

# Update of the integrated national Energy and climate plan

## Draft

In accordance with 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, 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

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## **Section A: National plan**

# 1. OVERVIEW AND PROCEDURE FOR DRAWING UP THE PLAN

## 1.1. Summary

### 1.1.1. Political, economic, environmental, and social context of the plan

This plan is in the context of the timely achievement of the objectives of the United Nations General Assembly resolution of 25 September 2015 entitled ‘Transforming our world: the UN 2030 Agenda for Sustainable Development’. In particular, it contributes to achieving SDG 7 of ensuring access to affordable, reliable, sustainable and modern energy for all. At the same time, the plan contributes to the timely implementation of SDG 13 to take immediate action to combat climate change and its impacts, in line with the systemic integration of the SDGs.

Russia’s war of aggression against Ukraine means a change of time in many ways. The German economy and the EU have so far been too dependent on individual suppliers of fossil fuels. The high replacement cost, in addition to the trade frictions caused by the COVID-19 pandemic, has contributed to a one-off increase in inflation in the history of the Federal Republic and the euro area. In order to safeguard our prosperity and quality of life in the future, it is crucial to strengthen our economic resilience in Germany and Europe, and to accelerate the transition towards a social and environmental market economy, in which energy remains secure but also affordable.

At European level, the REPowerEU plan, the Fit for 55 package and the European Climate Law have set the ground for this. The REPowerEU plan allows for an exemption from over-reliance on individual fossil energy suppliers through ambitious energy savings, faster deployment of renewable energies and the development of wider international energy supply relationships that increasingly rely on renewable energy. With the Fit for 55 package, Europe is an international leader and the European Climate Law sets itself as the first continent to become climate neutral by 2050. The aim is to limit global warming to under 1.5 degrees and to safeguard our future prosperity.

In the light of these profound geopolitical, political and socio-economic changes, the Federal Government has revised its National Energy and Climate Action Plan 2021-2030 (NECP). Central elements of Germany’s energy and climate policy are the 2030 climate change programme with the Federal Climate Protection Act, which requires Germany to achieve net greenhouse gas neutrality by 2045, and the Energy Efficiency Strategy 2050 with the National

Energy Efficiency Plan. Lignite phase-out in North Rhine-Westphalia will be brought forward to 2030. The nuclear phase-out was completed in 2023.

Energy and climate policy are constantly evolving. For example, two legislative packages have already removed many barriers to accelerating the roll-out of renewable energies and declared the use of renewable energy to be an overriding public interest. By 2030, 80 % of gross electricity consumption is to be produced from renewable energy sources. By 2030, 215 GW of photovoltaics and around 115 GW of wind on land will be tendered out and at least 30 GW expanded at sea. The Energy Efficiency Act will establish for the first time in 2023 a cross-sectoral framework to increase energy efficiency, setting targets in line with the amendment to the EU Energy Efficiency Directive. With the recast of the Federal Climate Protection Act in 2021 and the new comprehensive climate change programme, the Federal Government reaffirmed its ambitious climate targets. In order to achieve these objectives and at the same time contribute to the diversification of energy imports and thus to Germany's security of supply, the Federal Government has decided to update the National Hydrogen Strategy (NWS). The amendment of the

Building Energy Act initiates the decarbonisation of the heating sector. The CO<sub>2</sub> Cost Allocation Act now provides that the costs of carbon dioxide for heating oil, natural gas and other fuels in the building sector are to be shared between the landlord and the tenant. Sustainability of public finances also remains important for the sustainability of the government. With the Climate and Transformation Fund, the Federal Government has laid the financing of its investments in the future on a sound and predictable basis. In order to be able to implement them, the necessary specialists are needed. In some areas and regions, the shortage of skilled workers is already a challenge. The Federal Government's aim is therefore to safeguard and expand the skilled labour base in Germany. To this end, it has drawn up a new strategy for skilled workers and adopted a new law on the immigration of skilled workers.

All measures and strategies referred to in or resulting from the NECP are subject to funding reservation and subject to the competence/competence of the Federal Government under financial constitutional law. They do not involve (pre-)defining the budget, nor do they prejudge the budgetary legislator. Any additional staff and material resources required as a result of the plan for the Federal Government shall be fully and permanently financed within the framework of the applicable budgetary and financial planning in the respective section.

#### **1.1.11. Strategy relating to the five dimensions of the Energy Union**

European solutions are needed to bring security of supply, competitiveness and climate protection together efficiently and cost-effectively in the energy transition. Germany's energy and climate policy is guided by the European framework, including the five dimensions of the Energy Union.

#### **1.1.11.1. Summary table of key objectives, policies and measures of the plan**

Table A1: Key 2030 targets along the Energy Union dimensions



## 1. Decarbonisation

### ▶ .1. GHG emissions and removals

1. National climate targets: at least -65 % by 2030 compared to 1990, at least -88 % by 2040, GHG neutrality by 2045

2. Objectives for the development of natural sinks pursuant to Section 3a of the KSG

3. EU climate target: at least -55 % net by 2030 compared to 1990, broken down into

3.1. ETS: EU-wide target -62 % by 2030 compared to 2005

3.2. ETS2: EU-wide target of -43 % by 2030 compared to 2005

3.3. ESR: EU-wide target of -40 % by 2030 compared to 2005

3.4. Germany ESR target: —50 % by 2030 compared to 2005

4. LULUCF:

4.1. The EU-wide target is a sink of 310 Mt CO<sub>2</sub>eq in 2030 or an improvement of the sink by 42.2 Mt vs. 2016-18 in 2030

4.2. Germany's aim is to improve the sink by 3.8 Mt vs. 2016-18 (target of a 30.8 Mt sink based on outdated inventory data)

5. Climate neutrality of the federal administration by 2030

### ▶ .2. Renewable energy

▶ 40 % share of renewable energy in gross final energy consumption in 2030 as Germany's contribution to the EU 2030 target of 42.5 % (DEU target to the EU 2030 target) share of energy from renewable sources in gross final consumption of energy in 2030 in the sectors

▶ Electricity (600 TWh RES-E in 2030, at least 80 % of gross electricity consumption)

▶ Heating and cooling: 50 % of grid-bound renewable heat and/or unavoidable waste heat by 2030

▶ Transport: 30 % of gross final energy consumption in 2030 (according to RED II methodology)

▶ In addition, Technology-specific targets in the electricity sector in 2030 (installed performance 2030 in GW)

▶ Onshore wind: 115 GW to 2030.160 GW by 2040

▶ Photovoltaics: 215 GW to 2030.400 GW by 2040

▶ Wind at sea: at least 30 GW to 2030.40 GW by 2035 and 70 GW by 2045

▶ Biomass: GW by 2030

▶ Hydropower and others: No specific legally defined hydropower targets

▶ National Hydrogen Strategy: Accelerate market uptake for hydrogen

## 2. Energy efficiency

- ▶ According to the decision of the Bundestag of 21 September 2023 on an Energy Efficiency Act, Germany's final energy consumption (EEV) is to be reduced by 26.5 % compared to 2008 to 1867 terawatt-hours final energy consumption by at least by 2030, while primary energy consumption (PEV) is to be reduced by 39.3 % to 2252 terawatt-hours primary energy consumption.

### **3. Security of energy supply**

- ▶ Meet energy demand in Germany at all times
- ▶ Maintain resilience to supply crises
  - ▶ Further reduce the likelihood of supply crises
- ▶ Provide precautionary measures and reserves in the event of deterioration of the supply situation

### **4. Internal energy market**

- ▶ Implementation of the envisaged level of interconnection in accordance with Article 4(d) of the Governance Regulation
- ▶ Develop and modernise networks in line with needs
- ▶ View energy infrastructures together
- ▶ Coupling electricity, heat and transport sectors – sector coupling
- ▶ Phasing out and phasing out coal-fired electricity generation
- ▶ Further strengthen the European internal electricity market and ensure flexibility in electricity demand.
- ▶ Further coupling electricity markets

### **5. Research, innovation, competitiveness**

- ▶ The Federal Government aims to strengthen energy research between 2020 and 2030. This is why it has set itself the target for funding energy research in 2020-2022 of around EUR 1.3 billion per year.
- ▶ Drive forward-looking innovation for the transformation of energy supply
- ▶ Maintain, develop and create a competitive industrial, commercial and SME base and jobs in Germany and create the foundations for prosperity and quality of life

Table A2: Key policies and actions along the Energy Union dimensions

## **1. Decarbonisation**

### **1.1. GHG emissions and removals**

- ▶ Implementation of the objectives in the Climate Change Act (KSG) and climate change programmes (key measures from the programmes are mentioned in the following dimensions)
- ▶ Programme of measures for climate-neutral federal administration (§ 15(1) KSG)

1. EU Emissions Trading System
  2. Energy and electricity taxation
  3. Carbon pricing for transport and heat (BEHG)
  4. CO2 Cost Allocation Act
- 1.2. Renewable energy
- ▶ Renewable Energy Act
  - ▶ Wind Energy On Sea Act (WindSeeG)
  - ▶ Accelerate planning and permit-granting procedures for the development of onshore and offshore wind energy.
  - ▶ Better synchronisation of the deployment of renewable energy with grid expansion
  - ▶ Better regionalisation of renewable energy expansion
  - ▶ Further development of combined heat and power (CHP)
  - ▶ Regional cooperation
  - ▶ Strengthening self-consumers in the electricity sector
  - ▶ National Hydrogen Strategy Package
  - ▶ Subsidising purely electric vehicles through environmental bonuses
  - ▶ Strengthening Germany's battery cell production site
  - ▶ Building Energy Act (Building Energy Act)\*
  - ▶ Energy efficiency strategy for buildings (ESG)\*
  - ▶ Federal funding for efficient heating networks\*
  - ▶ Law on Heat Planning and Decarbonisation of Heat Networks
  
  - ▶ Federal Funding for Efficient Buildings (BEG)\*

*\* Measures from the buildings sector (see 2. 'Energy efficiency'), which also contribute significantly to Dimension 1 'Reducing CO2 emissions'.*

## **2. Energy efficiency**

- ▶ Energy Efficiency Act
- ▶ National Energy Efficiency Action Plan 2.0 (NAPE)
- ▶ Long-term renovation strategy (LTRS)
- ▶ Energy efficiency strategy for buildings (ESG)
- ▶ Building Energy Act (Building Energy Act – GEG)
- ▶ Federal Funding for Efficient Buildings (BEG)

- ▶ Tax support for energy renovation of buildings
- ▶ Carbon pricing in the heating and transport sectors
- ▶ Promotion of energy advice for all consumer groups
- ▶ Outreach: Information and activation campaign “80 million together for energy transitions”

### **3. Security of energy supply**

- ▶ Act on electricity and gas supply (Energy Industry Act – EnWG)
- ▶ Act on the Security of Energy Supply (Energy Security Act – EnSiG)
- ▶ Regulation on security of gas supply in a supply crisis (Gas Security Regulation – GasSV)
- ▶ National preventive action plans and emergency plans for natural gas under Regulation (EU) 2017/1938 (former Regulation (EU) No 994/2010)
- ▶ Solidarity mechanism under Regulation (EU) 2017/1938
- ▶ Expansion of the LNG site in Germany
- ▶ Petroleum Stockpiling Act (ÖlbevG)
- ▶ Mineral Oil Data Act (MinÖlDatG)

### **4. Internal energy market**

Implementation of the envisaged level of interconnection in accordance with Article 4(d) of the Governance Regulation:

- ▶ Development of cross-border electricity interconnectors
- ▶ Strengthening regional cooperation

Develop and modernise networks in line with needs:

- ▶ Faster expansion of electricity grids
- ▶ Optimisation of existing networks
- ▶ Monitoring of electricity and gas grid development projects
- ▶ Speed up smart meter rollout massively and complete it by 2030 (or 2032 for large-scale power-measured installations and large consumers)

Coupling electricity, heat and transport sectors – sector coupling

- ▶ Remove barriers to the coupling of the electricity, heat and transport sectors

Gradual reduction and phasing out of coal-fired electricity generation:

- ▶ Coal Power Generation Termination Act
- ▶ Accompanying structural policies

Keeping the electricity market 2.0 functioning and ensuring flexibility of the energy system:

- ▶ Further integrate and make European electricity markets more flexible
- ▶ Implement the concept of “benefit rather than regulate”
- ▶ Flexibilising CHP plants through pilot projects for modernised CHP plants
- ▶ Principle of redispatching: Optimisation measures around redispatching
- ▶ National Flexibility Check on Flexibility Barriers and Identification of Flexibility Potentials

Further link electricity markets:

- ▶ Action plan to reduce network congestion
- ▶ Creation of a Central and Eastern European Capacity Calculation Region (CORE)
- ▶ Optimisation of intraday trading capacity

## **5. Research, innovation, competitiveness**

- ▶ 7. Energy Research Programme – Innovation for the Energy Transition
- ▶ Regulatory sandboxes and strengthening technology transfer
- ▶ Cross-system issues (e.g. sector coupling, digitalisation)
- ▶ Better involvement of start-ups
- ▶ Strengthening international cooperation

## 1.2. Overview of current policy situation

### 1.2.1. National and Union energy system and policy context of the national plan

Climate change is one of the biggest challenges of our times. At national, European and international level, the Federal Government directs its climate, energy and economic policies to 1.5 degrees. It is ambitious in deriving its objectives from the joint contribution to which the European Union has committed itself under the Paris Agreement. In the negotiations on the Fit for 55 package, the Federal Government supports the European Commission’s proposals.

Energy and climate policy needs a European framework, as energy and climate decisions of one Member State inevitably affect other Member States. The National Energy and Climate Plans (NECPs) can help to achieve greater convergence of national policies.

Energy efficiency and the development of renewable energy will be key pillars of Europe’s energy transition. This is in line with and supports the German energy transformation strategy.

The completion of the European internal energy market is a prerequisite for the success of the energy transition in Germany and the EU. Open, flexible markets and fair competition are essential for cost-effective and secure energy supply and for the integration of renewable energy into the market.

Electricity markets need to be interconnected and send the necessary price signals. This will provide a secure framework for the necessary investments and flexibility in energy production

and consumption.

### **1.2.11. Current energy and climate policies and measures relating to the five dimensions of the Energy Union**

See chapter 1.1.ii. for a summary. A detailed description is given in Chapter 3.

#### **1.2.11.1. Key issues of cross-border relevance**

##### **Dimension 1: Reduction of CO<sub>2</sub> emissions**

###### **1.1 GHG emissions and removals**

Germany contributes to the achievement of the EU's 2030 climate target and the objectives of the Paris Agreement on climate change. Exchanges with other Member States take place mainly on national climate change strategies and non- and sub-state climate change projects (by NGOs and municipalities) in order to share experiences and best practices and to identify and discuss possible impacts on other Member States as early as possible. Another key issue in exchanges with other Member States is the design and implementation of EU climate policy.

###### **1.2 Renewable energy**

Due to Germany's geographical location in the centre of Europe, the development of renewable energies in Germany has a wide range of effects on its neighbouring countries. The integration of renewable energies into the grid and systems is a high priority for the Federal Government (see Chapter 3.1.2.). The Federal Government focuses on regional cooperation with other Member States, which is an important driver for the market integration of renewable energies. The Federal Government will therefore open tenders for electricity from renewable energy sources to installations located in other EU Member States. On the island of Bornholm, Germany and Denmark will develop a joint offshore project and connect to the German and Danish electricity grids. The Federal Government is also actively participating in the North Seas Energy Forum and participates in the Working Group on Renewable Energy under the Baltic Energy Market Interconnection Plan (BEMIP) (see Chapters 1.4., 3.2., 3.4.3.). Germany has also played an active role in the Renewable Energy Concerted Action Forum (CA-RES) from the outset.

##### **Dimension 2: Energy efficiency**

In principle, there are no issues of direct cross-border relevance to this dimension. However, there are cross-border cooperation projects with EU neighbouring countries, as well as various initiatives to exchange best practice in the field of efficiency (see chapter 3.2.).

##### **Dimension 3: Security of energy supply**

Functioning energy markets provide the best guarantee to ensure the security of energy supply across the Union and to reduce the risk of harmful effects of supply disruptions. Where the

security of energy supply of a Member State is threatened, there is a risk that measures taken unilaterally by that Member State may jeopardise the proper functioning of the internal market and affect the supply of energy in other Member States. Different import routes are available to supply the German gas market, through which neighbouring markets can also obtain gas from Germany through different routes. Import diversification is taking place, inter alia, through the deployment of LNG infrastructure. This reduces the risk of supply disruption for both German and neighbouring gas markets. The German electricity market is also strongly integrated into the European internal electricity market. It is an essential pillar for the security of electricity supply in Germany and Europe. Furthermore, security of supply will be strengthened by the roll-out of other energy sources. Germany aims to build a powerful hydrogen infrastructure that will already be connected to EU neighbouring countries through a first European hydrogen network in 2030.

In order to be able to carry out cross-border measures to maintain security of supply in neighbouring Member States in the event of a crisis, i.e. in the event of a significant and persistent shortfall in energy demand, cross-border coordination between involved German and neighbouring foreignactors is imperative in advance, with the support of the competent authorities, if necessary.

#### **Dimension 4: Internal energy market**

The European internal market is the backbone of Europe's energy transition and is central to ensuring a secure, cost-effective and environmentally sound energy supply, including in Germany.

The exchange of electricity between EU Member States is becoming increasingly important: Cross-regional synergies between generation and consumption can be used to make the electricity system even more flexible. The Federal Government is therefore actively participating in various regional cooperation forums with a view to deeper integration of the European internal electricity market. In particular, the Pentalateral Energy Forum and the Baltic Energy Market Interconnection Plan (BEMIP) should also be mentioned here (see Chapters 1.4., 3.2., 3.4.3.).

#### **Dimension 5: Research, innovation, competitiveness**

Like many European countries, Germany is facing major research and innovation challenges in the context of the energy transition towards a larger share of clean and renewable energy. In particular, the integration of increasing amounts of fluctuating wind and solar power, the digitalisation of energy supply and sector coupling including thermal energy are common themes and still depend on technological innovation. Regional cooperation helps to deal effectively with issues, make effective use of cross-border infrastructure and make efficient use of financial resources. Research cooperation takes place in the international and in particular European framework through the Federal Government's participation in Horizon 2020/Europe and the implementation of the objectives of the Strategic Energy Technology (SET) Plan through joint research projects and coordination on funding priorities. Regional and bilateral cooperation is an opportunity to combine efforts and implement them more

effectively in geographical and thematic areas. Last but not least, international cooperation is a prerequisite for keeping the German research landscape at world-class frontiers across technologies.

### **1.2.1 v. Administrative structures for the implementation of national energy and climate policies**

The energy transition and climate protection are implemented by the Federal Government, the Länder and municipalities. At federal level, the Federal Ministry of Economic Affairs and Climate Protection (BMWK) is the lead institution.

Federal and Land level continuously coordinate on the implementation of the energy transition. Find on a six-monthly basis

The Federal Chancellor met with the heads of government of the Länder, in which the relevant federal ministers also participate. They discuss, among other things, the state of implementation of the energy transition. The relevant ministers of the Federal Government and the Länder also discuss their priorities each year during the conferences of economic and environment ministers and coordinate the next steps in the energy transition. This institutional coordination will be complemented by ad hoc discussions at management level, as well as continuous cooperation and close exchanges at technical level.

### **1.3 . Consultations and involvement of national and Union entities and their outcome**

This chapter will be fleshed out after the consultations that will take place in the course of 2023-2024. The Federal Ministry of Economic Affairs and Climate Protection provides information on the NECP process and the opportunities for participation in the consultations on its website. Link:

[https://www.bmwk.de/Redaktion/DE/Textsammlungen/Energie/n\\_ebp.html](https://www.bmwk.de/Redaktion/DE/Textsammlungen/Energie/n_ebp.html)

### **1.4 . Regional cooperation in preparing the plan**

#### **1.4.1. Elements subject to joint or coordinated planning with other Member States**

During the preparation of the draft NECPs, the EU Member States of the Pentalateral Energy Forum (Belgium, Luxembourg, the Netherlands, France, Austria and Germany) exchanged views. Germany has also bilaterally exchanged views with several neighbouring countries, including Denmark, Austria and Czechia. The Federal Government expressly welcomes the multilateral and bilateral cooperation and underlines its importance for achieving the EU's energy and climate targets in 2030.

## **COMMON PENTA CHAPTER FOR NATIONAL ENERGY AND CLIMATE PLANS**



## **Pentalateral Energy Forum – Regional Energy Cooperation Platform**

The Pentalateral Energy Forum (Penta) is the voluntary regional cooperation since 2005 between Belgium, France, Germany, Luxembourg, the Netherlands, and since 2011 with Austria, representing more than 40 % of the EU population and covering more than 50 % of electricity generation in the EU. Switzerland has been a permanent observer since 2011 and is actively involved in technical work and decision-making. In close cooperation with the European Commission (on invitation), the Pentalateral Energy Forum promotes cooperation between all relevant parties to contribute to a reliable, decarbonised and efficient electricity system based on integrated and well-functioning markets. As the electricity sector plays a crucial role in the overall decarbonisation of our societies by 2050 at the latest, Pentacountries are committed to further increasing the share of renewables and fully decarbonise their electricity system as soon as possible and ideally by 2035.

Cooperation is led by the ministers responsible for energy policy, who meet regularly. The follow-up of the activities will be ensured by the Penta coordinators under the guidance of the respective Directors-General of the PentaLänder. The work programme is implemented by Ministries, Transmission System Operators (TSOs), Distribution System Operators (DSOs), regulators and market participants, who meet regularly in four thematic support groups. In order for each support group to achieve its objective, exchanges between and within support groups will be strongly encouraged and supervised at the level of the NSEC coordinators. Support groups are also linked to other international fora, such as the North Seas Energy Cooperation.

As the transition to a decarbonised energy system continues to accelerate, countries become increasingly interdependent and regional cooperation is becoming increasingly important to address the emerging challenges. The Pentalateral Energy Forum is well placed to address these challenges, such as security of supply, market integration, energy efficiency and decarbonisation. Over the past two decades, PentaCountries have moved from a purely national perspective to energy markets to a regional approach. This puts the Penta countries in an ideal position to contribute to the next phase of the energy transition.

### **Security of supply**

Security of supply has been a key issue since the establishment of the Pentalateral Energy Forum. Since then, countries have worked closely together to promote security of supply, solidarity and confidence building, and to prevent, anticipate and manage electricity crises. Remarkable milestones have been achieved through various regional adequacy assessments, joint crisis exercises and a common framework under EU Regulation 2019/941 on risk-preparedness in the electricity sector.

Today, the work on security of supply is organised in a dedicated support group divided into two main areas of work: Resource adequacy assessments on the one hand and risk preparedness on the other. Future work is planned for these two areas of work and for the interface between them.

### *Resource adequacy assessments*

As regards resource adequacy assessment, the Penta countries will cooperate with the European studies conducted by ENTSO-E (European Resource Adequacy Assessment, seasonal forecasts) to improve coordination and benefits for the Penta countries. Based on the extensive expertise and knowledge in this area, the Penta TSOs could carry out complementary sensitivity analyses with a particular focus on the PentaRegion, taking into account regional specificities and cross-border interdependencies. The topics that merit further regional research include:

The link between national energy system planning, the implementation of the TEN-E Regulation and the rapid development of the European energy system;

The role of demand side response (DSR) and other flexible resources to ensure system adequacy;

Methodological improvements in the assessment of resource adequacy;

The need to increase network capacity and optimise the existing network;

Analysis of critical situations and possible countermeasures.

### *Risk appetite*

As regards risk appetite, the objective is to promote regional cooperation in the Penta region in order to prevent, prepare for and manage electricity crises in a spirit of solidarity and transparency, while fully respecting the requirements of a competitive internal electricity market and the operational security procedures of transmission system operators. The Penta countries will seek to ensure effective cooperation between all relevant bodies involved in crisis management, as well as between the European, regional and national levels. In this sense, the work will focus on the implementation of the 1st December 2021 signed a Memorandum of Understanding on risk-preparedness in the electricity sector, in particular on:

Analysis and assessment of regional measures, including the necessary technical, legal and financial arrangements for their implementation;

Organisation of regional exercises;

Revision of the relevant regional electricity crisis scenarios for the Penta region in close coordination with ENTSO-E and the Commission regarding applicable methodologies

Should an electricity crisis occur within Penta, the agreed framework will apply.

### *Interface between resource adequacy assessment and risk preparedness*

In addition, Penta countries will work at the interface between resource adequacy assessment

and risk preparedness. As a first step, the Pentastudy made *methodological improvements in the assessment of resource adequacy*, which looked at the differences and overlaps. Penta aims to close the existing gaps between long-term analysis and short-term operational planning, technical and policy-making, as well as between countries. In particular, Penta intends to support the further development of analytical tools and procedures for information exchange and decision-making, closely involving ministries, transmission system operators (TSOs), distribution system operators (DSOs), regulatory authorities, ACER, ENTSO-E, EU DSOs and the regional security centres in the Penta region (Coreso and TSCNET).

## **Market integration**

The Pentalateral Energy Forum has two decades of experience in market integration issues. During this period, Penta has witnessed and driven major changes in the political landscape, with remarkable milestones such as the introduction of flow-oriented market coupling, first in the Penta region and now in a larger part of continental Europe.

### *Promoting future-proof market design*

In recent years, work on market integration within Penta has expanded both in terms of focus and issues addressed. Penta ministers have consistently placed hydrogen on the national and European agenda as a key element for system and market integration. The newly created SG4 actively contributes to the development of an integrated EU hydrogen market.

The Pentalateral Energy Forum will also contribute to the integration of renewable energy and the development of a future decarbonised electricity system in which integrated markets play a key role. The two studies “Vision 2050” and “Flexibility” were recently commissioned to this end. These studies were carried out in the framework of the Support Group 3 (SG3) for the future electricity system and will serve as a basis for future work in the framework of Penta.

The Vision 2050 report compares national decarbonisation scenarios and proposes modules for a common political vision of the future electricity system. These modules describe the components necessary for the efficient development of a future electricity system. The Penta countries will continue work on the 2050 vision by drafting a political declaration setting out a common vision for the future integrated energy system.

In order to achieve such a future electricity system, the Penta countries recognise the need for a future-proof market design and actively exchange views on improving and implementing electricity market regulation; at the same time, it is important to identify areas where further action is needed. Based on their experience so far, the Penta countries will work together to identify the benefits of an integrated and market-based approach to potential policy issues. They will continue to exchange technical know-how and organise projects that contribute to the concrete implementation of energy policy in the Penta regions.

### *Flexibility*

The Flexibility Report provides additional insights into the current and future state of flexibility in the region. It outlines the flexibility needs and sources of flexibility arising from the integration of renewable energy sources for 2030/40/50 and shows that cooperation between countries can create significant synergies and reduce overall flexibility needs. The report also contains important recommendations to promote flexibility across the region and possible measures to improve the flexibility of market participants. Therefore, the Penta countries will:

Exchange views on the harmonisation of non-standardised products such as network congestion management (e.g. redispatching and topological measures).

Discuss how to facilitate the flexible behaviour of market participants to balance the energy system through wholesale markets and the safe and stable operation of electricity systems.

Monitor the evolution of the technical requirements for the additional electricity demand (e.g. heat pumps and other sources of flexibility) to ensure interoperability so that the additional electricity demand is truly flexible.

Cooperate on the implementation of flexibility provisions in upcoming EU legislation, such as the electricity market reform and the network code on demand management. Wherever possible, Penta countries will try to take into account the flexibility needs of regions when designing national policies.

### **Energy efficiency**

The Pentalateral Energy Forum recognises the importance of increased energy efficiency to reduce dependence on fossil fuels and reduce the scale of the challenges of the energy transition. In this respect, Penta sees the value of both energy savings and the flexibility of electricity demand. Penta countries exchanged views on the implementation of the electricity demand reduction commitment established by EU legislation in winter 2022/2023.

The Penta countries will continue their cooperation by exchanging views on the implementation of the revised Energy Efficiency Directive and by sharing best practices in the field of energy saving.

### **Decarbonisation**

As described above and building on the work done so far on the 2050 Vision, the Penta countries continue to work on a common political vision for a decarbonised electricity system to be implemented as soon as possible and ideally by 2035. The Penta countries will work together to boost the development of renewable energy and raise awareness of the importance of flexibility towards a fully decarbonised electricity system without compromising security of supply. The Penta countries recognise that they seek better regional cooperation to exploit synergies and achieve efficiency gains. The Penta countries will analyse the added value of enhanced regional cooperation in the integration of renewable energy, grid planning, the connection of offshore to onshore installations (in cooperation with the North Sea energy

cooperation) and in addressing other issues with cross-border implications that may arise in the transition to a decarbonised electricity system.

### *Hydrogen*

In 2020, a dedicated hydrogen support group was set up to drive Penta's activities and close cooperation on hydrogen. SG4 focuses on regulatory and market developments regarding the use of hydrogen in the Penta countries, in compliance with national, European and international rules. On the basis of the political declaration signed in 2020 on the role of hydrogen in decarbonising the energy system in Europe and recent developments, including REPowerEU and the International Energy Agency's 10-point plan to reduce the European Union's dependence on Russian natural gas, the Penta countries exchange information and define common positions on the future market design for hydrogen deployment developments. The SG4 will focus in particular on the development of hydrogen certification; of the arising

Address hydrogen infrastructure in the Penta region and the necessary steps to develop cross-border connections, and monitor progress in the implementation of Penta's hydrogen strategies, including the development of rules, support mechanisms, investments, supply and demand developments and trade.

## **NSEC COMMON CHAPTER FOR NATIONAL ENERGY AND CLIMATE PLANS**

### **North Sea Energy Cooperation – Offshore Renewable Energy Cooperation**

Germany is part of the larger North Sea region with significant renewable energy potential. Offshore wind will play an increasingly important role in achieving Europe's energy and climate goals. The EU Offshore Strategy has set an ambitious goal of unlocking 300 GW of offshore wind capacity and 40 GW of ocean energy by 2050. On 19 January 2023, the North Sea Energy Cooperation (NSEC) enabled the development of a non-binding agreement on the 2050 targets for offshore renewable energy production, with intermediate steps in 2040 and 2030, for the priority offshore grid corridors of the North Sea under the TEN-E Regulation. The targets for the priority North Sea Offshore Grid Corridor (NSOG) are 60.3 GW in 2030, between 134.9 and 158 GW in 2040 and between 171.6 and 218 GW in 2050. The offshore sector, the deployment of renewable energy and integrated offshore strategic development will thus have a much larger dimension. High energy prices, such as 2022, and geopolitical events threatening the European energy system, have highlighted the need to accelerate the expansion of domestic renewable energy generation capacity and regional offshore transmission grids as soon as possible in order to significantly improve energy security.

Germany is working with the other NSEC countries to identify, analyse and implement opportunities for concrete cooperation projects. NSEC is a voluntary, bottom-up and market-oriented regional cooperation initiative launched in 2016 with the following objectives:

- Create synergies;
- Avoid incompatibilities between national strategies;
- Exchange knowledge on international best practices;
- Promote common strategies where possible and appropriate.

Ministers responsible for energy meet regularly within the framework of NSEC. In 2023, the NSEC comprises Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands, Norway and Sweden, with the participation of the European Commission. On the 18th day On December 2022, the NSEC Energy Ministers and the EU Commissioner for Energy signed a Memorandum of Understanding on cooperation with the UK on offshore renewable energy. This Memorandum of Understanding is based on the Trade and Cooperation Agreement between the European Union and the United Kingdom of 30. December 2020, builds on NSEC and is a self-standing and complementary measure to the existing NSEC framework.

For the offshore wind sector, a predictable and long-term stable operating environment is essential to enable long-term investment and further cost reductions. To this end, existing barriers need to be removed and attractive investment conditions created. NSEC members together make an important contribution to achieving these objectives by regularly exchanging expertise on various topics in the four NSEC Support Groups (SGs):

- SG1: Development of hybrid and community projects;
- SG2: Permits, maritime spatial planning and environmental aspects;
- SG3: Funding and support frameworks;
- SG4: Long-term network and infrastructure planning.

In order for each support group to achieve its objective, exchanges between and within support groups will be strongly encouraged and managed at the level of the NSEC coordinators. Examples include offshore wind farms (SG1 and SG4), maritime spatial planning and network planning (SG2 and SG4) and how non-price criteria are innovation in relation to the key challenges for accelerating, cost-effective and responsible deployment of offshore.

Wind energy (SG1, SG3 and SG4). Finally, support groups also cooperate closely with other international fora, such as the Pentilateral Energy Forum and the Clean Industrial Forum, in the planning of onshore grids, market arrangements and stakeholder engagement.

### **Development of hybrid and community projects**

The SG1 of the NSEC acts as a platform for cooperation on concepts for potential offshore wind projects and coordinated electricity infrastructure, including transmission infrastructure. With the increasing number of joint and hybrid projects of the NSEC countries, the group has intensified its activities in the North Sea region to accompany discussions at technical and inter-ministerial level and the exchange of best practices during the project progress.

In addition to joint projects on offshore wind energy involving several countries, the Support Group is also working on potential ‘hybrid’ solutions with cross-border options to connect offshore wind farms to more than one electricity market and achieve synergies between countries; the Support Group also discusses the relevant EU and national market regulations.

Therefore, SG1 members are developing ways to cooperate on hybrid projects and to overcome possible legal, regulatory and distribution barriers. The SG1 will continue to work on removing barriers and on the steps for hybrid and joint projects that can be implemented at national and regional level. In addition, cooperation will continue to serve as a forum to reflect on how to address issues related to legislative procedures at EU and national level.

### **Permits, maritime spatial planning and environmental aspects**

To achieve our energy and climate targets in the EU, we need to accelerate planning and permitting procedures at EU and national level, while better understanding the possible ecological limits of large-scale wind expansion in the North Sea and the impact on other sea users. SG2 has an inventory of the spatial

Tensions in the development of offshore wind farms in 2030 at regional level. The next steps are to better define environmental tensions and potential development threats and define

spatial strategies to prevent or reduce such threats. In order to increase knowledge and support the deployment of offshore wind turbines in the North Sea, the countries bordering the North Sea will continue to work closely with the relevant authorities for energy, maritime spatial planning and environment in the areas of maritime spatial planning, environmental research and cumulative impact assessment of wind farms.

### **Funding and support frameworks**

Offshore tenders are a key issue for the funding and support framework. NSEC members coordinate offshore tenders through the exchange of information on national procurement schedules in the framework of SG3. In the working group, countries also exchange best practices on participation in tenders, zero subsidy support, design elements to promote system and sector integration, and grid connection rules. In order to achieve the ambitious goals, joint projects are becoming increasingly important.

For this reason, the group also addresses funding opportunities for joint cross-border offshore projects, including through EU financial instruments such as the Connecting Europe Facility and the EU Renewable Energy Financing Mechanism. Finally, Power Purchase Agreements (PPAs) play an increasingly important role in financing offshore projects. Countries will address the problems, obstacles and solutions for wider acceptance of the PPAs. The group also exchanged views on decommissioning, extension of operating life and retrofitting of wind farms.

The aim of the exchange is also to jointly develop and discuss ideas for the medium-term future of the offshore energy system in terms of installed capacity, e.g. through coordinated tender plans.

### **2050 horizon: Long-term network and infrastructure planning**

The NSEC-SG4 works with ENTSO-E to provide and coordinate contributions to the North Seas Offshore Network Development Plan under the EU TEN-E Regulation. In addition, the SG4 intends to expand the discussion on long-term network planning to include the early development and development of environmentally friendly offshore hydrogen production and hydrogen transport, as well as their potential role in an increasingly interconnected North Sea energy system. Green hydrogen will play an important role in decarbonising our energy system. Power-to-X, and hydrogen in particular, will play a key role in providing flexibility where and when it is needed. Demand for hydrogen is expected to increase significantly, especially after 2030, both because of its potential as a storage energy carrier and as a fuel and raw material for hard-to-electrify areas. Several NSEC countries have announced targets for the production of green hydrogen on land and at sea. In SG4, NSEC countries will share first experiences on hydrogen related to offshore wind, as well as knowledge on transport infrastructure, renewable energy development and offshore power-to-X production. They will work together to learn about offshore hydrogen production, discuss the deployment of electrolysis and increase synergies between the long-term planning of offshore and hydrogen grids. In all aspects of medium- and long-term infrastructure planning, the SG4 underlines the importance of a comprehensive engagement in this planning process with Member States and



relevant stakeholders, including industry and non-governmental organisations, in order to anticipate and address supply chain bottlenecks (e.g. development and availability of wind farms) in deploying and accelerating the deployment of our North Sea energy system. This is closely linked to the importance of protecting the security of critical offshore and underwater-infrastructure and the supply of critical raw materials through innovation and improved circular economy.

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

The energy transition and climate action can only succeed if it is embedded in a European context and strengthened through regional cooperation. Regional cooperation in the form of bilateral cooperation or joint initiatives and forums with several EU Member States is therefore a central part of the Federal Government's energy and climate policy. This chapter will be specified with a view to drawing up the Federal Government's final energy and climate plan. Some of the main existing regional co-operations with European partners can be found at the relevant regional cooperation bodies in the NECP draft:

##### **Bilateral cooperation**

The Federal Government maintains close energy and climate cooperation with many other EU Member States, in particular their immediate neighbours. With some Member States, this cooperation has been confirmed and made more concrete by the Memorandum of Understanding. In the current legislature, for example, the already existing and very good energy and climate policy cooperation between France and Germany was strengthened in the framework of the Franco-German Declaration of January 2023. Cooperation projects with France are established, inter alia, in the Franco-German Energy Platform, in the internal energy market and in energy research (see Chapter 3.2., 3.4.3., 3.5.). There is also an intensive exchange of knowledge and experience within the framework of the German-French Energy Transition Bureau (DFBEW). Solidarity agreements have been concluded with several Member States to support each other with gas supplies in the event of an emergency.

##### **European Climate Action Initiative**

The European Climate Action Initiative (EUKI) is a support initiative of the BMWK to strengthen European cooperation in the further development and implementation of ambitious climate policy. EUKI funds non-investitive climate change projects, in particular by civil society and sub-national administrations in Europe. Themes for bi- and multilateral projects under the EUCI are the development of climate strategies and their implementation at different levels of exchange on climate policy instruments, policies and projects in the relevant sectors: Climate policy, energy transition and climate-neutral buildings, mobility, just transition, carbon removal and sustainable economy. In addition to project implementation, EUKI aims at sharing knowledge and experience between project organisations and with other climate change experts.

##### **Baltic Energy Market Interconnection Plan (BEMIP)**

BEMIP has been in place since 2009 and includes all EU countries bordering the Baltic Sea

and Norway as observers and is mainly organised by the European Commission. The Federal Government participates in the BEMIP working groups (see Chapter 3.1.2.).

### **North Seas Energy Forum/North Sea Energy Cooperation**

In 2016, the North Seas Energy Forum was set up by the North Seas Energy Forum, along with the EU Commission, to further develop their cooperation in the field of energy. This forum will focus on cooperation on the development of wind energy at sea, the development of grid infrastructure and maritime spatial planning in the North Sea. As part of the initiative, the relevant Member States, including the Federal Republic of Germany, have also started to exchange on the relevant parts of the NECPs of the North Sea countries and to develop common NECP elements (see Chapters 3.1.2., 3.5.).

### **Pentalateral Energy Forum**

This is a co-operation between Belgium, Luxembourg, the Netherlands, France, Austria and Germany, which has been in place since 2005, focusing on electricity market coupling, security of supply, crisis preparedness and flexibility in electricity markets. Switzerland has observer status in the Forum (see chapter 3.4.3.).

### **Pentalateral Gas Forum**

This is a co-operation between Belgium, Luxembourg and Belgium, which has been in place since 2009.

The Netherlands, France and Germany, which focus on gas supply issues (see chapter 3.3.).

### **Cooperation in regional groups in the framework of Transeuropean Networks Energy (TEN-E regional groups)**

The Federal Government cooperates with other Member States in several regional groups within the framework of TEN-E. The regional groups correspond to the energy infrastructure priority corridors laid down in the TEN-E Regulation and are responsible for identifying projects of common interest (PCIs) at regional level for the development of energy infrastructure under the TEN-E Regulation. According to Article 4 of the TEN-E Regulation, the projects concerned are expected to contribute, inter alia, to market integration, sustainability, competition (diversification of sources, routes and suppliers) and security of supply (see chapters 3.3. and 3.4.3.).

# 2. NATIONAL OBJECTIVES AND TERMS OF REFERENCE

## 2.1. Decarbonisation dimension

### 2.1.1. Greenhouse gas emissions and removals

The elements set out in point (a)(1) of Article 4

#### **Binding annual national limit values under the EU Climate Sharing Regulation (ESR)**

In order to achieve the EU's 2030 climate target (at least -55 % net-greenhouse gas reduction), the European Parliament and the European Council have also revised the EU Climate Sharing Regulation (ESR) and the LULUCF Regulation. The EU Climate Change Regulation now includes a binding reduction target for Germany of 50 % compared to 2005 in 2030 (instead of 38 % so far) for the non-ETS sectors (EU ETS1), i.e. road transport, buildings, agriculture, smaller energy production and industrial installations, waste. The annual emission levels for the relevant sectors laid down in the Federal Climate Change Act (KSG) are in line with the revised EU Climate Change Regulation.

#### **Land Use, Land Use Change and Forestry (LULUCF) assurances**

The LULUCF Regulation has been revised as part of the European Fit for 55 package. Member States will receive a gap target for 2030 and a budget target for 2026-2029. For the period 2021-25, the current LULUCF targets continue to apply, whereby the combined direct debits from the land use categories taken into account under Article 2 shall not exceed the credits at the end of the five-year period from 2021 to 2025 (so-called "no net debit rule"). From 2026 onwards, the Regulation provides for absolute sink targets for each Member State, expressed as an improvement compared to the base period 2016-18. According to the current assessment, the gap target for 2030 (improvement of the sink by 3.8 Mt CO<sub>2</sub> equivalent) and the budget target 2026-2029 are in line with the target of the Federal Climate Change Act (KSG) for the LULUCF sector (improve the sink to 25 Mt CO<sub>2</sub> equivalent on average for the years 2027-30). It should be borne in mind that the 2030 target of the KSG cannot be easily compared to the EU-LULUCF target, as both targets differ in the calculation method and data base.

Where applicable, other national objectives and targets consistent with the Paris Agreement and the 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 the Federal Climate Protection Act, Germany has set itself the objective of becoming net-zero greenhouse gas by 2045. Greenhouse gas emissions should be reduced by at least 65 % by 2030 and by at least 88 % by 2040 compared to 1990. This makes Germany's targets even more ambitious than the European targets of achieving climate neutrality by 2050 and a net reduction of at least 55 % in greenhouse gas emissions by 2030.

In accordance with the first sentence of Section 15(1) of the Federal Climate Protection Act, the Federal Government has set itself the objective of organising the federal administration in a climate-neutral manner by 2030.

### **2.1.2. Renewable energy**

#### 2.1.2.1. The elements set out in point (a)(2) of Article 4

The rapid expansion of renewable energies is central to achieving climate change objectives and ensuring affordable and secure energy supplies. In March 2023, the European Parliament and the European Council provisionally agreed on a revision of the Renewable Energy Directive with more ambitious targets. The aim is to increase the share of renewable energy in the EU to at least 42.5 % of gross final energy consumption by 2030, but to reach a target of 45 %. For Germany too, this means: the development of renewable energies and their use must be stepped up in order to meet European requirements.

To limit global warming to 1.5 °C, the Federal Government adopted a comprehensive legislative amendment to energy policy in April 2022. The new Renewable Energy Act sets higher deployment targets for wind and solar energy and gives legal priority to the expansion of renewable energy in planning processes over other balancing interests. By 2030, at least 80 % of gross electricity consumption in Germany should come from renewable energy sources. The expansion paths for wind and solar energy will be significantly increased: The expansion target for offshore wind energy will increase to at least 30 gigawatts (GW) by 2030, to at least 40 GW by 2035 and to at least 70 GW by 2045. For onshore wind energy, a total of 10 GW of installed capacity is expected to reach a total of 115 GW by 2030 or 160 GW from 2040, and for solar installations 22 GW per year, to reach a total of around 215 GW by 2030 and 400 GW by 2040.

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

The sectoral trajectories are submitted in the final report of the update of the NECP.

2.1.2.111. 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

The expected trajectories will be submitted in the final report of the update of the NECP.

2.1.3. 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

According to the 2023 projection report, biomass fuel demand is assumed to be between 1440 and 1.523 PJ in 2030, with the possibility to provide 862-903 PJ from domestic sources in the form of biomass fuels. In 2045, demand for biomass fuels is assumed to be between 1.196 and 1.321 PJ, with only 871-925 PJ available from domestic sources in the form of biomass fuels. With regard to the LULUCF sector, the 2030 sink target of -35 MtCO<sub>2</sub>eq and -40 MtCO<sub>2</sub>eq in 2045 will not be achieved.

The Federal Government is currently preparing the National Biomass Strategy (Nabis) in order to create the framework conditions for climate change mitigation and resource-efficient production and use of biomass. Priority should be given to the material use of biomass over energy use.

2.1.2. V. Other national trajectories and targets, including long-term and sector-specific trajectories (e.g. share of renewable energy in district heating, use of renewable energy in buildings, renewable energy production by cities, renewable energy communities and renewable self-consumers, energy produced from sewage sludge from waste water treatment)

### **Share of renewable energy in heating and cooling networks**

The share of renewable energy and waste heat in district heating in Germany was around 23 % in 2020 and around 25 % in 2022 [BDEW 2023]. On this basis, projected trajectories compatible with the RED can be calculated. Assuming a current share of 25 % RES and waste heat, this means, taking into account the targeted increase in the share of district heating from around 10 % to 25 % in 2045, an increase of around 44 % RES and waste heat in district heating by 2030. The government coalition has a target for 2030 of:

50 % EE and waste heat and full decarbonisation of heat networks by 2045. This is to be enshrined in the Heat Planning Act.

### **Use of renewable energy in buildings – indicative national target under Article 15a of the Renewable Energy Directive**

In line with the requirements of the new Article 15a of the Renewable Energy Directive,

Germany sets an indicative target as a national contribution to achieving the EU-wide target of 49 % of final energy consumption in the buildings sector by 2030. This path essentially relates to the polluter pays principle and thus also includes the share of renewable energy in the electricity mix and district heating, but also energy production near-building.

## **2.2. Energy efficiency dimension**

### **2.2.1. The elements set out in Article 4(b)**

#### **National contributions to the Union 2030 target**

In summer 2023, the European Parliament and the European Council approved the amendment to the EU Energy Efficiency Directive (EED). In March 2023, the European Parliament and the European Council reached the provisional political agreement. It provides for a reduction in final energy consumption in the EU by 11.7 % by 2030 compared to the estimated final energy consumption in 2020 for 2030. This means a binding cap of 763 Mtoe for final energy consumption at EU level. All EU Member States are expected to contribute to the achievement of the target by presenting indicative trajectories in their National Energy and Climate Plans.

On 21 September 2023, with the Energy Efficiency Act, the Bundestag adopted a cross-sectoral framework to increase energy efficiency in order to support the implementation of the obligations under the EED (see also Table A1).

#### **Cumulative energy savings under new Article 8 of the EU Energy Efficiency Directive (Energy Efficiency Directive – EED)**

The cumulative savings target under the new Article 8(1)(b) of the EED for the period 2021 to 2030 is 5 757.1 PJ or 137,51 Mtoe, based on the statistical data currently available from Eurostat. The previous target under point (b) of the first sentence of Article 7(1) was 3 996.5 PJ or 95.46 Mtoe. It is notified on the basis of Annex III to Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action (concerning the notification by Member States of measures and methodologies for the implementation of Article 7 of Directive 2012/27/EU). The notification required thereafter, together with the other necessary information, is attached to the present text as a provisional annex pursuant to Article 3(2)(h) of Regulation (EU) 2018/1999. The determination of the savings target pursuant to point (b) of the first sentence of Article 8(1) of the Energy Efficiency Directive is based on Eurostat's data on final energy consumption in Germany from 2016 to 2018, as required by the Directive requiring the use of data before 1 January 2019.

#### **Long-term renovation strategy pursuant to Article 2a of the Energy Performance of Buildings Directive**

The building sector plays a key role in the energy transition and the achievement of the long-term climate objective. According to preliminary data for 2022, final energy consumption in the building sector was 2.893 PJ (804 TWh). This represents 34 % of total final energy consumption. Most of this is accounted for by households with 1.931 PJ (537 TWh) and partly

by industry and commerce with a total of 962 PJ (267 TWh).

The buildings sector's emissions from direct burning of fossil oil, gas and tw. Coal in boilers amounted to around 112 Mt CO<sub>2,eq</sub> in 2022, accounting for almost 15 % of the total emissions of 746 Mt CO<sub>2,eq</sub>. In addition, the resulting contributions from the buildings are due to increased electricity demand for heating in the energy sector (around [100] Mt CO<sub>2,eq</sub>) and emissions from the construction phase. Buildings are currently responsible for about 40 % of emissions in Germany. This underlines the importance of buildings for decarbonisation.

At national level, under the Federal Climate Protection Act (in accordance with the source principle), the building sector should not emit more than 67 million tonnes of CO<sub>2</sub> equivalents in 2030. In order to achieve this objective, Germany's strategy is to decarbonise as well as to further reduce final energy consumption in the buildings sector. As early as 2016, the buildings efficiency strategy described this path in principle, with important framework parameters changing since then. A wide range of instruments must be used to achieve the targets and this can only be achieved through a combination of measures to increase the use of renewable energy in buildings and increase energy efficiency or reduce final energy consumption.

It is important to ensure that these measures are feasible, affordable, economically, technologically open, environmentally and, last but not least, reliable, durable and user-friendly. Social impacts must also be taken into account. Across sectors, further savings can be achieved by reducing indirect emissions. These are associated with the production of building materials, components, plant engineering, etc. in the industrial sector. The transformation of the building sector towards full net-zero greenhouse gas emissions makes it necessary to capture the life-cycle environmental impacts and resource consumption of buildings. The Federal Government has already taken an important step in this regard by establishing the life-cycle assessment of the Sustainable Building Quality Label (QNG) in the sustainability class of the Federal Funding for Efficient Buildings (BEG) and in the climate-friendly new building support programme (KFN). In addition to promoting the use of resource-efficient building materials, the selective dismantling of buildings and the recycling of building materials can also help to reduce energy demand. The instrument mix should draw on a balanced link between carbon pricing, regulatory requirements and flanking, socially balanced support policy, and will be complemented by other incentive instruments (e.g. fiscal).

With the long-term renovation strategy pursuant to Article 2a of the EPBD, the Federal Government has submitted an overall strategy for the building stock. It provides a comprehensive overview of the building stock, tools and nationally planned measures.

As part of the NECP progress report, Germany updated the building sector data base where possible and necessary. In addition, no more recent data are available at the time of the draft NECP update.

The measures outlined in the long-term renovation strategy have since been implemented, further developed and supplemented. This is updated in Chapter 3. In particular, the fast-track building programme presented at national level in summer 2022, which was further developed with the 2023 Climate Action Programme, shows how it has set the right track for the GHG

reduction targets set. It addresses key measures of the renovation strategy and adapts them to the changed ambitions. An even more efficient and targeted use of existing financial resources, while taking into account social aspects, is a key challenge in the continuation of measures to ensure that the requirements can be met by all stakeholders.

The EU Buildings Directive (EPBD) and the German Building Energy Act (Building Energy Act) revise the key legislative framework for the long-term renovation strategy. Against this background, a comprehensive update of the LTRS at the time of submission of the draft is not possible. In addition, the draft EPBD provides for a new format with the National Renovation Plan, reflecting the national strategies for decarbonising the building sector. Germany will present a revised strategy at the end of June 2024 or prepare the National Renovation Plan in accordance with the final unified Buildings Directive and the deadlines set therein. The extent to which a revision of the long-term renovation strategy beyond an update of measures and the updating of important metrics is necessary should be assessed in the light of the new process on the renovation plan.

2.2.11. The indicative milestones for 2030, 2040 and 2050, the domestically established measurable progress indicators, an evidence-based estimate of expected energy savings and wider benefits, and their contributions to the Union's energy efficiency targets as included in the roadmaps set out in the long-term renovation strategies for 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 progress indicators from the long-term renovation strategy pursuant to Article 2a(2) EPBD**

The indicative milestone was derived from the Long-Term Renovation Strategy (LTRS) under Article 2a(2) of the EPBD. Given that the contributions of individual sectors to the reduction of greenhouse gas emissions in Germany for the years after 2030 are not yet determined nationally, Germany will quantify the milestones for 2040 and 2050 once the necessary choices have been made. The update of the annual emission levels is planned for 2024. On this basis, the indicators and indicative milestones can be further developed as part of the update of the LTRS by 30 June 2024 or when the National Renovation Plan is drawn up in accordance with the results of the new version of the EPBD. Germany has set energy performance as the first indicator and provided an update of the values as part of the progress report (see Figure 14). A review of the 2030 target is currently taking place in the light of the adjusted targets of the Energy Efficiency-Directive. The target value shown in Table A3 corresponds to that defined in the LTRS. As part of the work on updating the LTRS and drawing up the National Renovation Plan, Germany is examining the design of further indicators. Complementary indicators also result from the maintenance of the



building data base in the future.

Table A3: Indicative milestone according to the Long Term Renovation Strategy (2020)

	2008 (base year)	2021	2030
Energy performance — non-renewable Primary energy consumption (PEVn.E. in PJ)	4.400	3.410	2.000

### **Total floor area/energy savings to be renovated according to new Article 6 of the EU Energy Efficiency Directive, using the example of public buildings**

A significant part of the EU's energy savings is to be achieved through energy renovations. To this end, 3 % of the total floor area of heated and/or cooled buildings must be owned by the public every year. Facilities (federal, state, municipal) are renovated at least into nearly zero-energy buildings (NZEBS) or zero-emission buildings (ZEBs). In order to document the progress made, Germany, in coordination with the Länder, is developing a public building inventory. To this end, first consultations between stakeholders will take place in 2023. In parallel, Germany is looking for an alternative approach showing equivalent savings. Once the test has been carried out, this shall, where appropriate, be carried out by 31 January. Send a notification to the European Commission on December 2023.

2.2.111. 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

### **Transport**

In the 2010 Energy Concept, it was decided to reduce final energy consumption in transport by around 10 % by 2020 and by around 40 % by 2050 compared to 2005. In the 2050 Climate Action Plan, the Federal Government also decided that the transport system in Germany should be almost independent of fossil carbon fuels and thus largely greenhouse gas-neutral in 2050. The Federal Climate Change Act, adopted at the end of 2019 and amended in 2021, stipulates that transport must reduce its greenhouse gas emissions by 48 % by 2023 compared to 1990. On 21 June 2023, the Federal Cabinet adopted a draft law for the revision of the Federal

Climate Protection Act. It provides for a multi-annual and cross-sectoral overall assessment of the actual and expected total annual emission levels for the years 2021 to 2030. According to the draft, each sector must continue to make its fair contribution. The assessment shall be based on the annual emission levels of the respective sectors.

### **Heating and cooling**

There are no targets for wired heating and cooling other than those mentioned in 2.1.2.v.

### **2.3. Dimension Energy security**

#### 2.3.1. The elements set out in point (c) of Article 4

Security of energy supply in Germany is in principle guaranteed if the supply to the general public can be guaranteed on a stable basis at all times under economic, climate and social conditions. The crucial importance of ensuring a secure energy supply with sufficient availability of all necessary energy sources and infrastructure has been highlighted by the energy crisis resulting from Russia's war of aggression against Ukraine. The assessment of energy security typically takes place in two independent Dimensions done:

Resource availability, transmission, distribution and tax security. In the light of recent experience, the third dimension is the existence of effective mechanisms and management capacities for crisis preparedness and response. Flexibility, resilience and redundancy allow for effective responses to threats of shortages. Comprehensive monitoring and risk analysis help to take into account new threats and develop adaptation strategies in a timely manner. It is important to maintain resilience to supply crises, reduce the likelihood of supply crises and maintain preparedness measures such as reserves. As energy sources are interrelated in some cases complex, a systemic perspective is needed to ensure security of energy supply. In principle, the expansion of renewable energies through ambitious targets and improving energy efficiency will stabilise security of supply and diversification of:

Energy supply. At European level, this link has been underlined, for example, by the REPower EU Plan.

In order to cope with possible restrictions and disruptions in the supply of energy sources, the European Union has a concrete framework which is constantly being developed. It sets out how each Member State needs to respond to crisis situations. This concerns both a disruption of oil supply and gas and electricity supply. For example, European rules on gas storage were adopted for the first time in 2022. These were implemented in Germany by means of the Gas Storage Act. To this end, the Energy Industry Act (EnWG) was amended, which regulates key requirements on security of supply.

#### **Gas supply in Germany is highly secure and reliable.**

In accordance with Article 8 of 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 and in the context of good crisis preparation, the Federal Republic of Germany is preparing the emergency gas emergency plan for Germany. Regulation (EU) 2017/1938 strengthens the internal market in natural gas in the European Union and provides for a uniform approach by the EU Member States in the event of a supply crisis. Under Council Regulation (EU) 2022/1369 of 5 August 2022 on coordinated demand-reduction measures for gas, which was limited until 31 March 2024, Germany implemented in 2022 a number of voluntary demand-reduction measures that contribute to strengthening the security of energy supply.

When the Russian Federation started a war of aggression against Ukraine, a Contracting Party to the Energy Community, on 24 February 2022, the conditions for assessing security of supply in Germany and the EU changed. In the course of 2022, Russia first made it difficult to purchase natural gas by introducing rules on payment in roubles and sanctioning former Russian state-owned companies in Germany and Europe. In addition, Germany's direct supply via the Nord Stream 1 pipeline was gradually reduced; the cessation of the Yamal pipeline transit through Poland and the reduction of Ukraine's transit also reduced the

Supply of natural gas to Western and Eastern Europe. With the destruction of the Nord Stream 1 pipeline at the end of September 2022 and the end of the maintenance of the Belarus-Polish Yamal border crossing, the infrastructural supply of Russian pipeline gas to Germany is also technically completely excluded in the long term. The deteriorating supply conditions and the sudden cessation of gas supply from Russia led Germany and the EU to refocus and strengthen their security of gas supply in 2022.

In Germany, the tense supply situation at political level was accompanied by the first declaration of the early warning level on 30 March 2022 and the announcement of the alert state on 23 June 2022 by the BMWK in accordance with the emergency plan for gas. Before the early warning level was declared, the overarching crisis team for natural gas was established, which is responsible for advising the BMWK in the course of the supply crisis and in the run-up to a deterioration of the gas supply situation. In particular, the Gas Crisis Team ensured a consultation mechanism between the actors involved in the management of the crisis and ensured the exchange of the necessary information.

In order to specifically prevent a gas shortage, the German Federal Government implemented several measures. These include, on the basis of the Energy Security Act (EnSiG), the Regulation on the security of energy supply on short-term effectiveness. Measures (Short-term energy supply security measures regulation, EnSikuMaV), limited to April 2023, and the Regulation on the security of energy supply on medium-term effective measures (Medium-Term Energy Supply Assurance Regulation, EnSimiMaV), limited to autumn 2024, to reduce the gas consumption of industry and households to a crisis-appropriate level. This was linked to the public energy saving campaign "80 million together for energy transitions". The amendments to the Energy Industry Act (EnWG), including the introduction of filling levels for German natural gas storage facilities, amendments to the EnSiG, and the introduction of the Act on Accelerating the Use of Liquefied Natural Gas (LNG-Beaccelerungsgesetz, LNGG) and the subsequent construction of LNG infrastructure and direct import of first LNG volumes at the German North and

The Baltic Sea coast stabilised gas supply to Germany in December 2022/January 2023. In addition, in order to stabilise Germany's natural gas supply, imports of natural gas from Norway, the Netherlands and Belgium were increased and the requirement to deodorise natural gas from France to feed into the German natural gas network was abolished. So far (as at 31 August 2023) a severe gas shortage has been adequately prevented. The crisis preparedness measures and planning as described in this emergency plan for gas will adequately prevent a severe gas shortage in the foreseeable future.

Should the supply situation deteriorate, the Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railways (BNetzA), in consultation with market players and Länder, developed a significant number of crisis management processes and measures. These processes and measures operate in the run-up to and during a gas shortage. They reduce the impact of a shortage on industry and the population, and make it as efficient as possible and can be resolved. In order to support an effective distribution of gas volumes in a shortage, BNetzA and the German market area manager Trading Hub Europe GmbH introduced the Gas Safety Platform (SiPla) on the basis of the EnSiG and the Gas Security Regulation (GasSV) in autumn 2022. This digital platform for data exchange and communication helps the demand distributor, on the one hand, to manage quantities still available at national level and, on the other hand, to discharge Germany's solidarity obligations towards EU Member States that are infrastructurally connected to Germany in accordance with Article 13 of Regulation (EU) 2017/1938.

In order to address the critical supply situation in 2022 and in view of the 2022/23 and 2023/24 winters considered critical, the measures implemented in Germany were complemented by the adoption at European level of several gas emergency regulations by the Member States and the European Commission. These included mainly Council Regulation (EU) 2022/1369 of 5 August 2022 on coordinated demand-reduction measures for gas (Gas Savings Regulation), limited in time until 31 March 2024, Council Regulation (EU) 2022/2576 of 19 March 2024. December 2022 on more solidarity through better coordination of gas purchases, reliable

Price benchmarks and the cross-border exchange of gas (Gas Emergency Regulation), limited to 18. December 2023, and the adaptation of Regulation (EU) 2017/1938 with regard to mandatory filling targets for natural gas storage.

Regulation (EU) 2017/1938, which is the basic document of German and European security of gas supply, provides for a comprehensive toolbox to strengthen the EU internal market in natural gas and achieve an adequate level of preparedness in the event of a supply crisis. Building on this, the course of the energy and primarily natural gas crisis in 2022 showed the Government of the Federal Republic of Germany's ability to act urgently to respond to the crisis, on the one hand, by adapting relevant crisis-mitigating German and European standards. On the other hand, the cooperation between federal authorities, federal states, BNetzA and market actors such as transmission system operators and the German market area manager Gas, Trading Hub Europe GmbH (THE), significantly strengthened the resilience of the German gas supply. The management of this supply crisis has shown in practice that the security of gas supply in the EU is a shared responsibility of the Member States, their competent authorities and gas companies and the European Commission, that the German gas market is only to be considered in infrastructure interconnection with EU neighbouring countries and beyond, and that a supply crisis can only be resolved together.

For the purposes of classifying the severity of a supply crisis, Regulation (EU) 2017/1938 distinguishes three crisis levels: Early warning, alert and emergency level. The early warning and alert level provides for market-based measures by gas suppliers. After the emergency level has been declared by the Federal Government by means of a regulation, 'non-market-based

measures' can be taken as a public intervention by the competent authority. Regulation (EU) 2017/1938 also complements the crisis levels with obligations on businesses and the responsibilities of national authorities and the EU Commission. According to Article 8(2) of Regulation (EU) 2017/1938, the Member States are required to define the planned crisis management and preventive measures as part of preventive action plans and emergency plans. The BMWK is responsible for drawing up the Preventive Action Plan and Emergency Plan; BNetzA prepares the national and, where appropriate, regional risk assessment as part of a regional group.

The events and ultimately averted gas supply shortage in 2022 and spring 2023 have strongly demonstrated the need for a coordinated and coherent approach at EU and national level. In response to the gas crisis 2022/23, the overall necessity and relevance of the described measures and procedures have been demonstrated. Previously inconceivable events quickly put the overall system at risk, which could ultimately be resolved by all the parties involved. Adequate crisis forecasting and preparedness remains highly relevant in preparation for a possible deterioration of the supply situation.

## **Oil**

Germany's oil crisis preparedness is embedded both within the European Union and supranationally within the framework of the International Energy Agency (IEA). The EU and the IEA have rules on German oil crisis preparedness, which have been transposed centrally into national law by the Petroleum Stockpiling Act (Ölbereserveungsgesetz – ÖlbevG) and the Mineral Oil Data Act. In Germany, they are the legal basis for a comprehensive stockpiling of oil and petroleum products for the purposes of crisis preparedness. Accordingly, in Germany, oil stocks of crude oil, petrol, diesel, extra light liquid fuel oil (HEL) and fuel JET A-1 are held for 90 days of net imports. Proper oil stocks are ensured by the Oil Stockholding Association, a body governed by public law. In the event of a supply crisis, BMWK, the Federal Office for Economic Affairs and Export Control (BAFA) and the Petroleum Stockpiling Association (EBV), including the Supply Coordination Group (KGV), a group in which the oil industry is represented shall cooperate in accordance with established procedures to release the stocks of the EBV in the event of a crisis.

On the basis of the EnSiG, the Ordinance on the prioritisation of transport of energy carriers by rail to secure energy supply (EnSiTr) was also adopted, which is particularly relevant for the management of the rail transport of oil and petroleum products with planning priority.

## **Electricity**

Germany has a secure electricity supply and is one of the countries with the most secure supply system in the EU. Germany's geographical location in Europe makes a stable electricity supply central to the entire European internal market. At the same time, Germany benefits from this situation, as the exchange of electricity with its neighbours creates the possibility to export and import in times of shortage.

The secure supply of electricity is one of the main objectives laid down in the Energy Industry

Act (EnWG). This objective is particularly important in the context of the progressive expansion of renewable energies, the increase in electricity consumption through the electrification of other sectors and the simultaneous phase-out of nuclear and coal-fired power generation. Germany has therefore established multi-layered processes to continuously review and maintain security of supply, which allow for an early and preventive response to an undesirable reduction in security of supply levels. These processes include the annual review of the need for grid reserve power plants, the system relevance test for power plants leaving the market and the continuous monitoring of security of supply in the area of electricity supply. (see also chapter 2.4.3.ii.).

As in the gas and oil sector, ensuring security of supply in the electricity sector is primarily a task of electricity supply companies. The following national requirements apply to undertakings:

- Under Paragraphs 1 and 2 of the EnWG, they have the task of ensuring the most secure, affordable, consumer-friendly, efficient and environmentally sound electricity supply to the general public.
- In accordance with § 13 EnWG have the operators of:  
Transmission networks are responsible for the system. For this purpose, the network and market-related measures referred to in Section 13 of the EnWG are available to them.
- According to § 14 EnWG, electricity distribution system operators are provided with equivalent measures such as transmission system operators. In doing so, they must support measures taken by the transmission system operator or an upstream electricity distribution system operator in whose system they are integrated by means of their own measures, in accordance with the latter's instructions.

The European risk-preparedness requirements also play an important role in the electricity sector. Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2019 on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC is decisive. On the basis of that regulation, Germany has its 'risk-preparedness plan pursuant to Article 10 of Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2019 on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC' (status: 20 January 2023).

## **Coal**

Coal will in future play no role in Germany as an energy source for electricity generation. For this reason, there is no mention of coal energy sources in chapter 3.3. The last coal-fired power plant in Germany is to be shut down by 2038 at the latest. Lignite will be phased out in North Rhine-Westphalia by 2030.

2.3.11. National objectives with regard to increasing: the diversification of energy sources and supply from third countries for the purpose of increasing the resilience of regional and national energy systems

The Federal Government is constantly vigilant to ensure that Germany's energy supply is adequately diversified. It continuously monitors the development of energy supply and reports on this in its monitoring reports under Section 51 of the Energy Industry Act (Energiewirtschaftsgesetz EnWG). According to this, electricity supply in Germany is based on a relatively broad generation mix between energy sources, which minimises to a large extent the risk of a shortage of supply of individual energy sources. For Germany's gas supply, diversification of supply sources and transport routes is an essential pillar. The gas industry is making intensive efforts to develop gas infrastructure (pipelines and storage) and to further diversify gas purchases.

### **Natural gas/petroleum**

A relatively large number of import routes are available for the supply of natural gas to the German market. The LNG Acceleration Act, adopted in May 2023, further extended it with the development of German LNG infrastructure. Neighbouring markets can also purchase gas through different means. This means that the risk of supply disruption will be reduced for both the German and neighbouring markets. Cross-border flows exist with all neighbouring countries and gas supplies from Norway via pipelines without transit through other countries. Germany has a sufficiently secure oil pipeline network. The supply of oil is based on market economy criteria. There is no need for state regulation. The gas and oil industry shall ensure that gas and oil supplies are sufficiently diversified and shall ensure that diversification is maintained.

### **Coal**

Lignite is fully supported in Germany. The supply can be considered as secure. Coal imports are widely diversified. The security of supply of hard coal is estimated to be high due to the liquid world market and international supply structures.

### **Electricity**

For electricity, an increase in the so-called interconnectivity is foreseen, depending on several indicators (see 2.4.1.i). The aim is to strengthen the internal electricity market through new interconnectors. At the same time, the interconnectors will also be mainly available to the electricity market. In this context, the Electricity Market Regulation 2019/943 requires Member States to have a minimum trading capacity of 70 % by the end of 2025 at the latest. Further information on the development of interconnectors is given in chapter 2.4.

2.3.111. 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

The Federal Government is constantly monitoring adequate diversification of Germany's energy supply. As a result of Russia's war of aggression against Ukraine, the Federal Government has successfully ended energy dependency on Russia.

2.3.1. . National objectives with regard to increasing the flexibility of the national energy system, in particular by means of deploying domestic energy sources, demand response and energy storage

As already explained in Chapter 2.1.2., the Federal Government is pursuing a continuous expansion of the share of renewable energy sources in gross final energy consumption, as well as in the electricity, heating and cooling and transport sectors. The national targets are set out in this chapter.

The integration of renewable energy into the electricity market and the increasing electrification of other sectors requires demand-side and supply-side flexibility. This is discussed in more detail in 2.4.3.ii.

## **2.4. Dimension Internal energy market**

### 2.4.1. Electricity interconnectivity

Germany's key concern is to strengthen the European internal electricity market. The larger the market area for electricity and the more liquid the flow of electricity, the easier, more precise and cheaper, the fluctuating injection of wind and solar power can be offset by flexible generators and consumers across Europe. Such a large and liquid European market area is important in order to implement a European energy transition in a cost-effective and secure way. It is also important to address the structural challenge that in Europe the most cost-effective locations of electricity generation and electricity demand centres are often geographically disparate.

In order to be able to trade electricity between all EU Member States at all times, grid expansion is central. This is because only if trade on balance sheet is followed by genuine exchanges of electricity can the Member States:

rely on electricity from neighbouring countries and make their national energy transitions more efficient by reducing national production while ensuring security of supply. Grid development is therefore the backbone of the European internal electricity market by distributing traded electricity to the Member States. Germany will therefore invest substantially in national and cross-border network development.

Europe needs network deployment and Germany needs a lot of it. This is because Germany will continue to develop renewable energy sources in the future and thus make a significant



contribution to the EU's 2030 target. In addition, the German electricity grid flows not only from north to southern Germany, but also from Germany to our neighbouring countries and other things, because of its central geographical location. Germany faces particularly serious challenges in terms of network development needs and the Federal Government is addressing them decisively.

2.4.1.1. The level of electricity interconnectivity that the Member State aims for in 2030 in consideration of the electricity interconnection target for 2030 of at least 15 %, with a strategy with the level from 2021 onwards defined in close cooperation with affected Member States, taking into account the 2020 interconnection target of 10 % and the following indicators of the urgency of 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;
- (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

In principle, the Federal Government supports the development of further interconnections with other Member States in the interests of a functioning European internal market for electricity. Due to the importance of electricity grids for European electricity exchanges, Germany also supports the EU 2030 targets for grid expansion.

Two things are important in the implementation of the objectives: Firstly, it is central to coordinate national and European grid development through the provisions of Articles 13 and 14 of the EU Electricity Market Regulation. In the future, Germany will synchronise the development of interconnectors with the development of the corresponding national networks. Second, the general objectives on electricity interconnection require the right indicator, which takes into account differences between Member States in terms of geography and energy mix. This explains in detail:

The general objectives for the EU electricity interconnection target should be based on installed generation capacity (10 % by 2020, 15 % by 2030). In Germany, due to the expansion of renewable energy sources, installed generation capacity grows disproportionately to the expansion of interconnectors. Against this background, the three differentiated indicators are central as the basis for decisions to develop the interconnectors in accordance with Article 4(d)(1) – (3) of the Governance Regulation. By implementing the interconnectors already under construction and planned by 2030, Germany aims to ensure compliance with these indicators.

## 2.4.2. Energy transmission infrastructure

Germany is aware of the importance of national grid expansion for the functioning of the European internal electricity market. The Federal Government is therefore taking a firm stance on the expansion of the network. By 2030, substantial expansion and reinforcement measures of the German electricity grids will be implemented in an amount of approximately 8.500 km. Transmission system operators expect an investment of around EUR 55 billion by 2030. These are investments in the European internal electricity market and Europe's place of business. However, such large-scale investment plans need sufficient time to implement them. In parallel, the Federal Government is therefore preparing an action plan to reduce network congestion as part of the

Electricity Market Regulation, which includes network, generation and redispatch related measures (see section 3.4.3.i.).

The following sections explain in detail the plans of the Federal Government.

### 2.4.2.1. Key electricity and gas transmission infrastructure projects and if applicable

Modernisation projects necessary to achieve the objectives and targets under the five dimensions of the Energy Union Strategy

#### 2.4.2.11. where applicable, main infrastructure projects envisaged other than Projects of Common Interest (PCIs)

Sub-chapters 2.4.2.i. and 2.4.2.ii. are presented together.

For the development of energy transmission infrastructure for electricity and gas, the transmission system operators shall draw up new network development plans (NEPs) in accordance with Section 12b EnWG for electricity and 15 A EnWG for gas. Network development plans for electricity and gas are drawn up in a multi-stage process in which network operators and the Federal Network Agency, as the regulatory authority, are substantially involved.

### **Electricity transmission infrastructure**

On the basis of the network development plans, the Federal Government has laid down the urgent need for a total of almost 14.000 km of lines (see below), of which approximately 1 400 km of interconnections. In addition, new measures will be significantly added in the current NEP process. This is due not least to the fact that for the first time the current NEP has changed perspectives and describes three pathways up to the achievement of net greenhouse gas neutrality in 2045. In their draft, TSOs identify five new HVDC measures and some 4.500 km of AC grid development. The Federal Network Agency examines these measures and, on this basis, will issue a recommendation for the new measures to be enshrined in law.

As early as 2009, the EnLAG adopted pipelines with a total length of approximately 1 800 km.

In the Federal Requirements Plan Act (BBPIG),

Based on previous NEPS lines with a total length of approximately 12.200 km. The status of the BBPIG and EnLAG projects after the first quarter of 2023 is as follows:

- Development objectives of the Federal Requirements Plan Act: A total length of approximately 12.200 km; currently almost 800 km (around 7 %) approved; 1.100 km (approx. 9 %) 38 of the 97 projects are identified as transnational or cross-border. Of the 97 projects under the Federal Requirements Plan Act, eight are currently PCI projects (Nos 1, 2, 3, 4, 5, 32, 48 and 49). Three PCI projects have already entered into operation (Nos 29, 30 and 33).
- Expansion objectives of the Energy Power Lines Expansion Act: Total length approx. 1.800 km; currently almost 300 km (around 17 % of the total length); 1.400 km (around 78 %) have been realised. Project No 1 under the Energieleitungsausbaugesetz is also a PCI project.

Against this background, the 2021 coalition agreement foresees increased efforts to expand electricity grids. Numerous rules were adopted in 2022 and 2023 to facilitate and accelerate network deployment. In addition to changes to the legal framework, best practice exchanges between the licensing authorities will be promoted in a targeted manner and the objectives of as simple, economic and rapid network expansion as possible will be strengthened. Regular, transparent and realistic monitoring and control are essential for the timely implementation of all network development projects under the NEP. In addition to the monitoring published on a quarterly basis by the Federal Network Agency, the BMWK has developed a network expansion control system since 2019 and further strengthened and further developed in autumn 2022.

### **Gas transmission infrastructure**

The exhaustion and conversion of the gas transmission network in accordance with § 15a EnWG is determined by the NEP for gas. It shall be drawn up by the transmission system operators in each even calendar year. The 113 measures included in the NEP Gas 2016 – 2026 include a pipeline construction of approximately 848 km.

#### 2.4.3. Market integration

2.4.3.1. National objectives for other aspects of the internal energy market, such as increasing system flexibility, in particular in relation to the promotion of competitive electricity prices in accordance with the relevant sectoral legislation, market integration and coupling to increase the tradable capacity of existing interconnectors, smart grids, aggregation, demand response, storage, distributed generation, deployment planning mechanisms, redispatching and feed-in restrictions of generating installations, and real-time price signals, including a timetable for the achievement of the objectives;

2.4.3.11. Where applicable, national objectives related to the non-discriminatory participation of renewable energy, demand response and storage, including via aggregation, in all energy markets including a timeframe for when the objectives are to be met

2.4.3.111. 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;

Sub-chapters 2.4.3.i., 2.4.3.ii. and 2.4.3.iii. are presented together.

### **A large, liquid market area for efficient balancing of production and consumption**

In order to ensure a secure and cost-efficient supply of electricity while integrating increasing shares of renewable energy into the electricity system, Germany has opted for the energy only market and a single German bidding zone. The large market area makes it possible to exploit geographical balancing effects in terms of production and consumption. The high level of liquidity in the electricity market helps to combine supply and demand in a flexible and efficient manner, including in the case of variable renewable electricity generation. It also reduces the power of large suppliers over the market outcome and allows innovative players to enter the market. Uniform wholesale prices ensure that the most cost-effective generation technologies prevail in the electricity mix, regardless of location. The installations with the lowest operational costs are used nationally. This reduces the variable costs of the system as a whole. The single German bidding zone and a large European electricity market area reduce the overall demand for generation capacity, demand response and storage. This also reduces the investment and maintenance costs of the overall system.

The Federal Government is convinced that the European internal market for electricity, and therefore the development of electricity networks, is the best way to ensure a cost-effective electricity supply.

The single German bidding zone and a large European electricity market area reduce the overall demand for generation capacity, demand response and storage. The exchange of electricity between European countries is becoming increasingly important: Cross-regional synergies between generation and consumption can be used to make the electricity system even more flexible. It also enables European capacities to jointly ensure security of supply. Both reduce the total cost of electricity production in Europe as a whole.

### **The sectors are linked**

Sector coupling, i.e. the efficient use of electricity from renewable energy sources, will be promoted in order to further decarbonise the industry, buildings and transport sectors. Renewable electricity will play an increasing role in demand sectors through sector coupling. A particular role is also played by buildings which, in the light of the high photovoltaic (cover)

deployment targets, are growing as generators and, in combination with storage and mobility and heat pump applications, have a significant impact on the flexibility of the electricity grid.

### **Phasing out and phasing out coal-fired electricity generation**

The gradual reduction and phasing out of coal-fired electricity generation will contribute to achieving net-zero greenhouse gas emissions. The last coal-fired power plant in Germany is to be shut down by 2038 at the latest. Lignite will be phased out in North Rhine-Westphalia by 2030.

### **Strengthen the link between electricity markets**

The increased coupling of the German electricity market with neighbouring markets is a key step towards achieving the Energy Union and European market integration. The European target model of a harmonised capacity calculation methodology for day-ahead and intraday-trading provides guidance on capacity allocation and congestion management.

### **Reduce network congestion**

At EU level, the proposals of the European Parliament and the Council on the Electricity Market Regulation require Member States to reduce their internal structural bottlenecks. Electricity transport needs in the German transmission system will continue to increase and network bottlenecks will increase at least until the completion of the large high-voltage direct current (HVDC) transmission lines. One reason for this is the progressive geographical separation between production and consumption. A large part of the load centres are located in the south and west of Germany, while new wind turbines are predominantly located in the north and east of Germany. At the same time, power plants in southern Germany will be phased out as part of the phase-out of nuclear and coal. Moreover, due to its geographical location between the Scandinavian electricity markets with comparatively low prices and the western and southern European countries with relatively high electricity prices, Germany is a hub for international electricity trade: Germany often exports market-driven to its southern neighbours.

The EU rules on the opening of the interconnectors (Article 14 of the Electricity Market Regulation) highlight cross-border trade in electricity and lead to increased transport needs by limiting the use of internal grid bottlenecks and loop flows in the allocation of capacity on cross-border interconnections. With the 'Bidding Zone Action Plan', the Federal Government presented in 2019 a package of measures to gradually increase the minimum trading capacity available for cross-border trade in electricity to 70 % over a linear path by the end of 2025.

2.4.4. iv. National objectives with regard to ensuring electricity system adequacy, where applicable, 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

### **Ensuring adequacy**

Germany's objective is to strengthen the European internal electricity market and to ensure security of supply in Europe together. In the monitoring report on security of supply in the electricity sector, adopted by the Federal Cabinet on 1 February 2023, BNetzA considers the development of the electricity market under the assumption of the legally planned expansion of renewable energies, the electricity grid and the transformation of the power plant park necessary for decarbonisation. The report shows that, in the scenarios chosen, the secure supply of electricity can be ensured between 2025 and 2031. This requires market and network developments, such as demand-side demand flexibility and extensive use of cross-border redispatching.

Nevertheless, markets, including the electricity market, are insufficiently prepared for events the probability of which is considered by market players to be unquantifiable or negligible. If the event happens, the potential damage to businesses and the economy can be very high at the same time. In order to make the German and European electricity system more resilient to unpredictable developments and crises, Germany currently considers reserves outside the electricity market to be essential. This is particularly true in the context of the phase-out of nuclear and coal-fired electricity generation in Germany. However, reserves are also likely to be needed in the long term in a net-zero GHG-neutral electricity system.

A strategic reserve, the so-called Capacity Reserve, currently protects the electricity market against unforeseeable events. The Capacity Reserve only covers power plants that do not participate in the electricity market and do not distort competition and price formation.

Crisis preparedness is of high importance for Germany. The aim is to make Germany even more resilient to crises. To this end, it has proved its worth in the gas supply crisis.

Maintain power plant capacity outside the market and support the electricity system if needed. The experience of the crisis has shown that the European requirements for the use of strategic reserves are too restrictive to contribute to a crisis. The Federal Government will therefore promote a consistent legal framework at European level, which also allows reserves to be kept in order to address crisis situations.

European capacities jointly ensure security of supply. In a large, liquid European market area, synergies between different locations with different production conditions can be exploited. This will provide an efficient response to fluctuations in production and consumption and reduce the overall cost of electricity production and the need for capacity. This presupposes that security of supply is considered at European level – and no longer only at national level – that there is sufficient capacity in the common internal market, even in situations of scarcity, and that electricity can actually be transported across borders.

### **Ensuring flexibility**

The integration of renewable energy into the electricity market and the increasing electrification of other sectors requires demand-side and supply-side flexibility to compensate for the fluctuating supply of wind and solar power in Europe and Germany. The Federal Government aims at a flexible electricity system consisting of well-developed electricity grids,

flexible power plants and consumers. Storage should also play a role where they make sense. The need for flexibility in the electricity market has become even more pressing in light of the fact that the revision of the Renewable Energy Directive includes the EU 2030 target for the share of renewable energy in gross final energy consumption from at least 32 % to at least 42.5 %, plus an indicative additional 2.5 %. This makes the development of renewable energies, their use in other sectors and the corresponding flexibility of the electricity market much more urgent, as the share of renewable energy in the EU will have to rise to significantly more than two-thirds of the European electricity mix.

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

In Germany, competition among retail suppliers is high. The aim is to maintain the high level of competition in the electricity and gas retail markets. This is based on competitive price formation and market liberalisation. Where appropriate, the Federal Government systematically develops the legal framework for the protection of household customers. For example, consumer protection has been further strengthened in the implementation of the EU Electricity Market Directive by increasing transparency.

Further details on the protection of energy consumers and the competitiveness of the retail market are set out in Part 3.4.3.iv.

#### **2.4.4. Energy poverty**

Where applicable, national objectives with regard to energy poverty including a timeframe for when the objectives are to be met

It is important for Germany that energy remains affordable as part of the energy transition. The Federal Government therefore aims to ensure affordability for all citizens. In particular, the focus is on households at risk of being overburdened by high energy prices. In the context of the energy price crisis, the Federal Government is analysing the impact of high energy prices on households.

The Federal Government takes a comprehensive approach to combating poverty in social law, which does not focus on individual elements of demand, such as energy. If financial support is needed to ensure subsistence, benefits under the minimum social security schemes are provided under the Second and Twelfth Social Code (Basic Insurance for Jobseekers – Social Code II and Social Assistance – Social Code XII). This includes, among other things, the so-called ‘standard needs’, which also covers, for example, the costs of general household electricity. Expenditure on heating energy is included in accommodation and heating needs to the extent of the appropriate actual expenditure. In addition, energy debt can normally also be taken over on a loan basis.

The scope of these entitlements is determined by the legislator in the light of the nature of the needs and the resources needed to achieve them. Electricity is included in the standard flat-rate demand and is thus included in the annual standard demand update, unless the standard

requirements for one year are to be recalculated. The need for heating energy is taken into account in the accommodation and heating needs to be granted in addition to the standard requirements (Section 22 of Volume II of the Social Code; § 35 SGB XII). Heating energy, including heating electricity, is taken into account to the extent that it is reasonable (if expenditure is higher than average, it is checked whether this can be justified in individual cases). Hot water costs are taken into account in central hot water supply via heating costs. In the case of decentralised hot water, additional needs are recognised for each person in the household.

The basic condition for entitlement to benefits under the minimum social security schemes in SGB II and SGB XII is that the person concerned is in need of assistance because he or she cannot cover his or her subsistence (the minimum subsistence level) from his or her own income and assets (see, for example, Paragraph 7(1), first sentence, point 3, Paragraph 9(1) of the SGB II and Paragraph 27(1) and (2) and Paragraph 41(1) of SGB XII). In so far as this is the case, services are provided for household electricity (as part of the standard demand), decentralised hot water supply and adequate heating energy (see, for example, Sections 20(1), 21(7) and 22(1) of Volume II of the Social Code).

Both the basic provision for jobseekers under the SGB II (citizens' allowance) and social assistance under SGB XII offer a wide range of support to prevent electricity barriers. To the extent that payment obligations for energy costs cannot be met and the energy supply has been blocked or threatens to do so, loans or, in exceptional cases, subsidies may also be considered (cf. Sections 24(1) and 22(8) of Volume II of the Social Code; Sections 37(1), 36(1) SGB XII). Support under § 36(1) SGB XII is also possible for persons who are not otherwise entitled to benefits under SGB II or SGB XII (cf. § 21, second sentence, SGB XII). For the month in which an annual bill for heating energy costs or the expenditure for an appropriate stockpiling of heating fuels is due, under Volume II, services may also be obtained from persons who are not otherwise entitled to public money (cf. the third sentence of Section 37(2) of Volume II of the Social Code; one-off citizen's allowance). The same applies to persons who are not or are no longer able to work in social assistance (§ 35).

Paragraph 5 of SGB XII). In addition, both basic provision for jobseekers and social assistance can be provided directly to the energy supplier in order to avoid the risk of disconnection in advance (cf. § 24(2) and § 22(7) SGB II; § 35(3) SGB XII).”

A housing cost subsidy under the Housing Allowance Act can also be granted to people on low incomes. The housing benefit is intended to provide economic security for an adequate and family-friendly dwelling and is paid as a rent subsidy or as a subsidy for owner-occupied dwellings (Section 1 of the Housing Allowance Act). A person entitled to housing benefit is any natural person who has rented or used accommodation in a similar relationship or has ownership of it (Section 3 of the Housing Benefits Act).

Housing benefit depends on the size of the household, the rent or burden to be taken into account and the total income (Section 4 of the Housing Allowance Act). In addition, regions in Germany are allocated to different levels of rent, which have an impact on the level of housing benefit (Section 12 of the Housing Allowance Act). Housing benefit also includes a



contribution to heating costs calculated on the basis of the number of household members to be taken into account (§ 12(6) of the Housing Benefits Act). It was introduced as a lump sum to reduce the burden of increasing energy costs added to the eligible rent or financial burden.

The housing benefit was substantially reformed as of 1 January 2023. The recipient group has been tripled. The amount of housing benefit was doubled on average. In addition, a climate and heating cost component has been introduced.

Through the introduction of the electricity and gas price brakes, the Federal Government has also taken measures to contain the sharply increased costs for energy. Citizens and businesses have been relieved from the increased costs since January 2023 thanks to price brakes for gas and electricity. The aim is to keep energy costs affordable while ensuring a secure supply of gas and electricity for consumers, industry and SMEs. To this end, household prices for gas were capped at 12 cents per kilowatt-hour and for electricity at 40 cents per kilowatt-hour for a base consumption of 80 % of historical consumption, usually compared to the previous year. For district heating, the capped price is 9.5 cents per kilowatt-hour. These price brakes benefit all citizens and aim to prevent emerging energy poverty.

The Federal Government focuses on providing information, advice and assistance to citizens on energy-related issues. To this end, the Federal Government promotes the energy advice of consumer centres and the energysaving check. As part of the ‘Electricity-Chek’ project, formerly long-term unemployed people specifically advise low-income households on savings in thermal energy, water and electricity. The aim is to reduce CO<sub>2</sub> emissions and reduce energy costs for households and public authorities. The advice focuses on energy-saving behaviour in the fields of heat, water and electricity, as well as on achieving additional savings through the replacement of refrigerating appliances.

As part of the energy advice provided by consumer centres, households receive independent and neutral advice on energy costs, efficiency and savings in this area. The advisory portfolio includes energy saving (electricity, heating), energy bills (electricity, gas, heating), renewable energies, energy renovation, modern heating technology and funding opportunities. Consumers can seek advice free of charge during face-to-face conversations at the Consumer Centres’ helpdesks, or by telephone or video, and online lectures are also offered. In addition, where necessary, energy consultants may also examine the specific situation in the house or apartment in order to be able to make appropriate recommendations, e.g. on improving energy efficiency or on the use of renewable energies. These benefits are to be paid in the form of a uniform contribution of EUR 30, while low-income households receive them free of charge.

2.5.1. National objectives and funding targets for public and, where available, private research and innovation relating to the Energy Union including, where appropriate, a timeframe for when the objectives are to be met

Research, development and demonstration of innovative energy technologies are also dependent on public research funding, in addition to private sector engagement. Public research funding is intended to support technological developments and innovation activities by industry, research organisations and universities, from basic research to applied research, to the transfer of technology or innovation to the market, and to foster their cooperation. As a key element of energy policy, publicly funded energy research is guided by the political objectives of the Federal Government and addresses major challenges of the energy transition. The central research policy framework for energy research funding in Germany is a cross-departmental energy research programme of the Federal Government as a flagship multi-annual programme for coordinating the funding activities of the various ministries involved.

The 7th The Energy Research Programme supports technical and non-technological innovation and research for the energy transition along the entire value chain. This includes increasing energy efficiency, integrating renewable energy into the energy system and developing alternative industrial processes with reduced or zero greenhouse gas emissions.

Funding for research in the field of energy makes an important contribution to the modernisation of the German and European economy and to securing the industrial base. To this end, new trends, such as digitalisation, technology skills in the field of energy will be maintained and expanded. The activation of innovation potential in small and medium-sized enterprises and young businesses has a particular role to play.

The current 7th The Federal Government’s energy research programme has the following objectives:

- Advancing the energy transition: The core objective of research funding is to develop innovative, holistic solutions to the challenges of the energy transition and to bring them quickly to the market. This will be supported by a broad support approach along the entire energy chain and by a special focus on the transfer of results. In addition to the technical aspects of the energy transition, the focus is also on the non-technical aspects of the energy transition, such as societal processes or innovation-friendly framework conditions and their interaction. Particular priority will be given to innovative technologies and approaches that can contribute to significant progress in increasing efficiency and integrating renewable energy into the demand of sectors. In this context, the complex tasks in the heating sector (space heat and process heat) are given high priority.
- The Vtärken industrial site: Funding for research in the field of energy makes an important contribution to the modernisation of the German and European economy and

to securing the industrial base. The aim is to take good account of new trends such as digitalisation, to maintain and develop technology skills in the field of energy and to improve export opportunities for innovative energy technologies. Research funding will therefore also be directed towards technologies for global markets, in particular in developing and emerging economies. The activation of innovation potential in small and medium-sized enterprises and young businesses has a particular role to play in this regard.

- Social risk preparedness: Through the technology-open programme approach, energy-research contributes to the timely development and deployment of a wide range of technology options for the energy transformation process. This creates the necessary room for manoeuvre to react in the future to developments which are not foreseeable today.

2.5.11. Where applicable, national 2050 targets related to the promotion of clean energy technologies and any national targets with long-term targets (by 2050) for the deployment of low-carbon technologies, including technologies for decarbonisation of energy and CO<sub>2</sub>-intensive industries and for any related transport and storage infrastructure

Emissions are a major driver of anthropogenic climate change. In Germany, CO<sub>2</sub> emissions occur predominantly in the context of the use of fossil fuels such as coal, oil and gas. Reducing energy-related CO<sub>2</sub> emissions is therefore a key objective of energy policy. Energy research addresses this objective by developing alternative industrial processes with reduced or zero greenhouse gas emissions, integrating renewable energy into the energy system and increasing energy efficiency.

Two complementary strategies are being pursued in the area of industrial processes. On the one hand, increasing energy efficiency through reduced energy use leads to a permanent reduction in energy-related CO<sub>2</sub> emissions in the industrial sector. On the other hand, technologies to close the carbon cycle are being developed for certain industrial processes where the production of CO<sub>2</sub> is difficult or impossible to avoid due to the process. For example, CO<sub>2</sub> can be used in the chemical industry as a starting point for basic substances (transposition into polymers, basic chemicals, etc.). It can also be used to produce liquid fuels in the context of sector coupling. Closing the carbon cycle requires technologies to capture CO<sub>2</sub> from waste gases or the atmosphere. This may be biological (plant growth) or technical procedures. Research and development of CO<sub>2</sub> technologies for the capture, transport, storage and utilisation of CO<sub>2</sub> will be stepped up so that domestic companies and research institutions can be at the forefront of these technologies, which are also relevant for exports.

2.5.111. Where applicable, national objectives with regard to competitiveness

A successful energy transition must be designed in such a way as to preserve the industrial base. It makes an important contribution to growth and job retention. In the energy transition, energy-intensive industry has three main priorities: Cost development (including electricity costs), security of supply and reliable framework conditions. Additional energy and emissions trading costs can lead to competitive disadvantages, especially for companies operating

globally. It is important to ensure planning and investment certainty for companies in Germany and Europe and to preserve their international competitiveness, in order to prevent the relocation of production and jobs abroad through so-called carbon leakage.

Industry plays a prominent role in tackling the economic consequences of climate change, increasing resource and energy efficiency and using renewable energies. Innovative energy technologies that combine climate change and industrial policy objectives are crucial to this end. National, time-limited support measures can also help to ensure the competitiveness of industry.

Research, industry, investors and public authorities work closely together to seize opportunities through targeted innovation processes for energy-efficient and climate-friendly solutions in all lead markets and key technologies relevant to Germany. For example, the existing potential in sector coupling, storage and efficiency technologies, plant construction, microelectronics and basic industries must be exploited. Research and industrial policy in this sense is expected to deliver first-mover benefits both domestically and in international markets with a positive impact on competitiveness and employment.

# 3. POLICIES ACTIONS

# AND

## 3.1. Decarbonisation dimension

### 3.1.1. GHG emissions and removals

The Federal Climate Change Act, as amended on 18 August 2021, sets out overall reduction pathways for greenhouse gas emissions and also defines sector-specific pathways for energy, industry, transport, buildings, agriculture and other (waste) by 2030. The sectors are not defined according to ETS and non-ETS emissions. A majority of emissions relevant to the Effort-Sharing Regulation (ESR) are to be found in particular in the transport, buildings, agriculture and waste sectors. The Federal Government monitors compliance with the emission reduction pathways up to net-zero greenhouse gas emissions in 2045 each year in a monitoring process that is enshrined in the Federal Climate Protection Act alongside the abatement pathways. The Federal Government is also legally obliged to set out in climate protection programmes what measures it will take to comply with the climate protection objectives enshrined in the KSG. If the annual monitoring reveals that the targets have not been met, the Federal Government is obliged to take additional measures.

3.1.1.1. Policies and measures to achieve the target set out in Regulation (EU) 2018/842 and referred to in point 2.1.1 of this Section and policies and measures to comply with Regulation (EU) 2018/841 covering all key emission sectors and sectors for enhancement of removals in view of the Union's climate-neutrality objective set out in Article 2(1) of Regulation (EU) 2021/1119

#### **Cross-sectoral measures**

Since 1 January 2021, the Fuel Emissions Trading Act has priced emissions from fuels and fuels that are currently not covered by the EU emissions trading scheme. The law thus plays a central role in achieving the

Mitigation targets under the EU Climate Change Regulation. The national fuel emissions trading scheme will be transferred to the EU fuel emissions trading from 2027 onwards, which would be introduced by amending the EU Emissions Trading Directive 2003/87/EC. The Energy Efficiency Act was adopted by the Bundestag on 21 September 2023. The Act establishes a cross-sectoral framework to increase energy efficiency and implements, among other things, the amended EU Energy Efficiency Directive by setting national efficiency targets, requiring companies with energy consumption above 7.5 GWh to implement an energy management system, establishing

prevention, use and reporting obligations on waste heat, and setting efficiency and heat requirements for data centres.

## **Building**

Key measures in the buildings sector include federal support for efficient buildings, tax support for renovation of buildings and the Building Energy Act (Building Energy Act – GEG). In particular, the obligation to use 65 % renewable energy in new-built heating systems in the JIT reduces the use of fossil fuels in heat generation. The law is designed to be technologically open; this includes switching to heat pumps, district heating, biomass or prospective hydrogen and hydrogen derivatives. The pricing of CO<sub>2</sub> by the BEHG is supportive in the bundle of instruments as an amplifier, which in particular improves the competitiveness of GHG-neutral heating options vis-à-vis gas and oil boilers. The Carbon Costs Allocation Act ensures that the incentive of the carbon price also works appropriately in rented buildings and, depending on the energy quality of the building, also incentivises landlords to renovate the building. Furthermore, on 16 August 2023, the Federal Government adopted a draft Heat Planning Act, which obliges the Länder to ensure that heat plans are drawn up for their entire territory within certain deadlines. This is intended to achieve ever-growing shares of renewable energy in the heat supply. The draft is currently being discussed in the parliamentary procedure. The measures are described in more detail in the chapter on energy efficiency.

## **Transport sector**

Key measures in the transport sector include the revision and updating of the EU CO<sub>2</sub> emission standards for new cars and vans, the increase and extension of the GHG quota and, at national level, the BEHG, and the CO<sub>2</sub> differentiation of HGV tolls. In the coming years, the Federal Government will provide significant funding to modernise and expand the rail network. By 2027, Deutsche Bahn AG's investment needs of around EUR 45 billion are to be met by, inter alia, a share of the revenues from the newly introduced CO<sub>2</sub> surcharge on the HGV toll. In order for rail freight to reach a market share of 25 % by 2030, the pro-rata promotion of track access charges in rail freight transport will be continued and incentives for investment from the sector in digitalisation, automation and vehicle technology in freight transport will be reinforced. The use of public transport became easier and cheaper with the introduction of the new German ticket on 1 May 2023. The ticket at the subscription price of EUR 49 per month allows public transport to be used throughout Germany. In order to increase the overall attractiveness of local public transport, a pact for expansion and modernisation is to be adopted by which the Federal Government, the Länder and municipalities agree, inter alia, on the financing up to 2030, including the own shares of the Länder and municipalities, and the distribution of federal funds.

## **Waste sector**

Key measures in the waste management sector include the extension of landfill ventilation measures, optimised gas collection and food waste reduction.

## **Agriculture**

Key measures in agriculture include reducing nitrogen surpluses, including reducing ammonia emissions and targeted reduction of nitrous oxide emissions, and improving nitrogen efficiency, in particular by amending fertiliser legislation, promoting low-emission slurry storage and cutting techniques, and research, expanding organic farming, strengthening the fermentation of farmyard manure of animal origin, combined with gas-tight storage of digestate. The Federal Government is also working to base the development of animal herds on the basis of the area and in

Bring it in line with climate, water and emission objectives.

The following measures will be carried out in each area of activity:

### *Reducing nitrogen surpluses:*

Implementation of the Fertiliser Ordinance, evaluation/further development of the substance flow balance regulation, Federal nutrient management programme; Reduction of ammonia emissions under the National Air Pollution Control Programme, Investment and Support Programme and TA Luft; Research on nitrous oxide emissions, interaction N<sub>2</sub>O/NH<sub>3</sub>, etc.;

Research in precision farming on the savings potential of more efficient fertilisation (nitrogen), e.g. in digital experimentation fields; Strengthening the data base/monitoring, in particular the support measures for reporting, etc.

### *Strengthening the digestion of farmyard manure of animal origin and agricultural residues:*

Support for the conversion of biogas installations towards higher use of slurry; Promoting gas-tight storage of digestate in existing installations; Support for research and development and model and demonstration projects for the co-digestion of farmyard manure with further residues, digitalisation and efficiency measures; etc.

### *Development of organic farming:*

The expansion of organically farmed land is also a climate measure – for example, with the conversion to organic farming, the area-based greenhouse

gas emissions from crops are reduced by half. In its coalition agreement, the Federal Government has set itself the target of 30 % of agricultural land under organic farming by 2030. The BMEL is therefore working on a 2030 organic strategy of the Federal Government with comprehensive measures that help to strengthen organic farming. The Bio-Strategy 2030 is expected to be adopted by the Cabinet in autumn 2023. These measures include, inter alia, strengthening research, which:

Value chains, the organic food out-of-house sector, the improvement of promotion and education.

#### *Reducing greenhouse gas emissions from livestock*

The Federal Government will realise further potential savings in animal husbandry and animal nutrition. In addition to research, the future development of animal populations will be important. A combination of appropriate measures is intended to ensure that greenhouse gas emissions and other environmental impacts are reduced during the conversion of livestock farming. These include land retention measures and indirect influences on the livestock population in Germany. The Federal Government shall base its support on the fact that livestock farming on farms is to be carried out in a ratio of no more than two livestock units per hectare. Land retention is, for example, part of the new federal programme to support the conversion of livestock farming in the pig sector, which is under preparation. Other measures in the area of animal feed include support for the further development and establishment of the use of workable electronic systems for precision feeding of farm animals with the aim of maximising nutrient and energy recovery of feed used in an optimised ration.

#### *Energy efficiency in agriculture*

The technologies used in agriculture and horticulture can be further improved in terms of their energy needs. For this purpose, the Federal Programme for Energy Efficiency in Agriculture and Horticulture will be continued and further developed and the use of renewable energy sources promoted. The measures include training and energy advice on farms with subsequent CO<sub>2</sub> savings investments, individual measures for energy saving and the use of renewable energy for stationary small consumers, buildings and mobile agricultural machinery in accordance with a positive list, regular evaluation of the entire federal programme, training and advice on the energy-efficient operation of heavy agricultural machinery and support for the use of the relevant technology, improvement of the data basis for reporting energy consumption from stationary use (direct measurement of energy consumption).

On the demand side, the Federal Ministry of Food and Agriculture provides



for the promotion of sustainable consumption in the area of nutrition. The political challenge is to create a better framework to make it easy for consumers to feed well, i.e. healthy and sustainable. This requires an integrated food policy based on a mix of instruments. Food environments are of key importance. These must be designed in such a way as to promote factors that facilitate sustainable diets. The Federal Government is preparing a nutrition strategy to promote healthy and sustainable diets.

### **Land use, land-use change and forestry**

On 29 March 2023, the Federal Government adopted the **Action Programme for Natural Climate Action**. The aim is to protect, strengthen and restore ecosystems. The programme combines climate protection with nature protection and ensures that degraded ecosystems become healthy, resilient and diverse through a variety of actions. It includes, inter alia, the following measures:

**Increasing forest cover for climate action and biodiversity:** Through an exchange between the Federal Government and the Länder, opportunities are identified and implemented how to implement as much initial afforestation as possible on suitable areas, where appropriate in pilot regions, in accordance with, in particular, biodiversity-enhancing requirements. In return, the corresponding GAK funding area will be phased out in close consultation with the Länder.

**Creating species-rich and climate-resilient forests through restoration and forest conversion:** The Federal Government plans further programme expenditure on forest conversion and reforestation. These could be implemented in a Community implementation and financing structure with the Länder in the framework of the ANK, provided that there are no constitutional and budgetary reasons to prevent them from doing so, by means of funding of equivalent quality and quantity. In return, the corresponding GAK funding areas will be phased out in close coordination with the Länder.

**Financial incentives for additional climate protection and biodiversity services in forests:** In addition to the existing support programme ‘Climate-adapted forest management’, which further accelerates forest conversion towards climate-adapted forests through the promotion of targeted measures, it is intended to develop a complementary funding instrument. This creates targeted financial incentives for achieving desirable conditions, such as additional structural diversity and biodiversity in forests that are closer to nature, and thus also aims at partly extensive forest management.

**Protect old semi-natural beech forests:** According to the coalition agreement, the federal government has the common objective of ‘stopping the felling of old, semi-natural beech forests owned by the public’. This is to

be implemented as a first step on federal land. The contribution of the other public forest owners, i.e. the Länder and municipalities, will be implemented through an “Alliance of Volunteers”. Possibilities to extend the target to private forests will also be explored.

**Climate Wildness:** A programme to secure smaller wilderness areas in forests, bogs, floodplains, coasts, mountains, former military training centres and post-mining landscapes will be relaunched.

**Support for semi-natural areas:** In the interests of natural climate protection, support for carbon storage measures in the agricultural landscape with a simultaneous positive impact on biodiversity, high permanence, good detectability, appropriate additionality and low leakage effects will continue to be provided under the Joint Scheme for Agricultural Structure and Coastal Protection, as well as under the Natural Climate Action Programme. This concerns, inter alia, the development of support for the creation of wooden strips, field copses, hedgerows, knocks and allies, e.g. with fruit trees, especially on field margins, and agroforestry systems. The creation of flower strips and flower areas and agroforestry will also be used, for example, under the organic schemes of the 1st. CAP pillar.

**Accelerate bog rewetting:** In order to speed up the measures already adopted, the Federal Government will, in the short term, promote federal support measures for climate protection through bog soil protection. The Federal Government has adopted the National Moor Protection Strategy and will rapidly start its implementation, enter into agreements with the Länder, as part of the acceleration of planning and approval, also conclude appropriate agreements with the Länder, review the instruments of planning law together with the Länder in order to give greater weight to moor protection in technical and territorial planning, create a right of pre-emption for public authorities to bog soils and create a federal funding offer agreed with the Länder, to successfully establish alternative forms of farming on rewetted, previously dewatered peatlands, and also to improve the condition of unused and protected bog soils by means of restoration measures.

**Strengthening and promoting urban trees, urban forests and forest gardens:** A new investment programme is intended to promote tree plantings and new urban forests for climate change adaptation and promotion of biodiversity as part of the Federal Government’s financial constitutional possibilities.

**Strengthening ecological management of green spaces in municipalities:** This new support programme is intended to support municipalities in the transition to ecological green land management within the limits of the Federal Government’s financial constitutional possibilities.

**Further measures to increase the resilience of terrestrial ecosystems:** As measures to increase the resilience of terrestrial ecosystems, in particular:

- swiftly implement the national water strategy adopted by the Federal Government on 15 March 2023 and establish a ‘Federal programme for climate-related measures in water management and water development’;
- developing a support programme for national restoration plans in line with the European Union nature restoration targets;
- the legal bases for soil protection are reviewed and federal soil protection law adapted to the challenges of climate protection, climate change adaptation and the preservation of biodiversity, taking into account the different uses;
- Land take and soil sealing are reduced and existing desealing potentials are used to a greater extent than in the past; and
- other support programmes, which are not listed in detail here, which are set up under the Natural Climate Action Programme for the restoration of ecosystems.

**Improved GHG monitoring and reporting:** The accuracy and robustness of emission data and forecasting tools for reporting will be improved, including remote sensing systems where possible in the data collection. The power to regulate greenhouse gas emissions in the LULUCF sector is to be used to regulate the basis for recording and reporting greenhouse gas emissions in the LULUCF sector. The draft Regulation is due to be presented by the end of 2024.

The following measures are not explicitly included in the Action Programme for Natural Climate Change, but also contribute to the LULUCF sector’s balance sheet:

**Introduction and dissemination of forest management, particularly adapted to climate change,** which maintains and develops resilient, adaptable and productive forests. It contributes to the enhancement of biodiversity and contributes to climate change mitigation and other ecosystem services. For this purpose, the Federal Ministry of Food and Agriculture’s ‘climate-adapted forest management’ funding programme was launched.

**Reorientation of the joint task for agricultural structures and coastal protection (GAK):** On the basis of the reform of the GRW, the Federal Government will refocus the joint task on the basis of its objectives and advocates for over-annual and flexible funding. New tasks such as nature conservation and climate adaptation need to be secured by appropriate

funding. Cooperation between nature conservation and agriculture should be given a legal basis for agricultural support.

**Sustainable and regional value-added networks for wood as a raw material:** The coalition agreement provides for the implementation of a timber building initiative to support regional value chains. As part of this, the efficient and climate-friendly use of wood as raw material is promoted through model and demonstration projects, with the Federal Government as a role model and frontrunner in climate and resource-efficient construction. It will also support R & D projects in this field;

strengthening knowledge transfer, advice and broad-based technical and consumer information, incentivising sustainable, climate-friendly construction with wood and other renewable raw materials and other sustainable construction methods, by further developing the relevant climate-relevant regulatory frameworks, regulations and decision-making bases.

**Strengthening communication and outreach:** All ongoing and new climate change mitigation activities in the LULUCF sector, in particular natural climate change mitigation, will be presented more widely and promoted through appropriate measures to further improve the acceptance and success of the measures.

**Humus maintenance and cultivation in arable land:** Carbon enrichment activities will be researched and demonstrated in supported projects. The development of organic farming also contributes to carbon accumulation. The planting of hedgerows, knicks and allies, for example, also contributes to humus construction. Forest strips on agricultural land improve soil quality and reduce CO<sub>2</sub> and pollutant pollution.

**Maintenance of permanent grassland:** Grasslands hold high carbon stocks. Maintaining permanent grassland is therefore also an important climate measure. The continuation of the rules for the protection of permanent pasture in the common agricultural policy contributes to this.

#### **Further action on greenhouse gas removals**

#### **Support programme for the expansion of landfill ventilation and optimisation of gas receptacles**

Key measures in the area of other emissions, which focus on the vast majority of the emissions from these emissions, are landfill ventilation, thus transforming methane into carbon dioxide based on biogenic carbon and thus net-zero greenhouse gas (GHG) emissions, and optimisation of gas receptacles.

#### **Light Construction Technology Transfer Programme**

Lightweight construction aims to reduce the weight of products, save materials and energy, and increase circularity – while maintaining or improving functionality. From design to production, use and recycling of materials and products, this can save resources and reduce CO<sub>2</sub> emissions.

Since 2020, the light construction technology transfer programme has supported politically relevant and application-oriented projects with high industrial participation. This will support Germany's industrial base in the important theme of light construction and material efficiency, while promoting environmental and climate protection. Innovative light construction technologies and materials contribute, in the medium and long term, to industrial transformation and to the resilience of businesses in times of raw material supply shortages and rising energy prices.

The funding programme is due to be amended in 2023. The planned technology transfer

programme ‘light construction and material efficiency’ will focus more on material efficiency, circular economy, digitalisation and automation.

3.1.1.11. Where relevant, regional cooperation in this area

#### **European Climate Action Initiative**

To step up cross-border cooperation and transfer of experience in the field of greenhouse gas reduction at non-governmental level, the BMU launched the ‘European Climate Action Initiative’ in 2017. Projects supporting the exchange of good practices between sub-state actors, civil society, business and academia will be supported. However, the Federal Government is also in regular exchanges with other Member States. There are well-established bilateral formats with a large number of EU Member States.

#### **Meseberg Climate Working Group (Climate WG)**

With the Meseberg Declaration of 19 June 2018, Germany and France agreed to set up an inter-departmental High Level Climate Working Group (“Climate WG”). The Climate WG supports the implementation of the Paris Agreement on climate change. This includes developing common views on the energy transition and sustainable finance instruments, as well as on economic incentives, including aspects of carbon pricing. The inaugural meeting of the Climate WG took place in Paris on 6 September 2018. The Climate WG reports on its work to the Franco-German Council of Ministers. It meets at least once a year under the guidance of the State Secretaries responsible for climate change.

3.1.1.111. 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

#### **National Climate Change Initiative (NCI)**

With the NKI, the Federal Government has initiated and promoted numerous climate protection projects since 2008 (Federal Ministry of the Environment, Nature Conservation and Nuclear Safety until 2021, the Federal Ministry of Economic Affairs and Climate Protection) and thereby makes an important contribution to achieving national climate objectives. Their programmes and projects cover a wide range of climate action: By developing long-term strategies, supporting professional climate change management and investment support, the NKI helps to anchor climate action on the ground. The main target groups of the NCI are municipalities, business and consumers, as well as schools and educational institutions. By the end of 2022, around 45.200 projects had been implemented, with funding of around EUR 1.54 billion.

#### **Implementation of the Sustainable Finance Strategy**

The purpose of the Sustainable Finance Strategy is to further develop Germany into a leading sustainable finance location, to support the discussion and implementation processes at national, European and global level, and to contribute to a structured, clustered stakeholder

dialogue. On 25 February 2019, the Committee of State Secretary for Sustainable Development decided to develop a Sustainable Finance Strategy of the Federal Government (in force since 5 May 2021) and to set up a Sustainable Finance Advisory Council of the Federal Government (against 10 June 2022). Key steps towards more sustainable finance and strengthening

Private capital has already been mobilised, e.g. expanding the issuance of Green Federal Bonds (Bund issued successfully since 2020); Spending Review 2021/2022 ‘Linking Sustainable Development Goals with the Federal Budget’ and the establishment of the International Sustainability Standards Board in Frankfurt as the key standard setter for global sustainability reporting.

### **Further develop KfW as a transformative promotional bank to support the transformation of economic sectors and financial markets for a GHG-neutral future**

KfW will be further developed as a promotional bank to support the transformation of economic sectors and financial markets for a net-zero greenhouse gas future. Proposals for concrete implementation will be made taking into account the Sustainable Finance Strategy, within the limits of KfW’s existing capital base and in line with KfW’s strategic target system. At the same time, the Federal Government will promote appropriate transformation processes in multilateral development banks through its influence on the competent bodies of the banks. The EU Taxonomy and its results should be reflected in the basic principle.

### **“Green” federal securities**

Since 2020, the Federal Government has issued green federal securities and thus supports the development of sustainable financial markets in line with the UN 2030 Agenda. The issuance creates transparency about federal green spending. The preparation and follow-up of the issue of green federal securities is an inter-ministerial measure. The tasks include selecting and evaluating suitable green expenditure and later reporting on the effects achieved within the thematic departments (e.g. for energy, transport, research, etc.). The Federal Government continues its issuance strategy in the green bond segment. With the construction of a green yield curve in Europe, Germany is internationally positioned as a sustainable finance location.

### **Digital ecosystems for a climate-friendly industry**

The digitalisation of supply chains across sectors and the development of digital ecosystems enables novel industry 4.0 applications and business models. These multilateral and trusted data ecosystems should enable scalable, automated and widespread application of data-based solutions to boost energy and resource savings potentials, including across companies. One of the objectives of the programme is to enable companies to transparently map and manage carbon footprints along entire supply chains through appropriate data-based solutions.

It is based on the assessment for the preparation of the Federal Government’s SSF, which estimates that the programme will have an impact of 1.59 Mt CO<sub>2</sub>/a in 2030, with the available budget of EUR 550 million. The further development will be continued on a pro rata basis, in particular no extension in principle is assumed by this instrument compared to 2030.

## **Climate and Transformation Fund (KTF)**

The KTF is a key instrument for financing the energy transition and climate action. With this special fund, the Federal Government supports in particular the energy renovation of buildings, but also climate-friendly new construction, the decarbonisation of industry and the expansion of renewable energies, alternative powertrains and the expansion of refuelling and charging infrastructure.

The KTF will also support the development of a hydrogen economy with refuelling infrastructure, as well as support for semiconductor production from 2024. Semiconductor production is highly relevant for GHG-neutral technologies – and thus for a successful transformation of the German economy towards net-zero greenhouse gas emissions. In addition, as of 2024, funds will also be earmarked for investments in railway infrastructure in the KTF.

In total, approximately EUR 211.8 billion will be allocated to the tasks of the KTF between 2024 and 2027. Of these, around EUR 63.5 billion are for the relief of citizens and businesses, around EUR 60.7 billion for the promotion of buildings, around EUR 18.6 billion for the development of the hydrogen industry, around EUR 13.9 billion to promote electro-mobility and further development of charging infrastructure and EUR 12.5 billion for railway infrastructure and EUR 12.2

Billion euros to boost semiconductor production.

## **DARP**

In the German recovery and resilience plan (DARP), three projects led by the BMWK are dedicated to the decarbonisation of industry: the “IPCEI Hydrogen” as well as the “Industrial Decarbonisation Support Programmes” and “Climate Contracts”. They receive, among others, European funding from the Recovery and Resilience Facility for a total amount of EUR 2.5 billion.

The actions under the climate-friendly mobility component of the DARP aim to establish alternative technologies in the transport sector in a sustainable way, make it more energy-efficient, climate-friendly and environmentally friendly, thereby further advancing the energy transition in transport.

### *IPCEI Hydrogen*

The IPCEI Hydrogen aims to support integrated projects along the entire hydrogen value chain, from green hydrogen production through infrastructure to industrial use and mobility. Priority will be given to investment costs (CAPEX). IPCEI Hydrogen is co-financed by BMWK, BMDV and the Länder. The Federal Government contributes 70 % of the total funding to the IPCEI projects and 30 % to the Länder.

### *Support programmes Decarbonising Industry*



With the support programme ‘Decarbonisation in industry’, the federal government supports the energy-intensive (basic) industry (e.g. steel, chemicals, cement) in developing and investing in innovative climate protection technologies to avoid process-related greenhouse gas emissions. These are mainly due to the technologically necessary use of fossil raw materials (e.g. coal coke in steel production) and can in many cases be avoided only by means of completely new production processes (e.g. direct reduction instead of blast furnace route in steel production). This often means the transformation of entire industrial sites.

### *Climate change contracts*

The ‘Climate Change Contracts’ funding programme helps industrial companies to invest in and operate climate-friendly production facilities that would not otherwise be expected (e.g. steel, cement, paper or glass). Above all, however, it will trigger the much-needed market transformation: Climate change agreements provide an incentive for the necessary technologies and infrastructure to be developed and built in Germany. This creates production facilities and pipelines for hydrogen, know-how in the financing, construction and operation of climate-friendly facilities, and markets for climate-friendly end-products (green lead markets). This means that climate change contracts are not only a key instrument for climate protection, but also for Germany’s industrial and innovation centre.

### **3.1.2. Renewable energy**

3.1.2.1. Policies and measures to achieve the national contribution to the binding 2030 Union target for renewable energy and trajectories as referred to in point (a)(2) Article 4, and, where applicable or available, the elements referred to in point 2.1.2 of this Annex, including sector- and technology-specific measures

#### **Reform of the Renewable Energy Act (EEG 2023)**

The reform of the Renewable Energy Act (EEG 2023), which entered into force on 01/01/2023, is the largest reform in decades. It includes numerous measures to accelerate the roll-out of renewable energy, with a target of at least 80 % of renewable energy in gross electricity consumption in 2030. Particular emphasis should be placed on the newly introduced principle that renewable energies are in the overriding public interest and serve public security purposes. In future, renewable energies will therefore take precedence over other interests in balancing decisions. This will increase the pace of planning and approval procedures.

#### **Expansion of renewable energy to at least 80 % of gross electricity consumption by 2030**

The targeted, efficient, grid-synchronous and increasingly market-oriented development of renewable energy is a crucial building block for achieving the climate targets in the energy sector. The Federal Government has the target of achieving a share of at least 80 % of electricity consumption from renewable sources in 2030. The share of renewable energies in gross electricity consumption in 2018 was around 38 %. The development of renewable energy sources in electricity generation is strongly encouraged and controlled by the Renewable Energy Sources Act. The Renewable Energy Act sets out expansion paths for this purpose: The

expansion paths for wind and solar energy were significantly increased by the Renewable Energy Sources Act 2023: For onshore wind energy, 10 Gigawatts (GW) are expected to be installed annually to reach a total of 115 GW by 2030 or 160 GW from 2040, and for solar installations 22 GW per year to reach a total of around 215 GW by 2030 and 400 GW by 2040. The expansion target for offshore wind energy will increase to at least 30 GW by 2030, to at least 40 GW by 2035 and to at least 70 GW by 2045.

In addition to the expansion paths, the share of renewable energies in gross electricity consumption is largely influenced by the evolution of electricity consumption (e.g. efficiency and sector coupling). As outlined in the Climate Change Programme, further measures are planned in relation to the expansion of renewable energy to at least 80 % of gross electricity consumption by 2030. These measures are specified in legislative proposals.

### **Wind Energy On Sea Act (WindSeeG)**

A comprehensive amendment to the Wind Energy Act (WindSeeG) entered into force on 1 January 2023. The amendment aims to contribute to the objective of increasing the share of renewable energy in electricity consumption to at least 80 % by 2030. To this end, the amendment significantly increases the expansion paths and tender volumes. The expansion target for offshore wind energy will increase to at least 30 gigawatts (GW) by 2030. At least 40 GW of installed capacity by 2035 and at least 70 Gigawatts by 2045. In particular, the amendment speeds up procurement, planning and authorisation procedures by bundling and streamlining audits. The applicable tender design will be redesigned. In addition, offshore expansion will be explicitly in the overriding public interest in the future and will be strengthened in balancing decisions with other public goods.

### **2023 Maritime Wind Development Plan**

In January 2023, the competent Federal Maritime and Hydrographic Agency published the new 2023 land development plan for wind energy at sea. It secures the land to reach the 2030 target and already sets the basis for reaching the 2040 target.

### **Offshore pre-deployment 2022**

In addition, in the area of offshore wind energy, the 2022 offshore implementation agreement was concluded between the participating Länder and industry stakeholders. In particular, the core of the agreement is concrete timetables for defined milestones with regard to the start and end of the relevant planning and authorisation procedures, as well as the start and commissioning of offshore connection lines.

### **Wind-an-Land Act**

The Wind-an-Land Act has been in force since 1 February 2023. It includes the introduction of the Wind Energy Demand Act (WindBG), legal consequences in the Building Code (BauGB) and monitoring provisions in the Renewable Energy Act (EEG).

## **Wind-on-shore strategy**

The wind-on-shore strategy is a comprehensive work programme with legal and non-statutory measures in 12 fields of action to accelerate the development of onshore wind energy and to remove barriers.

### *Area targets for 2032*

The Wind Energy Demand Act (WindBG) ensures that by the end of 2027 a total share of 1 %, 4 % of the federal area is available for use onshore wind energy and 2 % by the end of 2032. Individual area targets are set for each Land, which in 2032 are between 1.8 % and 2.2 per cent of the respective Land area. If the targets are missed by the cut-off dates, wind turbines in the entire planning area are given preferential treatment in the outdoor area. By integrating the area targets into the

Planning legislation will simplify and speed up planning procedures.

### *Speeding up and simplifying permitting procedures (onshore wind)*

In 2021, approval procedures last on average over two years from the submission of the initial documents and more than 10 months from the establishment of completeness of the application documents. Many measures have been taken to shorten the procedures. Among other things, the principle that renewable energy is in the overriding public interest and serves public security has been included in the Renewable Energy Sources Act 2023. Renewable energy installations must therefore be taken into account as a matter of priority in all assessments of protected interests.

The implementation rules for Article 6 of the EU Emergency Authorisation Regulation (Regulation (EU) 2022/2577) are significantly accelerated in the Wind Energy Demand Act (WindBG). For the period of 18 months in designated wind areas, the assessment of environmental impact and species protection legislation is not required. Uniform national standardisation in the area of species protection also creates significant simplifications in the authorisation procedures. To this end, the Federal Nature Conservation Act (BNatschG) has been amended. Further facilitations in designated wind areas and further standardisation in species conservation legislation are planned, among other things.

In addition to the planned measures under species protection legislation, a number of other measures are planned to improve the framework conditions for the development of onshore wind energy. For example, an amendment to the Federal Immission Control Act (BImSchG), the central law under which onshore wind turbines are approved in Germany, is currently under negotiation in Parliament. In particular, it includes procedural acceleration measures for onshore wind turbines and electrolysers for green hydrogen. The planned actions include, for example, simplification for repowering projects, strengthening the role of the project manager, improving the “public authority cut-off” regime and more efficient (urgent) legal procedures.

## **Better synchronisation of the deployment of renewable energy with grid expansion**

The current phase of the EEG focuses on grid and system integration of renewable energies. As a major EU Member State in the middle of Europe, the Federal Government's future main tasks are therefore to develop transmission networks and to modernise and optimise existing networks. Optimisation and further development of network operation, including redispatching, may also be considered. This is essentially a European challenge: Electricity generation in the most favourable locations implies the need for sufficient electricity transport to the load centres. The early expansion of renewable energy sources makes this challenge particularly visible in Germany. In addition, the ever-increasing injection of electricity from renewable energy sources often takes place at distribution grid level. This creates additional challenges for the development and further development of regional electricity grids. In order to better reconcile the development of renewable energy sources in the electricity sector with grid expansion, in addition to network-related measures, direct deployment management of renewable energies is also taking place.

### **Review of regional governance of renewable energy in the electricity sector**

Regional management of renewable energies has, in particular, an impact on the expansion plans and targets of the Länder, on network development planning and on the acceptance of the expansion of renewable energy sources, and therefore has a high political relevance. It also contributes to a better synchronisation of the development of electricity grids and renewable energy. The options for regional governance in the development of renewables are very flexible: While for large power plants the flexibility lies in the generation itself, renewable energy generation capacity can be spatially managed in the short and medium term, with identified grid load demand and corresponding policy frameworks. In addition, regional management with higher installed wind power in southern Germany would lead to a reduction in cost-intensive cutbacks due to lower demand for electricity transport from north to south.

### **Energy Industry Act**

A further acceleration is achieved by the amendments to the Energy Industry Act (EnWG) in 2022 to further accelerate the construction of offshore connection lines, in particular through the parallel construction of several interconnectors per year in a route corridor.

### **EU Emergency Permit Regulation**

In addition, implementing rules on Article 6 of the EU Emergency Authorisation Regulation were already transposed into national law in March 2023. This will further speed up procedures for the development of renewable energy and electricity grids. As a result of the scheme, the environmental impact assessment and the species protection legislation does not apply for a period of 18 months in designated renewable energy and grid areas which have already undergone a strategic environmental assessment (SEA). In order to safeguard species protection, proportionate prevention and mitigation measures shall be implemented on the basis of existing data.

### **Heating and cooling**

For the building sector, the measures to implement the Energy Efficiency Strategy for Buildings (ESG) are set out in the long-term renovation strategy (see heating and cooling related measures in the building sector in chapter 3.2. on energy efficiency). Many of these measures also contribute to the achievement of the renewable energy dimension. Of particular importance here is the amendment of the Building Energy Act (obligation to use 65 % renewable energy) in conjunction with the Heat Planning Act. In addition, buildings with photovoltaic installations, which receive increased support under the EEGreform, contribute significantly to the achievement of the national renewable energy expansion targets.

### **Further development of combined heat and power (CHP)**

With the instruments for fuel switching from coal to gas and for boosting the use of renewable energy, for example in the field of heat generation, the 2020 amendment to the CHP Act established decarbonisation and flexibility as key elements for the further development of cogeneration. A key objective was to accompany the phase-out of coal in Germany. The reduction of the eligible expenditure started in 2020

Full-use hours continued with the so-called ‘immediate climate change programme’ of spring 2022. This will continually increase the incentive for CHP plants to drive in line with the electricity market. In addition, the hydrogen capability requirement was introduced as a major change in 2022. As a result, new CHP plants with an electrical capacity of more than 10 megawatts must be planned and constructed in such a way that they can later be converted to hydrogen at low additional costs. This avoids lock-in effects in fossil-only power plants.

### **Transport**

The update of the National Hydrogen Strategy (NWS), adopted in July 2023, creates the framework for the future production and use of green hydrogen (produced from renewable energy) and thus for innovation and investment. The vision of the update of the National Hydrogen Strategy adopted in July 2023 is designed to ensure that hydrogen and its derivatives will be used by 2030, in particular in industry, heavy-duty vehicles and increasingly in aviation and waterborne transport. The strategy brings together short, medium and long-term measures to this end. Accordingly, in addition to direct electrification, hydrogen and fuel cell technology and Power-to-X (PtX) fuels will also play an increasing role. Transport measures address, inter alia, the development of a core network at hydrogen refuelling stations, the promotion of renewable fuels or the creation of the necessary framework conditions. A Master Plan for Hydrogen and Fuel Cell Technology in Transport will be developed to target the scaling up of hydrogen and its derived fuels, fuel cell vehicles, fuel cell components and systems and the infrastructure needed. The Master Plan, taking into account and bringing together existing processes and strategies, support programmes and regulatory measures, will define concrete action steps with a timetable and address the possible contribution to achieving the national climate targets by 2045.

Where relevant, specific measures for regional cooperation, as well as, as an option, the estimated excess production of energy from renewable sources which could be transferred to other Member States in order to achieve the national contribution and trajectories referred to in point 2.1.2

Increased regional cooperation with other Member States is another driver of the market integration of renewable energies. The Federal Government is focusing on this in the coming years.

### **Opening of tenders in the electricity sector**

Under the State aid approval of the Renewable Energy Sources Act, since 2017 the Federal Government has had to open calls for tenders for electricity from renewable energy sources amounting to 5 % of the capacity to be newly installed each year to installations located in other EU Member States. The aim of the opening-up is to strengthen regional cooperation, which should contribute to a common understanding of market integration and the promotion of renewable energy, and to a greater convergence of national support schemes. Cross-border calls for tender are subject to the principle of reciprocity, a cooperation agreement with the partner country and the physical import of the supported electricity in the partner country. Cross-border tenders can be implemented through both mutually opened and joint tenders with one or more partner countries. The Cross-border Renewable Energy Regulation already provides a legal basis for cross-border tenders for onshore wind and photovoltaics. Experience has also been gained in implementation: For example, a pilot cooperation with the Kingdom of Denmark was carried out in 2016 with the Kingdom of Denmark with mutually opened calls for tenders for open-air photovoltaic installations. In this open call for tenders, only outdoor photovoltaic installations in Denmark have been awarded a contract. The Federal Government is also actively engaged in attracting partners to further cooperation and is currently discussing with Luxembourg and France in particular. In addition, on the basis of the experience gained, the Federal Government plans to draw up a ‘window window’ concept in order to increase the transparency of cross-border tenders for stakeholders in other Member States. The concept is intended to offer governments and companies from other Member States to cross-border tenders by:

Federal Government to participate and clarify which tender conditions would apply in the event of cooperation.

### **Baltic Energy Market Interconnection Plan (BEMIP) – Working Group on Renewable Energy**

The BEMIP Working Group on Renewable Energy provides a platform for the exchange of experience between the participating Member States in the development of renewable energy, in particular as regards the planning and promotion of the further development of renewable energy. The Group also aims to build a common vision of the EU’s Baltic Sea countries for the development of renewable energy, in particular in the field of offshore wind energy, and to identify potential cooperation projects. Germany actively supports the initiative and advocates that the Baltic Seacountries bordering the EU exchange the relevant parts of their National

Climate and Energy Plans (NECPs) in the framework of the Working Group. Synergy effects with the North Sea onenergy cooperation (see below) should be exploited. There is potential for cooperation in the Baltic Sea region, for example, in the sharing of electricity infrastructure in the context of the development of wind energy at sea.

### **North Sea Renewable Energy Cooperation**

This cooperation will focus on cooperation on the development of wind energy at sea, the development of grid infrastructure and cross-border maritime spatial planning in the North Sea. As part of the initiative, the relevant Member States, including the Federal Republic of Germany, have also started to exchange views on the relevant parts of the NECPs of the North Sea countries. North Sea cooperation focuses on the coordination of objectives and development strategies, including the individual bidding dates for offshore wind, and the exchange of experience in developing wind energy at sea (support systems, spatial and grid planning, etc.). The purpose of the NECP cooperation is to establish an aggregated development plan for offshore wind energy in the North Sea area and to create as coordinated and continuous project pipeline as possible. In addition, in the context of North Sea energy cooperation, the relevant Member States, including the Federal Republic of Germany, are also working on concepts for possible joint projects for the exploitation of wind energy at sea or on so-called hybrid projects, where the grid connection and connection of the offshore wind turbines can be used simultaneously as an interconnector and to drain the electricity generated. The Federal Government actively participates in North Sea cooperation (inter alia by chairing Working Group 3 on the promotion and financing of wind energy at sea). The Federal Government sees North Sea energy cooperation as a major opportunity for further integration of the internal energy market and will continue to promote enhanced exchange of best practice, improved coordination in the use of energy and grid development in the North Sea and the preparation and design of concrete joint projects. Germany has actively participated in the common chapter of North Sea cooperation.

### **Technical assistance in Greece and Cyprus**

Since 2013, there has been a strategic partnership between the Federal Republic of Germany and Greece in the field of renewable energy and energy efficiency. The Federal Government is financing the provision of technical assistance in Greece for the reform of the renewable and efficiency sectors (TARES, TARES+ and TARES4 and H2Greece) through the Technical Support Instrument (TSI) and the European Commission's predecessor Structural Reform Support Service (SRSS). This is ensured in the form of advisory services provided locally by the Gesellschaft für Internationale Zusammenarbeit (GIZ) in Berlin and Athens. The advice will focus on supporting reform measures to achieve Greece's national 2020 targets and developing a long-term strategy for energy and climate policy up to 2050, in particular with a view to further developing renewable energy and energy efficiency, as well as the necessary adjustments of the Greek electricity market to increasing shares of renewable energy. The projects also support the exchange of experience between the Federal Republic of Germany and Greece in the preparation of the National Climate and Energy Plans (NECPs) for 2030. The technical assistance also foresees the development and implementation of concrete renewable pilot projects, such as on public buildings or on a Greek island, as well as the

implementation of the Greek National Hydrogen Strategy. The aim is to provide concrete examples of the feasibility and cost-effectiveness of projects with high shares of renewables in Greece.

In Cyprus, the BMWK is supporting a TSI project to support floating photovoltaics, energy storage and offshore renewable energy as of September 2023. In line with the objectives of the Cypriot NECP, the project will support the increased use of renewable energy sources and energy storage facilities in Cyprus in order to reduce greenhouse gas emissions from the electricity sector and improve its security of supply.

### **Concerted Action Renewable Energy**

The Renewable Energy Concerted Action Forum (CA-RES) was established in 2010 with the aim of enabling experts from Member States to informally exchange experiences on the implementation of the Renewable Energy Directive. Germany has taken an active role in the Forum from the outset by leading thematic sub-groups. As part of the ongoing CA-RES phase since 2021, Germany manages the ‘Core Theme 1 Governance, Target Achievement and Cooperation’ and is responsible for the preparation and follow-up of the plenary meetings held twice a year. In this role, Germany focuses on improving the coordination of national energy policies in the field of renewable energy. For example, at the initiative of Germany, a meeting was held at the plenary meeting in Vienna in May 2023 to strengthen NECPs, implement the revision of RED II and regional cooperation between Member States.

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

### **Levy system in the Renewable Energy Act (EEG)**

Citizens and the economy will be relieved from the electricity price by reducing the EEG-surcharge to zero by 1 July 2022 and completely abolished by 1 January 2023 and by paying support for renewable energy from the Climate and Transformation Fund (KTF) special investment fund.

### **Investments in storage technology**

In the coalition agreement, the Federal Government agreed on the 19th Enshrined in the legislature’s intention to invest in storage technologies and smart marketing concepts in order to continue to ensure security of supply in all parts of Germany and to minimise EEG and system costs.

### **KfW Renewable Energy Programme**

The programme will provide long-term low-interest financing for measures for the use of



renewable energy for electricity, electricity and heat generation in cogeneration plants, as well as measures to integrate renewable energy into the energy system. Up to 100 % of the eligible investment costs will be financed up to a maximum of EUR 50 million per project.

### **Heating and cooling**

Since September 2022, the Federal Aid Programme for Efficient Heating Networks (BEW), for which a total of around EUR 4 billion is planned until 2027, has been providing financial support for the expansion and transformation of the heat networks towards net-zero greenhouse gas heat supply. The programme supports the construction and conversion of heat networks to renewable energies and unavoidable waste heat. Connections to a heat network and heat networks with up to 16 connected buildings or 100 housing units are eligible for federal funding for efficient buildings (BEW).

The programme, together with the Heat Planning Act, should form the basis for reaching the target of producing 50 % of wired heating and cooling from renewable energy and unavoidable waste heat by 2030. By 2045, the heating and cooling networks will be fully decarbonised.

For the building sector, the measures to implement the Energy Efficiency Strategy Buildings were set out in the Long-Term Renovation Strategy (for an update see heating and cooling related measures in the building sector in chapter 3.2. on energy efficiency). In addition, the 2022 Urgent Buildings Programme adapts the set of measures to current developments and new objectives. Many of them

Measures also contribute to the achievement of objectives in the renewable energy dimension, in particular the Federal Funding for Efficient Buildings (BEG), the Federal Support for Efficient Heating Networks (BEW), the extension and transformation of heat networks and the construction of heat networks with a high proportion of renewable energy sources and waste heat, and the climate-friendly new construction programme (CFN). The provisions of the JIT, which require the use of renewable energy in the replacement of heating systems in existing buildings, are also supported by support measures.

### **Promoting the production of green hydrogen (offshore electrolysis)**

In addition to offshore electricity production, offshore electrolysis is crucial for the decarbonisation of the industry. The Federal Government is promoting offshore electrolysis and would like to financially support technologies for the production of green hydrogen at sea. Therefore, the Regulation on the award of other energy production sectors is currently in the process of being revised in order to integrate the possibility of support.

### **Transport**

Under the National Innovation Programme for Hydrogen and Fuel Cell Technology, the BMDV promotes research and development on all transport applications, as well as the procurement of vehicles, necessary refuelling infrastructure and electrolysis facilities to produce hydrogen for use in mobility. The second phase of the NIP (2016 – 2026) is

increasingly focused on scaling up hydrogen and fuel cell technologies, technological optimisation and addressing remaining market gaps. More than EUR 970 million has already been allocated since 2016.

The promotion of public refuelling infrastructure is a priority of the NIP. A separate budget title is available for the deployment of refuelling and recharging infrastructure in the Climate and Transformation Fund (KTF). Almost 90 hydrogen refuelling stations for cars and vans have been deployed in Germany by the end of 2023, including through the promotion of the BMDV through the NIP, one of the most developed networks in Europe; of these, almost 20 can be used for trucks and buses at the same time. The BMDV is now focusing its support on the expansion of the network of refuelling stations for heavy-duty vehicles and buses.

The Hyland – Hydrogen Regions in Germany programme takes a holistic approach to the regionalisation of hydrogen applications in transport in the context of the NIP. For the first use cases, in addition to vehicle applications, the necessary refuelling infrastructure and, where appropriate, hydrogen production will be included. Regions will be supported in a three-step approach in developing integrated regional hydrogen concepts from networking, design and implementation.

With the ‘Guidelines on the promotion of alternative propulsion in rail transport’, the BMDV supports the transition from rail vehicles to alternative powertrains and the deployment of the necessary infrastructure. The funding is designed to be technology-open to provide the appropriate technology option for each context of deployment. The focus is on battery electric and fuel cell-based trains. The Directive thus contributes to closing the missing links in the network without overhead lines and to achieving the climate targets for rail transport.

The BMDV supports the creation of a decentralised innovation and technology centre for hydrogen with the sites Duisburg, Chemnitz, Pfeffenhausen and Northern Germany (North German cluster from Bremen/Bremerhaven, Hamburg and Stade). Initial authorisations will be sought in 2023. The BMDV provides a total start-up financing of up to EUR 290 million for the ITZ. Within the framework of the Important Project of Common European Interest (IPCEI), the BMDV has led transport-related projects, two of them in the Technology Wave (IPCEI Hy2Tech, approved by the European Commission since 07/2022). Four transport-related projects are part of the mobility wave (IPCEI Hy2Move, pre-notified to the Commission since 11/2022), coordinated by the BMDV for the eight EU Member States involved. The aim is to establish a hydrogen market as far as possible across the value chain with cross-border projects between EU partners. This is also instrumental in implementing, inter alia, the National Hydrogen Strategy.

In addition, more support should be given to alternative powertrains on railway lines where this makes economic and environmental sense and where electrification is not economically viable.

**1.1.1.** iv. Where applicable, the assessment of the support for electricity from renewable sources that Member States are to carry out pursuant to Article 6(4) of Directive (EU) 2018/2001

**1.1.2.** v. Specific measures to establish one or more contact points, streamline administrative procedures, provide information and training, and promote the conclusion of PPAs Summary of policies and measures in the framework that Member States are required to implement pursuant to 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

### **Single contact points**

#### *Federal Network Agency*

Includes reporting of power generating modules, network development and the implementation of tenders in the EEG.

#### *Federal Office of Shipping and Hydrography*

Responsible for land planning and preliminary investigations and permits in the field of offshore wind energy.

#### *National Organisation Hydrogen (NOW) GmbH*

Established in 2008 as a programme company of the BMDV, NOW GmbH performs tasks in the area of designing, coordinating and implementing national strategies and public programmes in the technology field on behalf of the Federal Government. This includes in particular electromobility with fuel cells and batteries, including electricity-based fuels, as well as the deployment and market uptake of fuel cell technology in traffic and stationary areas.

In this capacity, NOW GmbH is responsible, inter alia, for the implementation of the National Innovation Programme for Hydrogen and

Fuel Cell Technology (NIP), the E-Mobility Funding Guidelines, the Master Plan charging infrastructure and the technology-open funding programmes for the procurement of buses, commercial vehicles and rail vehicles with alternative powertrains.

#### *Citizens' Dialogue on electricity grid (BDS)*

The BDS serves an open and transparent exchange between all parties involved in the development of the electricity grid in Germany. It provides basic information and answers questions on network deployment.

## **Regulatory framework for the development of renewable energy communities**

Renewable energy communities have great potential for the successful deployment of renewable energy at national and European level. In Germany, the regulatory framework for renewable energy communities includes the following key aspects: Access to renewable energy communities is open to end-consumers on a non-discriminatory basis as access for renewable energy communities to existing support schemes.

In addition, civic energy companies operating onshore wind energy installations with installed capacity up to and including 18 megawatts and/or solar installations in the first segment with installed capacity up to and including 6 megawatts do not need to participate in EEG tenders in order to receive EEG support. The installations also benefit from uniform pricing: The level of remuneration for onshore wind turbines is determined on the basis of the average of the bid values of the highest bid in the previous year. For solar installations, on the other hand, the average of the highest bid values still to be awarded in the previous year of commissioning is used.

### **1.1.3.** iv. Assessment of the necessity to build new infrastructure for district heating and cooling produced from renewable sources

The conversion of heat supply to net-zero greenhouse gas (GHG) energy sources must ultimately be carried out on site, taking into account the local

Realities are implemented. To this end, the Federal Act on Heat Planning and Decarbonisation of Heat Networks (Heat Planning Act) is to introduce heat planning as the central strategic instrument for the heat transition. The aim of the new law is to ensure that heat planning is comprehensively developed by 2028, with the participation of all relevant actors at local level. The heat planning should represent the development of a net-zero greenhouse gas heat supply by 2045 and identify sub-areas suitable for pipeline or decentralised heat supply. The law also sets requirements for the roll-out of renewable energy and unavoidable waste heat in heat networks up to full decarbonisation in 2045.

### **1.1.4.** vii. Where applicable, specific measures on the promotion of the use of energy from biomass, especially for new biomass mobilisation taking into account: Biomass availability, including sustainable biomass: own potential and imports from third countries; other biomass uses by other sectors (agriculture and forest-based sectors); as well as measures for the sustainability of biomass production and use

The Federal Government is currently preparing the National Biomass Strategy (Nabis). The aim is to create the framework conditions for sustainable climate-effective and resource-efficient production and use of biomass in Germany.

## **‘Renewable raw materials’ support programme**

The aim of this programme is to support research, development and demonstration projects on the energy use of renewable raw materials. In addition to research and development projects, the focus is on process and process optimisation with a practical demonstration and pilot

character.

#### **1.1.5. Other elements of the dimension**

1.1.5.1. Any national policies and measures affecting EU ETS sectors and assessment of complementarity with and impact on the EU ETS

##### **National transposition of EU Directive 2003/87 through the Greenhouse Gas Emissions Trading Act (TEHG)**

The reform of the EU ETS at European level is currently being transposed into national law through a legislative amendment to the TEHG.

National policies and measures to achieve the 2050 climate plan targets in the European Emissions Trading Scheme (ETS) sectors effectively reduce CO<sub>2</sub> emissions across the EU if unused emission allowances do not lead to emissions in other Member States (so-called waterbed effect). The extent to which such a waterbed effect exists depends, inter alia, on the impact of the Market Stability Reserve (MSR) in the ETS.

##### **Decommissioning of electricity generation capacity**

In the event of closure of electricity generation capacity due to additional national measures, the second sentence of Article 12(4) of the ETS Directive gives Member States the possibility to cancel allowances from national auction volumes. With the draft Act amending the Greenhouse Gas Emissions Trading Act, the Federal Government proposes that this possibility be transposed into national law in accordance with the requirements of Article 12(4) of the ETS Directive and that the decision on this be left to the Federal Government's discretion. This discretionary decision must also take into account, in particular, the surplus reduction already brought about by the MSR starting in 2019. Cancellation requires a decision by the Federal Government. When the Federal Government decides on the cancellation of allowances, account must be taken of the relevant budgetary framework.

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

##### **Climate neutral federal administration**

The Federal Climate Protection Act (KSG) gives the federal administration a special role model to move towards a net-zero greenhouse gas (GHG)-neutral Germany. In accordance with Section 15(1) of the KSG, it is therefore a stated objective of the Federal Government to organise the federal administration in a climate neutral manner by 2030. The Federal Government has already adopted measures to implement this target in the 2030 Climate Action Programme, the 2023 Climate Action Programme and the Programme for Sustainability – Further Development in 2021. The state of implementation of the measures included in the programme of measures for sustainability is recorded in an annual monitoring report.

In order to achieve climate neutrality by 2030, each authority and body of the federal

administration shall make its own efforts to reduce greenhouse gas emissions. In order to coordinate and support the activities of the federal administration, the Coordination Office for Climate-Neutral Federal Administration (KKB) was set up. The KKB draws up a programme of measures for the federal administration to achieve climate neutrality, which will include requirements for a climate-neutral organisation of the federal administration. In addition, the KKB draws up an initial climate assessment to determine the greenhouse gas emissions of the direct federal administration, with data from 2021, which is then continued annually.

Climate neutrality of the federal administration is to be achieved, in particular, by saving energy, by providing, converting, using and storing energy efficiently, as well as by using renewable energy sources and by choosing the most climate-friendly means of transport. Attention must be paid to the efficient use of natural resources (Section 15(2) of the KSG).

The measures adopted so far in the 2030 climate protection programme and in the programme of measures for sustainability – further development in 2021 concern various areas of action and include, inter alia, the introduction of environmental management systems in the federal administration, compliance with the applicable legal energy requirements for new construction and renovation projects of federal buildings (see Cabinet decision of 25 August 2021 on energy efficiency definitions for federal buildings, ‘Promote function of Federal buildings for energy efficiency’), electrification of federal vehicle fleets, reduction of emissions from missions, etc.

### **Digital ecosystems for a climate-friendly industry**

The digitalisation of supply chains across sectors and the development of digital ecosystems enables novel industry 4.0 applications and business models. These multilateral and trusted data ecosystems aim to enable scalable, automated and widespread application of data-based solutions, including across companies, to boost energy and resource savings potentials. The aim of the programme is, inter alia, to enable companies to transparently map and manage carbon footprints along entire supply chains through appropriate data-based solutions and to support a closed and circular economy.

### **National Hydrogen Strategy (NWS)**

Accelerating the uptake of hydrogen: The market uptake of hydrogen, its derivatives and hydrogen application technologies is significantly accelerated and the level of ambition is massively increased along the entire value chain.

Ensuring sufficient availability of hydrogen and its derivatives: The target for domestic electrolysis capacity in 2030 will be increased from 5 GW to at least 10 GW. The remaining needs are covered by imports. A separate import strategy for hydrogen and its derivatives will be developed.

Building a powerful hydrogen infrastructure: The creation of the necessary hydrogen infrastructure is of particular importance. To this end, the Federal Cabinet decided at the end of May, with the current amendment to the Energy Industry Act (EnWG), the legal and regulatory framework for the future core hydrogen network for Germany as the first stage of

the development of hydrogen infrastructure. By 2027/2028, IPCEI support will construct a hydrogen start-up network with more than 1 800 km of newly built hydrogen pipelines in Germany; around 4.500 km are added across Europe (European Hydrogen Backbone). Extension will connect all major production, import and storage centres to relevant customers by 2030.

Establishment of hydrogen applications in the sectors: By 2030, hydrogen and its derivatives will in particular:

Applications in industry, heavy-duty vehicles and increasingly used in aviation and waterborne transport. In the electricity sector, hydrogen contributes to energy security; by gas-fired power plants (H<sub>2</sub>-ready) that can be converted to greenhouse gas-neutral gases and by electrolyzers that are useful to the system, in particular as variable and system-relevant stabilisers or flexible loads. The framework conditions are currently being developed in the JIT, heat planning and the European gas market package for the future use of hydrogen in centralised and decentralised heat supply.

Germany will become a lead supplier of hydrogen technologies by 2030: German suppliers are increasing their technology leadership and offer the whole value chain of hydrogen technologies, from production (e.g. electrolyzers) to different applications (e.g. fuel cell technology).

Creating the right framework conditions: Coherent legal frameworks at national, European and, as far as possible, international level support market uptake. This includes, in particular, efficient planning and authorisation procedures, uniform standards and certification schemes, sufficiently resourced and coordinated management at all levels.

Import strategy: In addition, since the beginning of the legislature, the Federal Government has been working hard to secure the availability of hydrogen alongside the ramp-up of domestic production through imports from partner countries. To this end, a parallel import strategy for hydrogen and its derivatives is being developed. It shall also take into account sustainability criteria in line with the global Sustainable Development Goals. The import strategy will send a signal to partner countries that Germany will cooperate globally, enable reliable supply chains to Germany, establish environmental standards and be available as a technology partner. This spring, the Federal Government already agreed with Norway on the long-term supply of hydrogen.

### **Sector coupling**

Direct use of renewable electricity can unlock efficiency potentials and reduce the use of fossil fuels. Also in those applications where other GHG reduction options are difficult to implement through direct use of electricity (e.g. in aviation and maritime transport or some industrial processes), electricity-based technologies, based on renewable energy, are also an important option to achieve energy and climate objectives. Sector coupling is the subject of a wide range of support measures, projects and programmes. The detailed descriptions of the measures can be found in the relevant chapters, see heat network systems in chapter 3.1.2.v., low-emission

mobility in chapter 3.1.3.iii., Federal support for efficient buildings in chapter 3.2.iii., market integration in chapter 3.4.3.i., regulatory sandboxes and SINTEG in chapter 3.5.1.

3.1.3.1 v. low-emission mobility policies and measures (including electrification of transport)

The Federal Government wants to make mobility as safe, affordable and climate-friendly as possible. The main pillars for low-emission mobility to meet the climate targets in transport are the deployment of electric vehicles based on renewable electricity and the use of zero- and zero-carbon fuels.

### **Bring low-carbon cars to the road**

At least 15 million fully electric cars are expected to be registered in Germany by 2030. In addition to fleet regulation, additional measures are needed to significantly increase the share of alternative powered vehicles in the sale of new vehicles and to significantly reduce CO<sub>2</sub> emissions from passenger cars. These measures should significantly reduce the additional costs of electric cars compared to cars with a pure combustion engine and should take into account the attractiveness of refuelling and charging infrastructure from the customer's point of view. At the same time, they stimulate supply and demand for alternative powertrains. The Law on tax incentives for electromobility extended until 2030, inter alia, the official car regime for the use of a battery electric vehicle or a plug-in hybrid vehicle. In addition, the private use of pure electric vehicles up to the gross list price of EUR 60,000 is not valued at half the tax base, but at a quarter of the tax base. In addition, the tax exemption provided for in Paragraph 3d of the Law on Motor Vehicle Tax became applicable until 31. December 2025. The duration of the exemption, which is limited to 10 years, shall not exceed 31 years. December 2030. In a further step, a purchase premium, shared by the Federal Government and manufacturers, was granted for the purchase and leasing of electric vehicles. Since the beginning of 2023, the purchase premium has been paid only to vehicles that have a proven positive climate change effect, i.e. minimise CO<sub>2</sub> emissions on-farm. The Federal Government has also made the motor vehicle tax more in line with CO<sub>2</sub> emissions. For new registrations as of 1 January 2021, the tax base is mainly based on the CO<sub>2</sub> test values per km and increased above 95 g CO<sub>2</sub>/km in steps. The Federal Government has also advocated at European level that from 2035 burners can be authorised, which can only be refuelled with e-fuels. It is being organised at European level. In addition, the 10th Federal Immission Control Regulation (10th BImSchV) in such a way that paraffinic diesel fuels in pure form (including E-diesel and HVO100) can also be refueled in the future.

### **Upgrade refuelling and recharging infrastructure (PKW field)**

The development of a comprehensive, responsive and user-friendly charging infrastructure is a prerequisite for the acceptance and growth of e-mobility. The Federal Government aims to further develop publicly accessible recharging infrastructure and to have a total of 1 million publicly accessible recharging points available in Germany by 2030.

Following the adoption in 2019 of the first master plan for charging infrastructure in the



cabinet, the Federal Government's Master Plan for charging infrastructure II was followed on 19 October 2022. As an overall strategy, it sets out the objectives and measures of the entire Federal Government for the further development of charging infrastructure. The measures focus on the availability of space, the empowerment of municipal actors and the integration of charging infrastructure and electricity grid development. For a coordinated roll-out of the public charging infrastructure at the different levels (federal/Länder/municipalities), the 'National Coordination Point for charging infrastructure' was set up in 2019.

Through the calls for tender for the German network, the Federal Government is responsible for the construction of fast charging infrastructure at around 1000 new sites throughout Germany. Some EUR 1.9 billion of financing is planned for this purpose. The BMDV awards the 'regionalless' for 900 sites in rural and urban areas. Autobahn GmbH is awarding the 'motorwayless' for 200 sites at unmanaged rest areas along the motorways. The BMDV successfully completed the tender for the German network (regionalless) and awarded the contracts to 10 companies in September 2023; these will create and operate a total of around 8000 new ultra-fast recharging points for electric cars.

As a further measure, in March 2023 the Federal Government included a service station supply requirement in the 'Modernisation package for climate protection and planning acceleration'. The aim is to equip a significant share of public refuelling stations with fast charging infrastructure in order to accelerate the widespread roll-out of recharging infrastructure and increase trust in e-mobility. The statutory transposition is carried out by the BMDV.

Support is a central pillar in supporting the deployment of recharging infrastructure. The funding guidelines 'Solar electricity for electric vehicles' were published in the Federal Gazette on 4 September 2023. The subject of the support is a package for self-consumption of electricity consisting of charging station, photovoltaic system and storage. Within a day following the launch of the application portal, KfW was able to issue around 33.000 funding commitments, thus absorbing EUR 300 million. A further EUR 200 million is foreseen for 2024.

Under the funding guidelines 'Recharging infrastructure for electric vehicles – businesses and municipalities', published on 17 November 2021, recharging points with a power output of up to 22 kilowatts were supported. It is no longer possible to submit an application. Over the past year, the BMDV approved the funding of around 255.000 new recharging points for businesses and municipalities. A total of EUR 229 million was earmarked for this purpose.

The 'funding programme for charging infrastructure in residential buildings' started on 24 November 2020. Support was provided for the purchase and installation of 11 kW charging equipment. With a total funding of EUR 800 million, approximately one million recharging points were applied for until the funds were used up; of these, around 700.000 new recharging points have been installed in residential buildings.

On 18 September 2023, on the basis of the E-Mobility Funding Guidelines, a funding call for the construction of fast commercial charging infrastructure for cars and trucks was published for up to EUR 400 million. The target group is companies, commercial fleet operators and

employers with employment places.

The funding guideline ‘Publicly accessible charging infrastructure for electric vehicles’, with a planned volume of EUR 500 million, was published on 21 July 2021. All calls are closed. According to the current situation, some EUR 160 million have been committed for some 14.000 recharging points. Some EUR 51 million could be committed for the modernisation of charging infrastructure.

Under the funding programme ‘Recharging infrastructure on the ground’ of 24 March 2021, EUR 300 million was made available to support publicly accessible recharging infrastructure for SMEs and local authorities. The authorisation procedure has been completed. According to the current state of play, some EUR 174 million have been committed for some 17.000 recharging points.

The promotion of public refuelling infrastructure is a priority of the NIP. As of the end of 2023, almost 90 hydrogen refuelling stations for cars and vans have been built in Germany, including through the promotion of the BMDV through the NIP, one of the most developed networks across Europe. Their pressure level corresponds to 700 bar of the EU Regulation on the deployment of alternative fuels infrastructure (AFIR), of which almost 20 can be used for trucks and buses at the same time, with an additional 350 bar. The BMDV is now focusing its support on the expansion of the network of refuelling stations for heavy-duty vehicles and buses.

### **Bring low-carbon trucks onto the road (use vehicle field)**

The Federal Government will support the purchase of trucks with alternative, climate-friendly propulsion systems, including hydrogen technologies, and will support the development of refuelling and recharging infrastructure adapted to the needs. The objective is that by 2030 around one third of the mileage of heavy road freight transport will be electric or carbon-free or carbon neutral fuels. In addition, CO<sub>2</sub> differentiation of the HGV toll is being promoted in favour of less polluting and free vehicles. The Federal Government will introduce an effective CO<sub>2</sub> surcharge on the lorry toll from the end of 2023, taking advantage of the legal space available. The European legal framework for such a CO<sub>2</sub> bonus and differentiation was established by the amendment to the Eurovignette Directive. Zero-emission vehicles shall only be allowed until 31. Are exempted from the obligation to pay a toll on December 2025. They will then only have to pay a 75 % reduction for infrastructure costs, as well as the external cost sub-rate for air and noise pollution. The adoption of the revised Directive requires subsequent transposition into German law. A strong regulatory instrument has already been adopted at European level with the regulation of CO<sub>2</sub> fleets for commercial vehicles. It ensures a 30 % reduction in fleet and European-wide CO<sub>2</sub> emissions by 2030 (for heavy-duty vehicles) and 31 % for light-duty vehicles. However, in order to achieve the GHG reduction targets for the transport sector as a whole, a higher reduction is needed for commercial vehicles. Further measures should therefore be added to the regulation of the fleet. These accompanying measures are based, first, on the additional costs of alternative powered commercial vehicles:

The development of commercial hydrogen fuelcell commercial vehicles will be developed, for example, in the framework of the National Innovation Programme. Hydrogen and Continue to promote fuel cell technology (NIP) for all segments so that vehicles with this technology will be offered by the mid-2020s at the latest. HGVs using methane gas (CNG, LNG) also play an important role in climate-friendly freight transport, especially when regenerative biomethane and electricity-based methane are used instead of fossil natural gas.

### **Upgrade refuelling and charging and overhead contact line infrastructure (use vehicle field)**

The deployment of refuelling, charging and overhead contact line infrastructure for alternative powertrains shall be based on the intended traffic or logistical applications. A systemic approach from the use of renewable energy to customer aspects for zero-emission logistics needs to be taken into account. The Federal Government shall draw up concepts for: Charging options for battery trucks, overhead contact lines for trucks and hydrogen refuelling points. In accordance with the National Hydrogen Strategy, updated in 2023, a master plan for hydrogen and fuel cell technology in transport will also be drawn up in order to target the scaling up of the required infrastructure. In order to implement the EU Regulation on the deployment of alternative fuels infrastructure (AFIR), the National Strategic Framework should also outline the indicative deployment targets for 2027 and the achievement of the EU targets by 2030. The Master Plan for charging infrastructure II has already been adopted by the federal government, see. P. 119.

### **Increase in the proportion of electric motor vehicles in accordance with Section 2 of the Electromobility Act (EmoG) and biogas-fuelled motor vehicles in the Federal Administration's fleet**

Target agreement: Increase the share of motor vehicles with alternative and environmentally friendly propulsion technologies in new and replacement procurement to as far as possible 40 % by 2025 and 100 % by 2030. This includes battery electric vehicles, fuel cell vehicles, externally chargeable hybrid electric vehicles that meet the minimum criteria laid down in Section 3 EmoG, and vehicles which can be shown to be running 100 % on biogas. In 2030, the share of plug-in hybrids in federal vehicle fleets should not exceed 50 %. Special vehicles and heavy-duty vehicles are excluded from this quota, but if technically feasible, they are also gradually replaced by electric cars within the meaning of § 2 EmoG or by other motor vehicles with alternative and environmentally friendly propulsion technologies which are at least equivalent, taking into account the needs of the service. Vehicles used for national and alliance defence and corresponding international obligations of the Federal Republic of Germany are not taken into account because of their specification and their specific capability requirements.

### **Support for climate-friendly retrofitting of ground-based electricity installations at airports**

Aircraft also need electricity on the ground, while they are maintained, loaded and refuelled.

This electricity often comes from auxiliary turbines in the aircraft or is produced in remote parking spaces with diesel generating sets. Direct electricity, batteries or hydrogen can be supplied to aircraft more efficient, zero-emission and significantly quieter than in the past. At EU level, the Alternative Fuel Infrastructure Regulation (AFIR) published in the Official Journal of the European Union on 22 September 2023 requires Member States to ensure that at all TEN-T core and TEN-T comprehensive network airports the power supply to stationary aircraft at all aircraft pre-field positions used for commercial air transport to embark or disembark passengers or to load or unload goods by 31.12.2029. In order to support airports in this task, the Federal Government has put in place a support programme to provide investment grants until the end of 2026 for the procurement of mobile and stationary, environmentally friendly ground-based electricity installations for the supply of aircraft, as well as the recharging and refuelling infrastructure needed for operation.

### **Enable transport to be automated, connected, liquefied, innovative forms of mobility**

Digitalisation can significantly improve existing traffic routines such as traffic flow and parking management through automation, connectivity and artificial intelligence. Digitalisation can also create new opportunities: for example, digital services with user-friendly, app-based operating concepts enable simplified sharing offers for both cars and bicycles, electric scooters and e-scooters, and allow for the integration of LPT services. In addition, digital connectivity allows pooling of journeys and the choice of a vehicle size suitable for an individual journey. The Federal Government will continue and intensify the practical testing of automation, networking and the use of artificial intelligence for mobility in digital test fields and demonstration projects, and will support the transition to normal operation. Experimentation clauses will also improve the conditions for doing so. The aim of the Federal Government's Gigabit Strategy is to provide a comprehensive energy- and resource-efficient supply of fibre connections to the home and the latest mobile communications standard, wherever people live, work and travel – including in rural areas. In view of emerging application scenarios for digital mobility, computing infrastructure is also increasingly considered an integral part of digital networks for the gigabit society. In addition, digital working models (e.g. increased use of home office and videoconferencing) help to avoid travelling.

### **Tax support for electromobility (Act on further tax incentives for electro-mobility and amending further tax rules)**

*Company car taxation – Extension of the current special scheme for electric vehicles:*

If an official car is also used for private purposes, this advantage is in principle taxed at 1 % of the domestic list price (the so-called list price method). In 2018, this tax base was halved for electric and off-vehicle charging hybrid electric vehicles. In order to create a long-term, legally certain planning framework for the market take-up of electromobility, this special scheme was introduced until 31. December 2030 is extended (Section 6(1)(4) second sentence, points 3 and 4, and 3rd and 4th sentence, EStG). In order to ensure that the Federal Government's environmental objectives are properly taken into account with a longer-term effect, the technical requirements of the special scheme have been increased in two stages: From 1

January 2022 to 31. A minimum range of 60 km applies (using the electric propulsion engine only) on December 2024. From 1 January 2025 to 31. A minimum range of 80 km applies (using the electric propulsion engine only) on December 2030. The maximum CO<sub>2</sub> emissions of 50 g/km remain unchanged for the whole period. For the use of vehicles which have zero CO<sub>2</sub> emissions/km and whose gross list price does not exceed EUR 60,000, only one quarter of the tax base is taken into account.

*Special depreciation for electric vehicles and electric cargo bikes:*

Subject to positive approval under State aid law by the European Commission, special depreciation of 50 % of the purchase costs may be used for the purchase of new, purely electric commercial vehicles (vehicle categories N) and for the purchase of new electric cargo bikes in the period from 2020 to the end of 2030, in the year of acquisition, in addition to the regular linear deduction for wear and tear. In order to benefit from a special depreciation, it is necessary that the electric vehicle or the e-bike is used to generate income and form part of the taxpayer's fixed assets.

*Business tax relief for the rental and leasing of electric vehicles:*

Pursuant to the first sentence of Paragraph 8(1)(d) of the GewStG, rental and leasing expenses for movable assets of the undertaking are to be added to the profit from the business for the purposes of trade tax. As a result, the addition is 5 % of the expenditure (1/4 out of 1/5). By way of derogation, rental and leasing expenses for electric vehicles and off-vehicle charging hybrid electric vehicles meeting certain pollutant emission or range criteria and for hired bicycles other than motor vehicles shall only be added to 2.5 % (1/4 of 1/10), provided that they are based on contracts concluded after the 31st. Were concluded on December 2019 (second sentence of Section 8(1)(d) of the GewStG). The measure is limited to 2030.

*Extension of the tax exemption for charging current and the flat-rate taxation for the transfer of ownership of a charging device:*

Advantages granted by the employer for the electric charging of an electric vehicle or hybrid electric vehicle in the employer's operation or an associated undertaking and for the commercial charging device temporarily provided for private use are exempt from tax under Paragraph 3(46) of the EStG. The exemption was valid until the 31st year. December 2020 for a limited period. The employer also has the option of levying wage tax on the above-mentioned benefits at a flat rate of 25 % (Section 40(2), first sentence, point 6, EStG). Flat-rate taxation was also applicable until 31. December 2020 for a limited period. In order to further promote electro-mobility, both measures were implemented by 31. December 2030.

*Tax-exempt job ticket and introduction of a flat-rate tax scheme for job tickets:*

Under Paragraph 3(15) of the EStG, in addition to the remuneration already due, the employer's benefits are exempt from tax from 2019 onwards in respect of the employee's expenditure on public transport journeys between home and first place of work (e.g. job ticket). The services received free of tax are to be set off against the distance-based flat rate; the

deduction of occupational costs will be reduced accordingly. The scheme applies indefinitely. The introduction of a new flat-rate tax option of 25 %, while at the same time waiving the reduction of the employee's flat-rate distance allowance, which can be deducted as an occupational cost, is intended to increase the acceptance of 'job tickets' for employees who are unable to use public transport or can only use public transport to a very limited extent (second to fourth sentences of Paragraph 40(2) of the EStG). It also applies to the remuneration referred to in Paragraph 3(15) of the EStG which is not paid in addition to the salary already due (but by means of salary conversion) and therefore does not fulfil the conditions for exemption from tax. The scheme applies indefinitely.

*Extension of the tax exemption for the supply of an industrial bicycle or electric bicycle to the employee:*

If the employer provides the employee with a service bicycle free of charge or at a reduced cost, the pecuniary advantage resulting from private use will be exempt from tax from 2019 (Section 3(37) EStG). The condition is that the supply of bicycles is additional to the remuneration already due. This is intended to reward the fact that the employer provides a genuine additional service and does not reduce the employee's gross salary in return. The tax-exempt monetary advantage shall not be set off against the distance-based flat rate; the deduction of professional expenses remains. To date, up to 31 December 2021, the duration of the measure is set to expire on 31 December 2021. December 2030.

*Extension of the exemption for the private use of a business bicycle or electric bicycle:*

If the holder uses a business bicycle for private purposes, this is not taken into account when calculating profits (Section 6(1)(4) sentence 6 EStG). The advantage does not need to be taxed. To date, up to 31 December 2021 was limited in time until 31 December 2021. December 2030.

### **Industrial manufacturing for mobile and stationary energy storage (“battery cell”)**

The need for mobile and stationary energy storage is growing at a rapid pace internationally. The Federal Government's aim is to unlock the great added value potential of this key technology also in Germany and Europe. To this end, since 2020, the BMWK has been supporting the development of efficient battery cell manufacturing in Germany through two IPCEIs (Important Projects of Common European Interest). For these two IPCEIs, around EUR 1.5 billion will be made available by 2030 under KTF Title 893 04 'Industrial manufacturing for mobile and stationary energy storage' by 2030.

### **Specific measures to reduce emissions from urban road transport**

At the second municipal summit on 28 November 2017, the Federal Government put in place a package of measures to improve air quality in cities, with the 'Emergency Clean Air Programme'. The emergency programme is worth EUR 1 billion. The programme covers measures for the electrification of urban transport and the deployment of charging infrastructure, measures for the digitalisation of transport systems and measures to retrofit

diesel buses in LPT with exhaust after-treatment systems. At the 3<sup>rd</sup> Local Summit, 3<sup>rd</sup> Further funding for the emergency programme was decided by the Federal Government on December 2018. This means that a total of up to EUR 1.5 billion is available for affected municipalities. In addition, a further EUR 432 million was approved for the funding guidelines for the retrofitting of light and heavy craft and delivery vehicles and for the retrofitting of heavy municipal vehicles.

### **National policy framework for the deployment of alternative fuels infrastructure (NSR)**

The policy framework includes charging infrastructure for electric vehicles, natural gas supply infrastructure (compressed and liquefied natural gas) and hydrogen supply infrastructure for fuel cell vehicles. In transposing Directive 2014/94/EU, the NSR sets targets for publicly accessible refuelling and recharging infrastructure and puts them under appropriate measures.

### **National Innovation Programme Hydrogen and Fuel Cell Technology (NIP 2)**

Under the National Innovation Programme for Hydrogen and Fuel Cell Technology, the BMDV promotes research and development on all transport applications, as well as the procurement of vehicles, necessary refuelling infrastructure; and

Electrolysis installations for the production of hydrogen for use in mobility. The second phase of the NIP (2016 – 2026) is increasingly focused on scaling up hydrogen and fuel cell technologies, technological optimisation and addressing remaining market gaps. More than EUR 970 million has already been allocated since 2016.

The Hyland – Hydrogen Regions in Germany programme takes a holistic approach to the regionalisation of hydrogen applications in transport in the context of the NIP. For the first use cases, in addition to vehicle applications, the necessary refuelling infrastructure and, where appropriate, hydrogen production will be included. Regions will be supported in a three-step approach in developing integrated regional hydrogen concepts from networking, design and implementation.

### **Promoting alternative propulsion in rail transport**

With the ‘Guidelines on the promotion of alternative propulsion in rail transport’, the BMDV supports the transition from rail vehicles to alternative powertrains and the deployment of the necessary infrastructure. The funding is designed to be technology-open to provide the appropriate technology option for each context of deployment. The focus is on battery electric and fuel cell-based trains. The Directive thus contributes to closing the missing links in the network without overhead lines and to achieving the climate targets for rail transport.

### **Promotion of alternative powertrains in the public sector Public transport**

The Federal Government – within the framework of the corresponding funding guidelines of the BMWK (formerly BMU) and the BMDV – is funding numerous projects for the

technological development and/or procurement of electric, hybrid and biogas-fuelled buses. Since 2021, the BMDV has promoted the market take-up of alternative bus powertrains through a stand-alone, technology-open directive.

### **Further development of the Mobility and Fuel Strategy (FMS) 2013**

The FMD adopted by the Federal Cabinet in June 2013 contributes to the energy transition in transport. It gives an overview of technologies and energy and fuel options in the different transport modes. Alternative powertrains and the use of renewable liquid and gaseous fuels to decarbonise transport play a key role.

### **Development of electricity-based fuels**

Fuel cell will also play a major role in the mobility of the future, especially for trucks and other heavy vehicles. In the longer term, Power-to-X (PtX) fuels will also play an increasing role. The Federal Government will create framework conditions for the development and large-volume scaling of electrolysis and refinery processes for the production of electricity-based greenhouse gas-neutral gases and fuels. This allows the use of climate-friendly base and fuels, in particular in industry, chemistry, air, heavy load and waterborne transport. In the medium and long term, hydrogen-based fuel cell technology can also be widely used in the mobility sector, especially in trucks and other heavy vehicles. It also launches an industrial policy initiative of the European Union to build an efficient supply of e-fuels. In view of the medium-term sub-quotas for renewable fuels of non-biological origin for aviation and waterborne transport, it is necessary to examine the need to accompany these efforts in implementing RED II for transport.

### **Support for advanced biofuels**

The use of biofuels in the fuel mix reduces the fossil content of the fuel and thus the level of CO<sub>2</sub> pricing of the fuel. The development of liquid and gaseous regenerative fuels from biomass and their large-scale production in biogas and synthesis plants will be supported in order to be able to use them in certain segments of the transport sector in the medium and long term. There is no additional support for first generation food and feed crop-based biofuels. In future, bioenergy production will be based more on waste and residues. It is therefore important to actually cover all waste and residues. Growing areas for bioenergy are not to be expected and cannot be considered due to area restrictions. The sustainability criteria of RED II also apply to imports (from the internal market and from third countries). As part of the national implementation of REDII, a sub-quota for duplicative biofuels, taking into account environmental, economic and technical feasibility, will be introduced. Advanced biofuels are already on the market and already contribute to GHG reduction in the transport sector. Existing research and development gaps in innovative continuing biofuels (e.g. straw fuels) will be filled by projects and demonstration projects in order to achieve large-scale production in the medium term.

### **Promoting natural gas mobility**



With the tax support for natural gas as a fuel until 2026, as well as the temporary exemption from tolls, the Federal Government demonstrates its interest in developing natural gas mobility. This can make an important contribution to CO<sub>2</sub> savings through the use of biomethane gas and in future <sup>regenerative</sup>synthetic methane.

### **Strengthening rail passenger transport**

This package of measures focuses on the reduction of CO<sub>2</sub> through the modal shift from transport to rail, which should be significantly strengthened to this end. In addition, the electrification of other rail lines and the use of alternative powertrains (hydrogen, battery) can further drive decarbonisation.

The Federal Government and Deutsche Bahn will invest around EUR 86 billion by 2030 to renew the rail network. This will further increase the performance of rail infrastructure. The introduction of digital control and backup technology on key axes and the digitalisation of interlocking will also significantly increase capacity. Congestion corridors on the rail network are being developed in a targeted manner. These measures form the basis for the gradual implementation of the German act. It also aims to expand and compact the electrified network. Regionalisation funds will be steadily increased over the next few years, which will also serve to strengthen local public transport.

The development and deployment of further technologies for digitalised rail operations will also lead to significant efficiency gains in the rail system. Similarly, capacity increases in existing infrastructure can be achieved by running trains at a lower distance without losing safety. Despite the increase in traffic on rail, this reduces the need for new and upgrades.

This additional capacity increase places high demands on planning and construction capacity, also in view of the need for replacement investment measures. The financing will be carried out through the Service and Financing Agreement, which is to apply from 2020 for a period of 10 years. Ways of increasing planning and investment certainty will also be explored through capacity building and deployment of digital command and security technologies and the digitalisation of interlocking. The Federal Government will provide additional federal funding of EUR 11 billion between 2020 and 2030 to strengthen rail, of which EUR 5.5 billion as additional equity for DB AG. This will enable society to invest additional capital in modernising, expanding and electrifying the rail network and the railway system.

Before the coronavirus pandemic, flights were sometimes cheaper than rail travel to the same destination. From the point of view of climate change, this is a wrong incentive effect. Therefore, on 1 January 2020, the turnover tax on long-distance rail tickets was reduced from 19 % to the reduced VAT rate of 7 %. In return, the air transport tax was increased as of 1 April 2020.

### **Attractiveness of LPT Increasing**

The purpose of this package of measures is to strengthen local public transport. Responsibility for this lies with the Länder and municipalities. Public passenger transport, in particular in the

rail sector, is associated with significantly lower GHG emissions per passenger kilometre than individual motorised transport (MIV) due to the high level of electrification and energy efficiency of electric systems. The focus of this area of action is therefore the reduction of CO<sub>2</sub> through the modal shift from MIV to LPT and the transformation of LPT into alternative powertrains. The use of these powertrains in buses and local passenger transport has a direct climate effect compared to conventional technologies and also contributes to the reduction of air pollutants and noise. In addition, decarbonisation in public passenger transport, for example through the use of alternative powertrains) in buses and local passenger transport, can also be further promoted.

A variety of measures are needed to increase the attractiveness of local public transport: network expansion and expansion of S, U and trams, improving the quality of supply, improving reliability, establishing more frequent connections, and increasing comfort and safety. Last but not least, a consistent digitalisation of local public transport is necessary.

In recent years, the Federal Government has increased regionalisation funds on several occasions in order to implement the Federal Government's climate change package and to help the sector cope with the financial disadvantages caused by the coronavirus outbreak. In 2023, 'regular' regionalisation funds already amount to EUR 10.9 billion. In addition, EUR 1.5 billion will be added to the German ticket launched on 1 May 2023.

By increasing federal funding under the GVFG for the expansion of public transport to EUR 1 billion annually from 2021 onwards, the Federal Government has created the conditions for improving the attractiveness of local public transport. This will make it possible to develop the local rail network. The modalities of the GVFG are to be further aligned with the climate-friendliness objectives of LPT. In order to ensure that additional expansion measures can be planned in concrete terms in the coming years, the Federal Government has increased the budget to EUR 2 billion per year from 2025 onwards.

The modernisation and electrification of bus fleets will be further enhanced by increasing support for buses with electric and hydrogen-based drives, as well as buses powered by biogas. Up to 50 % of urban buses should be electric by 2030. This requires tailor-made support and support. The Federal Government also supports local transport through the 'Model projects to strengthen local public transport' funding programme, which was launched at the beginning of 2021. Currently, 19 pilot projects are supported from two funding calls for a total of around EUR 320 million.

### **Extension of cycle paths and bicycle parking facilities; and Improving framework conditions**

The Federal Government will make cycling more attractive by further improving road transport conditions and road safety. The National Radical Traffic Plan 3.0 (NRVP 3.0) – the Cycling Strategy for Germany until 2030 – also made cycling strategic in the context of climate change. Objective: More, better and safer cycling in cities and rural areas in Germany (including doubling cycling kilometres by 2030). In various programmes, the Federal Government provides comprehensive funding for investment and non-investment promotion and financing of cycling under the responsibility of the Länder and municipalities, including programmes to

support:

- everyday cycle infrastructure (special urban and rural programme)
- long-distance cycle routes for tourism (Germany's wheel network)
- of lighthouse projects (pilot investment projects)
- bicycle parks at railway stations
- research, compacts and communication (non-investment model projects implementing the NRVP)
- on equipping heavy-duty vehicles with turning assistance systems
- upgrading structures at junctions between railway lines and roads in favour of cycling (support under railway crossing law) and
- for the extension of operational routes on the federal waterways suitable for cycling.

The development of cycle paths along federal roads is also continuing. Particular attention will be paid to filling gaps in the cycling network. To this end, the Federal Government has consolidated the funds for the construction and maintenance of cycle paths on federal roads. By awarding grants for high-speed cycle paths, the Federal Government supports the Länder, municipalities and associations of municipalities in developing a sustainable transport system designed for high-speed cycling and usable at low loss times. The aim is to promote the transition to bicycles.

The existing shortage of skilled workers in local communities is reflected in a training campaign, the 'Inviting participants' course.

Cycling networks' and other training and networking events for civil engineers, transport and urban planners at the Federal Mobility Forum. The seven Foundation professors of cycling are also an important pillar to ensure sustainable training and research on sustainable mobility.

Cycling has also been improved by creating a more bicycle-friendly environment. The coalition agreement provides for road transport legislation to be adapted so that, in addition to the fluidity and safety of transport, the objectives of climate and environmental protection, health and urban development are taken into account in order to allow countries and municipalities to take decisions. A draft of 10 Act amending the StVG, adopted by the Federal Cabinet, which serves to implement the coalition agreement, is being discussed by the Bundesrat and the German authorities. Bundestages.

A draft amendment to the Road Traffic Regulation, which includes, inter alia, extended instructions from the road transport authorities to provide adequate space for running and dormant cycle traffic, was agreed between the departments. A referral from the Bundesrat will be sought in 2023.

### **Strengthening rail freight transport**

Rail freight will also benefit significantly from the modernisation and capacity improvement on the rail network. This will make freight transport by rail faster and more attractive. The strengthening of combined transport will bring more goods to rail. In order to increase the

transfer of goods to rail, single wagon transport as an alternative to the lorry is encouraged by reducing plant prices. Today, the current standard European train length of 740 metres for freight trains is not reached on many lines in Germany. By expanding the 740 meter network for freight trains, the Federal Government intends to change this in order to improve capacity, quality and costs. In addition, there is a modern control and security technique. In combined transport, the package of measures aims to increase efficiency and reduce costs (e.g. by reducing process and waiting times, optimising the use of resources in the terminal and in the run-up to and after), by digitising information processes and processing information by:

Transshipment facilities are digitally controlled. In addition, the electrified freight network should be expanded and compacted. The extension programme 'Electrical freight rail' promotes the further electrification of rail freight lines. It also promotes 'alternative propulsion techniques' for rail vehicles used in freight transport. Rail's attractiveness for freight transport is to be increased through the implementation of the Federal Programme for the Future of Rail Freight Transport, which aims to make rail freight more modern, efficient and user-friendly. In addition, provided that a positive evaluation is carried out in 2021, an increase in attractiveness is to be achieved by continuing to promote track access charges in 2023. In addition, in particular to strengthen single wagon traffic, there is support to reduce the price of equipment. The package of measures thus incorporates key interim results from the 'Future Rail Alliance' (May 2019) with a focus on climate protection.

### **Modernisation of inland waterway transport and use of shore-side electricity in ports**

The aim is to increase the share of inland waterway transport in freight transport through the implementation of climate change mitigation measures from the IWT Master Plan (May 2019). The support programme for the modernisation of inland waterway vessels will be further developed. Infrastructure improvements to bottlenecks (measures for urgent needs-relief measures (VB-E)) are to be implemented more quickly and a supreme law will be launched to identify the projects for subsequent action laws. In addition, the abolition of shipping duties, which has already been decided and has been in force since 1 January 2019, is to remain in place. In order to enable them to switch to electricity and low-emission and low-emission fuels, levies on shore-side electricity in maritime ports will be reduced and low-emission fuels will be temporarily promoted. Regulatory law will also have to apply on a permanent basis. The FuelEU Maritime Regulation introduced an obligation for shore-side electricity for passenger and container ships.

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

### **Phasing out fossil subsidies in G20/G7**

The G20 agreed in 2009 to eliminate inefficient fossil fuel subsidies in the medium term. The G7 has set itself the goal of eliminating inefficient fossil subsidies by 2025. Germany will carry out a more intensive and regular assessment of subsidies in view of their climate impact (e.g. in the context of spending reviews) and further develop reporting on climate-damaging subsidies.

## **Federal Government Subsidies Report**

As part of the Federal Government's subsidy reporting, a regular sustainability assessment of all subsidies is carried out every two years. It examines the long-term economic, environmental and social effects of the subsidy in question, for example in terms of economic prosperity and future-preparedness, climate protection and resource protection or safeguarding employment, and the results are documented in the subsidy report. The current 29th Subsidy report for the years 2021 to 2024 was adopted by the Federal Government on 30 August 2023.

Measures for the rational use of energy and the use of renewable energy are set out in detail in Chapter 5.2.2.

### **Comprehensive evaluation of tax benefits**

In accordance with the subsidy policy guidelines, all subsidies taken into account in the subsidy report must in principle be evaluated on a regular basis in terms of the extent to which the objectives have been achieved, as well as their efficiency and transparency. Most recently, the Federal Government has carried out a systematic evaluation of a total of 33 tax advantages listed in the subsidy report in the context of a research report, in particular with regard to the achievement of objectives, efficiency, instrumental suitability and, for the first time, their sustainability. The research project thus makes an effective contribution to evidence-based financial and tax policies. A key focus on evaluation was also in the area of energy and electricity taxation. The results of the evaluation reflect the opinion of the independent evaluators and were published on 30 October 2019. In summary, the experts point out in their recommendations that there are often divergent arguments in favour of and against changes in tax benefits and it is up to the legislator to weigh up the advantages and disadvantages of possible reforms. In this sense, the Federal Government will examine the results of the report with regard to the need for action or optimisation of the individual measures.

### **Phasing out of coal subsidies**

The main measure in Germany to reduce subsidies for fossil fuels was the phasing out of subsidies for coal production. The German hard coal industry was not competitive, in particular because of its geologically high production costs. In order to enable the coal industry to be phased out in a socially responsible manner, Germany granted subsidies for the sale of domestically produced coal to cover the necessary closure measures and bridging aid for outgoing workers. The subsidies for domestic hard coal sales were paid for the last time in 2018 and the coal industry was then terminated. Post-decommissioning activities were subsidised up to and including 2022. The granting of subsidies for early retirement of outgoing coal workers (adaptation allowance) expires at the end of 2027.

## **3.2. Energy efficiency dimension**

Planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 as well as other objectives referred to in point 2.2, including

planned measures and instruments (also of a financial nature) to promote the energy performance of buildings, in particular with regard to the following:

The revised EU Energy Efficiency Directive (EED) foresees a significant increase in energy efficiency and a reduction in energy consumption. To this end, national energy efficiency policies are currently in line with the new

Objectives and targets adapted. The Energy Efficiency Act, adopted in the Bundestag on 21 September 2023, aims to create a national cross-sectoral framework to increase energy efficiency.

There is still a gap to the achievement of the target in 2030 based on the reference scenario of Germany's 2023 projection report. Significant additional efficiency measures are therefore needed, some of which still need to be developed and implemented.

The Federal Government's energy efficiency policy is based on a broad mix of instruments for all sectors, based on the principle of 'advice and information, support, researchers and researchers'. The current key actions are detailed below. Further actions will be complemented in the final NECP 2024.

### **3.2.1. Policies and measures related to the elements set out in point 2.3**

In order to implement formerly Article 7 of the EU Energy Efficiency Directive, the Federal Government made use of strategic measures in the first savings period of 2014-2020 and thus a broad set of measures. This approach is also maintained for the second savings period 2021-2030 for the implementation of Article 8(1), first sentence, point (b) of the Energy Efficiency Directive. An overview of the measures currently planned by Germany to achieve end-use energy savings pursuant to Article 8 EED of approximately 5 757.1 PJ and 137,51 Mtoe respectively are attached to the present National Energy and Climate Plan as a provisional annex pursuant to Article 3(2)(h) of Regulation (EU) 2018/1999. As the national transposition of the revised Energy Efficiency Directive can only just start after its adoption in July 2023, it is a provisional annex. In addition, further measures are needed to achieve the presumably missing end-use energy savings.

#### **Energy Efficiency Act**

The Energy Efficiency Act (EnEfG), adopted in the Bundestag on 21 September 2023, is intended to implement the amended European Energy Efficiency Directive (EED) and establishes a cross-sectoral framework for increasing energy efficiency and concrete savings targets in Germany. The law also includes specific savings measures through the exemplary role of public authorities and the increased use of energy and environmental management systems. The Act also specifies energy efficiency and waste heat requirements for data centres and requirements to improve the prevention and use of waste heat.

#### **Energy efficiency first principle**

In all sectors, efficiency first is the highest principle. This is now also laid down as a principle in the amended EED Article 3. The Federal Government is currently analysing the measures by which the principle can be implemented in order to provide meaningful support for the process of further energy demand reduction.

### **Climate Action Programme 2023**

The 2023 Climate Action Programme also includes numerous measures that, in addition to decarbonisation, lead to primary and final energy consumption reductions (see Chapter 3.1.).

#### **3.2.11. Long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private, including policies, measures and actions to stimulate cost-effective deep renovation and policies and actions to target the worst performing segments of the national building stock, in accordance with Article 2a of Directive 2010/31/EU**

In accordance with Article 2a of the EU Directive on the energy performance of buildings, the Federal Government has submitted to the European Commission a Long-Term Renovation Strategy (LTRS). The LTRS is intended to provide each Member State with a roadmap of measures and measurable nationally defined progress indicators to achieve long-term climate objectives and identify pathways and incentives to renovate the national building stock. The EU Buildings Directive sets out an objective to ensure a highly energy efficient and decarbonised national building stock and to facilitate the cost-effective transformation of existing buildings into nearly zero-energy buildings (EPBD, Directive (EU) 2018/844). In principle, the following applies to the building area: in order to significantly reduce non-renewable primary energy consumption, the

Efficiency measures significantly reduce energy demand for heating and cooling and significantly increase the share of renewable energy in meeting the remaining demand. Measures such as insulation of the building envelope, the installation of efficient windows or other façade components, the airtight construction of buildings and the use of high-efficiency technical systems for heating, cooling, lighting and lighting can improve the efficiency potential. The measures implemented so far to achieve the energy and climate targets have made significant progress on climate change mitigation and energy efficiency, reducing greenhouse gas emissions from the building sector by around 46 % between 1990 and 2021 to 112 Mt CO<sub>2</sub> (1990: 210 Mt CO<sub>2</sub>). The share of renewable energy in final energy consumption for heating and cooling increased by around 15 percentage points over the same period to 17.4 % in 2022. In the building sector, the Federal Funding for Efficient Buildings (with its predecessors the CO<sub>2</sub> Building Renovation Programme, the Market Incentive Programme (MAP), the Energy Efficiency Incentive Programme (APEE) and the Heating Optimisation Programme (HZO)) has provided significant impetus to improving energy efficiency or increasing the share of renewable energies in the building sector, which have contributed significantly to these positive developments. Nevertheless, scientific analysis shows that there is a need to speed up these developments to achieve the 2030 targets. In order to make the necessary progress in improving energy performance and reducing CO<sub>2</sub> emissions in the building sector, an immediate programme for the buildings sector was developed in 2022. This

has been further developed and has been included in the 2023 Climate Action Programme.

Measures in the building sector must in principle be designed in practice, open to technology and can be financed and integrated across plants in such a way that barriers are addressed, support measures are taken up widely, ensure the high quality of renovation measures and consider the potential for energy efficiency and use of renewable energy in buildings together.

There is no comprehensive revision of the LTRS in the draft update of the NECP. However, measures have been further developed and complemented. This evolution is set out below.

### **Energy advice**

The Federal Support for Energy Advisory for Housing (EBW) is aimed at owners of residential buildings (private homeowners, housing associations and housing owners' communities). A qualified energy consultant examines the entire property and prepares a comprehensive energy advisory report (individual renovation roadmap). In addition to energy saving potentials, the use of renewable energies and the necessary investments are estimated, as well as the heating and CO2 savings. Energy advice thus helps to integrate energy efficiency and renewable energy into the planning and decision-making process and thus exploit the efficiency potential at the most appropriate time. This will better inform building owners about the added value of energy modernisation measures. Because investments are most useful if they: upcoming

Maintenance or

Modernisation measures will be combined.

Since January 2021, the energy advice for non-residential buildings, installations and systems (EBN) combines energy advice in small and medium-sized enterprises (EBM) and energy advice for non-residential buildings of municipalities and non-profit organisations (EBKs), including contracting checks. Support is targeted at municipalities, small and medium-sized enterprises (SMEs), municipal enterprises and non-profit organisations. Advice is provided on renovation, including schools, kindergartens and administrative buildings, and on energy optimisation of operational processes.

The individual and independent advice on energy saving opportunities for private consumers, supported by the BMWK, is organised by the Verbraucherzentrale Bundesverband e.V. (vzbv) and is carried out with the involvement of the consumer centres of the Länder. Energy advice is provided in around 1000 advice centres currently available throughout the country. There are face-to-face consultations, telephone consultations, online consultations or as an energy check on various topics in your own house (basic check for tenant households on electricity, heat and household appliances, heating check, building check, solar heatcheck). Webinars are offered to private consumers on a regular basis.

### **National efficiency label for old heating systems**

Since 2017, the national efficiency label for old heating systems provides consumers with information on the efficiency status of their boilers over 15 years of age and is intended to motivate the replacement of inefficient boilers. Pursuant to § 17 EnVKG, district chimney



sweeps are legally obliged to affix the label and receive compensation for expenses.

### **Building Energy Act (Building Energy Act – GEG)**

The new construction standard in terms of permitted primary energy demand was raised to the 55 efficiency house in a first amended JIT. The JIT amendment entered into force on 01/01/2023.

A second amendment to the JIT established that, as of 1 January 2024, any newly built-in heating must in principle be operated with at least 65 % renewable energy. This applies immediately to new buildings within new building areas, and for existing buildings and new buildings outside new building areas, the obligation is introduced in staggered periods with the expiry of the heat planning deadlines (from mid-2026, or mid-2028). As a result, the law is closely intertwined with the future requirements for heat planning. If new oil or gas heating systems are installed during the transitional period, extensive advice should be provided beforehand, as these heating systems will also have to meet increasing renewable quotas from 2029 onwards.

### **Federal Funding for Efficient Buildings (BEG)**

The Federal Funding for Efficient Buildings (BEG) supports measures to improve energy efficiency in residential and non-residential buildings, as well as the replacement of old fossil heating systems with heating based on renewable energy sources. Full renovations to the efficiency house standard are supported through low-interest loans from KfW with repayment grants and individual measures, in particular on the building envelope and plant engineering through grants from the BAFA. There are special support incentives (bonuses) for the renovation of energy poor buildings, implementation as serial renovations and heat pumps that are particularly efficient or use natural refrigerants.

### **Support of serial refurbishment**

The Federal Government is supporting the industrial pre-production of facade and roof components and a standardised installation of plant technology. Feasibility studies, pilot projects and production capacity building will be supported.

In addition, the Federal Government has introduced a bonus of 15 percentage points for serial renovation within the federal funding for efficient buildings. The aim is to put into practice the approaches developed in the framework of the pilot projects carried out. The aim is to renovate buildings at high quality and shorten refurbishment times.

### **Law on Heat Planning and Decarbonisation of Heat Networks**

The Federal Act on Heat Planning and Decarbonisation of Heat Networks (Heat Planning Act) aims to introduce heat planning on 1 January 2024 as the central strategic instrument for the heat transition (cf. 3.1.2.vi.). The legislative process is expected to be finalised in autumn 2023.

## **Federal funding for efficient heating networks (BEW)**

Since September 2022, federal funding for efficient heat networks (BEW) has been providing financial support for the conversion and conversion of heat networks towards climate-neutral heat supply (see 3.1.2.iii.)

## **Heat pump offensive**

Heat pumps are the key technology for renewing decentralised heat production. The BMWK has therefore launched a major heat pump offensive in summer 2022 and has since been working with a broad coalition of industry, industry, crafts, trade unions and academia in the framework of the heat pump summits on the objective set out in a memorandum of understanding that at least 500.000 heat pumps will be rebuilt every year from 2024.

In a 2023 roadmap, stakeholders agreed on measures to:

- scaling up the production of heat pumps and critical components;
- the further development of heat pumps in terms of efficiency, natural refrigerants, installability and standardisation, including for cost degression;
- improving the availability of professionals;
- the provision of information on technology to the public and specialised public; and
- improving the framework conditions for the installation and operation of heat pumps, e.g. by adapting the model construction code;

Since 1 April 2023, the federal funding for the development of heat pumps has supported craft, energy advisory and planning companies that qualify their staff to use heat pumps in the building stock.

## **Tax support for energy renovation of buildings**

As a key measure in the building sector, tax support for energy renovation of buildings was introduced on 1 January 2020. The new instrument at the time complements the existing funding schemes in the building sector since then and can be used as an alternative to the investment support programmes. A deduction from the tax liability will ensure that as many residential building owners as possible benefit from the measure. Individual renovation measures on owner-occupied dwellings, which are also classified as eligible under the existing building support programmes. This includes individual measures, in particular the replacement of heating, but also the installation of new windows or insulation of roofs and external walls. 20 % of the investment costs (max. EUR 40,000 per residential property) are eligible; which are tax deductible over 3 years.

## **Energy-efficient urban redevelopment**

The KfW Energetic Urban Renovation Programme promotes climate change mitigation and adaptation measures through district-based approaches and their support through renovation management with grants (KfW programme 432). Selected neighbourhood-related

infrastructure measures are supported by subsidised loans (KfW programmes 201/202).

The programme promotes neighbourhood-related climate change mitigation and links it to other urban planning aspects. Integrated neighbourhood concepts show energy saving potential and options for the use of renewable energies. Optionally, green and blue infrastructure measures in the neighbourhood can also be developed in the concepts.

### **Further development of the Innovation Programme for Future Construction**

Construction faces particular challenges: The transition towards climate and net-zero greenhouse gas emissions by 2045 must be shaped, existing resources should be saved and the need for green and affordable housing needs to be met. At the same time, unstable supply chains, material shortages and increased prices are making it increasingly difficult to reduce the current backlog of building permits at an acceptable cost and within reasonable timeframes.

In order to fulfil these tasks, all those involved in construction research – the Federal Government and other institutions as promoters, research and construction practices – have a share of responsibility. Application-oriented construction research should provide new impetus for a sustainable transformation of the entire construction sector.

### **Energy transition constructions**

The Energy Transition Construction Research Initiative brings together the promotion of research, development and demonstration of energy-efficient buildings and neighbourhoods, contributes to networking the wide range of research fields and increases the visibility of energy innovation through targeted outreach activities. It is a key element of energy research funding under the 7th Energy research programme and does not constitute a separate funding programme.

The building sector has a key role to play in the heat transition in unlocking efficiency potentials and integrating renewable energies. The systemic interaction between buildings, neighbourhoods and energy infrastructure is becoming increasingly important. Accompanying research on energy transition construction evaluates the results of research and demonstration projects and prepares them in such a way that they can be incorporated into planning and decision-making practice on a permanent basis.

The ‘EnEff.building.2050’ support measure will continue under the BMWK energy research programme under the name ‘climate neutral building stock 2050’. The support measure complements the R & D and demonstration projects in the Energy Transition Construction Research Initiative. The objective of the action is to achieve a significant reduction in non-renewable primary energy demand by speeding up the deployment of available but novel technologies and processes. It will take on board innovations and results from long-standing research and the focus on removing barriers to enable the exemplary implementation of ambitious projects on the path to a climate-neutral building stock.

### **Example-setting role of federal buildings**

In order to fulfil the exemplary role of federal buildings, the energy efficiency requirements for climate-neutral new/extension buildings and renovations of the Federal Government (EEFB) for new buildings and renovation projects (buildings of the direct and indirect federal administration) are implemented as minimum structural requirements in accordance with the decree of 25 August 2021.

The EEFB defines the current energy standards for federal buildings in order to fulfil their role as an example and to achieve the climate policy objectives for federal buildings.

The key points for energy efficiency determinations were set out in the 2030 Climate Action Programme. Accordingly, the EEFB laid down the efficiency building standards EGB 40 for new buildings and ETUC 55 for building renovations, in line with the Federal Funding Scheme for Efficient Buildings (BEG). The corresponding EDFB requirements go beyond the legal requirements of the Building Energy Act (Building Energy Act – GEG) for annual primary energy needs (use of renewable energies) and structural heat protection (building envelope).

In order to achieve the specified climate protection targets for federal buildings, annual renovation rates are also set by 2045. The aim is to reach the total building stock by 2045 at

Take account of a corresponding start-up period of a reorganisation.

The EEFB is therefore a step towards the objective of net-zero greenhouse gas emissions for the federal buildings.

### **Further development of urban development (StBauF)**

Urban development policy of the Federal Government. Since 1971, the Federal Government-Länder programme has helped cities and municipalities to eliminate urban development problems and thus to strengthen them in a sustainable manner as places of economic activity and housing. Solutions to the challenges of climate change must also be considered. As part of the development of support for urban development in 2020, climate change mitigation and adaptation measures have therefore been better addressed. They are now mandatory and eligible for funding in all sub-programmes for urban development support. In particular, funding can be used to improve green infrastructure, such as the creation, maintenance or extension of green spaces and open spaces, and the networking of green and open spaces. However, measures for energy renovation of buildings, soil sealing, land recycling, climate-friendly mobility, use of climate-friendly building materials, greening of building sites or increasing biodiversity are also eligible for funding.

### **80 million Together for Energy Change Campaign**

In June 2022, the Federal Ministry of Economic Affairs and Climate Protection launched the information and activation campaign ‘80 million together for energy transitions’. It replaces the previous campaign “Germany Does Efficient”.

The aim is to inform, raise awareness and encourage consumers, as well as municipalities and businesses, about saving energy, increasing energy efficiency and developing renewable

energies. For more information, see chapter 3.2.iv. under Communication.

### **3.2.iii. Description of policies and measures to promote energy services in the public sector and measures to remove legal and other barriers to the use of energy performance contracting and other energy efficiency service models**

The Federal Government has taken extensive strategic measures to remove barriers to the uptake of energy services in the public sector. These range from information provision, training opportunities and funding programmes.

#### **Promotion of advice on energy-saving contracting in the framework of the EBN**

As part of the above-mentioned advisory programme ‘Energy consultancy for non-residential buildings, installations and systems’ (EBN, see Chapter 3.2.ii), a ‘contracting check’ is being co-financed for municipalities, among other things.

#### **Federal-Länder dialogue contracting**

The project will provide a platform for intensive exchange of energy-saving contracting between representatives from the Federal Government and the Länder. The project aims to remove barriers to the implementation of energy-saving contracting and to build up regional expertise in this area. To this end, annual plenary meetings and workshops, as well as a mentoring programme and the exchange of best practices are offered. The development of regional centres of excellence is also supported.

#### **Information on model contracts and guides**

On its website, the Federal Office for Energy Efficiency provides information on standard contracting contracts and guidelines on energy saving contracting available free of charge. This includes offers specifically aimed at public properties or local authorities.

#### **Municipal networks on energy and resource efficiency**

Municipalities can form a network of the National Climate Action Initiative (NKI) as part of the support programme for local authority guidelines in order to ensure that their energy and/or

Improve resource efficiency. Together, they can identify and implement savings through the support of a network team.

### **3.2.iv. Other planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 and other objectives referred to in point 2.2 (e.g. measures to promote the exemplary role of public bodies’ buildings and to promote energy efficient public procurement, measures to promote energy audits and energy management systems, consumer training and information and training measures, other measures to promote energy efficiency.**

The following list gives an overview of non-exhaustive measures to increase energy efficiency.

The NECP 2024 complements this list. Additional measures are likely to be needed to achieve the ambitious savings targets.

### **Carbon pricing**

Carbon pricing in the heating and transport sectors (BEHG)

Carbon pricing for the transport and heat sectors provides a price for greenhouse gas emissions, making the use of fossil fuels more expensive. In addition to its importance for decarbonisation, it is a key tool to increase energy efficiency. Reference is made to Chapter 3.1.1.i.

### **CO2 Cost Allocation Act**

For the first time, the Carbon Carbon Costs Allocation Act provides for the allocation of carbon dioxide costs in proportion to landlords and tenants. Prior to the entry into force of the law on 1 January 2023, landlords could fully pass on CO2 costs for the fuel to your tenants. The incentive effect of the price of carbon dioxide thus affected only tenants and encouraged them to make heating more economical. The Carbon Dioxide Costs Allocation Act now provides that the carbon dioxide costs incurred are to be apportioned on the basis of the energy quality of the building. The more it can be improved, the greater the share of

Carbon dioxide costs borne by the landlord (see Chapter 3.1.1.i.).

### **Product efficiency**

Minimum efficiency standards – EU Ecodesign Directive

Regulatory measure: Extend minimum standards for certain product groups to regulate the level of efficiency of technologies. In total, there are currently around 30 ecodesign regulations and 2 voluntary agreements.

### **Promoting the role of public authorities as a model**

*Exemplary role in the public building stock*

See Chapter 3.2.ii. on the long-term renovation strategy and here as a model for federal buildings.

*Energy efficient public procurement*

The largest demand for goods and services in Germany is the public sector, with a total procurement of three-digit billions of euros. Article 6 EED (Article 7 in the recast applicable as of October 2023) requires Member States to purchase only products, services and buildings with high energy performance, except for narrowly defined exceptions. The Public Procurement Regulation (VgV), which must be observed by all contracting authorities in pan-European calls for tenders, states in its § 67 (Procurement of energy-related supplies or services) that the highest level of energy efficiency and, where available, the highest energy

efficiency class is to be required where energy-related goods are procured or they are essential for the performance of a service. Energy efficiency must also be used as an evaluation criterion when determining the most economical bid. For the award of works, § 8c EU VOB/A (Procurement and Contract Regulations for construction works) contains an essentially identical provision. The standards will be aligned with the recast of the EED by October 2025. In addition to this obligation, the Act against Restrictions of Competition (GWB), the Public Procurement Regulation (VgV), the Procurement Regulation (Vergabe- und Vertragsordnung für Bau), Part A

(VOB/A) and the Defence and Security Procurement Regulation (VSVgV). The Federal Office for Energy Efficiency also publishes lists of energy efficiency criteria for different product categories as additional guidance for contracting entities.

As of 1 January 2022, the General Administrative Regulation on the Procurement of Climate-friendly Services (AVV Klima) replaced the General Administrative Regulation on the Procurement of Energy-Efficient Services (AVV EnEff), which had already been in force since 2008, in order to continue to ensure a high level of energy efficiency in all federal procurement procedures. In addition to continuing the requirements of the AVV EnEff, the AVV Climate supplements them with ambitious rules aimed at purchasing products and services that are particularly climate-relevant. For example, the AVV Klima specifies how climate protection aspects must be regularly taken into account in the preparation of the purchase, but also in the subsequent procurement procedure itself. In order to prevent or cause greenhouse gas emissions, a carbon price must in principle be calculated for procurement operations (so-called ‘shadow carbon price’). As a result, the amount of CO<sub>2</sub> emissions emitted over the whole life cycle is taken into account as a cost factor already at the time of purchase.

In addition, in order to facilitate practical guidance, the AVV Klima includes a ‘negative list’ of services which are in principle not to be procured. These particularly climate-relevant products include, for example, heating mushrooms or many products using fluorinated greenhouse gases as refrigerants. Similarly, certain products are no longer allowed for reasons of resource and climate protection, such as drinks in disposable packaging or disposable tableware in canteens and major events. In the future, the AVV Climate should be further developed into an AVV environment, taking into account relevant environmental aspects, in particular resource protection.

## **Energy audits/energy management system**

### *Energy audit obligation for non-SMEs*

Consideration is given here to those in Article 8(4)-7 of the EU Energy Efficiency Directive (2012/27/EU; (ED) resulting obligation for “non-SMEs” to carry out energy audits. The

Energy audits in the companies concerned are to be carried out by qualified and/or accredited experts. The Directive requires the first energy audit to be carried out by 5 at the latest. December 2015. In order to implement these requirements, the Energy Services Act (EDL-G) was amended accordingly with effect from 22 April 2015. According to this provision, large

enterprises (non-SMEs, i.e. enterprises not covered by the European Commission's SME definition (& 250 employees/turnover & EUR 50 million or annual balance sheet total & EUR 43 million)) are obliged to do so by 5. Carried out an energy audit in accordance with DIN EN 16247-1 on December 2015 and a further audit at least every four years thereafter. Companies with an energy management system certified in accordance with DIN EN ISO 50001 or an EMAS environmental management system are exempted from the obligation to carry out energy audits.

The 2019 amendment introduced a de minimis threshold of 500 MWh of total energy consumption. Below this threshold, a simplified energy audit may be carried out by means of a declaration of energy consumption and energy costs to BAFA. An online energy audit declaration was also introduced. This includes information on the company, the energy auditor, the energy consumption, the proposed energy efficiency measures and the cost of an energy audit.

The impact assessment of the measure will be based on the evaluation of the audit obligation under the Energy Services Act (EDL-G) (adelphi and IREES 2017). As part of this evaluation, a sample of companies obliged under the EDL-G was interviewed. Both the potentials identified during the audits and the EMS and the measures implemented were examined. The impact of the measures assessed here addresses only the measures that have not yet been implemented, which were identified in the course of the audits or the EMS. The effect of the EMS is attributed to the 'peak compensation' and 'Special compensation scheme' measures.

#### *Obligation to implement energy management systems*

Consideration is given here to those in Article 8(4)-7 of the EU Energy Efficiency Directive (2012/27/EU; EED) resulting obligation for 'non-SMEs' to carry out energy audits (see above, 'energy audit obligation for non-SMEs'). The

Energy audits in the companies concerned are to be carried out by qualified and/or accredited experts. The Directive requires the first energy audit to be carried out by 5 at the latest, December 2015. In order to implement these requirements, the Energy Services Act (EDL-G) was amended accordingly with effect from 22 April 2015. According to this provision, large enterprises (non-SMEs, i.e. enterprises not covered by the European Commission's SME definition (& 250 employees/turnover & EUR 50 million or annual balance sheet total & EUR 43 million)) are obliged to do so by 5. Carried out an energy audit in accordance with DIN EN 16247-1 on December 2015 and a further audit at least every four years thereafter. Companies with an energy management system certified in accordance with DIN EN ISO 50001 or an EMAS environmental management system are exempted from the obligation to carry out energy audits.

The 'Energy and Resource Efficiency in the Economy' funding programme also promotes the purchase and installation of measurement, control and regulatory technology and sensors for monitoring and efficient regulation of energy flows to be integrated into an energy management system. The purchase and installation of energy management software and the training of staff in the use of the software by third parties will also be encouraged. In addition,



advice on the introduction and maintenance of an energy management system in SMEs is promoted as part of the energy advice for SMEs.

#### *List of suppliers from the Federal Office for Energy Efficiency (BfEE)*

The Federal Office for Energy Efficiency (BfEE) maintains a free public list of providers active throughout Germany for energy services, energy audits and other energy efficiency measures. In the list of suppliers, final customers may: after Suppliers  
certain

Search for energy efficiency services in their postcode area and compare suppliers on the basis of different criteria. Suppliers can present their energy service offer in the list of suppliers.

#### *Energy efficiency and climate change networks*

Energy Efficiency Networks (EENs) bring together companies that want to set common energy efficiency and CO<sub>2</sub> reduction targets and learn from each other. Following a successful pilot phase of the EEN concept (including the LEEN (Learning Energy Efficiency Networks) project), the Federal Government decided in 2014 to implement EEN as a main pillar of the National Energy Efficiency Action Plan (NAPE). Up to 500 new networks should be established by 2020. To this end, a voluntary agreement entitled 'Energy Efficiency Networks Initiative' was signed in 2014 on the introduction of EEN between the Federal Government (BMWi and BMU, now BMWK and BMUV) and now 22 business associations and organisations. This is expected to save 75 PJ of primary energy and 5 MtCO<sub>2</sub>eq. Emissions are avoided. On 14 September 2020, the continuation and further development of the Energy Efficiency Networks Initiative was agreed. By 2025, 300-350 additional networks are expected to save 9-11 TWh of final energy and a further 5-6 MtCO<sub>2</sub>eq.

The networks should meet minimum requirements. This includes carrying out an energy audit at company level, setting a savings target at network level on the basis of individual company targets and raising the identified savings potential in accordance with the network objective. The networks are supported by a qualified energy consultant. The measures implemented are recorded as part of an annual monitoring exercise. As of 4 August 2023, a total of 387 networks were registered. According to the initiative, the envisaged amount of savings is expected to be achieved. The quantification of this measure is bottom-up, based on parameters from the monitoring of the networks and the number and size of the networks.

On 14 September 2020, the then Federal Ministry of Economic Affairs and Energy (BMWi) and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) agreed on the continuation and further development of the Energy Efficiency Networks initiative with 21 business associations and organisations (IEEKN 2020). The initiative, developed into an energy efficiency and climate change network, started in January 2021. A total of 387 networks have now been registered (as of: 04.08.2023).

#### **Consumer information/training**

*Independent advice at the Bundesverband e.V. (vzbv)*

See Chapter 3.2.ii. on the long-term renovation strategy.

*Federal funding for energy advice for residential buildings (individual renovation roadmap)*

See Chapter 3.2.ii. on the long-term renovation strategy.

*Federal funding for energy advisory services for non-residential buildings, installations and systems (EBN):*

See Chapter 3.2.ii. on the long-term renovation strategy.

*Small and medium-sized enterprises initiative on energy transition and climate action*

Launched in 2013 as a joint initiative between BMWi (now BMWK), BMU (now BMUV), DIHK and ZDH, the SME Initiative on the Energy Transition and Climate Action (MIE) aims to strengthen dialogue between policy-makers and medium-sized enterprises in industry, commerce and crafts and to support SMEs in improving energy efficiency.

In the same way as industry, the craft sector should receive support for the implementation of energy saving and climate protection measures. The 1 million craft businesses with 5.62 million employees, as well as the 363.000 apprentices, are heavily affected by the energy and climate transition process. The MIE provides companies with a fit-for-purpose, tailor-made mix of instruments and targeted support. The instruments will be channelled through a network of partners (7 environmental centres in the crafts sector and 55 transfer partners (manufacturing chambers, associations, guilds; Energy agencies) in width.

## **Industry**

*EU ETS Innovation Fund: Further development of the NER300 programme*

The focus of the programme is on emissions reduction. At the same time, however, it also has an impact on the reduction of primary energy consumption. Reference is made to Chapter 3.5.

*National decarbonisation programme*

The focus of the programme is on emissions reduction. At the same time, however, it also has an impact on the reduction of primary energy consumption. Reference is made to Chapter 3.5.

*CO2 prevention and use programme in basic industries*

The focus of the programme is on emissions reduction. At the same time, however, it also has an impact on the reduction of primary energy consumption. Reference is made to Chapter 3.5.

*Further development of efficiency networks*

The creation of energy efficiency networks will be stepped up. To this end, in conjunction with

the measure introducing a self-commitment by industry, recommendations from statutory energy audits or EMS will be accelerated. The continuation of the Energy Efficiency Networks initiative will be pursued in order to increase know-how transfer between companies.

#### *Resource efficiency and substitution*

This is only partly a new measure. It builds on the approaches set out in the German Resource Efficiency Programme. The aim of increased resource efficiency and substitution is to embed the circular/electricity principle in production processes, thereby unlocking untapped emission reduction potentials. The three main areas “Advice and Information”, “Promotion” and “Training and Vocational Training” are described below.

#### *Advice and information*

In addition to energy efficiency, companies should receive information and advice on the development and development of innovation with a focus on resource efficiency and substitution. The advice should build on the existing services provided by the Resource Efficiency Centre (CER) and, where possible, be linked to advice on energy efficiency. The focus of company-specific advice should be on SMEs, as in the CRE’s overarching advisory measures, as SMEs often have neither time nor staff capacity to:

Have a review of resource efficiency in your own company. The use of environmental management systems will be increased (ProgRess II). Energy audits have so far only measured energy consumption, and in accordance with the proposal, an explicit resource efficiency audit could be integrated into ProgRess II.

#### *Promote*

Financial resources are needed to enable companies, in particular, to implement broader investment measures to successfully integrate and increase resource efficiency within and along value chains through digitalisation and industry 4.0. Increased use of carbon-neutral raw materials as well as increased use of secondary materials are also conceivable. Particular attention should be paid to SMEs, as investment costs place SMEs more economically than larger firms. In order to demonstrate material and related greenhouse gas savings, it is necessary to present a resource efficiency approach that identifies the savings and describes possible secondary effects. The funding should focus on the use of resource-efficient processes and materials and resource substitution for lightweight construction (see point 3.5.iii for more details on the support programme for light construction).

#### *Further training and vocational training*

In order to stimulate innovation and implement investment properly, specific training of staff is also needed. Further training should build on existing services provided by the ZRE. For the consultations referred to in point (i), reference can be made to the national pool of qualified advisers already established by ZRE in cooperation with the Länder (in accordance with VDI Guideline 4801).

### *Energy tax advantages*

The Federal Government will examine on a case-by-case basis the extent to which existing energy or electricity tax advantages should be further aligned with the Federal Government's climate policy objectives. This review must take into account the votes on the draft new Energy Tax Directive (ETD) presented by the EU Commission under the Fit-for-55 package.

### **Communication**

#### *Information and activation campaign "80 million together for energy transitions"*

The wide-ranging information and activation campaign '80 million together for energy transitions' informs citizens, businesses, municipalities and other stakeholders about the development of renewable energies, raises awareness of how to use energy efficiently and motivates them to take their own measures to switch to renewable energies. The overall aim of the campaign is therefore to create broad acceptance of all necessary measures and the transformation process towards a climate-neutral society. The campaign is played through various channels (print, online, posters, etc.) and offers a wide range of information on, inter alia, funding, advice and practical videos on the website [www.energiwechsel.de](http://www.energiwechsel.de). It is not possible to quantify the impact of the campaign on savings, as this is a purely information measure and does not involve any support for investment measures.

Information and Competence Centre for Future-friendly Construction (IKzB) The IKzB promotes knowledge transfer and dialogue across society to further develop energyefficient construction of the future.

### **Transport**

#### *Strengthening rail passenger transport*

The focus of the programme is on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

#### *Making LPT more attractive*

The focus of the programme is on emissions reduction. At the same time, the programme also has an impact on reducing the

Primary energy consumption. Reference is made to Chapter 3.1.3.

#### *Development of cycle paths and bicycle parking facilities and improvement of framework conditions*

The focus of the programme is on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

### *Strengthening rail freight transport*

The focus of the programme is on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

### *Modernisation of inland waterway transport and use of shore-side electricity in ports*

The focus of the programme is on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

### *Promotion of low-carbon cars*

The focus of the programme is on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

### *Expansion of refuelling and recharging infrastructure*

The focus of the programme is on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

### *Promoting low-carbon trucks*

The focus of the programme is on emissions reduction. At the same time, the programme also has an impact on reducing the

Primary energy consumption. Reference is made to Chapter 3.1.3.

### *Refuelling, charging and overhead contact line infrastructure*

The focus of the programme is on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

### *Enable transport to be automated, connected, liquefied, innovative forms of mobility*

The focus of the programme is on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

### *Tax support for electromobility (Act on further tax incentives for electro-mobility and amending further tax rules)*

The focus of the programme is on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

### *Energy efficiency standards for electric vehicles*

The EU CO<sub>2</sub> fleet limits for new vehicles (cars and NFZs) contribute to reducing the energy

consumption of conventional powertrains (per km). However, vehicles powered by electricity or hydrogen do not have tailpipe CO2 emissions, regardless of their energy consumption. As a result, there is currently no European regulation on the energy efficiency of electric vehicles.

## **Agriculture**

### *Energy efficiency in agriculture*

The focus of the programme is on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.1.i.

### **3.2. v. Description of policies and measures to promote the contribution of local renewable energy communities to the implementation of the policies and measures referred to in points (i), (ii), (iii) and (iv)**

Reference is made to Chapter 3.1.2.v, which sets out the regulatory framework for the development of renewable energy communities.

### **3.3. vi. Description of measures to develop measures to utilise energy efficiency potentials of gas and electricity infrastructure**

Reference is made to the system development strategy in chapter 3.4.3.i.

### **3.4. vii. Where relevant, regional cooperation in this area**

#### **Franco-German Energy Platform**

Germany is working closely with France on energy efficiency on the basis of the “Joint Energy Declaration” of 31 March 2015. The Franco-German Energy Platform of dena (German Energy Agency) and ADEME (Agence de l’Environnement et de la Maîtrise de l’Energie) set up to implement the Energy Declaration includes two efficiency projects: The projects aim, on the one hand, at preparing and exchanging best practice examples across countries in the field of building renovation and, on the other hand, cooperation to promote energy efficiency in industry.

#### **German-Polish Energy Platform**

In the framework of the German-Polish Energy Platform, dena (German Energy Agency) and KAPE (Krajowa Agencja Poszanowania energii) work together on a cross-border project on climate-neutral heating and exchange of best practice examples in the German-Polish border area.

### **3.5. viii. Financing measures, including Union support and the use of Union funds, in the area at national level**

Financing measures in the form of intensive support or price and incentive mechanisms are

key components of efficiency measures. They complement other measures with targeted financial incentives to enable the implementation of energy efficiency measures in the different application fields. Energy consumers can thus reduce their energy bills in the long term. Investments in energy efficiency create not only cost advantages for businesses, but also new opportunities in international markets.

## **Promote**

The Federal Government has created framework conditions, inter alia by promoting efficiency measures and measures for the use of renewable heat, in order to increase the development and dissemination of innovative energy technologies from Germany. Investment support programmes therefore complement advisory and information provision with targeted financial incentives to enable energy efficiency measures to be implemented in the various application fields. Thus, energy consumers can reduce their energy bills in the long term (see “Long-term renovation strategy”). Investments in energy efficiency create not only cost advantages for businesses, but also new opportunities in international markets. For example, Germany exports to a significant extent goods used in the context of efficiency measures and renewable heat in the field of rational energy use and conversion, such as energy-efficient electrical appliances, insulation materials, building plant technology or components for production processes. For the building sector, the measures to implement the energy efficiency strategy for buildings are set out in the ‘Long-term Renovation Strategy’ in Chapter 3.2.ii.

### *Federal support for energy and resource efficiency in the economy*

The programme ‘Federal Support for Energy and Resource Efficiency in the Economy’ (EEW) brought together various previously existing support programmes of the Federal Ministry of Economic Affairs and Climate Protection (BMWK) and refocused and optimised the promotion of energy efficiency measures. In addition to support through traditional (removal) grants through the Guidelines on ‘Federal Support for Energy and Resource Efficiency in the Economy – Grant and Credit’, which consists of a total of six different funding modules, funding competition is also offered via the ‘Federal Promotion for Energy and Resource Efficiency in the Economy – Promotion Competition’. In the context of the energy crisis and the ambitious climate targets, both directives were amended in May 2023, including improved support conditions for other technologies for decarbonisation, such as deep geothermal energy and electrification of process heat, especially for SMEs, and a significant increase in funding competition. The EEW therefore consists of the following support modules:

Module 1: Cross-cutting technologies

Module 2: Process heat from renewable energy sources

Module 3: Measurement, sensor and control technology, sensors and energy management software

Module 4: Energy and resource optimisation of installations and processes

Module 5: Transformation concepts

## Module 6: Electrification of small businesses

### Promotional competition

#### **Energy and Electricity Tax Act**

The tax relief for the manufacturing industry is intended to prevent companies competing internationally from being penalised by high energy taxes. In addition to a general tax relief of 25 % for manufacturing companies and top-compensation with a relief of up to 90 % for businesses, there are complete tax reliefs for certain energy- and electro-intensive processes (e.g. electrolysis, metal processing, manufacture of glassware, ceramic products). The so-called peak equalisation is granted only if the company operates an energy or environmental management system (in the case of SMEs: Implementation of an alternative system) and the manufacturing industry as a whole meets the annual energy intensity reduction target. All the above-mentioned tax advantages shall apply to them.

The achievement of the objectives and the need for it have been evaluated. The peak compensation scheme was extended for a further year as of 1 January 2023.

### 3.6. Dimension Energy security

#### **Gas**

The German gas market is characterised by a large number of privately organised market players in the fields of natural gas networks, the operation of natural gas storage and the trading of natural gas with increasing levels of competition. In Germany, the following actors are in particular responsible for ensuring the supply of natural gas. The framework conditions of their respective activities in the market are based in particular on the Energy Industry Act (EnWG), the relevant regulations and regulations of the BNetzA and the generally recognised rules of the Deutsche Verein des Gas- und Wasserfachs e.V. (DVGW).

#### *Transmission system operators (TSOs)*

Transmission system operators for natural gas operate transmission systems which have border or market crossing points ensuring in particular the integration of large European import pipelines into the German transmission system. According to § 3(5) EnWG, transmission system operators are responsible for the proper operation, maintenance and development of a network.

#### *Gas Distribution System Operators (DSOs)*

Distribution system operators for natural gas operate natural gas distribution networks and, in accordance with § 3(8) EnWG, are responsible for their maintenance, development and construction of interconnections with other systems and consumers; this may include, for example, municipal works.



*Gas storage facility operator (underground storage operator, UGSB)*

In accordance with Section 3(6) EnWG, underground storage operators operate natural gas storage with the natural gas stored by traders.

*Transport customer (TK)*

According to § 3(31d) EnWG, shippers are wholesalers, natural gas suppliers, including the trading department of a vertically integrated undertaking, and final consumers.

*Market Area Manager (MGV) Trading Hub Europe GmbH (THE)*

According to § 2(11) Gas-NZV, the market area responsible for natural gas is a natural or legal person designated by the transmission system operators to provide services such as the efficient operation of access to natural gas systems in a market area.

The market area responsible for the whole German natural gas market area is Trading Hub Europe GmbH (THE). The operates the market area within the meaning of the “Agreement on cooperation pursuant to § 20(1)(b) EnWG between the operators of gas supply networks located in Germany”. The is a cooperation company of 11 German network companies bayernets GmbH, Fluxys TENP GmbH, GASCADE Gastransport GmbH, Gastransport Nord GmbH, Gasunie Deutschland Transport Services GmbH, GRTgaz Deutschland GmbH, Nowega GmbH, ONTRAS Gastransport GmbH, Open Grid Europe GmbH, terranets bw GmbH and Thyssengas GmbH.

In the German market area as a whole, the different network areas are allocated to a market area that is cross-gas quality. High calorific H-gas and low calorific L-gas can be traded in both markets. Transmission system operators shall ensure that the specified gas qualities are respected in the respective transmission system areas.

The tasks of THE include:

- Balance management: The allows for the conclusion of balancing contracts and holds balance circuits, sub-balanceaccounts and network accounts.
- Balancing energy management: The procures balancing energy to compensate for physical differences between input and off-take.
- Virtual trading point (VTP): Supply and operation – via the virtual trading point, balance responsible parties can transfer volumes of gas between balancing circuits.
- Security of supply: Since 2022, statutory tasks to ensure security of supply, e.g. by operating the gas security platform pursuant to Section 2b EnSiG, processing of gas solidarity pursuant to Regulation (EU) 2017/1938 for the Federal Republic of Germany pursuant to Section 2a EnSiG, purchasing natural gas for filling natural gas storage in accordance with Section 3a(1) EnWG.

### *Balance responsible party (BKV)*

The balance responsible party is a natural or legal person who, in accordance with Section 2(5) Gas Network Access Regulation (GasNZV), settles the balance with the market area manager. The BKVs nominate to the market area manager and the transmission system operators, on behalf of their shippers, and are responsible for the management of balances. The BKVs ensure the availability of quantities and balances within the market area.

### *Entry-exit network operators (EnB, ANB)*

Pursuant to §4(4) and (11), feed-in network operators and exit network operators are network operators between the operators of gas supply networks (KOVs) located in Germany, which conclude entry/exit contracts (including in the form of framework contracts for suppliers) with shippers in accordance with § 3(1) GasNZV.

## **3.3.1. Policies and measures related to the elements set out in point 2.3**

### **Natural gas: Measures to maintain and, where necessary, improve security of gas supply in Germany**

#### *Gas Preventive Action Plan*

Measures to preserve – and where necessary – improve security of supply in Germany are described in the Preventive Action Plan for Gas for the Federal Republic of Germany. This is to be prepared in accordance with Articles 8 and 9 of 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 and builds on the results of the national risk assessment to be carried out by each Member State pursuant to Article 7 of Regulation (EU) 2017/1938. BNetzA carries out the national risk assessment for the Federal Government. The Preventive Action Plan shall set out measures to prevent gas shortages that meet the infrastructure and supply standard, reduce the likelihood of supply crises, avoid regional supply shortages and increase resilience to supply crises. The PAP was last updated in 2023.

#### *Network Development Plan (NEP) – Gas*

Under Section 15a of the EnWG, transmission system operators are obliged to jointly develop the NEP gas over a two-year period. They jointly identify infrastructure needs for the next ten years. Distribution system operators shall provide the necessary information for this purpose. In the NEP Gas, a ‘security of supply scenario’ is also modelled, making assumptions about the impact of possible supply disruptions (Section 15a(1) EnWG). After approval by BNetzA, NEP Gas is binding on TSOs.

#### *Provision of information*

In order to safeguard gas supply, the TSOs/DSOs are obliged under Section 15(2) of the EnWG

to provide the necessary information to any other gas supply system operator connected to their own network. The obligation also applies to storage operators.

### *Reverse flow capacities*

Transmission system operators shall be responsible for the establishment of permanent bidirectional capacity for gas flows in all cross-border interconnectors. To this end, they shall cooperate with the adjacent transmission system operator. Out of a total of 36 physical border crossing points, 15 border points currently have bidirectional physical flow capacity.

(excluding: Harmonised cross-border Gas storage connections). These capacities are available on a permanent basis.

### *Storage*

Sufficient availability of storage capacity with high storage capacity is central to securing gas supplies, especially in the event of supply shortages and to cover seasonal variations in consumption. Currently, gas storage facilities with a total capacity of around 23 billion cubic metres are operated commercially in Germany at 41 sites. This means that Germany has the largest natural gas storage capacity in the European Union. The spatial distribution of the reservoirs extends almost to the whole of Germany, with regional centres in the north-west due to geological conditions. In accordance with their security of supply obligations, distributors are responsible for the use of commercial storage facilities by maintaining sufficient quantities to secure supplies to their customers in gas storage, in particular during the cooling season and in the event of unexpected supply disruptions.

### *Measures to remedy or mitigate the consequences of a gas supply disruption*

Although the gas supply situation in Germany is highly secure and reliable, in the event of a deterioration in the supply situation, there are the necessary national framework conditions and design rights for companies and public authorities to prepare and ensure the necessary cooperation and availability of measures for all parties involved. In particular, the following national provisions transposing Regulation (EU) 2017/1938 and EU regulations adopted in the context of crisis management are the legal bases for the implementation of crisis management and contingency planning in Germany: The Act on Electricity and Gas Supply (Energy Industry Act, EnWG), the Energy Security Act (Energiesicherheitsgesetz, EnSiG) and the Regulation on the security of gas supply in a supply crisis (Gas Security Ordinance, GasSV). Measures to remedy or mitigate the consequences of a gas supply disruption within the meaning of Article 10 of Regulation (EU) 2017/1938 are described in the Emergency Plan on Gas for the Federal Republic of Germany.

### *Act on Electricity and Gas Supply (Energy Industry Act, EnWG)*

According to Section 1(1) of the EnWG, the purpose of the EnWG is to ‘ensure the most secure, cheapest, consumer-friendly, efficient and greenhouse gas-neutral pipeline-based supply of natural gas to the general public, which is increasingly based on renewable energy’. In this

regard, the supply of protected customers is particularly important in Regulation (EU) 2017/1938. In Germany, protected customers pursuant to Article 6(1) of Regulation (EU) 2017/1938 are defined in Section 53a of the EnWG and include households, basic social services and district heating installations that cannot switch fuel to the extent that they supply household customers, standard load profile customers and those providing basic social services. Gas supply undertakings shall also be required to supply natural gas to this customer in the event of a partial interruption of the supply of natural gas or in the event of exceptionally high gas demand. In Germany, this obligation is laid down in § 53a EnWG. The Gas suppliers may rely on market-based (grid or market-related, non-public) measures.

Supplies to protected customers are possible only in the context of the security and reliability of the gas supply network. Transmission and distribution system operators therefore have a central role in their system responsibility for ensuring gas supply on the basis of Sections 15, 16 and 16a of the EnWG. If network or market-related measures do not enable system operators to remedy a disruption or threat to the security and reliability of the gas supply system or in a timely manner (Section 16(1) of the EnWG), this must be carried out by the system operators using the measures referred to in Section 16(2) EnWG.

In particular, in the event of a risk of gas shortages, the system operation and the allocation and planning of capacities, including transit capacities, shall be carried out in such a way as to safeguard the security of supply of protected customers and solidarity protected customers in other Member States. The gas supply undertakings carry out these tasks under their own responsibility.

#### *Act on the Security of Energy Supply (Energy Security Act, EnSiG)*

The toolkit of the EnSiG in combination with the Gas Security Regulation (GasSV) is only used in an emergency to safeguard the vital need for natural gas in the event that gas supply is directly endangered or disrupted and the threat or disruption of supply cannot be remedied by market-based measures, or cannot be remedied in a timely manner or only by disproportionate means. Vitally important is the need to fulfil public functions and international obligations as defined in the EnSiG. The instruments of the EnSiG are put into effect by the fact that the Federal Government establishes, by means of a statutory ordinance, that there is a risk or disruption to the energy supply. The Bundesrat's consent is not required in this respect. In order to achieve the above-mentioned objectives in the event of an emergency, regulations may be adopted pursuant to § 1(1) EnSiG on, inter alia, “production, transport, storage, distribution, supply, purchase, use and maximum prices of (...) gaseous energy sources (...)” and “accounting, record-keeping and reporting obligations concerning: the economic operations referred to above, quantities and prices and other market conditions relating to those goods.’

In particular, the statutory ordinance may provide, in accordance with paragraph 3, that ‘the supply, purchase or use of the goods may be limited in time, geographically or quantitatively or only for certain urgent supply purposes’. The validity of such regulations may not exceed six months. Their period of validity may be extended only with the consent of the Bundesrat.

The Gas Security Ordinance was adopted on the basis of the EnSiG. While market-based instruments and measures taken by gas suppliers in Germany are enshrined in law, in particular in the EnWG, EnSiG and GasSV lay down sovereign powers of intervention.

#### *Regulation on security of gas supply in a supply crisis (Gas Security Regulation – GasSV)*

The GasSV was adopted on the basis of the EnSiG. It governs the transfer of burden-sharing or public measures to the competent public authorities in the event of an emergency. In the event of a supra-regional supply shortage, the competent public authorities are the BNetzA and, in the event of a regional shortage of supply, the Länder. In order to meet the ‘essential needs’ of natural gas, paying particular attention to protected customers and minimising consequential damage, these competent authorities may issue orders under § 1 GasSV as load distributors.

When an intervention in the supra-regional interest, the balancing of electricity and gas economic interests or the use of natural gas storage and other gas supply facilities with a supra-regional importance has to be regulated, BNetzA, as the competent State body, assumes its role as federal electricity distribution company. If an intervention does not have a supra-regional impact, the regionally affected federal state assumes the burden sharing. Since in most cases a gas shortage is likely to have a supra-regional impact, BNetzA has the central role as the load distributor at the emergency stage.

#### *Natural gas emergency plan*

The natural gas emergency plan shall be established in accordance with Articles 8 and 10 of Regulation (EU) 2017/1938 concerning measures to safeguard the security of gas supply) and allocate the measures to three crisis levels (early warning, alert and emergency level). The occurrence of the crisis stage depends on the severity of the disruption, the expected economic and technical impact and the urgency of repairing the disruption at national level. The emergency plan was last updated in 2023.

#### *Ensure the supply of protected customers in a gas shortage/emergency situation.*

Supplies to protected customers are possible only in the context of the security and reliability of the gas supply network. TSOs and DSOs therefore have a central role to play in the context of their system responsibility for the security of gas supply on the basis of Sections 15, 16 and 16a EnWG. In particular, in the event of a risk of gas shortages, the system operation and the allocation and planning of capacities, including transit capacities, shall be carried out in such a way as to safeguard the security of supply of protected customers and solidarity protected customers in other Member States. The gas supply undertakings carry out these tasks under their own responsibility.

#### *Possible measures under orders pursuant to § 1 GasSV*

The Gas Security Platform (SiPla) is used as a digital platform for data exchange and communication to manage a wide range of processes for managing crisis situations at the gas

emergency level, as well as for solidarity requests from EU Member States connected to Germany. On the basis of Section 1(1)(4) EnSiG in conjunction with Section 1a GasSV, the Gas Safety Platform was developed by BNetzA and the market area manager for Gas, Trading Hub Europe GmbH (THE). It has been made available since October 2022 by the market area manager.

In accordance with § 1 GasSV, BNetzA can issue disposals to undertakings and companies that produce, purchase, transport or supply natural gas or operate gas storage facilities, as well as consumers through the allocation, purchase and use of gas, via the gas safety platform. Such orders constitute pre-defined, public/non-market-based measures within the meaning of Regulation (EU) 2017/1938. Under Section 1 of the GasSV, for example: Orders are issued to increase the storage of natural gas, substitution of natural gas by oil or other fuels, use of non-gas-generated electricity, limit the production of electricity in natural gas power plants, increase the level of production of natural gas, heating public buildings, reduce the consumption of natural gas to wholesale or other end users, reduce industrial customers, use of storage stocks of alternative fuels, restrict cross-border flows of natural gas (subject to the requirements of Articles 10(4) and 11(6) of Regulation (EU) 2017/1938.

#### *Measures to prevent gas shortages in winter 22/23*

In order to specifically prevent a gas shortage, the German Federal Government implemented several measures. These include the short-term energy security regulation. effective

##### Measures

(Short-term energy supply security measures regulation, EnSikuMaV), limited to April 2023, and the Ordinance on

Securing energy supply through measures that are effective in the medium term (Medium-Term Energy Supply Measures Ordinance, EnSimiMaV), limited to autumn 2024, to reduce the gas consumption of industry and households to a crisis-appropriate level. This was linked to the public energy saving campaign “80 million together for energy transitions”. The amendments to the Energy Industry Act (EnWG), including the introduction of filling levels for German natural gas storage facilities, amendments to the Energy Security Act (EnSiG) to better control and potential takeovers of critical energy infrastructure companies, and the introduction of the Act on Accelerating the Use of Liquid Natural Gas (LNG-Beaccelerungsgesetz, LNGG) and the subsequent construction of LNG infrastructure and direct import of first LNG volumes on the German North and Baltic coasts in December 2022/January 2023 stabilised Germany’s gas supply. In addition, in order to stabilise Germany’s natural gas supply, imports of natural gas from Belgium, the Netherlands and Norway were increased and the requirement to deodorise natural gas from France to feed into the German natural gas network was abolished. As of 30 October 2023, severe gas shortages have been adequately prevented. The crisis preparedness measures and planning as described in this updated emergency plan for natural gas will adequately prevent a severe gas shortage in the foreseeable future.

#### *Rapid deployment of LNG infrastructure*

Germany had no Liquefied Natural Gas (LNG) landing infrastructure until winter 2022. As of 2022, the Federal Government pushed the construction of so-called floating LNG terminals under pressure. First, it has secured four Floating Storage Regasification Units (FSRUs) on which LNG can be converted back into natural gas. Secondly, with an LNG Acceleration Act, it has created the legal conditions to accelerate the construction of the necessary land connections. For example, as of winter 2022/23, two FSRU vessels could be commissioned and LNG could be fed into the German gas supply network.

## **Oil**

### *Energy Security Act (EnSiG) – Petroleum*

The scope of the Energy Security Act includes, inter alia, oil and petroleum products. Rules on production, transport, storage, distribution and purchase of energy sources, including mineral oil, may be laid down by statutory ordinance. In particular, possible consumption-restrictive measures, such as speed limits or driving bans, may be envisaged, up to a possible ration of the supply of mineral oil. In the event of oil supply disruptions, which operators cannot absorb alone or cannot absorb in the short term, the release of oil reserves under the Oil Stockholding Act is the first and priority instrument. Measures such as speed limits and (partial) driving bans can be considered at most in the event of very severe and very long-lasting supply crises.

### *Petroleum Stockpiling Act (ÖlbevG)*

Since 1966, Germany has had a legal obligation to stock oil and petroleum products. It was introduced with the aim of securing energy supplies against at least short-term disruptions in the import flow in the face of growing dependence on oil imports. The Oil Stockpiling Act has been amended several times since then, not least because of European requirements and international developments. The Petroleum BevG comprehensively regulates the stockpiling of oil and petroleum products for the purposes of crisis preparedness. Subsequently, the Petroleum Stockholding Association (EBV) was set up as a federal public-law corporation with its registered office in Hamburg and was entrusted with stockpiling. He holds oil stocks of 90 days net imports of crude oil, petrol, diesel, fuel oil EL and JET A-1. In the event of a supply crisis, the Federal Ministry of Economic Affairs and Climate Protection (BMWK) issues a clearance regulation to compensate for the loss of supply due to stocks under the EBV.

### *Mineral Oil Data Act (MinÖlDatG)*

The MinÖlDatG is the legal basis for collecting mineral oil data from all major companies dealing with mineral oil. The mineral oil data form the basis for regular monitoring of German mineral oil supply, but also for measures to be taken in the event of a crisis. The Federal Office for Economic Affairs and Export Control (BAFA) collects mineral oil data on imports, exports, stocks and domestic sales of crude oil and petroleum products from the reporting companies on a monthly basis. The data collected are used for national and international crisis preparedness, in particular to provide information on current developments on the German oil market.

### *Traffic Services Act (VerkLG)*

There may be a need to require transport capacity in the event of major oil supply crises in which the Federal Government has identified a disruption of energy supply in accordance with the Energy Security Act, which cannot be remedied by market-based means, cannot be remedied in time or only by disproportionate means. As ‘authority entitled to request’ within the meaning of § 7

In the event of a crisis, the BAFA must commission transport services for the BMWi’s business from the ‘coordinating authority’ (Federal Office for Freight Transport).

### *Fuel Supply Restriction Ordinance (FuelLBV)*

The FuelLBV regulates the possible rationing of fuels by means of reference certificates. This is based on the Energy Security Act and the Federal Government’s finding that energy supply is disrupted.

### *Fuel Oil Supply Restriction Ordinance (HeizölLBV)*

The Heating OilLBV regulates the possible rationing of light heating oil on the basis of a reference quantity for a previous period. This is based on the Energy Security Act and the Federal Government’s finding that energy supply is disrupted.

### *Mineral Oil Compensation Regulation (MinölAV)*

MinölAV allows for fair sharing between over and under-served companies in the oil industry. The aim is to maintain market structures as far as possible and to sell mineral oil at market prices. The Regulation may, mutatis mutandis, in order to fulfil international obligations arising from the

International energy programme of the International Energy Agency. The legal basis is the Energy Security Act and the Federal Government’s finding that energy supply is disrupted.

### *Mineral Oil Management Regulation (MinölBewV)*

The MinölBewV regulates the possible rationing of motor and heating fuels and their production, distribution and use for the benefit of the population and the Bundeswehr and allied armed forces on the basis of the WiSiG in the case of Article 80a of the Basic Law. Again, the principle of ultima ratio applies here.

### *National Emergency Strategy Organisation (Neso)*

In addition, the National Emergency Strategy Organisation (Neso) has been established. Neso brings together the authorities, institutions and companies that are actively involved in their assessment, decision-making on response measures and their implementation in the event of oil crises. Neso is based on close cooperation between the authorities and companies, including their associations. The German Neso Secretariat coordinates the activities of the Neso



stakeholders. It assists the Crisis Supply Board and the Supply Coordination Group in carrying out their tasks and maintains contact with the IEA alongside and in coordination with the BMWi. The NESO manual, a crisis management instruction, has just been reworked.

### **Electricity market**

In Germany, a number of actors and all electricity supply companies are responsible for supplying electricity to the general public and carry out these tasks on their own responsibility. Before presenting the measures in the electricity sector, a brief reference is made to the key players:

*Transmission system operators (TSOs):* Responsible for the operation, maintenance and, where appropriate, development of the networks used for the transport of electricity over a high-voltage and high-voltage interconnected system, including cross-border interconnectors (cf. Section 3(10) and (32) of the Energy Industry Act).

*Distribution System Operator (DSO) – Electricity:* Perform the task of distributing electricity, that is to say, the transport of electricity at high, medium or low voltage (see Section 3(3) and No 37 of the EnWG).

*Balance responsible party (BKV) – Electricity:* The BKV is responsible for a balanced balance between injections and withdrawals in a balancing circuit in every quarter-hour period and, as an interface between network users and transmission system operators, assumes the economic responsibility for discrepancies between injections and withdrawals of a balancing circuit (cf. § 4(2) StromNZV).

Since electricity supply is only possible through secure and reliable grids, TSOs and DSOs have a central role to play. Under Paragraphs 13 and 14 of the EnWG, they must take appropriate measures to ensure the security and reliability of the electricity supply system. Network operators must coordinate closely with each other to fulfil their supply obligations.

*Measures to maintain and, where necessary, improve security of electricity supply in Germany*

A functioning European internal electricity market with free pricing generally ensures the right investment in generation and flexibility. At the same time, the Federal Government's policies and measures to ensure the adequacy and flexibility of the energy system create stronger incentives for market actors to secure their electricity supplies (see chapter 3.4.3.ii.). Nevertheless, markets are not always sufficiently prepared for very low probability events. In order to make the German and European electricity system more resilient to unpredictable developments and crises, Germany currently considers reserves outside the electricity market to be essential. This is particularly true in the context of the phase-out of nuclear and coal-fired electricity generation in Germany. However, reserves are also likely to be needed in the long term in a climate-neutral electricity system. Security of supply also needs to be ensured together in Europe.

In addition, the Federal Government is taking further measures to maintain and further improve

security of electricity supply.

#### *Operation of energy supply networks*

Under Section 11 of the EnWG, operators of energy supply networks are obliged to operate, maintain and optimise, strengthen and develop a secure, reliable and efficient energy supply network on a non-discriminatory basis, insofar as it is economically reasonable.

#### *Provision of information*

According to Section 12(2) of the EnWG, transmission system operators must provide operators of another network to which their own transmission systems are technically connected the necessary information to ensure safe and efficient operation, coordinated development and interconnection.

#### *Network Reserve*

In accordance with Section 13d EnWG, the TSOs shall hold facilities for the purpose of ensuring the security and reliability of the electricity supply system, in particular for the management of network congestion and for maintaining voltage and ensuring possible re-establishment of supply (grid reserve). The network reserve is 4.6 GW in winter 2023/2024.

#### *Capacity Reserve*

The Capacity Reserve serves to provide additional security for the electricity market and is governed by Section 13e of the EnWG and the Capacity Reserve Ordinance. It is held outside the electricity markets and is designed in such a way that incentives to invest and competition in electricity markets are not distorted as far as possible. For example, generating installations will be prohibited from returning to the electricity and balancing markets once they have been locked in the capacity reserve. In order for an installation to be eligible to participate in the Capacity Reserve, it must fulfil certain conditions relating to its location and its technical characteristics. Among other things, a plant must be connected to the German grid and meet certain flexibility requirements. The procurement of

Capacity shall be transparent, competitive and non-discriminatory. The reserve capacity to be procured (max. 2 GW) shall be tendered every two years and the TSOs shall select the admissible bids on the basis of the bid value in ascending order. The capacity reserve assets shall be activated by TSOs if demand on the electricity market is not expected to be fully met by supply. The retrieval will then take place in the event that the secure and reliable operation of the German transmission system is jeopardised and all network-side measures (e.g. Network interconnections) and all market measures (e.g.: Use of balancing energy). The uncovered balances responsible for a call are involved in the costs of the Capacity Reserve by paying an increased imbalance price (currently at least around 20 TEUR/MW) during the call. The Capacity Reserve did not yet have to be deployed.

Regular monitoring of the security of supply of electricity In accordance with Section 63(2) of

the EnWG, the Federal Network Agency shall draw up a monitoring report on the state of play and development of security of supply in the electricity sector at least every two years. The aim of this report is to ensure that security of supply is closely monitored and, if necessary, sufficient time for possible measures to ensure security of supply.

The last report on the monitoring of the security of supply of electricity was published in February 2023 and shows that the current plans of the Federal Government maintain a high level of electricity supply between 2025 and 2031 (including in the case of a coal phase-out in 2030). To this end, a number of generation and network developments need to be realised and efforts continued. This includes, for example, the construction of new power stations, the raising of flexibility potential or the implementation of cross-border redispatching. The security of supply to consumers applies both in terms of sufficient generation capacity and sufficient network capacity: The results of the market show that demand can be met at any time during the period up to 2030/31 in all hours of the year. The surveys carried out on the network show that, if the current target data are met, the network development will be used to make use of:

The potentials available to manage congestion can be ensured without congestion.

The Federal Network Agency has based its analysis on the Federal Government's ongoing plans for the transformation of the electricity system. These include: Renewable energy will be expanded in line with the objectives of the amended Renewable Energy Act (EEG 2023) and the amended Wind On-Lake Law – by 2030, the generation capacity of onshore wind, offshore wind and photovoltaic will be increased to 360 GW capacity. According to the network development plan, transmission and distribution networks will be upgraded.

On the basis of the report, the Federal Government has developed and adopted recommendations for action to ensure the security of supply analysed in the report. These include, but are not limited to:

- the scaling up of renewable energies;
- Activate the potential of local incentives and flexibility;
- accelerated planning and permit-granting procedures for network deployment; or
- Further develop reserve tools

The rules and measures referred to above for the gas sector in the event of a gas supply disruption apply very similarly to the electricity sector. First of all, under Section 13 of the EnWG, TSOs are entitled to take network and market-related measures and to use the grid and capacity reserves to eliminate threats or disruptions to the electricity supply system. In a next step, if these tools are not sufficient, TSOs are entitled and obliged to adjust all electricity injections, electricity transits and electricity withdrawals. If this is not sufficient, and there is a risk of an immediate threat or disruption to the energy supply, which jeopardises the fulfilment of vital energy needs, the instruments of the Energy Security Act and the accompanying

regulations apply:

*Energy Security Act (EnSiG)*

The Energy Security Act (EnSiG) contains rules to prevent an energy crisis and in the event of an imminent or acute energy crisis. It aims to prevent or remedy supply disruptions, take countermeasures and secure vital energy needs. It covers petroleum and petroleum products, other solid, liquid and gaseous energy, electrical energy and other energy sources (goods). The EnSiG is characterised by its comprehensive enabling framework. This concerns, inter alia, the authorisation to provide for certain measures to avoid an immediate threat or disruption to the energy supply and to take the necessary measures to safeguard vital energy needs in the event of an immediate hazard or disturbance. On the basis of the EnSiG, the Regulation on the security of electricity supply in a supply crisis (Electricity Security Regulation – EltSV) was adopted, inter alia, in the electricity sector.

*Regulation on security of electricity supply in a supply crisis (Electricity Security Ordinance – EltSV)*

On the basis of the EnSiG, the Electricity Security Regulation (EltSV) authorises the electricity distribution provider acting in the event of a crisis to take measures at all stages of the energy value chain. It may, for example, issue orders to undertakings and consumers on the allocation, purchase and use of electrical energy. The EltSV is in force, but is not applied until another statutory ordinance establishes that there is a threat or disruption to the energy supply within the meaning of the EnSiG and that the EltSV applies.

*Regulation on the safeguarding of electricity supply (Electricitylast Distribution Regulation – EltLastV) and General Administrative Regulation on the Electricity Load Distribution Regulation (EltLastVwV)*

In the event of voltage and defence, special arrangements shall be applied to remedy or mitigate the consequences of a power supply disruption. If the Bundestag has identified the case of tension or defence, or has specifically approved such a measure, the Federal Government may, on the basis of the Economic Security Act (WiSiG), regulate the supply of electricity for defence purposes by means of a regulation. On the basis of the WiSiG, the Electricity Load Distribution Regulation (EltLastV) was adopted. EltLastV aims to maintain electricity supply in the event of voltage or defence through state management measures. In accordance with the General Administrative Regulation on electricity load distribution (EltLastVwV), it covers the entire production, distribution and use of electricity. Similarly to the EltSV, the EltLastV cannot be easily applied either. In order for the EltLastV to be applied, its applicability must be established by means of another statutory ordinance. Like the EltLastV, the EltSV also authorises the load distributor to take measures at all stages of the energy value chain.

*Measures to be taken in the event of energy shortages*

Transmission system operators shall have the responsibility for the security and reliability of the electricity supply system. If the relevant measures pursuant to Section 13(2) EnWG are

found by a transmission system operator to be insufficient to prevent a supply disruption to vital needs within the meaning of Section 1 of the EnSiG, the transmission system operator must immediately inform the regulatory authority, i.e. the Federal Network Agency. Where the energy supply is directly endangered or disturbed to meet vital energy needs and the threat or disruption of energy supply cannot be remedied by market-based measures, cannot be remedied in a timely manner or only by disproportionate means, the powers of the EnSiG shall apply.

### 3.3.ii. Regional cooperation in this area

#### **Gas**

##### *Risk groups*

With the entry into force of Regulation (EU) 2017/1938 concerning measures to safeguard the security of gas supply, a regional chapter shall be added to the national preventive action plans and emergency plans. These chapters are developed jointly by the EU Member States in so-called risk groups. Germany has taken over the Presidency for the Baltic Sea Risk Group and co-operates in a further six risk groups (Ukraine, Belarus, North East, L-gas, Denmark and North Sea (consisting of the former risk groups Norway and UK).

##### *Consultations Preventive Action Plan and Emergency Plan*

In the context of crisis preparedness under Regulation (EU) 2017/1938, in addition to the national risk analyses, the above-mentioned national preventive action plan and the national emergency plan for crisis preparedness are drawn up. These plans are consulted in Germany with the departments of the Federal Government, the competent authorities of the 16 German Länder and professional and sectoral associations. At European level, in accordance with Article 8(6) of Regulation (EU) 2017/1938, the competent authorities of all nine EU Member States directly or via Switzerland are consulted. There are also consultations with a further 15 EU Member States of the risk groups in which Germany is part, as well as with Switzerland and the United Kingdom.

##### *Crisis cooperation mechanisms*

In principle, the coordination of information flows between Member States at all three levels of crisis lies with the EU Commission. The BMWK is the central point of contact for the gas infrastructure-related Member States, the EU Commission and beyond, and ensures the flow of information.

Given the diversity of congestion situations and the need for responses based on comprehensive information, the fundamental and main concerns of risk groups are to ensure the flow of information between Member States and relevant stakeholders of the risk group in a crisis situation. The cooperation mechanism within the risk group shall be subject to coordination procedures between Member States, transmission system operators, regulatory authorities and other persons authorised to provide information at different crisis levels. The

aim is to provide the relevant information holders with detailed information on the reason for and impact of a crisis situation and to coordinate potential mutually agreed solutions to prevent or mitigate adverse effects of a supply crisis.

In general, transmission system operators cooperate closely with the TSOs of the other Member States of the group, in particular through the Regional Coordination System for Gas (ReCo), established by the Association of European Transmission System Operators for Gas (ENTSO-G) in accordance with Article 3(6) of Regulation (EU) 2017/1938. At Member State level, this exchange takes place within the framework of the Gas Coordination Group (GCG) pursuant to Article 4 of Regulation (EU) 2017/1938. If a supply shortage is foreseeable, TSOs contact TSOs in the other Member States belonging to the risk group. To the extent possible, they shall agree on cross-border coordination of measures, including the exchange of information on necessary market-based measures with cross-border implications.

The ReCo team shall be activated by the 24-hour deployment teams of transmission system operators and ENTSO-G. Following the meetings, ENTSO-G shall inform the Agency for the Cooperation of Energy Regulators (ACER) and the European Commission.

If the declaration of the emergency level has been necessary and has been followed, the load distribution frames of the Member States belonging to the risk groups are in close contact with each other and, in particular, are informed of the expected extent of necessary cross-border flow restrictions.

#### *Solidarity between Member States in an acute bottleneck situation*

Pursuant to Article 13 of Regulation (EU) 2017/1938, Germany is obliged to make gas available on a market-based and non-market-based basis ‘solidarically’ in a severe gas shortage situation to EU neighbouring countries, including Italy. At the same time, these Member States are also obliged vis-à-vis Germany.

In the unlikely event of a gas shortage and the associated performance of tasks with regard to the European obligations under Section 2a(2) EnSiG, the Federal Government will provide the gas responsible for the market area with the necessary financial resources under budgetary law, including, where appropriate, at short notice under the emergency authorisation right pursuant to Section 37 BHO. The Federal Government is aware that THE cannot enter into legal transactions within the meaning of Section 2a(2) EnSiG before these funds are made available, provided that they trigger a payment obligation.

The obligation to provide solidarity applies irrespective of a fundamentally financial procedural and technical understanding in bilateral solidarity agreements. To date (as of August 2023), Germany has Denmark (14. December 2020) and Austria (01. December 2021) bilateral solidarity agreements concluded in accordance with Article 13 of Regulation (EU) 2017/1938.

Germany has prepared and implemented all the processes so that its neighbouring countries, including Italy, which are infrastructurally connected with Germany, can request and

adequately manage gas solidarity in a situation of severe gas shortages. All EU neighbouring countries connected to Germany, including Italy, have been informed of how the application of the principle of solidarity under Article 13 of Regulation (EU) 2017/1938 will be implemented by Germany or how Germany will fulfil its solidarity obligations towards these EU Member States under Article 13 of Regulation (EU) 2017/1938. In addition, Germany has asked its neighbouring countries, including Italy, to communicate the technical requirements that Germany must fulfil in order for Germany to be able to request gas solidarity from its neighbours, including Italy.

## **Oil**

Germany's oil crisis preparedness is internationally embedded both within the European Union (EU) and supranationally within the International Energy Agency (IEA). The respective oil stockholding organisations are involved in the work of the relevant EU and IEA working groups.

*Cooperation in regional groups in the framework of trans-European energy networks (TEN-E regional groups) – Oil*

In the area of oil infrastructure, there is also an energy infrastructure corridor for oil under the TEN-E regional groups, the Oil Supply Connections in Central Eastern Europe (OSC), in which Germany is a member.

*Annual Coordinating Meeting Entities Stockholding (ACOMES)*

ACOMES organises oil stockholding associations. They exchange on a yearly basis on specific, technical issues and new developments.

## **Electricity**

As part of crisis preparedness, in addition to national structures, regional structures will become increasingly important in the future. In accordance with the Electricity Risk Preparedness Regulation, which entered into force on 4 July 2019, provisions are to be introduced for the first time at European level to support EU Member States in order to jointly ensure security of electricity supply, including in extreme situations (see chapter 2.3.i.).

*Cross-border consideration of security of supply in the electricity market*

Security of supply in the electricity market needs to be considered on a cross-border basis, as the individual electricity markets are highly interlinked. A purely country-by-country approach would not estimate the actual level of security of supply. In doing so, the assessment of security of supply should be based on probabilities. The Federal Government builds its analysis on the security of supply of electricity on such probabilities-based approaches and continuously develops the underlying methodologies. The desired target level will be set in order to assess the actual security of supply and to identify any necessary measures. The Federal Government is also exploring adapted approaches to identifying and assessing specific crisis scenarios,

which may require the use of strategic reserves for risk prevention and management.

*Pentalateral Energy Forum – Security of electricity supply*

On security of electricity supply, the TSOs of the Penta States have regularly published a joint regional security of supply report since 2015. It builds on the same methodology as the national report (see above) and the



European Mid-Term Adequacy Forecast. Member States also held a first joint crisis exercise in 2018 with the participation of TSOs, regulators and ministries in the region. This exercise aimed to prepare Member States for closer cooperation in line with the Electricity Risk Preparedness Regulation. For further details, see Chapter 3.4.

### **3.3.111. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds**

Electricity grids, together with reserves such as capacity and grid reserve or security readiness, make a significant contribution to the security of energy supply. Electricity grids and reserves are financed through network charges.

In the gas sector, security of supply is ensured by modern and well-developed transmission networks (see chapter 2.4.2.)

## **3.4. Dimension Internal energy market**

### **3.4.1. Electricity infrastructure**

3.4.1.1. Policies and measures to achieve the targeted level of interconnectivity as set out in point (d) of Article 4

#### **Electricity Network Development Plan (NEP)**

Under Section 12b EnWG, transmission system operators are required to submit a joint NEP every two years. In doing so, they shall identify any measures necessary for the secure and reliable operation of the system. The network development plan looks at both medium-term developments (the next 10-15 years) and long-term scenarios looking into 2045. The underlying assumptions are set out in the scenario framework under Section 12a EnWG. This includes assumptions for new exchanges of electricity with other countries. On this basis, the NEP will then also examine the construction of new interconnectors. A cost-benefit analysis shall be carried out as provided for in Article 4(d)(1) of the Governance Regulation. This will also ensure that:

Interconnections with neighbouring countries with large price differences tend to perform better.

The NEP is reviewed and confirmed by the Federal Network Agency. The network expansion measures can then be included in the Federal Needs Plan Act and thus become legally binding.

*Interconnectors included in the Energy Power Lines Expansion Act (EnLAG) and the Federal Requirements Plan Act (BBPIG)*

For the last time, the Federal Requirements Plan Act was amended in 2022 on the basis of the NEP 2021-2035. The current Federal Needs Plan Act already contains many interconnectors which contribute to achieving the electricity interconnection target. The following tables show all the interconnectors included in the Power Lines Expansion Act and the Federal Requirements Plan Act.

Table A4: Interconnectors that have already been realised:

Projects EnLAG/BBPIG	No. under	TYNDP No.	Commissioning	Europ. Current status
De-NL (Niederrhein/Wesel – NL Doetinchen)	EnLAG No 13	113/145	2018	
De-PL (Uckermark Line, Section Vierraden – Krajnik)*	EnLAG No 3		2018	
De-DK (central axis; Kassø – Hamburg Nord – Dollern)	EnLAG No 1	39, 251	2020	
De-DK (Kriegers Flak Combined Grid Solution, P64)	BBPIG No 29	36/141	2020	
De-BE (ALEGrO Oberzier – BE border, P65)	BBPIG No 30	92	2020	
De-NO (NordLink, Wilster – South Norway)	BBPIG No 33	37	2021	.
De-DK (West Coastal Line Niebüll – DK border, P25)	BBPIG No 8	183	2023 (N)	(E)

\*Total entry into service in 2024 (Neuenhagen – Bertikov/Vierraden – Krajnik)

Table A5: Other interconnectors with scheduled commissioning by 2030:

EnLAG/BBPIG project	No. under	TYNDP No.	Target date according to doc	Europ. Current status <sup>a</sup>
De-SE (HansaPowerBridge, Güstrow – Sweden)	BBPIG No 69	176.995	2026 (currently postponed by SE)	
De-GB (NeuConnect, Fedderwarden – United Kingdom)	BBPIG No 70	309	2026	
De-FR (Eichstetten – Federal border FR)	BBPIG No 72	228	2026	
De-LU (Rural district of Trier-Saarburg – Bofferdange)	BBPIG No 71	328	2027	
De-AT (Altheim – Federal Border AT, Pleinting – Federal Border AT, Simbach – Federal Border AT)	BBPIG No 32	313	2027/30	PCI 3.1.1
De-FR (Uchtelfang – Ensdorf – Federal border)	BBPIG No 97	244	2030	
De-AT (point Neuravensburg – Federal border AT)	BBPIG No 40	3.221.477	2030	

Table A6: Other interconnectors with scheduled commissioning after 2030:

EnLAG/BBPIG project	No. under	TYNDP No.	Target date according to doc	Europ. Current status <sup>a</sup>
De-NL (Emden East – Eemshaven)	BBPIG No 86	1047	2034	
De-BE (Dahlem – Federal border)	BBPIG No 95	225	2035	
De-CH (Waldshut-Tiengen – Federal border)	BBPIG No 99	231	open	
De-PL (Eisenhüttenstadt – Baczyzna)	EnLAG No 12	229/230	open (reserved by PL)	
De-SE (HansaPowerBridge II, Sanitz/Gnewitz/Dettmannsdorf/Marlow – Sweden)	BBPIG No 83	2.671.262	open (reserved by SE)	

The current NEP looks into 2045 for the first time and represents an even higher level of ambition. Accordingly, additional network expansion measures will be added, which will further increase the level of interconnectivity.

#### 3.4.1.11. Regional cooperation in this area

Regional cooperation projects and cooperation extend beyond the field of electricity infrastructure and are presented in chapter 3.4.2.ii for chapter 3.4. on the internal energy market dimension.

3.4.1.111. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

The financing measures at national level and through Union funds are summarised in chapter 3.4.2.iii.

### **3.4.2. Energy transmission infrastructure**

3.4.2.1. Policies and measures related to the elements set out in point 2.4.2, including, where applicable, specific measures to enable the delivery of Projects of Common Interest (PCIs) and other key infrastructure projects

#### **Monitoring and control of grid expansion projects for electricity**

Since the beginning of 2016, the Federal Network Agency has prepared and published quarterly monitoring of the individual EnLAG and BBPIG projects and the connection lines of wind farms at sea ([www.netzausbau.de](http://www.netzausbau.de)). This will allow the public to be informed at any time about the progress of network roll-out. Since 2019, the BMWK network expansion control has been in place for onshore projects. It complements the existing network development monitoring at the Federal Network Agency. In 2020, BMWK-Controlling was extended to offshore projects. As part of the network expansion of control, the project promoters and competent licensing authorities inform the BMWK on a quarterly basis about the state of play and the planning of the individual projects. In addition, individual discussions take place, in particular on the HVDC projects, which are supplemented by regular, ad hoc discussions on the further federal, regional and offshore projects. [www.netzausbau.de](http://www.netzausbau.de)

#### **Faster expansion of electricity grids**

Numerous legislative and non-legislative measures have been taken in recent years to speed up the expansion of the electricity grid.

##### *Adjustments to the regulatory framework under the emergency energy package*

As part of the energy emergency measures package, in 2022 the possibilities for abandoning federal planning were broadened through a greater concentration of projects and the development of ‘preferential areas’. Greater bundling has also reduced the number of alternatives to be examined. In addition, the application documents have been simplified in federal technical planning and the conference on applications in federal planning can now be dispensed with. The requirement for local authorities to test overhead cables for DC projects has been abolished and the electronic design of documents in NABEG procedures has been consolidated. Toleration orders for preparatory works and their enforceability, as well as the authorisation and enforceability of the early start of construction have been simplified.

##### *Adjustments to the legal framework under the Energy Security Act*

With the Act amending the Energy Security Act and other energy regulations, further measures have been taken to accelerate grid expansion. In particular, the approval of the premature start of construction has been further improved, the notification procedure for conversion, enforcement and near-site mast changes has been extended, and isolated planning approval for ancillary installations has been made possible;

Discussion dates are now at the discretion of the Authority.

### *EU Emergency Permit Regulation*

Further acceleration was achieved with the EU Emergency Permit Regulation. In particular, the implementing rules for Article 6 speed up the procedures for the development of electricity grids. The transposition decided in the amending law on the ROG and other provisions makes it possible, for a limited period, to dispense with an environmental impact assessment and an assessment under species protection law if the network expansion projects in:

Areas for which a Strategic Environmental Assessment has been carried out.

### *Looking ahead to legislative changes*

Further adaptation of the legal framework is currently planned with the Act adapting energy management legislation to EU law and amending other energy legislation.

### *Best practice exchange*

On behalf of the BMWK, a ‘Practical Guide to Network Development’ (<https://www.bmwk.de/Redaktion/DE/Publikationen/Energie/praxisguide-Network-extension.html>) was prepared and published in October 2021. It contains more than 100 practical recommendations for action. The aim of the guide is to provide best practice examples to permit-granting authorities and project promoters of how to speed up and optimise network deployment. Recommendations on project management, resource management, public participation, approval and project implementation. In addition, the BMWK has already invited three best practice forums to present the findings gathered in the Practical Guide and to discuss selected topics in depth. In particular, the best practice forums are also intended to enable exchanges of experience and knowledge transfer at technical level between the relevant licensing authorities, the Federal Network Agency and the project promoters. Both are intended to contribute to making the authorisation and implementation of network development projects more efficient.

### *Reduction of audit scope and depth*

In addition, the BMWK, the Federal Network Agency and the transmission system operators are in close dialogue with a view to reducing the audit scope and depth of the approval process, while respecting the legal requirements, thereby reducing the length of the procedure. In this context, the planning and approval process should take greater account of the objectives of the fastest, economic and linear network deployment.

### **Optimisation and modernisation of the existing network**

Network operators are obliged to operate, optimise, reinforce and develop the electricity grid as required. Based on the so-called NOVA principle, optimisation takes precedence over grid reinforcement and expansion. In order to optimise existing grids, various measures are planned to increase the transmission capacity of the existing electricity grids. This includes, inter alia, the comprehensive roll-out of overhead line monitoring (temperature measurement allows for higher transmission capacity of the lines depending

on weather); Use of high temperature conductor ropes; short-term interim measures (in particular phase shifters for targeted flow management, temporary elevation load); the optimisation of redispatching processes and the introduction/development of modern, digital technologies and systems management concepts. In 2023, the Network Optimisation Action Plan will identify ad hoc measures to consistently increase congestion and optimise network infrastructure.

### **Secure electricity grid operation with 100 % renewable energy**

In addition to the rapid expansion of renewables and electricity grids, stable grid operation is essential for the further success of the energy transition towards a climate-neutral electricity system. The Roadmap System Stability, a mandate from the coalition agreement, aims to develop a roadmap for safe and robust system operation with 100 % renewables and to identify, plan and implement necessary and appropriate measures at an early stage. The process of developing the Roadmap for System Stability has been ongoing since autumn 2022. The publication is scheduled for the end of 2023. Once published, the roadmap measures will be implemented and monitored.

### **Price incentives and incentive regulation**

The aim of incentive regulation is to encourage network operators to behave in a similar way to competition and to prevent too high returns (“monopoly returns”). The regulatory framework provides that network operators can only refinance costs through network charges that would result from the efficient operation of the networks. The incentive regulation is thus aimed at cost-effectiveness of electricity and gas operators as monopoly providers and at limiting network costs in:

Interest from all industrial, commercial and private customers. The costs of each network operator are checked for ‘efficiency’ every five years (so-called efficiency comparison). It is a total cost benchmark that includes capital and operating costs alike. For a period of five years (regulatory period), a specific budget is then made available to network operators for the performance of tasks (receipt cap). If network operators exceed the efficiency targets, they may retain the additional revenues for the duration of the current regulatory period. The possibility of further economic incentives for network operators to encourage faster grid expansion and to promote the optimisation and modernisation of the electricity grid is currently being explored. For example, congestion management costs have so far not been subject to an efficiency comparison as permanently uninfluenced costs, so there is no explicit economic incentive to minimise congestion costs. Against this background, alternatives to the treatment of congestion management costs will be explored in order to make the costs of congestion management partly subject to an incentive instrument, where appropriate.

### **Network Development Plan (NEP) – Gas**

Under Section 15a of the EnWG, the TSOs are required to draw up the NEP together over a two-year period. It shall include all the effective measures necessary to optimise, reinforce and develop the system in line with needs and to ensure security of supply over the next ten years in order to ensure secure and reliable system operation. The DSOs provide the necessary information for this purpose, cf. Section 15a(4) EnWG. In accordance with the fourth sentence of Section 15a(1) EnWG, assumptions about possible disruptions to security of supply are also taken into account in the preparation of the NEP Gas. Following an assessment by BNetzA, this plan becomes binding on TSOs.

## **Monitoring of gas grid development projects**

With regard to the development of the gas transmission infrastructure, § 15b EnWG the obligation of Transmission system operators to prepare an implementation report in each odd calendar year and for the first time by 1 April 2017. This report shall provide information on the state of implementation of the latest published NEP and, in the case of delays in implementation of individual projects included in the NEP, the underlying reasons and possible impacts, e.g. in terms of capacity provision. BNetzA shall review and publish the implementation report and give all actual and potential network users the opportunity to comment. The results of this consultation will also be published by BNetzA and may feed into guidance for the next NEP process or other regulatory processes.

### 3.4.2.11. Regional cooperation in this area

#### **Pentalateral Energy Forum – Internal Energy Market**

The aim of the Pentalateral Energy Forum is to achieve closer interconnection of the electricity markets of the participating countries, test and implement new forms of cooperation, thus gaining experience in cross-border cooperation. Germany participates in the preparation of the regional security of supply report (see also chapter 3.3.i.).

#### **Electricity Neighbours**

As the name suggests, this cooperation covers all the neighbouring countries of the Federal Republic of Germany, as well as Norway and Sweden. It has been in place since 2014 and focuses on making electricity markets more flexible. It also serves to inform electricity neighbours about developments in Germany and to involve them in the national debate on the energy transition.

#### **Cooperation in regional groups in the framework of Transeuropean Networks Energy (TEN-E regional groups) – Internal electricity market**

For electricity infrastructure, there are four priority energy infrastructure corridors under the TEN-E regional groups, in which Germany is listed as the Member State concerned and thus a member of the relevant regional group. These include North Seas offshore grid (NSOG), North-south electricity interconnections in western Europe (NSI West Electricity), North-South electricity interconnections in central eastern and south eastern Europe (NSI East Electricity) and Baltic Energy Market Interconnection Plan in electricity (BEMIP Electricity, which should be distinguished from the BEMIP Cooperation Forum in Chapter 1.4.).

### 3.4.2.111. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

Investment in the expansion, reinforcement and optimisation of transmission networks is not only important for Germany's energy transition. They are also crucial to advance the European single market. The refinancing of these costs is governed by the incentive regulation and the Electricity Network Charges Regulation. There is a separate refinancing instrument for significant extension and restructuring investments in the transmission system with the instrument of the investment measure. Certain PCI projects may apply for financial support from the Connecting Europe Facility (CEF) for construction projects and

studies to prepare them. In the past, the German electricity grid projects “SuedLink” and “SuedOstLink” have received CEF funding.

### **3.4.3. Market integration**

#### 3.4.3.1. Policies and measures related to the elements set out in point 2.4.3

##### **Market integration measures**

Gradual reduction and phasing out of coal-fired electricity generation on the basis of the KVBG (up to 2038) and the law on accelerating the phase-out of lignite in the Rhine basin

A gradual reduction and phasing out of coal-fired electricity generation in Germany is foreseen. To this end, the ‘Law on the reduction and termination of coal-fired electricity generation and amending other laws’ (the Coal Exit Act) entered into force in August 2020. The Coal Exit Act implements the Commission’s energy policy recommendations on growth, structural change and employment. It includes provisions to reduce and end coal and lignite-fired electricity generation by 2038 at the latest, to continuously review security of supply, to cancel carbon allowances released and an adjustment allowance for older workers in the coal sector.

The main component of the Coal Exit Act (Mantel Act) is the Coal Power Generation Determination Act (KVBG), which regulates the gradual reduction of coal-fired electricity generation with fixed target dates in 2022 (both 15 GW of coal, lignite), 2030 (8 GW of coal, 9 GW of lignite) and 2038 (0 GW). Coal-fired electricity generation is reduced first by tendering procedures and then by statutory requirements. Lignite-fired electricity generation will be reduced by 2038 at the latest by means of a legally binding decommissioning path for lignite-fired power plants.

The law on accelerating the phase-out of lignite in the Rhine basin accelerated the phase-out of lignite in the Rhine basin by about 8 years and brought forward from 2028 to 2030. The law on accelerating the phase-out of lignite in the Rhine basin entered into force in December 2022.

##### **Sector coupling**

Sector coupling, i.e. the efficient, direct and indirect use of renewable electricity, will be promoted to replace fossil fuels in the heating, industry and transport sectors. The coupling or electrification of the sectors leads to a sharp increase in electricity demand in Germany (cf. 2.3.i.). Therefore, in addition to a sufficient supply of RES-E, stable and well-developed transmission and distribution networks are an important prerequisite for successful sector coupling. It also creates a level playing field that leaves it up to the market to determine which technologies will eventually prevail and thus be used. Innovation will be stimulated and modern technologies brought to the market. Ideally, efficient sector coupling and thus CO<sub>2</sub> reduction would be made possible mainly by market driven and without lock-in effects via price signals. For sector coupling to make a significant contribution to achieving climate neutrality by 2045, in addition to the necessary transport capacity for electricity at transmission and distribution level, high-speed generation capacity needs to be further developed.

##### **Action plan to reduce network congestion**



Based on Article 15 of the European Electricity Market Regulation, Germany submitted the ‘Bidding Zone Action Plan’ on 28 December 2019 in order to address structural grid bottlenecks. This plan represents the planned linear increase of the capacity available for cross-bidder electricity trading (minRAM) to 70 % by 31 December 2025. For 2022, the applicable minimum value in the CORE region (see section 3.4.3.i) was 31 %. The transmission system operators (TSOs) concerned are required to carry out an annual review of compliance with minRAM requirements. The TSOs’ report to implement this confirms that the requirements were complied with in 2022. Failures to comply with the minimum values were necessary in a few hours to ensure system safety and are therefore in line with the Electricity Market Regulation.

In addition, the Action Plan defines national measures to accelerate grid expansion (e.g. through shortened permitting procedures), to increase electricity transmission capacity (e.g. through weather-dependent overhead line operation), to improve congestion management (e.g. by integrating RES and CHP installations in redispatching) and to strengthen cross-border trade (e.g. through cross-border redispatching). Germany is also striving to step up existing cooperation with neighbouring countries and to initiate further cooperation projects.

### **Cross-border measures in the action plan to reduce network congestion**

Many measures that have a positive effect on network congestion can only be implemented jointly with neighbouring countries, for example because they require joint coordinated action. One example is the optimisation of cross-border redispatching, which can only be done jointly with neighbours. Recent studies by Consentec and IFHT show that optimising cross-border redispatching can significantly reduce redispatching costs for the whole region and contributes to meeting European electricity trading requirements. There are grid bottlenecks within the European electricity grids, which cannot be solved effectively with purely national measures. This is why Germany is already cooperating with many neighbouring countries on redispatching. These mostly bilateral co-operations will be complemented by further cooperation. In the medium term, cross-border redispatching will be optimised throughout the region. For this purpose, TSOs are currently developing a methodology, which is then to be approved by the national regulatory authorities. In order to bridge the gap, existing redispatching cooperation will be continued and, where possible, expanded.

### **Measures to improve market coupling**

#### *Creation of a Central and Eastern European Capacity Calculation Region (CORE)*

As a result of a decision of the Agency for the Cooperation of Energy Regulators (ACER) of November 2016, the Core region’s live-serving was the same on 8 June 2022. central and Eastern Europe Capacity calculation region created. This includes a total of 13 countries: Austria, Belgium, Croatia, Czechia, France, Germany, Hungary, Luxembourg, the Netherlands, Poland, Romania, Slovakia and Slovenia. The flow-based market coupling (FBMC), which uses an algorithm based on day-ahead electricity trading and a network model, makes it possible to make much more efficient use of scarce transmission capacity between bidding zones. This also strengthens the integration of renewable energy into the internal electricity market. In the next step, the introduction of flow-based market coupling will also be envisaged for intra-day electricity trading.

#### *Platform Climate Neutral Electricity System (PKNS)*

In the coalition agreement of the governing parties, the ‘PKNS Platform’ was designed as a process with broad involvement of stakeholders from the political, business, academic and civil society sectors to develop approaches to electricity market design in a largely climate neutral electricity system. In a joint process, solutions are identified, assessed against criteria and targeted concrete measures for medium- and long-term design. Federal Minister Robert Habeck opened the process with a plenary session on 20 February 2023. Since then, in addition to other plenary sessions, working groups have regularly held meetings on the four themes “Securing the financing of renewable energy”, “Developing and integrating flexibility options”, “Financing taxable residual capacity” and “Local signals in electricity markets”. In early August, the Registry published the first report entitled ‘Report on the Platform’s work on a climate-neutral electricity system (PKNS)’. A second report is planned to be published in winter 2023/24.

### *Coupling intra-day electricity trading*

In addition to the cross-border day-ahead market, the importance of cross-border intraday trade is also growing. Two parallel processes to optimise intraday trading capacity support this process: firstly, the so-called XBID (Cross-Border Intra-Day) project, which, since June 2018, connects intraday markets in northern, western and southern Europe, initially on the basis of conventional capacity allocation. Work is also ongoing to extend this market coupling towards Eastern Europe. On the other hand, the extension of flow-based market coupling to intraday trading. Both measures will help cross-border electricity markets to exchange flexibilities in the short term, i.e. close to real-time, in order to jointly respond to short-term changes in generation and demand.

### *System development strategy*

An efficient energy infrastructure requires coordinated planning in the various sectors (electricity, gas and future hydrogen). In this context, the BMWK draws up a system development strategy that addresses key issues relating to the decarbonisation of all sectors and thus develops an overall picture of the future requirements for the various energy infrastructures. In terms of infrastructure planning, the system development strategy can thus provide guidance to guide all processes. This will ensure efficient and consistent planning in electricity, gas and hydrogen.

3.4.3.11. 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, mechanisms for dispatching, re-dispatching and curtailment, real-time price signals, including the roll-out of intraday market coupling and cross-border balancing markets

### **Further integrate and make European electricity markets more flexible**

A European electricity system helps respond to both increasingly flexible production and fluctuating consumption, thus reducing the overall cost of electricity production and the need for capacity. One step that will further support the integration of European electricity markets is the planned implementation of flow-based market coupling in the intraday market within the CORE region (details on flow-based market coupling and the CORE region are presented in section 3.4.3.i). In addition, the Network Code Capacity Allocation and Congestion Management (NC CACM) establishes a methodology for coordinated cross-border redispatching. There are also currently two new NCs in the design phase. The Cyber Security NC aims to define a European harmonised cyber security standard for cross-border electricity flows. The NC

Demand Response aims to shape the participation of flexibility providers in European electricity markets.

### **Optimisation measures around redispatching**

For an increasing share of renewable energy in electricity generation and for progressive sector coupling, the question of how the interplay between the electricity market and the electricity grid can be organised in such a way that the whole system can operate safely and cost-effectively becomes increasingly important. The measures currently envisaged include:

- Increased utilisation of the existing network to increase the transport capacity of the networks (see 3.4.2.i).
- The more efficient organisation of redispatching with a view to gradually transforming today's feed-in management into a predictable process with balance sheet and energy balance has been implemented by law. Objective of introducing redispatching

2.0 is an increase in efficiency through an overall optimisation of the redispatch system across networks. The innovations brought about by Redispatch 2.0 include targeted forward planning of network congestion management, the inclusion of all generation potential  $\geq 100$  kW, the equal treatment of RES installations in balance sheet compensation, and a feed-in priority for RES installations, which is specified by means of minimum factors. This step is also intended to respond to the shift of production from the transmission system level to the distribution grid level in the context of the development of renewable energy. Network operators are currently implementing the requirements in practice. Cross-border redispatching will be transferred to a European regime to strengthen cross-border trade (see also 3.4.3.i.).

### **National Flexibility Check on Flexibility Barriers and Identification of Flexibility Potentials**

Currently, there are still rules that make flexible behaviour on the part of market players more difficult, so-called barriers to flexibility. If all technologies are to have equal market access, this means removing these barriers to flexibility. It is particularly cost-effective if the various options for flexibility – extended electricity grids, flexible power plants and consumers, storage, electricity exchanges with European neighbours – compete against each other. It is not intended to favour certain technologies by means of one-sided support or exceptions. This can be better decided by the market. The 'Platform for Climate-Neutral Electricity System' (see chapter 3.4.3.i) discusses with stakeholders the barriers and potential to develop and integrate flexibility options in order to develop the necessary framework to ensure that electricity demand is increasingly driven by electricity supply and the barriers can be addressed.

3.4.3.iii. Where applicable, measures to ensure the non-discriminatory participation of renewable energy, demand response and storage, including via aggregation, in all energy markets

### **Implement the concept of “benefit rather than regulate”**

In order to make the German electricity system largely climate neutral by 2035, every unit of green electricity should be consumed, wherever possible, rather than being unused. Strict phasing-out of RES installations must be avoided. Therefore, German law provides for rules on 'benefit rather than abs': Under Section 13(6a) EnWG, CHP plants already undertake to reduce the supply of CHP electricity to the

transmission system operators when there is a shortage in the transmission system and to produce the heat required by a power-to-heat (PtH) plant. This will relieve the grid congestion and avoid regulating electricity from renewable energy sources to the extent of the CHP feed-in reduction and the additional consumption of the PtH installation. This creates a double relief hub on network congestion. This also increases the flexibility of the overall system as a result of the fact that CHP installations equipped with electric heat generators can act flexibly as suppliers and customers not only at the service of network operators but also regularly on the electricity market.

In addition, in order to use green electricity, which cannot be transported off in individual hours of the year due to network congestion, in future for green added value on the ground rather than regulating it, it is intended to supplement the current legal provision with ‘benefit rather than regulating’.

3.4.3.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

In Germany, competition among suppliers in the energy retail sector is high. The number of players in the German electricity market is already as many players in the EU as barely anywhere else. According to the Federal Cartel Office’s 2022 market power report, only RWE clearly exceeded the presumption of dominance. LEAG and EnBW are approaching this threshold.

The number of electricity and gas suppliers in Germany has steadily increased in recent years. In 2021, over 1400 electricity suppliers and over 1000 gas suppliers were active on the German retail market. In addition, retail prices for electricity and gas are not regulated by the State. They are freely formed on a competitive basis. In most distribution network areas, more than 100 different suppliers offer supplies to household customers. Competitive price formation and market liberalisation should remain the basis for maintaining the high level of competitiveness in the electricity and gas retail markets.

### **Welfare of the Energy consumer and Competitiveness/market integration national and European**

Germany has a wide range of consumer protection measures in place. Examples include the existing transparency requirements. It is also worth mentioning here the possibility for consumers to seek out-of-court settlement of disputes concerning the connection to the grid, the supply of energy and the measurement of energy. The conciliation procedure, which is usually free of charge for consumers;

to which the

Energy supply companies are obliged to participate (pay) if they do not last more than three months and end with a recommendation from the conciliator. Although the conciliation recommendation is not binding, many suppliers comply with it. With the Market Guarder Energie, the Federal Association of Consumer Centres and the Consumer Centres specifically monitors the energy market from the point of view of consumers. An overall picture can thus be made up of individual complaints. This helps consumer protectors to detect wrong developments at an early stage and to alert them in good time to avoid harm to consumers. In doing so, the market monitor also contributes to a cost-effective and socially fair energy transition for consumers. The Electricity Market Directive has introduced a wide range of measures to protect consumers and strengthen consumer rights. These aim in particular at increasing transparency for consumers and include, inter alia, additional, under-year, free billing information, minimum requirements.

for

Billing and billing information or introducing standards for electricity comparison portals. Germany has transposed the measures into national law if they did not already exist at national level.

### **Concept of primary and replacement services**

The existing concept of universal and substitute supply also serves to protect household customers. This shall ensure that, in principle, every household customer has a legal right to be supplied with electricity or natural gas by the basic supplier in accordance with its published general conditions and general prices. This is done by means of a unilateral obligation to contract to the detriment of the respective subject to basic pension obligations

Energy utilities within the limits of economic reasonableness. For example, the law restricts the right of the basic supplier to immediately interrupt delivery in the event of late payment or to dissolve himself from the customer. There is also no minimum contractual duration for the provision of basic services; it can be terminated at any time and without reason for the customer at short notice.

### **Modification of the distance allowance for distance commuters**

Commuters who have to travel a long journey, especially in rural areas, often cannot rely on a developed local public transport service, nor are sufficient charging infrastructure and vehicles with a corresponding range available to switch to e-mobility in the short term. This will change in the coming years. For this reason, the flat-rate commuter allowance was increased to 35 cents from 2021 onwards from the 21st km onwards and again from 2022 to 38 cents temporarily until 31 December 2026.

### **Changes to housing benefit, tenancy law and energy legislation**

In order to avoid social hardship with rising heating costs, the housing benefit recipients will be supported by an increase in housing benefits as a result of the 2020 climate protection programme. The housing benefit CO<sub>2</sub> component, which entered into force in 2021, is a supplement to the rent to be taken into account and results in a higher housing benefit calculation. In addition, the law on the allocation of carbon dioxide costs created a fair distribution of CO<sub>2</sub> – costs between tenants and landlords – according to their influence on the energy consumption of the building. This leads to a double incentive effect: For tenants on energy-efficient behaviour and for landlords to invest in climate-friendly heating systems or energy renovations. The Act entered into force on 1 January 2023 and applies to new billing periods of heating and hot water costs starting from 1 January 2023.

With the entry into force of the Housing Allowance Plus Act on 1 January 2023, the Federal Government has also implemented the largest revision of the Housing Allowance Act (WoGG). The Federal Government has thus created the legal basis for targeted relief from higher housing and heating costs for lower income households in Germany. The reform focuses on increasing the entitlement to housing benefits and expanding the range of beneficiaries of housing benefits through the introduction of a heating cost component, a climate component and an increase in the general level of benefits. The climate component of the housing benefit (addition to the maximum rent of EUR 0.40 per square metre) acts as a low-bureaucratic cushion against higher rents in the energy-efficient housing stock and new buildings. As a result of the Housing Benefit Plus reform, the average housing benefit of previous recipient households is more than doubled from around EUR 180 to around EUR 370 per month, while the number of housing

benefit households increases from around 600.000 to around 2 million.

## **Transfers**

Increased energy costs are already taken into account in the transfers according to the established procedures. In the case of subsistence schemes under SGB II and SGB XII, this means that adequate expenditure on heating energy does not result in unreasonably high costs due to rising prices per unit of quantity. Changes in the prices of household electricity are taken into account when determining the level of standard flat-rate requirements and then in the annual updates.

## **Accompanying structural measures related to the gradual reduction and phasing out of coal-fired electricity generation**

The Federal Climate Protection Act provides for a reduction in German greenhouse gas emissions by 65 % by 2030 compared to 1990 emissions. The phase-out of the thermal recovery of coal (mainly lignite) makes a substantial contribution to achieving these objectives. However, the phase-out of coal poses structural challenges to lignite (and the location of coal-fired power plants). In order to actively shape structural change in these regions, the Bundestag, with the consent of the Bundesrat, adopted the Coal Regions Structural Reinforcement Act in August 2020. As part of the Act, the new Stick Act on the Investment of Coal Regions (InvKG) entered into force on 14 August 2020. In doing so, the Federal Government supports the regions affected by the phasing out of coal in managing structural change. This concerns both lignite regions and coal-fired power stations. The so-called first pillar of the InvKG includes federal financial assistance for particularly important investments by the Länder and their municipalities and associations of municipalities in lignite areas (see Chapter 1 InvKG). Project selection and implementation are the responsibility of the Länder. A total of up to EUR 14 billion is available to the countries by 2038. The second pillar of the InvKG includes measures under the responsibility of the Federal Government (see Chapters 3 and 4 of the InvKG). This will support lignite regions with up to EUR 26 billion until 2038.

The measures of the InvKG include, inter alia, the extension and establishment of federal programmes and initiatives (see Section 17 of the InvKG), the STARK Federal Programme (cf. Section 15 of the InvKG), the location of federal facilities in the territories (cf. Section 18 of the InvKG) and additional investments in federal trunk roads/railways (see Chapter 4 InvKG). The purpose of the newly created STARK Federal Programme is to support non-investment projects in the assisted areas of the InvKG. In Section 18 of the InvKG, the Federal Government undertakes to create at least 5000 new additional jobs by 31 December 2028 in federal authorities and other bodies in the coal regions.

In order to ensure optimum interaction between the measures of the Federal Government and the lignite states, the InvKG provides for the creation of a Federal-Länder coordination body (BLKG). Since August 2020, it has been monitoring and supporting the Federal Government and the governments of the Länder in the implementation and implementation of the measures, in particular through its recommendations (§ 25(1), sentence 2-5 InvKG). This is to ensure that the money only finances projects that are highly effective in the light of the funding objectives of the InvKG. The BLKG also plays an important coordinating role on the federal side. Thus, measures under Chapters 3 and 4 of the InvKG are not included in the federal financial planning until they have been adopted by the BLKG. On 10 August 2021, the hard coal administrative agreement for the structural aid for the locations of coal-fired power plants and the former Helmstedt lignite mine (see Chapter 2 of the InvKG) entered into force. In total, structural aid of up to EUR

1.09 billion is available to the countries concerned in this context until 2038 at the latest. The Free State of Thuringia will receive up to EUR 90 million from the funds for the Central German Revier for the former lignite-mining area of Altenburger Land.

The term ‘structural aid’ covers both federal financial assistance for particularly important investments by the Länder and their municipalities and associations of municipalities and other federal measures to promote structural change. With the administrative agreement for structural support, the countries concerned have essentially opted for the financial assistance. Project selection and implementation are also the responsibility of the Länder.

**3.4.3.** v. Description of measures to enable and develop demand response, including those addressing tariffs to support dynamic pricing

### **Dynamic electricity pricing contracts and smart meters**

Under the Electricity Market Directive, electricity suppliers should be able to offer dynamic electricity price contracts.

The 2021 amendment to the EnWG transposed into German law the provisions of EU law on electricity supply contracts with dynamic tariffs. In Germany, under Section 41a(1) of the EnWG, suppliers must, where technically and economically feasible, offer a tariff for the final consumption of electricity which provides an incentive to save energy or control energy consumption.

The provision in Section 41a(2) EnWG, most recently further developed with the Act on the Relaunch of the Digitalisation of the Energy Transition, Article 1 of the Act of 22 May 2023, BGBl. 2023 I No 133), applies specifically to customers with a smart metering system. According to that provision, all electricity suppliers – irrespective of the number of customers – will now be obliged to offer dynamic tariffs to their customers using smart metering systems from 2025 onwards. Currently, only suppliers supplying more than 100.000 end consumers are required to offer a dynamic electricity tariff to their customers using smart metering systems. This requirement is accompanied by the improved data base for network operators and market players, also introduced by the GNDEW, in particular in the form of quarter-hour values and improved monitoring of the state of the network.

At the same time, the roll-out of smart metering systems will be significantly accelerated and de-bureaucratised. In particular, a legal roll-out roadmap with binding targets and a concrete timeframe has been established; the requirement for market analysis and market declaration by the Federal Office for Information Security (BSI) is not applicable.

### **Establishment of a register of market master data**

The market master data register of the Federal Network Agency became operational at the beginning of 2019. The register collects the master data of all installations providing wired energy supply in the electricity and gas markets in Germany and by market actors and stored in a single online database. To the extent permitted by data protection legislation, the stored data are available on the internet at [www.martstammdatenregister.de](http://www.martstammdatenregister.de).

## **Speeding up and de-bureaucratising the rollout of smart metering systems, consistent development towards smart grids**

Consistent digitalisation is more important than ever for the Federal Government's climate and energy transition objectives. The massive expansion of renewable energies and the increasing sector coupling in the areas of mobility and heat require increased digitalisation. The transformation of Germany's energy system towards more renewable energy sources increases the requirements for secure and efficient operation of the grid. In the future, electricity generators and consumers will be connected and communicated digitally via a smart grid. A high level of resilience and cybersecurity, synergies and maximum system benefits through a platform approach are the strengths of the smart meter gateway (SMGW).

In Germany, since 2016, the metering station operation law (MsbG) has been the legal framework for the installation and operation of smart metering systems ("Smart Meter"). The MsbG requires the roll-out of certified devices with a certificate issued by the Federal Office for Information Security (BSI), which guarantees IT security and privacy by design. Currently, four (fifth certification procedures are currently completed) smart metergateway manufacturers have successfully passed all certifications. In order to maximise benefits, the MsbG standardises the smart meter gateway as a communication platform for many use cases (smart metering, smart grid, smart mobility, smart home, smart services) through extensive protection profiles and technical guidelines. The technical standards are continuously evolving in line with the requirements of the energy transition.

With the Act relaunching the digitalisation of the energy transition (GNDEW – entry into force on 27 May 2023) (BGBl. 2023 I No 133), in particular, the MsbG has been amended and the installation of smart meters is now becoming less bureaucratic and easier. In future, the Federal Office for Information Security (BSI) will no longer need to clear the smart meter rollout. The focus here is on the safe taxation and switching of installations and flexible consumption facilities by network operators and market actors via SMGW, which will be made widely available from 2025 onwards. Network operators and market actors also obtain the necessary data for a renewable energy system by means of grid condition data and quarterly-hour metering.

Only an efficient roll-out based on a cost-benefit assessment is allowed: Statutory price caps ensure acceptance and cost-effectiveness. The direct costs (measuring charges) for consumers and small plant operators have been significantly reduced by the GNDEW by capping the cost of a smart metering system to EUR 20 per year (corresponding to the current price cap for the modern metering equipment). At the same time, network operators will be more involved in bearing the costs. The cost-benefit assessment will be updated by the BMWK by 30 June 2024 as part of its reporting obligations under Section 48 of the MsbG.

### **3.4.4. Energy poverty**

3.4.4.1. Where applicable, policies and measures to achieve the objectives set out in point 2.4.4

The Federal Government takes a comprehensive approach to poverty reduction, which does not focus on individual demand elements, such as energy. Costs incurred by households in purchasing energy are taken into account in the same way as other elements of vital need. The existing legal arrangements include both



financial support for those in need over a longer period of time and in specific emergency situations, such as in the event of a supply disruption (see chapter 2.4.4).

### 3.5. Dimension Research, innovation and competitiveness

#### 3.5.1. Policies and measures related to the elements set out in point 2.5

#### **7. Federal Government Energy Research Programme**

The 7th The Federal Government's Energy Research Programme was adopted by the Federal Cabinet in September 2018. It provides the framework for the energy research activities of BMWK, BMBF, BMUV and BMEL. The 7th Energy research programme is the result of an extensive, upstream consultation process with stakeholders from academia, business and civil society.

The 7th Energy research programme covers the following main themes:

- Energy transition in the consumption sectors: Buildings and neighbourhoods, industry, commerce, trade and services, mobility and transport. According to the 'Efficiency First', project funding focuses here on the efficient use of energy and consumption reduction.
- Energy production: In addition to the main topics of wind and solar energy, other renewable energy generation technologies and thermal power plants play an important role.
- System integration: The focus here is on networks, storage and sector coupling.
- Cross-system research topics: These include energy system analysis, energy-related aspects of digitalisation, resource efficiency, CO<sub>2</sub> technologies and materials research, and societal aspects.
- Nuclear safety research is taking place in the context of the phase-out of nuclear energy for electricity generation.

There is a particular focus on improving and accelerating the transfer of technology and innovation.

The regulatory sandboxes for the energy transition were launched in the 7th Energy Research Programme enshrines an action that provides targeted support to projects that test systemic innovations and research results in real-life and on a diverse scale. They enable the transfer of technology and innovation to be accelerated by closing the gap between research and energy-related practices: the general sample before placing on the market. The transfer will be supported by networking activities (in particular energy research networks) and research communication. In addition, start-ups play a crucial role in the transfer process.

To strengthen European and international networking, the 7th Energy research programme has established European cooperation (SET-Plan, EU research framework programmes), bilateral initiatives, cooperation within the framework of the IEA-TCPs and with other international organisations, as well as the international Mission Innovation initiative.

#### **Research initiative on preventing process emissions in industry**

More than a third of industrial emissions – almost 8 % of total German greenhouse gas emissions – are due to production processes in the basic industries. In the area of industrial process emissions, a new research initiative will be launched to enable the German basic materials industry to explore and develop processes and process combinations that directly prevent greenhouse gases in key sectors such as iron and steel, cement and lime, chemistry and non-ferrous

Metals. In addition to technological innovations, the funding guidelines also focus on economic framework conditions and the competitiveness of the developed procedures, the optimisation of which is to be examined from the research side.

### **Finance and climate action**

At the heart is the development of a strong and actionable research community in Germany in the area of finance and climate protection. The research projects and a scientific support project deal with issues at the interfaces between the real and financial sectors (products, processes and market mechanisms for climate finance; the impact of sustainable financial products; identifying the needs of investors and private customers and the interactions between societal developments, climate change and the financial sector). There is a close connection with the Science Platform Sustainable Finance in order to achieve deeper dialogue, optimal networking and the greatest possible impact of sustainable finance science in Germany.

### **Research initiative on climate action in agriculture and forestry**

The objective of the research initiative is to increase the sink function of soils and forests, to develop strategies for land degradation-neutral land use, and to develop climate-friendly farms, inputs and production chains. Building on existing research results, innovative, cross-cutting and systemic approaches and approaches will be developed in regions and areas of action that have a particularly high potential to contribute effectively to climate change mitigation in line with other SDGs. This will be done through transdisciplinary approaches. The focus of content is the systemic consideration of farms and production chains, soil management and enhancement of sink function (CO<sub>2</sub> sequestration) and reduction of greenhouse gas emissions in areas such as fertilisation, forest, ACCESS for DPPN (plant-soil interactions to increase productivity and soil fertility, soil as a carbon sink), future agricultural systems and further development of sustainable dual or multiple uses of land in line with the UN 2030 Agenda for Sustainable Development.

### **National Bioeconomy Strategy**

The aim is to develop sustainably produced bio-based products and bio-based production processes, including through the substitution of fossil-based products and for the recycling/use (reprocessing) of consumer goods for new products (cascade use, circular economy). New actions include future technologies for the industrial bioeconomy (biohybrid technologies: Electrobiosynthesis and photobiosynthesis for CO<sub>2</sub> use), the support phase 3 of the Alliance Zero-CarbFP (material use of carbon-rich waste streams to produce functional biomass and produce/recovery materials using biotechnological processes) and microbial biofactories (CO<sub>2</sub> use in biotechnology).

### **Future construction of pilot projects for innovation in buildings**

This pilot project will usefully complement the BMWWSB's Innovation Programme for the Future Construction of Building, with the programme components of the departmental research and research funding programme, in order to support concrete construction and application projects with an innovative character.

Testing novel solutions in the real environment of building construction, refurbishment or dismantling (residential and non-residential) will support the market entry and approval of these solutions. This can encourage the broad application of innovative solutions and their further diffusion into general planning and construction practices. The aim of the pilot project is to increase the number of novel and hitherto non-market solutions for climate-neutrality, climate-adapted; energy efficient, establish resource-efficient, health-friendly and affordable construction in general planning and construction practices.

### **Federal Government's Wood Building Initiative**

The Federal Government's timber construction initiative, adopted on 21 June 2023, aims to strengthen the use of sustainable wood in the construction sector and increase climate protection, resource efficiency and faster construction. Eight areas of action, from the Federal Government's role as an example and the strengthening of research and innovation through the safeguarding of skilled labour and the transfer of knowledge to securing the supply of raw materials, are expected to significantly improve the use of wood and increase the rate of timber construction by 2030. Barriers will be reduced and equal competitive opportunities will be ensured for the use of a wide range of construction materials. The areas of action of the Wood Building Initiative describe priority themes and solutions which are implemented by the relevant federal ministries under their own responsibility and subject to the budgetary resources made available.

### **Research and observation of aerosols, clouds and trace gases in the context of the European research network ACTRIS**

ACTRIS (Aerosol, Clouds and Trace gas Research Infrastructure) was established by European Commission Implementing Decision on 25 April 2023 in the legal form of a European Research Infrastructure Consortium (ERIC). Objective of ACTRIS Research on aerosols, short-lived greenhouse gases (SLCP) clouds and air pollutants. The studies shall focus in particular on their spatial and temporal distribution. The lessons learned are an important scientific basis for future policy decisions on climate change mitigation and air pollution. Short-lived greenhouse gas measures have the advantage that climate impacts occur without significant delays due to the short lifetime of greenhouse gases in the atmosphere. In addition, synergies between climate protection and air pollution can be exploited. ACTRIS brings together research organisations from 16 European countries. Germany is a founding member of ACTRIS at European level. Many German research organisations are involved in ACTRIS. It is in the interest of Germany to strengthen the networking of leading European research institutions in the field of air pollutants and short-lived greenhouse gases. The Scientific Council has consistently given a positive assessment of the ACTRIS project. The German research institutions involved in the process are characterised by a high level of scientific expertise.

### **Innovation and competitiveness**

*Further development of CO<sub>2</sub> uses under CCU/CCS*

The further development of uses of CO<sub>2</sub>, the so-called CCU based on renewable energy, is already widely supported in Germany and is the subject of numerous research and development projects. With ‘CO<sub>2</sub>-Plus’ and ‘CO<sub>2</sub>-WIN’, the Federal Government has set up its own support programmes for CO<sub>2</sub> production, which focus on expanding the raw material base. Germany is also involved in ERA-Net Cofund ACT (Accelerating CCS Technologies), which promotes larger projects as well as the full range of CCS and CCU processes, i.e. capture, transport, storage or utilisation of CO<sub>2</sub>. There is currently no storage of CO<sub>2</sub> for research purposes in Germany. Germany is a founding member and leader of the PHOENIX initiative, which aims to strengthen the material use of CO<sub>2</sub> in the European framework. The capture of CO<sub>2</sub> from the atmosphere (DAC) is an increased focus and becomes a CO<sub>2</sub> technology under the 7th Energy research programme.

### *CO<sub>2</sub> prevention and use programme in basic industries*

The programme focuses on emissions reduction in the basic industries.

#### *Carbon Direct Avoidance (CDA):*

Part of the programme is those CO<sub>2</sub> prevention measures that are implemented together within a project with CCU/CCS and are thus an integrated part of a CCU/CCS action. This includes innovative technologies that lead to a significant reduction in greenhouse gas emissions in the basic industries.

#### *Carbon Capture and Utilisation (CCU):*

In addition, efficient circularity approaches and technologies are part of the programme; these include capture and utilisation technologies, including from the bioeconomy sector, but above all include those that enable the return to the loop following the use of carbon.

#### *Carbon Capture and Storage (CCS):*

The vast majority of the studies and scenarios have now confirmed that CCS technology is essential for net-zero greenhouse gas emissions by 2050, as it is a relatively cost-effective medium-term option for process-related emissions from the raw materials industry that cannot otherwise be avoided. In addition, a large number of mitigation strategies to achieve the global temperature targets of the Paris Agreement are based on so-called “negative emissions”; this would also require the availability of the elements of the entire CCS process chain. A broad consortium of scientists, business representatives and NGO representatives has recently called for CCS to be developed in a timely manner, supported by a debate with societal stakeholders, in order to make technology available for these industries as of 2030 (Acatech, September 2018); the deep subsoil below the North Sea has significant CO<sub>2</sub> storage capacity. The programme aims at adapting and scaling CO<sub>2</sub> capture methods on industrial installations, modelling and, where appropriate, developing regional, supra-regional and, where appropriate, European CO<sub>2</sub> networks and requirements for CO<sub>2</sub> streams during transport, European cooperation to store CO<sub>2</sub> in the deep subsoil of the North Sea, and a CCS dialogue process in the overall context of CO<sub>2</sub> reduction technologies with NGOs, associations, businesses and academia. With regard to CCS, reference is made to the report on CCS agreed in the Federal Government.

### **EU ETS Innovation Fund: Further development of the NER300 programme**

Under the European Emissions Trading Scheme, the so-called NER300 programme has been in place since 2011, which supported investments in innovative low-carbon demonstration projects in the energy sector. The funding budget was financed by the sale of 300 million EU ETS allowances. With the entry into force of the current EU multiannual financial framework 2021-2027, it was replaced by the EU funding format 'Innovation Fund'. The objective and purpose is a financing instrument to fulfil the EU's commitments under the Paris Agreement on climate change.

Support for the Innovation Fund focuses on innovative renewable energy technologies and processes in energy-intensive industries, such as Carbon Capture Utilisation and Storage Technology (CCUS), innovative renewable energy production and energy storage.

### **National decarbonisation programme**

The measure is a support programme in the field of development, demonstration and market deployment. In order to reduce emissions in the industrial sector as much as possible, it is also necessary to reduce to a large extent or completely process-related GHG emissions, which, according to the current state of the art, are impossible or difficult to prevent. To this end, key projects in the field of emission-intensive industries will be supported. These should serve both application-oriented R & D and testing on an industrial scale and wide market uptake of mature technologies and focus on their economic viability. In particular, the support programme shall promote the reduction of GHG emissions from the production of high-emission goods as much as possible, the optimisation of process chains, the conversion of processes to the use of renewable energy sources and raw materials, and the substitution of emission-intensive goods and technologies for hydrogen transformation and technologies for the use of CO<sub>2</sub>. The funding programme will be implemented by the Climate Action Competence Centre in Energy Intensive Industries (KEI) in Cottbus. The ECI also acts as a think tank and cross-sectoral, international and interdisciplinary knowledge platform on industrial decarbonisation. 3.5.i.13 "Smart Energy Window – Digital Agenda for Energy Transition" (SINTEG)

In parallel to the Energy Research Programme, the SINTEG programme will develop and demonstrate solutions to the technical, economic and regulatory challenges of the energy transition in five major model regions – so-called shop windows – with over 300 companies and other stakeholders. This will focus in particular on safe, efficient and mass-business processes, innovative technologies and market mechanisms for flexible, smart grids and markets. It focuses on the digitalisation of energy. The programme also aims to gather practical experience for the future development of the legal framework. To this end, the Federal Government adopted the SINTEG Regulation, which entered into force on 21 June 2017, with temporary 'experimental options'. The Regulation will enable SINTEG participants to test new technologies, processes and business models without economic disadvantages, such as digitalisation and sector coupling.

### **Digital Energy Transition Act (DGEW)**

Digitalisation is essential for achieving climate change objectives. To this end, the Digitalisation of the Energy Transition Act (DGEW) provides the right basis for cross-sectoral digitalisation. The necessary further measures will be taken for the implementation of this law, notably the further development of technical standards and the regulatory framework, such as better grid integration of renewable energies and flexible burdens.

## **Research and innovation agenda on the material use of CO2**

This measure addresses the use of CO2 from industrial emissions as a raw material to support a carbon neutral circular economy. The material use of fossil carbon is the basis of today's chemical value chain. The use of, for example, petroleum-derived naphtha leads to significant life-cycle CO2 emissions. The efficient use of CO2 as a carbon source combined with renewable electricity can open the way to circular economy and significantly reduce the carbon footprint of industries and products. The Research and Innovation Agenda aims to bring together promising research approaches, identify future research directions and support pathways into industrial application.

## **Better participation of start-ups in energy research**

Reducing energy consumption and greenhouse gas emissions requires leaving existing technological pathways and developing new, innovative solutions. Start-ups often play a crucial role in developing innovative ideas and problem solving. In the future, they make a significant contribution to the success of the energy transition. The traditional tools and mechanisms for project funding were too rarely tailored to these actors. The Federal Government therefore aims to set up start-ups with new and adapted funding formats in the 7th

Raise awareness of the energy research programme and increase its participation in all energy research topics. To this end, existing barriers will be gradually removed: On the one hand, by extending the content of the programme to non-technical innovations (business models, new services) related to technological innovations. On the other hand, by adapting and speeding up administrative procedures (e.g. micro-projects) and through new, more agile project designs and the creation of the research network start-ups networking platform. Start-ups with innovative ideas on the energy transition should be able to launch collaborative projects with scientific and business partners in a simpler way, thus giving new impetus to energy research.

## **Technologically sovereign batteries – The BMBF umbrella concept for battery research**

Electrification of industry, transport and other sectors is key to significantly reducing greenhouse gas emissions and achieving the net-zero emissions targets, including those enshrined in the EU's Net Zero Industry Act. The key role of battery technologies in achieving these objectives is reflected, inter alia, in the current ramp-up of battery (cell) productions in Europe. The further development of battery technologies and manufacturing capacities is progressing rapidly, in the light of geopolitical challenges and the still strong dependence on non-European suppliers, such as battery materials but also machinery and plant construction, Germany's resilience and competitiveness in battery technologies need to be further strengthened.

For this reason, the BMBF reorganised its battery technology research strategic framework with the BMBF umbrella concept for battery research published in January 2023. The funding initiatives and measures of this umbrella concept consider research and development from material to battery cell, from basic research to scaling up in industrial production processes, and focus on aspects of digitalisation and, in particular, circular economy. Education and training aspects, in particular the young scientific community, will also be actively promoted. The aim is to provide the technological basis for building a sustainable, competitive and technologically sovereign

Create battery value chain in and for Germany and Europe.

### **Key areas of mobility: (A) Urban mobility B) Systemic barriers to innovation mitigation**

Development of effective mobility concepts linked to social and technological innovations based on a systemic perspective. Impact levers for decarbonisation will be identified through analyses of the interplay of mobility flows, infrastructure networks, value chains, urban and spatial planning, as well as individual and societal requirements. On the one hand, the support is aimed at developing and testing climate-friendly mobility innovations, including in regulatory sandboxes and (regulatory) experimentation spaces. On the other hand, it will provide a sound basis for long-term innovation and transformation management. Two sub-measures:

- urban mobility of persons; and
- systemic innovation barriers to climate change mitigation, building on the results of the National Mobility Platform (NPM).

### **Digital Innovation Hub for Climate**

Initiating and financing a Digital Innovation Hub for Climate, focusing on connecting business, science and politics. Strengthen application-oriented research & development in the field of climate action through exchanges on digital innovation, as well as the use of digital technologies for climate change mitigation and the development of business models.

### **Green ICT: Research and development to reduce the carbon footprint of digital technologies**

The aim is to develop technological solutions to reduce the CO<sub>2</sub> consumption of digital technologies. Reducing the energy consumption of information-processing and storage components such as processors or server farms (clouds) and the associated Communication technologies (ICT/ICT) already have significant potential for climate action. New digital applications are emerging, in particular in the area of big data, the Internet of Things and artificial intelligence, which further increase the need for computing power for data mining. Given the fast-growing use of these technologies in the economy, it is essential to develop technological solutions to increase the energy efficiency of ICTs. There are joint initiatives with the European Union, such as the European Processor Initiative (EPI), which need to be further developed.

### **Skilled Immigration Act**

Tackling skills shortages has an important role to play in ensuring competitiveness. The Federal Government adopted one of the most modern immigration laws in 2023.

**3.5.ii. Possible cooperation with other Member States in this field; this shall include any information on how the objectives and policies of the SET-Plan are transposed to national circumstances.**

### **European energy research cooperation**

*Strategic Energy Technology Plan (EU-SET Plan)*

As part of the EU-SET Plan, Germany is actively involved in the further development of European energy research. Representatives from Germany participate in the thematic working groups and formulate strategies for further cooperation on different technologies. The results of the relevant working groups feed into the development and further development of the national funding priorities and were used in the preparation of the 7th Energy research programme. Strengthening cooperation on energy transition with other Member States is a key objective of the SET Plan. The Energy Research Programme aims to promote European cooperation under the umbrella of the SET-Plan. The research themes of the SET-Plan will be implemented in European cooperation mainly through the co-funded Clean Energy Transition Partnership (CETPartnership), an association of international donors and funding agencies that have published annual joint funding notices for a variety of technologies and system solutions since 2022. The envisaged duration of the partnership is from 2022 to 2027. During this period, funds will be consolidated and, if necessary, adequate growth. Germany is actively promoting the implementation of implementation plans for fourteen technology fields developed under the SET-Plan in the relevant working groups. These are: Photovoltaics, concentrated solar thermal technologies, wind, geothermal, ocean energy, energy systems, positive energy districts, HVDC & DC, energy efficient buildings, energy efficient industry, batteries, renewable fuels and bioenergy, and CCS-CCUS. In addition, a new working group on hydrogen is being set up.

#### *Clean Energy Transition Partnership (Cofund)*

The Federal Government is pursuing European and international research cooperation in the field of energy transition through active participation in the Clean Energy Transition Partnership (CETPartnership), a funding instrument under Horizon Europe to support cooperation between funding bodies at European and international level. The specific objective is the strategic coordination of national programmes with the implementation of joint calls to support transnational research and innovation projects. The annual calls for tenders launched in 2022 cover all topics under the 7th Energy research programme and implement the strategy of the SET Plan.

#### **Regional/Bilateral cooperation**

In addition to the ‘Berlin Model’ and CETPartnership cooperation, the following specific initiatives exist:

#### *North Sea cooperation in energy research*

In the context of North Sea energy cooperation, the Federal Government is helping to support the rapid development of offshore wind energy, including through joint and hybrid projects where offshore wind farms are connected through an interconnector in at least two Member States.

The 2022 North Sea Summit in Danish Esbjerg agreed closer cooperation between the neighbouring countries Denmark, the Netherlands, Belgium and Germany with the European Commission to jointly produce more offshore wind energy to replace fossil energy and contribute to the EU’s climate goals.

#### *Dutch-German funding call “ELECTROCHEMICAL materials and processes for green hydrogen and green chemistry”*

Germany and the Netherlands together form one of the strongest industrial clusters in the world. Both countries will need large quantities of renewable hydrogen for their industrial added value and import



essential parts of it. By pooling research efforts, the two countries can accelerate the path towards climate neutrality and exploit synergies in the transition to a sustainable hydrogen economy. The call for funding was published in October 2022 and the first projects will start in 2023.

The Danish-German intergovernmental agreement on the ‘Bornholm energy island’, concluded in 2023, established a common framework for the production and transmission of 3 GW of offshore wind energy near the Baltic island Bornholm to Denmark and Germany, as a first step of implementation.

#### *Cooperation on CCUS with North Sea riparians*

In the context of the North Sea Basin Task Force (NSBTF), Germany, together with other North Sea countries, is working on scientific, technical, legal, economic and political issues concerning CO2 storage below the North Sea and CO2 utilisation issues.

Greek-German research cooperation and support for young researchers The energy research is one of several pillars of research cooperation between Germany and Greece and has been addressed in two consecutive bilateral funding notices. Projects for the production, storage and efficient use of renewable energy and the sustainable and efficient supply of heating and cooling were supported. A continuation of the SRIA activities is under preparation.

#### *French-German Fellowship Programme*

With the Fellowship programme “Make Our Planet Great Again – German Research Initiative” (MOPGA-GRI), the Federal Government has established a support programme in parallel with the French initiative of the same name. The objective of the action is to enable renowned researchers and promising young researchers from abroad to conduct research at German universities and research institutions. Energy research is a priority area of the initiative alongside climate and earth system research. Five fellows with young groups were supported until 2022.

### **Strategic Research and Innovation Agenda ([SRIA](#))**

A Strategic Research and Innovation Agenda([SRIA](#)) was published in March 2022 as a result of the pan-European R & I agenda process on green hydrogen, bringing together the most important and urgent research priorities along the entire hydrogen value chain. Member States and the European Commission are now working together to implement the SRIA. BMBF is preparing research cooperation with various European countries, including France, Italy, Greece, etc.

### **3.5.iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds**

#### **Research**

##### *7. Energy research programme*

The 7th The energy research programme was adopted in the Federal Cabinet in 2018. In the context of the

7th In 2018-2022, a total of around EUR 6.2 billion was made available for research, development, demonstration and testing of future-proof technologies and concepts. This represents an increase of around 45 % compared to the reference period 2013-2017. For the period 2023-2030, it is planned to strengthen energy research.

## **DARP**

On Germany's recovery and resilience plan (DARP) and under the 7th The BMBF supports the Green Hydrogen flagship projects. The three major industrial-led hydrogen lead projects are developing solutions to accelerate and sustainably scale up hydrogen: H2Giga enables the future economic production of electrolyzers for the production of hydrogen, H2Mare opens completely new ways of producing hydrogen at sea and TransHyDE clarifies the routes for hydrogen transport and its distribution. You will receive up to EUR 700 million in European funding from the Recovery and Resilience Facility.

## **EU Framework Programme for Research and Innovation Horizon Europe**

No other country is as closely involved as Germany in the energy themes of the Climate, Energy and Mobility cluster in Horizon Europe. Through the National Contact Point for Climate, Energy & Mobility (NKS KEM), the Federal Government supports the participation of German researchers in consortia and their application for EU funding. Information and advisory activities of the NCP KEM help research and industry actors to make appropriate use of the comprehensive and complex opportunities offered by Horizon Europe on energy issues. In order to ensure Europe's ambitious energy and climate goals, the themes range from applied research options to technology-oriented development themes to support market uptake and dissemination activities. The involvement of the citizen as a consumer, as well as relevant socio-economic aspects, is becoming increasingly important.

## **Innovation and competitiveness**

### *Strengthening Germany's research centre for energy storage technology*

The Federal Government plans to provide research and funding for storage technologies in order to make Germany a location for battery cell production. There will also be a new Fraunhofer Institute for Storage Technologies.

### *CO<sub>2</sub>-Saving through resource efficiency and substitution*

The funds entered in KTF titles 6092 – 686 15 and 686 17 are used by the BMWK to finance research, development and innovation under the Le Light Construction Technology Transfer Programme (TTP LB). Lightweight construction aims to reduce the weight of products, save materials and energy, and increase circularity – while maintaining or improving functionality. From design to production, use and recycling of materials and products, this can save resources and reduce CO<sub>2</sub> emissions.

Since 2020, the Technology Transfer Programme Leichtbau (TTP LB) has supported politically relevant and application-oriented projects with high industrial participation. This will support Germany's industrial base in the important theme of light construction and material efficiency, while promoting environmental and climate protection. Innovative light construction technologies and materials contribute, in the medium

and long term, to industrial transformation and to the resilience of businesses in times of raw material supply shortages and rising energy prices.

The funding programme is due to be amended in 2023. The planned technology transfer programme 'light construction and material efficiency' will focus more on material efficiency, circular economy, digitalisation and automation.

### **Support for research for SMEs-innovative (resource efficiency and climate action)**

SMEs are important drivers of climate change mitigation. With SME- innovative, the BMBF offers small and medium-sized enterprises (SMEs) the opportunity to succeed in the market with new climate and resource efficiency products and processes, as a pioneer of technological progress. The support initiative is widely used by SMEs across Germany.

## **Section b:**

### **Analytical basis**

# 4. Current situation and projections with current policies and measures

The scenario with current policies and measures presented here is the reference scenario below. In this context, current policies and measures are those implemented or adopted by 31 August 2022.

The figures of the Reference Scenario are largely based on the results of the Measures Scenario of projections under Article 18 of Regulation (EU) 2018/1999 (Governance Regulation). The Federal Government also submitted these projections in 2023.

Scenarios reaching 2030 and 2040 are surrounded by uncertainties: In general, different trends are estimated in different scenarios depending on the assumptions, including those concerning the implementation of current policies and measures, and the methodology used. These differences reflect the uncertainties inherent in a multi-annual forecasting period. To the extent necessary, the Federal Government will therefore include other scenarios in its future reflections in addition to the present scenario.

It should also be borne in mind that, in the case of greenhouse gas emissions, the breakdown by sector in the EU reporting system differs from that of the Federal Climate Protection Act. The same applies to the presentation of renewable energy shares.

## 4.1. Projected evolution of the main exogenous Factors, the the Affect the evolution of the energy system and GHG emissions

### 4.1.1. Macroeconomic forecasts (GDP and population growth)

The population projected in the projections is based on information provided by the European Commission. For the purpose of preparing projections under Article 18 of the Governance Regulation, the European Commission provides assumptions every two years on, inter alia, population trends in the individual EU Member States (EC 2022). According to these figures, the population in Germany remains relatively constant at just over 83 million people up to and including 2040 (Table B1).

**Table B1: Economic and population assumptions, GDP in real prices**

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
<b>Population in thousands</b>	83,2	83,2	83,3	83,4	83,5	83,5	83,5	83,5	83,5	83,5	83,3	83,2	83,0	82,7
<b>Of GDP in EUR<sub>2019</sub> Billion</b>	3429	3477	3461	3542	3569	3596	3624	3653	3682	3711	3889	4150	4456	4767

Sources: EC (2022), BMWK/BMF (2022), cf. UBA (2023)

## Macroeconomic developments

For the years 2022 to 2027, the projections assume the growth rates of the Federal Government's autumn projection in 2022. The growth rate for 2027 is then updated for the years up to 2030. The years from 2030 follow the growth rates of the European Commission (EC 2022).

Gross domestic product is growing from around EUR 3430 billion in 2021 to EUR 3711 billion in 2030 and EUR 3889 billion in 2040 (Table B1).

The assumptions on growth rates made here do not correspond to the current federal government projection, the spring 2023 projection. As analytical work had to start in autumn 2022, this update could no longer be taken into account.

### 4.1.11. Sectoral changes expected to impact the energy system and GHG emissions

In the medium and long term, value added in non-energy intensive industries is growing more than in the energy-intensive industries (Table B2). As a result, the share of energy-intensive industries in Germany's gross value added is steadily decreasing. At the same time, value added in energy-intensive industries is also increasing. No direct conclusions can be drawn from this development as to the absolute level of energy consumption and GHG emissions. The development of production volumes and energy efficiency are crucial in this context.

**Table B2: Structural developments – Gross value added in manufacturing (industry) by sector, in billion euros, real prices in 2019**

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Energy-intensive industries	61	62	62	63	64	64	64	64	64	64	65	66	69	71
Non-energy-intensive industries	412	420	418	432	438	440	442	444	446	449	463	487	515	542
<b>Total</b>	<b>473</b>	<b>482</b>	<b>480</b>	<b>496</b>	<b>502</b>	<b>504</b>	<b>506</b>	<b>508</b>	<b>510</b>	<b>513</b>	<b>528</b>	<b>553</b>	<b>583</b>	<b>612</b>

Source: Fraunhofer ISI (2023) based on Destatis; for modelling 2023 projection report, co-action scenario (MMS)

### 4.1.11.1. Global energy trends, international fossil fuel prices, CO<sub>2</sub> price in the EU ETS

In recent years, prices on international energy markets have been volatile (Table B3). The years 2020 and 2021 were influenced by the special situation of the global Covid 19 pandemic: First, by the fall in prices due to reduced demand as a result of the reduction in economic activity and motorised transport (especially in 2020) and then by a price increase in 2021, partly due to economic catch-up effects. As of autumn 2021, prices in Europe started to rise in the context of the emerging energy crisis and market trends intensified again after the start of the Russian Federation's war of

aggression against Ukraine in February 2022.

In particular, as regards gas prices, actual gas prices in 2023 were significantly more moderate than expected at the time when the price path for that year was set.

**Table B3: Evolution of border crossing prices for crude oil, natural gas and hard coal over the period and carbon price 2021 to 2040**

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
<b>Crude oil Brent in euro <sub>2019</sub>9.7 /GJ HU</b>	15,6	13,6	11,7	10,5	9,6	8,8	8,5	8,3	8,0	7,9	7,8	7,7	7,5	
<b>Hard coal in euro <sub>2019</sub>3.0 /GJ HU</b>	10,8	8,3	6,8	6,0	5,4	4,8	4,2	3,6	3,1	2,9	2,8	2,7	2,6	
<b>Gas in euro <sub>2019</sub>7.5 /GJ HU</b>	16,1	29,6	20,4	14,6	11,2	10,0	8,9	7,8	6,7	6,4	6,0	5,7	5,3	
<b>EU ETS allowances in Euro <sub>2019</sub>/EEA</b>	51,5	74,2	81,9	85,1	91,3	100,6	102,6	104,7	106,7	108,8	125,0	141,3	151,2	161,1

Source: UBA (2022)

For international oil, gas and hard coal prices, EC (2022) assumed different price paths (Table B3): For the period up to the middle of the decade, price projections based on futures that were up to the autumn of 2022 are assumed. For the development around 2030 and beyond, projections from the World Energy Outlook (WEO) 2022

International Energy Agency (IEA) (Announced Pledges Scenario). For further details, see UBA (2022).

An expert estimate was used for the development of the carbon price in the European Emissions Trading System (EU ETS) for the period up to 2030, by way of derogation from EC (2022). For the period from 2030 onwards, the above-mentioned assumptions of the IEA were again adopted. For further details, see UBA (2022).

#### 4.1.1 v. evolution of technology costs

Specific technology costs were assumed in the modelling process for electricity, decentralised heat generation and passenger car technologies.

The assumed cost developments of the electricity generation technologies are described in Table B4 (costs at the time of commissioning). Nuclear energy, brown and hard coal are not an available option beyond the phase-out path and the costs are not presented. For natural gas as fossil power generation technologies, no further cost degression is assumed. However, in the case of renewable

energy, investment costs continue to decline. The cost of storage technologies is also decreasing and the cost of domestic batteries is falling significantly. In the case of hydrogenpower plants, no cost degressions are assumed. For electrolyzers, the cost decreases significantly.

**Table B4: Evolution of technology costs for electricity generation, Euro2019 per kW**

Technologies	2021	2022	2023	2024	2025	2026	2027	2028	2029	1030	1035	1040	1050
Natural gas – CCGT	995	995	995	995	995	995	995	995	995	995	995	995	995
Natural gas – GT	525	525	525	525	525	525	525	525	525	525	525	525	525
Wind on land	1112	1087	1351	1304	1258	1213	1170	1127	1085	1044	850	677	384
Wind at sea	3600	3558	3517	3486	3455	3426	3396	3366	3336	3306	3154	3001	2696
Photovoltaics (Open area plus 865 Roof)		754	844	808	773	740	708	676	646	617	483	370	192
PV storage battery (per kWh)	890	864	839	813	788	762	736	711	685	660	571	482	304
Large battery (per kWh)	628	607	585	564	542	521	499	478	456	434	366	298	162
Electrolysers	1369	1295	1221	1146	1072	998	924	850	775	701	628	555	409
Hydrogen power- plants	1095	1095	1095	1095	1095	1095	1095	1095	1095	1095	1095	1095	1095

Source: Modelling 2023 Projection Report, Co-measure Scenario (MMS) Specific investment costs in EUR 2019/kW

The assumed cost developments of decentralised heat generation technologies are described in Table B5. They refer to the date of commissioning and are assumed to be constant over time for modelling. The specific investment costs for the cut-off year 2022 (no operating costs) are shown.

**Table B5: Technology costs for heat production, Euro2019 per kW**

Technologies	
<b>(a) small buildings (15 kW)</b>	
Gas calorific value	561
Fuel oil calorific value	724
Biomass (pellet boiler)	927



Heat pumps – air	2202
Heat pumps – brine	2331
<b>(b) large buildings (50 kW)</b>	
Gas calorific value	246
Fuel oil calorific value	223
Biomass (pellet boiler)	1403
Heat pumps – air	1627
Heat pumps – brine	2139

Source: Modelling 2023 projection report, co-action scenario (MMS)

For transport, the imputed costs per car are shown in Table B6. The cost of fossil fuelling cars is increasing slightly over time due to energy efficiency gains. For electric and hybrid powertrains, technology costs are decreasing, mainly driven by battery development. Fossil and hybrid powertrains will not be considered more than one available option in the long term.

**Table B6: Evolution of technology costs in the passenger car sector, vehicle costs in EUR 1000 in 2016**

TECHNO-logs	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Diesel	31	31	31	31	31	31	31	31	31	34				
Petrol	27	27	27	27	28	28	28	27	28	30				
Electric	37	34	32	31	30	29	29	29	28	27	29	29	28	28
Plug-inhybrid	32	31	30	29	29	29	29	29	29	32				
Hydrogen	58	55	53	51	49	48	47	46	44	42	41	38	37	36

Source Modelling 2023 Projection Report, Co-measures Scenario (MMS)

## 4.2. Decarbonisation dimension

### 4.2.1. GHG emissions and removals

4.2.1.1. Trends in current GHG emissions and removals in the sectors of the EU ETS, the EU Climate Change Regulation and LULUCF, as well as in different energy sectors

The annual greenhouse gas emissions for the period 2010 to 2021 are shown in Table B7. The values and delimitation of the sectors are taken from the GHG inventory (UBA 2023). LULUCF emissions and emissions from international aviation and maritime transport are not included in the total in line with international conventions. A total of 760 million tonnes of CO<sub>2</sub>eq were emitted in 2021. This represents a 39 % reduction compared to the 1990 base year.

**Table B7: Greenhouse gas emissions by sector for the years 2010 to 2021, in Mt CO<sub>2</sub>eq**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
<b>Energy-related emissions</b>	<b>800</b>	<b>776</b>	<b>783</b>	<b>804</b>	<b>763</b>	<b>768</b>	<b>769</b>	<b>749</b>	<b>718</b>	<b>671</b>	<b>613</b>	<b>642</b>
Energy industry	356	353	364	370	351	339	335	313	301	252	213	240
Manufacturing	124	121	117	118	118	126	128	130	125	122	121	126
Transport	154	156	155	159	160	163	166	169	163	165	146	148
Other*	154	134	136	146	125	131	131	129	122	127	129	124
Diffuse emissions	12	11	12	11	10	10	9	8	7	5	4	4
<b>Non-energy emissions</b>	<b>132</b>	<b>131</b>	<b>130</b>	<b>130</b>	<b>131</b>	<b>129</b>	<b>130</b>	<b>133</b>	<b>128</b>	<b>123</b>	<b>118</b>	<b>118</b>
Industrial processes	62	62	61	61	61	60	62	65	63	60	55	57
Agriculture	59	59	60	61	62	62	62	61	59	59	58	56
Waste	11	10	9	8	8	7	7	6	6	5	5	4
<b>Total</b>	<b>932</b>	<b>908</b>	<b>913</b>	<b>934</b>	<b>893</b>	<b>897</b>	<b>899</b>	<b>882</b>	<b>846</b>	<b>795</b>	<b>731</b>	<b>760</b>
<u>For information: LULUCF</u>	-3	-9	-17	-16	-9	-11	-14	-11	-8	-7	4	4
<u>For information: International Air and maritime transport</u>	33	32	33	33	32	32	35	36	35	34	17	22

Other \*) are households, business, trade and services including military

Source: Greenhouse gas inventory, UBA (2023)

Annual greenhouse gas emissions include emissions in the sectors subject to the European Emissions Trading Scheme (ETS) and emissions under the EU Climate Change Regulation (ESD) (Table B8).

**Table B8: Greenhouse gas emissions under ETS and non-ETS for the years 2010 to 2021, Mt CO<sub>2</sub>eq**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ETS emissions excluding international <sup>455</sup> Aviation		450	453	481	461	456	453	438	423	363	321
ESD emissions 2013 – 2020				460	437	444	454	467	434	444	407

Sources: ETS emissions: DEHST (2011-2021; VET reports), ESD emissions: European Union

## Transaction Log

It is true that emissions from European aviation are subject to emissions trading. They are not shown here because the achievement of national targets only takes account of domestic air transport. Data for 2021 are not yet available. The load-sharing emissions result from total emissions excluding LULUCF the ETS emissions, subtracting national aviation emissions and subtracting NF3 emissions where they are part of the inventory.

4.2.1.11. Projections of sectoral developments with current national and Union policies and measures at least until 2040 (including for 2030)

The results by sector for the baseline projections are described in Table B9. The total

GHG emissions excluding international transport and LULUCF will be reduced to around 467 Mt CO<sub>2</sub>eq by 2030. This corresponds to a reduction of almost 63 % compared to 1990. Large reductions since 1990 have been particularly visible in the energy sector (-83 %) and in industry (55 %), the decline in agriculture (-30 %) and the transport sector (-28 %).

**Table B9: Greenhouse gas emissions in the reference scenario – by sector for the years 2023 to 2050, in Mt CO<sub>2</sub>eq**

	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
<b>Energy-related emissions</b>	<b>679</b>	<b>627</b>	<b>590</b>	<b>536</b>	<b>483</b>	<b>441</b>	<b>399</b>	<b>370</b>	<b>270</b>	<b>189</b>	<b>154</b>	<b>134</b>
Energy industry	280	232	210	169	132	108	82	73	55	36	37	38
Industry	122	121	118	113	108	102	95	88	64	50	42	37
Transport	153	153	146	142	136	131	126	119	87	55	34	22
Other	117	113	109	104	100	94	89	84	58	43	36	31
Diffuse emissions	7	7	7	7	7	7	7	7	6	5	5	5
<b>Non-energy emissions</b>	<b>120</b>	<b>117</b>	<b>115</b>	<b>112</b>	<b>108</b>	<b>105</b>	<b>101</b>	<b>97</b>	<b>84</b>	<b>75</b>	<b>75</b>	<b>75</b>
Industrial processes	56	54	52	50	48	45	42	39	28	22	21	21
Agriculture	56	55	55	54	54	53	53	52	51	50	50	50
Waste	8	8	8	7	7	6	6	6	4	3	3	3
<b>Total</b>	<b>798</b>	<b>744</b>	<b>704</b>	<b>647</b>	<b>591</b>	<b>546</b>	<b>500</b>	<b>467</b>	<b>354</b>	<b>264</b>	<b>229</b>	<b>209</b>
<u>For information:</u> LULUCF	—12	—14	—13	—15	—16	—15	—17	—18	—21	—17	—17	—15
<u>For information:</u> International aviation and maritime transport	33	35	36	36	36	37	37	37	39	39	40	40

Source: Modelling 2023 projection report, co-action scenario (MMS)

Projections of annual greenhouse gas emissions can again be made by emissions in ETS sectors and sectors subject to the EU Climate Change Regulation (Table B10). The conventions shall apply as described in Table B8.

**Table B10: Greenhouse gas emissions in the Reference Scenario – under ETS and EU Climate Change Regulation for the years 2023 to 2050, Mt CO<sub>2</sub>eq**

	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
ETS emissions excluding international aviation	393	343	317	270	227	197	165	148	105	73	66	63
ESR emissions	403	398	385	375	362	347	332	317	247	189	161	143

Source: Modelling 2023 projection report, co-action scenario (MMS)

#### 4.2.2. Renewable energy

4.2.2.1. Current share of renewable energy in gross final energy consumption in different sectors (heating and cooling, electricity and transport) and by technologies within these sectors

The shares of renewable energy in energy consumption are shown in Table B11. Between 2010 and 2022, the share of gross final energy consumption increased by almost 9 percentage points to 20.4 %.

**Table B11: Renewable energy – % share of total sectoral consumption for the years 2010 to 2022**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
<b>Gross final energy-consumption*</b>	<b>11,7</b>	<b>12,5</b>	<b>13,5</b>	<b>13,8</b>	<b>14,4</b>	<b>14,9</b>	<b>14,9</b>	<b>15,5</b>	<b>16,7</b>	<b>17,3</b>	<b>19,1</b>	<b>19,2</b>	<b>20,4</b>
Gross final energy consumption (national statistics)	11,4	12,5	13,6	13,7	14,3	15,1	14,9	16,0	16,8	17,7	19,4	18,8	20,3
<b>Electricity*</b>	<b>18,2</b>	<b>20,9</b>	<b>23,6</b>	<b>25,3</b>	<b>28,2</b>	<b>30,9</b>	<b>32,3</b>	<b>34,6</b>	<b>37,6</b>	<b>40,6</b>	<b>44,2</b>	<b>43,7</b>	<b>N.B.</b>
Electricity (national statistics) <sup>1</sup>	17,1	20,4	23,6	25,1	27,3	31,4	31,6	36,0	37,7	42,0	45,2	41,2	46,2
Wind to ry	6,2	8,1	8,4	8,6	9,6	12,1	11,3	14,7	15,3	17,6	18,9	15,9	18,2
Wind for Sea (Offshore)	0,0	0,1	0,1	0,2	0,2	1,4	2,1	2,9	3,3	4,3	4,9	4,3	4,6
Photovoltaics	1,9	3,3	4,4	5,1	6,0	6,4	6,3	6,5	7,5	7,9	8,9	8,7	11,1
Hydropower	3,4	2,9	3,6	3,8	3,3	3,2	3,4	3,4	3,1	3,5	3,4	3,5	3,2
Biomass	4,7	5,3	6,3	6,6	7,1	7,4	7,5	7,5	7,5	7,7	8,1	7,8	8,1
Biogenic share of Waste	0,8	0,8	0,8	0,9	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0
<b>Transport*</b>	<b>6,4</b>	<b>6,5</b>	<b>7,3</b>	<b>7,3</b>	<b>6,9</b>	<b>6,6</b>	<b>7,0</b>	<b>7,0</b>	<b>7,9</b>	<b>7,6</b>	<b>10,0</b>	<b>8,0</b>	<b>8,8</b>
Transport (national Statistics)	5,8	5,7	6,0	5,4	5,6	5,2	5,2	5,3	5,6	5,6	7,6	6,8	6,8
Biodiesel (incl. HVO and vegetable oil)	4,0	3,8	4,0	3,5	3,6	3,3	3,2	3,3	3,5	3,4	5,2	4,3	4,1
Biogenic petrol	1,4	1,4	1,5	1,4	1,4	1,4	1,3	1,3	1,4	1,3	1,4	1,4	1,5
Biomethane	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2
EE – Electricity	0,3	0,4	0,5	0,5	0,5	0,6	0,6	0,7	0,7	0,8	0,9	0,9	1,0
<b>Heating and cooling*</b>	<b>12,1</b>	<b>12,6</b>	<b>13,4</b>	<b>13,4</b>	<b>13,4</b>	<b>13,4</b>	<b>13,0</b>	<b>13,4</b>	<b>14,2</b>	<b>14,5</b>	<b>14,5</b>	<b>15,4</b>	<b>N.B.</b>
Heating and cooling (national statistics)	12,3	12,7	13,7	13,8	14,0	13,9	13,7	14,0	14,9	15,1	15,3	15,8	17,4
Biomass and renewable waste	11,4	11,6	12,5	12,5	12,4	12,3	12,0	12,2	12,9	13,1	13,0	13,6	14,6
Other renewable Energy	0,9	1,1	1,2	1,2	1,5	1,6	1,6	1,7	2,0	2,0	2,2	2,2	2,7

Other renewable energy sources include geothermal energy, environmental heat;  
Solar thermal, renewable district heating  
Source: UBA (2023)

There are still significant differences between sectors and areas of application. The electricity sector

\*until 2020 Directive 2009/28/EC, from 2021 onwards (Directive 2018/2001)  
in line with Directive 2009/28/EC, inter alia, without normalisation of water and wind power and with all  
electricity produced from biomass.

is the main driver of the increasing share of renewables in gross final energy consumption. By 2021, the share of electricity increased by around 25 percentage points compared to 2010 to 43.7 %. The share of renewable energy in the electricity sector has thus increased significantly more than the share in the transport sector (8.8 % in 2022) and in heating and cooling (15.4 % in 2021). In these two sectors, renewable energy has increased moderately since 2010.

#### 4.2.2.11. Projections of development with current policies and measures for 2030 (with outlook by 2040)

The continuation of existing instruments, as assumed in the reference scenario, has different effects on the use of renewable energy in different sectors. Renewable hydrogen, known as green hydrogen, can have a relevant impact on the shares of renewable energy in all three sectors. The modelling of the 2023 projection report (co-action scenario; MMS), used here in the report, covers total hydrogen imports. The extent to which these imports come from renewable energy sources or from other sources was neither predetermined nor the result of modelling. In Germany, further policy decisions are being made to this end as part of the hydrogen strategy. Nevertheless, in order to be able to identify the sectoral and technological renewable shares at this point, calculations were carried out in two variants that span the entire theoretical range of results. The actual future share will be within this space.

Table B12a describes the evolution when imports of hydrogen and hydrogen derivatives are entirely renewable throughout the period (100 per cent green hydrogen).

Under these assumptions, the share of renewable energy in gross final energy consumption increases by around 19 percentage points from 2023 to 40.2 % in 2030 (EU statistics). In the following years, the increase continues into slightly lower increases. According to national statistics, the share is 40.4 % in 2030.

In the electricity sector, the expansion of renewable technologies is progressing, in particular wind energy and photovoltaics. Imported green hydrogen starts in 2028 with a small share. The share of renewable energy in gross electricity consumption increases to 84.9 % by 2030. This is the value according to EU and national statistics. The slight differences in statistics are adjusted by the characteristics of the modelling exercise.

**Table B12a: Renewable energy in the Reference Scenario – Shares of total sectoral consumption for the years 2023 to 2050, % – at Assuming only green hydrogen imports**

	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
<b>Gross final energy-consumption</b>	<b>21,0</b>	<b>22,1</b>	<b>24,1</b>	<b>26,6</b>	<b>29,4</b>	<b>32,7</b>	<b>36,1</b>	<b>40,2</b>	<b>54,4</b>	<b>65,0</b>	<b>69,6</b>	<b>72,4</b>
Total gross final energy-consumption (national statistics)	21,1	22,2	24,2	26,7	29,6	32,8	36,3	40,4	54,5	64,9	69,3	71,9

<b>Electricity (Eurostat)</b>												
<b>U.S</b>	<b>48,6</b>	<b>51,6</b>	<b>56,5</b>	<b>62,7</b>	<b>68,1</b>	<b>73,2</b>	<b>78,8</b>	<b>84,9</b>	<b>96,4</b>	<b>97,5</b>	<b>95,2</b>	<b>93,9</b>
Onshore wind	19,6	20,1	21,7	24,5	26,8	28,9	30,8	32,3	36,4	33,9	33,2	32,9
Wind at sea	5,0	5,3	6,1	7,0	7,5	8,1	9,4	12,0	15,1	16,9	16,3	16,3
Photovoltaics	11,5	13,4	15,9	18,7	21,6	24,5	27,4	30,0	37,5	41,3	40,8	39,8
Hydropower	3,5	3,5	3,4	3,4	3,3	3,2	3,2	3,1	2,6	2,2	2,2	2,1
Biomass (incl. biogenic share of waste)												
	8,9	9,2	9,3	9,0	8,8	8,4	7,9	7,3	4,4	2,8	2,4	2,3
Geothermal energy	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Imported greener Hydrogen												
	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,3	0,2	0,2	0,3
<b>Transport (RED II)</b>	<b>9,4</b>	<b>11,0</b>	<b>12,9</b>	<b>15,4</b>	<b>19,4</b>	<b>24,2</b>	<b>28,9</b>	<b>34,6</b>	<b>61,3</b>	<b>80,2</b>	<b>88,8</b>	<b>92,9</b>
Transport (national Statistics)												
	6,2	6,6	7,3	8,3	10,2	12,2	14,2	17,0	27,8	41,9	51,4	57,4
Biodiesel (incl. HVO and vegetable oil)												
	3,4	3,3	3,3	3,3	3,6	4,0	3,9	3,9	3,5	3,7	3,7	3,7



Biogenic												
Petrol fuels	1,1	1,2	1,2	1,3	1,4	1,6	1,7	1,9	1,9	1,8	1,8	1,7
Biogases	0,3	0,5	0,4	0,5	0,4	0,4	0,4	0,3	0,2	0,1	0,0	0,0
Renewable electricity	1,3	1,7	2,4	3,1	4,0	5,1	6,4	8,1	19,0	31,7	39,3	44,4
Green hydrogen/ E-fuels	0,0	0,0	0,0	0,1	0,6	1,2	1,8	2,8	3,2	4,6	6,6	7,5
<b>Heating and cooling (Eurostat)</b>												
U.S	<b>17,5</b>	<b>18,3</b>	<b>19,3</b>	<b>20,6</b>	<b>22,1</b>	<b>24,3</b>	<b>26,7</b>	<b>29,2</b>	<b>41,5</b>	<b>43,9</b>	<b>46,0</b>	<b>47,9</b>
Biomass and renewable waste	12,0	12,3	12,7	13,2	13,8	14,7	15,5	16,5	21,2	21,9	22,6	23,1
Other renewable Energy	5,5	6,0	6,6	7,3	8,0	8,9	9,7	10,5	14,9	16,1	17,3	18,5
Hydrogen	0,0	0,0	0,0	0,1	0,2	0,7	1,5	2,2	5,3	5,8	6,1	6,3

Other renewable energy sources include geothermal, environmental heat, solar thermal, renewable district heating

Note: Variations in the sum due to rounding differences

Source: Modelling 2023 projection report, co-action scenario (MMS)

According to EU statistics, the share of renewable energy in the transport sector is growing rapidly to 34.6 % by 2030 due to the multiple counting of individual technologies. There is also a significant increase of 17 % according to national statistics. This development is mainly driven by the increasing share of renewable electricity used for e-mobility. The share of biogenic fuels is growing slowly until 2030 and remains close to the level achieved. Green hydrogen/e-fuels are slowly becoming more important at the end of the decade, especially in the aviation and maritime sectors, but overall lag behind electro-mobility.

With regard to heating and cooling, it is also true that differences between EU and national statistics are offset by the specific features of the modelling exercise and are therefore assumed to have the same statistical values in a simplified way. By 2030, the share of renewable energy will increase by almost 12 percentage points to 29.2 %. The share of biomass and renewable waste is increasing steadily over time. However, in the course of the 2020s, other renewable energies, i.e.

Geothermal energy, environmental heat, solar thermal and renewable district heating are increasingly important.

Table B12b describes the trend in the opposite assumption that imports of hydrogen and hydrogen derivatives come entirely from sources other than renewable energy (0 per cent green hydrogen). Consequently, the share of renewable energy sources is lower than when it comes to assuming hydrogen imports from fully renewable energy sources.

**Table B12b: Renewable energy in the Reference Scenario – Shares of total**

**sectoral consumption for the years 2023 to 2050, % – assuming hydrogen imports  
from non-renewable sources only**

	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
<b>Gross final energy-consumption</b>	<b>21,0</b>	<b>22,1</b>	<b>24,1</b>	<b>26,6</b>	<b>29,3</b>	<b>32,1</b>	<b>35,1</b>	<b>38,5</b>	<b>51,8</b>	<b>62,1</b>	<b>65,4</b>	<b>68,0</b>
Total gross final energy-consumption (national statistics)	21,1	22,2	24,2	26,7	29,4	32,2	35,2	38,7	51,9	62,0	65,1	67,6
<b>Electricity (Eurostat)</b>												
U.S	<b>48,6</b>	<b>51,6</b>	<b>56,5</b>	<b>62,7</b>	<b>68,1</b>	<b>73,2</b>	<b>78,7</b>	<b>84,8</b>	<b>96,1</b>	<b>97,3</b>	<b>95,1</b>	<b>93,5</b>
Onshore wind	19,6	20,1	21,7	24,5	26,8	28,9	30,8	32,3	36,4	33,9	33,2	32,9
Wind at sea	5,0	5,3	6,1	7,0	7,5	8,1	9,4	12,0	15,1	16,9	16,3	16,3
Photovoltaics	11,5	13,4	15,9	18,7	21,6	24,5	27,4	30,0	37,5	41,3	40,8	39,8
Hydropower	3,5	3,5	3,4	3,4	3,3	3,2	3,2	3,1	2,6	2,2	2,2	2,1
Biomass (incl. biogenic content of waste)	8,9	9,2	9,3	9,0	8,8	8,4	7,9	7,3	4,4	2,8	2,4	2,3
Geothermal energy	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Imported greener Hydrogen	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<b>Transport (RED II)</b>	<b>9,4</b>	<b>11,0</b>	<b>12,9</b>	<b>15,5</b>	<b>19,0</b>	<b>23,2</b>	<b>27,2</b>	<b>32,2</b>	<b>59,5</b>	<b>78,3</b>	<b>86,5</b>	<b>90,5</b>
Transport (national Statistics)	6,2	6,6	7,3	8,4	9,8	11,3	12,7	14,6	25,6	38,9	47,0	52,4
Biodiesel (incl. HVO and vegetable oil)	3,4	3,3	3,3	3,3	3,6	4,0	3,9	3,9	3,5	3,7	3,7	3,7
Biogenic Petrol fuels	1,1	1,2	1,2	1,3	1,4	1,6	1,7	1,9	1,9	1,8	1,8	1,7
Biogases	0,3	0,5	0,4	0,5	0,4	0,4	0,4	0,3	0,2	0,1	0,0	0,0
Renewable electricity	1,3	1,7	2,4	3,1	4,0	5,1	6,4	8,1	19,0	31,6	39,2	44,2
Green hydrogen/E-fuels	0,0	0,0	0,0	0,2	0,2	0,3	0,3	0,4	1,0	1,7	2,3	2,8
<b>Heating and cooling (Eurostat)</b>												
U.S	<b>17,5</b>	<b>18,3</b>	<b>19,3</b>	<b>20,6</b>	<b>22,1</b>	<b>23,9</b>	<b>25,7</b>	<b>27,6</b>	<b>37,8</b>	<b>47,3</b>	<b>50,8</b>	<b>54,4</b>
Biomass and renewable waste	12,0	12,3	12,7	13,2	13,8	14,7	15,5	16,5	21,2	24,1	25,5	27,4
Other renewable Energy	5,5	6,0	6,6	7,3	8,0	8,9	9,7	10,4	14,8	20,5	22,2	23,6
Green hydrogen	0,0	0,0	0,0	0,1	0,2	0,4	0,5	0,7	1,9	2,7	3,1	3,4

Other renewable energy sources include geothermal, environmental heat, solar thermal, renewable district

heating

Note: Variations in the sum due to rounding differences

Source: Modelling 2023 projection report, co-measures—  
Scenario (MMS)

Compared to Tables B12a and B12b, differences in renewable shares only emerge from 2026 and 2027 when the imported hydrogen is used. At the technological level, only hydrogen applications differ accordingly. At sector level, all sectors are affected, the electricity sector is significantly less than the transport sector and heating and cooling. These differences in the assumption of fully green hydrogen imports are initially in the low range of well below 1 percentage point and increase to just under 4 % for transport by 2050 and above 5 percentage points for heating and cooling.

Taking both tables together, according to EU statistics, the share of renewable energy in gross final energy consumption in 2030 ranges from 38.5 % to 40.2 %. (According to national statistics it is 38.7 % to 40.4 %)

The share of renewable energy in the electricity sector is in a narrow range of 84.8 % to 84.0 % in 2030. According to EU statistics, the share of renewable energy in transport in 2030 ranges from 32.2 % to 34.6 % (according to national statistics 14.6-17 %). The share of renewable

Energy in heating and cooling is between 27.6 % and 29.2 % in 2030.

The higher the future realised shares of green hydrogen in total hydrogen imports, the closer the share of renewable energy is at the top of the ranges shown.

## 4.3. Energy efficiency

### 4.3.1. Current primary and final energy consumption in the economy and per sector (including industry, residential, service and transport)

Between 2008 and 2022, primary energy consumption decreased by around 18.5 %. Between 2010 and 2022, the decrease was 17.6 %. Final energy consumption decreased by 7.1 % between 2008 and 2022, and final energy consumption decreased by 8.6 % between 2010 and 2022 (Table B13).

The different end-use sectors have experienced different decreases in consumption since 2010. Household consumption decreased by 12.2 % between 2010 and 2022. The decline in industry (other mining and manufacturing) was 10.4 % and in trade, trade and services (GHD) by 9.5 %. Transport consumption decreased by only 2.5 %.

**Table B13: Primary energy consumption (PEV), final energy consumption (FEC) total and by sector, 2008 to 2022, in PJ**

	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
<b>PEV</b>	<b>14.380</b>	<b>14.217</b>	<b>13.599</b>	<b>13.447</b>	<b>13.822</b>	<b>13.180</b>	<b>13.262</b>	<b>13.491</b>	<b>13.523</b>	<b>13.129</b>	<b>12.805</b>	<b>11.895</b>	<b>12.440</b>	<b>11.714</b>
<b>EEV</b>	<b>9.159</b>	<b>9.310</b>	<b>8.881</b>	<b>8.919</b>	<b>9.179</b>	<b>8.699</b>	<b>8.898</b>	<b>9.071</b>	<b>9.208</b>	<b>8.924</b>	<b>8.973</b>	<b>8.400</b>	<b>8.785</b>	<b>8.507</b>
Industry <sup>1</sup>	2.587	2.592	2.634	2.587	2.551	2.545	2.548	2.609	2.666	2.601	2.512	2.395	2.607	2.322
Transport	2.571	2.559	2.568	2.559	2.612	2.616	2.621	2.690	2.765	2.704	2.722	2.288	2.354	2.494
Households	2.558	2.676	2.333	2.427	2.556	2.188	2.302	2.376	2.342	2.320	2.425	2.402	2.479	2.349
GHD <sup>2</sup>	1.443	1.483	1.346	1.345	1.460	1.350	1.428	1.396	1.434	1.299	1.315	1.315	1.346	1.343

1 other mining and manufacturing

2 Trade, trade, services

Source: BMWK (2023)

#### 4.3.11. Current potential for the application of high-efficiency cogeneration and efficient district heating and cooling

Heating and cooling networks play a central role in the transformation for climate-neutral heating and cooling. Their importance and scope will increase in the future. On the other hand, the importance of mostly fossil-based cogeneration for the provision of district heating and cooling will decrease in the future. The evolution of CHP heat production in the reference scenario is shown in Table B14. In response to Russia's war of aggression in Ukraine and the resulting supply shortages of fossil imports, the share of renewable energy and waste heat in heating and cooling networks will be significantly increased in Germany. This is based, inter alia, on the EU requirements under the EED and the REDs.

The share of renewable energy and waste heat in district heating in Germany was around 23 % in 2020 and around 25 % in 2022. It is expected to increase to 50 % by 2030 and to fully decarbonise district heating and cooling by 2045. The legal basis for this is currently laid down in the Act on Heat Planning and Decarbonisation of Heating Networks. The law was adopted by the Federal Cabinet on 16 August 2023 and is to be adopted by the Bundestag and Bundesrat in the current year. The legal bases then applicable will be updated or supplemented accordingly before the NECP update is finalised.



**Table B14: Heat production from CHP plants in the reference scenario up to 2050, in TWh**

	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Brown coal	10	9	8	7	4	4	3	1	0	0	0	0
Coal	18	13	9	8	4	4	2	1	0	0	0	0
Gas	93	96	95	92	93	90	88	85	66	20	20	18
Mineral oil	8	9	8	8	7	5	5	5	3	1	1	1
Biomass	59	61	63	63	63	61	59	55	38	29	28	29
Other	22	22	22	21	21	21	20	20	19	19	19	19
Hydrogen	0	0	0	0	0	1	1	2	6	3	4	5
<b>Total</b>	<b>210</b>	<b>210</b>	<b>205</b>	<b>200</b>	<b>192</b>	<b>184</b>	<b>177</b>	<b>168</b>	<b>133</b>	<b>73</b>	<b>71</b>	<b>72</b>

Note: Biomass including the biogenic fraction of waste Source: Modelling 2023 projection report, co-action scenario (MMS)

#### 4.3.111. Projections taking into account the current energy efficiency policies, measures and programmes for primary and final energy consumption described in point 1.2.ii. for each sector at least until 2040 (including for 2030)

In the reference scenario, primary energy consumption will decrease by 29.2 % by 2030 and by 38.2 % by 2040 compared to 2010. During the same period, final energy consumption decreases by just over 16.2 % and 25.8 % respectively (Table 15).

**Table B15: Primary energy consumption (PEV), final energy consumption (FEC) in the Reference Scenario – total and by sector for the years 2023 to 2050, in PJ**

	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
<b>PEV</b>	<b>12.122</b>	<b>11.875</b>	<b>11.582</b>	<b>11.210</b>	<b>10.858</b>	<b>10.578</b>	<b>10.306</b>	<b>10.071</b>	<b>9.292</b>	<b>8.784</b>	<b>8.554</b>	<b>8.435</b>
<b>EEV</b>	<b>8.571</b>	<b>8.581</b>	<b>8.433</b>	<b>8.303</b>	<b>8.179</b>	<b>8.048</b>	<b>7.931</b>	<b>7.804</b>	<b>7.297</b>	<b>6.904</b>	<b>6.683</b>	<b>6.559</b>
Industry <sup>1</sup>	2.463	2.493	2.476	2.439	2.404	2.364	2.332	2.293	2.192	2.155	2.176	2.202
Transport	2.616	2.656	2.595	2.564	2.522	2.489	2.455	2.407	2.221	2.064	1.978	1.945
Households	2.295	2.270	2.230	2.191	2.162	2.115	2.072	2.036	1.836	1.687	1.581	1.503
GHD <sub>2</sub>	1.196	1.161	1.132	1.109	1.092	1.080	1.072	1.067	1.047	999	948	908

- 1 other mining and manufacturing;
- 2 Trade, trade, services

Source: Modelling 2023 projection report, co-action scenario (MMS)

The largest decrease in final energy consumption is in the sectors of commerce, commerce and services and households, with around 28 % and 23.9 % by 2030 (compared to 2010). In industry, overall final energy consumption is declining and falls by 11.5 % by 2030. Also in the transport sector, energy consumption at the end of the decade is moderately decreasing by 5.9 % compared to the reference year 2010.

#### 4.3.1. Cost-optimal levels of minimum energy performance requirements resulting from national calculations, in accordance with Article 5 of Directive 2010/31/EU

The studies on cost-optimal levels of minimum energy performance requirements in buildings are currently being updated.

### 4.4. Security of energy supply

#### 4.4.1. Current energy mix, domestic energy resources, import dependency, including relevant risks

The current energy supply in Germany continues to be dominated by the consumption of fossil fuels. Mineral oil, gases and coal accounts for slightly less than 80 % of primary energy consumption in 2022 (Table B16). The share of renewable energy has increased to over 17 %

**Table B16: Primary energy consumption by energy carrier for the years 2010 to 2022, in PJ**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022*
Coal	1.714	1.715	1.725	1.840	1.759	1.729	1.693	1.502	1.428	1.084	896	1.112	1.128
Brown coal	1.512	1.564	1.645	1.629	1.574	1.565	1.511	1.507	1.481	1.163	958	1.127	1.168
Mineral oils	4.684	4.525	4.527	4.628	4.493	4.491	4.566	4.671	4.452	4.511	4.087	4.039	4.116
Gases	3.171	2.911	2.920	3.059	2.660	2.770	3.056	3.159	3.091	3.214	3.136	3.303	2.792
Nuclear energy	1.533	1.178	1.085	1.061	1.060	1.001	923	833	829	819	702	754	379
Renewable energy	1.413	1.463	1.385	1.499	1.519	1.644	1.676	1.797	1.802	1.904	1.972	1.949	2.026
Other energy-carriers	254	267	244	222	237	234	247	243	222	226	213	222	205
External-tradebalance Electrical energy	-64	-23	-83	-116	-122	-174	-182	-189	-175	-118	-68	-67	-98

<b>Total</b>	<b>14.217</b>	<b>13.599</b>	<b>13.447</b>	<b>13.822</b>	<b>13.180</b>	<b>13.262</b>	<b>13.491</b>	<b>13.523</b>	<b>13.129</b>	<b>12.805</b>	<b>11.895</b>	<b>12.440</b>	<b>11.714</b>
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\*) Data for the year 2022 are provisional.

Only fossil gases. Biogas is listed under renewable energy. Net exports of electricity are weighted with negative signs.

Source: BMWK (2023)

Table B17 shows the percentage of net imports as imports minus exports and inventory changes in relation to actual primary energy consumption. Mathematical values above 100 % for 2022 are due to stockpile increases, which had increased in the wake of Russia's war of aggression against Ukraine and the related energy crisis.

The import dependency of the energy mix is mainly due to the high consumption of fossil fuels, the vast majority of which are imported. An exception is lignite, which is wholly domestically extracted and even exported to a small extent. At the end of 2018, subsidies for domestic hard coal sales were terminated. As of 2019, the share of imports of hard coal will increase to 100 %. Security of supply with imported hard coal is estimated to be high due to the liquid world market and international supply structures. Between 2010 and 2021, the importance of the countries of the former Soviet Union in importing hard coal into Germany has steadily increased, reaching around 50 % in 2021. Together with three other countries, the USA (17 %), Australia (13 %) and Colombia (6 per cent), these countries account for over 80 per cent of hard coal imports into Germany.

Following the entry into force of the EU coal embargo on Russian exports on 11 August 2022, the existing German coal imports had to be replaced in the short term. As a result, Russia's share of hard coal imports decreased to 29 % in 2022 and was mainly replaced by deliveries from the US (21 %), Colombia (16 %) and Australia (14 %).

**Table B17: Import dependency for the years 2010 to 2022, net imports as a percentage**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Coal	77,0	81,6	80,3	86,8	87,3	88,4	94,8	91,9	88,3	105,5	92,9	97,7	104,6
Brown coal	—1,6	—1,8	—1,9	—1,9	—2,7	—2,6	—1,9	—2,1	—2,2	—2,4	—2,3	—2,3	—2,2
Mineral oils	97,8	96,3	98,3	97,6	97,8	98,7	98,0	97,0	97,2	99,1	98,3	96,8	98,4
Gases	81,3	86,7	85,6	86,8	89,1	88,6	90,2	91,3	95,6	98,6	88,7	88,8	106,1
Nuclear energy	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Renewable energy	—0,6	0,0	0,5	—0,8	—1,7	—1,4	—1,4	—1,3	0,3	—0,8	1,2	—0,2	—0,5
<b>Total</b>	<b>59,0</b>	<b>60,6</b>	<b>61,3</b>	<b>62,4</b>	<b>61,6</b>	<b>61,7</b>	<b>63,8</b>	<b>63,3</b>	<b>63,6</b>	<b>67,4</b>	<b>63,7</b>	<b>63,0</b>	<b>68,9</b>

The percentages of net imports are imports minus exports and bunkers) in relation to primary energy consumption. Arithmetic values of more than 100 % are due to stock increases. Nuclear energy is considered as domestic primary energy as defined by Eurostat: BMWK (2023)

While gas consumption decreased by around 380 PJ between 2010 and 2022, domestic production



decreased significantly over the same period. Overall, the share of imports of gases increased significantly. Germany imported about 95 % of its natural gas demand. In 2023, Germany receives its gas imports mainly from the three countries Norway, the Netherlands and Belgium, or landed LNG imports in these countries. The Federal Network Agency collects these figures and the transit volumes as part of its monitoring report.

Mineral oils are imported almost entirely. Germany sourced the largest share of its mineral oil imports from Russia, with just over 25 % in 2022, followed by Norway (around 15 %) and the US (around 14 %). Africa's contribution was around 14 per cent, including Libya with around 5 per cent and Nigeria with 3 %. The share of OPEC member countries was around 18 %.

#### **4.4.11. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)**

In the reference projection, primary energy consumption decreases by around 3.690 PJ between 2023 and 2030 (Table B18). The decline in primary energy consumption for fossil fuels is mainly driven by the increasing use of renewable energy in the buildings and electricity sectors, reduced conversion losses for wind, PV and electromobility, and the decline in coal and mineral oil consumption. In electricity generation, the shares of coal and lignite fall significantly, mainly due to the long-term increase in CO<sub>2</sub> prices in the ETS. Electricity production from natural gas is also steadily declining from around the middle of the decade. The use of domestic nuclear energy will be completely phased out as of 2023. The short-term and short-term extension of the lifetimes of the nuclear power plants at the beginning of 2023 could no longer be taken into account in the modelling carried out mainly in 2022. Renewable energy consumption is growing significantly, by 2030 by 53 % compared to 2023, and continues at lower growth rates in the decades thereafter.

**Table B18: Primary energy consumption in the reference scenario after Energy carriers from 2023 to 2050, in PJ**

	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Coal	1.562	1.239	1.078	923	780	710	644	584	443	406	373	381
Brown coal	1.203	975	901	628	377	225	56	30	11	6	4	4
Mineral oils	4.134	4.248	4.149	4.058	3.944	3.804	3.674	3.493	2.795	2.207	1.881	1.685
Gases	2.895	2.898	2.833	2.808	2.769	2.638	2.511	2.340	1.808	1.310	1.265	1.222
Nuclear energy <sup>s</sup>	0	0	0	0	0	0	0	0	0	0	0	0
Renewable energy	2.257	2.362	2.495	2.672	2.863	3.045	3.238	3.455	4.187	4.746	4.841	4.947
He/she earns other energy	243	227	211	193	178	213	255	318	367	344	361	319
External els balance Electrical energy*	-173	-74	-86	-72	-52	-56	-72	-149	-318	-234	-170	-123
<b>Total</b>	<b>12.122</b>	<b>11.875</b>	<b>11.582</b>	<b>11.210</b>	<b>10.858</b>	<b>10.578</b>	<b>10.306</b>	<b>10.071</b>	<b>9.292</b>	<b>8.784</b>	<b>8.554</b>	<b>8.435</b>

\* including low shares of district heating

Source: Modelling 2023 projection report, co-measures— Scenario (MMS)

The reference projection shows that with the switch from imported conventional to renewable energy, import dependency decreases from 69.7 % in 2023, with a peak of 70.2 % in 2024, to 65.2 % in 2030. The level of dependency further decreases in subsequent years to 60.1 % in 2040. (Table B19). While the share of domestic energy sources is increasing as a result of the decline in indigenous lignite use and the phasing out of nuclear energy, the increasing share of domestic renewable energy dominates the overall development. The decreasing share of imports of renewable energy refers in particular to imports of biomass.

**Table B19: Import dependency in the Reference Scenario – net imports for 2023 to 2050, %**

Energy source	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Coal	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
Brown coal	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Mineral oils	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Gases	90,5	89,3	89,7	90,4	91,0	91,4	91,4	91,4	92,0	92,5	93,1	93,7
Nuclear energy	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Renewable energy	13,5	15,2	15,8	15,8	16,1	16,1	15,7	14,7	13,0	11,6	10,3	9,4
<b>Total</b>	<b>69,7</b>	<b>70,2</b>	<b>69,4</b>	<b>69,6</b>	<b>69,5</b>	<b>68,7</b>	<b>67,9</b>	<b>65,2</b>	<b>62,6</b>	<b>60,1</b>	<b>57,5</b>	<b>55,0</b>

The percentages of net imports (imports minus exports and bunkers) in relation to primary energy consumption. It is also assumed that there will be no lignite exports from 2023 (but historically it is already very low). Nuclear energy is considered as domestic primary energy as defined by Eurostat. Consequently, the use of nuclear energy for the production of electricity does not increase import dependency. The energy mix of the German electricity import reflects the energy mix of the surrounding countries from which Germany purchases electricity. This includes different shares of electricity from renewable sources (wind, solar, hydro, bioenergy) and conventional energy sources (mainly coal, natural gas and nuclear energy) depending on the market situation. The latter may change proportionally due to reduction pathways in some neighbouring countries.

The potential import needs for biomass fuels are derived from the projected consumption of biomass fuels minus the sum of the projected biomass fuel generation in agriculture and forestry and the estimation of biomass fuels from biogenic residues and waste raw materials (see 2023 projection report, chapter 3.4.2) Source: Modelling 2023 projection report, co-action scenario (MMS)

## 4.5. Internal energy market

### 4.5.1. Electricity interconnectivity

#### 4.5.1.1. Current interconnection level and main interconnectors

The development of electricity trading capacity in the European grid interconnection, which is assumed for quantitative analysis, is based on the Ten-Year Network Development Plan (TYNDP 2022) in the long term. The assumptions are presented in Table B20.

**Table B20: Reference scenario – average available trading capacity for Germany and its electrical neighbours, from 2020 to 2050, in MW**

Export (from after...)	DE	AT	BE	CH	CZ	DK	FR	NL	NO	PL	SE	UK	Total
2020	5000	0	800	2150	1600	2850	1468	0	400	615	0	0	14883
2025	5000	500	800	2150	1600	2850	1468	0	400	615	0	0	15383
2030	6000	500	3273	2150	2550	2880	2500	1400	1000	2015	1400	0	25668
2035	6400	550	3273	2150	2805	2880	2750	1400	1375	2015	1400	0	26998
2040	6800	600	3273	2150	3060	2880	3000	1400	1750	2015	1400	0	28328

2045	6800	600	3273	2150	3060	2880	3000	1400	1750	2015	1400	28328
2050	6800	600	3273	2150	3060	2880	3000	1400	1750	2015	1400	28328

Import (from... to (DE))	AT	BE	CH	CZ	DK	FR	NL	NO	PL	SE	UK	Total
2020	5000	0	4000	3750	585	1500	553	0	1050	615	0	17053
2025	5000	500	4000	3750	585	1500	553	0	1050	615	0	17553
2030	6000	500	4165	3750	2543	2880	2500	1400	1500	2015	1400	28653
2035	6400	550	4165	3750	2797	2880	2750	1400	1875	2015	1400	29982
2040	6800	600	4165	3750	3051	2880	3000	1400	2250	2015	1400	31311
2045	6800	600	4165	3750	3051	2880	3000	1400	2250	2015	1400	31311
2050	6800	600	4165	3750	3051	2880	3000	1400	2250	2015	1400	31311

At the time of calibration of the model, the Network Development Plan (NEP) had not yet been published, so no comparison could be made here with the current data.

Source: ENTSO-E TYNDP 2022 scenario Global Ambition and additional own assumptions

#### 4.5.1.11. Projections of interconnector expansion requirements (including for the year 2030)

The Network Development Plan (NEP) shall review, over a two-year period, the requirements for the development of transmission systems arising from the evolution of the domestic production and consumption structure as well as from the European internal energy market. The results of the NEP are published on [www.netzentwicklungsplan.de](http://www.netzentwicklungsplan.de) [HYPERLINK](#) "http://www.netzentwicklungsplan.de/" and, in their most up-to-date version, are used as a basis for the quantitative analyses for the National Energy and Climate Plan.

### 4.5.2. Energy transmission infrastructure

#### 4.5.2.1. Key characteristics of the existing transmission infrastructure for electricity and gas

##### Electricity

According to TSOs, the German electricity transmission system currently comprises around 38.5000 km of lines in the extra high voltage (220/380 kV). Further details on electricity infrastructure can be found in Chapter 3.4.1.

##### Gas

Germany has a modern and robust gas transport infrastructure with a large gas pipeline network with a total length of 613.605 km (year 2022, BDEW May 2023); of which 130.393 km of low-pressure network, 182.624 km of medium pressure network, 126.766 km of high-pressure network and 173.822 km of domestic lines. The network of transmission system operators (TSOs) has more than 110 compressor stations and is connected to the gas networks of neighbouring countries through more than 25 border crossing points (BCPs). The German gas transmission network is divided into a gas area with high-calorific gas (H-gas) and low-calorific gas (L-gas).

Network development measures to optimise and reinforce the network in line with needs, to develop the network in line with needs and to ensure security of supply are included in the network development plan for gas. This must be prepared by the transmission system operators (see chapter 3.4.2.i. and below).

4.5.2.11. Projections of network expansion requirements at least until 2040 (including for the year 2030)

## **Electricity**

With regard to the expansion of the electricity grid, please refer to the comments in Chapters 2.4.2 and 3.4.1.

## **Gas**

Details of the current network development plan for gas will be provided by the Federal Government in the forthcoming final NECP update.

### **4.5.3. Electricity and gas markets, energy prices**

#### 4.5.3.1. Current situation of electricity and gas markets, including energy prices

As of September 2021, the day-ahead wholesale electricity price had already increased. This trend continued over the turn of 2021/2022 and intensified in the wake of Russia's aggression against Ukraine. Since then, gas and coal prices have also risen significantly.

The evolution of electricity prices was very volatile and closely correlated with gas prices, as gas-fired power plants set the price in the electricity market in many hours. Gas price developments, in turn depended to a large extent on the evolution of Ukraine's crisis and the respective escalation steps of the Russian side in supplying gas to Germany and Europe. (BNetzA 2023) In particular in mid-2022, maximum wholesale electricity prices were achieved. Since then, the wholesale electricity price has tended to fall into 2023. However, prices remain above pre-2021 levels.

According to analyses by the BDEW (2023), consumer prices for electricity show a significant increase from 2021 onwards, continuing into 2023. In spite of a decline in government-related price components, such as, in particular, the abolition of the EEG surcharge, the increase in purchasing costs has recently dominated the consumer price. The current fall in wholesale prices causes a slight reversal of the trend in procurement costs. The average electricity price for new sales for small to medium-sized industrial enterprises (excluding electricity tax) has recently dropped significantly.

The current average annual electricity price for small to medium-sized industrial enterprises has more than halved compared to the peaks in the second half of 2022.

Consumer prices for natural gas reflect the above trend in purchasing costs. Following the sharp increases in the second half of 2022, a decrease in price levels can be observed on average for the current year 2023, but this does not compensate for the price increases since 2021 (cf. BDEW 2023). Further explanations and updates are presented in the final NECP update.

4.5.3.11. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

Charges, levies and charges are levied on final consumers' prices of natural gas and electricity. These price components refinance, for example, the grid infrastructure and the development of renewable energy. However, for reasons of climate protection and for reasons of energy and, last but not least, distribution policy, other forms of refinancing are also conceivable. Against this background, the long-term evolution of end-user prices for fuels and electricity is not only dependent on (global) price and cost developments and is therefore uncertain. Projection results must, in principle, be viewed and classified in this context.

Updated price projections for the reference scenario will be provided in the final NECP update.

## 4.6. Research, innovation and competitiveness

### 4.6.1. Current situation of the low-carbon technology sector and, where possible, its position on the global market (this analysis shall be carried out at Union or global level)

Low-carbon technologies are an integral part of the green technologies sector. Current political, social, technological and economic developments are driving the sector forward in an unprecedented way: This includes, in addition to the European Union's Green Deal, the growing demand for sustainable economic concepts and efforts to rebuild economies in a climate-friendly way to overcome the COVID-19 pandemic.

Previous forecasts of global and national market growth have been clearly confirmed and continue to provide a positive outlook (BMU, 2021). In 2020, the market volume of German environmental technology and resource efficiency was EUR 392 billion. By 2030, the total volume of domestic lead markets will more than double to EUR 856 billion. This corresponds to an average annual growth rate of 8.1 %. Energy efficiency remains the largest lead market (EUR 117 billion), followed by the lead market for sustainable mobility (EUR 91 billion).

The energy transition drives the lead market for environmentally friendly production, storage and distribution of energy. In addition to renewable energy photovoltaics and wind, stationary storage technologies in the form of batteries and hydrogen will drive the market even more in the future. The expected annual growth by 2030 is 8.5 % higher than the industry average.

In addition, the increasing interconnection of generation, distribution and consumption of electricity and heat requires major investments. Within sustainable mobility as defined in the UN 2030 Agenda, demand is shifting from efficiency technologies to e-mobility. Alternative propulsion technologies have by far the highest expansion speed. The market segment will develop with an average annual growth of 13.3 % between 2020 and 2030, so that the global

The market is expected to reach EUR 623 billion by 2030 (2016: EUR 34 billion).

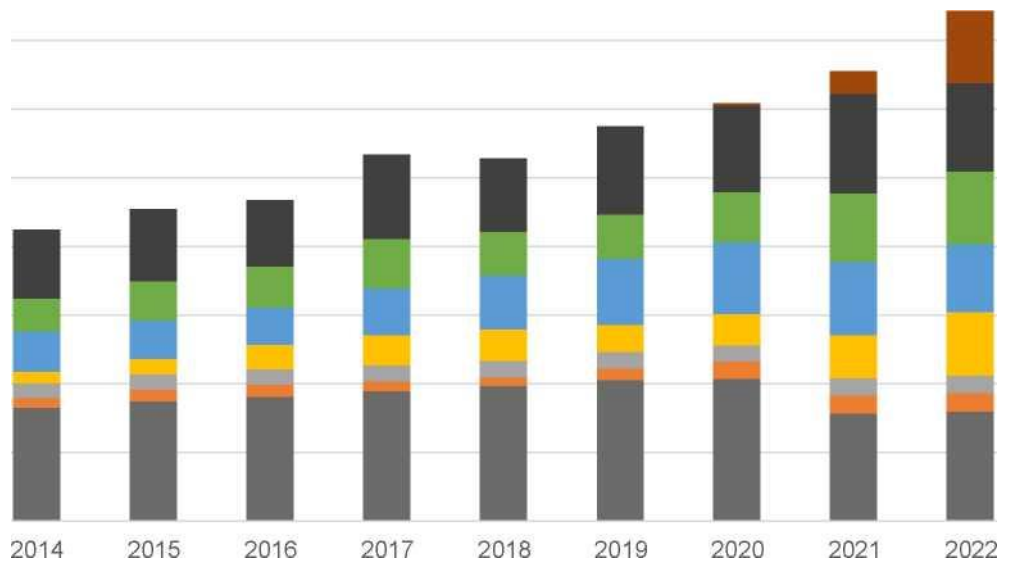
German suppliers are successfully defending their position on the global market. Products, processes and services of environmental engineering and resource efficiency 'Made in Germany' have a strong reputation worldwide and explain the strong export performance of the German industry. While Germany's share of global economic output is around 3 %, environmental technology and resource efficiency companies contribute around 14 % to the global market of their sector. Europe remains the most important market for German suppliers; Countries such as Brazil, Mexico, Canada, Japan and South Korea are increasingly important as exporting countries.

#### 4.6.11. Current level of public and possible private spending on research and innovation in low-carbon technologies, current number of patents and current number of researchers

Public spending on energy research has more than doubled over the last decade. In 2022, the Federal Government invested EUR 1.49 billion under the energy research programme. The funds are divided between direct project funding and institutional support for the Helmholtz community. In addition,

the Länder reported their own expenditure on energy research in 2020 totalling around EUR 387 million. (Figure B1)





1600,00  
 1400,00  
 1200,00  
 1000,00  
 800,00  
 600,00  
 400,00  
 200,00

**Figure B1: Support for energy research in Germany since 2014 in EUR million**

- Project funding: Strategic funding formats
- Project funding: Energy production
- Project funding: System integration: Networks, storage, sector coupling
- Project funding: Energy transition in the consumption sectors
- Project funding: Cross-system research themes of the energy transition
- Project funding: Nuclear safety research
- Accompanying measures

Source: BMWK

Spending on business R & D is an important factor for innovation, both in low-carbon technologies and for a competitive economy as a whole. According to estimates by the Stifterverbands Wissenschaftsstatistik (Stifterverbands Wissenschaftsstatistik), businesses' R & D activities have increased markedly since the end of the COVID-19 pandemic. There are currently no estimates of current expenditure on innovative low-carbon technologies. However, business surveys show that, among other things, climate protection or climate neutrality is gaining importance and is a driver for research and development activities: More than 41 % of the R & D companies surveyed wanted to have carried out or commissioned R & D with a specific contribution to climate neutrality in 2021 (Stickerverband Wissenschaftsstatistik 2023).

Analyses of patent applications published by the German Patent and Trademark Office (DPMA) and the European Patent Office (EPO) with effect for Germany show that German companies have a leading position in climate-friendly technologies in their home market. Innovation in electromobility and alternative energy sources has increased significantly in recent years, while the development of alternative energy production has stagnated for years (DPMA, 2021, 2022). Detailed quantitative assessments cannot be provided at this stage.

#### **4.6.111. Breakdown of current price elements representing the three main price components (energy, grids, taxes and levies) electricity prices of industry**

Electricity prices for industrial companies vary considerably. Current surveys by the Federal Network Agency and the Federal Cartel Office investigate electricity prices for industrial companies (24 GWh annual purchase volume) which are not covered by the statutory exemptions as of 1 April 2022. These electricity prices are essentially in the range of 13.60 to 35.03 ct/kWh (excluding VAT). The average price is 22.51 ct/kWh. Table B21 describes the price components. At 12.77 ct/kWh, the cost of energy procurement and distribution represents on average more than half of the total price.

The long-standing technical cut-off date for the data collection in 2022 was three months before the EEG-surcharge was reduced to zero in Germany. In a statistically correct manner, the EEG-surcharge is still shown in Table B21. Without the EEG-surcharge, the average price would be less than 19 cents/kWh under other similar conditions. Under this assumption, the cost of energy procurement and distribution would average more than two thirds of the total price.

**Table B21: Electricity price components for industrial customers**

Electricity price level for industrial customers (excluding: Benefits) as at 1 April 2022	CT/kWh (arithmetic mean values)
Net network charge	2,94
Measurement, metering point operation	0,02
Concession fee	0,14
EEG-Surcharge	3,72
Other levies*	0,87
Electricity tax	2,05
Price component to be influenced by the supplier	12,77 (residual amount)
<b>Total price (excluding VAT)</b>	<b>22,51</b>

Industrial customers with an assumed annual consumption of 24 GWh without benefits  
 Other surcharges include levies under the KWKG, §19 StromNEV, surcharge under § 18  
 AbLaV, offshore grid levy.

Source: BNetzA/BKartA (2023)

If, on the other hand, electricity consumers meet the requirements of the rules laid down in the relevant regulations and laws, there are reductions in the various levies and levies (Table 23). If all possibilities for reduction are met, the price component, which cannot be influenced by the supplier, could fall from just under 10 cents/kWh to less than 1 ct/kWh.

**Table B22: Possible advantages for industrial customers**

Retrieval of prices by 1 April 2022	Assumed value	Possible reduction	Remaining amount <sup>1</sup>
EEG-Surcharge	3,72	—3,51	0,21
Electricity tax	2,05	—2,05	0,00
Net network charge	2,94	—2,35	0,59
other levies	0,87	—0,73	0,13
Concession fee	0,14	—0,14	0,00
<b>Total</b>	<b>9,73</b>	<b>—8,79</b>	<b>0,94</b>

Industrial customers with assumed consumption of 24 GWh per year Source: BNetzA/BKartA (2023)

In individual cases, electricity prices vary greatly from one undertaking to another. For example, individual purchase volumes and profiles play a role in determining prices. There are also regional differences, such as network charges. Various relief schemes, including the EEGsurcharge and the electricity tax, result in reduced payment obligations, in particular for companies whose production is particularly energy-intensive and which are highly competitive at international level, under certain conditions. These relief schemes contribute to the preservation of Germany’s industrial base in return for compensation (in view of the climate objectives) and are in the overall economic interest. For the Federal Government, it is clear that the international competitiveness of German industry must be ensured. The aim remains to avoid the relocation of companies to countries with lower environmental standards or lower levies on energy (“carbon leakage”).

#### 4.6.iv. Description of energy subsidies, including for fossil fuels

Currently, in particular, the following subsidies for energy (Table 23) exist in Germany, which, directly or indirectly, also subsidise fossil fuels.

**Table B23: Overview of subsidies related to energy sources according to the Federal Government's subsidy report**

No.	Name of Subsidy	Amount of the grant or grant or tax reduction in 2023 in EUR (data circular 29). Federal Government Subsidies Report)	Objective of the measure and climate impact	Duration/Expiration
1	Grants to the Sales of German hard coal for Electricity generation, sales to the steel industry and compensation for charges arising from: Capacity adaptation		Ensuring the socially and regionally compatible phasing out of the German coal industry by the end of 2018.	Expired as at 31.12.2018
2	Award from Adjustment allowance (APG) to Employees of the Coal mines	45.500.000	Ensuring the socially and regionally compatible phasing out of the German coal industry by the end of 2018.	Limited to 2027
3	Electricity price-compensation	2.993.000.000	Grants to electro-intensive companies to compensate for increases in electricity prices due to emissions trading.	Limited to 31.12.2030
4	Tax relief for businesses of the Land and Forestry (agricultural diesel)	440.000.000	Agricultural holdings shall benefit from a tax-paid diesel fuel in so far as it is used for land management purposes. or ground-bound Animal husbandry has been used. The purpose of the subsidy is to maintain an independent supply and to ensure the competitiveness of the German agricultural and forestry sector.	unlimited
5	Tax relief for Energy products used for the propulsion of gas turbines and combustion engines in eligible installations within the meaning of Section 3 of the Energy Tax Act (electricity production, combined heat and power	The tax revenue shall be: through the Advantage is not de facto reduced.	The measure is based on the technical requirements laid down in European law. Distinction between heating and fuel. For certain uses (mainly electricity production in CHP plants), fuels are thus first reduced to the Heitzoff tax rate. As a result, double taxation (on the output side is subject to electricity tax) can be avoided by favouring input into the production of electricity.	unlimited

	Interconnection, gas transport and storage)			
6	Tax relief for Energy products which: in Associated with the production of energy products (producer privilege)	270.000.000	With regard to energy products produced on their own account, the subsidy is mandatory under EU Directive 2003/96/EC. For external energy products is not one optional A reduction in energy tax, which implements a reduction of the tax burden on the minimum tax rate under EU law.	unlimited
7	Energy tax reduction for certain processes and procedures	450.000.000	The subsidy exempts particularly energy-intensive processes and procedures from the energy tax.	unlimited
8	Energy tax on electricity production	1.750.000.000	Action the purpose of which is to avoid Double taxation of electricity generation.	unlimited
9	Total Energy tax relief for combinedheat and power	400.000.000	The measure supports the production of electricity and heat in CHP plants	31.12.2023
10	Partially Energy tax relief for combinedheat and power	85.000.000	The measure supports the production of electricity and heat in CHP plants	unlimited
11	Energy tax reduction for Enterprises in the manufacturing sector and Companies of Land and Forestry	170.000.000	The support is intended to ensure the international competitiveness of manufacturing and agricultural and forestry enterprises.	unlimited
12	Energy tax reduction for Company of the producer Trades in Special cases (peak compensation)	(175.000.000)	The scheme will relieve the burden on manufacturing companies in order not to burden them in terms of their international competitiveness beyond a sustainable level of retention. The scheme is designed to protect against carbon leakage. Peak balancing is currently in place until the end of 2023.	Limited to 31.12.2023
13	Electricity tax credit for Company of the producer Trades and Companies of	950.000.000	The support is intended to ensure the international competitiveness of manufacturing and agricultural and forestry enterprises.	unlimited

	Land and Forestry			
14	Electricity tax credit for certain processes and Procedure	750.000.000	The subsidy exempts particularly electro-intensive processes and processes from the electricity tax. The support serves of the Fuse of the Competitiveness of German industry and protection against carbon leakage.	unlimited
15	Electricity tax credit for Enterprises in the manufacturing sector in Special cases (peak compensation)	(1.375.000.000)	The scheme will relieve the burden on manufacturing companies in order not to burden them in terms of their international competitiveness beyond a sustainable level of retention. The scheme is designed to protect against carbon leakage. Peak balancing is currently in place until the end of 2023.	Limited to 31.12.2023
16	Tax relief for natural gas used as propellant	36.000.000	Gas fuels can substitute liquid fossil fuels and contribute to the diversification of energy supply. The support provided for resource conservation and climate protection to establish natural gas in the fuel market.	Limited to 31.12.2026
17	Energy tax reduction from Machinery and vehicles used exclusively for handling goods in seaports	25.000.000	The subsidy promotes the shift from road to maritime and rail transport, which can have beneficial effects on the environment.	unlimited
18	Tax relief for Energy products used in domestic air transport	504.000.000	The purpose of the subsidy is to safeguard the Germany's economic location.	unlimited
19	Tax relief for Energy products which: in of the Inland waterway transport is used	115.000.000	The aim is to bring the competitive conditions of navigation on other waterways into line with the tax exemption applicable to the Rhine river basin under international agreements.	unlimited
20	Tax relief for local public authorities	65.000.000	Strengthening local public transport over distances of up to 50 km will contribute to climate-friendly mobility.	unlimited
21	Power control allowance for driving in Rail wagons and traffic with:	115.000.000	The subsidy strengthens the environmentally friendly modes of transport (railways and trolleybuses) over private transport.	unlimited

	Overhead contact line somnibus			
22	Electricity tax reduction for Shore-side electricity supplying from Watercraft	2.000.000	The advantage of shore-side electricity supply serves to reduce air pollution in German seaports.	unlimited
23	Tax exemption for Electricity from renewable Energy sources	64.000.000	There should be an incentive the electricity produced by large renewable energy installations is at least as follows: To be used already at the place of production.	unlimited
24	Exemption for electricity from so- called small installations with a rated output of up to 2 megawatts	622.000.000	The exemption promotes electricity generation and use from renewable energy sources and highly efficient combined power and heat production plants.	unlimited
25	Tax relief for the local public	1.000.000	The subsidy is intended to safeguard and strengthen the competitiveness of electric passenger transport.	unlimited

More detailed information can be found in the latest 29.  
Subsidy report from the Federal Government.



# 5. Impact assessment of planned policies and measures

5.1. Impacts of planned policies and measures described in Section 3 on the energy system and GHG emissions and removals, compared to projections with current policies and measures (described in section 4)

**5.1.1. Projections of the evolution of the energy system and of greenhouse gas emissions and removals, but also, where relevant, emissions of air pollutants pursuant to Directive (EU) 2016/2284, with planned policies and measures at least until 10 years after the period covered by the plan (including the last year of the validity period of the plan), taking into account relevant Union policies and measures.**

Appropriate policies and measures should reduce greenhouse gas emissions by at least 65 % by 2030. In addition, as German contributions to the EU energy targets, Germany's primary energy consumption is expected to decrease by 39.3 % by 2030 compared to 2008 and final energy consumption by at least 26.5 % by 2030 compared to 2008. The share of renewable energy in gross final energy consumption in Germany is expected to be 42.5 % in 2030 (Chapter 2).

The baseline scenario presented in Chapter 4 shall take into account policies and measures which, by 31 August:  
Implemented or adopted in 2022. Since this  
Additional measures have been adopted or entered into force set. There are also other policies and measures in:  
planning. A full presentation of all planned  
Finally, policies and measures are not yet available.  
will be accompanied by an updated list of the entry into force of  
Measures submitted for the final NECP update. The final NECP  
Update is accordingly presented with the projections of developments.  
the energy system, emissions and removals of  
Greenhouse gases.

As described above, in addition to the measures described in Chapter 4, the Federal Government has in the meantime introduced further climate protection measures. These are included in the draft 2023 climate change programme of 21 June 2023. These measures aim to fill a large part of the remaining gap to meet national climate targets. An updated projection of the mitigation effect will be provided with the final NECP update.

**5.1.11. Assessment of policy interactions (between existing policies and measures and**

**planned policies and measures within a policy dimension and between existing policies and measures and planned policies and measures of different dimensions) at least until the last year of the period covered by the plan, in particular to establish a robust understanding of the impact of energy efficiency/energy savings policies on the sizing of the energy system and to reduce the risk of stranded investment in energy supply**

Further improvement of energy efficiency is a key building block of the Federal Government's climate policy. Such policies and measures are also part of the latest climate change programme 2023. The CO<sub>2</sub> price<sub>for</sub>heating and transport is to be re-increased as planned from 2024 onwards, following the suspension of the planned increase in the price path in 2023, in order to specifically improve the economic viability of climate-friendly techniques compared to more climate-damaging alternatives. As of 2027, the transfer of this national<sub>carbon</sub>price to the new EU ETS 2 is planned.

The revenues from European and national carbon pricing – in so far as they are not needed to finance the German Emissions Trading Authority – are transferred to the Climate and Transformation Fund in accordance with Section 4 of the KTF Act (see 3.1.1.iii). Not least in order to avoid social hardship, support programmes remain an integral part of the policy mix. In this context, the funding requirements are adapted in regular terms to the transformation paths necessary to achieve the objectives, as was done in 2022, for example in the revision of the Federal Funding for Efficient Buildings (BEG). Carbon leakage risks are addressed by the funding guidelines on electricity price compensation and by the Regulation on measures to prevent carbon leakage through the national fuel emissions trading (BECV), which entered into force in 2021.

National CO<sub>2</sub> pricing <sub>for</sub>emissionsOutside the EU ETS will make sustainable biomass economically more attractive as an energy carrier in line with the UN 2030 Agenda, in various, sometimes competing, energy uses such as electricity generation, biofuels or thermal recovery in industry and buildings. The sustainable raw material potential for biomass use in Germany is limited, as is the case for imported biomass, and it is therefore important to direct scarce biomass into efficient uses through policies and measures. A concept for this is currently being developed with the National Biomass Strategy, which should also contribute to meeting the targets for the development of natural sinks.

Germany's energy efficiency policy identifies potential for efficiency across all sectors and thus makes it possible to set up or develop support programmes in a targeted manner. Due to the multitude of interactions between individual policies and measures, the integrated impact of the programme can only be seen in this way and not as the sum of the effects of individual actions. The following points are discussed in more detail:

Rebound effects may occur in energy saving measures, for example in buildings or industry. The immediate effect of saving energy by a measure is offset by a partial increase in energy consumption. For example, tenants of rehabilitated buildings, sometimes heat their homes at a higher temperature than before renovation, thereby recovering part of the expected energy savings.

The interactions of energy efficiency measures are mathematically taken into account when determining savings effects through individual interaction factors. Annex III to the NECP provides an overview of this. A description of how the additionality of the respective measures was ensured can be found under the methodological aspects of the measures described.

This list will be completed in the final update of the NECP.

In the energy sector, the phasing out of coal-fired power generation and accelerating the roll-out of renewable energy are two major and landmark policy measures that are closely interlinked: The gradual decline in fossil electricity generation from brown and hard coal will be replaced by additional renewable electricity. Security of supply will be maintained throughout the process. The necessary changes in the regulation of energy markets and infrastructure planning are part of the energy transition.

For policies and actions between different policy areas, a number of cross-cutting policy approaches and systemic links are relevant:

For example, increased electrification in transport and heating and cooling contributes significantly to fossil fuel substitutions and thus to the effective decarbonisation of these sectors. At the same time, photovoltaic systems are being installed on buildings, which are mostly used in the grid or used for mobile or heat applications. This sector coupling strategy is important to achieve greenhouse gas reductions in all sectors and to achieve the overarching climate targets. Measures such as the promotion of electro-mobility or the uptake of heat pumps lead to increased electricity demand. If the sum of additional demand is met by fossil generation capacity, this creates additional challenges in achieving the targets in the transformation sector; be it the deployment targets for renewable energy or the decarbonisation of electricity generation. For this reason, the simultaneous reduction of energy demand by increasing energy efficiency is crucial.

#### **5.1.111. Assessment of interactions between existing policies and measures and planned policies and measures, and between those policies and measures and Union climate and energy policy measures**

In principle, policies and measures adopted by the Federal Government are always developed and adopted in the light of existing and planned measures of the European Union. This also applies to energy and climate. It is precisely in these

It is important to achieve positive interactions between individual measures. Synergies and spill-over effects are important as they can support and accelerate the achievement of national and European energy and climate targets.

More specific information on the interactions will be provided after decisions have been taken on the design of planned policies and measures.

## **5.2. Macroeconomic and, to the extent feasible, the health,**

environmental, employment and education, skills and social impacts, including just transition aspects (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 to projections with existing policies and measures

### **Impact on the economy and on education, skills and social conditions**

Comments on the impact of further measures on the development of gross domestic product (GDP) will be presented for the final NECP update. The comments will focus in particular on changes in investment activity and the impact on consumption patterns via relative electricity price developments, energy costs and wage developments. The impact on employment structures is also addressed.

For example, employment in the energy sector is changing: The last two decades show a gradual but noticeable shift in employment from traditional, mostly conventional, energy sectors to renewable energies. Such a development is a logical consequence of the intended decarbonisation of the energy system in Germany and will continue. But the digitalisation and transformation of the economy towards net-zero greenhouse gas emissions also lead to massive shifts in the skills required. The transformation of the German economy towards a digital, green economy can only be achieved with the necessary skilled workers. There is already a shortage of skilled workers in many sectors of the German economy, both highly skilled workers and academics. Demographic change will further exacerbate the shortage. Occupational groups related to the energy transition are also affected, such as technical and IT professions and construction professions. Additional information will be provided in the final NECP update.

#### **—Social conditions, including just transition aspects**

It is important for the Federal Government that no one is left behind in the transformation process and achieves a just transition to net-zero greenhouse gas emissions. When designing energy and climate measures, the Federal Government therefore always focuses on the social dimensions of its action. This is because transformations can only succeed with the support of the whole population. Affordability, e.g. of energy services, food or housing, must always be guaranteed for all sections of the population. For this reason, the Federal Government supports citizens in their transformation through a number of current support measures.

The national emissions trading (nETS) for heating and transport (BEHG) has shown that this low-income household has a higher relative burden than high-income households (Federal Government 2022). At the same time, an essential asset relief measure counters this: By abolishing the EEG-surcharge, lower income groups benefit more than upper income groups. The premature reduction to zero in 2022 and the definitive abolition of the EEG-surcharge in 2023 will thus fully alleviate the burden on household customers.

As of January 2024, according to the Bundestag resolution of 8 September 2023, the Federal Funding for Efficient Buildings (BEG, individual measures, heating support) provides for an income bonus of 30 % for owner-occupied owners with a taxable household of up to EUR 40,000.

A supplementary loan – with an interest rebate of up to EUR 90,000 of taxable annual household income – will also be available for the exchange of heating and other individual efficiency measures.

The transition from the nETS to ETS2 in 2027 also needs to pay particular attention to distributional effects with regard to lower and middle income groups. In addition to national measures, the European Social Climate Fund will have a special role to play here. The Federal Government will ensure that the funds earmarked for Germany from 2026 will support the target groups defined in Regulation (EU) No 955 (2023) in the transformation process.

The CO2 Cost Allocation Act regulates the allocation of CO2 costs between tenants and landlords. The aim is to incentivise both sides of the tenancy: for the tenant on energy-efficient behaviour and for the landlord to invest in climate-friendly heating systems or energy renovations. To this end, the cost of CO2 for residential buildings is divided on the basis of the energy quality of the rented building. Tenants in buildings with poor energy renovation will be relieved. This discharge is expected to be felt for the first time in 2024 when operating the operating accounts for the first accounting period 2023.

With the entry into force of the Housing Allowance Plus Act, the Federal Government has also implemented the largest revision of the Housing Allowance Act (WoGG). The Federal Government has thus created the legal basis for targeted relief from higher housing and heating costs for lower income households in Germany. The reform focuses on increasing the entitlement to housing benefits and expanding the range of beneficiaries of housing benefits through the introduction of a heating cost component, a climate component and an increase in the general level of benefits.

One measure that continues to benefit lower income groups is the promotion of the so-called ‘electricitycheck’. This measure will provide advice and financial support to low-income households on electricity and heating energy savings.

The extent to which people can participate and benefit from energy transition and transformation measures varies from region to region. For example, inhabitants of rural regions and cities are affected in various ways by the necessary transformation in the energy, transport, buildings and agriculture sectors. For example, under current LPT structures, rural households often rely on the car, which means that the transition to climate-friendly e-mobility can place considerable financial burdens on low-income households in particular. Transport measures address mobility pressures that are particularly affecting people in rural areas.

The strong expansion of renewable energies is also visible in rural areas rather than in cities. Structural change presents challenges and opportunities for lagging regions. Opportunities exist in the often rural regions, for example, through land availability, which can be used for

renewable energy production, which in turn can be an economic advantage for location. In recent years, a number of settlement successes have been recorded in structurally weak areas, also against this background.

In terms of jobs, the opposite effects can be observed in structurally weak regions: On the one hand, the transformation unleashes workers in certain areas and, on the other hand, labour and skilled labour shortages tend to increase as a result of demographic change and migration. In principle, less-favoured regions, which often also face specific structural challenges, are likely to be increasingly affected by ageing societies and by labour and skills shortages over the next few years and decades than structurally strong regions. Against this background, the Federal Government and the Länder have also focused on soft location factors in the reform of the Joint Task for Improvement of the Regional Economic Structure (GRW) adopted in December 2022. In addition to existing measures to create and safeguard jobs, regions should be encouraged to become more attractive not only for businesses but also for employees through increased funding opportunities in the field of regional services of general interest. With the reform, the Federal Government and the Länder aim to make the GRW an even more effective tool for shaping regional transformation processes. To this end, the

Broadens the scope of the GRW, which in future no longer aims solely at job creation, but to three main objectives, including accelerating transformation processes towards a climate-neutral and sustainable economy. In this context, funding opportunities have been broadened to accelerate the transition towards a climate-neutral and sustainable economy.

Further reform projects in the area of regional structural support, in particular the further development of the overall German support system for structurally weak regions during this legislative term, are also intended to further improve the sustainability of structurally weak regions.

### **Environmental and health impacts,**

[Update reservation – present text of the section is (broadly) from NECP 2020. Please check the update. Take note of guidance on this from the 2022 NECP Guidance – on the understanding that no explicit planned measures are described here in the draft NECP,]

Existing and planned policies and measures are intended to provide relief for the environment and health, as well as synergies for a sustainable energy sector. At the same time, adverse environmental and health effects due to the further development of renewable energies and further technological developments must be largely ruled out.

Energy conversion processes continue to account for a large proportion of air pollution in Germany. In addition to greenhouse gases, air pollutants are released in particular in all sectors combusting fossil and biogenic fuels. The material inputs of the energy sector into the environment also have an impact on human health. For example, nitrogen dioxide (NO<sub>2</sub>), as a by-product of processes in combustion plants and combustion engines, is a respiratory irritant that increases the irritation of other pollutants, so that respiratory or cardiovascular diseases may occur. Fine dusts also have a negative impact on human health. Decarbonisation

measures reduce these emissions and thus the burden on people and nature in many areas.

Furthermore, the most efficient use of raw materials and sustainable land use make a significant contribution to climate protection and biodiversity protection. This is because the extraction, processing and transport of energy sources and energy installations, including the supply chains, involves the use of land. The task is to minimise this land use and avoid permanent soil degradation and loss of land for other purposes and uses. The aim is to ensure that the development of energy sources is nature-friendly and, as far as possible, to keep them out of areas of value for nature conservation. This requires smart planning and control, which identifies suitable areas and excludes unsuitable areas.

The accelerated expansion of renewable energies, in particular the overriding public interest given to renewable energies, and the changes in species protection (see section 3.1.2 above: The Renewable Energy Sources Act 2023, Implementation of the EU Emergency Ordinance) create pressures on nature and environmental protection, which require compensation. This includes in particular the implementation of species support programmes. The relevant provisions of the EEG apply until electricity production in Germany is almost greenhouse gas-neutral, and the provisions of the EU Emergency Authorisation Regulation apply only for a transitional period.

## 5.3. Overview of investment needs

### 5.3.1. Existing investment flows and forward investment assumptions with regard to the planned policies and measures

Making the energy transition a success, while providing modern and efficient infrastructure, will require increased investment in the coming years. Already in the last two decades, the energy sector has invested heavily in transforming the energy system. However, significant investments have also been made by households and businesses in Germany in areas of final energy demand.

In order to achieve its climate objectives, Germany shall also make financial flows consistent with lowgreenhouse gas emissions and climate-resilient development in order to implement the third long-term objective of the Paris Agreement set out in Article 2.1.c. The operationalisation of this objective is necessary in order to channel the necessary funding into the transformation of net-zero development and, on the other hand, to put an end to climate-damaging financing.

The energy sector includes the supply of fuels, the operation and maintenance of energy production, storage and distribution facilities, and trade in final energy. This refers to both fossil and increasingly renewable energy sources. In these energy sectors, more than EUR 30 billion were invested in 2021 (GWS 2023). Most of this was for investments in the provision of electricity and heat. Lower shares were related to investments in final energy distribution infrastructure (electricity, gas, heat) and storage (gas, electricity, heat) and fuel supply.

Investments in final energy demand mainly concern heating and transport. Expenditure on energy renovation of buildings is an important factor in this regard. It is estimated that EUR 46.5 billion were invested in 2020 (BMWK 2023). Energy renovation of buildings is one of the key measures to increase energy efficiency; The coverage of investments in other areas of energy efficiency remains incomplete.

Investments under existing measures are made primarily by households and businesses. Only in individual sectors, such as public electricity and heat, are public promoters directly investing in the transformation of the energy system. At the same time, the public sector provides substantial financial resources to support private investment.

Achieving net greenhouse gas neutrality in Germany in 2045 involves significant additional investments. Studies show that these investments are at least in the order of magnitude in the high tens of billions of billions of euros per year. Additional information is provided in the final NECP update.

#### 5.3.11. Sector or market risk factors or barriers in the national or regional context

Investments in climate protection and in a future-proof energy system in Germany cannot be considered in isolation in an economy-wide ‘empty space’. Planned investments and the implementation of planned policies may hamper or at least slow down measures due to possible economic or structural bottlenecks. The continued investment of a sizeable billions of euros in



recent years can be seen as an indication that such risks of shortages have so far not been more relevant. For example, public support programmes, such as those that KfW may face financing constraints for businesses and households, so that individual investment, which (also) makes sense for the economy as a whole, does not stop.

Furthermore, sufficient raw materials must continue to be available in order not to restrict the production of key (investment) items for climate protection and the energy transition. The same applies to a sufficient number of professionals to efficiently implement the planned investments.

It is also important to ensure that cross-cutting effects such as rebound effects at the level of energy demand and lock-in effects for certain infrastructure investments limit the efficient implementation of energy transition investments and their effectiveness.

A lack of planning certainty can also make investment in climate change mitigation and a future-proof energy system more difficult. The Federal Government's climate policy therefore includes, in particular, measures that provide planning certainty. This includes in particular carbon pricing in the form of the European Emissions Trading Scheme (EU ETS) and the national emissions trading system (nETS) for heating and transport. Finally, a key determinant of investment is the level of government regulated price components. Against this background, the Federal Government had abolished the EEG-surcharge and instead financed the EEG from federal funds.

#### **5.3.111. Analysis of additional public finance support or resources to fill identified gaps identified under point ii**

In so far as the measures of the Climate Action Programme are financed through public funding, this is essentially anchored in the 2024 Climate and Transformation Fund (KTF) Economic Plan. As a result, the KTF remains the central financing instrument for the energy transition and climate change in Germany. A total of billions of billions of euros will be allocated to climate action and the energy transition by 2030, i.e. together with support measures outside the KTF.

The Länder use significant funding from the European Regional Development Fund (ERDF) to support climate protection. Coal regions particularly affected by structural change will also receive funding from the new EU Just Transition Fund (JTF). The JTF aims to help mitigate the negative impact of the energy transition by supporting the territories and workers most affected and to promote a balanced social and economic transition. In addition to the established Structural Funds, EU regions can receive financial support from the JTF for innovation and competitiveness. The JTF will thus help to reconcile economics and ecology and enable a socially acceptable support for structural change.

Where planned policies and measures are continued and strengthened on the basis of existing measures, the existing funding mechanisms, such as support for energy renovation of buildings through national public support programmes, for example, will continue.

It is currently unclear whether and to what extent EU financing mechanisms will be used to finance investments needed in Germany.

#### 5.4. Impact of the planned actions described in section 3 Policies and Measures for other Member States and regional cooperation at least until: go to the last Year of Validity period of the plan with a comparison with projections with current policies and measures

##### 5.4.1. Impacts on the energy system in neighbouring and other Member States in the region to the extent possible

###### **Electricity**

The further expansion of electricity lines within Germany and neighbouring countries, as well as the progressive expansion of renewable energies in all European countries, will – according to today’s assessment – lead to an increasing convergence of electricity systems in Germany and its neighbouring countries. Cross-regional electricity exchange will help to better integrate volatile electricity generation, especially from wind and PV, into the overall system, thus improving the security of supply situation in the region as a whole. At the same time, cross-regional exchanges of backup capacities (power plants, storage, load flexibility) also increase the efficiency of the electricity system in all countries.

###### **Gas**

Decarbonisation efforts could already lead to reductions in the use of gas by 2030, in particular natural gas, primary and end-ergetically. This could be due to declining final energy demand in buildings due to energy renovations and increasing shares of renewables.

### **Energy prices**

In principle, it can be assumed that falling demand for fossil fuels as a result of climate protection measures in Germany and Europe tends to lead to falling energy prices. At the same time, increasing demand for hydrogen leads to rising prices. The impact of national measures on international fuel markets is rather small.

There is a somewhat stronger influence on electricity prices, especially in neighbouring countries. A key measure of the climate change programme is the phase-out of coal-fired power generation. At the same time, renewable electricity production is increasing. With high EU ETS prices, an increasing share of renewable energy in gross electricity consumption tends to decrease domestic and other Member States' wholesale prices in the long term. On the other hand, the strong expansion of renewable energy planned in neighbouring countries also lowers the domestic wholesale price. As purchasing costs play a central role in the level of retail electricity prices, there is a direct impact on consumers.

The evolution of future electricity prices will be shaped, among other things, by electricity demand through the implementation of stronger sector coupling in heating and transport. Further details on the evolution of electricity prices are included in the final NECP.

### **Utilities**

The Federal Network Agency regularly monitors security of supply in the area of electricity and natural gas supply by pipeline. The latest report of February 2023 shows that the current plans of the Federal Government maintain a high level of electricity supply between 2025 and 2031 (including in the case of a coal phase-out in 2030). The Federal Network Agency has based its analysis on the Federal Government's ongoing plans for the transformation of the electricity system. These include: Renewable energy will be expanded in line with the objectives of the amended Renewable Energy Act (EEG 2023) and the amended Wind On Sea Act – by 2030 the generation capacity from shore wind, wind at sea and photovoltaic will be increased to 360 GW capacity. According to the network development plan, transmission and distribution networks will be upgraded. According to the report, the electricity system is even so robust to achieve these targets that security of supply would continue to be guaranteed if 10 gigawatts (GW) of generation capacity are less on the market. The progressive and increasing integration of European electricity markets contributes to security of supply.

### **Energy market integration**

A key element in energy market integration is the further development of trade capacity between Member States. The direct and indirect measures for grid expansion envisaged in the Climate Action Programme will provide the basis for further intensifying electricity trade with neighbouring countries. Increasing cross-border trade helps to better integrate renewable energy into the electricity system, make more efficient use of manageable capacities and

flexibility options and harmonise wholesale electricity prices. This will reduce electricity system costs in all countries. The energy mix of the German electricity import reflects the energy mix of the surrounding countries from which Germany purchases electricity. This includes different shares of electricity from renewable sources (wind, solar, hydro, bioenergy) and conventional energy sources (mainly coal, natural gas and nuclear energy) depending on the market situation. The latter may change proportionally due to reduction pathways in some neighbouring countries.

#### **5.4.111. Possible impact on regional cooperation**

##### **Electricity**

In the electricity system, the importance of regional cooperation is expected to increase. The more interconnected national electricity systems are, the more important is regular exchanges between countries at regional level. On the one hand, this serves to enhance the exchange of information than would be possible on a pan-European level. Secondly, regionally specific aspects can be better addressed and appropriate

Solutions are found. And third, regional cooperation can explore new innovative approaches to the operation of the electricity system that are indispensable in a fundamentally changing system. Thus, common learning curves can first be organised at regional level before the tested measures become the European standard.

##### **Gas**

In Germany and many of its neighbouring countries, there are intensive efforts to decarbonise the remaining gas demand. By 2030, this may mean that today's pipeline infrastructure, to the extent that it is to be used for future use of hydrogen, will also have to be tested and, if necessary, upgraded across borders for the uptake of hydrogen blending. Other pipes could be fully repurposed for hydrogen transport. This will require extensive bilateral and regional coordination to achieve the corresponding cost-effective upscaling.

The current planning for the core hydrogen network published by transmission system operators in July 2023 (see <https://fnb-gas.de/wasserstoffnetz-wasserstoff-kernnetz/>) identifies potential switching lines. The aim is for pipeline switchovers to around 60 % of the core hydrogen network infrastructure. There has not yet been a final application for the core hydrogen network, so no final statements can be made on specific switchovers. According to current plans, however, more than 5 000 km of conversion lines are to be expected by 2032.

##### **Oil**

This shift away from oil consumption in heating has led, on the one hand, to the development of environmentally friendly fuel technologies and, on the other hand, the need to develop new potentials such as 'power to heat' or for new fuels in the future (e.g. E-fuels). At the same time, the importance of regional/international cooperation will increase. In particular in the context of the development of new technical fuel oil use systems and new fuel developments for the

future, cross-border cooperation will be highly relevant. Developing solutions for new heating systems or propulsion systems at national level is sufficient as long as these models of thinking are discussed at laboratory level. Should developments become market-ready, international cooperation will be essential in order to be able to enter the market.

Electrification of the transport sector will, in the future, lead to a reduction in fuel demand and thus put pressure on the European refinery industry. It is important to ensure that security of supply is maintained during this transformation process.

### 5.5. The contribution of the planned policies and measures to the achievement of the Union's climate-neutrality objective set out in Article 2(1) of Regulation (EU) 2021/1119';

With the Federal Climate Protection Act (Bundes-Climate Protection Act, KSG), as amended on 18 August 2021, Germany committed itself to achieving net greenhouse gas neutrality by 2045 and a negative net emission balance after 2050. In line with these objectives, the Federal Climate Protection Act sets out an emission reduction trajectory from 2021 to 2040 inclusive; the Federal Government is to adopt a legislative proposal setting the annual reduction targets for the years 2041 to 2045 at the latest by 2032.

Compliance with the KSG trajectory is checked annually; if the trajectory is not met, the Federal Government is obliged to adopt additional mitigation measures. An amendment of the KSG is currently in the parliamentary procedure.

The measures included in the 2023 Climate Action Programme will largely close the gap to the 2030 climate target identified in the 2021 projection report, if the measures are implemented consistently. This is the first time that a reduction contribution of 65 % in 2030 compared to 1990 is in reach.

In addition to the trajectories, Section 3a of the KSG lays down a target for the development of natural sinks. The Federal Government's natural climate action programme, adopted in March 2023, is intended to make a significant contribution to achieving these objectives.

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Actions concerning  
Transposition of Article 8 of the  
Directive EU 2023/1791



Subject to further examination, the Federal Government of the Federal Republic of Germany hereby submits to the Commission a preliminary notification of the planned transposition of Article 8 of Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency (as amended by Directive (EU) 2023/1791) (hereafter EED). The notification shall contain the following information, in accordance with point 5 of Annex V EED and Annex III to Regulation (EU) 2018/1999:

- A preliminary quantification of the savings target for the Federal Republic of Germany in accordance with Article 8(1)(b) EED (Section 1);
- A description of the possible use of the options provided for in Article 8(2) EED (Section 2);
- The preliminary identification of policy measures referred to in Article 11 EED, including the cumulative end-use energy savings to be achieved by them over the period 2021-2030, as well as the further methodological explanation of this estimate (Section 3);
- Information on the calculation methods used (Section 4)
- and measures and systems to verify and monitor savings (Section 5).

The corresponding requirements in Article 8 and Annex V EED and Annex III to Regulation (EU) 2018/1999 have been taken into account when estimating the cumulative end-use energy savings resulting from the measures.

The planned implementation may be subject to change as a result of future decisions by the Federal Government and the Bundestag [Lower House of Parliament]. For example, the Federal Government will communicate other instruments and measures relevant to the fulfilment of Article 8(1)(b) EED in a timely manner and thereby ensure that the Federal Republic of Germany will achieve the savings target under Article 8 EED. These may consist, inter alia, of other existing policy measures to increase energy efficiency. This may also include the notification of additional measures. The Federal Government will also inform the European Commission of any adjustments to its reporting obligations under the Governance Regulation.

**1. Calculation of the level of the total amount of the aid for the whole period from 1 January 2021 to 31 January 2021 December 2030 energy savings obligations**

**a) annual final energy consumption averaged over the last three-year period prior to the 1 January 2019**

The calculation basis for determining the savings target under Article 7(1)(b) EED is based on the values of the average final energy consumption of the Federal Republic from 2016 to 2018 based on EUROSTAT's final energy consumption figures.

- Final energy consumption in 2016: 216,87 Mtoe (9 079 PJ)
- Final energy consumption in 2017: 218,62 Mtoe (9 153 PJ)
- Final energy consumption 2018: 215,17 Mtoe (9 009 PJ)
- Average final energy consumption per year for 2016-2018: **9.081 PJ/216,89 Mtoe**

**b) Total cumulative energy savings in final energy consumption to be achieved in accordance with point (b) of Article 8(1) of Directive 2012/27/EU [in ktoe]**

The savings target under Article 8(1)(b) EED is therefore estimated at 5 757.15 PJ and 95.46 Mtoe. This results from the following breakdown:

	Percent		
	in PJ		in Mtoe
<b>2021-2023</b>	0,8	1961,427	46,84789
<b>2024-2025</b>	1,3	1534,635	36,65413
<b>2026-2027</b>	1,5	1225,892	29,27993
<b>2028-2030</b>	1,9	1035,198	24,72527
<b>Total</b>		5757,153	137,5072

**c) Data and sources used in the calculation of final energy consumption:**

The figures for final energy consumption are based on Eurostat data<sup>25</sup>. In Eurostat's database, the indicator to track progress towards the targets is coded 'FEC2020-2030' and 'Final energy consumption (Europe 2020-2030)'.

**2. Use of the options provided for in Article 8(6) and (8) of Directive 2023/XX/EU:**

The German Government does not currently intend to make use of the options provided for in Article 8(2) EED.

**3. Policy measures to achieve the energy savings referred to in Article 8(1) of Directive 2023/1791:**

In order to achieve the savings target of 5 757.2 PJ and 137.5 Mtoe under Article 8(1) EED, the Federal Government chooses to implement alternative policy measures in accordance with Article 10 EED. A combination of existing measures and new measures to be adopted shall be used. The Federal Government reserves the right to notify the Commission of any further measures to achieve the objectives referred to in Article 8 as soon as they are adopted.

**a) Overview of expected cumulative end-use energy savings for the period from 1 January 2021 to 31 January 2021 December 2030**

The following table provides an overview of the existing and planned alternative measures under Article 10 EED and the expected cumulative end-use energy savings for the period from 1 January 2021 to 31 January 2021. December 2030:

	Action title	Subject
	Federal support for energy and resource efficiency in the economy (grant and credit and promotion competition)	Promotion of cross-cutting technologies, renewable process heat, metrology, control and regulation technology, sensory and energy management software, off-site waste heat utilisation, transformation concepts, resource efficiency, energy-related optimisation of installations and processes and technology-open implementation of energy efficiency projects in enterprises
	Federal funding for efficient buildings (BEG)	Promotion of energy efficiency in buildings (residential, non-residential, individual measures).
	Cooling and Climate Directive	Promoting efficiency gains in refrigeration/air-conditioning systems
	Federal programme for Promoting energy efficiency and CO <sub>2</sub> savings in agriculture and horticulture	Promote (Advice; Knowledge transfer and Information projects; Individual measures; Energy efficiency investments; Renewable Energy production and Waste heat utilisation; Interconnections and distribution networks for the transfer of energy efficient district heating and cooling)
	Selected elements of the Local Government Directive	Promoting the energy efficiency of indoor air systems, indoor/household lighting, outdoor lighting
	Promote the serial Remediation	Speeding up energy renovation while increasing the depth and pace of renovation was integrated into the BEG.
	<del>Promotion of electro-mobility</del> <del>electro-mobility</del> Environmental bonus directive on the promotion of electrical energy operated Vehicles (environmental bonus)	Pro rata support for purely electric vehicles through an environmental bonus
	Funding guideline for Purchase of Electric buses in local public transport	Support for the purchase of plug-in hybrid buses and battery buses
	Building Energy Act (Building Energy Act – GEG) existing	Existing requirements for new and existing residential and non-residential buildings
	Building Energy Act (Building Energy Act) – -65 % requirement	Rules on future heating with a renewable share of at least 65 %
	Energy and electricity tax	Steering effect through excise duties
	Carbon pricing for the Transport and heat sectors	Carbon pricing for transport and heat from 2021 onwards (fuels and heating)

	Air transport tax	Air transport tax
	Tax support for energy Building renovation	Tax reduction for energy measures for self-residential buildings
	HGV tolls	Heavy goods vehicle tolls
	Making rail travel cheaper	Reduction of VAT on long-distance rail journeys
	Energy consultations	Support for energy advisory services for residential buildings and households, for non-residential buildings of municipalities and non-profit organisations and for small and medium-sized enterprises
	Energy-savingCheck	Advice to low-income households on saving electricity and energy.
	SME Initiative Energy transition and Climate change mitigation (MIE)	Support through training and networking projects for small and medium-sized enterprises in crafts and industry on energy efficiency and climate protection
	Heating label	Consumer information on the efficiency status of their waste heater and funding possibilities
	Energy Efficiency and Energy Efficiency Initiative Climate change networks	Voluntary agreement to set up energy efficiency and climate protection networks to increase energy efficiency in enterprises
	Climate-neutral Federal administration	Commitment by the Federal Government to make the federal administration climate neutral by means of various measures

**b) Description of the measures in accordance with the requirements of points 3.2 and 3.3 of paragraph 3 of Annex III and point (c) – (d) of Annex III to Regulation (EU) 2018/1999**

A detailed description of these measures and the savings they achieve each year, in accordance with the requirements of Annex III, paragraph 3, points 3.2 and 3.3, and Annex III(4)(c) to (d) of Regulation (EU) 2018/1999, once the Federal Government has updated and re-implemented measures in accordance with the requirements of Article 8 of Regulation (EU) 2018/1999.

**c) Measures and share of savings to be achieved in households in energy poverty in accordance with Article 8(3)**

Measure M23 StromsparCheck and M21 Energieberatungen (VZBV part) address energy poverty. The energy savingCheck is aimed exclusively at the target group of low-income households, thus making a significant contribution to combating energy poverty. Low-income households receive targeted advice on electricity and energy savings and are provided free of charge with energy saving products. In the context of the measures for energy advice to households by the consumer centres, which is part of measure M21 Energy advisory services, all the services offered by the consumer centres for low-income households are free of charge. The Verbraucherzentrale-Bundesverband (VZBV) offers various types of energy advice, particularly in the field of households and residential buildings. In addition to online advice and telephone helplines, other formats of personal advice are available. These include, first of all, the energy checks, which address differentiated priorities around the (private) home in different ways. These are the basic check, the building check, the heating and solar thermal check, the detailed check and the fitness check for the use of solar thermal or photovoltaic technology. Advice is provided by qualified energy consultants (requirements such as:

Energy efficiency experts from the BEG funding of the BMWK) on all issues of energy and electricity saving and the use of renewable energies or billing issues related to their own home.

The Federal Government is also preparing further measures and updating existing measures in order to comply with the requirements.

The share of savings to be achieved in households affected by energy poverty in accordance with Article 8(3) is currently still being calculated.

- 4. Calculation methodology for measures notified under Article 10 of Directive 2012/27/EU (as amended by Directive 2021/1791) (excluding tax measures)**
- a) Measurement methods used in accordance with point 1 of Annex V to Directive 2012/27/EU (as amended by Directive 2023/1791)**

Depending on the measure, different measurement methods are used depending on the data available. For most of the support measures, the savings presented are based on projections of savings collected and measured through evaluations in accordance with Annex V(1)(a) EED.

- b) Method to express the energy savings (primary or final energy savings);**

The savings of the above measures are presented in final energy.

- c) Lifetimes of measures, rate at which the savings decline over time and approach used to take into account the lifetime of savings;**

The information on the lifetime of the measures in question can be found in the leaflets of the measures presented under 3. In so far as these could be attributed to one of the measures listed in Annex VIII of the Commission Recommendation on the implementation of energy savings obligations under the Energy Efficiency Directive<sup>35</sup>, the lifetimes specified therein were used. In this case, there is no reference to the source. If no suitable lifespan has been found, this has been defined and justified in the leaflet.

The issue of degradation, i.e. the decrease in savings over time, for example due to wear and tear of the new products/components, does not seem to be more relevant in the current state of the discussion. There has been no empirical evidence of wear for investment measures at least at the beginning of life. On 15/03/2019, an expert hosted by the European Commission took place in Brussels on the topic of lifespans and degradation of savings. The workshop documents and the outcome protocol state that there is currently no robust scientific basis to develop a methodology to explicitly take into account the degradation of savings. Against this background, a declining rate was not calculated at this stage, as it would not be statistically robust.

- d) Brief description of the calculation methodology, including how additionality and materiality of savings are ensured and which methodologies and benchmarks are used for deemed and scaled savings;**

The Commission's recommendations of 2 July 2010 are used to calculate energy savings (title: Recommendations on measurement and testing methods under Directive 2006/32/EC on energy end-use efficiency and energy services). The bottom-up calculation methods proposed therein focus on measures in the fields of buildings and installations, equipment and lighting. They have been adopted by the European Commission as non-binding proposals and/or recommendations in order to give the Member States the freedom to adapt the calculation methods appropriately in line with the very different national information and data situations between the Member States. The Commission's recommendations on calculating energy savings by means of bottom-up calculation methods do not cover all areas of action in which energy efficiency measures have been implemented. The Commission's recommendations therefore expressly provide that Member States are to develop or use additional national bottom-up calculation methods for those instruments for which there are no recommendations from the European Commission on the calculation of the resulting energy savings. This concerns, in particular, instruments and measures in the field of transport and mobility and cross-cutting measures. The Federal Government has made use of this option accordingly. In addition, existing evaluations of support measures/programmes were used in cases where they were available in an appropriate way. Such programme evaluations shall also be based on bottom-up calculation methods. However, they are usually linked to additional empirical building blocks, such as standardised interviews or expert interviews, and can therefore in principle provide more accurate estimates of the energy savings achieved through increased effort and associated higher evaluation costs.

The methods were already set out in the second. The Federal Republic of Germany's National Energy Efficiency Action Plan (NEAP 2011) for the calculation of energy savings induced by measures is applied and presented in detail in a methodological accompanying document. Subsequently, these methods were used to report further NEEAPs and notifications on the implementation of Article 7 EED for the period 2014-2020 and further developed taking into account the requirements set out in the Annex to the Commission Recommendation on the implementation of energy savings obligations under the Energy Efficiency Directive, Brussels, 13 September 2023, C(2023) 1791 final.

The calculation method used for each measure (calculation formula based on the Commission's recommendations, national calculation formula or reliance on existing external evaluation) is set out in the policy documents. The net effects are taking into account possible deadweight, anticipating, spillover, structural and rebound effects. In addition, the interactions between the measures according to the individual interaction factors listed in section 4e have been

taken into account. A description of how additionality of the respective measures is ensured can be found in the methodological aspects of the measures described in section 3 above.

In the case of energy efficiency support programmes, it follows from the provisions of budgetary law, in particular Section 23 of the Federal Budget Code, that measures are in principle not eligible if they could be carried out economically without support or if the implementation of the measure is legally prescribed. It follows that support must be essential for the implementation of a (energy efficiency) measure and thus also minimise possible deadweight effects.

**e) Information on how the possible overlaps between the measures and individual actions are addressed to avoid double counting of energy savings;**

The Federal Government uses so-called interaction factors (or 'instrument factors') when calculating energy savings effects. These interaction factors are a correction variable to avoid double counting of energy savings. They shall ensure that any double counting that occurs (in particular where a single energy saving measure is addressed by a larger set of instruments and programmes) is corrected and that the total amount of energy savings identified is included only once in the total savings. Energy savings in a given area are allocated pro rata to the measures addressing this sector.

The use of interaction factors (or, at the time, 'instrument factors') was already used as a methodological approach in the second. The Federal Republic of Germany's National Energy Efficiency Action Plan (NEEAP 2011) for the calculation of energy savings induced by measures is applied and presented in detail in a methodological accompanying document. Subsequently, this approach was also used and developed for the reporting of the further NEEAPs and the notifications implementing Article 7 EED for the period 2014-2020.

For the notified measures, the joint overlap is estimated for each pair of measures. However, this can only be done once all the measures to be notified are known and will be submitted accordingly.

**f) Where relevant, climatic variations and approach used.**

As Germany is relatively homogeneous in climate, different climatic conditions are not taken into account in the notified measures or are not intended to be taken into account.

Interactions with other measures have already been taken into account in the quantification of the savings effect.

**5. Monitoring and review**

**a) Brief description of the monitoring and verification system and the process of the verification;**

In order to ensure that the objectives set are actually achieved, financial measures to achieve energy savings are regularly evaluated and monitored by independent external evaluators, institutes or bodies. In accordance with the provisions of the Federal Budget Regulation (Section 7(2) BHO), they are subject to a review of their success. It examines the achievement of the objectives, the effectiveness and the efficiency of the measures. A systematic and transparent assessment is carried out in accordance with the quality standards of the Deutsche Gesellschaft für Evaluation (DeGEval). Depending on the measure or the specific evaluation design of each measure, energy savings are either calculated directly by the evaluators or the evaluation results are used as a basis for energy savings calculations by the competent departments (e.g. taking into account the number of actual aid cases and measures actually implemented with an energy saving effect). In order to fulfil its statutory tasks, a monitoring and verification system was set up by the Federal Office for Energy Efficiency. A structured monitoring template collects, among other things, information on the savings achieved by the alternative measures under Article 10 EED (the results of evaluations carried out by independent bodies in the case of measures with financial impact) from the actors responsible for the measures. A subsequent plausibility check is carried out to check the completeness and consistency of the data (within one reporting year, compared to default values of comparable measures and over time).

**b) Implementing public authority and its main responsibilities in charge of monitoring and verification system in relation to the energy efficiency obligation scheme or alternative measures;**

The Federal Office for Energy Efficiency (BfEE), set up in the Federal Office for Economic Affairs and Export Control (BAFA), carries out, on the basis of the legal basis of the Energy Services Act<sup>37</sup>, the task of monitoring the impact of energy efficiency mechanisms and other public policy measures aimed at achieving energy savings for final customers and preparing these savings for reporting purposes within the framework of national and European energy efficiency and savings targets. This includes monitoring and verifying the savings effect of the alternative measures in accordance with Article 10 EED.

**c) Independence of monitoring and verification from the obligated, participating or entrusted parties;**

Measures with a financial impact to achieve energy savings are regularly evaluated and monitored by independent external experts, institutions or bodies.

**d) Statistically significant proportion of energy efficiency improvement measures and proportion and criteria used to define and select a representative sample;**

The definition of a statistically significant sample size depends largely on the number of cases considered and other framework conditions of the measure. Therefore, a general definition, such as percentages and case numbers, is not possible, but must be considered in the light of the specific context of the measure.

The Federal Ministry of Climate Protection and Economy (BMWK) has developed a methodological guide<sup>38</sup>, which is to be taken into account by external experts when evaluating efficiency measures and provides a uniform methodology for the ex-post and accompanying evaluation of energy efficiency policy measures. This also helps to ensure the quality of the evaluation results. Depending on the case number considered, the guidance document describes how the observed savings of a statistically significant proportion of energy efficiency improvement measures are evaluated, taking into account a representative sample.

**e) Reporting obligations for obligated parties (savings achieved by each obligated party, or each sub-category of obligated party, and in total under the scheme).**

In the absence of an energy efficiency obligation scheme, no parties within the meaning of Article 9 EED are 'obligated' in Germany. However, the departments responsible for the measures report on the effects of the measures as part of the regular monitoring of savings from efficiency measures.<sup>37</sup> Act amending the Energy Services and Other Energy Efficiency Measures Act (EDL-G).

<sup>38</sup> Methodological guide for evaluation of BMWi efficiency measures (Project No 63/15 – Reinforcement)

**f) Publication of energy savings achieved (each year) under the energy efficiency obligation scheme and alternative measures;**

Continuous monitoring and comprehensive monitoring of the implementation of all planned measures and their mitigation effects will be carried out in the form of an update of the Federal Government's regularly published reports on monitoring the energy transition and the 'Climate Protection Report'.

**g) Information on Member State legislation on penalties to be applied in the case of non-compliance;**

Depending on the different nature of the alternative measures chosen by the Federal Republic of Germany under Article 10 of the EED, the possible penalties attached to them also differ in the event of non-compliance with the respective requirements. For example, a general distinction can be made between measures in the field of regulatory law and support measures. In the case of aid measures, funding is paid only after the verification of all the documents to be submitted in the use-of-funds procedure has been completed. In accordance with the General Ancillary Provisions pursuant to VV No 5.1 to Section 44 of the Federal Budget Code, the applicant is obliged to keep all relevant documents available for at least five years and, in the event of an inspection, to submit them. If he does not comply with this obligation, the condition for granting the aid is no longer applicable and the funding plus interest may be recovered. In the case of measures granting tax or levy privileges, they shall be withdrawn in the event of non-compliance. Infringements of administrative law are penalised by a fine (e.g. if the requirements of Section 48 GEG (M11) are not met, a fine of up to fifty thousand euros may be imposed).

**h) Information on policy measures provided for in the event that progress is not satisfactory.**

On the basis of the monitoring carried out by the Federal Office for Energy Efficiency, an annual review of the effectiveness of the measures referred to above is planned. For example, the Federal Government creates objectivity in achieving its efficiency and climate objectives. To this end, the Federal Government will give notice to the Cabinet Committee on Climate Change ('Climate Cabinet') and task it with annually reviewing the effectiveness, efficiency and accuracy of the measures taken<sup>39</sup>. In the event of unsatisfactory progress, the responsible departmental minister for the sector that does not meet his statutory targets shall submit an immediate post-control programme to the Climate Cabinet within three months of the confirmation of the emissions data by the Commission of Experts. On this basis, the Climate Cabinet prepares decisions on how the "2030 Climate Protection Programme" adopted by the Federal Government will be jointly adapted to achieve its underlying objectives.