transit are systematically addressed from a security and

27Under this target, nuclear fuel is considered as an imported resource. For this reason, this value is not directly comparable to the value given in the analytical annexes to this document, since, according to the energy balance, there is heat coming from nuclear reactions which, by definition, is not imported.

28The WAM3 scenario assumes an import balance of 10 TWh/year.

cost-compensation perspective.

- Ensure that the diversification of primary energy sources is achieved in accordance with the target corridors of the Czech Republic's State Energy Concept, which means, inter alia, the continued development of nuclear energy in the Czech Republic.

- The pillar of the Czech Republic's energy security is nuclear resources capable of operating manageable (24/7) and having a high utilisation factor (85-90 %). Stocks of fresh nuclear fuel guarantee the Czech Republic's energy independence. Nuclear power plants are also key to maintaining the stability of the electricity system and lower system costs in the future. In order to maintain and potentially strengthen the contribution of nuclear power to electricity and heat generation, the construction of new nuclear resources in existing nuclear sites but on non-nuclear sites (mainly SMRs) needs to be accelerated. One of the prerequisites is the acceleration of permitting processes for the construction of new nuclear resources. The length of authorisation processes shall not jeopardise the safeguarding of a high level of nuclear safety, radiation protection, security, non-proliferation and radiological emergency management, as provided for by international standards, Euratom law and Czech Atomic Law, which must always be a priority, and must provide sufficient scope to assess compliance with any requirements imposed on the design of nuclear installations contained in the relevant legislation and international requirements and recommendations. In order to assess the assurance of a high level of safety of nuclear installations within the administrative deadlines for individual permits, it is essential to ensure sufficient qualified human resources and adequate financial resources for the competent regulatory authorities (e.g.: SÚJB). In particular, this should be taken into account in view of the significant increase in competitive demand for professionals on a pan-European scale, as the lack of experts, both on the part of the operator and the State, will lead to blocking any strategic plans in this regard.Ensure speeding up permitting schemes for the construction of renewable energy sources.
- Systematically support the development of the transmission system and the gas transmission system to prepare for a gradual transition to clean hydrogen allowing the exploitation of system efficiency synergies within the framework of the 'compensation sector' concept.

2.3.1.3 Gas

In the field of gas, the following can be considered as the main headline targets of the Czech Republic:

- Ensure diversification of gas sources and transport routes through the implementation of planned infrastructure projects, as well as the efficient functioning of domestic gas storage facilities.
- Ensure effective access to transit capacities for the supply of natural gas to Czech consumers.

– Continuously ensure reverse operation capability and the rehabilitation and development of the pipeline transmission system.

Ensure capacity for the supply of natural gas (in particular with a view to increasing its demand for heat supply and electricity generation).

- Maintain the Czech Republic's transit role in the transport of natural gas or gaseous fuels in general.
- Support projects providing storage capacity in the Czech Republic amounting to 35-40 % of annual gas consumption and production capacity guaranteed for two months at least 70 % of peak daily consumption in the winter period. Ensure conditions for the operation of the transmission system in reverse direction and the capacity to supply gas from the north or west at a level of at least[40]m³/day.
- Support financially and institutionally both the transformation of existing biogas plants for the production of biomethane and new biomethane stations, synthetic gas production stations and hydrogen production facilities, including their connection to the gas system.
- Ensuring connection and possible gas transmission and distribution capacities when replacing coal with gas at large customers (heat plants).

- In the context of decarbonisation objectives, prepare the gas transmission and distribution system for a higher share of new types of gas and the convergence of the electricity and gas sectors (sector coupling).
- Describe and implement tools for reporting renewable gas targets (the need for a system of uniform reporting obligations and targets based on certificates linked to other carbon emission monitoring and reporting systems (see biomethane and hydrogen tracking and reporting to the EU database prepared by the European Commission).
- Ensure the timely development of hydrogen production, transport, import, storage and use in the Czech economy as an important contribution to its decarbonisation and competitiveness of industry, transport and energy.
- Ensure the legislative anchoring of hydrogen in the Energy Act and other related legislation, set up a regulatory and financial framework to support hydrogen projects. Facilitate the long-term sustainability of existing gas transport infrastructure for the use of sustainable fuels through Repurposing/retrofitting.
- Update the Czech Republic's Hydrogen Strategy to include specific objectives, deadlines and instruments necessary to kick-start the hydrogen economy.
- Create conditions for transport and storage of CO_2.
- Develop a study and test hydrogen storage in the Czech Republic (underground storage facilities, salt caverns, etc.)
- Build the Czech Republic's transit role in the field of hydrogen transport to ensure a smooth transition from natural gas to hydrogen.

2.3.1.4 Oil sector

In the oil sector, the following can be considered as the main headline targets of the Czech Republic:

- Support other projects increasing the diversification of oil and product supply options to the Czech Republic, e.g. increasing the capacity of the TAL pipeline, construction of the Litvínov-Leuna oil pipeline (Spergau).
- Support the development and strengthening of the existing system for transporting oil to the Czech Republic in order to ensure and maintain sufficient transport capacity for refineries in the Czech Republic and, in cooperation with other countries (Slovakia, Ukraine, Russia), to maintain the operating capacity of the entire cost-built transmission system in the past.
- Maintain two functional oil supply routes to the Czech Republic from two different directions as a basis oil security of the Czech Republic.
- Maintain emergency stocks of crude oil and petroleum products in accordance with the new calculation methodology of Council Directive 2009/119/EC at a level of at least 90 days of net imports and verify their actual availability for use in crisis situations.
- Ensure the continued maintenance of operational oil processing capacities in the Czech Republic amounting to at least 50 % of normal domestic consumption.
- Ensure the end of import dependency on the Russian Federation, in line with the REPower EU strategy.

2.3.1.5 Heating

In the heating sector, the following can be considered as the main headline targets of the Czech Republic:

- Maintaining, as a matter of priority, both economically and energy-efficient, thermal energy supply systems, provided that they are fundamentally transformed.
- Ensure conditions for compliance with taxonomy obligations for CHP plants.

- Create the conditions for the transformation of the heating sector and the exit from coal and, in the longer term, from natural gas. Each system needs to be transformed on the basis of strategic planning at local level, first to look for the potential for energy savings, to use renewable heat and waste heat while moving to low-temperature systems (branch), and then to consider replacing resources. Support the transition, in particular, of medium and smaller heat supply systems, to multi-fuel systems using locally available biomass, natural gas and, where appropriate, additional fuel, where natural gas will play a stabilising and complementary role.
- Create conditions within heat supply systems for efficient use of heat from renewable and secondary energy sources available at regional and local level.
- Promote, in particular, the use of larger CHP plants for regulatory services.
- Create the conditions for securing the role of heat plants in island operations of individual areas in emergency situations.
- Ensure the integration of smaller heat sources into smart grid systems and decentralised management.
- Support and develop the ability to supply energy in local (island) subsystems in the event of system breakdown due to major disturbances caused by natural events or by terrorist or cyber-attacks, to the extent necessary to minimise the supply of the population and to maintain the functionality of critical infrastructure.
- In the context of the ongoing decentralisation of electricity sources, the overall flexibility of the energy system will need to be ensured. From this perspective, heat sources should be more involved in the provision of ancillary services at both distribution and transmission system level. At the same time, thanks to the possibility of using CHP, production resources contribute to flexible electricity supply, while on the other hand technologies such as electric boilers and heat pumps have the potential to increase the ability of the power generation/consumption side.

- I. National objectives in terms of increasing diversification of energy sources and supplies from third countries

countries to increase the resilience of regional and national energy systems

Since the last update of the EQS, the international security environment has deteriorated with significant economic and energy impacts. As Czechia is a net importer of oil and gas and has no potential to reverse this situation, it is strongly influenced by adverse international developments. Russia is responsible for the deterioration of security on the European continent and has decided to implement its colonial ambitions.

In this spirit, Russia is also deliberately acting against our economic stability. In the energy sector, it has a particularly strong influence as a major exporter, which exploits its political objectives incompatible with Czechia's security interests. This trend precedes Russia's invasion of Ukraine and fully upgraded in the course of 2022 by unilateral shrinkage of gas supplies to Europe. We felt this to ourselves when a Russian energy weapon signed up to an unprecedented increase in final energy prices.

Russia has not long beenhaving as a rational, let alone, a reliable economic partner. On the contrary, it is an immediate and direct threat to Czech security interests. Czechia must therefore be relieved of its dependence on Russian energy exports. Over the past year, we have managed to fully replace Russian gas supplies and are taking steps to similarly succeed in replacing Russian oil. It is in Czechia's interest to further diversify and extend its independence from Russia to other energy commodities. In line with this, we will also support the strengthening and extension of European sanctions. But we will never put our own energy security at risk. As with all effective sanctions, the measure has to breathe more on the other side than we alone. We also see a shift away from Russian energy commodities as irreversible. **Regardless of further Russian actions, Czechia must not return to a dependent position.** As a landlocked state, Czechia will work closely with European partners to meet its energy needs.

The Czech Republic has a relatively well-diversified energy mix. The objectives for the diversification of energy sources are mainly embodied in the Czech Republic's national energy concept (see Chapter 2.3.1.1). With regard to the objectives of supply of energy commodities from third countries, more information is provided in point (iii) of this Chapter.

Hydrogen as an energy carrier can further help increase the diversification of energy sources, as there are many more places in the world where renewable hydrogen can be produced than natural gas.

- II. Where applicable, national objectives with regard to reducing energy import dependency from third countries, for the purpose of increasing the resilience of regional and national energy systems

As regards reducing dependence on energy imports and increasing the diversification of resources consumed or imported, the following objectives may be highlighted (or rather quantifiable indicators).

– Ensure sufficient resources in the electricity sector commensurate with the expected availability of electricity imports;
– reduce and maintain diversification below 0.25 in the long term;
– reduce and maintain diversification of gross electricity production below 0.35 in the long term;
– reduce and maintain the diversification of imports below 0.30 in the long term;
– reduce the share of energy imports in gross value added below 2010 levels;
– stabilise the impact of energy imports on the balance of payments.

- v. National objectives in terms of increasing the flexibility of the national energy system, in particular through the use of indigenous energy sources, demand response and energy storage

On 14 March 2023, the European Commission published a proposal for a reform of the EU electricity market.29 As part of the proposal for a Regulation of the European Parliament and of the Council amending Regulations (EU) 2019/943 and (EU) 2019/942 and Directives (EU) 2018/2001 and (EU) 2019/944 in order to improve the Union's electricity market design.

The draft Article 19c, which deals with the assessment of flexibility needs, enshrines that by 1 January 2025 and every two years thereafter, the regulatory authority of each Member State shall assess the need for flexibility in the electricity system. The draft Article 19d enshrines the obligation to set an indicative national target for demand response and storage.The indicative national target for demand response and storage will therefore be set following the outcome of the legislative process at EU level.

Dimension 'Internal energy market'

2.4.1 Electricity interconnectivity (2030 Framework target)

1. Electricity interconnectivity level that the Member State wishes to achieve in year 2030 taking into account the 2030 target of at least 15 % electricity interconnection, together with a strategy setting the level from 2021 onwards in close cooperation with the Member States concerned, taking into account the interconnection target of 10 % for 2020 and the following indicators of urgency for action:

   1) price differential in the wholesale market exceeding an indicative threshold of EUR 2/MWh between Member States, regions or bidding zones;

   2) nominal transmission capacity of interconnectors below 30 % of peak load;

29 The proposal is available on the European Commission's website (link).

3) nominal transmission capacity of interconnectors below 30 % of installed renewable generation.

Each new interconnector shall be subject to a socioeconomic and environmental cost-benefit analysis and implemented only if the potential benefits outweigh the costs

Connectivity target for 2030

The overarching transmission system interconnectivity target for 2030 corresponds to maintaining import and export capacity of the transmission system relative to the maximum load at a level of at least 30 % and 35 %[32] respectively. However, this target is not directly comparable to the European target of 15 % by 2030, as this target is expressed in relation to installed capacity. In general, the target in the Czech Republic's State Energy Concept corresponds to the 15 % target, as the share of maximum load to installed capacity corresponds to around 50 % (53 % in 2017)[33]. The Czech Republic therefore undertakes primarily to meet the target expressed in the Czech Republic's State Energy Concept, which is already fully at a relatively significant extent, but achieving this objective should correspond to compliance with the Barcelona Agreement (the 15 % target for 2030), despite the fact that the evolution of maximum load and installed capacity may vary to some extent.

The level of interconnection of the Czech Republic's transmission system is an area which is continuously monitored and assessed in particular by ČEPS's transmission system operator, on the one hand at national level, in accordance with the Czech Republic's State Energy Concept, which directly requires that the import or export capacity of the Czech Republic's transmission system be maintained in proportion to the maximum load at a level of at least 30 % or 35 %, and, on the other hand, at European level, in the context of the European 10-year network development plan, which assesses compliance with the 2012 Barcelona criterion at 10 % transmission system interconnectivity and the interconnection target for 2030 at 15 %. Table 23 shows the projected level of connectivity in 2030 (in both export and import directions) relative to the maximum load, in two scenarios. In both cases, the target values of 30 % and 35 % should be achieved with a relatively significant margin. Table 24 then shows the expected level of connectivity related to the installed capacity. Both scenario A and scenario B assume the same installed capacity in this respect, so there are no differences between these scenarios. The current level of connectivity is then described in chapter 4.5.1.

Figure 23: *Projected connectivity level in 2030 (relating to maximum load)*

	Scenario (a)	Scenario B
Interconsectivity (export)	58.0 %	60.2 %
Interconnectivity (import)	50.0 %	51.8 %

Source: ČEPS, a.s.

Figure 24: *Projected level of connectivity in 2030 under the Barcelona Agreement (relating to in-power)*

	Scenario (a)	Scenario B

[32] Target status and PIII.1 strategy, respectively, under Priority III – Infrastructure and International Cooperation.
[33] In 2017, the maximum load (according to the Energy Regulatory Office's data) corresponded to 11 768 MW and the installed capacity (according to ČEPS, a.s.) was 22 216 MW.

Interconsectivity (export)	44.1 %	44.1 %
Interconnectivity (import)	38.0 %	38.0 %

Source: ČEPS, a.s.

Calculation methodology

The current model of foreign transmission systems is used to calculate the export and import capacity of the Czech Republic's transmission system and, in the case of the Czech Republic, the parts of the transmission system with investment projects to be implemented by the reference year are added. For cross-border capacity calculations, the so-called ENTSO-E NTC is a methodology modified for the needs of transit systems such as PS ČR (strong link and interaction between borders). The process for establishing cross-border capacities is anchored in ČEPS's internal workflow, which is in line with the procedure for determining free tradable capacities for auctions, which is listed on ČEPS's website. The calculation of the percentages of export and import capacity of the PG of the Czech Republic is then based on the share of total export/import capacity in MW for a given year and the forecast of the net load for the corresponding year.30

Formula for calculating connectivity (in the export direction):

$$P_{ex\%} \qquad \frac{P_{sumEXPORT}}{p_{max.OAD}} \; 100$$

Interconnectivity calculation formula (in the import direction):

$$P_{m\%} = \frac{P_{SumiMPORT}}{P_{max<=OAD}} \; 100$$

2.4.2 Energy transmission infrastructure

i. Major infrastructure projects for the transmission of electricity and gas and/or projects to modernise it that are necessary to achieve the objectives and targets under the five dimensions of the Energy Union Strategy

Electricity

The transmission system operator ČEPS, in accordance with the Energy Act, draws up every two years the so-called Czech Republic's Transmission System Development Plan, which is approved by the ERÚ after the Ministry of Industry and Trade has given its opinion. The Czech Republic's 10-year development plan is published on the website of ČEPS31. The Czech Republic's development plan meets the requirements for its subject matter in the Energy Act and concerns measures taken to ensure adequate capacity of the transmission system in order to meet the requirements necessary to ensure security of electricity supply. More information on the expected development of the electricity system is provided in chapter 4.5.2.3.

Gas

Each year, the transmission system operator NET4GAS draws up a 10-year plan for the development of the transmission system in the Czech Republic, in accordance with the Energy Act. The plan shall cover

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Load and installed power30 projections are not fully consistent with those for the purpose of this material, which is due, inter alia, to the other detail and purpose of these projections. However, there should be no serious disproportionate/consistency in this respect.

31 The Czech Republic's 10-year transmission system development plan is available at the following link: https://www.ceps.cz/cs/rozvoj-ps

measures taken to ensure adequate capacity of the transmission system to meet the requirements necessary to ensure security of gas supply. The plan includes, inter alia, the planned investment projects that will increase the capacity of the transmission system over the next ten years, as well as an analysis of the infrastructural security of gas supply. The 10-year plan is approved by the ERO after the Ministry of Industry and Industry and is published on the NET4GAS website.32 More information on the expected development of the transmission system is provided in chapter 4.5.2.4.

ii. Where applicable, main intended infrastructure projects other than Projects of common interest (PCIs)33

Electricity

The above-mentioned Czech Development Plan also translates into the content of the regional investment plan of the Continental Central and Eastern Europe region and the 10-year EU Transmission Network Development Plan, which are adopted by ENTSO-E on a biennial basis. The Czech Republic’s development plan covers not only PCI projects but also projects ensuring adequate capacity of the Czech Republic’s transmission system to meet the requirements necessary to ensure security of electricity supply.

Gas

The development of gas infrastructure will take place in accordance with the approved 10-year transmission system development plan in the Czech Republic, which is updated every year. The projects aim, on the one hand, to maintain the capacity of the transmission system and to upgrade it and, at the same time, to develop it directly.

The current most important challenge for which the transmission system operator is preparing is the possibility of transporting hydrogen in the future. Two hydrogen projects are under preparation, namely the Central European Hydrogen Corridor (CEHC) and the Czech-German Hydrogen Interconnector (CGHI). Both projects are expected to become operational by 2030, while seeking to obtain the status of Projects of Common Interest (PCI) in 2023. Pipelines for hydrogen transport are already available and no sections need to be built. CEHC and CGHI could thus be the first hydrogen corridors to import renewable hydrogen to Europe’s central and match.

Another project is the implementation of the Czech-Polish bi-directional interconnection project. While the Czech Republic is already connected to Poland via the border transfer point Cieszyn, it is only one-way in the direction from the Czech Republic to Poland. The Czech Republic will analyse the possibilities for two-way connections with Poland with sufficient capacity. As part of this cross-border project, the implementation of the national pipeline on the Bezměrov-Libhozz route (the Moravia Capacity Extension II project) is also part of this cross-border project. In addition to cross-border, this project is of national importance, which would allow for an increase in capacity in the Northern Moravia region. The development of gas infrastructure in line with future trends can be assumed beyond the horizon of the Ten-Year Break Plan. The gradual decarbonisation of the European economy could build on the so-called hybrid system, using both electricity and gas networks.

Gas infrastructure as a whole, i.e. not only transport but also distribution, needs to be prepared in a timely manner for new trends such as an increased pace of decarbonisation (and away from fossil fuels), a switch to clean fuels and the associated increased interaction between the gas and electricity sectors. The infrastructure will have to manage not only natural gas but also blends of ZP and hydrogen (blending) and,

32 The 10-year plan for the development of the Czech Republic’s transmission system is available at the following link: https://www.net4gas.cz/cz/projekty/rozvojove-plany/

33In accordance with Regulation (EU) 2022/869 of the European Parliament and of the Council of 30 May 2022 on guidelines for trans-European energy infrastructure, amending Regulations (EC) No 715/2009, (EU) 2019/942 and (EU) 2019/943 and Directives 2009/73/EC and (EU) 2019/944, and repealing Regulation (EU) No 347/2013 (OJ L 152, 3.6.2022, p. 45).

in the final phase, clean hydrogen. The requirement to transport CO2 cannot be excluded in the future. At the same time, gas infrastructure can be used to increase flexibility in the electricity sector through storage at a given moment of excess electricity.

The operating conditions for flows from the north or west should be at least 40 m/day capacity level of at[least]40 m^3/day. This criterion is currently fulfilled. However, the transmission system will also have to be able to supply an energy source base (electric plants and heat plants) – expansion of natural gas-fired sources up to 15 % of installed capacity (currently over 8 %) and BAT parameters (Best Available Technology), expansion of micro-cogeneration sources and use of gas in transport. This will mean the potential connection of new direct gas customers from both the transmission and, in particular, the distribution networks (electricity plants, CHP plants) and the creation of adequate capacities on these networks. If the policy objectives of the SEK are to be met in a liberalised gas environment, all stakeholders need to cooperate.

There is already an increasing interest of investors in connecting generation resources to the grid for the use of non-electrically connected RES generating plants or planning hydrogen production from surplus electricity, therefore it is necessary to ensure that the grids are transformed into blended or clean hydrogen, including consumption. In the context of the development of physical supplies, a tool for reporting targets stemming from European legislation (need for a system of uniform reporting of obligations and targets based on certificates linked to other carbon emission monitoring and reporting systems, see biomethane and hydrogen monitoring).

2.4.3 Market integration

1. National objectives related to other aspects of the internal energy market, such as increases flexibility of the system, in particular with regard to the promotion of competitive electricity prices in accordance with relevant sector-specific regulations, market integration and interconnection aimed at increasing the tradable capacity of existing interconnectors, smart grids, aggregation, demand response, storage, distributed generation, dispatching, redispatching and curtailment mechanisms for renewable energy and real-time price signals, including a timeframe for achieving these targets

2.4.3.1 Electricity

The integration of day-ahead and intraday markets in Europe, based on implicit allocation of cross-border capacities, has a history of more than 15 years of market coupling, initially only between neighbouring countries34 on the basis of bilateral or multilateral agreements. Subsequently, these already interconnected markets were further integrated into larger regions.

One of the main benefits of market integration is the opening-up of a larger – single electricity market. The energy market segmented into individual national markets (although physically interconnected) is inefficient and trading is more risky and therefore expensive. In interconnected markets, participants can better respond to changes in production and consumption. The system thus opens the door to other players, stabilises the market and makes the market more transparent. The result is an increase in competition, leading to downward pressure on prices. In turn, traders can translate savings from linked markets into their pricing policy.

The additional benefits resulting from the integration of short-term electricity markets can be summarised as follows:

34For example, in 2009 the Czech and Slovak day-ahead electricity markets were interconnected.

- optimal use is made of cross-border transmission capacities;
- integration helps to balance national electricity systems;
- price indices are stabilising and the volatility of the difference in electricity spot prices between EU markets is declining;
- the purchase of often unused capacities of cross-border profiles in explicit auctions is limited;
- risks associated with the purchase of cross-border capacity without ownership of electricity decrease export/import and vice versa.

The adoption of Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management (CACM Regulation) based on Regulation (EC) 714/2009 on conditions for access to the network for cross-border exchanges in electricity was an important step not only to support the creation of a single Union electricity market, but also demonstrated the importance of the European Commission's integration topic.

In accordance with the requirements of the CACM Regulation, OTE, a.s. was on 7 10. 2015 appointed by the NEMO to provide single day-ahead or intraday coupling in the Czech Republic35. That provision was further extended by decision of 1 October 2019 for the period from 10 October 2019 to 31 December 2023 and is not only a clear confirmation and positive assessment of the market operator's activities to date, but above all by the market operator's commitment to actively participate in European integration activities. Together with the other European exchanges designated as NEMOs and European Transmission System Operators, OTE a.s. cooperates to fulfil the obligations to develop and ultimately operate a single day-ahead and intraday electricity market in the EU in accordance with the requirements laid down in the CACM Regulation.

As part of the cooperation of all NEMOs in the EU, a plan was developed in June 2017 for the joint deployment and performance of the functions of the day-ahead and intraday electricity market coupling – the so-called MCO plan. It laid down rules on governance and cooperation between the different NEMOs, defines the relationship with third parties and also describes the transition of existing day-ahead and intraday interconnected initiatives to a single interconnected day-ahead and intraday markets.

Following the CACM Regulation, inter alia the following methodologies have been developed and subsequently approved:

- methodology of products that NEMOs may include in the single day-to-day interconnection
- and intraday markets,
- the methodology of replacement procedures;
- methodology for harmonised maximum and minimum clearing prices;
- methodology of the price coupling algorithm and continuous trading matching algorithm.

These methodologies shall be kept up to date, taking into account requests from electricity market participants or the Agency for the Cooperation of Energy Regulators (ACER).

In early 2020, a new version of the joint design of the day-ahead coupling algorithm and continuous trading matching algorithm was approved by ACER and a new version of the joint product design for SIDC aimed

35 For more information, please refer to the following link: http://www.ote-cr.cz/kratkodobe-trhy/integrace-trhu/all-nemo-cooperation

at incorporating a roadmap for the development and preparation of intraday electricity auctions, which should be part of the SIDC and complement intraday continuous trading. Such intraday auctions should be ready in the first half of 2024. Their primary objective is to value the available transmission capacity in intraday trading, as there is no market valuation of transmission capacity in the context of continuous trading. During 2022, the design of these intraday auctions was underway. The implementation of technical and procedural solutions started in 2022 and testing of the technical solutions started in 2023 and will continue throughout the year.

For the relevant delivery day, 3 intraday auctions will be organised in the following sequence:

- IDA 1: D-1 15.00 for all delivery hours on D;
- IDA 2: D-1 22.00 for all delivery hours on D;
- IDA 3: D 10.00 for delivery hours 13-24 on D.

Table 25: *Main national market integration objectives (electro-energy)*

National headline targets	Description
Complete, further develop and finally operate a single day-ahead and intraday electricity market in the EU as required by Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management (CACM Regulation) and the resulting methodologies.	The aim is to fulfil the single market framework established by Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management based on Regulation (EC) 714/2009 on conditions for access to the network for cross-border exchanges in electricity.
Implement the MCO plan.	The MCO plan lays down rules for management and cooperation between the different NEMOs, defines the relationship with third parties, and also describes the transition existing initiatives connected day-ahead and intraday markets in the single interconnected day-ahead and intraday markets.
Calculation of cross-border transmission capacities for long-term time framework coordinated with other TSOs of the capacity calculation region of Core.	The TSO in the Czech Republic will be ready for a coordinated calculation of cross-border transmission capacities for a long-term timeframe as defined in the Core Capacity Calculation Region. By introducing a coordinated calculation at all boundaries of the Czech Republic's bidding zone, the target model for capacity calculation will be achieved as part of the implementation uniform; Committee in the long-term electricity market.
Calculation intraday cross-border intraday time frame transmission capacities coordinated with other operators	Transmission operator systems in the Czech Republic the Republic will be ready for a coordinated calculation of cross-border transmission capacities

the transmission systems of the Core capacity calculation region.	in the Core Capacity Calculation Region. By introducing a coordinated calculation at all boundaries of the Czech Republic's bidding zone, the target model for capacity calculation will be achieved as part of the implementation uniform; Committee in the short-term electricity market
Calculation of cross-border transmission capacities for time framework market with Regulatory energy coordinated with others subsidy the transmission systems of the Core capacity calculation region.	Transmission operator systems in the Czech Republic the Republic will be prepared for a coordinated calculation of cross-border transmission capacities for the balancing energy timeframe as determined in the Core Capacity Calculation Region. The implementation of a coordinated calculation at all borders of the Czech Republic's bidding zone will achieve the target capacity calculation model as part of the implementation of a single, European short-term electricity market
Enable efficient cross-border electricity trading by fulfilling legislative requirements on minimum cross-border capacities.	Transmission operator systems in the Czech Republic the Republic will take all necessary steps to continue to offer day-ahead cross-border capacities in accordance with Article 16 of Regulation (EU) 2019/943 of the European Parliament and of the Council, i.e. to offer cross-border capacities of at least 70 % of transmission capacity while respecting operational security limits
In the **day-ahead electricity market,** ensuring the operation of the interconnected day-ahead electricity market.	The Czech Republic is connected in the day-ahead electricity market with the rest of the EU In June 2021, the 4M MC region was connected to the interconnected MRC region, creating a single European day-ahead market (SDAC) and the implementation in June 2022 of the Flow-based method for calculating cross-border capacities in the CORE region. The implementation of PCR solutions allows market participants to benefit from the same supply structure as market participants in the EU. The operationalisation of the interconnected single day-ahead electricity market within the SDAC is a key element in maintaining the stability of electricity trading.
Implement in the **intraday electricity market a** project for intraday auctions and thereby complete the methodology for pricing intraday cross-zonal capacity prepared and approved in the EU under the CACM Regulation.	On the basis of the CACM Regulation and the resulting methodology for pricing intraday cross-zonal capacity approved by ACER on 24 January 2019, the development and preparation of intraday electricity auctions started, which should be part of the SIDC and complement intraday continuous trading. These intraday auctions

	they should be ready in the first half of 2024. Their primary objective is to value the available transfer capacity within intraday trading, as there is no market valuation of transmission capacity in the context of continuous trading. During 2022 preparation was ongoing design the following intraday auctions
Joint procurement of frequency restoration reserve with automatic activation (aFRR) of the balancing service with Austria and Germany.	Operator transmission systems Czech the Republic of ČEPS, a.s., together with the transmission system operators of Austria and Germany, will connect their markets while respecting the rules of the Regulation Commission (EU) 2017/2195. The implementation project is called ALPACA[40]
Central management of cross-border transmission capacities of Capacity Management Function for the European regulatory energy market.	Czech Transmission Operator systems it operates, develops and services a central tool for managing cross-border transmission capacities of Capacity Management Function (CMF) for the European regulatory energy market. The CMF is a mandatory instrument defined by EU legislation.
Electricity Data Centre	Operator transmission systems Czech the Republic of ČEPS, a.s., together with other operators systems in the Czech Republic the Republic of Poland, it will build an electricity data centre, which will be a key element for the implementation of a new market model involving electricity sharing, storage and providing flexibility from aggregation resulting from Directive EU 2019/944 on common rules for the internal market in electricity.
Enabling an independent aggregator	Design of an independent aggregator model to allow independent aggregation of flexibility (at the level of the demand and delivery point regardless of voltage level).
Introduce a **15-minute imbalance settlement period in the balancing services market** as of 1 July 2024.	In accordance with the applicability of the EBGL Regulation, a 15-minute imbalance settlement period will be introduced in the Czech Republic on 1 July 2024
In the **intraday electricity market, the target** is to introduce 15-minute products as of 1.7.2024.	Deployment 15 minutes products on the intraday market follows the obligations arising from the EBGL Regulation and the introduction of a 15-minute imbalance settlement period in the Czech Republic. As a result, 15-minute products can be introduced for the Czech trade region as part

[40] Allocation of Cross-zonal Capacity and Procurement of aFRR Cooperation Agreement

	continuous trading so within intraday auctions as of 1.7.2024.
In the **day-ahead electricity market,** the aim is to introduce 15-minute products at the latest by early 2025.	The introduction of 15-minute products on the day-ahead market follows the obligations arising from the EBGL Regulation and the introduction of a 15-minute imbalance settlement period in the Czech Republic. Taking into account the specificities of the interconnected market, the introduction of 15-minute products within the SDAC must be harmonised across all EU countries.
Energy Data Centre	In order to facilitate faster integration of RES, the concept will be sector coupling a technologies Power2Gas will be built a data centre for co-management of hydrogen production under the Balancing Service (ČEPS) mode, on the one hand, and NET4GAS to manage the operation of the gas system on the other hand.

Gas sector

The integration of gas markets (natural gas/methane and, in the future, hydrogen) as part of the creation of a single market for gas within the EU lags well behind the integration of electricity markets. Apart from infrastructure projects, which are more aimed at facilitating capacity reservations for gas traders or making areas not directly linked to each other commercially available, no integration projects aimed at connecting organised gas markets in our region are currently under discussion.

The Czech Republic intends to help complete the internal energy market, namely the internal market in gas, by removing narrow infrastructure peas between the Czech Republic and its neighbours. The interconnection with Germany and Slovakia is already sufficiently robust. While the Czech Republic is already connected to Poland via the border transfer point Cieszyn, it is only one-way in the direction from the Czech Republic to Poland. There is still no physical connection between the Czech Republic and Austria. Another project is the implementation of the Czech-Polish bi-directional interconnection project. While the Czech Republic is already connected to Poland via the border transfer point Cieszyn, it is only one-way in the direction from the Czech Republic to Poland. The Czech Republic will analyse the possibilities for two-way connections with Poland with sufficient capacity.

Support for the implementation of PCI-status projects will help to create and subsequently integrate the gas market, namely hydrogen. The market for this commodity is still being formed and support for hydrogen PCI projects carried out in the Czech Republic with cross-border implications will contribute to its creation, to the integration of national markets in the area and to the creation of a central European regional gas market, and will support the implementation of other (including national) projects of this type. There are still no cross-border connections for hydrogen transport.

The national gas market in the Czech Republic has been fully liberalised since 2007 and the ERU regulates only those prices which, for technical or organisational reasons, cannot be shaped by market mechanisms in a competitive environment. Several dozen gas traders have been active on the market for gas in the Czech Republic for a long time and offer services to customers. The market for gas in the Czech Republic operates on a non-discriminatory basis, whereby any trader can reach out to any customer and all customers can enter into a contract with any trader. The prices of the supply services and other supply conditions depend only on mutual agreement. The developed competitive environment in the gas market has enabled the emergence of a wide range of offers from traders, both in terms of price and related trading conditions. The dynamics of the market thus depend more on customers' ability and willingness to switch suppliers and thus to secure more favourable conditions for themselves. The Energy Act and its implementing legislation guarantees all customers the right to switch gas suppliers. This amendment is free of charge. Thus, subject to existing commercial conditions, each customer has the right and the choice of his gas supplier.

Trading in the internal gas market is then carried out either through bilateral trading or through an organised short-term market. For more information see chapter 4.5.3.

ii. Where applicable, national targets for the non-discriminatory integration of energy from renewable energy

resources, demand response and energy storage, including through aggregation, in all energy markets, including a timeframe for achieving these objectives

Integration of renewable energy sources, demand response, energy storage and flexibility aggregation is addressed in the National Smart Grid Action Plan (NAP) and its update 'National Smart Grid Action Plan 2019-2030'. The national targets, including the timeframe for their achievement, are set out in this document. More detailed information can be found in chapter 3.4.3 under (ii). The provisions of Directive 2018/2001 and its revision, which are currently pending approval and entry into force, are also important in this respect.

iii. Where applicable, national objectives with regard to ensuring that consumers participate in the energy system and benefit from self-generation and new technologies, including smart meters;

Within the framework of the national action plan for smart grids (see information in Chapter 3.4.3 in section ii), the conditions for the deployment of smart metering in the Czech Republic are being prepared. The upcoming solution also takes into account the legislative measures issued under the 'Clean Energy for All Europeans' package in the area of the internal electricity market (Directive (EU) 2019/944 of the European Parliament and of the Council on common rules for the internal market in electricity).

iv. National objectives with regard to ensuring electricity system adequacy, as well as for the flexibility of the energy system with regard to renewable energy production, including a timeframe for when the objectives are to be met

The Czech Republic's objective is to ensure resource adequacy assessed under the existing European framework while maintaining the applicable safety standard. Ensuring resource adequacy is the responsibility of the operator of the transferor, which is ČEPS, a.s. in the Czech Republic, and the State creates the conditions to ensure such proportionality. The secure operation of the electricity system and the required quality of electricity supply depend, in addition to the reliability of the transmission system and the distribution system, on a balanced mix that is not directly controlled by transmission and distribution system operators. At the same time, the Czech Republic's national energy concept assumes risks to ensure resource adequacy already after 2030 and envisages a sharp increase in import dependency, which can reach almost the maximum safe import balance and exceeds the energy self-sufficiency requirement (covering at least 90 % of domestic consumption). The TSO shall annually provide an outlook of the resource adequacy status, including the design of measures to resolve any problems and identify the risks that give rise to those problems. The resource adequacy assessment shall be established by the TSO in accordance with the Regulation

Of the European Parliament and of the Council, which replaced Regulation (EC) 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity.

The document prepared by the TSO is then based on a system risk analysis of the reliability of the EC performance balance using a probabilistic approach for different periods and scenarios of consumption, levels of construction and renewal/life of conventional sources, cross-border capacity options, renewable energy sources and decentralised energy sources. The evaluation shall include the development of scenarios for possible developments in the electricity sector and an evaluation of potential risks requiring generation and system adequacy measures.

Articles 11 and 25 of Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity set out the procedure for quantifying the value of lost load VOLL (VOLL) and the reliability standards $LOLE_{NS}$ (Loss of Load Expectation Norma). The relevant provisions of EU legislation further regulate the methodologies proposed by ENTSO-E and subsequently approved by ACER in October 2020.

- *Methodology for the European resource adequacy assessment*
- *Methodology for calculating the value of lost load, the cost of new entry and the reliability standard*

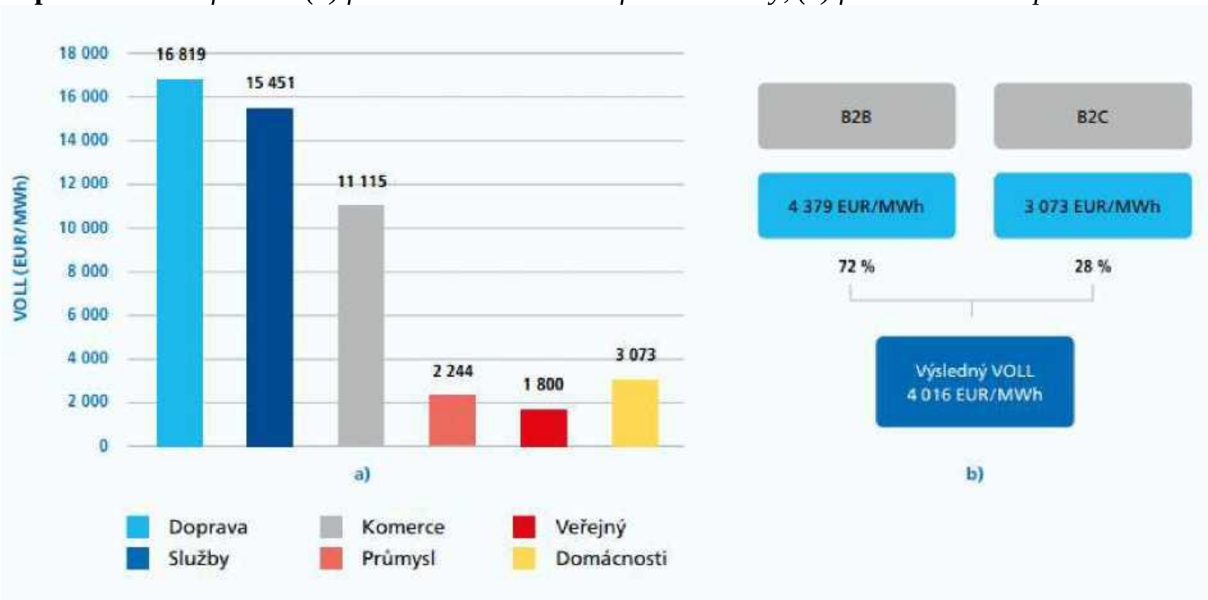
In order to calculate the reliability standard, the ENTSO-E methodology for Member States requires that VOLL and CONE values are set first. The need for setting VOLL and CONE values must then be seen in conjunction with the assessment and possible decision on the implementation of remedial measures in case of unsatisfactory reliability of electricity supply.

VOLL (or the value of non-delivered energy) indicates the value of electricity in EUR/MWh that is not delivered to end-users by the system, either as a result of a failure in the distribution or transmission system or due to insufficient generation capacity. The ENTSO-E's VOLL methodology recommends a direct interview method based on the principle of customers' willingness to pay for an uninterrupted supply of electricity (Willingness to Pay) while also reflecting developments in electricity market conditions. In practice, one average system value for VOLL is set for better interdirection. The resulting value is thus calculated on the basis of weighted averages of the VOLL values of the sectors surveyed (transport, services, commercials, industry, households and the public sector) taking into account the sector's share of total annual electricity consumption in a given country.

In order to validate the VOLL value, a comparison can then be made with the value determined using the macroeconomic method. This method consists of determining the share of gross value added (GVA) for a given year and the net electricity consumption in the same year. However, this method does not sufficiently eliminate external influences (e.g. energy intensity, austerity programmes, changes in consumption patterns due to electro-mobility or electrification of industrial segments with high emission loads) and therefore, according to ENTSO-E's methodology, VOLL must be determined on the basis of the Willingness to Pay principle.[36]

36 More information, including the methodology used, is provided in the EC CR Resource Adequacy Assessment until 2040 (reference).

Graph 18: *Value of VOLL (a) for individual sectors of the economy, (b) for the Czech Republic*



First, on the basis of the direct method, the VOLL values were determined separately for segment B2B and segment B2C. The resulting system VOLL was then calculated, which for the Czech Republic is set at EUR 4016/MWh (approximately CZK 100000/MWh). Given that the weighting system used in compiling the VOLL value took into account the share of the B2B and B2C segments in the Czech Republic's total consumption, the B2B segment has a greater influence on the result of the system VOLL due to its higher consumption. The transport, service and commercial sectors are higher in terms of sector VOLL, mainly due to the need for these sectors to avoid disruptions. On the other hand, industrial and household sectors are more equipped with storage, self-generation (cogeneration, battery systems, FVE, diesel aggregates), which means that their willingness to pay for uninterrupted electricity supply is lower. The overall willingness of Czech customers to pay is lower compared to Western countries, mainly due to lower revenues, GDP and other externalities. Irrespective of the segment, customers perceive any further sub-payment related to energy costs negatively.

CONE values (or the cost of input of a new source) are calculated for each reference technology and include both investment (CONE$_{fixed}$) and operational costs (CONE$_{variable}$). CONE$_{fixed}$ includes investment costs and fixed operating costs – these costs are aggregated and recalculated per year, the total number of years being taken as the construction period and the economic lifetime of the resource. Fixed operating costs do not include the fuel price, the purchase of allowances and other variable costs (OPEX). The CONE$_{fixed}$ parameter is expressed in EUR per MW per year.

Table 26: *Explanation of parameters*

Designation	**Relevance of parameter**
EAC	annual necessary costs per MW calculated over the economic lifetime and construction of the
	as defined in Article 15 of ENTSO-E and ACER
K_d	de-rating factor, expresses the "availability rate" of a resource in case of network scarcity in the
	to be provided separately for each technology

De-rating factor expresses the availability of a given resource to cover peaks (when a shortage of production is assumed). As a result, generally less manageable resources have a lower (lower) de-rating factor, and the final CONE$_{fixed}$ is higher for these technologies. The CONE$_{variable}$ is the variable costs per unit of energy produced during the economic lifetime of the resource. The costs include the fuel price, emission allowances and other variable operating and maintenance costs. The parameter is based in EUR per MWh.

It is in the interest of individual EU Member States to determine the reliability standard of LOL_{ENS} above which the reliability of electricity supply (source adequacy) is compromised. The excess of the reliability standard is seen as an indication of the legitimacy of the State's intervention in market conditions in order to initiate the implementation of measures that would reduce the scarcity of resources when it overcomes. However, setting a single and long-term reliability standard value is very difficult because it depends on the current state of the system, changing technology prices, technical and socio-economic marginal conditions and their expected evolution. Therefore, the reliability standard will be regularly updated when the EC ČR's resource adequacy assessment (MAF CZ) is being drawn up.

Although historically the reliability standard for $LOLE_{NS}$ is not uniformly defined across European countries, most States set it between 1 and 10 hours per year. However, the ENTSO-E's methodology harmonises the way the value of the reliability standard is determined according to the economic parameters of the country. According to the ENTSO-E methodology, the reliability standard $LOLE_{NS}$ is defined as a minimum from a set of so-called $_{LOLE}$ THR thresholds for each reference technology.

$$LE_{NS} = (i\ 0\ LE\ tã)$$

The LOLEthr thresholds of reference technologies determine which specific technologies are economically justifiable due to their investment costs. These thresholds are determined according to the valuation of non-supply of electricity (VOLL) and the economic parameters of the new source (CONE). The LOLEthr threshold is set on a technology-by-technology basis as follows:

$$LOLE_{THR} = \frac{cONE_{fixed}}{VOLL - CONE_{\sim inariable}}$$

Table 27: *Overview of LOLEthr thresholds per type of technology*

Source type	DCGT— Rctroicite	OCG7	CCGT	DSH	ICE Gas Engine	HU Super krill block	IS	VTE	FVE
	15 h/y	18 h/y	MH/y	33 h/y	51 h/y	1O4h/y	219 h/y	fiSSh/y	926 h/y

The reliability standard for $LOLE_{NS}$ for the Czech Republic is thus determined by the technology with the lowest cost in the case of an extension of the lifetime of a gas source – 15 h/y.

VOLL, CONE and reliability standards shall be regularly updated at least every five years according to ENTSO-E methodologies or earlier in the event of significant changes in the energy sector. In this respect, we assume that the VOLL and the associated $LOLE_{NS}$ value will be updated in the second half of 2023.

A higher degree of integration with other sectors such as heating, gas or transport can also contribute to increased flexibility of the electricity system. In the case of the heating sector, this is particularly the case for power2heat technologies, which have been deployed in the Czech Republic for a long time, but support for their development should be considered. Gas is the production of hydrogen by electrolysis (power2Gas technology) and, where appropriate, its methaneisation into synthetic methane. Specific measures on financial support for energy stored in gaseous form in the gas system may depend on the EU legislative framework to be presented in the European Commission's "gas package 2020". In the field of transport, this may include the use of electricity storage in electric vehicles and the coordination of their charging during the period of excess electricity.

The flexibility of the energy system in terms of renewable energy production is specifically addressed in the National Smart Grid Action Plan or its update 'National Smart Grid Action Plan 20192030'. The national targets, including the timeframe for their achievement, are set out in this document. More detailed information can be found in chapter 3.4.3 under (ii).

In the context of the development of intermittent resources, it will also be necessary to invest in the development of electricity storage, demand response (DSR) and, where appropriate, to evaluate the need to put in place a capacity mechanism or other forms of support for a successful energy transition and decarbonisation if these investments are not triggered by the market. The use of hydrogen is also an important aspect of accumulation. Electrolysers on an integrated energy system can play a crucial role in system services. Hydrogen is also a tool that strengthens energy security by providing a potential zero-emission source of flexibility for grid management.

v. Where applicable, national objectives to protect energy consumers and improve competitiveness energy retail sector

More detailed information is provided in Chapter 3.4.3, specifically point (iv), which deals with policies and measures to protect consumers, in particular vulnerable and possibly energy poor consumers, and to strengthen the competitiveness and competitiveness of the retail energy market.

Energy poverty

1. Where applicable, national targets in terms of energy poverty, including a timeframe for their achieving

This chapter builds on the 2020 National Plan and will be updated, as appropriate, as part of the finalisation of the update of this document.

2.4.4.1 National energy poverty target

The definition of energy poverty has not yet been legislatedly in the Czech legal order. However, under the new Energy Efficiency Directive, energy poverty is defined as:

– lack of access for households to essential energy services that provide basic standards and a decent standard of living and health, including adequate heating, hot water, cooling, lighting and energy to power appliances, in the relevant national context, existing social policy and other relevant policies, due to a combination of factors including unavailability, lack of disposable income, high energy expenditure and low household energy efficiency;

This definition will thus be transposed into Czech law as required by the new Energy Efficiency Directive.

At the same time, as part of the fulfilment of the obligation under Article 8 of the 2021 Energy Efficiency Directive (yet this is an unapproved proposal), the Czech Republic will set up instruments in such a way that energy efficiency improvements are also implemented for low-income groups, see Chapter 3.2.

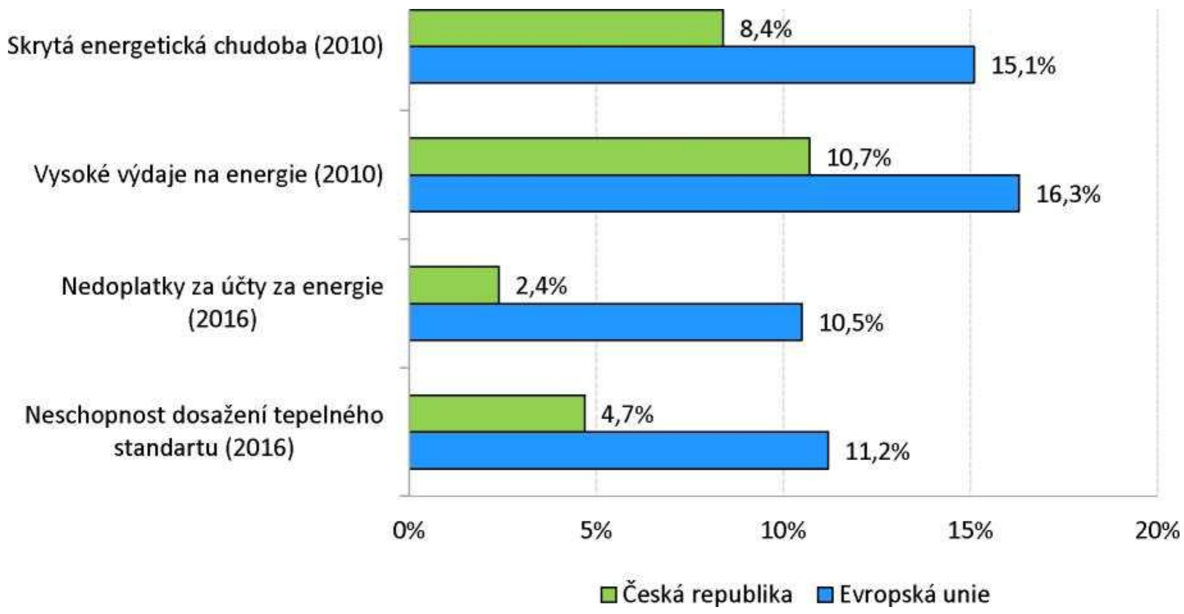
2.4.4.2 Contextual information for energy poverty37

The Czech Republic performs better than the EU average for household sector indicators. Around 4.7 % of households were unable to maintain sufficient comfort for heating in 2016 and only 2.4 % had difficulties in paying energy bills.

The Czech Republic is slightly better than the EU average for expenditure-based indicators. Around 10.7 % of households spend more than twice the median on energy and 8.4 % spend on energy so low that they are likely to live in hidden energy poverty.

37This information is drawn from the material dealing with the Czech Republic in the framework of the Energy Poverty Observatory. However, these data will need to be validated and their indicative value verified for the Czech Republic, including on the basis of the methodology developed.

Graph 19: *Comparison of indicators against EU average*

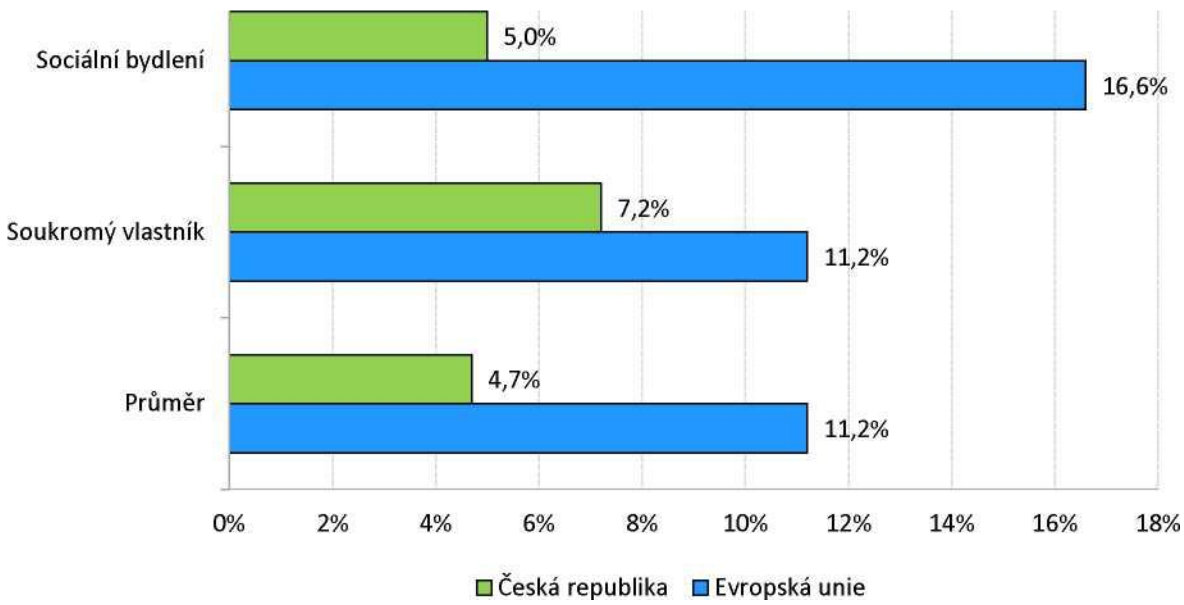


Source: Energy Observatory

Energy poverty (or indicators or indicators) in the Czech Republic has been gradually decreasing since 2005. The share of households that could not maintain sufficient hot comfort decreased from 11 % in 2005 to 5 % in 2016, and the number of households with arrears on energy bills decreased from 5 % in 2005 to 2 % in 2016.

Indicators in the household sector suggest that energy poverty in the Czech Republic is mostly a problem for private tenants. However, there are no clear groups by type of dwelling or urbanisation density where energy poverty is most significant. There seems to be no clear socio-economic group that is particularly at risk of energy poverty in the Czech Republic.

Graph 20: *Inability to ensure sufficient heating (comparison of the Czech Republic with the European average)*



Source: Energy Observatory

Dimension "Research, Innovation and Competitiveness"

i. National objectives and funding target areas for public and, where available, private research and innovation related to the Energy Union, including the timeframe for achieving these objectives

The Czech Republic does not have specific quantifiable public R & D & I targets specifically linked to the Energy Union. The problem of setting energy and climate targets is linked, among other things, to the structure of public R & D & I funding, which is not sector-oriented but is designed in national and sectorial support programmes. The strategic objectives are then described in more detail in the relevant strategy papers. This concerns in particular the National Research and Innovation Strategy for Smart Specialisation38 and National Priorities for Oriented Research, Experimental Development and Innovation39.

In total, the National Priorities for Oriented Research, Experimental Development and Innovation identifies six main priority areas, the closest focus of the Energy Union to the priority area Energy Sustainability and Material Resources. This area is subdivided into three sub-areas: (I) sustainable energy; (II) improving the energy intensity of the economy and (iii) a material base. More information can be found in Chapter 3.5.

The national priorities for oriented research, experimental development and innovation contain indicative proportions of funding per priority area that should be earmarked for implementation within the overall R & D & I budget. Based on this strategy paper, approximately 18 % of total R & D & I budgets

38 The document is available at the following link: https://www.mpo.cz/cz/podnikani/ris3-strategie/
39 The document is available at the following link: https://www.vyzkum.cz/FrontClanek.aspx?idsekce=653383

should be allocated to the priority Sustainable Energy and Material Resources (see Table 28).

Table 28: *Indicative distribution of funds between priority areas*

Name of priority area	Share of funds
A competitive knowledge-based economy	20 %
Sustainability of energy and material resources	18 %
Environment for quality of life	18 %
Social and cultural challenges	10 %
Healthy population	20 %
Secure society	14 %

Source: National priorities for oriented research, experimental development and innovation

R & D & I is also specifically addressed in the Czech Republic's State Energy Concept. Table 29 lists the priority areas for R & D & I on the basis of this strategic document. Other strategic documents in the field of energy, such as the National Action Plan for the Development of Nuclear Energy in the Czech Republic, the National Smart Network Action Plan, the National Clean Mobility Action Plan (NAP) are also addressed in a partial way in the areas of R & D & I.

Table 29: *R & D & I priority areas based on the State Energy Concept*

Priority area	More detailed description
Renewable (alternative) energy sources	More efficient use of biomass, development of advanced biofuels made from non-food biomass and waste, development of new photovoltaic systems including control elements, geothermal resources in the Czech Republic's geological conditions, energy use of hydrogen including fuel cell electrolysers, heat pumps of all categories with high efficiency.
Nuclear technology	Research on prospective generation III+ and IV nuclear technologies, increasing the efficiency, lifespan and safety of nuclear sources, addressing radioactive waste and spent fuel management, addressing the end of the fuel cycle, developing both in the field and in engineering and/or special construction technologies for nuclear energy in relation to material engineering. Possibilities to produce hydrogen using nuclear technologists.
More efficient use of fossil energy sources	Research into more efficient and new technologies for the combustion of traditional fossil fuels, e.g. clean coal technologies with BAT-appropriate parameters or better and future economic-ecological requirements, development of high temperature materials, applied research and innovation in gas and steam turbines, heat exchangers, cogeneration systems, geological storage of carbon dioxide.
Improving the efficiency and reliability of energy systems and grids	Improving the efficiency and reliability of energy systems and energy media grids, integrating decentralised energy resources and back-up in case of risk situations, developing management systems at transmission and distribution network level; the development of smart grids and the use of decentralised network, generation and consumption management, including storage management options in central and local systems (in particular at distribution system level); systems reliability management systems and their regional integration, maintenance and network operation systems based on component monitoring and risk management and emergency management mechanisms
	island subsystems (in particular at transmission network level); development of protective equipment against cyber-attacks and protection of telecommunication systems, pilot projects in the field of electro-

Energy recovery of waste	Research and development of new technologies for energy recovery of secondary raw materials and waste that cannot be materially recovered.
Transport systems	Increasing the efficiency of public transport systems and means, including electric traction vehicles and their propulsion; the development of fuel cells and the development of accumulators for the development of electric vehicles; development of infrastructure for electric vehicles and the hydrogen economy; development of telematic traffic management systems towards automation and optimisation of individual transport; projects to reduce losses in power supply systems and electric traction equipment in transport.

Source: Czech State Energy Concept (2015)

On the basis of the measures in the Czech Republic's State Energy Concept, the successor programme THÉTA II to the previous THÉTA Technology Agency programme was approved in order to ensure follow-up support for applied energy research and innovation for projects of public interest, new technologies with rapid application and long-term technological perspectives THÉTA II. In the follow-up programme, greater emphasis will be placed on involving Czech actors in international energy projects and, overall, on supporting the strengthening of international cooperation on energy topics. The Technology Agency will cooperate with the Ministry of Industry and Trade in the preparation and implementation of the programme in a similar way as in the THÉTA programme. For more information on THÉTA II, see chapter 3.5.1.5.

ii. Where available, national 2050 targets for the promotion of clean energy and, where applicable, national targets including long-term targets (2050) for the deployment of low-carbon technologies, including the decarbonisation of energy and carbon intensive industries, as well as related carbon transport and storage infrastructure, where applicable

The Czech Republic does not have specific national targets for the deployment of low-carbon technologies by 2050 beyond those set out in other parts of this document. The introduction of specific technologies should also be mainly driven by the market. The State may create R & D & I conditions or sub-support specific technologies in accordance with public aid rules, but it is questionable whether it is the role of the State to specify targets for the deployment of certain technologies and thus distort the market environment.

iii. Where applicable, national objectives with regard to competitiveness

National objectives or strategies for the Czech Republic's direction in this area are set out in specific strategy documents. In this regard, mention may be made in particular of the State Energy Concept, the National Research and Innovation Strategy for Smart Specialisation of the Czech Republic, which aims to effectively target European, national, regional and private funds towards priority innovative specialisations in order to fully exploit the Czech Republic's knowledge potential. In this way, the strategy makes a significant contribution to strengthening the competitiveness of the economy. In addition, for example, it is possible to mention National Initiative Industry 4.0. The Czech Republic is also currently preparing an Economic Strategy, which should define the main objectives for the Czech Republic's economy by 2030. In this respect, it will be a key plan for the Czech economy, based on ten pillars from industry and energy, innovation, raw materials policy, transport design, business support and education reform. In addition, a so-called National Investment Plan (NIP) is being prepared, which should provide a detailed mapping of the investments needed, including in the energy sector, to a minimum over the next ten years. In addition, the Czech Republic's Innovation Strategy 2019-2030 was approved by the Czech Government Resolution of 4 February 2019 No 104. It is a strategic framework plan that sets out government R & D & I policy to help the Czech Republic move among Europe's most innovative countries over 12 years. The innovation strategy consists of nine interlinked pillars with backgrounds, key strategic objectives and the tools to achieve them. These are areas: R & D funding and evaluation, Innovation and Research Centres, National Start-up and Spin-off Environments, Polytechnic Education, Digitalisation, Mobility and Building

Environment, Intellectual Property Protection, Frequent Investment and Chyter Marketing. The Czech Republic also considers it important in this regard to the EU Competitiveness Council, in which the Czech Republic actively participates.

National high-level competitiveness targets resulting from the State Energy Concept. These objectives are:

- Maintain the transfer capacity for both export and import at a level of at least 30 % of the EC load;
- Optimise the discounted energy costs;
- Maintain energy price levels up to a maximum of 120 % of the OECD level;
- Reach and maintain final electricity and gas prices below EU28 levels;
- Achieve and maintain the share of energy expenditure in total household expenditure as low as possible below 10 %;
- Optimise the contribution of the energy sector to gross value added;
- Reduce the share of energy imports in gross value added below 2010 levels;
- Maintain a positive summary economic added value of the energy sector;
- Stabilise the impact of energy imports on the balance of payments.

3 Policies and measures

3.1 Dimension “Carbon Emission Reduction”

In combustion processes, the Czech Republic has long been confronted with emissions of health-risk substances into the air ($PM_{2.5}$, PM_{10}, PAH polycyclic aromatic hydrocarbons, benzo(a)pyrene, NOx, VOC, ground-level ozone, CO, dioxins, toxic metals and others) arising from the combustion of coal in domestic heating plants in almost every municipality in the Czech Republic. Emissions from old diesel and petrol engines in transport also pose a health risk. For reasons of both severity and national scale, it is desirable to reduce greenhouse CO_2 emissions from combustion processes in these major areas of domestic plants and old diesel and petrol engines, even as a major multiplier effect, which at the same time warrants State intervention to protect the health of the population, as the damage to health and property to fuel and energy prices is far from being internalised.

3.1.1 GHG emissions and removals

1. Policies and measures to achieve the objective set by Regulation (EU) 2018/842, as set out in in point 2.1.1, and policies and measures to comply with Regulation (EU) 2018/841, covering all key emitting sectors and sectors promoting removals, taking into account the long-term objective of becoming a low-emission economy and ensuring a balance between emissions and removals in line with the Paris Agreement;

1.1.1.1 Transport sector

The transport policy of the Czech Republic for 2021-2027, with a view to 2050, sets out strategic and conceptual objectives and guiding principles for the development of transport and transport networks. These are gradually being developed in follow-up strategies. The main objective is to create the conditions for the development of a high-quality transport system based on the characteristics of each mode of transport and the principles of competition, taking into account its economic, social, environmental and public health impacts. The Czech Republic’s State Environment Policy 2030 with a view to 2050 also contains requirements concerning the promotion of the use of alternative fuels, the development of environmentally friendly transport or economic instruments to include externalities from all modes of transport.

Transport policy foresees the gradual replacement of conventional fuels (i.e. oil-based fuels) for alternative energy in road transport and the further electrification of railways and urban public transport, and a gradual shift of freight transport from road to rail or waterborne transport. A similar sub-target for 2030 is set by the Czech Republic’s State Energy Concept (2015) and the Czech National Emissions Reduction Programme (2019).

A number of measures are in place in the Czech Republic to enhance the use of different types of alternative fuels. Alternatively powered vehicles for the transport of passengers or vehicles for the transport of goods with a maximum authorised weight of less than 12 tonnes (hybrid drives, electric motors, CNG, LPG and bioethanol E85) are exempt from this tax under Act No 16/1993 Coll. on road tax, natural gas used in transport is favoured by a lower rate of excise duty. A certain (albeit lower) advantage in this area also applies to the use of LPG in transport.

A new update of the NAP CM is currently being prepared, primarily based on the requirements of the approved Regulation of the European Parliament and of the Council on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU of the European Parliament and of the Council (the so-called AFIR). More detailed information on this programme can be found in Chapter 3.1.3.1 of the National Clean Mobility Action Plan.

In the 2014-2020 period, support for clean mobility is supported by several current Operational Programmes. While the Operational Programme Transport (OPD) aims to support publicly accessible recharging and refuelling infrastructure (CNG/LNG/hydrogen), the Integrated Regional Operational Programme (IROP) supports the development of clean mobility in public transport and the Operational Programme Entrepreneurship and Innovation for Competitiveness (OP PIK) supports the uptake of electromobility in the business sector. Reference could also be made to the Operational Programme Prague – Growth Pole of the Czech Republic, which created a new specific objective for the purchase of fully emission-free electrobuses, including the construction of infrastructure for electric buses. Operational programmes also include other measures with an impact on greenhouse gas savings in all priority axes aimed at developing infrastructure for rail (integration of the TEN-T network) and other sustainable transport (e.g. upgrading of the electric traction of urban public transport).

Pursuant to Act No 201/2012 on air protection, a fuel supplier is obliged to gradually reduce greenhouse gas emissions per unit of energy contained in the fuel in the full life cycle of the fuel. By the end of 2020, it had to achieve a 6 % reduction in greenhouse gas emissions. Only biofuels fulfilling the sustainability criteria under Government Regulation No 189/2018 on sustainability criteria for biofuels and the reduction of greenhouse gas emissions from transport fuels may be counted towards compliance. The Excise Duty Act No 353/2003 lays down the tax burden on individual fuels.

The development of a SUMP is an important tool for developing a sustainable urban transport system. The aim is to comprehensively address the issue of mobility in larger cities linked to peri-urban areas, not only transport issues but also the possibility of influencing mobility and how it can be met. SUMPs should be drawn up and regularly updated in cities above 40 thousand inhabitants.

Energy savings in passenger transport are based on increasing the use of public transport and in freight transport by increasing rail performance at the expense of road transport. The concept of public transport, prepared as the initial strategic document of the Ministry of Transport for Public Transport for the years 2015 to 2020, with a view to 2030, therefore aims at improving the public transport system. Public transport operators and transport infrastructure managers can apply for support through the Integrated Regional Operational Programme for a wide range of activities linked to increasing sustainable forms of transport, e.g. for fleet renewal. This will be necessary if Government Regulation No 49/2015 Coll. is to be complied with, so that the average age of vehicles in regular public transport is not more than 9 years.

In the field of freight transport, reference should be made to the 2017-2023 Freight Transport Concept with a view to 2030, which, in view of the more difficult process of deploying alternative energy in freight transport, is particularly relevant for urban freight transport and city logistics. According to this concept, the supply of historical city centres in particular must be provided by smaller trucks, preferably for alternative energy. In the short term, the use of LNG (possibly bioLNG) should have the greatest potential in this area in the long term, in turn, can be electricity or hydrogen. Road freight transport should also be covered more broadly in the upcoming update of the National Clean Mobility Action Plan.

The increased safety and fluidity of traffic in all transport modes also contributes to fuel savings, with the objective of the agreed Action Plan for the Development of Intelligent Transport Systems up to 2020 with a 2050 perspective. Intelligent systems will make it possible, among other things, to monitor the technical condition of transport routes and prevent serious road accidents. The implementation of the National Strategy for the Development of Cycling Transport for 20132020 and the Urban and Active Mobility Concept 2021-2023 (MD) aims to improve the coordination of the development and conditions for the use of this environmentally friendly non-motorised mode of transport.

In order to promote the use of environmentally friendly vehicles, the Czech Republic's National Emission

Reduction Programme includes the measure ‘Conversion of the public administration’s fleet into alternative powered vehicles. On 1 December, Act No 360/2022 Coll. on the promotion of low-emission vehicles through public procurement and public passenger transport services entered into force, which sets minimum shares of low-emission vehicles by 2025 and 2030.

Low emission zones (LEZs) are geographically defined areas that limit the access of cars on the basis of their emission levels, in order to improve air quality in these areas. The rules for the classification of road motor vehicles in emission categories and on emissions plaques were laid down in Government Regulation No 56/2013. The implementation of low emission zones is also supported under the National Environment Programme. The national programme also aims to promote alternative modes of transport (e.g. carsharing, bikesharing, alternative propulsion, non-motorised modes of transport). In 2016-2019, the Ministry of the Environment launched 4 calls under the National Environment Programme for municipalities, regions and organisations set up by them to support the purchase of alternatively powered vehicles. The largest call so far, with an allocation of CZK 600 million, was launched in June 2022 and should support the acquisition of 1485 alternatively powered vehicles and 200 charging stations. These calls are complementary to those in the OPPIK and OP TAK for legal persons.

The introduction of a special registration number plate ‘EL’ (effective as of April 2019), which is linked to the waiving of the registration tax, as well as the exemption from charging for the use of tolled infrastructure (‘driving vignettes’) from 2020 for electric or hydrogen vehicles with emissions up to 50 g CO2/km or, for vignettes, discounts for natural gas and biomethane vehicles from 2021 may be mentioned as a further measure.

Transport is also an important domain for the use of hydrogen technologies. Hydrogen deployment is mainly foreseen for passenger bus, train and long-distance freight transport. The AFIR prescribes the number of hydrogen filling stations to be built around TEN-T corridors and urban nodes.

Following the update of the revised Directive 2018/2001 on the promotion of the use of energy from renewable energy sources of June 2023, fuel suppliers will have to meet a new mandatory sectoral target in a combined target of 5.5 % of advanced biofuels, biogas and renewable fuels of non-biological origin, with 1 % of total consumption to be met by only renewable fuels of non-biological origin by 2030.

1.1.1.2 Agriculture and forestry sector

The processing of agricultural residues at biogas stations is an important way of using methane and preventing it spontaneously. The main tool for promoting the use of biogas was the introduction of feed-in tariffs and green bonuses linked to the amount of electricity produced. The construction of biogas stations has been supported under operational programmes and is also supported in the current period. The construction of biogas plants using bio-waste is supported by the Environment Operational Programme, while the Operational Programme Enterprise and Innovation for Competitiveness can support the removal of heat from existing biogas stations for efficient use. In addition, under the Common Agricultural Policy Strategic Plan 2023-2027, the roofing of digestate end warehouses at agricultural biogas stations and support for the installation of biogas storage will be supported.

The Common Agricultural Policy Strategic Plan 2023-2027 and will address the achievement of climate objectives by 2027, in particular through interventions implemented under specific objective 4 ‘Contribute to climate change mitigation and adaptation, including by reducing greenhouse gas emissions and promoting carbon sequestration, and to further promote sustainable energy. In part, Specifi Objective 2 interventions “Strengthening market orientation and increasing the competitiveness of farms in the short and long term, including through a greater focus on research, technology and digitalisation” will also work.

The development of organic farming, in which the use of nitrogen mineral fertilisers is completely prohibited, is an important tool to reduce the consumption of mineral fertilisers. The organic farming scheme is established by Regulation (EU) 2018/848 of the Council and of the European Parliament of 30 May 2018 on organic production and labelling of organic products and repealing Council Regulation (EC) No 834/2007. The support provided under the Common Agricultural Policy Strategic Plan has a major impact on the expansion of agricultural land under organic farming.

Mandatory compliance with GAEC standards and SMRs, transposed by Government Regulation No 73/2023 laying down cross-compliance rules for payments to farmers, facilitates soil carbon sequestration. The payment of aids in the form of direct payments and environmental rural development interventions per area or livestock shall be conditional, inter alia, on compliance with those standards and requirements. Within the framework of the Common Agricultural Policy Strategic Plan, agri-environment-climate measures are positive to maintain or enhance nitrogen retention capacity by setting up appropriate land management or moving to a culture with higher retention potential. Another effect of this measure is the reinforcement of anti-erosion measures with high sequestration impact, especially in nitrates of vulnerable zones or along watercourses (grassland treatment). Promoting sustainable management of permanent grassland will also contribute to soil carbon sequestration.

The promotion of afforestation of agricultural land is another tool to tackle climate through forest expansion under the Common Agricultural Policy Strategic Plan. Government Regulation No 63/2023 laying down the conditions for the implementation of measures for afforestation of agricultural land provides for subsidies for the establishment of forest cover, for the maintenance of forest cover for 5 years and for the cessation of agricultural production on afforested land for 10 years. The newly introduced support for agroforestry also contributes to promoting carbon sequestration and has anti-erosion functions. The establishment of two types of agroforestry systems (arable land and grassland) and after-care for five years is supported.

It also contributes to reducing emissions from forest fires and maintaining carbon stocks in biomass and soils in order to prevent damage to forests from forest fires and natural disasters and catastrophic events.

2. The National Forestry Programme contains ‘Key Action 6 – Reducing the impacts of expected global climate change and extreme weather events’, which is based on 12 concrete actions. These measures generally aim at creating more resilient forest ecosystems by supporting diversified forest stands, making the greatest possible use of natural processes, diverse species composition, natural regeneration and variability in cultivation practices.

The strategy of the Ministry of Agriculture with a view to 2030 under Objective D.2 ‘Competitive forest-based value chain’ aims, inter alia, to: (i) creating conditions for increased domestic use and consumption of wood and wood products; (II) creating the conditions for investments in the forestry sector and the downstream value chain leading to the production of higher value-added timber products; (III) reducing exports of wood from the Czech Republic; (IV) promoting research and development to improve the use of wood and the search for new product options using wood.

All of this is intended to increase the use of wood as a renewable carbon binding raw material and to the substitution of other materials whose production is associated with high $CO2_{emissions}$. The reduction in exports of raw wood and its processing (mainly sawn wood and wood panels) in the Czech Republic will make a positive contribution to the Czech Republic’s emission balance.

3.1.1.3 Waste sector

The basic legislation in the field of waste and circular economy in the Czech Republic are Act No 541/2020 on waste, Act No 542/2020 on end-of-life products, Act No 477/2001 on packaging, and Act No 243/2022 on limiting the environmental impact of selected plastic products.

The new Waste Act, the End-of-Life Products Act and the amendment to the Packaging Act were adopted with effect from 1 January 2021, following the necessary implementation of the revised European directives on waste, packaging and end-of-life products. They contain a number of measures to support the development of recycling and the circular economy.

A new Decree No 169/2023 laying down the conditions under which solid fuel from waste ceases to be waste was adopted in 2023, setting the rules under which waste-based fuels can be recovered outside the waste regime, thereby simplifying the recovery of waste fuels and diverting waste from landfills towards their energy recovery.

In addition, further decrees are being prepared in order to determine the conditions under which selected waste may be disposed of from the waste regime. These are wastes of soil and aggregates, as well as concrete, bricks and mixtures thereof, and third, slag waste and energy by-products. Setting end-of-waste criteria for selected waste streams will lead to higher material recovery rates and increase their circularity.

The main strategy document and instrument for managing waste management is the Czech Republic's Waste Management Plan 2015 to 2024 (POH CR), which at the same time implements and further develops the Czech Republic's State Environment Policy 2012-2020. The POH of the Czech Republic is designed in accordance with the waste hierarchy set out in the above-mentioned Directive 2008/98/EC on waste. The strategic objectives of the plan are waste prevention and reduction of specific waste generation, minimisation of adverse effects of waste generation and management on human health and the environment, sustainable development of society and moving closer to a European 'recycling society', maximising the use of waste as a substitute for primary resources and the transition to a circular economy.

In May 2022, the Czech Government approved an update of the Waste Management Plan of the Czech Republic for the period 2015-2024, with a view to 2035. The updated Waste Management Plan of the Czech Republic takes into account the changes in the new Waste Act, sets new ambitious targets and strategies for waste management based on the targets of the relevant European Union directives binding on the Czech Republic. At the same time, the adopted update started the preparation of regional waste management plans, which serve as strategic documents for waste management in the territory of each region – the adoption of the regional waste management plans is expected in 2023 at the latest by the end of 2024.

As part of the update of the Waste Management Plan of the Czech Republic, the Waste Prevention Programme of the Czech Republic, which forms part of it, was also updated. The waste prevention programme implemented the requirements of Directive 98/2008/EC on waste as regards waste prevention measures. As part of the update, a new part was added to the Waste Management Plan of the Czech Republic aimed at reducing the quantity and preventing the generation of food waste. Reducing waste also reduces the need for its treatment and the associated greenhouse gas emissions.

The Strategic Framework for the Circular Economy of the Czech Republic 2040 (known as Cirkular Czechia 2040), which was approved by the Czech Government in December 2021, is a guiding concept for the Czech Republic's transition to a circular economy by 2040.

Circular Czechia 2040 proposes a vision, targets and concrete measures to help strengthen the circular economy in the Czech Republic. In addition to improving the general state of the environment and reducing waste generation and better waste management, the Czech Republic, through the circular economy, is also intended to be resilient in the long term to future environmental threats, including climate change and biodiversity loss, and to develop an overall sustainable social system, to further strengthen the competitiveness and technological maturity of the economy, to increase security of supply of raw materials and resilience to external shocks, as well as to create new jobs.

In June 2023, the Czech Government approved the Action Plan on Circular Czechia 2040 for the period up to 2027, which develops 10 areas as part of the Czech Republic's transition to a circular economy and sets out tasks and activities for the involved departments responsible for their implementation.

3.1.1.4 Industry sector

In particular, the implementation of cross-cutting measures based on EU legislation is key to reducing greenhouse gas emissions in the industry sector. In addition to the EU ETS, integrated pollution prevention and control, in accordance with Act No 76/2002 on integrated prevention, makes a major contribution to reducing emissions. Emissions of fluorinated gases are regulated by Act No 73/2012 on substances that deplete the ozone layer and on fluorinated greenhouse gases and by Decree No 257/2012 on the prevention of emissions of substances that deplete the ozone layer and on fluorinated greenhouse gases and by Decree No 243/2023 on the implementation of certain provisions of the Act on substances that deplete the ozone layer and on fluorinated greenhouse gases, which transpose the relevant EU regulations.

Achieving climate and energy objectives in the manufacturing sector, such as steel, chemical, ceramic, cement, glass, paper, brick and lime, is a separate and very complex issue. These sectors have significant potential in this regard, which must be considered in the context of national strategy and policy-making. In particular, due to the wide variety of technologies used and developed and the specific needs, the sector is not addressed in more detail in the material submitted. This presupposes the rapid development of a separate industrial policy in the Czech Republic for the period 2021-2030, with a view to 2050, addressing the issue of this sector in a comprehensive manner, i.e. including the maximisation of support (including the State) for the development and application of all technologies contributing to the achievement of climate and energy objectives, physical and affordability of energy, maximum protection of competitiveness, etc. In this regard, the National Economic Strategy 2030 is being prepared, including the National Investment Plan.

In the coming years, based on the revised Directive 2018/2001 on the promotion of the use of energy from renewable energy sources of June 2023, Member States will also have to meet the mandatory sectoral industry target of replacing 42 % of fossil hydrogen consumption with renewable fuels of non-biological origin for final energy and non-energy by 2030 and will be increased to 60 % in 2035. Hydrogen used as an intermediate product for the production of conventional fuels, hydrogen that is produced by decarbonising industrial residual gases and is used to replace the specific objectives from which it is produced and hydrogen that is produced as a by-product or derived from a by-product in industrial installations shall be excluded from the sectoral target for industry.

3.1.1.5 Energy sector

The energy sector’s contribution to and/or reduction of greenhouse gas emissions is described in detail in the other parts of this document. However, it is useful to highlight the role of individual energy sources in the energy mix in reducing greenhouse gases. By 2030, photovoltaic and wind power plants will play a crucial role in the decarbonisation of the electricity sector. In the longer term, it is useful to briefly describe the role of nuclear energy as a stable, manageable, high-value zero-emission energy source for the[45] network (the rollout and expected development of other zero-emission sources in particular is described in other parts of this document), so the combination of nuclear and renewable sources has lower systemic costs and thus represents cost-effective decarbonisation. At the same time, nuclear energy has made an important contribution to energy security and independence, thanks to the high energy density and the possibility of fresh fuel reserves over the years.

Strategically, it is important to support the new construction of renewables. It is foreseen to build a new 8 GWe installed capacity of photovoltaic plants connected to the grid and a new 1.2 GWe installed wind capacity by 2030. However, in order to achieve lower hundreds (around 300) of new wind farms by 2030, more hundreds (600-800) wind turbines need to be developed.

A total of 6 nuclear units, 2 units at Temelín and 4 units at Dukovany, with a total installed capacity of 4240 MWe, are currently operating in the Czech Republic. In addition, 4 research reactors are in operation in the Czech Republic. Key National Strategy Papers confirm the maintenance of the operation of existing nuclear units and the strengthening of the current share of nuclear energy in the energy mix and its further development. The Government-approved by the Government for the updated State Energy Concept of the Czech Republic envisages the completion of the construction of a new nuclear source in Dukovan 2036 and other JZ in the Dukovany and Temelín sites by the 1940s, and to maintain the installed capacity to at least the existing level, and to seek to increase the share of the core in the energy mix by 2050 and the use of heat from the Temelín NPP and the Dukovany NPP.

In accordance with Government Regulation No 349/2022, ensure that the Czech Republic's headline targets for the production of electricity from nuclear power plants, including the so-called corridors, are met, with an increase in the share of nuclear energy in primary energy sources to 25-33 % (from around 15 % currently) and an increase in the share of gross electricity production to 46-58 % (2022: 37 %).

In parallel to the construction of the new nuclear units, ensure the reliable operation of the Temelín NPP hot water for the heat supply of České Budějovic and the implementation of the Dukovany-Brno hot water (COD 2030) in line with Government Resolution 1059/2022. For the safe and reliable operation of the Dukovan to Brno hot water, ensure the construction of two new nuclear units on this site to ensure the availability of at least 2 nuclear units for the period from 2047, when the last unit of the existing power plant should be shut down, due to the regular fuel exchange in one

Nuclear sources have lower demand for support services and network investments compared to intermittent sources. Thus, in the context of emission reductions, they can mitigate the need for large-scale construction of gas resources for the provision of support services in a system with a high representation of intermittent sources.

units requiring the operation of at least one unit during this period, in particular during the winter period.

The largest source of greenhouse gas emissions (and pollutants) in the energy sector is coal mining and, in particular, its combustion in power plants, heat and local heating plants. The strategic objectives of the National Plan are, according to Government Resolution No 257 of 12 April 2023, approving the update of the Czech Republic's State Energy Concept and related strategic documents (Climate Protection Policies and the Czech National Energy and Climate Plan).

- Reduce the share of fossil fuels (used without capture technology) in primary energy consumption to 50 % by 2030 and 0 % by 2050, and to completely phase out the use of coal for electricity and heat generation by 2033.
- Achieve the share of RES in the gross final level corresponding to the EU 2030 target and increase it further by 2050 in line with the achievement of climate neutrality
- Decarbonise the heating sector

On the basis of these strategic objectives, it is necessary to prepare concrete plans to replace coal-fired power plants by 2033, to switch from coal to other sources by 2033 and to replace coal boilers and stoves for other sources by 2033. Similarly, it is necessary to envisage the end of lignite mining, which has no other uses than energy and, for economic reasons, makes no sense to import it.

Regional cooperation in the field of nuclear energy may be aimed at supporting the field of science and research and, where appropriate, sharing experiences and best practices.

ii. Where relevant, regional cooperation in this area

The Czech Republic does not consider this area to be relevant at the level of the National Plan. Alternatively, it sees that regional cooperation is set up in detail at EU level or at the level of international structures such as the UNFCCC.

iii. Without prejudice to the applicability of state aid rules, financing measures, including Union support and the use of Union funds, in this area at national level, where applicable

In reducing emissions outside the EU ETS, support from EU funds for the development of renewable energy sources and energy efficiency, as described in Chapters 3.1.2 and 3.2 below, contributes to reducing greenhouse gas emissions in transport, the Transport Operational Programme 2021-2027, which mainly supports the development of transport infrastructure, leading to a reduction in fuel and energy consumption. The Common Agricultural Policy Strategic Plan 2023-2027 contributes to reducing emissions and increasing sinks in the agricultural and forestry sectors through support for agri-environment-climate measures and modernisation of agricultural and forestry facilities. Among the national programmes, the New Green Savings Programme, which reduces greenhouse gas emissions in particular in the household sector, is key. Support from the Modernisation Fund will play a crucial role in the decarbonisation of the Czech Republic by 2030.

Renewable energy

i. Policies and measures to achieve the national contribution to the binding Union target for 2030 for renewable energy and trajectories referred to in Article 4(a)(2) and, where applicable, or where available, the elements listed in point 2.1.2 of this Annex, including specific sectoral and technological measures46 47

3.1.2.1 Existing policies for the promotion of renewable energy sources

The following table summarises existing renewable energy policies. This is merely an overview information.

Table 30: *Key current renewable energy policies*[47]

Policy/measure	Characteristics
Indirect support (reduction of administrative entitlements)	Reduction of administrative requirements for connection and operation of small resources up to 10 kW
Indirect support (compulsory assessment of installation)	Mandatory assessment of the installation of alternative systems to meet energy performance requirements for buildings
Indirect support (guarantees of energy origin)	Issuance of guarantees of origin
Indirect support (overview of efficient thermal energy supply systems)	An overview of efficient thermal energy supply systems pursuant to Section 25(5) of Act No 165/2012 on supported energy sources and amending certain acts.
Indirect support (territorial planning)	Amendment to the Energy Act and related acts by Act No 19/2023, known as LEX RZE I, with effect from 24 1. 2023 brought about the following changes: - In Section 2(2)(a), point 18, energy it was added that RES power generating plants with a total installed capacity of 1 MW or more were set up and operated in the public interest; - Section 2(1)(m)(2) of the Construction Act the definition of technical infrastructure has been adapted to include also renewable electricity generation facilities; - — as a result of the above changes, production facilities they regard electricity from RES with a total installed capacity of 1 MW or more as public technical infrastructure and thus enjoy the benefits referred to in Section 18(5) of the Construction Act – it may be placed in a non-developed territory, provided that territorial planning documents do not expressly exclude this for reasons of public interest and if this is consistent with the nature of the territory; this leads to the fact that, in a large part of the Czech Republic, there is the potential to locate a 1 MW RES power-generating facility and more without the need for prior amendment of the territorial planning
Indirect support (simplification of permitting processes)	The amendment to the Energy Act, known as LEX RES I, approved by Act No 19/2023 with effect from 24 January 2023, introduced the following changes:

46When planning these measures, Member States shall take into account the end of life of existing installations and the potential for repowering.

47This is not a full list, but rather the most important policies or policies specifically aimed at renewable energy sources.

	– definition of power generating facility and business definition in the energy sectors, the production of electricity from renewable sources is in the public interest from the point of view of spatial planning; – adaptation of the provision authorising customers to produce electricity for their own use without licensing, increasing the limit from 10 kW to 50 kW The amendment also included an amendment to the Construction Act (SZ): RES up to 50 kW do not require planning permission or consent – irrespective of whether FVE is on a building or land, the construction of ΦϛE in the urban development plan of the municipality must not be excluded. – for the open area, the delimitation of the area in the municipality’s zoning plan is required – it must not be a cultural monument, a monument, a zone or special protection area; RES up to 50 kW (on roof) unannounced and building permit – if it does not interfere with the structure of the construction – the way in which the building is used does not change – No environmental impact assessment required – fire safety requirements are met
Direct aid – Operating aid	Operating aid is legally enshrined in Act No 165/2012 on supported energy sources in the Czech Republic.
Direct aid – Investment aid – (State programmes)	New green savings (Ministry of Environment); OPŽP 2014-2020 (Ministry of Environment and Regions); The Modernisation Fund.
Direct aid – Investment support – (operational programmes)	Operational programme of technology and applications for competitiveness 2021-2027 OPTAK (Ministry of Industry and Trade) 2021-2027;
Direct aid – Investment support – (European Agricultural Fund for Rural Development)	However, the European Agricultural Fund for Rural Development – RDP (Ministry of Agriculture) – has already ended this type of support.

Investment support – heat (European Agricultural Fund for Rural Development)	However, the European Agricultural Fund for Rural Development – RDP (Ministry of Agriculture) – has already ended this type of support.
Tax instrument (exemption, reduction or refund)	Exemption from electricity tax for electricity from renewable sources which is consumed at the demand point where it was produced and installed capacity of the power generating facility does not exceed 30 kW in accordance with Section 8(1)(a) of Part Seven of Act No 261/2007 on the stabilisation of public budgets.
Tax instrument (exemption, reduction or refund)	Exemption from real estate tax.
Promoting the use of biofuels through mandatory reduction of greenhouse gas emissions from transport fuels	Promotion of the use of biofuels through the mandatory reduction of greenhouse gas emissions from motor fuels contained in Section 20(1) of Act No 201/2012 on air protection, as amended.
Promotion of biofuels (compulsory blending)	Mandatory blending of biofuels into petrol and diesel fuels.
Acceleration zones	Based on the European Commission’s plan to accelerate the shift away from Russian fossil fuels and the transition to clean and cheap energy sources (REPowerEU), Member States should identify and define so-called ‘acceleration zones’, areas where the construction of renewable energy sources is simplified by the state and thus accelerated. This requirement is also enshrined in the pending revision of the Renewable Energy Directive.

Source: Self-processing of the Ministry of Industry and Trade for the purposes of the National Plan

3.1.2.2 Policies to ensure the 2030 renewable target

The main policy to meet the national contribution to the European RES target of 42.5 % by 2030, as set out in Chapter 2.1.2, can be considered as the main policy to meet the national contribution to the European RES target of 42.5 % by 2030;

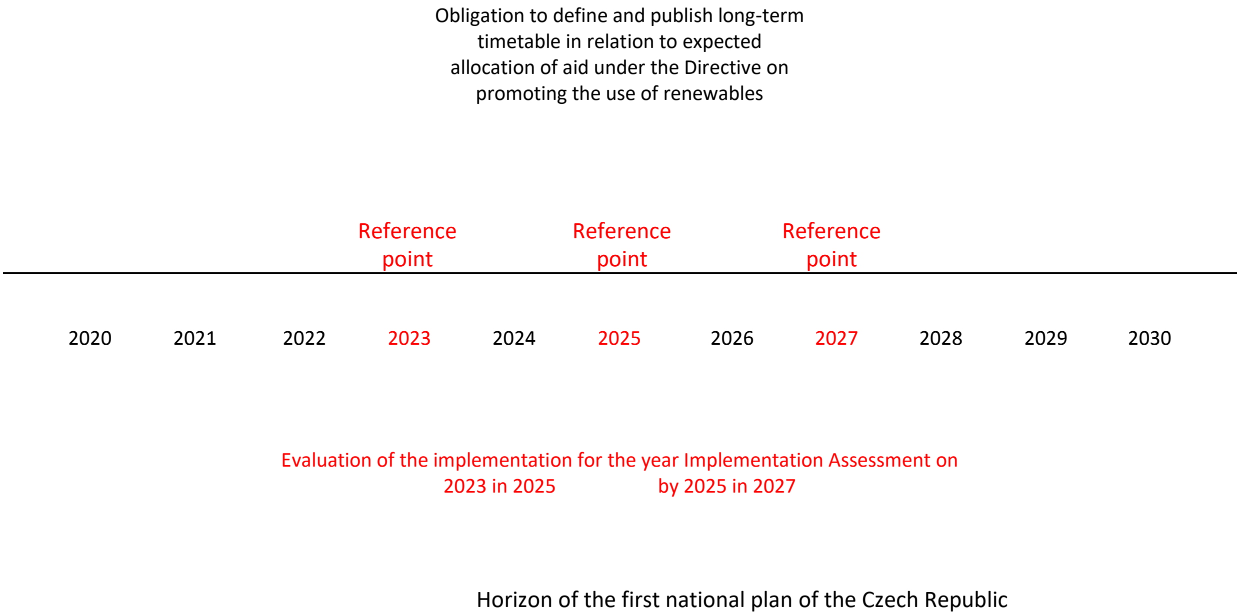
To ensure the production of renewable hydrogen needed to replace fossil hydrogen in the chemical and transport industry, as required by the revised Directive 2018/2001 on the promotion of the use of energy from renewable energy sources of June 2023, it will be necessary to create the conditions for the construction of electrolysers with a total installed capacity of around 300 MW, and relevant renewable electricity sources.

Link of the new aid scheme to national plans

Operating support for renewable and other supported resources after 2020 is linked to the implementation of the National Energy and Climate Plan (for 2021-2030). State support is granted in such a way as to achieve the trajectory or target point and control points set out in this document.

The Ministry of Industry and Trade will be the initiator for the use of appropriate RES support instruments (including other supported energy sources) by identifying the possibility of non-compliance with the Czech Republic’s national plan. In this respect, it always chooses which form of support is most appropriate at a given moment to ensure that the national RES target is met. In order to ensure predictability of the planned support to investors, the expected allocation of total public aid (investment and operating aid, both in the form of officially established aid and auction aid) will be set by the Ministry of Industry and Trade in 2023, 2025 and 2027, covering the following three years. This timetable and an estimate of all RES support granted (including other supported energy sources) for the following 3 years will be set out in the Government Decree. The Government Regulation will be updated annually and the different forms of support for new resources will be “activated” according to the needs of the evolution and delivery of the objectives. The definition of the development of supported energy sources for 2022, 2023 and 2024 is laid down in Government Regulation No 189/2022 on defining the development of supported energy sources.

Figure 1: *Link between the aid scheme under the amendment to Act No 165/2012 and the national plans*



Source: Self-processing of the Ministry of Industry and Trade for the purposes of the National Plan

ii. Where applicable, specific regional cooperation measures as well as (optional) estimated excess production of energy from renewable sources that could be transferred to another Member State to achieve the national contribution and trajectories referred to in point 2.1.2

The following measures can be identified as specific measures in the field of regional cooperation: (I) statistical transfer; (II) projects of common interest; (III) the EU RES Fund; (IV) the opening of support schemes and (v) the National Energy and Climate Plan; (VI) cross-border cooperation projects.

Statistical transfer

In 2021 and 2022, the Czech Republic used the voluntary domestic renewable production statistical route to another Member State. In particular, a statistical transfer of 465 GWh of energy from the Czech Republic to Slovenia was carried out in 2021 and a statistical energy transfer of 208 GWh was carried out between the same Member States in 2022.

Projects of common interest (PCI)/Connecting Europe Facility (CEF) projects

The Czech Republic also welcomes potential participation in projects of common interest (PCI) in the field of RES, or in projects supported under the Connecting Europe Facility (CEF). Of course, projects of common interest also depend heavily on the interest of investors and the suitability of the sites. The transmission system operator is currently preparing two hydrogen projects, namely the Central European Hydrogen Corridor (CEHC) and the Czech-German Hydrogen Interconnector (CGHI), which seek to obtain PCI status in 2023. Both projects have an expected year of entry into operation of 2030.

European RES Fund

The Czech Republic does not exclude its involvement in the activities of the European RES Fund. However, at this point in time, this is not necessary in order to achieve the above contribution.

Opening of support schemes

The legislative framework for opening support schemes is enshrined in Directive 2018/2001 on the promotion of the use of energy from renewable sources, namely Article 5 thereof. The Directive states that Member States may allow participation in support schemes for electricity from renewable sources for producers located in other Member States. When opening participation in support schemes for electricity from renewable sources, Member States may provide that support for an indicative share of the newly-supported capacity, or of the budget allocated thereto, in each year is open to producers located in other Member States. Such indicative shares may, in each year, amount to at least 5 % from 2023 to 2026 and at least 10 % from 2027 to 2030, or, where lower, to the level of interconnectivity of the Member State concerned in any given year. The Czech Republic reflected the above legislative framework when drafting the amendment to Act No 165/2012 on supported energy sources (the Directive was not effective at the time of drafting).

National Energy and Climate Plan

As a measure for regional cooperation in the field of RES, the Czech Republic also prepares the national energy and climate plan as such. On the basis of this planning document, it will be possible to compare planned national approaches and, where appropriate, identify options for joint RES projects and/or cross-border impacts of policies.

Cross-border cooperation projects

The RESINDUSTRY project, which aims, inter alia, to exchange best practice in setting up subsidy programmes can be mentioned as a concrete project. This project involves the Czech Republic, Spain, Malta, Austria, Poland, Estonia and Finland48.

iii. Specific measures on financial support, where applicable, including Union support and the use of Union funds, for the promotion of the production and use of energy from renewable sources in electricity, heating and cooling, and transport

Financial support for the development of renewables can be divided into three basic groups:

– **Measures paid for by building owners and builders without aid – measures** and instruments based on the possibility of ‘compulsory’ or ‘forced’ installation of RES power plants by building owners and builders in order to meet the energy performance requirements of buildings and to gradually tighten these requirements to reach the value of nearly zero-energy buildings.

– **Investment support** – maximum use if the Czech Republic has sufficient EU funds at its disposal, ev. ring-fenced financial resources (for more information see chapter 3.2). Furthermore, the Modernisation Fund, consisting of the sale of emission allowances and other instruments linked to the EU ETS, will be used to support RES investments (and other investments including industrial

48 For more information, please refer to the following link.

decarbonisation, energy efficiency, development of the hydrogen economy, etc.). (more detailed information on revenues from the auctioning of emission allowances and their potential use is provided in Chapter 3.2, section viii.).

Operating aid – aid will be considered for certain types and types of RES for which the cost generation price of energy is currently higher than the market price of energy and only investment aid will ensure their further development. For sources using biomass and biogas, the maximum possible energy efficiency of the use of this primary fuel will be promoted, i.e. the production of biomethane and the production of energy in a high-efficiency cogeneration plant using useful heat of at least 50 % of the heat produced. This aid serves to cover the difference in fuel costs, as the amount of the aid will be set in such a way as to compensate for the increased cost of purchasing RES-based fuel compared to fossil fuel or to compensate for the increased cost of producing energy from RES compared to the market price of energy49. More information on financing the development of RES is provided in chapter 5.3.

iv. Where applicable, an assessment of the support for electricity from renewable sources to be required by Member States
implement under Article 6(4) of the Directive on the promotion of the use of energy from renewable sources

An assessment of the effectiveness of support schemes for electricity from renewable sources is carried out in the Czech Republic every year, through the preparation of Government Regulation No 189/2022 on defining the development of supported energy sources, which sets the values and capacities of the supported resources within the following three years, defining the types and extent of the energy sources supported and amending it annually. This Government Decree shall be supplemented by an additional year each year in order to maintain the 3-year horizon for investors. The Energy Regulatory Office is also involved in the process of determining this scale and assesses, among other things, the effectiveness of the type of aid in question with regard to other support programmes, in particular public support in the form of investment subsidies. The public is also included in the drafting process as part of the submission of comments and suggestions in the standard comment process.

v. Specific measures for the establishment of one or more contact points, simplification administrative procedures, provision of information and training and facilitation of the use of power purchase agreements

Summary of policies and measures that are part of the enabling framework to be put in place by Member States in accordance with Articles 21(6) and 22(5) of Directive (EU) 2018/2001 to promote and facilitate the development of renewable self-consumption and renewable energy communities

Simplifying administrative procedures

1) Legislative changes to simplify administrative procedures

New Construction Act No 283/2021 (NSZ) regulates specific time limits for issuing permits. The building authority shall take a decision on the application no later than

a) 30 days from the date on which the procedure is initiated in the case of a simple construction,

b) 60 days from the date on which proceedings were initiated in other cases

This is known as maintenance support for electricity or heat, which has been introduced in Act No 165/2012 pursuant to Sections 6a and 25a since 2021.

The above period may be extended by up to 30 days in particularly complex cases or, where an oral hearing is held, by 60 days in proceedings involving a large number of parties, or where there is a need to serve by public order on persons on whom there is a proven failure to serve or if it is necessary to serve abroad.

The absence of a binding opinion by the institution concerned within the time limit shall be accompanied by the fiction of a positive binding opinion, unless the binding opinions of the authorities concerned are annexed to the application, and shall be requested by the building authority itself.

The amendment to the new Construction Act further waives the application of the appeal principle in the judicial review of decisions. The procedures and procedures initiated shall be completed in accordance with the existing legislation.

The range of buildings that do not require assessment by the construction authority is also extended (e.g. selected RES constructions, forest kindergartens, connections up to 25 m).

On 23 January 2023, Act No 19/2023 amending Act No 458/2000 on business conditions and the performance of State administration in the energy sectors and amending certain acts (the Energy Act), as amended, and other related acts, was published in the Collection of Acts. This amendment facilitated the construction of renewable energy sources with effect from 24 January 2023 by allowing the operation of renewable energy sources with an installed capacity of up to 50 kW without a licence from the Energy Regulatory Office. The amendment also introduces an amendment to the Construction Act, which provides that construction works for the production of energy from renewable sources with a total installed capacity of up to 50 kW, provided that they comply with territorial planning documents, with the exception of the construction of a waterwork, cultural monuments and buildings in a special protected area, a monument reserve or a monument area, neither a decision on the location of the building nor land-use consent is required. Construction works necessary for the installation using a renewable energy source (e.g. roof photovoltaics) with a total installed capacity of up to 50 kW, provided that they do not interfere with the structure of the structure of the building, do not change the way in which the building is used, do not require an environmental impact assessment, the conditions in particular for fire safety under the legislation governing the safe installation of power-generating facilities are met, and they are not a cultural monument, do not require a building permit or notification to the construction authority. The definition of power generating facility and the definition of business in the energy sectors has been adapted so that the power generating facility from renewable sources of 1 MW or more is in the public interest.

2) Procedural integration

In cooperation with the Ministry of the Environment, a new JES (Single Environmental Opinion) is being introduced in the form of a binding opinion to coordinate public interests in the field of the environment as a whole (according to individual component regulations). From the point of view of the SÚ, this is a binding opinion.

The coordinated binding opinion, including the JES, will be issued by the municipal authority with extended powers and, in the cases provided for by law, the regional authority (KÚ).

In the event that the construction project does not require an EIA, the KÚ will issue a coordinated binding opinion including the JES (the fiction of a positive binding opinion without conditions may be applied).

Where a construction project requires an EIA, the issuing of a coordinated binding opinion, including the JES, will depend on whether the developer will have a binding EIA opinion before the application for development consent is submitted.

If a binding EIA opinion has been issued, the KÚ issues a coordinated binding opinion including the JES (the fiction of a positive binding opinion without conditions can be applied). In the absence of a binding EIA opinion, the coordinated binding opinion and the JES will be separate supporting documents, and any fiction of a positive binding opinion without conditions will be applied in relation to the coordinated binding opinion.

The sanitary centres (health protection) and the Fire Rescue Service (fire safety requirements) will continue to issue separate binding opinions (the fiction of a positive binding opinion without conditions may be applied).

The regional authority will issue a coordinated binding opinion, including the JES or a coordinated binding opinion, and the JES, for the procedures conducted by the Transport and Energy Building Office (DES).

The Ministry of the Environment (MoE), the Ministry of Agriculture (MZE), the Ministry of Culture (MK) will be review bodies for binding opinions (ABs).

3) Digitalisation, efficiency and transparency of the permit-granting process

With the introduction of a completely new system of computerisation, building offices will be able to carry out a significant part of their activities electronically, enabling the electronic submission of forms as well as documentation and other management documents. The harmonisation of all the document formats used and the creation of an IT system for the computerisation of the procedures conducted at the building offices will reduce the administrative burden and make activities more efficient, both financially and over time. At the same time, this will increase the efficiency of public administration and thus increase the competitiveness of the Czech Republic in the international environment. These adjustments will increase the transparency of the entire process of execution of the agenda throughout the Republic, but also the coordination between the different authorities concerned, the persons concerned and the possibility of monitoring statistics.

The standardisation and construction of a single information system will consequently ensure a higher level of service for construction offices. The new Construction Act No 283/2021 has already entered into force on 29 July 2021. This Act was amended by Act No 152/2023, which entered into force on 5 June 2023.

Areas necessary for the Czech Republic’s contribution to the RES objective and areas for accelerating RES deployment

The areas necessary for the Czech Republic’s contribution to the RES objective are areas where the construction of renewable sources is possible. Areas for accelerating RES deployment are areas where the state simplifies and accelerates the construction of renewable energy sources. This is a subset of essential areas. Their definition is part of the European Commission’s plan to urgently move away from Russian fossil fuels and the transition to clean and cheap energy sources (REPowerEU). It is foreseen that by the end of 2023, this will also be a legal obligation for EU countries resulting from the entry into force of the revised Directive 2018/2001 on the promotion of energy from renewable sources. An analysis of possible areas for acceleration zones is ongoing. The mandatory delimitation of acceleration zones is the subject of spatial planning.

Strengthening grid capacity to connect RES and accelerate the connection process

To ensure sufficient infrastructure capacity for seamless connection and operation of RES, the State will incentivise and accelerate investments in the optimisation of the distribution network and the reinforcement of networks. According to the NAP SG, automation, voltage control and reactive power flow management measures are much cheaper than conventional network reinforcements. The software solution is a key element, the distribution system can be adapted faster and cheaper. However, investment in classical reinforcements (infrastructure) is inevitable.

A transparent system of free display of connectivity capacities through the PDS website with all necessary technical data will be put in place. Any lack of capacity or threat to reliable and secure operations shall be demonstrated in writing by the operator to the connection applicant, supported by the underlying data and calculations. In the case of connection of a power generating facility with an installed capacity of up to 10 kW, the lack of capacity exemption of distribution facilities shall not apply when assessing the connection request. Speculation on spare capacity will be avoided, whereby the TCT will have the right to cancel the booking if the customer does not meet the terms and conditions and the connection date.

Legislative anchoring of energy communities, renewable energy communities and active customer

Energy and renewable energy communities

The draft amendment to Act 458/2000, currently in the legislative process (expected effective date from 1 January 2024), introduces a definition of the Energy Community in line with Directive 2019/944 on rules for the internal market in electricity and a definition of renewable energy communities in line with Directive 2018/2001 on the promotion of the use of energy from renewable sources.

It is a legal person which is based on voluntary and open participation and is effectively controlled by members or partners, which are natural persons, small enterprises, local authorities or legal persons established or controlled by local authorities. The main purpose is not to generate a profit, but to provide environmental, economic or social benefits to its members or to the territory where it operates. The definitions deliberately do not define the specific legal forms that a community would have to take in order to carry out its activities. However, this does not mean that the freedom of legal forms in the community is unlimited. The legal form chosen must always ensure the openness and voluntary nature of participation, a primary purpose other than profit-making and the verifiability of compliance with the condition of effective control.

The Energy Community shall be entitled to:

Collect electricity at its demand point for self-consumption
Generation of electricity
Sell electricity produced in an electricity generating facility operated by an association or a member thereof to share electricity generated within an electricity generating facility operated by the community to the point of demand of its member

In order to share electricity, the community shall be obliged to register at the data centre the assignment and termination of the assignment of its members' delivery points and delivery points; registration is not subject to a fee. In sharing, the community shall have the right to use the distribution and transmission system. Members of the community may share electricity with each other and members vis-à-vis the community. The Community and the members shall have the right to conduct measurements.

Active customer

The amendment will allow self-generating customers to withdraw their electricity produced at another point of demand using the distribution system. Furthermore, an active customer shall be entitled to share electricity produced in the production plant operated by that customer to another customer, provided that those customers have delivery points in the same building and the distribution system is not used for the sharing of electricity. It is also entitled to sell the electricity produced in his production site to an electricity trader.

The Decree on the Electricity Market Rules, the amendment of which has been in force since 1 January 2023, lays down rules for the distribution of the electricity produced in a multi-family building among customers or residents of a multi-family building in whose premises the electricity generating facility is installed. Any customer who chooses to participate in this 'specific form of sharing' in a dwelling remains all rights, such as the right to choose and switch electricity supplier. In addition, that customer has the possibility to choose in what proportion it will consume, within the co-operating customer group, the electricity produced in a common power plant, mostly a solar power plant (e.g. supplemented by storage systems for the electricity produced), normally installed on the roof of a multi-family building. On the electricity thus consumed, customers shall save both commercial and regulated payments per MWh, i.e. the volume of electricity consumed. The consumption of the electricity produced and the record of the progress shall be carried out by the relevant distribution system operator, which records, processes, evaluates and then passes on to the market operator and dealer for settlement to each customer.50

Support for the establishment of energy/RES communities (or community energy projects)

Modernisation Fund

In general, support for the creation and implementation of citizen energy communities and RES communities is being prepared under the Modernisation Fund. This fund should primarily support the resource component of energy communities ("common" resources outside the housing sector) and the integration elements of energy communities (connecting individual RES into larger units through smart metering and advanced grids, local energy sharing, increased energy storage, etc.).

Some additional information on funding in this area is provided in Chapter 5.3.

National Recovery Plan/New Green Savings

Under component 2.5 of the National Recovery Plan, support51 is foreseen for the development of community energy in the residential sector. Therefore, the New Green Savings 2030 programme will support the installation of new RES in order to exclude barriers to their future participation in a wider energy community. The New Green Savings 2030 programme will also support smaller common energy storage facilities for multiple houses or the creation of energy communities within individual apartment buildings (this element could allow at least a partial solution to the administrative barriers linked to the approval of energy renovations of apartment buildings by their residents – the issue of community-owners), or other investment measures linked to community energy. In particular, non-investment measures could support the establishment of energy communities, as well as awareness-raising, education, etc. aimed at developing community energy. In supporting the establishment of energy communities, the principle of equal opportunities will be taken into account, in particular in terms of creating inclusive jobs, gender equality and taking into account the needs of perspectives of all households, including low-income ones. Component 2.5 will therefore also contribute to the creation and development of energy communities in the Czech Republic through the New Green Savings 2030 programme.

Some additional information on funding in this area is provided in Chapter 5.3.

vi. Assessment of the necessity to build new infrastructure for district heating and cooling produced

50 More information is available on the website of the Energy Regulatory Office (link).
51 More information is available on the website of the National Recovery Plan (link).

from renewable sources

Thermal energy supply systems are the energy infrastructure necessary for the efficient use of heat from renewable and secondary energy sources that cannot be obtained and/or used separately at individual building level (less biomass, biogas derived from waste, geothermal energy, waste heat from industrial processes, etc.). The use of locally available heat sources contributes to the decentralisation of energy, reduces dependence on fossil fuel imports and strengthens the local economy.

The Czech Republic has a well-developed heating system, which needs to be gradually transformed for the use of low-carbon energy sources, including energy from secondary sources and waste heat, and their transport to consumers, in particular in urban agglomerations.

In particular, the development of the use of renewable energy sources in existing heat supply systems will be crucial for the achievement of the Czech Republic's 2030 target. The Czech Republic therefore plans to support, in particular, the modernisation of existing heat supply systems to meet the requirements for efficient thermal energy supply systems under the Energy Efficiency Directive. However, there is also scope for the creation of new (especially smaller) heat supply systems produced from renewable sources, for example through the use of heat from biogas stations, which today are mostly used to produce electricity and potentially have a significant amount of heat produced from renewable sources. The solution can be to convert existing power plants from biogas to biomethane plants and to use biomethane for CHP on site using heat.

vii. Where applicable, specific measures on the promotion of the use of energy from biomass, especially for new biomass mobilisation taking into account: (I) the availability of biomass, including sustainably produced biomass: domestic potential as well as imports from third countries; (II) other uses of biomass in other sectors (agricultural and forestry sectors), as well as measures for the sustainability of biomass production and use

On the basis of the Council Implementing Decision on the approval of the assessment of the recovery and resilience plan for Czechia, the document 'Assessment of trajectories for the sustainable use of bioenergy in the Czech Republic' has been prepared52. This document is one of the reforms, or one of the milestones, conditioning the absorption of funds from the RRP of the Czech Republic, namely components 2.2, 2.3 and 2.5, as well as investments in bioenergy in the fields of energy, transport, environment, climate change, forestry or agriculture financed by other EU or national funds in full compliance with legal requirements, including DNSH requirements.

The objective of that assessment shall be to quantify and, where appropriate, adequately describe the demand for bioenergy and its resources, with an emphasis on their sustainability, so as to objectively demonstrate the sufficiency of sustainable biomass resources by 2030 to meet demand. As well as describing impacts on land use, land use change, forest carbon sinks, biodiversity and air quality. The aim is also to provide guidance for investment in the use of biomass and waste residues from biomass use, both from private and public funds.

Furthermore, the Czech Government's programme statement of January 2022 enshrines the task of processing strategic material that will look more closely at woody biomass as a raw material. As a result of this task, the creation of the Standing Working Group on Raw Materials Policy on Wood of the Government Council on Energy and Raw Materials Strategy was initiated. The work of this working group started in mid-2022. The summary material should be prepared by the end of 2023.

More detailed information with regard to biomass availability is provided in Chapter 2.1.2.

52 The material is available on the website of the Ministry of Industry and Trade (link).

3.1.3 Other elements of this dimension

i. Where applicable, national policy and measures affecting sectors covered by EU Emissions Trading System (EU ETS) and assessment of complementarity and impact on the EU ETS

The EU ETS is partly affected by the promotion of renewable electricity generation and end-use energy savings leading to a reduction in the demand for emission allowances in installations in the EU ETS.

ii. Policies and measures to achieve other national targets, where applicable

Policies and measures to achieve the national targets are detailed in other parts of this material. The Czech Republic considers it relevant in this section to mention strategies, plans and measures on adaptation to climate change.

The Strategy for Adaptation to Climate Change in the Czech Republic (the 'Adaptation Strategy of the Czech Republic') was approved by Government Resolution No 861 of 26 October 2015 and updated by Government Resolution No 785 of 13 September 2021. The document is drawn up for the years 2021-2030. It was prepared in the framework of interdepartmental cooperation, with the Ministry of the Environment being the coordinator of the preparation of the overall material. The Czech Republic's Adaptation Strategy aims to increase the Czech Republic's preparedness for climate change – reducing vulnerability and increasing the resiliency of human society and ecosystems to climate change, thus reducing its negative effects.

In order to ensure a systemic approach, the strategy is structured according to 7 main climate change manifestations in the Czech Republic, in which the key sectors affected by the climate change manifestation are identified and the main impacts, vulnerabilities and risks are described. The main manifestations of climate change in the Czech Republic are long-term droughts, floods and flash floods, heavy precipitation, rising temperatures, extremely high temperatures, extreme winds, vegetation fires.The Czech Republic's strategy also identifies priority impact areas (sectors) for which the greatest impacts of climate change are expected. These sectors are forestry, agriculture, water regime in the countryside and water management, urbanised landscapes, biodiversity and ecosystem services, health and hygiene, tourism, industry and energy, transport, cultural environment and a safe environment.

In the draft part of the strategy, it sets out the basic principles of adaptation, a vision with a view to 2050 and the 2030 targets, in the implementation part, summarises the management and implementation tools and the communication strategy, including public engagement. The strategy also sets out the framework for adaptation measures for 2021-2025 and the link between adaptation objectives and sectoral and other Czech strategies, examples of good practice, etc.

The continuous implementation of the Adaptation Strategy of the Czech Republic will be evaluated in 2025 and every 5 years thereafter.

The Czech Republic's Adaptation Strategy Implementation Document is the National Action Plan for Adaptation to Climate Change ('the Action Plan') and its first update was approved by Government Resolution No 785 of 13 September 2021 (previous version approved in January 2017).

The Action Plan develops the 2021-2025 framework of actions set out in the Adaptation Strategy into specific tasks to attribute responsibility, delivery dates, relevance of action to different climate change manifestations and sources of finance. The action plan contains 108 adaptation measures, broken down into 322 specific tasks assigned to the relevant ministries, specifying the deadlines for implementation, the relevance of the measures to the different manifestations of climate change, the sources of financing and the projected costs until 2025. Compared to the previous version of the Action Plan, the total number of actions and tasks has been reduced despite the fact that over 60 tasks were proposed or redefined on the basis of needs. The number of specific actions and the tasks assigned to them are due to a broad cross-sectorial overlap between climate change impacts and adaptation needs, as well as by the fact that the vast majority of measures (more than 80 %) are in some sense already contained in other strategic material of national importance.The Czech Republic, as an EU Member State, has committed itself to common EU targets and is actively involved in negotiations on adaptation policy within the EU. The Czech Republic's adaptation strategy is in line with the EU Adaptation Strategy.

iii. Policies and measures to achieve low emission mobility (including electrification of transport)

National action plan for clean mobility53

National Clean Mobility Action Plan

Policies and measures to support the development of low-emission mobility are contained in particular in the National Clean Mobility Action Plan (NAP CM).

Since 2015, the Czech Republic has already established a National Action Plan for Clean Mobility. Over time, revisions are taking place to reflect developments in this area. It was updated in 2020 on the basis of new EU legislative and non-legislative documents in the field of emission reductions in transport and renewable energy requirements in transport. A new update of the NAP CM is currently being prepared, primarily based on the requirements of the approved Regulation of the European Parliament and of the Council on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU of the European Parliament and of the Council (the so-called AFIR). The update will include new predictions of the number of passenger cars and predictions of publicly accessible infrastructure. New NAP CM will focus more on non-road transport. By mid-2024, a new update of the NAP CM should be submitted to the Czech Government for approval. This document will then be sent to the European Commission.

The European Green Deal and the Fit for 55 package of legislative proposals aimed at reducing Europe's greenhouse gas emissions by 55 % by 2030 compared to 1990 can be seen as the most significant change in the context of the development of clean mobility since the initial NAP CM was approved. This objective is an intermediate step towards achieving carbon neutrality by 2050, to which the European Union has legally committed itself. Achieving climate neutrality at EU level in 2050 requires ever-increasing greenhouse gas emissions from transport to be reduced by around 90 %. The European Green Deal, together with the 'Fit for 55' package, brings concrete steps to achieve the objectives.

In order to meet the strategic objectives of the update of the NAP CM, it is crucial that financial support will also be provided for the period 2023-2027, in particular from EU funds. Substantial investments, around 8.3 billion. For example, they are intended to support the purchase of vehicles for public transport from the Integrated Operational Programme (IROP) of the Ministry of Regional Development. Another part of the funds (CZK 600 million from the National Renewal Plan) is allocated by the Ministry of the Environment to support municipalities, regions or non-profit organisations for the purchase of alternatively powered vehicles – electric cars, hydrogen-powered vehicles, including recharging points.

NPO funds under the New Green Savings programme support the construction of charging stations in residential and family homes (CZK 144 million). The Ministry of Industry and Trade is currently preparing a call to support the purchase of zero-emission vehicles (el, H2) and the construction of non-

53 The material is available at the following link: https://www.mpo.cz/cz/prumysl/zpracovatelsky-industry/automobile industry/narodni-Accni-plan-ciste-mobility-167456/

public infrastructure for businesses with an allocation of 2 billion. CZK.

Another major source is the Transport Operational Programme, from which around 6 billion will flow. CZK to support the construction of public recharging and refuelling infrastructure. Additional funds will be used from the Modernisation Fund.

The implementation of the NAP CM is continuously monitored and evaluated; the results of this assessment are contained in annual reports, which are submitted to the Government of the Czech Republic for information on 30 September each year. The following table provides a summary summary of the development of clean mobility based on Information on the implementation of the National Clean Mobility Action Plan (NAP CM) actions for 2022.

Table 31: *Indicators for the development of clean mobility*

Pointer	NAP CM forecast for 2022	Actual situation for the year
Number of Battery Electric Vehicles	13800-19 50054	14 161 + 939
Number of recharging points	2900-3 800	1364 DS/2643 DB
Electricity consumed at recharging points accessible to the public (MWh)55	11 800	
Number of CNG vehicles	28200 to 30100	30 085
Number of LNG buses	65-120	159
Number of public CNG filling stations	233-238	230
Numbers of LNG filling stations – public/mobile		5
Consumption of CNG in transport (million^3)	141,7	97,434
LNG transport consumption (million^3)		3,796

54central and high scenario

MIT55 statistics based on data sent from DS owners/operators

Source: Information on the implementation of the National Clean Mobility Action Plan (NAP CM) actions for 2022

E-mobility

The new update of the NAP CM envisages a baseline scenario for the development of electro-mobility by 2030 and 2035 respectively.

Expected development

Target number of BEVs, PHEVs in the category of passenger cars

Consumption of bioCNG in transport (million^3)		14,926

Table 32: *Target number of BEVs, PHEVs in the category of passenger cars*

Year	2030	2035
Target number (BEV + PHEV) [ks] (from – to)	200000-450 000	600000-1 400 000

Table 33: *Target number of light commercial vehicles*

Year	2030	2035
Target number (BEV) [ks] (from – to)	9000-22 000	35000-86 000

Table 34: *Target number of buses within the MoHD*

Year	2030	2035
Target number (BEV) [ks] (from – to)	570-1 050	1070-1 800

Expected development

Recharging infrastructure

Table 35: *Target number of recharging infrastructure (recharging points)*[54]

Year/Number of recharging points with recharging power	2030	2035
up to 50 kW [ks]	10000-27 000	32000-87 500
50-150 kW [piece]	450-1 150	1200-3 200
150-350 kW [piece]	35-100	150-450
Target number [ks]	**10485-28 250**	**33350-91 150**

[54] The source of the information provided is the working version of the update of the National Clean Mobility Action Plan, which is being prepared at the time of preparation of the update. Where appropriate, these values will be updated as part of the finalisation of the update of the Czech Republic's national plan.

Development of electro-mobility from the perspective of network infrastructure development

Another relevant document for the future development of electromobility is the National Action Plan for Smart Networks and accompanying materials. This concerns, in particular, a study for the purposes of the National Smart Network Action Plan, which is, inter alia, focused in detail on the analysis of the measures needed to ensure the readiness of distribution systems.

3.1.3.3 Natural gas

The evolution of the CNG car fleet, despite the drop in sales in 2018 and 1st half of 2019, due to the shortage of CNG cars on the Czech market, has been in the long term around 30 % of annual growth. Around 23 thousand natural gas vehicles are currently operated in the Czech Republic (vifrom *Table 37*). The average year-on-year growth of the car fleet has remained at 32 % in the long term. The number of CNG buses is growing every year thanks to the use of subsidies for their purchase and is now operating around 1300, representing more than 6 % of the Czech car fleet. Parking in mass underground garages remains one of the significant barriers affecting the development of CNG cars.

The CNG refuelling infrastructure is developed every year. There are currently 199 public CNG service stations in the Czech Republic, as well as around 50 non-public CNG company filling stations and around 200 domestic slow filling facilities. More than 60 % of public refuelling points are in service stations, others are accessible at company premises or as stand-alone delivery points. A non-public CNG refuelling station, with more than 50, is operated by private companies and some transport undertakings. Companies and small craftsmen also use slowly CNG filling facilities (domestic fillers) of more than 200. The average annual growth rate is 25 %.

The development of LNG infrastructure has so far been at an early stage in the Czech Republic. There is one public LNG station and several mobile LNG refuelling points, mostly used by firms in LNG truck testing. However, an important fact is that project preparation is currently underway, with the subsequent implementation of 13 new public LNG refuelling points, which will be created by 2022 with the subsidy support of the Ministry of Transport under the Operational Programme Transport.

The potential and use of biomethane, both in the form of bio-CNG and bioLNG, is also an integral part of the problem. This is crucial in the long term, as biomethane has significantly lower greenhouse gas emissions than fossil CNG/LNG. Gradual replacement of biomethane instead of fossil CNG/LNG is necessary for the environmental benefits of this alternative fuel.

Table 36: *Evolution of the number of CNG vehicles in circulation in the Czech Republic in 2010-2022*

Year	Total Vehicles	OA and LUV	Busses
2016	15 500	13 970	1 020
2017	18 900	17 160	1 120
2018	22 600	20 660	1 234
2019	25 310	23 036	1 453
2020	27 748	25 043	1 714
2021	29 610	27 303	1 830
2022	30 085	27 895	1 800

Source: Information on the implementation of the update of the NAP ČM 2022;

Table 37: *Evolution of the number of public CNG refuelling stations in the Czech Republic in 2014-2022*

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022

number of public CNG fillers	75	108	143	164	185	207	219	228	230

Source: Information on compliance with the update of NAP ČM 2022, Czech Gas Union

3.1.3.4 Hydrogen mobility

NAP CM declares the interest of the Czech Republic to include hydrogen in the national policy framework for alternative fuels in transport under Directive 2014/94/EU on the deployment of alternative fuels infrastructure. This corresponds to the Czech Republic's target for the development of hydrogen refuelling stations. According to this document, 3-5 stations should be created in the Czech Republic by 2025. This is an initial objective, and the NAP CM envisages that it may be increased in the future, on the basis of a study to assess more comprehensively the potential of hydrogen mobility in the Czech Republic. NAP CM also notes that hydrogen mobility should be supported by the same measures as e-mobility, as this is known as hydrogen electro-mobility. Therefore, for example, the development of hydrogen filling station infrastructure should be stimulated by means of investment aid. Similarly, hydrogen vehicles are expected to benefit from the same advantages as electric cars, whether in urban parking or using preferential lanes. The exemption of such vehicles from the payment of motorway charges is also envisaged. In order to realise these advantages, hydrogen vehicles will be included in the category of 'electric vehicles', for which special registration plates (starting with the 'EL' letters) will be issued free of charge. The issuance of these special number plates (including for hydrogen vehicles) started in 2019.

The NAP CM's task with regard to the study of hydrogen mobility opportunities in the Czech Republic was completed in 2017, when the study was carried out by Grant Thornton Advisory for the Ministry of Transport56. This study contains 4 scenarios for possible long-term developments in the field of hydrogen mobility in the Czech Republic. Based on a simulation of possible future scenarios for the development of the hydrogen vehicle market, the study includes predictions of the number of vehicles and hydrogen refuelling stations for 2025, 2030 and 2050. The model outputs of this study clearly show that if at least the baseline scenario is to be fulfilled, at least 12 hydrogen refuelling stations in the Czech Republic need to be built by 2025. For this reason, during the future update of the NAP CM, the Ministry of Transport should promote the adaptation of the national target for the number of hydrogen refuelling stations from the current 3-5 stations to 12 stations.

In June 2017, the study was agreed by the Minister for Transport, stating that it should be a basis for the Ministry of Transport to update the NAP CM. It was subsequently submitted for information to the Government of the Czech Republic. In 2018, some parts of the study (including the baseline prediction) were further updated. Developments in this area may be further refined in the context of a future update of the NAP CM.

The update of the NAP CM carried out in 2023 is more detailed in hydrogen technology and vehicle propulsion via hydrogen than the original NAP CM and sets out strategic objectives in this area. The update of the NAP CM is based on the above study and targets hydrogen mobility to reach the range of 3000 to 5200 passenger and light-duty hydrogen vehicles by 2030. At the same time, the NAP CM targets 160-250 hydrogen buses by 2030. In the area of freight transport, it is not yet possible to identify such a

56 The English version of the study "Use of Hydrogen Powered Vehicles in Transport in the Czech Republic" is available here: https://www.mdcr.cz/Dokumenty?lang=en-GB&mssfd=Strategie

specific objective, as the above-mentioned study did not address the subject.

3.1.3.5 Other alternative fuels

Other alternative fuels include in particular LPG/bioLPG, synthetic fuels and ammonia-based fuels. The updating of the CM NAP is more detailed on these fuels, in particular as part of the accompanying analytical material. The following provides information on the expected/potential development only for bioLPG, which is the fuel that can be identified as the most likely development for other alternative fuels at least in the medium term, compared to other alternative fuels such as synthetic fuels and ammonia-based fuels. Alternative fuels from renewable sources can temporarily play a very important role in reducing CO2 production in the Czech Republic, given the age of the fleet, which is undergoing renewal.

LPG/Bio LPG

Fossil LPG

With regard to the method of obtaining LPG (created as a 'residue' in oil refining or extracted as 'secondary gas' in the extraction of natural gas, both of which amount to approximately 3-4 % of the product produced), LPG is considered to be a product that will be in stable quantities on the market for as long as additional fossil fuels are available. A decrease in availability can only be expected in the context of the reduction of fossil fuel supply to the European market.

BioLPG

After 2020, a gradual increase in the supply of bioLPG to the market is expected. BioLPG is produced as a by-product in the production of HVO (that is, as in the case of classical LPG, waste). Technologies for the direct production of bioLPG from waste cellulose are also being tested and other production methods can be expected to follow.

Specificities of the use of LPG/bioLPG on the Czech market

The advantage of LPG on the Czech market is the fully developed distribution infrastructure (around 900 refuelling stations) and the high popularity of this fuel (around 170000 vehicles).

The main fuel potential is in conversions of older vehicles with lower emission parameters. Thus, LPG can partially address the emissions of the older car fleet in a large part of the company, which does not have sufficient resources to buy a 'cleaner' vehicle and permanently uses vehicles above average age.

Currently LPG is used almost exclusively in passenger cars and small municipal vehicles. Some development projects (e.g.: Spain, USA) are also testing additional LPG applications for heavy-duty vehicles (e.g. buses). It can be assumed that such vehicles will also appear very quickly in the Czech Republic, as opposed to other alternative technologies, there is no need to develop the supply infrastructure.

LPG (propane – butane) as a household energy source

LPG is used in households as a source for heat production (bulk, in limited cases of bottles) or cooking (bottles) and in the Czech Republic it amounts to around 80000 tonnes per year. LPG is an efficient alternative at locations not connected to natural gas distribution systems. Again, the advantage of using LPG is lower emissions (compared to solid fuel local areas) and simple handling. The availability of the product, as well as experience in other countries (UK, Spain, France, Italy...), suggests that LPG may experience an increase in consumption in this area if consumers are incentivised to switch to cleaner fuels.

The future of bioLPG 2050+

BioLPG development projects focus on waste recovery. It is therefore an emission neutral source from the GHG point of view. The current RDE tests on LPG also show very low emissions of harmful substances, a source that can also be used in populated areas in the long term. Good fuel storage, long vehicle coastdowns and minimum technical constraints in production/restructuring (relatively light and well positionable tanks compared to CNG) also uploads easy use

Possible restriction

Like any other alternative fuels, LPG is only accepted by the market thanks to the tax relief (current tax rate in the Czech Republic mirrors the EU minimum requirements). The prediction of consumption is processed provided that the existing tax burden is maintained, or the ratio of LPG taxation to other conventional or alternative fuels available is maintained. Any unilateral increase in the tax burden on LPG would have the effect of reducing the consumption of that fuel.

3.1.3.6 Requirements of the revised Directive 2018/2001 of the European Parliament and of the Council on the promotion of energy from renewable energy in the field of transport

Under the provisional agreement on the revision of Directive 2018/2001 of the European Parliament and of the Council of 30 March 2023 on the promotion of the use of energy from renewable sources, which also regulates the targets for the use of renewable sources in transport, Member States can choose between a binding target to reduce the greenhouse gas intensity in transport by 14.5 % through the use of renewable sources by 2030 and a binding target of at least 29 % of the share of renewable energy sources in final energy consumption in the transport sector by 2030.

The Interim Agreement also sets a binding combined sub-target of 5.5 % for advanced biofuels (generally derived from non-food raw materials) and renewable fuels of non-biological origin (mostly renewable hydrogen and hydrogen-based synthetic fuels) in the share of renewable energy supplied to the transport sector. This target sets a requirement for a minimum share of 1 % of renewable fuels of non-biological origin (RFNBO) in the share of renewable energy supplied to the transport sector in 2030.

The Czech Republic seeks, by means of the planned amendments to the national legislation, to break down this objective, or to divide it, into suppliers of different types of transport fuels to which certain mandatory percentages of RES within the fuel in question will be prescribed. In doing so, the fullest possible use will be made of first-generation biofuels, while respecting both the technical quality parameters of the individual fuels set out in the normative documents and the real use of the fuels concerned by the Czech fleet, which is significantly outdated (in 2022, the average age of the car fleet was 15.73 years) and its renewal is slow.

Car manufacturers will also have a significant impact on the use of individual fuels in transport in the coming years, where Regulation (EU) 2019/631 of the European Parliament and of the Council sets the average emissions of 130 g CO 2/km for cars sold within the EU,202195gCO 2/km, a 15 % reduction of emissions from 2025 compared to 2021 and 37.5 % from 2030 onwards. Similar targets are defined for manufacturers of light commercial vehicles and with a time lag (from 2025), but similarly ambitious for heavier trucks (the 2022 revision of Regulation (EU) 2019/1242 of the European Parliament and of the Council envisages extending the scope to include trailers, buses and other groups of trucks). Targets for manufacturers will decisively influence the composition of the fleet and thus the potential for alternative fuels and propulsion. Given that the emission targets for manufacturers are set at EU level and not at individual Member State level, it is essential that the Czech Republic implements the relevant measures to support the development of the market for alternative fuels vehicles. At the same time, if the fleet is not sufficiently renewed (in particular as a result of the lack of sufficient support), imports of older second-hand vehicles with all negative consequences may increase in the conditions of the passenger car market in the Czech Republic. The assumptions that the targets set for manufacturers will automatically contribute to the renewal of the vehicle fleet may not be met in the Czech Republic's market conditions.

EU requirements for car manufacturers and fuel suppliers are not compatible with each other. For this reason too, as it is currently very difficult to estimate future real developments in these areas, domestic legislation will allow fuel suppliers to fulfil their RES commitments in transport not only directly but also to exploit the potential of RES from other fuel suppliers by pooling them in a similar way as national legislation already allows for emission savings.

3.1.3.7 Voluntary commitments by municipalities and cities

Municipalities and cities are among the major greenhouse gas polluters, with energy consumption (buildings, public lighting, new construction) and transport being the main sources of pollution. As part of the strategic planning process, many cities and municipalities are starting to be aware of this problem and, within the framework of self-governance, are making commitments to reduce greenhouse gas emissions on their territory that go beyond national or European legislation. An example is the Covenant of Mayors. This trend should be taken into account in the future, as well as the national level of activity of municipalities and cities in the transition to a low-emission regime.

IV. Where applicable, national policies, timelines and measures planned to phase out energy subsidies, in particular for fossil fuels

A list of energy subsidies and subsidies for fossil fuels is set out in section 4.6 specifically in section (iv). These subsidies are key to achieving the EU’s climate objectives, reducing air pollution, increasing the share of viable energy sources and reducing energy intensity. Therefore, the Czech Republic does not intend to systemise these subsidies, also in view of the EU’s increased ambition in these areas by 2030. Information on the expected reduction of fossil fuel subsidies and fossil fuel subsidies is also provided in Section 4.6 (iv).

Dimension ‘Energy efficiency’

Planned policies, measures and programmes to achieve the national energy efficiency contribution for 2030, the implementation of the Long-Term Building Renovation Strategy and the fulfilment of the energy savings obligation under Article 8 of the revision of Directive 2012/27/EU on energy efficiency (2021 proposal) and other targets mentioned in Annex I of Regulation 2018/1999

The Czech Republic draws on the experience of the 2014-2020 programming period when setting the energy efficiency obligation policy in accordance with Article 8 of the new Energy Efficiency Directive. The design of individual measures is based on knowledge of the potential for energy savings in individual sectors, the cost-effectiveness of these measures and the feasibility of implementing these measures in national circumstances. In the 2014-2020 period, the Czech Republic has encountered limits for the application of certain alternative measures, while the potential for using other measures which it has not yet implemented has been identified.

In the light of the above, the Czech Republic will fulfil its obligation under Article 8 of the Energy Efficiency Directive with alternative policy measures containing financial mechanisms to promote energy saving measures, regulatory measures, a scheme of voluntary agreements with energy suppliers and distributors in the field of energy efficiency improvements, energy taxes, behavioural measures. The choice and setting of measures to implement the commitment maximises the potential for achieving synergies between the different measures.

Table 38: *Measures to comply with Article 8 of the 2021 Directive (not yet approved legislation)*[57]

57The ratios may vary depending on the specific areas of support (in particular with regard to the set-up of the

Type of measures	Share of accumulated savings
Financial mechanisms	45 %
Voluntary agreements	3 %
Regulatory measures	50 %
Taxation measures	2 %

Table 39 contains a proposal for the implementation of measures meeting the criteria of Article 8 of the EED, including estimated new and cumulated energy savings over the period 2021-2030, which the Czech Republic should ensure compliance with the cumulative savings obligation by 2030.

Overlaps are taken into account in the calculation of the benefits of each measure and double counting of savings is eliminated. Detailed information meeting the requirements of Article 8 and Annex V of the Energy and Efficiency Directive and Annex III of the Regulation on the Governance of the Energy Union can be found in Annex 4 to this document.

In view of the level of ambition, the possibilities for implementing the measures in the 'Additional measures' section of the table will continue to be developed, as well as unidentified measures to be ready for implementation, not only in case the chosen measures prove insufficient.

Modernisation Fund).

Table 39: *Overview of measures to comply with the energy savings obligation and estimated energy savings for the period 2021-2030*

Title of measure	**Estimate of accumulated savings (PJ)**
Financial measures	
OP Technologies and Applications for Competitiveness 2021-2027	13
OP Enterprise and Innovation for Competitiveness 2014-2020	30
OP Environment 2021-2027	9,5
OP Environment 2014-2020	15,5
Integrated Regional Operational Programme 2021-2027	13,5
Integrated Regional Operational Programme 2014-2020	7
OP Transport 2021-2027	30
New green savings 2021-2030	62
New green savings 2014-2021	17
New green savings Light	4
NPO 2.2 – Public sector	6
NPO 2.4 – Sustainable mobility	3
EFEKT programme	12,5
Modernisation Fund	80
Taxation measures	
Environmental tax on fuels	15
Regulatory measures	
Prohibition of operation of solid fuel boilers in emission classes 1 and 2	50
Energy audits	3
Crisis measures to reduce energy consumption	65

Maximum weights of trucks	10
Construction technical requirements for construction and renovation	90
Heating rules	70
Modal change in transport	50
Voluntary agreements	18,5
Additional measures57	
Compensation	—
Exceptional accelerated depreciation	—
Energy consultancy	—
Minimum energy standards for buildings	—
Total	**674,5**

57 Potentcial energy savings will be analysed and the calculation methodology notified

Measures to achieve the objectives of the Long-Term Building Renovation Strategy

These measures are in line with the fulfilment of the obligation of Article 8 of the 2021 Directive.

Renovation barriers and measures to overcome them

Family houses

Owners of family homes most often renovate themselves, with their own money and gradually. Owners are not accustomed to using the services of construction firms, borrowing money or applying for a subsidy. They renovate gradually, part by lot, as we have enough resources. On the part of the group of these owners, the aim is to carry out renovations with a minimum of administrative tasks.

Improving housing comfort, saving energy bills and the technical condition of the house was the most important factor in the renovation decision.

The aim in this group is to improve the quality and complexity of renovations. Key to achieving the objective is to change the attitude of the general public towards energy efficiency and energy savings. Without a change of attitude, the application of additional support mechanisms for the implementation of quality renovations will be inefficient or not used. Despite the efforts made so far to promote the improvement of the energy performance of buildings and the reduction of household consumption, efforts need to be stepped up. Despite their motivation for renovation, the way to reach out to homeowners is possible. For the period 2020-2030, the Czech Republic will therefore focus on raising awareness of the issue of improving energy efficiency and adopting efficient energy management (regulation, ventilation, efficient use of energy-saving appliances, etc.) as part of everyday life. Non-investment measures will be complemented by investment aid from the State. As appropriate instruments to achieve the above-mentioned objective, the Czech Republic will adopt a renewal of the existing aid scheme with greater emphasis on the use of non-subsidising financial mechanisms, such as soft loans and guarantees. Finally, as the survey shows, there is a need to focus on ensuring the 'administrative simplicity' of carrying out the renovation, both in terms of legislative requirements and when preparing the application for aid.

Energy renovation schemes for single-family houses will continue to include special conditions for low-income households, so that no one is excluded from support and reduce the energy intensity of their housing.

Multi-family buildings

Cooperative houses have a more comprehensive approach, with more measures being implemented more often, at the same time (the complete building envelope – windows, envelopes, roofs). As a result, this category is likely to show a higher financial intensity of renovation, a longer period of time needed for the preparation and actual implementation of the renovation, but also more frequent complications in approving the renovation and with its project if they wanted to use subsidies for funding. Unlike other categories, energy cost savings prevail as the main motivation. The other categories are more often renovated gradually. The vast majority of buildings are renovated from their own funds from the repair fund.

The category of individual owners renovates least frequently, has a more significantly lower proportion of the use of commercial loans in its financing, and almost half of the renovations will take place without a tendering procedure per supplier and without the presence of the builder, which is lower than for the other categories. It is in this category that there is a markedly low incentive to renovate due to the purpose of the use of the building, which is often the rental of housing units. In such a case, the owner has no incentive to implement the measure either because of the state of emergency or the need to reduce energy costs.

As in the case of single-family houses, the aim of this group is to improve the quality and complexity of renovations, especially in the case of ownership by associations of owners and individual owners.

In the case of individual owners, there is a need to find an incentive factor for renovation to increase interest in carrying out renovations. In such cases, it will be necessary to consider the introduction of appropriate instruments, in particular at the municipatory level. As in the case of single-family houses, a campaign to bring energy efficiency improvements closer to the general public will be key for the period 2020-2030. Owners will be addressed through topics that motivate them to carry out renovations in order to achieve more implementation.

As in the case of single-family buildings, energy renovation schemes for multi-family buildings will continue to include special conditions for low-income households, so that no one is excluded from support and reduce the energy intensity of their housing. Safeguards will also be part of the rules and support to protect tenants from inadequate price increases or loss of housing as a result of renovation.

Public sector

Smaller municipalities are more likely to manage buildings themselves. They are managed by the mayor, councillor or councillor, who is often the initiator of the renovation and prepares the form of renovation together with an external designer. Renovations in smaller municipalities often take place on an ad-hoc basis without a long-term renovation plan. Subsidies are the main source of funding. Larger municipalities make greater use of external building management opportunities and are also more involved in building management by those occupying the building. Instead of the municipality's management, asset management, investment activities or other dedicated parts of the Office play a greater role here, which have the capacity to initiate and prepare the renovation. There is a more frequent plan for investment activities and the importance of subsidies to secure financing is slightly diminished. Key to setting up additional policies to implement the long-term renovation strategy for buildings is the finding that saving energy bills, improving comfort and improving the state of health is an incentive to implement energy-saving projects. At the same time, there is a certain degree of 'subsidisation dependency' for all municipalities. For renovation, more than 3/4 of municipalities benefit from subsidies, and waiting for the available subsidy is presented as the most common reason for delaying the implementation of energy-saving projects. In particular, higher subsidies for larger or better renovations could be an incentive for municipalities to make renovations easier and more frequent, and for smaller municipalities to support the preparation of project documentation. On the contrary, there is no interest in interest-free loans.

The aim for this group is to increase the number and complexity of renovations (i.e. a combination of reduced energy consumption and the use of renewable energy sources). Given that this group implements projects in cooperation with experts, there is no need to focus on the quality of project implementation, which in turn is a problem in the residential sector. It is necessary to maintain the current financial scheme for this sector, i.e. the subsidy scheme. However, it is necessary to adapt the settings to meet more needs and requirements of the municipalities. There is a need to focus on technical assistance, covering both project preparation and administrative provision of the application for financial support. As cost savings prove to be an incentive factor, it is necessary to assist municipalities in implementing energy management in order to identify the potential for reducing energy consumption and/or operating costs.

Private sector

The main drivers for the implementation of energy-saving projects are the reduction of operating costs, the improvement of the state of the art and the improvement of comfort. Only a minimum of respondents used the State financial scheme to implement the measure. The main reason for this is the need to modify the project in order to meet the criteria and administrative requirements for granting the aid. In particular, aid from the State would be welcomed by entrepreneurs in the form of tax advantages and the provision of technical assistance, including the administration of the aid application.

Like the public sector, the aim for this group is to increase the number and complexity of renovations (i.e. a combination of reduced energy consumption and the use of renewable energy sources). The state of energy management in enterprises is key to reflecting on further instruments to support the renovation of buildings in the private sector. Despite the fulfilment of legal obligations in the field of energy auditing and/or the introduction of energy management, entrepreneurs do not have any idea of energy expenditure. At the same time, savings in operating costs are an incentive for implementation. In the following period, it is necessary to focus instruments on improving energy management in the business sector. As most projects are prepared by external actors, the availability of these services (in terms of financial and quality) should ensure a higher incentive to implement building renovation projects.

Economic measures

The high initial investment costs of the energy-saving renovation of buildings are one of the main barriers to the implementation thereof. The Czech Republic has many years of experience in offering support schemes to help different groups of property owners achieve energy savings.

There is a need for a substantial increase in appropriations for building renovation programmes. Complement the grant with soft loans and multi-layered advice available to all.

The Czech Republic continues the established system of financial support for building renovations through a broad portfolio of investment and non-investment support programmes. In addition to grants, the expansion of the portfolio of financial instruments according to the needs of the different actors is being discussed. An analysis of the potential energy savings and the necessary investment means that, while the overall renovation of a building is a long-lasting measure (typically around 20 years), it also means that the return on this investment is around 4-6 % per year and possibly higher. Given the comparable investment options, this is attractive (although not too much for the business community, but for institutions and households, as well as for investment funds or banks).

Legislative and administrative measures

In view of the necessary transposition of the revision of Directive 2012/27/EU on energy efficiency and the revision of Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings, a comprehensive amendment will be made to Act 406/2000 on energy management.

Measures in the field of training and consultancy

Ignorance of specific appropriate measures to improve the energy performance of a particular building, the investment demands thereof, and potential savings, increases the transaction cost of renovating buildings. This barrier can be weakened to some extent by strengthening the role of state-guaranteed advice in the so-called Energy Consultation and Information Centres beyond EKIS. It is also considered to prepare model projects quantifying the investment costs and savings achieved for common types of buildings.

The above should rather be seen as an overview of the two sides in which the Czech Republic will focus on setting up specific measures. These will be completed following the transposition and implementation of the revision of the Energy Performance of Buildings Directive.

i. Description of policy and measures to promote energy services in the public sector and measures on removing legal and other barriers to the use of energy performance contracts and other energy efficiency service models[58]

Continued support for the use of the EPC method in particular in the public sector is foreseen for the

58In accordance with Article 18 of Directive 2012/27/EU.

period 2021-2030 in order to maximise the efficiency of the public money invested and the energy savings achieved. To this end, it is envisaged to remove barriers to the use of the EPC method by public bodies, in particular through training in the field of public procurement of complex services, support for energy providers' information centres and support for regional offices aimed at promoting the use of energy services.

ii. Other planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030, as well as other targets referred to in point 2.2 (e.g. measures to promote the exemplary role of public buildings and energy efficient public procurement, measures to promote energy audits and energy management systems, consumer information and education59measures60 and other measures to promote energy efficiency61)

All relevant policies, measures and programmes are described under the other parts of this chapter or other parts of this document, as appropriate.

iii. Where applicable, a description of policies and measures to promote the role of local renewable energy communities in contributing to the implementation of policies and measures in points i, ii, iii and iv

As stated in the previous sections summarising policies to meet the objectives and commitments of energy efficiency, the Czech Republic will make efforts to create local information centres towards the general public. In the light of public opinion, these services should not be unaffordable to the public or be made available at a minimum price. We also see the strengthening of capacity at local and regional level in the field of energy and energy efficiency, the training of employees and the strengthening of their powers in the implementation of instruments and measures, both at national and local level, to be essential. In order to implement such a scheme, the Czech Republic is considering using the EU LIFE programme.

iv. Description of measures to develop measures to utilise energy efficiency potentials of gas and electricity infrastructure62

Electricity63

Losses in the transmission system are mainly determined by the size of the transmitted power for transformation with the DSO, the outflow of power from the power plants connected to the transmission system, and the magnitude of the overflow over the transmission system determined by commercial exchanges between individual trading zones in the interconnected European system.

In an area under the control of the transmission system operator and which does not lead to a reduction in operational security and reliability of electricity supply, two areas of loss reduction can be considered in general. This is an area of infrastructure investment and resources for system management.

Infrastructure investment window

Increasing the permeability of the network and thus achieving higher connectivity, which, if specifically applied, results in reduced losses throughout the system. The increase in system permeability with an impact on loss reduction is mainly driven by the need to increase active power transmission opportunities

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59In accordance with Article 8 of Directive 2012/27/EU.

60In accordance with Articles 12 and 17 of Directive 2012/27/EU

61In accordance with Article 19 of Directive 2012/27/EU.

62In accordance with Article 15(2) of Directive 2012/27/EU.

There is more detailed material in63 this area, developed with the input of ČEPS a.s., ČEZ Distribuce, a.s. and PREdistribuce, a.s., which is more detailed in this area. That material contains only a certain summary of that more detailed material.

from sources to consumption and within an interconnected European electricity system, thereby meeting loss reduction requirements in the long term. An example of implementation is the process of assessing needs in each corridor, where necessary, higher parameters (higher current capacity, duplication of lines) leading to a lower unit loss factor.

As part of the standard end-of-life renewal process, a predetermined amount of transformers is exchanged annually between the transmission and distribution system. These transformers are replaced by completely new machines with higher unit power, and the transformation of 220/110 kV will gradually be replaced by 400/110kV.

Thus, as regards the reduction of losses on lines, the transmission system involves the use of larger cross-section ropes in fully upgraded lines, resulting in a reduction in the losses of that line. For example, the difference in the use of 434-AL1/56-ST1A instead of 350AlFe4 means a decrease of about 30 % in unit operating losses with the same active power transmission. Type 490-AL1/64-ST1A cables are currently being used and will continue to contribute to the reduction of active power transmission losses on key lines that are upgraded or duplicated with an expected nominal transmission capability of around 2500 A. Significant investment in the transmission system involving the use of lower specific resistance ropes.

Area of system management resources

The reduction of losses in the transmission system by changing network operation is very limited. The deviation from the basic connection generally results in an increase in losses in the transmission system. The parameter in the form of location and size of active power supply/consumption, which significantly affects the size of the losses, is not controllable by the TSO and, if so, at a high cost price. From this perspective, only the production of reactive power, which partly contributes to losses in the transmission system, can be affected. There is scope for implementing resources for resource management and compensation in order not only to ensure safety and reliability of operations, but also to reduce losses. In particular, approaches or tools applied in this area are automatic voltage regulators in cooperation with the optimisation tool.

In general, measures taken to reduce losses should always be applied taking into account the site and in order to achieve a reduction in overall losses and not with regard to the losses of one type of installation. In the area of system management tools, space is limited by the possibilities of using available regulatory means, which are already fully used in the transmission system today, but there is scope in the areas of pilot projects allowing for greater integration and coordination.

Approaches to improve energy performance in the distribution system

The ability of the distributor to influence the reduction of electricity consumption is severely constrained by legislation and the obligation to deliver the contracted quantity of electricity to final customers. It should also be borne in mind that, despite the distributor’s efforts to implement procedures and technologies that help to reduce losses, there are a number of trends linked specifically to the development of renewables, which lead to increased losses. For example, wider deployment of renewables tends to increase the amount of reactive energy in the grid, leading to increased losses. In addition, small intermittent sources are connected asymmetrically to the network, which can lead to a disproportionate burden on some terminals and thus also increase losses. In addition, the development of decentralised production and some appliances (e.g. pulse resource management) may also be linked to the introduction of higher harmonics into the network, which may also result in higher losses.

The potential scope for reducing electricity consumption that can be influenced by the distributor is mainly in the area of technical and non-technical losses. Examples include the introduction of new technologies, the unification of voltages, the renewal of existing installations and the replacement of existing grid elements with new ones with higher efficiency and better parameters, as well as the control of the demand point to detect unauthorised electricity offtakes.

Based on data on electricity consumption and losses for individual voltage levels, we can conclude that the largest room for reducing consumption or technical losses is at the low voltage level (nn) and partly at the high voltage level (vn).

Loss-reducing measures can therefore, in general, be divided into two groups:

– restoration of the network through the exchange of key network elements with more efficient and better parameters. In the context of distribution, this is mainly a replacement of transformers and an increase in cross-sections of conductors. From a cost-effectiveness point of view, this is an option which must always be assessed in the light of the specific conditions of its application, since the financial costs incurred may not always justify the results achieved – mainly in terms of local load and network topology.
– the second group of measures is an alternative to the generalised application of more efficient features and better parameters. This involves deploying elements that allow, for example, advanced network management and monitoring methods. In the context of synergistic effects, these elements are deployed, both for reasons of better burden sharing (and thus reducing losses), but also because of the need for better monitoring of the network at lower voltage levels, which is one of the main distribution challenges in view of changing consumption/production patterns.

Gas

With a gradual shift away from coal sources, the use of natural gas, biogas and prospectively synthetic methane and hydrogen will be sufficiently enhanced in the Czech Republic. The gas system has the potential to contribute to the energy efficiency objective, e.g. by installing more efficient installations that reduce the energy performance of system operation. This can be done as part of the continuous maintenance and modernisation of the system. For example, the installation of more efficient compression stations could be carried out with a contribution from the EU structural funds.

v. Possible regional cooperation in this area

The basic information on the regional dimension at Czech level is presented below.

Act No 406/2000 requires the regions and the city of Prague to draw up a territorial energy concept and to process it at regular intervals. In addition to this obligation, regions and municipalities carry out energy audits from a certain size and/or introduce an energy management system. The above-mentioned documents make it possible to evaluate energy efficiency by region. These evaluations are important to set up appropriate measures that are acceptable across the public administration.

The Ministry of Industry and Trade is acting with the aim of creating a platform where implementation issues of the above-mentioned documents can be addressed. Discussions are being held intensively by representatives of these entities in order to save interest in the issue of energy efficiency, to identify the potential in the territory and to explore possibilities to realise this potential.The authorities concerned are the bodies involved in approving legal acts as well as strategic documents. They are therefore indirectly involved in the formulation of the State’s energy efficiency policy.

vi. Financing measures, including Union support and the use of Union funds, in the area at national level

The financial measures and sources of financing are summarised in chapter 5.3.

vii. Energy efficiency instruments and measures beyond those falling under Article 7 of the EED

The tables below set out the instruments and measures beyond those falling under Article 7. This point

(point/part of ix) has been added beyond the structure required by Regulation 2018/1999.

Table 40: *Instruments and measures going beyond measures falling under Articles 7 and 8 respectively (under the 2021 proposal for a directive)*

Measures	Description
Investment support for the deployment of CHP	There is stable investment support for the deployment of CHP in both operational and national programmes. Under the current programming period, support to the business sector is allocated in the Operational Programme for Entrepreneurship and Innovation for Competitiveness. In this case, this concerns in particular the broad-based specific objective 3.2 *Energy Savings* as well as the narrowly targeted specific objective 3.5 *Energy savings in the MTA*. In addition, investment aid is allocated in the Operational Programme Environment, namely in specific objective 2.2 Reduction of emissions of stationary sources and specific objective 3.2 Increasing material and energy recovery of waste. In specific objective 5.1 Reducing the energy performance of public buildings and increasing the use of renewable energy sources, aid is granted to the public sector
Operating support for the deployment of CHP	Support for CHP in the Czech Republic also includes operating aid to ensure the development of high-efficiency CHP and the reduction of primary energy consumption. Operating aid for high-efficiency CHP is part of the support system for electricity and heat production from RES. The aid is Legislatively enshrined in Act No 165/2015 on supported energy sources.
Investment aid for the modernisation of the transmission and distribution network to increase efficiency and to support the renovation and modernisation of heated distribution facilities	Under the Operational Programme Enterprise and Innovation for Competitiveness, priority axis 3 – 'Efficient energy management, development of energy infrastructure and renewable energy sources, support for the deployment of new technologies in the field of energy management and secondary raw materials', is allocated to upgrade the transmission and distribution network in order to increase their efficiency, including the implementation of smart grid elements. It is also intended to support the renovation and modernisation of district heating installations as part of the support programme for energy savings in heat supply systems.
Investment support construction charging infrastructures for electric vehicles, hydrogen refuelling stations and other infrastructure for alternative powered vehicles	Under the Operational Programme Transport, under the specific objective – Creating *conditions for a wider use of alternatively powered vehicles on the road network*, investment aid is provided for the construction of a backbone and complementary network of recharging points and other infrastructure for alternative powered vehicles. The investment aid contributes to creating an environment for speeding up the market uptake of vehicles for alternative vehicles in the Czech Republic, which contributes positively to increasing the efficiency of passenger transport and thus directly reduces final energy consumption.

Table 41: *Instruments and measures going beyond measures falling under Articles 7 and 8 respectively (under the 2021 proposal for a directive)*

Measures	Description
Obligation to improve the energy performance of buildings	Under Section 7 of Act No 406/2000 on energy management, as amended, in the case of the construction of a new building, the developer is required to comply with the requirements for the energy performance of a building pursuant to the implementing legislation and, when applying for a building permit, an application for a joint permit to install and permit the construction, an application for modification of a structure before its completion, with an impact on its energy performance, or the declaration of the construction by means of an energy performance certificate of the building. In addition, obligations are granted following a major change to a completed building, but also for changes other than major changes to the completed building
Obligation to draw up an energy performance certificate for a building	Pursuant to Section 7a of Act No 406/2000 on energy management, as amended, the entities listed by the Act are required to draw up an energy performance certificate for a building under the conditions specified by the Act.
Energy labelling obligations	Section 8 of Act No 406/2000 on energy management, as amended, determines the obligations of energy-related suppliers of products which are subject to energy labelling requirements.
Obligation perform energy audit and prepare an energy assessment	Under Sections 9 and 9a of Act No 406/2000 on energy management, as amended, the entities listed by the Act are required, under the conditions specified by the Act, to carry out an energy audit or an energy assessment for the building or energy economy, even beyond the EU requirements.
Obligations linked to the award of specific conditions in the field of energy efficiency in the case of public contracts	Pursuant to Section 9b of Act No 406/2000 on energy management, as amended, in the case of above-threshold public supply or service contracts by central institutions, the contracting authority must lay down specific technical conditions in the field of energy efficiency, in particular in relation to the labelling of energy-related products, ecodesign, energy performance class of a building. In the award of public contracts, the following conditions shall apply: (i) the highest available class for energy-labelled products, (ii) the most efficient product on the market if covered by ecodesign, (iii) the highest fuel class

	efficiency in the case of tyres, (iv) for the acquisition of buildings the obligation not to purchase a lower-than-saving classification class – C, (v) an obligation for renting buildings better than a less efficient classification class – D
Minimum energy efficiency obligation for energy sources and distribution systems	Pursuant to Section 6 of Act No 406/2000 on energy management, as amended, the obligation to ensure a minimum efficiency in the use of energy is laid down in the case of newly established electricity or thermal energy generating plants and in the case of plants for which a modification of the completed construction is carried out. In addition, pursuant to Section 6, the obligation to ensure the efficiency of the energy distribution system is laid down in the case of newly created installations and in the case of installations for which a modification of the completed construction is carried out
Obligation to control combustion sources	In order to ensure the declared efficiency of combustion sources, the legal provisions in force (Act No 201/2012 on air protection and Act No 406/2000 on energy management) provide for periodic inspection of combustion sources with an effective rated output of more than 10 kW or 20 kW and the relevant distribution systems for thermal energy. The existence of mandatory checks ensures energy-efficient operation of combustion sources and thus eliminates the increase in energy consumption due to suboptimal operation of combustion sources
Regulatory measures for reductions losses transmission, transport and distribution	The Czech Republic implements a regulatory framework under Act No 458/2000 on business conditions and, after State administration in the energy sectors, for reducing losses in the transmission, transmission and distribution of energy. For this purpose, a regulatory methodology applicable to regulated transmission, transmission and distribution entities is developed, which includes an efficiency factor that incentivises entities to reduce regulated costs. The regulatory framework in place provides long-term incentives to reduce losses
Obligation to draw up territorial energy concepts at the level of the regions and the capital city of Prague	The territorial energy concept sets out the objectives and principles of energy management in a defined area. The territorial energy concept includes the assessment of the technical and economic potential of energy savings, the definition of the instruments to achieve them and the design of options for future development. The development of a territorial energy concept creates conditions for reducing energy consumption at the level of the regional government in accordance with the Czech Republic’s energy-climate objectives.

Table 42: *Instruments and measures beyond those falling under Articles 7 and 8 respectively (under the 2021 proposal for a directive) (other measures)*

Measures	Description
Support for modal shift in freight transport64	On the basis of the Government-approved Freight Transport Concept 2017-2023, create an environment in which logistics and freight transport can provide the necessary level of service to ensure the competitiveness of the economy while making cost-effective use of existing resources. The concept aims to maximise the use of efficient forms of freight transport.

64Compliance with the requirements/parameters in the proposed revision of the TEN-T Regulation related to the upgrading of the relevant rail infrastructure for freight (e.g. ensuring the passage of 740 m long trains and P400 is a prerequisite for the implementation of the measure.

Energy security dimension 65

I.Policies and measures related to the elements set out in point 2.366

3.3.1.1 Electricity sector

The main policies and measures to ensure security of supply in the electricity sector are the following:

- Development of the transmission system (or distribution systems) to ensure system and generation adequacy and security of electricity supply ensuring long-term compliance with the N-1 criterion;
- generation adequacy measures;
- the development of an integrated electricity market;
- measures stemming from European legislation;
- diversifying the electricity mix while developing sufficiently manageable emission-free sources (primarily nuclear power plants);
- emergency management of the system and prevention of an emergency.

Development of the transmission system

The development of electricity soar is key to ensuring security of electricity supply. In the Czech Republic, the main responsibility for ensuring the development of the transmission system lies with its operator. The development of the transmission system is also significantly coordinated at EU level. Detailed information on the current state and expected development of electricity infrastructure is provided in chapter 4.5.2.

Generation adequacy measures

In the area of generation adequacy, a generation adequacy outlook, including a proposal for measures to resolve potential generation adequacy problems on an annual basis in accordance with the requirements of Regulation (EU) 2019/943 of the European Parliament and of the Council and relevant methodologies, is continuously developed.The development of the generation adequacy status67 outlook is set out in Chapter 4.4.1.5.

In 2021, a reliability standard was also established under the Regulation, along with other auxiliary indicators (VOLL, CONE), in accordance with the Methodology for calculating the value of lost load, the cost of new entry and the reliability standard approved by ACER's Association of Energy Regulators. VOLL, CONE and reliability standards shall be regularly updated at least every five years according to ENTSO-E methodologies, or earlier in the event of significant changes in the energy sector. The values also need to be evaluated in the national context and used to assess the economic justification of remedial measures in case of resource inadequacy affecting the reliability of EC operations and security of supply. These are, as a rule, the following measures, entitling a Member State to intervene in the event of a market failure:

- operational tools of a predominantly non-investment nature (tariffs, flexibility, including consumption side management, capacity mechanisms)

65Policies and measures shall reflect the energy efficiency first principle.

66Consistency shall be ensured with the preventive action and emergency plans under Regulation [as proposed by COM(2016) 52] concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010, as well as the risk preparedness plans under Regulation [as proposed by COM(2016) 862] on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC.

67 The last assessment of the EC Czech Republic's generation adequacy was carried out in the course of 2018 and is available here: https://www.mpo.cz/cz/energetika/elektroenergetika/hodnoceni-vyrobni-primerenosti-es-cr-do-roku-2030--233193/

- instruments of an investment nature (construction of a new resource, accumulation)

In addition, detailed analysis and methodologies are being developed to determine the reliability standard using generally used reliability indicators, on the basis of which a legislative or non-legislative anchoring of a safety standard in the area of generation adequacy should be possible. A summary of the outlook for the generation adequacy status is given in chapter 4.4.1.6. The need to ensure sufficient generation capacity, also in view of the gradual decline of fossil fuel conventional sources, will most likely require the creation of a form of strategic reserve, most probably for 2025-2035, where the Czech energy market may experience the first significant electricity shortages and power shortages. The set-up of this reserve will be based on the legislative requirements laid down in particular by Regulation (EU) 2019/943. Any strategic reserve will be established or defined by law, preceded by an impact assessment of the measure. The settings and parameters of the strategic reserve are already being discussed at the level of a dedicated task force.

Developing an integrated electricity market

One important element in enhancing energy security is the further development of the internal electricity market and its continued integration. The internal energy market is a separate dimension of the Energy Union and is further described in other parts of this document, namely chapters 2.4, 3.4 and 4.5.

Measures stemming from European legislation

Security of electricity supply is already very much covered by specific European legislation in this area. In this regard, Regulation 2019/941 of 5 June 2019 on risk-preparedness in the field of electricity and repealing Directive 2005/89/EC, published as part of the 'Clean Energy for All Europeans' legislative package, which entered into force on 4 July 2019, may be specifically mentioned.

Diversification of the electricity mix

The Czech Republic will seek to diversify as much as possible the energy mix or electricity mix and minimise the sources for which large quantities of input fuel must be imported from abroad. The strategically optimal composition of the electricity mix for 2040 is enshrined in the approved State Energy Concept of the Czech Republic and is set out in Chapter 1.2.1.1. In this regard, it is important to highlight the role of nuclear energy, which should gradually assume the role of coal energy in the electricity mix (in particular after 2035). In this context, existing coal resource sites for the use of small and medium-sized nuclear reactor technology (SMR) will be explored. Increasing the share of nuclear energy and renewables at the expense of fossil fuels is also a key prerequisite for achieving long-term greenhouse gas emission reduction commitments, as outlined in Chapter 3.1.1.5. The Czech Republic no longer has its own resources of uranium ore (or has resources at its disposal, but production has ceased), so fuel to nuclear power plants is imported from abroad. However, compared to natural gas in particular, nuclear fuel can be stored in quantities that ensure consumption several years ahead. Thus, even if it is not a domestic resource, from the point of view of energy security or import dependency, this energy source is a better alternative than natural gas, for example. More detailed information on the diversification of nuclear fuel is provided in section 4.4.1.8.

Emergency management of the system and prevention of an emergency

The issue of emergency situations, on the other hand, is the subject of Act No 458/2000 on business conditions and the performance of State administration in the energy sectors and amending certain acts (the Energy Act), as amended, which incorporates the relevant European Union legislation and governs, in accordance with directly applicable European Union legislation, the conditions for doing business and the exercise of State administration in the energy sectors of electricity, gas and heating, as well as the rights and obligations of natural and legal persons.

Energy emergency

According to the Energy Act, ‘emergency’ means a situation which has arisen in the electricity system, the gas system or the thermal energy supply system as a result of natural events, measures taken by State authorities in the event of a state of emergency, state of danger or state of war, accidents or accumulation of disturbances in electricity generation, transmission and distribution facilities, accidents at installations for the production, transmission, distribution and storage of gas, accidents at thermal energy supply system installations, smog situations in accordance with specific regulations; acts of terrorism, an imbalance in the balance of the electricity system or part thereof, an imbalance in the balance of the gas system or part thereof, an imbalance in the thermal energy supply system, the transmission of a disturbance from the foreign electricity system, a threat to the physical security or protection of persons, and which causes a significant and sudden shortage of electricity, gas or thermal energy, or a threat to the integrity of the electricity system, the gas system or the thermal energy supply system, its security and reliability of operation, in the case of an electricity system or a gas system in the whole of the national territory or part thereof.

The Act further defines the term ‘prevention of an emergency’ as a set of measures and actions carried out in a situation where there is a real risk of an emergency occurring. In the case of a gas system, it then consists of two phases, namely an early warning where there is information that an emergency may occur, and a warning where customers’ supply actually deteriorates, but no general reduction in consumption is yet necessary.

The exact time of the occurrence or termination of an emergency for the entire national territory shall be declared by the transmission system operator in the mass media and notified without delay to the Ministry of Industry and Trade, the Energy Regulatory Office, the Ministry of Interior, the market operator, the regional authorities and the Prague City Council. Similarly, the TSO shall notify the TSO of the prevention of an emergency within 1 hour after the start of the relevant activities and without delay to the Ministry of Industry and Trade, the Energy Regulatory Office, the Ministry of Interior, the market operator, the regional authorities and the Prague City Council. For a demarcated area or part of it, such obligations shall be imposed on distribution system operators. In the heating sector, the state of emergency and its termination shall be declared by the Ministry of Industry and Trade, for part of it, by the regional authority or Prague City Council through the media or by any other appropriate means. The authority declaring the emergency must immediately inform the Ministry of the Interior and the relevant firefighting services of the regions of the projected duration of the restriction on the supply of thermal energy.

In accordance with the enabling provisions of Act No 458/2000 on business conditions and the performance of State administration in the energy sectors and amending certain acts (the Energy Act), the Ministry of Industry and Trade shall lay down by decree the measures and procedures to be applied in order to prevent an emergency, an emergency and to remedy the consequences of an emergency, the method of declaring an emergency and notifying the prevention of an emergency, and the procedures for limiting electricity generation, the consumption of electricity, gas and heat, including the regulatory, switching and frequency plan, the safety standard of the gas supply required and the content of emergency plans, the method of ensuring gas safety standards, the content of the documents for drawing up the preventive action plan and the emergency plan in accordance with directly applicable European Union legislation and the deadlines for sending them to the Ministry. In the field of electricity, this authorisation corresponds to Decree No 80/2010 on the state of the electricity emergency and on the content of the emergency plan, in the field of gas, Decree No 344/2012 Coll., as amended by Decree No 215/2015, and in the heating sector it is Decree No 225/2001 laying down the procedure for the occurrence and removal of an emergency in the heating sector.

In particular, the issue of dealing with crisis situations is the subject of Act No 240/2000 on crisis management (the Crisis Act), as amended, which lays down the powers and powers of state and local authority authorities and the rights and obligations of legal and natural persons in preparing for, and dealing with, the defence of the Czech Republic against external aggression, and the responsibility for breaches of these obligations.

Protecting critical infrastructure

Critical infrastructure, according to Act No 240/2000 on crisis management and amending certain acts (the Crisis Act), means an element or system of critical infrastructure elements the disruption of which would have a serious impact on the safety of the State, the safeguarding of the basic needs of the population, the health of persons or the economy of the State. In particular, a critical infrastructure element is the construction, equipment, means or public infrastructure, determined according to the cross-cutting and sectoral criteria established by Government Regulation No 432/2010 on the criteria for the identification of a critical infrastructure element, as amended. In determining these elements, their criticality is assessed, i.e. the degree of impact of the failure of the feature and its irreplaceability, or the possibility of alternative provision of its function.

Critical infrastructure protection is a measure aimed at reducing the risk of disruption to the function of a critical infrastructure element under the Crisis Act. A critical infrastructure entity means an operator of a critical infrastructure element and, in the case of an operator of a European Critical Infrastructure Element, it shall be considered an entity of European Critical Infrastructure.

Directive (EU) 2022/2557 of the European Parliament and of the Council on the resilience of critical entities and repealing Council Directive 2008/114/EC (CER Directive) was adopted in December 2022, which the Czech Republic is currently transposing as part of the revision of crisis legislation. In view of the multitude of new requirements, the issue of critical infrastructure protection will be exempted from the Crisis Act and addressed by a separate Critical Infrastructure Act. The main systemic change brought about by the CER Directive is a shift away from the different elements of critical infrastructure and, conversely, putting emphasis on the provision of an essential service as a whole. In addition to implementing the requirements of the CER Directive, the new Act on Critical Infrastructure will take into account the experience of the crisis act so far.

Type plans for crisis management

Type plans shall set out, for a specific type of crisis situation, the recommended type procedures, policies and measures to address them. According to Government Regulation No 462/2000, they form part of the crisis plan. The scope of the Ministry of Industry and Trade is: (I) a type plan to deal with large-scale electricity supply disruptions; (II) a type plan to deal with a major gas supply disruption. According to Government Regulation No 462/2000 Coll., the crisis plan also includes the development of type plans for procedures to deal with specific species of threat of crisis situations identified in the threat analysis.

Emergency plans

Emergency preparedness is a prerequisite for the successful management of emergencies (from disaster conditions, floods, systemic breakdowns to the declaration of an emergency, in accordance with Act No 458/2000).

The essence of emergency preparedness is the ability to react in a timely and correct manner when an emergency or crisis occurs and to eliminate as far as possible the risk of endangering life, health, property or the environment.

In accordance with Act No 458/2000, the so-called Energy Act, emergency plans are drawn up, which constitute a set of planned measures to prevent and avert emergency situations and to deal with them effectively and rapidly.

Procedure for the renewal of electricity supply in the distribution network

The procedure for limiting electricity consumption and restoring electricity supply within the distribution system is laid down primarily on the basis of Decree No 80/2010 on the state of the electricity emergency and on the content of the emergency plan.

Under Paragraph 1 of this Decree, the limitation of electricity consumption in areas where an emergency is threatened or for which an emergency has been declared is determined by the application of the relevant level of the regulatory plan, the switch-off plan, the operational shutdown of parts of the installation or the automatic operation of frequency relays in accordance with the frequency plan, to the extent necessary to balance the power balance of the part of the electricity system concerned.

Pursuant to Paragraph 3(2), regional distribution system operators shall transmit to the transmission system operator, by 30 September of each year, updated power values for each control stage and stage of the switch-off plan and frequency plan.

The use and content of the regulatory plan, switch-off plan, frequency plan and emergency plan are laid down in the relevant annexes to the Decree.

3.3.1.2 Gas sector

The main policies and measures to ensure security of supply in the gas sector are:

- Diversification of gas sources and transport routes (closely linked to the development of the transmission system);
- measures stemming from European legislation;
- development of the transmission system (or distribution systems) to ensure system adequacy and security of gas supply ensuring long-term compliance with the N-1 criterion and the ‘S-1’ criterion;
- development of transmission and distribution systems enabling the integration of the production of gases from renewable energy sources and their transport to the point of consumption;
- the development of an integrated gas market;
- strict monitoring by gas traders of compliance with the security of supply standard for protected customers;
- measures to ensure sufficient storage capacity and efficient use of gas storage facilities;
- emergency management of the gas system and prevention of an emergency;
- adaptation to changes in gas flows caused by reduced or zero natural gas supplies from the Russian Federation following the outbreak of the war in Ukraine in February 2022;
- preparing for the gradual emergence and development of the hydrogen economy in the Czech Republic (concerns the modification of the legislation, regulatory and financial framework for all links in the energy chain, i.e. production, transport, distribution, consumption and storage).
- Ensuring a technical conversion of the natural gas consumer to hydrogen.
- Promote the reinforcement of transport capacities from DE to CZ (i.e. the removal of bottlenecks in the German transmission system in a western direction -> East; in particular, the construction of CS Rehden and CS Wittenburg) is an appropriate solution at a faster pace than planned in the current TYNDP 2022. At the same time, it is important to maintain the type of capacity provided (i.e. uninterrupted) capacity from Germany to VIP Brandov. This can be achieved, for example, by the appropriate location and size of LNG terminals in Germany; the connection to existing OPAL/EUGAL gas pipeline systems makes Mukran/Lubmin the most suitable area. Both

government and gas operators can promote this through their tools (CZ-DE intergovernmental consultations, working groups, etc.).

– Subrpora at government level on support for the construction of new LNG terminals with sufficient capacity (in particular in the Mukran and Lubmin areas). These pipelines are already directly plugged into the NET4GAS pipelines. Consider possible investment input, possibly entrusting the selected entity to provide capacity at LNG terminals to Czech customers. There should also be a clear commitment to the State in the NECPs to support traders' capacity efforts in this gradually expanded LNG terminal.
– Seek to maintain sufficient gas transmission route capacities for Czech customers. Active participation in public consultations (e.g. TYNDP, Germany).
– Responding to changes in gas flows and quality caused by the involvement of biomethane mills in local networks.

Diversification of natural gas and hydrogen transport sources and routes

The Czech Republic is almost exclusively dependent on imports of this commodity in the field of natural gas. Domestic production of natural gas only accounts for a negligible part of domestic consumption (around 2-3 %). For this reason, it is very important to ensure the diversification of natural gas sources and transport routes. The Czech Republic uses very good connections to the gas infrastructure of neighbouring countries, namely Germany and Slovakia, thanks to the transit pipelines that cross its territory in the east-west, west-east and partially north-south directions. The connection to the Polish gas infrastructure is limited (there is only a connection from the Czech Republic to Poland) and there is no direct connection between the Czech Republic and Austria. In this respect, it is worth mentioning the possibility of reverse flows following gas supply constraints in 2009, when historically predominated from east to west. In recent years, thanks to the implementation of the Nord Stream I pipeline, the flow through the Czech Republic from west to east predominated. For more information see chapter 4.5.2.2.

Until February 2022, the vast majority of imported natural gas came from the Russian Federation. However, as a result of the war in Ukraine, gas supplies to the Czech Republic from Russia are currently zero by the Bratri, Yamal and Nord Stream I pipelines (born 2023). It is now important to have access to other natural gas sources (Norway and LNG) to ensure the supply of natural gas to Czech customers. Without direct access to the sea and therefore without the possibility to build its own LNG terminals, the Czech Republic is now primarily dependent on gas supplies via cross-border pipelines from Germany. Therefore, Germany's LNG development projects clearly have the potential to increase security of gas supply not only for Germany but also for the Czech Republic (and other central and eastern European markets). However, in order to increase the availability of gas supplies to the Czech Republic, it is necessary to develop not only the LNG terminal infrastructure itself, but also the German national gas infrastructure. Currently, existing transport capacities between new LNG terminals on the German North Sea coast and interconnection points between Germany and the Czech Republic are very limited. Such restrictions seriously jeopardise the security of gas supply of the Czech Republic (and other central and eastern European markets). The lack of firm capacity on the German side has already led to a shortening of nominations from Germany to the Czech Republic at the end of October 2022, confirming that firm capacities on these routes are limited. For this reason, there is a need to accelerate the implementation of certain German gas infrastructure development projects aimed at increasing technical capacity towards the Czech Republic. Such as the project to build a new Wittenburg compression station, which will increase the capacity of the NEL gas pipeline. This project can be considered to be the most beneficial in terms of capacity increase in the west-east direction. Other projects include the expansion of the Rehden compression station or the construction of the Achim/Embsen compression station.

In the context of ensuring the diversification of sources and the expansion of transport routes, the Czech-Polish bi-directional interconnection (the pipeline on the Bezměrov-Hať route) is an important project.

This is a project of strategic and safety importance for the Czech Republic, which aims to interconnect the gas networks of Poland and the Czech Republic in a two-way way. The implementation of the project will extend transport routes and enable diversification of natural gas sources for the Czech Republic by connecting to a potential source of gas other than the Russian Federation, namely LNG from Poland and natural gas from Norway. The project is prepared as 100 % H2 ready for future hydrogen transport. The implementation of the project depends on the decision of the state authorities on its importance and funding.

The development of new types of gas (biomethane, synthetic gas, hydrogen) will also lead to greater security in the future. A group of 31 European gas infrastructure operators, the European Hydrogen Backbone, offers transport routes that can be used in the future for the import of hydrogen. The study produced by this initiative is not binding, but mutual cooperation, discussions and shared knowledge within the European Gas System Operators involved is an invaluable source of information for the future possible gradual transformation of the current gas transmission infrastructure into hydrogen. For the Czech Republic, there is potential for hydrogen imports through three transport corridors out of a total of five, namely: corridor A: North Africa & Southern Europe, Corridor D: Scandinavian-Baltic Corridor, Corridor E: Eastern and South-Eastern Europe. This means that hydrogen transport to the Czech Republic will be allowed in the future from the eastern direction (e.g. from Ukraine to Slovakia), southwards (e.g. from North Africa through Italy and Austria, and from Türkiye and Greece via Romania, Hungary and Slovakia), as well as from the north-west (e.g. Baltic and Northern Germany) to industrial clusters in southern Germany and further west.

Security of supply with regard to the diversification of natural gas sources and transport routes and the robustness of the transmission system is expressed under the N-1 criterion, in line with the requirements of the methodology of Regulation EU 2017/1938. Criterion N-1 is quantified by the transmission system operator as part of the Ten-Year Development Plan. The recommended value of this criterion under Regulation EU 2017/1938 corresponds to 100 %. Table 43 quantifies the security of gas supply for the Czech Republic in 2023-2032 according to criterion N-1, based on the data used in the 10-year transmission system development plan in the Czech Republic 2019-2028[68]. Figure 21 then shows a comparison of the minimum value required by the Regulation and the expected evolution of the N-1 criterion for the period 2023-2032.

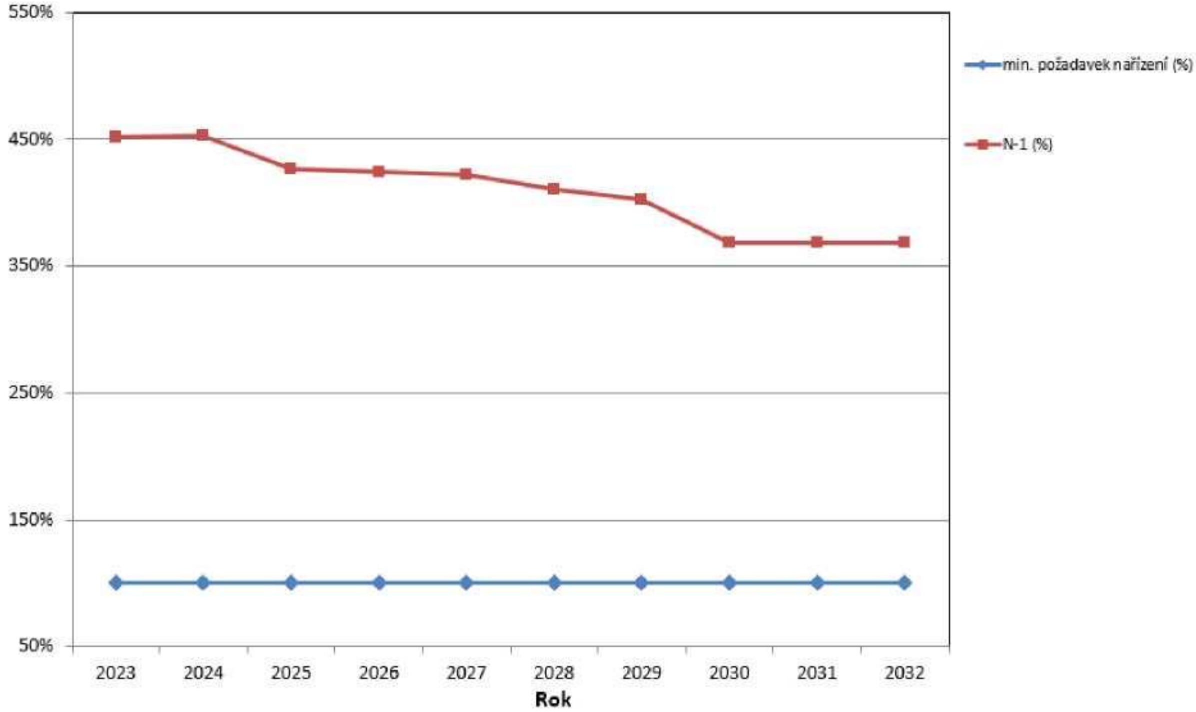
Table 43: *Quantification of security of gas supply for the Czech Republic in 2023-2032 in accordance with the N-1 formula*

(GWh/d)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
P_m	5,1	5,8	5,6	5,9	5,7	5,4	4,3	4,4	3,8	3,2
S_m	618,0	618,0	712,3	712,3	712,3	712,3	712,3	712,3	712,3	712,3
EP_m	4 306,7	4 306,7	4 306,7	4 306,7	4 306,7	4 306,7	4 306,7	4 306,7	4 306,7	4 306,7
I_m	1 640,4	1 640,4	1 640,4	1 640,4	1 640,4	1 640,4	1 640,4	1 640,4	1 640,4	1 640,4
D_{max}	727,4	727,4	792,6	797,7	802,8	824,4	840,3	918,4	918,4	918,4
Min.	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
N-1	452,2	452,3	427,0	424,3	421,6	410,5	402,6	368,4	368,3	368,2

[68] At the time of preparation of the National Transmission System Development Plan in the Czech Republic for the period 2024-2033, work on its preparation had already started.

Source: Ten-year Transmission System Development Plan in the Czech Republic – 2023-2032

Graph 21: *Quantification of security of gas supply for the Czech Republic in 2023-2032 in accordance with the N-1 formula*



Source: Ten-year Transmission System Development Plan in the Czech Republic – 2023-2032

Measures stemming from European legislation

The security of gas supply area is already very much covered by specific European legislation in this area.

In October 2017, Regulation (EU) 2017/1938 of the European Parliament and of the Council concerning measures to safeguard the security of gas supply entered into force, replacing (or repealing) the former Regulation 994/2010. The coordination of emergency planning at national, regional and Union level shall maintain the responsibility of preparing risk-onlying, preventive action plans and emergency plans. At the same time, other specific measures are being put in place, such as the principle of solidarity. The Regulation also gives rise to an obligation to comply with the infrastructure standard at the level of compliance with the N-1 criterion, or to establish and comply with the security standard of natural gas supply. These obligations are subsequently specified by national legislation, in particular Act No 458/2000 and Decree No 344/2012, as amended.

Development of the transmission system ensuring system adequacy and security of gas supply

The development of the transmission system shall aim at ensuring system adequacy and security of gas supply, including at the level of: (I) maintaining the Czech Republic’s transit role on a European scale; (II) a higher level of interconnection between the transmission systems of individual EU Member States; (III) removing bottlenecks at national level and (iv) enabling the transport of low-carbon gases.

The expected development of the transmission system is the subject of the so-called 10-year transmission system development plan, which is drawn up annually by the transport operator. The plan takes measures to ensure system adequacy and security of gas supply. Ten-year transmission system development plan: (I) indicates which parts of the transmission system need to be built or extended in the next 10 years, (ii) defines all the investments in the transmission system decided by the transmission system operator and the new investments to be made in the following three years.

When drawing up the 10-year development plan, the transmission system operator shall base itself on existing and predictable future gas supply and demand. To that end, the transmission system operator shall carry out an analysis of the development of gas production, supply, import and export, taking into account the planned development of distribution systems connected to the transmission system, the planned development of gas storage facilities and the European Union-wide transmission system development plan prepared pursuant to Regulation (EC) No 715/2009.

The purpose of the Ten-Year Development Plan is to provide an overview of the expected investments representing an increase in the capacity of the Czech transmission system and to assess the capacity of the transmission system to comply with the requirements of: (I) the State Energy Concept (if applicable, other relevant strategic documents); (II) ensuring the security of supply standard by ensuring compliance with criterion N-1.

Developing an integrated gas market

One important element in enhancing energy security is the further development of the internal market in natural gas and its continued integration. As mentioned in the introduction to the chapter, it is now important to have access to gas sources in Norway and to LNG terminals supplied via pipelines from Germany to ensure security of gas supply. In order to increase the availability of gas supplies, efforts will therefore also need to be made to develop the national German gas infrastructure in order to remove capacity constraints that limit the security of gas supply to the Czech Republic. The internal energy market is a separate dimension of the Energy Union and is further described in other parts of this document, namely chapters 2.4, 3.4 and 4.5.

Achieving an environmentally and economically sustainable and socially acceptable energy transition that guarantees security of energy supply requires a balanced approach. In this context, reference should be made to the proposal for the Gas and Hydrogen Package, which aims to create the right regulatory environment for the decarbonisation of the EU gas sector. The proposal was a revision of the existing European gas legislation, which will be redrafted into a new version (the so-called "recast"). The proposal for the Gas and Hydrogen Package is partly based on the existing principles applicable to the natural gas market. The creation of a hydrogen market is based on the rules of a well-functioning European internal market in natural gas, which, over its lifetime, has proven to be based on appropriately chosen and effective principles.

Security standard of supply

Ensuring the so-called security of supply standard is a key policy to ensure security of gas supply. The obligation to ensure a security standard of supply is directly imposed by Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010. The supply security standard is further regulated by Energy Act No 458/2000, as amended. The method of ensuring the safety standard, its establishment and other related elements are governed by Decree No 344/2012 on the gas emergency and on how to ensure the security standard of gas supply, as amended (as amended by Decree No 37/2023).

The Market Operator is tasked with monitoring and evaluating the fulfilment of the security standard of supply within the remit. An inspection is then carried out by the Energy Regulatory Office, which, in addition, regularly publishes a monthly report on the evaluation of the security standard of gas supply in the Czech Republic during the heating season as part of its monitoring of gas statistics. That report shall contain aggregated information on compliance with the safety standard, in particular with regard to the obligation to store a minimum of 30 % in gas storage facilities, the collateral structure and how it is demonstrated by protected customers' shares, and other relevant indicators.

Measures to ensure sufficient storage capacity and efficient use of gas storage facilities

In 2022, as a result of Russia's military aggression in Ukraine, there were fundamental changes in the energy domain. These changes significantly affected the territory of the Union as a whole, pointing out that the current security of supply rules at the time were not sufficiently adapted to sudden major changes in the geopolitical situation. Based on the European Commission's analysis of risk-preparedness and security of gas supply within the Union, a new Regulation (EU) 2022/1032 of 29 June 2022 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 with regard to gas storage has been adopted. In accordance with this Regulation, each Member State is to ensure in principle that the capacity of underground gas storage facilities located on its territory and directly connected to a market area of that Member State is filled to at least 90 % of their capacity at Member State level on 1 November of each year. The obligations arising from this Regulation have also been reflected in the adaptation of national legislation.

Based on the measure enshrined in the State Energy Concept (2015), the total capacity of gas storage facilities should be maintained at 35-40 % of the annual gas consumption. In 2016, where the consumption of natural gas corresponded to a level of 88.2 TWh, the value of this criterion was 37 %. Taking into account the expected consumption of natural gas and the evolution of storage capacity, this criterion should be fulfilled by 2030 (or 2028[68]). In the Czech Republic, natural gas storage facilities are operated on a commercial basis and investments in additional storage capacities may be affected, inter alia, by the following factors: (I) the difference between summer and winter gas prices; (II) greater market integration and interconnectivity of gas systems (i.e. increased flexibility in the market) leading to greater competition for the services offered by gas storage operators, (iii) decisions on the construction of storage facilities are often subject to binding interest on the part of a particular trader; (IV) nor the security of supply standard (BSD) has a direct impact on the expansion of storage capacities connected to the Czech system; it is possible to use foreign gas storage facilities provided that there is sufficient contracted transport capacity to the Czech Republic, which the storage operator can provide and offer to the market as part of a standard product; (v) the setting of the gas market, including the level of transmission tariffs to and from the gas storage facility, will create key conditions for storage and should be set in such a way as to ensure efficient use of gas storage facilities and maintain the optimal level of storage capacity as required by the State Energy Concept (2015).

Storage capacity for 2 months at 70 % of peak daily consumption in winter should also be guaranteed. The largest daily consumption was reached on 23 January 2006, i.e. 68 million$^{m^3}$; this would correspond to the required production capacity of 47.6$^{m^3}$. The maximum production capacity of all reservoirs connected to the Czech system is 69.7 m^{3-} however, storage facilities usually reach maximum filling levels and it can be reasonably assumed that at the end of the winter season the required production capacity may no longer be guaranteed. However, it should be pointed out that the criterion is only aggregate and as such does not fully capture the specific characteristics of the Czech reservoirs, in particular the geographical distribution, which cannot be described as perfectly optimal, since almost all of them are located in Moravia, with only the Háje reservoir in Bohemia, which is due to the appropriate conditions for their location.

More detailed information on existing capacity and distribution of gas storage facilities, as well as on the expected development of capacity and production capacity, is provided in sections 4.5.2.2 and 4.5.2.4 respectively.

Emergency management of the gas system and prevention of an emergency

Emergency system management

The operation of the system is supervised by the carrier's gas dispatching, through the measuring apparatus and dispatching points of other operators (distributors and storages), is informed of the status of the network, while the traffic simulation can obtain the expected operational values for that status. A

68Based on the 10-year transmission system development plan in the Czech Republic 2019-2028 significant difference between expected and actual values may indicate an accident at an installation. Reliable and safe operation requires that dispatching points for transporters, storage operators and distributors are able to co-operate even in the event of an accident on the system. The NET4GAS Havary Transmission System Plan is an essential document dealing with emergency situations. For the prevention of an emergency and in the event of an emergency, the Havarij Plan for the Czech Republic's gas system is also drawn up. The emergency response plan shall be reviewed and refined annually. In addition, Decree 344/2012 deals with the procedure for declaring an emergency. Article 13 of Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard security of gas supply and repealing Regulation (EU) No 994/2010 establishes a solidarity process during which a Member State is obliged to offer natural gas to the requesting Member State for its solidarity-protected customers. The Government of the Czech Republic and the Ministry of Industry and Trade, as the competent authority, are responsible for the provision of and claims for solidarity, in accordance with the planned amendment of national legislation, on the basis of the recommendations of the transmission system operator or the Central Crisis Staff established by it. The priority of the procedures laid down is to maximise the use of solidarity on the basis of the market principle and the non-market principle of limiting gas consumption to final customers who are not protected in the context of solidarity.

Prevention of an emergency

In order to avoid an emergency in the early warning phase (Stage 1), the storage capacity of both transmission and distribution systems is used, storage operators examine the possibility of maximum pumping from storage facilities, as well as miners verify extraction possibilities and traders verify the possibility of increasing gas imports into the Republic. All of them shall inform transporters without delay of the delivery options. The emergency situation at the early warning stage shall be notified without delay by the transporter or distribution company to storage operators, gas producers, traders and customers in the area concerned and, within one hour of the declaration of the situation, to the Ministry of Industry and Trade, the ERÚ, the Ministry of the Interior of the Czech Republic and the regional authorities. Emergency commissions and crisis teams are activated. The market operator shall notify all market players that imbalance settlement will take place in an emergency mode.

In addition, the carrier may declare a state of emergency prevention in a situation of alert (2nd stage) for the entire national territory. In doing so, the agreed transmission, distribution and supply of gas to all demand points of Group A customers (customers above 630 MWh per year) are limited to the extent of their ability to switch to replacement fuel. If the measure is not effective, gas delivery to defined customer demand points may be interrupted. The identification of the sites concerned shall be communicated by the operator to the carrier or to the distribution companies and traders to which those points belong. In addition to the previously mentioned entities, the declaration of an emergency in the alert situation will be extended to include Český rozhlas. It is also not possible to claim compensation for loss of profit in the event of clearing.

3.3.1.3 Oil and petroleum products

The main policies and measures to ensure the security of supply of oil and petroleum products are:

- diversification of oil transport sources and transport routes;
- securing emergency oil stocks.

Of course, the safety of oil and petroleum products is broader than the above. The detailed analysis in this document is not useful and is more detailed in other materials. Some more detailed information on the state of play is available, for example, in the Report on the Development of the Energy Sector in Oil and Petroleum Products69.

The provision of emergency oil stocks can be considered as one of the main energy security measures. In Czech law, the obligation to establish and maintain emergency stocks of crude oil and petroleum products is enshrined in Act No 189/1999 on emergency oil stocks, on the management of oil emergencies and amending certain related acts (the Emergency Oil Stocks Act), of 29 July 1999, as amended. Article 2(2) of this Act, which deals with the establishment and maintenance of emergency stocks, provides as follows: 'Emergency stocks shall be established and maintained by the Administration of State Material Reserves from crude oil and selected petroleum products equal to at least 90 days of average daily net imports of the reference year.' In this regard, an important implementing provision is Decree No 165/2013 on the types of crude oil and the composition of petroleum products for storage in emergency oil stocks, on the calculation of the level of emergency oil stocks, on storage facilities and on reporting of emergency oil stocks.

3.3.1.4 Heating sector

The sector transformation plan so far has been largely based on the replacement of coal with natural gas and, to some extent, on the use of energy from waste and biomass. Subsequently, natural gas will gradually be replaced by low-carbon heat sources with the objective of achieving carbon neutrality by 2050. At the same time, the share of district heating in the Czech Republic (in the housing sector) is among the highest in the EU. This is a very good starting point and an opportunity for an efficient and systemic solution to the overall decarbonisation of heating. Existing systems can thus enable the efficient involvement of decentralised sources (e.g. heat pumps, solar panels), provide flexibility in the production of heat (and electricity) and provide overall energy services to existing and new customers. This opportunity should be used in cooperation with all stakeholders (towns/municipalities, customers, heating companies) to make the necessary adjustments.

Strategic planning of consumption and heating at urban level is a key element of the transformation of the heating sector. This is an essential condition for effective decarbonisation and transformation (not only) of the heating sector. In the next step, the transfration of the heating sector must be based on the energy efficiency first principle, i.e. based on a gradual reduction in consumption for final customers, inter alia in relation to the Long-Term Building Renovation Strategy, but also on savings in industry and in the distribution of heat. Subsequently, the transformation of the heating sector (and the wider heating co-text) is based on a diversified use of energy sources – first and foremost the full potential of waste heat, followed by local renewable energy sources (solar energy, sustainable biomass) and, in the next step, other energy sources (natural gas and others).

The 3 rd (and 4th) generation are complex systems that are also connected to the electricity system and involve a large number of actors. A coordinated and participatory approach of these actors (cities, heat plants, industry, customers) will therefore be key to the successful transformation of the heating sector.

Energy security can be seen from several angles. The primary objective of users (customers) of the heating sector is primarily to ensure a stable supply of thermal energy. From the point of view of operators of heat sources and heat supply systems, it is necessary to ensure that their business in the sector is predictable and ultimately carried out at a profit.

The following areas have been identified as primary projects (or trends) in the heating sector, in line with the strategic national documents:

– diversification of energy sources and decentralisation of inefficient systems;

69 This document is available electronically here: https://www.mpo.cz/cz/energetika/statni-energeticka-policy/right-o-development-energy-sector-v-area-petroleum-a-oil-product-za-year-2016--235988/

– flexibility in the supply of electricity and other products and services.

Diversification and decentralisation of resources

Based on strategic national documents, a higher degree of diversification of heat sources is expected in the future due to the gradual substitution of coal (as one of the primary fuels in the heating sector for larger sources) with so-called alternative fuels. In particular, this is an increase in the proportion of use:

– waste for energy purposes;
– biomass;
– natural gas.

In the various strategic documents (e.g. the 20122020 Biomass Action Plan in the Czech Republic), the heating sector is mentioned as one of the sectors with a high biomass potential, which should help to replace coal at least in part. The main focus should be on the use of local biomass resources, in particular:

– residual biomass species;
– targeted biomass;
– biodegradable municipal waste.

The potential of biomass can be seen, on the one hand, in individual heat production and, on the other hand, in the case of central heat generators in high-efficiency CHP.

In the case of inefficient systems, they can be expected to disintegrate into smaller units, in particular by using cogeneration units.

At the same time, the strategy papers mention efforts to move most of the expeller's resources to high-efficiency cogeneration production where technically possible and economically advantageous.

Diversifying supply chains and eliminating supply dependency from Russia also plays an important role.

Flexibility in the supply of electricity and other products and services

In the context of the ongoing decentralisation of electricity sources, the overall flexibility of the energy system will need to be ensured. From this perspective, heat sources should be more involved in the provision of ancillary services at both distribution and transmission system level.

At the same time, thanks to the possibility of using CHP, production resources contribute to flexible electricity supply, while on the other hand technologies such as electric boilers and heat pumps have the potential to increase the ability of the power generation/consumption side.

Last but not least, it is important to mention the development of the market not only for thermal and electricity but also, for example, for cold energy.

3.3.1.5 Long-term supply of nuclear materials and fuel

In the framework of the State Energy Concept, the section on tools for the performance of state administration defines an instrument: "Set mandatory security standards for gas supply and stocks of nuclear fuel in accordance with the legislation in force, proportionate to the expected security of supply and international situation".

In accordance with the requirements of the current State Energy Concept and the subsequent strategies and priorities (including the National Action Plan for the Development of Nuclear Energy in the Czech Republic), the target safety standard is defined as: 'The need to secure nuclear fuel stocks or to create such conditions (technical, commercial, licensing) for the supply of nuclear fuel, guaranteeing the nominal operation of all units on all sites of nuclear power plants for a period of four years.' The 2040 Strategy further specifies in the Energy Security Priority for this objective: "To align the achievement of this target in time with increasing the share of nuclear energy to the target level of 50-60 % of final consumption”.

In 2018, the ‘Security of Nuclear Fuel Supply Standards’ was prepared, which contains a description of the current state and foreseeable evolution of nuclear fuel stocks for individual power plants and was discussed in part by the Technical and Investment Working Group of the Standing Committee on Nuclear Energy and the Standing Committee on the Construction of New Nuclear Resources in the Czech Republic70. Upon request, this material will be dealt with by the Standing Committee on Nuclear Energy or by the Standing Committee on the Construction of New Nuclear Resources in the Czech Republic. More information on the current state and outlook of securing the long-term supply of nuclear fuel is provided in section 4.4.1.8.

3.3.1.6 Cybersecurity in the field of energy

The energy sector is the intermediary of the essential function of the State. It is therefore a high-priority sector in terms of safety and the requirements to maintain the sector’s functionality are therefore essential. In this respect, both the energy sector and individual subsectors have been regulated by Act No 181/2014 on cybersecurity from the very beginning of its entry into force. The National Cyber and Information Security Agency (NÚKIB) is the governor of this Act and its implementation. Compliance with Act No 181/2014 on cybersecurity and Implementing Decree No 82/2018 on cybersecurity, which specify the specific obligations to be fulfilled by the relevant entities, can therefore be identified as the main measures in the field of cybersecurity. The cybersecurity of their organisations is thus ensured by entities through the fulfilment of the obligations imposed on them by the Cybersecurity Act or by Implementing Decree No 82/2018 on cybersecurity, depending on the nature of the entity.

Criteria are laid down in the implementing legislation when assessing whether a system is critical and therefore its administrator is to be classified as an obliged entity under the Act. These consist, in particular, of certain limits on the impact of a breach of information security in those systems that need to be taken into account.

Act No 181/2014 on cybersecurity entered into force in 2015 and its main objective is to increase the cybersecurity of the Czech Republic, especially in the most critical areas.

In the energy sector, these are, in particular, essential pipelines or power plants. The objectives of the critical so-called critical information infrastructure are to cover information and communication systems that build on these physical elements (critical infrastructure). A breach of the security of information of those information or communication systems could have significant negative effects on the functioning of critical infrastructure elements.

In 2016, the European Commission issued Directive 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union (the so-called NIS Directive). In relation to energy, the NIS Directive redefines the operator of an essential service. Following the transposition of the NIS Directive into national law, this becomes another obliged entity within the meaning of Act No 181/2014. The introduction of the Basic Service Operator Institute in the Czech legal environment has led to an extension of the circle of obliged entities in the energy sector. The impact values required for the inclusion of the management of the information system in question under the regulation of Act No 181/2014 are lower in relation to this institution than in the case of critical information infrastructure.

70On 18 February, the Statute was amended by Government Resolution No 132, including a change of name.

The NIS Directive obliges Member States to regulate in the energy sector three sub-sectors, namely the electricity, oil and gas sub-sectors. In addition to the mandatory sub-sectors, the Czech Republic has classified the heating sector. The criteria for determining the operator of an essential service and the basic service information system are themselves laid down in Implementing Decree No 437/2017 on the criteria for determining the operator of an essential service, as amended. A different formal process for the identification of these systems by the NÚKIB would also be adopted compared to the critical information infrastructure. It does so, unlike critical information infrastructure, by issuing an ex officio decision in an administrative procedure initiated by the NÚKIB itself.

ii. Regional cooperation in this area

In the field of gas, regional cooperation in this area takes place, inter alia, on the preparation platform of the Gas Regional Investment Plan for Central and Eastern Europe (CEE GRIP). It is also possible to mention meetings at the level of the Gas Coordination Group. Regional cooperation also follows from the Regulation on security of supply in the field of natural gas, which enshrines the principle of solidarity and the development of regional chapters of risk analysis, preventive action plans and emergency plans. In the field of energy, the issue is addressed in a number of already existing structures, such as cooperation at ENTSO-E level. Regional cooperation on energy security is likely to be further strengthened on the basis of the Regulation on security of electricity supply, which was part of the 'Clean Energy for All Europeans' legislative package. Other forms of cooperation can be mentioned in the context of regional cooperation in the gas sector, such as: Gas Regional Initiatives of the SSE and various pan-European working groups of ACER, CEER or ENTSO-G.

iii. Where applicable, financial measures in the area at national level, including Union support and use of Union funds

In particular, financial measures in the field of energy security at national level, including EU support and the use of EU funds, are linked to financial measures related to the development of electricity and gas infrastructure. This information is more declassified in Chapter 3.4.

Dimension 'Internal energy market' [71] [72]

3.4.1 Electricity infrastructure

i. Policies and measures to achieve the targeted level of interconnectivity as set out in point (d) of Article 4

The Czech Republic's overall interconnection target corresponds to maintaining import or export capacity of the transmission system relative to the maximum load at a level of at least 30 % and 35 % respectively. This is in line with the connectivity target of 15 % by 2030 (based on installed capacity). The Czech Republic is currently meeting this objective with a relatively significant margin and it is expected that this will continue to be the case in the future (see Chapter 2.4.1 and Chapter 4.5.1). Therefore, the Czech Republic does not consider it necessary to have specific policies and measures to achieve this objective.

The assessment of the planned export and import capacity of the Czech Republic's transmission system and its sufficiency for commercial exchanges and, in particular, for the safe operation of the transmission sparkling industry is carried out on a regular basis, both in the preparation of the 10-year development plan for the Czech Republic's transmission system and in the context of cooperation on the 10-year

71Policies and measures shall reflect the energy efficiency first principle.
72Permanent shutdown of V280 lines takes place in 2023.

development plan at ENSTO-E level. In the above-mentioned development plans, ČEPS prepares system measures in the medium and long term that will ensure the required sufficient transmission capacity and help maintain reliable, secure and efficient operation not only of the Czech Republic but also of the entire European interconnected system. In particular, in the context of enhancing profiles, this includes:

- strengthening the international profile with Slovakia to lighten the overloaded profile of Nošovice (CZ) – Varín (SK) while increasing cross-border transmission capacities with Slovakia. The reinforcement is part of the conceptual solution for the planned decommissioning of the existing inter-state lines V280 [73] (Sokolnice (CZ) – Senice (SK)) and V270 (Lískovec (CZ) – P. Bystrica (SK)) from operation.
- the strengthening of international profiles with Poland, Austria and Germany, which is the subject of further studies and is the subject of further development of the Czech Republic's CP and cooperation with neighbouring transmission system operators.

Another aspect affecting the development of transmission system capacities on border profiles, which it is appropriate to mention in this context, is ČEPS's strategy of replacing the 220 kV system with a 400 kV system. More information is also provided in chapter 4.5.2.

ii. Regional cooperation in this area73

In accordance with Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity, the development plan is also reflected in the content of the regional investment plan of the Continental Central and Eastern Europe region over a two-year interval. Therefore, a number of CEPS's upcoming development investment actions are part of the 2022 Regional Investment Plan for Continental Central and Eastern Europe and are included in the 2022 Decent European Transmission System Development Plan, which is subject to an assessment against defined criteria as part of its development.

One of the cooperation initiatives is the Electricity neighbours initiative. Electricity neighbours is an initiative created in 2015 on the basis of a Joint Declaration prepared by the German Federal Ministry of Economic Affairs and Energy in cooperation with the European Commission and the countries of the Pentalateral Energy Forum. The group consists of Germany, France, the Benelux countries, Denmark, Italy, Norkso, Sweden, Poland and the Czech Republic. The declaration underlines the importance of the internal market as the most economic means of ensuring security of supply.

The real evolution of operational security in each region and the response to blackouts in Western Europe in 2006 led to the creation of ad-hoc coordination platforms (Coreso, TSC, SSC) aimed at ensuring operational coordination between the dispatching sites of the participating TSOs.

Over the years and with the growing need for coordination, inter alia due to the increasing share of intermittent electricity sources in the interconnected European system, cooperation between TSOs has become much more coherent and detailed.

In June 2017, TSCNet and Coreso, as the two future RSCs (RSC) in accordance with the SO GL (System Operation Guideline) Regulation, signed a framework cooperation agreement.74 This means sharing assets, methodologies and tools, joint or alternating service provision and developing or developing new services and assets. The adopted SO GL Regulation, together with the CACM (Capacity Alocation and Congestion Management Guideline) and the Regulation NC ER (Emergency Restoration Network Code) sufficiently define the mandatory cooperation of TSOs with regional security coordinators.

73Non-European regional PCI resolution groups established under Regulation (EU) No 347/2013 (replaced by new Regulation 2022/869 of 30 May 2022).

74In that regard, it is relevant to mention Regulation (EU) 2019/943 of the European Parliament and of the Council on the internal market for electricity, which legislates, in Article 35, the so-called regional coordination centres, which should replace the RSC entities.

On 23 January 2019, in accordance with Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure, Czechia approved theSlovak project of common interest ACON. Under the CEF financial instrument, E.ON Distribuce, a.s. and Západoslovenská distribučná, a.s. received EUR 91.2 million from the European Commission for the international smart energy system project ACON Smart Grids. This is the first-ever distribution company project in the Central and Eastern European region to succeed in the EU's so-called Projects of Common Interest (PCIs). In addition to distribution companies, ACON is supported by transmission system operators in the Czech and Slovak Republic – ČEPS, a.s., and Slovenská elektrizačná prenosová sústava, a.s. and other partners. Work on the modernisation of distribution networks will start in both countries already this year and will continue until 2024. This project, implemented in the Czech Republic by E.ON Distribuce, a.s., aims at modernising and increasing the efficiency of the distribution system and enhancing cross-border cooperation between Slovakia and the Czech Republic. Thanks to the project, smart technologies will be introduced into the distribution grid to help regulate energy exactly according to consumption and will enable more renewable sources to be involved in the future. Investments in smart grids will increase the stability and security of supply and the economic efficiency of networks, while improving the quality of remote network management. This is all to prepare the grid for the next decade to enable the connection of electric cars, batteries and other devices that will become part of everyday life.

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

Investments in the electricity sector can be considered very important, including in relation to the use of EU funds. In particular, the reason for these investments is that a significant part of the generation resources and the electricity system is 35 years old or more and requires adequate investment in maintenance, renewal and modernisation. There is also a need to adapt to new technologies and further technological developments, both on the resource side and on the consumption side. Electricity grids should be continuously upgraded to enable the further development of new electricity generation sources (increase of free connection capacity). In addition to the EU funds, the Czech Republic also benefited from CEF funding. Drawing from the CEF programme is possible for the Czech Republic in accordance with the inclusion of Czech projects in future new PCI lists.

The actual use of structural funds can be summarised as follows. To date, eight projects with a total value of CZK 1609 million have been approved to increase the modernisation and capacity of the transmission system, the EU contribution is CZK 643 million, as at 21. 3. CZK 23 million was paid for three projects. In the area of modernisation and capacity of distribution systems, seven projects are currently being administered, with total project expenditure of CZK 289 million, of which the EU contribution amounts to CZK 116 million. The sub-domain of electricity transmission, distribution and storage and modernisation of energy infrastructure is supported in the framework of the OP PIK in the 2014-2020 period, namely under Priority Axis 3, Investment Priority 3, Development and Deployment of Smart Distribution Systems operating at low and high voltage levels, SC 3.3 'Increase the application of smart grid elements in distribution systems'.

According to the programme document of the OP PIK, the total allocation for investment grants for this investment priority amounted to EUR 37 million. 3. In total, three applications were approved, with a total investment subsidy of CZK 152,641 million. There has also been less interest in subsidies for the construction of smart electricity grids, which should cover the expected significantly higher integration of decentralised resources into the system and the introduction of new consumption management services. However, the interest of regulated entities is closely linked to the set V. regulatory period.

In 2017, the European Commission approved a request to amend or remove the share for large enterprises in SC 3.2, 3.3 and 3.5. This should ensure a higher absorption capacity. The OP PIK supports the increase of the application of smart grid elements (Smart Grids I – distribution networks) and the energy security of the transmission system (Smart Grids II – transmission networks).

3.4.2 Natural gas and hydrogen transport infrastructure

i. Policies and measures related to the elements set out in point 2.4.2, including, where appropriate, specific

measures to ensure the implementation of Projects of Common Interest (PCI) and other major infrastructure projects

Since the entry into force of Commission Regulation (EU) 2017/459 of 16 March 2017 establishing a network code on capacity allocation mechanisms in gas transmission systems in 2017, transmission system operators on each side of the entry-exit system border under this Regulation have cooperated together in the process of assessing market demand for incremental capacity and carrying out technical studies of incremental capacity projects for their joint interconnection points.

The last assessment of market demand under the above-mentioned Regulation took place in 2021 and resulted in the launch of the incremental capacity project at the Czech-Polish border (TRA-N-140), in which NET4GAS, s.r.o. cooperated with the Polish transmission system operator GAZ-SYSTEM, S.A.

During the preparation of the project, the General Court of the Court of Justice of the European Union issued its judgment of 16 March 2022, in Joined Cases T-684/19 and T-704/19, which declared Chapter V of Commission Regulation (EU) 2017/459 setting out the parameters of the incremental capacity process to be inapplicable. This created legal uncertainty throughout the process, resulting in the absence of a coordinated decision of the NRAs on the upcoming Czech-Polish gas interconnection project (TRA-N-140), thus ending the incremental capacity process at the Czech-Polish border.

Transmission system operators are now discussing the way forward at both European and national level and with the participation of national regulatory authorities. In any event, according to the legislation in force, market participants may at any time initiate an incremental capacity project to the transmission system operators at a given border and the relevant transmission system operators will examine the initiative.

In addition, non-commercial infrastructural projects fulfilling the criteria for inclusion in the so-called list of projects of common interest (PCI) under Regulation (EU) 2022/869 of the European Parliament and of the Council of 30 May 2022[75]laying down new guidelines for trans-European energy infrastructure and repealing, inter alia, Regulation (EU) No 347/2013 may be implemented. These projects can then benefit from certain benefits from this Regulation and the acquisition of PCI status. The last type of project are national projects governed by Act No 458/2000 on business conditions and the performance of state administration in the energy sectors and amending certain acts (the Energy Act).

ii. Regional cooperation in this area[76]

Context of regional cooperation

The Czech Republic produces only 2 % of its natural gas consumption and is therefore dependent on imports from third countries. Sufficient diversification of transport routes (Gazelle gas pipeline and reverse gas flows at border delivery points), together with the liberalisation of the market, has led to the security of gas supply currently very well ensured for domestic customers. At the same time, the

75Projects of common interest are kept up to date and the inclusion of these specific projects in the national plan does not mean that these projects can be considered binding.

76Other than the PCI Regional Groups established under Regulation (EU) No 347/2013.

transmission system operator in the Czech Republic is an important gas transiter for the markets in Western, Central and Southern Europe. It is currently not possible to determine precisely the impact of decarbonisation in the European and Czech context on the Czech gas network and concrete information on how this network will be used to minimise the sunk costs of the transmission system operator. Technological solutions to decarbonise the gas sector on a large scale in both the EU and the Czech Republic are currently not developed, and it is therefore appropriate to keep this infrastructure for future use both for natural gas and for new types of gas. A combination of natural gas with CCS or CCU to store or use carbon from gas fission can be considered. Another trend is the decarbonisation of the gas sector. The expected impact of decarbonisation in both the European and Czech contexts on the gas network will consist of the introduction of different renewable and low-emission gases. Deployment is likely to evolve at different paces across the EU, but the application of technologies to new gases is already expected by 2030. The revision of the Gas Regulation and Directive, as part of the so-called Gas Package, aims to facilitate the increased uptake of renewable and low-emission gases through the development of hydrogen infrastructure complementing the natural gas network. At the same time, natural gas in the gas system will be partly replaced by other gases (e.g. hydrogen, biomethane, synthetic methane). It will be most cost-effective to leave the existing gas infrastructure for future use for both natural gas and new types of gases, including hydrogen. At the same time, consideration could be given to combining natural gas with CCS or CCU for the storage or use of carbon generated by gas fission. For this reason, it is likely that in the longer term there may be a need to ensure the use of gas infrastructure also for the transport of $CO2_{to}$ locations where carbon will be stored or used, including outside the Czech Republic. Another European trend that, following the European hydrogen strategies, the FIT for 55 package, the Gas and Decarbonisation Package as well as REPowerEU, is becoming a reality through the use of synthetic methane, biomethane and hydrogen, as a partial substitute for natural gas. Concrete decisions on the application of technologies to new types of gases can be expected in 2020-2030, will depend heavily on the research and development of these technologists and economies of scale when deploying them.

Regional cooperation in the field of natural gas

In the field of natural gas, micro- and macro-regional cooperation takes place at several levels. Within the Gas Coordination Group, which meets regularly around a year, EU Member States discuss security, legislative and economic issues related to the EU gas sector.

Regional infrastructure cooperation is strengthened at operational level through the implementation of PCI projects, which are regularly discussed in smaller groups set up on a geographical basis.

The revised Security of Gas Supply Regulation (2017/1938) created risk groups through which regional risk management is carried out. Countries are discussing factors that could jeopardise the stability of gas supplies in the future and are looking for ways to mitigate risks. The Czech Republic is an active member of three regional groups, namely Ukrainian, Baltic and Belarusian. In addition, the so-called ‘Solidarity’ mechanism has been established, which obliges states to cooperate more closely with their neighbours in managing crisis situations and to codify the mechanism to provide cross-border assistance in the event of imminent gas supply shortages to protected customers.

The V4 Gas Forum is regularly organised by the chairing countries V4 (in the Czech Republic under the responsibility of the Ministry of Industry and Trade). The content of the meeting is always fully within the remit of the Presidency, but the debate on the possibilities for regional cooperation on the development of gas infrastructure and the search for a common position on the legislative proposals currently under discussion by the Council of the EU is the central thrust. The V4 Gas Forum is now discussing the legal and operational aspects of the implementation of Solidarity.

It is also known as the “Budapest Process”, a platform for meetings in V4+B4+ format. This platform has been a relative novelty so far and it is currently difficult to estimate how an initiative will develop or have a specific focus.

Preparedness and regional cooperation in hydrogen transport

In the future, according to the Hydrogen Strategy of the Czech Republic, the Czech Republic is expected to have to import hydrogen from countries where the conditions for the production of renewable hydrogen are more favourable. In order to import hydrogen, infrastructure will have to be prepared and hydrogen could replace current imports of natural gas and oil. The strategy further states that the Czech Republic can be an important player in the transport of hydrogen from south to north and east to west. But this requires the timely preparedness of our gas transmission system to transport hydrogen. Thanks to its favourable geographical location, the Czech Republic can play an important role in the future transit of renewable and low-carbon gases.

The transmission system operator NET4GAS shall examine and explore the possibilities of its infrastructure in order to define its readiness to transport gas blends with different hydrogen concentrations and to transport clean hydrogen. Internal technical hydrogen preparedness activities fall under the long-term H2 Readiness (H2R) programme, which aims to capture the technical, strategic, commercial, legislative, regulatory, financial and organisational areas needed to prepare the transmission system for the hydrogen future. In the medium term, this will very likely include both the transport of a mixture of hydrogen and natural gas and the transport of clean hydrogen in separate pipelines. The basis for exploring technical readiness is the categorisation of more than 90 thematic areas relevant for the technical hydrogen readiness, from control armour components to activities such as leakage detection, to a methodology for calculating the wall thickness of new hydrogen compatible pipes. The proposal for a revision of Regulation (EC) No 715/2009, currently in the legislative process in the so-called Trilogue between the European Commission, the European Parliament and the Council of the EU, obliges transmission system operators to accept up to five percent of hydrogen by volume at cross-border interconnection points as of October 2025. Whether this obligation will be part of future legislation in force depends on the outcome of the trilogue negotiations, which is likely to be concluded by the end of 2023.

Experience across European Transmission System Operators shows that the blending of hydrogen into natural gas at lower percentage units does not imply the need for more extensive infrastructural adaptations. However, this hypothesis had to be verified in detail in order to take into account the technical specificities of the Czech transmission system. For example, under the H2R programme, for the 5 % threshold, the vast majority of all relevant topics have already been analysed with the following result: More material adjustments will only be needed in the area of commercial measurement, where part of the measuring instruments will have to be replaced – whether due to inability to identify or continue to process hydrogen (e.g. some process gas chromatographs and recalculators) or because hydrogen compatibility is not confirmed by the manufacturer (e.g. some older rotary and turbine meters). Minor treatments will concern compression machines (e.g. reset of combustion control software or replacement of o-rings for blowers), lubricants and sealants, or sleeve on cleaning sands.

In addition to internal and national activities, the transmission system operator also addresses this topic at international level. For example, the transmission system operator is involved in the initiative of a group of 31 European gas infrastructure operators from 28 European countries, with a vision to develop hydrogen transport infrastructure, the European Hydrogen Backbone. The study produced by this initiative is not binding, but mutual cooperation, discussions and shared knowledge within the European Gas System Operators involved is an invaluable source of information for the future possible gradual transformation of the current gas transmission infrastructure into hydrogen.

At the same time, the transmission system operator was involved in the Central European Hydrogen Corridor (CEHC), 'SunsHyne Corridor' and 'Czech-German Hydrogen Interconnector CGHI' initiatives. The Central European Hydrogen Corridor and SunsHyne Corridor projects concern the implementation of the 'Repurposing' part of the infrastructure between the Lanžhot and Waidhaus border points (DN

1000+ gas pipeline, ca. 400 km) in the southern part of the Czech transmission system in order to be able to transport clean hydrogen. For the Czech-German Hydrogen Interconnection, the aim is to implement the 'Repurposing' part of the infrastructure between Brandov and Waidhaus border points (DN 1400, ca. 170 km) in the western part of the Czech transmission system.

These projects were nominated as candidate projects for the newly emerging list of Projects of Common Interest (PCI) and Projects of Common Interest (PMI) in accordance with the revised Regulation 2022/869 (TEN-E).

These initiatives, in cooperation with Central European Gas Companies, aim to build a hydrogen "motorway" across Central Europe, which should serve to transport hydrogen from future production areas in Ukraine, North Africa, Baltic and Northern Germany, which, in their view, offers excellent conditions for its massive organic production. The hydrogen corridors will allow the transport of hydrogen between its production facilities and its consumers in the Czech Republic and in other countries along the corridors.

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

For infrastructure projects with PCI/PMI status, it is possible to receive financial support from the Connecting Europe Facility (CEF) under the revised Regulation 2022/869 (TEN-E) in the current programming period 2021-2027. In this respect, e.g. Repurposing/retrofit natural gas infrastructure projects can be envisaged. The transmission system operator NET4GAS has nominated two projects for the emerging list of Projects of Common Interest (PCI) and Projects of Common Interest (PMI). These are the Czech-German Hydrogen Interconnection (Czech-German) projects

Hydrogen Interconnector (CGHI) and Central European Hydrogen Corridor (CEHC). The repurposing/retrofitting area of natural gas infrastructure will also be financially supported in the period up to 2030, e.g. through the Modernisation Fund.

Following the publication of the REPowerEU plan, support from the Recovery and Resilience Facility (RRF) is currently available for infrastructure projects that are in line with the REPowerEU objectives set out in Article 21c of Regulation (EU) 2021/241 of the European Parliament and of the Council of 12 February 2021 establishing the Recovery and Resilience Facility, as amended. These objectives include, for example, support for infrastructure projects to ensure security of supply, diversification of sources and transport routes.

3.4.3 Market integration

1 . Policies and measures related to the elements set out in point 2.4.3

2 .4.3.1 Electricity

The Czech Republic's policies and measures in this area are primarily pursued in the light of the international overlap of EU legislation, namely Regulation No 2015/1222 (CACM), Regulation 2016/1719 (FCA), Regulation 2016/2195 (EBGL), 2017/1458 (SOGL) and the resulting conditions and methodologies. This is particularly the case for the MCO plan, see chapter 2.4.3, which is binding on all NEMOs within the EU.

As part of the cooperation of all NEMOs in the EU, a plan was first developed in June 2017 for the joint deployment and performance of the functions of the day-ahead and intraday electricity market coupling – the so-called MCO plan. It laid down rules on governance and cooperation between the different NEMOs, defines the relationship with third parties and also describes the transition of existing day-ahead and intraday interconnected initiatives to a single interconnected day-ahead and intraday markets.

Further to the CACM Regulation, the following methodologies have been developed by the NEMO: (I) the methodology of the products that NEMOs may include in the single day-ahead and intraday coupling; (II) the methodology for replacement procedures; (III) the methodology for harmonised maximum and minimum clearing prices and the methodology for the reconciliation of the day-ahead coupling algorithm and continuous trading matching algorithm. These methodologies shall be continuously updated to take into account the requirements of electricity market participants or the Agency for the Cooperation of Energy Regulators (ACER).

Long-term transfer rights market

The Czech Republic, through the transmission system operator ČEPS, a.s., has been using a single EU platform for allocating long-term financial transmission rights according to harmonised rules for several years. 77At the same time, it is already possible to obtain financial transmission rights such as options at all bidding zones borders of the Czech Republic. Financial transmission rights are offered in the form of annual and monthly products.

Thus, for the coming period, the main objective of the Czech Republic and ČEPS, a.s. is to establish a coordinated calculation of cross-border transmission capacities for the long-term timeframe in the Core region in Q4/2024.

Day-ahead electricity market integration

As part of the MCO Roadmap, the Price Coupling of Regions (PCR) project based on the cooperation of power exchanges was established as a technical solution to enable day-ahead market integration. OTE, a.s., has been a full member of the project since 2013 and is therefore involved in the development of this solution.

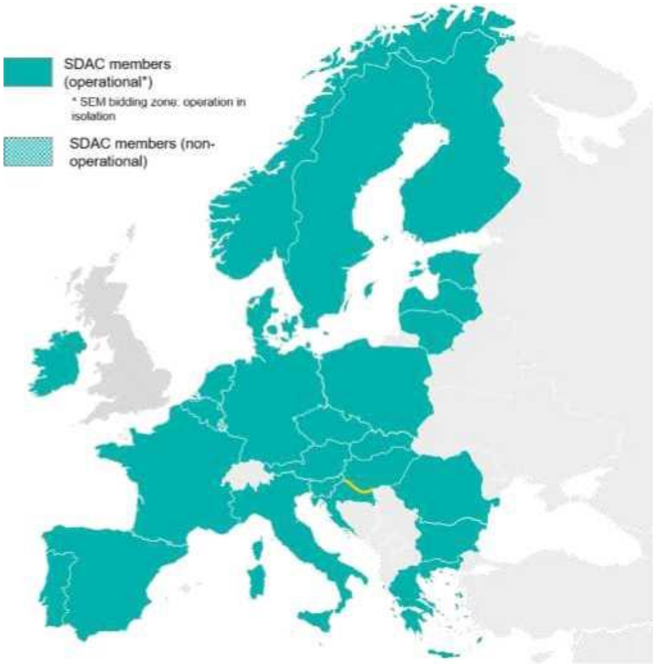
The PCR project provides a single algorithm known as EUPHEMIA and unified operational procedures for efficient electricity pricing and the use of cross-border transmission capacity. The main aspects of algorithm development in recent years and in the follow-up were in particular:

- Geographical spread and natural growth of the market;
- Transition from the NTC to the capacity calculation method using the Flow-Based method;
- The possibility of having multiple NEMOs in one bidding zone;
- The requirements of the CACM Regulation for the algorithm;
- New requirements from stakeholders;
- Changes to the topology of the network.

In the coming years, further intensive research on this algorithm is planned to ensure sufficient quality, robustness and stability of the single day-ahead market algorithm in Europe, in line with the set of requirements for the price coupling algorithm.

Figure 2: *The current state of interconnected day-ahead electricity markets in Europe*

77 For more information see https://www.jao.eu/



Source: OTE, a.s.

Until June 2021, there were two parallel and equivalent projects under the implementation of the CACM Regulation: Multi Regional Coupling ("MRC") and 4M Market Coupling ("4M MC"). The so-called DE-AT-PL-4M MC project, or the Interim Coupling Project ('ICP'), was completed by the full market interconnection of these projects on 17 June 2021. Under the ICP, an implicit capacity allocation based on the NTC method was introduced at 6 borders (PL-DE, PL-CZ, PL-SK, CZ-DE, CZ-AT and HU-AT border). This completes the integration of the single day-ahead electricity market (SDAC – Single Day-Ahead Coupling).

The completion of the ICP in 2022 was followed by the implementation of market coupling under the Core FB MC project based on flow-based capacity calculation.

Flow-based MC is a method in which physical grid limits are based on available capacities on critical network elements and energy transmission distribution factors defined for each critical element and each bidding zone within Core CCR.

These factors describe how the change in the balance (import-export difference) of each bidding zone changes the energy flow through each single critical element. The computational market coupling algorithm then looks for optimal energy flows between bidding zones. Compared to the NTC method used in the past to calculate cross-border capacity, the FB method increases the overall societal benefits. The FB method is more sophisticated, taking into account multiple parameters and optimisation conditions and therefore better reflects the real conditions of the network.

A flow-based capacity calculation method is required under Article 20 of Commission Regulation 2015/1222 laying down guidelines on capacity allocation and congestion management (CACM Regulation) and constitutes an important part of the European target model achieved precisely by the Flow-Based operationalisation of the Flow-Based method on 8 June 2022.

Integration of the intraday electricity market

As the amount of crash renewable generation, such as solar and wind power, market participants are increasingly interested in trading in intraday markets. The main reason for this is the increasingly difficult to maintain balance after the day-ahead market closure. Achieving a balanced position as close as possible to an hour of supply is beneficial for both market participants and energy systems. This also contributes to reducing the need for reserves and related costs to maintain the stability of the energy system.

SIDC (Single Intraday Coupling) represents the cross-border interconnection of individual intraday markets across Europe, responding to market needs by creating a transparent and more efficient continuous trading environment that allows market participants to easily trade their intraday positions across different EU markets without the need for explicit allocation of transmission capacity. An integrated intraday market increases the overall efficiency of intraday trading through:

- promoting effective competition;
- increase in liquidity (i.e. increasing the ease with which energy can be purchased and sold quickly without affecting its price);
- facilitating the sharing of productive resources across Europe; and
- possibilities for market participants to respond more easily to unexpected changes in consumption and outages.

SIDC is a joint initiative of nominated electricity market operators (NEMOS) and Transmission System Operators (TSOs), which enables continuous cross-border trade across Europe. This is the continuation of the XBID project (the Cross Border Intraday), which in June 2018 presented a technical solution for the creation of a single intraday market through a continuous intraday trading platform. SIDC enables the integration and expansion of energy networks across Europe. This technical solution was launched on 12 and 13 June 2018 in 14 European countries and one year later the parties announced the successful first year of operation.

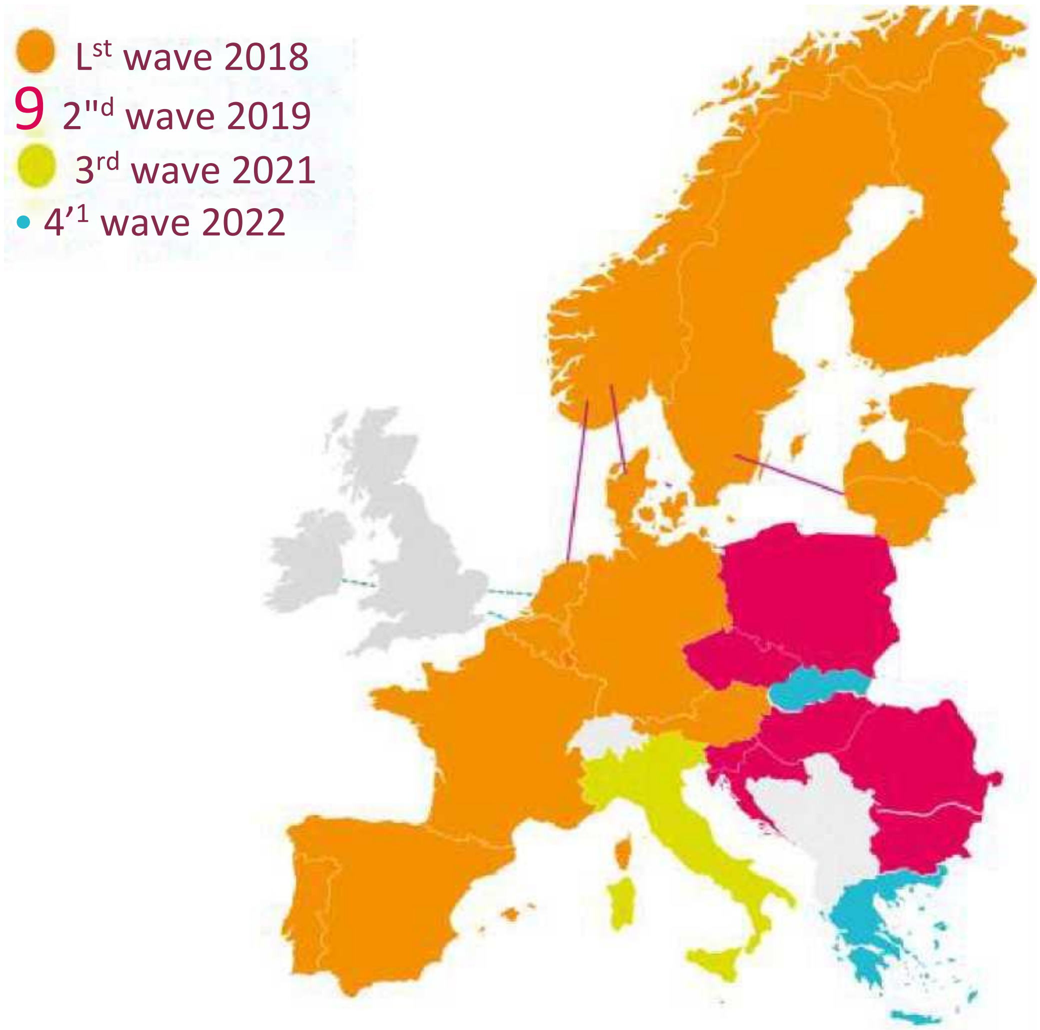
On 19 and 20 November 2019, OTE, a.s., as nominated electricity market operator in the Czech Republic and ČEPS, a.s., as transmission system operator of the Czech Republic, together with similar entities in six other European countries, joined the SIDC as part of the second wave of launch. This has resulted in the interconnection of 21 countries in total and is a very important milestone in the operation of the intraday market in the Czech Republic.

Following the successful participation of the Czech Republic in the European Selected Electricity Interconnection (SIDC), a further significant change took place in June 2020 in the intraday market, namely an extension of intraday electricity trading until 5 minutes before the start of the delivery hour. Italy was also successfully connected to SIDC in mid-2021. Transmission system operators of the United Kingdom of Great Britain and Northern Ireland k31. 12. 2020 ceased their activities in the SIDC project due to the consequence of Brexit.

Due to Slovakia’s involvement in the SIDC, a so-called local implementation project within the SIDC was launched in 2020 by nominated electricity market operators and transmission system operators from Slovakia, the Czech Republic, Poland and Hungary to include in the interconnected intraday market at the end of 2022 the border between Slovakia and the Czech Republic, Slovakia and Hungary and Slovakia and Poland. This link was successfully completed on 29 November 2022.

In the area of the calculation of intraday cross-border transmission capacities, a coordinated calculation shall be phased in as far as possible, taking into account the agreement of all States and TSOs, NEMOs, national regulatory authorities and ACER respectively.

Figure 3: *The state of interconnected intraday electricity markets in Europe as at 1 January 2023*



Source: OTE, a.s.

Balancing services market

Over the past period, the Czech market for balancing energy and balancing services has gradually been integrated with the market in the European Union:

- Introduction of European, harmonised price caps on balancing energy.
- Introduction of a European Standard Rating Energy Product (RR) from replacement reserves in 2020.
- Launch of the European platform for the exchange of balancing energy TERRE78 in 2020. The Czech Republic was the first country to use the platform.
- Introduction of European, standard products for balancing energy from frequency restoration reserves with manual (mFRR) and automatic activation (aFRR) in 2022.
- Launching the use of European platforms for the exchange of balancing energy PICASSO79 and MARI80.

  The Czech Republic was the first country to use the platform in 2022.
- The introduction of a marginal pricing of standard balancing energy products in 2022.
- Implementation of an imbalance settlement system in accordance with Commission Regulation (EU) 2017/2195.

78Trans-European Replacement Reserves Exchange

79Platform for the International Coordination of the Automatic frequency restoration process and Stable System Operation

80Manually Activated Reserves Initiative

- Interconnection of the national market for Frequency Control reserves (FCR) with an additional 11 TSOs in Q1/2023. The Czech TSO purchases all its necessary volume on this day-ahead market.
- A simplified certification process for balancing services for series-produced energy equipment is in place as of Q3/2023.
- Baseline to evaluate the flexibility provided to installations up to the installed capacity of 30 MW at all voltage levels since Q3/2023.

The Czech Republic will follow up on the changes already made in the coming periods, with a view to providing balancing services with enhanced options compared to the status quo. The aim is to enable the involvement of decentralised energy through an implicit and in particular explicit aggregator and to prepare for the risk of shutdown of fossil fuel burning plants, which now provide a large part of the balancing services, without sufficient flexibility from non-fossil installations in the Czech electricity system:

- Joint procurement of frequency restoration reserve with automatic activation (aFRR) with Austria and Germany in 2025.
- Central management of cross-border transmission capacities of Capacity Management Function for the European regulatory energy market in Q4/2023.
- Rules for the legislative anchoring of the independent aggregator in 2024.
- The calculation of cross-border transmission capacities for the balancing energy market timeframe shall be coordinated with other TSOs of the Core capacity calculation region.

Gas

The Czech Republic intends to help complete the internal energy market, namely the internal market in gas, by removing narrow infrastructure peas between the Czech Republic and its neighbours. The implementation of the Czech-Polish bi-directional interconnection project (Bezměrov-Hať pipeline) will help to resolve the infrastructure bottlenecks between the Czech Republic and Poland. This project is primarily of strategic and security importance for the Czech Republic, where its implementation will lead to two-way interconnections between the transmission systems of Poland and the Czech Republic. The implementation of the project will expand transport routes and diversify the sources of natural gas for the Czech Republic by connecting to a potential source of gas other than the Russian Federation, namely LNG from Poland and natural gas from Norway. Therefore, the Czech Republic considers this project important for national interests and will provide all possible cooperation, including funding for the implementation of this project.

Support for the implementation of PCI-status projects enabling direct interconnection with the gas networks of neighbouring countries will further help to create and subsequently integrate the market for gases, namely hydrogen. These projects contribute to the integration of national markets in the area and the creation of a central European regional gas market, namely predominantly hydrogen.

See also the information in chapter 2.4.3.2.

ii. Measures to increase the flexibility of the energy system with regard to renewable energy production, such as smart grids, aggregation, demand response, storage, distributed generation, dispatching mechanisms, redispatching, storage of electricity into hydrogen and renewable energy curtailment and real-time price signals, including the deployment of intraday market coupling and cross-border balancing markets

National Smart Network Action Plan

The key strategic and planning document containing measures to increase the flexibility of the energy system is the National Action Plan for Smart Networks, which is drawn up by the Ministry of Industry and Trade on the basis of the task set out in the Czech Republic's 2015 State Energy Concept. The National Action Plan for Smart Networks (NAP SG) was approved by the Czech Government in March 2015 by Czech Government Resolution No 149 of 4 March 2015.

The period up to 2019 was characterised as preparatory in the context of the NAP SG, with the aim of preparing the necessary analyses, proposing and agreeing on a target model for the implementation of smart grids in the Czech Republic, the completion and evaluation of pilot projects and the development of the Smart Measurement Implementation (AMM) procedure.

On 16 September 2019, the Czech Government approved the update of the NAP SG or the National Smart Network Action Plan 2019-2030 (NAP SG 2019-2030)[82]. At the same time, a NAP SG evaluation report on 31 December 2018 was drawn up in order to obtain detailed information on the fulfilment of individual cards and policies and measures under the NAP SG.

The following areas have been identified as relevant areas within the scope of the updated NAP SG:

- Legislation (EU legislation – network regulations, winter legislative package, new technologies);
- Use of aggregation, flexibility for electricity systems (decentralised energy sources, consumption);
- Electro-mobility (integration and use for the operation of the electricity system);
- Digitalisation and its use (automation, communication);
- Decentralised energy sources (integration and use for the operation of the electricity system);
- Dispatching control (including operational measurements);
- Storage (integration and use for electricity system operation);
- Smart metering (AMM).

Table 44 provides an overview of the 20 projects (measures/tasks) that were hosted under NAP SG 2019-2030, broken down into three main areas. The projects are subdivided into three main groups: support, implementation and pilot. NAP SG 2019-2030 then contains detailed tender sheets for each project, setting out the timetable for the solution, the responsibility for performance, the expected benefits and other information.

Table 44: *Overview of NAP measures SG 2019-2030 per area*

Areas/programmes	Projects (measures/tasks)
I – Legislation, tariff system, regulation	Legislative support (support project)
	Monitoring and implementation of EC regulations (network codes) (implementation project)
	Introducing 15 minutes interval evaluation of deviations (implementation project)
II – Use of new technologies in EC CR operations	Installation of electricity quality measurements (implementation project)
	Frequency overburdening (implementation project)

[82] The National Smart Network Action Plan 2019-2030 is available on the following link.

	Battery system flexibility (0.5 MW and above) for provision balance sheet a other support services (pilot project)
	Flexibilities (0.5 MW and above) for the provision of balancing and other support services (pilot project)
	Flexibility of large consumers (involved in 110 KR) to provide balance sheet and other support services (pilot project)
	Aggregation of consumption side flexibility providers (including prosumers) involved in vin and nn for the provision of balance sheet and other support services (pilot project)
	Accumulation, use of accumulation as part of the installation of FVE in nn networks (supporting project)
	Technical DataHUB – Digitalisation of EC CR operations in future conditions (implementation project)
	Management Q
III – Integration of new technologies into the EC	Implementation of smart metering (realisation project)
	Implementation of smart stations at ground level (remote control, monitoring, signalling) (implementation project)
	Implementation of remotely controlled switchgear (DOP) on outdoor wiring (implementation project)
	Nn Network Automation (ASDŘ) (support project)
	Integration of electromobility into DS (pilot and support project)
	Development and construction of optical telecommunications infrastructure (implementation project)
	Energy DataHUB – part of the business (implementation project)
	Use of Power to X technology for the accumulation of RES surplus electricity (supported project)

Source: Self-processing of the Ministry of Industry and Trade on the basis of the National Smart Network Action Plan 2019-2030

Measures stemming from European legislation

The reconfiguration of the market in order to increase its flexibility is carried out as part of the implementation of Regulation (EU) 2016/1719 of the European Commission of 26 September 2016 establishing a guideline on forward capacity allocation (the so-called FCA Regulation), Regulation (EU) 2015/1222 of the European Commission of 24 July 2015 establishing a guideline on capacity allocation and congestion management (the so-called CACM Regulation) and the European Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing (the so-called EB Regulation).

The FCA Regulation lays down detailed rules for the allocation of cross-zonal capacity in the forward market, the establishment of a common methodology for the determination of long-term cross-zonal capacity, the creation of a single allocation platform at European level offering long-term transmission rights, and the possibility to return long-term transmission rights to subsequent forward capacity allocation or transfer them between market participants.

The CACM Regulation lays down a detailed guideline on cross-zonal capacity allocation and congestion management in day-ahead and intraday markets, including requirements for the establishment of common methodologies for determining the volume of capacity that is simultaneously available between bidding zones, criteria for assessing efficiency and a review process to define bidding zones.

The EB Regulation lays down a detailed guideline on electricity balancing, including the establishment of common principles for the procurement and settlement of frequency control reserves, frequency restoration reserves and replacement reserves, including a common methodology for the activation of frequency restoration reserves and replacement reserves.

iii. Where applicable, measures to ensure the non-discriminatory participation of renewable energy, demand response and storage, including via aggregation, in all energy markets

Pursuant to Act No 165/2012 on supported energy sources, the transmission system operator or distribution system operator is required, in its licence, to connect as a matter of priority to the transmission system or distribution system a power-generating facility from an subsidised source for the purpose of transmission of electricity or the distribution of electricity, if the producer so requests and meets the conditions for connection, with the exception of a demonstrable lack of capacity of transmission and distribution facilities or where the safe and reliable operation of the electricity system is jeopardised. At the same time, the operator of a transmission system or distribution system must, at the request of a producer whose electricity generating facility using a subsidised source is to be connected to the distribution or transmission system, provide information necessary for the connection, an estimate of the costs associated with the connection, deadlines for the receipt and processing of the connection application, and an estimate of the time required to complete the connection.

The National Smart Network Action Plan (NAP) for smart grids and its updates, i.e. the National Smart Network Action Plan 2019-2030, deals in detail with regard to the demand side and the overall flexibility. These measures are set out in more detail in section (ii), in particular Table 44 in summary.

Sub-measures with regard to demand-side flexibility are also included in the established European legislation, in particular Directive (EU) 2019/944 of the European Parliament and of the Council on common rules for the internal market for electricity. The measures required by this Directive will be progressively transposed into national legislation.

iv. Policies and measures to protect consumers, especially vulnerable and, where applicable, energy poor consumers, and to improve the competitiveness and contestability of the retail energy market

Policies and measures to protect the legitimate interests of customers and consumers in the energy sectors to meet all reasonable energy supply requirements:

- securing the supply of energy sources at the most competitive prices for consumers;

- ensuring adequate measures to promote more efficient use of energy by consumers;
- an increased level of consumer protection, in particular household customers;
- ensuring that consumers are informed about their energy consumption and costs at sufficient intervals; non-discriminatory payment systems;
- ensuring that consumers are informed of their rights in the energy sector;
- ensuring the enforcement of consumer rights – establishing fast and efficient complaint procedures and out-of-court dispute settlement tools;
- ensuring that effective means of dispute settlement are available to all customers;
- issuing binding decisions on the protection of consumer rights in disputes with energy undertakings;
- issuing binding decisions on energy undertakings; imposing effective, proportionate and dissuasive penalties on energy undertakings;
- promoting fair competition that enables consumers to take full advantage of the opportunities in energy markets.

Energy poverty can be characterised as a multidimensional phenomenon from many different perspectives. The underlying model criteria may nevertheless represent a situation where households find themselves in an insufficient level of basic energy service due to a combination of high energy expenditure, low household income, energy inefficient buildings and equipment, possibly combined with the specific energy needs of those households. Therefore, energy poverty alone can be seen as an issue at the intersection of social, economic and environmental agendas. This is why, in terms of solutions, there is an integrated approach, which may include both social policy measures and measures to improve energy efficiency in households and, finally, measures to make consumers more aware of energy savings (enhancing the position of consumers, in particular vulnerable consumers).

Rather than focusing on the definition of vulnerable customers, the main focus of the EU is on the existence of support systems and the definition of which categories of customers are covered by this support. In relation to vulnerable customers, however defined in each Member State in the light of national circumstances, Member States are to ensure that the rights and obligations to protect and promote this category of customers are applied.

Therefore, criteria must first be established at Czech level to define a situation known as energy poverty, so as to enable the monitoring (regular monitoring) of the situation of energy poverty in the Czech Republic. It is only if, on the basis of market research and analysis, the priorities on which interventions will be developed and implemented, and which make it possible to assess their effectiveness, can the concept of 'vulnerable customer' be understood and defined in the Czech Republic.

Notwithstanding the fact that there is currently no definition of energy poverty or a vulnerable customer in the Czech Republic, customer support schemes are already in place, which partly meet the requirements of the Directives, allowing economic support and protection against disconnection of weak customers. A combination of economic support within social systems, together with tools to protect the supply of customers in emergency situations (supplier of last resort, over-licensed obligation). However, the Czech Republic does not have an economic support system specific to energy, which is not, however, in direct contradiction with EU requirements, as this requires a high degree of caution when considering interference with the internal market in electricity or gas, including in the case of a project to protect vulnerable customers.

Existing support systems:

- a system of economic support specific to the energy sector (the Czech Republic does not have an energy-specific economic support system. In most countries with an energy support system in the energy sector, the system covers customers with income below a defined level.);
- the system of economic support outside the energy sector (characteristic factor is that customers can

receive some financial support if needed (in the Czech Republic’s social system environment).

- a system of non-economic support specific to the energy sector (a system of non-financial support, such as in particular protection against disconnection, can act as a complement to an economic support system. In the Czech Republic, include under these measures the institutes of the supplier of last resort and obligations in addition to the licence provided for in the Energy Act).

A vulnerable customer, whose position may be derived from the state of energy poverty, must be suitably characterised in legislation so that he can be adequately protected. The default theoretical parameters of a vulnerable customer may, in particular, represent a situation in which the customer:

- is significantly less able than a typical consumer to protect or represent his interests in the energy market (for example, because of age or health);
- in the event of a negative energy supply situation, his personal status will be more damaged by the event than another customer in the same situation.

In particular, there is no systematic collection of information on the number of households in energy poverty specifically in the Czech Republic, so there can be no binding parameters characterising a vulnerable customer. Therefore, there cannot ultimately be a system of economic support for vulnerable customers, tailored to the energy sector.

In this regard, the principles on which new policies and measures to protect vulnerable and energy-poor consumers should be based are:

- in order to identify energy poverty among household customers in the Czech Republic, it will be necessary to publish the parameters and criteria used to determine, measure and monitor it – important factors in the design of indicators for measuring energy poverty are, inter alia, low incomes, high energy expenditure and low energy efficiency of homes;
- drawing up a national action plan or other appropriate framework to combat this problem, aimed at reducing the number of people facing this problem and ensuring the necessary energy supply for vulnerable and energy poor customers;
- applying an integrated approach, for example in the context of energy and social policies – measures must be adapted to the specific situation identified and may include social or energy policy measures relating to the payment of electricity bills, to investments in the energy efficiency of residential buildings or to consumer protection, such as protection against disconnection;
- the community energy principle can be an appropriate tool to combat energy poverty and can also bring about progress in energy efficiency at household level and reduce consumption and obtain lower supply tariffs – community energy can allow some groups of household consumers who would otherwise not be able to participate in the energy market;
- ensuring the protection of energy poor or vulnerable customers should be implemented by means other than public intervention in price setting for the supply of electricity or gas – an exception to this rule is an intervention in the form of a ‘public service’, but this must also be in accordance with transparently defined conditions and only in well-defined cases.

Further information on energy poverty is provided in Chapters 2.4.4 and 3.4.4.

v. Description of measures to enable and develop demand response, including those addressing tariffs to support dynamic pricing[81]

Demand-side flexibility measures are included in particular in the National Smart Network Action Plan or its update, the National Smart Network Action Plan 2019-2030. These measures are set out in more

81In accordance with Article 15(8) of Directive 2012/27/EU.

detail in section (ii), in particular Table 44 in summary.

Sub-measures with regard to demand-side flexibility are also included in the established European legislation, in particular Directive (EU) 2019/944 of the European Parliament and of the Council on common rules for the internal market for electricity. The measures required by this Directive will be progressively transposed into national legislation.

3.4.4 Energy poverty

1. Where applicable, policies and measures to achieve the objectives set out in point 2.4.4

The Czech Republic currently does not have policies or measures specifically aimed at reducing energy poverty. This issue is mainly addressed by social policies and, where appropriate, in a partial manner by consumer protection policies. However, the Czech Republic is also dealing with this issue in the light of the approved European legislation. Work is ongoing on the design of the methodology for identifying a vulnerable and energy poor customer and the tools to address this problem (for more information see chapter 2.4.4). It is only after the development of this methodology that it is likely that specific measures and policies in this area can be proposed. Under the National Environment Programme, the first call for a pilot programme of financial assistance to households and municipalities in Karlovarské, Moravian-Silesian and Ústí nad Labem regions is ongoing. The programme is aimed at pre-financing the replacement of non-compliant solid fuel boilers in households by means of soft loans to natural persons, and part of the support is intended to provide the services of a boiler exchange specialist to provide the household with comprehensive advisory services. The programme therefore aims to achieve socially weak households to support the replacement of a substandard heat source in a residential building and can therefore, to some extent, be considered as addressing energy poverty, which is also energy-specific. The Czech Republic will report on developments in this regard in the context of periodic progress reports in accordance with Regulation 2018/1999.

The definition of energy poverty has not yet been legislatedly in the Czech legal order. However, under the new Energy Efficiency Directive (the 2021 proposal, which is not yet in force), energy poverty is defined as:

– lack of access for households to essential energy services that provide basic standards and a decent standard of living and health, including adequate heating, hot water, cooling, lighting and energy to power appliances, in the relevant national context, existing social policy and other relevant policies, due to a combination of factors including unavailability, lack of disposable income, high energy expenditure and low energy efficiency of households;

This definition will thus be transposed into Czech law in the sense that the new Energy Efficiency Directive (the 2021 proposal, which is not yet in force) requires.

At the same time, as part of the implementation of the obligation under Article 8 of the Energy Efficiency Directive (the 2021 proposal, which is not yet in force), the Czech Republic will set up instruments to ensure that energy efficiency improvements are also implemented for low-income groups, in proportion to the cumulative final consumption savings based on the Member State’s commitment and the ratio of eurostat indicators defined by the Directive, which are:

– Inability to maintain sufficient heat at home (Eurostat, SILC [ilc_mdes01]);
– Service arrears (Eurostat, SILC, [ilc_mdes07]) and
– Total number of inhabitants living in dwellings with a leaking roof, damp walls, floors, or foundations or with rotting window frames or floors (Eurostat, SILC [ilc_mdho01]);
– At-risk-of-poverty rate (Eurostat, SILC and ECHP surveys [ilc_li02]) (cut-off point: 60 % of median equivalised income after social transfers.

New Green Savings programme82

The new green savings Light is a programme for the elderly and low-income households. It was prepared to limit as much as possible the need for own funds to implement austerity measures to help vulnerable households reduce housing costs.

Under the New Green Savings programme, public funding is currently available for:

- insulationfacades
- insulation roofs
- insulation ceiling
- insulation floors
- window exchange
- replacement of entrance doors

Solar water heating

In this respect, an advisory network has also been set up, comprising hundreds of trained counsellors from the Local Action Groups and the EKIS consultation centres, to help meet all the needs of applicants to apply and receive the subsidy free of charge. Assistance shall include identifying appropriate measures, producing photographic documentation and expert opinion, assisting with the establishment of an electronic identity, assistance with requesting supporting documents confirming that the applicant is a legitimate applicant, submitting an application, assisting with communication with the implementing firm, acquiring photographic documentation of the measures carried out, drawing up a report on the implementation of the supported measures and evidence of implementation. Even if the applicants deal with the application themselves, they need an expert opinion and a report on the measures implemented from the NZÚ Light consultants.

Social Climate Fund83

In view of the possible impacts that may be caused by the extension of emissions trading to the buildings and transport sectors (EU ETS2), the Social Climate Fund was established by Regulation (EU) 2023/955 of the European Parliament and of the Council of 10 May. It is expected to provide up to 50 billion funding between 2026 and 2032. To support policies aimed at addressing social impacts on vulnerable households, vulnerable micro-enterprises and vulnerable transport users, inter alia, the Fund should contribute through measures and investments to reduce dependence on fossil fuels.

82More information is available on the New Green Savings website (link)
83 https://www.mzp.cz/cz/news_20220104-Ceske-predsednictvi-splnilo-sve-priority-v-oblasti-zivotniho-

Table 45: *Czech Republic's financial resources for energy modernisation by 2030*

Financial resources for the Czech Republic to modernise the energy sector by 2030	
Revenue from emission allowances	334 billion CZK
Modernisation Fund	EUR 400 billion CZK
Revenues from the sale of allowances in the housing and road transport sectors (ETS2) and the Social Climate Fund	100 billion CZK
Just Transition Fund	EUR 37.3 billion CZK
National programmes financed by the European Regional Development Fund (ERDF)	162 billion CZK
National programmes financed by the Cohesion Fund	102.5 billion CZK
National Recovery Plan	EUR 67.3 billion CZK
Extension of the RRF to deliver on REPower EU objectives	EUR 11.25 billion CZK
Total	EUR 1 214,35 billion CZK

Source: Ministry of the Environment

Pen subsidies for low-income households84

A call of 1.7 billion crowns was launched at the beginning of April 2023 to replace heating systems in low-income households. This call will cover around 15 thousand exchanges for the most vulnerable households.

3.4.5 Regulatory area

The concept of linking the new electricity market design to the requirements for change in regulated prices and tariffs – innovation of the electricity tariff structure

Major changes affecting the energy sector, such as the increase in the number of decentralised resources, the expected development of storage, flexibility, the increase in the number of electric vehicles and related charging points, or the roll-out of AMM will have a significant impact on all electricity market participants. These changes need to be prepared not only by primary legislation but also by secondary legislation governing the tariff structure (the principle of charging regulated prices). These energy changes will, in addition to clear benefits, result in an increase in the necessary investments and system operation costs. The change in the tariff structure must therefore be complex and not only allow new technologies to be operated, but, in order to maintain stability in the price of electricity transmission and distribution, it must also place greater emphasis on efficient use of the grids. Therefore, the

84 https://www.mzp.cz/cz/news_20230405-MZP-spousti-dalsi-vlnu-popularnich-kotlikovych-dotaci-pro-nicoprijmove-domacities

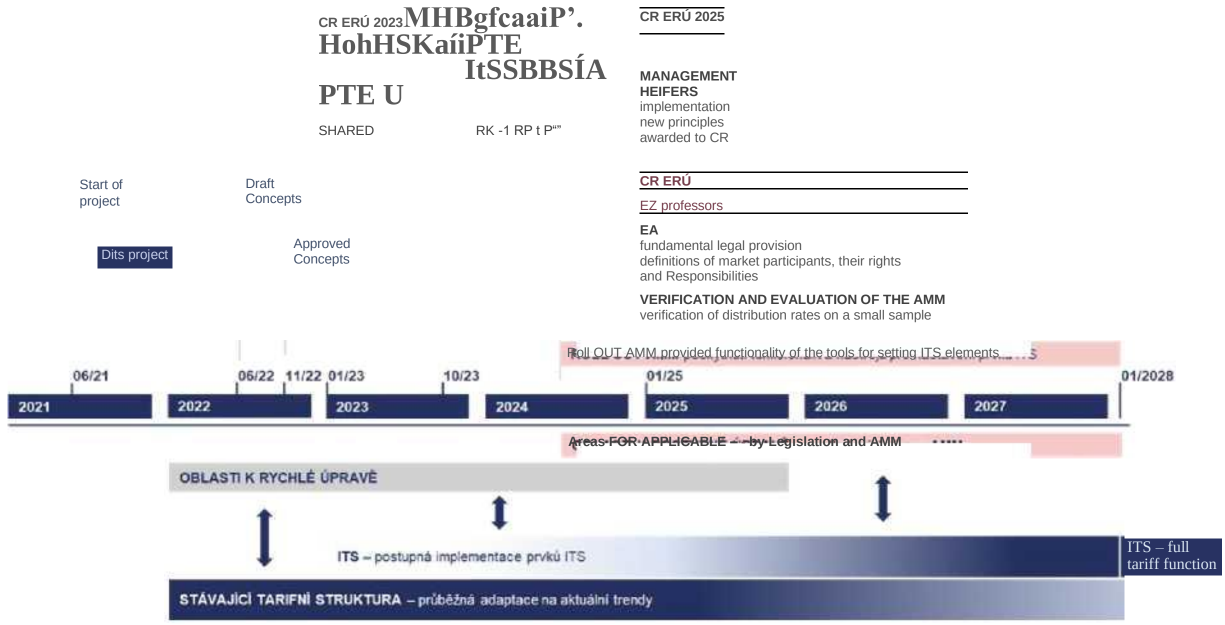
Energy Regulatory Office has *prepared a concept for linking the new design of the electricity market with the requirements for a change in regulated prices and tariffs*, which has the following objectives:

- a price for customers corresponding to the costs and benefits it generates in the system and it brings to the system,
- long-term predictability of the tariff system, channelling it towards new energy;
- increased use and efficiency of the operation and development of the electricity system.

These objectives will be reflected in the gradually implemented measures within the remit of the Energy Regulatory Office, including:

- enabling electricity sharing within apartment buildings – implemented since the beginning of 2023 in the Decree on Electricity Market Rules;
- streamlining the use of transmission and distribution systems at very high-voltage and high-voltage power demand levels – planned from April 2024;
- streamlining the use of transmission and distribution systems at very high and high voltage levels in unsolicited reactive energy – planned from the beginning of 2025;
- verification of new distribution tariffs at low-voltage level – gradual changes planned from 2026 onwards.

Figure 4: *Timetable for regulatory changes*



Source: Energy Regulatory Office

Meeting the objectives set by the Energy Regulatory Authority in the *Concept for linking the new design of the electricity market with the requirements for a change in regulated prices and tariffs* will allow for a switch to new energy.

<u>**Methodology for price regulation for the next regulatory period**</u>

In June 2020, the Energy Regulatory Office published the Z*principles of price regulation for the regulatory period 2021-2025 (V. regulatory period) for the electricity, gas, electricity and gas market operator activities and mandatory buyers*. The next regulatory period therefore starts in 2026 and, according to the current legislation, the Energy Regulatory Authority will publish a draft price regulation methodology 16 months before the start of this period, the final version of the price regulation methodology must be published 10 months before the start of the regulatory period.

In the price regulation methodology, the Energy Regulatory Office shall establish price control methods, conditions and procedures for the entire regulatory period so as to create the conditions for a transparent, predictable and long-term stable investment environment in the electricity and gas sectors, while ensuring the stability and acceptability of regulated prices. Thus, the methodology for price regulation will have to reflect both the EU's increasing climate and energy targets, strike a balance between a predictable environment and the need to ensure a quicker response to similar changes that have occurred in the recent past, but will also have to cope with the effects of the energy crisis, which can be expected to be achieved in the course of the next regulatory period.

Dimension "Research, Innovation and Competitiveness"

I. Policies and measures related to the elements set out in point 2.5

3.5.1.1 National R & D & I Policy of the Czech Republic 2021+[87]

The national R & D & I policy of the Czech Republic 2021+ (NP R & D & I 2021+) is the overarching strategic document at national level for R & D & I. It provides a strategic framework for the development of all components of research, development and innovation (R & D & I) in the Czech Republic (basic research, oriented and applied research, experimental development and innovation) and uses their joint action to develop the knowledge society and promote the economic, environmental, cultural and social development of the Czech Republic. The R & D & I Strategy Paper contributes to the fulfilment of some of the enabling conditions for the possibility to benefit from EU funds in the 2021-2027 programming period.

3.5.1.2 NationalR & I Oriented Research, Experimental Development and Innovation Priorities[88]

The national priorities for oriented research, experimental development and innovation were approved by the Government of the Czech Republic on 19 July 2012. The national priorities for oriented research, experimental development and innovation are valid for the period up to 2030, with gradual implementation. Within the defined 6 priority areas, there are 24 sub-areas with a total of 170 specific objectives. The paper provides a description of the different priority areas and sub-areas, lists the links between the different areas and defines several systemic measures. The material also contains a statement on the assumption of the allocation of R & D and innovation expenditure from the state budget to the different areas.

The update of this strategy paper is currently under discussion.

Table 46: *Energy-related priority areas under the NPOV*

Area	Sub-area
Renewable sources of energy	Developing an economically efficient solar energy
	Evolution of the economically efficient use of geothermal energy
	Development of economically efficient use of biomass
Nuclear sources	Efficient long-term use of current nuclear power plants

[87]https://www.vyzkum.cz/FrontClanek.aspx?idsekce=913172
[88] The material is available at the following link: https://www.vyzkum.cz/FrontClanek.aspx?idsekce=653383

	Promoting the safety of nuclear installations
	Research to support the construction and operation of new economically efficient and safe blocks
	Fuel cycle research and development
	Disposal of radioactive waste and used fuel
	R & D in Generation IV reactors, in particular efficient and safe fast reactors
Fossil Fuels	Economically efficient and environmentally friendly fossil energy and heating
Electricity grids including energy storage	Capacity, reliability and security of electricity backbone transmission networks
	Modification of demand-side management networks
	Electricity storage including use of hydropower
	Security and resilience of distribution networks
Heat/cool production and distribution, including CHP and trigeneration	Baseload heat demand from power plants
	High-efficiency cogeneration (trigeneration) in SCZT sources in sub-load plants (system services)
	Distributed cogeneration from all types of sources
	Heat transmission and storage
	Efficient management of indoor environment regulation
	Alternative sources – recovery of waste
Energy in transport	Increase the share of liquid and gaseous biofuels to replace fossil resources
	Increase the share of electricity used for propulsion as a substitute for fossil resources
	Prospectively deploy the use of hydrogen as an energy source for propulsion in transport
The systemic development of the Czech Republic's energy sector in the context of the development of the EU's energy sector	System analyses to promote a balanced State Energy Concept (SEC), other related State Strategy Papers and regional development concepts with a view to the EU framework
	Integral concept for the development of municipalities and regions with demonstration projects (SET Plan link – Smart Cities and Smart Regions)

Source: National priorities for oriented research, experimental development and innovation

3.5.1.3 National Research and Innovation Strategies for Smart Specialisation of the Czech Republic – RIS 3 Strategy

EU Member States were required to prepare their National Research and Innovation Strategies for Smart Specialisation (National RIS3 Strategies) in order to identify suitable forward-looking areas of the economy, which should subsequently be supported by the European Structural and Investment Funds (ESIF). To this end, the Czech Republic has prepared its National RIS3 strategy that reflects the priorities of our economy on which ESIF programmes and selected national R & D support programmes should focus. Table 47 lists the priority areas for research in the field of energy based on the National Research and Innovation Strategy for Smart Specialisation of the Czech Republic. The approval of the National RIS3 strategy by the Czech Government and the European Commission was a necessary condition for drawing on the relevant ESIF (under the so-called ex-ante conditionalities).

This is a strategic document ensuring the effective targeting of European, national and territorial budgets and related private resources to support oriented and applied research and innovation in priority areas identified for the future. This document is an update of the original National RIS3 Strategy for the 2014-2020 programming period, the last revision of which was approved by the Government of the Czech Republic in 2018. The new National RIS3 strategy for the 2021-2027 programming period reflects, inter alia, recent analyses prepared to support the R & D & I area in the Czech Republic, mid-term evaluation conclusions and new strategic documents drawn up after 2018 both in the Czech Republic and at EU level. The shift towards finding new innovative solutions with a view to long-term sustainability and the Covid-19 crisis also has a significant impact on the direction of the strategy. The aim of the update is also to hear the calls for a more concise and comprehensible approach to the priorities of the National RIS3 Strategy and the document as a whole. At the same time, the existence and implementation of a smart specialisation strategy is an essential condition for implementing European Union85 (EU) cohesion policy interventions in the field of research, development and innovation (R & D & I) under the so-called General Regulation for EU funds (namely Annex IV). The Ministry of Industry and Trade is responsible for fulfilling this basic condition, co-governing officers being the Office of the Government of the Czech Republic (RVVI) and the Ministry of Education, Youth and Sport. The EU sets out seven criteria for fulfilling this enabling condition, on the basis of which the continuous fulfilment of the enabling condition is assessed.

85Regulation (EU) 2021/1060 of the European Parliament and of the Council of 24 June 2021 laying down common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund, the Just Transition Fund and the European Maritime, Fisheries and Aquaculture Fund and financial rules for those and for the Asylum, Migration and Integration Fund, the Internal Security Fund and the Instrument for Financial Support for Border Management and Visa Policy.

Table 47: *Research priority areas based on RIS 3 Strategy*

Key application from vat/thematic area	Application Reading
Advanced machinery and technology[11]	• Mechanical engineering, mechatronics • Industrial chemistry • Metallurgy • Energy
Digital and electrical engineering	• Electronics and electrical engineering * Digital economy and digital content
Transport for the 21st century	• Automotive Rolling Stock and Rolling Stock * Aerospace industry
Health care	• Pharmaceuticals, biotechnology, medical devices and Life Sciences
Cultural and creative industries	* New and traditional cultural and creative sectors
Sustainable agriculture and environmental sectors	• Sustainable management of natural resources • Sustainable agriculture and forestry • Sustainable food production —Ensuring a healthy and high-quality environment, biodiversity and ecology of natural resources • Sustainable construction, human settlements and technical protection of the environment

Source: National RIS3 Strategy

3.5.1.4 Innovation Strategy 2019-2030

The Czech Republic's Innovation Strategy 2019-2030 was approved by Government Resolution No 104 of 4 February 2019. It is a strategic framework plan that sets out government R & D & I policy to help the Czech Republic move among Europe's most innovative countries over 12 years.

The innovation strategy consists of nine interlinked pillars with backgrounds, key strategic objectives and the tools to achieve them. These are areas: R & D funding and evaluation, innovation and research centres, national start-ups and spin-off environments, polytechnical education, digitalisation, mobility and construction environment, intellectual property protection, smart investment and smart marketing.

The innovation strategy was developed by the Government's R & D & I Council in close cooperation with a team of more than 30 people from business, scientists, academics and representatives of the public administration.

THÉTA programme

One of the main instruments for supporting applied research specifically in the energy sector is the THÉTA programme, which is managed by the Czech Technical Agency. The programme was established on the basis of measures from the State Energy Concept.

The focus of the THÉTA programme is based on the updated State Energy Concept of the Czech Republic, which was approved by the Government of the Czech Republic in May 2015. The programme is aimed at supporting projects whose results have a high potential for application in a number of areas of social life for the people of the Czech Republic. Horizon Progam was until 2025 and for the period from 2018 to 2025 (i.e. 8 years in total). The first tender was launched in 2017, the second tender was launched in 2018 and the third tender was launched in October 2019. The fourth tender was then launched in 2021 and the fifth in 2022. The maximum duration of project solutions was set at 8 years, but varies from sub-programme to sub-programme.

The objective of the programme was to contribute, through outputs, results and impacts from the supported projects, in the medium and long term, to the vision for the transformation and modernisation of the energy sector in line with agreed strategic materials. This objective has been achieved by supporting energy R & D & I with a focus on: (I) promoting projects in the public interest; (II) new technologies and system elements with a high potential for rapid application on the ground, (iii) support for long-term technological perspectives, corresponding to the split between the different sub-programmes.

By the end of the fifth call, 563 projects had been submitted for all sub-programmes, of which 230 projects had been supported by the end of the fourth call. Evaluation of the fifth tender is pending.

In the first tender, 102 projects were submitted and 56 were supported. This is a success rate of 54.9 %. 108 projects were submitted in the second tender, of which 58 projects were supported. The success rate was 53.70 %, 141 candidates applied for the third call and supported 45 projects – a success rate of 31.91 %. 212 projects were launched in the fourth tender and 71 were supported. The success rate was 33.49 %. 124 projects have been submitted to the tender (only projects under sub-programmes 1 and 2).

Table 48: *Success of projects in THÉTA tenders*

Competition	Projects submitted	Projects supported	Success
1 VS	102	56	54.9 %
2 VS	108	58	53.70 %

3 VS	141	45	31.91 %
4 VS	212	71	33.49 %
5 VS	124	66	53.22 %

The financial cost of the 1st tender was CZK 1047 million, of which CZK 783 million is expenditure from the State budget in the form of dedicated grants with an aid intensity of 75 %. The remaining part of the budget consisted of non-public resources (CZK 264 million).

The financial cost of the 2nd tender was CZK 1300 million, of which CZK 984 million is expenditure from the State budget in the form of dedicated aid with an aid intensity of 76 %. The remaining part of the budget consisted of non-public resources (CZK 316 million). In the 2nd tender, the aid intensity target was 82.9 % in sub-programme 1, 59.1 % in sub-programme 2 and 85.4 % in sub-programme 3.

The total cost of the 3 rd tender was CZK 1025 million, of which CZK 717 million is expenditure from the State budget in the form of dedicated aid with an average aid intensity of 70.44 % for the programme. The remaining part of the budget consisted of non-public resources (CZK 308 million). In the 3 rd tender, the average aid intensity in sub-programme 1 is 82 % in sub-programme 2 57 % and 3 88 %.

The total cost of the 4th tender was 1.06 billion. CZK. CZK 709,03 million is expenditure from the State budget in the form of dedicated aid with an average aid intensity of 67.13 % per programme. The remaining part of the budget consisted of non-public resources (CZK 350, 97 million). In the 4th tender, the average aid intensity for sub-programme 1 is 84.93 % in sub-programme 2 58.47 % and 86.05 % in sub-programme 3.

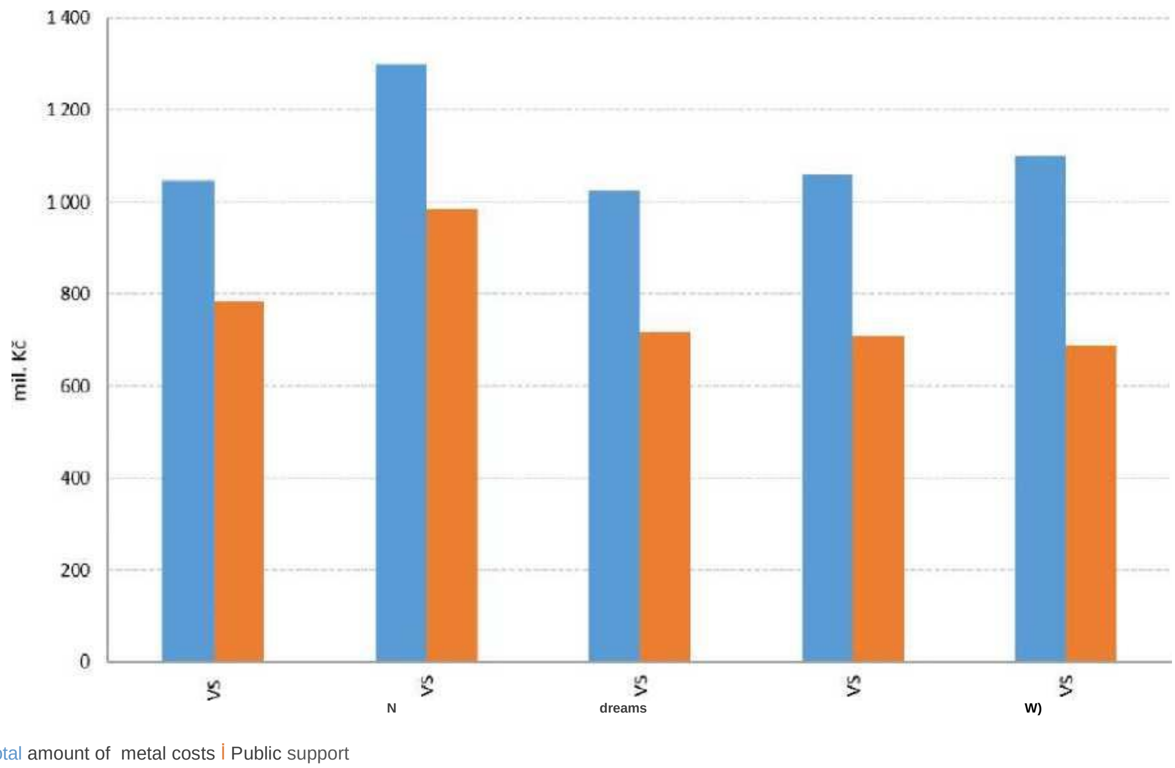
The total cost of the 5th tender was 1.10 billion. CZK. CZK 687,66 million is expenditure from the State budget in the form of dedicated aid with an average aid intensity of 62.58 % per programme. The remaining part of the budget consisted of non-public resources (CZK 412,34 million). In the 5th tender, the average aid intensity for sub-programmes 1 is 83.87 % and 59.33 % in sub-programme 2 and 86.05 % respectively. Sub-programme 3 was not launched in the 5th tender.

Table 49: *Information on individual THÉTA tenders*

Competition	Total cost	State budget	Private resources	Aid intensity
1 VS	1047 million	783 million	264 million	75 %
2 VS	1300 million	984 million	316 million	82.9 %
3 VS	1025 million	717 million	308 million	70 %
4 VS	1060 million	709,03 million	350,97 million	67.13 %

5 VS	1100 million	687,66 million	412,34 million	62.58 %

Graph 22: *Public support and private resources (THÉTA)*



3.5.1.5 Preparation of the THÉTA II programme

The THÉTA 2 programme will be the successor of the upcoming THÉTA programme. It will serve as one of the main instruments for delivering the fifth pillar of the Energy Union on energy science, research and innovation, as well as an ambitious decarbonisation goal for 2050. As the THÉTA programme is coming to an end, there is a need for a follow-up programme that also reflects the future needs of the energy sector for science, research and innovation related to the global transformation. The THÉTA 2 programme builds on the activities and priorities of the European Strategic Energy Technology Plan (SET Plan), especially in terms of priorities and relevance of technology for the Czech Republic.

The total expenditure for implementing the programme is forecast at CZK 10 621.7 million, of which CZK 7410 million will be financed from the State budget for R & D and innovation and CZK 3 211.7 million from other sources. The financing of the Programme will be implemented according to the possibilities of the State budget

Support in the programme's 'most busiest' years will be around 1 billion. CZK. This corresponds to about 85 % increase in the allocation of public funds compared to THÉTA, but it is necessary to take into account in particular the expected increase in the importance of THÉTA 2 in the context of current energy trends.

The Programme should support science, research and innovation projects aiming at the export of investments, technologies or the involvement of companies in transnational supply chains to transform the world's energy sector in line with the requirements of the Paris Agreement. From this perspective, it is in the interest of the Czech Republic to respond to this opportunity. The proposed budget for THÉTA 2 should therefore be seen as minimal and already reflecting the tightness of the State budget.

For the purpose of achieving the objective, the Programme shall be divided into three sub-programmes which, according to focus and scope, support and complement each other:

- Sub-programme 1: Research in the public interest
- Sub-programme 2: Energy technologies for competitiveness
- Sub-programme 3: Technologies to ensure the long-term sustainability of energy

Other relevant TA CR programmes

Environment for Life Programme

The programme of applied research, experimental development and innovation in the field of the environment – Environment for Life was approved by Government Resolution No 204 of 25 March 2019. The aid provider is the Technical Agency of the Czech Republic, and the Ministry of the Environment is the gestor of content.

The focus of the Environment for Life Programme is determined by the updated State Environment Policy 2012-2020 of the Czech Republic (hereinafter also referred to as the SPŽP), which was approved by the Government in November 2016. In order to improve the quality of environmental protection in the Czech Republic and to fulfil its commitments in this area within the European Union and international conventions, applied research, experimental development and innovation will focus on the priority thematic areas of the SPEF, i.e. protection and sustainable use of natural resources, climate protection and improvement of air quality, improvement of waste management and use, protection of nature and landscapes and a safe and resilient environment, including the prevention and reduction of the consequences of natural and anthropogenic hazards.

The objective of the Programme is to provide new environmental solutions, to stabilise and broaden the knowledge base that will significantly contribute to ensuring a healthy and high-quality environment in the Czech Republic and the sustainable use of its resources, minimising negative impacts of human activity on the environment, including transboundary impacts, and thus contributing to the improvement of the quality of life in Europe and in the global context.

These solutions will contribute to reducing the impacts of climate change on nature and society, in particular mitigating droughts and preventing droughts, reducing the impacts of other meteorological extremes (wind, floods, extreme temperatures), increasing air and water quality, developing a circular economy and efficient use of raw materials, protecting natural resources, water, soil and rock environments, preserving biodiversity and improving nature and landscape protection, developing environmentally friendly and environmentally friendly and climate change resilient and safe societies.

The specific objectives of the programme are as follows:

1. Contribute to adaptation to climate change and the introduction of economically efficient mitigation measures
2. Contribute to improving the quality of the environment and promoting the implementation of circular economy principles (circular economy)
3. Promote a resilient and safe society and nature

The priority areas of the programme are as follows:

– climate action – climate action, mitigation and adaptation to the increased extremity of rainfall and temperatures, both in settlements and in the open air;
– protection of the air;
– waste and circular economy;

- protection of water, soil, rock environment and other natural resources;
- biodiversity, nature and landscape protection;
- environmentally friendly society, a safe and resilient environment, specific tools for environmental protection and sustainable development.

The first environment for life competition was launched on 12 June 2019.

SIGMA

SIGMA is a new comprehensive instrument of its kind aimed at fulfilling and addressing a number of objectives and measures set out in key strategic and policy documents for R & D & I in the Czech Republic, and which will allow flexibility to respond to the needs of society and the economy that may arise from unexpected situations. The main vision of the new broad aid instrument envisaged is to consolidate several current TA CR programmes into a single programme, allow support to regions according to their innovation potential, support for cross-cutting and systemic measures, including leaving room for support in areas/topics at the time of the programme’s preparation. SIGMA will progressively implement activities from the current ZÉTA, ÉTA, GAMA 2, DELTA 2 and EU instruments (in which the provider will be involved).

DELTA

The DELTA 2 programme aims at promoting knowledge and skills leading to new products, processes and services or substantially improving them. It therefore supports projects focused on specific outputs in applied research that will be put into practice once completed. On the Czech side, businesses and research organisations can be involved in the project and their foreign partners submit complementary project proposals to the relevant foreign organisation. In order to receive aid, projects must be supported at the same time by the Czech (TA ČR) and foreign parties (foreign organisations in the locality). The list of foreign organisations for a given call is usually published 2-3 months before it is published.

Research infrastructures of the Czech Republic

In 2009, as part of Act No 130/2002 on support for research, experimental development and innovation from public funds and amending certain related acts (Act on support for research, experimental development and innovation), as amended, a specific legislative instrument for supporting research infrastructures of the Czech Republic was newly established. The Ministry of Education, Youth and Sports has become the central body of the state administration responsible for the financing of the so-called ‘large research infrastructures’ from public funds in the Czech Republic*, a large research infrastructure being defined as ‘research infrastructure which is essential for a comprehensive research and development activity with a high financial and technological intensity, which is approved by the government and set up for use by other research organisations~~.~~’ (Research infrastructure, in accordance with Article 2(91) of Commission Regulation (EU) No 651/2014, means “facilities: resources and related services used by the scientific community to conduct research in relevant disciplines, including scientific equipment and research material, knowledge-based resources such as collections, archives and structured scientific information, information and communication technology infrastructures such as GRID networks, computer and software, means of communication, as well as any other elements of a unique nature necessary to conduct the research.’)*

In 2010, the Czech Republic’s Road Map of major R & D & I infrastructures was drawn up for the first time, which, in terms of structure and substance, corresponds to the ESFRI Road Map, updated in 2011,2015 and 2019. A completely new Roadmap for major research infrastructures of the Czech

Republic for the years 2023 to 2026 will also be drawn up in 202390. Thus, since 2010, the Czech Republic's roadmap for large research infrastructures has been a strategic document setting out the concept of the support and further investment development of large research infrastructures and represents the Czech Republic's contribution to the European effort for a strategic approach to research infrastructures at both national and macro-regional EU level.

The following major research infrastructures are supported in the field of energy: (I*) Czech International Centre of Research Reactors (CICRR)*; (II) *COMPASS – Tokamak for fusion research*; (III) *Energy recovery of waste and gas purification (ENREGAT)*; (IV) *VR-1 Nuclear Experimental Hub (WCZV)*. The *Surface Physics Laboratory – Hydrogen Technology Centre (SPL* – HTC) is also active in the field of fuel cells and hydrogen technologies.

Competence Centres/National Competence Centres

Competence Centres

The Competence Centre Programme was approved by Government Resolution No 55 of 19 January 2011. The draft amendments to the Competence Centre programme were approved by Government Resolution No 146 of 27 February 2013. The programme was aimed at supporting the creation and operation of R & D & I centres in progressive disciplines with high application and innovative potential and with a view to making a significant contribution to the growth of the competitiveness of the Czech Republic.

In the framework of the Technical Agency of the Czech Republic, the Competence Centre has set up the following centres in the field of energy: Competence Centre for Energy Recovery of Waste, Centre for Advanced Nuclear Technologies (Canut), Advanced Heat and Power Generation Technologies, Centre for Research and Experimental Development of Reliable Energy and Centre for the Development of Nuclear and Radiation Safety Technologies: RANUS – TD.

National Competence Centres

The programme to support applied research, experimental development and innovation of the National Centre of Competence (NCK) was approved by Resolution of the Government of the Czech Republic n°291 of 29. 4. 2019. The aim of the programme is to bring together already existing successful centres created with the support of the Czech Technical Agency (Centre for Competence), GA ČR (Centre of Excellence) and operational programmes (in particular the Centre's R & DpI) with other research centres and units into one integrated system. The programme will help to significantly strengthen the segment of applied research organisations and motivate relevant existing research workplaces with a view to concentrating their research and technological capacities in NCK centres where high-quality applied research will be carried out according to the needs of the application domain. The National Centre of Competence then creates the National Centre for Energy.

The Programme may be used for synergies and complementarities with the Union's Horizon Europe programme and other international programmes consistent with the Programme's focus.

Supported National Energy Competence Centres include the National Centre for Energy, the National Centre for Energy II and the Centre for Advanced Nuclear Technologies II and the National Competence Centre for Hydrogen Mobility. In view of the potential and commitments of the Czech Republic at international level, in particular the Green Deal, the main mandatory output of the above-mentioned

90 The document is available at the following link: http://www.msmt.cz/vyzkum-a-vyvoj-2/cestovni-mapa-cr-Whalky-infrastructure-pro-survey

national competence centres is to develop the strategic agenda as a background material and recommendations for the administration and policy-making in the field of research. The knowledge domain of NCCs, consisting of top-level experts at national and international level using unique scientific background, is ready to support the government in their field, who are responsible for sub-strategies to help formulate relevant strategies in the sense of "research for policy".

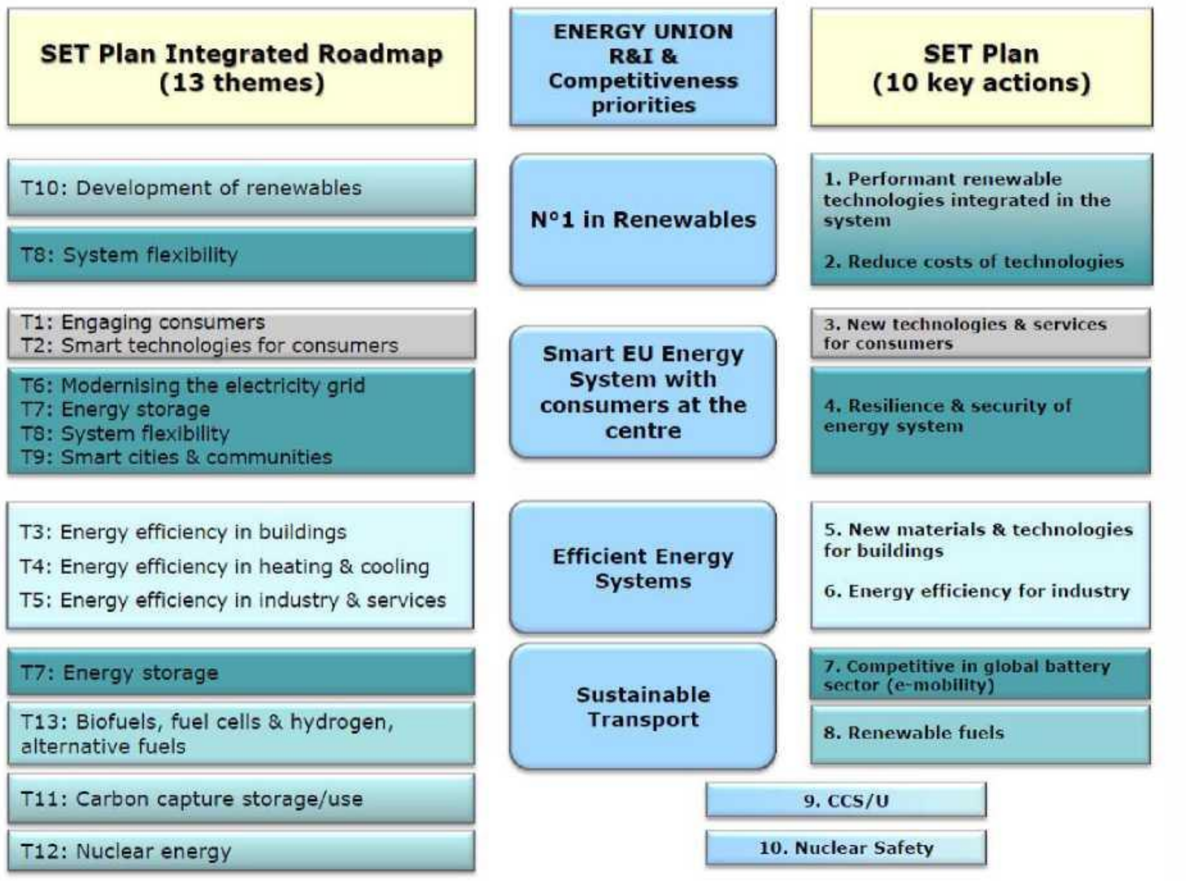
Set Plan

The Czech Republic is relatively much involved in cooperation with other Member States in the field of science and research, both at the level of the structures of the European Strategic Energy Technology Plan (SET Plan) and its other pillars (e.g. the European Energy Research Alliance91). There is also a relatively significant involvement of the Czech Republic in the EU's Framework Programme for Research and Innovation (Horizon Europe). The Czech Republic is also involved in European but also international research in major scientific workplaces.

The priorities of the Strategic Energy Technology Plan (see Table 50) are already largely reflected in the State Energy Concept in areas defining the main R & D priorities. The SET Plan's priorities have also been taken into account in detail in the preparation of the THÉTA II programme, which is specifically focused on energy. The specific reflection, relative use of the SET-Plan priorities and their modification to the Czech Republic is specifically set out in the text of the approved programme THÉTA II and in the underlying analyses of this programme.

91European Energy Research Alliance (EERA)

Table 50: *Priorities under the Integrated Roadmap, Energy Union Priorities, 10 SET Actions Roadmap*



Source: SETIS Information System

Horizon Europe

Horizon Europe is the EU’s framework programme for research and innovation for 2021-2027. The programme builds on the achievements of Horizon 2020, which ended in December 2020 and is often referred to as the EU’s ‘success story’.

The programme’s budget is EUR 95,517 billion (current prices), 30 % more than Horizon 2020. The budget increase reflects the fact that research and innovation remains one of the EU’s top political priorities. The budget is divided between the three main pillars and one cross-cutting area of the programme.The largest part of the budget is dedicated to tackling global challenges. Horizon Europe is not only the largest, but also the most ambitious research and innovation programme so far, with the potential to generate significant scientific, societal and economic impact, to contribute to climate objectives and to create new high-skilled jobs.

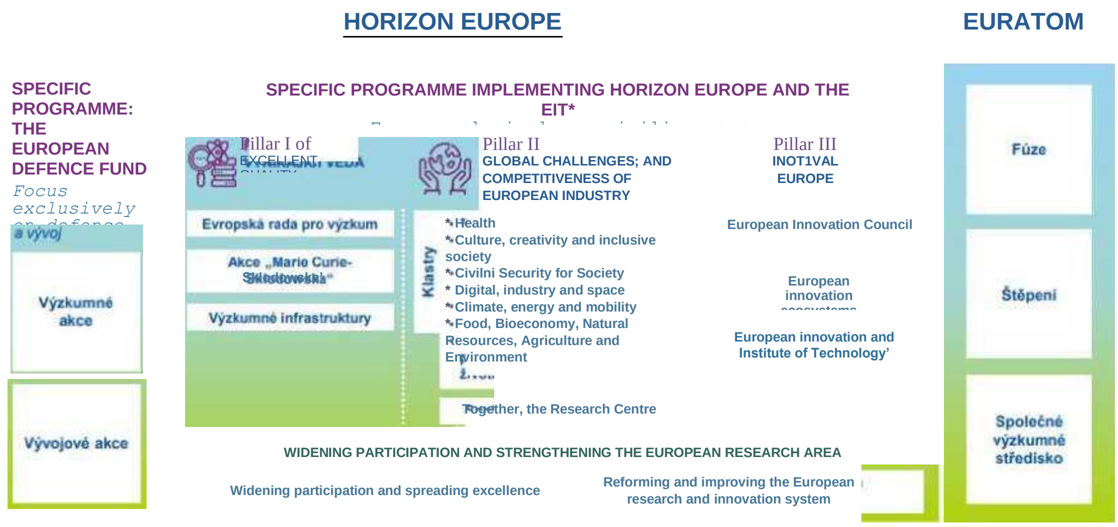
The novelty of the programme is the missions linked to thematic clusters in the second pillar. Missions are defined as portfolios of projects with bold and measurable objectives. The concept of missions was inspired by Apollo 11, which had a huge impact on the whole of humanity. The word “impact” (science, society and citizens) is very often mixed in the context of missions. The impact of the missions is expected to be many times greater than would be the case for individual projects. The bottom-up approach, which allows a wide range of actors to be involved in their design, is a hallmark of missions.

In addition to missions, clusters are also accompanied by European Partnerships, initiatives implemented by the European Commission in cooperation with public or private partners. The European Innovation Council, whose projects have already been piloted in Horizon 2020 and is becoming an integral part of the third pillar,

also plays an important role in the programme. There is a strong focus on the openness of science. Open access to publications and research data is becoming a standard requirement and modem for the programme's operandi. New opportunities for involving countries with good scientific, innovation and technological capacity are also being opened up.

Two key legislative acts are the Rules for Participation and Dissemination and the Strategic Plan.

Figure 5: *Horizon Europe and Euratom scheme*



The European Institute of Innovation and Technology (EIT) is not part of a specific programme

Source:See link

European Partnership

The Ministry of Industry and Trade, together with the Czech Technical Agency (TA CR), is involved in two European Partnerships, which have energy under the new EU Horizon Europe programme. European Partnerships are a tool that will replace the instruments used so far, such as ERA-NET Cofund, Joint Programme Initiatives (JPIs), Joint Technology Initiatives (JTIs) and others. European Partnerships are part of Pillar 2, Cluster 5 – Climate, Energy and Transport of Horizon Europe.

There are three types of EU partnerships, of which the TA ČR participates in one cofund (co-funded) type. Like ERA-NET Cofund, the EU cofund-type partnerships provide the opportunity for providers from individual Member States (such as the TA CR), associated countries and most non-European countries to launch joint international calls on an agreed theme. The European Commission contributes 30 % of the total amount to the project support budget to national providers.

"Energy" partnerships are: Clean Energy Transition (CET) and Driving Urban Transition (DUT). The Ministry of Industry and Trade are also members of the consortium outside the Czech Republic's TA and, in the CET partnership, the Ministry of the Environment.

ERA-NET Cofund

The Czech Republic participates in the last ERA-NET Cofund – ERA-NET EnerDigit in the energy sector. This is an international smart energy challenge launched by ERA-Net Smart Energy Systems in cooperation with Mission Innovation. The main theme of this "ERA-NET" is "digital transformation for green energy transition" and aims to financially support international research projects on digital solutions for energy systems and networks.

The Czech Republic is also involved in research cooperation programmes at the level of the International

Energy Agency.

Involvement in research within the International Energy Agency

IEA questionnaire

The Article of the International Energy Agency (IEA) obliges the Czech Republic to report selected statistical data in the form of questionnaires. One of them is a questionnaire focused on R & D in the energy sector. In order to prepare statistical data for this questionnaire, a detailed analysis of expenditure on scientific and research projects since 1996 has been carried out.

IEA Technology Cooperation Programmes

Participation of the Czech Republic in the IEA Technology Collaboration Programme

The Czech Republic is present in the following IEA Technology Collaboration Programs (TCPs):

1) ECB: Energy in Buildings and Municipalities Programme

The participating countries in the EBC are: Australia, Austria, Belgium, Canada, PR China, Czech Republic, Denmark, Finland, France, Germany, Italy, Ireland, Japan, Republic of Korea, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom and the United States of America.

The Czech Republic is present in the “anex” 72: Assessment of life cycle related environmental impacts of buildings, in "annex 75: Cost-effective renovation of buildings at district level of the Kombination of Energy Efficiency and Renewables and Annex 83: Positive Energy Areas (PED).

Annex 72: Positive energy districts – Work phase of the annex for the Czech Republic started in 2016 and ended in 2021.

Annex 75: Positive energy districts – the Annex working phase for the Czech Republic started on 1 November 2017 and was completed in 2021.

Annex 83: Positive energy districts – The working phase of the Annex for the Czech Republic starts on 1 November 2020 and will be completed in 2024.

2) ‘Fluidised bed conversion’

The International Energy Agency’s (IEA) Technology Cooperation Programme (TCP) in Fluidised bed conversion (FBC) of clean energy fuels provides a framework for international cooperation on the development and deployment of energy technologies. Currently, 18 countries are active parties: Austria, Canada, China, Czech Republic, France, Finland, Greece, Hungary, Italy, Japan, Korea, Portugal, Poland, Russia, Spain, Sweden, the United Kingdom and the United States.

In this TCP, VŠB-TU Ostrava operates in cooperation with the ČVUT in Prague.

3) “Gender” in energy

In 2018, the Czech Republic participated in the Clean Energy Technology Cooperation Programme (C3E TCP) to strengthen cooperation with international partners and to develop and improve data collection on gender diversity. The Government of the Czech Republic has designated the Technical University of Ostrava as contracting party to the C3E TCP.

4) TCP Heat pumps

Barriers to participation in TCP

As regards barriers to participation in TPC, there are several:

- Lack of information: private entities do not have sufficient information on TCP. It is also not very useful that there is a relatively large diversity between TCPs in terms of cost sharing x task sharing, structure, etc.

- Transaction costs: potential participants stressed that migration costs (such as travel costs) are an obstacle to participation in the TCP.
- Participation costs: Some entry fees are relatively high and it is difficult to assess whether the added value of the results justifying the fees is difficult to assess.
- Lack of visible results: some potential participants reported a lack of visible results (this may be partly explained by a lack of information). Knowledge sharing may not be a sufficient incentive for a private company.

Section B: Analytical basis[92]

[92] See Part 2 for the detailed list of parameters and variables to be included in Section B of the plan.

4 STATE OF PLAY AND ESTIMATES BASED ON EXISTING POLICIES AND MEASURES[93.94]

4.1 Projected evolution of main exogenous factors influencing energy system and GHG emission developments

i. I. Macroeconomic forecasts (GDP and population growth)

4.1.1.1 Expected population evolution (demographic projections)

The Czech Statistical Office prepares population projections in about five-year cycles – the latest projection was prepared in 2018, an update is expected by the end of 2023. The aim of the projection is, in the long term, to outline the direction of future population trends and to show possible changes in population numbers and age composition, subject to the embedded assumptions for future development of the natural currency (or fertility and mortality) and migration. However, a projection whose objective feature is vague cannot anticipate the sudden effects of external influences, such as a deep economic crisis, major changes in the system of social measures, epidemics of diseases or major medical discoveries that may affect mortality or fertility levels in the short and longer term, or adjustments to legislative measures affecting the volume and structure of migratory flows. Therefore, the results of the projection must always be understood conditionally and interpreted in relation to the input parameters. The ČSÚ’s projection is deterministic, developed in three options: medium, low and high. The middle option is, from the author’s point of view, the most likely scenario of future population development (in the terminological sense, so-called forecast). For this reason, the main focus in the text is on the assumptions and results of the middle option.

Expected evolution of population and age composition (medium option)

The Czech population will continue to grow in the near future or in the first eleven forecast years if the assumptions for future fertility, mortality and migration in the middle option are met. It will reach 10,784 million at the end of the 20s, compared to 10,610 million at the projection threshold. Thereafter, since the 1930s, the population is expected to follow a slightly decreasing trend, interrupted in the second half of the 40s by stagnation. The population is expected to remain above 10.7 million until 2058.

In the 1960s and 1970s, the size of our population is expected to decrease further. It is expected to fall to 10.4 million by the early 1980s. However, in the last two decades of this century, the population of the Czech Republic is forecast to grow again – to 10,527 million at the beginning of 2101.

[93] Current situation shall reflect the date of submission of the national plan (or latest available date). Existing policies and measures encompass implemented and adopted policies and measures. Adopted policies and measures are those for which a formal government decision has been taken before the date of submission of the national plan and for which there is a clear commitment to implement them. Implemented policies and measures are those for which one or more of the following applies at the date of submission of the national plan: national legislation is in force, one or more voluntary agreements have been established, financial resources have been allocated, human resources have been mobilised.

[94] The selection of exogenous factors may be based on the assumptions made in the EU Reference Scenario 2016 or other subsequent policy scenarios for the same variables. Besides, Member States specific results of the EU Reference Scenario 2016 as well as results of subsequent policy scenarios may also be a useful source of information when developing national projections with existing policies and measures and impact assessments.

Thus, while the expected trend is not stable, changes should not be dramatic. At the maximum (1. 1. 2029) the population should be 1.6 % higher than the projection threshold, at a minimum (1. 1. 2081) then 1.9 %

lower.

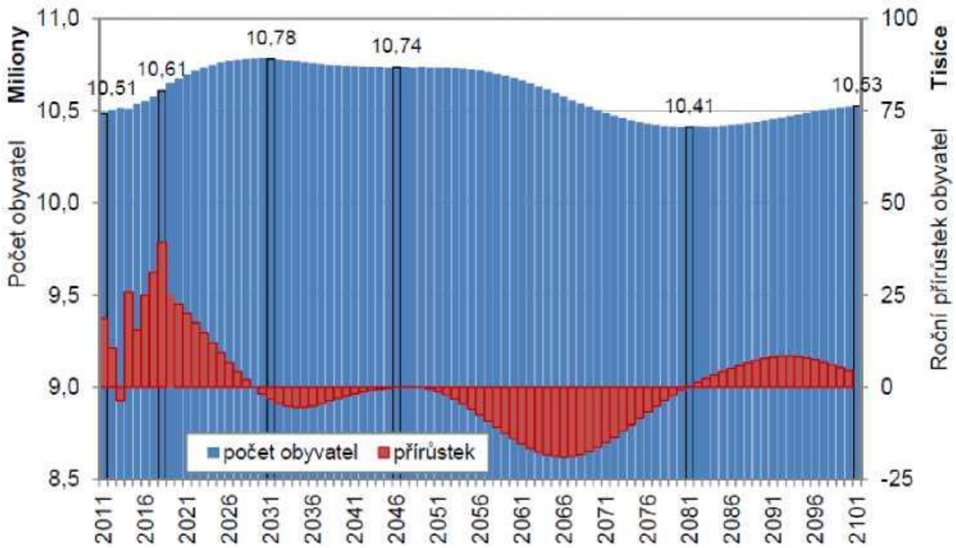
Thus, looking at the whole forecast period, the future evolution of the total population can be generalised to – in principle – to maintain current sizes or moderate fluctuations around this value.

With the distribution of projected population growth into a natural currency and a migration component, it is clear that, with the exception of 2018, population growth will only ensure a positive external migration balance that is able to offset (and exceed) the expected negative balance of the natural currency. At the same time, natural currency losses will not be small. From 2025 to the end of the century, the number of deaths is expected to outweigh the number of live births of more than 15 thousand people each year. The decline in natural currency is expected to peak in the mid-1960s, when almost 45 thousand people are expected to lose every year.

Table 51: *Expected demographic developments*

Pointer	2017 *	2018	2020	2030	2040	2050	2060	2070	2080	2090	2100
Population k 31. 12. (thousands)	10 610	10 649	10 697	10 782	10 740	10 736	10 665	10 488	10 411	10 456	10 527
Overall increment	31 235	39 369	22 589	— 1 810	—2 263	—448	—14 000	—16 364	—880	7 865	4 554
Natural increment	2 962	1 369	—3 411	— 810	—28 263	—26 448	—40 000	—42 364	—26 880	—18 135	—21 446
Increment moving	28 273	38 000	26 000	26 000	26 000	26 000	26 000	26 000	26 000	26 000	26 000

Graph 23: *Real and expected population (as at 1 1.) and annual accruals, 2011-210, medium option*



Although the expected change in the total population of the Czech Republic is not significant, the age composition of the population is a significant variable. Over the years, there will be substantial changes in the number of different age groups (and their proportions), both from the point of view of the three basic age groups and more detailed – in terms of five-year-old age groups.

4.1.1.2 Expected economic growth

Expected economic growth is projected according to the MF's macro-economic forecast of August 2023,95, the outlook for long-term impact assessments (until 2050) uses the growth benchmark in the E3ME model, which is a model trajectory to compare the impact of policies between the WEM+ scenario (i.e. developments in macroeconomic aggregates without the impact of Fit for 55 policies) and WAM3 (i.e. developments in macro-economic aggregates with the impact of Fit for 55 policies, i.e. the revision of the EU ETS and other regulatory measures at EU level, taking into account the model of the use of revenues from emissions trading – see chapter 5.

Table 52: *Expected evolution of key macroeconomic indicators*

GDP – uses at constant prices – annual

chain-linked volumes, reference year 2015

Source: CZECH STATISTICAL OFFICE. Calculations and predictions of the Ministry of Finance of the Czech Republic.

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
								Prediction	*editing*	*Outlook*	*Outlook*
Gross domestic product	*billion 2 015 CZK*	**4 988**	**5 148**	**5 304**	**5 013**	**5 191**	**5 313**	**5 305**	**5 428**	**5 560**	**5 688**
	growth in %	5,2	3,2	3,0	—	3,6	2,	—	2,3	2,4	2,3
	growth in % (1)	5,3	3,2	3,0	—	3,5	2,	0,0	2,2	2,5	2,4
Household consumption expenditure	*billion 2 015 CZK*	**2 355**	**2 438**	**2 504**	**2 322**	**2 418**	**2 401**	**2 318**	**2 409**	**2 497**	**2 565**
	growth in %	4,0	3,5	2,7	—	4,1	—0,7	—	3,9	3,7	2,7
Government consumption expenditure	*billion 2 015 CZK*	**913**	**949**	**973**	**1 014**	**1 027**	**1 033**	**1 058**	**1 076**	**1 098**	**1 120**
	growth in %	1,8	3,9	2,5	4,2	1,4	0,	2,4	1,8	2,0	2,0
Gross capital formation	*billion 2 015 CZK*	**1 323**	**1 425**	**1 489**	**1 351**	**1 609**	**1 699**	**1 621**	**1 560**	**1 532**	**1 542**
	growth in %	6,5	7,7	4,5	—	19,1	5,	—	—3,8	—1,8	0,7
Fixed capital	*billion 2 015 CZK*	1 248	1 374	1 455	1 368	1 379	1 420	1 432	1 443	1 470	1 501
	growth in %	4,9	10,0	5,9	—	0,8	3,	0,8	0,7	1,9	2,1
Changes in inventories and valuables	*billion 2 015 CZK*	75	51	34	—	230	279	189	117	62	41
Exports of goods and services	*billion 2 015 CZK*	**4 168**	**4 322**	**4 386**	**4 034**	**4 312**	**4 623**	**4 823**	**5 045**	**5 250**	**5 414**
	growth in %	7,2	3,7	1,5	—	6,9	7,	4,3	4,6	4,1	3,1
Imports of goods and services	*billion 2 015 CZK*	**3 771**	**3 989**	**4 051**	**3 719**	**4 214**	**4 479**	**4 531**	**4 664**	**4 811**	**4 943**
	growth in %	6,3	5,8	1,5	—	13,3	6,	1,2	2,9	3,2	2,7
Gross domestic expenditure	*billion 2 015 CZK*	**4 592**	**4 811**	**4 964**	**4 693**	**5 053**	**5 131**	**4 997**	**5 049**	**5 134**	**5 235**
	growth in %	4,3	4,8	3,2	—	7,7	1,	—	1,0	1,7	2,0
Methodological Discretion	*billion 2 015 CZK*	—1	3	3	10	38	36	15	2	—5	—9
Real gross domestic income	*billion 2 015 CZK*	**4 988**	**5 149**	**5 324**	**5 083**	**5 259**	**5 232**	**5 297**	**5 426**	**5 559**	**5 688**
	growth in %	4,3	3,2	3,4	—	3,4	—	1,2	2,4	2,4	2,3
Contributions to GDP growth											
Gross domestic expenditure	*p. b.*	**3,9**	**4,4**	**3,0**	—	**7,2**	**1,5**	**—2,6**	**1,0**	**1,6**	**1,8**
Final consumption	*p. b.*	**2,3**	**2,4**	**1,8**	—	**2,2**	—	**—1,1**	**2,1**	**2,1**	**1,7**
Expenditure of households	*p. b.*	1,9	1,7	1,3	—	1,9	—	—1,6	1,8	1,7	1,3

95 https://www.mfcr.cz/cs/rozpoctova-politika/makroekonomika/makroekonomicka-predictions/2023/Macroeconomic-predication-August-2023-52667

Government expenditure	p. b.	0,3	0,7	0,5	0,8	0,3	0,1	0,5	0,4	0,4	0,4
Gross capital formation	p. b.	**1,7**	**2,0**	**1,2**	—	**5,0**	**1,7**	**—1,5**	**—1,1**	**—0,5**	**0,2**
Fixed capital formation	p. b.	1,2	2,5	1,6	—	0,2	0,8	0,2	0,2	0,5	0,5
Change in inventories	p. b.	0,5	—	—0.3	—	4,8	0,9	—1,7	—1,3	—1,0	—0,4
External trade balance	p. b.	**1,2**	—	**0,0**	—	**—3,6**	**0,9**	**2,4**	**1,3**	**0,8**	**0,5**
Balance of goods	p. b.	0,9	—	0,4	—	—3,6	1,4	2,4	1,2	0,8	0,4
Balance of services	p. b.	0,3	—	—0,4	—	0,0	—	0,0	0,2	0,1	0,1
Gross added-value	billion 2 015 CZK	**4 491**	**4 644**	**4 784**	**4 532**	**4 687**	**4 797**	.	.	.	.
	growth in %	5,2	3,4	3,0	—	3,4	2,3	.	.	.	.
Balance of taxes and subsidies on products	billion 2 015 CZK	**497**	**504**	**521**	**480**	**504**	**516**	.	.	.	.

(1) From seasonality and working day-adjusted data

ii. Sectoral changes expected to impact the energy system and GHG emissions

The changes in sectors that could have an impact on the energy sector and greenhouse gas emissions are detailed in the relevant chapters of this document and the analytical annexes.

iii. Global energy trends, international fossil fuel prices, EU ETS carbon price

4.1.1.3 Global energy trends

Recent trends in the world energy sector

This chapter builds on the 2020 National Plan and will be updated, as appropriate, as part of the finalisation of the update of this document.

Global energy demand grew by 2.1 % in 2017, according to preliminary estimates by the IEA96, more than double the growth in 2016. Global energy demand in 2017 was estimated at 14050 million tonnes of oil equivalent (Mtoe), compared to 10035 Mtoe in 2000.

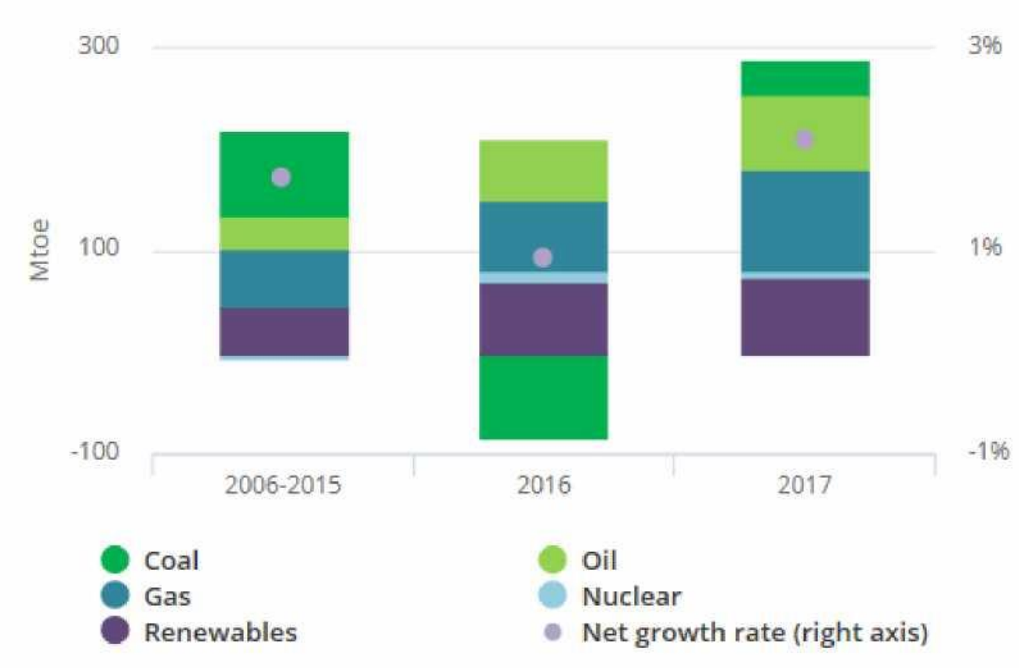
Fossil fuels covered more than 70 % of the increase in energy demand worldwide. Natural gas demand grew most, reaching a record share of 22 % of total energy demand. Renewable energy sources also experienced relatively strong growth, accounting for around a quarter of global growth in energy demand, while nuclear energy accounted for the rest of this growth. The global share of fossil fuels in global energy demand remained at 81 % in 2017, a level that has remained stable for over three decades despite strong growth in renewables.

Improving the energy efficiency of the world's energy sector has slowed down. The rate of decline in global energy intensity, defined as energy consumption per unit of economic output, decreased to only 1.7 % in 2017, well below the annual increase of 2.0 % achieved in 2016.

Growth in global energy demand was concentrated mainly in Asia, while China and India together accounted for more than 40 % of the total increase in demand. Energy demand in all advanced economies contributed more than 20 % to global growth in energy demand, although their share of total energy consumption continued to decline. The countries of South East Asia (8 % of the world's energy demand growth) and Africa (6 %) also recorded remarkable growth, although energy consumption per capita in these regions remains below the world average.

Graph 24: *Average annual growth in world energy demand broken down by fuel*

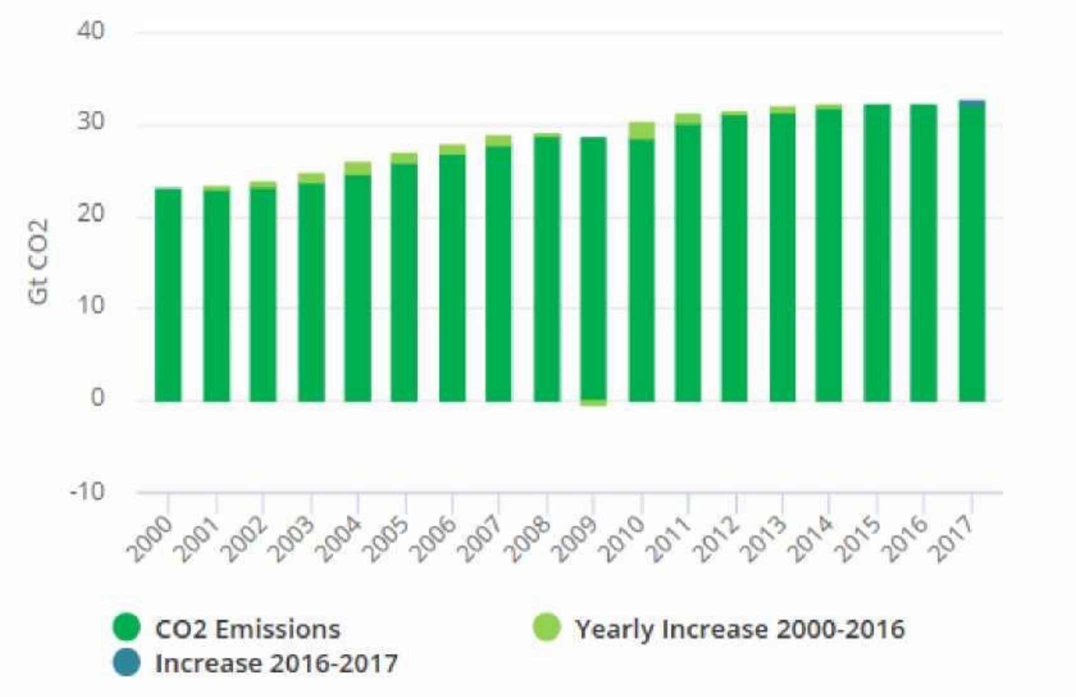
96 Recent trends in the world energy sector have been drawn from information from the International Energy Agency (IEA), namely the publication "Global Energy & CO2 Status Report", available online at https://www.iea.org/geco/.



Source: International Energy Agency; Global Energy & CO2 Status Report (online)

Global CO2 emissionsrelated to energy conversion grew by 1.4 % in 2017, reaching a historic peak of 32.5 billion tonnes, a resumption of growth after three years of relative stagnation. However, the increase inCO2 emissions was not universal. While most major economies have seen an increase, some others experienced declines, including the United States, the United Kingdom, Mexico and Japan. The United States recorded the largest decline, mainly due to increased use of renewables.

Graph 25: *World CO2 emissions related to energy conversion*

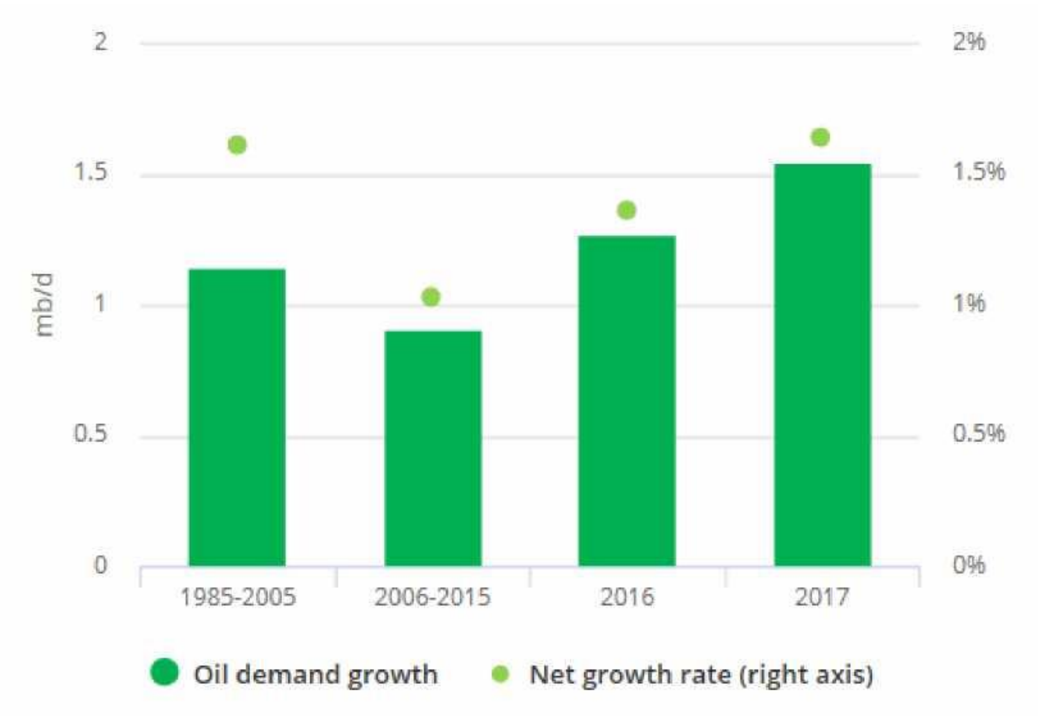


Source: International Energy Agency; Global Energy & CO2 Status Report (online)

World demand for oil grew by 1.6 % in 2017 (or 1.5 million barrels per day), which is much higher than the average growth rate of 1 % over the last decade. The increasing share of sport commercial vehicles (SUVs) and light trucks in large economies and demand in the petrochemical sector were the main drivers of this growth.97

97In this regard, it is useful to mention the phenomenon of plastic shift linked to increased knowledge of global negative environmental impacts, which can potentially affect oil consumption in the petrochemical sector.

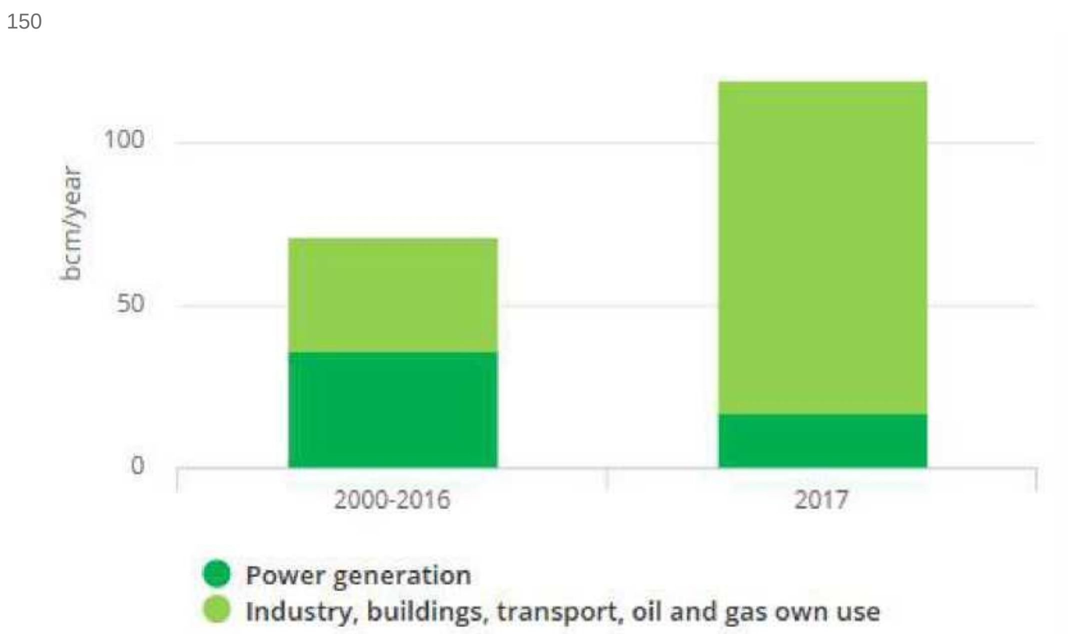
Graph 26: *Average annual growth in demand for oil*



Source: International Energy Agency; Global Energy & CO2 Status Report (online)

Global demand for natural gas grew by 3 %, largely due to relatively large supply and relatively low costs. China alone was responsible for almost 30 % of global growth. In the past decade, half of the global gas demand growth came from the energy sector; however, last year, more than 80 % of the increase came from the industrial and building sectors.

Graph 27: *Average annual growth in natural gas demand*



Source: International Energy Agency; Global Energy & CO2 Status Report (online)

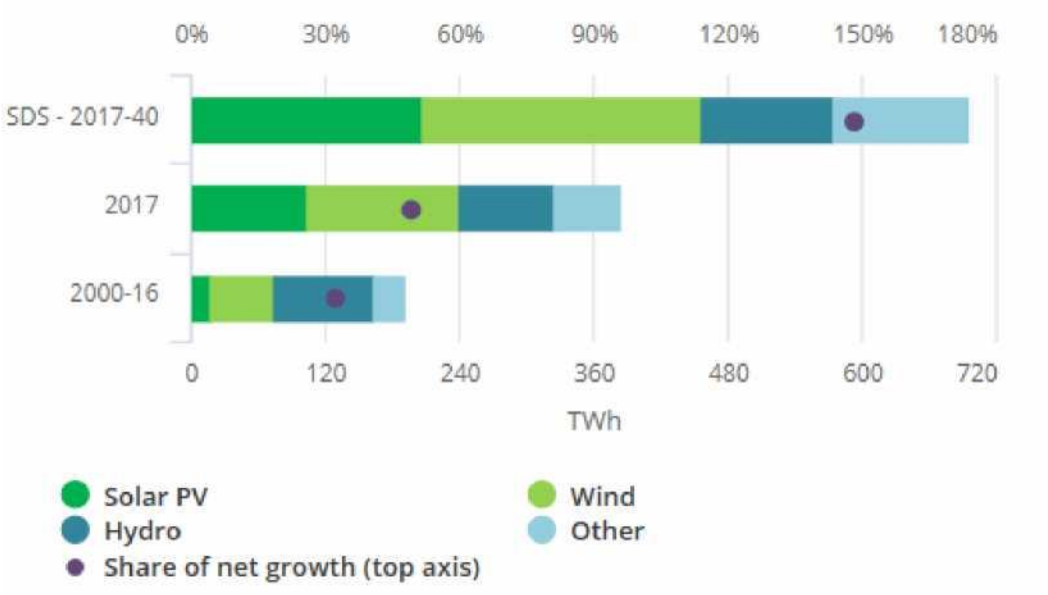
Global demand for coal increased by 1 % in 2017, reversing the downward trend observed over the last two years. This growth was mainly driven by demand in Asia, which was almost entirely due to the increase in coal-fired electricity generation.

Figure 28: *Average annual growth in demand for coal*

Source: International Energy Agency; Global Energy & CO2 Status Report (online)

Renewables recorded the highest growth rate from all energy sources in 2017, covering a quarter of the world's energy demand growth. China and the United States have led to this unprecedented growth and contributed to around 50 % of the increase in renewable electricity generation, followed by the European Union, India and Japan. Wind energy accounted for 36 % of renewable output growth.

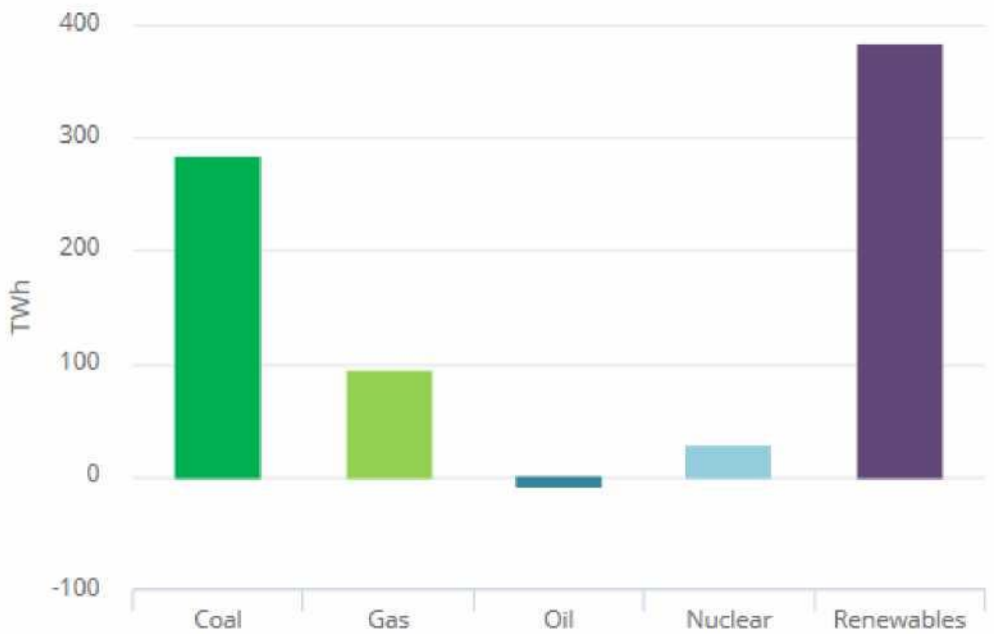
Figure 29: *Average annual growth of world RES output (including comparison with SDS scenario)*



Source: International Energy Agency; Global Energy & CO2 Status Report (online)

Global electricity demand grew by 3.1 % in 2017, well above the overall increase in energy demand. China and India together accounted for around 70 % of this growth. Electricity production from nuclear power plants increased by 26 TWh in 2017 as a relatively large number of new nuclear capacities were launched.

Figure 30: *Change in the production mix of electricity by fuel between 2016/2017*



Source: International Energy Agency; Global Energy & CO2 Status Report (online)

Global energy efficiency gains slowed down dramatically in 2017, mainly due to policy inadequacy as well as relatively low prices for basic energy commodities. Global energy intensity improved by only 1.7 % in 2017 and 2.3 % on average over the last three years.

Graf č. 31: *Průměrná meziroční změny energetické intenzity ((včetně srovnání se scénářem SDS)*

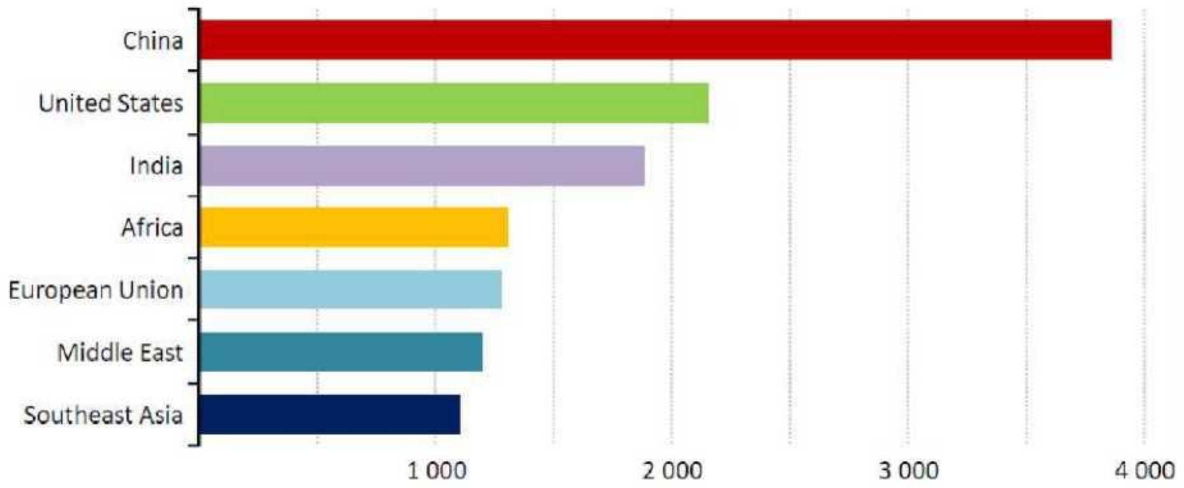
Source: International Energy Agency; Global Energy & CO2 Status Report (online)

World Energy Outlook

According to the IEA baseline scenario,98 increasing incomes and population growth of around 1.7 billion people, mostly in urban areas in emerging economies, will lead to an increase in global energy demand by more than a quarter by 2040. The increase in global demand would then be about twice as high as the absence of gradual improvements in energy efficiency, which is a strong policy instrument to address concerns with a view to ensuring energy security and sustainability. Almost all of the additional demand growth comes from India-led emerging economies. In 2000, Europe and North America accounted for more than 40 % of global energy demand and emerging economies in Asia around 20 %. By 2040, it is foreseeable that these shares will be reversed.

Figure 32: *World energy demand by country according to WEO 2018 (IEA) in Mtoe*

98The World Energy Outlook was drawn from information from the International Energy Agency (IEA), namely the World Energy Outlook 2018. The baseline is the 'New Policy Scenario' scenario.



Source: International Energy Outlook (WEO 2018)

The significant shift in energy consumption to Asia is reflected in all fuels and technologies, as well as energy investment. Asia is expected to account for up to half of global gas growth, 60 % of the increase in wind and solar panels, more than 80 % of the increase in oil consumption and more than 100 % of the increase in coal consumption and the use of nuclear energy (taking into account the decline in other regions).

The international energy sector is transformed in different ways due to the shift in supply, demand and technological trends. International energy trade flows are increasingly channelled to the Asia region, from the Middle East, Russia, Canada, Brazil and the United States. This is illustrated, inter alia, by the fact that Asia's share of global oil and gas trade is expected to rise from about half to more than two thirds by 2040. New ways of transforming energy are also visible at regional level, as digitalisation and increasingly cost-efficient renewable energy technologies make it possible to use distributed and community-based energy supply models.

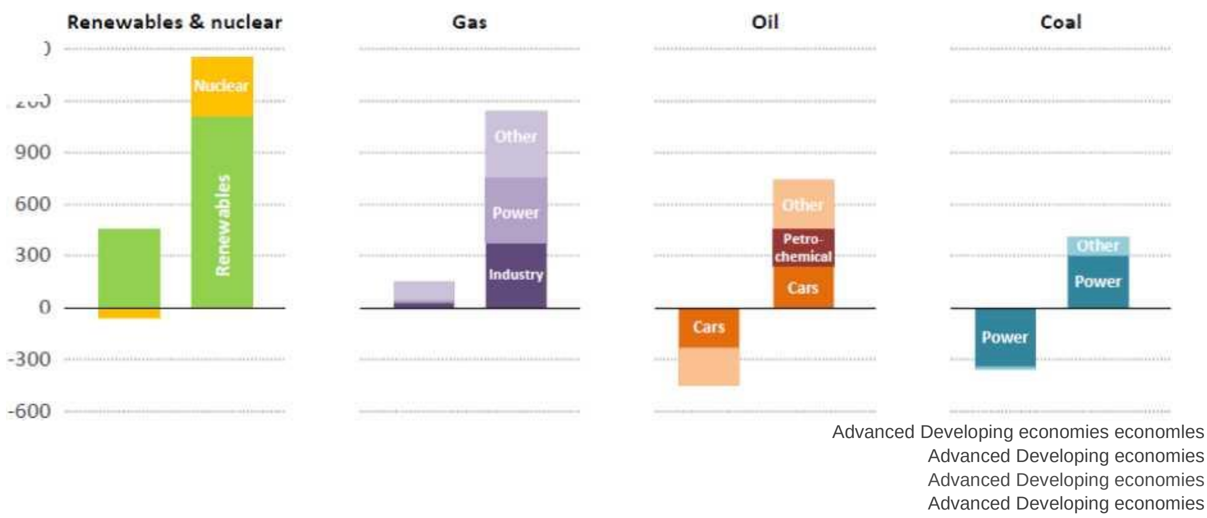
The electricity sector has been undergoing its most dramatic transformation since its inception around a hundred years ago. Electricity is increasingly the preferred fuel in economies, which are rather based on "lighter" industries, services and digital technologies. The share of the electricity sector in global final consumption is currently close to 20 % and can be expected to develop further. Promoting policies and reducing technology costs are leading to the rapid growth of variable renewables, making the energy sector a frontrunner in emission reduction efforts. However, it is crucial to ensure that the whole system functions in a way that ensures a reliable supply in the future.

The use of coal saw a year-on-year increase in 2017, after two years of decline, but final investment decisions for new coal-fired power plants were well below the levels observed in recent years. Once the current wave of construction of coal-fired power plants ends, the flow of new coal-fired power plants will slow down after 2020. However, it is too early to depreciate coal from the global energy mix: the average age of coal-fired power plants in Asia is under 15 years, compared to around 40 years in developed economies. The industrial use of coal, showing a slight increase until 2040, is likely to show relative stagnation in world consumption, while the decline in use in China, Europe and North America will be offset by an increase in use in India and South-East Asia.

Figure 33: *Changes in world fuel demand according to WEO 2018 (IEA) in Mtoe*

1 500

1 200



Source: International Energy Outlook (WEO 2018)

The use of oil in road transport is expected to peak around mid-2020. However, the use of oil in petrochemicals, cargo, aviation and shipping will still contribute to the overall growth in oil demand. The reduction in consumption in the conventional fleet due to increased propulsion efficiency will result in a three times higher demand reduction compared to 3 million barrels per day (mb/d), which will be replaced approximately. 300 million electric cars in road transport in 2040. However, the pace of change and fuel switching in the transport sector, which accounts for around a quarter of total oil demand, is not accompanied by equally rapid changes in other sectors. The industrial sector of petrochemicals is expected to be the largest source of growth in oil use. Assuming that the overall recycling rate of plastics would double, demand would only fall at about 1.5 mb/d out of the total projected increase of more than 5 mb/d by 2040. Overall oil demand growth to 106 mb/d in 2040 under the New Policies Scenario scenario comes almost exclusively from emerging economies.

Natural gas is expected to be “overridden” around 2030 of coal consumption and become the second largest fuel in the global energy mix. Industrial consumers will be the largest part of the 40 % increase in natural gas consumption. LNG gas trade will more than double by 2040, in particular in response to growing demand from emerging economies at the forefront of China. Russia remains the world’s largest exporter of gas, also due to its expansion to Asian markets, but an increasingly integrated European energy market gives buyers more gas supply options. A higher share of wind and photovoltaic power plants reduces the capacity utilisation of gas-fired power plants in Europe and the modernisation of existing buildings also helps to reduce gas consumption for heating. However, gas infrastructure still plays a crucial role, in particular in ensuring the demand for heat in the winter months and ensuring uninterrupted electricity supply.

4.1.1.4 Historical developments in international oil, coal and gas prices

This chapter builds on the 2020 National Plan and will be updated, as appropriate, as part of the finalisation of the update of this document.

Historical evolution of oil price

The period from around mid-2015 to the end of 2017 was marked by relatively low oil prices of 40-50 USD/bbl, and at the beginning of 2016, prices were very low, up to USD 30/bbl. The period of low prices was due to a number of factors, but a significant increase in unconventional oil production in the United States is identified as an important factor in this respect. A gradual increase in prices started in the fourth quarter of 2017, driven by relatively high growth in demand, but also due to other factors such as the decline in production due to the geopolitical situation (for example, a decrease in production in Venezuela can be mentioned in this respect). The future evolution of oil prices is very difficult to estimate and, for example, according to the International Energy Agency, it is necessary to prepare for a period of increased volatility in international prices. Indeed, despite a significant increase in output in the United States, there is a relatively significant increase in demand, which already stands at almost 100 million barrels per day (3rd quarter of 2018) and is driven mainly by the consumption of Asian states. Investment in oil prospection and production has been at very low levels for several years and there is a risk of under-production in the medium term (around 5 years), which may imply a period of relatively high oil prices. A more detailed analysis and description of historical oil prices goes beyond this material and is closely monitored by specialised bodies and organisations such as the International Energy Agency (the Czech Republic has been a member of the International Energy Agency since 2001). On the basis of the task arising from the State Energy Concept approved in 2015, the Ministry of Industry and Trade prepares annually a report on energy developments in the field of oil and petroleum products, including historical price developments.

Figure 34: *Historical oil price developments (North Sea Brent FOB oil prices)*

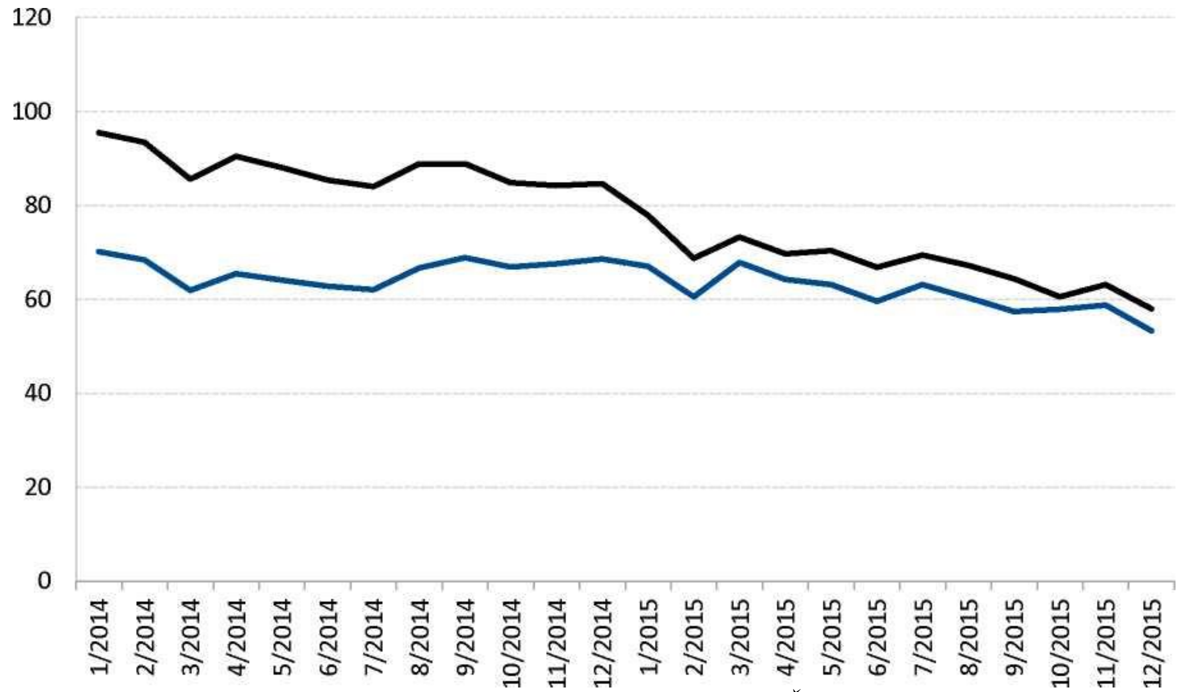
Source: U.S. Energy Information Administration

Historical evolution of the price of coal

World prices for hard coal, both contractual and spot, have traditionally been mainly driven by US and Australian coal prices. In recent years, coal prices in North-West European ports reached their peak in summer 2008, before weakening significantly in the context of the emerging global economic crisis. The gradual increase in prices resumes in 2010 and is around a relatively high level of USD 120-130 per tonne in mid-2011. The long-term peak reached USD 139,05 per tonne in January 2011. However, already in the second half of the same year, a fall to around USD 100/t has already occurred during the second half of the same year in the context of an unusually moderate winter. In 2013 and 2014, the prices of power coal were volatile, but were characterised by a downward trend. For example, in 2013, the price of cif power coal in North-West European ports was the highest in March, at USD 105,11 and EUR 81.08 respectively, the lowest in July – USD 85.26 and EUR 65.18 respectively. The euro prices fell by almost

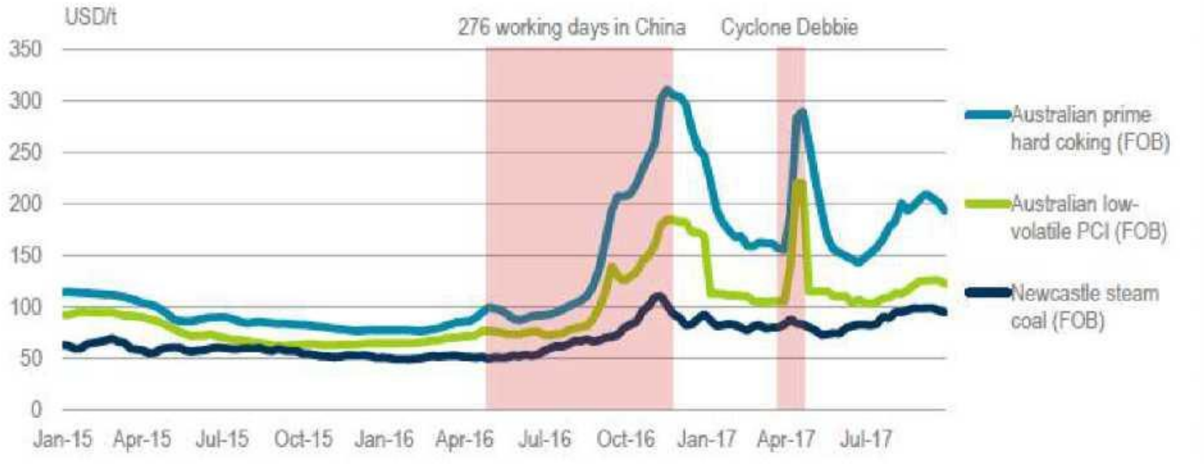
EUR 10 to EUR 71.50 per tonne in April. 2013 concluded an average price of USD 97.07 per tonne in December and/or EUR 70.83/tonne. 2014 kick off the January price of USD 95.48/t and EUR 70.16/tonne. In both cases, this is the peak of the year as it is followed by price depression, e.g. USD 84.02/t and/or EUR 67.92 per tonne in March. 2014 closed average prices of USD 84.62/tonne and EUR 68.63 per tonne in December. In 2015, the price of power coal fell further to USD 45/tonne at the end of the year.

Graph 35: *Historical evolution of the price of hard coal (USD/tonne)*



Source: Minerals in the Czech Republic (ČGS); Euracoal Market report (2016)

Figure 36: *Historical evolution of coal prices 2015-2017 (USD/t)*

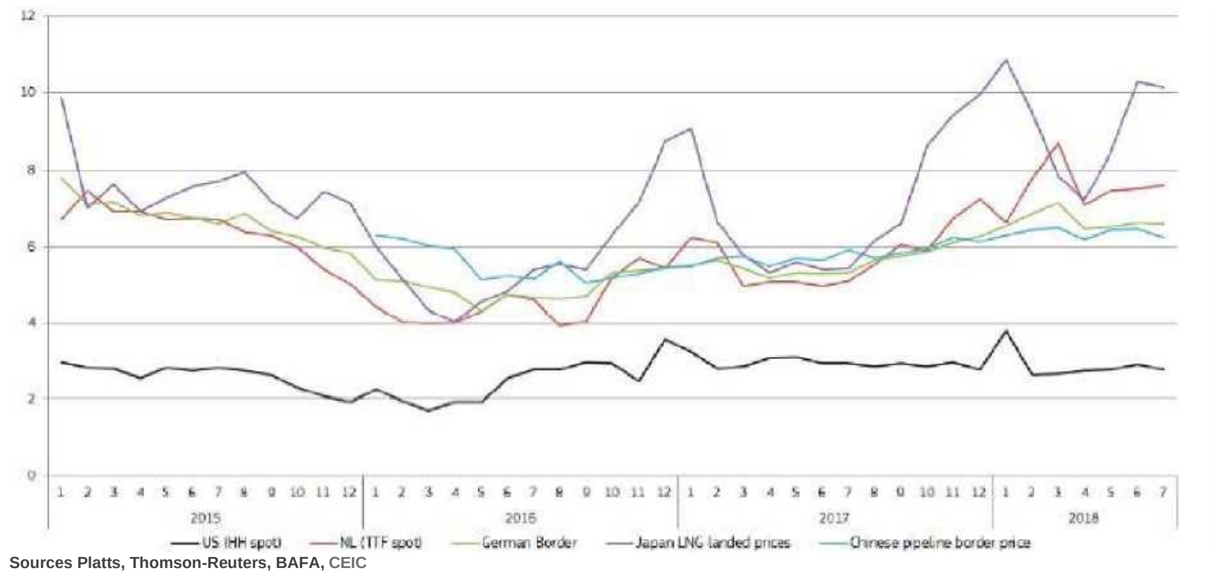


Source: Coal 2017 – Analysis and Forecastst to 2022 (IEA); IHS Energy (2017)

Historical evolution of the price of natural gas

Graph 37 shows an international comparison of wholesale gas prices. International gas prices have converged over the last few years. However, this trend was interrupted during the last two winter periods (2016-2017 and 2017-2018), when Asian prices showed a sharp increase due to strong seasonal demand. European and US prices have also increased, but to a lesser extent, leading to a widening gap between regional prices.

Graph 37: *International comparison of gas prices per region (USD/mmbtu)*



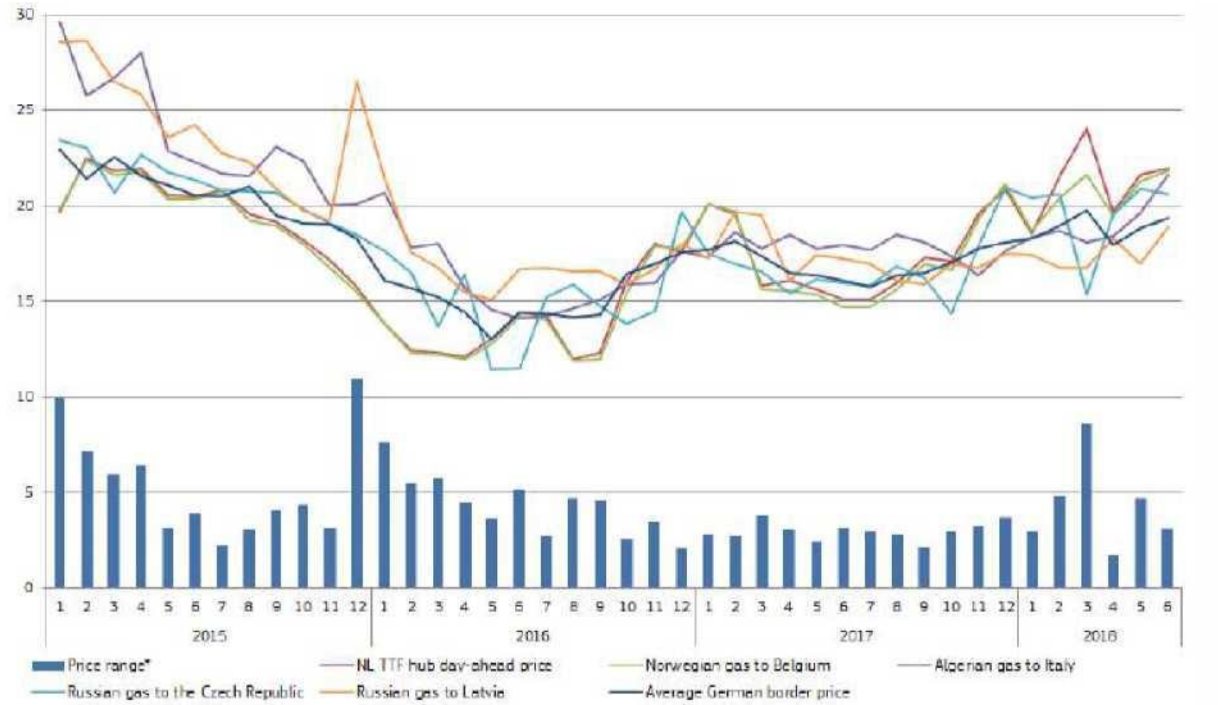
Source: Quarterly Report on European Gas Markets (volume 11, issue 2, second quarter of 2018)

Graph 38 compares the selection of estimated border prices for gas supplies from the main EU exporters: Russia, Norway and Algeria. The evolution of daily prices within the Dutch gas hub TTF is also presented for comparison.

There has been gradual price convergence over the last three years, driven by markedly falling oil prices in the second half of 2014 and 2015 with a delayed impact on oil-indexed prices. A greater focus on demand- and supply-driven pricing within the hub (in contrast to price formation based on oil price indexation) has also contributed to partial price convergence.

Typically, in 2015-2016, the indexed prices of Russian gas to Latvia and Algerian gas were higher than prices based on pricing within the mushroom, but this difference practically disappeared in 2017. In the second half of the year, prices derived from demand and supply within the hub started to rise, while the prices of indexed oil stabilised or even decreased. As a result, in November/December 2017, prices derived from indexation to oil prices were lower than those indexed to mushrooms. In the first quarter of 2018, 'hub' prices increased significantly, particularly in March due to low temperatures. Prices indexed to oil prices have remained relatively stable as the delayed impact of oil price increases on global markets has not yet materialised.

Graph 38*: Comparison of intra-EU wholesale price estimates (EUR/MWh)*



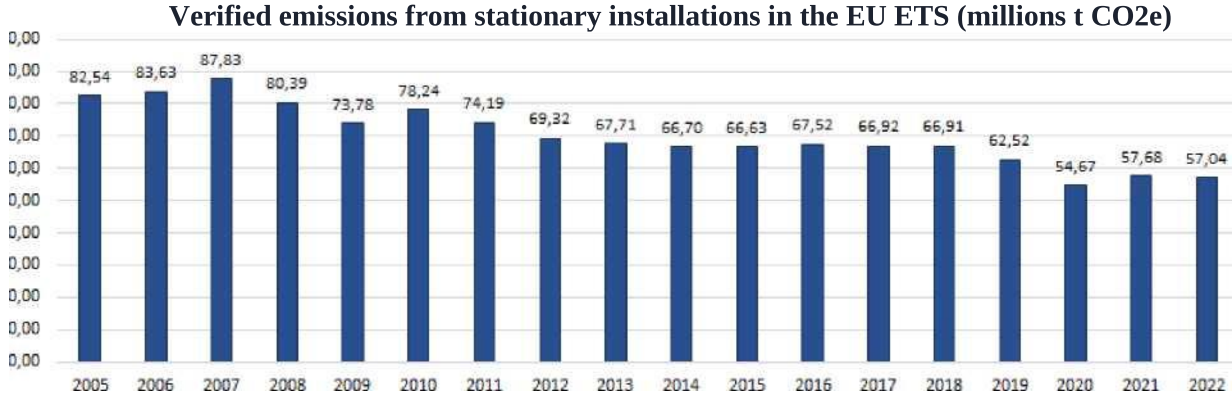
Source: Eurostat COMEXT and European Commission estimations, BAFA, Platts
*The difference between the highest and lowest price depicted on the graph
Note: Border prices are estimations of prices of piped gas imports paid at the border of the importing country, based on information collected by customs agencies, and are deemed to be representative of long-term contracts.

Source: Quarterly Report on European Gas Markets (volume 11, issue 2, second quarter of 2018)

4.1.1.5 Carbon price in the Emissions Trading System

The European Emissions Trading System (EU ETS) is a key instrument of EU climate policy as it covers almost half of all EU emissions (or 36 % according to the two most recent EC reports on the functioning of the EU ETS of October 2021 and December 2022). Trade in allowances is therefore one of the means to meet the current target of reducing GHG emissions in the EU by at least 40 % compared to 1990, which means a 43 % reduction in emissions for sectors in the EU ETS compared to 2005. The system includes emissions of carbon dioxide (CO_2), nitrous oxide (N_2O) and perfluorocarbons (PFCs). Subsequently, the ambition of reducing greenhouse gas emissions by at least 55 % compared to 1990 has increased, which means for sectors in the EU ETS to reduce emissions by 62 % compared to 2005 in ETS1 and 43 % in ETS2 (the relevant EU legislation has led to an extension of the EU ETS).

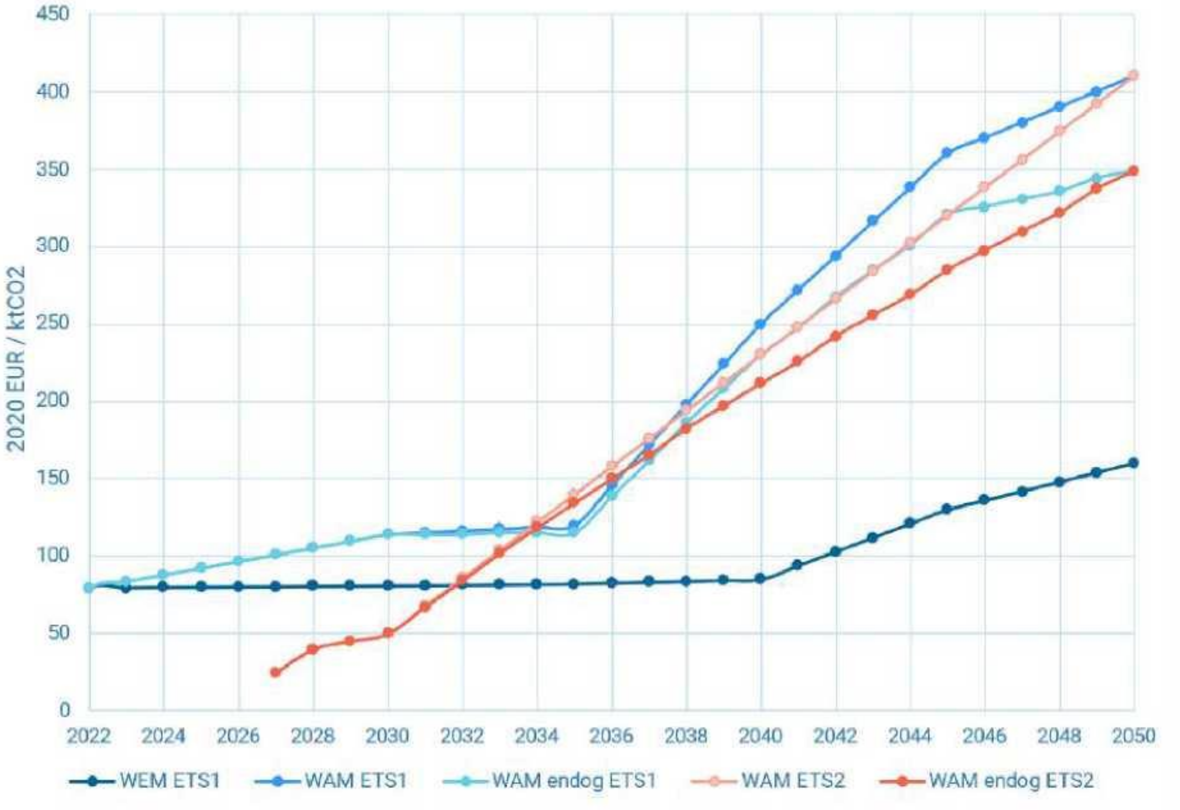
Figure 39: *Verified emissions from stationary installations in the EU ETS (millions t CO2eq.)*



The original set-up of the system envisaged emission allowance prices (EUA) that would incentivise emission reductions, but their prices were too low in the long term and did not encourage producers to reduce emissions. The low prices were due to a high surplus of allowances on the market from previous periods. This was due to the unestimated allocation needed in the first period, the drop in industrial production as a result of the economic recession, the stagnation or the fall in electricity as a result of austerity measures, and massive support, in particular, for renewables at the expense of fossil fuels.

In December 2017, there was a consensus on European legislation dealing with the trading of emission allowances. The main changes agreed include: (I) faster decrease in the quantity of allowances (LRF 2.2 %); (II) stricter 'market stability reserve' (24 % levy, as of 2024 cancellation); (III) strengthening benchmarks; (IV) more measures against carbon leakage; (v) new financial mechanisms (funds, derogations). On 27 September 2018, the European ETS legislation for the period 2021-2030 was officially approved. A revised version of the EU ETS legislation was adopted in 2023, reflecting an increase in ambition in terms of reducing greenhouse gas emissions by at least 55 % compared to 1990 (in line with the overall target).

Figure 40: *Considered evolution of the emission allowance price (ktCO2ev)*



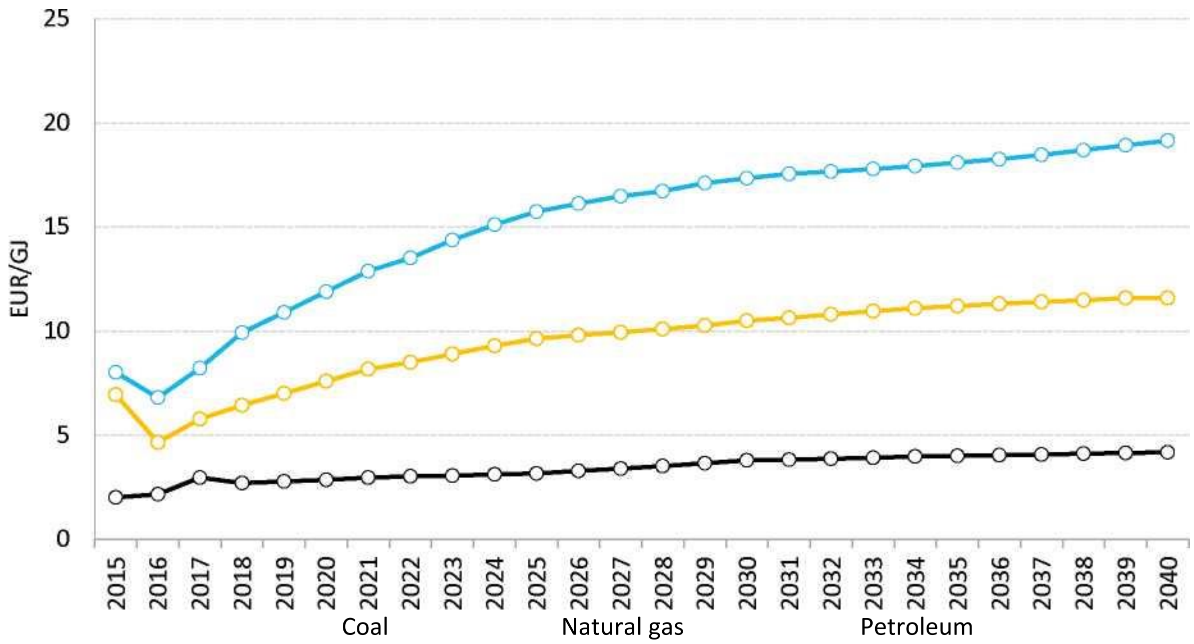
Source: SEEPIA outputs

4.1.1.6 Prices of internationally traded fuels

This chapter builds on the 2020 National Plan and will be updated, as appropriate, as part of the finalisation of the update of this document.

Graph 41 shows the outlook for the prices of inter-nationally traded fuels (i.e. coal, natural gas and oil) drawn from the recommended parameters for the preparation of the national plan by the European Commission. Comparable assumptions in this regard are intended to ensure better comparability of the national plans of each Member State. The tables in Annex 3 to this document provide more detailed information on the outlooks presented in the chart. As these are prospects for fuels that had been drawn up some time ago, these forecasts have been corrected by the European Commission. Despite this, it should be noted that the outlook for the prices of internationally traded fuels is subject to significant uncertainty, not least in view of the horizon of this prediction.

Figure 41: *International fuel price outlook with adjustment in 2015-2024*



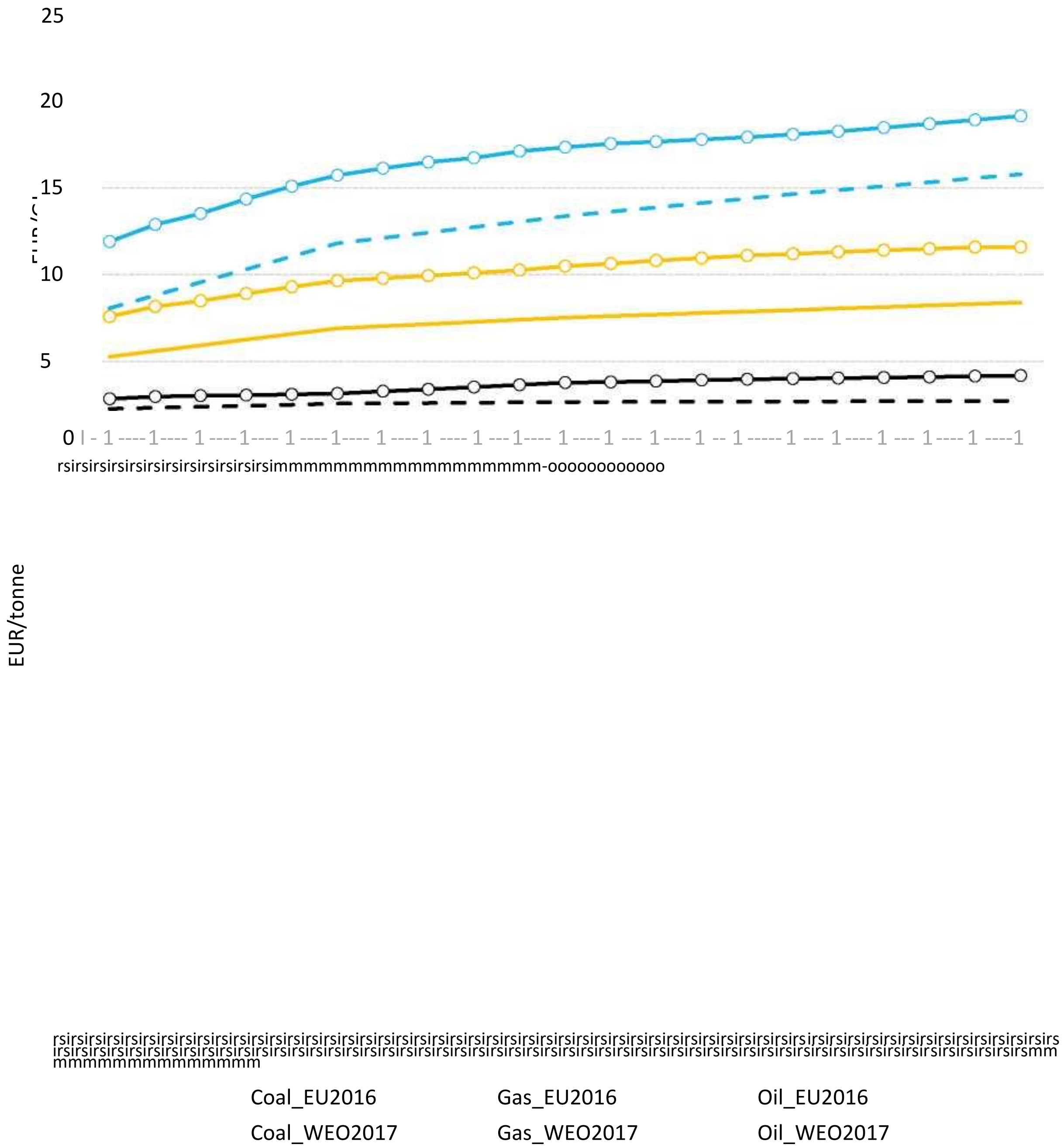
Source: Recommended parameters for the preparation of the National Plan (August 2018)

4.1.1.7 Evolution of power electricity prices depending on input assumptions

This chapter builds on the 2020 National Plan and will be updated, as appropriate, as part of the finalisation of the update of this document.

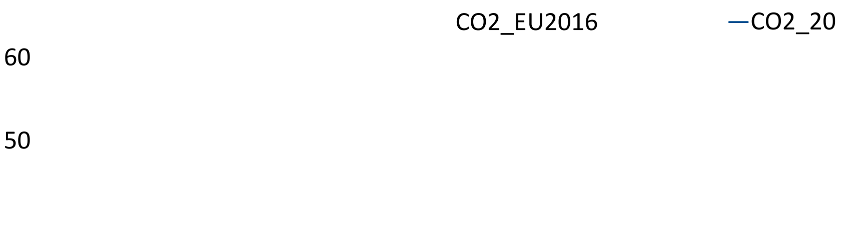
On the basis of the input assumptions for the underlying funds (in particular the prices of internationally traded energy commodities), a pan-European model has created a power price outlook, which is further fed into energy modelling and from which, for example, the costs of future support for renewables are derived in more detail. The outlook is then revised in a variant, which takes into account the potential uncertainty of future developments. An alternative price source for internationally traded energy commodities (coal, gas, oil) based on the resources of the International Energy Agency (namely the 2017 World Energy Outlook) is used for comparison.

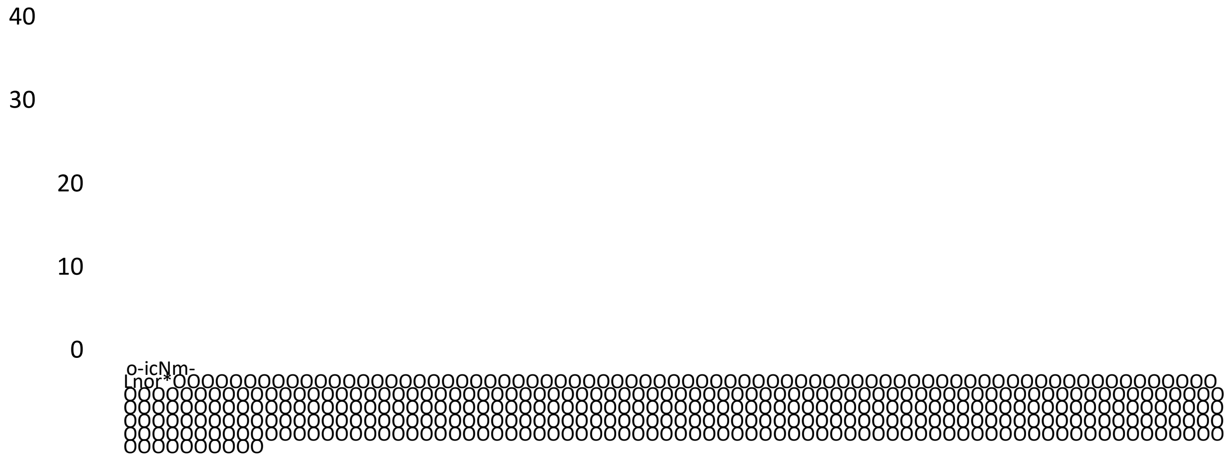
Figure 42: *Base fuel price outlook*



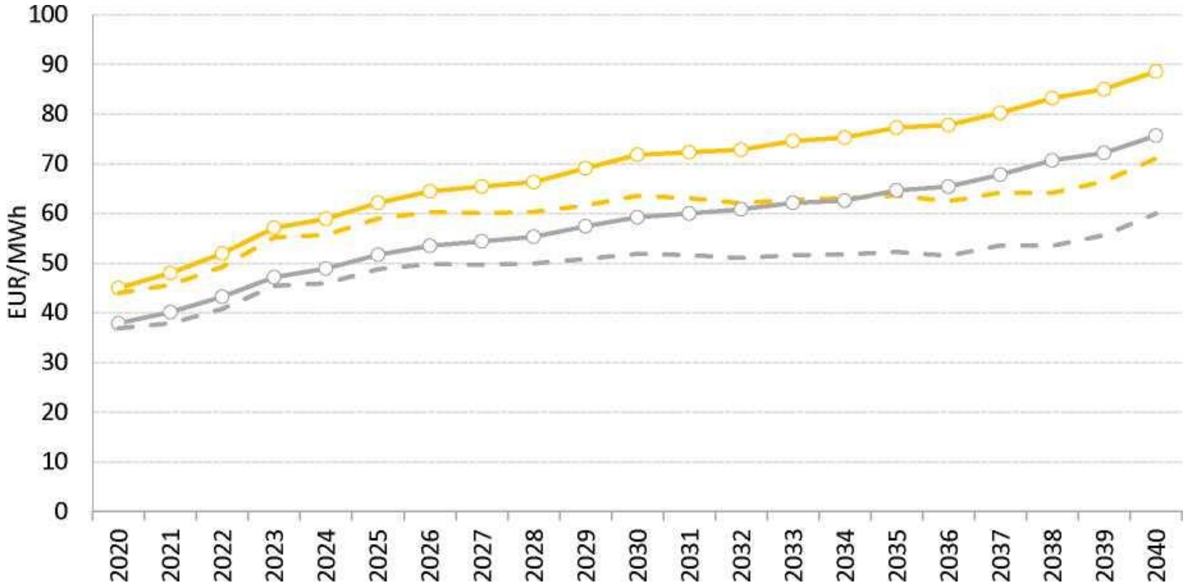
Source: Self-analysis based on PLEXOS

No 43: *Scenarios for the evolution of the price of emission allowances*





Source: Own analysis based on assumptions for the development of the national plan



Graph 44: *Evolution of the price of power electricity at the allowance price based on EU 2016 assumptions*

Source: Self-analysis based on PLEXOS

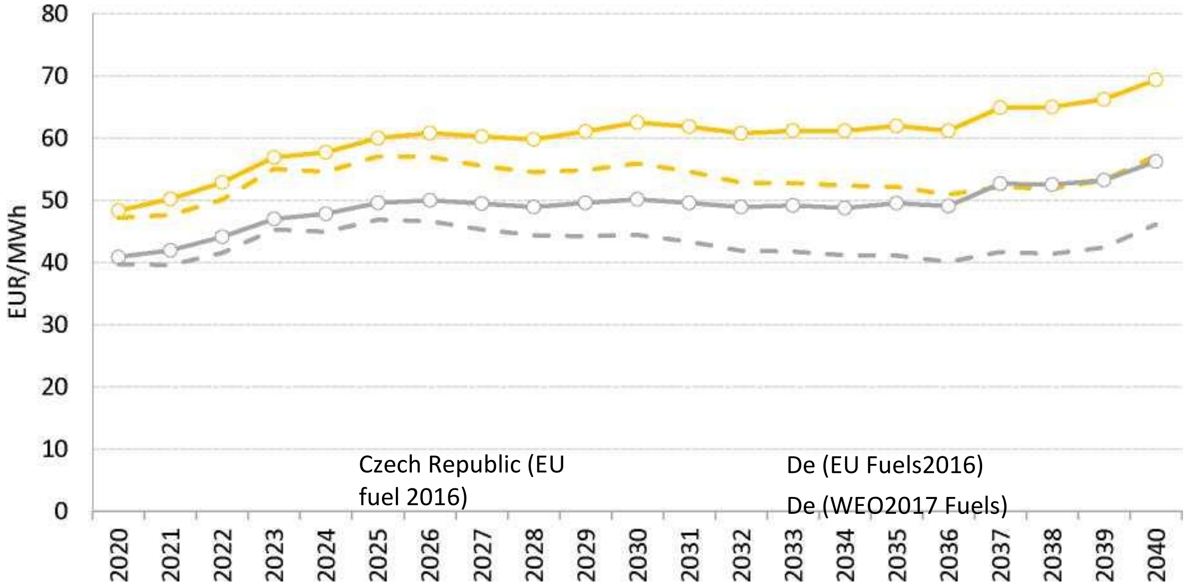


Figure 45: *Evolution of the price of power electricity at the allowance price of EUR 20/tonne*

Czech Republic (EU fuel 2016)
De (EU Fuels2016)
De (WEO2017 Fuels)

Source: Self-analysis based on PLEXOS

IV. Technology cost developments

In view of the developmental changes in technology costs, the information provided by the European Commission for the preparation of this document has been used to the maximum extent possible, based on the so-called EU Reference Scenario 2016. Those assumptions are not mentioned here in the tabular form or in the graphic form because of the size of that material. In the absence of data and for verification purposes, national analyses were used, in particular the expected long-term balance between the supply and demand of gas, which is processed annually by the electricity and gas market operator OTE, a.s.

Dimension "Carbon emission reduction"

4.2.1 GHG emissions and removals

1. Trends in current greenhouse gas emissions and removals in the trading system emissions, effort-sharing and LULUCF and individual energy sectors

As one of the parties to the United Nations Framework Convention on Climate Change, the Czech Republic has an obligation to prepare and regularly update a national inventory of reporting greenhouse gas emissions and sinks. In addition, membership of the European Union gives rise to additional requirements for the Czech Republic, such as fulfilling the obligations specified in Article 26 of Regulation (EU) 2018/1999. The results of the national inventory report below present the level of greenhouse gas emissions for the 1990 to 2021 series. The inventory of greenhouse gas emissions and sinks has been prepared in accordance with the Intergovernmental Panel on Climate Change Methodological Guidance: IPCC 2006 Guidelines (IPCC 2006).

According to data from the latest available inventory of greenhouse gas emissions and sinks, greenhouse gas emissions in the Czech Republic decreased by 33.70 % between 1990[99] and 2021, with LULUCF accounting and 40.70 % excluding LULUCF. The energy sector accounts for the largest share (70 %) of total emissions, of which 97 % are related to fuel combustion. Table 53, Table 54 and Chart 46 shows the evolution of greenhouse gas emissions and sinks in this period, broken down by individual greenhouse gas and IPCC sector[100].

99Land use, land use change and forestry
100Intergovernmental Panel on Climate Change

Table 53: *Greenhouse gas emissions 1990-2021 [kt CO_2 eq.]*

	CO_2[1]	CH_4[3]	N2[3]	HFCs	PFCs	NF_3	SF_6	Total[4]	
								WITH LULUCF	No LULUCF
1990	164 250,44	26 870,31	7624,44		NO		86,83	192 141,74	200 727,48
1991	148 883,27	25 470,94	6459,90				86,66	172 694,08	182 629,01
1992	145 705,80	23 518,27	5766,47				88,03	166 603,02	176 672,61
1993	140 124,04	22 981,25	5182,96				89,22	159 291,06	169 978,92
1994	132 668,04	21 570,01	5137,37				90,35	151 612,06	160 995,00
1995	131 622,22	21 206,37	5414,42	86,87	0,01	NO	91,40	150 236,87	159 914,11
1996	135 018,67	21 217,99	5217,96	215,43	0,68	NO	101,32	153 824,14	163 237,28
1997	130 941,62	20 620,17	5221,27	388,92	1,62	NO	99,06	150 223,13	158 687,40
1998	125 608,82	19 708,88	5143,84	529,34	1,54	NO	97,89	144 313,17	152 468,54
1999	116 671,89	18 736,52	4967,55	635,90	1,08	NO	98,88	134 000,80	142 387,89
2000	127 235,99	17 660,61	5372,59	799,77	4,43	NO	111,73	143 224,57	152 392,44
2001	127 144,37	16 997,68	5585,50	997,94	9,15	NO	101,85	142 776,88	151 937,44
2002	123 696,96	16 637,44	5201,96	1098,28	15,17	NO	125,00	139 178,98	148 107,87
2003	127 571,70	16 505,88	4811,80	1211,48	8,36	NO	149,14	142 957,05	151 274,67
2004	128 291,63	15 955,20	5393,34	1327,48	12,41	NO	124,32	143 947,30	152 090,42
2005	125 690,74	16 587,31	5270,18	1346,93	14,38	NO	115,28	141 805,92	150 064,01
2006	126 555,14	16 822,60	5175,02	1586,29	29,02	NO	108,34	144 262,44	151 340,23
2007	128 382,09	16 281,80	5232,51	1943,85	27,20	NO	96,67	146 443,55	152 951,02
2008	122 951,00	16 331,96	5261,22	2202,65	37,05	NO	91,39	140 017,34	147 860,74
2009	114 999,01	15 505,13	4513,51	2221,14	42,14	NO	91,79	130 477,32	138 263,06

2010	117 490,71	15 770,66	4435,97	2438,10	44,34	0,14	85,30	134 001,15	141 156,01
2011	115 201,99	15 673,76	4990,98	2648,54	8,08	0,55	91,36	132 016,41	139 535,68
2012	111 298,44	15 610,99	4898,58	2751,78	6,17	0,83	95,28	127 839,89	135 533,90
2013	106 732,70	14 920,32	4672,49	2880,61	4,18	1,32	85,59	122 997,74	130 079,36
2014	104 256,20	14 912,89	4815,86	3060,06	3,12	2,22	82,36	120 878,77	127 913,14
2015	105 022,27	14 972,21	5173,94	3309,69	2,11	2,01	80,67	122 348,18	129 312,28
2016	106 680,87	14 526,36	5310,70	3528,34	1,78	2,01	81,04	124 770,72	130 878,00
2017	107 776,57	14 288,09	5090,67	3742,04	1,97	3,12	76,30	127 184,01	131 682,84
2018	106 358,39	14 190,41	4800,54	3793,36	2,07	2,91	72,72	130 891,68	129 889,85
2019	101 032,69	13 830,19	4741,16	3823,44	1,57	2,36	70,09	131 887,66	124 109,59
2020	91 697,36	13 131,58	4492,15	3734,29	0,97	2,02	67,16	124 987,37	113 719,52
2021	96 665,23	13 232,72	4691,18	3711,40	0,31	1,46	64,68	123 393,65	119 035,64
%**2)**	—41.15	—50.75	—38.79	4172,54	347 619,24	ON	—25.50	—33.70	—40.70

[1] *Greenhouse gas emissions excluding LULUCF emissions/sinks*

[2] *in relation to base year*

[3] *including LULUCF*

[4] *including indirect emissions*

Source: ČHMÚ

Table 54: *Greenhouse gas emissions and sinks 1990-2021 by IPCC sector [kt CO_2 eq.]*

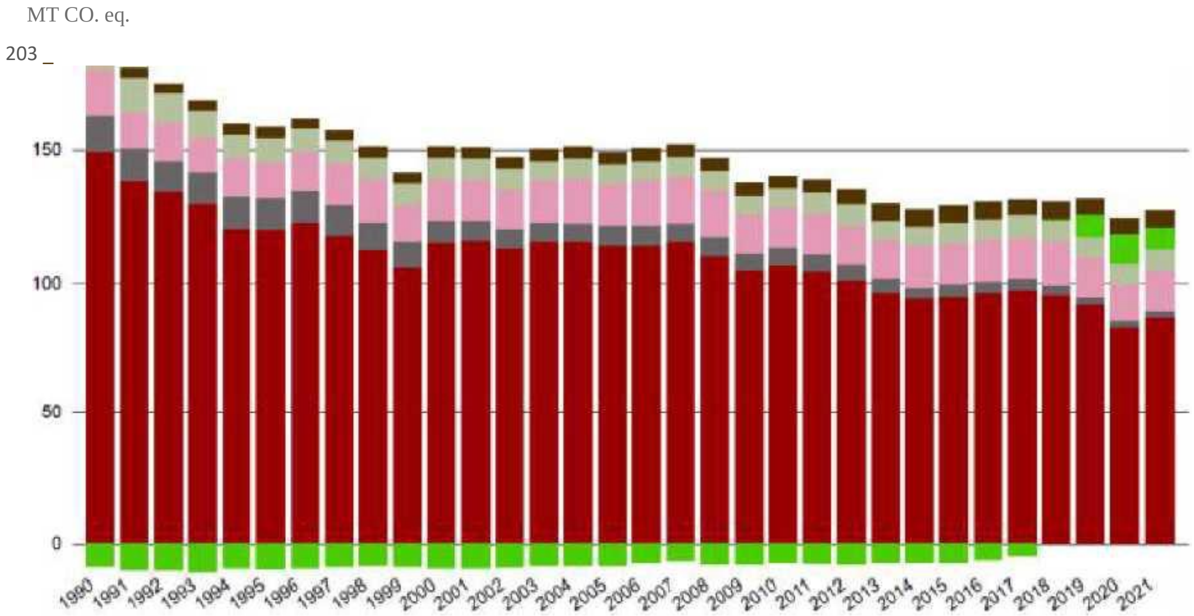
	1. Energy	2. Industrial processes and product use	3. Agriculture	4. LULUCF	5. Wastes
1990	163 204,26	17 115,22	15 136,37	—8 585,74	3 319,42
1991	150 464,89	13 767,97	13 143,94	—9 934,93	3 482,86
1992	145 724,81	14 522,80	11 318,44	—10 069,58	3 468,80
1993	141 387,77	13 351,21	10 041,84	—10 687,22	3 542,85
1994	132 043,98	14 607,00	9 070,07	—9 382,93	3 689,59
1995	131 369,57	14 160,51	9 170,80	—9 677,24	3 671,07
1996	134 178,42	14 955,97	8 876,50	—9 413,14	3 698,76
1997	128 902,25	15 981,64	8 500,75	—8 464,27	3 815,72
1998	122 822,28	16 137,84	8 140,04	—8 155,36	3 934,44
1999	115 394,71	13 547,35	8 186,73	—8 387,08	3 933,21
2000	123 740,91	15 136,89	8 281,61	—9 167,87	3 979,80
2001	123 673,45	14 423,90	8 544,77	—9 160,56	4 118,03
2002	120 402,12	14 193,17	8 139,80	—8 928,89	4 230,67
2003	122 943,66	15 279,97	7 550,38	—8 317,62	4 378,88
2004	122 614,70	16 238,04	7 841,83	—8 143,12	4 315,41
2005	121 844,35	14 913,51	7 814,76	—8 258,09	4 362,37
2006	121 945,78	16 051,34	7 744,25	—7 077,79	4 425,41
2007	122 756,13	16 782,17	7 950,73	—6 507,47	4 340,86
2008	117 528,02	16 678,58	8 015,36	—7 843,40	4 546,62
2009	111 397,68	14 033,36	7 190,49	—7 785,74	4 658,77
2010	113 218,32	14 880,08	7 146,92	—7 154,86	4 922,25
2011	110 728,26	15 217,04	7 650,75	—7 519,27	4 971,95
2012	106 916,41	14 975,35	7 572,90	—7 694,01	5 145,52
2013	101 483,57	14 852,00	7 484,56	—7 081,62	5 431,57
2014	98 467,15	15 627,44	7 559,94	—7 034,38	5 425,52
2015	99 474,44	15 355,43	8 164,50	—6 964,10	5 512,08
2016	100 718,69	15 437,81	8 405,22	—6 107,28	5 545,24
2017	101 495,95	15 685,00	8 191,44	— 4498,83	5 579,54
2018	99 321,78	16 237,99	7 989,79	1 001,83	5 630,50
2019	94 310,67	15 537,88	7 933,44	7 778,07	5 669,27
2020	84 914,69	14 763,80	7 717,83	11 267,85	5 675,72
2021	88 662,03	16 173,01	7 844,54	8 358,01	5 702,11
[1]**%**	4.41 %	9.55 %	1.64 %	—25.82 %	0.46 %

2%	— 45.67 %	— 5.51 %	—48.17 %	—197.35 %	71.78 %

[1] *Difference with respect to the previous year*
[2] *Difference in relation to base year*

Source: ČHMÚ

Figure 46: Greenhouse gas emissions and sinks 1990-2021 by IPCC sector [Mt CO_2 eq.]



Source: ČHMÚ

Tables 55 and 56 show in more detail the trend of GHG emissions from IPCC categories for selected years.

Table 55: *Greenhouse gas emissions and sinks for selected years broken down by IPCC category [kt CO_2 eq.] (Part 1)*

Categories	1990	1995	2000	2005	2010	2015	2020
Total emissions	**190189,53**	**148694,71**	**141971,34**	**140676,90**	**133012,72**	**121542,35**	**124339,90**
1. Energy	**163204,26**	**131369,57**	**123740,91**	**121844,35**	**113218,32**	**99474,44**	**84914,69**
A. Fuel combustion (sectoral approach)	149368,96	120105,03	115192,45	114219,28	106782,40	94541,41	82292,18
1. Energy industry	56830,03	61734,87	62034,93	63138,26	62175,65	53666,27	41 591,71
2. Manufacturing and construction	47105,11	24464,51	23422,11	18842,92	12112,49	9869,85	10 266,13
3. Transport	11249,60	10410,03	12238,29	17365,33	16795,00	17480,41	17 721,56
4. Other sectors	33989,81	23278,66	17318,39	14605,37	15377,55	13152,44	12 397,78
5. Other	194,42	216,95	178,73	267,40	321,70	372,43	315,00
B. Pugitive emissions	13835,30	11264,54	8548,46	7625,07	6435,93	4933,04	2622,51
1. Solid fuels	12637,63	10337,18	7569,76	6623,56	5436,18	4246,64	1 938,58
2. Oil and natural gas and other emissions from energy production	1197,66	927,35	978,71	1001,51	999,75	686,39	683,93
2. Industrial processes	**17115,22**	**14160,51**	**15136,89**	**14913,51**	**14880,08**	**15355,43**	**14763,80**
A. Mineral industry	4082,45	3019,09	3633,37	3345,75	3048,42	3084,24	3 218,44
B. Chemical industry	2825,39	2694,75	2828,76	2706,44	2330,82	2035,86	1 611,91
C. Metallurgical industry	9811,61	7981,27	7434,79	7080,15	6610,22	6496,16	5 796,14
D. Non-energy use of products and use of solvents	125,56	103,75	140,30	120,85	123,73	145,37	133,31
E. Electronic Industry	NO,NO	NO,NO	11,16	6,17	38,28	5,20	4,51
F. Use of ODS	NO	86,88	801,88	1356,30	2445,92	3311,42	3 734,87
G. Manufacture and use of other products	270,21	274,78	286,27	297,50	282,43	276,61	263,78
3. Agriculture	NO	NO	0,37	0,36	0,26	0,57	0,84

A. Enteric fermentation	**15136,37**	**9170,80**	**8281,61**	**7814,76**	**7146,92**	**8164,50**	**7717,83**
B. Management of manure	6611,86	4275,50	3604,25	3376,57	3309,43	3492,23	3 631,11
D. Agricultural soils	2571,36	1760,28	1573,66	1311,80	939,40	730,91	777,56
G. Soil liming	4607,91	2909,89	2869,93	2912,78	2672,69	3502,62	2 988,33
H. Urea application	1236,71	115,86	117,89	67,18	64,53	171,20	164,87

Source: ČHMÚ

Table 56: *Greenhouse gas emissions and sinks for selected years broken down by IPCC category [kt CO_2 eq.] (Part 2)*

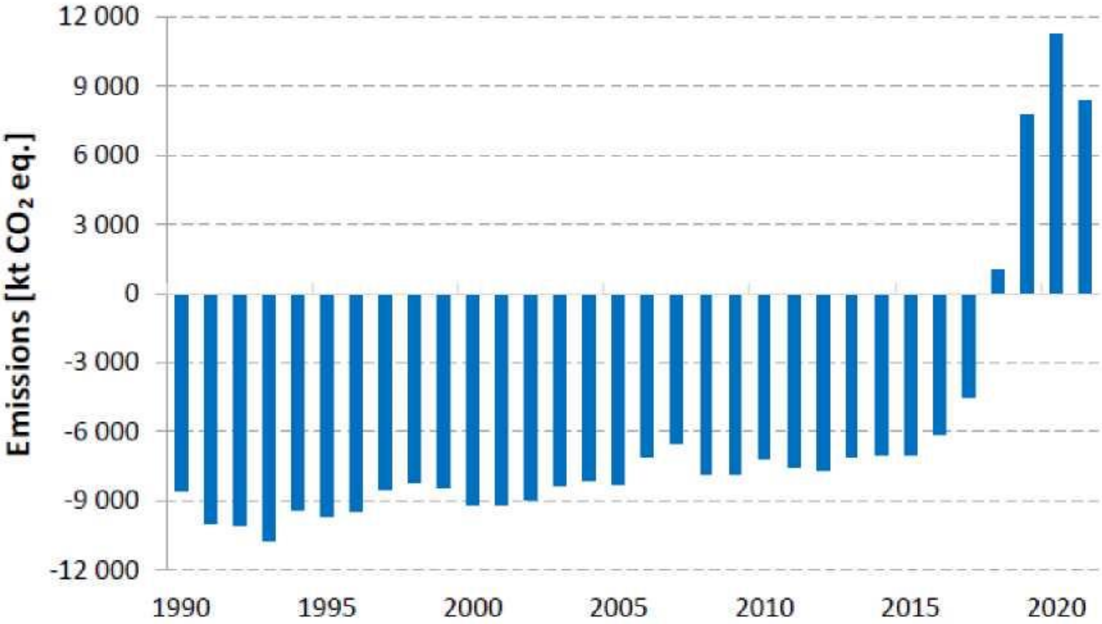
Categories	1990	1995	2000	2005	2010	2015	2020
4. Land use, land use change and forestry	**—8585,74**	**—9677,24**	**—9167,87**	**—8258,09**	**—7154,86**	**—6964,10**	**11267,85**
A. Forest land	—7222,05	—9009,86	—8010,28	—6878,69	—5543,70	—6325,46	14 239,51
B. Cropland	115,93	153,47	133,19	98,23	108,65	82,65	49,39
C. Pastvine	—143,84	—301,83	—364,80	—361,93	—354,20	—426,22	—477,26
D. Wetlands	24,11	12,16	37,84	24,61	41,15	27,36	36,35
E. Installed area	318,81	294,74	306,05	292,62	212,78	154,32	211,55
F. Other	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
G. Harvested wood products	—1680,47	—827,19	—1270,88	—1433,82	—1620,46	—477,68	—2 792,16
5. Wastes	**3319,42**	**3671,07**	**3979,80**	**4362,37**	**4922,25**	**5512,08**	**5675,72**
A. Disposal of solid waste	2007,82	2440,80	2830,43	3072,49	3468,89	3582,05	3 689,00
B. Biological treatment of solid waste	NO,IE	NO,IE	NO,IE	62,64	218,67	749,71	806,82
C. Incineration and open incineration of waste	20,43	59,97	51,22	107,20	120,24	106,36	113,37
D. Wastewater treatment	1291,18	1170,29	1098,15	1120,05	1114,44	1073,95	1 066,53
MEMO items:							
International transport	674,58	583,49	498,01	977,37	961,51	904,39	349,06
Emissions from biomass	6445,39	5788,68	6658,56	8758,22	12487,52	16536,42	19 212,76
Indirect emissions N_2O	976,31	502,42	395,99	382,84	326,65	260,15	201,40
Indirect CO2 emissions	1952,21	1542,16	1253,23	1129,02	988,43	805,83	647,47
Total emissions excluding LULUCF	**198775,27**	**158371,95**	**151139,21**	**148934,99**	**140167,57**	**128506,45**	**113072,05**
Total emissions with LULUCF	**190189,53**	**148694,71**	**141971,34**	**140676,90**	**133012,72**	**121542,35**	**124339,90**

Total emissions including indirect CO_2, excluding LULUCF	**200727,48**	**159914,11**	**152392,44**	**150064,01**	**141156,01**	**129312,28**	**113719,52**
Total emissions including indirect CO_2, with LULUCF	**192141,74**	**150236,87**	**143224,56**	**141805,92**	**134001,15**	**122348,18**	**124987,37**

Source: ČHMÚ

The LULUCF sector offsets on average around 6 % of the Czech Republic's total greenhouse gas emissions per year for almost three decades since 1990. During this period, the sector's emission balance was negative, representing the fixation (linkage) of CO_2 in ecosystems. This has changed since 2018, when forestry dealt with historically extreme calamity with the death of mainly spruce stands, which is conditioned by an exceptionally dry period in Central Europe. As a result of increased sanitary (inadvertent) mining, the forestry sector became a net emitter of CO_2 in 2018-2021, which temporarily contributes to the Czech Republic's emissions to a very significant extent. The turmoil peaked in 2020, emissions have been decreasing since that year. Historical emissions and sinks from the LULUCF sector are shown in Graph 49 and a further outlook for forestry is estimated under the scenarios presented in Graph 4.

Figure 47: *Emissions and sinks from the LULUCF sector 1990-2021 [000 tCO_2 eq.]*



Source: ČHMÚ

Verified emissions from stationary sources covered by the EU ETS decreased by 30.82 % between 2005 and 2022. Emissions in non-ETS sectors show a rather volatile trend between 2005 and 2021. In particular, emissions from the waste and transport sectors are increasing. The Czech Republic has significantly exceeded its target for non-ETS sectors by 2020, which allowed a maximum increase of 9 % in emissions from these sectors compared to 2005, and sold part of the surplus achieved to the Federal Republic of Germany. In the first year of the new period 2021 to 2030, the Czech Republic's emissions were also well below the 2021 allocation. However, the current projections show that in the second half of the new period, the Czech Republic may have difficulties in reaching the ambitious target of reducing emissions in these sectors by 26 % by 2030 compared to 2005. New or updated measures to achieve this objective should be included in the upcoming update of the Climate Policy in the Czech Republic.

Table 57: *Verified emissions from stationary installations in the EU ETS (million of CO2eq.)*

	2005	2006	2007	2008	2009	2010	2011	2012	2013
EU ETS emissions	82,45	83,62	87,83	80,40	73,78	75,58	74,19	69,32	67,71
	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**

Source: EUTL

EU ETS emissions	66,70	66,63	67,53	66,98	66,91	62,52	54,68	57,87	57,04

Table 58: *Emissions in sectors outside the EU ETS (ESD/ESR) 2005-2021 (million CO2eq.)*

	2005	2006	2007	2008	2009	2010	2011	2012	2013
ESD/ESR emissions	63,06	63,35	61,04	63,51	60,85	62,04	61,99	62,91	61,46
	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
ESD/ESR emissions	57,62	61,28	62,82	62,40	60,62	60,54	58,65	59,32	—

Source: EUROSTAT, ČHMÚ

II. Estimates of sectoral developments in the application of existing national and Union policies and measures until at least 2040 (as well as for 2030)

This chapter builds on the 2020 National Plan and will be updated as part of the finalisation of the update of this document.

The projections for greenhouse gas emissions shall be based on data from the latest available inventory of greenhouse gas emissions and sinks as described in section 4.2.1. (i). Emission projections include two scenarios (WEM – taking into account the effect of current policies and measures on the evolution of greenhouse gas emissions, WAM – foresees the effect of planned policies and measures on the evolution of greenhouse gas emissions). Emission projections are made separately for each of the sectors (1. Energy, 2. Industrial processes and product use, 3. Agriculture, 4. LULUCF, 5. Wastes) with specific emphasis on key emission sources (sources having a significant impact on total landscape emissions in terms of absolute emission values, taking into account the observed emission trend and taking into account the level of uncertainty identified for the source).

Projections of GHG emissions from sector 1. Energy is based on data provided by the Ministry of Industry and Trade. In particular, projections for energy and heat production and final consumption projections by sector (industry, transport, services, households, agriculture and others). The MESSAGE model,101which is used for medium- to long-term energy planning, for the analysis of climate change policies and the development of national or regional scenarios, has been used to produce GHG emission projections.

Projections of GHG emissions from sector 2. Industrial processes and product use are based on production prospects for selected products such as cement, lime, iron, steel, etc., provided by the Ministry of Industry and Industry and those prepared by sector experts (in particular for fluorinated greenhouse gases). The GHG projections themselves are based on the methodology used in the greenhouse gas emission and sink inventory, which is in line with IPCC Guidelines 2006. For the projection of emissions of fluorinated greenhouse gases used in refrigeration and air conditioning techniques, the national specific model used was Phoenix.

Projections of GHG emissions from sector 3. Agriculture is based on the Strategy of the Ministry of Agriculture of the Czech Republic, with a view to 2030, updated by the Deputy Minister for Agriculture's statement on the Strategy and on consultations with experts on agricultural policies and measures and rural development. Important inputs to the projections are data on the evolution of livestock populations, the amount of nitrogen from fertilisers applied to agricultural land and the annual harvest of agricultural crops. Projections of greenhouse gas emissions shall be based on the methodology used in an inventory of greenhouse gas emissions and sinks that is in line with IPCC Guidelines 2006.

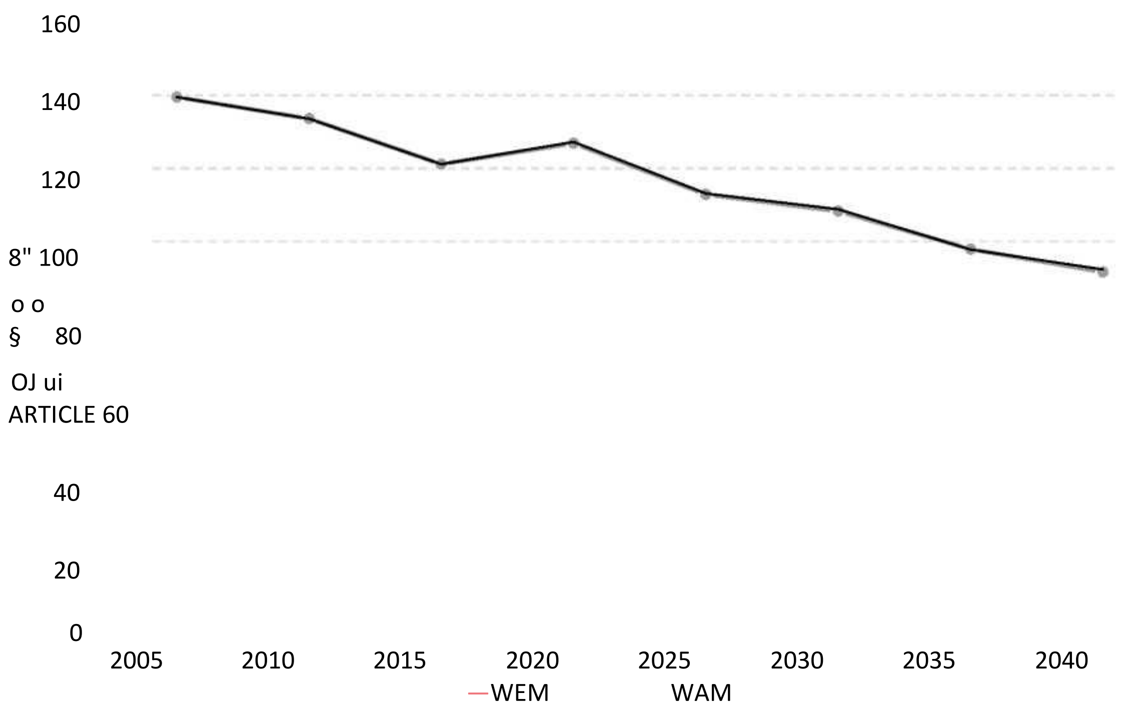
When projecting greenhouse gas emissions from sector 4. LULUCF has a specific focus on the category of forest land, which is a key category in the LULUCF sector, but also in the entire National Emission Inventory

101Model for Energy Supply Strategy Alternatives and their General Environmental Impacts and sinks of greenhouse gases. In relation to the LULUCF sector and carbon neutrality, it should be pointed out that the role of forestry in the Czech Republic in terms of CO2 sinks will change in the next few yearsdue to the accidental harvesting of the bark beetle. For these reasons, it is likely that the managed forest land category will temporarily show CO2emissions. For this reason, forest-related projections are prepared using the EFISCEN model102. The EFISCEN model is one of the most commonly used models for different roles associated with projecting the development of forest resources in European conditions. The projections of greenhouse gas emissions for the other LULUCF categories are based on correlations between the estimated emissions for 2016 and the corresponding areas for the predicted years.

Projections of GHG emissions from sector 5. The waste is based on the data provided in the Waste Management Plan of the Czech Republic, which contains waste management projections up to 2024. Data for projections beyond 2024 were extrapolated on the basis of a trend and an expert estimate. The GHG projections themselves are based on the methodology used in the greenhouse gas emission and sink inventory, which is in line with IPCC Guidelines 2006.

Graph 48 and Table 59 show the results of the projections of total greenhouse gas emissions for the WEM and WAM scenarios. In the short term up to 2020, greenhouse gas emissions are expected to increase compared to the status quo, with overall emissions starting to decline gradually for both scenarios from 2025 onwards. Both scenarios show a decrease of around 24 % of total greenhouse gas emissions over the 2040 horizon compared to the status quo. The GHG projections under the WAM scenario are only slightly more unfavourable (see Table 59) with regard to the reduction of GHG emissions compared to the WEM scenario. The difference is due to the projections of emissions from the LULUCF sector, where the WAM scenario considers changes in the age structure and species composition of the forest (detailed below).

Figure 48: *Results of projections of total GHG emissions for WEM and WAM scenario (including LULUCF)*



Source: ČHMÚ

102European Forest Information Scenario Model

Table 59: *Results of projections of total GHG emissions for WEM and WAM scenario (including LULUCF) [Mt CO_2 eq.]*

	Historic emissions			Projections of greenhouse gas emissions				
	2005	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
WEM	139,45	133,57	121,09	126,83	112,85	108,22	97,84	91,59
WAM	139,45	133,57	121,09	127,18	113,12	108,71	97,78	92,29

Source: ČHMÚ

Table 60: *Results of non-EU-ETS GHG projections for WEM and WAM scenario [Mt CO2 eq.]*

	Historic emissions			Projections of greenhouse gas emissions				
	2005	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
WEM	64,54	57,99	54,44	63,20	58,34	53,96	49,70	45,72
WAM	64,54	57,99	54,44	64,10	56,87	52,83	47,91	44,61

Source: ČHMÚ

Table 61 shows the results of projections of total greenhouse gas emissions by type of gas. The most significant decrease in emissions compared to the status quo is expected for hydrofluorinated hydrocarbons (HFCs). The use of HFCs is strictly limited by European legislation, but also at global level (adding HFCs to the Montreal Protocol list of controlled substances). Emissions are also expected to decrease for CO_2 and CH_4, while a slight increase is expected for N 2O emissions, linked to an increase in emissions from agriculture.

Figure 61: *Results of total GHG projections for WEM and WAM scenario for individual gases (including LULUCF) [Mt CO_2 eq.]*

	Historic emissions			Projections of greenhouse gas emissions				
	2005	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
	WEM							
CO2	117,67	111,39	98,19	103,81	90,79	87,93	78,80	73,90
CH4	14,73	14,54	14,02	13,61	13,09	12,07	11,39	10,23
N2O	6,14	5,50	5,86	5,89	6,08	6,21	6,24	6,24
F – Gases	0,92	2,14	3,01	3,51	2,88	2,00	1,41	1,21
	WAM							
CO2	117,67	111,39	98,19	104,17	91,08	88,70	79,58	75,32
CH4	14,73	14,54	14,02	13,61	13,08	11,80	10,55	9,51
N2O	6,14	5,50	5,86	5,89	6,07	6,21	6,23	6,24
F – Gases	0,92	2,14	3,01	Only WEM scenario				

Chart 49 and Table 62 show the results of projections of total greenhouse gas emissions by sector. The most significant decrease in total greenhouse gas emissions compared to the current situation (around 32 %) is projected for sector 1. Energy. The projections are based on evidence provided by the Ministry of Industry and Industry. For Sector 1. Energy projections were prepared for the WEM and WAM

Source: ČHMÚ

scenarios. Unlike the WEM scenario, the WAM scenario envisages additional transport measures. However, given the share of transport in total energy emissions, the differences between WEM and WAM are not significant.

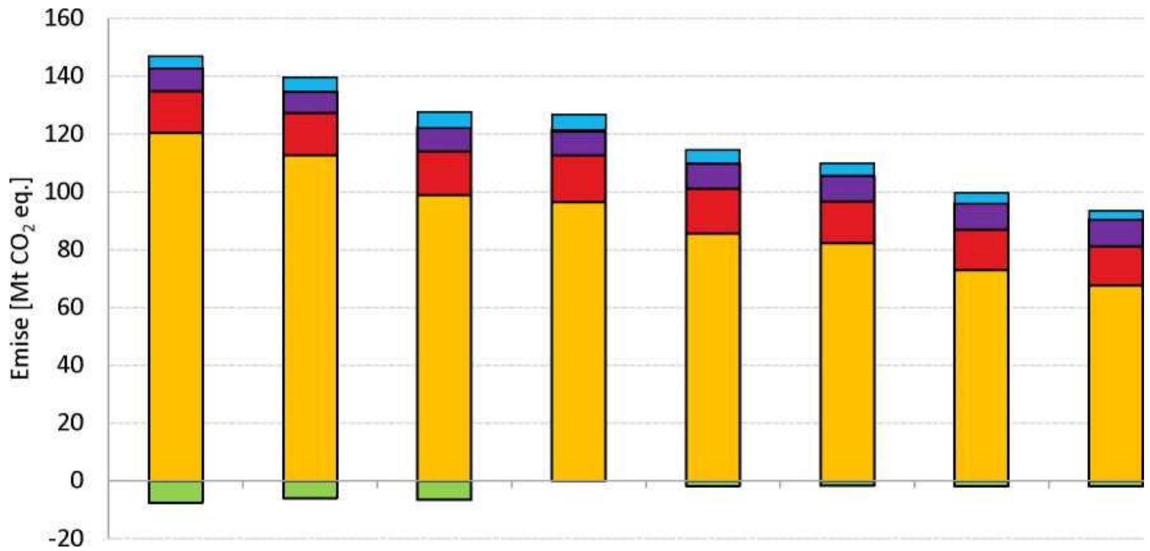
Given that the prediction of the production of selected MIT products does not foresee a decline in industrial production in the period up to 2040, GHG emissions from sector 2. Industrial processes and product uptake are slowly decreasing. Emission reductions are mainly driven by legislation on the use of fluorinated greenhouse gases, which requires manufacturers/importers/exporters to switch gradually to alternative refrigerants.

For sector 3. According to the results of the projections, an increasing trend in greenhouse gas emissions can be expected in particular for the manure management and enteric fermentation categories. The increase in emissions is due to the projected increase in the livestock population, which is based on documentation from the Ministry of Agriculture.

Of the prepared projections for sector 4. LULUCF foresees a gradual loss of CO2 removal capacity over a time horizon up to 2040. Emission projections for sector 4. LULUCF includes changes in age structure (WEM) and age structure and species composition (WAM – more diverse stands with a significantly higher proportion of broadleaved trees) of Czech forests. While the WAM scenario appears to be a slightly more negative scenario in terms of sinks (absorption) over the 2040 horizon, it should lead to more stable and resilient forest stands better adapted to changing environmental conditions – increasing the safety and long-term sustainability of forest production.

For sector 5. According to the results of the projections, greenhouse gas emissions can be expected to decrease after both scenarios. The decrease in emissions is more pronounced for the WAM scenario, which uses stricter recovery coefficients for landfill gas.

Graph 49: *Results of projections of total GHG emissions for the WEM sector by sector scenario*



Source: ČHMÚ

Figure 62: *Results of projections of total GHG emissions for WEM and WAM sector by sector*

	Historic emissions			Projections of greenhouse gas emissions				
[MT CO_2 eq.]	2005	2010	2015	2020	2025	2030	2035	2040
	WEM							
1. Energy	120,35	112,65	98,96	96,49	85,66	82,15	73,03	67,59
2. Industrial processes and product use	14,55	14,65	14,99	16,05	15,35	14,43	13,78	13,60
3. Agriculture	7,80	7,41	8,16	8,36	8,77	9,05	9,15	9,17
4. LULUCF	—7,54	—6,00	—6,53	0,55	—1,74	—1,63	—1,73	—1,81
5. Wastes	4,29	4,86	5,51	5,38	4,81	4,22	3,61	3,03
	WAM							
1. Energy	120,35	112,65	98,96	96,15	85,28	81,78	72,69	67,29
2. Industrial processes and product use	14,55	14,65	14,99	Only WEM scenario				
3. Agriculture	7,80	7,41	8,16	Only WEM scenario				

	Historic emissions			Projections of greenhouse gas emissions				
	2005	2010	2015	2020	2025	2030	2035	2040
[MT CO_2 eq.]	WEM							
4. LULUCF	—7,54	—6,00	—6,53	1,25	—1,09	—0,49	—0,61	—0,10
5. Wastes	4,29	4,86	5,51	5,38	4,80	3,95	2,77	2,32

Source: ČHMÚ

Table 63 provides a more detailed view of the results of the GHG emission projections from sector 1. Energy, which in 2016 accounted for up to 80 % of the Czech Republic's total emissions (including LULUCF and indirect emissions). For the energy sector, total greenhouse gas emissions are expected to decrease gradually over a time horizon up to 2040.

Table 63: *Results of projections of total GHG emissions from the Energy sector for WEM and WAM scenario*

	Historic emissions			Projections of greenhouse gas emissions				
	2005	2010	2015	2020	2025	2030	2035	2040
[MT CO2 eq.]	WEM							
A. Fuel combustion (sectoral approach)	113,94	106,85	94,57	92,46	81,80	78,84	69,79	64,89
1. Energy industry	63,17	62,12	53,68	51,49	42,54	42,24	36,26	34,02
2. Manufacturing and construction	18,84	12,09	9,70	9,86	9,83	9,68	9,61	9,52
3. Transport	17,11	17,01	17,74	17,94	17,39	16,10	14,27	12,22
4. Other sectors	14,55	15,30	13,07	12,94	11,82	10,59	9,43	8,90
5. Other	0,27	0,33	0,38	0,23	0,23	0,23	0,23	0,23
B. Pugitive emissions	6,41	5,79	4,39	4,03	3,86	3,31	3,24	2,70
1. Solid fuels	5,51	4,89	3,77	3,38	3,07	2,68	2,58	2,02
2. Oil and natural gas and other emissions from energy production	0,90	0,90	0,61	0,65	0,79	0,63	0,65	0,69
	WAM							
A. Fuel combustion (sectoral approach)	113,94	106,85	94,57	92,12	81,43	78,47	69,45	64,59
	Historic emissions			Projections of greenhouse gas emissions				
[MT CO2 eq.]	2005	2010	2015	2020	2025	2030	2035	2040

	WEM							
1. Energy industry	63,17	62,12	53,68	Only WEM scenario				
2. Manufacturing and construction	18,84	12,09	9,70	Only WEM scenario				
3. Transport	17,11	17,01	17,74	17,60	17,01	15,73	13,93	11,92
4. Other sectors	14,55	15,30	13,07	Only WEM scenario				
5. Other	0,27	0,33	0,38	Only WEM scenario				
B. Pugitive emissions	6,41	5,79	4,39	Only WEM scenario				
1. Solid fuels	5,51	4,89	3,77	Only WEM scenario				
2. Oil and natural gas and other emissions from energy production	0,90	0,90	0,61	Only WEM scenario				

Source: ČHMÚ

(III) Interactions with air quality and air emissions policy

The link between the National Plan and the issue of air protection was implemented through the preparation of the update of the National Emission Reduction Programme. This central air protection strategy paper fulfils the requirements for drawing up national air pollution control programmes imposed on Member States by Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants. It also sets national emission reduction commitments, known as emission ceilings, for 2020, 2025 and 2030.

An update of the National Emission Reduction Programme is currently under preparation. The preparation is coordinated with the preparation of the National Plan, as it uses its structures and parameters as input assumptions for calculating the emission projections of selected air pollutants. The revised national emission projections prepared and announced as of August 2023 indicate that by 2025 and 2030 the Czech Republic will meet all the established national emission reduction commitments without the need to set additional measures to reduce emissions of monitored pollutants (SO_2, NO_X, volatile organic substances other than methane (NMVOC), ammonia (NH_3) and primary particulate matter $PM_{2.5}$. However, ammonia emissions require close attention as there are some risks of non-compliance with national commitments given the results of the national emission projection. The following update of the national emission projections in 2025 will be key for further assessment.

The update of the NPSE also assessed the contribution of foreign sources to air pollution in the Czech Republic. According to the modelling results of an advanced chemical model, the relative contribution of foreign sources to the average annual PM10 concentration in most territories is 30-60 %, but it may be lower in areas with higher pollution from Czech sources (e.g. local heating, industrial or mining activities). It ranges between 60-80 % in border areas or in areas with a lack of Czech resources. For $PM_{2.5}$, the situation is similar, with the contribution of foreign sources alone being on average 5 % higher.

In particular, increasing the share of non-combustion renewable energy sources, increasing energy efficiency, reducing energy intensity and increasing the use of waste heat can be seen as positive interventions in this area with a positive impact on air quality. Furthermore, from the point of view of

SO2 emissions, the positive substitution of fossil (primarily coal) fuels is other energy sources, but the projected emissions projection shows compliance with the emission reduction commitments set for SO_2 with a significant margin for all the years analysed (2020, 2025, 2030). The problem in terms of maintaining and improving air quality is the heat generation sector of sources with a rated thermal input of up to 300 kW, i.e. the domestic local heating sector, where the national plan foresees a significant share of the target for renewable heat production. The increased use of biomass is linked to emissions of air pollutants, which need to be compensated by technological renewal of sources and improvements in the quality of source operators, which are ensured by the requirement to operate boilers of at least 3 rd and higher classes (according to ČSN EN 303-5) from 2024, a set of subsidy titles to promote the exchange of resources and measures to raise the awareness of the operators of the correct heating method (measure DB11).

The road transport sector accounts for around 28 % of total nitrogen oxide emissions and is the most significant source of these emissions into the atmosphere. Emission reductions can be achieved through higher fleet renewal rates and more widespread alternative powered vehicles, both for cars and trucks and public transport vehicles (e-mobility and hydrogen mobility), but it is necessary to look for an emission-free way of producing these fuels instead of fossil-based production. There is also significant potential to shift transport performance from road to rail, which is targeted by measure AB23 of the update of the NPSE. The different options for meeting the set share of renewables in transport do not differ significantly in terms of total transport emissions, with higher electricity representation leading to a positive effect of sequestration of emissions from traffic-loaded sites, thus reducing the impact on air quality. An increase in the share of natural gas/biogas at the expense of conventional fuels (petrol and diesel) has some positive impact on emission reductions. The Czech Republic's National Emission Reduction Programme contains a comprehensive measure 'Additional reduction of emissions from the road transport sector to 2030', which provided for an additional reduction in emissions from the transport sector, based on the conclusions of the analytical and conceptual documents 'Analysis of vehicle charging in the Czech Republic' and the update of the National Action Plan Clean Mobility'. Given that the conclusions of the first of these documents were vague in view of the objectives of the Czech Republic's National Emissions Reduction Programme, the project 'Reducing savings in emissions from road transport by 2030 achieved through the application of selected tax and charging instruments' was created and was supported under the 'Media for Life' programme of the TA of the Czech Republic. The developer of project No SS03010156 is CDV and partner organisations (CO <=P UK, MENDELU, ALL). The main objective of the project is to assess the possibilities of achieving the reduction target of 5 kt of NO_X emissions from transport by 2030 compared to the NPSE-WM scenario (as defined by the National Emission Reduction Programme of the Czech Republic 2019) using tax and tax instruments. The project will end in 2023.

Ammonia is a problematic pollutant, with more than 90 % of emissions from agriculture. The Czech Republic's National Emission Reduction Programme contains several measures directed towards this sector and, as part of the ongoing update, measures which have not yet been implemented will be reformed in order to maximise their impact and ensure cooperation with the Ministry of Agriculture.

Overall, following the update of the National Emission Reduction Programme, it is proposed to maintain 3 priority measures to reduce emissions of selected air pollutants, 13 support measures and 6 cross-cutting measures. None of these measures are newly defined, most of them remain from the 2019 update, and a small proportion of the Czech Republic's National Emissions Reduction Programme approved in 2015. Some measures were fulfilled and were therefore excluded from the catalogue of measures. Similarly, measures the continued implementation of which was no longer possible or effective on the basis of binding decisions or analyses carried out were excluded. The measures mainly target the public energy sectors of heat generation, local domestic heating, transport and the agricultural sector.

Table 64: *National emission projections for 2025 and 2030 in kt/year*

	NO_X		NMVOC		SO_2		NH_3		$PM_{2,5}$	
Emissions 2005 (kt)	283		343		208		74		74	
Emissions 2021 (kt)	140		261		61		67		59	
Commitment 2025	49 %	(144 kt)	34 %	(226 kt)	55 %	(94 kt)	14 %	(64 kt)	38 %	(46 kt)
2030 commitment	64 %	(102 kt)	50 %	(171 kt)	66 %	(71 kt)	22 %	(58 kt)	60 %	(30 kt)
Projections 2025 (kt)	99		163		46		60		29	
Projections 2030 (kt)	84		151		36		58		26	

Source: ČHMÚ

Energy from renewable sources

i. Current share of energy from renewable sources in gross final energy consumption and by sector (heating and cooling, electricity and transport) as well as the technologies in each of these sectors

The total share of renewable energy sources in gross final energy consumption according to EUROSTAT methodology was 17.67 % in 2021. Table 65 shows the evolution of the share of renewable energy sources in gross final consumption in 2010-2021.103 Figure 50 presents the same graphically.

Table 65: *Share of RES in gross final consumption 2010-2021 (%)104*

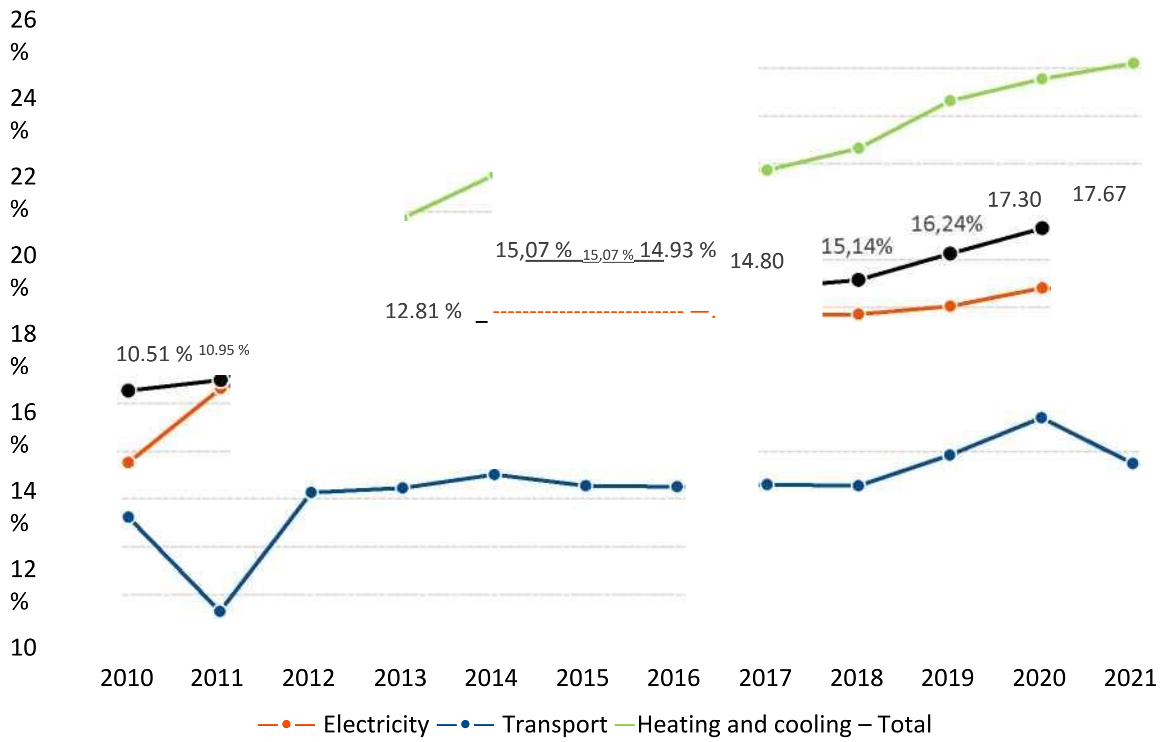
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Electricity	7,52	10,61	11,67	12,78	13,89	14,07	13,61	13,65	13,71	14,05	14,81	14,54
Transport	5,22	1,29	6,25	6,44	7,00	6,54	6,5	6,62	6,56	7,84	9,38	7,49
Heating	14,1	15,39	16,25	17,71	19,53	19,79	19,88	19,73	20,64	22,63	23,53	24,19
Total	10,51	10,95	12,81	13,93	15,07	15,07	14,93	14,80	15,14	16,24	17,30	17,67

Source: share of RES based on EUROSTAT (MPO, Czech Statistical Office) methodology

103 More information is available in Ministry of Industry and Trade statistics (link)

104Following the approval of the Directive of the European Parliament and of the Council amending Directive (EU) 2018/2001 of the European Parliament and of the Council, there has been a partial change in methodology (in particular in the field of transport). This methodology is also applied for the period prior to 2020.

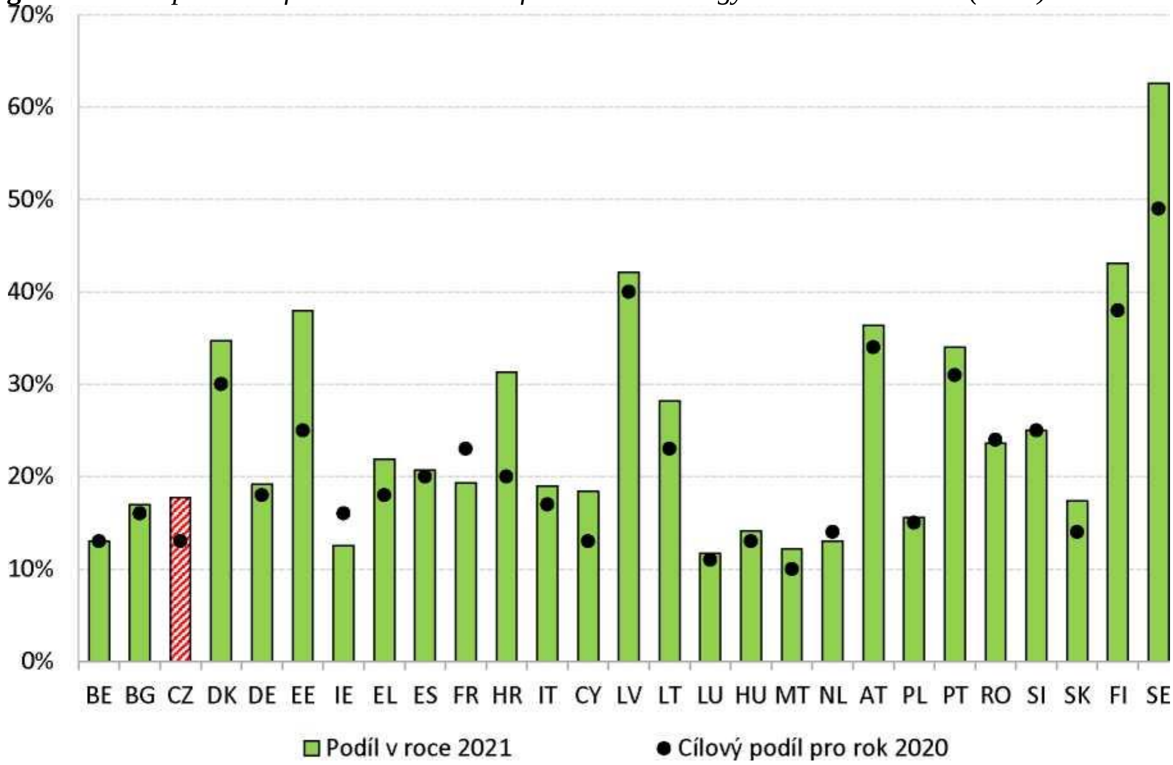
Figure 50: *Share of RES in total gross final consumption*



Source: share of RES based on EUROSTAT (MPO, Czech Statistical Office) methodology

The graph below shows a comparison of the share of renewable energy sources in 2021 in the EUROSTAT methodology, including targets for the share of renewables per Member State by 2020.

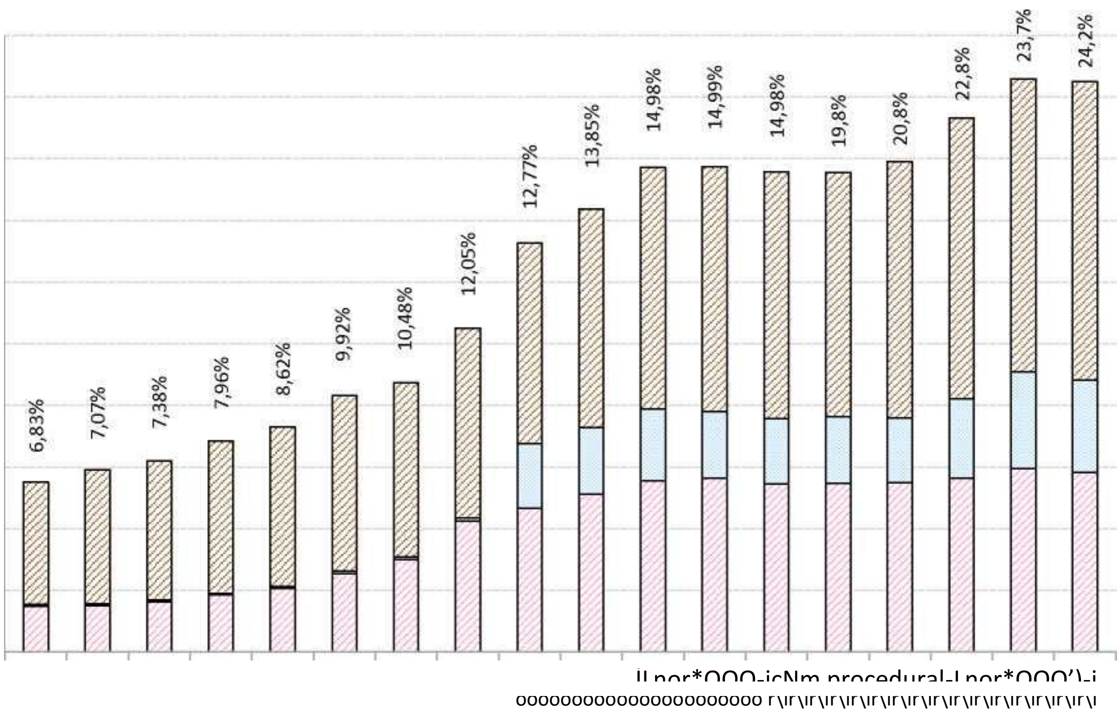
Figure 51: *Comparison of the overall share of renewable energy sources in the EU (2021)*



Source: share of RES based on EUROSTAT methodology (link)

Graph 53 shows the evolution of the share of renewable energy sources in gross final consumption in the electricity sector since 2004, broken down by fuel. In 2021, the share of renewables in the energy sector reached 14.54 %. Renewables used in electricity production account for a total share of around 3.01 %. Figure 54 shows the evolution of the share of renewable energy sources in gross final consumption in the transport sector in 2004-2021, broken down by fuel. The consumption of renewable energy sources in 2021 reached 7.49 % of total gross final consumption in the transport sector. The share of renewables in transport contributes only around 1.28 % to the overall share. Figure 55 then shows the evolution of the share of renewable energy sources in the heating and cooling sector broken down into individual fuels, which accounts for the largest share at a level of around 10.60 % of the total share. The share of renewables in the heating and cooling sector is also the highest compared to other sectors, corresponding to 24.19 % in 2021.

Figure 52: *Share of RES in gross final consumption (sector contributions) in 20042021*



50 %

45 %

40 %

35 %

30 %

25 %
20 %

15 %

10 %

5 %

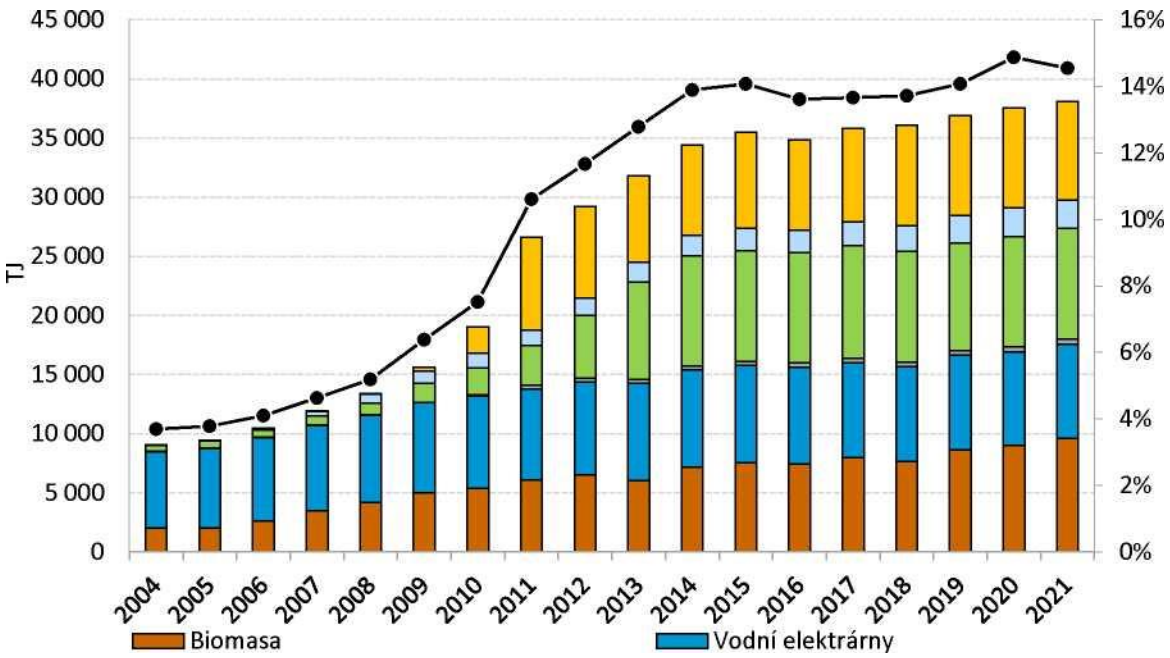
0 %

EL Electricity □ Transport 0 Heating and cooling

Source: share of RES based on EUROSTAT (MPO, Czech Statistical Office) methodology

Figure 53: *Share of RES in gross final consumption in electricity sector 2004-2021*

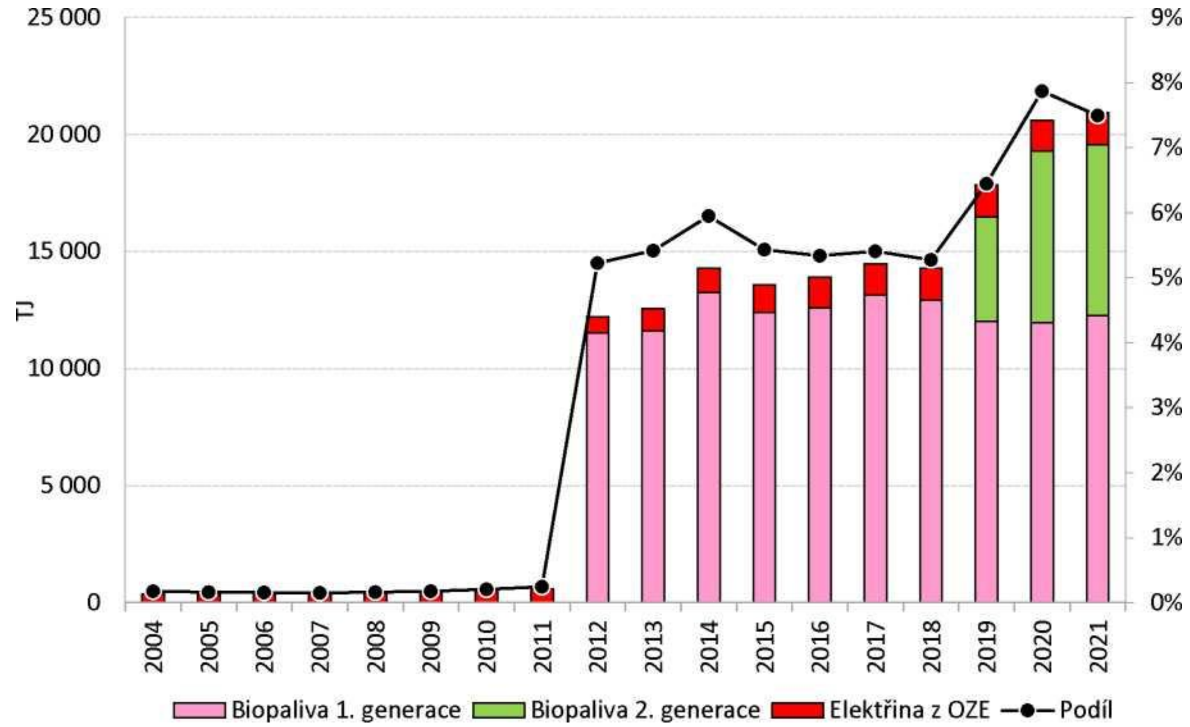
—•— Share



Biological part MSW Biogas stations (and biogas from the grid)

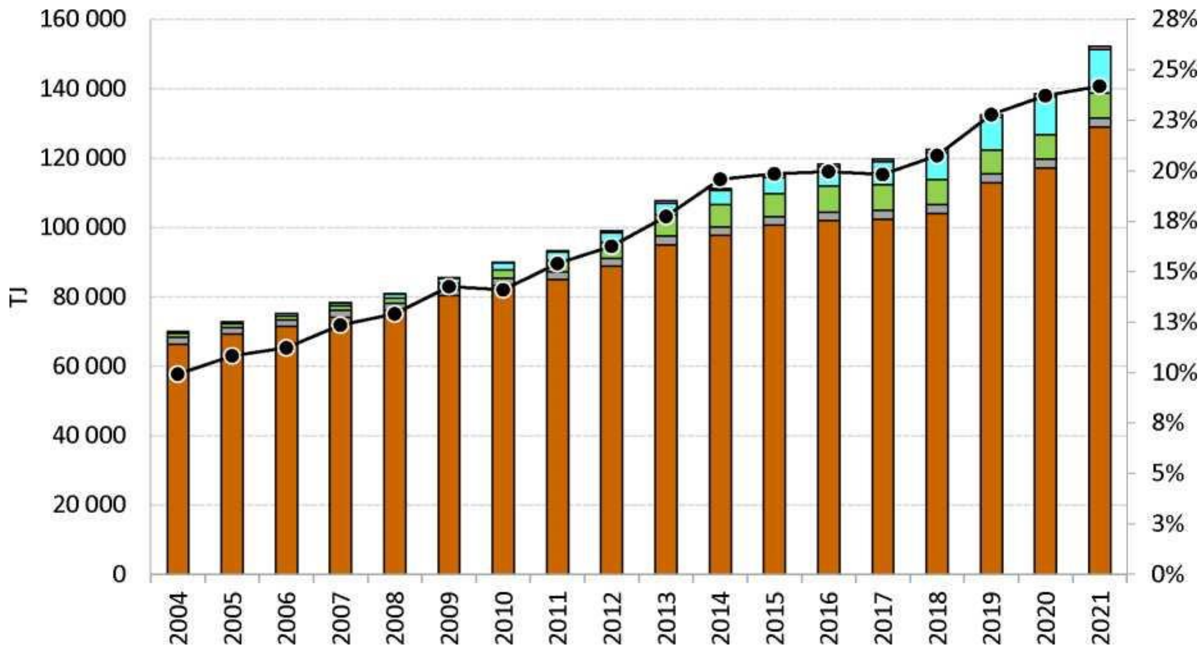
Source: share of RES based on EUROSTAT (MPO, Czech Statistical Office) methodology

Figure 54: *Share of RES in gross final consumption in transport in 2004-2021*



Source: share of RES based on EUROSTAT (MPO, Czech Statistical Office) methodology

Figure 55: *Share of RES in gross final consumption in heating and cooling in 2004-2021*



Biomass Biological part MSW Biogas station
Heat pumps Solar thermal collectors – Share

Source: share of RES based on EUROSTAT (MPO, Czech Statistical Office) methodology

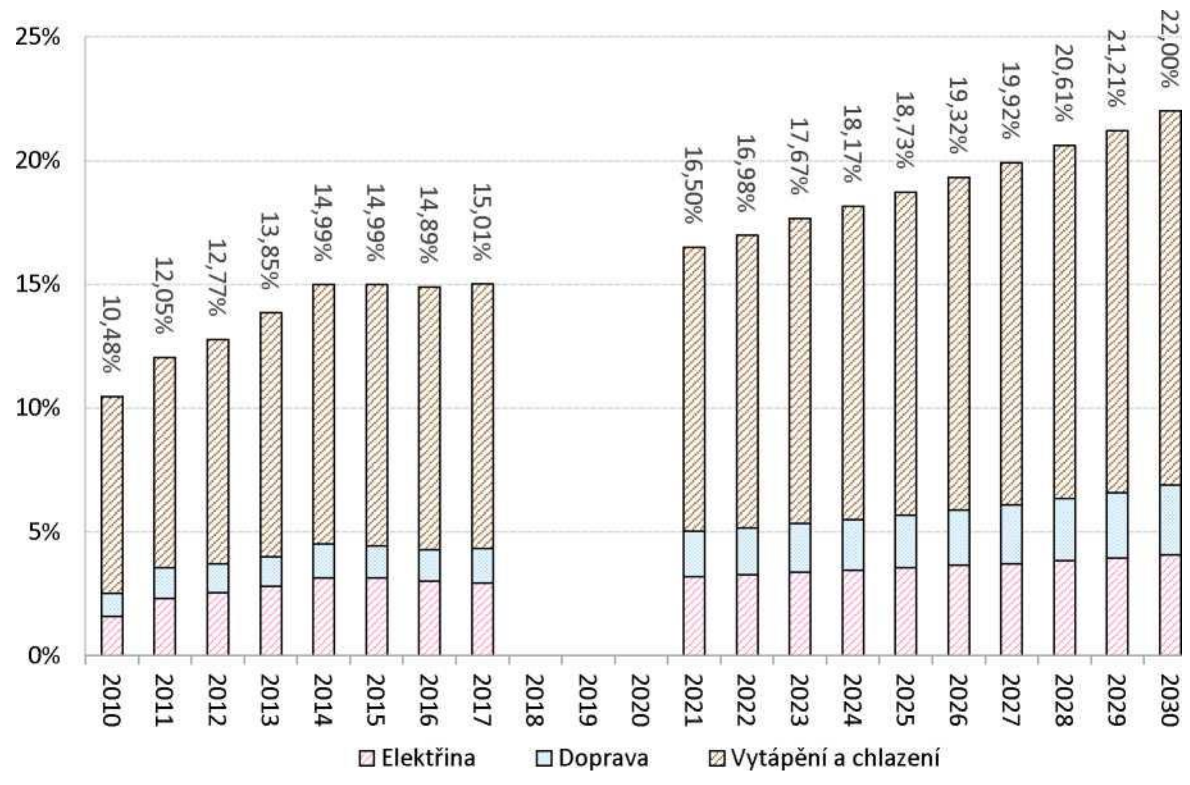
ii. Indicative projections of developments in the implementation of current policies for 2030 (with a view to year
2040)

Estimation of the evolution of RES share in the implementation of existing policies

This chapter builds on the 2020 National Plan and will be updated, as appropriate, as part of the finalisation of the update of this document.

The estimated developments in the implementation of the policies and measures listed in Chapter 3.1.2 are presented in Chapter 2.1.2. The proposed policies are designed to achieve the objective, so that the estimated developments in the implementation of existing or upcoming policies are identical to those set out in Chapter 2.1.2. Graph 56 shows the expected evolution of the share of RES by sector, based on the policies outlined in the relevant section of this document. In this respect, there is a relatively large treasury matrix entitled 'Development of supported energy sources by 2030', which sets out a detailed estimate of the development of individual renewable energy sources by 2030 (this material is only available in Czech). By 2040, renewables should account for 17-22 % of primary energy sources and 18-25 % of gross electricity production according to the State Energy Concept.

Figure 56: *Estimate of the evolution of the share of RES up to 2030 by sector*



Source: Self-processing of the Ministry of Industry and Trade for the purposes of the National Plan

Forecast of the development of renewable gas

The Czech Republic currently consumes about 500 TWh of primary energy, of which fossil sources are around 330 TWh, or 70 %. In particular, coal will be gradually replaced by renewable energy sources, nuclear sources and natural gas, especially in the electricity and heating sectors. Natural gas will play an important role as transition fuel in the domestic energy mix. It will make a significant contribution to achieving ambitious CO2 reduction targets in the coming years. However, natural gas will also need to be gradually replaced towards 2050 in the light of the objectives of the European Green Deal. Biomethane and hydrogen will replace it in the future.

When fossil fuels are gradually replaced, alternative sources of energy must therefore be ensured in a timely manner and continuously available for industry, transport, electricity generation and heat supply. This is particularly true for coal substitution, which today has a high share of electricity production and central heating (around 150 TWh).

Given the increasing use of renewable energy sources and their intermittent nature, on the one hand, and the specific climate constraints on renewable energy production in the Czech Republic, on the other hand, the deficit in electricity and heat generation increases significantly over time when they are needed. The Czech Republic will therefore need energy sources which are permanently available throughout the year, which can be stored in the long term and in the short term and are competitive with other energy sources in terms of costs. Gaseous fuels can play an important role, both because of their technological possibilities for balancing imbalances in the electricity system and the possibility of converting electricity into gaseous fuels. This creates the potential to significantly enhance the stability of the whole system, for example by making gaseous fuels more easily and cheaper to store and transport, as well as helping to make more efficient use of renewables. In this way, the benefits of already existing energy infrastructure can be maximised for the most efficient transition to a low-emission economy combining natural gas with decarbonised and renewable gases. Thus, renewable gases can play an important role in increasing the share of electricity generation from intermittent renewables.

The development of renewable gases depends on several factors. A key issue will be the existence of public support for the production, transmission, distribution and storage of renewable gases. Therefore, the future set-up of both financial and institutional support for the development of renewable gas production (see chapter 3.1.2.2) will be key. This includes, inter alia, the transformation of existing biogas plants for the production of biomethane as well as new biomethane stations, including their connection to the gas system. In addition to biogas and biomethane plants, there are hydrogen production technologies as well as bioLPG technologies. While these technologies are already known, the operation of these plants is currently unprofitable due to high operating costs.

Renewable gases include renewable hydrogen. The Ministry of the Environment and the Ministry of Industry and Trade have long-term plans to support the development of hydrogen production in the Czech Republic, taking into account the production rules defined in the delegated act for the production of renewable fuels of non-biological origin, which are part of the Directive to promote the use of renewable energy sources. The Czech Republic will be obliged to meet the sectorial targets for renewable hydrogen and massive imports from countries with more suitable conditions cannot be foreseen for 2030, apart from the possibility of importing a mixture of hydrogen with natural gas. For this reason, it is also appropriate to set the aid in proportion to the expected production of renewable hydrogen in the Czech Republic, taking into account that renewable hydrogen will initially be consumed where it is produced. The high investment and operational costs will have to be addressed with a view to kick-starting renewable hydrogen consumption. At the same time, a part of the current gas transmission system will need to be prepared for expected imports of renewable hydrogen after 2030.

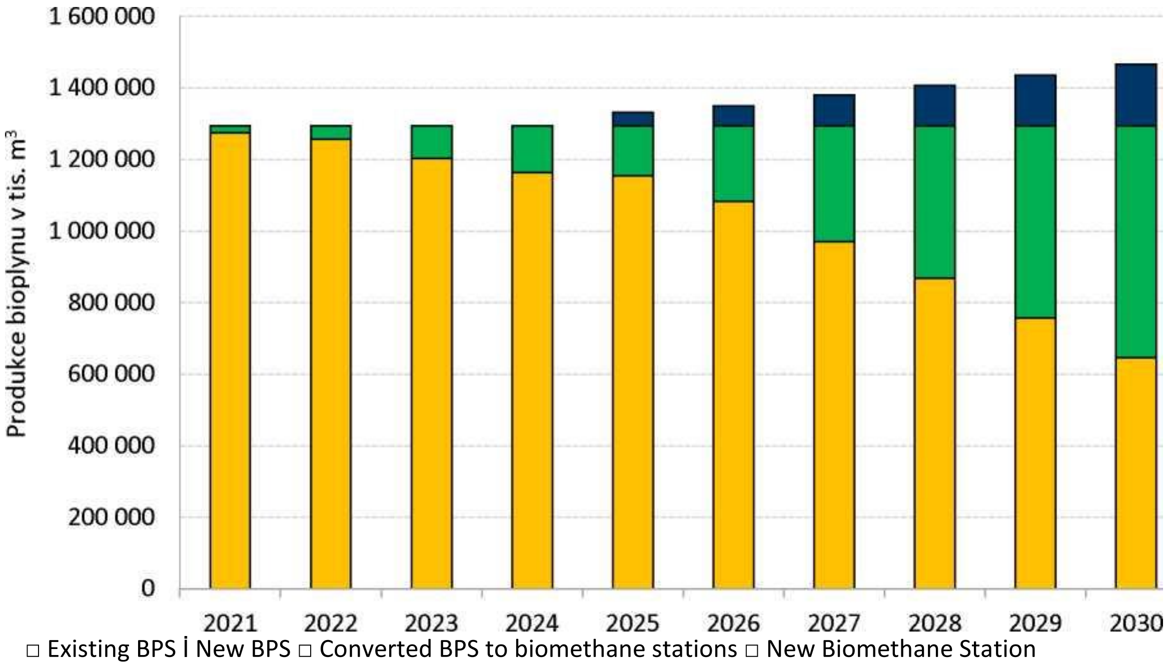
Gas from renewable energy sources can already play an important role in the period 2021-2030 and beyond, not only in electricity generation, but also in the transport and heating and cooling sectors, and under the revision of Directive 2018/2001 adopted in June 2023 also in industry and transport. There are currently around 400 biogas plants in the Czech Republic, more than 100 municipal and industrial sewage treatment plants with sludge gas production and almost 70 plants with landfill gas production. Biogas stations account[105] for around 1.5 % of the current share of total final RES energy consumption (see section 2.1.2). The vast majority of biogas plants produce heat and electricity as part of cogeneration. The biogas sector is very well suited to the extension of flexibility, the installation of Power to Gas systems, the production of biomethane and/or the capture of CO2. In the Czech Republic, biomethane is currently produced and injected into the gas network in units of the installation (they are the biogas station Rapotín, Litomyšl, Mladá Boleslav, Upper Suchá and ÚČOV Prague).

In the context, inter alia, of the share of RES in the transport sector, measures are prepared (see section 3.1.2) to partially incentivise the transformation of part of existing biogas stations into biomethane stations or the emergence of new biomethane stations in the period 2021-2030. This conversion should take place primarily for biogas stations with a lower use of useful heat and in the vicinity of high-pressure pipelines, which should also have positive effects on increasing the use of primary energy sources. The following graph shows the expected biogas production split into existing, converted and new. In order to reduce the cost of traffic and increase efficiency, efforts will be made to inject gas into the lowest possible pressure level of the pipelines. By adapting legislation and standards, two-way pressure reduction stations can be used to connect a non-pressurised distribution network. This measure will lead to a reduction in both operational and investment costs and an increase in the connection of production facilities.

Figure 57: *Expected biogas production split into existing, converted and new*[106]

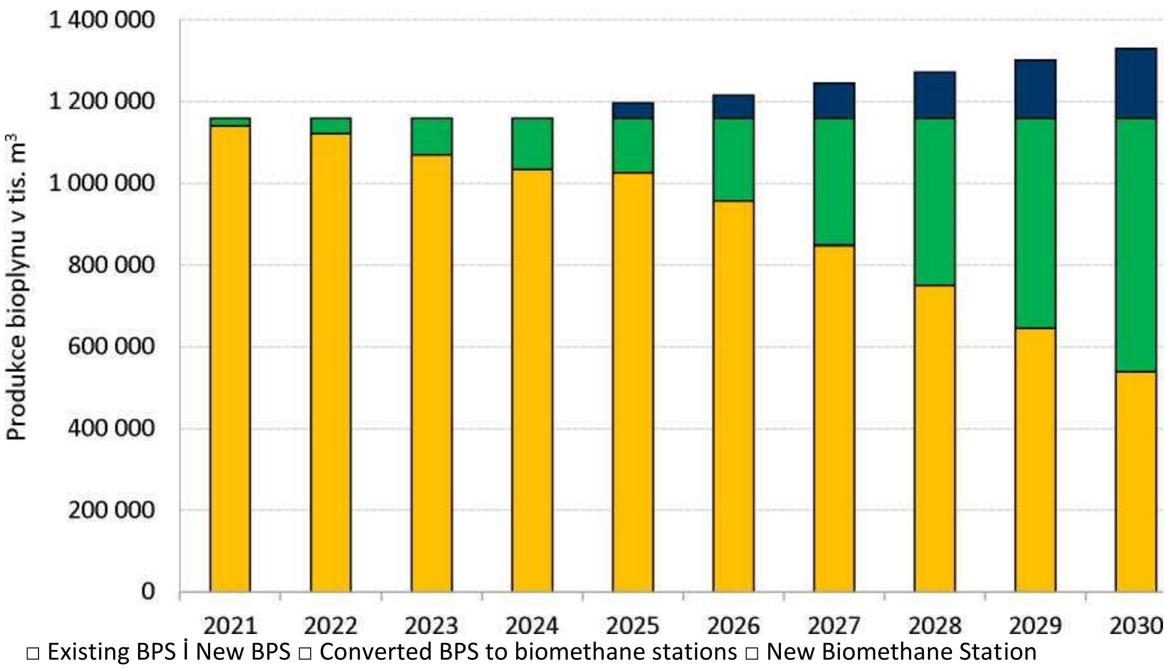
[105] Biogas stations including sewage treatment plants by producing sludge gas and production plants with landfill gas production. Unless otherwise stated, the term ‘biogas stations’, including sewage treatment plants and plants with the production of landfill gas.

Several new biogas plants are[106] expected to be built, but their overall biogas production is relatively low compared to other categories.



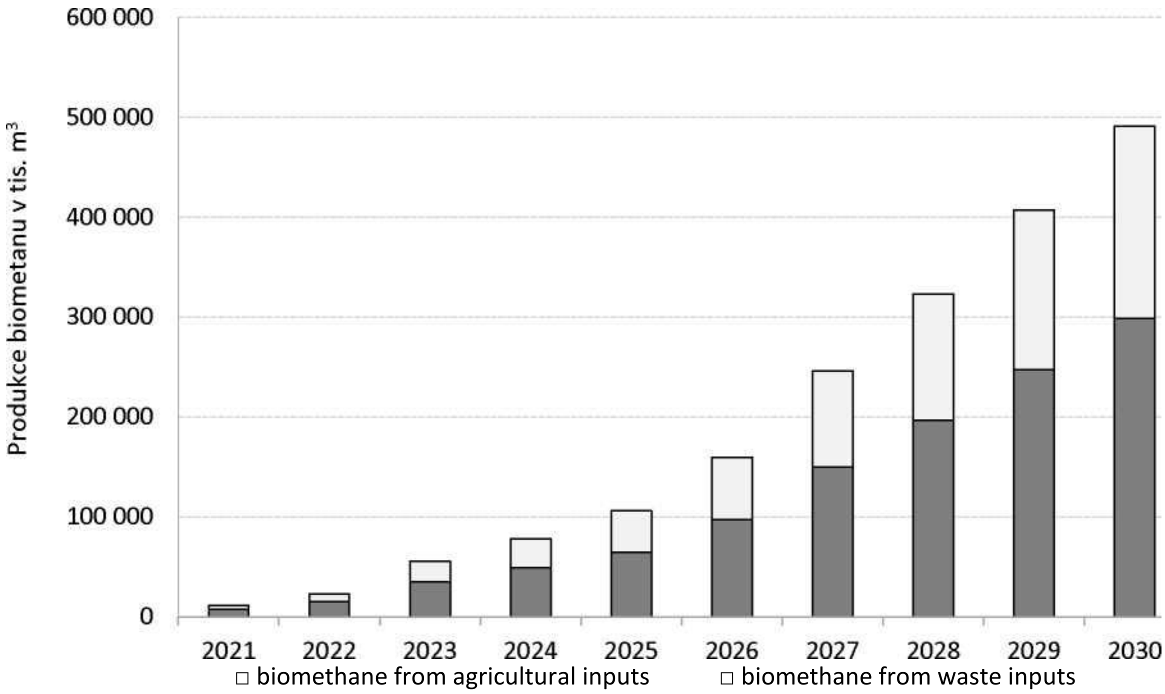
Source: Self-processing of the Ministry of Industry and Trade for the purposes of the National Plan

Figure 58: *Expected biogas production (agricultural biogas stations)*



Source: The actual processing of the Ministry of Industry and Trade for the purposes of the National Plan Graf 59 shows the expected distribution of biomethane by feedstock. The availability of biodegradable waste and agricultural by-products is a prerequisite for this distribution in practice. For the transport of biomethane to the point of consumption, the use of the existing gas system shall be envisaged, taking into account the distance of existing biogas stations to the gas system so that they are reasonably connected. The Czech Republic would like to report the full allocation of “advanced” biomethane to the transport sector and will endeavour to find an acceptable reporting mechanism for this purpose. ‘Unadvanced’ biomethane from agricultural raw materials is expected to be consumed mainly in the heating and cooling sector.

Figure 59: *Expected production of biomethane by source*



Source: Self-processing of the Ministry of Industry and Trade for the purposes of the National Plan

The table below shows the expected final consumption of biogas by sector. The reason for the decrease in final consumption in the electricity sector due to the projected conversion of part of the plants is described in more detail above. Only ‘advanced’ biomethane from waste raw materials is expected to be consumed in the transport sector (the table shows the consumption without taking into account multipliers).

Table 66: *Final consumption of biogas by sector in TJ*

Final consumption of biogas	2016	2020	2025	2030
Electricity	9 320,5	9 469,5	8 970,0	5 683,0
Transport	0	0	1 416,1	6 554
Heating and cooling	7 489,0	7 595,0	8 926,5	13 582,8
Total	16 809,5	17 064,5	19 312,6	25 819,8

Source: Self-processing of the Ministry of Industry and Trade for the purposes of the National Plan

In this respect, it is assumed that all biomethane from waste raw materials (i.e. advanced biomethane) injected into the gas network will be consumingly allocated within the transport sector (respecting the ‘mass balance’ approach), while unadvanced biomethane injected into the gas network will be consumed in the same proportion to natural gas consumption. Chapter 2.1.2 (v) provides information on the expected consumption of biogas and biomethane in the context of the heat sold.

The above is only a summary of the relatively comprehensive analysis, which is published under the background paper “Development of supported energy sources by 2030.

As already mentioned in the introduction to the chapter, hydrogen is another gas that can be qualified as renewable when produced from renewable energy sources. There is currently a strong political will in the European Union to promote hydrogen as an important energy vector for achieving ambitious decarbonisation goals. Hydrogen will be used not only in hard-to-decarbonise areas of industry, but also in heat production, transport and other applications. The willingness to use hydrogen is expressed, among other things, by the European Commission issued by the European Hydrogen Strategy and by individual EU Member States through their national hydrogen strategies. The Czech Republic is not an exception in this respect. On 27 July 2021, the Ministry of Industry and Trade (MPO) issued a National Hydrogen Strategy for the Czech Republic, which was approved by the government the day before. The hydrogen strategy of the Czech Republic (hereinafter also referred to as “the Strategy”) analyses the different options for hydrogen production and use and identifies priority areas for further development. Its strategic objectives include reducing greenhouse gas emissions and promoting economic growth. The hydrogen strategy is built on four key pillars:

- low-carbon hydrogen production;
- use of low-carbon hydrogen;
- transport and storage of hydrogen;
- hydrogen technologies.

Building on the European Hydrogen Strategy and the objectives of the European Green Deal, this strategy focuses on the period 2021-2050, at the end of which the Czech Republic should achieve climate neutrality. The early stages of the Strategy place emphasis on ensuring a balance between hydrogen production and consumption in order to ensure an efficient use of available resources. The strategy analyses the different pillars and identifies priority areas to be developed, but also those whose development cannot be recommended. The strategy aims to accelerate the implementation process of hydrogen technologies across economic sectors while minimising the associated costs.

In the area of hydrogen production, the Strategy puts emphasis not only on renewable production but also on the use of other alternative low-carbon hydrogen production options, such as the use of natural gas with CO2 capture and processing, pyrolysis/plasma gasification of organic waste and the production of hydrogen using electricity and heat from nuclear power plants. Hydrogen deployment should start where the use of hydrogen is the most cost-effective. Therefore, according to the Strategy, priority should be given to the deployment of hydrogen in transport first and then, following a fall in price, its use in the energy sector and as chemical raw materials and heat sources in industry. In addition to direct use in industry or transport, excess energy produced from RES may be stored in the form of hydrogen. Power-to-Gas hydrogen as an energy carrier can play an important role in the future energy mix for the stabilisation and balancing medium of the entire energy system.

While hydrogen will help to exploit the energy surplus generated from RES effectively, domestic hydrogen production will not be able to fully meet future domestic demand. In its REPowerEU plan, the European Commission itself foresees 660 TWh of hydrogen in the EU in 2030, half of which is consumed

hydrogen will be imported from outside the EU. In order to facilitate hydrogen imports, the European Commission will support the development of several hydrogen corridors, e.g. through the Mediterranean, the North Sea region, North Africa, South-Eastern Europe and, as soon as conditions allow, despite connectivity with Ukraine (see Central European Hydrogen Corridor). In the future, according to the Strategy, the Czech Republic is expected to have to import hydrogen from countries where the conditions for producing renewable hydrogen are more advantageous as they have more sunshine and wind. In order to import hydrogen, infrastructure will have to be prepared and hydrogen could replace current imports of natural gas and oil. The strategy further states that the Czech Republic can be an important player in the transport of hydrogen from the south to north and east to west. However, this requires the timely preparedness of our gas transmission system for the transmission and distribution of hydrogen. More information can be found in chapter 3.4.2.

Dimension 'Energy efficiency'

i. Current primary and final energy consumption in the economy and per sector (including: industry, housing, services and transport)

Table 67: *Current primary and final energy consumption in the economy and per sector*

	Source j[107]	One bow	2016	2017	2018	2019	2020	2021
Primary energy consumption	1	I.E.	1 722 299	1 799 801	1 804 260	1 782 909	1 681 895	1 777 503
Total final energy consumption	1	I.E.	999 234	1 030 453	1 018 403	1 019 143	999 041	1 067 510
Final energy consumption by sector:								
industry	1	I.E.	269 332	282 092	280 723	277 492	275 121	293 484
transport	1	I.E.	268 680	277 057	278 836	283 814	267 063	288 046
households	1	I.E.	302 981	308 163	300 073	295 771	302 982	332 751
services	1	I.E.	129 535	133 338	131 017	133 759	125 146	124 192
Final energy consumption according to the Europe methodology 2020-2030	2	I.E.	1 039 409	1 067 746	1 060 494	1 057 998	1 025 465	1 095 906
Primary energy consumption according to the Europe methodology 2020-2030	2	I.E.	1 663 847	1 689 592	1 694 846	1 663 957	1 573 720	1 656 670
Gross value added by sector – 2005 prices:								
Industry	2	million CZ	1 478 630	1 577 321	1 600 188	1 631 646	1 469 897	1 518 627
Services	2	million CZ	2 222 873	2 334 310	2 448 397	2 541 595	2 454 597	2 570 372
Gross value added by sector – current prices:								
Industry	2	million CZ	1 602 603	1 671 637	1 719 045	1 826 073	1 751 957	1 848 845

[107] Resources: 1 – Aggregated Energy Balance (MPO, Eurostat methodology 2017); 2 – Eurostat; 3 – Ministry of Transport; 4 – Czech Statistical Office

Services	2	million CZK	2 612 003	2 815 824	3 052 304	3 299 045	3 332 288	3 589 275
Disposable income of households	2	million CZK	2 496 929	2 666 442	2 841 747	3 029 061	3 105 556	3 331 115
Gross domestic product (GDP) – 2005 prices	2	million CZK	4 141 785	4 355 863	4 496 125	4 632 352	4 377 435	4 532 954
Gross domestic product (GDP) – current prices	2	million CZK	4 796 873	5 110 743	5 410 761	5 791 498	5 709 131	6 108 717
Electricity generation from thermal power plants	1	GWh	77 479	81 226	82 384	80 844	75 094	78 544
Electricity generation from combined heat and power	1	GWh	17 113	16 690	16 141	15 872	16 078	15 624
Heat generation from thermal power generation	1	I.E.	127 519	122 851	118 123	116 266	112 845	121 343
Heat production from cogeneration incl. waste heat from industrial processes	1	I.E.	99 023	94 710	90 221	87 830	85 752	91 927
Fuel consumption for the generation of energy from consumption	1	I.E.	889 383	924 497	933 186	907 701	843 885	882 153
Number of person-kilometres	3	million	118 957	124 165	129 967	132 996	90 600	111 721
Number of tonne-kilometres	3	million	68 172	62 936	60 327	57 888	73 529	82 493
Population (mean)	4	person	10 565 284	10 589 526	10 625 695	10 669 324	10 700 155	10 499 812

Source: 7. Progress report on the achievement of national energy efficiency targets in the Czech Republic

ii. Current potential for the use of high-efficiency cogeneration and efficient district heating and cooling107

This chapter builds on the 2020 National Plan and will be updated, as appropriate, as part of the finalisation of the update of this document.

Combined heat and power

A) Current status – electricity generated, heat produced and installed capacity:
Evolution and state of play of CHP use:

Table 68: *State of electricity production and useful heat supply from CHP in 2017*

	CHP up to 1 MWe including		CHP above 1 MWe up to 5 MWe including		CHP above 5 MWe including		Total CHP	
	Gross electricity generation	Delivery of useful heat	Gross electricity generation	Delivery of useful heat	Gross electricity generation	Delivery of useful heat	Gross electricity generation	Delivery of useful heat
	(GWh)	(I.E.)	(GWh)	(I.E.)	(GWh)	(I.E.)	(GWh)	(I.E.)
CHP	**1 622,2**	**4 865,9**	**1 387,3**	**7 557,9**	**7 221,3**	**91 196,5**	**10 230,8**	**103 620,3**
Biomass	17,4	466,0	97,8	918,5	1 011,8	9 143,5	1 126,9	10 527,9

107In accordance with Article 14(1) of Directive 2012/27/EU.

Biogas	1 219,2	1 328,4	584,7	546,5	27,3	128,7	1 831,2	2 003,7
Coal	0,2	8,0	31,2	1 062,6	1 178,6	13 654,3	1 210,0	14 725,0
Brown coal	10,3	1 034,7	30,7	1 173,3	4 048,8	55 037,4	4 089,8	57 245,4
Coke	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Waste Heat	0,0	0,0	18,2	561,5	1,5	68,6	19,7	630,1
Other liquid fuels	0,0	0,0	15,4	276,7	2,5	76,5	17,8	353,2
Other solid fuels	0,8	0,9	20,2	663,4	98,6	1 828,3	119,6	2 492,6
Other gases	9,7	167,3	127,1	220,5	243,1	4 168,5	379,9	4 556,3
Other	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Fuel oils	6,5	31,4	1,3	0,6	9,8	131,7	17,6	163,7
Natural gas	358,0	1 829,3	460,8	2 134,2	599,4	6 958,9	1 418,2	10 922,3
Total inst. el. power (MWe)	**396,4**		**389,1**		**10 392,1**		**11 177,6**	
Total inst. tep. power (MWt)		**906,0**		**1 436,4**		**22 208,4**		**24 550,9**

Source: ERÚ, 2017 annual report on the operation of the EC Czech Republic

Table 69: *Evolution of installed MWe capacity 2013-2018 (in MWe)*

	CHP up to and including 1 MWe	CHP above 1 MWe up to and including	CHP above 5 MWe inclusive	Total CHP
2014	309,6	321,8	9 915,6	10 547,0
2015	320,2	347,3	10 032,0	10 699,5
2016	339,3	356,6	10 019,9	10 715,8
2017	396,4	389,1	10 392,1	11 177,6
2018	411,9	390,7	10 806,7	11 609,4
difference 2014-2018	102,3	68,9	891,1	1 062,4

Source: ERÚ, Annual report on the operation of the EC Czech Republic 2014-2018

B) Projected evolution – options for new CHP installation

The prediction for the post-2020 period is mainly based on the need for heat supply and the trend towards a gradual decline. The results of the 2015 MIT study ‘Assessment of the potential of high-efficiency cogeneration and efficient district heating and cooling for the Czech Republic’, drawn up by the Ministry of Industry and Industry, defining the expected development of CHP over the period 2015-2025, the outputs of which are set out below, current values and information from the ERU, MPO and OTE databases, and information and development assumptions from relevant associations and associations, were used in the prediction process. The ‘assessment of the potential of high-efficiency cogeneration and efficient district heating and cooling for the Czech Republic’ used statistical values and facts in 2013. The results are summarised as follows:

- The potential for the development of high-efficiency CHP has been identified in particular for smaller sources with electrical capacity at MW_e level. It is likely to consist of increasing the number of micro-cogeneration units (capacity below 50 kWe), small (capacity below 1 MWe) and medium sources with natural gas-based CHP. High-efficiency CHP resources can also be expected to grow in the areas of biomass use, biogas plants (including heat extraction from existing sources) and in the development of energy recovery of waste. However, the development of these areas of high-efficiency CHP is conditional on maintaining stable economic incentives for investors and resource operators.
- In the area of large resources, only limited potential for the development of high-efficiency CHP has been identified. Heat from large sources such as heat plants and energy plants, as well as

most power plants, is currently used at the place of production or delivered to the consumer by means of a heat supply system (hereinafter referred to as 'SZT'). Rather, large-sourced MTA will involve a change in the fuel base (co-incineration of renewable energy sources (RES) or alternative fuels) or an improvement (increase) of CHP parameters (achievement of higher efficiency or primary energy savings) as a result of the reconstruction of the source. However, for large sources, the risk of a possible reduction in electricity production from high-efficiency CHP cannot be ignored. Current developments in the energy markets (and its consequences of lowering the wholesale electricity price) may lead to a decline in electricity generation from high-efficiency CHP to large sources and a shift to a partial power operating regime. Most of the large heat sources in the Czech Republic use solid fossil fuels. The maintenance of the current level of electricity production from high-efficiency CHP is therefore also jeopardised by the tightening of environmental requirements and the expected increase in the cost ofCO_2 allowances.

- The study identified a technical growth potential for micro, small and medium gas CHP (i.e. up to 5 MW) of 830 MW and in the subsequent cost-benefit analysis (CBA) identified as the optimal scenario, i.e. with the highest NPV, the CHP scenario with the following parameters:

  a) with a growth of 33 MWe of new installed sources for micro-cogeneration up to 50 kW
  b) with the growth of 227 MWe of new installed sources of small and medium-sized gaseous fuels with a capacity of 50 kW-5 MW,
  c) with an increase of 62 MWe of new installed sources of cogeneration on RES and other alternative fuels,

<u>We subdivide the whole prediction into four parts:</u>

1. **CHP used to replace existing in particular coal sources**
2. **CHP in new heat sold, biogas and waste recovery**
3. **CHP that will replace or complement heat plants using natural gas**
4. **Micro-cogeneration**

C) Summary of projected developments in new cogeneration over the period 2020-2030:

Table 70: *Projected overall developments in CHP*

Year	**Installed electrical capacity (year-to-year increments) (MWe)**			
	CHP used to replace existing in particular coal sources	CHP in new heat sold, biogas and waste recovery	CHP that will replace or complement heat plants using natural gas	Micro-cogeneration
2020	10	14	25	2
2021	30	55	25	2
2022	30	15,5	25	2
2023	30	17,5	25	3
2024	25	13,5	25	3
2025	25	4	25	3
2026	25	4	25	3
2027	25	3	25	3
2028	10	12,5	25	3
2029	10	12,5	25	3

2030	10	2	25	3
Total	230	153,5	275	30

D) Refurbishment and modernisation of CHP plants currently in operation

For the resources currently in operation, we assume that between 2021 and 2030 most of these resources will continue to be operational and many of these resources will also be refurbished and upgraded in that period.

Power-generating facilities which cease to qualify for the current aid and are energy efficient will be able to apply for new operating aid schemes to keep these plants in operation (aid for electricity for the maintenance of power-generating facilities in operation or support for electricity production in an upgraded power generating facility) unless they benefit from other operating aid (e.g. aid for RES or depots) – as the cumulation of operating aid is not appropriate under the EU environmental and energy State aid rules (EEAG).

On the basis of the preceding paragraph, it is therefore assumed that, at the end of entitlement to current operating aid for electricity from CHP, only power generating facilities using fuel sources other than RES will benefit from support for CHP (such as aid for maintaining the power-generating facility in operation or promoting electricity produced in a modernised power generating facility).

Secondary energy sources

(A) Current state – energy generated and distribution

Table 71 shows the gross electricity production from each type of secondary source in 2016-2018.

Table 71: *Gross electricity production from secondary sources in 2006-2018*

Gross Electricity Production (GWh)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Heating gas (coal)	97	85	52	42	40	27	31	35	48	36	43	41	53
Converter gas	20	21	23	23	26	27	23	27	30	26	24	25	23
Final gas from soot production	0	0	0	0	0	0	0	0	16	14	16	12	16
Poor expansion gas	3	11	10	8	7	9	7	7	6	5	6	4	9
Hydrog final gas. Refining	0	0	0	0	0	0	0	0	0	0	1	0	0
Tail gas (LPG)	14	13	14	10	13	16	14	12	17	15	16	19	20
Industrial wastes	0	1	3	2	3	7	7	9	10	20	15	16	14
MSW (non-renewable component)	8	8	8	7	24	60	58	55	59	58	65	76	67
Heat from chemical process	0	0	0	0	0	0	0	0	9	1	18	18	18
Waste Heat	9	39	36	28	25	28	22	25	27	27	25	25	25
Refinery fuel gas (other)	34	26	36	32	27	12	10	8	11	13	12	20	20
Mixture of flakes	45	42	37	41	33	44	42	42	41	39	41	40	40
Firedamp gas	29	56	161	216	233	250	267	288	289	284	276	278	257

Resources supported through operating support

At present, in terms of operating aid, secondary energy sources are de facto divided into three categories

– mining gases (closed and open/acting mines);
– waste incinerators (energy recovery facilities);
– waste heat, including the use of so-called ‘torque reduction’, which uses steam energy that is defeated in electricity reduction stations.

Evolution and state of play of the use of secondary resources108:

In 2018, a total of 61 sources using secondary sources were registered in the OTE system and operated in a total of 41 power generating plants. The highest number of generators are registered in power plants using open/acting mine mine gas, with a total of 22 sources with a total capacity of 304 MW (most sources are 1.56 MW or 25 MW). This is followed by power-generating plants using closed mine gas, with a total of 18 sources with a total capacity of 21.4 MW (most sources are 1.56 MW). Furthermore, 4 municipal waste incinerators are also registered in the OTE system. The rest of the sources and power-generating facilities from secondary sources are other secondary sources, most of which are the use of waste heat or energy.

Heat supply systems

In this respect, it is also desirable to maintain district heating systems where their operation is more efficient and environmentally friendly than individual heating technologies. In order to ensure a sufficient level of energy security in the heating sector, maximum use of domestic Pez is needed. In the area of central heat sources, the most efficient use of indigenous coal in high-efficiency CHP in accordance with the best available techniques (BAT) is concerned. At the same time, it is desirable to increase the share of biomass in final heat consumption, either in the form of co-incineration with coal on central heat sources or in the form of domestic biomass boilers. There is a need to create appropriate conditions for the use of waste heat within the central heat supply.

Pursuant to Act No 165/2012 on supported energy sources, as amended, an efficient thermal energy supply system is a system to which at least 50 % of heat from renewable sources, 50 % of waste heat, 75 % of cogeneration or 50 % of heat from a combination of these options was supplied in the previous calendar year. The Energy Regulatory Authority is obliged by law to register and publish an inventory of efficient thermal energy supply systems by 30 April109. On the basis of the amendment to the Act on subsidised energy sources, from 1 January 2016, it is not possible to grant subsidies for heat pumps or solar systems which, through their operation, would impair the overall average annual efficiency of existing efficient thermal energy supply systems.

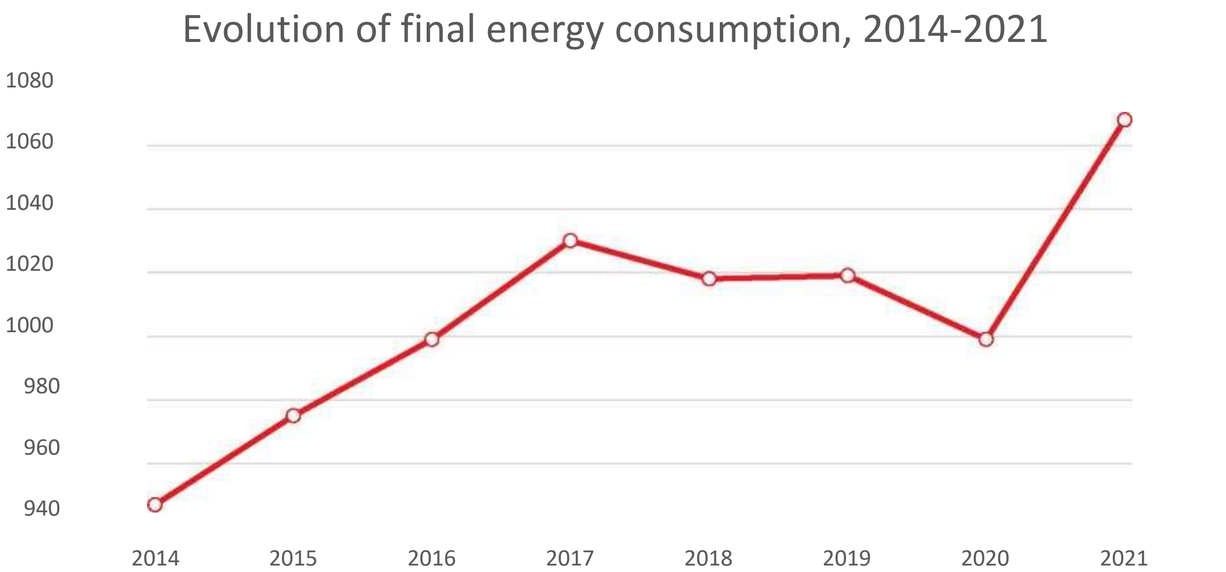
108Information from the electricity and gas market operator OTE, a.s.
109 Overview of efficient thermal energy supply systems at 29. 4. 2019 is available at the following link.

III. Projections considering existing energy efficiency policies, measures and programmes as described under 1.2. ii) for primary and final energy consumption for each sector at least until 2040 (including for the year 2030)110

4.3.1.1 National energy efficiency target for 2020

The trend in final energy consumption, which is based on the Czech Republic's aggregate energy balance, shows a year-on-year decline since 2017, until 2020, which was nevertheless marked by the Covid-19 pandemic. 2021 then saw a step increase and recovery from final energy consumption even compared to the pre-pandemic year 2019.

Graph 60: *Evolution of final energy consumption, 2014-2021*

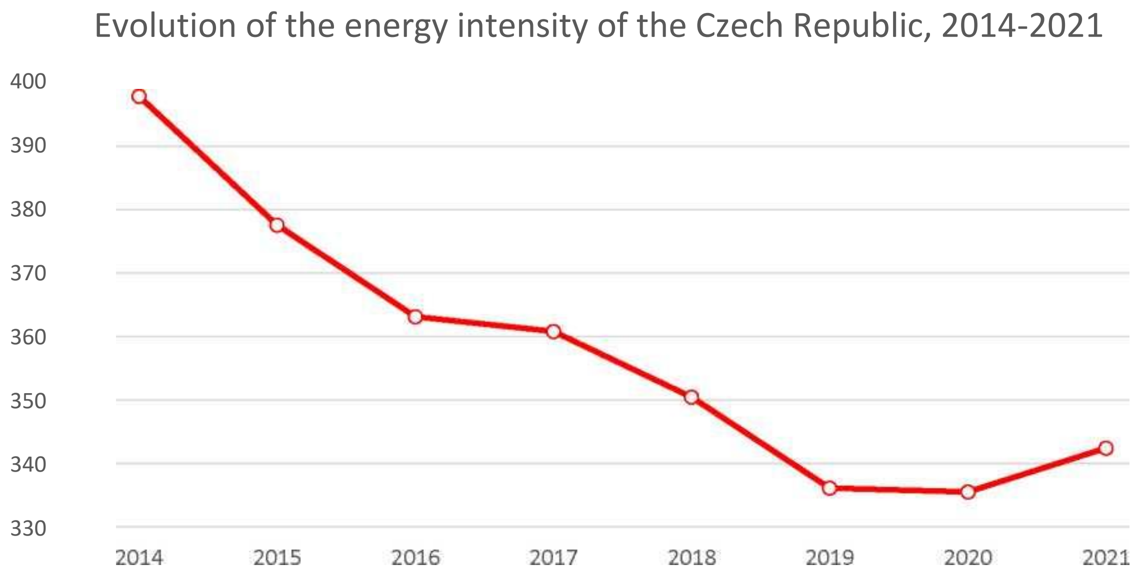


Source: MINISTRY OF INDUSTRY AND TRADE

Significant fluctuations are noted when monitoring the trend in final consumption without any adjustment for external effects, and their origin is hard to identify. For this reason too, it is interesting to look at energy efficiency improvements through an indicator other than the absolute value of final consumption, for example from the point of view of the Czech Republic's energy intensity. In 2021, the level of energy intensity increased for the first time after a long period of time, abandoning a long-lasting downward trend. In 2021, it reached CZK 342 GJ/million of GDP, which is comparable to the pre-2019 value111. The energy performance curve thus follows the final energy consumption curve.

110This reference business as usual projection shall be the basis for the 2030 final and primary energy consumption target which is described in 2.3 and for conversion factors.
111Gross domestic product at market prices 2010 (source: Eurostat).

Graph 61: *Evolution of the energy intensity of the Czech Republic, 2014-2021*



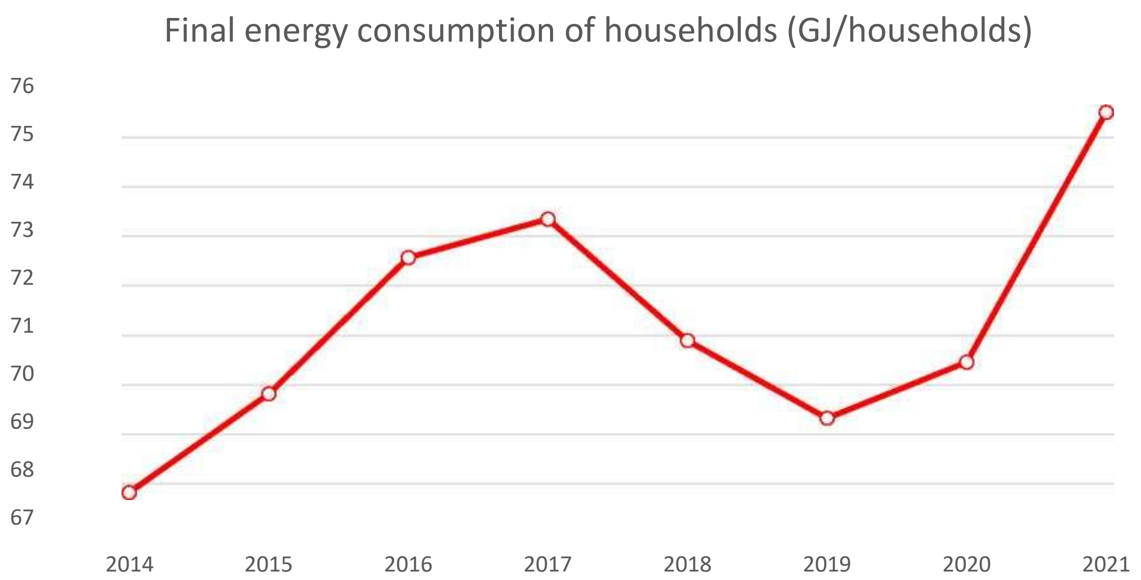
Source: Ministry of Industry, Eurostat

A more detailed analysis of the evolution of final energy consumption by sector is presented below.

Households sector

The household sector has seen a sharp increase in energy consumption, which was driven by pandemic measures, where residents spent much more time in their homes. The energy intensity of households, expressed per housing unit, also shows growth in 2021, reaching 76 GJ/byte.

Graph 62: *Final energy consumption per household, 2014-2021*

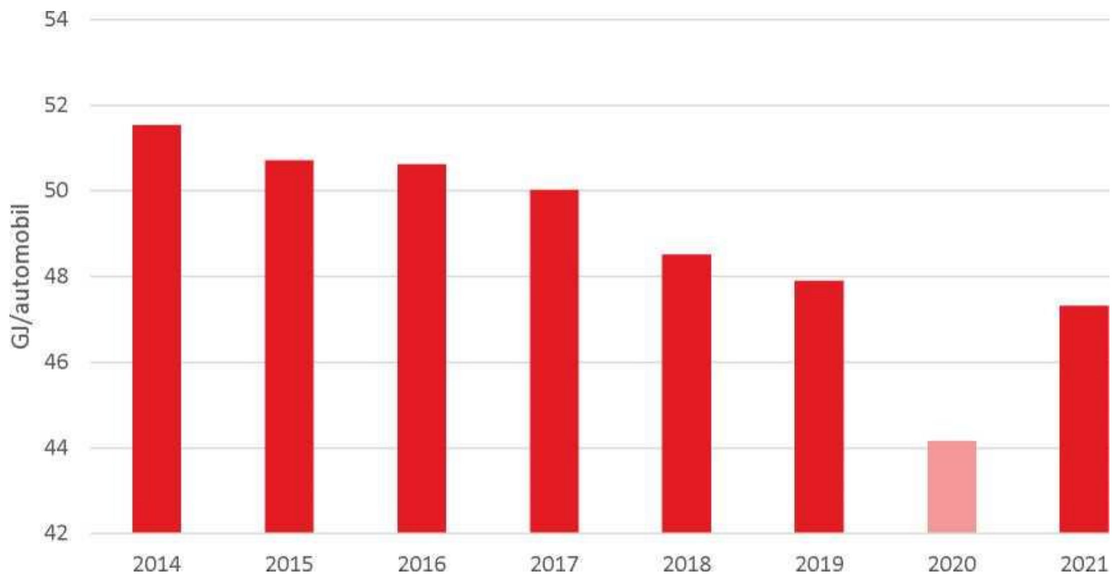


Source: MINISTRY OF INDUSTRY AND TRADE

Transport sector

Energy consumption in the transport sector returned to the 2019 baseline in 2021, after a significant decrease in 2020 driven by pandemic measures. In terms of value, consumption remains at 288 PJ.

Graph 63: Energy consumption in the transport sector per car, 2014-2021



Source: Ministry of Transport, Ministry of Industry and Trade

In terms of energy consumption per car (including only individual car transport), there has also been an increase, but the value is similar to 47 GJ/car in 2019.

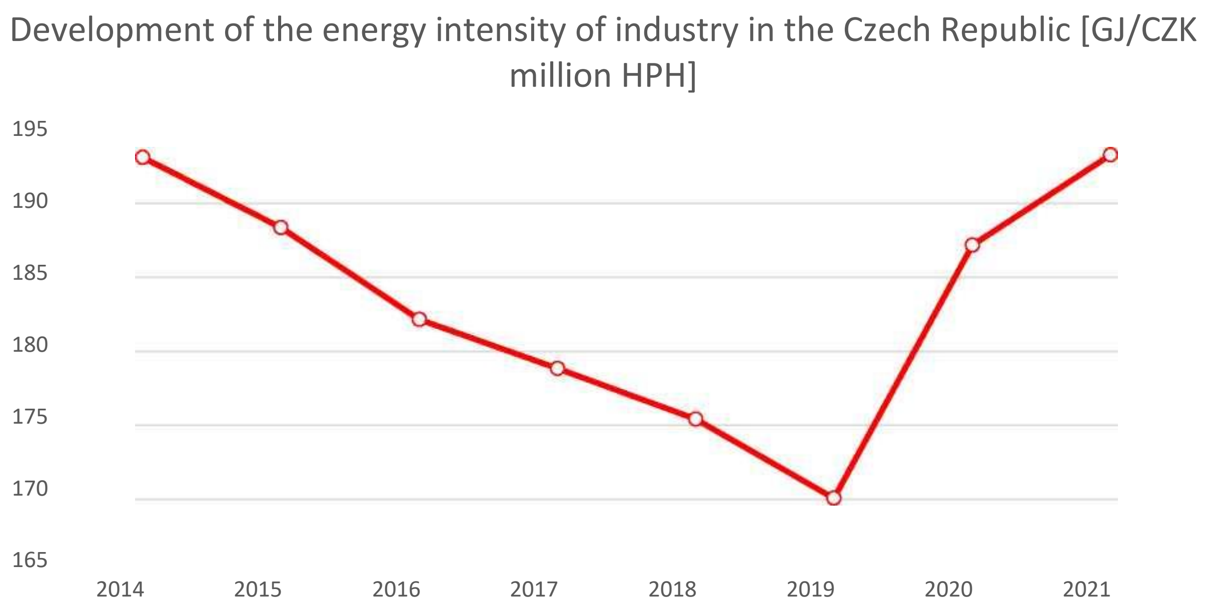
Industry sector

The industrial sector, compared to the year before the pandemic, shows an increase in final energy consumption of 5.8 %, reflecting the increase in industry's energy intensity (Graph 64). The increase in industry's energy intensity was driven, in addition to the increase in energy consumption, by the decline in gross value added (GVA) to which it is related.

As regards the ratio of energy consumption to industrial production measured against the Industrial Production Index (IPP),112there was a slight year-on-year decline of 0.3 %, but did not reach the pre-COVID-19 baseline.

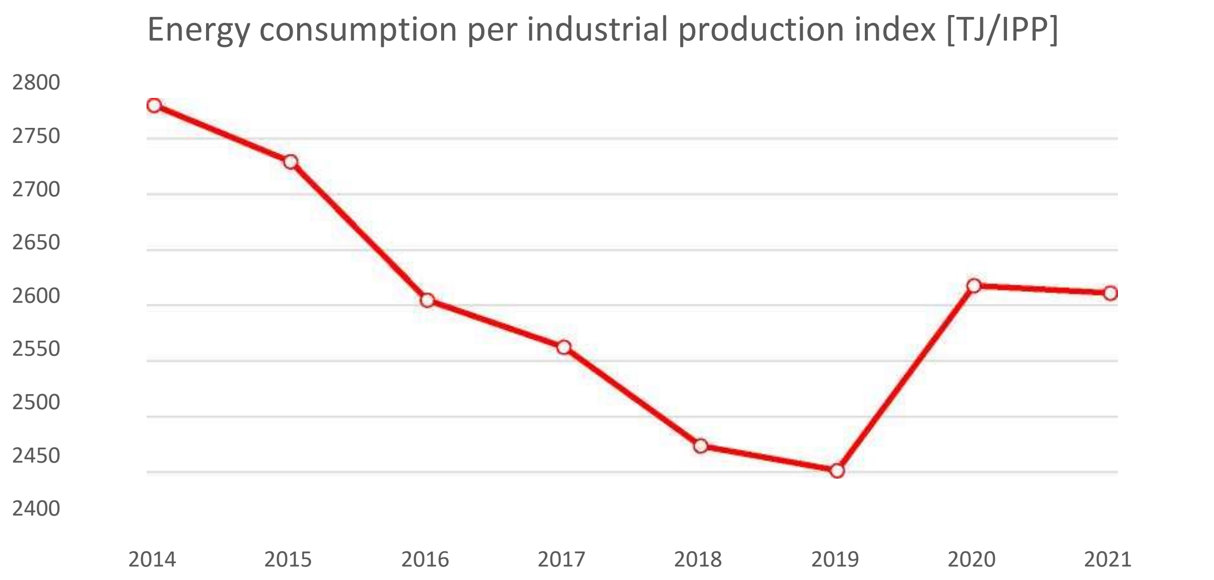
112The industrial production index (IPI) measures own output from industries, price-adjusted. The index is primarily calculated as a monthly basic index, currently for an average month in 2015.

Graph 64: Evolution of energy intensity of industry in the Czech Republic, 2014-2021



Source: Czech Statistical Office, MIT

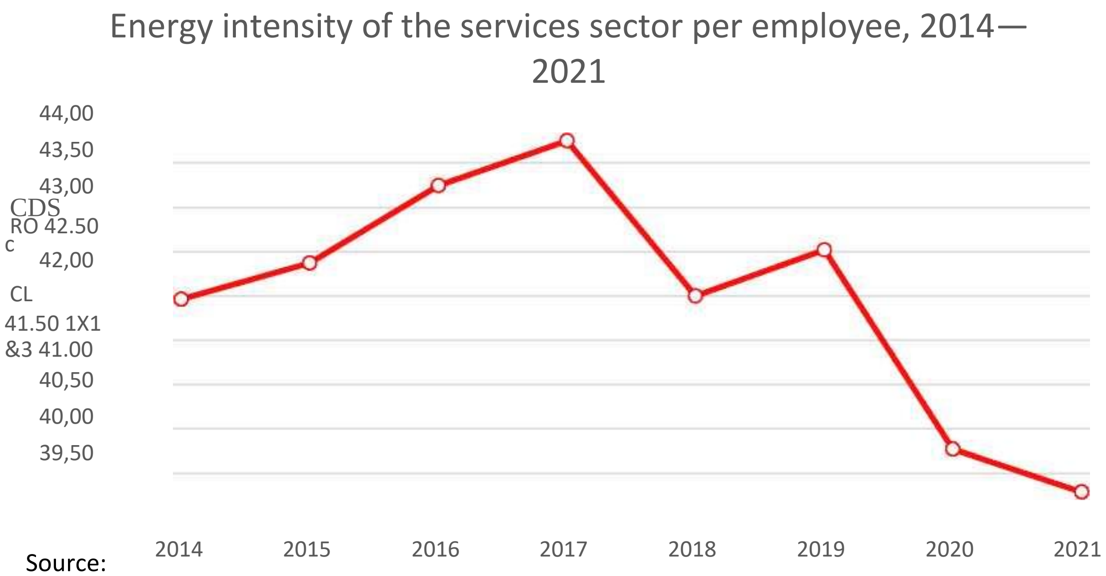
Graph 65: *Energy consumption linked to industrial production, 2014-2021*



Services sector

The services sector alone shows a long-term decline in energy consumption, which has not been disrupted by the pandemic. As a result, energy intensity in the services sector per employee also declined to 39.8 GJ and declined by 1.2 % year-on-year.

Graph 66: *Energy intensity of the services sector per employee, 2014-2021*



Source: Czech Statistical Office, MIT

4.3.1.2 Czech Republic's contribution to the EU energy consumption targets for 2030

For the purpose of setting the national contribution, Member States may use the formula in Annex I to the new 2021 EED, where the Czech Republic considers it most appropriate for the period 2030 to set contributions in accordance with this calculation**.** The indicative contribution to the binding EU final energy consumption target is calculated at 846 PJ. The indicative contribution to the non-binding primary consumption target is calculated at 1 206 PJ.

This potential takes into account the effect of planned strategies, policies and measures to be implemented in the period up to 2030, provided that:

- taking into account climatic conditions, no increase in the number of tropical days in the summer period and significant changes and intensity of the heating season is foreseen compared to 2016;
- GDP growth in line with the assumptions in section 4.1.1.2;
- the annual increase of the residential area in the light of demographic change in the Czech Republic, in accordance with the assumptions set out in Section 4.1.1.1;
- growth in transport performance in the transport sector;
- a change in the structure of the economy (increase in the services sector and the decline of heavy industry);
- increase/decrease in manufacturing in the industrial sector.

Strategies and policies affecting the level of final energy consumption include in particular:

- Long-term building renovation strategy under Article 2a of the EPBD;
- obligation under Article 5 of the Energy Efficiency Directive;
- obligation under Article 7 of the Energy Efficiency Directive;
- legislative and regulatory measures as a result of the transposition and implementation of national and EU legislation;
- planned strategies and policies in additional packaging covering, inter alia, the transport sector and expressed in the following conceptual materials:

on the Czech Republic's State Energy Concept;

the National Reform Programme (NRP);

on the State Environmental Policy;

o Climate Policy in the Czech Republic;

on the strategic framework for sustainable development of the Czech Republic;

o National Clean Mobility Action Plan. Transport policy of the Czech Republic for 2021-2027 with a view to 2050

o

IV. Cost-optimal levels of minimum energy performance requirements resulting from national calculations, in accordance with Article 5 of Directive 2010/31/EU

In 2010, the European Parliament adopted Directive 2010/31/EU on the energy performance of buildings (EPBD II). Member States were obliged to introduce by 2012 legislation requiring the improvement of the energy performance of new and renovated buildings in accordance with this Directive. The concrete implementation of improvements in energy performance in buildings must be done by each Member State on the basis of a cost-optimal level, so that the measures required by the legislation are cost-effective. The EU requests that the input data for cost-optimal calculations be updated in 2017 at the latest.

In order to achieve the desired optimisation, the European Commission issued methodological guidelines in June 2011, partially specifying the generally mandated methodological framework set out in the Directive.

Article 5 of Directive 2010/31/EU

Calculation of cost-optimal levels of minimum energy performance requirements

1. The Commission shall establish, by means of delegated acts in accordance with Articles 23, 24 and 25, a comparative methodology framework for the calculation of cost-optimal levels of minimum energy performance requirements for buildings and building elements.

The comparative methodology framework has been established in accordance with Annex III and distinguishes between new and existing buildings and between different categories of buildings.

2. Member States shall calculate cost-optimal levels of minimum energy performance requirements using the comparative methodology framework developed in accordance with paragraph 1 and relevant parameters such as climatic conditions and the practical availability of energy infrastructure, and compare the results of that calculation with the minimum energy performance requirements in force.

Member States shall report to the Commission all input data and assumptions used for those calculations and the results of those calculations. The report may be included in the Energy Efficiency Action Plans referred to in Article 14(2) of Directive 2006/32/EC. Member States shall submit those reports to the Commission at regular intervals, which shall not be longer than five years. The first report shall be submitted by 30 June 2012.

3. If the result of the comparison performed in accordance with paragraph 2 shows that the minimum energy performance requirements in force are significantly less energy efficient than cost-optimal levels of minimum energy performance requirements, the Member State concerned shall justify this difference in writing to the Commission in the report referred to in paragraph 2, accompanied, to the extent that the gap cannot be justified, by a plan outlining appropriate steps to significantly reduce the gap by the next

review of the energy performance requirements as referred to in Article 4(1).

In this respect, it should also be noted that the Czech Republic sent an update of the optimal level of minimum energy performance requirements in 2018.113 The Czech Republic prepared the third report, which was finalised in May 2023 and will be notified to the European Commission. Dramatic increases in the price of construction materials and, at the same time, a substantial increase in energy prices are a major change. Methodologically, the calculation of cost-optimal levels is significantly larger than previous reports. The basic number of variants per building is around 4000. At the same time, the number of buildings has been expanded to include an administrative building with a light envelope. Given the significant technological shift, there has also been a significant increase in variants. Extensive data collection has also taken place with the involvement of construction companies, calculators and professional organisations.

Conclusions:

The cost-optimal level of the parameters of the packaging structures of new buildings is around the recommended values under Decree No 264/2020 on the energy performance of buildings. This is due to an increase in the prices of construction measures and energy prices, which did not allow for a shift towards a higher standard of the building envelope.

- A heat pump is identified as the most appropriate heating method, depending on its application, from water-to-water type, ground-to-water to air-to-water. The seasonal coefficient of performance is decisive. The installation of a photovoltaic system is also cost-optimal.
- The cost-optimal level of parameters for changes to completed structures (reconstruction) is at the recommended values under the Decree on the energy performance of buildings.
- Forced exchange of air with recovery will significantly reduce the parameters of the energy supplied. By evaluating the forced and natural variants, it can be said that the costs of natural ventilation options are lower than those of the forced ventilation options. Forced ventilation is particularly important with a view to ensuring a long-term quality indoor environment and comfort for the operation of the building. Therefore, settings of NZEB requirements (currently force the installation of forced ventilation) cannot be regarded as inappropriate.
- The quality of lighting has a moderate influence on the changes in the calculation, cost-optimal for most of the power-saving lighting options with steering.

4.4 Energy security dimension

1. Current energy mix, indigenous energy sources, import dependency, including relevant risks

Current and expected energy mix

This chapter builds on the 2020 National Plan and will be updated, as appropriate, as part of the finalisation of the update of this document.

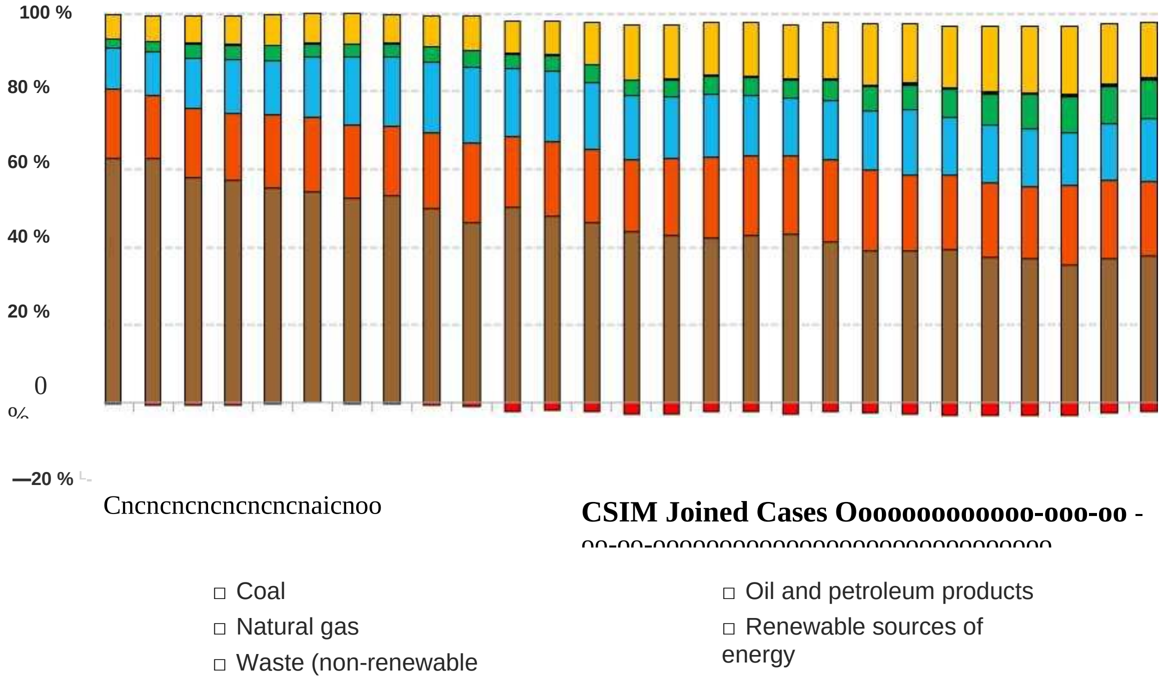
Current energy mix

Figure 67 shows the evolution of the energy mix at the level of primary energy sources. In 2016, total primary energy sources stood at 1 790.6 TJ. The largest share of 38.69 % (excluding electricity, which was negative) was made up of solid fuels, in particular lignite and coal. Oil (and derived petroleum products) is the second largest source of energy, accounting for 19.42 % in 2016. Natural gas then

113 It is a document entitled: Updating the inputs of the cost optim of buildings in the Czech Republic in accordance with Article 5 of the EPBD II Directive, available here: reference.

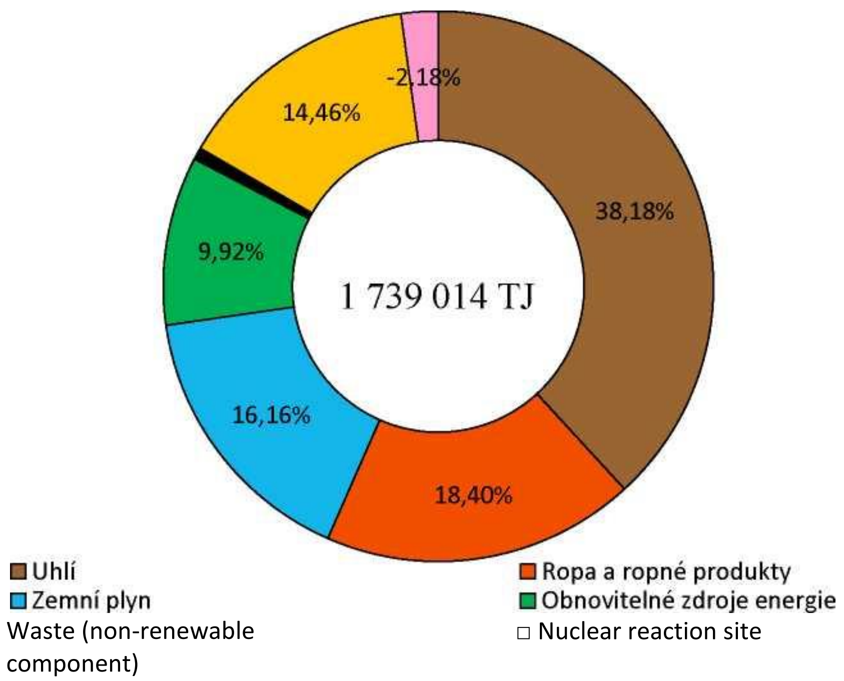
accounted for 16.41 %. Heat from the nuclear response contributed 14.69 %. Renewable energy sources accounted for 10.08 % and waste and its non-renewable component accounted for around 1 % of the total energy mix.

Graph 67: *Evolution of the energy mix at the level of primary energy sources*



Source: Energy balance according to EUROSTAT methodology (1.12.2017)

Graph 68: *Relative representation of fuels in primary energy sources in 2016*

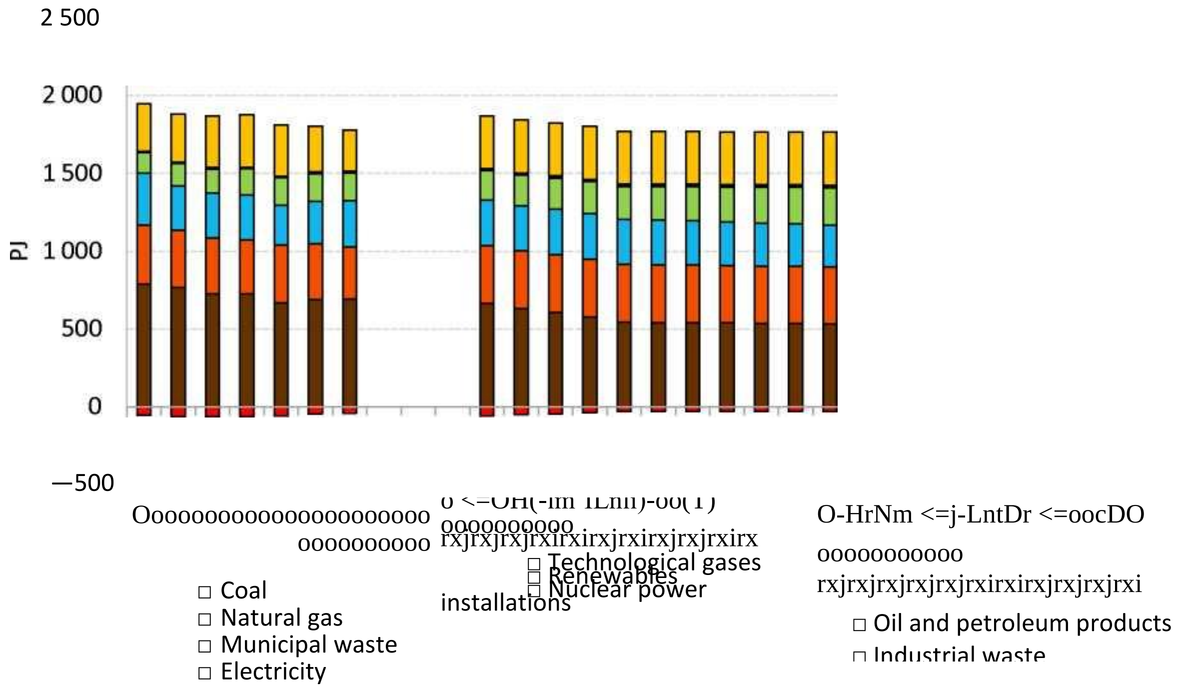


Source: Energy balance according to EUROSTAT methodology (1.12.2017)

Expected energy mix

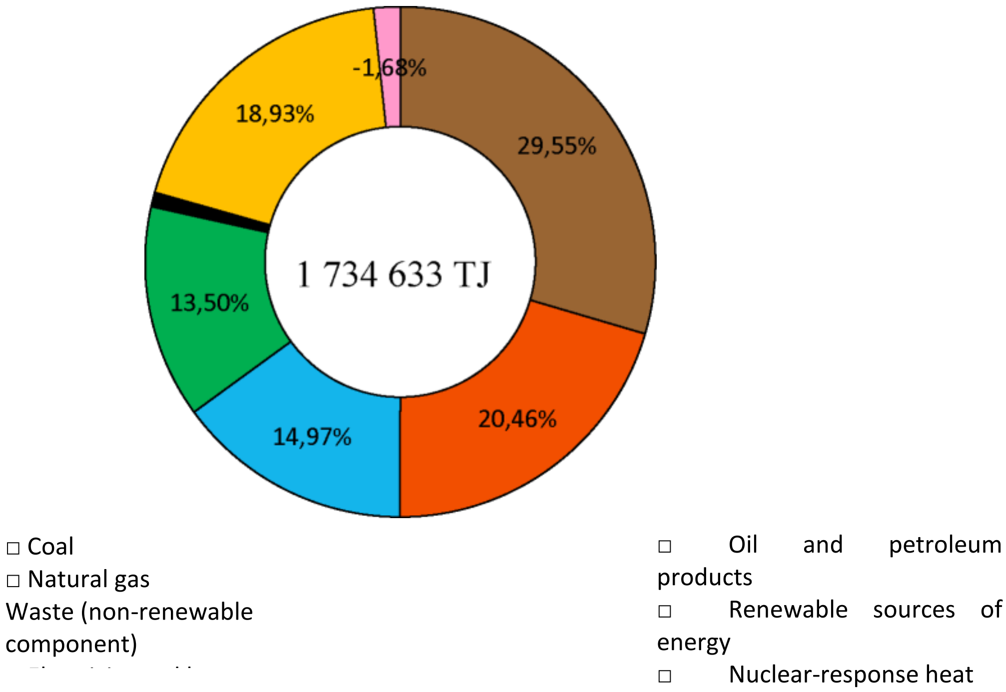
Figure 69 shows the expected evolution of the energy mix at the level of primary energy sources. Figure 70 then shows the relative share of individual fuels in primary energy sources. More detailed information is provided in Annex 1, which provides a simplified energy balance for 2016, 2020, 2025 and 2030. More information on the estimated evolution of the energy system is further provided in Chapter 5.1, specifically in section (i).

Graph 69: *Expected evolution of the energy mix at the level of primary energy sources*



Source: self-processing of the Ministry of Industry and Industry and Trade

Graph 70: *Relative representation of fuels in primary energy sources in 2030*

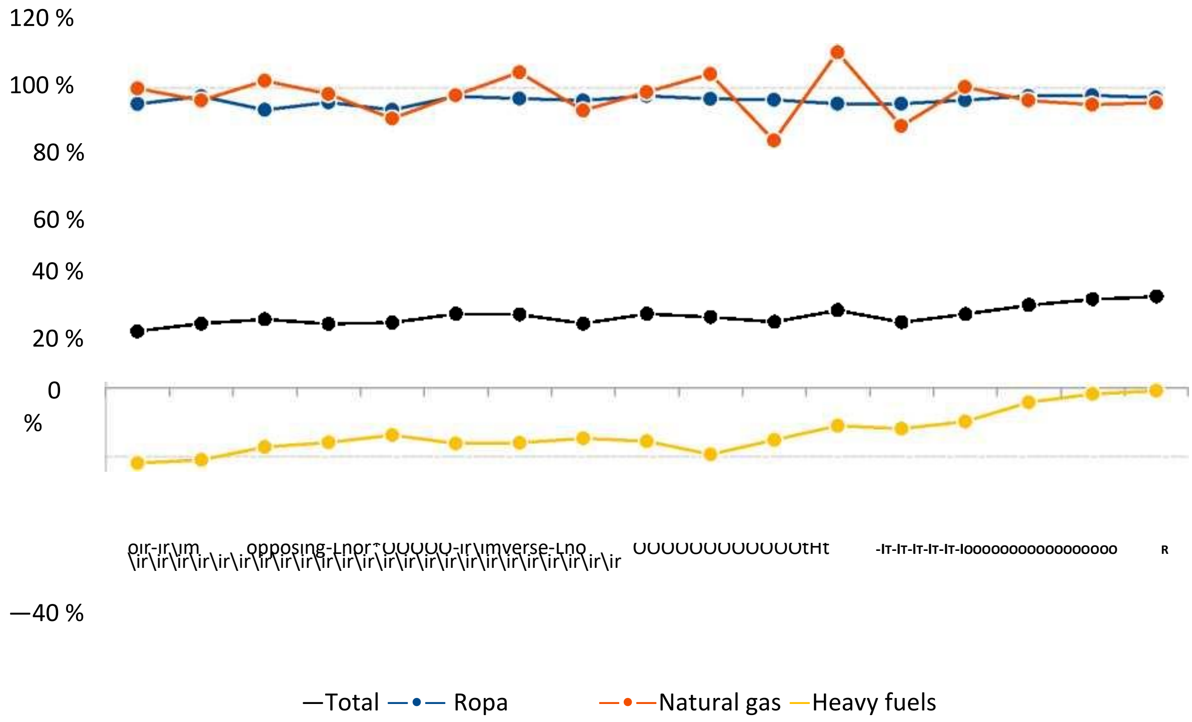


Source: self-processing of the Ministry of Industry and Industry and Trade

Import dependency

According to EUROSTAT, the total import dependency of the Czech Republic is around 30 % (32.8 % in 2016). The Czech Republic is basically fully dependent on imports from third countries in the field of oil and gas. Even in the case of oil and natural gas, the extraction of these raw materials takes place in the Czech Republic, but this is essentially marginal in view of the overall need. The development of local production of biomethane, synthetic methane and hydrogen can, in the long term, contribute to reducing import dependency for natural gas, as should oil with higher use of biofuels. In the case of consumption of solid fuels, in particular lignite and coal, the Czech Republic is currently self-sufficient. Nuclear fuel for both domestic nuclear power plants is also imported, and following the cessation of uranium mining in 2017, the Czech Republic is also fully dependent on the acquisition of feedstock for enrichment and for the manufacture of nuclear fuel. The Czech Republic is also an exporting country with regard to electricity (about 11 TWh in 2016).

Graph 71: *Import dependency per major fuel*

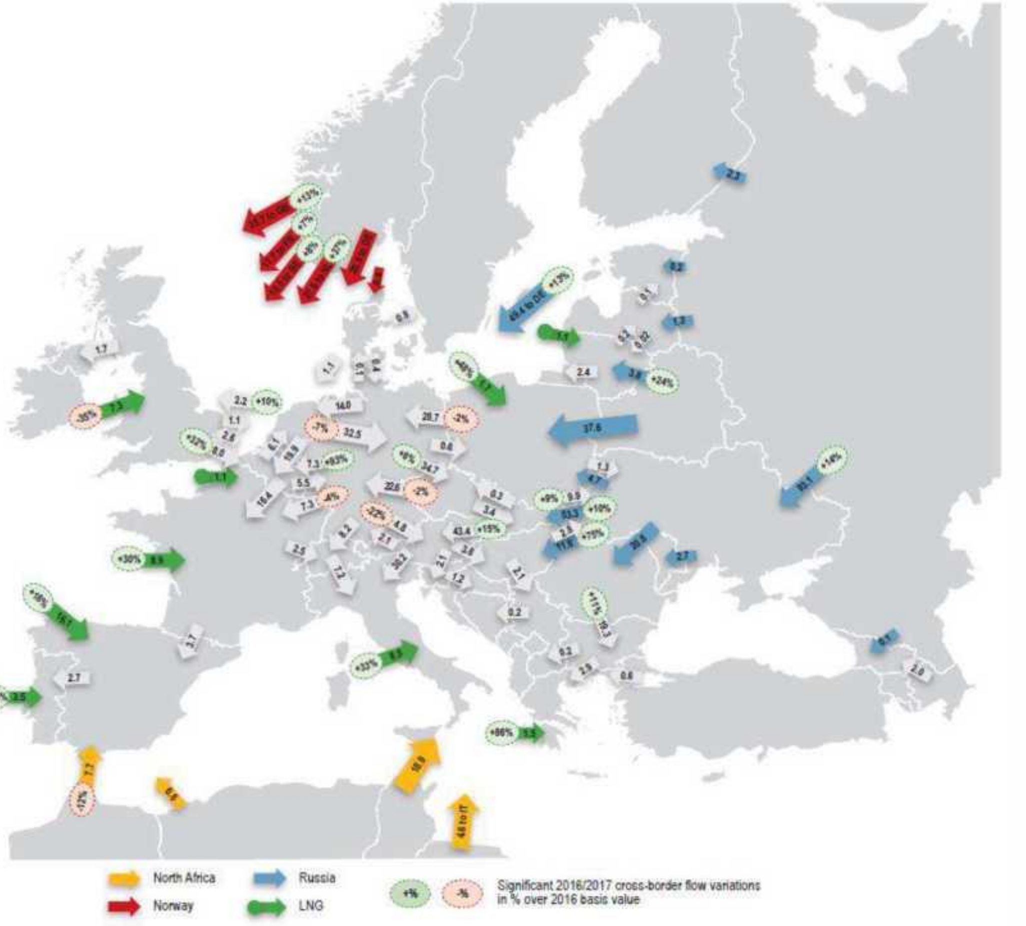


Source: EUROSTAT

4.4.1.3 Natural gas diversification

A well-developed infrastructure for cross-border interconnections as well as domestic transport makes it possible to ensure sufficient gas supplies to the Czech Republic from abroad. Gas supplies to the Czech Republic have been almost exclusively passing through the Federal Republic of Germany for several years (see Figure 6). The Czech Republic's dependence on imports of natural gas is almost 100 % and would not change significantly even if there is greater use of unconventional gas sources in the Czech Republic.

Figure 6: *Physical gas flows within the EU in 2017 and their changes compared to 2016*

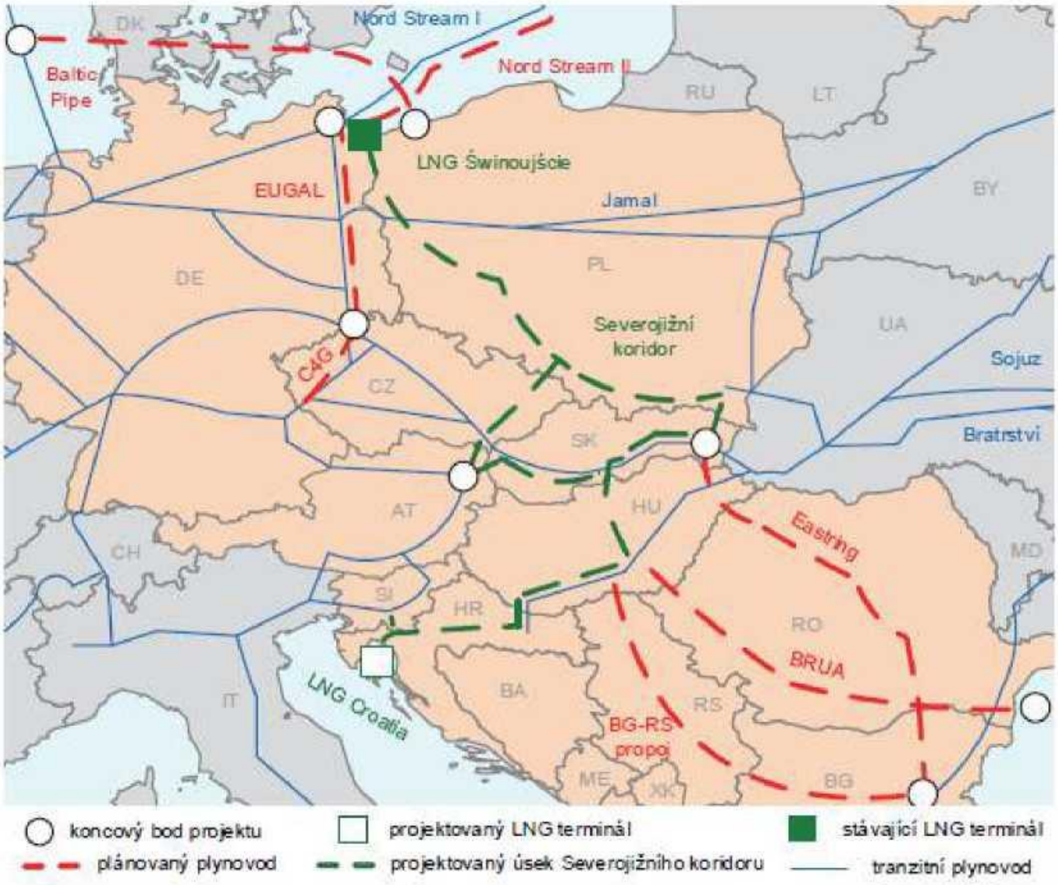


Source: ACER based on IEA (2017).
Notarial: The domestic production ofMSs is not included. The reported Nonvegian flows into Denmark originating from offshore fields that are only connected to the Danish system.

Source: Monitoring the Internal Electricity and Natural Gas Markets in 2017 (ACER/CEER)

The main measures in the area of natural gas diversification are the development of infrastructure with neighbouring countries, measures for the integration of the natural gas market and measures aimed at increasing the production of gas from RES. Figure 7 shows transnational development projects and LNG terminals relevant for the Czech Republic. In the Czech Republic's view, an increase in physical diversification (i.e. diversification of natural gas sources) is difficult to secure, even if cross-border infrastructure continues to be developed. The contribution of the continued development of infrastructure allowing new suppliers to access EU markets (in particular TANAP, TAP and LNG projects) to the Czech Republic's source diversification could be considered relatively limited.

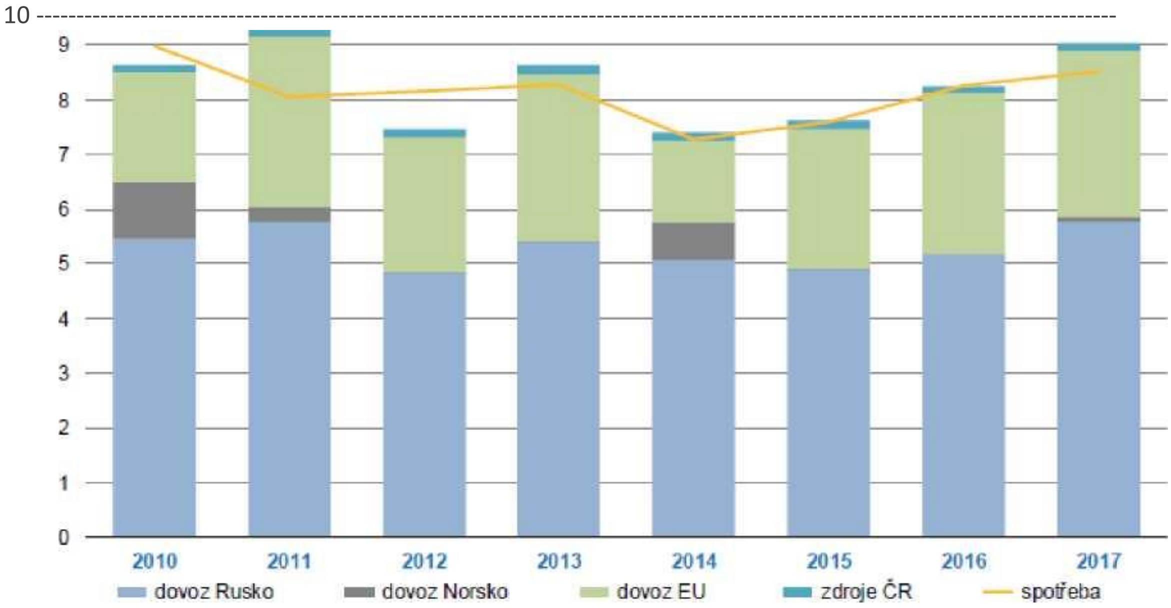
Figure 7: *Development projects with a transnational character and LNG terminals*



Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2018)

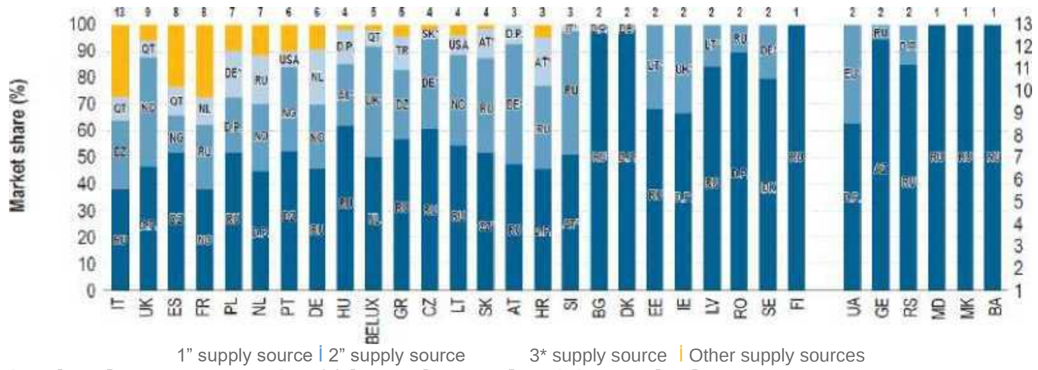
Fromthe Czech Republic’s point of view, the continued integration of the natural gas market, which contributes to commercial diversification, is beneficial in view of the diversification of natural gas supplies. Figure 72 shows the natural gas balance showing that about one third of imported gas is procured through the EU market, although molecularly it is gas from the Russian Federation. The development of local production of biomethane and, where appropriate, synthetic methane and hydrogen is also an important measure contributing to reducing natural gas import dependency or diversification, and in particular hydrogen, it is a significant increase in energy security (resilience). The REPowerEU plan and its measures also have a significant impact on the diversification of gas supplies. An estimate of the development of renewable gas is given in section 0.

Graph 72: *Natural gas balance in the Czech Republic*



Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2018)

Graph 73: *Estimated diversification of natural gas sources (2017)*



Source ACER based on Eurostat, IEA British Petroleum and EnC Secretarlat data.

Not. D.P stands tor domestic production. The astensk referencing to MSs with hquid hubs where gas is thought to have been purchased. For Denmark, the share of domestic production also including the Norwegian offshore fíelds that are part of the Damsh upstream network.

Source: Monitoring the Internal Electricity and Natural Gas Markets in 2017 (ACER/CEER)

4.4.1.4 Diversification in hydrogen

As part of the preparation of the European Hydrogen Backbone, the conversion of the existing gas transmission network for the transport of clean hydrogen is being prepared. However, some sections of the system will need to be rebuilt.

It is important for the Czech Republic:

- Central European Hydrogen Corridor (CEHC);
- Czech-German Hydrogen Interconnector (CGHI).

Both corridors could be completed by 2030 and each would provide transport capacity around 144 GWh/day (1.5 million tonnes of renewable hydrogen per year). Corridors have their entry points:

- **Lanžhot**, connection to Slovakia – renewable hydrogen from Ukraine, Southern Europe, North Africa etc.
- **Brandov**, connection from northern Germany – renewable hydrogen from northern Germany; imports into German ports from around the world.

Figure 8: *European Hydrogen Backbone*

Source: European Hydrogen Backbone

Figure 9: *Hydrogen transport corridors in the Czech Republic*

red line: Central European Hydrogen Corridor (CEHC)

green Line: Czech-German Hydrogen Interconnector (CGHI)

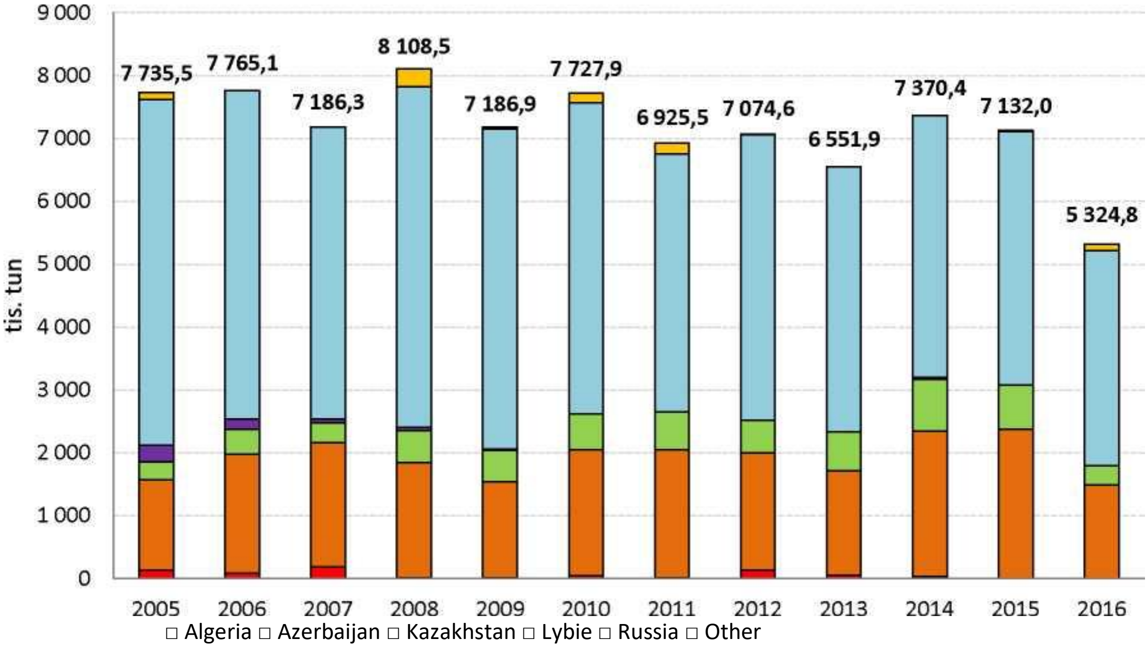
Source: Net4Gas

4.4.1.5 Diversification of crude oil and petroleum products

This chapter builds on the 2020 National Plan and will be updated, as appropriate, as part of the finalisation of the update of this document.

In 2017, the Czech Republic imported 7 813,6 thousand tonnes of crude oil (the average imports over the last 10 years correspond to 7127,5 thousand tonnes). The largest part was imported from the Russian Federation (52.47 %), followed by Azerbaijan (31.04 %), Kazakhstan (12.62 %), while the rest accounted for 3.86 %. Domestic production corresponded only to 117 thousand tonnes in 2016. For the transport of oil, the Czech Republic uses two pipelines, the Družba pipeline (the transport capacity available to the Czech Republic is 9 million tonnes of oil per year), which mainly transports oil from Russia and the IKL pipeline (transport capacity equivalent to 10 million tonnes of oil per year), which transports oil from the Caspian Sea region. The Czech Republic therefore has both the diversification of sources and the diversification of transport routes. Oil import costs corresponded to CZK 72 396 million in 2017 (the average of the last 10 years is CZK 84947 million). The Czech Republic is also an importer of petroleum products, but at the same time exports some of the petroleum products. The total negative external balance for oil and petroleum products thus corresponds to around 80 billion. CZK. This amounted to 91.7 billion in 2017. CZK 136.3 billion in 2014. CZK. In the Czech Republic, oil is currently being processed in two refineries, namely Litvínov and Kralupy. The combined processing capacity of the two refineries corresponds to approximately 8.7 million tonnes of crude oil per year. Domestic refineries account for approximately 80 % of the domestic consumption of petrol and diesel by producing so-called refinery output. The Refinery in Litvínov – Zaluí processes mainly sulphur oil from the Russian Federation (Russian Export Blend), which is transported to the Czech Republic by the Družba pipeline (also in relatively small quantities via the IKL pipeline). Kralupy refineries process sweet oil, i.e. low sulphur oil imported into the Czech Republic through the IKL oil pipeline, in particular oil from the Caspian Sea region, i.e. types of oil known as Azeri, CPC and Turkmeni blend, as well as oil from North Africa.115

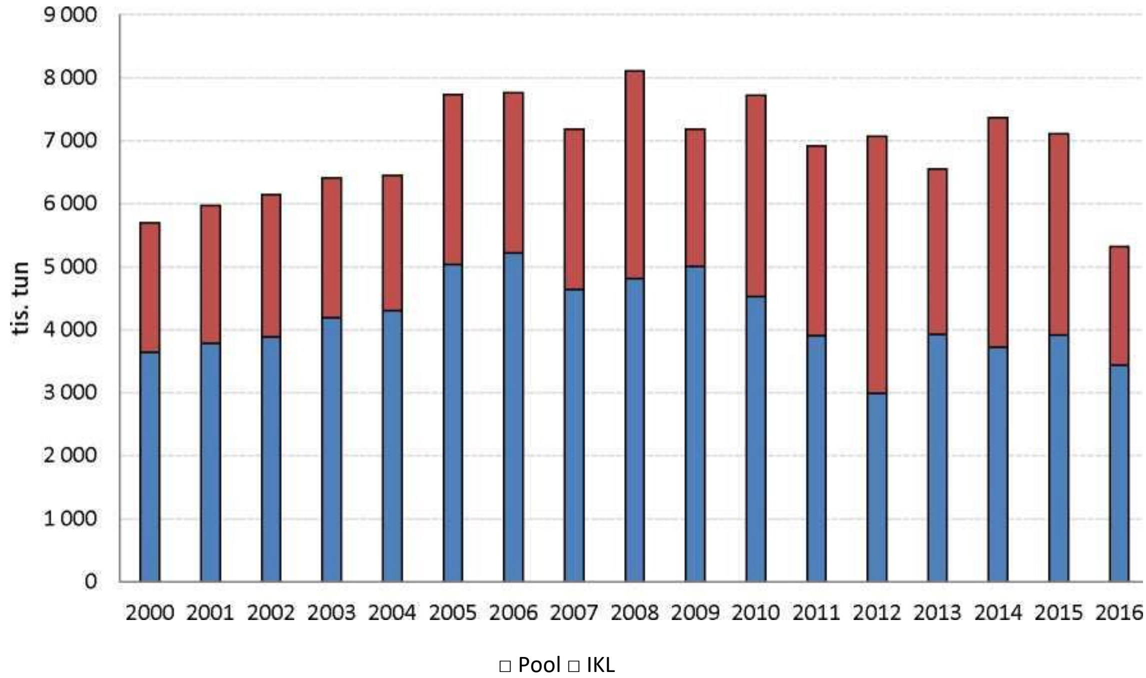
Graph 74: *Oil imports into the Czech Republic by country of origin 2005-2016*



Source: Czech Statistical Office

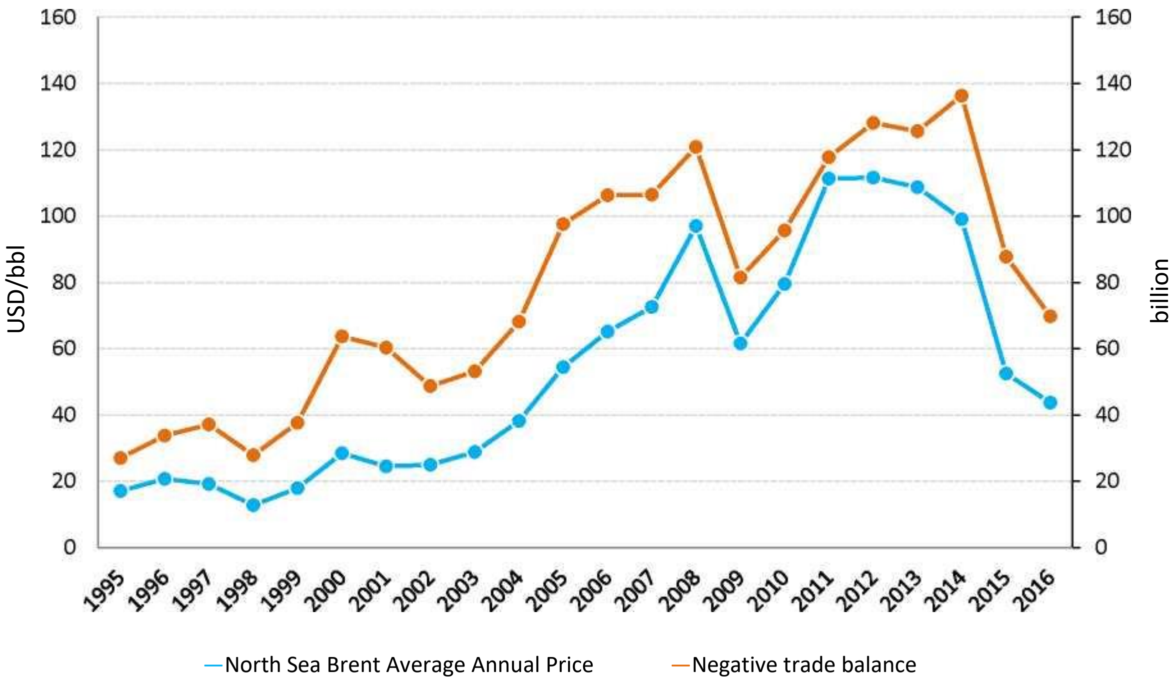
115 More information can be found, inter alia, in the Energy Sector Development Report 2016 on Oil and Petroleum Products, available here: https://www.mpo.cz/cz/energetika/statni-energeticka- policy/right-o-development-energy-sector-v-area-petroleum-a-oil-product-za-year-2016--235988/

Graph 75: *Evolution of oil imports into the Czech Republic between 2000 and 2016 by the Družba and IKL pipelines*



Source: MERO,

GraphNo 76: *Developments in Brent oil price and negative external oil balance*



Source: Oil and petroleum products – 2016 balance sheet (MPO)

4.4.1.6 Development of generation capacity and long-term electricity balance

The transmission system operator ČEPS, a.s., has consistently analysed the current risks associated with the development of production capacities in the EU. To this end, and in accordance with Articles 23 and 24 of Regulation (EU) 2019/943 of the European Parliament and of the Council, it prepares and publishes each year an assessment of the EC Czech Republic's resource adequacy. The current evaluation covers the period up to 2040 and its full version is available on the ČEPS, a.s. website (Czech version: https://www.ceps.cz/cs/zdrojova-primerenost English version: https://www.ceps.cz/en/resource-adequacy) and the Ministry of Industry and Trade.

The 2022 EC Czech Republic's resource adequacy assessment was prepared in line with ENTSO-E's methodological recommendations. In addition to the medium-term resource adequacy outlook in place, it also includes a longer-term strategic outlook until 2040.

Like other EU TSOs, ČEPS has a legislative obligation to participate in the development of the European Resource Adequacy Assessment (ERAA), which builds on its predecessor Mid-term Adequacy Forecast (MAF). The European evaluation shall be carried out by ENTSO-E on an annual basis and shall include central reference scenarios that map out a possible trajectory for the development of the European electricity sector in the medium term of ten years.

Regulation 2019/943 requires producers and other market participants (e.g. traders, customers, market operators and others in the Czech Republic) to provide transmission system operators with data on the expected use of generation resources, taking into account the availability of primary resources and appropriate forecast demand and supply scenarios. The data received from TSOs shall, together with the central assumptions defined by ENTSO-E, enter the simulations of the central reference scenarios. These scenarios may be further expanded in the national resource adequacy assessment if changes in the energy sector can be assumed in a given country compared to the central reference scenarios of ENTSO-E. The new procedures and principles are mainly implemented to refine the modelling of cross-border transmission network capacities using the Flow-Based (FB) method and to assess the economic viability of resources, the Economic Viability Assessment (EVA). The EVA model, based on economic parameters, assesses the economic rationale of the operation of the resource and, in order to reduce the systemic price, decides whether the source is shut down, its lifespan or whether it is worth investing in a new resource. In addition, ERAA also aims at a gradual transition to calculations for all years over the chosen ten-year horizon and the use of a single modelling tool.

In particular, the European assessment recalls the results of the central EVA reference scenario without capacity mechanisms, which shows the prediction of European energy developments for the 2025, 2027 and 2030 target years. The results for a number of Member States already show a risk of resource disproportionality in 2025, and the application of EVA further exacerbates this risk by the shutdown of a large number of resources deemed to be non-economic. In 2030, Germany and Luxembourg are the highest number of hours LOLE (> 20h), followed by France.

Figure 10: *ERAA 2022***Results – Central EVA Reference Scenario without Capacity Mechanisms, LOLE values in 2030**

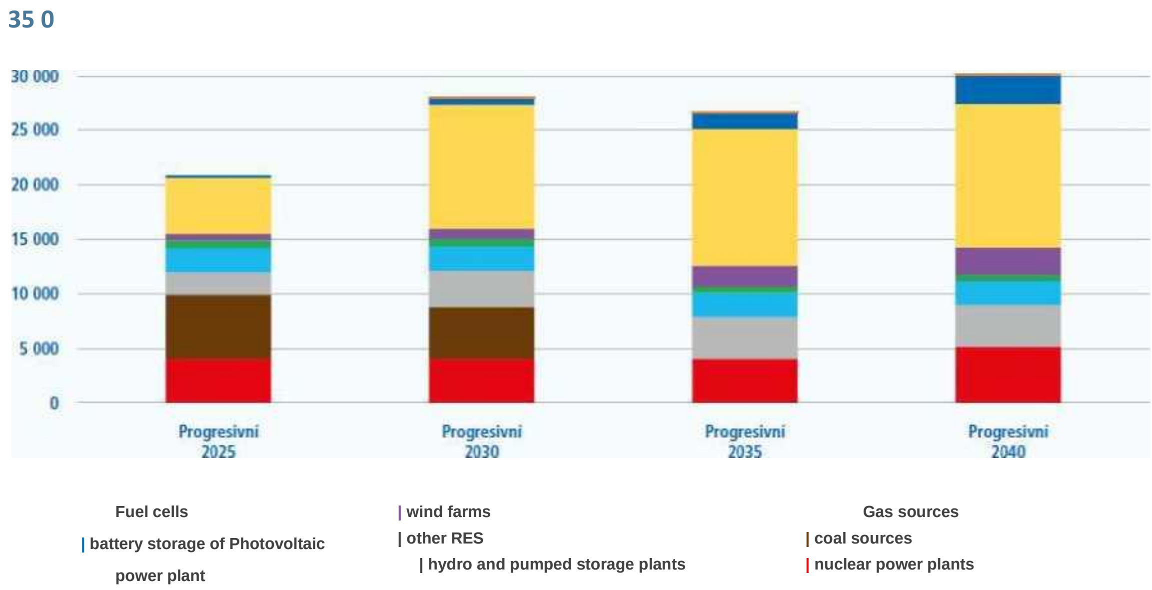
LOLE (h)
LOLE = 0 h/yr
LOLE with 0.1 h/yr
LOLE > 0.1 h/yr

ENTSO-E source

MAF CZ 2022 performed calculations showing, in a progressive scenario (which ČEPS considers to be the most likely trajectory for the development of the Czech energy mix), that after 2030 there are insufficient electricity to cover consumption, expressed in EENS of 1.2 GWh

The forward-looking scenario represents the accelerated decline of coal resources by 2033 and the higher level of penetration of renewables under the Modernisation Fund and other instruments to support their development. The scenario is based on a development prediction that takes into account the EU's ambitious emission reduction targets and envisages an increase in electricity consumption due to large-scale electrification. Complete completion of the transformation of the heating sector (CZT) and autopower from coal to natural gas, biomass, waste or other alternative fuels is under consideration by the end of 2030.

Graph 77: *Net installed capacity in Progressive scenario per year and source category*



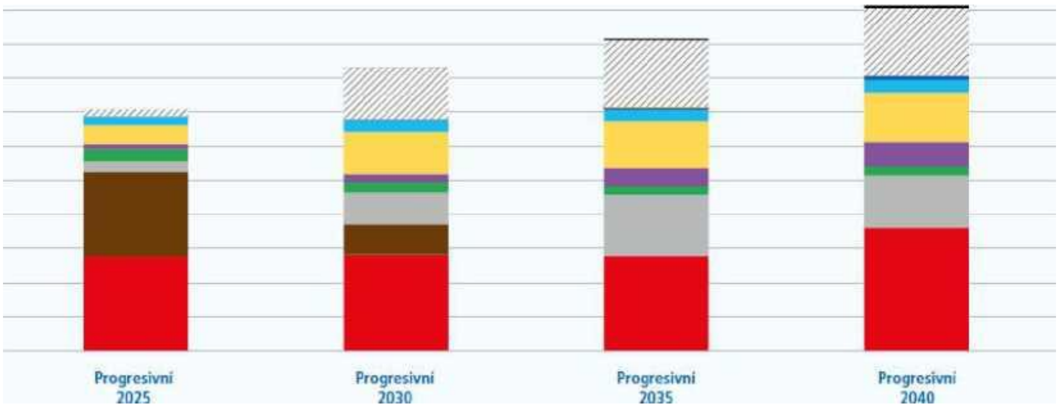
Installed capacity	Progressive 2025	Progressive	Progressive 2035	Progressive 2040
Fuel cells	0 MW	5 MW	13 MW	29 MW
Battery accumulation	220 MW	637 MW	1 491 MW	2 585
Photovoltaic plants	5 159	11 406 MW	12 567 MW	13 238 MW
Wind plants	617 MW	958 MW	1 959 MW	2 500
Other RES	688 MW	655 MW	558 MW	584 MW
Hydro and pumped storage	2 241	2 241 MW	2 241 MW	2 241
Gas sources	2 071	3 381 MW	3 811 MW	3 790
Coal Sources	7 222	5 747 MW	0 MW	0 MW
Nuclear power installations	4 047	4 047 MW	4 047 MW	5 187

Source: ČEPS analyses

The graph below showing the annual balance in a progressive scenario shows how the system is affected by the end of coal-fired power generation in 2033, when by 2035 the value of EENS undelivered energy rises to 305 GWh, while at the same time exceeding the national reliability standard expressed in LOLE. In 2035, the LOLE is 146 h/yr, leading to a progressive disproportionate supply scenario, despite a significant increase in gas production and an increase in the volume of imported energy. The evolution of the EENS indicator towards 2040 shows that even the launch of a new nuclear source in Dukovans in 2036 cannot compensate for the decline in fossil resources and the EENS continues to grow to 798 GWh per year.

Graph 78: *Annual balances in a progressive scenario for individual years and resource categories*

110 000



4| Re- delivery
Balance of imports and
exports Fuel cells
| battery accumulation
| hydro and pumped storage plants for
Fotovoltaic power plants
| wind farms
H Other RES
Gas sources
| coal sources
| nuclear power plants

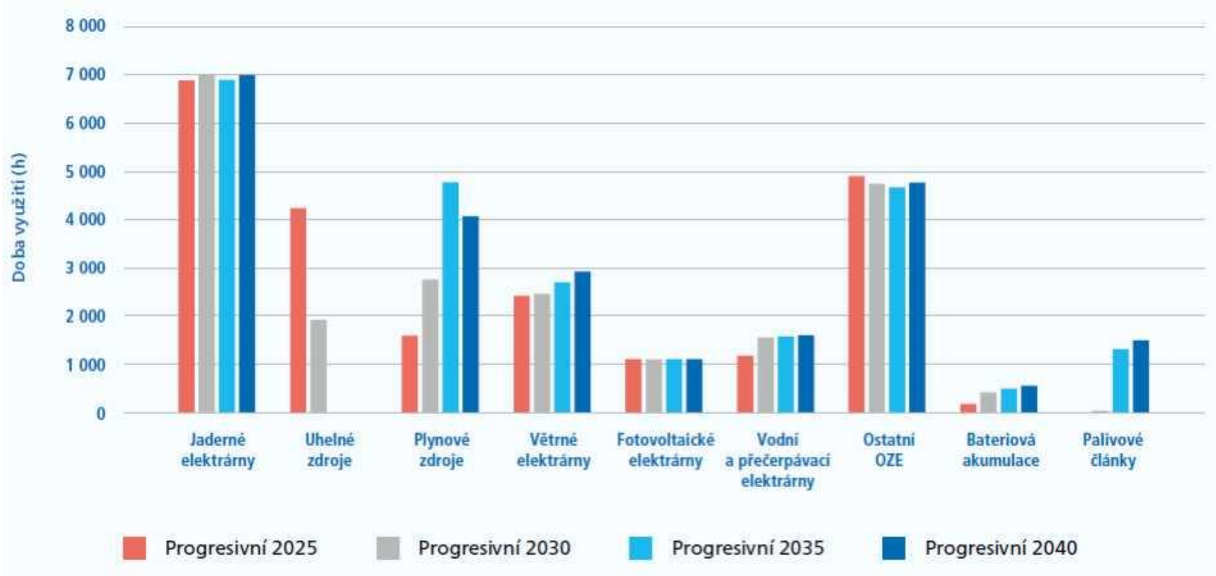
100 000
90 000
80000
.c
g 70 000
J 60 000
•>50 000
MS. |40000
z 30 000
20 000
10 0O0
0

	Progressive 2O2S	Progressive 2030	Progressive 2035	Progressive 2040
Non-delivery	OGWh	1 GWh	305 GWh	798 GWh
External balance of goods	2 121 G	15 218 GWh	19 981 GWh	19 961
Fuel cells	OGWh	OGWh	16 GWh	42 GWh
Battery accumulation	36 GWh	2S6 GWh	718 GWh	1 401 G
Hydro and pumped storage	2 605 G	3 4S2 GWh	3 495 GWh	3 554 G
Photovoltaic plants	5 658 G	12 469 GWh	13 782 GWh	14 518
Wind plants	1 484 G	2 349 GWh	5 258 GWh	7 280 G
Other RES	3 374 G	3 109 GWh	2 605 GWh	2 784 G
Gas sources	3 273 G	9 298 GWh	18 195 GWh	15 437
Uhelne resources	24 961 GWh	9 039 GWh	OGWh	OGWh
Nuclear power installations	27 883 GWh	28 381 GWh	27 921 GWh	36 326

Source: ČEPS analyses

The graph below shows the evolution of the annual hourly use of the different resource categories, which again show the impact of coal shutdown and increasing consumption. It is precisely the combination of coal-fired phase-outs, higher consumption, resource scarcity abroad leading to a significant increase in gas generation after 2040. The duration of the use of renewables does not change too much over time, due to the link between the operation of these technologies and natural conditions. Similarly, there is no change in the annual hourly use of nuclear sources which, for economic reasons, operate as baseload sources while maintaining a constant level of production.

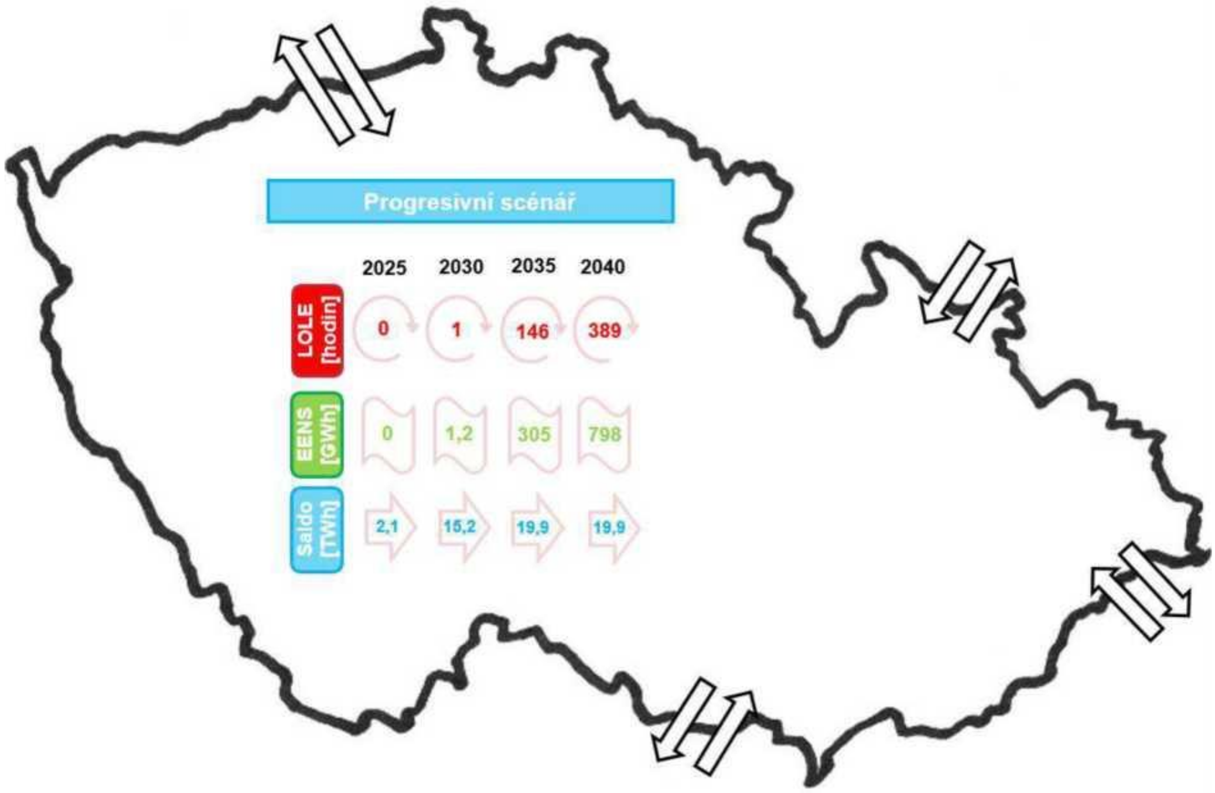
Graph 79: *Annual power utilisation of each resource category for the period 2025-2040*



Source: ČEPS analyses

A progressive scenario, which considers the decline of coal sources by 2033, a more ambitious increase in installed RES capacity and an increase in consumption in 2035, shows 146 h lost load and EENS stands at 305 GWh. In 2040, LOLE is up to 389 hours, with an EENS of 798 GWh. The progressive scenario does not meet the requirements for reliability of electricity supply since 2035. The system would thus be highly disproportionate to the source, in particular because of the phase-out of coal-fired electricity generation as early as 2033, without replacement in the form of new sources. There is also a risk that this situation will occur for economic reasons even earlier than 2033, in particular because of the rising price of emission allowances, where coal resources cease to be competitive on the market.

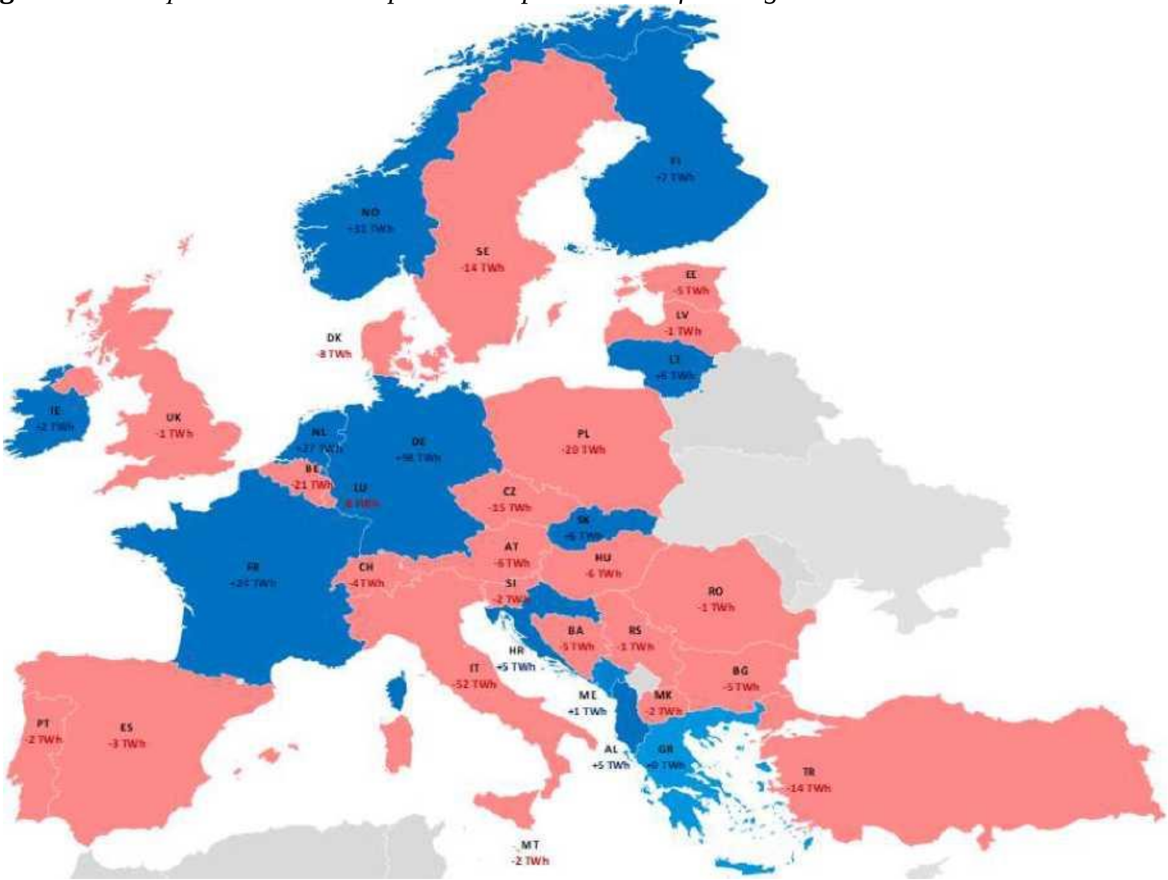
Figure 11: *Probabilistic indicators LOLE and EENS for Progressive scenario 2025-2040, including balance*



Source: Assessment of the EC Czech Republic's resource adequacy by 2040 (MAF CZ 2022)

The analyses show that due to the phasing out of coal resources and the end of nuclear lifetimes, the level of installed capacity will decrease. The planned development of RES and decentralised generation, as calculated above, contributes only to a limited extent to addressing the security of electricity supply. Given the evolution of the performance balances of the surrounding countries in our region, import alone cannot be relied on to ensure a secure and reliable supply.

Figure 12: *European countries' import and export balance for Progressive 2030 scenario*



Source: Analysis by ČEPS, a.s.

The results of simulations of the development of the electricity system show that the volume of imported electricity is increasing due to the lack of domestic production capacity and the increasing consumption of electricity due to electrification (especially in transport and heating, but also in industrial production). In 2035 and 2040, the import value is within the maximum technically possible import limit of 20 TWh. As regards the possibilities to import electricity from the surrounding countries, the surplus is more marked by the scenario mainly in France and Germany. However, changes in the German and French energy strategies, together with the published taxonomy and the Fit for 55 package, will lead to increased consumption of hydrogen (especially from RES), which will affect the available import opportunities from abroad.

There is currently no new source with installed capacity in the order of hundreds of MW in preparation or implementation in the Czech Republic, which could become operational in the 2030 perspective. In the medium term, there is limited scope for additional investment in fossil fuel resources. The main reason for this is the greening measures for fossil resources and thus the need for increased investment to implement them.

The results of the simulations mentioned in the previous chapter show that, in order to achieve resource adequacy and to comply with the reliability of the operation of the EC ČR (LOLE & 15 h), it will be necessary to supply the system with new energy sources in certain time sections. The system needs to be complemented by new sources (so-called 'sourcing') in response to the reported energy shortage. For MAF CZ 2022, two source options have been implemented.

- A simplified approach based on coverage of the total EENS with new sources requires net installed capacity in the system by the following quantity (with the requirement of a maximum import balance of 20 TWh) per time section.

- In the case of higher energy self-sufficiency requirements under ASEK (covering at least 90 % of consumption with domestic sources), the following amount of source is needed based on the results of the simulations.

Table 72: *Overview of the additional net installed capacity at a maximum import balance of 20 TWh and at 90 % energy self-sufficiency*

Need for supply [MW]	2025	2030	2035	2040
Maximum import balance (max 20 TWh)	0	0	76	200
Energy self-sufficiency according to ASEK (90 % of consumption)	0	1 760	2 818	2 740

Source: Analysis by ČEPS, a.s.

With the shutdown of coal resources, the Czech Republic will lose a significant part of its manageable electricity production, which will have to be replaced. Compensation will be necessary not only for the generation and sale of electricity for the power electricity market and for supplies to consumers, but also for the balancing market. Balancing services shall be purchased by the transmission system operator for balancing generation and consumption at all times and for the reliable and quality of electricity supply. Taking into account the gradual deterioration of security of supply indicators and exceeding them in 2035 as a result of the abandonment of coal resources in 2033, it is clear that the early shutdown of coal resources will bring electricity shortages for the power electricity market, consumers and the balancing services market closer to 2030. Therefore, like other Member States in the European Union, the Czech Republic is also examining measures other than purely market-based measures in order not to comply with national reliability standards and thus to ensure the gradual, manageable decarbonisation of electricity production while respecting the objective of the State Energy Concept to ensure performance adequacy in relation to the maximum load on the electricity system. The instruments under consideration include a capacity mechanism that could be able to eliminate risks to both the power electricity market and the balancing services market or an incentive scheme for controlled exit. At the same time, we are following the ongoing revision of electricity market rules, the so-called Reform of the EU electricity market design, which is likely to offer Member States further options to ensure security of supply, be it in the form of CfD, PPA, providing flexibility in setting up a capacity mechanism or introducing a support scheme for flexibility.

4.4.1.7 Provision of non-frequency transmission system services

Recovery plan for system failures

ČEPS, as the exclusive operator of the electricity transmission system (electricity lines 400 kV and 220 kV) in the Czech Republic, is required to draw up a restoration plan in accordance with Article 23 of Commission Regulation (EU) 2017/2196 of 24 November 2017 establishing a network code on defence and restoration of the electricity system (NCER), in consultation in particular with the relevant distribution system operators, significant network users, the national regulatory authority, neighbouring TSOs and other system operators in the Continental Europe synchronous area. The restoration plan shall include technical and organisational measures to restore the system to normal operation, in particular measures and procedures to restore the power supply when the transmission system is in blackout condition, i.e. where at least one of the following conditions is met:

- more than 50 % of abstractions in the Czech Republic have been lost;
- or if the Czech Republic completely lacks tension for at least 3 minutes.

According to Article 24 of the NCER(1), the measures must be implemented and maintained in the Recovery Plan.

In addition, according to Article 23 NCER(4)(f), the Recovery Plan must include the number of energy sources in the TSO's control area that are necessary to restore the power supply of its system as part of a self-recovery strategy with black start capability, fast resynchronised (through self-consumption operation) and island operation capabilities.

The electricity system is designed and operated to meet the reliability criterion 'N-1' (the failure of any defined transmission system element shall not cause the permissible operating parameters to be exceeded). For the system thus designed, while complying with that criterion, the probability of a failure accompanied by a disturbance of the normal operating condition is very low. However, practical operation shows that, from time to time, the electricity system is exposed to a random grouping of phenomena leading to a widespread failure, which, in the worst-case scenario, may also result in a total loss of user voltage (blackout). Large outages in electricity supply mean a critical situation with a societal impact. In these cases, the Recovery Plan and its measures are activated.

The Czech Republic's transmission system renewal strategy is currently based on the rapid and priority provision of self-consumption of nuclear power plants for reasons of nuclear safety and on the submission of voltage from available resources to the self-consumption of system power plants (power plants connected to the transmission system and enabling power regulation as required by the system). This procedure shall ensure that sufficient and stable power is available within a relatively short time to restore the power supply of other network users. The operation of system power plants is also prepared for such procedures in view of regular joint training between ČEPS, distribution system operators and system power plants.

In the event of a complete loss of power, resources with black start capability are reserved for the initial provision of voltage to nuclear and other system power plants. These sources shall be regularly tested and certified. In the transmission system, these are the hydropower plant Orlík and the pumped storage power plants Dlouhé and Dalešice. Up-to-date sources certified for dark start provide stable power for at least two attempts to run any one of the restoration blocks (operation for at least 6 hours).

A key follow-up is the entry into operation of additional system resources for the expansion of the renewed part of the system. The TSO shall conduct comprehensive operational tests for the submission of voltage from dark start sources to selected system power plants in order to restore their own consumption. In the event of a successful test, these power plants are then included among the so-called system restoration blocks, which will ensure the initial restoration of the system and provide power for the next power supply renewal of the users of the electricity system.

For this purpose, the following resources are included in the Recovery Plan and tested:

- Dukovany nuclear power plant (however, with a view to ensuring nuclear safety, the restoration of the system through Dukovan has more restrictive conditions)
- Coal Chvaletice Power Plant
- Coal Prunéřov power plant 2,
- Coal Tušimice 2 power plant
- Počerady coal-fired power plant.

Therefore, the operation of coal-fired power plants is essential and difficult to replace until the early 1930s in order to meet the requirements of the NCER and ensure a rapid and reliable recovery of the system after blackouts.

In the future, the initial system restoration strategy envisages the participation of, in particular, future (PARO) gas-fired power plants. For new sources, capacity to participate in island operations and rapid resynchronisation can be applied as part of the attachment requirements. However, the expected number of such sources will be lower than the current presence of coal-fired power plants. Therefore, ČEPS screens procedures with a higher involvement of DSOs. However, these procedures will involve the use of a higher number of smaller resources at the same time, putting increased demands on management, communication and setting up the necessary processes. At the same time, by 2030 it is not realistic that new (PARO) gas-fired power plants will emerge or that coal-fired power plants will be fully replaced by common processes with distribution systems. The shut-down of coal-fired power plants will lead to a slower restoration of the system into a normal operating state with a higher risk.

The real involvement of RES and in particular of energy storage systems in system restoration requires further research into power electronics enabling Grid Forming functions, i.e. a function where inverters will have advanced system support features, including black start for larger grid units. These sources, given their primary energy source, may not always be available and may not provide stable power for the minimum necessary time to deploy additional sources, as well as currently available black start sources or power plants classified as system restoration blocks. Again, this entails a risk for successfully bringing the system into normal operation and increased demands to ensure appropriate technical and organisational measures. Therefore, at this point in time, we do not consider that the state of experience and deployment of power electronics is sufficient to replace coal resources in the 2030 horizon.

In the context of the projected downturn in coal power, it is therefore necessary to ensure the maintenance of black start capabilities in the nodes of North-West Bohemia, Eastern Bohemia and Moravian-Silesian in the transition period until the beginning of the 30th year.

Voltage and reactive power control

The regulatory scope of the reactive power of existing and planned facilities, in synergy with the compensation available to ČEPS, constitutes an important tool (overall) in the area of voltage management and reactive power. The expected development of the transmission system, in particular the duplication of transmission lines, will ensure an increase in transmission capacities, while at the same time leading to an increase in reactive power generated by PS lines. Together with decentralised production and higher ducting rates in the Czech Republic, the electricity system will face, in particular, at a time of lower load, an increase in the generated reactive power in DS and the associated increase in voltage at the respective forwarding point PS/110 kV. In the case of a rapid shutdown of coal resources involved in voltage management, there will be a lack of regulatory means, creating a risk to system operation. Therefore, in order to ensure the operational safety limit in terms of voltage control and reactive power, it is necessary to have stable sources capable of voltage control (e.g. coal/parogas/nuclear power plants) before their full compensation range is replaced by ČEPS's own compensation means and DS regulatory capabilities. In the case of a step shutdown of all coal-fired power plants and the unavailability of new stable sources, full replacement can be expected after 2033. However, it is not possible to wait for a significant acceleration with regard to the planning authorisation processes.

In order to ensure operational security and the ability to keep voltage within the allowed operating limits, the verification of the adequacy of the planned compensation and the identification of the need for compensation in the CP shall be carried out on a regular basis by specifying the development of the system and the evolution of the operation and availability of other means not only for voltage management. The analysis shall also study other aspects affecting secure and reliable system operation (e.g. dynamic scope of reactive power control in the direction of both reactive power supply and reactive power take, electricity quality, adequacy of compensation for the area concerned in view of cost-effective system operation). On the basis of the analyses, a concept is prepared for the development of compensatory funds in the Czech Republic until 2032, which defines the location of new compensatory buffers, including technical design and performance. The U/Q regulation service, in particular in the nodes of north-western Bohemia, Eastern Bohemia and Moravian-Silesian, needs to be ensured on existing sources during the transitional period until the entry into operation of new compensatory means and is a key condition for ensuring the reliable operation of CP within the permitted quality parameters.

Measures to maintain inertia

The loss of conventional sources with synchronous generators also leads to a loss of inertia in the system. Generally, inertia, which is the natural physical characteristic of the rotating masses of the synchronous sets, helps to stabilise the frequency of the electricity system. With the loss of inertia, higher variations in frequency and speed of changes can be expected, leading to higher susceptibility of the entire electricity system to fault conditions. The analyses carried out show that the inertia of the Czech Republic's electricity system with the shutdown of coal resources will actually decrease, but the overall situation is rescued by large machines in nuclear power plants, which will provide sufficient natural inertia and ensure compliance with the minimum permitted level together with other synchronous machines in the system. However, in view of possible fault conditions, ČEPS is concerned with the area of artificial inertia that could be provided by power-equipped devices (again as a Grid Forming function). This feature is expected to be available on a larger scale in the system only after 2030.

Measures for the provision of non-frequency services during the downturn of coal energy by 2032

The three non-frequency services described above in the nodes of north-western Bohemia, Eastern Bohemia and Moravian-Silesian will not be provided in the event of a sudden shutdown of existing coal resources that these services today provide. The current service delivery mechanism for one year in advance is based on the steady state of long-term operation of all key system power plants. However, this is very risky for the downturn of coal energy and the gradual development of new resources and services, as the long-term plans of operators of current resources as well as potential investors in new resources cannot be taken into account and ČEPS has no tools to enforce the provision of key non-frequency services if existing coal resources are completely shut down. For a transitional period from 2026 to around 2032, i.e. until the technical means in ČEPS networks are gradually completed and a new system of coordination of smaller resources in distribution networks is set up, services will be ensured by long-term auctions.

The auction will be issued by ČEPS for the core three non-frequency services in hub areas where reliable operation and renewal of the transmission system could not be ensured under the applicable legislation after the shutdown of coal resources. The relevant hub, the service parameters (their scope and required availability) will be defined and the auction will be open to all resources that can provide these services in a given hub area (i.e. potentially new sources). In a node where the only source of such services is realistically the only source of such services may be provided by direct contract with the approval of the ERO.

The auction shall take into account the planned commissioning of transmission system facilities and any new resources capable of providing these services. The auction for these services must take place no later than 2025 in order to ensure that the services are delivered from the potentially critical year 2026.

4.4.1.8 Securing the long-term supply of nuclear materials and fuel

Nuclear power plants are a source of baseload electricity important for the reliable operation of the electricity system and further contribute to the energy autonomy and independence of the Czech Republic. Therefore, securing the supply of nuclear fuel and ensuring the reliable operation of fuel is an important strategic factor.

The operator of the nuclear power plants in the Czech Republic is continuously assessing the behaviour and operating results of the fuel and implements fuel modifications in order to ensure the reliability of the fuel and improve its technical level. The Dukovany nuclear power plant uses fuel from JSC TVEL from the Russian Federation. Its operation has been smooth over the long term and its technical level and efficiency are continuously improved as part of the modifications. Fuel is currently used at an increased power of 105 % over a full five-year fuel cycle thanks to the latest fuel innovation (Gd-2M+) committed since 2014. At the same time, a new modification of the PK3+ envelope fuel was implemented, which will support the upcoming additional power increase using the plant's project reserves and the extension of fuel cycles. The Temelín nuclear power plant is also currently fuelled by JSC TVEL. In 2018, an advanced type of fuel with increased uranium content and enhanced structural strength (TVSA-T mod2) was delivered and introduced into block 2, allowing for further fuel efficiency gains. The development of this increased number of remote grids has removed emerging operational problems for previous modifications and allows for reliable operation at present. TVSA-T fuel supported the transition to an increased power of 104 % over the four-year fuel cycle and provides potential for the safe operation of blocks in the upcoming extended cycles.

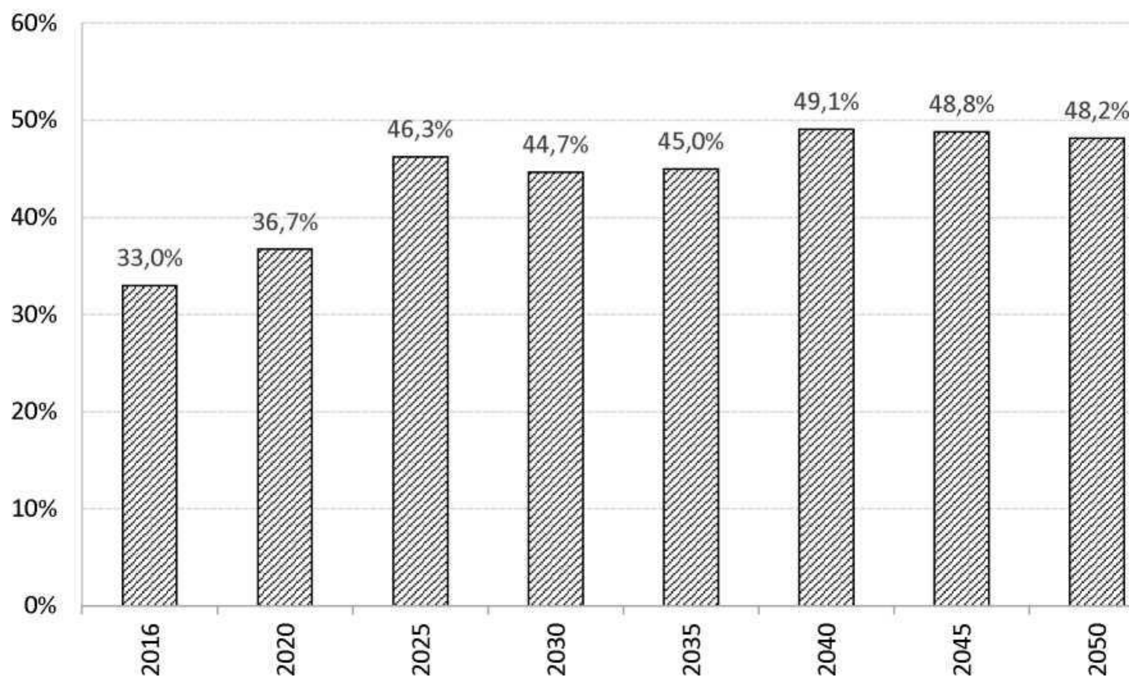
ČEZ, a.s. was aware of her dependence on a single fuel supplier a few years ago. It has therefore started activities leading to the provision of an alternative fuel supplier. However, as this is a complex long-term process, it has taken immediate steps to mitigate this risk. A stock of fresh nuclear fuel was created in both nuclear power plants. At the Dukovany nuclear power plant, the maximum storage capacity was filled to ensure the operation of all 4 units of the power plant for at least three annual fuel cycles. At the same time, an increase in this storage capacity is under preparation. At the Temelín nuclear power plant, a fuel reserve of one transhipment storage for each unit has been developed, but at the same time the process of diversification of supply has progressed. However, an increase in fresh fuel storage capacity is also being prepared at the Temelín nuclear power plant.

Nuclear fuel for the Dukovany nuclear power plant is sourced under a long-term contract of the Russian company TVEL, which provides not only for its production (fabrication) but also for the supply of conversion and enrichment services and partly the base uranium raw material. At the same time, a fuel supply contract was concluded in 2023 with Westinghouse Sweden Electric, which will cover part of the power plant's needs by supplying alternative fuel as of 2024. The development of alternative fuel for VVER reactors is also underway for units in Ukraine, Slovakia, Hungary and Finland. Thus, supplies from two different fuel suppliers are secured, while negotiations are ongoing to procure an additional alternative fuel supplier outside the Russian Federation. The operator ČEZ, a.s. ensures the purchase of nuclear materials and their processing on the world market for these supplies of alternative fuel. In the sense of the EURATOM Supply Agency's supply policy recommendations, the desired diversification of the supply base is maintained.

For Temelín nuclear power plant, contracts were signed with alternative suppliers Westinghouse Sweden Elctric AB and Framatome GmbH for the supply of fuel for the next period following a tender in 2022. Therefore, supplies from two different suppliers outside the Russian Federation are contractually secured. The operator ČEZ, a.s. ensures the purchase of nuclear materials and their processing on the world market for these supplies of alternative fuel. In the sense of the EURATOM Supply Agency's supply policy recommendations, the desired diversification of the supply base is maintained.

Following the escalation of the international political situation following the Russian Federation's aggression against Ukraine in 2021, the importance of increasing the competences of CEZ, a.s. and its supporting engineering organisations in the field of analyses needed for the licensing process and confirmation of safe fuel operation was confirmed. These competences are essential to gain independence from the existing fuel producers JSC TVEL from the Russian Federation and other Russian engineering and project organisations. ČEZ, a.s. has gained practical experience in the implementation of a project of 6 fuel test packages from the Westinghouse supplier. These fuel files have been developed and the relevant analyses were prepared with the active participation of ČEZ, a.s. and its support organisations. The experience gained makes it possible to implement the transition to complete alternative fuel loads under concluded contracts and thus to achieve independence from suppliers from the Russian Federation.

Graf č. 80: *Očekávaný vývoj dovozní závislosti*



Source: Self-processing of the Ministry of Industry and Trade for the purposes of the National Plan

Dimension 'Internal energy market'

4.5.1 Electricity interconnectivity116

i. Current interconnection level and main interconnectors117

The method for determining the level of electricity interconnectivity may vary according to what is the total available transmission capacity of all network profiles. The so-called "10 % interconnection target" under the Barcelona Agreement is measured as the ratio of net transmission capacity to installed generation capacity – with an emphasis on the integration of the internal electricity market. The Czech Republic's current Statutory Energy Concept further defines the degree of integration into international networks (interconnectivity rate of the Czech Republic) as the total available transmission capacity in proportion to the maximum load, which is determined by the share of the total export/import, the capacity of the transmission system in a given year and the outlook for the maximum net load of CP for the corresponding year.

For the purpose of comparing the two ways of determining the electricity interconnectivity rate mentioned above, the figures for the level of interconnectivity (export or import) are presented forward for 2024 and 2030 on the basis of ČEPS, a.s. It should be recalled here that the determination of the 'maximum' transmission capacity of the system is dependent on several assumptions, so that, in order to ensure full comparability of outputs, the calculation would have to be made under fixed and identical conditions, in particular for security reserves which take into account, in particular, circular flows that evolve over time. Given the uncertainties in the energy environment, in particular in the energy mix, these values can be

The Czech Republic's116 national plan is not a basis for drawing up territorial planning documents.

117With reference to overviews of existing transmission infrastructure by Transmission System Operators (TSOs).

considered as indicative.

Table 73: *Expected level of connectivity in 2024, 2030*

Year/Method of determination of connectivity rate/transmission capacity	Under the Barcelona Agreement [relating to installed capacity]		According to the Czech Republic's Statutory Energy Concept [relating to maximum load]	
	Export capacity [%]	Import capacity [%]	Export capacity [%]	Import capacity [%]
2019	29,6	28,0	55,6	52,6
2024	38,7	35,4	57,9	53,0
2030 (Association A)	44,1	38,0	58,0	50,0
2030 (B censor)	44,1	38,0	60,2	51,8

Source: Information from ČEPS, a.s.

The values in the above table (under the Barcelona Agreement) differ from the 2017 EU Communication118 because the newly performed calculations of ČEPS, a.s. include tools to effectively manage circular flows based on the implemented investment measures in 2017. This concerns, in particular, the consideration of the impact of the SEP on the determination of the level of the safety margin in the calculation.

Table 74: *Information provided in the NECPs reporting*

Name of national objective/objective	Year	
	2021	2022
Nominal transmission capacity to installed generation capacity	34.4 %	35.7 %
Nominal transmission capacity to peak load	63.1 %	61.3 %

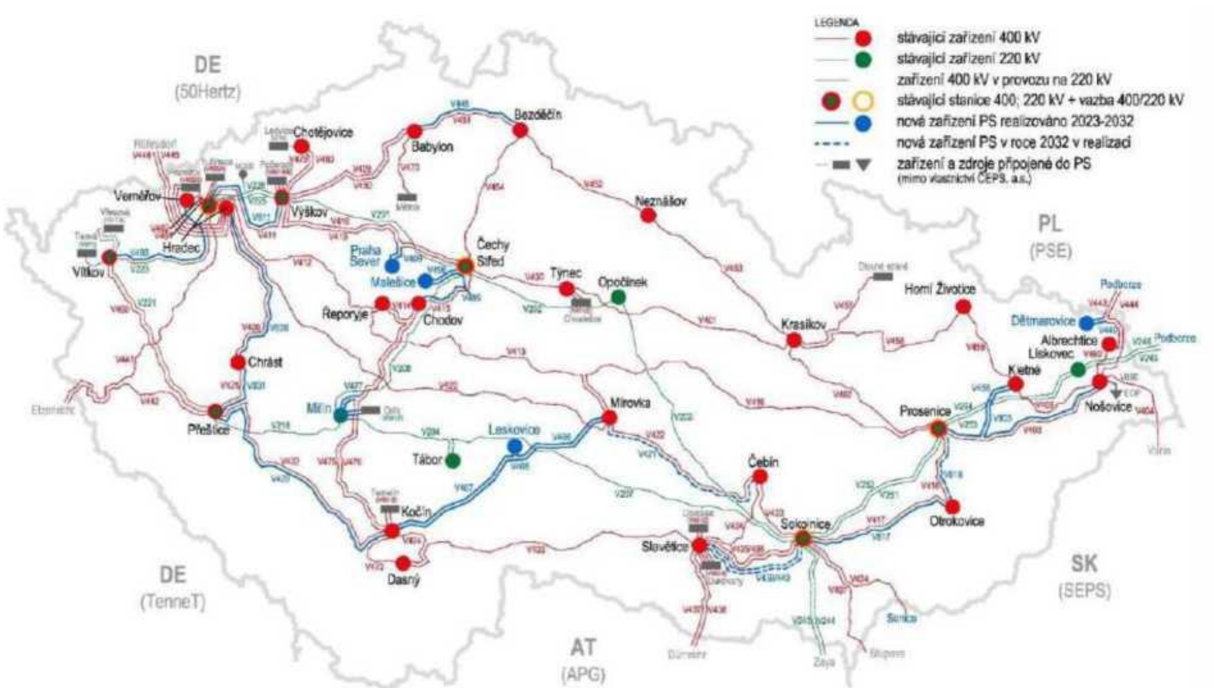
118Communication on strengthening Europe's energy networks COM(2017) 718, 23.11.2017

Nominal transmission capacity to installed renewable generation capacity	151.2 %	153.8 %

ii. Estimates of interconnector expansion requirements (inter alia for 2030)119

Estimates of the requirements for the extension of interconnectors are provided primarily in the framework of the Transmission System Development Plan of the Czech Republic 2021-2030 and the updated version 2023-2032, which is in the clearance phase at the time of drafting of this document. Estimates of further transmission system extensions are set out in more detail in sub-chapter 4.5.2.3.

Figure 13: *Development scheme of the Czech Republic's transmission network (state of play in 2032)*



Source: Czech Transmission Network Development Plan 2023-2032

Energy transmission infrastructure120

I.Key characteristics of the existing transmission infrastructure for electricity and gas121

4.5.2.1 Key features of existing electricity infrastructure

The key features of the existing infrastructure and the estimates of network expansion requirements are part of the published Czech Transmission System Development Plan 2023-2032, which is subject to a two-year update.

The transmission system in the Czech Republic is operated by ČEPS. ČEPS ensures the transmission of electricity in the required volume and with high reliability. The continuous renewal and development of the

119With reference to national network development plans and regional investment plans of TSOs.
The Czech Republic's120 national plan is not a basis for drawing up territorial planning documents.
121With reference to overviews of existing transmission infrastructure by TSOs.

transmission system, carried out by its operator, has the effect of increasing the transmission capacity of elements when equipment is refurbished and replaced, and thus the transmission system ensures, with high reliability, the connection and dispatch of the power of large sources, the supply of distribution and the required inter-state transmissions of electricity.

Table 75: *Length of transmission system lines in the Czech Republic*

Description of the device	Length of lines (in km)
400 kV lines	3 795
of which double and multiple	1 502
220 kV line	1 824
of which double and multiple	953
110 kV line	84
of which double and multiple	78

Source: Czech Republic's Transmission Services Development Plan 2023-2032

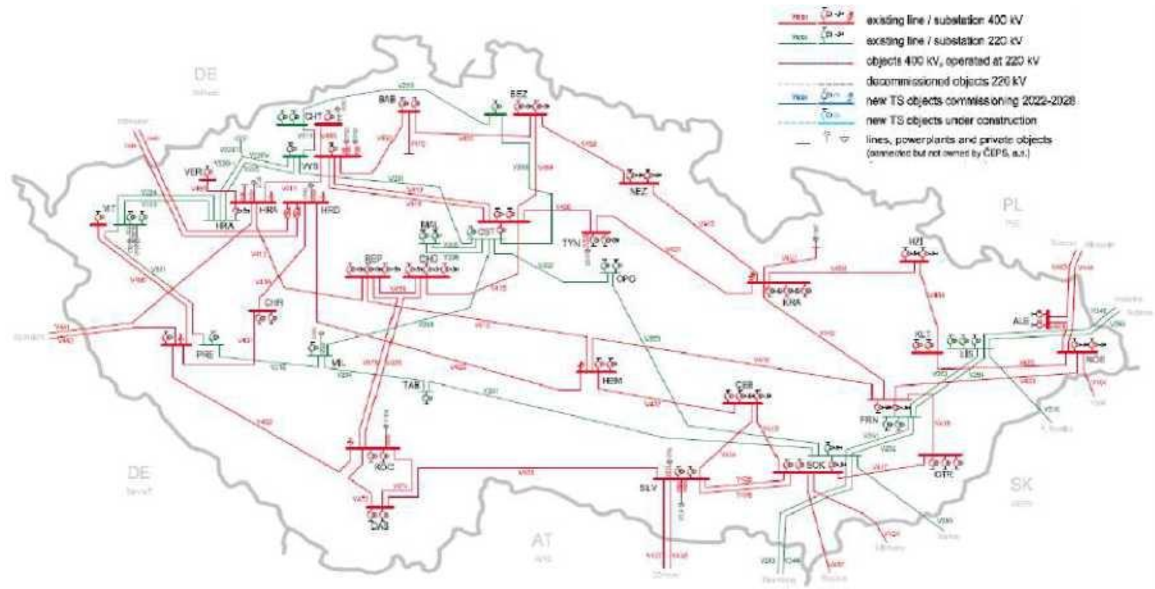
Table 76: *Number of foreign lines, substations and transformers within the transmission system*

Description of the device	Number of establishments
400 kV foreign leadership	11
Foreign leadership 220 kV	6
400 kV substations	29
220 kV substations	14
110 kV substations	1
400/220 kV transformers	4
400/110 kV transformers	51
220/110 kV transformers	20
400 kV-shift transformers (PST)	4

Source: Czech Republic's Transmission Services Development Plan 2023-2032

Since 2017, the 420 kV substation of Hradec u Kadana has been operating transverse control (PST) transformers located on the cross-border lines Hradec (CZ) – Röhrsdorf (DE). Their role is to prevent negative effects on the Czech Republic's CP by effectively limiting large fluctuating power flows following the cross-border profile of the transmission system between the Czech Republic and Germany. In 2017 and 2020 a new transformer plant 400/110 kV was launched in Vernéřov and Vítkov respectively in order to allow for an increase in the reserved power and/or capacity in the area, which is linked, inter alia, to the loss of power supplied to the 110 kV network by the shut-down of Prunéřov I power plant. The construction of substations above, together with other projects in the area, contributes to the integration of renewable electricity sources into the electricity system.

Figure 14: *Transmission system – current status*



Source: ČEPS

4.5.2.2 Key features of existing gas infrastructure

General characteristics of the gas system

The gas system is a set of all facilities used for the production, consumption, storage and transport of natural gas. The gas system consists mainly of: (I) pipeline infrastructure with different operating parameters; (II) control action elements – border transfer stations, compression stations, distribution hubs, caps and measuring fittings, etc.; (III) gas storage facilities for the storage of natural gas; (IV) production plants of both conventional and unconventional gas that can be injected into the gas system; (v) sampling and delivery points.

In terms of operational role, the system can be divided into two hierarchical units:

– Transmission system – High-pressure Gas Pipeline System (VVTL, VTL), action elements and related objects connected to foreign gas systems. The transmission system shall be subdivided into a transit system and a national transmission system.
– Regional and local distribution systems – high pressure, medium-pressure and low pressure pipelines (VTL, STL, NTL), actuators and related technological objects for the distribution of gas to final customers.

Within the Czech Republic, gas is transferred from the transmission system to distribution systems and directly connected customers. In addition, 8 gas storage facilities are connected to the transmission network. Deliveries are made through 968 delivery stations where commercial metering of the quantity of gas is installed. Gas quality is measured at 27 nodes of the system.

Transmission system

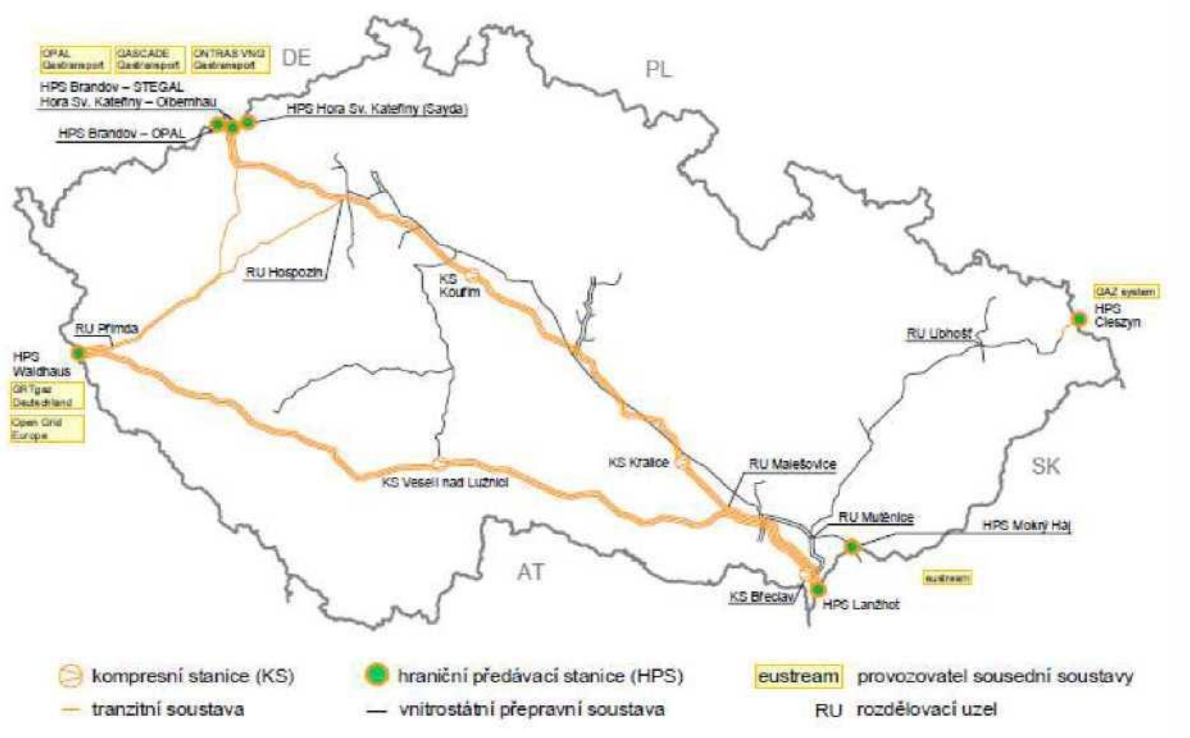
Pipelines for international transit and domestic traffic with a total length of approximately 4 058 km (2023), with nominal diameters from DN 80 to DN 1400 and nominal pressures from 4 to 8.4 MPa, i.e. the so-called transmission system is operated by NET4GAS in the Czech Republic. In particular, the transmission system shall provide the following functions: (I) transport of natural gas from international gas pipelines to

transmission stations or adjacent transmission systems; (II) delivery to selected purchasers122; (III)

122In order to be directly powered from the transit system, the customer shall comply with the technical criteria specified by the carrier and shall take at least 100 GWh of energy in the gas annually from the VVTL system, transport of gas to storage facilities in case of injection mode and transport of gas from storage facilities to points of consumption in storage mode.

The transmission system can be divided into four main branches. The north branch runs from Lanžhot to Brandova/Hory Sv Kateřina, the southern branch from Lanžhot to Rozvadov and the western branch connects the northern branch to the southern branch. In the south-eastern part of the country, the Moravian branch provides gas supplies to Moravian regions and connects to the Polish transport network. The northern, southern and western branches are connected in the key distribution nodes Jirkov, Rozvadov, Malešovice, Hospozín and Namda.

Figure 15: *Transmission system of the Czech Republic*



Source: Ten-year Transmission System Development Plan in the Czech Republic 2023-2032

Individual delivery points are connected to both the transit and the national transport system, totalling 100 delivery stations to distribution networks, storage facilities and border transfer stations. The transmission system is connected by seven border transfer stations to the surrounding transmission systems. Eight customers are connected directly to the transmission system. The table below provides information on pipeline lines of the transmission system.

Table 77: *Pipeline routes of the transmission system*

Specifications	Operating excess pressure (MPa)	Pipe clearance (mm)	Pipeline route lengths (km)
Transit system	To 8.4	800 to 1400	2 471
Gazelle pipeline	Between 4,9 and 8,4	1 400	166
National switch system	To 6.4	150 to 700	1 181

Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Reverse gas flows in the transmission system

or at least 10 GWh from the VTL.

During the gas crisis of January 2009, a provisional reverse flow was carried out in the west direction, which made it possible to supply not only customers in the Czech Republic but also in Slovakia. The gas was delivered via the Montenegro Border Transfer Station Saint Kateřiny to the Czech Republic. This did not lead to a reduction in the supply of gas to customers in the Czech Republic.

The implementation of the reverse flow within the framework of the European Energy Programme for the Economic Recovery of the Energy Sector (EEPR) consists of the following structures or modifications:

1. The modification at the MRS Hora Saint Kateřiny allowed the quantity of gas transported from Germany to the Czech Republic to be increased from 18 million 3/day to^{25}million$^{3\ m/}$day.
2. The modification of the pipeline at the Hospozín interconnection point made it possible to increase the quantity of gas transported between Olbernhau and Waidhaus up to 15$^{m^3/day}$.
3. The modification of the pipeline in Kralice's compression station in Oslavou enabled the use of compression works for the transport of gas in the west-east direction.
4. The modification of the pipeline at the Malešovice interconnection point allowed an increase in gas traffic in the direction from HPS Hora Saint Kateřiny to the Rozvadov distribution hub.
5. The modification of the pipeline system at the Břeclav compression station allowed the use of compression works for transport to Slovakia.
6. The modification in HPS Lanžhot allowed the measurement of the gas transported from the Czech Republic to Slovakia.
7. The modification of the reverse flow KS pipeline system was completed already in 2011.

Transit system

The task of the transit system is to ensure the transmission of natural gas via very high pressure levels (VVTL) gas transmission to other countries and to ensure the supply of gas to domestic customers. Thanks to the liberalisation of the gas sector, the use of the transmission system is determinated by the market, with network users wishing to transport gas through the system competing for transmission capacities. The Gazelle pipeline is exempted from third party access (RTPA) until the end of 2034. This exemption is granted only for transport capacities in the Brandov-Waidhaus route.

Between 2015 and 2016, projects increasing capacity by 12 million m^3 per day in the direction of Lanžhot were successfully completed in the transit system, including the southern branch in the direction of Rozvadov – Veselí nad Lužnice – Břeclav – Lanžhot, which previously served to transport gas from Lanžhot to Bavaria. Currently, in addition to the Tvrdonice gas storage, a single direct customer is connected to the transit system, namely a steam gas source in Počeradech.

National transmission system

The task of the national transmission system (VPS) is to transport gas from the transit system to distribution stations. The VPS consists of gas pipelines lower in the range of 150 to 700 mm with operational overpressures of 2.5 to 6.4 MPa. The total length of the routes of the national transmission system is 1 181 km. The connection to the transit system is in six delivery nodes. Due to the current pressure ratios, no compression stations are installed on the national transmission system, all gas storage facilities operated within the Czech gas system are connected to the system. The VPS also has a connection to the Slovak gas system (Mokrý Háj). This connection is currently not used.

Border Transfer Station

In locations at the border of the Czech Republic, where the transmission system of NET4GAS is connected to the transmission systems of the transmission system operators of neighbouring countries, both the volume and quality of gas are measured at Border Transfer Stations (BMPs). These places are at the Czech-Slovak border Lanžhot and Mokrý Háj (HPS on the Slovak side), Brandov and Hora Sv. Kateřiny on the Czech-Saxian border, on the Czech-Bavarian border and Waidhaus (HPS on the German side) and on the Czech-Polish border of Cieszyn (HPS on the Polish side).

Table 78: *Border handover station capacities (billion m^3/year)*

Profile and Border Transfer Station	Entry capacity in the Czech Republic	Exit capacity from the Czech Republic
SK-CZ	56	49
Lanžhot	56	49
Wet Hay	0	0
PL-CZ (Cieszyn)	0	1
AT-CZ	0	0
DE-CZ	102	54
Waidhaus	4	37
Montenegro Saint Kateřiny – Sayda	5	7
Montenegro Saint Kateřiny – Olbernhau/Brandov STEGAL	13	10
Brandov OPAL (for Gazelle)	40	0
Barandov EUGAL	40	0
Total capacity	158	103

Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Virtualisation of border points

Pursuant to Article 19 of Commission Regulation (EU) 2017/459 establishing a Network Code on Capacity Allocation Mechanisms in Gas Transmission Systems (NC CAM), transmission system operators are required to establish a virtual interconnection point on the basis of a description of specified conditions.

(VIP), wherever two or more interconnection points connect the same two adjacent entry-exit systems.

In the case of the Czech Republic, two virtual interconnection points have been established:

- VIP Brandov – with the German Gaspool commercial zone (since 1 November 2018);
- VIP Waidhaus with the German trade zone NCG (since 1 March 2019).

Since 1 October 2021, the two existing VIP points serve to reserve capacities and transport gas between the Czech Republic and the newly created German Trading Hub Europe (THE) trading zone, which merged the German trading zones of Gaspool and NCG.

All available firm and interruptible capacity shall be offered to the VIP. No capacity is offered beyond existing contractual relations at the physical interconnection points that are part of the VIP.

Compression stations

The required pressure in the pipelines is provided by five compression stations (CCs) located in the northern branch of Kralice nad Oslavou, in Kouřimi and Otivice and on the southern branch of Veselí nad Lužnice and Břeclavi. All compression stations except KS Otvice are capable of two-way traffic. The total installed capacity of the compressors is 281 MW of mechanical power.

Table 79: *Total installed capacity of compression stations (in MW)*

Name of compressor station	Number of combustion turbines and their capacity	Station installed capacity
Kouřim (North branch)	5x 6 MW + 2x 13 MW + 1x 12 MW	68 MW
Kralice nad Oslavou (North branch)	5x 6 MW + 2x 13 MW + 1x 12 MW	68 MW
Otvice (North)	3x 8 MW	24 MW
Břeclav (South)	9x 6 MW + 1x 16 MW + 1x 15 MW	85 MW
Veselí nad Lužnice (southern branch)	6 x 6 MW	36 MW

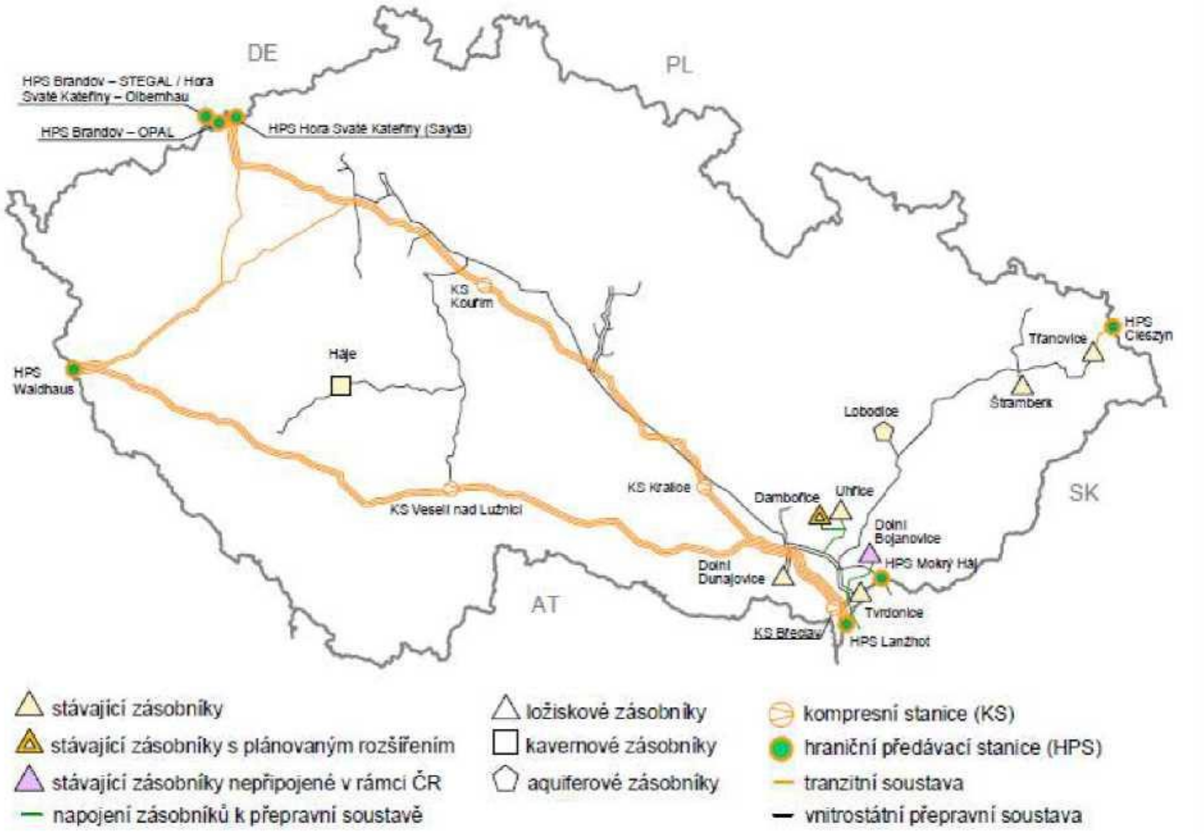
Source: Ten-year Transmission System Development Plan in the Czech Republic 2023-2032

Gas storage facilities

A total of 9 reservoirs are currently in operation in the Czech Republic, with 7 containers being of a bearing type, 1 aquifer (Lobodice) and 1 cafeteria type (Háje). Jedeen from storage facilities (Dolní Bojanovice) is located in the Czech Republic but is currently only connected to the Slovak transport network. The main role of storages in the system is the covering of demand peaks in the heating season, which could not be covered by gas imports. Traders use them for economic reasons, as in the heating season the price of gas tends to be higher than in the low season. Last but not least, storage facilities are an important element of the system in terms of security of gas supply in crisis situations.

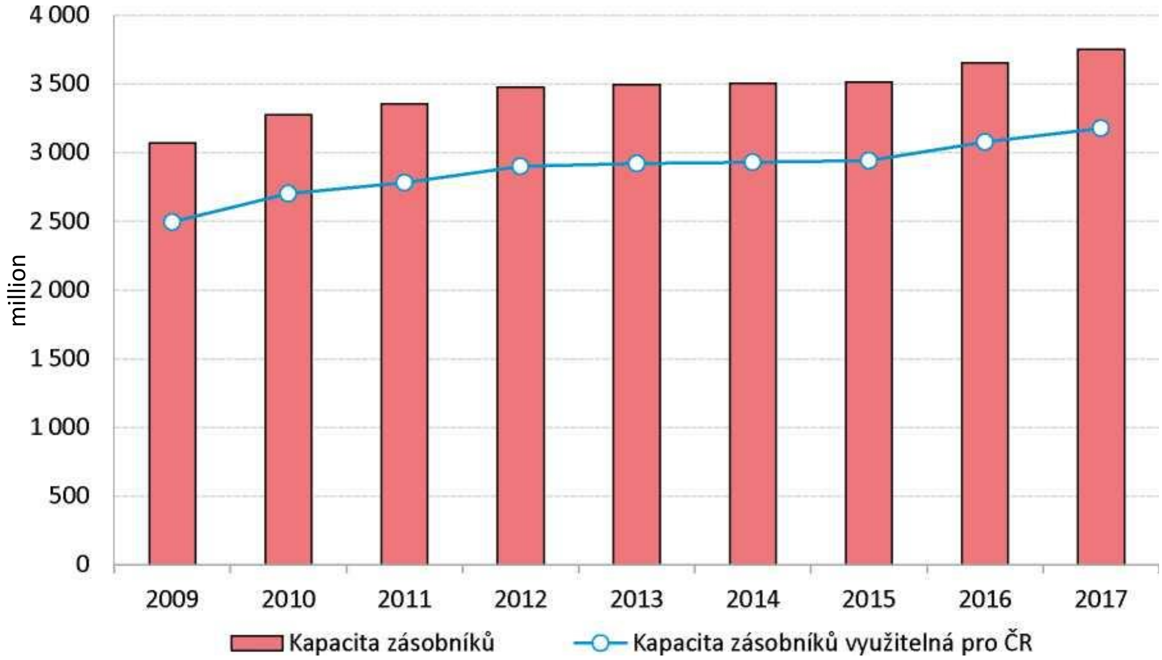
In recent years, the dynamic characteristics of storage facilities in the Czech Republic have improved by increasing their extraction capacity. The total available capacity of the storage facilities connected to the Czech system amounts to 3452 million $m^{3,}$ and their maximum capacity to produce about 77 million m^{3per} day. The total capacity of storage facilities located in the Czech Republic amounts to around 4095 million$^{m^3 \text{ and}}$ the maximum production capacity is almost 85 million m^{3per} day.

Figure 16: *Gas storage facilities – current state and expansion plans*



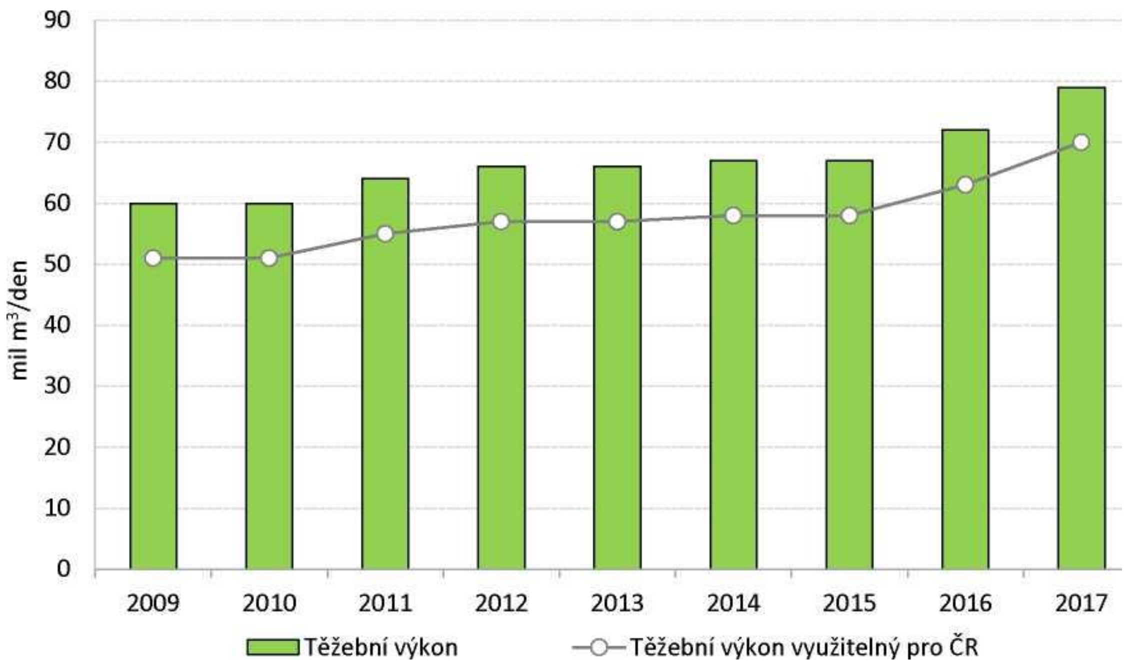
Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Graph 81: *Development of capacity of natural gas storage facilities in the Czech Republic*



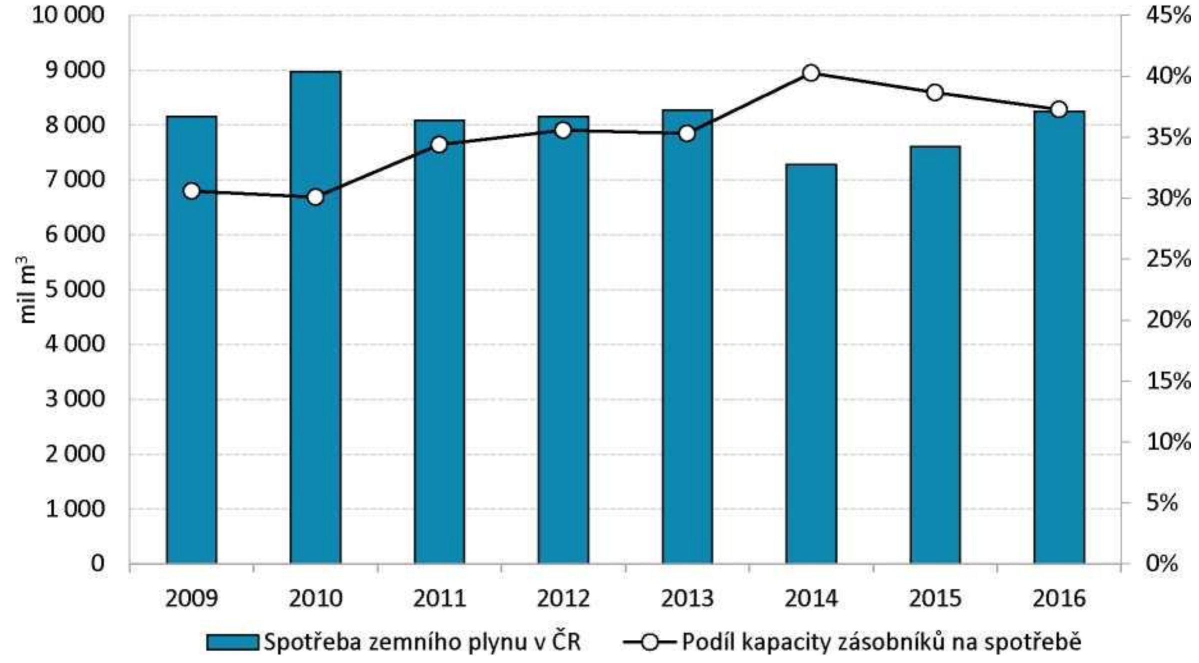
Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Graph 82: *Development of natural gas storage capacity in the Czech Republic*



Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Graph 83: *Share of natural gas storage capacity in domestic consumption*



Source: Annual report on the operation of the gas system of the Czech Republic for 2016 (ERÚ)

Obrázek č. 17: *Budoucí vodíková přepravní soustava*

Distribution systems

Distribution systems are responsible for transporting gas to final customers. Gas is mainly transported to the distribution systems from the transmission system via transfer stations, with a small part of the supply being gas from domestic production. Pipeline systems of distribution networks are the largest part of the gas system as a whole. Operated at different pressure levels – as high pressure (from 0.4 to 4

MPa), medium pressure (from 5 kPa to 0.4 MPa) and low pressure (up to 5 kPa). For reasons of reliability of supply, individual regional distribution systems (over 90000 customers) are operated in a grid configuration and can be interconnected by backup connections. No compression stations are operated as part of the distribution, nor are gas storage facilities connected there. In a few cases, distribution networks are connected to foreign networks – the supply of island areas or back-up cross-border couplers.

Three entities currently operate regional distribution networks:

- **GasNet** distributes in northern, central, western and eastern Bohemia, as well as southern and northern Moravia. Internally, it is subdivided into 4 sub-regional networks.
- **E.GD Distribution** provides distribution in southern Bohemia.
- **Pražská Gasárenská Distribuce distributes** on the territory of the capital city of Prague.

In addition to regional distribution networks, there are local distribution systems, often operated within larger industries. More recently, there has been an increasing number of cases where operators of these local systems take over local distribution systems from municipalities that have previously invested since their construction but do not want to operate them. 65 local distribution systems are currently in operation.

II. Projections of network expansion requirements at least until 2040 (including for the year 2030)123

Estimates of electricity infrastructure dissemination requirements

Development of the transmission system

Every second year, in order to ensure secure and reliable and efficient operation of the transmission system, the Transmission Network Operator shall draw up a 10-year Transmission System Development Plan of the Czech Republic. The plan is a two-fold measure which briefly summarises the following list and are described in detail in the text below:

- conceptual solution: strategic investments in the medium and long term leading to the conceptual development of the EC (maintenance, new lines, moving towards a downgrade of the 220 kV network);
- dynamic measures: sub-investment technical measures allowing customers to be connected (often limited or conditional) in a shorter period than that allowed by the conceptual solution. This concerns in particular the connection of new resources to CP or the development of transformative PS/DS links.

Conceptual solution

Renewal of station and line installations

ČEPS, a.s. performs the renewal of station facilities and PS lines to the extent that it is appropriate to ensure the permanent required safety and reliability of the operation of the PS. The typical lifespan of power installations – in particular lines – is usually 40 years and is influenced by the maintenance method and the environmental conditions in which the equipment is operated. Interchangeable parts of equipment shall be replaced when they exceed their useful life; in the case of tower structures, their useful life can be extended up to twice as many as possible by proper maintenance. After each change of conductors and insulators, the failure rate of the lines decreases.

Enhancement of transmission capability

ČEPS, a.s. prepares and implements systemic measures to strengthen the transmission capacity of CPs,

123With reference to national network development plans and regional investment plans of TSOs.

upgrade and duplicate existing lines, and build new lines, expand and upgrade substations. The construction of new 400 kV lines is intended to supplement and reinforce the 400 kV system and replace the 220 kV network. A reinforced 400 kV network will gradually assume the role of 220 kV by 2040. The possibilities for building new lines in the new corridors are limited and the preparation is lengthy (10 years or more). Therefore, when renewing the 400 kV line, ČEPS, a.s. applies a dual-line construction concept on existing lines. The following table summarises the construction of new lines.

Table 80: *Length of new lines in CP 2050 (km)*

PS line construction work	Length of new 400 kV lines in 2017-2025	Length of new 400 kV lines in 2026-2050
PS line construction in a new route	189	70
Construction of a double PS line on the route of the original line	572	629
Total length of new PS lines	761	699

Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

International cooperation

In the context of ENTSO-E's ENTSO-E, coordination in planning the future design of electricity networks and their further cooperation is important. The list of projects of common interest referred to in Commission Delegated Regulation (EU) 2022/564 of 19 November 2021 amending Regulation (EU) No 347/2013 of the European Parliament and of the Council as regards the Union list of projects of common interest includes four projects planned by ČEPS124. These projects not only meet the requirements to ensure the safety and reliability of the operation of CP, but also contribute to the achievement of European objectives with regard to the security of operation of the entire interconnected system.

Dynamic measures

In parallel to the above, often time-consuming, measures are also looking for short- and medium-term solutions that are acceptable on a temporary basis. These solutions include, in particular, upgrading PS lines with an increase in the permissible 80 °C conductor temperature, dynamic line loading, power-reducing automation (AOV) and deeper coordination of the operation of the transmission system and distribution networks.

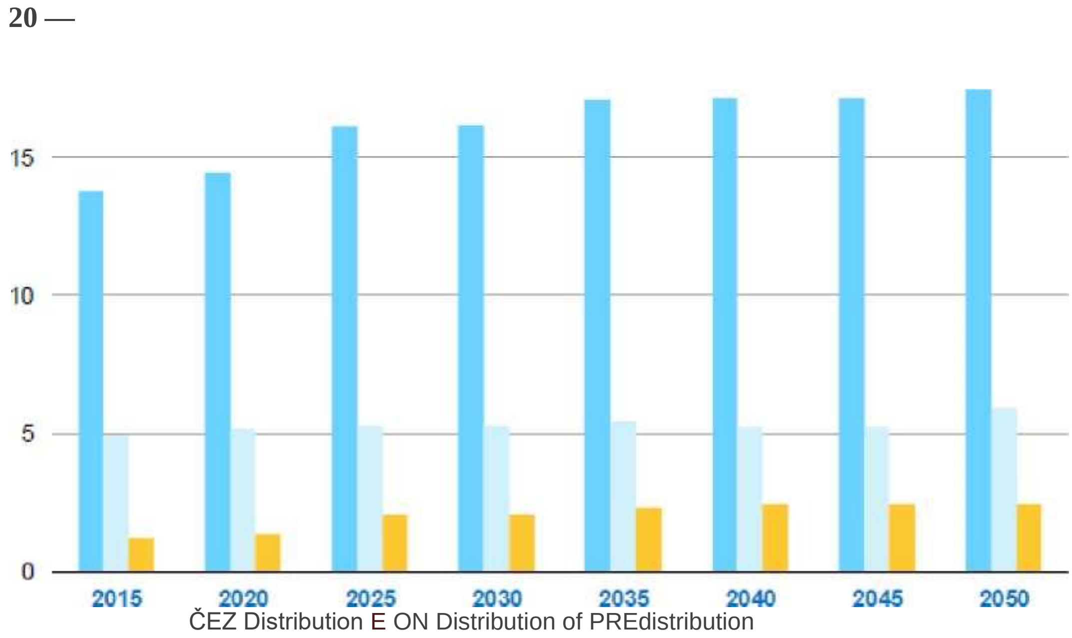
New PS substations and transformation power

Strengthening the transformative link PS/110 kV will only be implemented for the transformation of 400/110 kV, with 9550 MVAs of transformation power expected to increase by 2050. In view of the decline in the transformation of 220/110 kV (4200 MVA), the overall increase in transformation power PS/110 kV by 2050 will be 5350 MVA, with an expected peak demand increase of 600 to 3 400 MW (depending on the variant) compared to winter 2017 values. The evolution of the installed capacity of transformers PS/110 kV is shown in the figure below. The construction of new substations in CP responds to long-term trends in the territory, such as the shutdown of large resources in 110 kV networks, the development of consumption and the downgrading of 220 kV. By 2025, this is the construction of a new transformation of 400/110 kV in a total of 4 sites (new 400 kV substations in Vítkov, Dětmarovice, Prague North, Milín). Between 2026 and 2 050.400 kV substations are planned in Opočínek, Lískovec,

124Projects of common interest shall be kept up-to-date and the identification of these specific projects in The national plan does not mean that these projects can be considered binding.

Malešice, Tábor and Rohatec, which will gradually replace the shutdown 220 kV substations. The following figures show the projected development of CP under ČEPS for 2025 and 2050.

Graph 84: *Installed capacity of transformers PS/110 kV (in GVA)*



Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

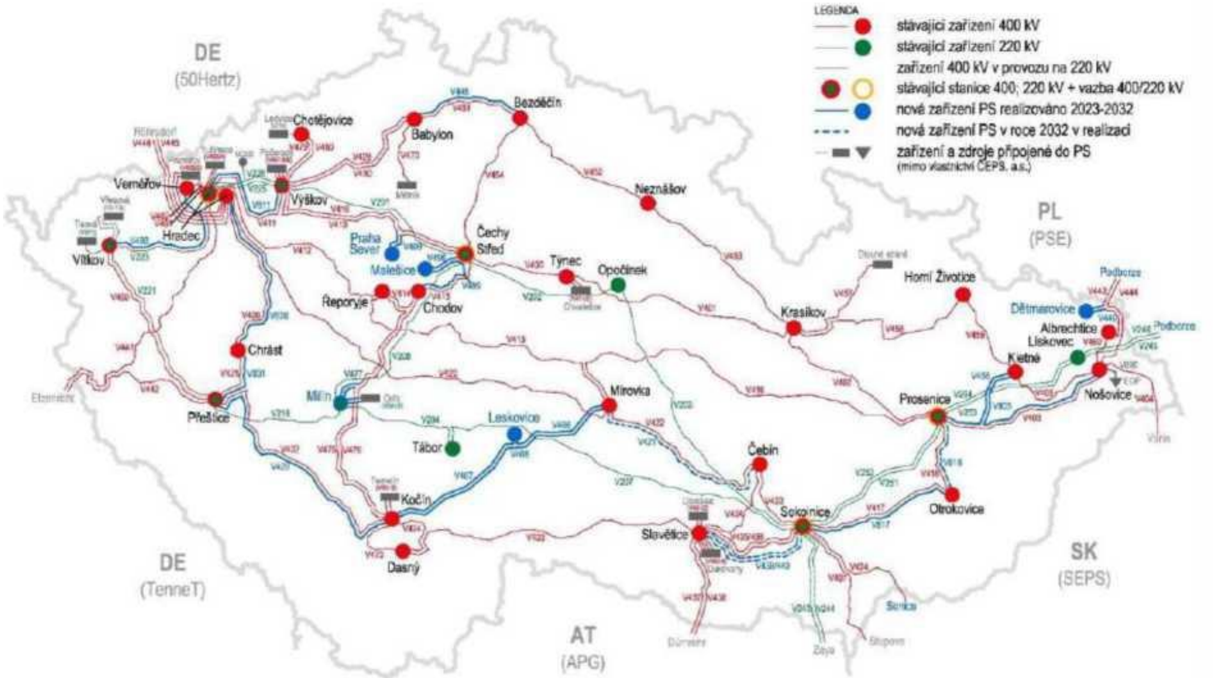
New technologies in the transmission system

The aim of maintaining the reliability of operations under new conditions is an incentive for the implementation of new features. In particular, the increased demand for inter-state electricity transmissions and the increasing representation of decentralised resources and their expected further development. With limited possibilities for the construction of liner constructions, new technologies are already being introduced in the Czech Republic's PS in order to increase the transmission capacity of lines and to increase the reliability and efficiency of the operation of PBS. These are notably:

- construction of transmission, transformation and compensation facilities in PS;
- dynamic loading of PS elements to increase the transmission capabilities of the network;
- higher control functions (predictment models, traffic optimisation, defence against failures,
- business models),
- remote control of PS substations,
- automatic limiting of generation for sources to prevent and spread network failures.

Other potentially usable technologies not yet used in the Czech PA include the use of high temperature conductors or superconductors and equipment for controlling active and reactive power flows (FACTS). In case of indication of non-compliant operating parameters, the above mentioned new technologies may be used to eliminate non-compliant conditions. The development of the transmission network is shown in the following figures.

Figure 18: *Development scheme of the Czech Republic's transmission network (situation as at 2032)*



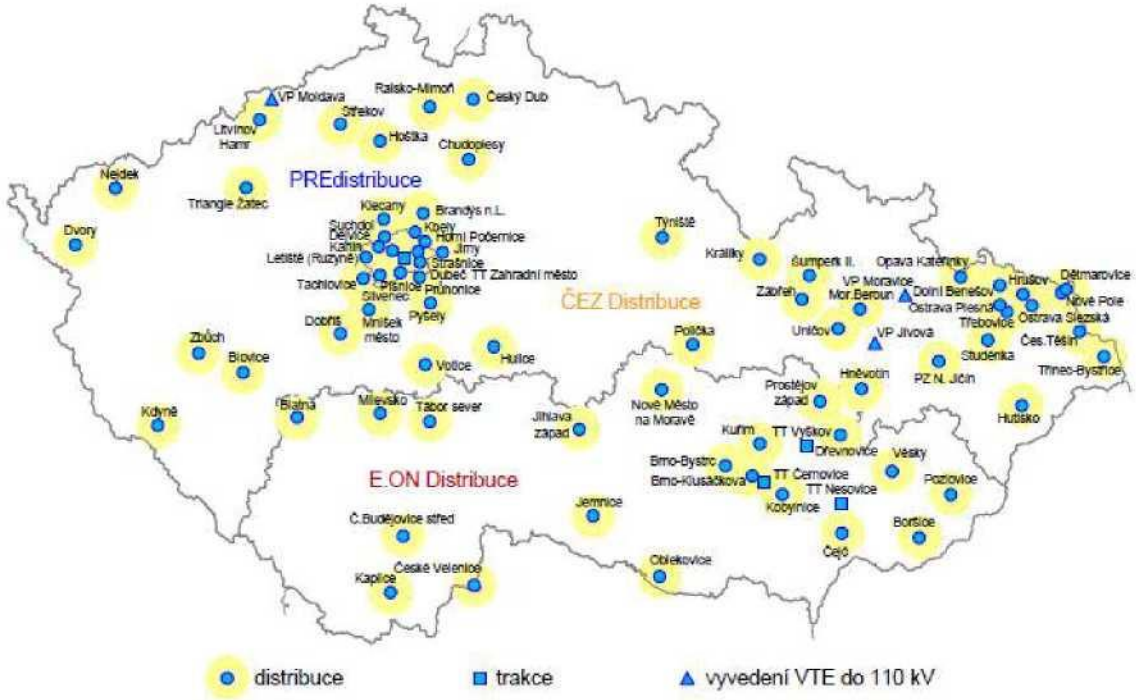
Source: ČEPS, a.s.

Distribution networks

Development of 110 kV networks

The development of 110 kV networks is being prepared for a shorter period of time, therefore the operation of these networks is analysed in more detail only for 2025. The development of 110 kV networks is based on the current needs of the regions and the economic capacity of distributors. Individual distribution companies must prepare their development in such a way as to ensure on a permanent basis the demands of customers for the supply of electricity and producers to take power from sources. The development of distribution networks is affected by changes in CP, in particular in the transformative link PS/110 kV, which affect both the development of 110 kV networks in the relevant nodes and their operational involvement. The main focus of development is to strengthen and renovate the existing 110 kV lines. New 110 kV substations are planned in line with the expected load according to the requirements of the customers in the respective regions. 81 new 110 kV stations are under construction. Their location is shown in the figure below and their distribution and number in the table below. The next table gives an overview of the lengths of new and reconstructed lines of 110 kV.

Figure 19: *Planned substation 110 kV*[125]



Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Table 81: *Planned substations 110 kV (number)*

110 kV substations	ČEZ Distribution	E.ON Distribution	PRE Distribution	Total
110 kV/wn distribution transformer	44	20	10	74
Traction transformer	0	3	1	4
Power extraction from VTE and FVE	3	0	0	3
Total number of 110 kV stations	47	23	11	81

Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Table 82: *Length of new and reconstructed lines of 110 kV (in km)*

110 kV line construction work	ČEZ Distribution	E.ON Distribution	PRE Distribution	Total
Construction of 110 kV line in the new route	616	201	73	890
Refurbishment of 110 kV lines	523	474	19	1 016
Total length of new and reverse management	1 139	675	92	1 906

Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

[125] This is a long-term perspective rather to illustrate possible development. The implementation of the projects will be further phased in.

Development of zon and nn networks

The development of distribution networks of vats and nn and their further construction is subject to administrative and economic burdens. In addition to the construction of new lines and refurbishment of existing lines, new technologies will be increasingly used in knots and nn networks, the use of which should lead to maintaining current relatively comfortable traffic and increasing traffic reliability. In addition to the reinforcement and expansion of existing distribution networks, the following elements will apply in the development of DS:

- the increasing share of cableisation of distribution networks;
- development and implementation of automation elements at the voltage level of VN, as well as NN enabling the central and autonomous control of these networks;
- development of automated network management systems also at lower voltage levels;
- control of the active and reactive power of the decentralised resources according to the needs of network operation;
- managing selected parts of the distribution networks according to network operation needs and preparing for the implementation of the needs and requirements of new players in the electricity market (prosumers, aggregator, smart home);
- electrical energy storage managed according to network needs, including storage by PDS, – development of data and telecommunication infrastructure at voltage level of VN for network management options, – implementation of smart metering – AMM;
- the use of non-frequency ancillary services to optimise the operation of distribution networks.

The increase in installed capacity of new decentralised resources will have a major impact on the development of knots and nn networks. The operational needs of distribution networks, in particular in the area of supporting the voltage profile, will require greater involvement of new decentralised resources in the DS management system. According to the DS operating rules, this aspect is also decisive for the size of the connected power of the decentralised resources to a particular network of vn or nn. The networks shall be gradually equipped with devices enabling two-way communication between the DS operator and network customers or nodes respectively. At the same time, a number of autonomous devices will be used to assess the state of the network on the basis of data exchange and take appropriate steps to streamline the operation of the system without the intervention of the dispatcher. This includes, for example, automatic reconfiguration of engagement in case of failure, re-synchronisation to the EC after failure, etc. In this context, the use of reclosers, smart section switches, vn/nn transformers with the possibility to switch under load (OLTC) and other devices of a similar nature are expected to operate. These measures, together with the use of the regulatory capabilities of decentralised resources, will make it easier to integrate more of these resources into the DS.

Distribution companies verify the security, operational reliability and clarity of the management of distribution networks with new technologies through pilot projects. The use and, above all, the management of new technological elements in distribution networks should enable:

- output closure of the production chain – consumption including accumulation to the extent possible at distribution network level;
- efficient utilisation and coordination of generation, consumption and accumulation in DS leading to a reduction of transmission losses in networks and minimising reserved capacities for transformations PS/110 kV;
- more efficient operation and management of networks with maximum levels of automation.

Estimates of gas infrastructure expansion requirements

The role of gas in general

Reducing greenhouse gas emissions in the Czech and European economies will lead to new systemic solutions. In the future, it is therefore possible to anticipate the use of the conversion potential of the gas sector, which would make it possible to store currently unnecessary energy in gaseous form. This solution would help to reduce congestion on the transmission grid, enhance security of supply and reduce emissions. Typically, hydrogen production by electrolysis (power2Gas technology) and possibly methanisation into synthetic methane can be considered.

The process of decarbonisation and the development of new technological solutions will have an impact on the use of the gas system in the Czech Republic. At present, it is not possible to determine precisely what impact decarbonisation will have on the Czech gas network in the European and Czech context and concrete information on how this network will be used to minimise the sunk costs of the transmission system operator. Technological solutions to decarbonise the gas sector on a large scale in both the EU and the Czech Republic are currently not being developed, and it is therefore appropriate to maintain and further develop this infrastructure for future use both for natural gas and for new types of gas. A combination of natural gas with CCS or CCU to store or use carbon from gas fission can be considered. Thus, the possibility of future use of gas infrastructure may be essential to meet the energy needs of final customers.

Transmission system

Plans for changes in the transmission system are updated annually in the form of a 10-year plan for the development of the transmission system in the Czech Republic (the Development Plan) prepared by the transmission system operator (NET4GAS). The plan is approved by the ERO, with the last approved version coming from 2022, which was prepared for the period 2023-2032. Development projects are generally divided into six project categories related to the objective of the project (i) reverse flow projects; (II) connection of power plants and heat plants; (III) increase of exit capacity into the domestic zone; (IV) connection of new storage capacities; (v) projects increasing cross-border capacity; (VI) hydrogen infrastructure projects and (vii) innovation.

The development plan also analyses the evolution of maximum daily consumption and output capacity into different regional networks and regions. In general, TSO capacities in regional distribution systems are higher than the region's highest historical daily consumption in the last 20 years. The exception is Northern Moravia, which is supplied by only one line of the national transmission system. The current situation can only be described as conditionally satisfactory, but the capacity required to inject gas into the storage facilities exceeds the technical capacity of the system and would not be able to import demand in the region in the heating season without the interaction of storage facilities. Such a situation makes it very difficult to connect new large gas customers in the area. NET4GAS responded to these complications by preparing the Moravia project (Tvrdonice-Libhošt pipeline). This project is divided into two stages. The first phase – Moravia Capacity Extension (Tvrdonice-Bezměrov) project – was completed at the end of 2022. The second phase – the Moravia Capacity Extension II project – is planned as part of a cross-border Czech-Polish bi-directional interconnection project aimed at implementing a two-way interconnection between Poland and the Czech Republic. However, the project also has a national purpose, with an increase in capacity in the Northern Moravia region.

Table 83: *Projects listed in the 10-year plan for the development of the reparcellular system in the Czech Republic;*[125]

125These projects shall be continuously updated in line with the update of the 10-year development plans. Their reference here is therefore illustrative and their reference in that context cannot be regarded as binding.

Project category	Project code	Title of the project	Status	Transmission system interconnection point	Approximate capacity increase (GWh/d)	Expected year of entry into operation	PCI Status
Connection of power plants and heat plants	E-2-001	Connection of power plant/heat plant	FID	X domestic	18,1	2024	NO
	E-2-002	Connection of power plant/heat plant	non-FID	X domestic	15,9	2028	NO
	E-2-003	Connection of power plant/heat plant	non-FID	X domestic	35,7	2029	NO
	E-2-004	Connection of power plant/heat plant	non-FID	X domestic	42,4	2029	NO
Increase of exit capacity to the domestic zone	DZ-3-002	Moravia project	MORAVIA CAPACITY EXTENSION – see below the project project DZ-3-005 for more information on the project.				
			Phase MORAVIA CAPACITY EXTENSION II – for more information on the project see below the project project DZ-3-014.				
	DZ-3-005	Moravia Capacity Extension (MCE) Technical sub-project (stage) of the Moravia project (DZ-3-002)	FID	X domestic	158[b]	2022	NO
	DZ-3-014	Moravia Capacity Extension II (MCE II) Technical sub-project (stage) of the Moravia project (DZ-3-002)	non-FID	X domestic *[E,X CZ/PL (Het)]*	to 71.1([b] *[PL>CZ: to 208 CZ>PL: 57,3]*	2026	NO
	DZ-3-003	Connection of a directly connected customer	FID	X domestic	0,3	2024	NO
	DZ-3-004	Connection of a directly connected customer	FID	X domestic	2,9	2027	NO
	DZ-3-007	Connection of a directly connected customer	FID	X domestic	6,1 (the approximate increase in capacity is conditional on the operationalisation of the DZ-3-009 project)	2024	NO
	DZ-3-008	Increasing grid connections	FID	X domestic	50.9[c]	2024	NO
	DZ-3-009	Increase in capacity of the national transmission system	FID	X domestic	up to 47.7 (the implementation of the project will enable the creation	2024	NO

					project DZ-3-007)		
	DZ-3-010	Increasing grid connections	non-FID	X domestic	18.7[d] (the approximate increase in capacity is conditional on the operationalisation of the DZ-3-011 project)	2027	NO
	DZ-3-011	Increase in capacity of the national transmission system	non-FID	X domestic	to 84.9 (implementation of the project will enable capacity to be created for the DZ-3-010 project)	2027	NO
	DZ-3-012	Increasing grid connections	Complete	X domestic	0,4[e]	2022	NO
Connection of new storage capacity	UGS-4-003	Connection of the gas storage device	FID	E,X ZP	mining: 94 injection: 73	2024	NO
Projects increasing cross-border capacity	TRA-N—140	Poland-Czech interconnection MDAR 2021	non-FID	OPTION 1			
				E CZ/PL (Cieszyn)	PL>CZ: 30,5	2030	NO
				OPTION 2			
				E,X CZ/PL (Het) *[X domestic]*	PL>CZ: 30.5 *(up to 208 GWh/d according to the technical solution on PL side)* CZ>PL: 57,3 *[up to 71.1[fb)]]*	2026	NO
	TRA-N—1009	Czech-Polish bi-directional interconnection	non-FID	E,X CZ/PL (Het) *[X domestic]*	PL>CZ: to 208 *(according to the technical solution on PL side)* CZ>PL: 57,3 *[up to[71.1eb)]]*	2026	NO

Notes to the table:

(a) The values provided on the website or other documents of the transmission system operator may differ slightly from those in the Development Plan. The difference may be due to capacity effects resulting from seasonal consumption in the Czech Republic due to competing capacities, the use of other GCV values, conversions and/or rounding.

(b) This is a planned increase in exit capacity into the domestic zone. The current exit capacity of the existing transmission system (ca. 101-134 GWh/d) is not included in this value.

(C) That value represents an approximate increase in the capacity of the connectivity applicant, who will gradually use it over the period 2024-2027. The approximate increase in capacity of the handover station concerned by this project is around 38.2 GWh/d.

d) That value represents an approximate increase in the capacity of the connectivity applicant. The approximate increase in capacity of the handover station concerned by this project is approximately 20.4 GWh/d.

e) That value represents an approximate increase in the capacity of the connectivity applicant. The capacity of the handover station concerned by this project has not changed, but there has been an overall exchange of the measuring and control system.

Source: Ten-year Transmission System Development Plan in the Czech Republic 2023-2032

At the same time, the transmission system operator is preparing two hydrogen infrastructure projects which could not be included in the Ten-Year Transmission System Development Plan in the Czech Republic 2023-2032. These are the Central European Hydrogen Corridor (CEHC) and the Czech-German Hydrogen Interconnector (CGHI) projects. Both projects are expected to become operational by 2030, while seeking to obtain the status of Projects of Common Interest (PCI) in 2023.

Table 84: *Hydrogen infrastructure projects*[127]

Project category	Project code	Title of the project	Status	Transmission system interconnection point	Approximate capacity increase (GWh/d)	Expected year of entry into operation	PCI Status
Hydrogen turkey infrastructure projects	HYD-N—990	Central European Hydrogen Corridor (CEHC)	non-FID	E SK/CZ (Lanžhot) X CZ/DE (Waidhaus)	144	2029	No (-candiate)
	HYD-N—1034	Czech-German Hydrogen Interconnector (CGHI)	non-FID	E DE/CZ (Brandov) X CZ/DE (Waidhaus)	144	2029	No (-candiate)

Source: NET4GAS

Gas storage facilities

There is currently some development of the Dambořice magazine, which will take place gradually. Capacity will increase from the current 190 mm^3 to 250 m^{3in} 2018, to 298 m^3 in 2020, estimated to 315 m^3, then to 448 m^3, and then to a final 448 m^3, the production capacity is gradually increased from 4.5 m to 7.5 m^3/day and the injection power from 3.5 m to 4.5 m^3/day.

Increasing the parameters of the Dambořice storage facility is the only development project for storage facilities in the Czech Republic. Furthermore, only the connection of the Dolní Bojanovice storage facility (576 million m^3)^{to}the Czech system is expected. The implementation of other projects that were previously declared is not seen by the 2017 optician: This includes, for example, a cavern container in Lower Rožence (200^{million}m^3), a cavern container in round by the Council (200 to 400 m^3), a bunker at Břeclavi (200 million m^3).

Figure 85 shows the current state and expected development of natural gas storage facilities. Figure 86 then shows the maximum quantity of gas stored between 2019 and 2028 for the Czech Republic in accordance with the underground storage site operators' intentions. Figure 87 then shows the expected maximum daily power

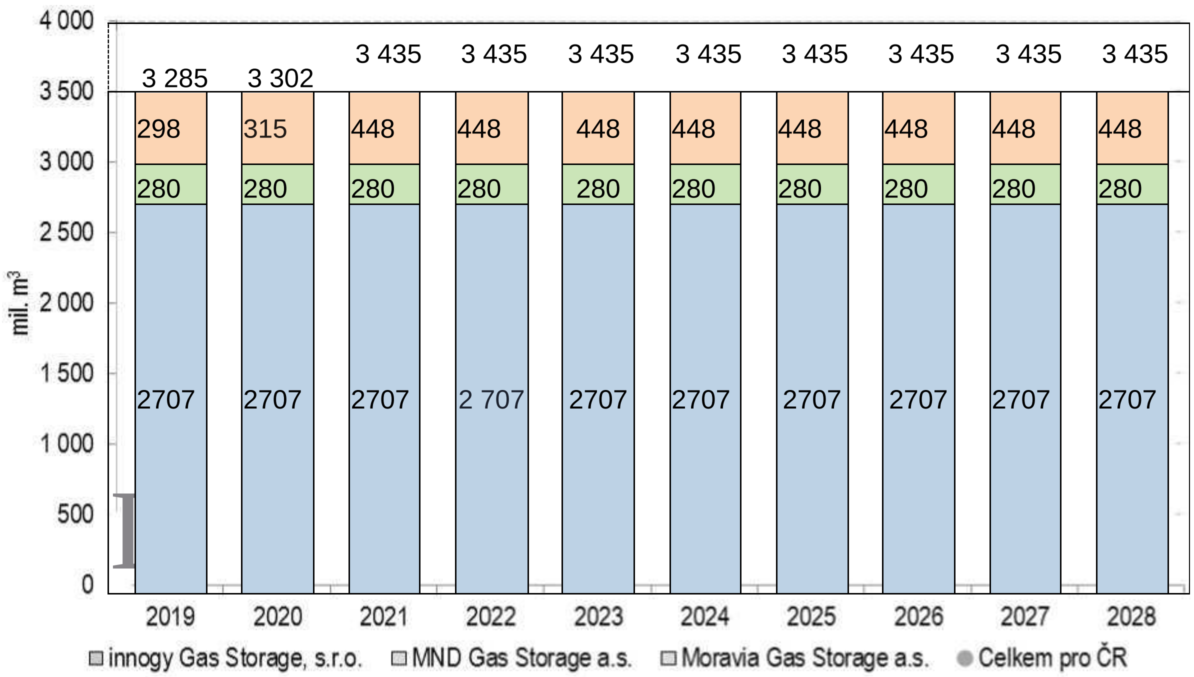
[127] These projects are kept up to date. Their reference here is therefore illustrative and their reference in that context cannot be regarded as binding.

gas production between 2019 and 2028 for the Czech Republic. Graph 88 then surrenders the expected share of natural gas storage capacity in domestic consumption on the basis of the 10-year transmission network development plan.

Graph 85: *Gas storage facilities – state of play and development*

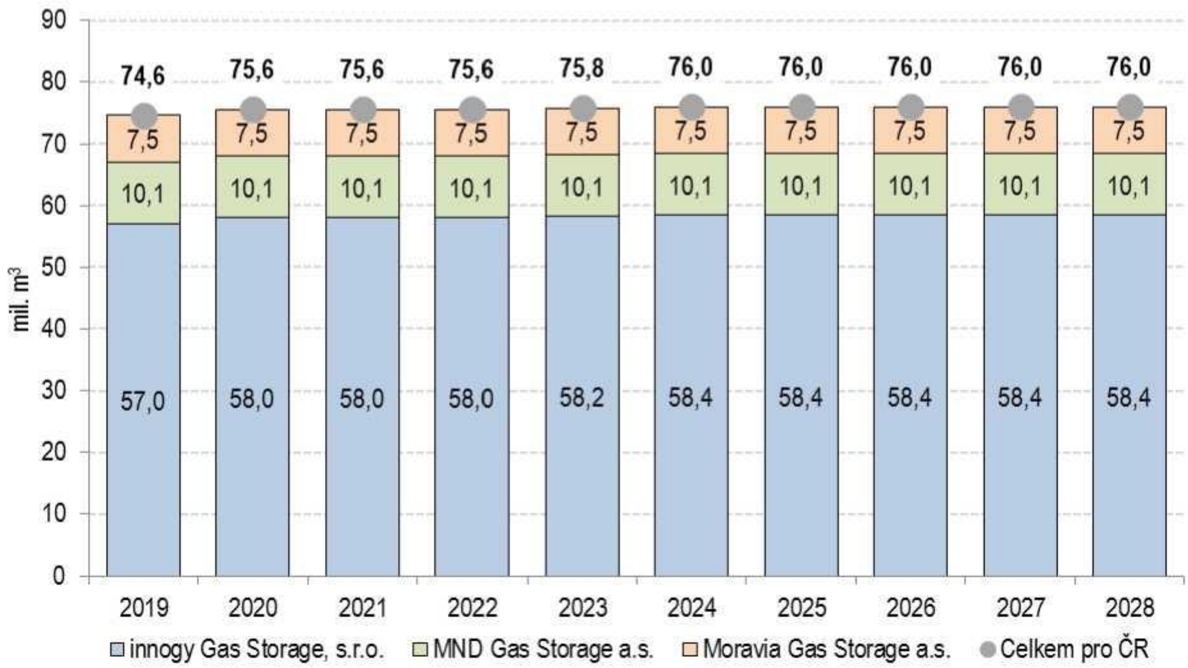
Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Graph 86: *Maximum quantity of stored gas between 2019 and 2028 for the Czech Republic*



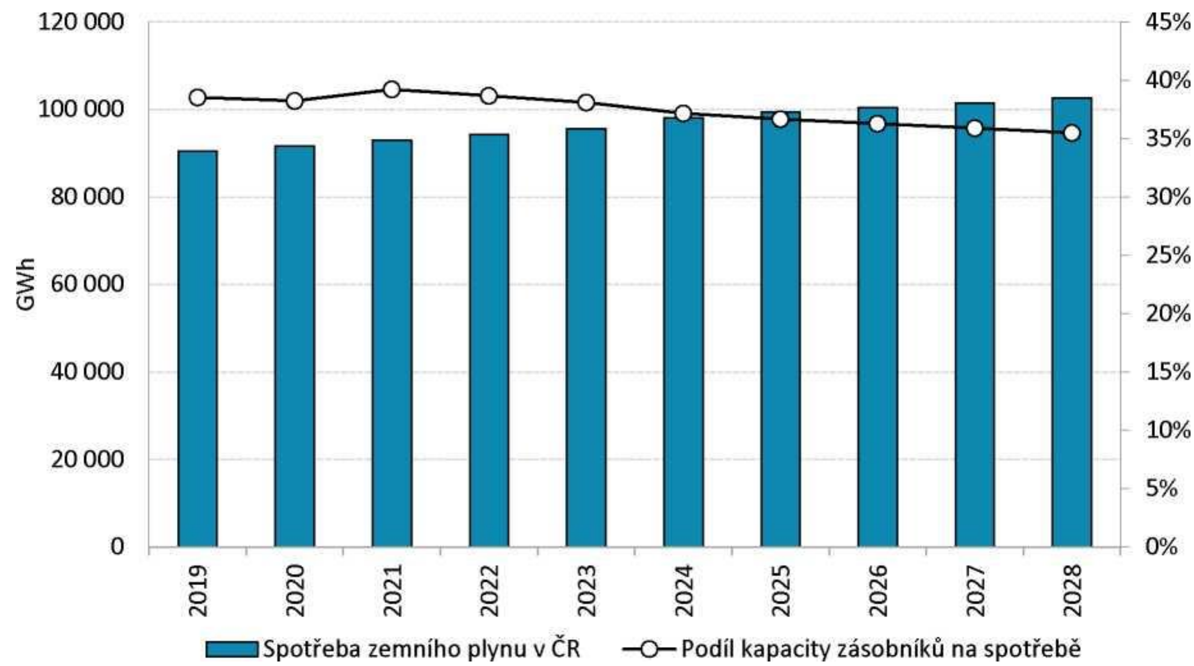
Source: Energy Regulatory Office

Graph 87: *Maximum daily gas production capacity between 2019 and 2028 for the Czech Republic*



Source: Energy Regulatory Office

Graph 88: *Expected share of natural gas storage capacity in domestic consumption*



Source: 10-year Transmission System Development Plan in the Czech Republic 2019-2028

Distribution systems

While several large-scale development projects are possible in the transmission system, distribution networks are considered to be completed from the perspective of natural gas distribution. Almost all cities above 5000 inhabitants are gasified and 78 % of municipalities are gasified in total. Distribution development in the VTL area is minimal – in this case only units of km per year. Increases are rather expected for local STLs and NTL networks, where the lengths of new routes increase by around 100 km per year.

Natural gas and subsequently renewable gases (biomethane and hydrogen) will allow for a gradual transition from the use of solid fuels in final consumption and small heat supply systems in the period up to 2050, in line with decarbonisation objectives, to partially compensate for the loss of supply from coal-fired energy, and a partial exit from liquid fuels in transport. Distribution networks will play a crucial role in achieving this. It is therefore necessary to ensure high reliability and safety of operations in line with European standards and their necessary development in line with the growth of final consumption of gas or renewable gases or their blends.

In order to ensure business reliability, the distribution companies currently focus mainly on the renewal of existing networks and other facilities, in which they invest significant funds. In particular, a high standard of safe operation will be maintained by continuing the elimination of technical risks, which is an integral part of the planned renewal of the network.

From the point of view of the development of the grid, this will involve connecting existing coal sources in their transition to gas, increasing the capacity of existing central gas sources and connecting new energy-efficient cogeneration and micro-cogeneration units, especially in the case of inefficient heat supply systems. It should be pointed out that in many cases it will be only the cost of building the connection, as there is sufficient network capacity within the reach of the above-mentioned objects.

Another important aspect in the development of the network will be the connection of biomethane stations enabling the injection of renewable biomethane into the distribution network. Support for biomethane by distribution system operators will consist mainly in the purchase of upstream pipelines and, where appropriate, related technological facilities. In the medium term, support is also foreseen for the development of the distribution network in the context of projects for the production of renewable electricity, which will be injected into the distribution network blended with natural gas or local islands with the distribution of clean renewable hydrogen.

A separate topic is the transformation of the gas network into the distribution of clean hydrogen. It appears that the vast majority of the underground part of the grid will be usable without modification, but it will be necessary to transform part of the above-ground distribution system facilities, gas demand facilities and final installations into hydrogen applications. We expect the start of the physical transition to clean hydrogen in the 30s, a complete transformation to the whole grid between 2040-2050.

Both the renewal and the development of distribution networks are hampered by the high administrative burden, especially in the investor preparation phase. In this context, the legislative framework should create the conditions for significantly speeding up the preparation and implementation of liner constructions of energy infrastructure. It will also be necessary to ensure the territorial protection of areas and corridors for the restoration and development of distribution systems through spatial planning tools.

The economic aspect of distribution system operation by increasing distribution efficiency is also a necessary view when planning investment actions, thus optimising the costs incurred in operating the network in relation to the quantity of gas distributed and thus improving the economy of the network. Where it is efficient, new modern unexcavated technologies are used in the construction of networks, which reduce the already high delivery costs.

Electricity and gas markets, energy prices[128]

I. Current situation of electricity and gas markets, including energy prices

4.5.3.1 Legislative context

The implementation of European directives and regulations on market liberalisation and ensuring the principle of regulated access to networks, namely Directive (EU) 2019/944 of the European Parliament and of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity are implemented through a functioning electricity market. In a liberalised gas market, this is the implementation of Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in natural gas.

The EU's energy strategy is continuously regulated and corrected through the adopted 'liberalisation packages'.

4.5.3.2 Market model

Short and long-term market balance should be effectively ensured by market mechanisms in line with the established market framework. In practice, this means that responsibilities are shared between market participants, market operators and system operators, i.e. between non-regulated and regulated entities. From an administrative point of view, it can be said that a significant part of the system balance planning prior to the delivery hour is left to the market participants, while ensuring the balance between electricity supply and demand at all times of operation is entrusted to the TSO. Markets are organised in consecutive time bands and their results are binding on individual participants.

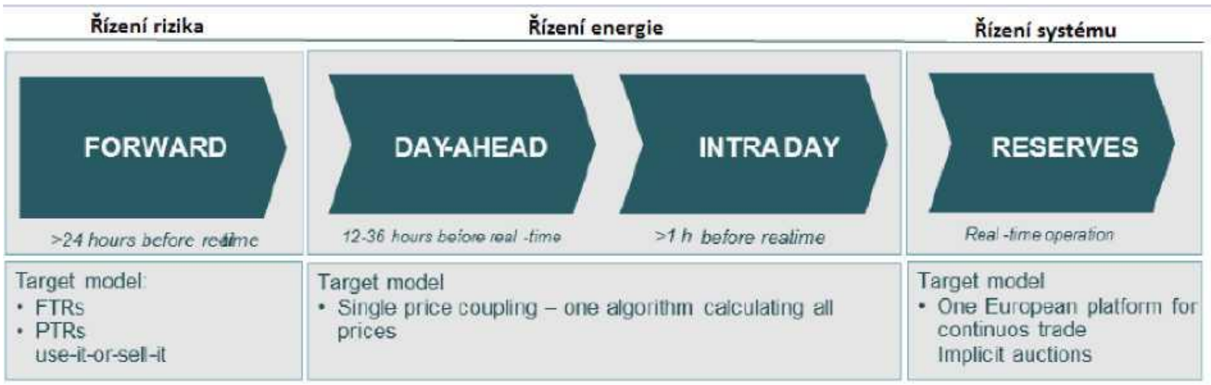
Physical exchanges of energy shall take place in real time, where equal supply and demand for electricity must apply at all times. System operation planning shall be carried out by the transmission system operator on the basis of commercial results in the electricity markets. On the basis of this data, TSOs plan the system load and the necessary reserve power size to ensure the safe operation of the EC.

An entity's deviation from the contractual values, i.e. the purchase/delivery from/to the EC in quantities other than the entity's commercial position, triggers the need for EC regulation by TSOs and is therefore financially penalised.

Figure 20 then shows the temporal continuity of markets.

Figure 20: *Target model of the EU electricity market*

In the process of finalising the national plans, the[128] European Commission published non-paper with information considered relevant in this regard. This is a wide range of information on market concentration, liquidity, etc. A lot of this information is already included in this section; much of this information is already monitored and reported by the relevant organisations, in particular ACER and CEER. The Czech Republic will attempt to complete this information in the relevant progress report.



Source: European Comission: Electricity Market Functioning: Current Distortions, and How to Model Their Removal

A functional and transarent day-ahead electricity market with the downstream intraday market is the cornerstone of the European electricity market model. In this regard, the gas sector is dominated by the intraday gas market. Day-ahead or intraday offers represent market participants' expectations for the day ahead. Changes in weather forecasts, unexpected base or industrial base outages indicate that deviation from planned consumption/production is inevitable. A deviation from planned consumption or production values is then charged for billing according to the size and direction of the deviation compared to the system deviation.

These deviations need to be balanced in real time by the TSOs in order for the European synchronous EC to be balanced at all times, this balance is indicated by a stable frequency value of 50 Hz. The balancing energy needed to ensure system balance is procured by TSOs by activating ancillary services, purchasing on the European platform for the exchange of balancing energy from replacement reserves, and in emergency cases from abroad. The costs incurred for balancing the system are then spread among market participants on the basis of the size of their imbalance.

Compared to the electricity market, where all deviations are settled financially at a price determined according to the direction and size of the system deviation, gas can use the so-called 'linepack flexibility service' for the evaluation and settlement of deviations. This is due to the natural storage capacity and robustness of the gas system. It allows for the oscillation of the balance responsible parties' trading position within a set amount of flexibility so that, unless these limits are exceeded, additional balancing costs are not generated. Deviations up to these limits do not affect the smooth and secure operation of the gas system.

4.5.3.3 Overview of the state of the market in the Czech Republic

The rights and obligations of individual participants in the electricity and gas markets are laid down in Act No 458/2000 on business conditions and the performance of State administration in the energy sectors and amending certain acts, as amended (the Energy Act), and the implementing decrees thereto.

Electricity

The electricity sector is further regulated by ERÚ Decree No 408/2015 on electricity market rules ('Electricity Market Rules'), as amended.

The model of the market in greens in the Czech Republic is based on the principle of ensuring the balancing responsibility of individual imbalance settlement entities.

Electricity market participants have balancing responsibility and are imbalance settlement agents and may transfer balancing responsibilities to another imbalance settlement entity on the basis of a contract.

Under Paragraph 22 of the Energy Act, electricity market participants are defined as:

a) electricity generators;
b) the transmission system operator;
c) distribution system operators;
d) market operator;
e) electricity dealers;
f) customers.

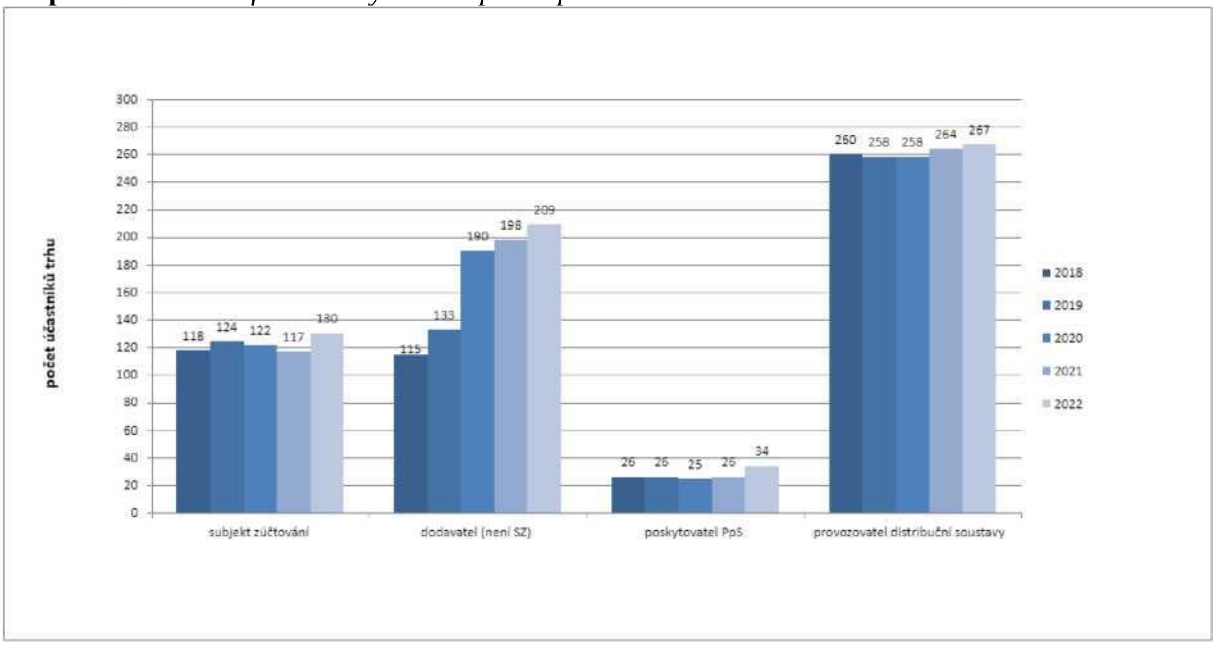
The table and figure below show the number of registered electricity market participants with the Market Operator per type of participant on 31 12. 2022 and year-on-year change from 31. 12. 2021.

Table 85: *Number of electricity market participants*

type of participant	number at 31. 12. 2022	y-Y change
balance responsible party	130	+ 13
Supplier	209	+ 11
provider of support services	34	+ 8
distribution system operator	267	+ 3
a transmission system operator	1	0

Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

Graph 89: *Number of electricity market participants*



Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

Gas

In the field of gas, the Energy Act is based, in particular, on the ERÚ Decree No 349/2015 on gas market rules (‘Gas Market Rules’), as amended.

As regards the gas sector, the participants in the gas market are (see Section 56 of the Energy Act):

a) gas producers;
b) transmission system operator,
c) operators distribution systems;
d) operators gas storage facilities;
e) gas dealers;
f) customers;
g) market operator.

The gas market model shall be based on the same principle as in the electricity market, where a gas market participant with regulated access rights to the transmission or distribution system is responsible for balancing and is the imbalance settlement agent, or may delegate balancing responsibility to another imbalance balancing entity under a contract.

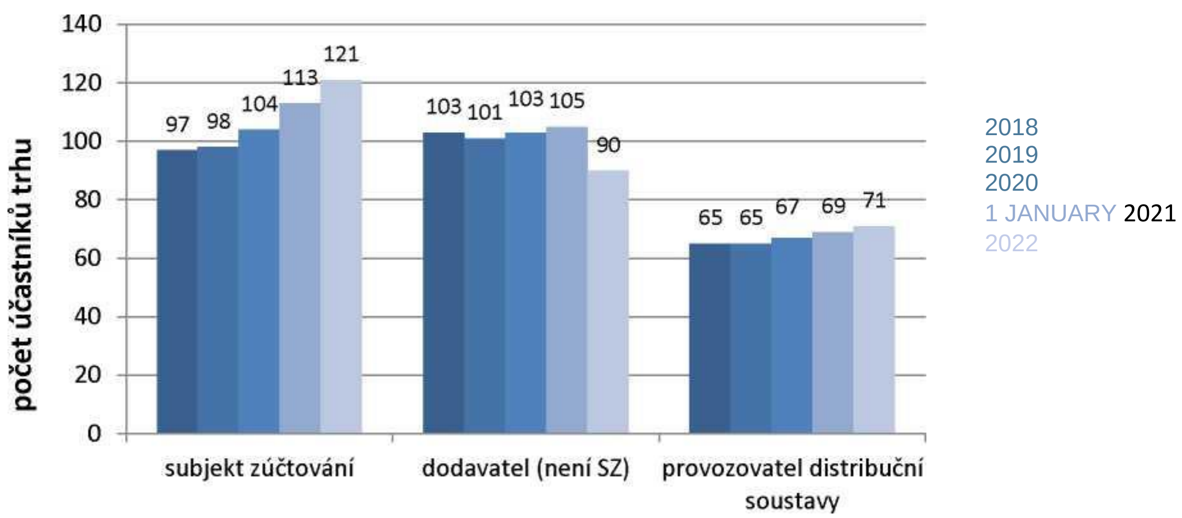
The table and figure below show the number of registered gas market participants with the Market Operator per type of participant on 31 12. 2022 and year-on-year changes to 31 December 12. 2021.

Table 86: *Number of gas market participants*

type of participant	number at 31. 12. 2022	y-Y change
balance responsible party	121	+ 8
supplier	90	—15
distribution system operator	71	+ 2
transmission system operator	1	0
gas storage operator	4	0

Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

Graph 90: *Number of gas market participants*



Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

Switching of supplier – electricity market

From 1. 1. 2006 the electricity market in the Czech Republic is open to all customers, each of whom can choose an electricity supplier according to its decision. In the Central System of the Market Operator (CS OTE), any switching of supplier is related to a specific point of demand (OPM), i.e. the measured point of delivery and take-over of electricity between two market participants or the consumption of electricity. Close to 6.24 million OPMs of electricity connected to the Czech electricity system were registered in the central system of the market operator at the end of 2022. This is to ensure the recording of measured electricity inputs and off-takes of individual suppliers to the Czech Republic's system and their attribution to the relevant balance responsible parties. The following table shows the evolution of the number of production and consumption OPMs by type of measurement and their registration in the OTE CS.

Table 87: *Number of changes of electricity supplier in a given year and month*

Month	number of changes of electricity supplier			
	Year			
	2003-2019	**2020**	**2021**	**2022**
January	972 851	124 110	106 510	182 020
February	260 633	29 338	27 722	60 169
March	265 571	31 806	30 671	37 375
April	274 923	32 198	30 401	32 809
may	269 466	30 066	30 345	28 447
June	282 475	31 000	36 745	23 543
July	264 794	29 875	33 513	22 246
August	266 698	25 306	30 310	22 606
September	392 752	27 305	37 248	30 556
OCT	282 936	27 785	55 402	32 617
November	297 602	29 366	362 274	26 865
December	282 322	27 926	228 336	20 045
total	**4 113 023**	**446 081**	**1 009 477**	**519 298**
total 2003-2022	**6 087 879**			

Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

In 2022, 519298 changes of electricity supplier per OPM were registered in the market operator's system, keeping the interest in switching electricity supplier at high levels.

The situation of the electricity market in 2022, in particular rising commodity prices in organised short-term markets, as documented, among other things, made several electricity suppliers unable to continue to supply their customers and the service provided ceased the supply activity. Among the most important trading companies that ceased their activities in the electricity market during 2022 were e.g. Lumius, s.r.o., Manta Commodities SE or CONTE spol. s.r.o. Customers whose electricity suppliers were no longer able to ensure the supply of electricity were transferred to a supplier of last resort or opted for another supplier in an accelerated switching mode. The supplier of last resort is a tool that protects consumers in the event of the bankruptcy of any energy supplier and has a legal obligation to supply electricity to the customer for a maximum period specified in the Energy Act. This period was initially set at up to 6 months, but with the amendment to Energy Act No 176/2022, it was effective from 27. 6. 2022 the last resort delivery obligation under Section 12a(2) and better among them will find the optimal product for its needs. This in turn translates into increased customer motivation. The amendment to the Energy Act has been amended in such a way that supplies of last resort cease to exist within 3 months of their creation if the customer does not change the electricity supplier before the expiry of that period and customers switch to standard products. At any time during this period, the customers concerned must choose a new regular supplier and conclude a new standard electricity supply contract with him. A total of 10909 electricity demand points were transferred to the last resort supplier in 2022.

Switching of supplier – gas market

As of 1 January 2007, all final customers of gas have the right to switch supplier free of charge and thus also have the possibility to influence part of their total costs for the supply of gas. Thus, 2022 was already the 16th year of operation of the open gas market, in which each gas customer could choose its supplier according to his choice. All customer demand points (OPMs) for which a switch of supplier has been replaced by a network trader or has been fully registered by the distribution system operator are individually registered in the market operator's system. The remaining OPMs (i.e. the points of demand of the trader belonging to the network), if any, are registered in the market operator's system in sum. This ensures that all measured gas inputs and off-takes of individual suppliers are recorded and at the same time allocated to balance responsible parties. The following table shows the number of gas supplier changes for OPM by category of demand in each month of 2022.

Table 88: *Number of gas switching by OPM by consumption category in 2022*

month	Total	sampling category			
		VO	JO	MO	DOM
January 2022	73 927	327	1 024	18 433	54 143
February 2022	26 488	6	50	3 830	22 602
March 2022	17 982	1	18	2 061	15 902
April 2022	15 887	16	27	1 807	14 037
may 2022	12 410	7	22	1 455	10 926
June 2022	12 680	3	13	2 088	10 576
July 2022	12 049	17	80	1 083	10 869
Aug 2022	8 471	17	76	1 032	7 346
September 2022	16 892	7	23	1 187	15 675
October 2022	22 523	27	51	1 422	21 023
November 2022	13 652	12	29	1 501	12 110
December 2022	10 662	1	15	1 086	9 560
Total 2022	**243 623**	**441**	**1 428**	**36 985**	**204 769**

Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

The table shows the numbers of OPMs per category of collection for which there has been a change of supplier in each month of 2022. A total of 243623 changes took place during the year, approximately half less than in 2021 (488933 changes). Transfers of customer demand points from the supplier of last resort to the standard supply mode are also included in the 2022 number of supplier changes.

Table 89: *Gas switching 2017-2022*

	2017	2018	2019	2020	2021	2022
End-User	305	395	314	280	331	441
Medium customer	1 357	1 620	1 123	1 073	1 248	1 428
Malo-Consumer	26 205	34 436	22 545	23 256	37 081	36 985
Household	199 678	226 974	190 446	176 716	450 273	204 769
Total	**227 545**	**263 425**	**214 428**	**201 325**	**488 933**	**243 623**

Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

The unprecedented increase in gas prices linked to its short-term shortage and related supply chain disruptions in 2022 led to problems in securing gas supply for 14 gas traders. As of January, Czech Energy s.r.o. and Lumius spol. s r.o. left the gas market due to the loss of the ability of these traders to supply gas to their customers and the inability to ensure compliance with the financial conditions of imbalance settlement. For the same reason, První Moravská Gasar s.r.o. and Manta Commodities SE ceased their operations in March 2022. Also in March, Independent Energy s.r.o. lost the right (licence) to supply gas. In December 2022, Energy For Future, a.s. followed by Energy For Future, a.s., which ceased to be able to meet the financial conditions of imbalance settlement. The customers to whom the aforementioned companies supplied gas were transferred to a supplier of last resort or opted for another supplier in an accelerated mode. In the course of 2022, the relevant balance responsible party terminated prematurely the assumption of balancing responsibility either on parts or on the entire portfolio of demand points of an additional 8 gas suppliers. These customer demand points were automatically transferred to the supplier of last resort.

The supplier of last resort is a tool that protects consumers in the event of the bankruptcy of any energy supplier and has a legal obligation to supply gas to the customer for a maximum period of 3 months. During this period, the customers concerned must choose again the standard gas supply on the basis of a newly concluded contract. A total of 3063 customer demand points were transferred to the supplier of last resort in 2022.

Trading on the electricity market in the Czech Republic

Electricity trading in the Czech Republic takes place through:

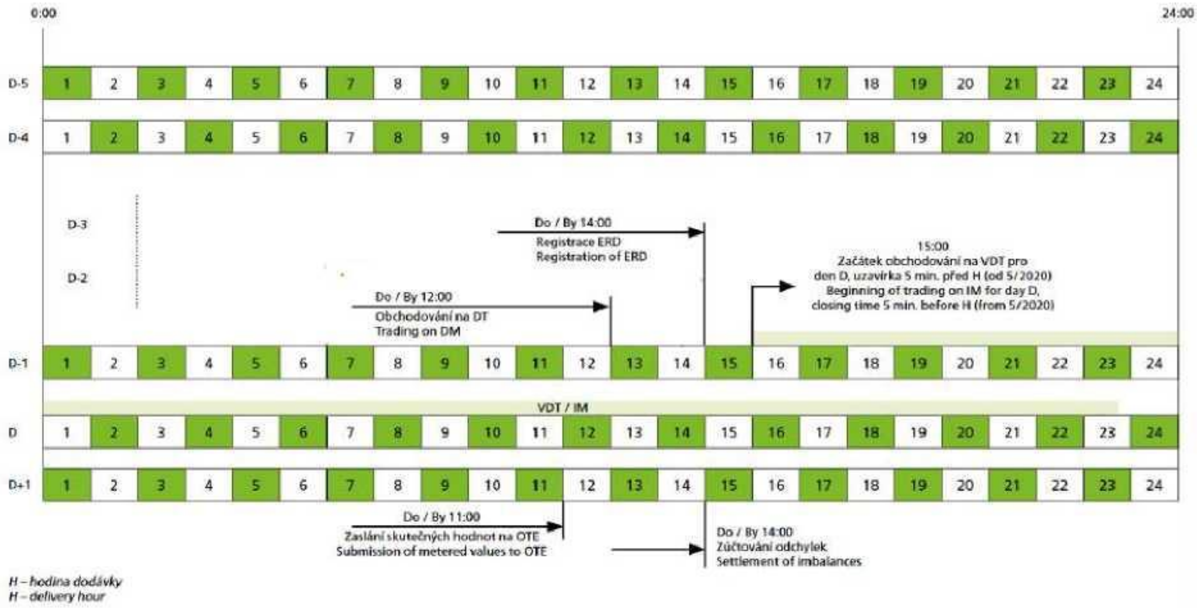
- bilateral trading;

  organised short-term market:
  - day-ahead spot market (DT);
  - intraday market (VDT).

Imbalance settlement (including trading of balancing energy) is also part of electricity trading in the Czech Republic.

Energy legislation requires market participants – balance responsible parties – to register their bilateral transactions in the OTE system by means of so-called implementation charts (ERDs). Imbalance settlement (including trading in balancing energy) is part of electricity trading in the Czech Republic. The periods of each activity are shown in the figure below.

Figure 21: *Time structure of the electricity market*



Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

Bilateral trades

As mentioned above, where market participants sell or purchase electricity through bilateral transactions, they are obliged to register these transactions in the OTE system.

Bilateral domestic electricity supply transactions were submitted to the market operator for registration by individual balance responsible parties (CA) in the form of execution diagrams (ERDs) no later than 14.00 on the day preceding the day on which the supply was to be made, which was also the closing point for bilateral trading. Only the quantity of bilaterally traded electricity is registered in the OTE system without indicating its price. The financial settlement of those transactions is made directly between the parties to the transaction, outside the OTE system, and OTE is not the central counterparty of those transactions. A prerequisite for the registration of these execution diagrams is, inter alia, that the condition of financial collateral for the PZ is met from the point of view of the emergence of possible variations by the CAs that these transactions could give rise.

These bilateral transactions shall include:

- bilateral national agreements (Classtic DVS, stock exchange129);
- bilateral contracts for the export of electricity (export) and for the import of electricity from abroad (import)130.

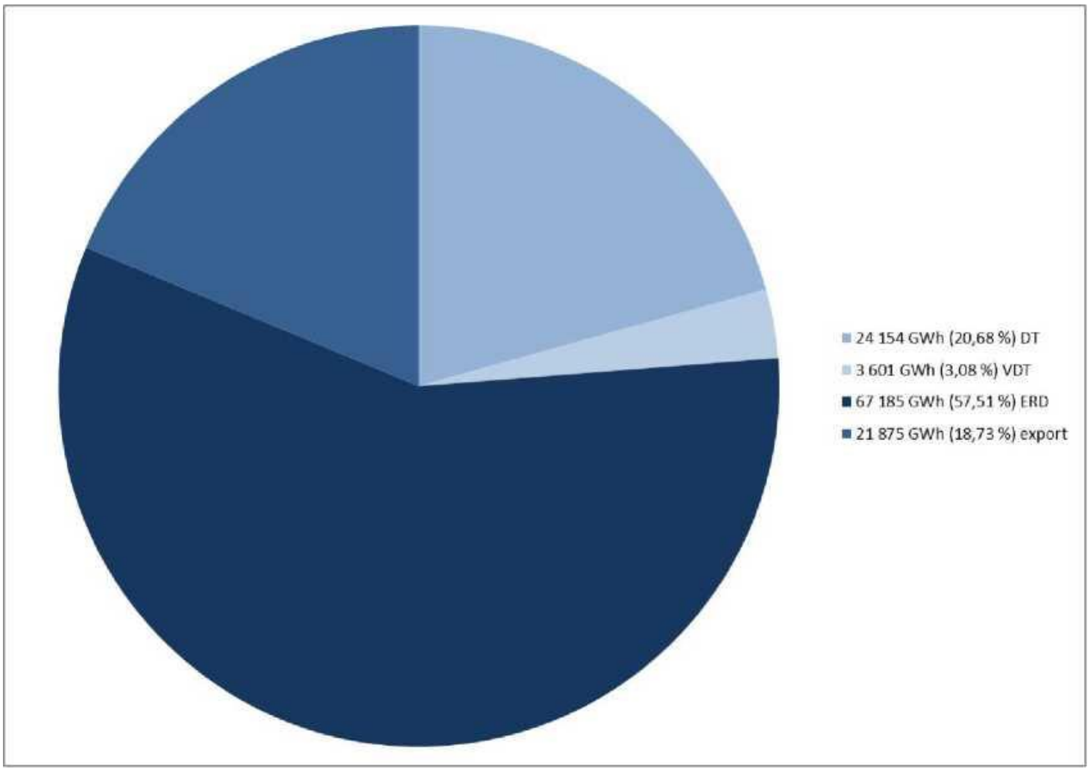
In 2022, 58 % of the electricity sold and 75 % of purchased electricity were registered in the OTE system in the form of domestic (national) execution diagrams, as shown in Figures 98 and 99. The total volume of domestic bilateral transactions via execution diagrams reached 67.19 TWh in 2022.

In addition to the above, electricity financial settlement transactions are still ongoing on commodity exchanges, which serve to hedge risks against rising/decreasing electricity prices in the long term.

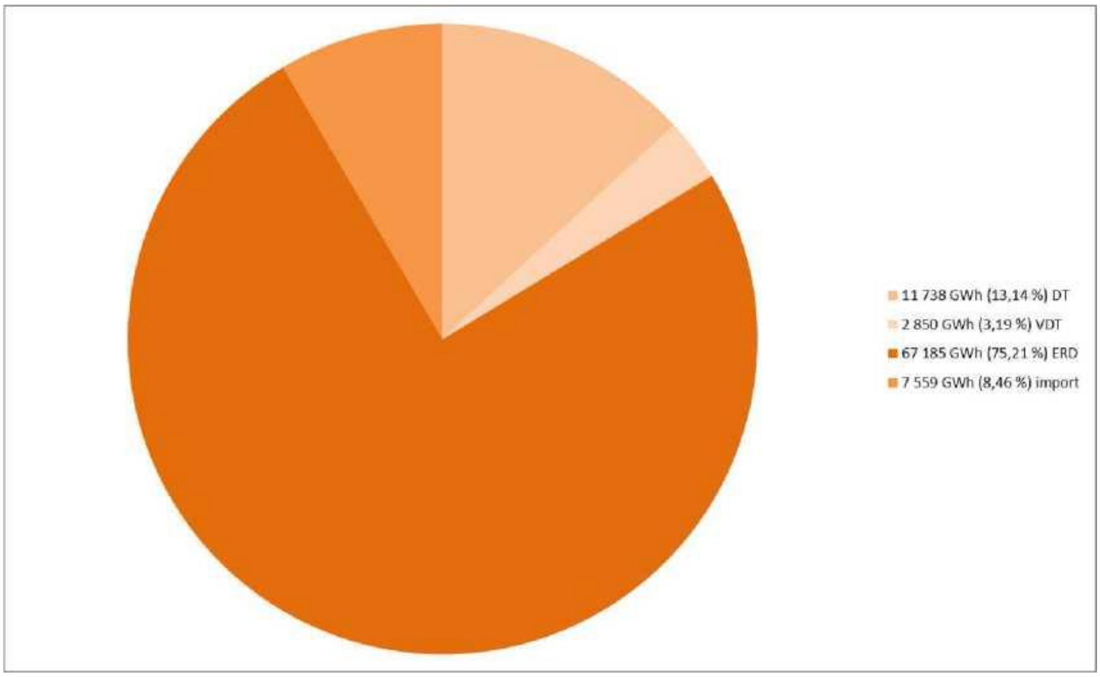
Graph 91: *Quantity of electricity traded – sales (GWh; %) – processed in OTE in 2022*

129The term exchange DVS here refers to Power Exchange Central Europe, a.s. (PXE) transactions entered into the OTE system for each imbalance settlement participant.

130Exports and imports resulting from the interconnected day-ahead and intraday electricity markets, Market Coupling (MC) – SDAC (Single Day Ahead Coupling) and SIDC (Single Intraday Coupling) are also included in exports and imports.


24 154 GWh (20,68 %) DT
3 601 GWh (3,08 %) VDT
67 185 GWh (57,51 %) ERD
21 875 GWh (18,73 %) export

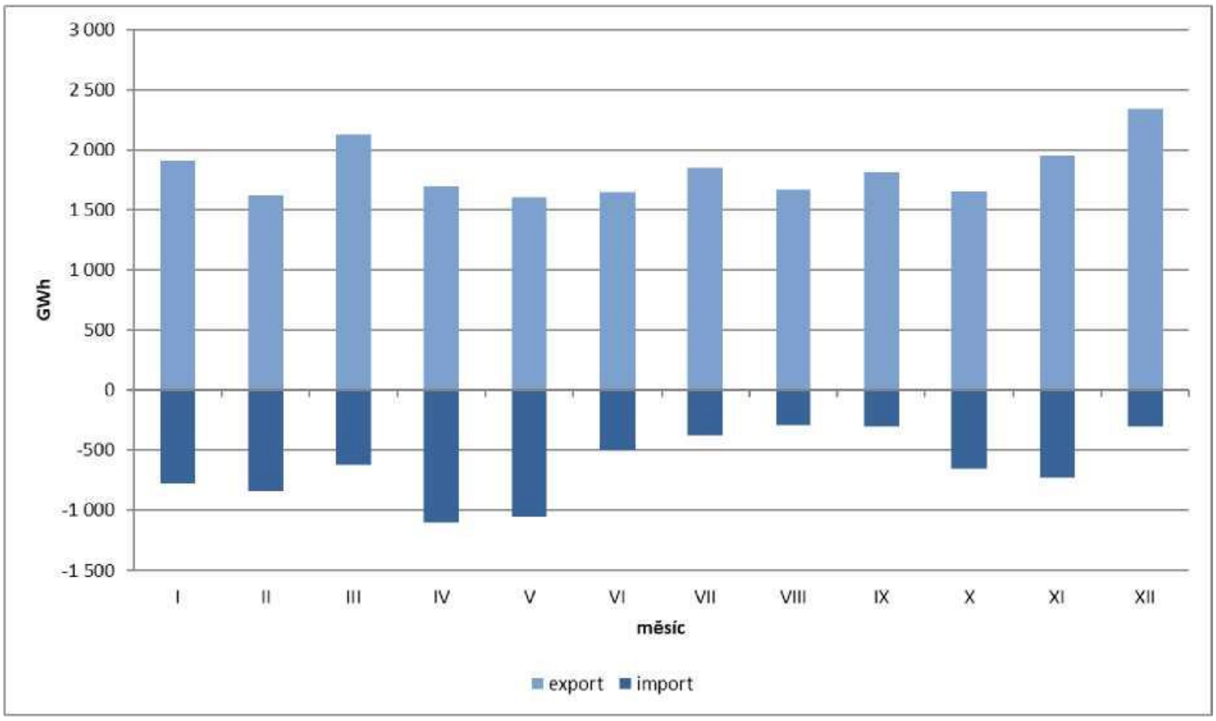
Graph 92: *Quantity of electricity traded – purchases (GWh; %) – processed in OTE in 2022*



Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

The values of cross-border transactions contracted on the export side totalled 21 875 GWh in 2022, while the import volume in 2022 was 7 559 GWh. The figure below shows the quantities of electricity exported and imported in each month of 2022.

Graph 93: *Amount of electricity traded through export and import in 2022*



Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

Organised short-term electricity market

The organised short-term market in the Czech Republic is an important form of electricity trading. For energy market participants, thanks to the substantial increase in liquidity in recent years, it is a reliable guarantee that they can purchase or sell the relevant commodity even shortly before the delivery date (day, minute) in response to the current situation in the system or in their production or customer portfolio. The aim and purpose of the short-term market is not only to reduce the risk of a deviation, but also to increase security and reliability of supply. Liquid short-term markets are also essential in their pricing, where transaction prices on these markets are used as a basis for the settlement of financial instruments traded on commodity exchanges or serve as a guide to the prices of other contracts between the supplier and the customer.

Table 90: *Comparison of the underlying parameters of the different markets*

			gas
	DT	VDT	VDT
form of the market	daily auctions	continuous pairing	continuous pairing
traded period	1 hour	1 hour	** 24 hours
minimum tradable quantity	0.1 MWh	0.1 MWh	0.1 MWh
maximum tradable quantity	99 999 MWh	*999 MWh	9 999 999.9 MWh
smallest quantity	0.1 MWh	0.1 MWh	0.1 MWh
currency of the transactions	EUR	EUR	EUR
minimum Possible Price	—EUR 500/MWh	EUR 999/MWh	EUR 0.01/MWh
maximum possible price	***EUR 4 000 /MWh	EUR 9999/MWh	EUR 4000/MWh
smallest possible price narrative	EUR 0.01/MWh	EUR 0.01/MWh	EUR 0.01/MWh
zero price option	YES	YES	NO
time for market opening	unlimited	15.00 D-1	9.00 D-1
time foreclosure	12.00 D-1	H-0:05	5:00 D+ 1

* Within one tender

** Gas day from 06:00 to 06:00

*** The second auction is announced when the price floor of EUR 150/MWh or the price cap of EUR 1500/MWh is reached or exceeded

Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

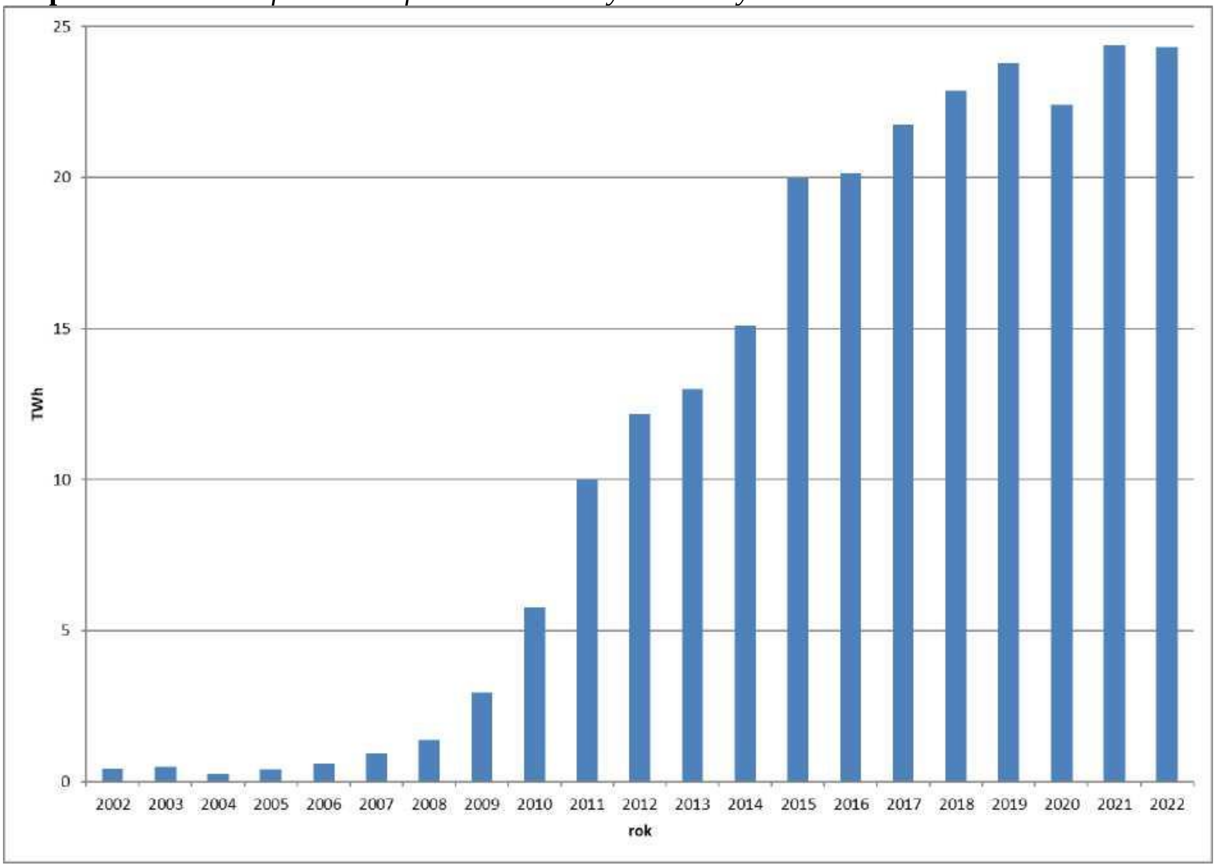
Day-ahead electricity market

The day-ahead electricity market in the Czech Republic is based on the principle of implicit allocation of cross-border capacity (MC) and June 2021 was operated jointly with the Slovak, Hungarian and Romanian markets under the 4M MC designation. In June 2021, these four day-ahead markets were interconnected to the interconnected MRC region, creating a single European day-ahead market (SDAC) and, as of June 2022, a change in the capacity calculation method by switching to a method whereby capacity calculation is based on physical flows (the Flow Based method), i.e. where the physical network limits are based on available capacities on critical network elements and energy transmission distribution factors defined for each critical element and each bidding zone within the Core CCR region (see also ACER Decision 06/2016).

On the day-ahead market in the Czech Republic, market participants in the Czech Republic and other EU countries can satisfy their requirements to purchase or sell electricity for the following day in all market areas without the need for explicit acquisition of transmission capacity.

The implementation of PCR solutions allows market participants to benefit from the same supply structure as market participants in the EU. They can therefore create different production and consumption scenarios at different price levels and thus increase the ability to implement their business strategy in the day-ahead market. At the same time, traders can submit an unlimited number of offers.

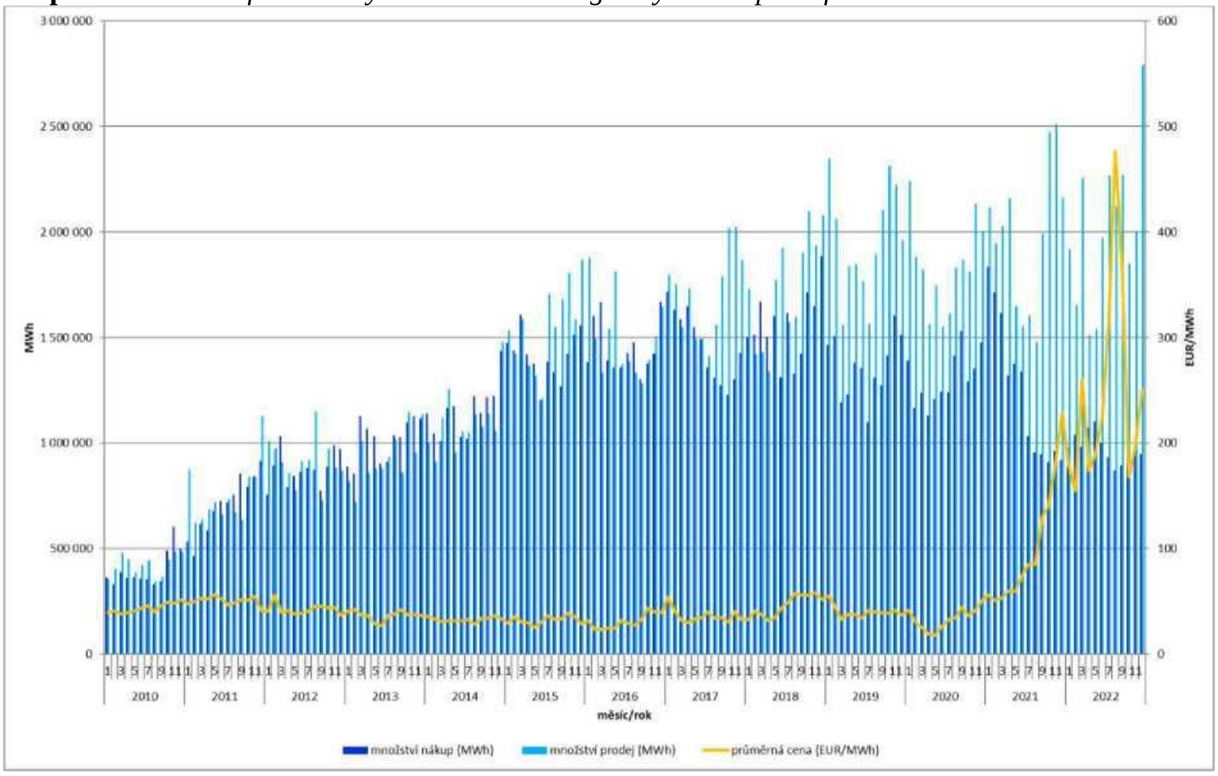
Graph 94: *Evolution of volumes of traded electricity on the day-ahead market in 2002-2022*



Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

The electricity trades concluded on the OTE day-ahead market for 2022 amounted to 24.31 TWh. This is comparable to 2021 in which market participants concluded transactions with a total volume of 24.36 TWh. The total volume traded on DT in the Czech Republic again represented almost 40 % of the domestic net consumption in 2022.

Graph 95: *Volume of electricity traded and average day-ahead price flow in 2022*



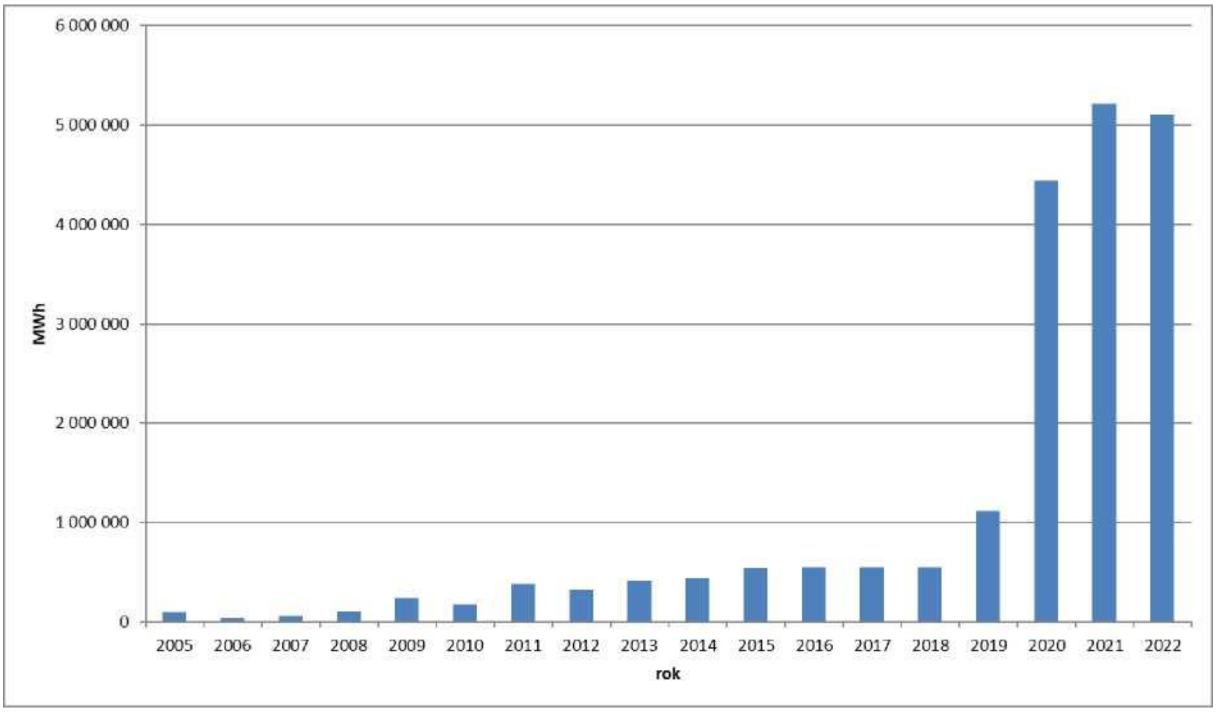
Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

Intraday electricity market

Through the organised intraday electricity market, traders shall offer or demand electricity anonymously during the business day up to a limit of 5 minutes before the start of the delivery hour. Intraday trading shall be opened at 15.00 for all trading hours of the following day and the values of cross-border capacities are published between 18.00 and 22.00. The minimum bid quantity is 0.1 MWh, maximum 999 MWh, quantity to be entered in MWh with a distinction to one decimal place. Trading takes place on a continuous matching basis and the trading currency is EUR. The minimum bid price is EUR 999/MWh and maximum + EUR 999/MWh.

In 2022, 5.11 TWh was traded in the intraday electricity market, almost comparable to 2021 (5.21 TWh).

Graph 96: *Volume of electricity traded in the intraday market 2005-2022*



Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

Trading on the market in gas in the Czech Republic

The gas market model shall be based on the balancing responsibility principle, whereby a gas market participant with regulated access rights to the transmission or distribution system is responsible for balancing and is the imbalance settlement entity, or may delegate balancing responsibility to another imbalance settlement entity under a contract. A business unit shall be, in accordance with European legislation, one gas day starting at 6.00 a.m. on a given calendar day and ending at 6.00 a.m. on the following calendar day.

Gas trading in the Czech Republic takes place through:

- bilateral trading;
- an organised short-term market in the form of an intraday market (VDT).

Gas trading in the Czech Republic also includes imbalance settlements.

In addition to the above, there are still gas financial settlement transactions on commodity exchanges, which mainly serve to hedge risks against gas price increases/decreases in the long term. These transactions are registered with the market operator in the same way as bilateral trading.

The notification of gas quantities vis-à-vis market participants is done by sending so-called nominations.

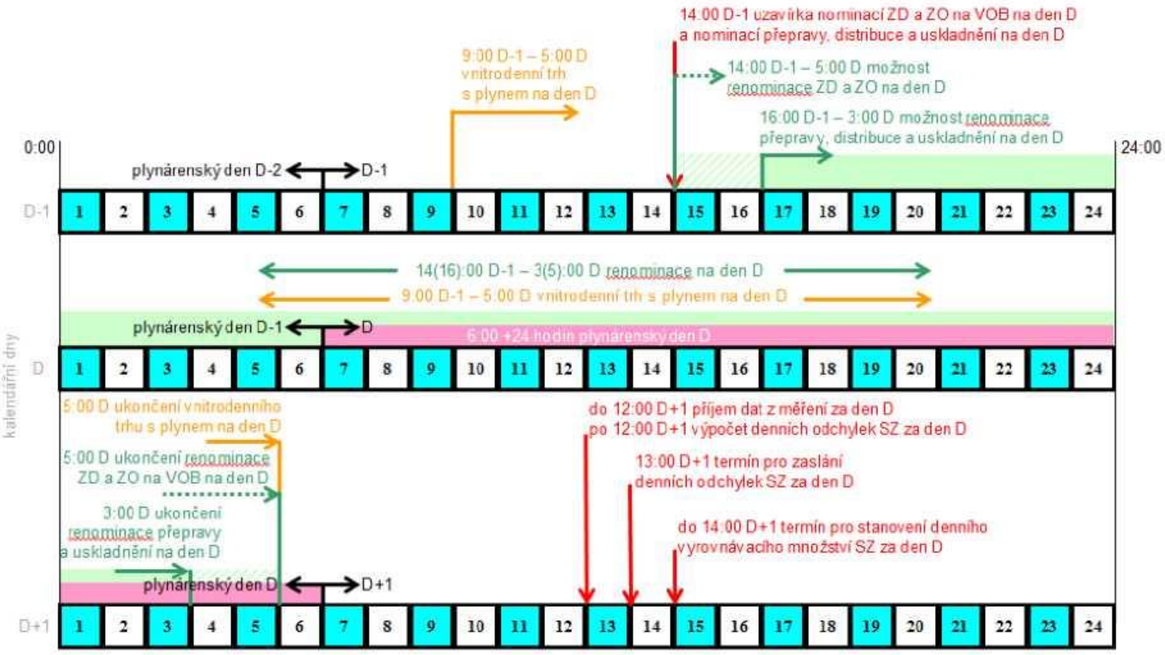
Nominations are divided into:

- **nomination of transmission –** order to transport gas at entry and exit points of border transfer stations (BCPs), i.e. export and import of gas from/to the transmission system in the Czech Republic, order to transport gas at entry and exit points of virtual gas storage facilities (VZP) or order
    - the transport of gas to a customer’s demand point directly connected to the transmission network with a reserved capacity greater than or equal to 5 000 MWh/day;
- **nomination of storage** – order to inject or pump the specified quantity of gas into or a virtual gas storage facility,

– **nomination of distribution** – order to distribute gas at the entry points of gas production plants and at entry and exit points of cross-border pipelines (PPLs), or export and import of gas from/to a given distribution system in the Czech Republic;
– **nomination of a commitment to deliver (TA) and an obligation to withdraw (IB)** – transactions that are executed through the VOB between individual traders (passing gas to VOB), with the VOB as being delivered/withdrawn.

All nominations shall be registered by the balance responsible party with the market operator or with the relevant operators by 14:00 on the day preceding the start of the gas delivery day. After this time, the nomination of transmissions with neighbouring transmission system operators, the nomination of distribution with neighbouring DSOs, the nomination of storage between the transmission system operator and the gas storage facility operator, and nominations at a virtual trading point between balance responsible parties shall take place after this time. However, the possibility of adjusting the trading position for market participants does not end. Until almost the end of gas day 'D', the balance responsible party can adjust its position by sending a re-nomination or correcting nomination of its liabilities. It is nominated at the same time for a single gas day.The time structure of the gas market is shown in the figure below.

Figure 22: *Time structure of the gas market for 2022*



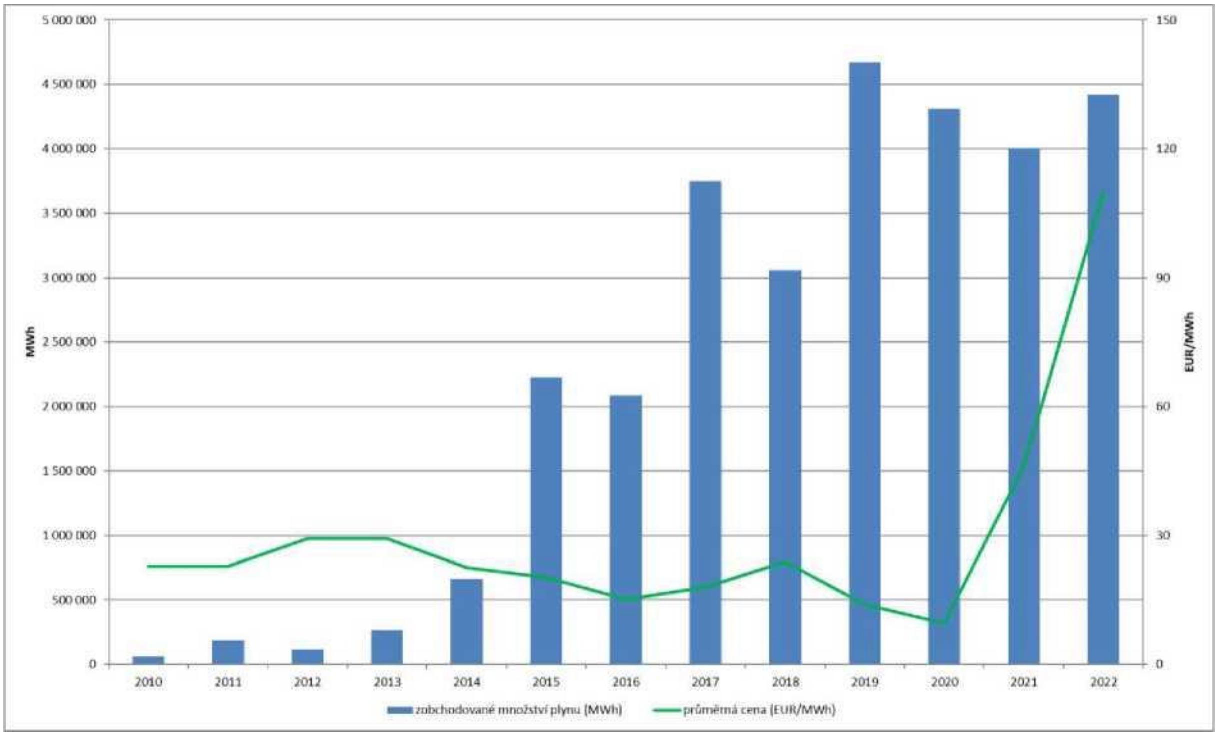
Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

Organised short-term gas market

The organised intraday gas market allows market participants to trade continuously throughout the gas day. The intraday gas market for a given supply day shall be opened at 9.00 on the day preceding the gas day on which the supply takes place and shall end one hour before the end of the gas day on which the supply takes place.

A total of 4 423 GWh of gas was traded in the intraday gas market in 2022. The weighted average price of traded gas in the intraday market in 2022 was EUR 109,94/MWh, an increase of 138 % in the weighted gas price compared to 2021.

Graph 97: *Volume of gas traded and average prices in the intraday gas market 2010-2022*



Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

On the basis of the prices achieved on the intraday gas market organised by the market operator, the OTE Index is set. The OTE Index and the prices on the EEX in Germany (Within Day Reference Price for the NCG Zone)131, respectively132 between 2020 and 2022, are shown in the figure below.

Graph 98: *Comparison of the OTE Index and EEX-CEGH prices in 2016 and 2017*

Source: Annual Electricity and Gas Market Report 2022 (OTE, a.s.)

The high correlation of gas prices on the OTE and EEX markets demonstrates sufficient cross-border capacities and the maturity of the Czech short-term organised gas market.

II. Projections of developments in the implementation of existing policies and measures until at least 2040 (as well as for
by 2030)

The aim and purpose of short-term markets are both to reduce the risk of a deviation and to increase the security and reliability of supply of both commodities. Liquid short-term markets are also of significant importance in their pricing, where transaction prices on these markets are used as a basis for the settlement of financial instruments traded on commodity exchanges or as a guide to the prices of other contracts between supplier and customer. This is reflected as much as possible by OTE, inter alia, in the integration activities in which it actively participates. The already integrated day-ahead market under the 4M Market Coupling integrated in November 2019 the intraday electricity market. In June 2021, the 4M MC region was connected to the interconnected MRC region, creating a Single Day-Ahead Market Coupling (SDAC) and the implementation of the Flow-base method for calculating cross-border

131Net Connect Germany, a common commercial zone of several transmission system operators in the south of Germany,
from 1. 10. 2021 merged with GPL (Gaspool) into the common commercial zone THE (Trading Hub Europe)
132Trading Hub Europe, from 1. 10. 2021 Market Operator for the whole region of Germany

capacities in the CORE region in June 2022.

The Single Intraday Market Coupling (SIDC) is a joint initiative of nominated electricity market operators (NEMOS) and Transmission System Operators (TSOs), which enables continuous cross-border trade across Europe and responds to market needs by creating a transparent and more efficient continuous business environment that allows market participants to easily trade their intraday positions across EU markets and without the need for explicit allocation of transmission capacity. The Czech Republic's intraday electricity market has been part of the SIDC as part of the integration of European intraday markets since 19 November 2019. In 2021, the intraday electricity market was traded across borders across 22 countries. In November 2022, the latest enlargement took place, when the markets of Slovakia and Greece joined. Intraday electricity markets, 25 EU countries in total, are now interconnected via SIDC. The implementation of intraday auctions is currently underway and are expected to become operational in the first half of 2024.

The next change will be the transition to a 15-minute clearing and trading period in the Czech Republic as from 1 7. 2024.

In the area of the gas market, as part of the creation of a single gas market within the EU, it is currently well lagging behind the integration of electricity markets. The TRU (Trading Region Upgrade) service provided in 2018 and 2019 by the Austrian and Czech transmission system operators Gas Connect Austria and NET4GAS for commercial interconnections between the Czech and Austrian transmission systems, even in the absence of direct physical transport infrastructure[133] between the two countries, was not provided in 2022.

In this context, the Czech Republic is working towards the completion of the internal energy market, namely the internal gas market, in particular by removing narrow infrastructural throats and market barriers between the Czech Republic and its neighbours, namely Poland and Austria.

The aim should be to create an integrated energy system linking both the electricity and gas sectors. Within an integrated energy market, there is scope to exploit the synergies between the two systems and to better plan infrastructure development.

4.6 Dimension "Research, Innovation and Competitiveness"

I.The state of play of the low-carbon technology sector and, where appropriate, its position in the global market

(this analysis should be carried out at Union or global level)

In the Czech Republic's view, the current state of the low-carbon technology sector and their position on the global market goes beyond the focus of this document and, at the same time, it is not appropriate to carry out this assessment in isolation at the level of individual Member States.

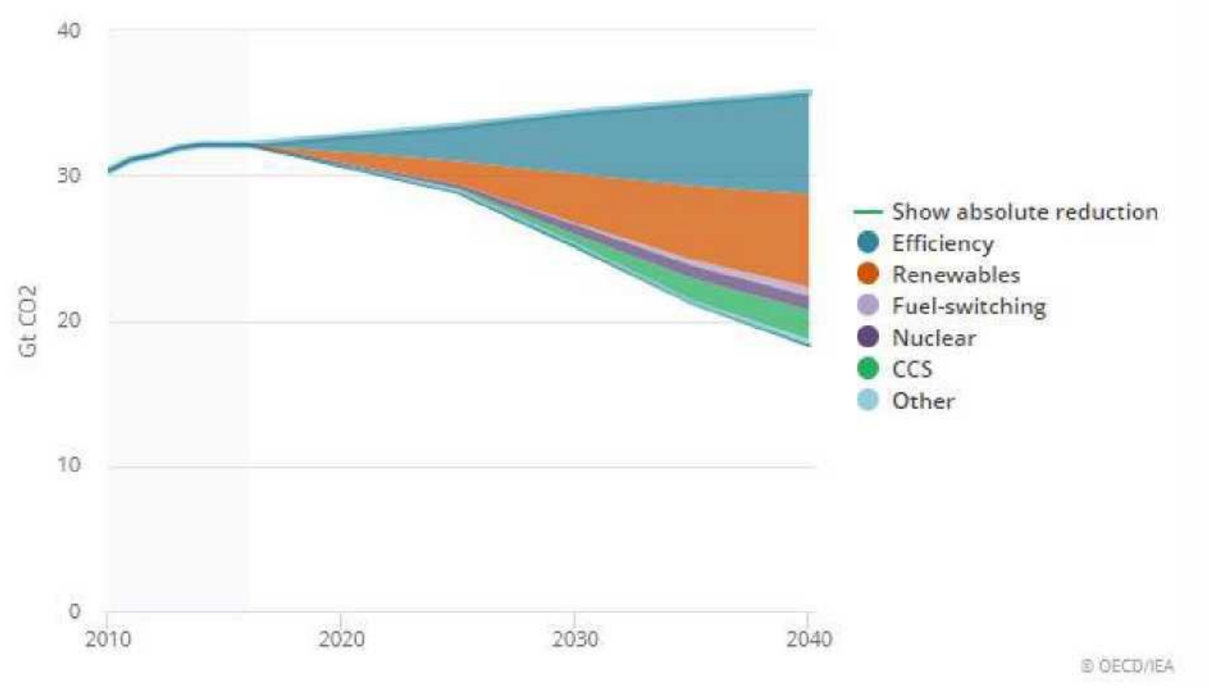
However, the Czech Republic is closely monitoring the state of low-carbon technologies in order to respond to these developments where appropriate. Since 2001, the Czech Republic has been a member of the International Energy Agency (IEA), which, among other areas, also deals with the status of low-carbon technologies and the monitoring of their development with a view to achieving long-term global greenhouse gas emission reduction targets. This information is mainly contained in the Energy

133The cross-border gas pipeline Hevlín (CZ) – LAA an der Thaya (AT), operated by the distribution system operator GasNet, s.r.o., is not a TRU service and is still operational. In September 2022, he distributed gas to Austria for several days.

Technology Perspectives (ETP) and "Tracking Clean Energy Progress (TCEP)".

Under the TCEP, the International Energy Agency monitors the additional CO2 emissionreductions needed to achieve the so-called Sustainable Development Scenario compared to the New Policies Scenario, by dividing the necessary reductions between the different low-emission technologies and technologies, but also demand-side measures (in particular energy efficiency improvements).

Figure 99: *Additional CO_2 savings under the SDS scenario compared to NPS*



Source: Tracking Clean Energy Progress

As part of the TCEP, the IEA evaluates the current contribution of each technology to achieving the objectives defined under the SPS. A total of 30 low-carbon technologies (or processes, not just technologies as such) ranked in a total of five categories, i) sources for electricity generation; (II) buildings; (III) transport; (IV) industry and (v) technologies and processes enabling integration. Renewables are further subdivided into a total of eight sub-categories (i.e. 37 categories in total).

According to the latest available assessment, only four categories were marked as 'on track' in 2017, namely (i) photovoltaics; (II) electromobility; (III) lighting and (iv) data centres and networks. A total of 22 technologies were labelled as 'more efforts needed' and finally a total of 11 technologies were marked as 'off track'.134

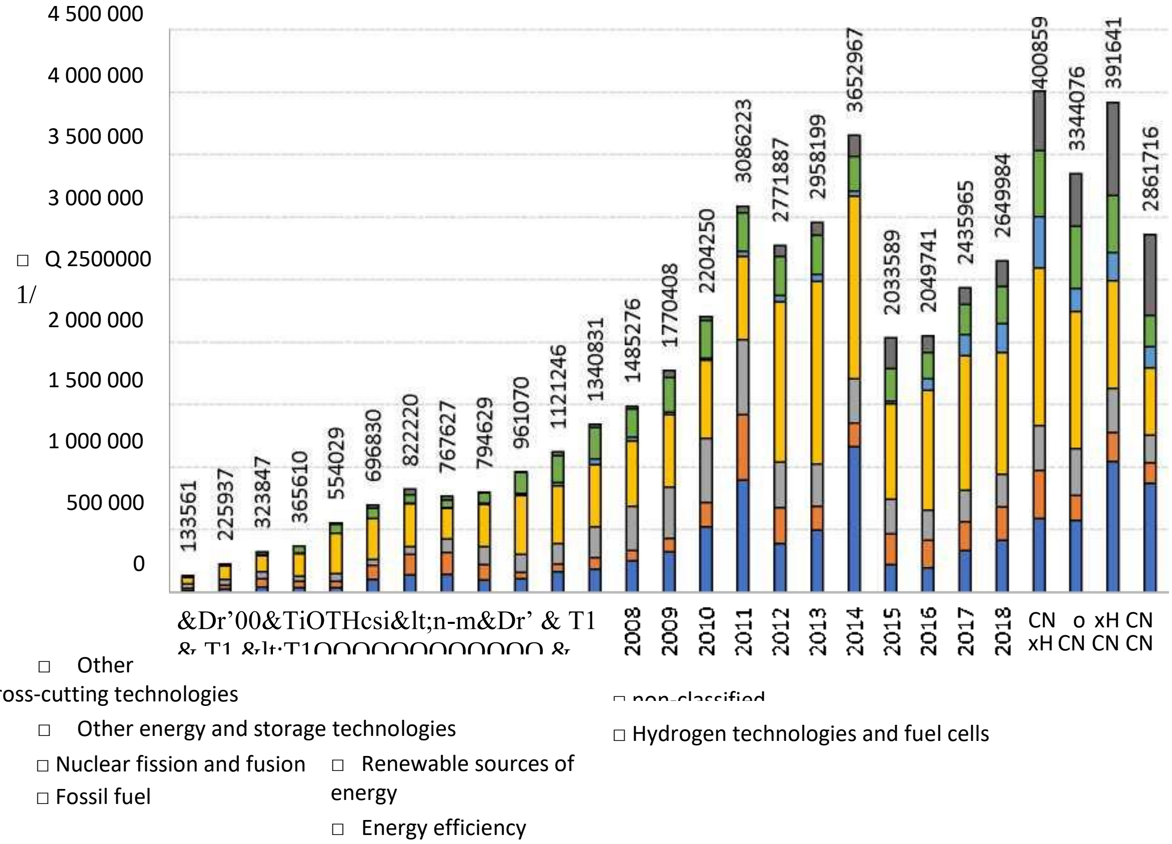
134 More information on the methodology and overall evaluation procedure can be found at https://www.iea.org/tcep/.

Current level of public and, where available, private research and innovation spending on low-carbon-technologies, current number of patents, and current number of researchers

The Czech Republic, as a member of the International Energy Agency (IEA), is obliged to report selected statistical data in the form of questionnaires. One of these questionnaires focuses on science and research in the energy sector. In order to report on these statistics, an analysis of expenditure on energy science and research has been carried out.135

The evolution of R & D in the energy sector has shown a gradual increase in spending on energy projects since the 1990s. It is clear that this topic is gaining political and social importance. For this reason too, some programmes supporting not only technological projects in general but directly R & D & I in the energy sector have been set up at the TA of the Czech Republic, in particular the THÉTA II programme. The evolution of R & D in the energy sector and the increasing trend over the last decade can be illustrated by graphs showing the eligible costs of energy projects, the re-psecutive development of aid from the State budget in 1996-2022.

Graph 100: *Development of eligible costs for science, research and innovation between 1996 and 2022*



Development of aid from the State budget 1996-2022

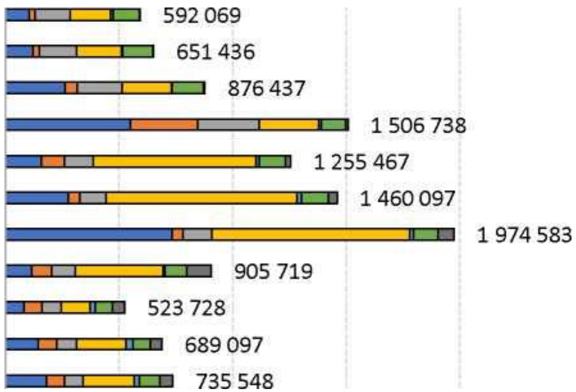
135 https://www.mpo.cz/cz/energetika/vyzkum-a-vyvoj-v-energetice/zapojeni-do-mezinarodniho-evropskeho-survey/statistics-deduced-na-explored-a-development-v-region-energy-pro-ucely-intervention-Internarodni-Energy-Agency-iea-259363/

Graf č. 102: *Vývoj podpory ze soukromého sektoru v letech 1996-2022*

Nezařaditelné
Ostatní energetické technologie a technologie ukládání
Jaderné štěpení a fúze
Fosilní paliva
Další průřezové technologie
Vodíkové technologie a paliv
Obnovitelné zdroje energie
Energetická účinnost

tis. CZK

1996 I 30456
1997 FOR 37636
1998 n 123650
1999 HIZO 151691
2000 ITT-n 254803
2001 .... 352 176
2002 .... 435 957
2003 .... 377 244
2004 .... 374 751
2005 .... 430 282
2006 .... 444 717
2007 .... 530 447



2019 I – 1055 584
2020 II II 991200
2021 --- N 891449
2022 627 805

tis. CZK

1996 D 103105
1997 JO 188301
1998 IO 200197
1999 213919
2 000 m=D 299226
2001 Tn-n 344654
2002 ~m-Til 386263
2003 TTT1 390383
2004 419878
2005 530788
BOTH 2006 AND II II 676529
2007 .... 1 810384
2008 893207
2009 III I ~R~n 1118972
2010 AND.......................... 1327813
....N.A.
2011 I 1579485
2012 lili II II 1516420
2013 lili II II 1496773
2014 – III II □ 1676581
2015 lili 1-1-1-1 1127870
2016 lili Lili 1526013
2017 lili I J 1746868
2018 lili I-I~I 1914436
2019 lili I I I I – 2953009
2020 lili Lili 2352876
2021 M III III B024962
2022 – 2022 .... I 2295535

It is not possible for the Czech Republic to determine the level of public funding for research and innovation in low-carbon technologies. The category of ‘low carbon technologies’ is not defined and introduced in the Czech Republic for the purpose of statistical surveys. The situation is further complicated by the fact that, for basic oriented research, the allocation to low-carbon technology may not be clearly identified. Table 91 shows the expenditure from the State budget for R & D & I for the period 2016-2019, where 2016 and 2017 correspond to reality and 2018 and 2019 are approved under the State budget. Based on National Oriented Research Priorities, an indicative allocation of 18 % of total public expenditure (Table 28) should be allocated to Sustainable Energy and Material Resources.

Table 91: *State budget expenditure on R & D & I until 2019 (CZK)*

	Reality 2016	**Reality 2017**	**State Budget 2018**	**State Budget 2019**
Office of the Government of the Czech Republic	62 486 218	76 370 186	79 403 981	65 506 346
Ministry of Foreign Affairs	0	9 986 613	25 152 000	25 336 000
Ministry of Defence	397 053 604	483 263 504	436 040 000	414 486 150
Ministry of Labour and Social Affairs		9 977 391	60 000 000	80 000 000
Ministry of the Interior	364 055 447	640 874 187	608 321 000	798 822 402
Ministry of the Environment	0	153 231 534	248 379 554	257 600 199
Czech Grant Agency	3 927 443 928	4 107 793 016	4 333 066 000	4 390 784 794
Ministry Industry and Trade	640 374 977	1 927 225 968	2 993 928 152	2 924 604 421
Ministry of Transport	0	15 332 946	50 000 000	50 000 000
Ministry of Agriculture	858 044 769	875 396 428	884 726 000	982 682 952
Ministry of Education, Youth and Sports.	15 296 759 600	16 690 662 807	18 751 885 565	19 734 339 959
Ministry of Culture	375 571 758	388 182 239	521 382 000	487 296 138
Ministry of Health	1 190 098 792	1 588 405 901	1 557 640 512	1 552 100 648
Ministry of Justice	7 890 470	7 050 373	0	0
Institute for the Study of Totalitarian Regimes	2 931 128	4 286 063	0	0
Academy of Sciences of the Czech Republic	4 777 930 160	5 231 659 779	5 684 692 000	6 022 421 793
Technology Agency of the Czech Republic	2 823 387 117	2 923 837 660	4 335 548 383	4 274 646 444
Total	30 724 027 967	35 133 536 594	40 570 165 147	42 060 628 246

Source: State budget expenditure on R & D & I in 2019

Information on the extent of public funding to the energy sector can be obtained using the research, development and innovation (R & D & I) classification of disciplines136. The categories of NPP (non-nuclear energy, energy consumption and use) and JF (nuclear energy) are relevant for the energy sector. Table 92 shows the support implemented in the fields of NPP and JF. Between 2009 and 2015, almost 3.6 billion were allocated in selected tenders to support projects with the main JE/JF field. The total cost was approximately CZK 5.2 billion. CZK. For projects with a secondary branch of the NPP and the JF,

136 see www.rvvi.cz – Overview of code lists – Classification of disciplines

the public support amounted to around 1.1 billion. CZK and total costs of more than 1.5 billion. CZK. Table 93 shows the approved dedicated support and total costs for the period 2016-2020 (these are projects approved before September 2016).

A minimum of EUR 4 billion should be allocated to the energy sector over the 2018-2025 horizon of applied research. CZK 5.7 billion from the State budget. Total funds, corresponding to authorised funds under THÉTA (provided that all allocated funds are exhausted). Of course, spending on research in the field of energy is not limited to this programme and will therefore very likely go beyond this scope, but this cannot be specifically quantified.

Table 92: *Dedicated support implemented and total costs in the fields of NPP, JF in thousands. CZK (2009-2015)*

		2009	2010	2011	2012	2013	2014	2015
Main field of the NPP, JF	Subsidies	314 843	428 187	586 492	726 330	606 529	489 885	436 152
	Costs	430 067	584 891	810 218	1 039 751	886 811	729 510	672 983
Secondary field of the NPP, JF	Subsidies	86 743	117 971	177 803	195 609	187 285	178 226	153 883
	Costs	114 850	156 195	235 471	265 468	269 272	267 247	237 796

Source: Background study of the THÉTA programme (TA CR, September 2016)

Table 93: *Approved special-purpose support and total costs in the fields of NPP, JF in thousands. CZK (2016-2020)*

		2016	2017	2018	2019	2020
Main field of the NPP, JF	Subsidies	348 428	267 920	151 052	114 173	568
	Costs	540 405	407 460	218 280	164 684	887
Secondary field of the NPP, JF	Subsidies	90 320	69 258	43 900	27 071	469
	Costs	138 903	107 366	67 016	42 403	629

Source: Background study of the THÉTA programme (TA CR, September 2016)

Table 94 presents key indicators in the field of science and research. This mentions, among other things, the development of staff in the field of science and research, or in science and research-related workplaces. However, not all of these persons carry out scientific activities. Table 95 then shows the number of specialists in science and technology. Table 96 then shows the development of patents, broken down into nationally granted patents and European patents validated for the Czech Republic. However, it should be pointed out that this information is not specific to energy and climate, or to 'low-carbon technologies', but is a sum of values for the whole of the Czech Republic and all sectors of science and research. Figures specifically measured for energy and climate are not available in detail to this extent.

Table 94: *Basic indicators of science and research (number; CZK million)*

	2005	2009	2010	2011	2012	2013	2014	2015	2016	2017
R & D workplace (indicated)	2 017	2 345	2 587	2 720	2 778	2 768	2 840	2 870	2 830	3 113

R & D personnel (indicated)	43 370	50 961	52 290	55 697	60 329	61 976	64 443	66 433	65 783	69 718
R & D expenditure (CZK million)	38 146	50 875	52 974	62 753	72 360	77 853	85 104	88 663	80 109	90 377

Source: Statistical Yearbook of the Czech Republic (2018), Chapter 23. Science, research and innovation[137]

Table 95: *Scientific and technical specialists (thousands of persons)*

	2014	2015	2016	2017
Science, mathematics and statistics	8,0	11,9	9,7	9,7
Biological and related disciplines	13,3	12,0	16,1	21,0
Manufacturing, construction and related industries	56,7	64,2	67,5	72,8
Electrical, electronics and electronic communications	12,2	13,1	17,6	20,0
Architecture, spatial planning, design and related disciplines	17,0	16,9	19,1	21,0
Other	4,4	3,1	3,0	0,0
Total	111,6	121,3	133,1	144,5

Source: Statistical Yearbook of the Czech Republic (2018), Chapter 23. Science, research and innovation

Table 96: *Evolution of patents (number)*

Pointer	2010	2014	2015	2016	2017
Patents granted through national channels	911	688	749	781	669
European patents validated for the Czech Republic	3 693	4 543	4 827	5 961	6 901
Total	**4 604**	**5 231**	**5 575**	**6 742**	**7 570**

Source: Statistical Yearbook of the Czech Republic (2018), Chapter 23. Science, research and innovation

Further information is available, inter alia, in a comprehensive manner in the ‘Analysis of the state of R & D & I in the Czech Republic and its comparison with abroad’, which is processed annually. The latest material available is 2017137138.

ii. A breakdown of current prices by element making up the three main components of the price (energy;
network, taxes/fees)

This chapter builds on the 2020 National Plan and will be updated, as appropriate, as part of the finalisation of the update of this document.

Breakdown of current prices by element

In this respect, it should be noted that the “submission” of this sub-chapter is relatively unclear, as it is not indicated which commodities/fuels are to be covered by these ceynxes. According to the requirement to split the main prices of a component, including the network component, it can be inferred that there is a requirement for so-called network commodities, i.e. electricity and natural gas (current energy prices

137 Available at the following link: https://www.czso.cz/csu/czso/23-veda-vyzkum-a-inovace
138 The material is available at the following link: https://www.vyzkum.cz/FrontClanek.aspx?idsekce=799467

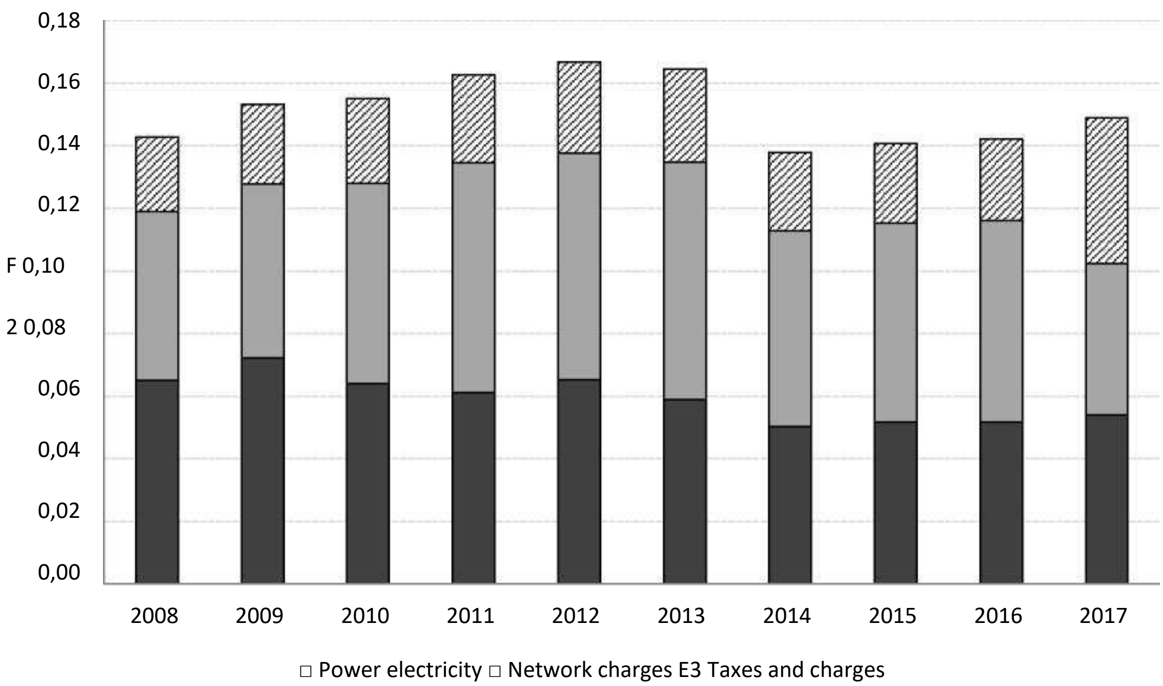
are significantly regional). The following are therefore:

information is provided on electricity, natural gas and hard coal prices. The Czech Republic also statistically monitors the prices of other fuels/commodities, such as comfortable fuels (motor gasoline and diesel), LPG, light and fuel oils, etc.

Electricity prices

Electricity prices (as well as natural gas prices) are available on publicly available EUROSTAT databases (background data are sent by the Czech Statistical Office). Some information on the evolution of electricity prices for the household and non-household sectors is presented below. Detailed information is available in EUROSTAT.139 Prices are also available in different consumption size bands, and the price may vary between bands. Only selected bands are listed below. Graph 103 shows the evolution of the electricity price for the household sector in the annual consumption band of 2.5-4.9 MWh in EUR/kWh, broken down into the various price components, i.e. the power electricity component, the network charges component and the tax and charges component. Figure 104 then shows a comparison of the prices of the Czech Republic with neighbouring countries and Hungary in purchasing power parity. Chart 105 shows the price of electricity broken down by component for sectors outside the household sector, for a selected consumption band. Chart 106 then shows a price comparison for the non-household sector.

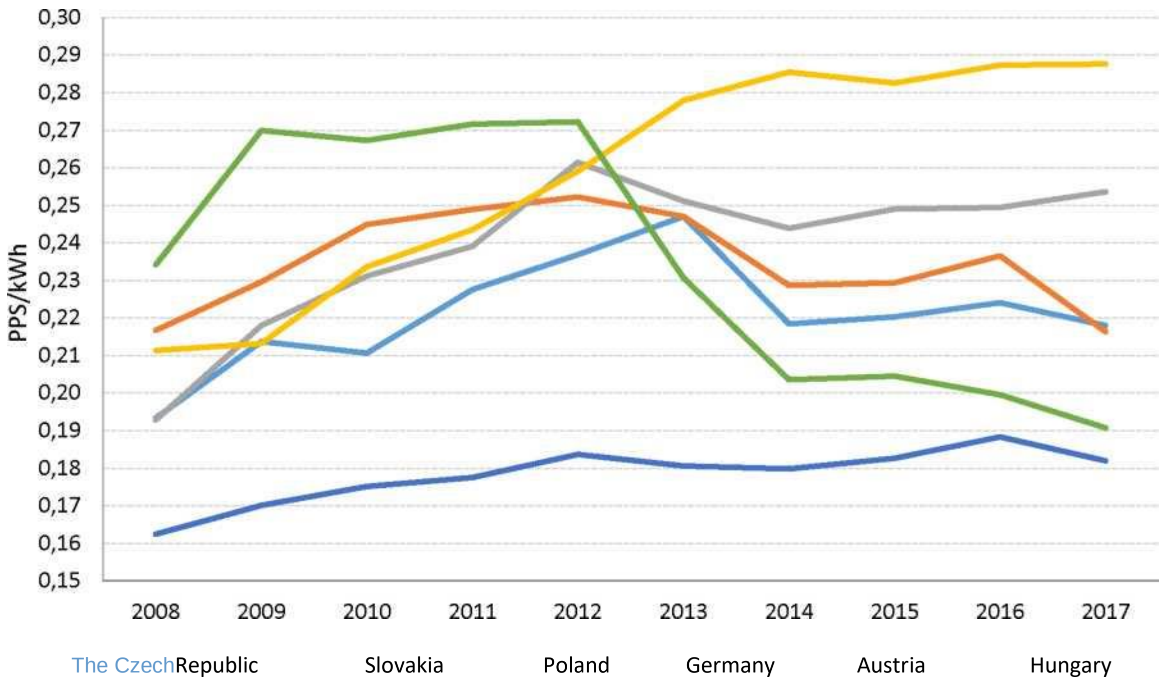
Graph 103: *Price of electricity for households (annual consumption band 2.5-4.9 MWh)*



Source: Eurostat (Electricity prices components for household consumers; nrg_pc_204_c)

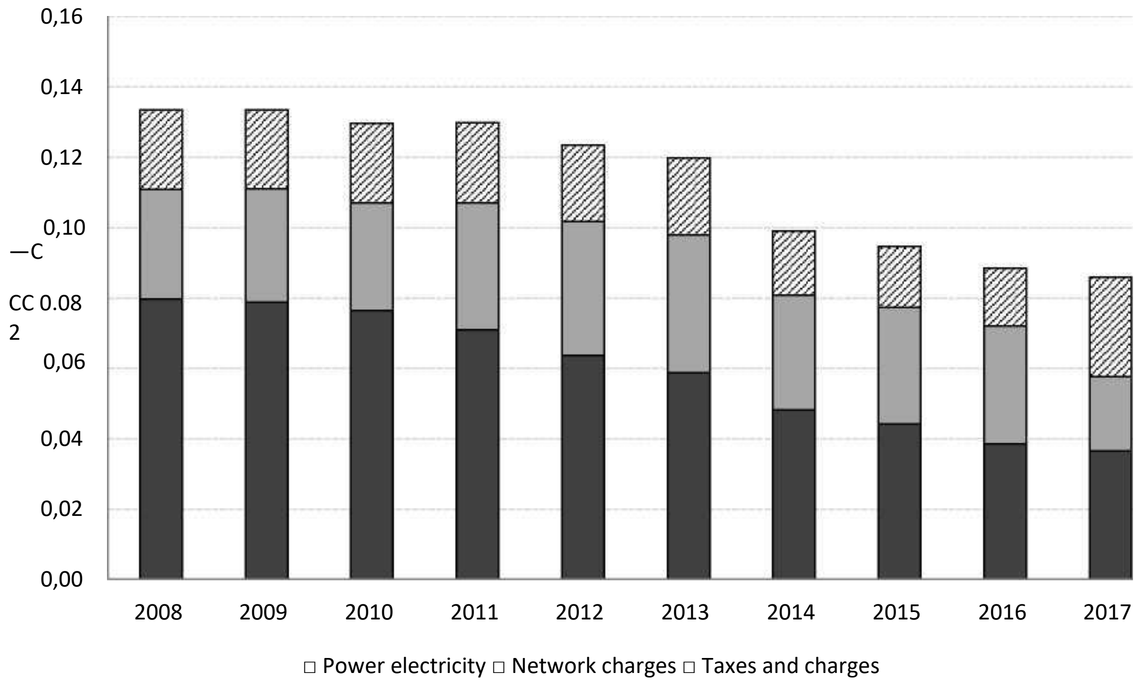
139 It is a database called ‘Energy statistics – price of natural gas and electicity (ngr_price), available at the following link: https://ec.europa.eu/eurostat/web/energy/data/database

Graph 104: *Comparison of electricity prices for households (annual consumption band*



Source: Eurostat (Electricity prices for household consumers; nrg_pc_204)

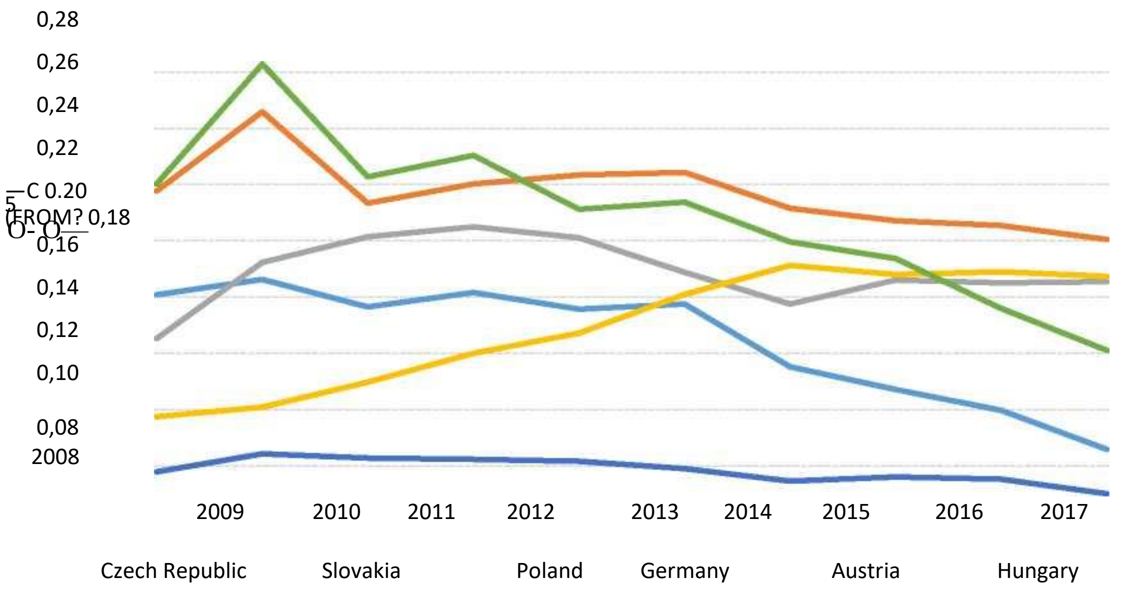
Graph 105: *Non-household electricity price (annual consumption band 500-2 000 MWh)140*



Source: Eurostat (Electricity prices components for non-household consumers, Electricity prices for non-household consumers; nrg_pc_205_c, nrg_pc_205)

140After this graph, two types of databases were used, namely nrg_pc_205_c and nrg_pc_205.

Graph 106: *Non-household electricity price comparison (annual consumption band 500-2 000 MWh)*



Source: Eurostat (Electricity prices for non-household consumers; nrg_pc_205)

Table 97 then shows the share of the individual components for the supply of electricity in 2018 according to the 2018 Price Decision of the Energy Regulatory Authority for Regulated Prices in Electricity and Gas, illustrating the split between the regulated and non-regulated components of the price. Table 98 then shows the quaternary evolution of electricity prices for industry and households, including taxation.

Table 97: *Share of individual components for electricity supply in 2018*

	Households	Small entrepreneurs	Large Customers (VVN)	Wholesale (VN)
Price of power electricity	43.31 %	38.4 %	75.26 %	61.85 %
Price of distribution	33.57 %	41.2 %	4.49 %	18.89 %
Price of provision of transmission	4.24 %	4.1 %	6.84 %	5.84 %
Support to the IMPLE	14.23 %	13.6 %	8.45 %	9.34 %
Price for System Services	2.79 %	2.7 %	4.97 %	4.08 %
Price for the activities of the market operator	1.87 %	0.1 %	0.00007 %	0.003 %

Source: ERO price decisions for regulated electricity and gas prices for 2018

Table 98: *Electricity price for industry and households including taxation141*

	Industry price in CZK/MWh						Price for households in CZK/MWh					
	Code of Civil	Spot. tax	VAT %	VAT	Taxation of customs	Total	Code of Civil	Spot. tax	VAT %	VAT	Taxation of customs	Total
1Q2016	2 179,1	28,3	0,0	0,0	28,3	2 207,4	3 122,0	28,0	0,21	662,0	690,0	3 812,0
2Q2016	2 151,0	28,3	0,0	0,0	28,3	2 179,3	3 122,0	28,0	0,21	662,0	690,0	3 812,0
3Q2016	2 144,2	28,3	0,0	0,0	28,3	2 172,5	3 122,0	28,0	0,21	662,0	690,0	3 812,0
4Q2016	2 152,0	28,3	0,0	0,0	28,3	2 180,3	3 122,0	28,0	0,21	662,0	690,0	3 812,0
1Q2017	2 054,1	28,3	0,0	0,0	28,3	2 082,4	3 127,0	28,0	0,21	663,0	691,0	3 818,0
2Q2017	2 038,2	28,3	0,0	0,0	28,3	2 066,5	3 127,0	28,0	0,21	663,0	691,0	3 818,0
3Q2017	2 030,7	28,3	0,0	0,0	28,3	2 059,0	3 127,0	28,0	0,21	663,0	691,0	3 818,0
4Q2017	2 040,0	28,3	0,0	0,0	28,3	2 068,3	3 127,0	28,0	0,21	663,0	691,0	3 818,0
1Q2018	2 047,7	28,3	0,0	0,0	28,3	2 076,0	3 205,0	28,0	0,21	679,0	707,0	3 912,0
2Q2018	2 048,5	28,3	0,0	0,0	28,3	2 076,8	3 238,0	28,0	0,21	686,0	714,0	3 952,0
3Q2018	2 077,9	28,3	0,0	0,0	28,3	2 106,2	3 302,0	28,0	0,21	699,0	727,0	4 029,0

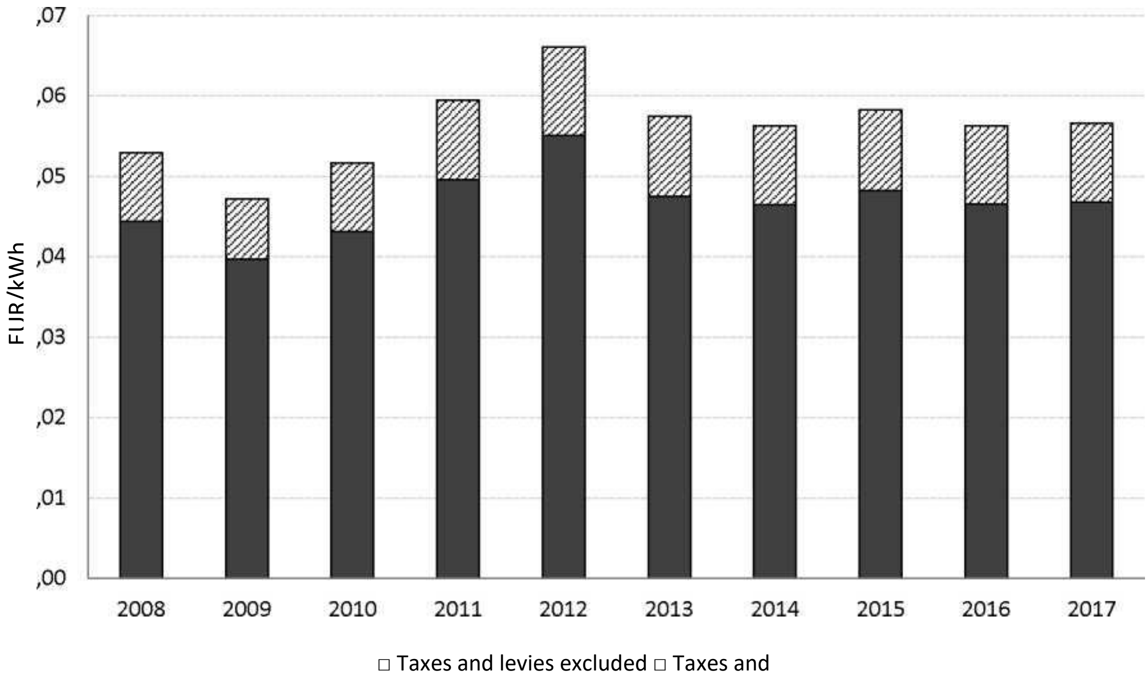
Source: Information for the "Energy prices & taxes" statement prepared for IEA

Natural gas prices

Graph 107 shows the evolution of the natural gas price for the household sector in the annual consumption band of 20-200 GJ in EUR/kWh, broken down into individual price components (or tax and non-tax components). Figure 108 then shows a comparison of the prices of the Czech Republic with neighbouring countries and Hungary in purchasing power parity. Figure 109 shows the price of natural gas broken down by component for sectors outside the household sector, for a selected consumption band. Chart 110 then shows a price comparison for non-household sectors.

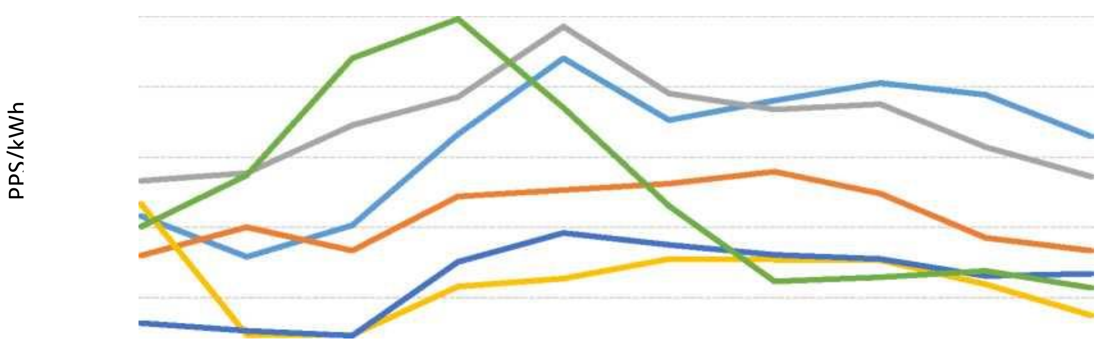
141On the basis of these statistics, a publication entitled 'Energy prices and taxes' is being prepared on a quarterly basis by the International Energy Agency. The last available edition of this publication is the third quarter of 2018.

No 107: *Price of gas for households (annual consumption band 20-*



1 — **Graph**

12



Source: Eurostat (Gas prices for household consumers; nrg_pc_202)

No 108: *Comparison of gas prices for households (annual consumption band 20-200 GJ)*

11

10

09

08

0,07

0,06

0,05

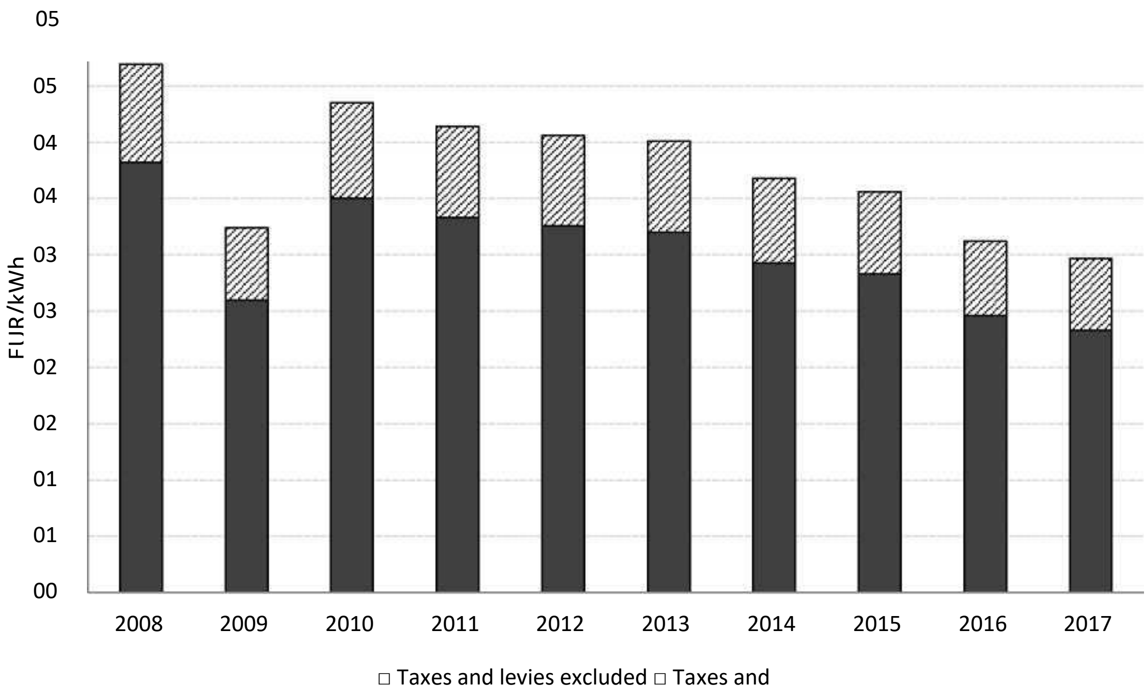
0,04

2008 2009 2010 2011 2012 2013 2014 2015 2016 2017

Czech Republic Slovakia Poland Germany Austria Hungary

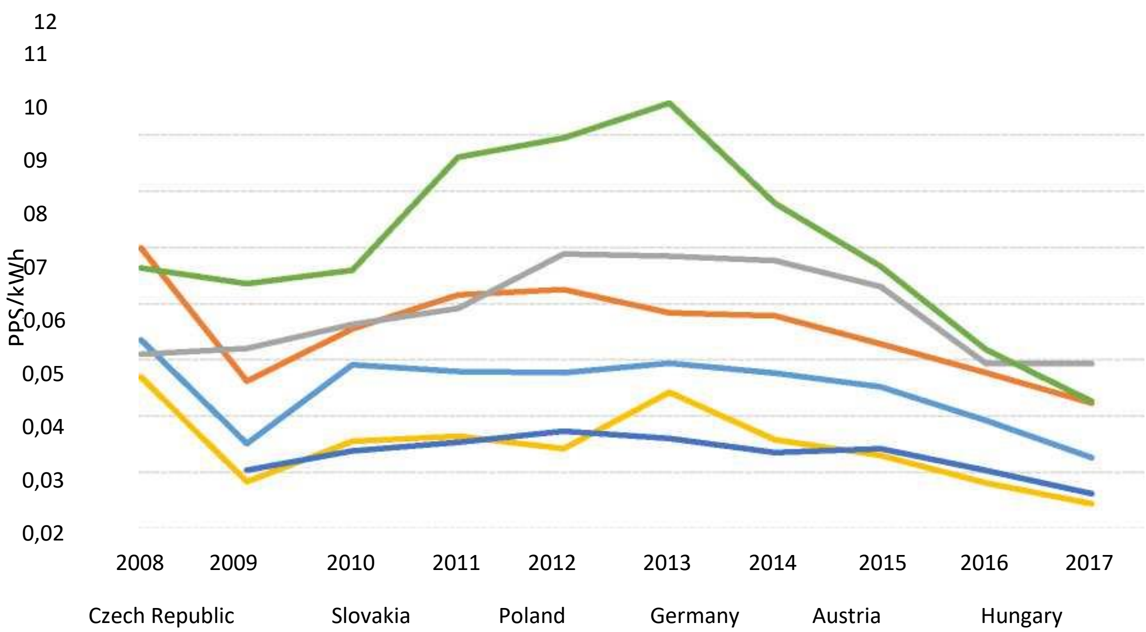
Source: Eurostat (Gas prices for household consumers, nrg_pc_202)

GraphNo 109: *Non-household gas*price **(annual consumption band 10-100 TJ)**



Source: Eurostat (Gas prices for non-household consumers; nrg_pc_203)

No 110: *Comparison of non-household gas prices (annual consumption band 10-100 TJ)*



Source: Eurostat (Gas prices for non-household consumers; nrg_pc_202)

Table 99 then shows the share of the individual components for the supply of natural gas in 2018 according to the 2018 price decision of the Energy Regulatory Authority for Regulated Prices in Electricity and Gas in order to illustrate the split of the different components between regulated and non-regulated price components. Table 100 then shows the quaternary evolution of electricity prices for industry and households, including taxation.

Table 99: *Share of individual components for the supply of natural gas in 2018*

	All categories of customers
Trade and commodity	75.73 %
Distribution	22.84 %
Transport	1.35 %
OTE services	0.08 %

Source: ERO price decisions for regulated electricity and gas prices for 2018

Table 100: *Natural gas prices for industry and households including taxation*[142]

	Industry price in CZK/MWh						Price for households in CZK/MWh					
	Code of Civil	Spot. tax	VAT %	VAT	Taxation of customs	Total	Code of Civil	Spot. tax	VAT %	VAT	Taxation of customs	Total
1Q2016	716,5	30,6	0,0	0,0	30,6	747,1	1 354,5	0,0	0,21	284,4	284,4	1 638,9
2Q2016	703,3	30,6	0,0	0,0	30,6	733,9	1 296,2	0,0	0,21	272,2	272,2	1 568,4
3Q2016	704,0	30,6	0,0	0,0	30,6	734,6	1 267,8	0,0	0,21	266,2	266,2	1 534,0
4Q2016	714,2	30,6	0,0	0,0	30,6	744,8	1 267,8	0,0	0,21	266,2	266,2	1 534,0
1Q2017	655,6	30,6	0,0	0,0	30,6	686,2	1 271,2	0,0	0,21	267,0	267,0	1 538,2
2Q2017	655,8	30,6	0,0	0,0	30,6	686,4	1 262,3	0,0	0,21	265,1	265,1	1 527,4
3Q2017	665,4	30,6	0,0	0,0	30,6	696,0	1 262,3	0,0	0,21	265,1	265,1	1 527,4
4Q2017	666,2	30,6	0,0	0,0	30,6	696,8	1 262,3	0,0	0,21	265,1	265,1	1 527,4
1Q2018	659,3	30,6	0,0	0,0	30,6	689,9	1 258,0	0,0	0,21	264,2	264,2	1 522,2
2Q2018	659,2	30,6	0,0	0,0	30,6	689,8	1 254,6	0,0	0,21	263,5	263,5	1 518,0
3Q2018	670,0	30,6	0,0	0,0	30,6	700,6	1 254,6	0,0	0,21	263,5	263,5	1 518,0

Source: Information for the "Energy prices & taxes" statement prepared for IEA

[142] On the basis of these statistics, a publication entitled 'Energy prices and taxes' is being prepared on a quarterly basis by the International Energy Agency. The last available edition of this publication is the third quarter of 2018.

Coal prices

Table 101: *Hard coal prices for industry and households, including taxation*

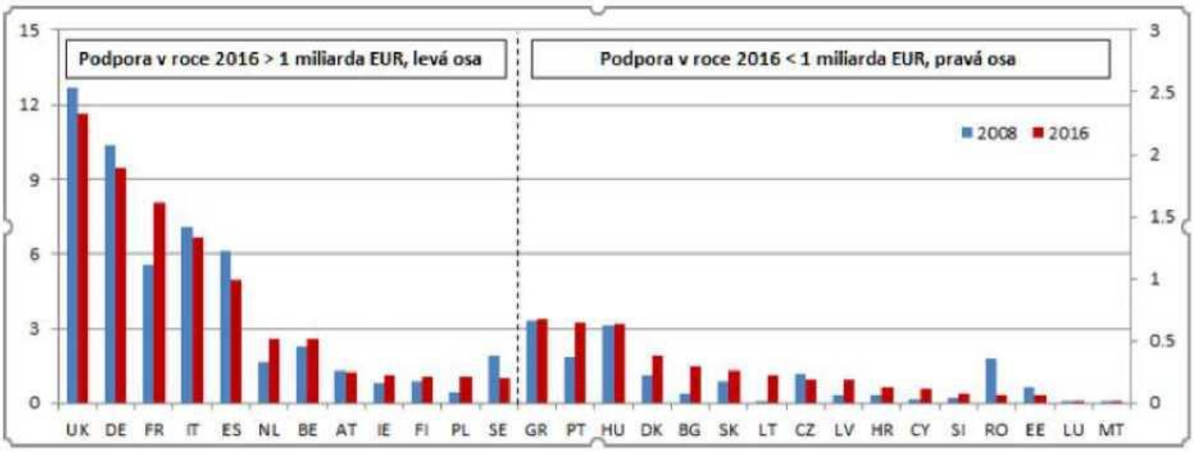
	Industry price in CZK/MWh[142]						Price for households in CZK/MWh					
	Code of Civil	Spot. tax	VAT %	VAT	Taxation of	Total	Code of Civil	Spot. tax	VAT %	VAT	Taxation of	Total
1Q2016							2 663,0	133,0	0,21	587,0	720,0	3 383,0
2Q2016							2 710,0	133,0	0,21	597,0	730,0	3 440,0
3Q2016							2 699,0	133,0	0,21	595,0	728,0	3 427,0
4Q2016							2 729,0	133,0	0,21	601,0	734,0	3 463,0
1Q2017							2 788,0	133,0	0,21	614,0	747,0	3 535,0
2Q2017							2 772,0	133,0	0,21	610,0	743,0	3 515,0
3Q2017							2 772,0	133,0	0,21	610,0	743,0	3 515,0
4Q2017							2 853,0	133,0	0,21	627,0	760,0	3 613,0
1Q2018							2 923,0	133,0	0,21	642,0	775,0	3 698,0
2Q2018							2 892,0	133,0	0,21	635,0	768,0	3 660,0
3Q2018							2 910,0	133,0	0,21	639,0	772,0	3 682,0

Source: Information for the "Energy prices & taxes" statement prepared for IEA

iii. Description of energy subsidies, including for fossil fuels

According to the Energy prices and costs in Europe from 9 January 2019, total European energy subsidies have increased in recent years, from EUR 148 billion in 2008 to EUR 169 billion in 2016. This increase was mainly due to the increase in subsidies for renewables, which amounted to EUR 76 billion in 2016. Fossil fuel subsidies are estimated at around 55 billion. EUR. Chart 111 shows the financial support for fossil fuels in the EU as set out in the above-mentioned document. Unfortunately, the Czech Republic does not have primary data in this regard. The Czech Republic also reports on fossil fuel subsidies in the OECD membership.

Graph 111: *Financial support for fossil fuels in the EU*



Source: Energy prices and costs in Europe

142This information is not publicly available.

Table 102 shows the identified subsidies to fossil fuels. Regulation (EU) 2018/1999 of the European Parliament and of the Council does not contain a definition of the term ‘fossil fuel subsidies’, the definition of the International Energy Agency (IEA) was used as a basis for identifying ‘fossil fuel subsidies’. According to the definition of the IEA, only housing assistance granted pursuant to Act No 117/1995 Coll. on State Social Support, as amended, can be considered as fossil fuel subsidies in the Czech Republic. More information on this contribution can be found directly in the table.

As regards the planned reduction of that subsidy, it may be noted that, in its resolution of 8 July 2019 No 502 on the conclusions of the Clean Air Dialogue and the proposal for further action, the Government, in cooperation with the Minister for the Environment, required the Minister for Labour and Social Affairs, in cooperation with the Minister for the Environment, to submit to the government, by 31 December 2019, an analysis of the set-up of the housing allowance, including an assessment of the possibilities for changing its set-up with a view to increasing the incentive for beneficiaries to favour environmentally friendly heating methods. The analysis showed that the proportion of households using solid fuels for heating and receiving some kind of social support for fuels is 0.33 % of all households in the Czech Republic. The current set-up of social benefits encourages the use of environmental heating methods, as their costs are covered and no additional bonus is possible. It is therefore not possible to anticipate the abolition of this contribution, which is also of a significant social nature, but should be modified on the basis of the Czech Government’s resolution, taking into account environmental impacts. The Czech Republic will report further on developments in this area in the relevant progress report.

In this respect, it should also be noted that burning fossil resources is generally linked to external costs (as well as other areas of human activity) and, more generally, not only fossil fuel subsidies but also relevant externalities should be quantified (this approach is already being developed partially by the OECD).

Table 102: *Subsidies for fossil fuels*

Name	Sector	Purpose	Fuel/carrier	Categories	Opening	Amount of subsidy (in CZK)	
						2020	2021
Refund of part of excise duty on mineral oils (diesel in the agricultural sector)	Agriculture	Boosting energy demand	Diesel	Tax refunds	2000	3 026 412 720	2 742 020 877
Exemption from excise duty on natural gas and certain other gases	Energy (transformation)	Boosting energy demand	Natural gas	Tax exemption	2008	2 202 717 110	2 387 266 735
Exemption from excise duty on solid fuels	Energy (transformation)	Boosting energy demand	Multiple types of fossil fuels	Tax exemption	2008	603 979 611	674 164 477
Refund of part of excise duty on mineral oils	Energy (transformation)	Boosting energy demand	Petroleum products	Tax refunds	2008	429 558 836	339 316 202
Use of funds from annual payments made by mining organisations for extraction areas and dedicated minerals acquired	Extraction of fossil fuels	Promotion of energy supply (production)	Brown coal	Other	1993	83 297 550	83 297 550
Use of funds from annual payments made by mining organisations for extraction areas and dedicated minerals acquired	Extraction of fossil fuels	Promotion of energy supply (production)	Brown coal	Other	1993	294 210 800	294 210 800
Use of a subsidy from national resources to reduce mining and to absorb the consequences of mining activities and mandatory social health costs	Extraction of fossil fuels	Support for restructuring of the sector	Brown coal	Grants	1992	1 813 250 000	1 813 250 000

Use of a subsidy from national resources to reduce mining and to absorb the consequences of mining activities and mandatory social health costs	Extraction of fossil fuels	Support for restructuring of the sector	Brown coal	Grants	1992	173 820 000	173 820 000
Use of a subsidy from national resources to reduce mining and to absorb the consequences of mining activities and mandatory social health costs	Extraction of fossil fuels	Support for restructuring of the sector	Brown coal	Grants	1992	289 700 000	289 700 000

5 IMPACT ASSESSMENT OF PLANNED POLICIES AND MEASURES144

5.1 Impacts of planned policies and measures described in section 3 on energy system and GHG emissions and removals, including comparison to projections with existing policies and measures (as described in section 4).

5.1.1.1 Analytical background sheet

In particular, an analytical assessment of the impacts of policies and possible transit pathways is carried out through the research consortium of the Centre for Socio-Economic Research on Environmental Policy Impacts (SEEPIA) (SS04030013, Environment for Life Programme, MoE) and the Research Consortium Integrated Air Quality Research, Assessment and Control (Aramis), funded by the Technical Agency of the Czech Republic (SS04030013, Environment for Life Programme, MoE). Other research projects under the Ministry of the Environment, the Ministry of Agriculture and the Ministry of Agriculture, the Ministry of Agriculture and the Ministry of Transport, extensive consultations with the administration, as well as studies carried out by independent and market players, are used in drawing up analytical evidence, in particular:

- NOx2030 – Predication of emissions savings from road transport by 2030 achieved by application selected tax and fee instruments (SS03010156)
- Model support for clean and sustainable mobility in the Czech Republic (TK04010099) (MOSUMO)
- Assessment of the resource adequacy of the electricity grid of the Czech Republic until 2040 (MAF CZ 2022) (ČEPS)
- Institute for Forest Ecosystem Research (IFER) – Member of the National Inventory System in relation to the emissions balance of the agriculture and LULUCF sectors
- Evaluation of the impact of the EU's Fit for 55 climate and energy package on the Czech Republic (MoE – SEEPIA, Aramis)
- Study on the impact of Fit for 55 on the Czech Republic's economy (MPO, Deloitte Advisory)
- Support to REPowerEU – Country Report – Czechia (EC, MPO, Trinomics, EGÚ Brno)

Evaluation of the impact of the EU's Fit for 55 climate and energy package on the Czech Republic (MoE – SEEPIA, Aramis)

- The consortium SEEPIA (MoE – TAČR) focuses on impact assessment and broad research support for the implementation of the European Green Deal policies in the Czech Republic, comprising 12 entities led by the Centre for Environmental Issues of Karlovy University. An up-to-date 'Fit for 55' impact analysis was carried out together with the Thematic Centre Aramis (Integrated Air Quality Research, Assessment and Control System). The study is based on a combination of the TIMES energy and transport model and two advanced macro-econometry

144Planned policies and measures are options under discussion and having a realistic chance of being adopted and implemented after the date of submission of the national plan. The resulting estimates under Section 5.1 will therefore include not only implemented and adopted policies and measures (estimates with existing policies and measures), but also planned policies and measures.

models. The E3ME model from Cambridge Econometrics is also used by the European Commission and renowned international institutions. Modelling takes into account increased natural gas prices. This study will be followed up by further analyses – an impact assessment of the REPowerEU package and a more detailed analysis of social impacts.

The study points to two possible decarbonisation trajectories in the Czech Republic:

- In the case of modelling with limited RES development according to the current network development strategy, the use of carbon capture and storage technology is favoured by the end of the 2030s. The limited development of RES leads to lower total domestic electricity production and would already become an importer of electricity between 2025 and 2030. At the same time, this trajectory assumes higher energy savings.
- The trajectory without capping the development of RES (i.e. assuming grid capacity) leads to an increase in the share of photovoltaics and wind energy (with the contribution of biomass and biofuels) after 2030 significantly above the level of the current grid development strategy. Under these conditions, the Czech Republic remains a moderate net exporter of electricity until 2050.
- However, the scenarios in this study were not defined with the objective of achieving climate neutrality by the end of 2050. Greenhouse gas emissions are reduced by a maximum of 91 % by 2050 at EU level and this reduction is only due to the Fit for 55 policy. The outcome is strongly influenced by the lack of detailed modelling of decarbonisation developments in the agricultural sector due to the absence of a technological module for this sector. Neither model leads to an energy transit based on hydrogen, which is mainly due to conservative assumptions about the possibilities of importing (green) hydrogen.

Summary of impacts from the perspective of the Fit for 55 objectives

- Reducing greenhouse gas emissions in the Czech Republic by 55 % by 2030 compared to 1990 is achievable. Sectors in the current ETS (energy, industry) may approach or even exceed the target of reducing greenhouse gas emissions by 61 % in 2030 compared to 2005 (at EU level). In high-price scenarios, a reduction of up to 76 % is possible in the Czech Republic. Achieving the reduction target of 43 % (EU) in 2030 compared to 2005 is more problematic in the buildings and transport sectors (ETS2) – it was achieved only in scenarios with a high price of emission allowances, with lower prices reducing emissions by 26-38 %. When capping the potential of RES, the Czech Republic will account for 21-30 % of the energy mix in 2030 (failure to meet the 31 % target for the Czech Republic), under the assumption of an increase in the capacity of the grid to integrate RES, they reach 31-47 %. The achievement of the energy efficiency targets is problematic under the set conditions of support. The share of battery electric passenger cars in the fleet is growing to 8.5-18 % in 2030 and 16.525.5 % in 2035.

Financing and investment

- Total revenues from the sale of emission allowances are estimated at 662 billion by 2030. CZK without the introduction of the Fit for 55 package and up to 1271 billion. CZK after its introduction. The modelling takes into account measures to support decarbonisation under the current set-up of the Modernisation Fund, with some assumptions using the Innovation Fund and the future Social Climate Fund. Decarbonisation investments are estimated at 1030 billion. CZK in a scenario without the introduction of the Fit for 55 package and in the range of 1090 billion. Up to CZK 2201 billion CZK in variants of the Fit for 55 implementation scenarios. This dispersion is due to the variations in the price evolution of emission allowances. Thus, Fit for 55 leads to additional investments of around 1170 billion. CZK (scenario with full use of revenues), 500 billion. CZK (scenario with 50 % use of revenues or low allowance price) or only 60 billion. CZK (scenario with 50 % utilisation and lower price of allowances). The modelled amount of aid required until 2030 is approximately comparable to the available sources of funding that the Czech Republic can obtain by charging for greenhouse gas emissions.

Economic and social impacts

- In the event of an early response and implementation in the Czech Republic, a slight increase in GDP growth can be achieved as a result of the explosion of investment activity and the economy; if the need for decarbonisation in the residential and transport sectors is underestimated, the growth dynamics may be slightly reduced as a result of reduced household consumption. The scenarios used did not include tax measures that could further mitigate the impacts on low-income households. (Energy and fuel expenditure varies significantly according to household income: in 2019, they were around 14-19 % for low-income households, but only around 8-10 % for high-income households; this inequality has now been exacerbated by the end of the super-gross wage and the gas crisis.)

Key messages for policy-making from impact assessments

- The objectives of the Fit for 55 package are ambitious for domestic policy, but in most cases achievable with a timely response and domestic policy setting. It is essential to set up an appropriate State investment policy and state aid. If only capped yields (around 50 % of funds) are used to achieve the energy-climate policy objectives, an overall worse impact on GDP and social impacts can be expected due to the negative impact on household consumption. Making full use of ETS1 and ETS2 revenues for decarbonisation and increased support for low-income households performs better in terms of both meeting climate targets and impacts on the economy and social impacts.
- Decarbonisation is a matter of economic policy and investment climate and is fundamentally influenced by the set-up of the tax system. Investment boom will be felt not only in the energy and industrial sectors (draining from coal, electrification, carbon sequestration) but also in the construction sector. It is therefore necessary to pay due attention to this sector, both in terms of labour supply and in terms of permitting processes and public procurement. Whatever happens until 2030 (including renovations), will fix and determine the Czech Republic's capacity to meet climate commitments in the next period and will also have a major impact on the impacts on households.
- Decarbonisation in buildings and transport is relatively more challenging than decarbonisation in industry and energy (taking into account baseline and target; and the focus so far on supporting the decarbonisation of industry and energy). It can be assumed that if significant funds were allocated to cover the investment needs of households, in particular before the actual introduction of ETS2 in 2026, the negative impacts could be eliminated. Furthermore, the adjustment of income tax and/or social levies could be an appropriate tool to address the social impact of low-income households as well as lower middle class.

<u>Study on the impact of Fit for 55 on the Czech Republic's economy (MPO, Deloitte Advisory)</u>

Calculation scenarios for the Fit for 55 impact analysis

- In order to evaluate these effects, a computational tool for predicting the evolution of CO2 emissions and assessing their impact on the energy balance has been developed and modelled in two scenarios.

1) Scenario excluding measures of the Fit for 55 package (i.e. Business As Usual, BAU)

- This scenario reflects the current commitments and targets in place before the Fit for 55 package was proposed. The scenario was defined to meet the following criteria:

- Cumulated savings in gross final consumption of energy from 2021 to 2030 of 462 PJ. This represents an annual decrease of 0.8 % in gross final energy consumption as indicated in the National Climate and Energy Plan1

- Share of renewable energy sources in gross final consumption of energy of at least 23 %

2) A scenario including measures of the Fit for 55 package (i.e. delivering on the Fit for 55 package and reducing CO2 emissions by at least 55 % compared to 1990)

- This scenario is based on the BAU scenario in which adjustments were made to meet the following criteria:
  - Reduction of CO2 emissions by at least 55 % compared to 1990 by 2030
  - (general objective Fit for 55) and efforts to minimise emissions in the 2050 horizon
  - Accumulated savings in gross final consumption of energy from 2021 to 2030 of 672 PJ. This represents an annual decrease of 1.5 % in gross final energy consumption from 2024 to 2030.
  - Share of renewable energy sources in gross final consumption of energy of at least 32 %. This is a national target, with a collective target of at least 40 %.
- Both scenarios were modelled for the purpose of assessing the impact of Fit for 55 on the Czech Republic. In order to provide the inputs and assumptions necessary for modelling using the Deloitte modelling tool, assumptions have been made on the potential for reducing CO2 emissions in energy-intensive industries and the potential of technologies to reduce emissions.

Main outputs and conclusions of the Fit for 55 impact modelling

- The possibilities for reducing emissions in the Czech Republic are strongly conditioned by the possibilities of greening the energy mix and electrification of processes across a range of activities (electric cars, heat pumps, etc.). Most decarbonisation efforts will require significant investment in industry, but electricity consumption will also increase. In the absence of sufficient renewable electricity, some decarbonisation measures may have the opposite effect of increasing emissions when there is insufficient emission-free energy and fossil fuels have to be burned.
- In the Fit for 55 scenario, the Fit for 55 target (at least 55 % reduction of CO2 emissions compared to 1990 by 2030) is met.
- The achievement of other objectives is already complicated and unclear. In summary, it is possible to assess that the national target of 32 % of RES share in gross final energy consumption requires a significant development of photovoltaic and wind resources.
- In order to achieve the objective of reducing final consumption, it is necessary to implement austerity measures. An important aspect in achieving this objective is the development of electro-mobility, where, although electricity consumption is increasing, fossil fuel consumption is falling to a greater extent, as electric motors are more energy efficient than internal combustion engines.
- The achievement of the final energy savings target is mainly achieved through energy savings in buildings. Buildings reduce the consumption of solid fossil fuels and heat, which are replaced by energy and electricity by means of heat pumps.
- The 55 % emission reduction target compared to 1990 is achieved in 2028 according to a computational model, but the emission neutrality target is not met. In the scenario fit for 55, compared to the BAU scenario, emissions decreased from 44,0 million tCO2 to 25.1 million tCO2 in 2050. Achieving emission neutrality would require even greater electrification, in particular investments in FVE, VTE and NPP. The continuation of heat pump installations, which are currently the most efficient heating method, is also a key prerequisite.
- On the basis of the calculations made, it appears that the achievement of the emission reduction target of 55 % by 2030 compared to 1990 is realistic.
- At the same time, however, in order to reach zero emissions in 2050, it is necessary to continue with further measures to reduce the emission intensity and consumption of both industry and energy and households. In areas of emission-intensive industries, the considered potential of non-fossil resources is not sufficient to cover the decarbonisation needs of industry.

- Emission reduction potential is mainly in the following areas:
  - o Reducing the energy performance of buildings and massive installation of RES and heat pump technologies
  - o Utilising the energy potential of buildings and, at the same time, modern technologies for the provision of community energy systems and decentralisedly managed units
  - o Reducing the overall energy performance of the final consumer target group on Developing hydrogen infrastructure (and in particular green hydrogen) to make it available in sufficient volumes at an economically affordable price for industrial technologies, with a view to meeting the emissions targets for the 2050 horizon.
  - o Developing nuclear energy to ensure a significant proportion of energy consumption coverage, allowing for the replacement of existing coal-mining sources without losing energy self-sufficiency, while allowing hydrogen to be used precisely for the application of natural gas substitution in industrial sectors
  - on Investing in resource adequacy and in the adequacy and adequacy of a stable transmission network of ČEPS to be able to cover the increased electricity requirements while ensuring stable electricity transmission. Around 3 000 MW is expected to be needed in reserve capacities, part of which should be CHP in the heating sector, the second part of the steam gas source (including new ones).
  - on Investing in recharging and hydrogen refuelling infrastructure and battery systems for both the electrification of transport and the use of smaller battery systems in decentralised systems and community energy
  - on Investments in support of the replacement of gases by biomethane in transport and setting up specific support instruments for its use.
  - on the development of electro-mobility and the necessary infrastructure

Estimate of total investments generated by the fit for 55 package in the Czech Republic

- With the implementation of the Fit for 55 package measures (compared to the BAU scenario), the largest investments are expected in terms of reducing consumption and installing FVE.
- Cumulated investments in this scenario for the period up to 2030 total EUR 1481 billion. CZK (whereas in the BAU scenario this was 893 billion CZK). This calculation method therefore assumes the impact of the Fit for 55 package in terms of investment of 588 billion. CZK.

<u>Support to REPowerEU – Country Report – Czechia (EC, MPO, Trinomics, EGÚ Brno)</u>

Energy dependence

The Czech Republic has historically been one of the EU countries most dependent on Russian fossil fuel imports. This is particularly true for natural gas, as 97 % of total consumption in 2021 was of Russian origin. While most of the oil flows through the IKL pipeline and the TAL pipeline (the IKL pipeline follows on from the TAL pipeline in Ingolstadt), namely 51 % in 2020, Russia is also a major supplier. The rest of the oil (49 %) was imported by the Družba pipeline.

The Czech Republic has managed to move away from dependence on Russian gas supplies faster than expected in spring 2022. Russian supplies replaced gas from Norway and LNG from terminals in the Netherlands and Belgium. These developments suggest that the fast disconnection path from Russian supplies and the parallel process of reducing gas consumption can be successfully completed in good circumstances in full before the target year 2027. As regards oil, a TAL+ project is under preparation, which should be able to end dependence on Russian oil by 2027 at the latest.

Saving energy

Final energy consumption in the Czech Republic has stagnated and reached 998 PJ (1 017 PJ in 2010) in 2020 [1]. The NECPs set the cumulative energy savings target for 2021-30 at 462 PJ, i.e. 8.4 PJ of new energy savings per year. For 2030, the final energy consumption target is 990 PJ. The government has already stated (in the NECPs) that the actual measures envisaged are unlikely to be sufficient to achieve the new European objectives linked to Fit for 55 or REPowerEU.

The gap analysis revealed a lack of awareness among the population of the potential for energy savings. In order to achieve energy savings successfully, it is necessary to change the general public's view of energy savings. The upcoming awareness-raising campaigns should help to achieve this. Further recommendations linked to the gap analysis are aimed at setting up the subsidy mechanisms. In the future, it seems desirable not to increase the number of subsidy mechanisms, but rather to make them more effective, as long-term stability and policy predictability are the most important for construction.

Low-income households are an important issue that should be given special attention. The solution is a specially designed subsidy programme where, in addition to increased financial support, they will be able to receive comprehensive advice. At the end of 2022, the Ministry of the Environment introduced a subsidy programme targeting low-income households (New Green Savings Light).

Renewable Energy Accelerated Deployment

Accelerating the development of renewable energy sources in Czechia is one of the most crucial issues, as their development has stagnated over the long term. Stagnation is also linked to photovoltaics, with installed capacity around 2.2 GW since 2010. For wind power, the situation is similar and the installed capacity is around 340 MW. The NECPs set a target of 22 % RES share in final energy consumption by 2030. However, it is clear that this target will need to be raised in view of the EU's increased ambition [2].

The main reason for the stagnation of RES development is the setting up of the regulatory framework and the lack of subsidy support (investment or operational). In both cases, however, the situation is improving significantly. Investment grants from the Modernisation Fund and RRP stimulate the development of new RES. By the end of 2022, the Ministry of Industry and Trade had presented an amendment to the Energy Act, which increases the limit for the installation of unlicensed photovoltaic plants (previously the maximum of 10 kW, now 50 kW). At the same time, the Government of the Czech Republic regularly amends Act No 165/2012 on the promotion of energy sources.

However, further reforms are needed to support the development of renewable energy sources (notably solar and wind). The GAP analysis identified the lack of legislative anchoring of the concept of community energy in the Czech legal environment (the adoption of Energy Act No 458/2000 is expected in the course of 2023). As regards legislation, another loophole is that there is no legal anchoring of a battery repository in the Czech legal environment. The roll-out of smart metering, which is still lacking in the Czech environment, will also help to develop RES.

Particular attention has been paid to the heating sector, which is mainly based on fossil fuels. Heat pumps have been identified as one of the technologies that can help decarbonise the heating sector. It contains reform proposals aimed at: the adjustment of the RES charge for sources using waste heat, the transfer of support for industrial heat pump technology to priority projects (in the Modernisation Fund) or the adjustment of the emission factor of electricity.

Diversification of energy supply

A loophole on this issue is its overdependence on Russian oil and gas. In the lens of the REPowerEU or Fit for 55 objectives, the high reliance on fossil fuels in the overall energy supply also appears problematic. However, it was already mentioned above that Czech dependence on Russian fossil fuels decreased significantly during 2022 and exceeded expectations. Since the closure of the Nord Stream 1 pipeline in September 2022, approximately 2.6 billion cubic metres of gas have been imported into the Czech Republic by the end of 2022. Of this, however, a maximum of 3.4 per cent could come from Russia (according to the Ministry of Industry and Trade). A reinforcement of the TAL pipeline (TAL+ project) is under preparation for the supply of oil, enabling independence from Russian supplies.

The Czech government plans to secure emission-free energy through new nuclear power plants in the long term. Other solutions to support diversification of supply have been identified. The gap analysis has shown that the potential of switching from fossil hydrogen to RFNBO-based renewable electricity production in the short to medium term is very limited. Even if the current hydrogen production in Czechia were fully renewable, it could only cover two thirds of the renewable hydrogen needed under the revised RED II targets. Moreover, the switch to renewable hydrogen production is not an option for most end-of-production.

GAP analysis also looked at the legislative environment on hydrogen with the following findings: the definition of hydrogen in Czech legislation as an energy carrier should be enshrined (currently Czech legislation only knows hydrogen as chemical raw material and fuel). The Energy Act treats the production of hydrogen using P2G as electricity consumption. This entails costs for the operator in the form of a tax on electricity or an RES contribution. It is therefore desirable to consider anchoring the operation of P2G power plants in Czech legislation in such a way that they are not perceived as final consumers of electricity as a result of this classification.

Proposed reforms and investments under REPowerEU

Based on extensive analysis and contacts with stakeholders and authorities in the Czech Republic, the following reforms and investments are proposed (not all proposed reforms are listed in the table):

Table 103: *Proposed reforms and investments under REPowerEU*

	R/I	gap identification	reform proposal description
EE	I	*Insufficient promotion of energy efficiency and subsidy progra*	Structured awareness campaign
EE	I	*insufficient financial and technical support of (ow-*	Special subsidy programme combinating higher subsidy with robust Consulting su pport
EE	R+I	*lack of long-term*	Energy management in municipalities with support in the preparation of comprehensive renovation plans
RES	R	t. term community energy *is not defined in the Czech legal*	Legislatively anchor the term community energy in the Energy Act
RES	R	*long permitting and administrative processes for wind energy*	Identification of suitable areas for wind energy development
RES	R	*insufficient support*	Electricity emission factor adjustment for heat pumps
RES	R	*insufficient support*	Consideration of Adjusting the promotion of RES fee for sources usingwaste heat
RES	R	*insufficient support*	Shiftingsupport for industrial heat pump technology to priority projects in Atodernisation fund
DIV	R+I	dominant *dependence on*	Tal pipeline capacity increase (TAL+ project)
DIV	R	*significant*	Definition of hydrogen in Czech legislation asan energy carrier
DIV	R	*Significant*	P2G hydrogen production considered as electricity consumption

Analytical basis for updating the Czech Republic's energy and climate strategies (SEEPIA, ČEPS)

Modelling tools

Times-CZ (version v03) – a technologically oriented, dynamic model of cost optimisation of the energy system covering the entire Czech Republic's energy balance from the extraction or import of energy raw materials through their transformation to the final use of energy services. The key exogenous parameter (input) to the model is the aggregate demand for energy services (°C heating, number of appliances, person-km, tonne-km, production of products, etc.). The model allows substitution between savings and consumption of energy carriers (TWh/GJ), substitution between domestic energy production (TWh/GJ) and imports (TWh, hydrogen) and substitution between energy transforming technologies. Cost optimisation covers all the costs of energy transformation (CAPEX, OPEX, WACC, taxes/subsidies/EUA) under the technological or resource constraints and is calculated for the entire energy system of the Czech Republic. Cost optimisation does not include the costs of upgrading and expanding transmission and distribution networks, which are currently unknown for the Czech Republic. The technology mix, energy savings, electricity imports, hydrogen imports and energy consumption (TWh, GJ) are the result of optimisation in the model.

PLEXOS – a commercial energy system modelling tool developed by Energy Exemplar, which is used to simulate the electricity market. This is a deterministic linear optimisation model that minimises the expected costs of electricity distribution taking into account different parameters. On the basis of the Memorandum of Cooperation between the UK Environmental Centre and ČEPS, a.s.[1], ČEPS validates the results of the proposed optimal mix of electricity generation by the TIMES-CZ model in terms of resource adequacy. Validation uses a methodology based on the Resource Adequacy Assessment (MAF CZ 2022; ČEPS 2023), where the technology mix and electricity consumption are model inputs and imports of electricity exports are the result of the model; in principle, electricity savings are not considered.

E3ME – the global macro-econometry model developed since the 1990s by Cambridge Econometrics, Ltd. The model builds on the post-keynesian economic theory and allows to capture both short-term dynamic changes and convergence towards a long-term trend. The diffusion of innovation and the choice between technologies responds flexibly to changes in prices and is embedded in separate modules (Future

Technology Transformations – Power, Heat, Transport, Steel, Agri) that allow for better representation of the development of new technologies and choices between them. The electricity storage requirement is based on modelling the residual load and non-delivery curve of RES generated electricity (Ueckerdt et al., 2017) and implied additional RES costs, according to Julch 2016.

DASMOD – a static microsimulation optimisation model that makes it possible to estimate the social impact of policies and measures according to the income deciles of Czech households. The model can predict impacts on income and income distribution, household expenditure and the resulting fiscal effects for different scenarios. The model is based on microdata for around 3000 households (reference year 2019) and is linked through elasticities and price changes to the E3ME model.

Model coupling

<u>TIMES model</u>

- Exogenous inputs from other models: production by 2050 of energy-intensive industries (non-metallic minerals, iron and steel, chemicals) and other industries predicted by the E3ME model; exports and imports of electricity for the annual period and day-night-peak from the PLEXOS model; weighted price of exported and imported electricity for the annual period and the day-night-1h.Polexs model; sourced resources (so that LOLE does not exceed 15 hours per year) from PLEXOS;
- Outputs to other models: electric energy consumption to PLEXOS; the technological mix for electricity generation into the PLEXOS model; requirement for electrolysers to PLEXOS; the volume of net imports of electricity (cap set according to PLEXOS) into the E3ME model; installed NJZ capacities in the E3ME model;

<u>PLEXOS model</u>

- Exogenous inputs from other models: electricity consumption from TIMES; the technology mix for electricity generation and the requirement for electrolysers from the TIMES model;
  Outputs to other models: exports and imports of electricity and weighted price exported and imported electricity into the TIMES model; sourced resources (LOLE & 15 hours per year) to TIMES;

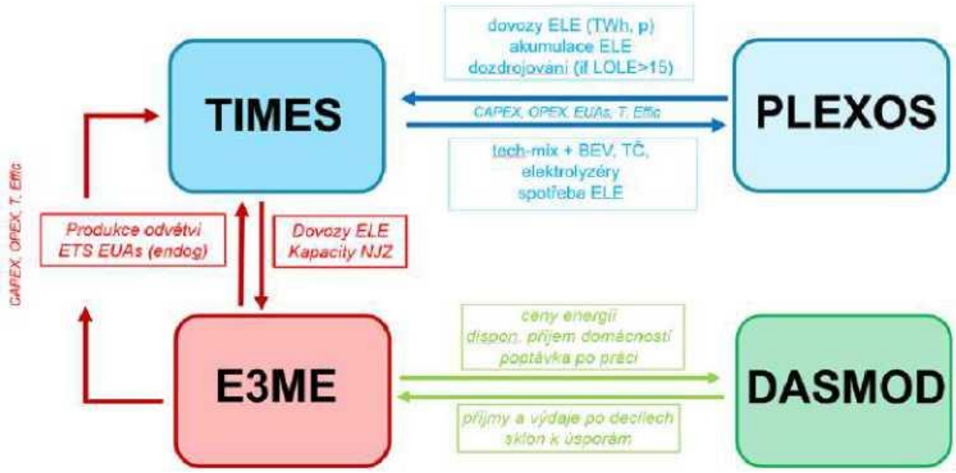
<u>E3ME model</u>

- Exogenous inputs from other models: the volume of net imports of electricity from the TIMES model; installed NJZ capacities from the TIMES model;
  Outputs to other models: production of energy-intensive industries and other industries into the TIMES model; (possibly: the price of EUA emission allowances at the emission target in the TIMES model); the change in the prices of consumer products and disposable household income into the DASMOD model;

<u>DASMOD model</u>

- Exogenous inputs from other models: the change in prices of consumer products and disposable household income from the E3ME model;
- Outputs to other models: not

Figure 23: *Model coupling scheme*



Validation of the results of the TIMES-CZ model by PLEXOS (ČEPS)

ČEPS, a.s., cooperates with SEEPIA to validate the results with the TIMES-CZ model of the proposed optimal mix of electricity generation in terms of resource adequacy.

Validation consists of verifying the ability of the proposed generation portfolio of resources (including import and export capacity) to meet the expected demand for electricity. Plexos modelling software and data sources from the ENTSO-E modelling to fulfil the obligations arising from European legislation are used for validation, in particular ERAA (European Resource Adequacy Assesment) and TYNDP (10-year network development plan). The data used in simulations are from 2021/2022. Validation uses a methodology based on the Methodology for Resource Adequacy Assessment (MAF CZ 2022).

Other key parameters entering the calculation:

- Battery capacities – 15 % of installed capacity of FVE and VTE (10 % in 2025)
- Availability of DSR – 100 MW

The outputs of the Unit Commitment simulations are:

- deployment of individual production units
- accumulation
- activation of market power management (DSR)
- balances of business areas
- non-delivery
- marginal price
- outages and shutdowns
- destroyed energy
- emitted CO2 and others.

Disproportionateness is defined by exceeding the LOLE (Loss of Load Expectation) confidence standard. The size of the source is then designed so that the LOLE does not exceed 15 hours per year.

Main assumptions of the scenarios

The analytical evidence seeks to achieve as much as possible the recommended principles for updating the NECPs and the objectives set by, inter alia, the new legislation of the Fit for 55 and REPowerEU packages, while taking into account that socially acceptable decarbonisation is a question of combining a price signal of GHG emissions pricing and revenue recycling to support investment and to counteract negative social impacts of transit on households. In particular, it includes:

- meeting the objectives of Regulation (EU) 2021/1119 on the European climate framework, namely a 55 % reduction in greenhouse gas emissions by 2030 (compared to 1990) and achieving neutrality by 2050;
- meeting the targets of Directive 2023/959, namely a 62 % emission reduction in ETS1 sectors by 2030 (compared to 2005) and a 43 % reduction in the road transport and buildings sectors covered by the ETS2 and a 42 % reduction, including additional sectors in the ETS2;
- achievement of the target for sinks in the land use and forestry sectors of 310 Mt in the EU and 1.228 Mt in the Czech Republic (Regulation (EU) 2023/839);
- targets in the energy sector – a 42.5 % share of renewable energy as agreed in the trilogue compromise on the proposal for a revision of the Directive on the promotion of energy from renewable sources ("RED3", Article 3); achieving savings of at least -11.7 % of final and primary energy consumption compared to the REF2020 scenario in the trilogue compromise on the proposal for a revision of the Energy Efficiency Directive ('EED', Article 4); achieving cumulative final energy savings in the form of an annual reduction of 0.8 % in the period 2021-2023, 1.3 % in 2024-2025, 1.5 % in the period 2026-2027 and 1.9 % in the period 2028-2030 (EED Article 8);
- industrial sector targets to achieve a share of renewable fuels of non-biological origin ('RFNBO') in hydrogen consumption in industry of 42 % by 2030 and 60 % by 2035 (Art. 22a RED3); achieving an annual growth rate of 1.6 pps for RES in industry (Article 22a; RED3);
- customs in the transport sector – achieving a 29 % share of RES or 14.5 % GHG savings from transport fuels by 2030 (Art. 25 RED3), reaching a minimum share of 5.5 % of advanced biofuels and RFNBO in transport (with multipliers; of which at least 1 % RFNBO) by 2030 (Art. 25 RED3); A 100 % reduction in CO2 emissions from new light-duty vehicles by 2035 (Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO2 emission performance standards for new passenger cars and for new light commercial vehicles and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011, as amended);
- in the buildings sector, the achievement of a 49 % share of energy from RES in buildings (Article 15a RED3), the achievement of an annual rate of decline in final energy consumption in the public sector (Article 5 EED) and the minimum annual rate of renewal of the floor area of public buildings (Article 6 EED); achieving an annual increase in the share of RES in heating and cooling by 0.8 pps (2021-2025) and 1.1 pps (2026-2030) (Art. 23 RED) and the indicative increase set by the Member State to reach the EU average rate of 1.8 pps; achieving the annual growth rate of the share of RES and waste heat in heating; and cooling by 2.2 pps (Article 24 RED3).
- quantification of economic, employment and competitiveness impacts and main social and environmental effects;
- a quantification of the investment volumes needed to achieve the objectives set, the planned policies and measures;
- set up support for fair transit and mitigation of social and environmental impacts – through the use of revenues from the sale of emission allowances through the Modernisation Fund, the Social Climate Fund, other revenues from emissions trading and other support mechanisms.

The modelling took place in several waves, in spring 2023, several scenarios were developed in the TIMES-CZ model to clarify the design options for the system:

- Wem – scenario without implementation of Fit for 55 policies
- WAM_10 % – electricity imports max. 10 % of consumption
- WAM1, WAM2 – Medium Scenarios, Electricity Imports max. 20 TWh (as per MAF 2022), WAM1 with fixed development of new (large) nuclear sources, WAM2 with fixed development, in particular SMR;
- WAM_CCUS – CCUS wide application, limited use of hydrogen
- WAM_nuclear – extensive fixed nuclear energy development
- WAM_opt – scenario with limited fixed technology constraints, emphasis on cost optimisation by the model
- WAM_H2 – hydrogen wide scenario, CCUS restrictions

Subsequently, adjustments were made to the parameters of the scenarios (in particular CCUS usage options, hydrogen import assumptions) which broke in the 3 WEM baselines, WAM1_nkep focusing on the development of RES and WAM2_nkep for the development of nuclear energy (and related sensitivity analyses). Models have been fully integrated and the macroeconomic dimension aligned with the E3ME model with the optimisation of the source base of the energy balance in TIMES-CZ, resource adequacy was evaluated by the PLEXOS model and more detailed outputs of social impacts were evaluated by the DASMOD model.

As a next step, the GDP growth benchmark of the E3ME model was corrected according to the macroeconomic prediction of MF145, the caps on RES and fixed nuclear sources (the so-called WAM1_plus and WAM2_plus) were adjusted. The resulting scenarios are WEM+ and WAM3, which take into account the outputs of the previous ones and the main assumptions are summarised in the table below:

Table 104: *Main assumptions of the WEM+ and WAM3 scenarios*

	WAM3	**WEM+**
Existing Dukovany NPP _ 2 040 MW	EDU1 (510 MW up to 2045) EDU2 (510 MW up to 2046) EDU3 (510 MW up to 2046) EDU4 (510 MW up to 2047)	EDU1 (510 MW up to 2045) EDU2 (510 MW up to 2046) EDU3 (510 MW up to 2046) EDU4 (510 MW up to 2047)
Existing Temelín NPP_2200MW	ETE1 (1 100 MW to 2060) ETE2 (1 100 MW to 2062)	ETE1 (1 100 MW to 2060) ETE2 (1 100 MW to 2062)
New nuclear source_1100 MW	NJZ1 EDU5 COD 2036	NJZ1 EDU5 COD 2040
Small modular reactor_SMR 350 MW	SMR1 COD 2035 + additional model result	model Result

145 https://www.mfcr.cz/cs/rozpoctova-politika/makroekonomika/makroekonomicka-predictions/2023/Macroeconomic-predication-August-2023-52667

Other New Nuclear Sources_1100MW	NJZ2 ETE3 COD 2039 NJZ3 ETE4 COD 2041 + additional model result	model Result
CapEx 1100MWe (2015 prices)	CapEx EUR 5400/kWe	CapEx EUR 5400/kWe
WACC 1100MWe	4 %	4 %
CAPEX SMR 350 MW	CapEx EUR 5400/kWe	CapEx EUR 5400/kWe
WACC SMR 350 MW	5 %	5 %
poison hot water – Brno	yes	No
FVE [PVS] 2030 *(total); capacity 2022: 2.09 GWe <=*	max. 10.1 GWe	max. 6 GWe
FVE [PVS] 2050 *(total)*	max 26.1 GWe	max. 21 GWe
VTE [WIND] 2030 *(total)*; *capacity 2022: 0,339 GWe <=*	max 1.5 GWe	max 0.7 GWe
VTE [WIND] 2050 *(total)*	max 5.5 GWe	max 3.5 GWe
PLEXOS (Sourcing in TIMES)	yes	No
MACRO: output of the industry	E3ME with revision of GDP growth according to MF prediction	E3ME with revision of GDP growth according to MF prediction
CCS	9 Mt (2033-2042), 18 Mt (2043) 2050)	No

Modelling limits

Non-modelled sectors

- The trajectory for ***greenhouse gas emissions*** up to 2050 is based entirely on the optimisation and simulation of TIMES (at Czech level) and E3ME (at EU level). When predicting the evolution of greenhouse gas emissions, two sectors for which greenhouse gas emissions are taken over are not subject to modelling:
    - on agriculture: projections from the study ‘Evaluation of the economic impacts of Fit For 55’ (ÚZEI 2023) and the study ‘Overview of options to reduce greenhouse gas emissions from agriculture in the Czech Republic’ prepared in cooperation with the SEEPIA and Aramis projects (UK COŽP, 2023);
    - wastes, except emissions from municipal waste incineration plants and F-gases: Reference scenario 2020 of the European Commission for the Czech Republic (EC 2021);
    - LULUCF-forestry: IFER projections carried out under project TAČR TL02000440; ‘Red scenario’ (Cienciala and Melichar, 2022).

Climate neutrality

- WAM with an exogenous price of emission allowances (EUR 410/tCO2 in 2050) will achieve a 90.4 % reduction in emissions by 2050 (compared to 1990), while the endogenous price scenario

(WAM1_EUA) achieved a 93 % reduction in greenhouse gas emissions at EU level at the price of allowances of over EUR 1400/t CO2 at the end of 2050. In the analyses, the emission target was therefore set at a lower value. As a result of the simulations, if emissions were to be reduced by more than 90 % in the EU compared to 1990, the price of emission allowances would have to be extremely high at the end of the period to 2050, assuming the level of investment aid used in this modelling. In other words, the ETS is not sufficient to bring emissions to the level indicated by the European Commission's analyses, i.e. 233-366 MtCO2e without LULUCF or 92-95 % below 1990 levels. The TIMES-CZ model shows similar results. For this reason, the TIMES-CZ model set the reduction in greenhouse gas emissions to 6 Mt CO2eq in 2050 (at Czech level).

- In the modelled part of the scheme, the system shows significant decreasing carbon pricing revenues, i.e. the marginal increase in the price of allowances only leads to a very small effect (reduction of emissions). It is therefore important to analyse the potential to reduce greenhouse gas emissions in non-modelled parts of the economy, especially in the agriculture sector, which is still projected to produce emissions at 6.3 Mt in 2050. Further reductions in greenhouse gas emissions in the agricultural sector are possible with an incentive to reduce the consumption of animal products. Reducing beef and sheep meat consumption by 15 % by 2030 and 50 % by 2050 could lead to a reduction of emissions to 5.66 Mt (-0.61 Mt) by the end of 2050. By adding a reduction in the consumption of cow's milk and cheese by the same amount, it could lead to a reduction to 5.22 Mt (-1.05 Mt) and a reduction in consumption of pork and poultry meat to 5.0 Mt (-1.27 Mt). The scenario with the highest diet change requiring a reduction in consumption of all animal products by 15 % by 2030 and 50 % by 2050 would lead to emissions at 4.73 Mt, i.e. a reduction of 1.54 Mt compared to the assumption of this study, according to the UZEI study (2023); Poore and Nemecek (2018); summarised in UK COŽP (2023).
- Biomass from agricultural land is another potential, which not only represents an additional non-emission source in a mix that has the potential to lead to negative emissions in CCS (the so-called BECCS), but will also lead to a reduction in emissions in the agricultural sector due to agricultural land use change.
- It is also important to revise the predictions of the species and age structure of forest development and thus forest sinks, which have been negatively affected by bark beetle calamity and extreme volumes of salvage logging in the last five years.
- Finally, the effect of behaviour on demand for energy services, especially in households, needs to be mentioned. The modelling presented is based on a relatively conservative (growth) assumption of the evolution of this demand. The size of the fleet is slightly increasing, although vehicle sharing and autonomous vehicles may lead to the opposite trend; the effect on the demand for mobility (person-kilometres) is not clear in the studies. Similarly, the demand for service (person-kilometres) due to the use of electric vehicles (BEV, hydrogen) may be affected in both directions as a result of a change in use and a change in the marginal costs of the service (due to different ratios of fixed investment costs and variable operating costs). The demand for heating, the number and frequency of use of electrical appliances is assumed without the negative effect of changing behaviour on consumption. For example, meta-analysis Khanna et al. (2021) summing up 360 effects from 122 studies from 25 countries indicates the potential to reduce energy consumption in households due to behavioural responses to non-investment interventions (such as providing information on self-consumption, consumption of others or consumption impacts, cash incentives) up to 15 %. Energy savings, especially electricity in the winter months, can contribute to meeting energy demand in sectors where consumption can be reduced much more difficult, for example in industry, and can also contribute to addressing resource disproportionates.

Resource adequacy and non-delivery

- Securing electricity supply will be an important aspect of decarbonisation. The analysis of this criterion received great attention in modelling. Resource adequacy was modelled by ČEPS experts using the PLEXOS model based on data from European Transmission Network Operators (TSOs). Based on this modelling, the inadequacy of the initial WAM scenarios was quantified, which were subsequently sourced so as not to exceed the LOLE reliability standard and this adjustment enters the next version of the scenario modelled by the TIMES-CZ model. Supply capacities are gas resources for balancing peaks, especially during the heating season. These are relatively conservative, expensive, non-delivery solutions. The problem of resource disproportionality can be partly mitigated by the use of energy from biogas stations; this option has not yet been fully reflected in the scenario modelling and can contribute to addressing this problem at the next stage of the analyses. However, this problem can also be addressed on the consumption side, namely through heat storage both in CHP plants and in individual houses, or a limited reduction in the thermal comfort of consumers during the heating season. This potential should not be neglected as it can lead to significant cost savings for gas resources, which will be used for a very limited period of time during the year, as well as to reduce emissions from these sources (in case of capturing CCS volumes for capturing gas emissions).

Development of transmission and distribution networks

- The increased installed capacity of RES will necessarily lead to the development (extension, upgrading) of transmission networks and, in particular, of distribution networks.
- The TIMES-CZ model includes these costs in a simplified form, according to the ETSAP TIMES modelling manual. Network costs need to be evaluated robustly with more appropriate analytical tools for the area in question.

Closing the gap between production and consumption

- System costs of RES typically include costs related to balancing the difference between electricity production and consumption. The modelling presented includes electricity storage in batteries – in the TIMES-CZ model, the installed capacity of batteries is equal to 15 % of the sum of installed wind and photovoltaic capacity, similar to the PLEXOS resource adequacy modelling, and in line with ENTSO-E (10 % in 2025). Similarly, short-term and long-term electricity storage is part of the simulations in the E3ME model, namely in the FTT:Power module. Thus, in both models, the costs of storing electricity produced from RES are already part of the costs and optimisation.
- The difference between production and consumption will be affected by a change in consumption that may be triggered by regulation (e.g. tariff policy). The modelling presented is based on the current electricity consumption profile, i.e. without demand side management and the potential dynamic price effect, and thus represents a conservative approach leading to higher costs. Another source of compensation for the gap between production and consumption will be battery vehicles, which should gradually become part of smart grids; the positive effect of battery electric vehicles is not yet reflected in the present study.
- Pumped storage is an alternative to storing generated electricity in batteries. Their potential was also not included in the available technologies. Another option is biogas stations.

Output of industries and macro-economic developments

- The scenarios presented are based on a long-term assumption of the evolution of the economy and thus of industrial production. This implies the growth of industrial sectors in all modelled scenarios, leading to a higher cruelty in the production of energy-intensive products. It should be stressed that this is not a macroeconomic prediction which is not possible in such a long period of time. In particular, the modelled scenarios are used to compare the impacts of energy-climate policies, i.e. regulatory and economic incentives for decarbonisation in the context of Fit for 55 policies and efforts to decarbonise the Czech Republic's economy compared to a scenario without increased ambitions. The growth of the economy will be influenced by a number of factors that were not part of the modelling:

- on Geopolitical risks in the world and the effects on the world economy
- o Impacts of climate change (not included, e.g. natural events)
- on the financial and economic crisis
- o Efficiency of public administration and related authorisation processes
- oChanges in consumption behaviour
- oDemographic changes
- o Changes related to major societal reforms (pension reform, tax reforms, etc.)
- on adjustments to the EU's transit financing system after 2030
- on Adjusting the regulatory environment in the EU after 2030
- on the fundamental breaks in technological progress
- on Delivering strategic investments that can represent major changes in energy demand
- o Other hardly foreseeable events

<u>Conditions dependent, in particular, on the activities of the public administration or the EU</u>

- Possibilities for imports of hydrogen
  - on the optimistic availability of hydrogen from imports at 36.7 TWh at a price of EUR 60/MWh in 2050. From 2040, the possibility of direct domestic hydrogen combustion is foreseen, i.e. gas boilers will also be adapted for direct hydrogen combustion. The assumptions about the available quantity of hydrogen for import into the Czech Republic and its price are based on the documentation provided by the Ministry of Industry and Industry for the preparation of an update of the Hydrogen Strategy. These documents foresee a gradual rise in the quantity of hydrogen available for imports into the Czech Republic from 2030 onwards at a level of up to 1 PJ (8.33 kt). From 2035 onwards, they foresee the capacity of all 3 pipeline routes – west (6 GW), north (6 GW) and south (3 GW), with a gradual pick-up of available hydrogen for imports totalling 24 PJ (200 kt) in 2035 to 132 PJ (1 100 kt) in 2050. In addition to hydrogen imported by pipelines, it is envisaged that hydrogen in the form of ammonia can only be imported for industrial consumption. The price of imported ammonia is lower than in pipeline hydrogen and its quantity is limited by the current consumption of hydrogen in industry 11.6 PJ (96 kt) (Czech Republic's Hydrogen Strategy, MIT 2021).
- Prerequisites for the use and application of CCUS technology
  - the costs of a permanent storage site or the price of storage within the envisaged internal carbon market in the EU are not included.
- Efficient use of revenues from emissions trading
  - o Full use of revenues and dedicated funds financed by the EU ETS to decarbonise across the economy and mitigate social impacts in line with the revised Fit for 55 legislation.
  - oOther funds not modelled, cohesion policy funds implicitly included in the inputs to the E3ME model, the key financial stimulus is not taken into account in the model, in particular the National Recovery Plan.

- Implementation and financing of investments
    - Construction of nuclear resources
    - Model predictions are largely optimistic (idealised) outlook;

      this presupposes effective (rrational) decision-making at more or less all levels (both public and private). It also implicitly envisages the existing and functional permitting processes necessary for a significant part of the investment activities required by the climate transact.

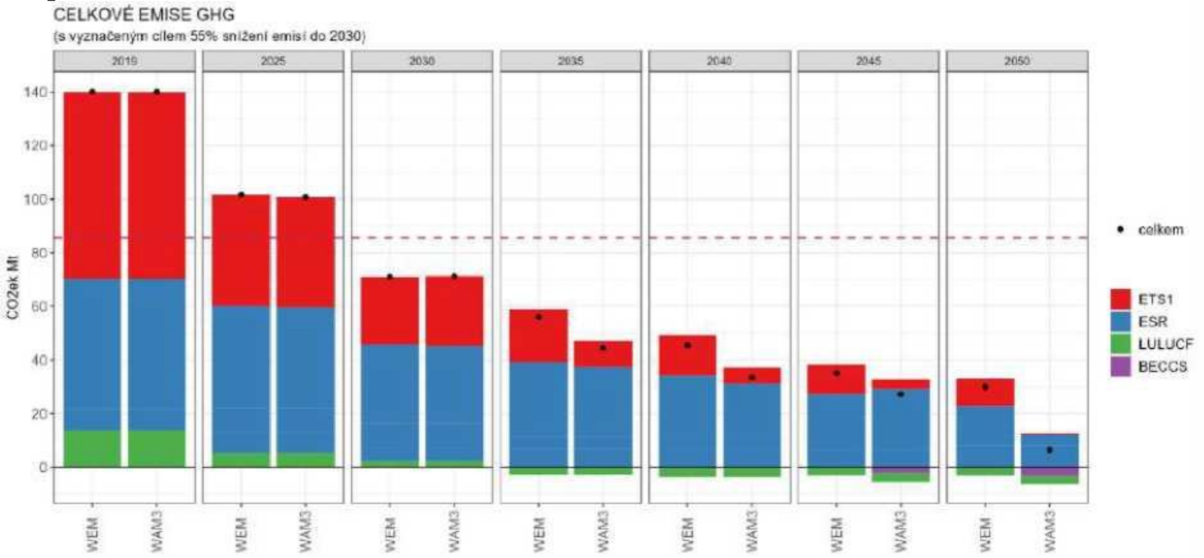
      on the model, it implicitly assumes available sources of investment financing
- Details of the technology mix – energy efficiency and savings
    - Most investments in climate projects relate to specific technologies that can be easily identified (e.g.: VTE, FVE, TIN or BEV). However, investments in energy savings/energy efficiency are often so-called integrated technologies, where the whole investment unit is replaced with an energy saving measure (e.g. replacement of a blast furnace for a hybrid furnace). In such cases, it is difficult to identify the part directly related to energy efficiency improvements to which public support should be linked. These integrated units (due to the limited detail of the models) may not receive public support for all aspects of savings/efficiency in the scenarios, and the impact of policies will then be less than would be the case with full support for integrated technologies. Modelling of policy impacts in these cases is a conservative estimate.

Table 105: *Model outputs (WEM+ and WAM3 scenarios)*

Objectives	Regulation	WAM3 Modelling Output
GHG		
GHG 2030 2021/1119) (compared to 1990)	—55 % (EU)	CZECH REPUBLIC (2030): —63 %
GHG neutrality in 2050 2021/1119)	net zero	CZECH REPUBLIC (2050): 6.3 Mt
ETS sector1 (Directive 2023/959) (compared to 2005)	—62 % (EU 2030)	CZECH REPUBLIC (2030): —68 %
ETS2 sector (Directive 2023/959) (compared to 2005)	—43 % (EU 2030; road transport and buildings)	CZECH REPUBLIC (2030): —35 %
	—42 % (EU 2030; incl. additional sectors)	
ESR 2030 (R. 2023/857) (compared to 2005)	—40 % (EU 2030)	CZECH REPUBLIC (2030): —32 % (significant effect of an external assumption of a 2 Mt decrease in emissions from waste and F-gases)
	—26 % (CZECH 2030)	
LULUCF (R. 2023/839)	—310 (EU)	+ 2.2 Mt
	—1.228 Mt (Czech Republic)	
Energy		
RES share (Art. 3 RED3)	42.5 % by 2030 (trilogue compromise) (EU)	CZECH REPUBLIC (2030): 30 %
final and primary energy savings (Art. 4 EED)	—11.7 % vs REF2020 by 2030 (trilogue compromise) (EU)	CZECH REPUBLIC (2030): —1 % of final consumption vs REF2020

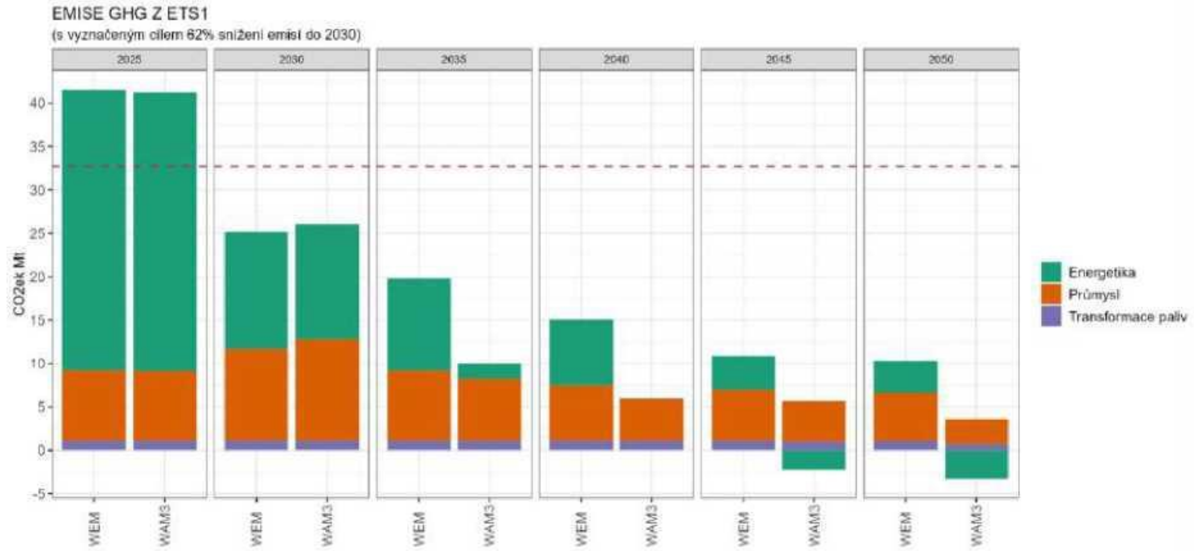
		—4 % of primary consumption vs REF2020
cumulative final energy savings (Art. 8 EED)	% annual reduction (2021-2023: 0.8 %; 2024-2025: 1.3 %; 2026-2027: 1.5 %;	Not available
minimum levels of taxation for energy products (proposal for a recast of Directive 2003/96/EC)	by energy content, with environmental graduation and HICP indexation	(not separately quantified)
Industry		
Share of RFNBO in hydrogen consumption in industry (Art. 22a RED3)	42 % (2030)	(CZECH 2030): 21 %
	60 % (2035)	CZECH REPUBLIC (2035): 31 %
	(mandatory)	
Annual growth rate of RES in industry (Art. 22a RED3)	1.6 pps (trilogue) (indicative)	Not available
Transport		
share of RES in transport/saving of GHG emissions from fuels (2030) (Art. 25 RED3)	29 % (RES share), 14.5 % (GHG saving)	Czech Republic's share of RES (2030): 24 %
Share of RFNBO in transport (until 2030) (Art. 25 RED3)	5.5 % (of which at least 1 % RFNBO) (with multipliers)	CZECH REPUBLIC (2030): 1 %
Share of advanced biofuels in transport (by 2030) (Art. 25 RED3)		CZECH REPUBLIC (2030): 3.1 %
emissions from new light-duty vehicles (2035) (R. 2023/851)	100 % reduction	100 % reduction
Buildings		
Share of energy from RES in buildings (Art. 15a RED3)	49 % (indicative)	Not available
Annual rate of decline in final energy consumption in the public sector (Article 5) EED)	1.9 % (trilogue)	It is not possible to evaluate – in the model it is not possible to separate public buildings from commercial buildings.
Annual rate of renovation of the floor area of public buildings (Art. 6 EED)	3 % (mandatory)	It is not possible to evaluate – in the model it is not possible to separate public buildings from commercial buildings.
Annual growth rate of RES share in heating and cooling (Art. 23 RED)	0.8 pps (2021-2025) and 1.1 pps (2026-2030) (trilogue; mandatory) (EU)	Not available
	+ indicative increase corresponding to 1.8 pps on average for the EU (Czech)	
Annual growth rate of the share of RES and waste heat in heating and cooling in RES (Article 24 RED3)	2.2 pps (trilogue; indicative)	Not available

Graph 112: *Total GHG emissions*



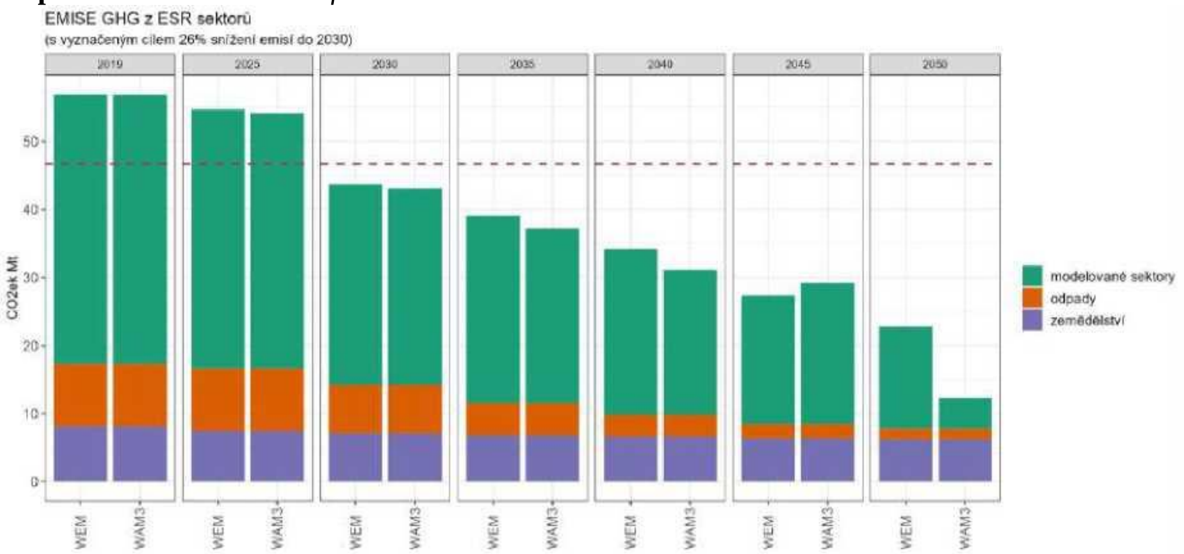
Source: SEEPIA modelling outputs

Graph 113: *GHG emissions from ETS 1*



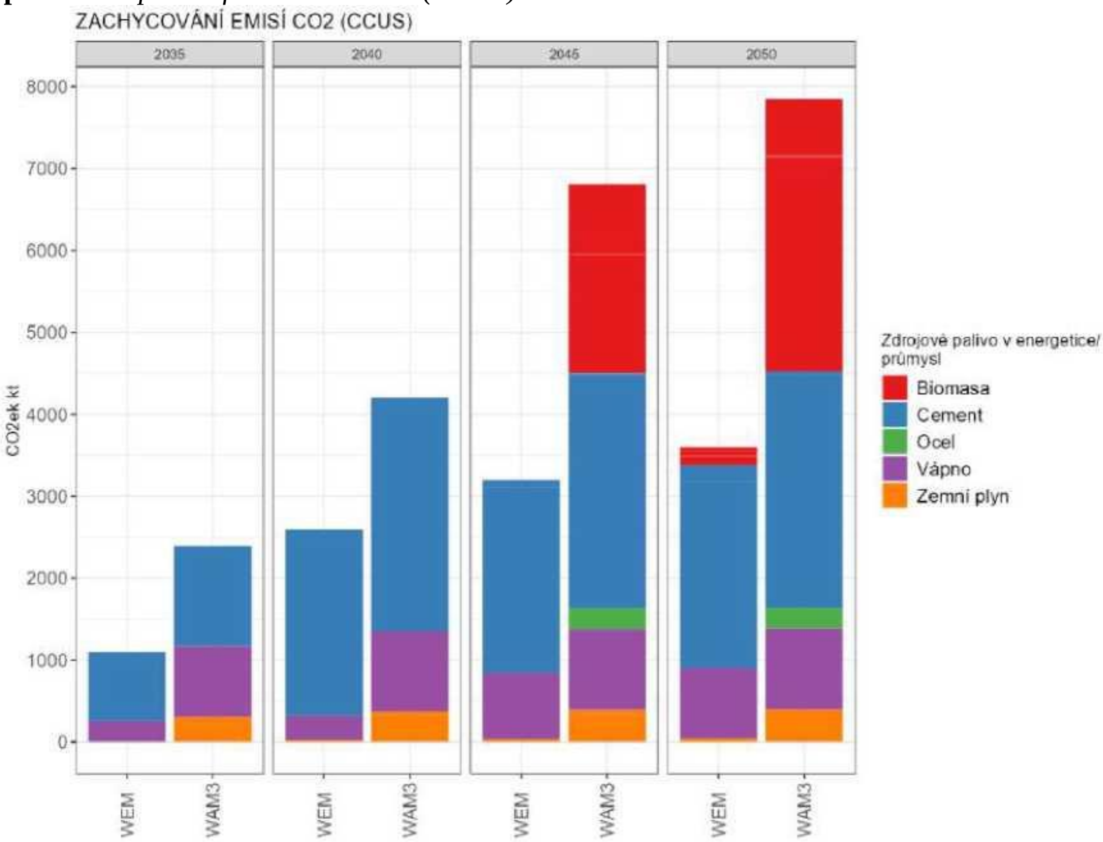
Source: SEEPIA modelling outputs

Graph 114: *GHG emissions from SR sectors*

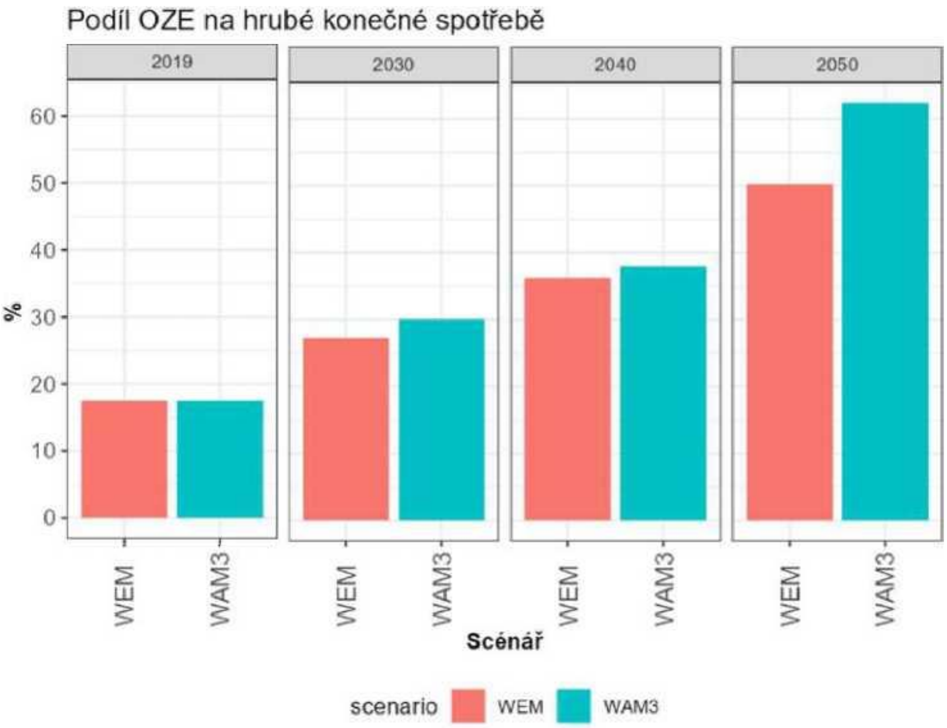


Source: SEEPIA modelling outputs

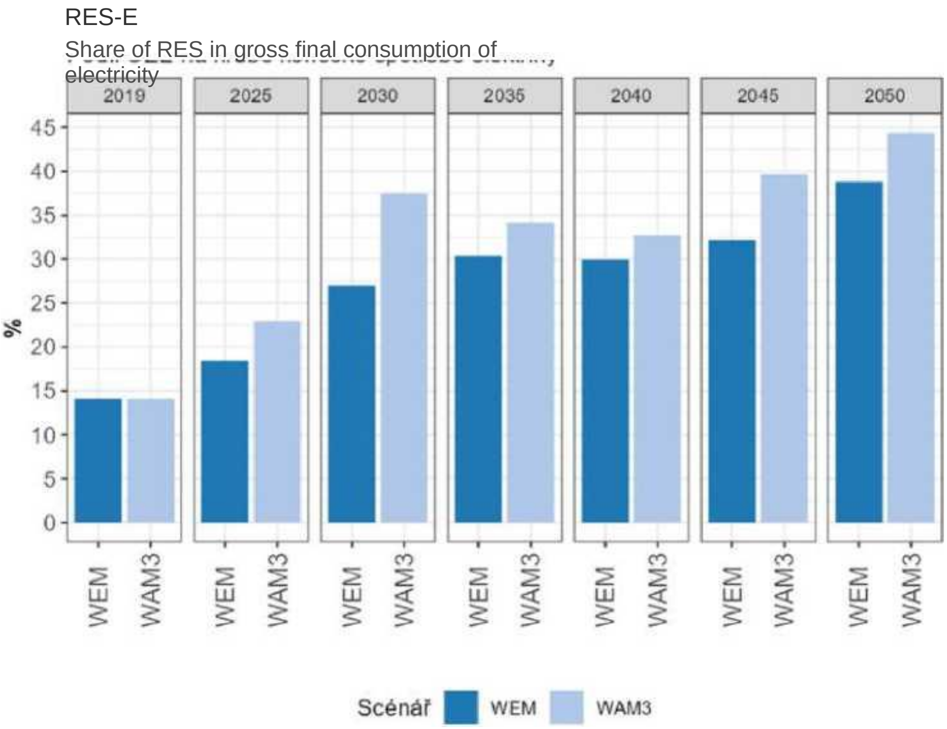
Graph 115: *Capture of CO2 emissions (CCUS)*



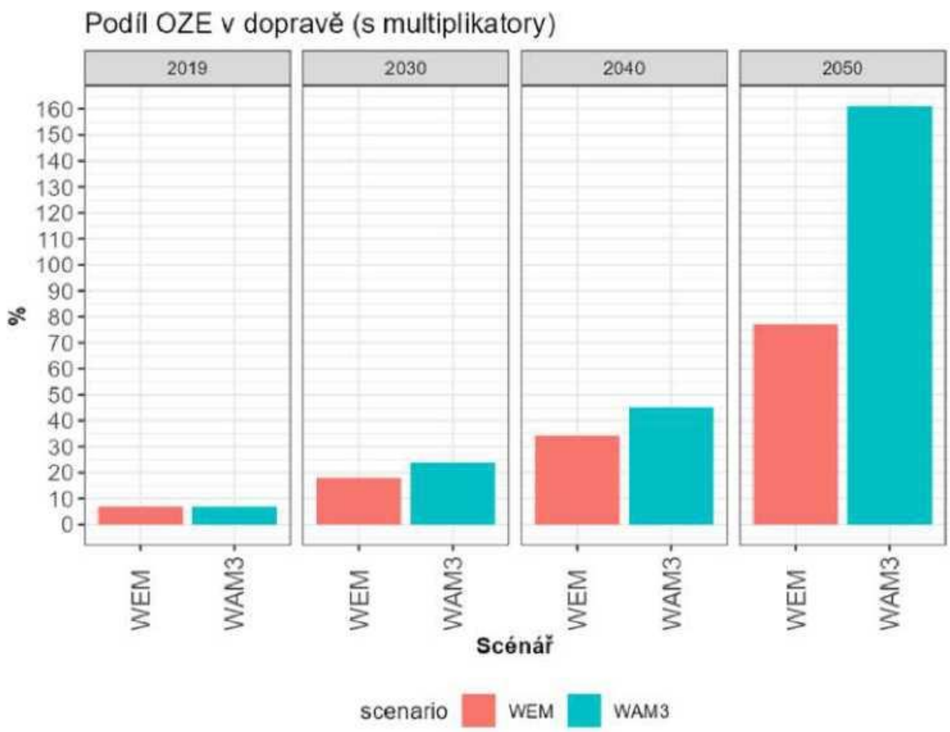
Graph 116: *Share of RES in gross final consumption*



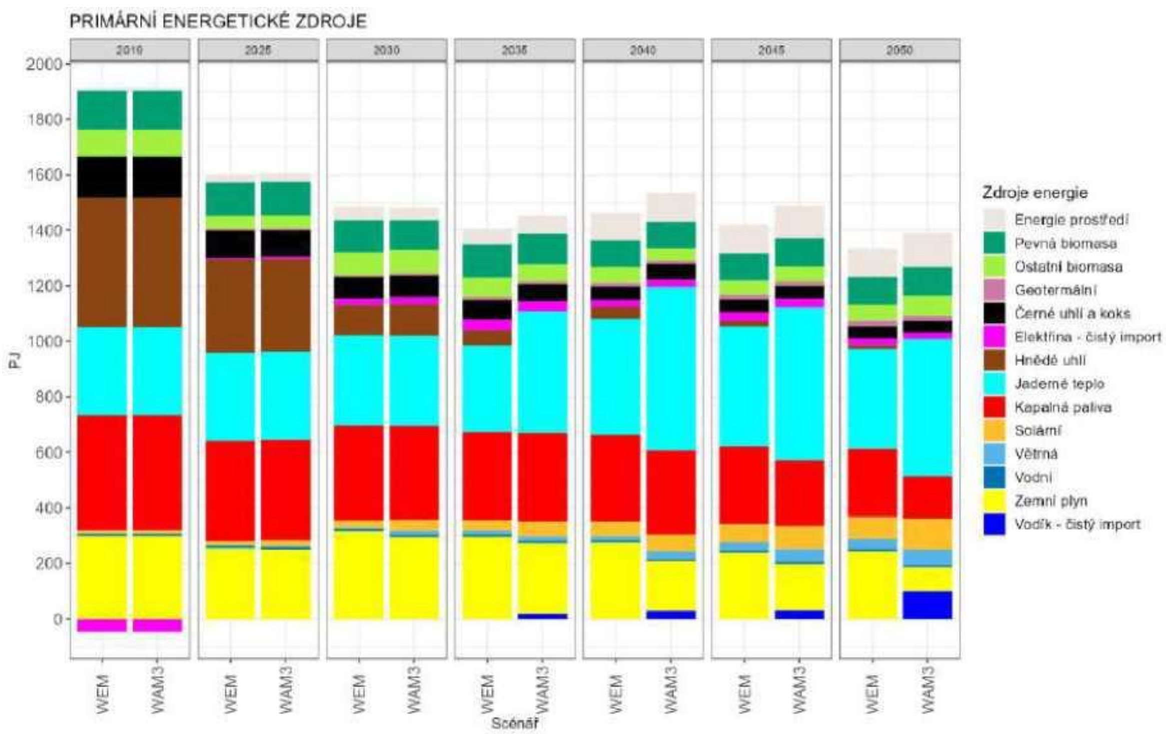
Graph 117: *Share of RES in gross final consumption of electricity*



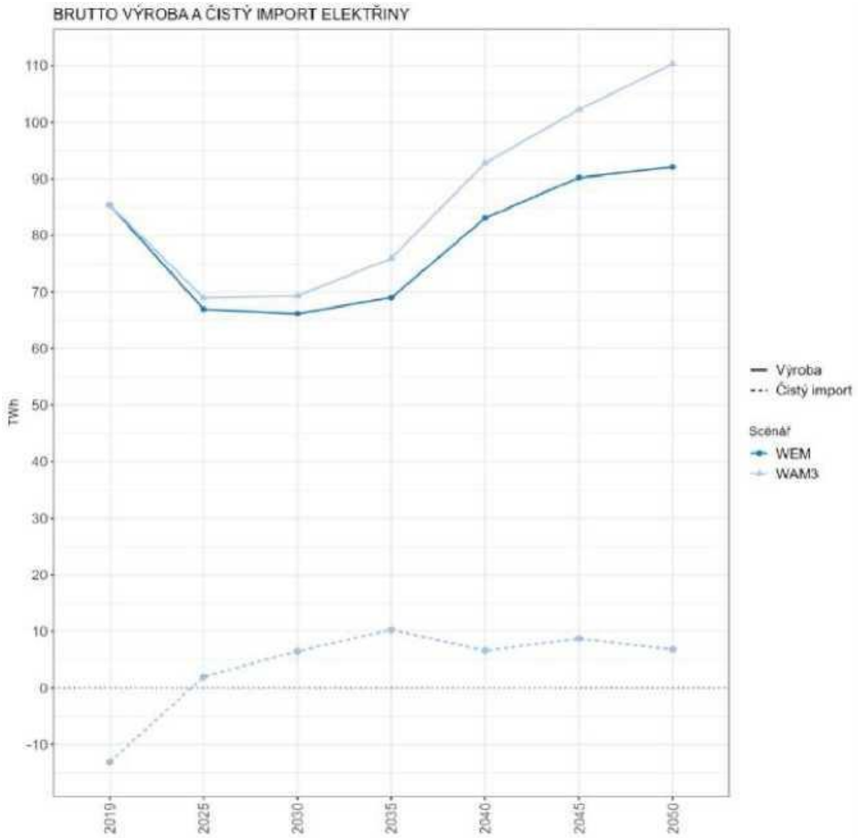
Graph 118: *Share of RES in transport (with multipliers)*



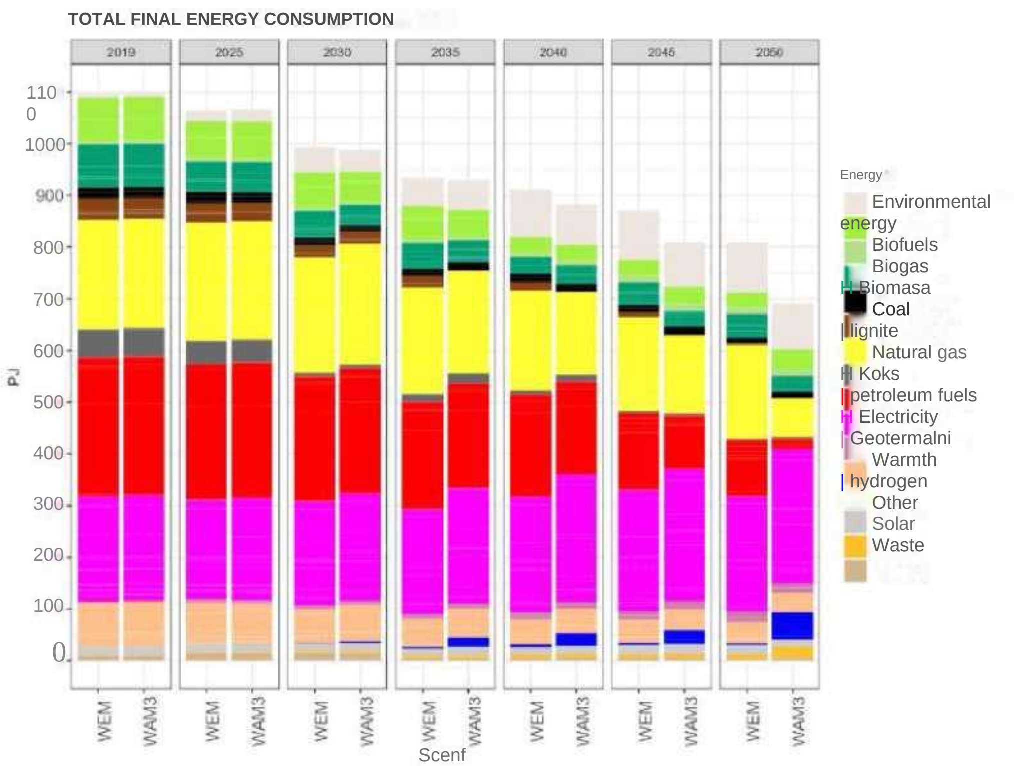
Graph 119: *Primary energy sources*



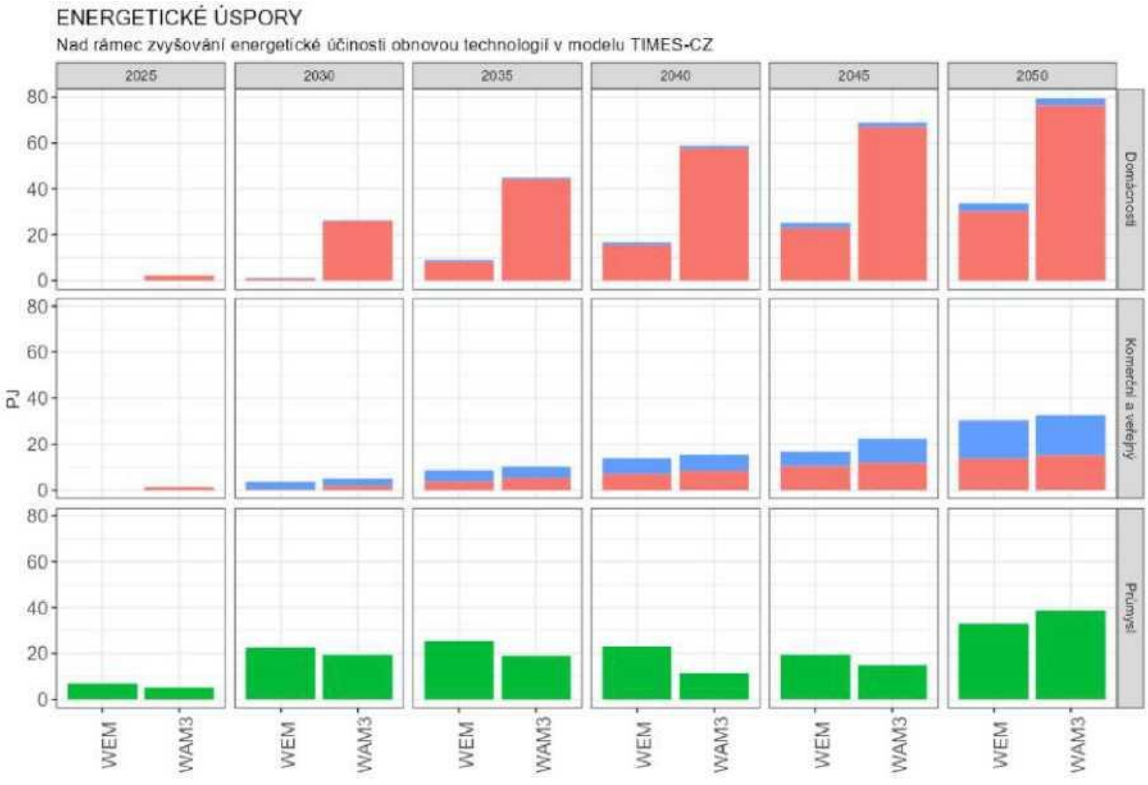
Graph 120: *Production (gross) and net import of electricity*



Graph 121: *Total final energy consumption*

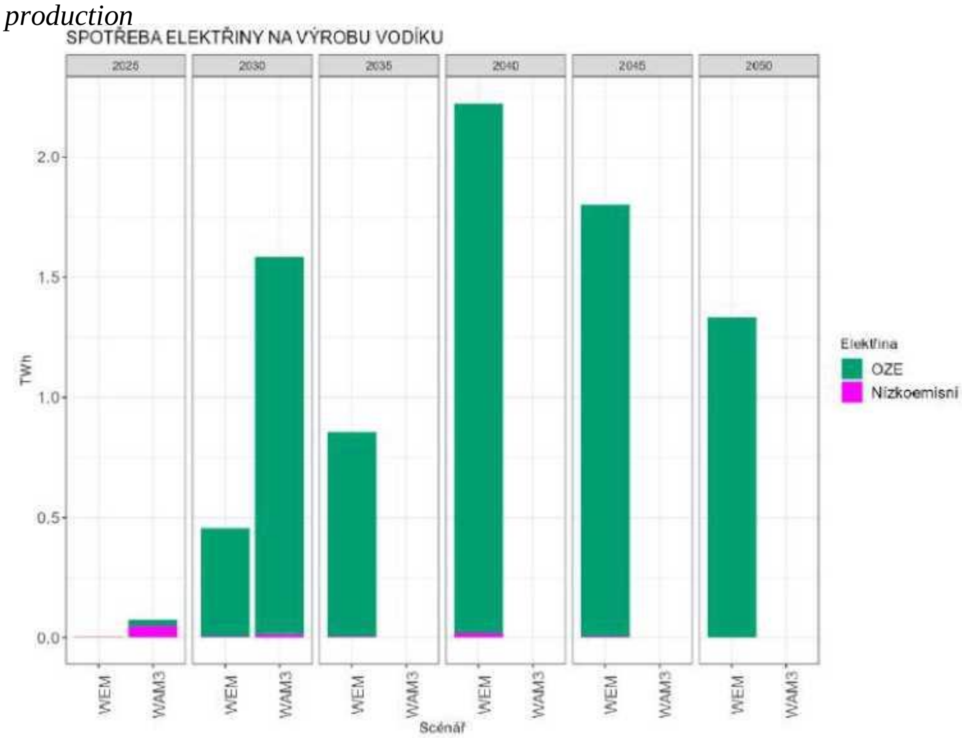


Graph 122: *Energy savings (beyond increasing energy efficiency through technology renewal)*

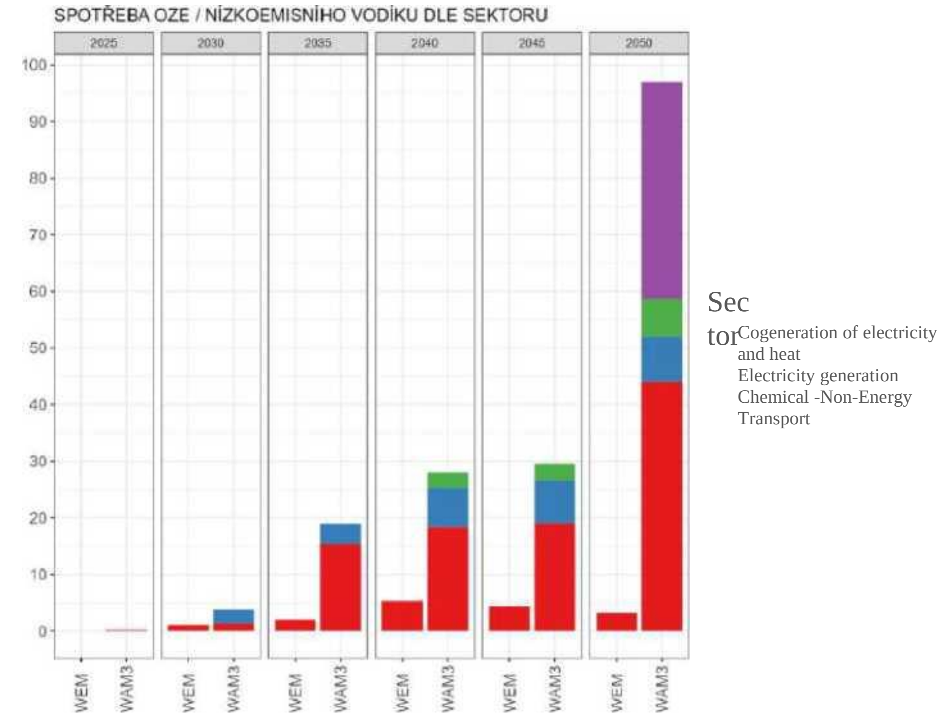


Type | | Renovation of | Heat Savings and technology H Increasing efficiency of other electrical appliances

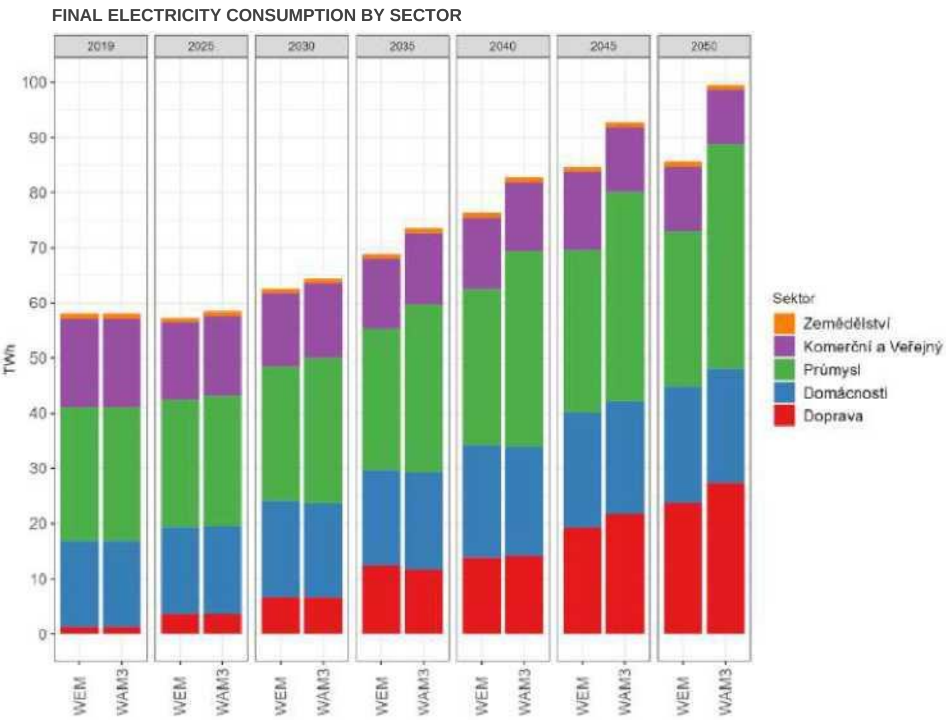
Graph 123: *Electricity consumption for hydrogen production*



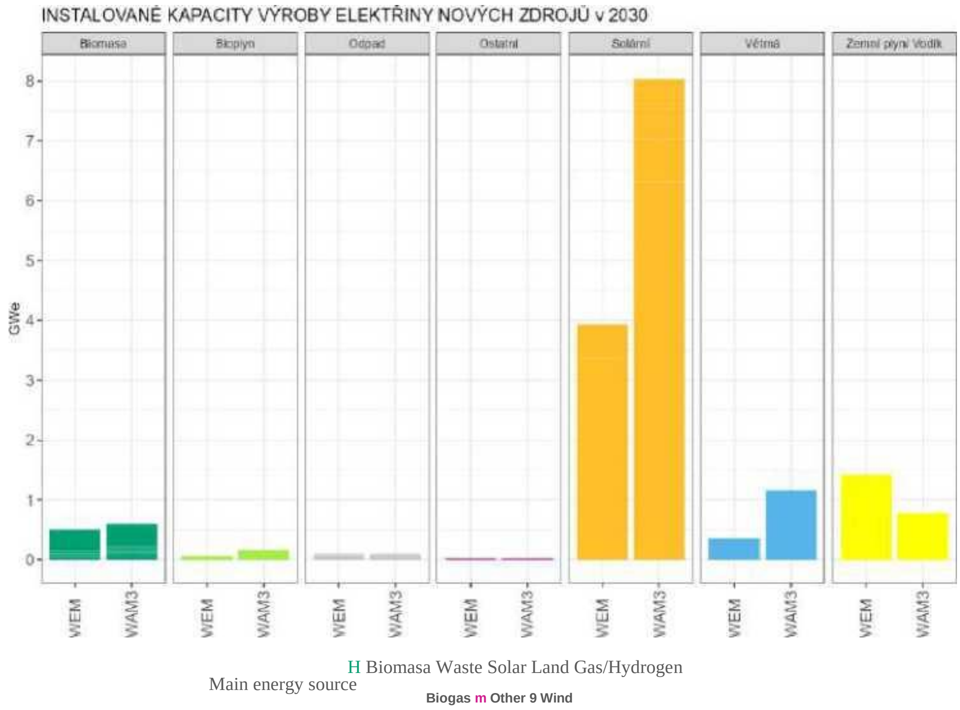
Graph 124: *Consumption of RES/low-emission hydrogen by sector*



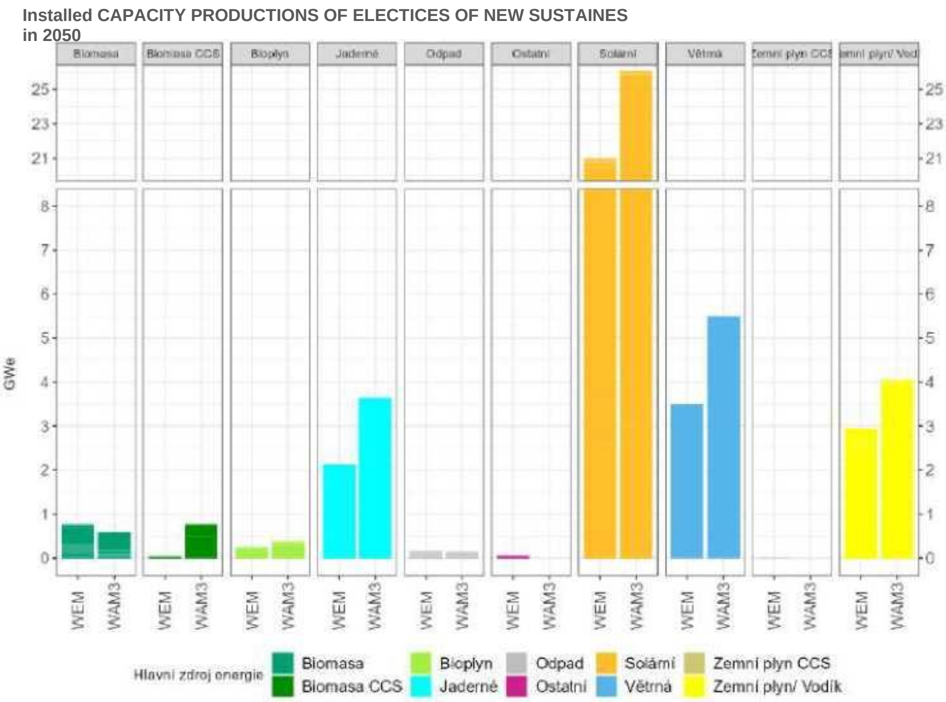
Graph 125: *Final electricity consumption by sector*



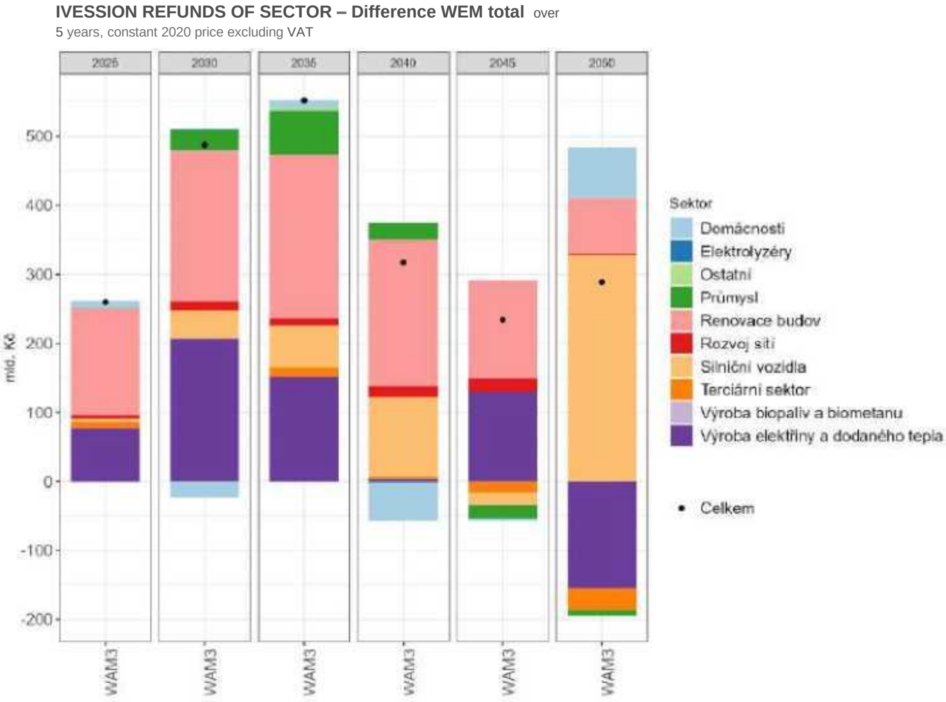
Graph 126: *Installed electricity generation capacity of new sources in 2030*



Graph 127: *Installed electricity generation capacity of new sources in 2030*



Graph 128: *Investment costs by sector (difference from WEM scenario)*

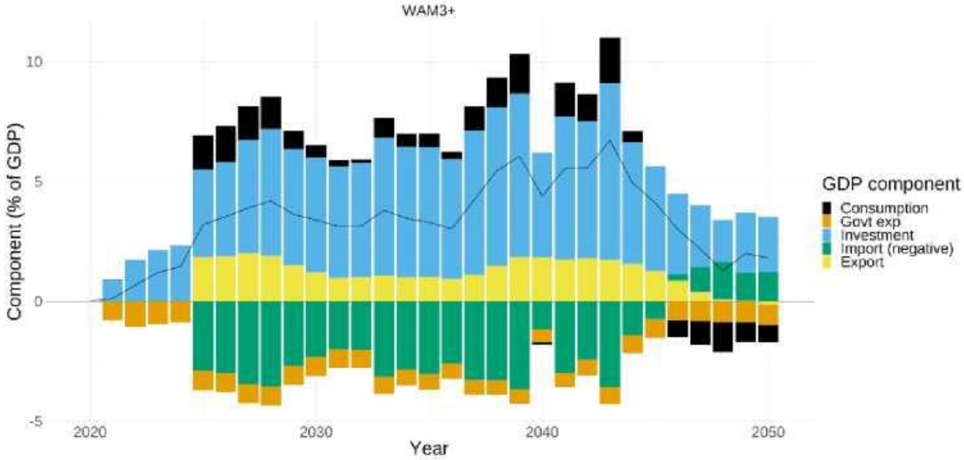


4.2.1

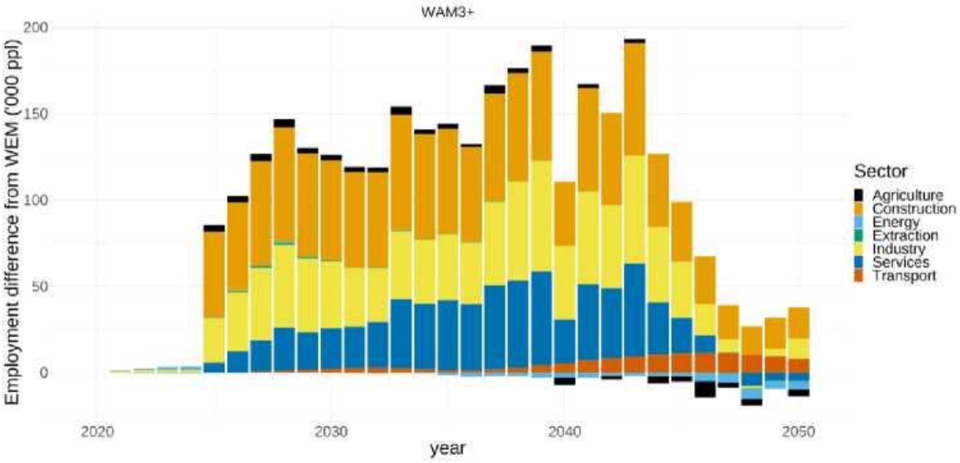
5.2 Macroeconomic and, where feasible, health, environmental, skills, social, employment and education impacts (in terms of costs and benefits as well as cost-effectiveness) of the planned policies and measures described in Section 3, at least until the last year of the period covered by the plan, including comparison with estimates under existing policies and measures

5.2.1.1 Macroeconomic impacts

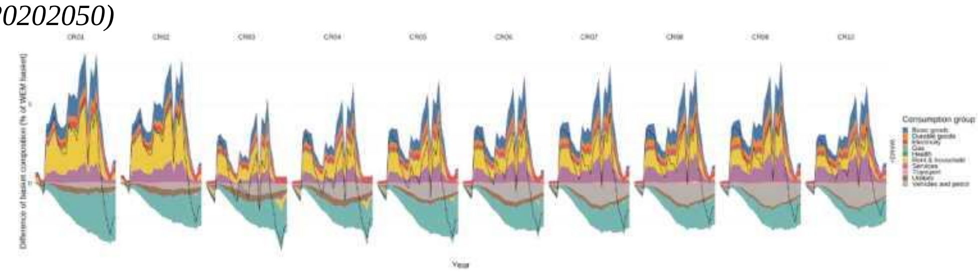
Graph 129: *WAM3 GDP difference to WEM+ (2020-2050)*



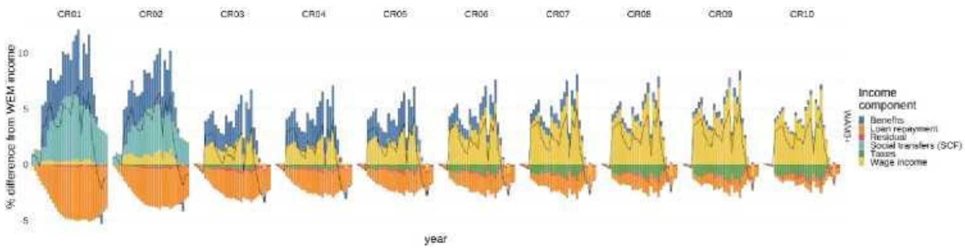
Graph 130: *WAM3 employment gap with WEM+ (2020-2050)*



Graph 131: *Distributional impacts – Difference in the composition of consumption buckets by income deciles (20202050)*



Graph 132: *Distributional effects – income gap by income decile (2020-2050) (emphasis added)*



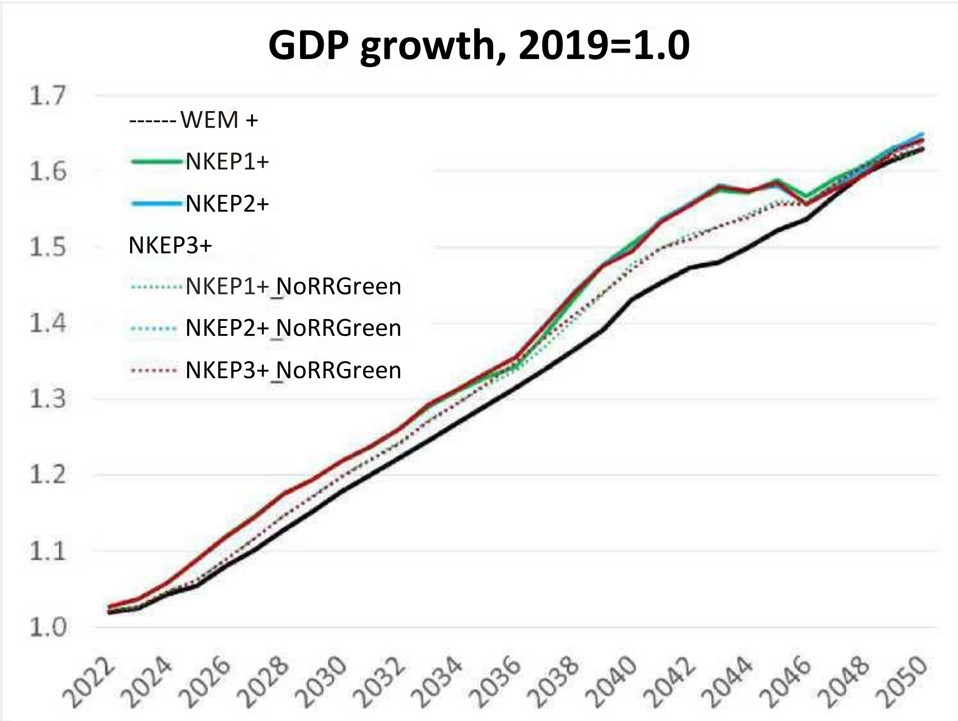
Long-term GDP growth benchmark

The benchmark for GDP growth in the E3ME model has been adjusted according to the MF's macroeconomic forecast of August 2023 until 2026 and continues to work according to its own growth benchmark. Modelling takes place at the level of the world's main economic units, and the model contains the EU on a national basis. Over the long period to 2050, this is a modelled trajectory for comparing WEM+ scenarios (i.e. without regulation of the Fit for 55 package) with policy-based scenarios – in particular, WAM3 or in the chart below NKEP3 represents the scenario considered as the final impact of the envisaged policies and measures in the NKEP with an impact on the achievement of the related objectives. However, the graph is not a prediction of the evolution of GDP over such a long period.

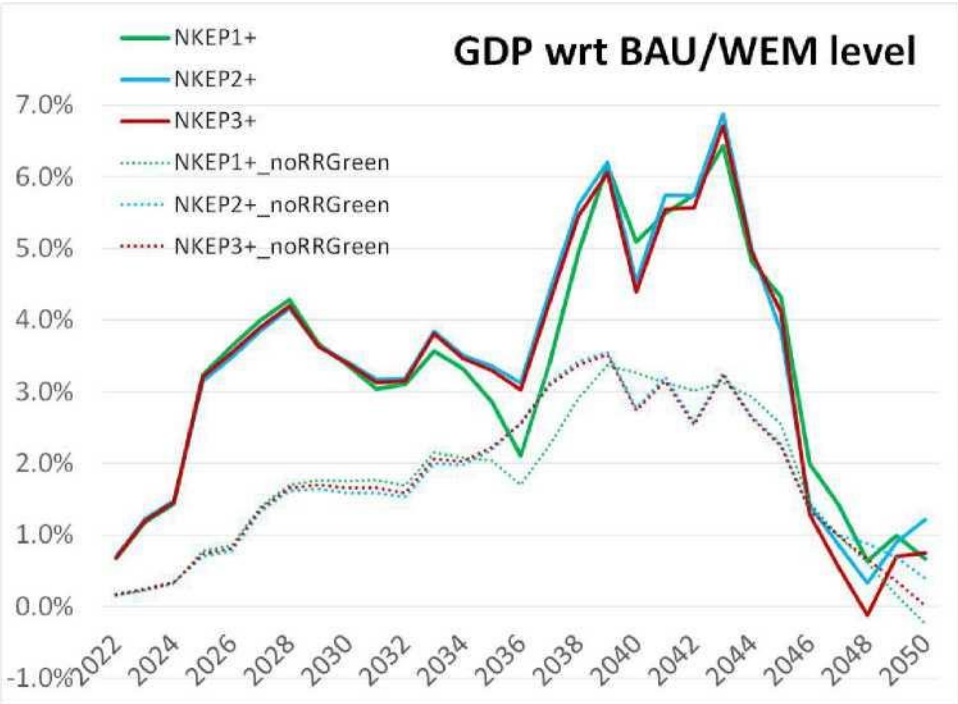
The use of revenues from emissions trading is crucial for the modelled impacts, the modelling simulates support flows (from EU ETS revenues) as follows:

- The WEM+ scenario includes the Modernisation Fund in the Czech Republic and the EU Innovation Fund as set out before Fit for 55, auction proceeds are revenue from the State budget
- NKEP1+, NKEP2+, NKEP3+ include the Modernisation Fund in the Czech Republic, the Social Climate Fund, the EU Innovation Fund (as set out in Fit for 55) and auction proceeds are allocated to support decarbonisation investments and mitigate negative social impacts
- The scenarios identified by "noRRGreen" include the Modernisation Fund in the Czech Republic, the Social Climate Fund, the EU Innovation Fund (as set out in Fit for 55), but auction proceeds are revenue from the State budget or used to cover existing expenditure and thus simulate the reduction of sovereign debt

Graph 133: *Comparison of scenarios taking into account Fit for 55 policies vis-à-vis WEM+*



Graph 134: *Comparison of scenarios with Fit for 55 policies vis-à-vis WEM+*



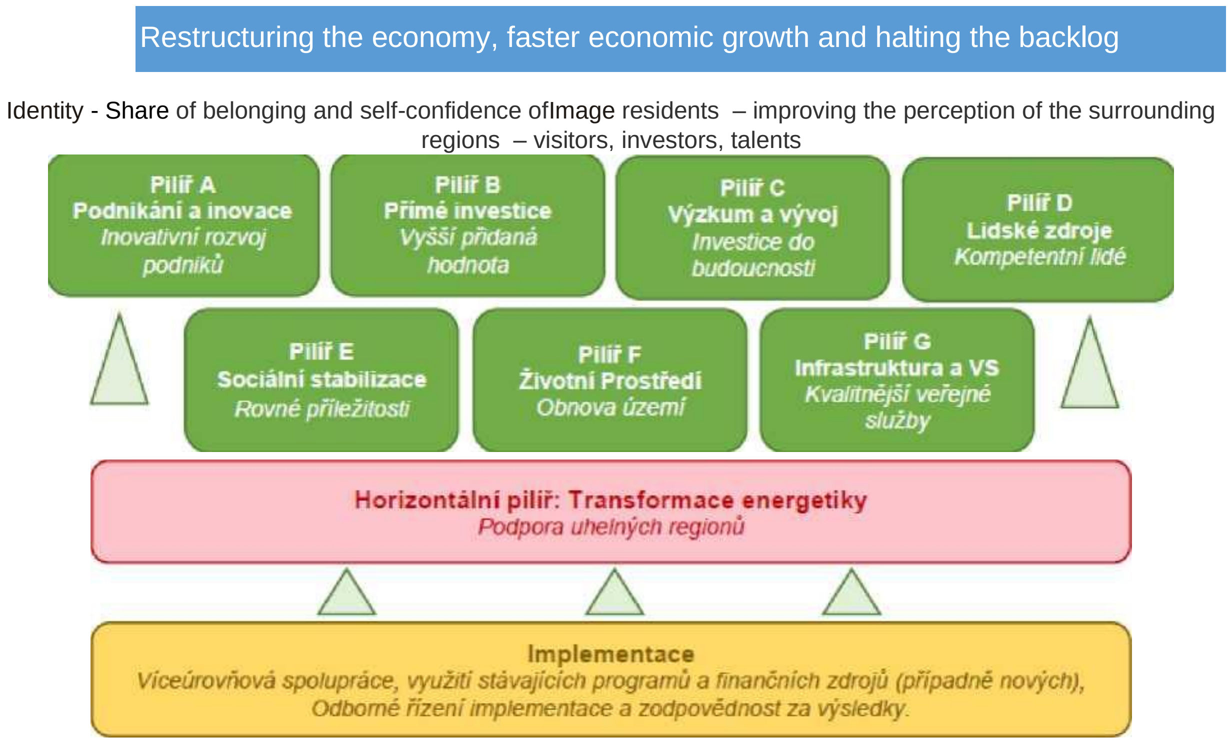
Just transition aspects

Re:START strategy

The RE:START strategy is a comprehensive framework for the economic restructuring of the Ústí nad Labem, Moravian-Silesian and Karlovy Vary regions to contribute to the just transition of coal regions. The programme was established on the basis of Government Resolution No 826 of 19 October 2015, under which the government decided on the need to support the economic restructuring of the Ústí nad

Labem, Moravian-Silesian and Karlovy Vary regions. On the basis of this resolution, the Ministry of Regional Development commissioned an initial analysis to assess in detail the current situation, the most serious problems and the development potential of the regions concerned. The subject of the analysis was not only an extensive macro-economic analysis, but also a collection of ideas and experiences that took place directly in the various regions. On the basis of an initial analysis, the so-called strategic framework has been developed. This document does not yet propose concrete measures, but identifies their basic principles common to all regions. The strategic framework expresses the government's long-term strategy to support, facilitate and accelerate the restructuring of the economy in structurally affected regions. Concrete measures are then part of the action plans. The action plans approved by the government combine measures from the business and innovation pillars, direct investment, R & D, human resources, social stabilisation, environment, infrastructure and public administration, energy transition. On 14 December 2022, the 5th update of the Comprehensive Action Plan of the restructuring strategy of the Ústí nad Labem, Moravian-Silesian and Karlovy Vary regions 2023-2024 was approved. Figure 18 presents the main objectives and pillars of the RE:START strategy. Table 121 then presents the cumulative financial requirements for the measures under each action plan. FOR 5. The Action Plan is then a pre-requisite for financial requirements.

Figure 24: *Key objectives and pillars of the RE strategy:START*



Source: Re:START strategy

Table 106: Global financial requirements for measures under each RE:START action plan

	1. Action plan	2. Action plan	3. Action plan	4. Action plan	5. Action plan
Total allocation in CZK million	**40 445**	**16 901**	**11 090**	**73 644**	**1 950**
Implementation time	2017-2030				

Source: Re:START strategy

Initiative for coal regions in transition

In 2017, the European Commission initiated the establishment of the Coal Regions Transformation Platform, later renamed the "Initiative for Coal Regions in Transition" initiative. In total, there are 41 regions in the EU in 12 Member States. In 2019, 18 coal regions were actively involved in the platform, including three regions from the Czech Republic, namely the Moravian-Silesian, Ústí nad Labem and Karlovy Vary regions. The Czech Republic considers the platform to be very important and will seek maximum involvement.

The initiative aims to help Member States and regions in their efforts to modernise their economies and prepare them to address the structural and technological transition in coal regions. The EU's commitment to the clean energy transition is irreversible and indisputable. The initiative aims to facilitate the development of long-term strategies in coal regions to support the clean energy transition by focusing more on social fairness, new skills and the financing of the real economy.

The Coal Commission of the Czech Republic

By Resolution No 565 of the Government of the Czech Republic of 30 July 2019, the so-called Uhelná Commission was set up. The Coal Commission is currently closed. This commission was chaired by the Minister for Industry and Trade together with the Minister for the Environment. The Commission had a total of 19 members. Key departments and offices, trade unions and industry/economic associations, non-profit organisations, regions, Chamber of Deputies and academia were represented. The Coal Commission's remit was defined by the following outputs: (I) an assessment of the future needs of lignite, focusing on the assessment of individual large combustion sources in the form of a comprehensive analysis; (II) an analysis of the potential for future diversion from the use of coal in combustion sources. The remit of the Commission is not limited in time. The Coal Commission has appointed three working groups: (I) to set a timetable for the depletion of coal, in the overall context of the Czech Republic's energy mix and climate protection; (II) for setting parameters for a possible diminution of resources and legislative issues, and (iii) for identifying social and economic impacts.

Territorial Just Transition Plan (TJTP)

Government Resolution No 815 of 17 July 2020 ordered the launch of the Territorial Just Transition Plan (TJTP). The Ministry of Regional Development and its coordinator, RESTART, have been tasked with coordinating this work. The document was processed in accordance with the prescribed structure laid down in Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021 establishing the Just Transition Fund. The processing was discussed with representatives of the European Commission, structurally affected regions and the departments concerned. The fund is intended for three regions – Ústí nad Labem, Moravian-Silesian and Karlovarský – which face serious socio-economic challenges due to the transition process towards a climate-neutral economy. Support for the so-called coal regions is mainly to create new jobs, help workers move to other sectors and rebuild land after mining or downstream industries. To address the social and economic consequences, a Just Transition Mechanism has been created.

The Just Transition Operational Programme builds on the Territorial Just Transition Plan in its strategic part as well as in the proposals for each priority. Together with this programme, it was approved by the European Commission on 26 September 2022. The update of the Territorial Just Transition Plan is linked to the Czech Republic's National Energy and Climate Plan.

5.3 Overview of funding sources and investment needs

Under Regulation 2018/1999, the following information should be provided under this part: (I) current investment flow and future investment assumptions in terms of planned policies and measures; (II) sectoral or market risk factors or barriers at national or regional level; (III) an analysis of the additional public financial support or the means to remedy the shortcomings identified as referred to in point (ii). A somewhat different structure has been chosen in this respect, but the information required by Regulation 2018/1999 should also be available under that structure.

5.3.1 Current investment flow

Table 107: *Overview of funding sources and assisted areas*

Programme	Source of funding	Time frame	Areas of support	Estimate of allocation (mld. (CZK)	N.B.
Technology and Competitiveness Operational Programme (OP TAK)	Cohesion funds	2021-2027	- promoting energy efficiency and reducing greenhouse gas emissions (specific objective 4.1.) - promotion of energy from renewable sources (specific objective 4.2.) - development of smart energy systems, grids and storage (specific objective 4.3.) - promoting clean mobility (specific objective 4.4.)	29,1	allocation of priority 4 (towards a low-carbon economy): EUR 29.14 billion CZK (SC 4.1: EUR 13 billion CZK; SC 4.2: EUR 6.7 billion CZK; SC 4.3: EUR 7.6 billion CZK; SC 4.4: EUR 1.9 billion (CZK)
Operational Programme Environment (RPE)	Cohesion funds	2021-2027	- improving the energy performance of public buildings and infrastructure and reducing greenhouse gas emissions - replacement of combustion sources (cold subsidies)	16,2	

Operational Programme Transport (OPD)	Cohesion funds	2021-2027	- upgrading of electrified lines and electrification - chargers and fillers for public use - construction and modernisation of tram and trolleybus lines	38,6	This is indicative allocation, mainly for upgrading electrified lines and electrification (12.2 billion). (CZK)
Modernisation Fund (ModFond)	EU ETS	2021-2030	- support for renewable energy sources - improving energy efficiency - decarbonising industry - decarbonising the heating sector - electricity distribution - reconstruction of public lighting - Community energy -purchase of vehicles for rail transport and combined transport technologies	389,5	RES+ NAVYEN ESTIMATE: 113 billion HEAT CZK: 71, 7 billion ENERG ETS: 60, 8 billion ENERG Com: EUR 15.2 billion CZK ENERG Gov: EUR 17.4 billion HOUSEnerg: 61, 7 billion CZK GREENGAS: CZK 13 billion LIGHTPUB: 6, 5 billion ELEGRID CZK: 17.4 billion COMUNERG: EUR 13 billion Purchase of vehicles and KD: CZK 45 billion

National Recovery Plan (NRP)	Innovation Fund	2021-2026	Component 2.2.1 Measures to improve the energy performance of buildings of organisational units of the State: support for the revitalisation of buildings of organisational units of the State with a view to reducing final energy consumption and achieving primary energy savings from non-renewable sources. MINISTRY OF INDUSTRY AND TRADE Component 2.2.2 Implementation of projects to improve the energy efficiency of public lighting systems: renovation and innovation of the public lighting system of cities and municipalities to achieve electricity savings, including preparation for charging stations in the form of pre-cabling (EV ready). MINISTRY OF INDUSTRY AND TRADE Component 2.2.3 Implementation of	33,0	Total allocation: EUR 8.265 billion CZK
			Component 2.5.3 Support for pre-project training and awareness-raising, education, training and awareness in the field of energy savings through vocational training and the enhancement of professional competences in the field of energy savings and their achievement by the		EUR 0,4 billion CZK
			Component 2.3 Transition to clean energy sources: - installation of FVE in the business sector - modernisation of heat distribution		EUR 6.7 billion CZK Component 2.3 (Clean power transition): (I) FVE installation within the business sector (public support: 5 billion CZK; (II) modernisation of heat distribution (public aid: EUR 1.66 billion (CZK)

			Component – 2.4 – MHD in Prague – Vehicles and lines		
			Component 2.5.1+ 2.5.2 – New green savings programme		EUR 17.6 billion CZK. Implementation of measures to improve the energy performance of household and multi-family buildings, replacement of inefficient heating sources with heat pumps and biomass boilers, FVE and FTS installations, adaptation and mitigation measures.
New Green Savings and New Green Savings Light			improving the energy performance of family and multi-family buildings	55	The new Green Savings (Green Savings) were financed from emission allowances (or the State budget – expenditure corresponding to assigned revenue) in the period 2014-2023 – 21.7 billion. CZK, receipt of applications closed on 11.10.2021. NEAs under NPO (component 2.5.1 + 2.5.2) – allocation of EUR 17.6 billion. CZK (including an increase of 1.98 billion. CZK in the NPO update, not yet approved by the Commission); the NEA's allocation from the NPO was exhausted at the end of 2022, the receipt of applications closed on 30/06/2023. A request received in addition to the NPO allocation is included in HOUSEnerg. HOUSEnerg – approx. 55 billion allocation CZK, includes the NZÚ Light.
Operational Programme Just Transition	Just Transition Fund	2021-2027	Clean energy, digital innovation, people and skills, circular economy, territorial renewal, entrepreneurship, research and development	EUR 1641492008 including TA EUR 1575832328 excluding TA	The OPST allows to address the social, economic and environmental impacts of the transition to a climate-neutral economy in Karlovarské, Moravian-Silesian and Karlovy Vary regions.

					Significant investments will be made in these regions through the JTF in: - supporting the development of new, forward-looking sectors, entrepreneurship, start-ups and transformation of existing ones - innovation and research to develop the innovation ecosystem in the regions; - new sources of clean energy, not only in transport and other sectors; - promoting digitalisation; - supporting the strengthening of the circular economy; - support for reskilling, retraining workers in new technologies and processes, supporting the creation/maintenance of jobs, – support for repurposing of territories directly and indirectly affected by mining or industrial activities.
EFEKT programme	State budget	2021-2027	support for pre-project preparation, consultancy activities in the form of energy consultation and information centres, education and energy management and energy concepts with a view to achieving energy savings and improving energy performance	1,0[146]	This is the planned budget. The actual allocation may vary according to the allocation negotiations in the context of the budgeting process.
Panel 2013+ programme	State budget	continuous challenge	preferential loans to owners of apartment buildings to promote the improvement of the energy	1,0	
Social Climate Fund	EU ETS2	2026-2032	The aid will be granted to vulnerable groups/see comment box on: □ temporary support insurance of vulnerable groups □ measures a investments: (a)	50	The aid pursues two objectives: □ greenhouse gas emissions reductions; □ — a reduction in the number of vulnerable households; households in particular

146The value will be adjusted in line with the medium-term budgetary outlook.

			energy effectiveness; (b) building renovation; (C) zero- and low-emission mobility and transport;		energy poverty, vulnerable micro-enterprises and vulnerable transport users.

Table 108: *Financial resources for the Czech Republic to modernise the energy sector by 2030*

Financial resources for the Czech Republic to modernise the energy sector by 2030

Revenue from emission allowances	**334 billion CZK**
Modernisation Fund	**EUR 400 billion CZK**
Revenues from the sale of allowances in the housing and road transport sectors (ETS2) and the Social Climate Fund	**100 billion CZK**
Just Transition Fund	**EUR 37.3 billion CZK**
National programmes financed by the European Regional Development Fund (ERDF)	**162 billion CZK**
National programmes financed by the Cohesion Fund	**102.5 billion CZK**
National Recovery Plan	**EUR 67.3 billion CZK**
Extending the RRF to deliver on REPower EU objectives	**EUR 11.25 billion CZK**
Total	**EUR 1 214,35 billion CZK**

Financial resources for energy modernisation	**Amount (billion) (CZK)**
Revenue from emission allowances	334
Modernisation Fund	400
Revenues from the sale of allowances in the housing and road transport sectors (ETS2) and the Social Climate Fund	100
Just Transition Fund	37,3
National programmes financed by the European Regional Development Fund (ERDF)	162
The Cohesion Fund	102,5
National Recovery Plan	67,3
Extension of the RRF to deliver on REPowerEU objectives	11,25
Total	1 214,35

5.3.2 Sources of funding

5.3.2.1 Overview of sources of funding

EU Multiannual Financial Framework and other financial resources at EU level

Under the Multiannual Financial Framework (MFF) 2021-2027, 30 % should be allocated to climate-related issues across the different parts of the whole budget. Table 109 provides an overview of the sources of funding for energy-climate coils at EU level for 2021-2027 (part of the programmes go beyond the MFF, the Innovation Fund, the Modernisation Fund and the Union Fund for RES Support). Table 110 then provides a quantification of the resources available for financing energy-climate objectives at EU level.

Table 109: *Overview of sources of funding for energy-climate objectives at EU level*

Name of programme	Description
The European Regional Development Fund and the Cohesion Fund.	Proposed budget 2021-2027: 273 billion EUR; strengthening the link between the European Semester and the national energy and climate plans; relevant target shells: area 2 ‘a greener, low-carbon Europe’, Climate mainstreeming: ERDF: 30 %, CF: 37 %.
Connecting Europe Facility (CEF)	Proposed budget 2021-2027: EUR 8.65 billion EUR; continuing support for TEN-E; new support for border support in the field of renewable energy sources at 15 % (CEF-E), 1 % of the budget earmarked for technical and administrative assistance; climate mainstreeming: 60 %.
InvestEU Programme	A new EU financial instrument, proposed budget: 38 billion EUR (mobilisation of private capital up to 650 billion. EUR); main illustrative partner: THE EIB; climate mainstreeming: 40 %.
Horizon Europe	Proposed budget 2021-2027: EUR 97.6 billion EUR (window ‘Climate, Energy and Mobility’: EUR 15 billion EUR); climate mainstreeming: 25 %.
Life programme	Proposed budget 2021-2027: EUR 5.45 billion EUR; programmes: nature and biodiversity, circular economy and quality of life, mitigation and adaptation of climate change, ‘clean energy transition’ (1 billion. EUR); climate mainstreeming: 61 %.
Union RES Support Fund	Enshrined in Article 33 of Regulation 2018/1999 on the Governance of the Energy Union and Climate Action. The implemented act should be held by the Energy Union Commission at the end of 2019 or early 2020.
Innovation fund	Established for the EU as a whole (no direct allocation per Member State, as in the case of the Modernisation Fund, but the European

	allocate 5 billion EUR to countries with below average GDP/ax); foreseen allocation: tens of billions EUR; adoption of first projects: half 2020; 60 % co-financing.
Modernisation Fund	Only 10 Member States (BG, CZ, EE; HR, LV, LT, HU, PL RO, SK)147; at least 80 % and 90 % must be allocated to priority projects.

Source: Overview presentation sent to the Technical Working Group by the European Commission (17. 9. 2019)

Table 110: *Quantification of funding sources for energy-climate objectives at EU level (EUR million)*

Name of programme	2021-2027 (EC proposal)	2014-2020 (EU27+EDF)
Main programmes relevant for energy and climate		
Connecting Europe Facility (CEF)	8,650	4,163
ITER	6,070	2 910
Nuclear Decommissioning (Lithuania)	552,0	451,0
Nuclear safety and decommissioning of nuclear resources (Bulgaria and Slovakia)	626,0	883,0
Life programme	5 450,0	3 170,0
of which clean energy	1 000,0	—
InvestEU	14 725,0	—
Horizon Europe	97 600,0	66 034,0
European Fund for Regional Development	226 308,0	193 398,0
The Cohesion Fund	46 692,0	74 589,0
Other possible energy and climate relevant programmes		
Euratom Research and Training Programme	2 400,0	2 085,0
Neighbourhood, Development and International Cooperation Instrument	89 500,0	70 428,0
Instrument for pre-accession assistance	14 500,0	12 799,0
Programmes outside the multi-annual financial framework		
Innovation fund	tens of billions EUR	—
Modernisation Fund	20 000	—

Source: Overview presentation sent to the Technical Working Group by the European Commission (17. 9. 2019)

147As of 2024, 13 Member States will be able to benefit – outside the existing new EL, PT and SI

Public sources of funding available to the Czech Republic

Table 111 gives an overview of the main sources of funding for the implementation of the National Plan of the Czech Republic. The main sources of public finance can be identified as (i) the State budget, (ii) the EU Multiannual Financial Framework/operational Programmes for 2021-2027, (iii) revenues from the sale of emission allowances and (iv) the Connecting Europe Facility (CEF). More detailed information on the different sources of funding is provided below.

Table 111: *Overview of sources of financing for the implementation of the National Plan of the Czech Republic*

Source of finance	Description
State budget	In particular, the State budget foresees operating support for renewable energy sources as well as programmes linked to the promotion of energy efficiency (e.g. the national EFEKT programmes, PANEL).
EU Multiannual Financial Framework/Operational Programmes (EU Funds) for 2021-2027	Energy and climate concern in particular the Operational Programme Competitiveness, the Environment Operational Programme, the Operational Programme Transport and the Integrated Regional Operational Programme, Rural Development Programme, etc.
Proceeds from the sale of emission allowances	Pursuant to the amendment to Act No 383/2012 on the conditions for trading in greenhouse gas emission allowances. The Government's draft amendment foresees use through the Modernisation Fund also for the fulfilment of energy-climate objectives under the responsibility of the Ministry of the Environment and the Ministry of Industry and Trade. The Czech Republic will also endeavour to prepare projects for the use of centres from the Innovation Fund
Connecting Europe Facility (CEF)	The Connecting Europe Facility (CEF) is an important financial mechanism for financing the key information infrastructure in the field of electricity and wildlife.

Source: self-processing of the Ministry of Industry and Industry and Trade

5.3.2.2 European Union Funds (EU Funds)

This is an important source of funding for the 2014-2020 period to ensure the development of the energy sector and the achievement of European and national energy targets. As regards the 2021-2027 period, on 2 May 2018, the EC published a proposal for the Multiannual Financial Framework 2021-2027. The budget is designed to address the main priorities and policies that provide the highest European added value. Overall, the Commission proposes a long-term budget of EUR 1279 billion in commitment appropriations (expressed in current prices) for the period from 2021 to 2027, corresponding to 1.11 % of the gross national income (GNI) of the EU-27. Taking into account inflation, the level of the budget increased slightly compared to the current 2014-2020 budget (including the European Development Fund). The Commission has proposed a similar budget for cohesion policy as in the current period (but a slight increase of 3 % without the UK). In its first proposal, the Commission allocated around EUR 226 billion for the European Regional Development Fund (ERDF), around EUR 47 billion for the Cohesion Fund (CF) and around EUR 100 billion for the European Social Fund (ESF). Within this framework, the European Commission has also published information on which areas of funds will go and how they will need to follow up on those directly managed by the European Commission. The Czech Republic has been allocated an amount of EUR 18 billion. EUR at constant prices, which represents a fall of around 24 % compared to this period (20.1 billion). EUR in current prices).

Table 112: *Multiannual Financial Framework 2021-2027*[148]

	07-13 (EUR billion)		14-20 (EUR billion)		2021+ (EUR billion)	
	EU	**CZECH REPUBLIC**	**EU**	**CZECH REPUBLIC**	**EU**	**CZECH REPUBLIC**
ERDF	201	13,66	212	11,94	226	10,524
FG	70	8,82	75,4 (incl. transfer to CEF)	6,14	47 (incl. transfer to CEF)	6,44
ESF/ESF+[149]	76	3,77	84	3,43	100	2,737
Total	347	26,12 (7.52 %)	371	21,51 (5.8 %)	373	approx. 20.02[150]

Source: Ministry of Regional Development (National Coordination Authority)

Based on the analytical part of the National Concept for the Implementation of Cohesion Policy (NKR) and taking into account the overarching document of the Czech Republic 2030, five development priorities have been identified, to which EU funds can most effectively contribute. These priorities are: (I) a low-carbon economy and environmental responsibility; (II) development based on research, innovation and technology application; (III) an educated society and human capital; (IV) accessibility and mobility; (v) the sustainable development of the territory.

Even though the Czech Republic will receive about a quarter of less funding under the 2021+ EU financial framework than in the current period, it is still a significant source of funding, part of which will be allocated to support the transition to a low-carbon and circular economy and adaptation to climate change, which is one of the key five policy objectives (namely objective CP2)[151].

Table 113: *Five key policy objectives of the Multiannual Financial Framework*

Target indication	**TargetDescription**
CP 1	A smarter Europe promoting innovative and smart economic transition
CP 2	A greener, low-carbon Europe by promoting a clean and just transition
CP 3	A more connected Europe by increasing mobility and regional accessibility of information and communication technologies
CP 4	A more social Europe through the implementation of the European Pillar of Social Rights

[148] In that regard, it should be noted that the proposal for allocations for the post-2020 period may vary according to the negotiations on the Multiannual Financial Framework and cohesion policy legislation and the related financial aspects.
[149] For the period 2021+, this is 'ESF+' – the European Social Fund Plus.
[150] Of the total amount, some EUR 314 million is still allocated to European Territorial Cooperation.
[151] There has been a reduction in the number of thematic objectives compared to the 11 thematic objectives in the 2014-2020 period.

CP 5	A Europe closer to citizens by promoting the sustainable and integrated development of urban, rural and coastal areas through local initiatives

Source: Ministry of Regional Development (National Coordination Authority)

More operational programmes, such as the Operational Programme Transport, the Integrated Regional Operational Programme and the Environment Operational Programme, are relevant for achieving the climate and energy objectives. However, in particular the Operational Competitiveness Programme. Table 114 then lists the specific objectives that correspond to the policy objective of CP2, namely the priority "Stepping towards a low carbon economy" (SC 3.1-SC 3.4) and the priority "More efficient management" (SC 4.1-SC.4.2). 16.7 billion should be allocated to those specific objectives over the period 2021-2027. CZK. The proposal for the Operational Programme Competitiveness should be submitted to the Czech Government for approval by 31 March 2020.

Table 114: *Specific objectives under CP2 (Operational Competitiveness Programme)*

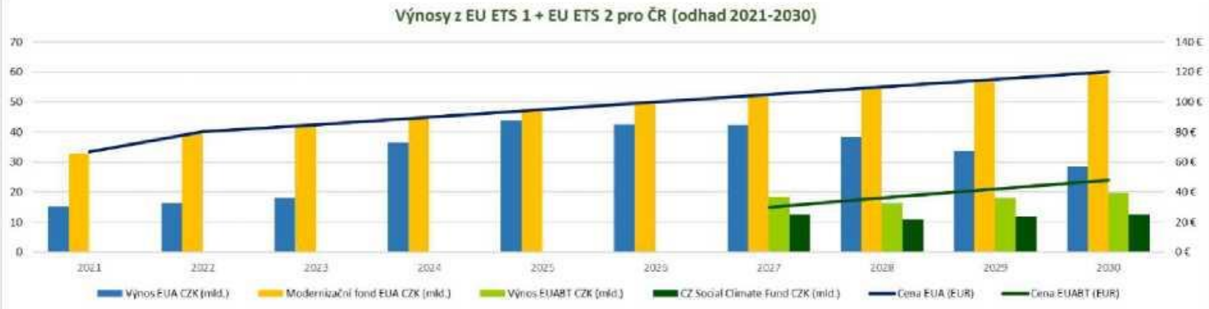
Target indication	TargetDescription
SC 3.1	Promoting energy efficiency measures
SC 3.2	Promotion of energy from RES
SC 3.3	Developing smart energy systems, grids and storage at local level
SC 3.4	Enhancing biodiversity, green infrastructure and reducing pollution
SC 4.1	Promoting climate change adaptation, risk prevention and disaster resilience
SC 4.2	Promoting the transition to a circular economy

Source: Ministry of Regional Development (National Coordination Authority)

5.3.2.3 Auction revenues for emission allowances

Expenditure corresponding to the assigned revenue from the sale of emission allowances shall be effected by means of a chapter. Ministry of the Environment, the Ministry of the Environment and the State Environment Fund on the basis of Act No 383/2012 on the conditions for greenhouse gas emission allowance trading. This law transposes Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading. The following chart shows the expected revenues from the sale of emission allowances in the period 2021-2030 and the distribution of those revenues. The amount of revenues depends on the price of the emission allowance.

Graph 135: Expected revenues from the sale of emission allowances in 2021-2030



Approximately it should be available for the period 2024-2030. EUR 762 billion CZK (depending on the price of the emission allowance).

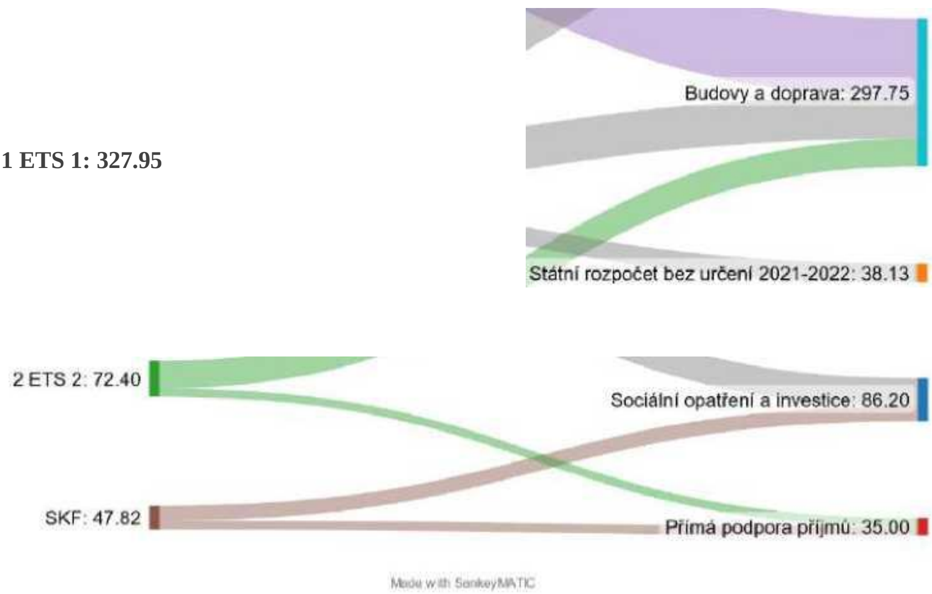
The figure below shows the expected sectoral distribution, around 47 % should go to energy and industry, 39 % to buildings and transport, 12 % to social measures and 2 % to direct income support.

Figure 25: *Use of revenues from emission allowances from 2021 to 2030* (billion) (CZK)

MODF: 481.26 **Energy and industry: 472.35**

Source: Ministry of the Environment

1 ETS 1: 327.95



5.3.2.4 Innovation Fund

The joint response of the European Union countries to the OVID-19 pandemic is the implementation of policies that will help mitigate the effects and support the recovery of the economy. Among them, the Recovery and Resilience Facility (RRF) is an essential economic element. The Recovery and Resilience Facility is one of the results of the agreement reached by the members of the European Council on 17-21 July 2020 on the EU's Multiannual Financial Framework and Next Generation EU for 2021-2027. This instrument aims to help European Union countries recover from the consequences of the pandemic and support investment in the green and digital transformation of the European economy.

The Government of the Czech Republic has prepared a National Recovery Plan. The national recovery plan is a strategic document by which the Czech Republic has requested a financial contribution from the Recovery and Resilience Facility

The National Recovery Plan contains the priorities of the Government of the Czech Republic and its individual components, including financial allocations, are designed to help bring the Czech economy out of the COVID-19 crisis and contribute to meeting reform and investment requirements.

The plan reflects the 2019 and 2020 specific Council recommendations to the Czech Republic under the so-called European Semester and its measures contribute to building resilience, to the digital and green transitions. It also reflects a demand for European legislation, with 37 % of expenditure to support climate transit and another 20 % to support the digital transition.

Investments included in the National Recovery Plan are broken down into 6 pillars, subdivided into components and specific reforms and investment actions.

Figure 26: *Scheme of the Czech National Recovery Plan*

In July 2023, the Government of the Czech Republic approved an updated National Recovery Plan (NRP), part of which will include a new RRF loan. Compared to the original NPO, with an allocation of 176.3 billion. This is an increase of approximately CZK 50 billion. CZK.

Figure 27: *Scheme for updating the Czech Republic's National Recovery Plan*

5.3.2.5 Just Transition Fund – The Just Transition Operational Programme.

The Just Transition Operational Programme is a completely new programme for 2021-2027 to address the effects of coal transition in the regions most affected – Karlovarské, Moravian-Silesian and Ústí nad Labem regions (the so-called coal regions).

In particular, the objective of the aid is to ensure sufficient employment for workers leaving the coal industry and improving the environment.

5.4 Impacts of planned policies and measures described in Section 3 on other Member States and regional cooperation at least until the last year of the envisaged period, including comparison with projections under existing policies and measures

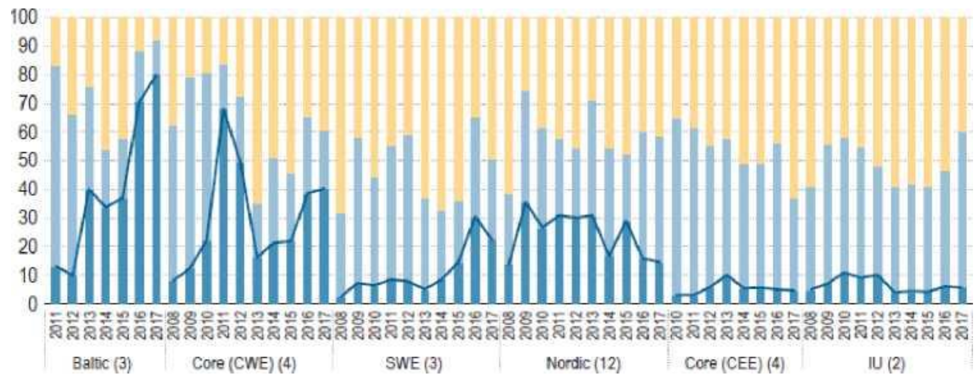
i) Impacts on the energy system in neighbouring and other Member States in the region to the extent possible

As part of the consultation process of the Czech Republic's national plan with the other Member States, which is described in more detail in Chapter 1.3 or part (iv), no policies and measures associated with significant regional impacts have been identified by the Member States consulted. Policies and measures that may have a potential impact on other Member States that are subject to a specific assessment of such impacts are, for example, cross-border infrastructure projects or other major projects subject to an environmental impact assessment. Key strategy papers are also subject to an environmental impact assessment, including a regional consultation. The Czech Republic's State Energy Concept underwent this process in 2014 and 2015.

ii) Impacts on energy prices, utilities and energy market integration

The Czech Republic is not a market large enough to have a significant impact on the price of electricity in the region. With regard to natural gas, the Czech Republic is a negligible producer in terms of volume. In turn, the continued integration of electricity and natural gas contributes to the gradual convergence of prices (see Chart 136 and Graph 137 respectively ACER/CEER source publication).

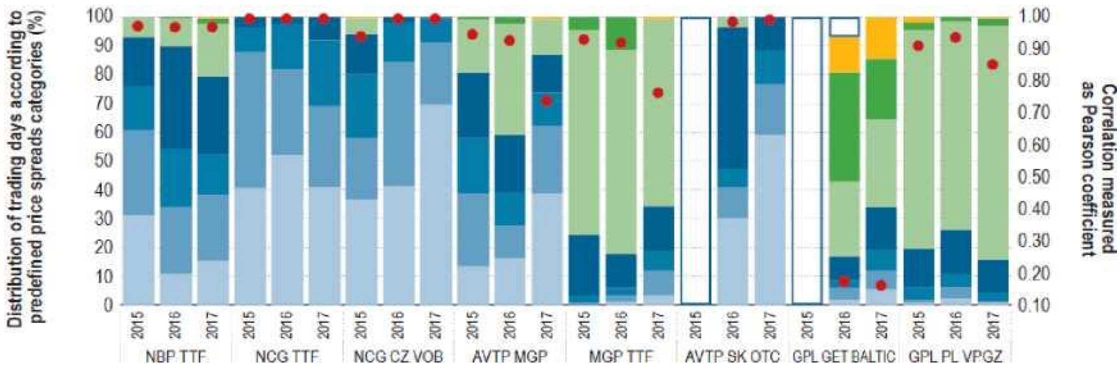
Graph 136: *Convergence of electricity prices in selected regions (DA)*



Full price convergence (0-1 euros/MWh diff.) I Moderate price convergence (1 – EUR 10/MWh diff.) Low price convergence (> EUR 10/MWh diff.) *Source: ENTSO-E and ACER calculations (2018).*

Notarial: The numbers in brackets reference to the number ofbidding zones included in the analysis per CCR.

Graf č. 137: *Konvergence cen zemního plynu ve vybraných regionech (DA)*



Source: Monitoring the Internal Electricity and Natural Gas Markets in 2017 (ACER/CEER)

Source: ACER based on Platts and/or/CIS Heren.
Notes: Spreads in euros/MWh are calculated as the absolute price differential between pairs of hubs, independent of discount or prémium. Lithuanian price analyses are based on a combination of day-ahead hub products and, for those days when day-ahead Products were not traded, specific products traded ex-post of delivery for balancing purposes, ureased as a proxy. In some instances (e.g. AVTP-MGP), price correlation worsened year on year. after enhanced price convergence: Narrowing Differentials gave some room for price movements in the Opposite direction, which affects correlation results. Beyond that, some days of price spikes were registered with significant impacts on correlatlons.

Source: Monitoring the Internal Electricity and Natural Gas Markets in 2017 (ACER/CEER)

iii) Impacts on regional cooperation, where applicable

I 0.0-0.2 2 – 0.2- I 0.4-0.6 I 0.6-1.0 1.0-3.0 3.10 -5.0-5.0 — 50 (all in euros/MWh) □ no tradesor price •

The Czech Republic already actively cooperates with other Member States in different areas. The preparation of the National Plan has contributed positively to deepening this cooperation and identified areas that can be further developed.

Annex No 1: Action cards for the purpose of complying with Article 7 of Directive 2012/27/EU, as amended

Table 115: *Operational Programme Competitiveness 2021-2027: Specific objective – Promoting energy efficiency measures*

Basic information	
Title of the policy action	**Operational Programme “Competitiveness Technologies and Applications 2021-2027”: Specific objective – Promoting energy efficiency**
Type of policy measure	Financial mechanism
Concise description of the policy measure	The measure is aimed at supporting investment in improving the energy efficiency of industrial technology and production processes and improving the energy performance of business buildings.
Planned budget	CZK 13000 million
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	13 PJ
Estimated new annual energy savings	0.47 PJ (since 2024)
Additional information	Due to the shift in project implementation, energy savings will be generated first from 2022.
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authority: Ministry Industry and Trade Obligations: Managing the financial mechanism, awarding financial grants, approving and controlling projects, independent monitoring and verification of energy savings.
Sectors targeted	Industry, services, non-residential buildings
Eligible individual energy saving measures	increasing the energy efficiency of production and technology processes; improving the energy performance of the building (building envelope, technical equipment); refurbishment and replacement of self-consumption facilities; refurbishment of electricity, gas and heat distribution systems, use of waste energy in production processes, construction of high (passive) energy standard buildings;

	implementation of building monitoring, automation and energy management elements, energy management
Durability of individual measures	Investment measures – industrial technologies: 10 years Investment measures – buildings: 12-30 years
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	The method of measured savings will be used to calculate energy savings if it is a cost-effective option for the individual measures implemented. In other cases, the method is used pro rata savings on based on engineering estimates. In both cases, energy savings are calculated by certified energy specialists authorised to do so under Act No 406/2000 on energy management, as amended. The calculation of energy savings is supported by an expert document (energy assessment and/or energy performance certificate) and is based on a comparison of final energy consumption before and after the implementation of the energy saving measure.
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	The calculation of cumulated energy savings takes into account: lifetime individual air— measures referred to above. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the commitment period. Taking into account the conditions for granting financial support and the sustainability period, there is no reduction in the annual energy savings over the lifetime of the measure. Lifetime savings energy in the case of implementation energy management is taken into account in the calculation accumulated savings energy.

Sources of information	Calculation of savings energy within professional documents are carried out in accordance with the methodology laid down in Decree No 78/2013 on the energy performance of buildings and Decree No
Additionality and materiality	
How has the additionality criterion been taken into account?	Individual measures and savings achieved are monitored, calculated and verified at the level of individual energy saving measures implemented. Given the market failure, these energy savings would not be realised without the existence of a policy measure. In the case of renovation of buildings (derogation according to Annex V, paragraph 2(b)), the baseline for determining energy savings shall be the energy consumption before the individual measure is implemented. Energy savings resulting from the implementation of individual replacements of energy-related products covered by ecodesign represent energy savings resulting from early replacement before the end of life of the original product. This situation is due to low motivation to replace products owing to a low level of energy-saving awareness and low energy prices.
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	The evaluation of energy savings will take into account the age of the replaced product. Calculation of savings energy will executed compliant the Commission's recommendation on the transposition of the energy savings obligation.
How was the materiality criterion taken into account?	In view of the market failure in particular in relation to the long payback period of individual measures, without the measure in question, i.e. without the provision of investment aid; licences were not targeted entities
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised. There will be no other financing mechanism for the same type of target group in the Czech Republic. The monitoring and verification system shall monitor unique identifiers that allow individual actions to be linked to a specific entity or object. This ensures that the monitoring system automatically deducts energy savings in case of overlaps to avoid double counting.
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	When individual measures are taken on a building, individual parts of a building must comply with the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings.

	In the case of exchanges of eco-designed energy-related products, only replacements for products meeting these parameters shall be encouraged. In the case of exchanges of energy-labelled products, only exchanges for products falling under the two highest energy performance classes, according to the relevant EU regulations, are encouraged.
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	Under the system for providing financial support under the financial mechanism (measure), each project is subject to a substantive evaluation process of the proposed individual energy saving measures. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project implementation and energy savings achieved are verified for all projects and ex-post after the project has been implemented. The ex-post control is supported by documentation demonstrating the implementation of the measures and an ex-post random on-the-spot check for a random sample of projects. The ex-ante and ex-post energy evaluation of individual measures and the calculation of savings are carried out independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000 on energy management, as amended (see methodology for calculating energy savings). The processing of the documents in question, the accuracy of the calculations and the savings declared are subject to control by the State Energy Inspectorate during checks under Act No 406/2000 and by the provider of financial support when checking the application for support. Verification of eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive are carried out by the competent service Ministries industry a trade responsible for implementing energy efficiency policy.
Authorities responsible for the monitoring and verification process	Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification from obligated, participating or entrusted parties	The ex-ante and ex-post energy assessments and the calculation of savings are carried out by independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000. In accordance with Act No 406/2000, the correctness of the energy evaluation and control of the activities of energy specialists is carried out by the State Energy Inspectorate.

	Verification shall be subject to a two-level evaluation of the energy savings achieved. The substantive evaluation of projects is carried out by a department responsible for the management of the financial mechanism (measure) independent of energy policy making. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the department responsible for implementing the
Verification of a representative sample	As part of the ex-post evaluation, each implemented project (individual measure) is verified.

Table 116: *New Green Savings Programme*

Basic information	
Title of the policy action	**New green savings 2014-2021**
Type of policy measure	Financial mechanism
Concise description of the policy measure	The measure aims at investment support for improving the energy performance of single-family and multi-family buildings. Partial and comprehensive renovations of residential buildings are supported.
Planned budget	
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	17 PJ
Estimated new annual energy savings	1 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	<u>Implementing authorities:</u> Ministry of the Environment, State Environmental Fund <u>Obligations</u>: Managing the financial mechanism, granting subsidies, approving and controlling projects, independent monitoring and verification of energy
Sectors targeted	households, residential buildings (family houses, apartment buildings)
Eligible individual energy saving measures	improving the energy performance of the building (building envelope, technical equipment); installation of self-consumption equipment; construction of high (passive) energy standard buildings, implementation of building monitoring, automation and energy management elements
Durability of individual measures	Investment measures – buildings: 12-30 years

Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	The method of measured savings will be used to calculate energy savings if it is a cost-effective option for the individual measures implemented. In other cases, the method is used pro rata savings on based on engineering estimates. The calculation of energy savings is done in both cases by certified energy specialists authorised to carry out activities pursuant to Act No 406/2000 on energy management, as amended. The calculation of energy savings is supported by an expert document (energy assessment and/or energy performance certificate) and is based on a comparison of final energy consumption before and after the implementation of the energy saving measure.
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	In the calculation of cumulated energy savings, the lifetime of individual measures is taken into account above. Contribution individual air— measures accumulated savings are taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the commitment period. Taking into account the conditions for granting financial support and the sustainability period, there is no reduction in the annual energy
Sources of information	Calculationsavings energy within professional documents are carried out in accordance with the methodology laid down in Decree No 78/2013 on the energy performance of buildings and Decree No
Additionality and materiality	
How has the additionality criterion been taken into account?	Individual measures and savings achieved are monitored, calculated and verified at the level of individual energy saving measures implemented. Given the market failure, these energy savings would not be realised without the existence of a policy measure. In the case of renovation of buildings (derogation according to Annex V, paragraph 2(b)), the baseline for determining energy savings shall be the energy consumption before the individual measure is implemented. Energy savings from individual exchanges of energy-related products

	energy savings from early replacement before the end of life of the original product are covered by ecodesign. This situation is due to low motivation to replace products owing to a low level of energy-saving awareness and low energy prices.
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	The evaluation of energy savings will take into account the age of the replaced product. The calculation of energy savings will be carried out in accordance with the Commission Recommendation on the transposition
How was the materiality criterion taken into account?	In view of the market failure in particular in relation to the long payback period of individual measures, without the measure in question, i.e. without the provision of investment aid; licences were not targeted entities
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised. There will be no other financing mechanism for the same type of target group in the Czech Republic. The monitoring and verification system shall monitor unique identifiers that allow individual actions to be linked to a specific entity or object. This ensures that the monitoring system automatically deducts energy savings in case of overlaps to avoid double counting.
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	When individual measures are taken on a building, individual parts of a building must comply with the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of eco-designed energy-related products, only replacements for products meeting these parameters shall be encouraged. In the case of exchanges of energy-labelled products, only exchanges for products falling under the two highest energy performance classes, according to the relevant EU regulations, are encouraged.
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	Under the system for providing financial support under the financial mechanism (measure), each project undergoes a substantive evaluation process of the proposed individual energy-saving measures by the measure manager – the State Environmental Fund. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project implementation is verified for all projects as well as ex-post after the implementation of the project. Ex-post control is supported by documentation demonstrating:

	implementation of the measures and ex-post random on-the-spot checks for a random sample of projects. The ex-ante and ex-post energy evaluation of individual measures and the calculation of savings are carried out independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000 on energy management, as amended (see methodology for calculating energy savings). The processing of the documents in question, the accuracy of the calculations and the savings declared are subject to control by the State Energy Inspectorate during checks under Act No 406/2000 and by the provider of financial support when checking the application for support. Verification of eligibility and reporting of energy savings achieved according to the criteria of Article 7 and Annex V of the Directive are carried out factually to the competent by department Ministry of Industry and Trade responsible for
Authorities responsible for the monitoring and verification process	State Environmental Fund, Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification from obligated, participating or entrusted parties	The ex-ante and ex-post energy assessments and the calculation of savings are carried out by independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000. Correctness of energy rating and control activities energy specialists are carried out by the State Energy Inspectorate under Act No 406/2000. Verification shall be subject to a two-level evaluation of the energy savings achieved. The substantive evaluation of projects is carried out by the department of the State Environmental Fund responsible for the management of the financial mechanism (measures) independent of energy policy-making. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for
Verification of a representative sample	As part of the ex-post evaluation, each implemented project (individual measure) is verified.

Table 117: *Successor to the New Green Savings Programme*

Basic information	
Title of the policy action	**New green savings 2022-2030**
Type of policy measure	Financial mechanism
Concise description of the policy measure	The measure aims at investment support for improving the energy performance of single-family and multi-

Partial and comprehensive renovations of residential buildings are supported.

Planned budget	
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	62 PJ
Estimated new annual energy savings	1-3 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authorities: Ministry of the Environment, State Environmental Fund Obligations: Managing the financial mechanism, granting subsidies, approving and controlling projects, independent monitoring and verification of energy
Sectors targeted	households, residential buildings (family houses, apartment buildings)
Eligible individual energy saving measures	improving the energy performance of the building (building envelope, technical equipment); installation of self-consumption equipment; construction of high (passive) energy standard buildings, implementation of building monitoring, automation and energy management elements
Durability of individual measures	Investment measures – buildings: 12-30 years
Tackling energy poverty	Yes
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	The method of measured savings will be used to calculate energy savings if it is a cost-effective option for the individual measures implemented. In other cases, the method is used pro rata savings on based on engineering estimates. The calculation of energy savings is done in both cases by certified energy specialists authorised to carry out activities pursuant to Act No 406/2000 on energy management, as amended. The calculation of energy savings is supported by an expert document (energy assessment and/or energy performance certificate) and is based on a comparison of final energy consumption before and after the implementation of the energy saving measure.
Energy saving metrics	Final energy consumption

Taking into account lifetimes and reducing energy savings over time	In the calculation of cumulated energy savings, the lifetime of individual measures is taken into account above. Contribution individual air— measures accumulated savings are taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the commitment period. Taking into account the conditions for granting financial support and the sustainability period, there is no reduction in the annual energy
Sources of information	Calculationsavings energy within professional documents are carried out in accordance with the methodology laid down in Decree No 78/2013 on the energy performance of buildings and Decree No
Additionality and materiality	
How has the additionality criterion been taken into account?	Individual measures and savings achieved are monitored, calculated and verified at the level of individual energy saving measures implemented. Given the market failure, these energy savings would not be realised without the existence of a policy measure. In the case of renovation of buildings (derogation according to Annex V, paragraph 2(b)), the baseline for determining energy savings shall be the energy consumption before the individual measure is implemented. Energy savings resulting from the implementation of individual replacements of energy-related products covered by ecodesign represent energy savings resulting from early replacement before the end of life of the original product. This situation is due to low motivation to replace products owing to a low level of energy-saving awareness and low energy prices.
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	The evaluation of energy savings will take into account the age of the replaced product. The calculation of energy savings will be carried out in accordance with the Commission Recommendation on the transposition
How was the materiality criterion taken into account?	In view of the market failure in particular in relation to the long payback period of individual measures, without the measure in question, i.e. without the provision of investment aid; licences were not targeted entities
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised. There will be no other financing mechanism for the same type of target group in the Czech Republic.

	The monitoring and verification system shall monitor unique identifiers that allow individual actions to be linked to a specific entity or object. This ensures that the monitoring system automatically deducts energy savings in case of overlaps to avoid double counting. It can be assumed that the successor programme of the NZÚ programme will, as is the case now, between the NZÚ programmes and the OPŽP II, risk of overlap with the so-called 'penit grants' under the OP Environment III programme. This risk will be excluded, as is currently the case in both programmes, by the conditions laid down for support.
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	When individual measures are taken on a building, individual parts of a building must comply with the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of eco-designed energy-related products, only replacements for products meeting these parameters shall be encouraged. In the case of exchanges of energy-labelled products, only exchanges for products falling under the two highest energy performance classes, according to the relevant EU regulations, are encouraged.
Iceand verification of achieved energy savings	
Brief description of the monitoring and verification system and the process of the verification;	Under the system for providing financial support under the financial mechanism (measure), each project undergoes a substantive evaluation process of the proposed individual energy-saving measures by the measure manager – the State Environmental Fund. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project implementation is verified for all projects as well as ex-post after the implementation of the project. The ex-post control is supported by documentation demonstrating the implementation of the measures and an ex-post random on-the-spot check for a random sample of projects. The ex-ante and ex-post energy evaluation of individual measures and the calculation of savings are carried out independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000 on energy management, as amended (see methodology for calculating energy savings). The processing of the documents in question, the accuracy of the calculations and the savings declared are subject to control by the State Energy

	the provider of financial support when checking the application for support. Verification of eligibility and reporting of energy savings achieved according to the criteria of Article 7 and Annex V of the Directive are carried out factually to the competent by department Ministry of Industry and Trade responsible for
Authorities responsible for the monitoring and verification process	State Environmental Fund, Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification from obligated, participating or entrusted parties	The ex-ante and ex-post energy assessments and the calculation of savings are carried out by independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000. Correctness of energy rating and control activities energy specialists are carried out by the State Energy Inspectorate under Act No 406/2000. Verification shall be subject to a two-level evaluation of the energy savings achieved. The substantive evaluation of projects is carried out by the department of the State Environmental Fund responsible for the management of the financial mechanism (measures) independent of energy policy-making. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for
Verification of a representative sample	As part of the ex-post evaluation, each implemented project (individual measure) is verified.

Table 118: *Operational Programme Environment (2021-2027): Specific objective – Promoting energy efficiency measures*

Basic information	
Title of the policy action	**Operational Programme Environment (2021--2027): Specific objective – Promoting energy efficiency measures**
Type of policy measure	Financial mechanism
Concise description of the policy measure	The measures are primarily aimed at investment aid reductions energy intensity non-residential public buildings and activities related to increasing the use of renewable energy sources.
Planned budget	CZK 14000 million
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	9.5 PJ
Estimated new annual energy savings	0.2 PJ
Additional information	Due to the shift in project implementation, energy savings will be generated first from 2022.
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authorities: Ministry of the Environment, State Environmental Fund Obligations: Managing the financial mechanism, awarding financial grants, approving and controlling projects, independent monitoring and verification of energy savings.
Sectors targeted	households (family houses) and non-residential public buildings
Eligible individual energy saving measures	improving the energy performance of the building (building envelope, technical equipment); refurbishment and replacement of self-consumption facilities; refurbishment of electricity, gas and heat distribution systems, construction of high (passive) energy standard buildings, implementation of building monitoring, automation and energy management elements
Durability of individual measures	Investment measures – buildings: 12-30 years
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	The method of measured savings will be used to calculate energy savings if it is a cost-effective option for the individual measures implemented. In other cases, it is used

	method pro rata savings on based on engineering estimates. In both cases, energy savings are calculated by certified energy specialists authorised to do so under Act No 406/2000 on energy management, as amended. The calculation of energy savings is supported by an expert document (energy assessment and/or energy performance certificate) and is based on a comparison of final energy consumption before and after the implementation of the energy saving measure.
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	The calculation of cumulated energy savings takes into account: lifetime individual air— measures referred to above. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the commitment period. Taking into account the conditions for granting financial support and the sustainability period, there is no reduction in the
Sources of information	The calculation of energy savings in technical documents is carried out in accordance with the methodology laid down in Decree No 78/2013 on the energy performance of buildings and Decree No 480/2012 on energy audit and energy assessment.
Additionality and materiality	
How has the additionality criterion been taken into account?	Individual measures and savings achieved are monitored, calculated and verified at the level of individual energy saving measures implemented. In view of the market failure, these savings would be: energy did not take place without existence policy measure. In the case of renovation of buildings (derogation according to Annex V, paragraph 2(b)), the baseline for determining energy savings shall be: consumption energy before implementation individual measures. Energy savings resulting from the implementation of individual replacements of energy-related products covered by ecodesign represent energy savings resulting from early replacement before the end of life of the original product. This situation is due to low

In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	The evaluation of energy savings will take into account the age of the replaced product. Calculation of savings energy will executed compliant the Commission’s recommendation on the transposition of the energy savings obligation.
How was the materiality criterion taken into account?	In view of the market failure in particular in relation to the long payback period of individual measures, without the measure in question, i.e. without the provision of investment aid; licences were not targeted entities
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised. There will be no other financing mechanism for the same type of target group in the Czech Republic. The monitoring and verification system shall monitor unique identifiers that allow individual actions to be linked to a specific entity or object. This ensures that the monitoring system automatically deducts energy savings in case of overlaps to avoid double counting. It can be assumed that the successor programme of the NZÚ programme will, as is the case now, between the NZÚ programmes and the OPŽP II, risk of overlap with the so-called ‘penit grants’ under the OP Environment III programme. This risk will be excluded, as is currently the case in both programmes, by the conditions laid down for support.
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	When individual measures are taken on a building, individual parts of a building must comply with the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of eco-designed energy-related products, only replacements for products meeting these parameters shall be encouraged. In the case of exchanges of energy-labelled products, only exchanges for products falling under the two highest energy performance classes, according to the relevant EU regulations, are encouraged.
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	Under the financial support scheme under the financial mechanism (measure), each project undergoes a substantive process of evaluating the proposed individual energy-saving measures by the measure manager – the State Environmental Fund environment. Within rating is

	ex-ante project implementation. Project implementation is verified for all projects as well as ex-post after the implementation of the project. Ex-post inspection is supported by documentation demonstrating the implementation of the measures and ex-post random on-the-spot checks for a random sample of projects. The ex-ante and ex-post energy evaluation of individual measures and the calculation of savings are carried out independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000 on energy management, as amended (see methodology for calculating energy savings). The processing of the documents in question, the accuracy of the calculations and the savings declared are subject to control by the State Energy Inspectorate during checks under Act No 406/2000 and by the provider of financial support when checking the application for support. Verification of eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive are carried out by the competent service Ministries industry a trade
Authorities responsible for the monitoring and verification process	State Environmental Fund, Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification from obligated, participating or entrusted parties	The ex-ante and ex-post energy assessments and the calculation of savings are carried out by independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000. In accordance with Act No 406/2000, the correctness of the energy evaluation and control of the activities of energy specialists is carried out by the State Energy Inspectorate. Verification shall be subject to a two-level evaluation of the energy savings achieved. The substantive evaluation of projects is carried out by the department of the State Environmental Fund responsible for the management of the financial mechanism (measures) independent of energy policy-making. Verification of eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive are carried out by the service Ministries industry a trade responsible for implementing energy efficiency
Verification of a representative sample	As part of the ex-post evaluation, each implemented project (individual measure) is verified.

Table 119: *PANEL programme*

Basic information

Title of the policy action	**PANEL programme**
Type of policy measure	Financial mechanism
Concise description of the policy measure	The measure is aimed at investment support for improving the energy intensity of apartment buildings in the form of subsidised loans.
Planned budget	CZK 15000 million
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	5.5 PJ
Estimated new annual energy savings	0.1 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authorities: State Housing Development Fund Obligations: Managing the financial mechanism, awarding financial grants, approving and controlling projects, independent monitoring and verification of
Sectors targeted	households, residential buildings (dwelling houses)
Eligible individual energy saving measures	improving the energy performance of the building (building envelope, technical equipment); refurbishment and replacement of self-consumption facilities; refurbishment of electricity, gas and heat distribution systems;
Durability of individual measures	Investment measures – buildings: 12-30 years
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	The method of measured savings will be used to calculate energy savings if it is a cost-effective option for the individual measures implemented. In other cases, the method is used pro rata savings on based on engineering estimates. In both cases, energy savings are calculated by certified energy specialists authorised to do so under Act No 406/2000 on energy management, as amended. The calculation of energy savings shall be supported by an expert document and shall be based on a comparison of the state of final energy consumption before and after the implementation of the energy saving measure.
Energy saving metrics	Final energy consumption

Taking into account lifetimes and reducing energy savings over time	The calculation of cumulated energy savings takes into account: lifetime individual air— measures referred to above. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the commitment period. Taking into account the conditions for granting financial support and the sustainability period, there is no reduction in the
Sources of information	The calculation of energy savings in technical documents is carried out in accordance with the methodology laid down in Decree No 78/2013 on the energy performance of buildings and Decree No 480/2012 on energy audit and energy assessment.
Additionality and materiality	
How has the additionality criterion been taken into account?	Individual measures and savings achieved are monitored, calculated and verified at the level of individual energy saving measures implemented. In view of the market failure, these savings would be: energy did not take place without existence policy measure. In the case of renovation of buildings (derogation according to Annex V, paragraph 2(b)), the baseline for determining energy savings shall be: consumption energy before implementation individual measures. Energy savings resulting from the implementation of individual replacements of energy-related products covered by ecodesign represent energy savings resulting from early replacement before the end of life of the original product. This situation is due to low
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	The evaluation of energy savings will take into account the age of the replaced product. Calculation of savings energy will executed compliant the Commission's recommendation on the transposition of the energy savings obligation.
How was the materiality criterion taken into account?	In view of the market failure in particular in relation to the long payback period of individual measures, without the measure in question, i.e. without the provision of investment aid; licences were not targeted entities
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	The monitoring and verification system shall monitor unique identifiers that allow individual actions to be linked to a specific entity or object. This ensures that the monitoring system automatically deducts

	energy savings in case of overlaps to avoid double counting.
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	When individual measures are taken on a building, individual parts of a building must comply with the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of eco-designed energy-related products, only replacements for products meeting these parameters shall be encouraged. In the case of exchanges of energy-labelled products, only exchanges for products falling under the two highest energy performance classes, according to the relevant EU regulations, are encouraged.
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	Under the system for providing financial support under a given financial mechanism (measure), each project undergoes a substantive evaluation process of the proposed individual energy-saving measures by the administrator of the measure – the State Housing Development Fund. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project implementation is verified for all projects as well as ex-post after the implementation of the project. The ex-post control is supported by documentation demonstrating the implementation of the measures and an ex-post random on-the-spot check for a random sample of projects. The ex-ante and ex-post energy evaluation of individual measures and the calculation of savings are carried out independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000 on energy management, as amended (see methodology for calculating energy savings). The processing of the documents in question, the accuracy of the calculations and the savings declared are subject to control by the State Energy Inspectorate during checks under Act No 406/2000 and by the provider of financial support when checking the application for support. Verification of eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive are carried out by the competent service Ministries industry a
Authorities responsible for the monitoring and verification process	State Housing Development Fund, Ministry of Industry and Trade, State Energy Inspectorate

Independence of monitoring and verification from obligated, participating or entrusted parties	The ex-ante and ex-post energy assessments and the calculation of savings are carried out by independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000. In accordance with Act No 406/2000, the correctness of the energy evaluation and control of the activities of energy specialists is carried out by the State Energy Inspectorate. Verification shall be subject to a two-level evaluation of the energy savings achieved. The substantive evaluation of projects is carried out by the Department of the State Housing Development Fund responsible for administration financial a mechanism (measures) independent from energy policy making. Verification of eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive are carried out by the service Ministries industry a trade
Verification of a representative sample	As part of the ex-post evaluation, each implemented project (individual measure) is verified.

Table 120: *Integrated Regional Operational Programme 2021-2027*

Basic information	
Title of the policy action	**Integrated Regional Operational Programme 20212027**
Type of policy measure	Financial mechanism
Concise description of the policy measure	The measure is concerned with investment aid for the acquisition of means of public transport using alternative forms of propulsion. The measure will speed up the replacement of less efficient conventionally powered vehicles and the introduction of new alternatively powered and comparatively more efficient vehicles, thus leading directly to energy-efficiency gains and energy savings in the transport sector.
Planned budget	CZK 8000 million
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	13.5 PJ
Estimated new annual energy savings	0.3 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authority: Ministry for Regional Development

	Obligations: Management of the financial mechanism, award of financial grants, approval and control of projects
Sectors targeted	Transport
Eligible individual energy saving measures	Individual actions supported: purchase of alternative powered public transport means of transport
Durability of individual measures	Investment measures – 15 years
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	For the calculation of energy savings from the direct purchase of more efficient alternative propulsion vehicles, the pro rata-saving method based on engineering estimates will be used through the normal efficiency of internal combustion engines and engines using alternative propulsions. The calculation takes into account the evolution of the use of cars and the projected state of the car fleet without the existence of a policy measure. The calculation takes into account the energy savings resulting from the accelerated replacement of less efficient conventional cars before their end of life, as well as incentives to purchase alternative powered cars instead of commonly purchased conventional
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	In the calculation of cumulated energy savings, the lifetime of individual measures is taken into account above. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of energy savings corresponds to the lifetime
Additionality and materiality	
How has the additionality criterion been taken into account?	Energy savings from the purchase of means of alternative propulsion are energy savings resulting from early replacement before the end of the original vehicle's life or from incentives to purchase more efficient vehicles. Under standard conditions without a policy measure, there would be no purchase of alternatively powered vehicles. This situation is due to low motivation to replace products owing to a low level of energy-saving awareness and low energy prices. Additionality is taken into account in the energy savings calculation model in relation to existing EU emission performance standards.

In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	The calculation of energy savings will be carried out in accordance with the Commission Recommendation on the transposition of the energy savings obligation.
How was the materiality criterion taken into account?	In view of the identified market failure, in particular in relation to the low incentive to purchase alternative powered vehicles due to the high price and the long payback period, in the absence of the measure in question, i.e. without the granting of investment support by the implementing authority, the target entities would not be incentivised to exchange conventional vehicles or to purchase alternatively
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised. There will be no other financing mechanism for the same type of target group in the Czech Republic.
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	Vehicle replacements supported must go beyond the established EU minimum emission performance standards.
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	Within the system of providing financial support under the financial mechanism (measure), each project undergoes an evaluation process by implementing organ (controller the financial mechanism). The ex-post control is supported by documentation demonstrating the implementation of the measures and an ex-post random on-the-spot check for a random sample of projects. The assessment of energy savings itself is carried out by the Ministry of Industry and Trade on the basis of an independently developed model for calculating energy savings. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the competent department of the Ministry of
Authorities responsible for the monitoring and verification process	Ministry of Regional Development, Ministry of Industry and Trade
Independence of monitoring and verification from obligated, participating or entrusted parties	Verification shall be subject to a two-level evaluation of individual energy saving measures. Substantive assessment projects are being implemented by department responsible for the management of the financial mechanism(s) independent of energy policy making. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the department responsible for implementing the

Verification of a representative sample	

Table 121: *Modernisation Fund*

Basic information	
Title of the policy action	**Modernisation Fund**
Type of policy measure	Financial mechanism
Concise description of the policy measure	The measure aims at investment support for improving the energy performance of public and non-residential and public buildings and business buildings, improving the energy performance of industrial technological and production processes;reductions energy intensity transport
Planned budget	CZK 50000 million[148]
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	80 PJ
Estimated new annual energy savings	2-3 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authorities: Ministry of the Environment, State Environmental Fund, Ministry of Transport, Ministry of Industry and Trade Obligations: Managing the financial mechanism, awarding financial grants, approving and controlling projects, independent monitoring and verification of energy savings.
Sectors targeted	energy, industry, services, public sector, transport, community energy
Indicative list of energy saving measures	improving the energy performance of the building (building envelope, technical equipment); increasing the energy efficiency of production and technology processes; refurbishment and replacement of energy generation facilities; purchase of alternatively powered vehicles, construction of supporting infrastructure for
Durability of individual measures	Investment measures – industrial technologies: 10 years

148This is not the total "budget" of the Modernisation Fund (see more detailed information in other parts), but the estimated part allocated to the implementation of Article 7 in the field of energy savings.

Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	For calculation savings energy in building works a the method of measured savings will be used for industrial processes if it is a cost-effective option in view of the individual measures implemented. In other cases, the method is used pro rata savings on based on engineering estimates. In both cases, energy savings are calculated by certified energy specialists authorised to do so under Act No 406/2000 on energy management, as amended. The calculation of energy savings shall be supported by an expert document and shall be based on a comparison of the state of final energy consumption before and after the implementation of the energy saving measure. The method will be used to calculate the energy savings from the direct purchase of more efficient alternative propulsion vehicles pro rata savings on based on technical engineering estimates through: normal efficiency of internal combustion engines and engines using alternative propulsion. The savings method will be used to calculate the energy savings resulting from the effect of the construction of alternative propulsion infrastructure for the purchase of alternatively powered vehicles. In order to assess the energy savings achieved by this measure, it is essential to: binding between encouraging the construction the State's infrastructure and the rate of replacement of conventional cars with lower engine efficiency for alternatively powered cars with comparable efficiency gains. Energy savings will be determined on the basis of the methodology to be developed. The calculation takes into account the evolution of the use of cars and the projected state of the car fleet without the existence of a policy measure. The calculation takes into account the energy savings resulting from the accelerated replacement of less
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	The calculation of cumulated energy savings takes into account: lifetime individual air— measures referred to above. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation.

	The lifetime of the savings from the implementation of investment measures exceeds the length of the commitment period. Taking into account the conditions for granting financial support and the sustainability period, there is no reduction in the annual energy savings over the lifetime of the measure The lifetime of energy savings also corresponds to the lifetime of passenger cars.

Additionality and materiality

How has the additionality criterion been taken into account?	Individual measures and savings achieved are monitored, calculated and verified at the level of individual energy saving measures implemented. Given the market failure, these energy savings would not be realised without the existence of a policy measure. In the case of renovation of buildings (derogation according to Annex V, paragraph 2(b)), the baseline for determining energy savings shall be: consumption energy before implementation individual measures. Energy savings resulting from the implementation of individual replacements of vehicles and energy-related products covered by eco-design and represent energy savings resulting from early replacement before the end of life of the original product. Energy savings from the purchase of alternatively powered cars are premature energy savings replacements before end of life original vehicles or incentives to purchase more efficient cars. Under standard conditions without a policy measure, the purchase of alternatively powered cars would not be the same. This situation is due to low motivation to replace products owing to a low level of energy-saving awareness and low energy prices. Additionality is taken into account in the energy savings calculation model in relation to existing EU emission performance standards (Regulation 2019/631 of the European Parliament and of the Council setting CO2 emission performance standards
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	The evaluation of energy savings will take into account the age of the replaced product/vehicle fleet and the standard period of replacement of vehicles. The calculation of energy savings will be carried out in accordance with the Commission Recommendation on the transposition of the energy savings obligation.
How was the materiality criterion taken into account?	In view of the market failure in particular in relation to the long payback period of individual measures, without the measure in question, i.e. without granting investment aid, there was no incentive for the target

	entities to implement these measures. In the light of the study carried out on the incentives for the purchase of alternatively powered cars and the identified market failure, in particular in relation to the low incentive to purchase alternative powered cars due to the high price and the long payback period, as well as the lack of sufficient infrastructure required for the operation of these cars, without the measure in question, i.e. without the granting of investment support by the implementing authority, the target entities would not be incentivised to carry out exchanges of conventional cars or to purchase alternatively powered cars.
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised. There will be no other financing mechanism for the same type of target group in the Czech Republic. The monitoring and verification system shall monitor unique identifiers that allow individual actions to be linked to a specific entity or object. This ensures that the monitoring system automatically deducts energy savings in case of overlaps to avoid double counting. The model for calculating energy savings will take into account: direct State support acquisition alternatively powered cars. Energy savings resulting from direct support for the acquisition of cars will be deducted from the energy savings resulting from support for the construction of infrastructure as part of the calculation of savings for this policy measure.
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	When individual measures are taken on a building, individual parts of a building must comply with the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of eco-designed energy-related products, only replacements for products meeting these parameters shall be encouraged. In the case of exchanges of energy-labelled products, only exchanges for products falling under the two highest energy performance classes, according to the relevant EU regulations, are encouraged.

Vehicle replacements supported must go beyond the established EU minimum emission performance standards.

Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	Under the financial support scheme under the financial mechanism (measure), each project undergoes a substantive process of evaluating the proposed individual energy-saving measures by the measure manager – the State Environmental Fund environment. Within rating is energy savings resulting from the ex-ante implementation of the project are also assessed. Project implementation is verified for all projects as well as ex-post after the implementation of the project. Ex-post inspection is supported by documentation demonstrating the implementation of the measures and ex-post random on-the-spot checks for a random sample of projects. The ex-ante and ex-post energy evaluation of individual measures and the calculation of savings are carried out independent certified energy specialists authorised to practise under Act No. 406/2000 Coll., energy management, as amended (see methodology for calculating energy savings). In case of migration on alternative drives implemented by evaluation of energy savings by the Ministry of Industry and Trade on the basis of an independently developed model for calculating energy savings. Processing of the concerned documents; correctness calculations and the declared savings are subject to control by the State Energy Inspectorate during checks under Act No 406/2000 and by the provider of financial support when checking applications for support.
Authorities responsible for the monitoring and verification process	State Environmental Fund, Ministry of Industry and Trade, State Energy Inspectorate, Ministry of Transport
Independence of monitoring and verification from obligated, participating or entrusted parties	The ex-ante and ex-post energy assessments and the calculation of savings are carried out by independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000. In accordance with Act No 406/2000, the correctness of the energy evaluation and control of the activities of energy specialists is carried out by the State Energy Inspectorate.

	Verification shall be subject to a two-level evaluation of the energy savings achieved. The substantive evaluation of projects is carried out by the department of the State Environmental Fund responsible for the management of the financial mechanism (measures) independent of energy policy-making. Verification of eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive are carried out by the service Ministries industry a trade responsible for implementing energy efficiency
Verification of a representative sample	As part of the ex-post evaluation, each implemented project (individual measure) is verified.

Table 122: *EFEKT programme*

Basic information	
Title of the policy action	**EFEKT programme**
Type of policy measure	Financial mechanism
Concise description of the policy measure	The measure focuses on investment and non-investment support for energy efficiency support measures. The financial mechanism provides specific support energy cost-effective measures with an emphasis on non-investment financial
Planned budget	
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	12.5 PJ
Estimated new annual energy savings	0,2-0.3 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authority: Ministry Industry and Trade Obligations: Managing the financial mechanism, awarding financial grants, approving and controlling projects, independent monitoring and verification of energy savings.
Sectors targeted	Public sector, industry, services, households
Eligible individual energy saving measures	Individual investment measures: reconstruction of public lighting Non-investment measures to incentivise the implementation of individual investment measures: providing targeted consultations with an impact on implementation energy savings measures

	through the Network of Energy Consultation and Information Centres (EKIS), preparing documentation for the preparation of the EPC project; Non-investment measures: implementation of energy management actions aimed at actively disseminating information and education in the field of energy savings
Durability of individual measures	Investment measure: 12-30 years Training actions: 2 years Energy management: 2 years
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	When individual investment measures are implemented, measured savings are used where this is feasible and cost-effective in view of the individual measures implemented. In other cases the scaled-savings method is used on the basis of engineering estimates. For energy savings resulting from targeted consultations and consumer behavioural change measures due to education and awareness raising, the method of the savings examined is used. The link between the consultation itself and the follow-up of the consulting person is essential to evaluate the energy savings achieved through targeted consultations. Energy savings were determined on the basis of a methodology developed by Czech Technical High Learning. In the case of the method of measured or proportional savings, the calculation of savings is carried out by certified energy specialists authorised to carry out activities pursuant to Act No 406/2000 on energy management. The calculation of energy savings is based on a comparison of the state of final energy consumption before and after the implementation of the energy saving measure, evidenced by an expert document – an energy audit, an energy opinion or an
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	The calculation of cumulated energy savings takes into account: lifetime individual air— measures referred to above. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the

	Taking into account the conditions for granting financial support and the sustainability period, there is no reduction in the annual energy savings over the lifetime of the measure. The lifetime of energy savings in the event of actions aimed at changing consumer behaviour and implementing energy management is taken into account in: calculation accumulated savings energy.
Sources of information	Methodology used to calculate energy savings is available here: https://www.mpo-efekt.cz/cz/ekis/publikace/90641.
Additionality and materiality	
How has the additionality criterion been taken into account?	Individual measures and savings achieved are monitored, calculated and verified at the level of individual energy saving measures implemented. Given the market failure, these energy savings would not be realised without the existence of a policy measure. In the case of renovation of buildings (derogation according to Annex V, paragraph 2(b)), the baseline for determining energy savings shall be the energy consumption before the individual measure is implemented. Energy savings resulting from the implementation of individual replacements of energy-related products covered by ecodesign represent energy savings resulting from early replacement before the end of life of the original product. This situation is due to low motivation to replace products owing to a low level of energy-saving awareness and low energy prices.
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	The evaluation of energy savings will take into account the age of the replaced product. Calculation of savings energy will executed compliant the Commission's recommendation on the transposition of the energy savings obligation.
How was the materiality criterion taken into account?	In view of the market failure in particular in relation to the long payback period of individual measures, without the measure in question, i.e. without the provision of investment aid; licences were not targeted entities motivated to implement these measures. On the basis of the above research, it was found, on the basis of a representative sample, that on the basis of policy: measures taking place to be
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the individual measures, the risk of double counting is minimised.

	The risk of double counting has been identified in the case of targeted consultations affecting the implementation of energy saving measures, where there are overlaps with other financial mechanisms. The survey carried out in the study entitled 'Assessment of the impacts of soft instruments in achieving energy efficiency objectives' found a 60 % overlap of implemented individual measures with other state financing mechanisms. As part of the energy savings calculation methodology, for a given individual measures counted with reduction
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	When individual measures are taken on a building, individual parts of a building must comply with the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of eco-designed energy-related products, only replacements for products meeting these parameters shall be encouraged. In the case of exchanges of energy-labelled products, only exchanges for products falling under the two highest energy performance classes, according to the relevant EU regulations, are encouraged.
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	Within the system for providing financial support under a given financial mechanism, investment measures undergo a substantive evaluation process. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project implementation and energy savings achieved are verified for all projects and ex-post after the project has been implemented. The ex-post control is supported by documentation demonstrating the implementation of the measures and an ex-post random on-the-spot check for a random sample of projects. The ex-ante and ex-post energy evaluation of individual measures and the calculation of savings are carried out independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000 on energy management, as amended (see methodology for calculating energy savings). The processing of the documents in question, the accuracy of the calculations and the savings declared are subject to control by the State Energy Inspectorate during checks under Act No 406/2000 and by the provider of financial support when checking the application for support.

	In the case of EPC projects, energy savings are verified a monitored within commitments resulting from a standard guaranteed result energy performance contract (EPC). As part of the energy savings calculated on the basis of the savings method examined, a survey was carried out which validated the energy saving rate on a representative sample of individual measures. Verification of eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive are carried out by the competent service Ministries industry a trade
Authorities responsible for the monitoring and verification process	Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification from obligated, participating or entrusted parties	The energy assessment of ex-ante and ex-post energy savings measurement and pro rata method shall be carried out in an independent manner. certified energy specialists authorised to carry out activities pursuant to Act No 406/2000. In accordance with Act No 406/2000, the correctness of the energy evaluation and control of the activities of energy specialists is carried out by the State Energy Inspectorate. Verification shall be subject to a two-level evaluation of the energy savings achieved. The substantive evaluation of projects is carried out by a department responsible for the management of the financial mechanism (measure) independent of energy policy making. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the department responsible for implementing the
Verification of a representative sample	As part of the ex-post evaluation, each implemented project (individual measure) is verified.

Table 123: *Taxation fuel*

Basic information	
Title of the policy action	**Taxation fuel**
Brief description of the tax measure	The policy measure generates energy savings from the introduction of excise duties on motor fuels beyond the minimum level of taxation under Council Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity. Savings are achieved by changing consumer behaviour with the effect of reducing fuel consumption.
Duration of the tax measure	2021-2030

Implementing authority	Ministry of Finance
Target sector and segment of taxpayers	Transport, all fuel consumers
Source of information	Legal reference: https://www.psp.cz/sqw/sbirka.sqw?cz=353&r=2003
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	15 PJ
Estimated new annual energy savings	1.5 PJ
Additional information	
Methodology for calculating energy savings	
Method of calculation of savings including taking into account additionality	Energy savings are determined on the basis of the difference between the projected development of fuel consumption without the application of excise duty and the actual consumption of motor fuels on the basis of the following formula: *(actual mine – minimum level of tax)* *= AP *energy price* 1, *energy consumption* * $\frac{1}{1 + Ap * \textit{Price elasticity}}$ = *energy consumption not taxed* *energy consumption without taxation – Energy consumption = energy savings* In the calculation of price elasticity, robust analysis; which took into account exogenous variables affecting energy consumption. For this reason, the counterfactual scenario is not constructed. Short-term price elasticity of 0,2052 is used to calculate energy savings. Short-term price elasticity was chosen to minimise overlaps with other measures. In case of risk of overlaps with other measures, a deduction of individual bottom-up approach measures will be made. The calculation of energy savings took into account the level of taxation beyond the EU minimum level of taxation. In the calculation, a value corresponding to the difference between the applicable tax amount and the EU minimum tax amount was used.
Price elasticity used in the calculation	Short-term price elasticity was used in the calculation of energy savings. The value of price elasticity complies with the conditions in force in the Czech Republic. The calculation of price elasticity was carried out by the Centre of the Economy of Regulated Industries of the University of Economics. Multidimensional regression analysis of the time series of endogenous and exogenous quantities was used to determine the

	For the purposes of the calculation, non-seasonally non-seasonally adjusted quarterly data of the relevant variables in the time series 2001 to 2017 were used. The relevant variables examined include: fuel price, fuel consumption, population, number of cars, road freight and passenger transport services including urban public transport (MHD), gross domestic product (GDP) per capita, average nominal gross monthly wage, nominal USD/CZK exchange rate, inflation. The sources of data are official statistics from the Czech Statistical Office, the Ministry of Industry and Trade, the Ministry of Transport, the Czech National Bank and Eurostat.
Taking into account savings reductions over time	Given the nature of the measure, the challenges remain unchanged over time. Savings are not accumulated during the commitment period.
How are any overlaps with other policy measures addressed to avoid double counting of savings?	Short-term price elasticity has been used to minimise the risk of overlaps and double counting. In case of risk of overlaps with other measures, a deduction of individual bottom-up approach measures will be made.
How independence from the implementing authority is ensured	The implementing authority for the tax measure is the Ministry of Finance. Verification of energy savings achieved, including its eligibility and declarationability according to the criteria of Article 7 and Annex V of the Directive, is carried out by the Ministry of Industry
Additional information and resources	**Source of the price elasticity study:** Estimation of the price elasticity of demand for petrol and diesel in the Czech Republic (Prague University of Economics)

Table 124: *Taxation of fuels in households*

Basic information	
Title of the policy action	**Taxation of fuels in households**
Brief description of the tax measure	The policy measure generates energy savings resulting from the introduction of excise duties on electricity and solid fuels used in households beyond the minimum level of taxation under Council Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity. Savings are achieved by changing consumer behaviour with the effect of reducing the consumption of these fuels.
Duration of the tax measure	2021-2030
Implementing authority	Ministry of Finance
Target sector and segment of taxpayers	Households, whole population
Source of information	Legal reference: https://www.psp.cz/sqw/sbirka.sqw?cz=261&r=2007
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	0.5 PJ
Estimated new annual energy savings	0.05 PJ

Additional information

Methodology for calculating energy savings	
Method of calculation of savings including taking into account additionality	Energy savings are determined on the basis of the difference between the projected development of fuel consumption without the application of excise duty and the actual consumption of motor fuels on the basis of the following formula: *(actual tax – minimum level)* ’= PO *energy price* 1, energy*consumption* * —— —— = *energy consumption not taxed* 1 + Ap * *Price elasticity* *energy consumption without taxation – Energy consumption = energy savings* As part of the calculation of price elasticity, a robust analysis was carried out, taking into account exogenous variables affecting energy consumption, including the impact of other measures to support energy savings in households. Of this reason not performed structure counterfactual scenario. Short-term price elasticity is used to calculate energy savings. Short-term price elasticity was chosen to minimise overlaps with other measures. In case of risk of overlaps with others measures will executed deduction individual bottom-up access measures. The calculation of energy savings took into account the level of taxation beyond the EU minimum level of
Price elasticity used in the calculation	Short-term price elasticity was used in the calculation of energy savings. The value of price elasticity complies with the conditions in force in the Czech Republic. The calculation of price elasticity was carried out by the Centre of the Economy of Regulated Industries of the University of Economics. Multidimensional results were used regression analysis time series endogenous and exogenous quantities. For the purposes of the calculation, non-seasonally non-seasonally adjusted quarterly data of relevant variables in the time series of at least 15 years have been used. The relevant variables examined include: price of the fuels in question, consumption, population, gross domestic product (GDP) per capita, average nominal gross monthly wage, nominal USD/CZK exchange rate, average air temperature, energy savings from other measures. The source of the data is the official statistics

	The Ministry of Industry and Trade, the Ministry of Transport, the Czech National Bank and Eurostat.
Taking into account savings reductions over time	Given the nature of the measure, the challenges remain unchanged over time. Savings are not accumulated during the commitment period.
How are any overlaps with other policy measures addressed to avoid double counting of savings?	Short-term price elasticity has been used to minimise the risk of overlaps and double counting. In case of risk of overlaps with other measures, a deduction of individual bottom-up approach measures will be made.
How independence from the implementing authority is ensured	The implementing authority for the tax measure is the Ministry of Finance. Verification of energy savings achieved, including its eligibility and declarationability according to the criteria of Article 7 and Annex V of the Directive, is carried out by the Ministry of Industry and
Additional information and resources	**Source of the price elasticity study:** A price elasticity study was carried out during the finalisation of the Czech National Plan.

Table 125*: Support to Ecodriving*

Basic information	
Title of the policy action	**Support to Ecodriving**
Type of policy measure	Financial mechanism, behavioural measures
Concise description of the policy measure	The measure is aimed at promoting energy-saving driving with a direct effect on increasing energy efficacy v transport. Support energy saving rides is implemented through financial support for the organisation of training activities in the field of energy-saving driving.
Planned budget	
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	6 PJ
Estimated new annual energy savings	0.2 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	<u>Implementing authority:</u> Ministry Industry and Trade <u>Obligations</u>: Managing the financial mechanism, awarding financial grants, approving and controlling projects, independent monitoring and verification of energy savings.
Sectors targeted	Public sector, industry, services, households

Eligible individual energy saving measures	activities aimed at actively disseminating information and education on energy efficiency (ecodriving)
v	Training actions: 2 years
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	The energy savings method used for the calculation of energy savings shall be the one used. Energy savings will be determined on the basis of the methodology to be developed. The model will be based on the premise of motivating educational activity towards a cost-effective way of driving on a
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	In the calculation of cumulated energy savings, the lifetime of individual measures is taken into account above. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of energy savings and its inclusion in the calculation of cumulated energy savings does not imply a reduction of the annual energy savings over
Sources of information	
Additionality and materiality	
How has the additionality criterion been taken into account?	Individual measures and savings achieved are monitored, calculated and verified at the level of individual energy saving measures implemented. Given the market failure, these energy savings would not be realised without the existence of a policy measure. This is due to a low level of awareness of energy savings and low fuel prices.
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	Not applicable.
How was the materiality criterion taken into account?	In view of the market failure, particularly in relation to the low level of awareness of energy savings and low fuel prices, it would be without the measure, i.e. No implementation aid training activities, there was no incentive for target entities to reduce fuel consumption.
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the individual measures, the risk of double counting is minimised.

How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	Not applicable.
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	Within the system for providing financial support under a given financial mechanism, the measures undergo a substantive evaluation process by the administrator of the financial mechanism. The evaluation assesses the key criteria for determining energy savings, i.e. the type of training action (individual measure), the type of target group, the number of people, etc. As part of the analysis to calculate energy savings, the following will be carried out: investigations; which verifiates on a representative sample of individual measures, the energy saving percentage. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the competent department of the Ministry of
Authorities responsible for the monitoring and verification process	Ministry Industry and Trade
Independence of monitoring and verification from obligated, participating or entrusted parties	Verification shall be subject to a two-level evaluation of the energy savings achieved. The substantive evaluation of projects is carried out by a department responsible for the management of the financial mechanism (measure) independent of energy policy making. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the department responsible for
Verification of a representative sample	As part of the ex-post evaluation, each implemented project (individual measure) is verified.

Table 126*: Operational Programme Enterprise and Innovation for Competitiveness 2014-2020 (SC) 3.2): Energy Savings Programme*

Basic information	
Title of the policy action	**Operational Programme Enterprise and Innovation for Competitiveness 2014-2020 (SC 3.2): Energy Savings Programme**
Type of policy measure	Financial mechanism
Concise description of the policy measure	The measure is aimed at investment aid to improve the energy efficiency of technological and production processes industry a reductions the energy performance of business buildings.
Planned budget	

Estimated energy savings 2021-2030	
Estimated cumulated energy savings	30 PJ
Estimated new annual energy savings	0,5-2 PJ
Additional information	This is a measure implemented in 20142020 that generates new individual measures in the period 2021-2030.
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authority: Ministry Industry and Trade Obligations: Managing the financial mechanism, awarding financial grants, approving and controlling projects, independent monitoring and verification of energy savings.
Sectors targeted	Industry, services, non-residential buildings
Eligible individual energy saving measures	increasing the energy efficiency of production and technology processes; improving the energy performance of the building (building envelope, technical equipment); refurbishment and replacement of self-consumption facilities; refurbishment of electricity, gas and heat distribution systems, use of waste energy in production processes, construction of high (passive) energy standard buildings; implementation of building monitoring, automation and energy management elements energy management
Durability of individual measures	Investment measures – industrial technologies: 10 years Investment measures – buildings: 12-30 years
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	The method of measured savings will be used to calculate energy savings if it is a cost-effective option for the individual measures implemented. In other cases, the method is used pro rata savings on based on engineering estimates. In both cases, energy savings are calculated by certified energy specialists authorised to do so under Act No 406/2000 on energy management, as amended. The calculation of energy savings is supported by an expert document (energy assessment and/or energy performance certificate)

	buildings) and is based on a comparison of final energy consumption before and after the implementation of the energy saving measure.
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	The calculation of cumulated energy savings takes into account: lifetime individual air— measures referred to above. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the commitment period. Taking into account the conditions for granting financial support and the sustainability period, there is no reduction in the annual energy savings over the lifetime of the measure. The lifetime of energy savings in the case of energy management is taken into account in the calculation accumulated savings energy.
Sources of information	The calculation of energy savings in technical documents is carried out in accordance with the methodology laid down in Decree No 78/2013 on the energy performance of buildings and Decree No 480/2012 on energy audit and energy assessment.
Additionality and materiality	
How has the additionality criterion been taken into account?	Individual measures and savings achieved are monitored, calculated and verified at the level of individual energy saving measures implemented. Given the market failure, these energy savings would not be realised without the existence of a policy measure. In the case of renovation of buildings (derogation according to Annex V, paragraph 2(b)), the baseline for determining energy savings shall be: consumption energy before implementation individual measures. Energy savings resulting from the implementation of individual replacements of energy-related products covered by ecodesign represent energy savings resulting from early replacement before the end of life of the original product. This situation is due to low motivation to replace products owing to a low level of energy-saving awareness and low energy prices.

In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	The evaluation of energy savings will take into account the age of the replaced product. Calculation of savings energy will executed compliant the Commission's recommendation on the transposition of the energy savings obligation.
How was the materiality criterion taken into account?	In view of the market failure in particular in relation to the long payback period of individual measures, without the measure in question, i.e. without the provision of investment aid; licences were not targeted entities
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised. There will be no other financing mechanism for the same type of target group in the Czech Republic. The monitoring and verification system shall monitor unique identifiers that allow individual actions to be linked to a specific entity or object. This ensures that the monitoring system automatically deducts energy savings in case of overlaps to avoid double counting.
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	When individual measures are taken on a building, individual parts of a building must comply with the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of eco-designed energy-related products, only replacements for products meeting these parameters shall be encouraged. In the case of exchanges of energy-labelled products, only exchanges for products falling under the two highest energy performance classes, according to the relevant EU regulations, are encouraged.
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	Under the system for providing financial support under the financial mechanism (measure), each project is subject to a substantive evaluation process of the proposed individual energy saving measures. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project implementation and energy savings achieved are verified for all projects and ex-post after the project has been implemented. The ex-post control is supported by documentation demonstrating the implementation of the measures and an ex-post random on-the-spot check for a random sample of projects.

	The ex-ante and ex-post energy evaluation of individual measures and the calculation of savings are carried out independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000 on energy management, as amended (see methodology for calculating energy savings). The processing of the documents in question, the accuracy of the calculations and the savings declared are subject to control by the State Energy Inspectorate during checks under Act No 406/2000 and by the provider of financial support when checking the application for support. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the competent department of the Ministry of Industry and Trade responsible for implementing the energy efficiency policy.
Authorities responsible for the monitoring and verification process	Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification from obligated, participating or entrusted parties	The ex-ante and ex-post energy assessments and the calculation of savings are carried out by independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000. In accordance with Act No 406/2000, the correctness of the energy evaluation and control of the activities of energy specialists is carried out by the State Energy Inspectorate. Verification shall be subject to a two-level evaluation of the energy savings achieved. The substantive evaluation of projects is carried out by a department responsible for the management of the financial mechanism (measure) independent of energy policy making. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the department responsible for
Verification of a representative sample	As part of the ex-post evaluation, each implemented project (individual measure) is verified.

Table 127: *Operational Programme Environment 2014-2020 (PO5): Energy savings*

Basic information	
Title of the policy action	**Operational Programme Environment 2014-2020 (PO5): Energy savings**
Type of policy measure	Financial mechanism
Concise description of the policy measure	The measure aims at investment support for improving the energy performance of non-residential public buildings from the Operational Programme Environment 2014-2020.

Planned budget

Estimated energy savings 2021-2030	
Estimated cumulated energy savings	PJ
Estimated new annual energy savings	0,5-1 PJ
Additional information	This is a measure implemented in 20142020 that generates new individual measures in the period 2021-2030.
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authorities: Ministry of the Environment, State Environmental Fund Obligations: Managing the financial mechanism, awarding financial grants, approving and controlling projects, independent monitoring and verification of energy savings.
Sectors targeted	households, residential buildings (family houses, apartment buildings)
Eligible individual energy saving measures	improving the energy performance of the building (building envelope, technical equipment); refurbishment and replacement of self-consumption facilities; refurbishment of electricity, gas and heat distribution systems, construction of high (passive) energy standard buildings, implementation of building monitoring, automation and energy management elements
Durability of individual measures	Investment measures – buildings: 12-30 years
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	The method of measured savings will be used to calculate energy savings if it is a cost-effective option for the individual measures implemented. In other cases, the method is used pro rata savings on based on engineering estimates. In both cases, energy savings are calculated by certified energy specialists authorised to do so under Act No 406/2000 on energy management, as amended. The calculation of energy savings is supported by an expert document (energy assessment and/or energy performance certificate) and is based on a comparison of final energy consumption before and after the implementation of the energy saving measure.
Energy saving metrics	Final energy consumption

Taking into account lifetimes and reducing energy savings over time	The calculation of cumulated energy savings takes into account: lifetime individual air— measures referred to above. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the commitment period. Taking into account the conditions for granting financial support and the sustainability period, there is no reduction in the
Sources of information	The calculation of energy savings in technical documents is carried out in accordance with the methodology laid down in Decree No 78/2013 on the energy performance of buildings and Decree No 480/2012 on energy audit and energy assessment.
Additionality and materiality	
How has the additionality criterion been taken into account?	Individual measures and savings achieved are monitored, calculated and verified at the level of individual energy saving measures implemented. In view of the market failure, these savings would be: energy did not take place without existence policy measure. In the case of renovation of buildings (derogation according to Annex V, paragraph 2(b)), the baseline for determining energy savings shall be: consumption energy before implementation individual measures. Energy savings resulting from the implementation of individual replacements of energy-related products covered by ecodesign represent energy savings resulting from early replacement before the end of life of the original product. This situation is due to low
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	The evaluation of energy savings will take into account the age of the replaced product. Calculation of savings energy will executed compliant the Commission's recommendation on the transposition of the energy savings obligation.
How was the materiality criterion taken into account?	In view of the market failure in particular in relation to the long payback period of individual measures, without the measure in question, i.e. without the provision of investment aid; licences were not targeted entities
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised. There will be no other financing mechanism for the same type of target group in the Czech Republic.

	The monitoring and verification system shall monitor unique identifiers that allow individual actions to be linked to a specific entity or object. This ensures that the monitoring system automatically deducts energy savings in case of overlaps to avoid double counting. It can be assumed that the successor programme of the NZÚ programme will, as is the case now, between the NZÚ programmes and the OPŽP II, risk of overlap with the so-called 'penit grants' under the OP Environment III programme. This risk will, as is currently the case in both programmes, be excluded by the conditions laid down for the aid.
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	When individual measures are taken on a building, individual parts of a building must comply with the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of eco-designed energy-related products, only replacements for products meeting these parameters shall be encouraged. In the case of exchanges of energy-labelled products, only exchanges for products falling under the two highest energy performance classes, according to the relevant EU regulations, are encouraged.
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	Under the financial support scheme under the financial mechanism (measure), each project undergoes a substantive process of evaluating the proposed individual energy-saving measures by the measure manager – the State Environmental Fund environment. Within rating is energy savings resulting from the ex-ante implementation of the project are also assessed. Project implementation is verified for all projects as well as ex-post after the implementation of the project. Ex-post control is supported by evidence documentation demonstrating the implementation of the measures and ex-post random on-the-spot checks for a random sample of projects. The ex-ante and ex-post energy evaluation of individual measures and the calculation of savings are carried out independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000 on energy management, as amended (see methodology for calculating energy savings). The processing of the documents in question,

	energy inspection during inspections under Act No 406/2000 and by the provider of financial support when checking applications for support. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the competent department of the Ministry of Industry and Trade responsible for implementing the energy efficiency policy.
Authorities responsible for the monitoring and verification process	State Environmental Fund, Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification from obligated, participating or entrusted parties	The ex-ante and ex-post energy assessments and the calculation of savings are carried out by independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000. In accordance with Act No 406/2000, the correctness of the energy evaluation and control of the activities of energy specialists is carried out by the State Energy Inspectorate. Verification shall be subject to a two-level evaluation of the energy savings achieved. The substantive evaluation of projects is carried out by the department of the State Environmental Fund responsible for the management of the financial mechanism (measures) independent of energy policy-making. Verification of eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive are carried out by the service Ministries industry a trade responsible for implementing energy efficiency
Verification of a representative sample	As part of the ex-post evaluation, each implemented project (individual measure) is verified.

Table 128: *Integrated Regional Operational Programme 2014-2020 (SC 2.5): Reducing energy intensity in the housing sector*

Basic information	
Title of the policy action	**Integrated Regional Operational Programme 20142020 (SC 2.5): Reducing energy intensity in the housing sector**
Type of policy measure	Financial mechanism
Concise description of the policy measure	The measure is aimed at investment support for improving the energy intensity of apartment buildings under the Integrated Regional Operational Programme.
Planned budget	
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	7 PJ
Estimated new annual energy savings	0.25 PJ

Additional information	This is a measure implemented in 20142020 that generates new individual measures in the period 2021-2030.
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authorities: Ministry for Regional Development Obligations: Managing the financial mechanism, awarding financial grants, approving and controlling projects, independent monitoring and verification of energy savings.
Sectors targeted	households, residential buildings (family houses, apartment buildings)
Eligible individual energy saving measures	improving the energy performance of the building (building envelope, technical equipment); refurbishment and replacement of self-consumption facilities; refurbishment of electricity, gas and heat distribution, implementation of monitoring, automation and management elements of the building's energy consumption
Durability of individual measures	Investment measures – buildings: 12-30 years
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	The method of measured savings will be used to calculate energy savings if it is a cost-effective option for the individual measures implemented. In other cases, the method is used pro rata savings on based on engineering estimates. In both cases, energy savings are calculated by certified energy specialists authorised to do so under Act No 406/2000 on energy management, as amended. The calculation of energy savings is supported by an expert document (energy assessment and/or energy performance certificate) and is based on a comparison of final energy consumption before and after the implementation of the energy saving measure.
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	The calculation of cumulated energy savings takes into account: lifetime individual air— measures referred to above. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation.

	The lifetime of the savings from the implementation of investment measures exceeds the length of the commitment period. Taking into account the conditions for granting financial support and the sustainability period, there is no reduction in the annual
Sources of information	Calculation of savings energy within professional documents are carried out in accordance with the methodology laid down in Decree No 78/2013 on the energy performance of buildings and Decree No
Additionality and materiality	
How has the additionality criterion been taken into account?	Individual measures and savings achieved are monitored, calculated and verified at the level of individual energy saving measures implemented. Given the market failure, these energy savings would not be realised without the existence of a policy measure. In the case of renovation of buildings (derogation according to Annex V, paragraph 2(b)), the baseline for determining energy savings shall be the energy consumption before the individual measure is implemented. Energy savings resulting from the implementation of individual replacements of energy-related products covered by ecodesign represent energy savings resulting from early replacement before the end of life of the original product. This situation is due to low motivation to replace products owing to a low level of energy-saving awareness and low energy prices.
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	The evaluation of energy savings will take into account the age of the replaced product. Calculation of savings energy will executed compliant the Commission’s recommendation on the transposition of the energy savings obligation.
How was the materiality criterion taken into account?	In view of the market failure in particular in relation to the long payback period of individual measures, without the measure in question, i.e. without the provision of investment aid; licences were not targeted entities
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised. There will be no other financing mechanism for the same type of target group in the Czech Republic. The monitoring and verification system shall monitor unique identifiers that allow individual actions to be linked to a specific entity or object. This ensures that the monitoring system automatically deducts energy savings in case of overlaps to avoid double counting.

How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	When individual measures are taken on a building, individual parts of a building must comply with the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of eco-designed energy-related products, only replacements for products meeting these parameters shall be encouraged. In the case of exchanges of energy-labelled products, only exchanges for products falling under the two highest energy performance classes, according to the relevant EU regulations, are encouraged.

Monitoring and verification of energy savings achieved

Brief description of the monitoring and verification system and the process of the verification;	Under the system for providing financial support under a given financial mechanism (measure), each project undergoes a substantive process of evaluating proposed individual energy-saving measures by the measure administrator – the Ministry of Regional Development. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project implementation is verified for all projects as well as ex-post after the implementation of the project. The ex-post control is supported by documentation demonstrating the implementation of the measures and an ex-post random on-the-spot check for a random sample of projects. The ex-ante and ex-post energy evaluation of individual measures and the calculation of savings are carried out independent certified energy specialists authorised to carry out activities pursuant to Act No 406/2000 on energy management, as amended (see methodology for calculating energy savings). The processing of the documents in question, the accuracy of the calculations and the savings declared are subject to control by the State Energy Inspectorate during checks under Act No 406/2000 and by the provider of financial support when checking the application for support. Verification of eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive are carried out by the competent service Ministries industry a trade
Authorities responsible for the monitoring and verification process	Ministry of Regional Development, Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification from obligated, participating or entrusted parties	Ex-ante and ex-post energy assessments and the calculation of savings are carried out by independent certified energy specialists authorised to perform

	activities pursuant to Act No. 406/2000 Coll. In accordance with Act No 406/2000, the correctness of the energy evaluation and control of the activities of energy specialists is carried out by the State Energy Inspectorate. Verification shall be subject to a two-level evaluation of the energy savings achieved. The substantive evaluation of projects is carried out by the department of the Ministry of Regional Development responsible for the management of the financial mechanism (measures) independent of energy policy-making. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out
Verification of a representative sample	As part of the ex-post evaluation, each implemented project (individual measure) is verified.

Table 129: *Ban on operating Class 1 and Class 2 solid fuel boilers*

Basic information	
Title of the policy action	**Ban on operating Class 1 and Class 2 solid fuel boilers**
Type of policy measure	Regulatory measures
Concise description of the policy measure	These are regulatory measures laying down minimum standards for the operation of stationary combustion sources, which are set beyond the scope of EU law. As of 2022, the entire territory of the Czech Republic will be banned from operating low-efficiency solid fuel boilers falling under Class 1 and Class 2 of EN 303-5. The obligation can also be implemented in advance on the basis of the decision of the municipality. The legislative obligation is laid down on the basis of Section 17(1) of Act No 201/2012 on air protection, as amended, or Annex 11. Under that law: prohibited operation of combustion stationary sources with a rated thermal input of 300 kW or less which do not meet the requirements of Class 1 and Class 2 boilers according to EN 303-5. Specifically, class 1 solid fuel boilers with &66 % efficiency and class 2 solid fuel boilers with an efficiency of &66-73 %.
Planned budget	
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	50 PJ
Estimated new annual energy savings	8 PJ
Additional information	The measure generates savings in 2024-2025
Main features of the policy measure	

Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authorities: Ministry of the Environment, municipalities with extended competence Obligations: implementation of legislation, monitoring of compliance with established obligations
Sectors targeted	Energy consumers
Eligible individual energy saving measures	Regulatory measures – banning the operation of combustion energy sources using solid fuels with low energy efficiency and mandatory replacement by energy efficient sources.
Durability of individual measures	Investment measures – buildings: 12-30 years
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	A combination of proportional and surveyed savings based on statistical data and engineering estimates will be used to calculate energy savings. The calculation of energy savings is carried out on the basis of a calculation of the difference between the energy consumption of mandatory shutdown boilers subject to the legislative obligation a consumption ordinary a the most likely alternatives available on the market to
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	In the calculation of cumulated energy savings, the lifetime of individual measures is taken into account above. Contribution individual air— measures accumulated savings are taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the commitment period. Taking into account the conditions for granting financial support and the sustainability period, there is no reduction in the annual energy savings
Additionality and materiality	
How has the additionality criterion been taken into account?	Energy savings resulting from the implementation of individual replacements of energy-related products covered by ecodesign represent energy savings resulting from early replacement before the end of life of the original product. This situation is due to low motivation to replace products owing to a low level of energy-saving awareness and low energy prices.
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	The evaluation of energy savings will take into account the age of the replaced product. The calculation of energy savings will be carried out in accordance with the Commission Recommendation on the transposition of

How was the materiality criterion taken into account?	In view of the market failure, in particular in relation to the long pay-back period of individual measures, it would be without the existence of the measure, i.e. without the granting of investment aid, licences were not targeted entities motivated by
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised. Under the established rules for providing financial support, it is not possible to financially support compliance with the legislative obligation United SE prohibition operation concerned boilers. Of this reason is the risk of overlap between this measure and other
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	Not relevant
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	Under Law No 201/2012, the monitoring of compliance with the prohibition on operating the classes of solid fuel boilers in question falls within the competence of the municipalities with extended competence, which have the right to: inspections on location, including checks operated boilers a their accessories, the fuels, raw materials and technologies used in connection with the operation. Failure to comply with the obligations under this Act shall be sanctioned. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by
Authorities responsible for the monitoring and verification process	Ministry of the Environment, Ministry of Industry and Trade, municipal authorities of municipalities with extended competence
Independence of monitoring and verification from obligated, participating or entrusted parties	The calculation of the energy saving is carried out on the basis of an analysis carried out by a body independent of the implementation of the prohibition on the operation of combustion sources in question. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for implementing the energy efficiency
Verification of a representative sample	The ex-post evaluation will verify the impact of the legislative obligation on a representative sample.

Table 130: *Voluntary energy efficiency scheme*

Basic information

Title of the policy action	**Voluntary energy efficiency scheme**
Type of policy measure	**Voluntary agreement/EEOS**
Concise description of the policy measure	Voluntary energy efficiency scheme represents implementation schema energy efficiency obligation under Article 9 of the EED on the basis of a voluntary arrangement between the State and stakeholders to carry out activities among final consumers aimed at reducing final energy consumption. Interested parties may be energy distributors and/or sales companies active in the energy services market in the electricity, gas and heating sectors; and/or companies significant energy consumption. Individual energy saving will be implemented by the different stakeholders measures compliant with responsibilities resulting from Directive 2012/27/EU on energy efficiency as amended by Directive 2018/2002[153].
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	18.5 PJ
Estimated annual energy savings	1 PJ
Additional information	
Main features of the scheme	
Implementing authority, stakeholders and their responsibilities	Implementing authority: Ministry Industry and Trade Stakeholders: energy distributors and/or sellers active in the electricity, gas and heating sectors Obligations: initiating, implementing and registering energy saving measures to reduce final consumer energy consumption; evaluation of energy saving measures on the basis of an agreed methodology; the provision of information by 31 March of the calendar year on the implementation of energy saving measures in the previous year in accordance with the approved methodology, namely: type of measures implemented, the amount of savings achieved from each individual measure determined on the basis of the approved imputability methodology; provide information and/or copies of documents upon request proving: implementation individual actions and reported energy savings respecting personal data protection requirements;

[153] Directive 2018/2002 is not the only directive governing the text of Directive 2012/27/EU

	where financial support has been used for the implementation of a measure or project from national or European funds, provide this overview to the responsible ministry; cooperate in the verification of energy savings from the implementation of the measures; communicate best practices and experience through communication and information activities for the professional/wide public, including according to the content standard for communication prepared by the responsible ministry; work with the responsible ministry to produce a catalogue of measures; work with the regulator to prepare a single information system for reporting energy savings.
Sectors targeted	Households, industry, services, public sector
Eligible individual energy saving measures	improving the energy performance of the building (building envelope, technical equipment); exchange of lighting (external, internal), introduction of control elements and optimisation improving the energy efficiency of production and technological processes, including the recovery of waste heat refurbishment and replacement of self-consumption facilities; refurbishment of electricity, gas and heat distribution, implementation of monitoring, automation and management elements of the building's energy consumption construction of charging points for electric vehicles, hydrogen refuelling stations and CNG/LNG refuelling stations, construction of supporting infrastructure for alternative powered vehicles purchase of new alternatively powered cars support for the implementation and implementation of energy management consultation and targeted promotion activities awareness raising activities on options for reducing energy consumption
Durability of individual measures	Investment measure: 12-30 years Training events, awareness-raising activities: 2 years Energy management: 2 years
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	

Methods for measuring energy savings	The expected method will be used to calculate energy savings savings on based on catalog standardised energy-saving measures, developed on the basis of monitored energy saving measures by an independent body and subsequently approved by the Ministry of Industry and Trade, as a gesture of energy efficiency policy.
Energy saving metrics	Final energy consumption
Taking into account savings reductions over time	The calculation of cumulated energy savings takes into account: lifetime individual air— measures referred to above. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the commitment period. Taking into account the energy services provided by stakeholders over the lifetime of the measure, there is no reduction in annual energy savings over the lifetime of the measure. Lifetime savings energy implementation in the case of training, awareness and energy management activities are taken into account in the calculation accumulated savings energy. Annual energy savings are not expected to be reduced
Additionality and materiality	
How has the additionality criterion been taken into account?	Individual measures and savings achieved are monitored, calculated and verified at the level of individual energy saving measures implemented. Given the market failure, these energy savings would not be realised without the activities of the stakeholders. In the case of renovation of buildings (derogation according to Annex V, paragraph 2(b)), the baseline for determining energy savings shall be the energy consumption before the individual measure is implemented. Energy savings resulting from the implementation of individual replacements of energy-related products covered by ecodesign represent energy savings resulting from early replacement before the end of life of the original product. This situation is due to low motivation to replace products owing to a low level of
In case the scheme promotes the accelerated introduction of more energy efficient products, how has the methodology for calculating savings been approached?	The evaluation of energy savings will take into account the age of the replaced product. Calculation of savings energy will executed compliant the Commission's recommendation on the transposition of the energy savings obligation.

How was the materiality criterion taken into account?	In view of the market failure, in particular in relation to the long pay-back period of individual measures, these measures would not have been implemented for the target entities without the activities of the interested
Other criteria	
How are any overlaps in the scheme and policy measures addressed in order to avoid double counting of savings?	The monitoring and verification system will use the IT platform for reporting, monitoring, verification of implemented individual actions. Unique identifiers that allow individual actions to be linked to a specific entity or object will be monitored within the IT platform. This ensures that the monitoring system automatically deducts energy savings in case of overlaps to avoid double counting.
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	When individual measures are taken on a building, individual parts of a building must comply with the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of eco-designed energy-related products, only replacements for products meeting these parameters shall be encouraged. In the case of exchanges of energy-labelled products, only exchanges for products falling under the two highest energy performance classes, according to the relevant EU regulations, are encouraged. Vehicle replacements supported must go beyond the EU minimum emission performance standards.
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	Energy savings are monitored and verified as part of the obligations under the standard energy performance contract. Stakeholders provide through the online IT platform information on the implemented measures needed to declare energy savings by the implementing authority. The implementation of individual measures is supported by adequate documentation from stakeholders, which is archived for ex-post control purposes. Verification of eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive are carried out by the competent service Ministries industry a trade responsible for implementing energy efficiency policy.
Authorities responsible for the monitoring and verification process	Ministry of Industry and Trade, stakeholders

Independence of monitoring and verification from obligated, participating or entrusted parties	Monitoring of energy savings is carried out by stakeholders on the basis of a developed catalogue of standardised measures. Verification of the implementation of the individual measures declared shall be carried out by the implementing authority, where appropriate, by an independent State audit authority, on the basis of the documentation provided or, where appropriate, by on-the-spot checks. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade
Verification of a representative sample	Energy savings achieved are verified ex-post on a representative sample of individual measures.
Procedure where progress in achieving savings is not sufficient	Introduction of a legislative obligation to achieve energy savings under Article 7a of Directive 2012/27/EU on energy efficiency as amended by Directive 2018/2002

Table 131: *Voluntary agreement with distributors and sellers of energy appliances*

Basic information	
Title of the policy action	**Voluntary agreement with distributors and sellers of energy appliances**
Type of policy measure	**Voluntary Partnership Agreement**
Concise description of the policy measure	The objective of the voluntary agreement is to implement measures to promote the replacement of energy-intensive appliances by distributors and sellers of such appliances. Based on a voluntary agreement, stakeholders will encourage energy consumers to replace obsolete appliances, to rapidly replace appliances and to purchase the most efficient alternatives available on the market. Increased motivation is implemented through direct exchanges appliances, customer services and information activities by distributors and sellers of energy
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	6.6 PJ
Estimated annual energy savings	0.12 PJ
Additional information	Not yet implemented.
Main features of the scheme	

Implementing authority, stakeholders and their responsibilities	Implementing authority: Ministry Industry and Trade Stakeholders: distributors and/or sellers of energy-related products Obligations: carrying out information activities, monitoring the sale of energy appliances by energy performance class, monitoring of the decommissioning of energy appliances by energy performance class
Sectors targeted	Households, industry, services, public sector
Eligible individual energy saving measures	replacement of energy-related products consultation and targeted promotion activities awareness-raising activities on reduction opportunitiesconsumption energy through correct operation of energy appliances
Durability of individual measures	Investment measure: 10 years Training events, awareness-raising activities: 2 years
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	The energy savings method will be used to calculate the energy savings. The survey carried out will demonstrate the impact of the voluntary agreement on the replacement of energy appliances, on the basis of an analysis of the data on energy appliances being discarded, the appliances purchased and the
Energy saving metrics	Final energy consumption
Taking into account savings reductions over time	The calculation of cumulated energy savings takes into account: lifetime individual air— measures referred to above. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the commitment period. Taking into account the energy services provided by stakeholders over the lifetime of the measure, there is no reduction in annual energy savings over the lifetime of the measure. The lifetime of energy savings in the case of training and awareness-raising activities is taken into account in the calculation of accumulated energy savings. Annual energy savings are not expected to be reduced over the lifetime of the measure.
Additionality and materiality	

How has the additionality criterion been taken into account?	Individual measures and savings achieved are monitored, calculated and verified at the level of individual energy saving measures implemented. In view of the market failure, these savings would be: energy activities not implemented without stakeholders. Energy savings resulting from the implementation of individual replacements of energy-related products covered by ecodesign represent energy savings resulting from early replacement before the end of life of the original product. This situation is due to low motivation to replace products owing to a low level of energy-saving awareness and low energy prices.
In case the scheme promotes the accelerated introduction of more energy efficient products, how has the methodology for calculating savings been approached?	The evaluation of energy savings will take into account the average age of the replaced products. The calculation of energy savings will be carried out in accordance with the Commission Recommendation on the transposition of the energy savings obligation.
How was the materiality criterion taken into account?	In view of the market failure, particularly in relation to low awareness and long payback times of individual measures, without the activities of the interested parties, exchanges of energy appliances would not have been carried out to such an extent by the target entities and would also not have been purchased on the market for the most efficient alternatives.
Other criteria	
How are any overlaps in the scheme and policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised. There will be no financial mechanism or other policy measure for the replacement of energy appliances in the Czech Republic. For this reason, the risk of overlap and double counting is minimised.
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	In the case of exchanges of eco-designed energy-related products, only replacements for products meeting these parameters shall be encouraged. In the case of exchanges of energy-labelled products, only exchanges for products falling under the two highest energy performance classes, according to the relevant EU regulations, are encouraged.
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	Energy savings are monitored and verified on the basis of data on discarded, sold energy appliances and stakeholder activities. Stakeholders provide through an online platform information on the implemented measures needed to declare energy savings by the implementing authority.

	Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the competent department of the Ministry of Industry and Trade responsible for implementing the energy efficiency policy.
Authorities responsible for the monitoring and verification process	Ministry of Industry and Trade, stakeholders
Independence of monitoring and verification from obligated, participating or entrusted parties	Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for implementing the energy
Verification of a representative sample	

Table 132: *Information campaign on energy efficiency awareness*

Basic information	
Title of the policy action	**Information campaign on energy efficiency awareness**
Type of policy measure	Behavioural measures
Concise description of the policy measure	The measure is aimed at raising awareness of energy efficiency with a view to changing the behaviour of energy consumers and reducing energy consumption. The information campaign will be multi-level in order to maximise the impact on energy consumers. The outreach activities will be implemented through TV spots, printed media information activities, social media outreach activities and, last but not least, via an online platform.
Planned budget	
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	
Estimated new annual energy savings	
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authority: Ministry Industry and Trade Obligations: implementation of individual measures, independent monitoring and verification of energy savings.
Sectors targeted	households
Eligible individual energy saving measures	national multi-level energy efficiency awareness campaign
Durability of individual measures	Training actions: 2 years
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	For energy savings resulting from measures to change consumer behaviour as a result of education and awareness raising, the method of the savings examined is used. In the calculation of energy savings, the impact of campaigns on consumer behaviour is taken into account: consumption energy v ordinary households. This presupposes that, in the absence of energy advice, these entities would not, in most cases, deal with their energy consumption.

	The average level of energy savings is in the range of 2-3 % per year. On the basis of a survey carried out by the Ministry of Industry and Trade, it is clear that the level of household awareness of energy consumption and the importance of energy savings is low in the Czech Republic. Therefore, the level of average energy savings can be considered to be at the upper limit of 3 %. Average household consumption is used in the calculation of energy savings.
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	In the calculation of cumulated energy savings, the lifetime of individual measures is taken into account above. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of energy savings in the event of actions aimed at changing consumer behaviour is taken into account in the calculation of accumulated energy savings. Annual energy savings are not expected to be reduced over the lifetime of the measure.
Sources of information	Research demonstrating average energy savings: Hunt Allcott. (2011). Social norms and energy conservation. Journal of Public Economics, Volume 95, Issues 9-10, https://doi.org/10.1016/j.jpubeco.2011.03.003
Additionality and materiality	
How has the additionality criterion been taken into account?	Having regard to the market failure in relation to low awareness o wider benefits energy austerity measures and low energy prices would not materialise without the existence of a policy measure.
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	Not applicable.
How was the materiality criterion taken into account?	In view of market failure, without a targeted awareness-raising campaign, the target would not be incentivised to change behaviour and reduce energy consumption. Based on the above research, it was found, on the basis of a representative sample, that there is a reduction in energy consumption on the basis of awareness raising measures.
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the individual measures, the risk of double counting is minimised. No other national awareness campaign will be carried out in a given year. Other activities in the field

	awareness raising under other stakeholder measures/activities will be deducted on the basis of the bottom-up approach.
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	Not applicable.
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	As part of the research, a survey was carried out to validate the energy saving rate on a representative sample of individual measures. As part of the evaluation of the effect of the campaign, the impact of information activities on the number of energy consumers will be assessed. Verification of eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive are carried out by the competent service Ministries industry a trade responsible for implementing energy efficiency
Authorities responsible for the monitoring and verification process	Ministry Industry and Trade
Independence of monitoring and verification from obligated, participating or entrusted parties	An evaluation of the impact of the campaign on energy consumers will be carried out by an independent body.
Verification of a representative sample	As part of the ex-post evaluation, a representative sample survey will identify the percentage energy savings of selected energy consumers.

Basic information	
Title of the policy action	**New green savings Light**
Type of policy measure	Financial mechanism
Concise description of the policy measure	The measure aims at investment support to improve the energy performance of family houses owned by vulnerable low-income households affected by energy poverty.
Planned budget	
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	4 PJ
Estimated new annual energy savings	0.5 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authorities: Ministry of the Environment, State Environmental Fund Obligations: Managing the financial mechanism, awarding financial grants, approving and controlling projects, independent monitoring and verification of energy savings.
Sectors targeted	households
Eligible individual energy saving measures	• improving the energy performance of a building (building envelope, technical equipment), • refurbishment and replacement of self-consumption facilities; • refurbishment of electricity, gas and heat distribution
Durability of individual measures	Investment measures – buildings: 12-30 years
Tackling energy poverty	Yes
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	The method of measured savings will be used to calculate energy savings if it is a cost-effective option for the individual measures implemented. In other cases, the method is used pro rata savings on based on engineering estimates. The calculation of energy savings is carried out by energy consultants. The calculation of energy savings is supported by an expert document and is based on a

	the state of final energy consumption before and after the implementation of the energy saving measure.
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	The calculation of cumulated energy savings takes into account: lifetime individual air— measures referred to above. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the commitment period. Taking into account the conditions for granting financial support and the sustainability period, there is no reduction in the annual energy
Additionality and materiality	
How has the additionality criterion been taken into account?	Individual measures and savings achieved are monitored, calculated and verified at the level of individual energy saving measures implemented. Given the market failure, these energy savings would not be realised without the existence of a policy measure. In the case of renovation of buildings (derogation according to Annex V, paragraph 2(b)), the baseline for determining energy savings shall be: consumption energy before implementation individual measures. Energy savings resulting from the implementation of individual replacements of energy-related products covered by ecodesign represent energy savings resulting from early replacement before the end of life of the original product. This situation is due to low motivation to replace products owing to a low level of energy-saving awareness and low energy prices.
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	The evaluation of energy savings will take into account the age of the replaced product. Calculation of savings energy will executed compliant the Commission's recommendation on the transposition of the energy savings obligation.

How was the materiality criterion taken into account?	In view of the market failure in particular in relation to the long payback period of individual measures, without the measure in question, i.e. without the provision of investment aid; licences were not targeted entities
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised. There will be no other financing mechanism for the same type of target group in the Czech Republic. The monitoring and verification system shall monitor unique identifiers that allow individual actions to be linked to a specific entity or object. This ensures that the monitoring system automatically deducts energy savings in case of overlaps to avoid double counting.
Iceand verification of achieved energy savings	
Brief description of the monitoring and verification system and the process of the verification;	Under the financial support scheme under the financial mechanism (measure), each project undergoes a substantive process of evaluating the proposed individual energy-saving measures by the measure manager – the State Environmental Fund environment. Within rating is energy savings resulting from the ex-ante implementation of the project are also assessed. Project implementation is verified for all projects as well as ex-post after the implementation of the project. The ex-post control is supported by documentation demonstrating the implementation of the measures and an ex-post random on-the-spot check for a random sample of projects. The energy assessment of individual measures itself is carried out by independent energy consultants. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 8 and Annex V of the Directive is carried out by the competent department of the Ministry of Industry and Trade responsible for implementing the energy

Authorities responsible for the monitoring and verification process	State Environmental Fund, Ministry of Industry and Trade
Independence of monitoring and verification from obligated, participating or entrusted parties	The energy assessment is carried out by independent energy consultants. Verification shall be subject to a two-level evaluation of the energy savings achieved. The substantive evaluation of projects is carried out by the department of the State Environmental Fund responsible for the management of the financial mechanism (measures) independent of energy policy-making. Verification of eligibility and declaration of energy savings achieved in accordance with the criteria of Article 8 and Annex V of the Directive are carried out by the department of the Ministry of Industry and Trade responsible for implementation policy increasing energy
Verification of a representative sample	As part of the ex-post evaluation, each implemented project (individual measure) is verified.

Basic information	
Title of the policy action	**Construction technical requirements for construction and renovation**
Type of policy measure	Regulatory measures
Concise description of the policy measure	This is a regulatory measure laying down new stricter minimum technical requirements for the construction and renovation of buildings applicable from 2022. The obligation is laid down in Act No 406/2000 on energy management and Implementing Decree No 264/2020 on the energy performance of buildings.
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	90 PJ
Estimated new annual energy savings	1.7 PJ
Additional information	The measure generates savings in 2023-2030
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	<u>Implementing authorities:</u> Ministry Industry and Trade <u>Obligations</u>: implementation of minimum requirements, monitoring of compliance with established obligations

Sectors targeted	Energy consumers
Eligible individual energy saving measures	• Regulatory measures — • Minimum technical and energy requirements for the construction and renovation of buildings
Durability of individual measures	Investment measures – buildings: 12-30 years
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	A combination of proportional and surveyed savings based on statistical data and engineering estimates will be used to calculate energy savings. The calculation of energy savings shall be made on the basis of a calculation of the difference between the energy consumption of buildings constructed and renovated by default before the efficiency of the new requirements and buildings after the effectiveness of the
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	In the calculation of cumulated energy savings, the lifetime of individual measures is taken into account above. Contribution individual air— measures v accumulated savings are taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the
Additionality and materiality	
How has the additionality criterion been taken into account?	The energy savings resulting from the measures go beyond the minimum requirements of Union law, as this is a tightening up based on Czech policy beyond transposition.
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	Not relevant
How was the materiality criterion taken into account?	In view of the market failure, in particular in relation to the long payback period of individual measures, costs would be minimised without the measure in question, i.e. without setting minimum requirements.
Other criteria	

How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised. Under the established rules on the provision of financial support, it is not possible to financially support compliance with the legislative obligation. For this reason, the risk of overlap between this measure and other measures or financial mechanisms is minimised.
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	Not relevant
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	The monitoring of compliance with the obligation in question falls within the competence of the bodies of the building administration and the State Energy Inspectorate, which is the body concerned in building procedures and checks compliance with specific interests under Act No 406/2000 on energy management. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 8 and Annex V of the Directive is carried out by the competent department of the Ministry of Industry and Trade responsible for implementing the energy
Authorities responsible for the monitoring and verification process	Ministry of Industry and Trade, State Energy Inspectorate, Construction Administration Authorities
Independence of monitoring and verification from obligated, participating or entrusted parties	Monitoring and verification shall be carried out by authorities other than the implementing authority. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 8 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for implementing the energy efficiency
Verification of a representative sample	The ex-post evaluation will verify the impact of the legislative obligation on a representative sample.

Basic information	
Title of the policy action	**Heating rules**
Type of policy measure	Regulatory measures
Concise description of the policy measure	These are regulatory measures setting out requirements for the regulation of the heating system, heating rules linked to compliance with average temperatures at

	heated spaces and rules for the allocation of heating and hot water costs. The requirements are or will be laid down in Act No 406/2000 on energy management and implementing legislation governing the regulation of temperatures and by Act No 67/2013 and Implementing Decree No 269/2015 on the allocation of heating costs and the joint preparation of hot water for a house.
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	70 PJ
Estimated new annual energy savings	10 PJ
Additional information	The measure generates savings in 2024-2030
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authorities: Ministry of Industry and Trade, Ministry of Regional Development Obligations: implementation of minimum requirements, monitoring of compliance with established obligations
Sectors targeted	Energy consumers
Eligible individual energy saving measures	Regulatory measures • buildings • minimum requirements for heating • control of heating systems
Durability of individual measures	Regulatory measures – saving generated every year
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	A combination of proportional and surveyed savings based on statistical data and engineering estimates will be used to calculate energy savings. The calculation of energy savings shall be made on the basis of a calculation of the difference between the energy consumption of households, commercial and public entities before and after the introduction of new obligations. The ENERGO 2021 statistical survey was used for the baseline energy consumption, among others, analysis Odyssee-Mure a internal analyses
Energy saving metrics	Final energy consumption

Taking into account lifetimes and reducing energy savings over time	In the calculation of cumulated energy savings, the lifetime of individual measures is taken into account above. Contribution individual air— measures v accumulated savings are taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the
Additionality and materiality	
How has the additionality criterion been taken into account?	The energy savings resulting from the measure go beyond the minimum requirements of Union law, as this area is not regulated by Union law.
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	Not relevant
How was the materiality criterion taken into account?	In the light of existing statistical data, it is clear that energy performance, especially in the area of domestic heating but also commercial and public buildings, is high compared to the EU average, due to inefficient heating, high levels of heated rooms in heating seasons and inefficient regulation. The measure directly addresses all of these factors affecting the energy consumption of heating.
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised.
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	Not relevant
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	It is the responsibility of the authorities of the State Energy Inspectorate to monitor compliance with the obligation in question. body responsible for monitoring compliance special interests under Act No 406/2000 on energy management.

	Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 8 and Annex V of the Directive is carried out by the competent department of the Ministry of Industry and Trade responsible for implementing the energy
Authorities responsible for the monitoring and verification process	Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification from obligated, participating or entrusted parties	Monitoring and verification shall be carried out by authorities other than the implementing authority. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 8 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for implementing the energy efficiency
Verification of a representative sample	The ex-post evaluation will verify the impact of the legislative obligation on a representative sample.

Basic information **Title of the policy action**	**Maximum weights of trucks**
Type of policy measure	Regulatory measures
Concise description of the policy measure **Estimated energy savings in period 2** **Estimated cumulated energy savings**	This is a regulatory measure laying down requirements on the maximum authorised weights of combinations of vehicles under Decree No 209/2018, which enable goods to be transported more efficiently and fuel consumption to be reduced. **21-2030** 10 PJ
Estimated new annual energy savings	1 PJ
Additional information **Main features of the policy measure implementing the authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure**	The measure generates savings over the period 2021-2030 Implementing authorities: Ministry of Transport Obligations: implementation of minimum requirements,
Sectors targeted	Transport, fuel consumers
Eligible individual energy saving measures	• Regulatory measures • fuel saving
Durability of individual measures	Regulatory measures – saving generated every year

v .---------- ------------------------- **Tackling energy poverty**	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	A combination of proportional and surveyed savings based on statistical data and engineering estimates will be used to calculate energy savings. The calculation of energy savings is carried out on the basis of a calculation of the difference between the consumption of fuel operated by semi-trailers in the Czech Republic with the maximum authorised weight determined by European legislation and the weight specified in Decree No 209/2018. It is possible to increase transport capacity by 12 % for one kit, thus reducing the need to increase the number of kits, thus
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	In the calculation of cumulated energy savings, the lifetime of individual measures is taken into account above. Contribution individual air— measures v accumulated savings are taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the
Additionality and materiality	
How has the additionality criterion been taken into account?	The energy savings resulting from the measure go beyond the minimum requirements of Union law.
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	Not relevant
How was the materiality criterion taken into account?	Given the direct impact of authorised transport weights on the energy consumption of trucks and the energy intensity of freight transport, the measure leads to direct savings.
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised.

How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	Not relevant
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	The calculation of the amount of savings and the verification of eligibility and reporting of energy savings achieved in accordance with the criteria of Article 8 and Annex V of the Directive are carried out by the competent department of the Ministry of Industry and Trade responsible for implementing the energy
Authorities responsible for the monitoring and verification process	The Ministry of Industry and Trade,
Independence of monitoring and verification from obligated, participating or entrusted parties	Monitoring and verification shall be carried out by authorities other than the implementing authority. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 8 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for implementing the energy efficiency
Verification of a representative sample	A study was carried out as part of the ex-post evaluation.

Basic information	
Title of the policy action	**Modal change in transport**
Type of policy measure	Regulatory measures, Financial measures
Concise description of the policy measure	These are regulatory measures laying down requirements for passenger and freight transport, together with a positive incentive for energy consumers to use less energy-intensive modes of transport in accordance with the Czech Transport Policy. The measure will reduce the energy intensity of passenger transport by promoting urban public transport and reducing the share of individual passenger transport. Furthermore, the measure will also lead to a reduction in the energy intensity of freight transport by promoting a
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	50 PJ
Estimated new annual energy savings	5 PJ
Additional information	The measure generates savings in 2022-2030

Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authorities: Ministry of Transport Obligations: implementation of minimum requirements, monitoring of compliance with established obligations
Sectors targeted	Transport, fuel consumers
Eligible individual energy saving measures	• Combination of regulatory and financial measures to improve the energy intensity of passenger and freight transport, including: • completion of transit rail corridors; upgrading of lines • electrification of railway tractions, acceleration electrification of backbone lines to regions • ensuring sufficient capacity for freight transport for connecting industrial zones of strategic importance • replacement of diesel locomotives by electric • traction power conversion • building cycle paths • standards for parking spaces for bicycles and scooters • support for the deployment and use of urban public transport infrastructure • support for multimodal transport terminals • information campaigns on sustainable forms transport
Durability of individual measures	10-30 years
Tackling energy poverty	No
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	A combination of proportional and surveyed savings based on statistical data and engineering estimates will be used to calculate energy savings. The calculation of energy savings is made on the basis of a calculation of the difference between the energy consumption for passenger transport based on individual passenger transport and urban public transport and for road and rail-based freight transport. Only the difference between business-as-usual consumption is considered to

	usual and scenarios after the implementation of the measures defined in the Czech Transport Policy. Savings are counting on the basis of statistical data.
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	A lifetime of 10 years or more shall be taken into account in the calculation of cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of
Additionality and materiality	
How has the additionality criterion been taken into account?	The energy savings resulting from the measure go beyond the minimum requirements of Union law, as this area is not regulated by Union law.
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	Not relevant
How was the materiality criterion taken into account?	Given the direct impact of authorised transport weights on the energy consumption of trucks and the energy intensity of freight transport, the measure leads to direct savings.
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	The total amount of savings was reduced by 30 % (25 PJ) due to possible overlaps with other transport scheme measures.
How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	Not relevant
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	The calculation of the amount of savings and the verification of eligibility and reporting of energy savings achieved in accordance with the criteria of Article 8 and Annex V of the Directive are carried out by the competent department of the Ministry of Industry and Trade responsible for implementing the energy
Authorities responsible for the monitoring and verification process	The Ministry of Industry and Trade,
Independence of monitoring and verification from obligated, participating or entrusted parties	Monitoring and verification shall be carried out by authorities other than the implementing authority.

	Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 8 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for implementing the energy efficiency
Verification of a representative sample	As part of the ex-post evaluation, statistical data will be analysed for the entire commitment period.

Basic information	
Title of the policy action	**Crisis measures to reduce energy consumption**
Type of policy measure	Regulatory and behavioural measures
Concise description of the policy measure	Combinations broad spectra regulatory; behavioural a financial measures implemented during the energy crisis, final consumption has decreased immediately.
Estimated energy savings 2021-2030	
Estimated cumulated energy savings	65 PJ
Estimated new annual energy savings	65 PJ
Additional information	The measure generates savings in 2022
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the process of implementing the policy measure	Implementing authorities: Ministry of Industry and Trade, Ministry of Environment, Ministry of Labour and Social Affairs Obligations: implementation of minimum requirements, monitoring of compliance with established obligations
Sectors targeted	Energy consumers
Eligible individual energy saving measures	• temperature control of heated compartments • information campaigns • replacement of inefficient energy appliances • technical management of buildings; • monitoring of energy consumption and energy management • energy consultancy — • Advisory centres; • mobile consultants; • information helpline; • web-based information portals; • advice for the energy poor households and vulnerable customers

	through employment offices and social workers
Durability of individual measures	1 year
Tackling energy poverty	Yes
Methodology for calculating energy savings (Background information on the methodology for calculating energy savings)	
Methods for measuring energy savings	A combination of proportional and surveyed savings based on statistical data and engineering estimates will be used to calculate energy savings. The calculation of energy savings shall be based on a calculation of the difference between the standard energy consumption of households, commercial and public entities before and after the introduction of the
Energy saving metrics	Final energy consumption
Taking into account lifetimes and reducing energy savings over time	In the calculation of cumulated energy savings, the lifetime of individual measures is taken into account above. Contribution individual air— measures v accumulated savings are taken into account in line with the Commission Recommendation on the transposition of the energy savings obligation. The lifetime of the savings from the implementation of investment measures exceeds the length of the
Additionality and materiality	
How has the additionality criterion been taken into account?	The energy savings resulting from the measure go beyond the minimum requirements of Union law.
In case the measure promotes the accelerated uptake of more energy efficient products, how has the methodology for calculating savings been approached?	Not relevant
How was the materiality criterion taken into account?	Without the implementation of the measures, energy consumers would not have achieved such substantial energy savings.
Other criteria	
How are any overlaps between policy measures addressed in order to avoid double counting of savings?	Given the nature of the measure and the target audience, the risk of double counting is minimised.

How are quality standards (for products, services and installation of measures) promoted or required under the policy measure?	Not relevant
Monitoring and verification of energy savings achieved	
Brief description of the monitoring and verification system and the process of the verification;	Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 8 and Annex V of the Directive is carried out by the competent department of the Ministry of Industry and Trade responsible for implementing the energy
Authorities responsible for the monitoring and verification process	Ministry Industry and Trade
Independence of monitoring and verification from obligated, participating or entrusted parties	Monitoring and verification shall be carried out by authorities other than the implementing authority. Verification of the eligibility and reporting of energy savings achieved in accordance with the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for implementing the energy efficiency
Verification of a representative sample	The ex-post evaluation verified the impact at farm level.

Annex 2: List of images, tables and graphs

List of images:

Seznam tabulek:

Seznam grafů:

Annex 3: List of abbreviations

4M MC	trading on the common Czech-Slovakia-Hungary-Romanian interconnected day-ahead market (4M market coupling)
YES	Events of dissatisfied citizens (political party)
BACI	Interconnector between the Czech and Austrian Gas Transmission System (Bidirectional Austrian-Czech Interconnection)
BAT	best Available Technology
BAU	“business as usual”
BEV	battery Electric Vehicle
bottom-up	bottom-up approach (in reference to regional cooperation)
BP	petroleum company (British Petroleum)
BPS	biogas station
BRKO	biodegradable municipal waste
BRO	biodegradable waste
BSD	security standard of supply (natural gas)
BT	block market (electricity in the Czech Republic)

business as usual under normal conditions

CACM	(EU) Capacity Alocation and Congestion Managment
CCS	carbon Capture and Storage
CCU	carbon Capture and Utilisation
CDD	number of cooling degree days
CEE GRIP	preparation Platform for the Regional Investment Plan for Central and Eastern Europe
CEF	Connecting Europe Facility
CEGH	central European gas switchboard – Baumgarten
CEP	Central Project Repository

ceteris paribus	indication of the condition or presumption where the result is valid only provided that the other conditions do not change
FG	The Cohesion Fund
CIF	cost of Insurance and Freight
CNG	compressed natural gas
WHAT	Carbon monoxide
CO_2	Carbon dioxide
COP 21	Paris Agreement (Conference of Parties)
Core flow-based	common intraday capacity calculation methodology developed transmission system operators of a region
Coreso, TSC, SSC	coordination platforms to ensure operational coordination between the dispatching sites of the participating TSOs
CPI	Czech-Polish Interconnection (Czech-Polish Interconnection)
CPO02	European energy efficiency target
CEPS	Czech transmission operator (ČEPS, a.s.)
ČGS	The Czech Geological Service
ČHMÚ	Czech Hydrometeorological Institute
CNB	Czech National Bank
CZECH REPUBLIC	Czech Republic
ČSSD	Czech Social Democratic Party (political party)
CSO	Czech Statistical Office
DEZ	secondary energy sources
DS	distribution system
DT	daily spot market (electricity in the Czech Republic)
EBGL	Commission Regulation (EU) establishing a guideline on electricity balancing
EDU	Dukovany Nuclear Power Plant
EEPR	European Energy Programme for the Economic Recovery of the Energy Sector

EEX	European Energy Exchange
EFFECT	State programme to promote energy savings
EIA	Environmental Impact Assessment
EKIS	Energy consultation and information centres
ENERGO	Household sector statistical survey flag
ENS	energy gap indicator to cover expected typical annual consumption, including energy not served
ENTSO-E	European Network of Transmission System Operators for Electricity
EPC	energy Performance Contracting (Energy Performance Contracting)
ERD	system of execution diagrams
ERDF	European Fund for Regional Development
ERÚ	Energy Regulatory Office
ES ČR	electricity system of the Czech Republic
ESF	European social fund
ESIF	European Structural and Investment Funds
ESR	measures (EU) to comply with the LULUCF Regulation, covering all key emitting sectors and sectors to improve removal, to become a low-emission economy in line with the Paris Agreement
ETPS	energy Technology Perspectives – IEA (Energy Technology Perspectives) publication
EU ETS	European Union emission trading scheme
EUA	European Emission Allowances
EUPHEMIA	uniform algorithm for efficient pricing of electricity and the use of cross-border transmission capacity
Euracoal	European Association for Coal and Lignite)

Eurostat	statistical Office of the European Union
EU-SILC	(EU) survey only in permanently populated private dwellings (population projection, number of households)
EA	Energy Act
FACTS	use of high temperature conductors or superconductors and flow control devices
FCA	Regulation (EU) establishing a guideline on forward capacity allocation
FID	Final investment decission
FSC	Forest Stewardship Council
FVE	photovoltaic power plant
GASPOOL	German trade zone
Gazelle	pipeline
GHG	greenhouse House Gas
HDD	number of heating degree days
GDP	gross domestic product
GNI	gross national income
GVA	gross added-value
HPS	border Transfer Station
IEA	International Energy Agency
IGCC	International Grid Control Cooperation
IPCC	Intergovernmental Panel on Climate Change
IPP	Industrial production index
IPPC	Integrated pollution prevention and control
IROP	Integrated Regional Operational Programme
KO	municipal waste
ktoe	Kiloton of oil equivalent
CHP	combined power and heat generation
LČR	Forests of the Czech Republic
LIP 15	joint project for cross-border trade in the Czech Republic, Bulgaria, Austria;

Germany, Hungary, Poland, Romania, Slovenia, Croatia

LOLE supply reliability standard (Loss of Load Expectation)

LPG liquefied Petroleum Gas

LRF linear reduction factor/emission allowances/

LULUCF sector Land Use, Land Use Change and Forestry

M1 vehicles having a maximum of eight passenger seats

M2 vehicles having more than eight passenger seats (weight not exceeding 5 000 kg)

M3 vehicles having more than eight passenger seats (weight greater than 5 000 kg)

MAF reliability methodology applicable in the planning of remedial actions in case of indication of resource insufficiency and ENTSO-E report (Mid-term Adequacy Forecast)

MARI Manually Activated Reserves Initiative

MC market coupling principle

MCO a plan providing for the performance of the functions of NEMOs in the area of market Coupling Operator Plan

Mero ČR, a.s. Czech company, owning and operating the Družba and IKL pipelines on Czech territory

RME Rapeseed oil methyl ester

MF CR Ministry of Finance

MMR Ministry for Regional Development

PRIMES model modelling tool for EU analysis (in impact assessment and analysis of policy options)

Mothballing deactivation and storage of equipment or production equipment for possible future use

MINISTRY OF INDUSTRY AND TRADE Ministers of Industry and Trade

MRC	connected Western Europe flow-base region of cross-border capacity allocation (Multi Regional Coupling)
MT	Megatuna (equivalent to million tonnes)
Mtoe	million tonnes of oil equivalent
MINISTRY OF THE INTERIOR	Ministry of the Interior of the Czech Republic
MW	megawatt
N1	vehicles with a maximum permissible mass not exceeding 3 500 kg
N-1	safety criterion
N2	vehicles with a maximum authorised mass exceeding 3 500 kg but not exceeding 12 000 kg
N_2O	nitrous oxide
N3	vehicles with a maximum authorised mass exceeding 12 000 kg
NAP CM	National Clean Mobility Action Plan
THE NAP IS	National Nuclear Energy Action Plan
NAP RES	National Renewable Energy Action Plan
NAP SG	National Smart Network Action Plan
NAPEE	National Energy Savings Action Plan
NATO Central European Pipeline System (CEPS)	Central European Pipeline System in NATO
NC CAM	Network Code Capacity Allocation Management
NC ER	EU Commission Regulation establishing a Network Code on Electricity Restoration Network
NCG	German trade zone
NEMO	nominated Electricity Market Operator under CACM Regulation
NOT APPLICABLE	non-renewable energy sources
NET4GAS	Transport operator in the Czech Republic
NIL	National Forest Inventory

NPISHS	adjusted disposable income (transfers to households from general government or non-profit institutions serving households)
NKR	National concepts for the implementation of cohesion policy
NN North Sea Brent FOB	low voltage (or low-voltage networks)
No_x	Oxides of nitrogen
NPOV	National priorities for oriented research
NPR	National Reform Programme of the Czech Republic
NTC	net Transmission Capacity
NV	Government Regulation
OECD	Organisation for Economic Co-operation and Development
OLTC	greater use of reclosers, smart segment switches, vn/nn transformers with switches under load
OP PIK	Operational Programme Enterprise and Innovation for Competitiveness
OPD	Operational Programme Transport
OPEC	Organisation of the Petroleum Exporting Countries
OPM	measured place where electricity is supplied and taken over between two market participants or electricity consumption
OPEI	Loans to municipalities to upgrade housing 0 9 7 0 2.3
OP ENVIRONMENT	Operational Programme Environment
UN	United Nations
OTE, a.s.	Electricity and gas market operator
RES	renewable sources of energy
PCIs	project of Common Interest
PCR	Price Coupling of Regions under the MCO Plan

PEFC	Programme for the Endorsement of Forest Certification
PEZ	primary energy sources
PFCs	perfluorocarbons
PHEV	plug-in hybrid electric vehicles
PHM	motor fuels and lubricants
PICASSO	Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation
PJ	Petajoule (energy unit)
PLEXOS	Integrated energy model for energy market modelling
PM 10 matter)	particle size (relict dust) in micrometres (particulate)
POH CR	Waste management plan of the Czech Republic
PAK	Climate policy in the Czech Republic
PPL	cross-border pipeline
PPS	a transmission system operator
C4G project	increasing cross-border transport capacities at the borders of the Czech Republic with BRD and SK (“Capacity for Grid”)
RDPS	Rural development programme
PS ČR	transmission system of the Czech Republic
PST	transverse control transformers
PUPFL	land intended to fulfil forest functions
RES	supported energy sources
RDE	real Driving Emissions
RIA	Regulatory Impact Assessment
RIS3	National Research and Innovation Strategy for Smart Specialisation of the Czech Republic
RSC	regional Security Coordinator

RTPA	regulated third party access
SDAC	a single day-ahead electricity market in the EU
SEA	Strategic Environment Assessment
SEC	State Energy Policy
Set plan	European Strategic Energy Technology Plan
SIDC	single intraday electricity market in the EU
SO GL	EU Commission Regulation establishing a guideline on electricity transmission system operation guidelines
SOAF	ENTSO-E Report
SOS	Security of Supply
CFR	Regional Development Strategy of the Czech Republic
CA	balance responsible parties
MTA	heat supply system
THE CZECH REPUBLIC	Technology Agency of the Czech Republic
TAL	pipeline managed by TAL Group (Transalpine Pipeline)
TAP	solid alternative fuels
TCEP	IEA publication (Tracking Clean Energy Progress)
TEN-E	Trans-European Energy Networks
TEN-T	Trans-European Transport Networks
TERRE	Trans European Replacement Reserves Exchange)
THÉTA	programme to support applied research, experimental development and innovation
I.E.	terajoule (energy unit)
TKO	municipal solid waste
TNS	domestic net consumption

TriHyBus Czech hydrogen hybrid bus, an electrobus powered by fuel cells

TRU	the Business Area/Gas/TRU Improvement Project allows for direct interconnection of the Czech and Austrian gas markets (Trading Region Upgrade)
TSO	Transmission System Operator
TYNDP	Ten-year Transmission System Development Plan in the Czech Republic (Ten—Year Network Development Plan)/European 10-year network development plan
ÚHÚL	Forest Management Institute
USD PPP	USD in purchasing parity forces (USD) in purchasing power parity)
USD/bbl	dollars per barrel
VAV	science and research
VDT	intraday market (withelectricity v CZECH REPUBLIC)
VIPS	virtual interconnection point
VN	high voltage (or high-voltage network)
VOB	virtual Business Point (Virtual Trading) Point)/gas/
VOC	volatile organic substance (volatile organic Compound)
VOLL	supply reliability standard (Value of Loss Load)
VPS	national transmission system
VŠPS	labour force survey
VTE	wind farm
VTL, STL, NTL	high-pressure, medium-pressure and low-pressure gas pipeline system
VVTL	very high gas pipelines pressure levels
VZP	virtual gas storage facility
WEO	World Energy Outlook IEA)
XBID	joint project for cross-border trade between Czech-Polish and Bulgaria—Romanian
ZD	nomination of a commitment to supply/natural gas/
ZO	nomination of a commitment to withdraw/natural gas/
RS	natural gas
ESF+	European Social Fund Plus