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## **SECTION A: NATIONAL PLAN**

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# 1. OUTLINE AND PROCEDURE FOR DRAWING UP THE PLAN

## 1.1 Summary

### (i) *Political, economic, environmental, and social context of the plan*

The adoption of the Climate Law in 2020 set an ambitious direction for Danish climate policy and Denmark's climate diplomacy role in the world. The key objective is to reduce Danish greenhouse gas emissions by 70 % in 2030. 1990 level, and climate neutrality by 2050 at the latest. The new government, consisting of Social Democracy, the Left and the Moderats, will bring the climate neutrality target forward to 2045 and wishes to set a target of 110 % reduction by 2050 in addition. 1990 level. Since the Climal Act, more than 75 green deals have been signed and more than 110 billion have been prioritised for the major climate agreements. For example, agreements have been reached on a high and more uniform CO<sub>2</sub> e-tax for industry etc., a significant expansion of Denmark's renewable energy reduction and a binding reduction target for the agricultural and forestry sectors, which will contribute significantly to the release of 70 %.

The green transition takes into account the guiding principles of the Climate Law, which stipulate, among other things, that climate challenges are a global issue. Therefore, Denmark must be a pioneering country that can germinate and affect the rest of the world. In addition, the achievement of Denmark's climate targets must be as cost-efficient as possible, focusing on both the long-term green transition, sustainable business development and Danish competitiveness, sound public finances and employment, and that Danish business must develop and not be wound up. And in particular, Denmark must show that a green transition can be made while maintaining a strong welfare society in which cohesion and social balance are ensured.

The new government base *for Denmark of December 2022* stresses the crucial importance of keeping pace and ensuring a thorough implementation of the many climate actions that have been politically agreed. As the targets are met, the government is ready to set new, ambitious targets.

It is particularly important for Denmark to rapidly free from fossil fuels, both because of the climate but also in the light of the current war in Ukraine. This has become more important both because of geopolitical factors but also because of electricity and gas prices in Denmark.

To support implementation at all levels, the Government has set up a national energy crisis department (NEKST). NEKST is tasked with identifying solutions to green challenges in order to speed up the implementation of the Green Political Agreements. Among other things, NEKST will ensure national coordination of the deployment of green heat, which aims at reducing gas consumption as soon as possible and replacing it with green solutions. In addition, NEKST is also working to identify barriers to the agreed ambitions for the scaling of solar and wind on land and to recommend to the government any measures to accelerate deployment. NEKST acts in a rational manner and can deliver solutions to the acute green challenges that can be solved immediately. This means that action can be taken quickly – also in the course of NEKST's work. The Government Committee for the Green Transition follows the work of NEKST and is able to provide NEKST with new green tasks on an ongoing basis.

Despite the significant efforts to mitigate climate change, it is also necessary to better protect Denmark against flooding and extreme weather, which unfortunately must already be expected. The Danish ring will therefore also draw up a national climate adaptation plan to support timely implementation of the measures and ensure that the measures are organised in the best possible way.

In June 2022, the Social Democratic Party, the Venstre, the Socialist People's Party, the Radikale Venstre, the Unity List, Det Konservative Folkeparti, the Danish People's Party, the Liberal Alliance, the Alternative and

the Christian Democrats concluded the *Climate Agreement on green electricity and heat*, which aims, among other things, to ensure framework conditions that will enable the total production of electricity from solar and rural wind to be quadrupled by 2030. In addition, the parties agree to allow the supply of at least 4 gigawatts (GW) of sea wind for realisation by 2030, provided that the oceanic wind does not adversely affect State finances over the project period. It is expected that the flow from the parks can be used, inter alia, by PtX plants in Denmark. Political agreements have thus been reached on offshore wind farms to ensure a minimum of 19 GW, two of which are energy islands. However, the options are far from exhausted. The significant expansion of renewable energy (RES) can contribute with green electricity to both direct electricity consumption in Denmark, exports to the rest of Europe and green electricity for the production of green fuels such as aircraft, ships and heavy transport.

On 30 May 2023, the Government (Social Democrats, Venstre and Moderats) concluded with the Socialist People's Party, the Liberal Alliance, the Conservative People's Party, the Unity List, the Radikale Venstre, the Danish People's Party and the Alternative *Supplementary Agreement on the tendering framework for 6 GW of sea wind and energy island of Bornholm*. While the previous aspirations set high ambitions, this agreement sets out the concrete procurement framework. The agreement has the potential to secure green electricity for 14 million Danish and European households or more, and for the first time there will be state ownership of the 6 GW of classical offshore wind farms. It also introduces, for the first time, a number of new hourly requirements to participate in tenders, which will help raise the bar for sustainability and social responsibility compared to previous tenders. The agreement also contributes to security of supply and the establishment of a Marine Nature Fund will contribute, inter alia, to the knowledge of the environment and the naval effects of renewable energy expansion at sea and to the cost-effective restoration of marine nature and biodiversity with a view to improving the environmental status of the sea.

(ii) *Strategy on the five dimensions of the Energy Union*

### **Greenhouse gas reductions and RES**

With the adoption of the Climate Law in 2020, Denmark set the line for an ambitious Danish climate policy and Denmark's climate policy role in the world. Not least with the targets of reducing Danish greenhouse gas emissions by 70 % by 2030. 1990 and Denmark to become climate neutral by 2050 – an objective the government wants to bring forward to 2045. In addition, the government will propose a new target of 110 % reduction of greenhouse gas emissions by 2050 in addition. 1990.

Denmark has ambitions for large-scale renewable energy production. In the field of offshore wind, political agreements have been entered into on offshore wind farms, offering 9 GW of offshore wind, potentially at 14 GW or more, if the offshore wind growers make use of the freedom provided for in the agreement to construct as much capacity as possible on the land. In addition, work is underway to establish the North Sea energy island of at least 3 GW in 2033 and 10 GW, with 2040 as a target point. In addition, with the Agreement on green electricity and heat, Denmark has the ambition to enable a four-fold increase of renewable energy on land, equivalent to approximately 50 TWh.

### **Energy efficiency**

The government will ensure a strong focus on improving the energy efficiency of both private homes, businesses and public buildings. In recent years, Denmark has concluded a number of agreements that contribute to significant energy efficiency impacts. This applies, inter alia, to the *Climate Agreement for energy and industry, etc. (2020)*, *greening of road transport (2020)*, *Climate agreement on green electricity and heat (2022)* and *agreement on green tax reform for industry, etc. (2022)*. For example, Danish citizens can receive support to renovate their homes and convert to green heating. Companies can benefit from support for energy saving projects through the Business Pool, and municipalities and regions have been able to obtain grants to carry out energy improvement and digitalisation projects in their buildings.

Denmark has also promoted higher ambitions in the field of energy efficiency in the EU, including a higher energy efficiency target. Denmark notes with satisfaction that the European Parliament and the Council of the EU reached an agreement on the Energy Efficiency Directive on 10 March 2023 and looks forward to the final approval of the agreement.

### **Security of supply**

Denmark and Europe must become free of fossil fuels from Russian energy and eventually phase out fossil fuels. This is good for both climate and security of supply. As a result, *with regard to green electricity and heat* from June 2022, a political ambition has been set that gas will not be used for heating in Danish households from 2035 and that Denmark will be supplied with green gas by 100 at the latest. At the same time, the government's aim is to ensure that as many households as possible come away from individual gas and oil boilers as soon as possible. Households need to convert to district heating in the areas where it gives sense. In other areas, households need to convert to alternative green solutions, such as an individual heat pump.

Denmark has therefore initiated a number of measures to phase out the use of natural gas in the heating of households. Including with *the Climate Agreement on Green Electricity and Heating 2022* and the *Agreement on accelerated planning for the extraction of gas for heating and clear communication to citizens* of June 2022 between the then government and instigated the press organisation of Denmark's 98 municipalities – the National Association of Municipalities (KL), where municipal planning efforts have been launched with the ambition to deploy district heating by 2028, when it gives sense. In areas where district heating makes no sense, conversions to alternative green loosens, including through subsidy pools and advice, support the replacement of oil and gas boilers with alternative green solutions. It is also the ambition that, as of 2035, homes in Denmark will no longer be heated by gas boilers and that Denmark will be supplied with green gas by 100 at the latest. According to KF23, Denmark is expected to produce more green gas than we consume in 2030.

NEKST will support the green transition away from fossil energy and ensure thorough implementation of the politically agreed measures to, inter alia, make Denmark independent fossil fuels.

### **Internal energy market**

Denmark is one of the best connected countries in the EU, with interconnectivity exceeding the EU target for 2030. However, analysis and establishment of new foreign connections remains a high priority. Denmark will maintain and increase interconnectivity through projects coordinated with neighbouring countries, for example through the planned enthusiasts in the North Sea and Bornholm with an expected offshore wind capacity of over 13 GW. Denmark also has a strong focus on maintaining strong cooperation with neighbouring countries in relation to the development and integration of different markets.

Denmark is working to develop a free and competitive market to support the continued high integration of RES, flexible resources on both the consumption and production sides, facilitation of new players and technologies and strong sector coupling. In order to respond to this development, in 2021 the Danish Energy Agency published a series of analyses and recommendations for the electricity market – 'Market Model 3.0.' – the purpose of which is, inter alia, to support the objective of climate neutrality. Market Option 3.0 also aims to support increased electrification of both the industrial, heating and transport sectors and a balanced energy system where the production of RES is used most efficiently.

### **Research, innovation and competitiveness**

In order to achieve the 70 % target of the Climate Law, research into key technologies such as CCS, PTX and pyrolysis is needed and support their uptake. In 2020, the government launched a national green strategy:

“Green solutions of the future – Strategy for investing in green research, technology and innovation” to support a coherent effort from basic research to commercialisation of green technologies can thus support the achievement of the objectives of the Climate Law. Denmark has allocated significant funding for research, which has inter alia been translated into four mission-driven research and innovation partnerships between industry and knowledge institutions in areas with high reduction potential.

The government has also set up an expert committee to strengthen the knowledge base on the impact of the offensive green research and innovation efforts, and will, inter alia, present orientations on green forging and innovation for the future.

In 2023, a total of DKK 2,4 billion has been earmarked for green research. At the same time, the Government has agreed with the Danish Parliament’s parties to maintain the level of green research funding in the state research budget of at least DKK 2,4 billion (2023-pl) until 2025.

State funding for green research and development is being implemented through a number of channels, including mainly the Danish Innovation Fund and the Danish Free Research Fund, as well as the three development and demonstration plots: Energy Technology Development and Demonstration Programme (EUDP), Environmental Technology Development and Demonstration Programme (MUDP) and Green Development and Demonstration Programme (GUDP).

*(iii) Overview of key objectives, agreements and policies*

Table 1 illustrates an overview of key objectives, policies and agreements.

**Table 1. Overview of key objectives, policies and agreements**

Dimensions	Key objectives	Policies and agreements
<i>Greenhouse gas reductions and RES</i>	Denmark will reduce greenhouse gas emissions by 70 %. SAM-mention 1990.	The target has been adopted with the climate-o friend.
	Denmark will work towards climate neutrality by 2050.	The target has been adopted with the climate-o friend. The current government has an ambition to be climate neutral by 2045 and achieve 110 % Reductions in 2050.
	Extensive expansion of RES	In the field of offshore wind, political agreements have been reached on new tenders, together

		projects under construction and now also the new tenders could potentially more than sevenfold Denmark's offshore wind capacity by 2030 and a further 10 GW by 2040 as the target point. Denmark also has ambitions to enable a quadruple on-shore renewable energy equivalent to around 50 TWh.
<i>Energy efficiency</i>	Obligations under the EU Energy Efficiency Directive, hereunder the energy savings obligation and targets for energy savings installations.	The business pool of DKK 200-600 million per year in the period 2020-2029, with a total of DKK 3,7 billion. Conversion and transport contract subsidies and taxes imposed on the industry under green tax arrangements.
<i>Security of supply</i>	Stable and secure supply. Denmark has a planning target for the level of electricity-proof energy, which is set once a year by the Minister for Climate, Energy and Demonstration. The last fixed target applies to 2032 and is 38 break minutes by cut for an electricity consumer in one year.	Set out in the respective laws on electricity, gas and fire creators.
	Prevention of risks in the energy system.	Laws on emergency situations, cybersecurity and cabling in relation to the electricity grid.
	Transmission systems to other countries.	
<i>Internal energy market</i>	High degree of future interconnection, asset, optimisation of the use of the grid with a focus on flexibility and sector coupling, further integration of RES and a high level of security of supply.	Recommendations from the reporting of market model 3.0 initiated by the Energy Agreement of 29 June 2018
<i>Research, innovation and excellence</i>	To support Denmark's intention to reduce greenhouse gas emissions by 70 %. Compared to 1990 through the development and maturation of technologies.	National Strategy for Green Growth and Development <i>Future Green Solutions – Strategy for investing in green research, science and innovation</i> of September 2020. In addition, laws on public support programmes for

		research and innovation, including for the Innovation Fund, Denmark's Free Research Fund, EUDP, MUDP, GUDP and ELFORSK.
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## 1.2 Overview of current policy situation

- (i) *The national and EU energy systems and the political context of the national plan*

The EU helps to define a large part of the framework conditions, such as objectives, requirements and the trading system under which Danish climate action operates. Common climate regulation in the EU generally benefits Denmark as it creates a more level playing field and export opportunities for Danish companies.

The EU has an overall climate target of reducing total CO<sub>2</sub>e-emissions by at least 55 % by 2030. 1990 level. As a follow-up to the EU's 2030 climate targets, in July 2021 the European Commission presented the Fit for 55 legislative package, which has since been complemented by additional EU proposals in December 2021 (the so-called 'Winter Package'). Fit for 55 contains a wide range of proposals that involve a historically broad overhaul of the EU's climate and energy regulation, as well as new regulation in the areas of transport, among others. Many of the Fit for 55 negotiations have been concluded. The last agreements between the Council and the European Parliament on the EPBD, the Hydrogen and Gas Market Package and the Methane Regulation are expected to land in the course of 2023.

With several concrete Danish fingerprints, the agreements concluded between the Council and the European Parliament with a number of priorities that Denmark has worked to promote. It is therefore in line with Danish law that an increased level of CO<sub>2</sub> pricing has been agreed across sectors through a strengthened quota holder sub-system (EU ETS) and the extension of quota trading to maritime, road transport and heating of buildings. This increases the overall ambition of the EU ETS, so that emissions from ETS sectors need to be ducted from 43 % to 62 % in 2030. 2005 level. To this end, the Council and the European Parliament agree to establish a separate emissions trading system from 2027 for the buildings and road transport sectors, as well as fuel for certain other sectors. This goes well with Denmark working towards a new, more comprehensive and cost-effective climate architecture as soon as possible and by 2030 at the latest. Part of the revenues generated by the action will be used to support vulnerable households and micro-enterprises through a new Social Climate Fund. As part of this, the government has promoted climate regulation in agriculture through a separate land sector pillar for forests and soils. However, negotiations in the Council did not succeed in maintaining the proposal to establish a rural sector, as there was insufficient support for this. However, the issue of climate regulation in agriculture, including the establishment of a rural sector, is expected to be revisited in a few years' time when the European Commission proposes annual targets and management actions for the post-2030 period. As part of the EU's Fit for 55 package, the reduction commitments under the burden sharing agreement and the LULUCF Regulation have been substantially revised upwards. Denmark's national reduction target under the burden-sharing agreement has been increased from 39 % to 50 % in 2030. 2005 level. The reduction target covers these sectors of agriculture, road transport and buildings.

In addition to extending quota trading to road transport, other significant agreements have been reached in the field of transport. The revision of the EU aviation trading system under the Fit for 55 legislative package also includes fingerprints. Among other things, the decisions to extend the temporary derogation from the ETS for third country flights ('stop the clock') until 2027, rather than permanently delimiting the ETS to intra-EU flights, as well as accelerating the phasing out of free allocation for aviation by 2026, with Danish priorities. In addition, early involvement by Denmark has contributed to a significant strengthening of the CO<sub>2</sub> reduction



requirements for new light-duty vehicles, as a 100 % CO<sub>2</sub> emission reduction target for both new passenger cars and vans has been agreed by 2035. However, this is awaiting final approval by the Council and the European Parliament.

With the Fit for 55 package, the European Commission has also proposed to increase the EU's renewable energy (RES) target from 32 % to 40 % and the EU's energy efficiency target (EE) from at least 32.5 % to 36 % in 2030. Subsequently, the European Commission has put forward the REPowerEU proposal proposing to further increase the RES target to 45 % and the EE target further to almost 39 % in 2030. Both proposals are currently being negotiated between the Council and the European Parliament. In this context, Denmark will continue to work towards an increase in the renewable energy target to 45 % and a significantly strengthened energy efficiency improvement effort in the EU, including an increase in the EE target to at least 40 %.

As part of the Fit for 55 winter package, the European Commission presented a revision of the EPBD, as well as the hydrogen and gas market package. Trilogue negotiations on the EPBD between the Council and the European Parliament will start in spring 2023. The majority of Danish priorities are reflected in the general position of the Council. This means, among other things, that all new buildings should be zero-emission by 2030. For public buildings, this applies as early as 2028. In addition, solar photovoltaic installations are required for new public and commercial buildings above 250 m<sup>2</sup> in 2026, existing public and commercial buildings over 250 m<sup>2</sup> in 2027 and for all new residential buildings in 2029. The proposed revision of the Directive contains a number of obligations that Denmark is not expected to fulfil without further action.

The main objective of the European Commission's proposals for the revision of the Gas Directive and the Gas Regulation (also referred to as the Hydrogen and Gas Market Package) is to contribute to the achievement of the EU's climate targets of reducing greenhouse gas emissions by at least 55 % by 2030 and of climate neutrality by 2050. This, inter alia, by facilitating the uptake of renewable and low-carbon gases, including hydrogen, in the EU energy system. The aim is also to set a framework for hydrogen infrastructure and markets, building on the existing pan-European rules for the gas system. Denmark has been working for an ambitious hydrogen and gas market package that supports the EU and Denmark's climate objectives. Denmark attached great importance to the need for the package to contribute to the phase-out of fossil gas and a clear distinction between renewable and low-carbon gases. In this commitment, Denmark has reservations that low-carbon gases under the hydrogen and gas market package can be counted towards the achievement of the EU's climate objectives, in particular the sub-targets of the current Renewable Energy Directive.

### **REPowerEU**

In addition to the Fit for 55 package, the European Commission has put forward the "REPowerEU" plan on 18 May 2022 as a real response to rising energy prices and challenges to security of energy supply following the Russian invasion of Ukraine. In the plan, the European Commission presents a set of actions aimed at freeing the EU from Russian fossil fuels by accelerating the green transition as well as creating a more resilient energy system. The actions are divided into five key themes: (1) energy savings; (2) diversification of energy imports; (3) accelerating Europe's clean energy transition; (4) smart investments; and (5) enhancing preparedness.

To support the plan, two legislative proposals were presented at the same time: (1) funding proposals with EU support for REPowerEU actions and (2) energy regulation proposals with amendments to the Renewable Energy Directive, the Energy Efficiency Directive and the EPBD. The energy regulation proposals include proposals to increase the renewable energy target for 2030 to 45 %, to increase the EE target for 2030 to almost 39 %, to proposals for faster and smoother permitting procedures for renewable energy expansion, and to proposals for the installation of photovoltaic cells on roofs of buildings. In relation to the financing proposal, REPowerEU is added as a new chapter in Member States' recovery plans. This REPowerEU chapter will contain reforms and investments initiated after 1 February 2022 and completed by August 2026 in the following areas:

- a. energy infrastructure improvements;

- b. energy efficiency, de-carbonisation of industry, increased production and use of sustainable bio-methane and hydrogen, and increase renewable energy shares;
- c. address infrastructure bottlenecks;
- d. energy poverty and incentives to reduce energy demand;
- e. upskilling the workforce for green skills.

### **The importance of the Fit for 55 package for Danish achievement of the 70 % target**

The Fit for 55 package is expected to contribute to Denmark's achievement of the 70 % target and the proposals in the package to deliver substantial greenhouse gas reductions. At the same time, there are also proposals that could have a credible economic impact on governments, businesses and households.

A strengthened and extended ETS will help to realise Denmark's reduction commitments both in the burden-sharing agreement and in the 70 % measurement. Moreover, by sending a price signal, it complements existing sectoral regulation such as CO<sub>2</sub> displacement requirements in the Renewable Energy Directive, the EPBD and the Energy Efficiency Directive, thus contributing to increased reduction efforts.

For the strengthened reduction commitments in the burden sharing agreement, it is estimated with considerable uncertainty that the accumulated reduction shortfall over the period 2021 to 2030 (without the use of flexibility mechanisms) is around 15,8 million tonnes of CO<sub>2</sub>e based on climate depreciation 2022. Further reduction measures and/or the use of flexibility mechanisms are therefore necessary for Denmark to comply with the obligations. Denmark is estimated to have the possibility to use flexibility mechanisms (excluding the purchase of emission rights from other countries) corresponding to around 11,5 million tonnes of CO<sub>2</sub>e. If it is decided to make use of the flexibility mechanisms, the shortfall could thus be reduced to around 4,3 million tonnes of CO<sub>2</sub>e. There is a wide range of possible reduction measures, in particular agriculture and transport, which can contribute to achieving this.

The increased ambition of the LULUCF Regulation means that Denmark needs to reduce net emissions in the LULUCF sector by 0,44 million tonnes of CO<sub>2</sub> in 2030 compared to the average level of the baseline 2016-2018. This introduces a budgetary target for the period 2026-29. Denmark is expected to fulfil its obligations in the period 2021-2025. However, for the period 2026-2029, the proposal is estimated to result in an accumulated real reduction shortfall of approximately 8 million tonnes of CO<sub>2</sub>e for the period 2026-2029 and around 9,7 million tonnes of CO<sub>2</sub> for the whole period 2026-2030. The gap can be reduced by implementing the 55-65 % objective of the Agriculture Agreement. This will depend on the speed with which emissions are reduced, the distribution of reductions between the agricultural and LULUCF sectors and the decision to make use of flexibility mechanisms.

The calculations are subject to considerable uncertainty, including how the 70 % target is achieved through national measures in Denmark and how the trilogue negotiations between the European Commission, the Council and the European Parliament end up on the remaining proposals. The impact of the proposals also varies in relation to the fact that some proposals have a direct reduction effect on Danish targets and economic consequences, and others have a more indirect effect, for example by reducing leakage, increasing cost-effectiveness or providing increased export opportunities to Danish companies. In addition, a number of the proposals regulate greenhouse gas emissions from sectors such as international shipping and aviation, which are outside Denmark's national climate targets.

### **The Just Transition Fund**

As part of the EU's multiannual financial framework, the new EU fund, the Just Transition Fund (JTF), is established. The aim of the fund is to mitigate the impact of the green transition by financing the diversification and modernisation of the local economy and mitigating negative consequences for employment. Denmark is expected to receive a total of DKK 663 million in current prices over 2021-27. North and South Jutland have been identified as eligible parts of the country, as they are supposed to be most affected by the transition

process towards a climate-neutral economy by 2050.

Resources from the JTF are prioritised for five strands. DKK 100 million has been allocated to the development of businesslighthouses in northern and southern Jutland, which focuses on green technologies, including CCUS, green fuels, such as PTX, and sector coupling. DKK 100 million has been allocated for additional action in the field of hydrogen. DKK 50,5 million has been allocated to support the green transition of SMEs in North and South Jutland. DKK 196 million has been allocated to support the development of brown biorefining, such as pyrolysis technology. Finally, DKK 190 million has been allocated to support the development of local carbon capture, use and storage (CCUS) value chains.

### **Danish energy sector**

Emissions from the Danish energy and supply sector are expected to amount to 0,7 million tonnes of CO<sub>2e</sub> by 2030. Although the sector is expected to have very limited CO<sub>2e</sub>-emissions in 2030, the expansion of green energy in the engine is a prerequisite for achieving the Danish and European climate targets. The Government and the Danish Parliament have therefore concluded a number of agreements to expand the supply of green electricity and heat. The aim is to reduce emissions from other sectors through, for example, increased green electrification and increased use of green gases. In addition, the agreements will help foster Europe's green transition and the release of Russian oil and gas. With *the cli mega-agreement on green electricity and heat*, framework conditions have been agreed to allow renewable energy on land to be quadrupled by 2030. In addition, 6 GW of sea wind in Denmark are offered for establishment by the end of 2030 at the latest, and 3 GW for the Bornholm energy island for construction by the end of 2030 at the latest. With *the Supplementary Agreement on the Procurement Framework for 6 GW of offshore wind and energy island of Bornholm*, it has been decided to allow overplanting for the future offshore wind farms so that the total of 9 GW could potentially be increased to 14 GW or more. In addition, work is underway to establish the North Sea energy island of at least 3 GW in 2033 and 10 GW, with 2040 as a target point. A large part of the offshore wind development will be for export to Europe. The parties to the agreement agree that Denmark will go to the task in a way that reconciles the ambitions of massive green transition with good grocery. This is to ensure that Denmark's marine space and offshore wind resources contribute to the well-being and prosperity of the future, and that Denmark earns as much income and gain as possible for Danish society, citizens and businesses in respect of nature and biodiversity. The ambition of land-based renewable energy is linked to the fact that the expansion of green electricity in addition to Denmark's needs is to be built free of aid and that for users and businesses no significant costs should be imposed.

#### *(ii) Current energy and climate policies and measures related to the five dimensions of the Energy Union opinions*

See section 1.1.3. for objectives and policies related to the five dimensions. For a more detailed description, see Chapter 3.

#### *(iii) Key issues of cross-border relevance*

Offshore wind is highlighted in the European Commission's strategy for offshore renewable energy as an important part of the EU's future energy supply. The EU will need to five-fold its offshore wind capacity by 2030 to 60 GW. From 2030 to 2050, the EU needs to further five-fold its capacity to 300 GW to reach the climate neutrality objective. Geographically, the North Sea and the Baltic Sea can be highlighted as important regions if the potential for offshore wind in Europe is to be harnessed.

In May 2022, Denmark, together with Germany, Belgium and the Netherlands, held the North Sea Summit in Esbjerg. Here, countries set ambitions for the expansion of offshore wind in the North Sea to increase the pace

of the green transition while contributing to the phasing out of fossil energy sources. The North Sea Summit was a milestone in cooperation with Heads of Government and Energy Ministers from the four countries. At the summit, the Heads of State signed the Esbjerg Declaration, which set the goal of delivering at least 65 GW of sea wind by 2030 and a target of increasing capacity to at least 150 GW by 2050. To this end, energy ministers included a separate declaration to guide the achievement of the objectives of the Esbjerg Declaration, including through bilateral cooperation on connection to the North Sea energy island. In this context, Denmark and Belgium signed an agreement on the sale of Danish renewable energy shares to Belgium. At the same time, the agreement confirms work in Belgium on the energy island of the North Sea in 2033. The Netherlands agreed to a declaration with Denmark to prepare an analysis to serve as a basis for an external connection to the energy island. Germany and Denmark continued to reach an agreement to cooperate on hydrogen in the North Sea.

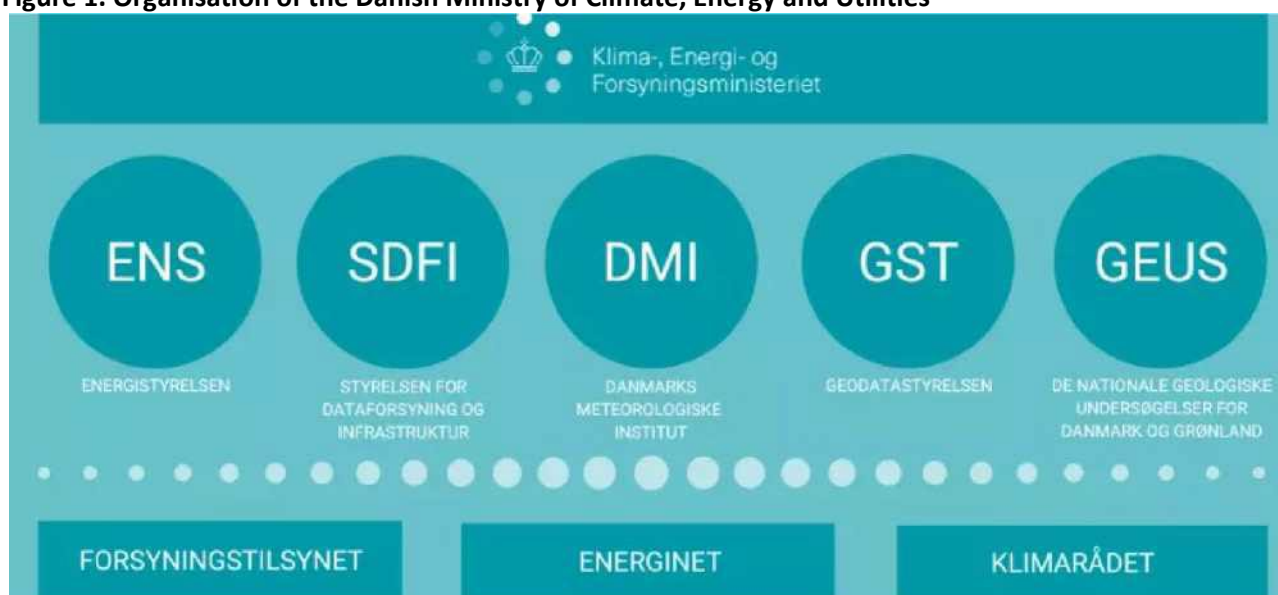
The North Sea energy island will be established in 2033 with connection to Belgium in the first phase. The full expansion of the energy island is expected to have a total capacity of 10 GW and external connections to several North Sea countries, probably including the Netherlands and Germany.

In August 2022, Denmark, together with Sweden, Finland, Germany, Poland, Estonia, Latvia and Lithuania, organised the Baltic Sea Summit in Marienburg. At the end of the Baltic Sea Summit, Energy Ministers and Polish representatives of the participating countries signed the Marienburg Declaration, setting a common ambition to establish at least 19.6 GW of sea wind in the Baltic Sea region by 2030, as well as to strengthen cross-border electricity cooperation. Denmark and Germany have reached a political agreement to couple Germany on the Bornholm energy island. The energy island can ensure green power for up to 4,5 million German households. In addition, Denmark engaged in new government cooperation with the Baltic States to transfer the Danish experience of building offshore wind. Cooperation will run until and including 2025.

*(iv) Administrative structure of implementing national energy and climate policies*

In order to coordinate the preparation of the NECP, a coordination and steering group has been set up with the premises from both the Ministry of Climate, Energy and Utilities and the Danish Energy Agency. The implementation of the plan is similar to other legislative initiatives in this area and is run by the Ministry of Climate, Energy and Utilities.

**Figure 1. Organisation of the Danish Ministry of Climate, Energy and Utilities**



The Danish Energy Agency's task is to advise the Minister for Climate, Energy and Utilities and to administer

the Climate, Energy and Supply Act. The Agency's areas of activity include energy consumption and savings, supply systems, exploration and extraction of oil and gas, etc., energy economics, energy technology, advice on greenhouse gas emissions from non-ETS sectors and responsibility for the economic regulation of waste and water. In order to promote climate and energy considerations, the Danish Energy Agency also administers a number of subsidy schemes, including aid for the production of renewable energy, research and development in the field of energy technology and the promotion of energy efficiency. Finally, the Agency is at the heart of Denmark's international climate and energy cooperation, where Denmark's experience of the green transition is shared with emerging economies and Western partner countries for the benefit of the climate and green.

**The Agency for Data Supply and Infrastructure** provides the public and private sectors with data of high quality that allow important societal decisions to be made on the best possible basis.

**DMI – The Danish Meteorological Institute** provides meteorological services in Denmark, the Faroe Islands, Greenland and the surrounding waters and airspace. Meteorological services include forecasts and warnings and of weather, climate and related environmental conditions in the atmosphere, land and water. The Institute is responsible for Denmark's international meteorological obligations and is the contact point for the exchange of international information.

The **Geodata Agency** is responsible for the measurement, mapping and cadastral registration of the whole of Denmark, Greenland, the Faroe Islands and all waters associated with them.

**GEUS – The Geological Study of Denmark and Greenland** is an independent Danish research and advisory institution operating in the fields of environmental geology, water, energy and mineral resources. GEUS collects and stores data and is responsible for research, advice and communication related to the exploitation and protection of natural geological resources in Denmark and Greenland.

The **Utility Regulator** must ensure strong and effective oversight of the supply sectors. In particular, the Utility Regulator shall safeguard the interests of consumers in the utilities sectors by working towards high efficiency, the lowest possible consumer prices in the short and long term, a secure and stable supply, as well as cost-effective technology development and a cost-effective green transition.

**Energinet** is an independent state-owned company which owns Denmark's electricity and natural gas transmission network. They also own the Danish gas storage company and help maintain gas supply in emergency situations. The primary responsibility of the energy network is to ensure the efficient operation and development of the overall infrastructure of the Electricity and Gas Council.

The **Climate Council** is an independent body of experts. It proposes cost-effective climate policy solutions, paving the way for a society with very low greenhouse gas emissions while maintaining well-being and development.

**The National Bioeconomy Panel** has been set up by the Government to provide advice on the use of biological resources for the green transition, including pyrolysis, biogas and CCS.

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

### *(i) Involvement of the national parliament*

Danish energy and climate policy is based on a large number of broad agreements across the Danish Parliament. The Danish Parliament has been informed of the draft update of the Danish National Energy and Climate Plan before its transmission to the European Commission.

*(ii) Involvement of local and regional authorities*

The report has been the subject of a public consultation, on the listening portal, via the EU's specialised committee and on energy management, including the Danish Association of Local Authorities and Danish Regions to submit their responses to the draft update of the Danish Energy and Climate Plan. No response to the consultation was received for this reason.

*(iii) Consultations of stakeholders, including the social partners, and engagement of civil society and the general public*

The draft update of Denmark's National Energy and Climate Plan (NECP) was submitted for public consultation on 16 May 2023, with a deadline of 6 June 2023 for the submission of responses. The report has been consulted on the listening portal, via the EU's specialised committees and at the energy administration.

A total of 12 responses were received during the consultation period.

The following 12 consulted parties have submitted comments on the NECP:

- Biogas Denmark
- Danish Almene Boliger
- Danish Waste Association
- Danish Chamber of Commerce
- Danish Federation of Yeekerforbund
- Danish Shipping
- Dansk Skovforening
- DANVA
  
- Danish Consumer Council Think
- Stiesdal Skyclean
- SYNERGY
- Group 92

**Electricity grid**

The Danish Consumer Council, Think, makes a number of proposals in the field of electricity relating to: consumer protection and – information, prices and price comparison, standardisation of designations, marketing guidelines, operation of electricity companies, information and climate behaviour, energy poverty, the competitive position of the electricity market and time-differentiated tariffs.

Dansk Erhverv makes a number of comments on the reform of the internal energy market, including speed, analytical work, competitive situation, tariffs, flexibility, etc.

DANVA proposes a dialogue between the Ministry of Climate, Energy and Utilities and water supply and waste water companies with a view to adjusting incentives in the water sector to contribute to balancing the electricity grid.

**Ministry's comments:**

*The Minister for Climate, Energy and Utilities welcomes all proposals for new policy measures and is welcome to engage in further dialogue on this matter.*

## **Waste and heat**

Dansk Erhverv notes that there is potential in district heating for efficiency in the district heating sector and calls on the government to realise the potential.

Dansk Skovforening asks the Government and others to consider the use of Danish tile biomass in district heating and whether tile fired district heating plants should be phased out. Furthermore, the Association notes that a consistent distinction is made between imported biomass and Danish biomass both in graphs and text in the report. The Association wants to be able to deduce from the climate and energy plan how the balance between the two types of biomass develops as a result of its energy policy – and that it is important to be proven that we have a domestic wood resource to support our strategic energy autonomy.

Biogas Denmark states that the use of biomass for heat production is exempt from energy and CO2 taxes “with the exception of biogas, which instead receives direct support in excess of the tax.” Biogas supplied directly from biogas plants to, for example, a combined heat and power plant is also exempt from tax. It is when the upgraded biogas is supplied via the gas network that is subject to the same taxes as natural gas. It is also important to clarify that there is no support for the use of biogas for heat production.

Stiesdal Skyclean calls for a focus on options to increase biomass supply as proposed by the National Bioeconomy Panel.

The Danish Waste Association has the following textual comments on the report:

- 1) The question is asked about the role of waste incineration, which supplies approximately 25 % of Danish district heating.
- 2) The question arises as to why waste represents only a small proportion of RES for district heating, see figure.
- 3) It should be noted that “separate assessments of the effects on emissions from companies covered by the EU ETS have not been carried out”. In addition, it points out that waste incineration plants are covered by the ETS and asks why the reduction of 0,6 million tonnes of CO2 in 2030 due to exposure to competition is not mentioned.

### **Ministry's comments:**

*The Minister for Climate, Energy and Utilities welcomes all proposals for new policy measures and is welcome to engage in further dialogue on this matter.*

*Fsva. NEKST would point out that NEKST must support the green transition and ensure thorough implementation of the policy-adopted measures to make Denmark independent of fossil fuels, among other things. The first two ‘Farvel for gas in Danish homes’ and ‘More sun and wind on land’ traces have been launched and are intended to map out leaching and continuously come up with solutions to break down the barriers that currently hinder the rollout of green heat solutions and for wind and solar energy to be built faster. It should be noted that the Government Committee for the Green Transition (GU) is following the work of NEKST and may give NEKST new green tasks on an ongoing basis. NEKST acts operationally and can trigger solutions to the acute green challenges that can be solved immediately. This means that swift action can be taken on a continuous basis. If the measures have financial or legal consequences, these will be submitted to the Government.*

*The Ministry of Climate, Energy and Utilities agrees that it is important to distinguish between imported biomass and Danish biomass. Therefore, the distribution between imported biomass and Danish biomass is shown in Figures 3 and 4 of the report. The text of Section 2.1.2 Renewable Energy (parts i and iv) also explains the distribution between imported biomass and Danish biomass. In the sections dealing with the Danish sustainability requirements or support for biomass, no distinction is made between imported biomass and*

*Danish biomass, as it evolves as a result of the energy policy pursued – and that it is important to be proven that we have a domestic wood resource that can support our strategic autonomy in the field of energy. The legislation is the same for imported biomass and Danish biomass.*

*As regards methane tax, it is true that biogas used in heating installations does not pay methane tax when used as a fuel in boiler plants, cf. the Danish Tax Agency's guidelines on biogas (E.A.4.4.11.3.2). Therefore, the funeral in section 2.1.2 is deleted: "with the exception of biogas, which instead receives direct support in excess of the tax."*

*The recommendations of the National Bioeconomy Panel are discussed in section 3.1.2 (vii). It is true that these recommendations also address the possibilities of increasing the Danish biomass supply. Therefore, this addition to the funeral has been made in this section: "and opportunities to increase*

*biomass supply in Denmark.'*

*Comments from the Danish Waste Association. The first point on the role of waste incineration in district heating is difficult to find, so the Ministry of Climate, Energy and Utilities notes that the response to the consultation has led to an adjustment of Denmark's National Climate and Energy Plan so that waste is explicitly mentioned as an energy source for district heating.*

*Second point that biogenic waste represents a negligible fraction of RES for district heating in Figure 8. We thank the Danish Ministry of Climate, Energy and Utilities for their response to the consultation, which drew the Ministry's attention to an error in Figure 8 and Table 7. The Ministry has corrected the errors.*

*Third point on ETS and exposure to competition in the combustion sector. The Ministry of Climate, Energy and Utilities notes that separate assessments of the effects on emissions from companies covered by the EU ETS are not carried out. The response to the consultation does not give rise to any adjustment.*

## **Biogas**

*Biogas Denmark emphasises that it is possible to achieve the target of 100 % green gas already in 2027 by frontloading the politically decided tenders. In addition, the Association has a number of textual comments on methane tax for biogas for heat, contribution to security of supply and the terms "biomethane" and "gas system".*

*With regard to biogas, the Danish Forestry Association notes that the Climate Action Plan and the Energy Plan could contribute to transparency in the biogas sector by providing information on the distribution of biogas from animal production and biomass waste, respectively.*

### **Ministry's comments:**

*In the Climate Agreement on Green Electricity and Heat 2022, it has been decided to bring forward the second call for tenders from 2026 to 2025. At the same time, it has been agreed to limit the production of supported biogas if domestic production outstrips consumption. The Ministry of Climate, Energy and Utilities thanks Biogas Denmark for textual comments.*

*The distribution of biogas from animal production and biomass waste refers the Ministry of Climate, Energy and Utilities to the Danish Energy Agency's website, where detailed statistics on biomass used in biogas production can be found.*

*Biogas Denmark has submitted a number of specific comments, several of which have given rise to specific adjustments, including methane tax on biogas for heat, contribution to security of supply and the terms "biomethane" and "gas system". Other specific comments have not given rise to adjustments, including in*



relation to Figure 12 and Figure 35, where further details are not deemed necessary.

## **Renewable energy**

Dansk Erhverv makes a number of proposals for RES expansion on land, including an annual target for RES-expansion, green treatment guarantee, framework conditions for investments in the electricity grid and tariff models.

The Danish Forestry Association notes that an ambition to quadruple RES on land is one of many policy agronomic demands and that a coherent climate plan should address the Aareal challenge.

Danske Almene Boliger notes that they disagree that there are no regulatory barriers to the establishment of renewable energy communities.

### **Ministry's comments:**

*The Minister for Climate, Energy and Utilities welcomes all proposals for new policy measures and is keen to engage in further dialogue in this regard.*

*The Minister for Climate, Energy and Utilities is aware that there are many interests at stake when it comes to prioritising areas for renewable energy, and that these must interact with other objectives relating to land use in Denmark. There is a continuous focus on safeguarding the different interests and considerations of nature, biodiversity, afforestation, etc. in the work on safe land for a fourfold increase of land-based RES by 2030.*

*With regard to regulatory barriers to renewable energy communities, Danske Almene Boliger (BL) refers to previous consultation responses issued in connection with Bill L37, the Draft Act amending the Electricity Supply Act and the Electricity Tax Act, and Orders issued on the basis of L 37.*

*In its previous responses to the consultation, BL noted that they considered as barriers, inter alia, the exclusive licensing of the network companies, the imposition of tariffs and charges for the transport of electricity, the requirements for distribution via the collective network and the impossibility of establishing internal electricity connections between buildings within a housing organisation.*

*First of all, the Danish Energy Agency notes that none of the barriers listed above prevents the creation of renewable energy communities or sharing within a renewable energy community.*

*The Danish Energy Agency notes that the general rule in the Electricity Supply Act is that the transport of electricity must take place via the collective electricity supply network.*

*The Danish Energy Agency notes that in the case of several electricity consumers, such as residents of a housing association, the transport of electricity to residents across the housing association's buildings will be the same as the 'distribution' of electricity under the rules of the Electricity Market Directive (see Article 2 (28)). The Danish Energy Agency also notes that distribution is an activity requiring a licence, irrespective of the name given to the electricity services used for the transport.*

*Specifically for housing associations, the Danish Energy Agency can state that it is the Danish Energy Agency's view that there is nothing to prevent housing communities, such as social housing, cooperative housing and housing communities, from entering into citizen energy communities and from installing and sharing energy via the collective electricity grid, on an equal footing with other actors.*

*The Danish Energy Agency therefore remains of the opinion that there are no regulatory barriers to the establishment of renewable energy communities and that the existing regulation limiting the ability of renewable energy communities to operate distribution is appropriate to maintain. It should also be noted that*

local collective tariff classification permits the classification of the members of an association of network users in their individual contract numbers or an overall common tariff settlement by an association of network users. Thus, a common tariff settlement of the association of network users may mean that the tariff basis may be charged together at one new measurement point created for that purpose.

In relation to BL's comment on the simple regulatory framework for renewable energy communities, the Danish Energy Agency notes first of all that the regulatory obligation of the Danish Utility Regulator is only one of a number of measures taken to ensure that renewable joint creators are subject to simple rules.

BL refers to the Authority's decision in Case No. 21/01123 where the Utility Regulator considers that they are not competent to bring a supervisory case. In this regard, the Danish Energy Agency notes that the Danish Utility Regulator is obliged to identify and monitor the removal of unjustified barriers and restrictions in the regulation for the development of renewable energy communities and citizen energy communities, cf. Section 181 of the Order. The results of the monitoring could serve as a basis for regulatory changes.

## **Transport**

Dansk Erhverv proposes that measures be taken to reduce the price of zero-emission lorries. For example, support for procurement.

Biogas Denmark notes that they want an increased focus on biogas trucks as a solution for the green transition of the transport sector.

<sup>1</sup> <https://www.retsinformation.dk/eli/lta/2021/1069>

Danish Shipping Company (DR) calls for international climate action, including Danish action in the UN Shipping Organisation (IMO), to be reflected in the NECP. DR therefore calls for the global emissions of shipping, the objectives of the Climate Partnership for Blue Denmark to be set out in Section 2.2 (iii). In addition, the Government is invited to set a target for the deployment of alternative fuels infrastructure for, inter alia, ships, to support investments from both buyers and producers of fuels.

### **Ministry's comments:**

*The Minister for Climate, Energy and Utilities welcomes all proposals for new policy measures and is welcome to engage in further dialogue on this matter.*

*The government base states that the government will take further action to promote zero-emission lorries, building on the pool of propulsion infrastructure for heavy road transport from the Infrastructure Settlement in 2021. For example, it should promote fleet conversion and the installation of recharging points. At the same time, the government wants to accelerate the transformation of heavy transport as well as maritime and aviation, including by promoting electrification and green fuels. In this regard, it should be noted that the current technology-neutral CO<sub>2</sub> displacement requirement provides an incentive for the use of renewable fuels with a high lifecycle reduction effect, such as biogas. The CO<sub>2</sub> displacement requirement is gradually increased by 2030.*

*In relation to the Shipping Organisation of the United Nations, it is noted that the NECPs will identify how EU Member States intend to achieve the EU's energy and climate targets for 2030. The comments on Danish climate diplomacy and work in the IMO therefore do not give rise to any changes to the draft national energy and climate plan of Denmark.*

## **Carbon Capture Storage**

Stiesdal Skyclean notes that pyrolysis is not a biological process but a technical/industrial process. Furthermore, it should be noted that the CO<sub>2</sub> storage capacity in question does not address the similarity of carbon storage on agricultural land through the addition of biocarbon from pyrolysis. Finally, it should be noted that NEKST should focus on pyrolysis and biocarbon application on agricultural land.

### **Ministry's comments:**

*The Ministry of Climate, Energy and Utilities agrees that pyrolysis and the production of biocarbon on an industrial scale are to be regarded as a technical/industrial process. However, the Ministry does not see any need to adapt Denmark's national energy and climate plan in this regard, as the aim of the plan is not to characterise for different technologies, including pyrolysis.*

*As regards storage capacity, the Ministry has adapted the report to better reflect the potential for carbon storage in agriculture through biochar.*

*As regards inclusion in NEKST, it should be noted that the Government will present a strategy for, inter alia, pyrolysis.*

## **Energy efficiency improvement**

Synergy notes that Denmark has not produced adequate reporting for the energy efficiency dimension. Synergy points out that the draft should outline the common EU energy efficiency target (2.2 (i), 1), the fulfilment of the energy savings obligation (2.2. (i), 2), the total public floor area to be renovated (2.2. (I), 4) and setting indicative milestones for the reduction of actual net heat use per m<sup>2</sup> in 2040 and 2050 (2.2. (II)). Synergy points out that the draft NECP refers to the fact that the recast EED has been agreed, but that the above should be explained under the current EED.

Dansk Erhverv proposes to convert the subsidy fund for energy efficiency improvements in commercial enterprises (the Business Fund) into an electrification and energy efficiency deduction for companies, and to convert the Building Pool etc. into an electrification and energy efficiency allowance for households. In addition, Dansk Erhverv notes that the promotion of electrification and efficient use of energy should be a key objective of the funds allocated to transition support for companies that have difficulties in transforming themselves in the Green Tax Reform for Industry, etc. Finally, Dansk Erhverv stresses that barriers to the use of surplus heat should be a key task for the work of NEKST.

### **Ministry's comments:**

*The government will ensure a strong focus on improving the energy efficiency of both private homes, businesses and public buildings. Following the entry into force of the recast Directive, the Government will assess the effort together and Denmark therefore expects to be able to report on the effort in the final update of the NECP in June 2024.*

*The Minister for Climate, Energy and Utilities welcomes all proposals for new policy measures and is welcome to engage in further dialogue on this matter.*

*As a result of the conversion of grant funds to a general deduction, this would mean, prima facie, that the deduction would be relatively small, as it would be spread over several projects. To this end, it will not be possible to ensure that the energy efficiency projects receiving deductions are additional. A general deduction will be associated with fewer administrative costs for grant applicants. The business pool has undergone a major optimisation from 2023 onwards, which has resulted in an increase in the demand for the grant funds. In this respect, it should be noted that the business pool is more technologically neutral than the proposed*

*deduction, as it also subsidises investments in CO2 reductions that do not involve electrification and energy-efficiency.*

*Funds in the Green Tax Reform for Industry, etc. earmarked for restructuring aid for those companies that have the greatest difficulties in restructuring are noted in the Danish Business Authority's comment. The specific design of the conversion aid has not yet been decided and will be decided on the basis of a discussion paper from the government.*

*In connection with the NEKST work track 'Farvel for gas in Danish homes', the use of surplus heat is an effective roll-out of district heating and other green heating solutions.*

### **Forest, agriculture and nature**

Dansk Skovforening commented on "Fit for 55" negotiations. They disagree that a common land sector pillar should be established at EU level, covering emissions and removals from the agriculture and LULUCF sectors. DS expresses concern that a combined sector "foresees off-setting of the climate load of food production.

The Danish Jekerforbund notes that planning in marine areas should be based on an ecosystem-based approach, which unfortunately the adopted marine plan is not. It remains important to update the technical knowledge on the interaction between nature and climate considerations, in particular:

targeted professional bases such as environmental impact assessments for energy installations are drawn up on. Awareness raising should always be done in cooperation with research institutions and should be given greater economic priority in policy work than is currently the case.

#### **Ministry's comments:**

*The Minister for Climate, Energy and Supply thanks the Danish Forestry Association for the final negotiations on the revision of the LULUCF Regulation. The revised legislative text states that the Commission is to submit a report to the European Parliament and the Council in 2024 on the use of the LULUCF Regulation. As part of this report, the Commission is expected to outline regulatory options for the period after 2030 and the Commission may subsequently present legislative proposals. On the basis of the Commission's analysis, the Government will take a position on the options for the period after 2030.*

*As regards the land challenge, the government is aware of this. The government base states, inter alia, that a future Biodiversity strategy and a partnership for a vision plan for Danish agriculture must address the diversity of land considerations identified by the Danish Forestry Association.*

*The agreement on Denmark's maritime plan was concluded on 7 June with all the parties of the Danish Parliament. The contract district agrees that Denmark's marine plan must be ecosystem-based, and the agreement is based on international principles and is therefore ecosystem-based according to the requirements of the Directive on ecosystem-based. In this context, the Parties to the Agreement agree to explore how to take into account new and existing knowledge and data, with a view to supporting and strengthening future ecosystem-based planning at sea while developing more sustainable fisheries.*

#### **Withdrawal**

The Danish Consumer Council Tænk, Biogas Danmark, Synergi and the 92 Group call for an increased degree of involvement. Here, Synergi and the 92 Group refer to Article 10 of the Governance Regulation, which provides the basis for the NECPs.

The 92 Working Party also calls for the establishment of multi-level dialogue with reference to Article 11 of the Management Regulation.

The 92 Working Party comments on the content of the report, that the draft updated Danish NECP is not up

to date and does not represent an increase in ambition, that an increased ambition in the NECP plans is part of complying with the Paris Agreement, climate action by the EU since 2019 requires national 2030 targets to be strengthened and the draft Danish NECP to include scenarios of additional efforts, cf. WAM 1-6.

#### **Ministry's comments:**

*Article 10 of the Governance Regulation provides the framework for the public consultation of the NECP. The article states: "Without prejudice to other requirements of Union law, each Member State shall ensure that the public is given early and effective opportunities to participate in the preparation of the draft integrated national energy and climate plan in respect of the 2021-2030 plans in the preparation of the final plan in good time before its adoption..."*

*Against this background, the Ministry of Climate, Energy and Utilities has sent the draft update of the national energy and climate plan for consultation from 16 May 2023 to 6 June 2023 inclusive. The Ministry of Climate, Energy and Utilities takes note of the comments on inclusion and consultation and, on this basis, will seek a longer consultation period in the context of the consultation of the final updated report in spring 2024.*

*As regards multi-level dialogue, Article 11 of the Management Regulation provides: "Each Member State shall have a multi-level climate and energy dialogue in accordance with national rules, in which local authorities, civil society organisations, industry, investors and other relevant stakeholders, as well as the public, can actively engage and discuss the different scenarios developed for energy and climate policy, including in the long term, and review progress made, unless they already have a structure that achieves this purpose. Integrated National Energy and Climate Plans may be discussed in the framework of such a dialog." Against this background, the Minister notes that Denmark's climate and energy policy is designed in close dialogue with all relevant stakeholders in formal bodies such as the Green Business Forum, the Climate Partnerships, Borger tinget, the Youth Climate Council and through consultations. K would like to engage in a dialogue on how to strengthen this work. Of course, the Minister for Climate, Energy and Utilities welcomes all possible proposals for new measures but is welcome to engage in further dialogue on this matter.*

#### **Other cross-cutting comments**

The 92 Working Party has the following cross-cutting comments on the content of the report:

1. The draft updated Danish NECP has not been updated and does not represent an increase in ambition.
2. that an increased ambition in the NECP plans is part of complying with the Paris Agreement;
3. Climate action by the EU since 2019 requires a tightening of national 2030 targets.
4. The draft Danish NECP shall include scenarios of "additionality" actions, cf. WAM 1-6.

#### **Ministry's comments:**

On the first and second points on the update of the Energy and Climate Plan and compliance with the Paris Agreement. It is the clear view of the Ministry of Climate, Energy and Supply that this is a continuous OPDA of the Danish Energy and Climate Plan, which complies with the principles laid down in the Governance Regulation.

It should be borne in mind that the NECP contains ambitions in much more areas than just greenhouse gas emissions, which – even together with the RES deployment – are just one in five dimensions described by the NECP. Thus, there has been an increase in ambition in several areas in the draft NECP update compared to the last NECP.

The Ministry of Climate, Energy and Utilities also considers that the guidelines issued by the European Commission do not infringe the Governance Regulation approved by the Council, Parliament and Commission of the European Union and drawn up in cooperation with all EU Member States. The Commission's guidelines

should therefore be seen as a guide and expression of the Commission's wishes, whereas the management scheme is EU law.

In addition, it should be stressed that, in the view of the Ministry of Climate, Energy and Utilities, the Governance Regulation does not intend to introduce new greenhouse gas obligations for Member States beyond what is already committed with the Länder. The National Energy and Climate Plans (NECPs) are basically a reporting tool created to allow the European Commission to monitor the achievement of the EU's overall objectives. Nevertheless, in its comments on the draft NECP, the Commission is expected to provide its assessment of whether Denmark contributes adequately to the achievement of the objectives later in 2023. However, that assessment of effort is based solely on the Commission's own expectations, and not on a politically agreed distribution key.

On the third point on the strengthening of the 2030 targets. See reply above. In addition, the policies and initiatives funded under this heading are. Denmark Recovery and Resilience Plan included in the NECP. It is not described in a separate section, as requested by the Commission's guidelines, but as in the reply to the first paragraph, the Commission guidelines are guidance and not EU legislation. The Ministry of Finance published their chapter to REPowerEU on 31/5-23, therefore it has not been possible to have the material (policies and initial ideas) included in the draft update of the NECP. It will be incorporated in the final version next year.

On the fourth point on "additionality" scenarios. Annex 1 to the Governance Regulation provides for the possibility for Member States to include in section 5 of the report an assessment of developments with instruments expected to be adopted after the submission of the Energy and Climate Target Plan. Those instruments are narrowly defined as those which are "under discussion and have a realistic chance of being adopted" after delivery of the report.

It is therefore the view of the Ministry of Climate, Energy and Utilities that Member States should not include scenarios of hypothetical developments, assuming the adoption of different instruments, on the basis of this paragraph. It is intended only to allow Member States to set out the possible consequences of measures that have a realistic prospect of adoption, but have not yet been formally adopted at the time of submission of the report.

### **SEA Directive**

The NECP has not been subject to a SEA under the SEA Directive. The Danish NECP is a general and strategic plan in which the criteria of the SEA Directive are not met. The Danish NECP reports on adopted and planned energy and climate targets, policies and agreements. The plan therefore provides a holistic overview of Danish energy and climate policy, but does not introduce new targets or policies itself. The plan itself does not therefore set the framework for future developments, as these are laid down in other agreements, plans and programmes.

#### *(iv) Consultation with other Member States*

Cooperation, coordination and dialogue have taken place with neighbouring countries through ad hoc networking groups where experience and knowledge sharing has taken place. In addition, the draft update of the report has been subject to regional consultation with Denmark's neighbouring countries, which have been part of these network groups. This includes Germany, Norway, Sweden, Finland and Iceland.

#### *(v) Iterative process with the Commission*

The dialogue with the European Commission has been conducted through working groups under the auspices of the Energy Union Committee and the Ad-hoc Working Group of Climate Change Committee. In addition, Denmark has engaged in bilateral dialogue with the European Commission.

## 1.4 regional cooperation in the preparation of the plans

(i) *Elements subject to joint or coordinated planning with other Member States*

### **North Sea Energy Cooperation – Regional cooperation on offshore renewable energy**

Denmark is part of the wider North Sea region, which has a high potential for renewable energy. The deployment of offshore wind energy will play an increasingly important role in achieving Europe's energy and climate goals. The EU offshore strategy has set the ambitious target of 300 GW of offshore wind and 40 GW of ocean energy installed capacity by 2050. On 19 January 2023, the North Sea Cooperation (NSEC) facilitated the development of the non-binding agreement on offshore renewable energy production targets in 2050, with intermediate steps in 2040 and 2030 for the priority offshore grid corridor North Sea offshore grids under the TEN-E Regulation. The targets for the NSOG priority offshore grid corridor amount to 60.3 GW in 2030, between 134,9 and 158 GW in 2040 and between 171,6 and 218 GW in 2050. This means a significant shift in the size of the offshore sector, fuelling renewable energy and strategically integrated offshore development. High energy prices, for example in 2022, and geopolitical events threatening the European energy system have highlighted the need to accelerate the deployment of domestic renewable energy production capacity and transmission networks at regional level as soon as possible, thereby significantly improving energy security.

Denmark is working with the other NSEC countries to identify, analyse and realise opportunities for concrete cooperation projects. The NSEC is a voluntary, bottom-up, market-oriented regional initiative, set up in 2016, which aims to:

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

Energy ministers meet regularly in the NSEC. In 2023, the NSEC consists of Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands, Norway and Sweden, with the participation of the European Commission. On 18 December 2022, the NSEC Energy Ministers and the European Commissioner for Energy signed a Memorandum of Understanding on cooperation on offshore renewable energy with the United Kingdom (UK). The establishment of this Memorandum of Understanding was provided for in the Trade and Cooperation Agreement between the European Union and the United Kingdom of 30 December 2020, which builds on the NSEC and is a separate complement to the NSEC framework.

For the offshore wind sector, offering a predictable and stable long-term operating environment is essential to facilitate long-term investments and further cost reductions. To this end, existing barriers need to be removed and attractive investment conditions should be created. NSEC members work together to make an important contribution to achieving these objectives through a regular exchange of expertise focusing on several topics within the four NSEC support groups:

- SG1: development of hybrid and joint projects
- SG2: permits, maritime planning and environmental considerations
- SG3: funding and support frameworks
- SG4: long-term network and infrastructure planning.

In order for each Support Group to meet its objectives, exchanges between and within the Support Groups at NSEC coordinator level are encouraged and monitored. Examples are in ports with SG1 and SG4, maritime

spatial planning and network planning with SG2 and SG4, and how criteria other than price criteria can enhance in innovation key challenges for an accelerated, cost-effective and responsible deployment of offshore wind with SG1, SG3 and SG4. Finally, the support groups also work closely with other international fora, such as the Pentilateral Energy Forum and the Clean Industrial Forum, as regards terrestrial network-planning, market events and stakeholder engagement.

### **Development of hybrid and joint projects**

The NSEC SG1 serves as a platform to cooperate on concepts for potential offshore wind projects and a coordinated electricity infrastructure, including transmission infrastructure. The group has increased its activity as the NSEC countries have launched more joint and hybrid projects in the North Sea to facilitate technical and ministerial discussions and exchange of best practices as projects progress.

In addition to joint offshore wind projects, which will be connected and supported by several countries, the support group is also working on possible “hybrid” solutions that use cross-border opportunities to connect offshore wind farms to more than one electricity market and create synergies between countries, as well as the corresponding EU and national market organisations.

For this reason, SG1 members are developing opportunities for cooperation on hybrid projects as well as on possible juridical, regulatory and commercial obstacles. SG1 will continue to work on obstacles and steps for hybrid and joint projects that can be addressed at national and regional level. In addition, cooperation will continue to serve as a forum to reflect on how to work on issues with legislative processes at EU and national level.

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

In order to achieve our energy and climate goals in the EU, there is a need to speed up the planning and permitting processes at EU and national level, while better understanding the possible ecological limits for large-scale wind development in the North Sea and the impacts on other sea users. SG2 produced an inventory of geographical tensions in the development of offshore wind farms up to 2030 at regional level. The next steps are set to better define environmental tensions and potential threats for development and to define spatial strategies to avoid or mitigate such threats. To increase knowledge and support the deployment of offshore wind in the North Sea, North Sea countries will continue to cooperate closely on maritime spatial planning, environmental research, cumulative impact assessments of wind farms between authorities responsible for energy, maritime spatial planning and the environment.

### **Funding and support frameworks**

Offshore procurement is a key issue for funding and support frameworks. NSEC members coordinate offshore tenders by exchanging information on the national procurement plans as part of SG3. In the Working Party, countries also exchange best practices on procurement design, non-subsidised support, design elements to facilitate system and sector integration, and grid connection schemes. In order to achieve the ambitious goals, joint projects are also becoming increasingly important.

Therefore, the Group is also examining funding opportunities for joint offshore cross-border projects, including through EU funding instruments such as the Connecting Europe Facility and the Union funding-mechanism for renewable energy. Finally, power purchase agreements (PPAs) play an increasingly important role in financing offshore projects. Countries will address issues, barriers and solutions for a wider use of PPAs. In addition, the group is exchanged on decommissioning, lifetime extension and repowering of wind farms.

The purpose of the exchanges is also to jointly develop and discuss ideas for the medium-term future of the



offshore energy system in terms of installed capacity, for example through the coordinated procurement packages.

### **Implementation of 2050: Long-term network and infrastructure planning**

NSEC SG4 works with ENTSO-E to provide and coordinate input to the North Sea Offshore Network Development Plan under the EU TEN-E Regulation. SG4 also aims to broaden discussions on slow grid planning to include the early development and scaling up of green offshore hydrogen production and transport, as well as its potential role in an increasingly interconnected North Sea energy system. Green hydrogen will be important for the decarbonisation of our energy system. Power-to-X, and hydrogen in particular, will play a key role in providing flexibility where and when needed. Demand for hydrogen is expected to increase significantly, in particular after 2030 due to both its potential as an energy carrier for storage and as a fuel and feedstock for hard-to-electrify activities. Several NSEC countries have announced targets for onshore and offshore green hydrogen production targets. In SG4, NSEC countries will exchange the first hydrogen calls related to offshore wind and exchange knowledge on transport infrastructure, energy development and offshore power-to-x production. They will work together to provide insights into offshore hydrogen production, discuss the roll-out of electrolysis and increase synergies between the long-term offshore grid and hydrogen network planning. In all aspects of infrastructure planning in the medium and long term, SG4 stresses the importance of a broad engagement in this planning process with Member States and relevant stakeholders, including industry and NGOs, in anticipating and addressing supply chain bottlenecks (e.g. development and availability of ports) in the deployment and acceleration of the delivery of our energy system in the North Sea. This is closely linked to the importance of safeguarding the safety of critical offshore and underwater infrastructure and the supply of critical raw materials through innovation and increased circularity.

### **Regional cooperation**

In preparing this plan, Denmark has used the NSEC, where experts in the support groups share information and experience on specific aspects, such as challenges and *best practice* in relation to the development of sea wind at national level, in particular in relation to the aggregation of national renewable offshore wind projections by 2030 and market integration.

The support groups below focus on the following topics:

Support group 1: Hybrid and joint projects

Support group 2: Maritime planning

Support group 3: Framework conditions for support and financing

Support group 4: Achievement of the 2050 target

### **Hybrid and joint projects**

The NSEC serves as a platform to cooperate on concepts for potential joint offshore wind projects and a coordinated electricity infrastructure, including transmission infrastructure.

Denmark is working with other NSEC countries on possibilities for concrete cooperation projects. In addition to joint offshore wind projects, to be connected to and supported by several Member States, this includes working on possible “hybrid” solutions that use cross-border solutions to connect offshore wind parks to the electricity grid and have synergies with connections between countries, as well as the conditions of the corresponding market.

Denmark therefore contributes to the development of opportunities for cooperation on hybrid projects as

well as cooperation on possible legal, regulatory and commercial barriers. By coordinating better interconnection between NSEC countries, an increased amount of excess energy production can flow across borders in order to impart demand in a well-functioning internal energy market.

The NSEC will continue to work on action plans for the specific hybrid projects, which could also be taken forward at national and regional level. In addition, cooperation will continue to serve as a forum to reflect on how to address uncertainties about legislative processes at EU and national level, as well as a forum to discuss options to address these issues.

### **Maritime planning**

In the North Sea Cooperation (NSEC), Denmark contributes to the work to establish a common methodology for the environment vurDeringer. In order to achieve our energy and climate goals in the EU, there is a need to better understand the possible environmentalallimits for large-scale wind expansion in the North Sea. Further work on marineplanning and environmental assessment is needed to exploit the potential of the North Sea. To build more knowledge and support offshore wind development in the North Sea, the North Sea countries will continue to cooperate closely on oceanplanning, environmental research, and cumulative impact assessment of wind farms between the authorities responsible for energy, marine planning and the environment. It should be noted that on 7 June 2023 a political agreement has been reached with all parliamentary parties to update Denmark's maritime plan.

### **Framework conditions for support and financing**

As regards actions, Denmark benefits from the NSEC in several ways. The work of the NSEC provides a platform for the exchange of best practice in support schemes, development and work on new concepts that address new challenges in relation to support for offshore wind, as well as the development of opportunities for future shared oceanwind projects.

Denmark cooperates in the NSEC to coordinate timing of tenders, exchange of *best practice* for the design of offshore wind support schemes and identification of common principles where possible, as well as possibilities for alignment of support.

As regards coordination of tenders, Denmark frequently shares information on its national procurement timetable with other NSEC countries in order to identify possible overlaps and ensure a continuous rhythm of stakeholder involvement, without projects to be stopped and started at all times.

Denmark shares and discusses the estimated projection of national ocean energy in the NSEC, as well as information on national marine energy design *plans and best practice* when designing tenders.

In addition, Denmark also contributes to the work of analysing and developing options for further mobilisation of investment capital for joint projects, for example through EU funds such as the European Fund for Strategic Investments (EFSI) and the Connecting Europe Facility (CEF), as well as institutional investors. Such emerging-joint projects could be cross-border renewable energy projects in line with the CEF proposal.

### **Achievement of the 2050 target**

In the fourth support group, Denmark has focused on three main topics: Development of the 2050 targets and exchange of knowledge and experience on hydrogen in the context of offshore wind. An important task has included setting and aggregating the 2030, 2040 and 2050 targets in the North Sea for the nine Member States. In addition to this, there is also cooperation with the Pentalateral Energy Forum on 2050 ambitions. In addition, an analysis on offshore wind and grid planning has also been prepared with recommendations for the North Sea region up to 2050, which was published in February 2022.

In addition, Denmark in this group has also cooperated with ENTSO-E in the context of the revised TEN-E Regulation, which entered into force in June 2022. The North Sea countries, with the support of the European

Commission, should defer and agree on a non-binding commitment by 2040 for the sea basin, with milestones in 2030 and 2040. Finally, there is also an increased focus on green hydrogen to build on the principles of the Esbjerg Declaration of 2022, as well as increased involvement of citizens and stakeholders.

## **BEMIP**

The Baltic Energy Market Interconnection Plan (BEMIP) consists of a high-level political and technical level, which includes working groups with, inter alia, infrastructure, the internal energy market, security of supply, renewable energy, energy efficiency, etc. There is also a focus on integrating the Baltic States' electricity networks with continental Europe. At the political level, the focus is on setting the political and strategic direction, as well as establishing political agreements for areas that cannot be solved at the operational or technical level. The work of BEMIP was also highlighted when Denmark held the Baltic Sea Summit in Marienborg on 30th August 2022.

## **Nordic Council of Ministers**

Denmark is a member of the Nordic Council of Ministers, the official institution for state cooperation in the Nordic region. This cooperation covers both climate and energy, with separate ministerial meetings, committees and technical working groups.

The Nordic Council of Ministers follows a vision towards 2030 for Nordic cooperation, which includes a focus on the green transition of the Nordic region to support the Nordic countries' ambitious climate targets. This vision will be translated into multi-annual cooperation programmes to ensure even closer cooperation on both climate and energy issues in the coming years. A larger part of the Nordic cooperation budget is also allocated to the climate and energy sectors.

Denmark continues to focus on projects in the field of energy and climate in Nordic cooperation, in particular in the transport sector, work on climate change, the Nordic electricity market and PTX. Since 2021, there has also been a greater focus on the expansion of renewable energy and security of supply of energy in Europe.

## **Nordic Climate Cooperation**

The Nordic Council of Ministers' vision is that the Nordic region must be the most sustainable and integrated region in the world by 2030. In 2019, the Nordic Prime Ministers signed a declaration stating that the Nordic must work for CO<sub>2</sub> neutrality both nationally and internationally. As a follow-up, the Nordic Council of Ministers has provided a forum for the exchange of experience and knowledge sharing on the green transition in the Nordic region through the project Climate Change in the Nordics. The Nordic countries cooperate on sustainable solutions such as transport, construction, food and energy. For example, in November 2022 the Nordic Transport Ministers adopted a declaration to strengthen cooperation on green transport, where countries will, inter alia, work together to pave the way for green aviation in the Nordic region by 2030, strengthen the cross-border cargo infrastructure for road transport and continue cooperation on zero-emission ferry transport in the Nordic region. The Nordic cooperation to counteract climate change for change sends a clear signal to the outside world that real and positive developments are possible.

## **Nordic Energy Cooperation**

The Nordic energy cooperation focuses on the Nordic electricity market, renewable energy, energy efficiency and many other energy-related issues. The Nordic countries aim to have the most competitive, innovative and consumer-oriented electricity market by 2030, which contributes to achieving the ambitious Nordic climate targets.

The Nordic Energy Cooperation Working Groups cover a wide range of projects in the field of energy. More recently, there has been an increased focus on cooperation on hydrogen.

In addition, the Nordic Council of Ministers also cooperates closely with the Baltic States. The Baltic States are

involved in a wide range of projects and initiatives in the Nordic countries, including an ad hoc working group on CCS and CCUS. The Nordic and Baltic countries also hold joint meetings focusing on common interests and challenges in the energy sector.

### **Nordic cooperation on energy research**

Nordic Energy Research is an institution of the Nordic Council of Ministers which serves as a platform for enthusiasm research and policy development. Nordic Energy Research has a close dialogue with the Nordic countries' National Research Council to develop the areas of Nordic energy research. The close cooperation between the Nordic countries is therefore also an integral part of Nordic Energy Research.

### **North Sea Basin Task Force**

The North Sea Basin Task Force (NSBTF) is composed of North Sea countries that aim to develop common principles for the transport, injection and permanent storage of CO<sub>2</sub>. As of March 2023, the NSBTF includes Denmark, Flanders, France, the Netherlands, Norway, the United Kingdom and Germany. All NSBTF members have ambitions for CCS (Carbon Capture and Storage) in their countries and recognise the role of CCS in limiting CO<sub>2</sub> emissions, regardless of the different national policies on CCS.

#### *(ii) Explanation of how regional cooperation is considered in the plan*

As mentioned earlier, Denmark benefits from regional cooperation in several ways. The NSEC is an important forum for cooperation on sea wind, while Nordic cooperation is much broader.

## 2. NATIONAL OBJECTIVES AND TARGETS

### 2.1 Decarbonisation dimension

#### 2.1.1 greenhouse gas emissions and reductions;

(i) *The elements set out in Article 4(b);*

In October 2014, the European Council agreed on the 2030 climate and energy framework on targets for greenhouse gas emissions, energy efficiency, renewable energy and interconnections. As regards greenhouse gas emissions, the EU approved a binding EU target of reducing greenhouse gas emissions by at least 40 % by 2030 compared to 1990.

The first agreement on the 2030 framework, specifically the EU's overall greenhouse gas reduction target of at least 40 %, laid the basis for the EU's contribution to the Paris Agreement. The EU *Intended Nationally Determined Contribution* (INDC) was formally endorsed by an Environment Council in March 2015. The 40 % reduction target was split into two separate targets with one within the EU Emissions Trading System (ETS) and one without ETS sectors (the latter with individual targets for Member States under the Effort Sharing Regulation – ESR) supported by further regulation of land use (LULUCF Regulation), as well as rules on renewable energy and energy efficiency.

In December 2020, the European Council agreed on a more ambitious EU target to reduce domestic gas emissions by at least 55 % in 2030 compared to 1990. Under the Paris Agreement, this agreement was presented as the updated EU *Nationally Determined Contribution* (NDC). As a follow-up, in June 2021 the Council adopted the European Climate Law, which commits member states to achieving the climate target for both 2030 and 2050.

In July 2021, the European Commission made subsequent proposals to revise all relevant EU legislation – including a proposal for the revision of the ESR with updated individual targets for EU Member States, as elaborated on this. In line with the NECP reporting requirements, this section provides information on the native binding reduction commitments established pursuant to EU legislation.

In the first ESR adopted in May 2018, Denmark was committed to a 39 % reduction of non-quota greenhouse gases in the period 2021-2030 in 2030. 2005.

In the revised ESR, which entered into force in May 2023, Denmark is committed to a 50 % reduction of greenhouse gas emissions outside the quota adjustment period in the period 2021-2030 in 2030. 2005.

Under the Effort Sharing Regulation, flexibility mechanisms ensuring cost-efficient reductions include the possibility of borrowing, saving and transferring annual emission allowances between years and between Member States (see Article 5), cancelling EU ETS allowances instead – which means in practice that reductions are made under the EU ETS instead of under the ESR (see Article 6) and the use of credits from LULUCF (see Article 7). Further details on the obligations under the ESR Regulation are included below.

In May 2023, a revised regulation of emissions by sources and carbon removals by sinks in the land sector also entered into force – the LULUCF Regulation (LULUCF: 'Land-use, land-use Change and Forestry') in force. Credits obtained under this Regulation may be used to achieve the non-allowance adjustment (ESR) target in accordance with the ESR rules up to a certain limit. The limit for Denmark is 14,6 million CO<sub>2</sub>equivalent credits from LULUCF in the period 2021-2030, divided into two separate envelopes of 7,3 million CO<sub>2</sub>equivalent credits from LULUCF in each of the periods 2021-2025 and 2026-2030. Further details on the obligations under the LULUCF Regulation are included below.

The EU has committed to reducing its ETS emissions by 62 % in 2030 from 2005 in order to achieve the overall reduction in greenhouse gas emissions of 55 % below 1990 levels by 2030.

In June 2018, all parties to the Danish Parliament agreed on a Danish energy agreement. In this context, the parties agreed to allocate funding which indicates the path to reach a renewable energy share of approximately 55 % in 2030. At the same time, under the agreement, Denmark achieves a renewable energy share in electricity consumption of more than 100 % and that at least 90 % of district heating use is based on forms of energy other than coal, oil and gas in 2030. The Parties agree to keep developments under constant review throughout the period of the Agreement. The parties also agreed to phase out coal in Danish electricity production by 2030 and to analyse how and how quickly the phase-out can be carried out safely.

Consistency with Denmark's long-term low carbon strategy is ensured, as Denmark's objectives under the ESR-for- scheme and the LULUCF Regulation are to be seen as a step in 2021-2030 towards the objective of working towards net-zero emissions in line with the Paris Agreement and towards a net-zero emissions target in the EU and Denmark by 2050.

### **Effort Sharing Regulation (ESR)**

With regard to greenhouse gas emissions and removals and contribution to achieving the economy-wide EU target for GHG emissions in 2030, Denmark's binding national targets for greenhouse gas emissions and the annual binding national limits under the Effort Sharing Regulation (ESR) are the following:

- **2021-2029:** Reducing Denmark's annual out-of-quota greenhouse gas emissions from each year from 2021 to 2029 respect fixed ceilings<sup>2</sup>.
- **2030:** Reducing Denmark's out-of-quota greenhouse gas emissions by at least 50 per cent in 2030; i.e. Denmark's out-of-quota emissions in 2005 determined pursuant to Section 3 of the Effort Sharing Regulation (ESR).

### **LULUCF Regulation**

As regards greenhouse gas emissions and removals and with a view to contributing to the achievement of the EU economy-wide greenhouse gas emission reduction target for 2030, Denmark's commitments under the LULUCF Regulation are the following:

- **2021-2030:** Accounting for emissions and removals associated with land use, land use and forestry ('LULUCF') declines in the periods from 2021 to 2025 and from 2026 to 2030, which occur in the following land accounting categories in the territory of Denmark in the EU: areas of afforestation, deforestation, cropland, agricultural land with grass, managed forest and harvested wood products, and from 2026 also managed wetlands, settlements and other land.
- **2021-2025:** Ensure that Denmark's LULUCF emissions do not exceed LULUCF removals according to the accounting rules when the sum of total emissions and removals on the territory of Denmark in the above-mentioned land accounting categories is calculated in accordance with the rules laid down in the LULUCF Regulation.
- **2026-2030:** Ensure that Denmark's net LULUCF emissions are reduced by 0,4 million tonnes of CO<sub>2</sub>e by 2030;

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<sup>2</sup>For 2021 and 2022, there will be no change in the ceilings set in 2020 under the ESR before the Fit for 55 amendment of the ESR. For 2023-2025, the ceilings in 2023 are determined on the line for linear reduction between the 2022 cap and the final emission cap for 2030. For 2026-2029, the ceilings in 2025 are determined on the line for linear reduction between the 2021-2023 average level (calculated from a point in time 9/12-dec in 2023) and the final emission cap for 2030. The final emission ceiling for 2030 is determined by calculating 50 % reduction from out-of-quota emissions in 2005, the last one being the 2005 emissions established by the 2020 decision.

compared to the average net emissions for 2016, 2017 and 2018. Further ensure that net emissions do not exceed a budgetary target for the period 2026-2029 set by the Commission in 2025 on the basis of the latest emission inventory.

- (ii) *Where applicable, other national objectives and targets consistent with Pa; the rice agreement and existing long-term strategies. Where applicable for the contribution to the overall Union commitment of reducing the GHG emissions, other objectives and targets, including sector targets and adaptation goals, if available*

An agreement on a Climate Law was reached in December 2019. The agreement contains the following key elements:

- The Climate Law is legally binding
- A target to reduce greenhouse gas emissions by 70 per cent by 2030 compared to 1990 levels;
- Commitment to reach net-zero emissions by 2050
- An obligation to set milestones every five years with a ten-year perspective;
- Setting an indicative milestone target for 2025
- Implementation of the Milestone targets in Danish legislation
- Emissions are calculated in accordance with the UN greenhouse gas inventory rules;
- The government will develop annual climate programmes that will outline concrete policies to reduce emissions
- Strengthening the Climate Change Council (Climara Council) with tasks such as:
  - Provision of professional assessments of the adequacy of the initiatives in the government's climate programme to reduce emissions
  - Recommendations for climate action
  - According to the Council's annual budget
  - More experts are added to the Council;
  - The political independence of the Council is strengthened as it can now elect its own president and member;
- A Climate Dialogue Forum in conjunction with the Climate Council with representatives from business organisations, think tanks, green organisations, workers' organisations and ministries
- Separate report on Denmark's impact on international emissions, including those related to international shipping and aviation. Furthermore, reductions from electricity produced from renewable sources and the effects of Denmark's bilateral energy cooperation may be included in the separate report. Finally, the separate report will highlight the impact of consumption.
- Formulation of an annual global climate strategy to ensure that Denmark continues its ambitious work on the global stage.
- A citizens' engagement initiative in relation to the government's upcoming climate action plan in 2020.

The Climate Law was adopted by the Danish Parliament in June 2020.

The Climate Law's target for 2030 is to reduce greenhouse gases by 70 % in addition. The 1990 level and the long-term goal for Denmark is to achieve net-zero emissions by 2050. In May 2021, a majority of the parliamentary parties reached an agreement on an indicative target for 2025 of 50-54 % reduction in addition. The 1990 level, which was written into the Climate Law in December 2021.

Further steps have been taken to ensure that climate, environment and nature are taken into account across all relevant policy areas. A permanent Government Committee on Green Transition has been set up to ensure that climate, environmental and nature impacts are taken into account in government proposals and draft laws.

The December 2022 government base contains a number of climate and energy-relevant objectives, which are set out in Box 1.

## Box 1. The government base: Selected sections from Chapter 4 on ambitious climate action

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*The Government will take the necessary decisions to put Denmark fully in line with the reduction targets for 2025 and 2030. The 70 % target is to be achieved, inter alia, by achieving the agricultural and forestry sector's reduction targets similar to those agreed in the 2021 Agriculture Agreement.*

*It is crucial for the government to keep pace and to ensure a thorough implementation of the many measures that have been politically adopted, so that we can be fully targeted. As the targets are met, the government is ready to set new, ambitious targets.*

*It is imperative for both Denmark and Europe to move quickly away from fossil fuels for reasons of security policy – also looking at the prices of electricity and heating in Danish households. The Government's aim is to ensure that as many households as possible come away from individual gas and oil boilers as soon as possible, which will help to lower Danes' energy costs in the coming winters.*

*In order to support implementation at all stages, the Government will therefore, following the same model as the National Operational Staff (NOST), reduce a national energy crisis loss (NEKST).*

*With the involvement of relevant societal stakeholders, NEKST shall, inter alia:*

- Ensure national coordination of the roll-out of district heating and other efforts aimed at reducing the consumption of natural gas and replacing it with renewable energy as soon as possible.*
- Identify barriers to the agreed ambitions for the scaling of solar and wind on land and sea wind and recommend to the government possible measures to facilitate the expansion of the ACCE.*
- Support the expansion of the electricity grid where capacity challenges already exist and contribute to the front-runner of electricity consumption and renewable electricity generation.*

### Section 4.1 | Objectives with the 70 % target

*Denmark must be a green frontrunner that sets and delivers ambitious climate targets and efforts, thus inspiring other countries to follow.*

*It is the linkage of action to the green transition and continued economic growth that will lead other countries to look at Denmark. We must show the world that it is possible to balance high climate ambitions, competitive business and social cohesion.*

*The Government will:*

- Achieve the reduction target for 2025 – and achieve the 2030 reduction target.*
- Ensure that politically agreed greenhouse gas reductions are realised in practice.*
- If the conditions are changed so that the climate depreciation in 2025 or later shows that the 70 % target is not achieved by agreed concrete means of action, propose further concrete instruments to ensure that we reach targets.*
- Work towards ambitious and cost-effective climate and energy regulation in the EU, contributing to the achievement of the 70 % target while at the same time making Europe independent from Russian fossil energy.*

### Section 4.2 New climate targets

*With our companies, technologies and knowledge, Denmark has an opportunity and a commitment to promote the uptake of green solutions in the EU and globally. The government will work towards an ambitious 2040 climate target in the EU and continue working on green strategic partnerships with other countries. The government will continue to cooperate with countries around the world to disseminate Danish experiences from decades of green transition work.*

*As we reach the 70 % target itself, it is natural to set new targets that can continuously ensure a high pace while increasing the focus on the implementation of already decided initiatives.*

*The government will bring the climate neutrality target forward to 2045. And to set a new target of 110 % reduction in 2050. 1990.*

*The government will propose an ambitious reduction target for 2035 and assess whether the reduction target in 2030 needs to be further revised upwards.*

*The Government wishes to raise the ambition of Denmark's footprint in the world by setting a target for the Danish climate effect, understood as the international climate effect resulting from Danish exports of energy technology and services. A solid technical basis for the objective must be created in cooperation with the Danish business community before it is treated politically.*

*The government will reduce the climate impact on public procurement, including the purchase of transport and the construction of public buildings.*

*The Government will examine the consequences of setting a target for the CO<sub>2</sub>e footprint for Danish consumption.*

Section 4.3 Vision for the future of Danish food production *Denmark is one of the most intensively cultivated countries in the world. We produce enough food to feed more than twice as many people than we are. It is good for the world and it helps to create export earnings and jobs.*

*We need to produce high-quality food products in an innovative, sustainable and more climate-friendly way. Danish agriculture is already strong in green innovation. The government's ambition is to continue developing – not phasing out – Danish food production.*

*In the coming years, agriculture and the food sector are facing an ambitious transition in many areas. Emissions need to be significantly reduced, we need to better protect drinking water, have more nature and forests, and strengthen ecology and plant-based production. The Government notes that the country itself has high ambitions for the green transition.*

*The Government will present a proposal for a climate tax on agriculture once the Green Tax Reform Expert Group has presented its conclusions. The climate tax shall ensure implementation of the development track and compliance with the binding reduction target for the agricultural and forestry sectors of 55 % to 65 % in 2030. 1990. The Government will ask the Expert Committee to present various scenarios to achieve this objective, in line with the recommendations presented by the Committee in the context of the CO<sub>2</sub>e-tax on industry, including taking into account the need to discourage relocation of production, taking into account international experience and the possibility of putting CO<sub>2</sub>e-tax on final consumption as a possible instrument.*



The tax must be designed in such a way that the industry is supported, so that the competitiveness of the industry is not reduced and the places of work are not shifted out of the country as a whole. Implementation is therefore in line with what a broad majority in the Danish Parliament was behind with the 2020 Climate Law: "Achieving Denmark's climate targets must be as cost-effective as possible, taking into account both the long-term green transition, bearing in mind skilled business development and Danish competitive power, sound public finances and employment, and that Danish business must be developed and not deviated."

The reductions must be realised with a focus on moving from development to implementation of the development tracks launched by the Agreement on Agriculture. It identified a total potential for reductions of 5 million tonnes of CO<sub>2</sub>e in 2030 from brown biorefining, slurry and manure management, feed additions, doubling the ecological area and further set-aside of low-lying land. This potential is at the top of the already agreed reductions of around 1,9 million tonnes of CO<sub>2</sub>e, where the instruments have already been decided with the 2021 agreement. The Government will focus on having these instruments taken into account as soon as possible.

Therefore, investment must be made in the green transition, food production and its competitive environment. Danish food production must be anechoe for compliance for other countries' agricultural transition, and it must therefore be ensured that production is not simply moved out of the country. Therefore, the nut from the levy must be directly returned to agriculture in order to support the transition of the industry. In addition, the government wants to spend part of the Green Fund on additional investments in technology for the green transition of agriculture.

If we are to successfully transform and develop Danish agriculture, we need to see

all efforts and challenges in a context.

The Government will therefore establish a partnership with agriculture, the food sector, nature organisations, consumer organisations and municipalities, which will propose a comprehensive vision plan for Danish agriculture.

The partnership will make its recommendations at the end of 2023 with a view to drawing up a comprehensive vision plan for Danish agriculture in the first half of 2024. A comprehensive vision plan must also address the overall targets for land use in Denmark for agriculture, nature, expansion of energy, etc.

In addition to the need to agree on new initiatives for the food industry, the Government will have a strong focus on the implementation of the Agriculture Agreement. Including set-aside of low-lying soils that go too slowly.

#### Section 4.5 More Danish forest

The government will present an ambitious forest plan with a target of 250.000 hectares of new forest in Denmark. The creation of new forests contributes significantly to achieving climate neutrality and, in the long term, to net zero emissions.

The forest plan must ensure maximum synergy and trade-off between the multiple purposes of new forests, identify key actors and already existing funds, and reflect on instruments.

This should be done in parallel with the development of the vision plan, which will focus, inter alia, on launching private afforestation. The forest plan and afforestation are financed by the Green Fund, seeking as much contribution as possible from private actors and existing grants.

#### Section 4.6 Increasing renewable energy development and transition away from fossil heating

We need to speed up the free flow of Russian gas and turbo the green transition with more renewable energy. The North Sea and the Baltic Sea will be green power centres providing green power to the rest of Europe. Unnecessary bureaucracy and inappropriate division of tasks must not hinder the rapid and efficient deployment of renewable energy.

The Government will:

- Shorten the processing time for the deployment of renewable energy so that it is not put on hold due to bureaucracy. In this context, the Government will consider whether smoother models for the expansion of offshore wind can be put in place while ensuring a fair share of the income to society from onshore and water energy – possibly in the form of an updated concession model. The government will also promote cooperation in the North Sea and Baltic Sea gions on faster and coordinated expansion with the necessary infrastructure to promote the green transition and sea wind.
  - Launch an analysis of the efficiency of the current division of tasks between state authorities, regions and municipalities, with a view to ensuring a high pace of deployment of renewable energy on land. Here, the Government will promote an active role for the State in the planning of energy parks in addition to municipal planning of renewable energy projects. The development of energy parks must be market-driven and carried out by private actors.
  - The government sees the energy system of the future as critical infrastructure. The development of renewable energy and the Danish electricity grid must therefore require the most secure and sustainable solutions on the market. Greater sustainability must be ensured in tenders, respecting the principles of the EU environmental sustainability taxonomy and the Danish climate objectives, as well as tools such as ESG and life cycle assessments. A particular challenge will be to create secure, stable and sustainable supply chains for the whole green transition from Europe and like-minded countries. Thering will therefore be fully committed to the development of a new European industrial policy to this end.
  - Increase the decoupling pool financed by Grøn Fund, so that up to 2030 there are funds to promote Denmark's decoupling from the gas network by cancelling off the cost of approximately DKK 8.000, which the State gas distribution company Evida charges when disconnecting from the grid.
- 
- Ensure a strong focus on the energy efficiency of both private homes, businesses and public buildings.
  - Launch a grid deployment plan and identify actions to support timely and efficient investments in the electricity grid. The Government will examine whether further measures are needed to make more efficient use of the electricity grid, including through, inter alia, more demand response. This work is based on the efforts of NEKST and may lead to changes in network regulation.
  - Establish the partnership "Together for Climate" to support accelerated climate action across state, municipalities and regions, civilian funds and businesses, with an emphasis on the citizen-oriented.
  - Increase the production of biogas so that Denmark can accelerate the displacement of Russian natural gas. Including, as far as possible, advancing the agreed calls for tenders.

#### Section 4.7 Greening transport

The government wants to accelerate the development of green transport in Denmark by 2030.

The Government will:

- Highlight the effects of the agreement on the green transition of road transport in order to make it more effective in the light of technological developments. Here, options for increasing the ambition of clean electric cars need to be explored.
- Take further action for the promotion of zero-emission lorries, building on the pool of powered heavy-duty road transport infrastructure from the Infrastructure Forward in 2021. For example, it should promote fleet conversion and the installation of recharging points.
- Introduce a passenger tax on air travel of an average of DKK 100. The revenue from this is used, inter alia, for measures for airports and areas around, the financing of the domestic green route and an increased age check.
- Enable the establishment of a domestic green route by 2025 and by 2030 fully domestic green aviation financed by the passenger tax, as well as increase the pace of the transformation of heavy transport as well as maritime and aviation, inter alia by promoting electrification and green fuels.

#### Section 4.9 Global climate action

*The government will work to ensure that the EU continues to be at the forefront of international climate agreements. Both to limit the global climate footprint of large emitters and rich countries – including beyond their borders – and to support the most vulnerable countries that suffer the greatest losses and damage from global warming.*

*The government will present a plan on how Denmark can live up to its share of the global commitments in the global climate agreements, in particular from COP15 and COP27, on financing for the world's poorest countries. Ways of using risk-taking public funds as a means of leveraging more private funds should be explored.*

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## **Adaptation target**

All parts of society must contribute to climate adaptation in Denmark. Addressing the climate challenge requires cooperation between authorities, organisations, private companies and landowners, whether the project is maintenance of existing roads, coastal protection, construction or investment in new infrastructure or marteries.

Climate adaptation is primarily based on initiatives at local level and involves municipalities, water utilities and landowners. These stakeholders know best the local circumstances and are therefore best placed to make adaptation decisions. In Denmark, the municipalities are the Climate Adaptation Authority.

The State itself has a responsibility as owner of infrastructure, buildings and land. However, the primary role of the State is to establish an appropriate framework for local climate adaptation, for example by adapting laws and regulations, but also by sub-supporting/contributing coordination and providing information and guidance to municipalities. A robust framework for action must support the concrete parties involved so that they can meet the challenge in a socio-economic way at the right time.

A new government took office at the end of 2022. The new government's government base highlights that despite significant efforts to mitigate climate change, it is also necessary to ensure that Denmark provides more against flooding and extreme weather conditions. The Government will therefore present a national climate change adaptation plan to support the timely implementation of the necessary measures and ensure that the measures are organised in the best possible way.

## **CCUS**

The Government and a broad majority of the Danish Parliament agreed in June 2020 on a climate agreement for energy and industry, etc., which included massive investments in the deployment of CCS. Since then, a large number of political agreements based on broad parliamentary support have encouraged the rapid development of CCS in Denmark. The agreements support the strategy, regulatory and regulatory development of CCS in Denmark and provide ecological support incentives for the development and implementation of CCS in Denmark.

**Table 2. Overview of political agreements on CCS and their content**

Agreements	Date of	CCS relevant content
Climate agreement for energy and industry, etc.	22 June, 2020	A pool will be allocated to promote CCUS technologies and deliver drifting domestic gas reductions by 2030 and beyond. A total of DKK 16,6 billion (2023 prices) is allocated. Cross-border transport of CO <sub>2</sub> shall be possible.
Research reserve 2021	30nd november, 2020	DKK 700 million for the establishment of four green research missions under the auspices of the Innovation Fund, including a mission focusing on the capture and storage or use of CO <sub>2</sub> under the name
The future of oil and gas extraction in the North Sea	3 December, 2020	DKK 200 million will be allocated in 2021-22 to development and monitoring projects for storage in the North Sea.
Roadmap for CO <sub>2</sub> Storage	30 June, 2021	The agreement consists of a series of measures to enable storage in the Danish subsoil, both in the short and long term. Specifically, the agreement starts the process of granting permits for CO <sub>2</sub> storage in Denmark underland in the North Sea.
Roadmap for Catch, Transport and Storage of CO <sub>2</sub>	14. decem BER, 2021	Agreement on the disbursement of the first phase of the CCUS pool. The agreement also aims to develop Denmark as a European hub for storing CO <sub>2</sub> .
Green Partial Agreement, Finance	4 December, 2021	DKK 2,6 billion (2023 prices) will be allocated to support negative-emissions. The expected impact is 0.5 Mt CO <sub>2</sub> pa for the period 2025-
Green tax reform	24 June, 2022	A total of DKK 17,2 billion (2023 prices) is allocated to an aid scheme <sup>3</sup> . Reductions of 1,8 million tonnes of CO <sub>2</sub> are expected in 2030.
Framework conditions for Co <sub>2</sub> storage in Dan-	21 June, 2022	20 % State ownership of off-shore storage licences.
Research reserve 2022	28 October 2021	DKK 295 million for four green research missions under the Innovation Fund, including a mission focusing on capturing and storing or using CO <sub>2</sub> . DKK 85 million for studies on possible on-shore and near-shore storage structures.
Research reserve 2023	28 February, 2023	DKK 300 million for four green research missions under the Innovation Fund, including a mission focusing on capturing and storing or using CO <sub>2</sub> . DKK 121,5 million for studies on possible on-shore and near-shore storage structures.

#### Potential for CO<sub>2</sub> catches from Danish point sources

CCUS interventions deal with the capture, storage and utilisation of carbon. The carbon may originate, for example, from biomass (biogenic carbon), atmospheric or fossil sources. Burning straw, wood pellets and waste emits CO<sub>2</sub> that can be captured and stored or used.

The total annual long-term CO<sub>2</sub> catch<sub>potential</sub> from Danish point sources is estimated to be 5,4-10.8 Mt CO<sub>2</sub>

<sup>3</sup>The support will start in 2026 and will run for 15 years.

divided between industrial, waste incineration, energy production and biogas plants. Of these, the agreed PUL is estimated to catch and store 3.2 Mt of CO<sub>2</sub> in 2030. It is estimated that more than half of the long-term potential comes from biogenic sources.

**Table 3. Estimates of Danish CO<sub>2</sub> catch potential**

<b>CO<sub>2</sub> catch potential Mtpa</b>	<b>2025</b>	<b>2030</b>	<b>2040</b>
Waste incineration	2,0-4,1	1,4-2,7	1,3-2,7
Heat and electricity	4,3-8,6	2,8-5,6	1,6-3,2
Industry	2,0-4,1	1,9-3,9	1,8-3,6
Biogas upgrade	0,5-1,1	0,7-1,4	0,7-1,3
<b>Total</b>	<b>8,9-17,9</b>	<b>6,9-13,7</b>	<b>5,4-10,8</b>
Fossil and Process	2,7-5,4	1,8-3,6	1,5-3,1
Biogenic	6,3-12,5	5,1-10,1	3,9-7,7

Low estimates of CO<sub>2</sub> catch potential (Mtpa) by sector and origin 2025, 2030 and 2040. Estimates for 2030 and 2040 are uncertain.

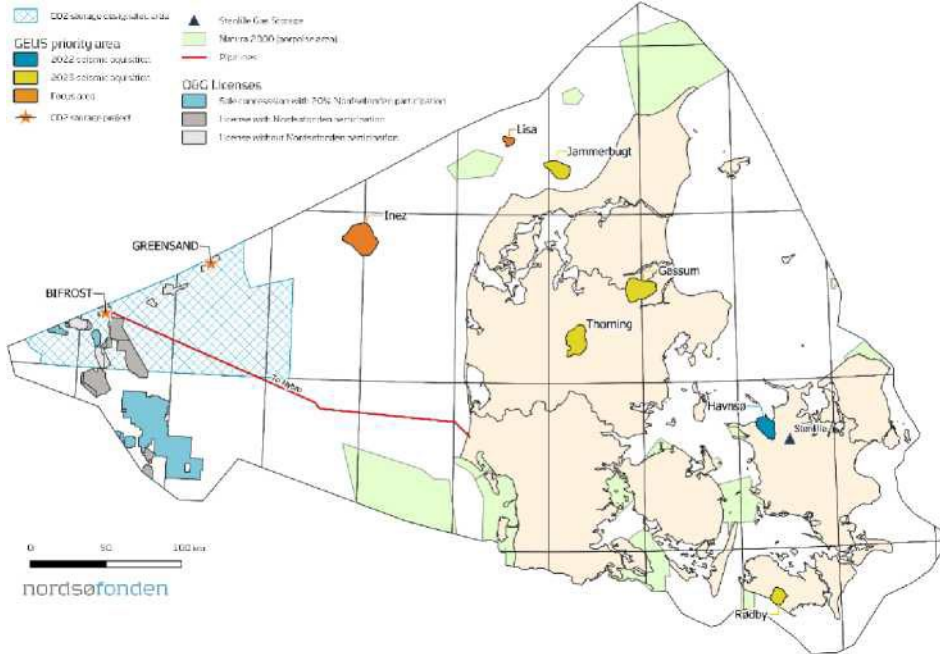
### **Storage capacity**

The National Geological Studies for Denmark and Greenland (GEUS) estimate the total storage capacity of a number of identified saline aquifers at 12.000 Mt and at least a further 10.000 Mt are estimated for other identified structures, open aquifers and vulcanoclastic sediments. The potential storage capacity for end-of-life oil and gas fields is also significant. In addition, a significant part of the Danish area is used for agriculture, where it will be technically possible to store carbon in the form of biocarbon from pyrolysis.

The structures are offshore, near-shore and onshore. As of March 2023, the first three exploration permits have been granted for offshore storage in the north-western North Sea, two of which are located in depleted oil and gas fields, and one for a Salin akvifer.

GEUS is currently exploring and mapping 8 potential land and coastal storage sites. At the same time, the Danish Energy Agency carries out a strategic environmental assessment of the areas. The completion of these activities and an evaluation of their results is likely to result in a call for further investigation applications in 2023/2024.

**Figure 2: Maps of 8 potential storage sites and offshore activities**



(Source: North Sea Fund)

The expected storage capacity of the 8 structures examined by GEUS is indicated in Table 4.

**Table 4. The expected storage capacity of the 8 structures provisionally identified by GEUS;**

Name of the structure	Capacity (mean, MtCO <sub>2</sub> )
Port lake (Gassum Fm)	306,0
Gassum (Gassum Fm)	585,0
Thorning (Gassum Fm)	295,0
Stenlille (Gassum Fm)	NA
Rødby (Bunter Fm)	209,0
Inez (Gassum Fm)	178,0
Inez (Haldager Fm)	3,1
Lisa (Gassum Fm)	29,3
Jammer bay	NA

### CCS project development

A number of project developments have taken place since 2020 and, from March 2023, Denmark has granted three exploration permits in relation to the Greensand and Bifrost offshore projects, as well as a pilot and demonstration permit for injection of less than 0,1 million of CO<sub>2</sub> to the Greensand project. The expected storage capacity for the Greensand-project is up to 1,5 million tonnes of CO<sub>2</sub> per year from 2025-2026 and 8 million tonnes of CO<sub>2</sub> from 2030. For the Bifrost project, storage capacity of 2-3 million tonnes of CO<sub>2</sub> per year is expected from 2029-2030 and 10-15 million tonnes of CO<sub>2</sub> per year from 2030-2032.

Other projects on land are in the planning phase. For example, the Norne project expects to be able to store 2,3 million tonnes of CO<sub>2</sub> per year in 2026 and 18,7 million tonnes of CO<sub>2</sub> per year in 2030. Another project, the Ruby project, expects to start from 2027 with an injection capacity of 1 million tonnes of CO<sub>2</sub> per year and up to 5-10 million tonnes of CO<sub>2</sub> per year in 2030. Finally, a small onshore project has been announced in Stenlille to learn about Danish onshore opportunities.

## Planned CO<sub>2</sub> transport infrastructure

The projects currently under development foresee different modes of transport, including national and transnational pipelines and maritime transport, port reception facilities, intermediate storage and truck transport. Decisions on a national transport network, its ownership, etc. are still to be decided.

## Support to the CCUS

The development of CCS has been supported by general research and development funds, including the Technology Development and Demonstration Programme (EUDP). This includes grants for the development and demonstration of CO<sub>2</sub> storage in depleted oil and gas fields in the North Sea.

In addition, GEUS has received funding to investigate a number of potential storage sites near-shore and onshore.

Other publicly funded initiatives in support of the CCUS include funds for a concrete mission focusing on the capture and storage or use of CO<sub>2</sub> under the auspices of the National Innovation Fund and the development of the CCUS in the North Jutland region funded through the EU-REACT programme.

In addition, DKK 190 million is made available from the EU Just Transition Fund for the development of local value chains for CO<sub>2</sub> capture, use and storage in the North Jutland and South Jutland parts. The funds will mitigate the negative impact of the transition to a climate-neutral economy on selected territories.

Private funds also support the development of the CCUS. For example, the Novo Nordisk Foundation has established the Novo Nordisk Fondens CO<sub>2</sub> Research Center, a mission-oriented centre to develop new knowledge on CO<sub>2</sub> capture, storage and use.

As part of the political agreements on the CCUS, more than DKK 35 billion has been allocated to implementing the CCUS as a climate tool.

**Table 5. Overview of CCUS funds**

	CCUS fund	NECCS fund	GSC fund
Eligible sources of CO <sub>2</sub>	Fossil, process and biogenic	Biogen (incl. DACCS)	Fossil, Process and Biogenic (incl. DACCS)
Contract Period	Up to 20 years per contract with opt-out option m/Detention sentence	Up to 8 years per contract without (limited detention penalty)	Up to 15 years per contract without (limited retention penalty)
First year of reduction	2025/26	2025	2026/27
Support period	2025-2049	2025-2032	2026-2043
Budget (2023 prices) *	DKK 16,6 billion	DKK 2,6 billion	DKK 17,2 billion

## 2.1.2 renewable energy

### (i) *The elements set out in Article 4(b);*

Denmark notes with satisfaction that an agreement has been reached between the European Parliament and the Council of the European Union on a recast Renewable Energy Directive. The Government will assess the late transposition once the recast Renewable Energy Directive has entered into force. Therefore, Denmark expects to report on the recast Directive in the final update of the NECP in June 2024.

In 2020, the Danish Parliament adopted the Danish Climate Law. The purpose of the Act is for Denmark to reduce greenhouse gas emissions in 2030 by 70 % compared to the 1990 level. Most recently, the Government, consisting of the Socialdemocratic, the Moderats and the Venstre, with the government base: Responsibility for Denmark 2022 presented that it will bring forward the climate neutrality target for 2050 to 2045 and proposed a new target of 110 % reduction by 2050. 1990. In addition, in 2018, the Danish Parliament

set aside funds to ensure that renewable energy accounts for approximately 55 % of Denmark's total energy consumption in 2030.

### **Offshore wind**

Since 2012, a number of political agreements have been concluded on offshore wind development in Denmark. This applies to the Energy and Industry Agreement of 2012, the Energy Agreement of 2018, the Climate Agreement for Energy and Industry of 2020, the Supplementary Agreement on Ownership and Construction of Energy Islands etc. of 2021 and, and the underlying contract preparatory lots of 2021 and 2022, the Supplementary Agreement on the Bornholm Energy Island of 2022, the Finance Act for 2022 and the Climate Agreement of 2022, and to the Medical Agreement on a tendering framework for 6 GW of sea wind and energy island of Bornholm of 2023.

In accordance with the 2012 Energy Agreement, offshore wind farms Horns Rev 3 on 406 MW and Kriegers Flak on 605 MW were put into operation in August 2019 and September 2021 respectively. In addition, coastal parks are expected from the 2012 Energy Agreement, Vesterhav South of 170 MW and Vesterhav Nord 180 MW, put into operation in 2023.

In the 2018 Energy Agreement, it was agreed that three new offshore wind farms would be built by 2030. The tender for the first Thor offshore wind farm of 1.000 MW has been decided and is expected to come into operation in 2027. The other Hesselø offshore wind farm has been delayed due to soft seabed challenges, but is expected to come into operation in 2029 with a capacity of 800-1.200 MW. The third park decided on the climate change agreement 2020 as part of the energy islands.

In the 2020 Climate Agreement, it was decided to construct two energy islands with 10 GW for the North Sea and 2 GW for the Bornholm energy island, provided that the projects are profitable. Energiø Bornholm was extended by 1 additional GW with the Supplementary Agreement on Bornholm Energy Island 2022. Energy island Bornholm is expected to become operational in 2030 and the first phase of the North Sea energy island of 3 GW is expected to be realised in 2033.

The Finance Act 2022 decided to offer a further 2 GW of sea wind. 1 out of 2 GW is placed at Bornholm energy island, cf. the expansion of Bornholm energy island from 2 to 3 GW.

In the 2022 Climate Agreement, it was decided that an additional minimum of 4 GW of sea wind would be offered foreelling by the end of 2030.

*With the Supplementary Agreement on the tendering framework for 6 GW of sea wind and energy island of Bornholm of 30 May 2023, the tender conditions for 6 GW of radial offshore wind farms and 3 GW of the Bornholm energy island were decided. All 9 GW have the possibility of overplanting, which could potentially lead to a total of 14 GW or more if the market wants the dealer-dealer settlement community.*

In connection with the above energy and climate agreements since 2018, tenders for 1 GW have been decided and political agreements have been made to tender for an additional 6 GW of radial sea wind and 3 GW of sea wind in connection with Bornholm energy island for construction by the end of 2030. With the Supplementary Agreement on Tender Frameworks for 6 GW of offshore wind and energy island of Bornholm, it was decided to grant overplanting for the future offshore wind farms so that the total of 9 GW could potentially be increased to 14 GW or more. In addition, there is an additional minimum of 3 GW in relation to

the first phase of the North Sea energy island by 2033 and, as soon as possible, the loss of a total of 10 GW with 2040 as a target point, taking into account the necessary external connections.

The government is working to adjust the open door regime to comply with EU legislation. In order to be bound by the adoption of the new maritime plan by agreement of 7 June 2023, which constitutes an overall planning for all the land interests at sea and seeks to balance nature, fisheries, renewable energy, etc., the parties to the agreement note that no new land is being designated for commercial project applications in open door terms. For three of the open doors applications, the land has already been allocated to RES in the current seaplan and areas. Remaining commercial project applications that are not attached to the Marine Plan will end up being rejected under the current Open Doors Scheme. Six open door projects have already been assessed for authorisation under the existing scheme.

### **Land wind and solar energy**

In June 2022, the then S government, with a broad majority in the Danish Parliament, concluded an agreement on green electricity and heat. The parties to the agreement agreed to ensure framework conditions to allow for a four-fold increase in total solar electricity production and wind by 2030. This requires a very comprehensive land use planning and rapid expansion of renewable energy on land. It is therefore necessary to develop a model of how the State can play an active role by 2030 in the planning of onshore energy parks, i.e. major state-designated areas where there can be a rapid expansion of a variety of renewable energy technologies, including wind turbines, solar photovoltaics and PtX installations, etc. The development of the parks must be market-driven and thus taken over by private developers, while the State's contribution may, for example, be via planning, etc. to remove barriers. The energy parks will be complementary to municipal planning of renewable energy projects and may, for example, also cross municipal boundaries;

In 2023, the Government will discuss binding targets for municipalities' land-use planning for renewable energy installations with the National Association of Local Authorities (KL). This will support the availability of sufficient land to quadruple total production from solar energy and land wind by 2030. The objective is linked to the fact that the development of green electricity, in addition to Denmark's needs, is to be constructed free of aid and that consumers and businesses are not subject to significant costs.

In addition, a number of initiatives have been adopted to strengthen local anchoring and support faster renewable energy deployment processes on land. This means, among other things, setting up a renewable travel team to ensure, among other things, the dissemination of good examples in connection with the realisation of renewable energy projects in municipalities. In addition, additional funding is provided for projects aimed at compensating local communities with many onshore wind turbines and solar photovoltaic installations in the nearby area.

In addition, a draft law amending the Planning Act was adopted in April 2023. The amendment extends the purpose of the Planning Act to climate in line with the environment, nature and growth and development, and the State supervision of municipal planning will in future also include climate protection as a national interest. The amendment also makes it possible to plan wind turbines and photovoltaic installations in rural- and freight landscapes. The amendments aim to help ensure a clear planning framework for RES installations.

In order to further promote the expansion of onshore wind and solar energy, the Government has decided to set up a National Energy Crisis Loss (NEKST) to ensure faster action on urgent green challenges. Through the involvement of relevant societal actors, NEKST will, inter alia, identify barriers to the agreed ambitions for the



scaling of solar and wind on land as well as offshore wind and recommend to the government any measures to accelerate deployment.

## **PTX**

The path towards a green society must be achieved, inter alia, through direct electrification and indirect electrification via PTX. PTX can contribute to an integrated and flexible energy system where PTX is integrated into the energy system in a way that supports and complements existing supply sectors such as electricity, gas and district heating.

PtX technology enables the production of fuels and chemicals that can replace fossil products in a number of hard-to-switch sectors, such as shipping, aviation, agriculture, parts of industry and parts of heavy road transport. PTX can contribute to achieving the Danish climate targets and in particular play a role in achieving the climate neutrality objective.

The previous government, together with a broad majority in the Danish Parliament, reached an agreement on the development and promotion of hydrogen and green fuels on 15 March 2022. The agreement aims to promote green hydrogen and green PtX products and includes the objective that Denmark will aim to build 4-6 GW of electrolyser capacity by 2030, taking into account, as far as possible, market conditions and taking into account the security of supply of the Danes. The deployment of 4-6 GW of electrolysis capacity will increase the need for green electricity. With the Climate Agreement on green electricity and heat, the parties to the agreement agree to ensure framework conditions to allow for a four-fold increase in total electricity production from solar and land wind by 2030, and it was decided to offer at least 4 additional GW of sea wind for deployment by the end of 2030. It is expected that the flow from offshore wind can be used, inter alia, by PtX plants in Denmark. The PtX agreement will also support the realisation of Denmark's export and business potential in the PtX area and contribute to lowering Denmark's global climate footprint and the achievement of national and international climate objectives.

In addition to the objective of electrolyser capacity, the agreement also includes several initiatives, including a PtX tender to support the industrialisation and scaling up of PtX production in Denmark. The total value of the tender procedure is DKK 1,25 billion, the European Commission approved the tender model on 15 February 2023 and the tender was published on 19 April 2023.

## **Biomass**

In 2021, biomass accounted for approximately 58 % of renewable energy production in the form of straw, pellets, wood chips, biogas and biodegradable waste for incineration. Imports accounted for 50 % of total bioenergy consumption in Denmark in 2021, mainly in the form of pellets (65 PJ), wood chips (22 PJ) and bioliquids (17 PJ).

From the 1990s to the present, there has been a significant fuel switch in the production of district heating. During that period, the consumption of coal for the production of district heating decreased from just under 50 % to 4.8 % in 2021. By contrast, the share based on renewable energy has increased from around 20 % to 2021 % of district heating production (from energy statistics 2021, p. 17). The use of biomass for heat production is exempt from energy and CO<sub>2</sub> taxes. A large part of biomass use for heat production takes place in large CHP plants.

Biomass (solid, gaseous and liquid) accounted for 2021 56 % of renewable energy for electricity production.

### **Heating and cooling**

The share of renewable energy in the Danish heating and cooling sector is estimated at approximately 42 % in 2021, including biomass and biodegradable waste. This figure indicates a decrease in the RES share of around 12 % in addition. The 2019 NECP. This is because the new EU Renewable Energy Directive (RES II Directive) was transposed into Danish law on 30 June 2021. The Directive introduced new rules on how bioenergy (solid biomass, biogas and biooil) can be taken into account when calculating the share of renewable energy. The new rules are therefore particularly important for the calculation of the RES share for the year 2021. The entry into force of the new rules in mid-2021 meant that biogas and biomass used by large electricity and heat producing plants in the first half of 2021 could not be included in the calculation of the RES share for 2021. Taken in isolation, this means that the RES share was about 7.6 % lower than it would otherwise have been if the regulatory change had not entered into force by mid-year.

A large part of the biomass is used in combined heat and power production in CHP plants, which are converted from fossil fuels to biomass. The conversion has taken place as a result of initiatives from the 2012 Energy Agreement, which allow a larger part of the production costs to accrue to district heating companies and consumers, as well as as a result of support pools for biomass based electricity production in CHP plants.

### **Biogas**

Biogas is a green, climate-neutral gas produced primarily from biomass consisting of agricultural, industrial and household residues. They are therefore resources which would otherwise be burned in certain installations or scattered on the fields from which they emit greenhouse gases into the surroundings. Using biomass for biogas instead reduces emissions from agriculture and at the same time makes gas consumption more climate friendly. The government will both frontload and increase biogas production. Most recently, the government base of the current government states that biogas production needs to be increased so that Denmark can crowd out Russian natural gas.

In 2012, three price supplements for electricity were introduced, 2 of which are still in force today. The first premium consists of a basic premium of DKK 0,825/kWh, adjusted for inflation by 60 % of the net price index. The second supplement is DKK 0,26/kWh electricity. It is linked to the market price of natural gas and includes a basic price. If the market price of natural gas falls below the bottom price, then the premium increases – and vice versa. The third premium (phased out) introduced in 2012 provided each producer with an additional DKK 0,10/kWh of electricity, reduced by DKK 0,02/kWh each year, and was phased out in 2020.

Similarly, for biogas, a support scheme for upgrading, processing and heating was introduced in 2012. These schemes include a basic supplement and a natural gas price supplement, which are adjusted once a year. The basic allowance is adjusted by 60 % of the net price index (upgrade and process). For the upgrade scheme, the basic supplement in 2023 is DKK 87,4/GJ. The natural gas price supplement is linked to the market price of natural gas. If the market price of natural gas decreases, the premium – and vice versa (upgrade, process and heat) will increase.

In the Energy Agreement June 2018, it was decided to phase out the current biogas support schemes by 2020. This means that no new plant can apply for aid under the closed subsidy schemes after 1 January 2020 and

that existing plants will continue to receive aid for a fixed depreciation period.

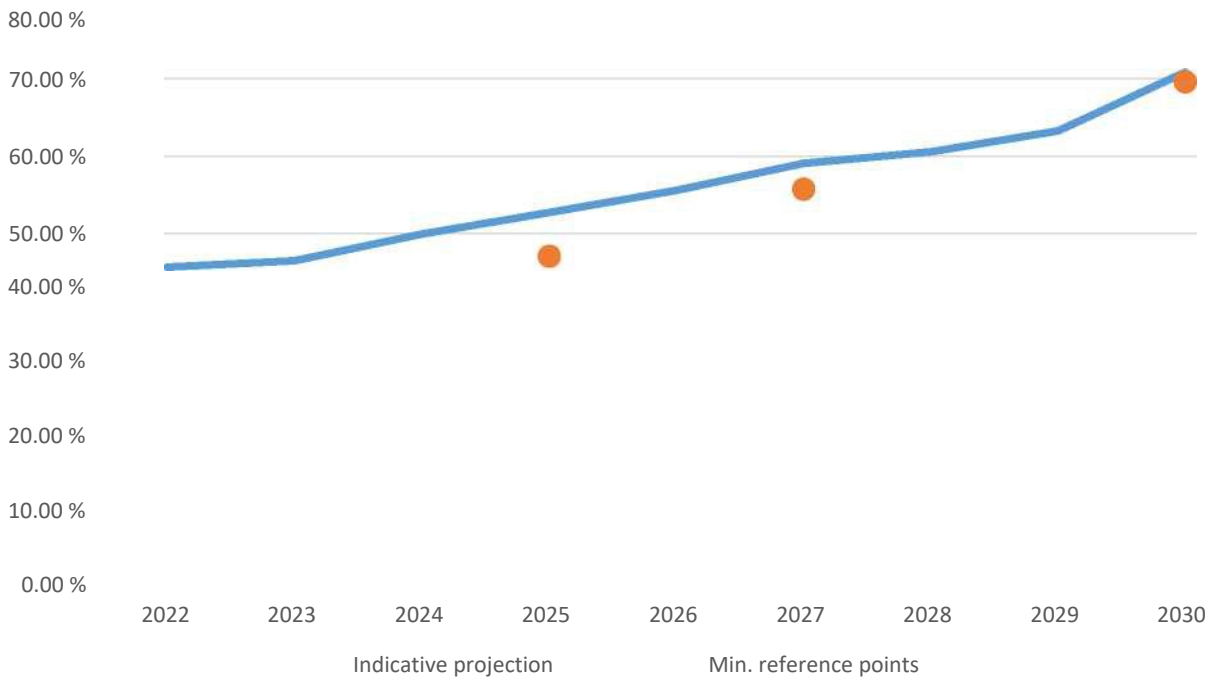
In June 2020, the Climate Agreement for Energy and Industry etc. agreed that future support for biogas and other green gases would be based on a bidding process – by 2030, a follow-up agreement of 21st December 2021 agreed that tenders would be based on fixed price supplements and that eligible gases in first tenders were upgraded biogas and e-methane produced with CO<sub>2</sub> from retrofitting plants injected hydrogen. The scheme has been pre-notified to the European Commission and is awaiting final approval under the State Aid Guidelines.

### **Climate depreciation**

Denmark expects to reach a total share of renewable energy of 71 % in 2030, and the share of renewable energy in electricity consumption is expected to exceed 100 % by 2030.

The indicative projection for the Danish contribution from 2022 onwards is shown in Figure 3. The projection represents a frozen policy scenario and gives rise to high uncertainty. Therefore, the actual share of renewable energy may deviate from this estimate.

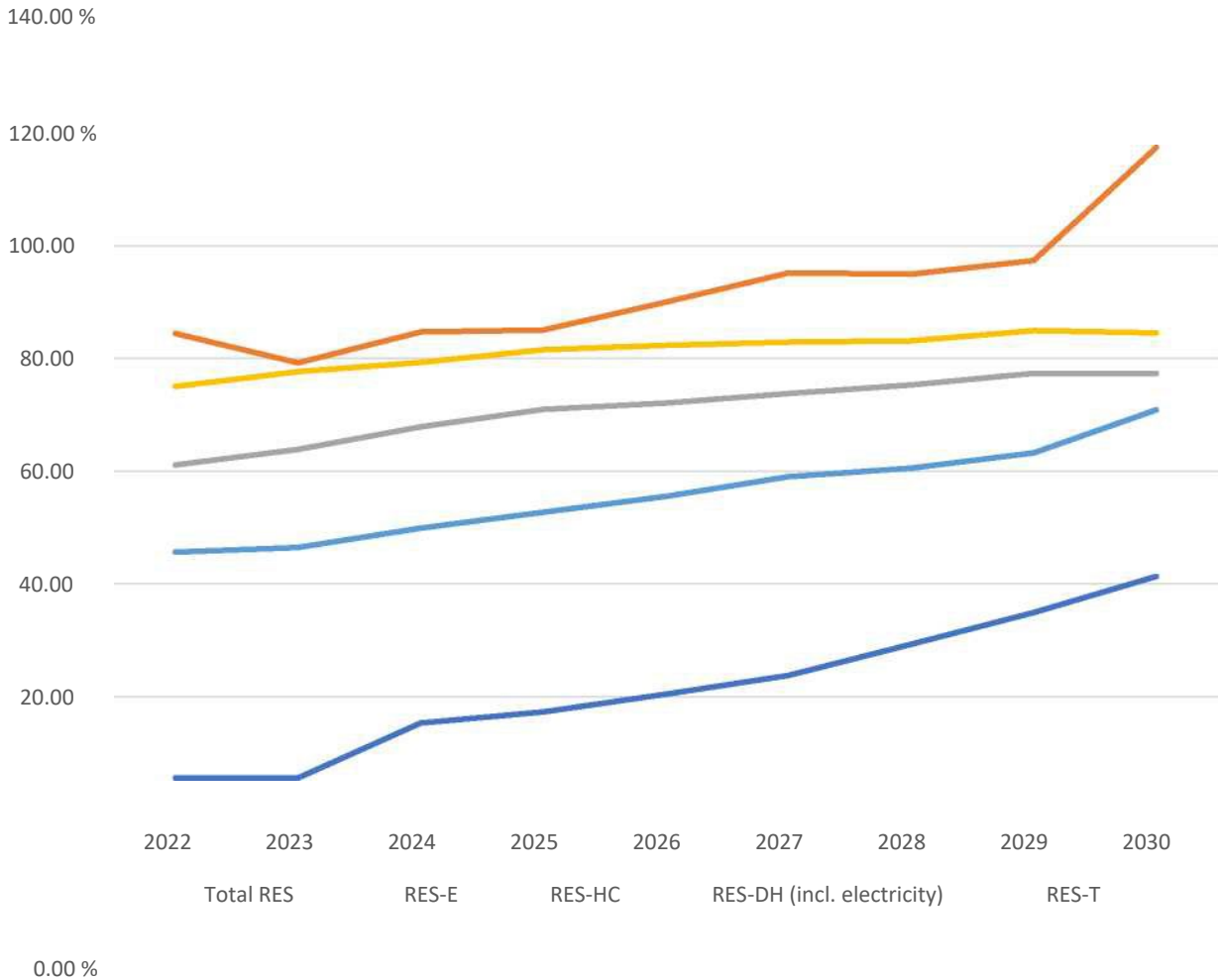
**Figure 3: Indicative projection for the share of energy from renewable sources in gross final use compared to the minimum reference points**



(ii) *Estimated trajectories for each sector's share of renewable energy in final energy consumption from 2021 to 2030 in the electricity, heating and cooling and transport sectors*

Denmark has not currently set individual targets for the share of renewable energy in the sectors. Figures for the renewable share of the sectors, based on the modelling of a frozen policy scenario, are given in Figure 4.

**Figure 4. Estimated projection for sectors' share of renewable energy**



Due to new investments in renewable energy, as well as a decision to phase out coal in the electricity generation sector by 2030, the RES share in electricity consumption is expected to exceed 100 % by 2030. For the district heating sector, it is projected that 85 % of heat in the district heating sector will be based on RES in 2030. For the heating and cooling sector as a whole, the RES share is expected to reach 77 % in 2030. For transport, the RESshare is expected to reach 41 % in 2030.

**The new indicative target for the share of renewable energy in the national building sector by 2030;**

The Renewable Energy Directive (VED) and the Energy Performance of Buildings Directive (EPBD) are under revision. On 10 March 2023, the European Parliament and the Council of the EU reached an agreement on the Energy Efficiency Directive, but the recast directive has not yet been formally approved and the final building requirements are therefore not yet known. Therefore, it is currently not possible to provide information on a possible future indicative target for the share of renewables to heating buildings.

Reference is made to sections 2.2 (i) to (iii) and 3.2 (i), (ii) and (iv) for deepening political agreements as well as adopted instruments that are expected to contribute to achieving a possible indicative target for the share of renewables to heating of buildings.

Reference is also made to the Building Regulations' requirements for renovation classes Sections 280-282 and Sections 293-298 on Building heating, which include requirements on the use of VE for heating purposes<sup>45</sup>.

**Figure 5: Annual increase in the share of RES in industry for 2022-2030**

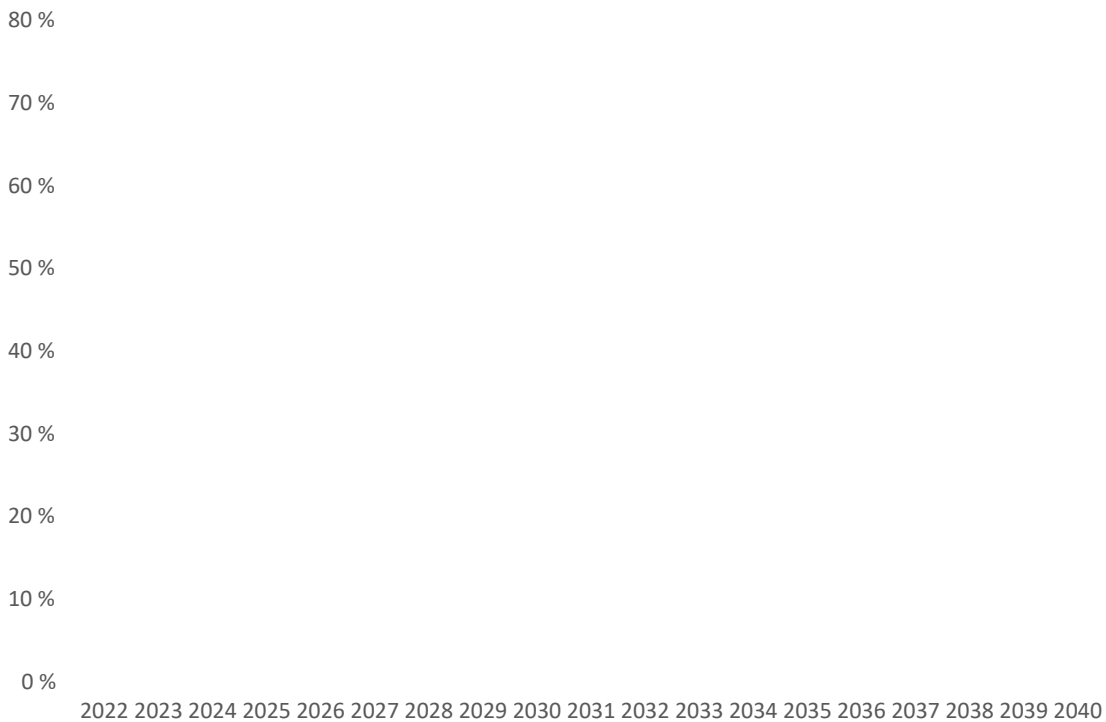


Figure 5 above shows the annual increase in the share of RES in industry in Denmark from 2022 to 2030. The trend shows that the share of renewable energy in industry increases from 29 % in 2022 to 70 % in 2030.

In the field of fuel, Denmark regulates a CO<sub>2</sub>e-displacement requirement. Danish legislation provides that in each of the years 2022-2029 there must be a reduction in life cycle greenhouse gas emissions per unit of energy from transport fuel supplied and electricity supplied for use in road vehicles for transport purposes by at least 6 % and at least 7 % by 2030.

Denmark will meet the requirements of the RED II Directive for the use of advanced biofuels in 2025 by setting a cap on the use of 1.g biofuel in the target fulfilment of the Danish CO<sub>2</sub> displacement requirement.

There is also no use requirement for RFNBO in Denmark. Before Denmark takes a position on a possible application requirement for RFNBO, clarification is sought as to whether minimum requirements for RFNBO are set out in the future revised VE II Directive or in the future regulations on air and maritime navigation –

Denmark plans to have one Danish domestic air route in Denmark by 2025 % green and that all domestic aviation is green from 2030.

Denmark expects that there will be 41 % renewable energy in the transport sector in 2030, cf. Figure 4 – calculated in accordance with the rules of the RES II Directive – including contributions from electricity to land transport.

- (iii) *Estimated trajectories by renewable energy technologies that the Member State expects to use to achieve the overall and sectoral renewable energy trajectory from 2021 to 2030, including the total projected gross final energy consumption in Mtoe for each technology and sector, as well as the total planned installed capacity in MW (broken down by new rated capacity and repowering) for each technology and sector;*

In order to reflect the EU's solar energy strategy, which aims to bring the EU's total photovoltaic capacity closer to 600 GW by 2030, the then Government has reached an agreement with a broad majority in the Danish Parliament to ensure framework conditions that will allow for a fourfold increase in total solar and land-based electricity production by 2030. In addition, under the TEN-E commitment and through the North Sea Cooperation (NSOG) and Baltic Sea Cooperation (BEMIP), Denmark has submitted non-binding target figures for offshore wind development by 2030. For the North Sea area, 5.3 GW have been submitted and for the Baltic Sea, 7.9 GW have been submitted in 2030 for new and existing offshore wind farms.

**Target to produce renewable gases, in particular by helping to promote the production of sustainable biogas and biomethane production in the EU to 35 bcm by 2030.**

There is a policy target of 100 % green gas in the Danish gas system in 2030. There are support schemes for the production and use of biogas, which are expected to deliver approximately 1,4 billion m<sup>3</sup> of biogas in 2030. In addition, a tender has been decided for biogas and other green gases in the gas system, which is expected to supply about 0,4 bcm of biomethane by 2030.

**Hydrogen production in Mtoe and electrolyser capacity in MW.**

The Agreement on the *Development and Promotion of Hydrogen and Green Fuels* aims to build a Danish electrolyser capacity of 4-6 GW in 2030.

Denmark has not yet set individual targets for specific technologies to be used to achieve supersector-specific targets. Figure 6 is based on available model simulations and shows the estimated projection for overall RES shares by technology.

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4 [https://bygningsreglementet.dk/Historisk/BR18\\_Version3/Tekniske-bestemmelser/11/Krav/280\\_282](https://bygningsreglementet.dk/Historisk/BR18_Version3/Tekniske-bestemmelser/11/Krav/280_282)

5 [https://bygningsreglementet.dk/Historisk/BR18\\_Version3/Tekniske-bestemmelser/11/BRV/Energiforbrug/Kap-1\\_7](https://bygningsreglementet.dk/Historisk/BR18_Version3/Tekniske-bestemmelser/11/BRV/Energiforbrug/Kap-1_7)

**Figure 6. Estimated projection for overall RES share by technology**

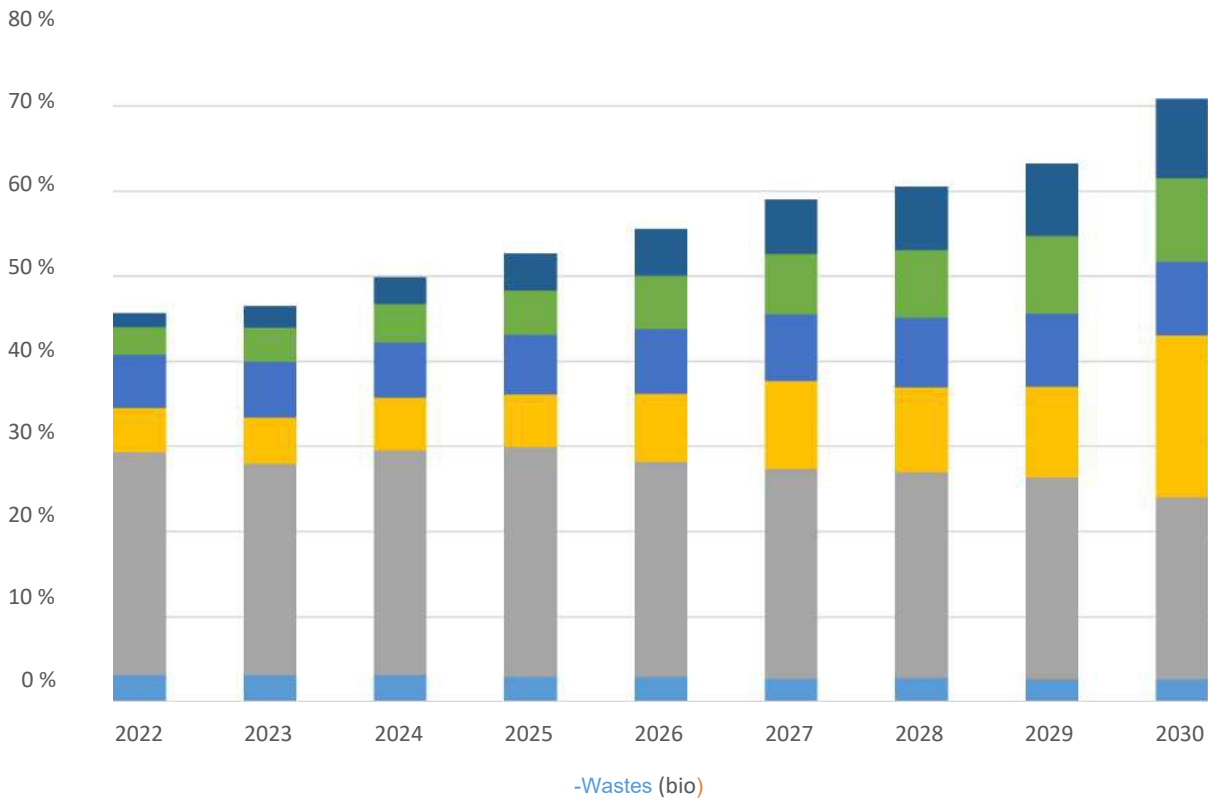
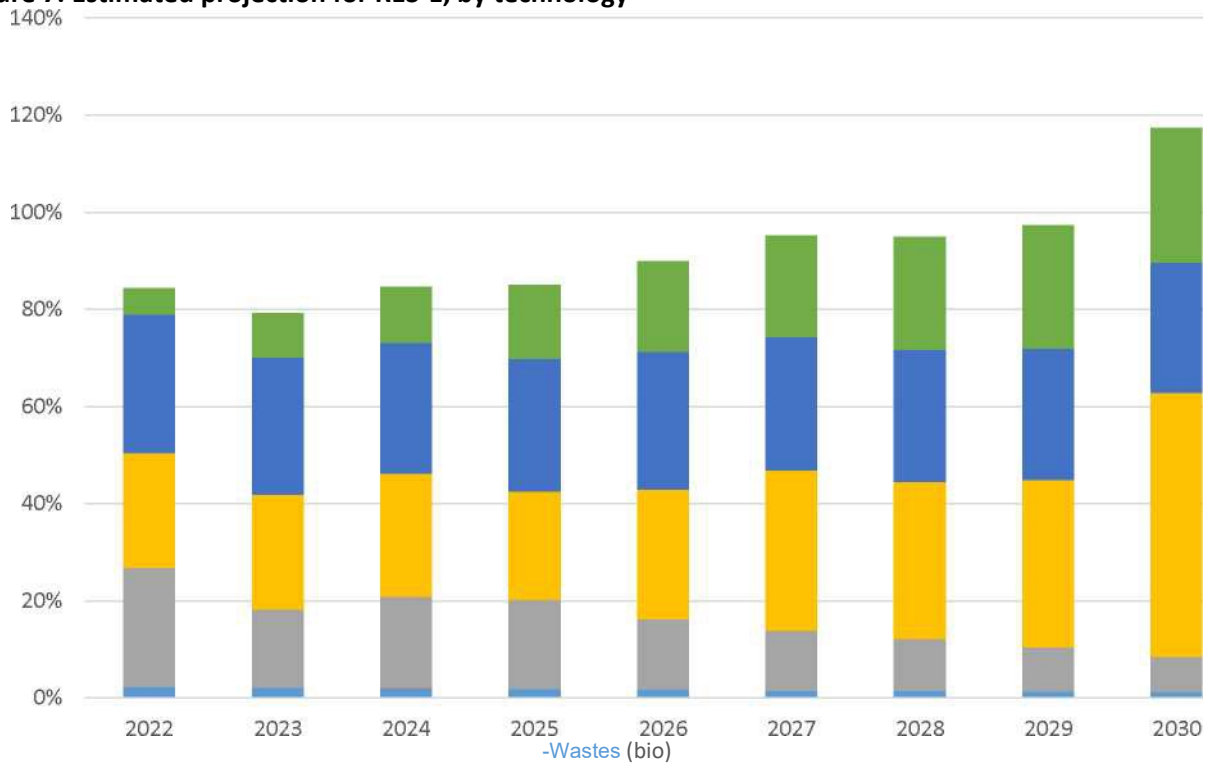


Figure 7 shows that particularly sea wind is expected to increase markedly by 2030. This is partly due to two new offshore wind farms with a minimum capacity of 1.800 MW. The first park will have a capacity of 1 GW. The park has been put up for tender, the area has been allocated and is expected to be completed in 2027. The tendering process for the second park is expected to be completed in 2024 and the park is expected to be completed in 2029 with a minimum capacity of 800 MW. In addition, 6 GW of sea wind is planned to be completed by the end of 2030. As they have only been finalised by the end of 2030, they are only included in 2030 to a limited extent. The share of renewables for toxicity is therefore expected to increase to 117 % in 2030.



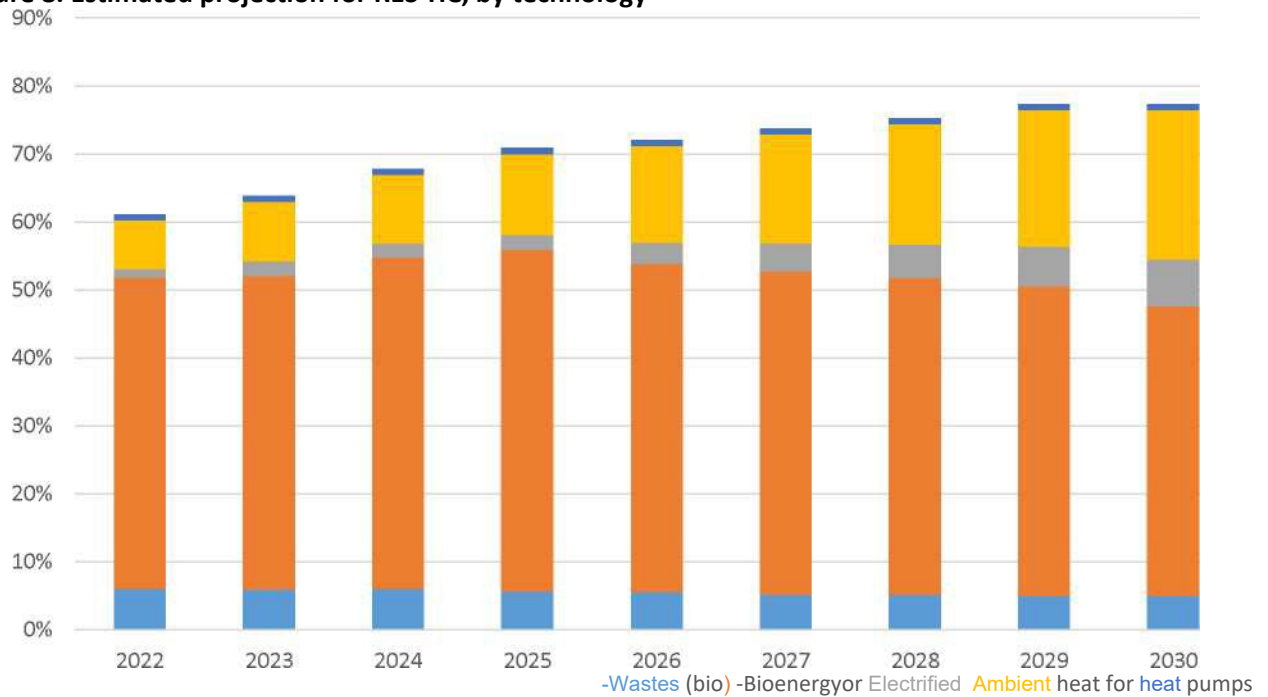
**Figure 7. Estimated projection for RES-E, by technology**



The expected share of renewable energy in the heating and cooling and district heating sectors is expected to be achieved mainly through the use of biomass and heat pumps, see Figure 8 and Figure 9.

For the heating and cooling sector, the share of renewable energy is expected to increase from 61.1 % in 2022 to 77.3 % in 2030. This three-hour increase is based on a frozen policy scenario and corresponds to an average increase over the whole period of 2 % per year. However, this increase is mainly in 2022-2029, as the share of RES is around the same in 2029-2030. Therefore, these figures include only recyclable energy and contributions from waste heat are not included.

**Figure 8. Estimated projection for RES-HC, by technology**



For the district heating sector, the share of renewable energy is expected to increase from 75 % in 2022 to 84.5 % in 2030. The increase corresponds to an average increase over the period 2022-2030 of 1.19 % per year, or 1.83 % and 0.55 % for the periods 2022-2026 and 2026-2030.

The increase in the share of renewable energy in the district heating sector comes to a large extent from new heat pumps, rising from 3 % in 2022 to 28.8 % in 2030. While the share of renewable energy for bioenergy falls from 58.7 % in 2022 to 43.7 % in 2030.

These figures include only recyclable energy and contributions from waste heat are not included. The share of renewable energy in the district heating sector is not expected to be 100 % in 2030, due to non-biodegradable waste.

**Figure 9. Estimated projection for RES-DH by technology**

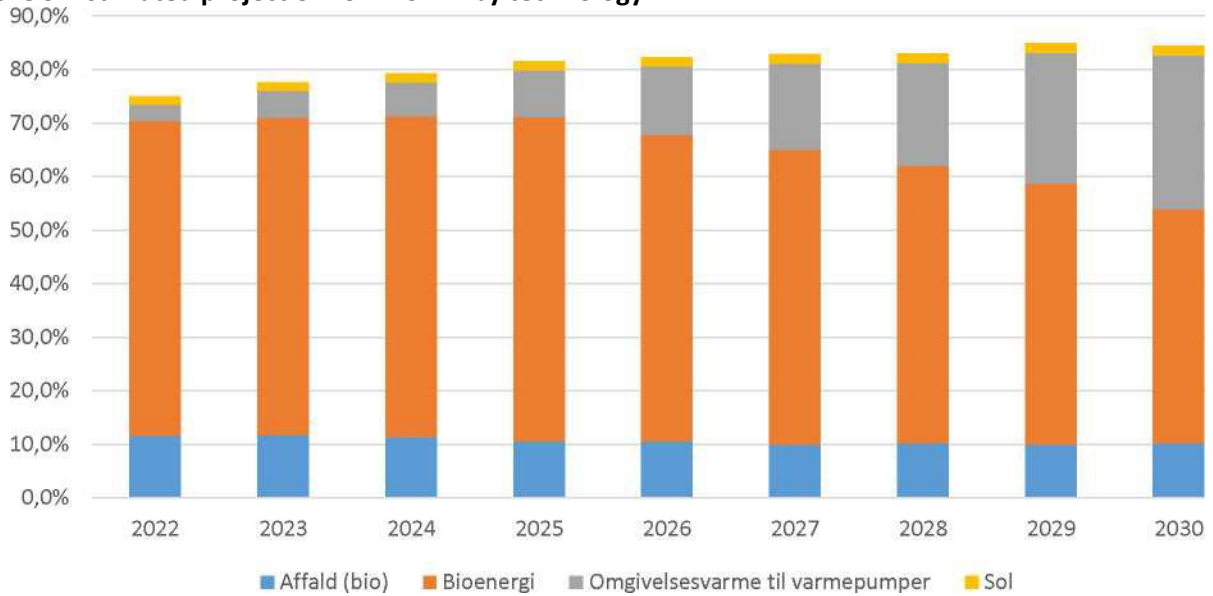
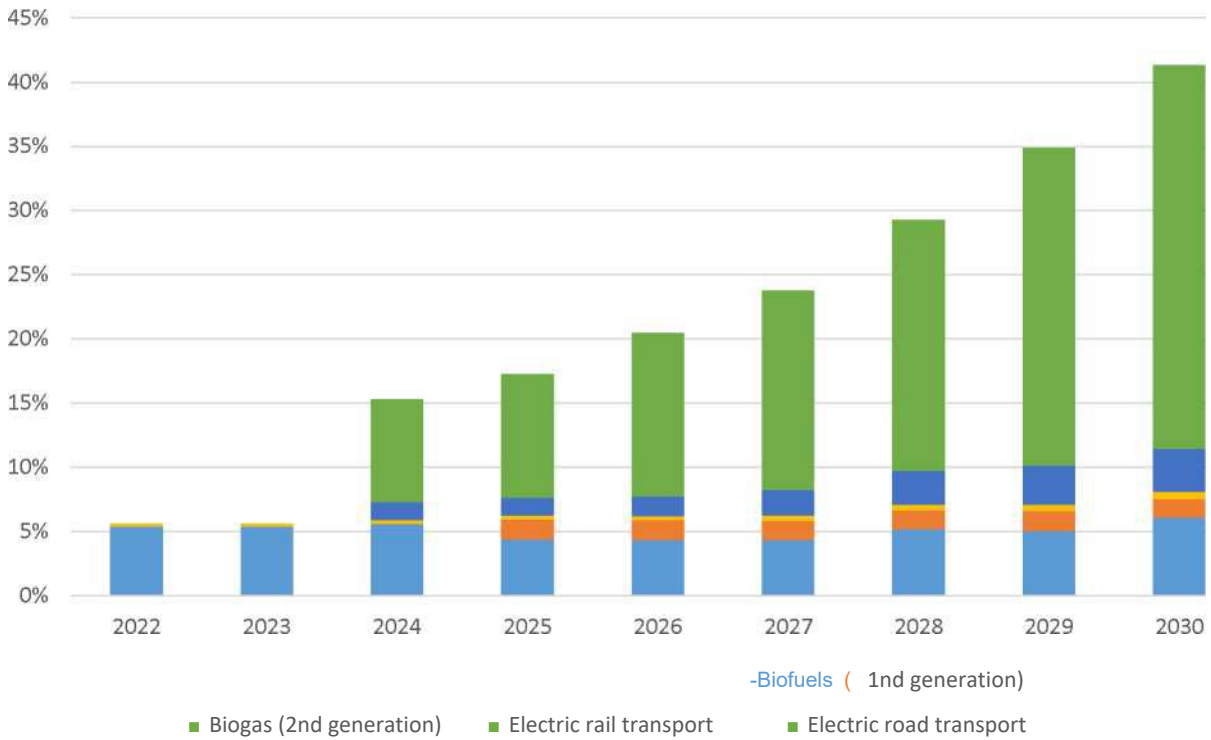


Figure 10 shows that the RES share for transport is expected to increase from 5.6 % in 2022 to 41.3 % in 2030 (based on the REDII method). The increase over the period is mainly due to increased electricity consumption of electric vehicles, combined with higher RES share of electricity in the grid. The increase in the electrification of rail transport from 2027 is mainly due to new electric trains and electrification of the line between Vejle and Ålborg, which is expected to become operational by the end of 2026. Uncertainties in relation to future technological developments and other factors require these figures to be read with caution.

**Figure 10. Estimated projection for RES transport by fuel type**



**Table 6: Estimated energy consumption by technology and sector**

Category	One-unit	2022	2023	2024	2025	2026	2027	2028	2029	2030
<b>Total-energy-consumption</b>	ktoe	<b>7207</b>	<b>7301</b>	<b>7856</b>	<b>8345</b>	<b>8815</b>	<b>9315</b>	<b>9422</b>	<b>9714</b>	<b>11113</b>
Waste (bio)	ktoe	504	499	496	466	458	426	425	407	405
Other	ktoe	1	1	1	1	1	1	1	1	1
Bio-Energy	ktoe	4129	3892	4160	4270	4009	3894	3767	3639	3361
Electricity	ktoe	0	0	0	0	0	0	0	0	0
Omgiiis-warm to VaR meumps	ktoe	508	627	716	833	992	1120	1234	1401	1539
Sun	ktoe	256	398	497	685	870	1008	1157	1308	1463
Offshore wind	ktoe	821	857	967	977	1273	1623	1554	1634	2985

Country-wind	ktoe	988	1027	1019	1113	1211	1242	1283	1323	1358
<b>RES- H UNCLOS share</b>	ktoe	<b>4361</b>	<b>4576</b>	<b>4795</b>	<b>4960</b>	<b>5045</b>	<b>5162</b>	<b>5255</b>	<b>5400</b>	<b>5405</b>
Waste (bio)	ktoe	426	423	420	393	387	361	360	346	345
Other	ktoe	0	0	0	0	0	0	0	0	0
Bio-Energy	ktoe	3275	3302	3447	3517	3379	3325	3254	3179	2982
Electricity	ktoe	88	160	148	148	220	291	342	411	477
Omgiiis-warm to VaR meumps	ktoe	508	627	716	833	992	1120	1234	1401	1539
Sun	ktoe	64	64	64	69	68	66	65	63	61
Offshore wind	ktoe	0	0	0	0	0	0	0	0	0
Country-wind	ktoe	0	0	0	0	0	0	0	0	0
<b>RES-E share</b>		<b>2929</b>	<b>2879</b>	<b>3190</b>	<b>3458</b>	<b>3852</b>	<b>4305</b>	<b>4463</b>	<b>4756</b>	<b>5929</b>
Waste (bio)	ktoe	77	76	76	73	71	66	65	61	60
Other	ktoe	1	1	1	1	1	1	1	1	1
Bio-Energy	ktoe	850	584	706	746	623	561	503	449	367
Electricity	ktoe	0	0	0	0	0	0	0	0	0
Offshore wind	ktoe	821	857	955	910	1143	1493	1519	1677	2742
Country-wind	ktoe	988	1027	1019	1113	1211	1242	1283	1323	1358
Omgiiis-warm to VaR meumps	ktoe	0	0	0	0	0	0	0	0	0
Sun	ktoe	192	334	433	616	802	942	1092	1245	1402
<b>RES- DH anPart</b>	ktoe	<b>2375</b>	<b>2432</b>	<b>2547</b>	<b>2638</b>	<b>2594</b>	<b>2542</b>	<b>2508</b>	<b>2512</b>	<b>2441</b>
Waste (bio)	ktoe	369	368	365	339	333	306	307	294	294

Other	ktoe	0	0	0	0	0	0	0	0	0
Bio-Energy	ktoe	1858	1856	1922	1961	1803	1688	1565	1443	1261
Electricity	ktoe	0	0	0	0	0	0	0	0	0
Omgiiis-warm to VaR	meumps									
	ktoe	94	155	207	281	402	491	580	720	832
Sun	ktoe	53	53	54	56	56	57	56	55	53
Offshore wind	ktoe	0	0	0	0	0	0	0	0	0
Country-wind	ktoe	0	0	0	0	0	0	0	0	0

**Table 7: Estimated installed RES capacity by technology and sector**

		2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity generation-capacity										
Waste <sup>6</sup>	MW	---	---	---	---	---	---	---	---	---
Biogas	MW	133	133	133	133	133	133	133	133	133
Biomass	MW	1695	1651	1648	1647	1647	1647	1647	1648	1648
Offshore wind	MW	2306	2656	2706	2706	3969	4356	4192	4985	8985
Hydro	MW	7	7	7	7	7	7	7	7	7
Land wind	MW	4774	4905	4856	5166	5472	5545	5674	5794	5905
Solar cells	MW	1853	3085	3911	5404	6919	8055	9262	10490	11740
Capacity of district heating production										
Waste <sup>6</sup>	MW	---	---	---	---	---	---	---	---	---
Biogas	MW	150	150	148	146	144	141	140	138	137
Biomass	MW	6053	6056	5887	5686	5469	5251	5247	5241	5249
Geothermia	MW	8	8	8	8	8	8	8	8	8
Industrial heat	MW	366	373	393	433	443	453	453	453	453
Solar heat	MW	1107	1107	1122	1131	1140	1149	1158	1167	1175

<sup>6</sup>The estimated installed RES capacity for waste will be calculated in MW for electricity and district heating respectively in the final version of the update of the National Energy and Climate Plan submitted to the European Commission in 2024. However, the total amount of waste in electricity and heat generation capacity is in tonnes 3,59 in 2020, 3,54 in 2023-2024, 3,28 in 2025, 3,19 in 2026, 2,98 in 2027, 2,97 in 2028, 2,76 in 2029 and 2,72 in 2030.

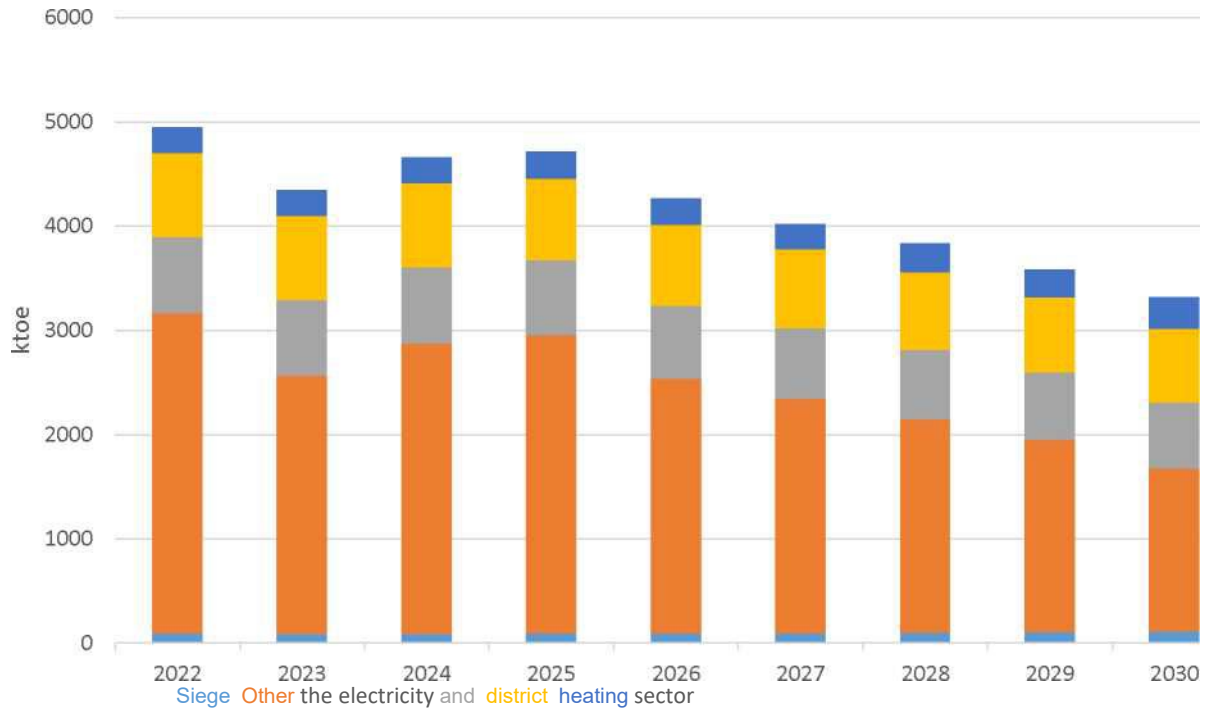
Heat pumps	MW	448	557	893	1162	1485	1758	2116	2573	2780
Heat pumps (shot heat)	MW	72	80	128	169	250	279	344	356	428
Heat pumps (geothermia)	MW									110

The volume of repowering projects depends on many factors, including specific market conditions and historical developments. Denmark has no specific objectives for repowering projects and the simulation for planned capacity does not explicitly distinguish between new capacity and capacity as a result of repowering. Therefore, there is no reliable data available on the volume of repowering projects, including the split of total planned installed capacity into new capacity and repowering.

*(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, a view of its origin and impact on the LULUCF sink;*

The consumption of biomass in Denmark has grown for several years and today (2021 data) the consumption of biomass accounts for around 70 % of the total consumption of renewable energy. Figure 11 shows developments by sector.

**Figure 11. Estimated projection for biofuels per sector, ktoe**



Denmark has not currently set any individual targets for bioenergy demand, either straightforward or broken down by sector, imports, etc. In 2022, biogas accounted for 34 % of total Danish gas consumption. The ambition is that biogas production in 2030 should be able to cover 100 % of Denmark’s gas consumption (source: kefm.dk). Climate depreciation 2023 shows that the use of bioenergy will continue at almost the same level until 2025, after which consumption is expected to decrease until 2030. Figure 11 shows the expected evolution up to 2030.

More than half of the current biomass fuel consumption is used for the production of district heating and electricity, and the use of biomass fuels for these purposes has almost quadrupled since 2000. The main year of this development is that almost all of Denmark’s coal-fired power plants have been converted into the use of biomass fuels.

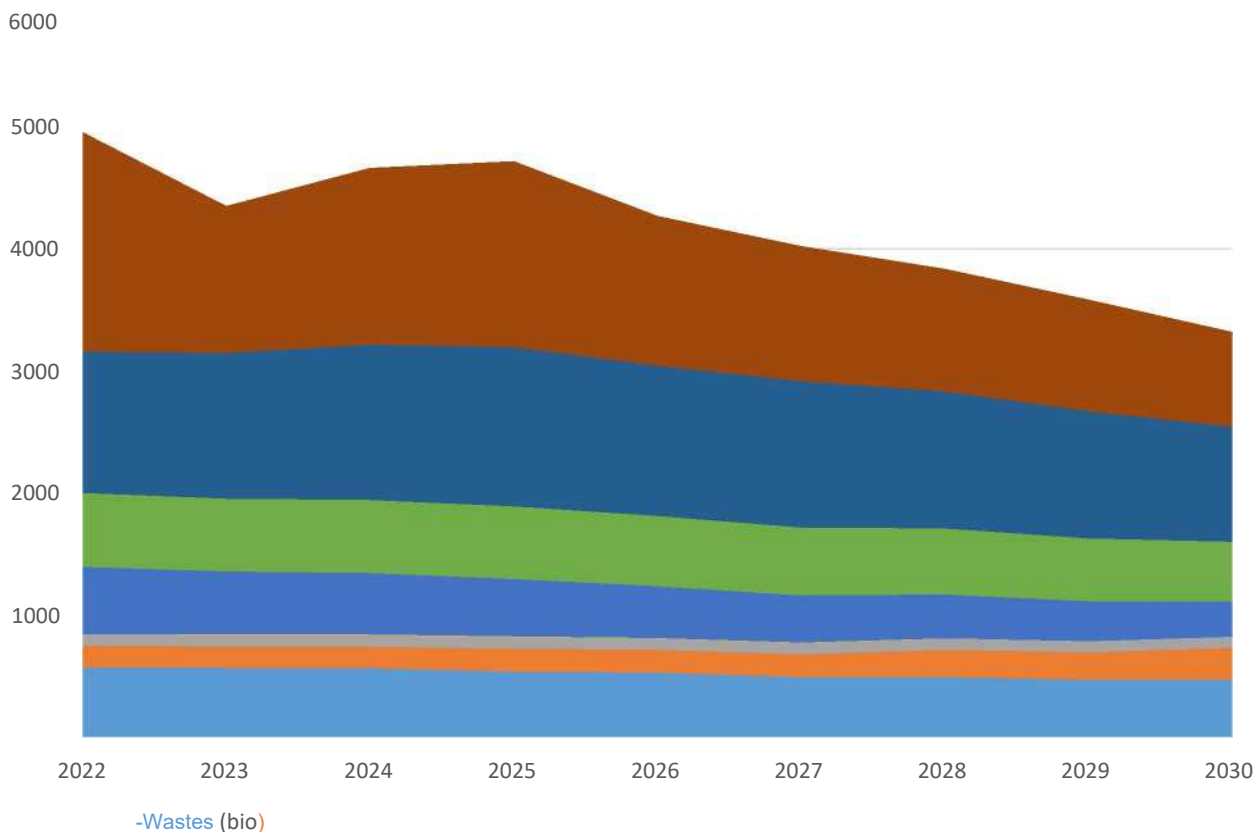
The use of biomass fuels in households currently accounts for 15 % of total consumption. In households, biomass fuels are used primarily for heating purposes using burning stoves (firewood) and biomassclays (wood pellets), as well as in the form of biomethane aturgas in the natural gas grid. In Denmark, there are energy and CO<sub>2</sub>taxes on fossil fuels for heating. For houses located outside areas with access to district heating and natural gas, the use of bioenergy for heating together with individual heat pumps is often the cheapest loose-operation.

Today, industry and transport use about 20 % of bioenergy together. According to climate depreciation 2023, consumption is expected to remain broadly stable by 2030 and then to decline slightly.



Figure 12 shows the historical and expected use of energy from biomass by fuel type. The figure shows that woody biomass today (2021 data) accounts for more than half of the total bioenergy consumption. As mentioned above, woody biomass includes wood chips, firewood, pellets and wood waste. The forecast in Figure 12 shows that the overall consumption of woody biomass will decrease after 2025 by 2030.

**Figure 12. Estimated biomass supply projection, by fuel type**



Denmark uses both domestic biomass fuels and imported biomass fuels. Figure 13 shows for different types of bioenergy, broken down by original sources and imports, based on data for 2021.

**Figure 13: Origin of biomass fuels, domestic and imported, 2021**

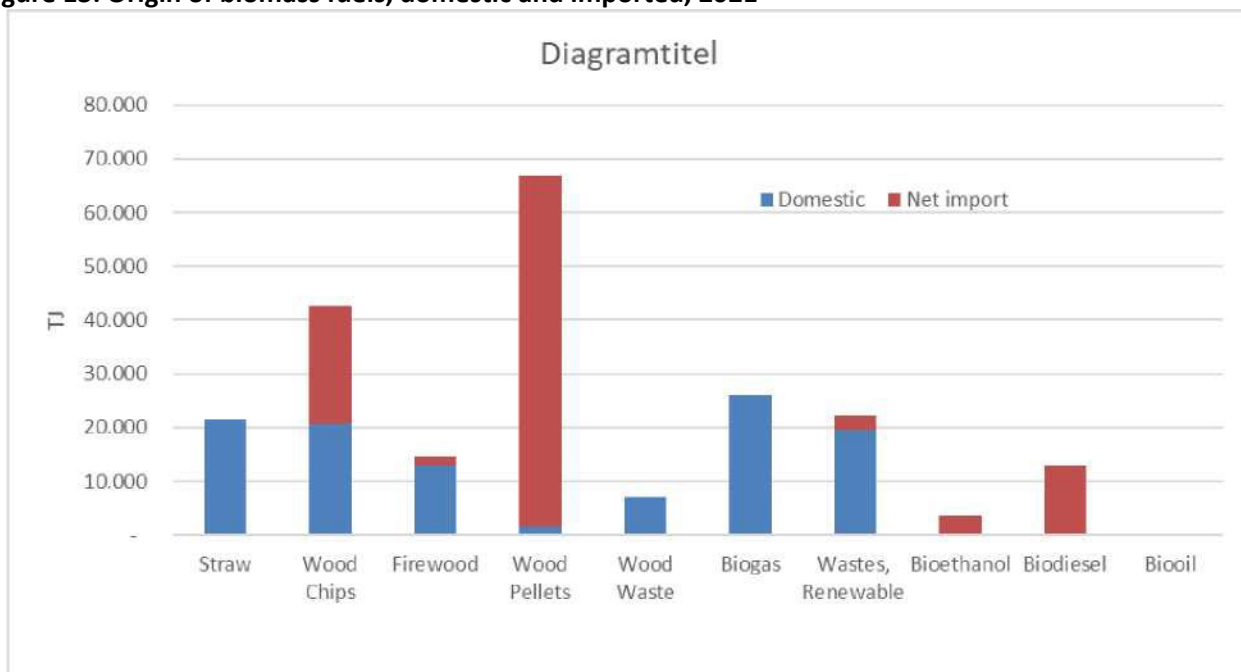
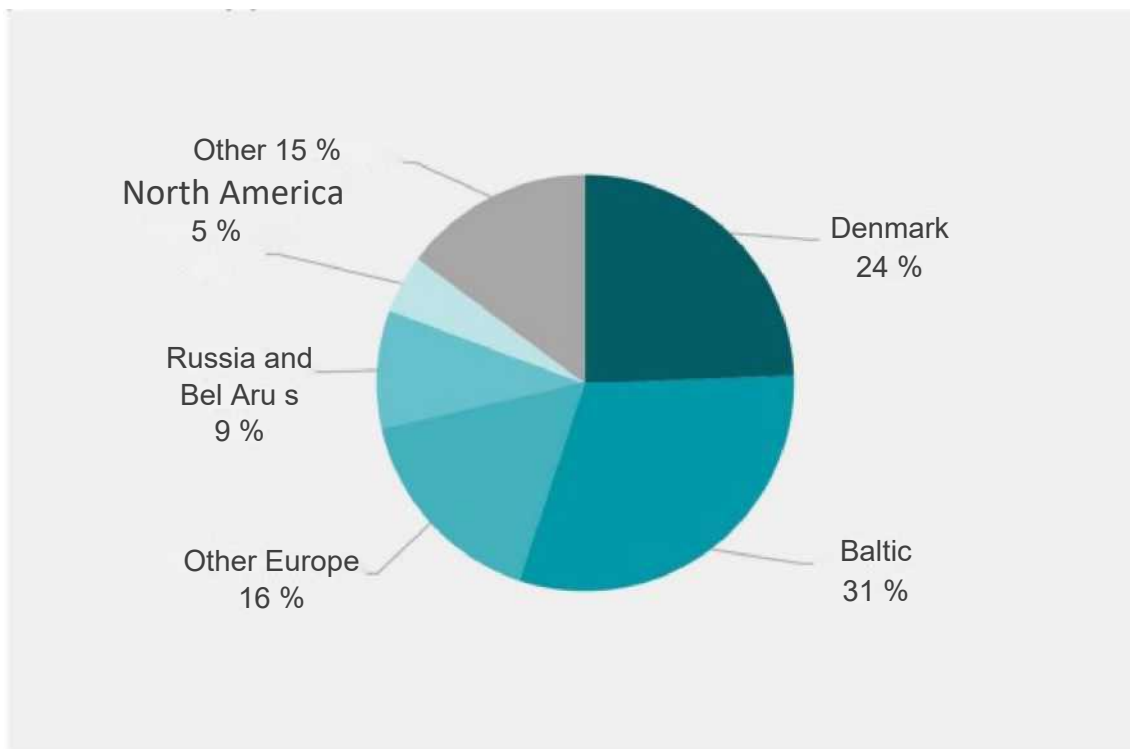


Figure 13 shows that import shares differ significantly between fuel types. Wood pellets, bioethanol and biodiesel are imported almost 100 % and wood chips are divided equally between imports and domestic sources, while the other types of biomass fuels come mainly from domestic sources.

The Danish climate status and projection do not include a forecast of the origin of biomass fuel clays, but it would be a reasonable assumption to say that the 2022 picture is also valid for the near future. However, EU sanctions against timber from Russia and Belarus have led importers to find new sources of wood pellets in particular. The main importing countries for wood pellets and wood chips for electricity and district heating production in Denmark are shown in Figure 14 below based on data for 2020.

**Figure 14: Geographical origin of total consumption (64 PJ) wood pellets and wood chips for electricity and district heating production in Denmark in 2020**



*(Source: Global Afrap Reporting 2022, Background Note No 3)*

Solid biomass fuels include the consumption of wood, straw and bio-waste for the production of electricity and heat in households, industry and the collective supply (electricity and district heating). Consumption in households etc. accounted for 2021 23 % of the total consumption of solid biomass fuels. The increase in consumption over the 2010s is due, inter alia, to the fact that a number of central CHP plants have been converted to fully or partially use biomass for the production of electricity and heat rather than natural gas and coal.

Half of Denmark's total consumption of wood fuels, i.e. both firewood, wood waste, wood chips and pellets, is imported. Thus, 48 % of the total quantity of wood used for the production of electricity, district heating and internal individual heat in Denmark in 2021 had Danish origin, while 52 % was imported.

Looking only at the consumption of wood pellets and wood chips, more than one fifth of the total volume of wood pellets and wood chips used to produce electricity and district heating in Denmark in 2021 was Danish origin, i.e. the wood originates from Danish forests, etc. The Baltic accounts for just over a third (37 %) of the total, and the rest comes from a wide sample of countries, including Germany, Sweden and North America. There is a significant difference between the geographical origin of wood chips and pellets. Thus, 51 % of wood chips used to produce electricity and district heating in 2021 are of Danish origin, but only 4 % of wood pellet consumption (see Figure 14).

### **Sustainability requirements for biomass**

A large part of the Danish RES share is based on imports of woody biomass for burning.

Denmark has implemented<sup>7</sup> the VE II Directive (Articles 29, 30 and 31) and a broad political agreement on wood biopulp<sup>8</sup> from October 2020. The Danish legal requirements on the sustainability of biomass for the production of electricity, heating and cooling entered into force on 30 June 2021. The Danish implementation imposes stricter requirements for woody biomass than the VEII Directive, while implementing the Directive's requirements for the sustainability of solid and gaseous biomass fuels for electricity and heat production for the other categories of biomass.

The stricter Danish implementation includes reduced plant limits for heating and cogeneration, which means that several plants are covered. In addition, there are requirements for several categories of biomass, namely wood from woody industries, hedgerows, etc. (non-forest) and additional requirements are imposed on forest biomass. Indeed, older installations are required to be subject to (higher) fossil greenhouse gas saving requirements in the disappearance chain.

Sustainability requirements must reduce as far as possible the risk of using 'unsustainable biomass' in Denmark, i.e. biomass with a high climate or biodiversity impact. At the same time, the requirements are formulated in a flexible manner in order to ensure security of supply and consumer heat prices.

In order to ensure a stable supply of wood pellets to private households, etc. during the supply crisis, a targeted relaxation has been facilitated, temporarily exempting importers and producers who sell wood pellets for individual heating in households, etc. from sustainability requirements. The temporary relief will run from 1 November 2022 to 30 April 2024.

### **Danish Forest Regulation**

The management of Denmark's forests is primarily regulated by the Forest Act. It lays down rules for the operation of peasant areas, which account for approximately 70 % of Denmark's forest area. Non-conservation forest areas include, inter alia, less privately owned forests and areas with Christmas trees and decorative green planted on agricultural land. The law aims to preserve and protect the country's forests and increase the forest area. The law also aims to promote the sustainable management of the country's forests. Denmark's implementation of the sustainability criteria of the Renewable Energy Directive (RED II) on forest cover all forests. This includes, among other requirements, the restoration of forest deposits harvested for the production of biomass fuels.

- (v) *Where applicable, other national trajectories and objectives, including those which are: long-term or sectoral (e.g. share of renewable energy in district heating, use of renewable energy in buildings, renewable energy produced by cities, renewables community and renewables self-consumers, energy recovered from sludge collected through waste water treatment)*

**National objectives to establish renewable energy communities in each municipality with a population of more than 10.000 people.**

Denmark has its well-developed collective electricity grid due to its relatively high population density, a history of citizen-owned electricity generation and the immediate absence of regulatory barriers to establishing

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<sup>7</sup>[Directive \(EU\) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources](#)

<sup>8</sup>[Agreement on sustainability requirements for woody biomass for energy \(kefm.dk\)](#)

renewable energy communities. Denmark has therefore not implemented any new measures aimed at ensuring a renewable energy community in all municipalities with a population of more than 10.000 citizens. [This section may be developed in the context of negotiations on the Electricity Market Directive and the Electricity Market Regulation.]

### **Offshore renewable energy development targets in the Marine Plan**

In the period 2022-2025, the Danish Energy Agency carries out a comprehensive fine-screening and sensitivity mapping on the Danish marine space in order to provide an overview of possible environmental impacts and challenges at large-scale sea wind and to assess the overall offshore wind potential in Danish marine waters. The project will be a key contribution to the planning challenges of offshore development. The project is not dependent on the marine plan, but will provide input for future sea wind planning. Denmark has registered offshore wind capacity in 2023 through the North Sea (NSEC) and Baltic Sea Cooperation (BEMIP) for a non-binding agreement on offshore renewable energy development by 2050. In the North Sea cooperation, Denmark helps to ensure that the full potential for offshore wind is achieved, and in this context Denmark has registered 35 GW of sea wind in 2050. For the Baltic Sea, 7.9 GW has been reported in 2030, while a capacity for 2050 in the Baltic Sea has not yet been registered.

On 7 June 2023, a political agreement was reached with all parliamentary parties to update Denmark's maritime plan with an attachment of approximately 31.000 km<sup>2</sup> to renewable energy and energy islands, which corresponds to approximately 30 % of Denmark's marine space. The Marine Plan itself does not contain targets for RES development. Offshore wind targets are included in various energy and climate agreements. Marine plan designations may change, including as a result of assessing the need for additional space for renewable energy.

## **2.2 energy efficiency dimension**

*(i) The elements set out in Article 4(b);*

*1) The indicative national energy efficiency contribution to achieving the Union's energy efficiency target of at least 32.5 % in 2030 referred to in Article 1(1) and Article 3(5) of Directive 2012/27/EU, based on either primary or final energy consumption, primary energy savings or equivalent energy savings or energy intensity. Member States shall indicate their contribution in the form of an absolute level of primary and final energy consumption in 2020 and in terms of absolute level of primary and final energy consumption in 2030, with an indicative trajectory for that contribution from 2021 onwards; they shall explain their underlying methodology and the conversion factors used;*

Denmark welcomes the agreement reached between the European Parliament and the Council of the European Union on a recast Energy Efficiency Directive, including a new binding common EU target on energy efficiency.

The government will ensure a strong focus on improving the energy efficiency of both private homes, businesses and public buildings. Following the entry into force of the recast Directive, the Government will assess the efforts together, and Denmark therefore expects to be able to report on the indicative national energy efficiency contribution in the eventual update of the NECP in June 2024.

*2) The cumulative amount of end-use energy savings to be achieved in the period 2021-2030 in line with Article 7(1)(b) on energy savings obligations under Directive 2012/27/EU.*

Denmark welcomes the agreement reached between the European Parliament and the Council of the

European Union on a recast Energy Efficiency Directive, including a new energy savings obligation.

As mentioned in the section above, once the recast Energy Efficiency Directive has entered into force, the Government will assess the effort together. Therefore, Denmark expects to report on the cumulative amount of end-use energy savings to be achieved in the period 2021-2030 under the recast Directive in the final update of the NECP in June 2024.

3) *The indicative milestones of the long-term strategy for the renovation of the national stock of residential and non-residential buildings (both public and private), the roadmap with the domestically driven, measurable progress indicators, an evidence-based estimate of expected energy savings and wider benefits, and the contributions to the Union's energy efficiency target as set out in Directive 2012/27/EU in line with Article 2a of Directive 2010/31/EU;*

Please refer to section 2.2 (ii) on the LTRS, etc.

4) *The total floor area to be renovated or equivalent annual energy savings to be achieved from 2021 to 2030 under Article 5 of Directive 2012/27/EU on public bodies' buildings as an example.*

With the agreement on a recast Energy Efficiency Directive, it is expected that new requirements will be introduced for savings and renovation in the public sector. Once the final recast EED enters into force, a concrete implementation model for the public sector recast will be developed and Denmark therefore expects to be able to report on this in the final update of the NECP in June 2024.

(ii) *Indicative milestones for 2030, 2040 and 2050, the domestic measurable progress indicator ER, a evidence-based estimate of expected energy savings and additional benefits and their contribution to the Union's energy efficiency targets included in the roadmaps set out in the long-standing renovation strategies of the national stock of both public and private residential and non-residential buildings, in accordance with Article 2a of Directive 2010/31/EU.*

As Directive 2010/31/EU on the energy performance of buildings (EPBD) is under revision and the final requirements for the building area are not known, including requirements for a possible national strategy for the renovation of buildings, it is currently not possible to provide further information on this. The following is therefore limited to Article 2a of the current EPBD and Denmark's long-term renovation strategy, as notified to the EU Commission on 10 March 2020 and 22 June 2021.

### **Long-term renovation strategy**

Article 2a of the EPBD requires each Member State to establish a long-term renovation strategy (LTRS) to support the renovation of the national building stock.

On 10 March 2020, Denmark published and notified Part 19 of Denmark's LTRS to the European Commission. However, in connection with the notification of Denmark's National Energy and Climate Plan (NECP) at the end of 2019, the Danish Government decided that the indicative milestones for 2030, 2040 and 2050, etc. would be set in connection with the forthcoming climate action plans to allow the inclusion of the possible effects of new initiatives in the indicative milestones.

Therefore, on 22 June 2021, Denmark notified Part 210 of Denmark's LTRS, which contains two non-binding indicative milestones for 2030, 2040 and 2050, cf. Table 2. In addition, the strategy sets out how the milestones contribute to achieving the Union's energy efficiency targets in line with Directive 2012/27/EU on energy efficiency. Part 2 of Denmark's renovation strategy must therefore be seen in conjunction with Part 1,

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9 <https://ens.dk/ansvarsomraader/energibesparelser/byggeri-og-renovering>

10 <https://ens.dk/ansvarsomraader/energibesparelser/byggeri-og-renovering>

which explains existing and known instruments in Denmark’s energy renovation efforts.

The indicative milestones are set on the basis of agreements such as the Climate Agreement for Energy and Industry etc. of 22 June 2020<sup>11</sup> and the Green Housing Agreement 2020 of 19 May 2020. Since the delivery of LTRS, a number of new agreements have been concluded which contribute to the achievement of the milestones, but new existing instruments, such as the agreement on green electricity and heat, etc., will only be taken into account when drawing up a new strategy for the implementation of future EPBD.

In accordance with Article 2a of the EPBD, the sub-targets must contribute to achieving the EU’s long-term target for 2050 of reducing greenhouse gas emissions by 80 % to 95 % in addition. 1990. The goal is to achieve a highly energy efficient and decarbonised building stock by 2050, facilitating the cost-effective transformation of existing buildings into nearly zero-energy buildings. Denmark has set the following two indicative milestones, which are further developed below.

**Table 7: Indicative milestones**

	2030	2040	2050
(1) reduction of net actual heat consumption per m <sup>2</sup> in dwellings;	5 %		
(2) reduction in calculated heat loss per m <sup>2</sup>	10 %	19 %	28 %

**Indicative milestone for the reduction in the actual calculated net heat consumption per m<sup>2</sup>**

The sub-target reflects the expected evolution of actual net heat consumption per m<sup>2</sup> heated area for dwellings built up to 2018 in Basic projection 2020. In addition to the effect of ongoing renovations, the target also takes into account effects of changes in consumer behaviour, for example if, following renovation, home owners won to increase indoor temperature to increase comfort (rebound effect). The intermediate target is determined on the basis of the evolution of net heat consumption in the Danish Energy Agency’s base projections (DB)<sup>12</sup>, adjusted for new measures (frozen policy approach). The LTRS has set a milestone of 5 % reduction in 2030 and no milestones for 2040 and 2050, due, inter alia, to the fact that the baseline projection actually only goes to 2030. Therefore, data from the projection for the period after 2030 has not been consolidated and does not include any effects of (new) instruments.

**Indicative milestones for a reduction in the calculated heat loss per m<sup>2</sup> based on energy labelling data**

The intermediate target is set on the basis of data in the energy labels on the evolution of the calculated heat loss. It is therefore a measure of a building’s energy standard and thus an expression of the energy renovation of buildings, while the milestone for the actual net heat consumption per m<sup>2</sup> is an expression of the total consumption, including the impact of user behaviour in the building.

The sub-target was set on the basis of a constant annual reduction as a percentage of the average annual development of the calculated heat loss in the period 2013-2019, during which development was mainly driven by the requirements of the energy labelling, information, etc. These measures continue and the target therefore reflects a projection of the expected development of energy renovation in Denmark without further policy measures. The period 2013-2019 has been selected as it is considered to have the highest available data quality due to better guidelines and a high level of education in the performance of the energy labels.

The sub-target of reduction in calculated heat losses per m<sup>2</sup> will not necessarily lead to an equivalent reduction in actual energy consumption. Furthermore, the sub-target is well in line with an analysis carried out by BUILD (formerly the State Construction Research Institute), which indicates that there is a viable potential for

<sup>11</sup><https://kefm.dk/aktuelt/nyheder/2020/jun/bred-klimaaf-tale-bringer-danmark-tilbage-i-den-groenne-foerertroeje>  
<sup>12</sup>The Danish Energy Agency’s projections have since changed their name to climate depreciation.

reducing the calculated net heat consumption per m<sup>2</sup> in existing buildings by 2050 of around 30 % in relation to heatconsumption in 2017.

### **Contribution to the Union's energy efficiency target**

By setting the indicative sub-target for reduction in calculated heat loss per m<sup>2</sup> based on energylabelling data, part of the existing building stock will be transformed into nearly zero-energy buildings (NZEBS). The Roadmap therefore includes<sup>13</sup> a number of requirements and instruments decided in the Climate Agreement for Energy and Industry etc. and the Green Housing Agreement to facilitate the cost-effective energy efficiency improvement of existing buildings for the different building segments: State buildings, private dwellings, social housing and commercialbuildings. The roadmap also includes analyses that may form the basis for possible decision-making proposals on future instruments and measures if there is a political desire for this. These possible future measures could further support ensuring that the existing building stock delivers more energy efficiencyby 2050.

The indicative milestones and the roadmap will thus contribute to the achievement of a decarbonised building stock by 2050, and must be seen in the context of Denmark's binding Climate Law with a target of 70 % reduction in greenhouse gasemissions by 2030 in addition. 1990 and that the government will bring forward the climate neutrality objective to 2045. And to set a new target of 110 % reduction in 2050. 1990, see Government basis.

This contributes to meeting the EU's long-term target for 2050 of reducing greenhouse gas emissions by 80-95 % in addition. 1990.

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

### **Phasing out fossil heating and energy efficiency**

In June 2020, the government concluded the *Climate Agreement for Energy and Industry, etc. 2020*. The agreement agreed, inter alia, to implement the following actions:

- Oil and gas need to be removed from the heating system and green electricity and green district heating instead.
- An analysis of the potential for phasing out oil and natural gas in household heating needs to be prepared.

In October 2020, the government concluded an *agreement on climate change for energy and industry, etc. 2020*. The agreement continued to agree that oil boilers and gas boilers should be phased out and replaced by heatpumps, district heating, etc.

In 2022, the Government concluded an agreement *on targeted hot neck*. The agreement states, among other things, that it is agreed that the Danish heating must be green and that gas is not to be used for heating in Danish households.

In June 2022, the government concluded *the Climate Agreement on Green Electricity and Heating 2022* (Climate Agreement 2022)<sup>14</sup>, where it was decided, among other things, that the ambition was to phase out all oil and gas boilers for heating by 2035. With previous agreements, a large number of actions have been initiated, see above. In addition, a plan to phase out fossil heating in municipal, regional and state buildings is

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<sup>13</sup>[https://ens.dk/sites/ens.dk/files/Energibesparelser/1\\_langsigtet\\_renoeringsstrategi\\_del\\_2.pdf](https://ens.dk/sites/ens.dk/files/Energibesparelser/1_langsigtet_renoeringsstrategi_del_2.pdf) page 5 onwards.

<sup>14</sup><https://www.regeringen.dk/media/11470/klimaaf tale-om-groen-stroem-og-varme.pdf>



being launched and a model for stopping new oil and gas boilers in residential buildings is being developed.

### **Transition in the transport sector**

For more information on the transition in the transport sector, see section 3.1 (ii).

## **2.3 Security of energy supply dimension**

### *(i) The elements set out in Article 4(b);*

In 2019, the Danish government, together with a majority in the Danish Parliament, adopted a new Climate Law. The Climate Law sets the target of a 70 % reduction in greenhouse gas emissions relative to 1990 and climate neutrality by 2050. Since 2020, the Danish Parliament has adopted a number of major climate agreements, including ‘Climate Agreement for Energy and Industry, etc.’ 2020” and “Climate deal on green electricity and heat 2022.” The 2020 climate agreement aims to develop, expand and integrate green technologies into the energy sector and industry, ensuring a greenhouse gas reduction of 3,4 million tonnes of CO<sub>2e</sub> by 2030. The 2022 climate agreement quadruples the production of solar and wind energy on land, as well as the possibility of fivefold increasing offshore wind power and sets the ambition for all gas in Denmark to be green by 2030 and that by 2035 there are no homes heated with gas.

Danish society depends on maintaining a high level of security of energy supply. Secure and stable energy supply benefits the country’s citizens and businesses. Denmark is working to undergo a cost-effective green transition of the energy sector, where security of supply remains a highpriority. To this end, the expansion of renewable energy, electrification, sector integration, the use of flexibility in electricity consumption and electricity generation, energy efficiency and continued high interconnectivity with neighbouring countries and market development shall be pursued.

Denmark is a small open economy with a significant geographical location in the North Sea and the Baltic Sea, which binds Scandinavia with Continental Europe. This means that the Danish possibilities for importing and exporting different forms of energy are unique. Denmark is working to make the most of these opportunities and to ensure the necessary physical and regulatory framework for international trade and cooperation.

Both in the field of gas and electricity, work is ongoing to ensure good international cooperation, both in terms of exchange links and common understanding of the risk approach. Regional cooperation in the Nordic region among authorities and at TSO level shall contribute to supporting an integrated electricity system across the grasslands.

The energy sector is currently being transformed in Denmark as part of a green transition. One element of this is the electrification of energy consumption in heating and transport. Another element is that a number of thermal power plants are being phased out over the next ten years, while new power generators based on solar and wind energy are being set up. This reduces dependence on energy imports from third countries. However, there are also indications that Denmark will have a more weather-dependent electricity system based on fluctuating electricity generation. The flexibility and adaptable technologies to balance the electricity system will therefore increase in the coming years.

Section 3.3 describes in more detail the energy crisis in 2022 as a result of Russia’s invasion of Ukraine and the actions taken at national and European level.

## Security of electricity supply

Security of energy supply is not defined in Danish legislation, but a definition of the term 'electricity security' can be found in the Electricity Supply Act No 984 of 12 May 2021, Section 5 (11). Security of electricity supply is defined as: *Likelihood that electricity is available to consumers when it is in demand*. Denmark has a planning target for the level of security of electricity supply, which is set once a year by the Minister for Climate, Energy and Supply. This is apparent from Section 47 (5) of the System Liability Order (Order No 1067 of 28 May 2021). The latest target is valid for 2032 and is 38 interruption minutes on average for an electricity consumer in one year. The 38 interruption minutes are spread over 31 minutes related to the Distri busnetwork and 7 minutes related to power adequacy and transmission network.

The planning target has been set on the basis of recommendations made by the Danish TSO Energinet in their annual report on security of electricity supply. The statement of security of electricity supply shall include an account of the statistical security of electricity supply, an assessment of the future security of electricity supply and forecasts thereof, information on new measures necessary to maintain the determined level of security of electricity supply and information on costs related thereto. The framework for the energy network's Redegørelse for security of electricity supply is laid down in Section 38 of the System Liability Order.

The security of electricity supply in Denmark is challenged by a number of trends related to the green transition. This concerns in particular the electrification of the heating and transport sectors, as well as the installation of major demand facilities such as PTX and data centres, which greatly increases electricity consumption by 2030 and 2050. In addition, the phasing out of thermal power plants and the expansion of solar and wind power generation are taking place at the same time as rapid steps towards 2030 and beyond, leading to more fluctuating electricity generation. At the same time, several of Denmark's neighbouring countries, on which Denmark relies on importing electricity in situations of low electricity production from RES, are even engaged in a major transformation of their energy system, which may increase the risk of imbalance between electricity generation and consumption.

These trends pose both network adequacy challenges, where grid deployment may be difficult to keep up with both solar and wind expansion and increasing electricity consumption. It also creates power adequacy drops, where periods of sunshine and wind, combined with high demand, can create situations of power shortage. At the same time, fewer adjustable power plants in the system may make it more difficult to obtain the necessary ancillary services.

To address these security of electricity supply challenges, Denmark is working on different solutions to this. In this context, the following could be mentioned in particular:

On 25 June 2022, the Government and a number of parties from the Danish Parliament concluded *the Climate Agreement on Green Electricity and Heating 2022*. With the agreement, the parties want to ensure framework conditions to enable a four-fold increase in total solar and land-based electricity production by 2030 and to enable the supply of at least 4 GW of offshore wind for real time by 2030, which can help to cover the new electricity consumption resulting from electrification.

Flexibility from both electricity consumption and electricity generation is essential to ensure a high level of security of electricity supply in the future, both for power adequacy and grid adequacy. To this end, analyses have been launched in Klima- aftane on green electricity and heat, inter alia for flexible grid connection

conditions and grid products. There are no speculative objectives on how much flexibility should be used in the system in the future. Flexibility shall be used where it is the most cost-effective solution. This is why Denmark is working to ensure the right regulatory framework for this to happen.

To support the electrification of the system and the use of flexibility, digitalisation is needed in the electricity sector. The Danish Energy Agency is therefore actively working on the digitalisation agenda for the supply area.

Looking ahead, PtX may play a significant role in the Danish energy system. PtX plants may account for a significant part of the electricity consumption in Denmark, as the aim is to build 4-6 GW of electrolysis capacity in 2030, cf. the agreement between the then government and a number of parties on the development and promotion of hydrogen and green fuels from 15 March 2022. At the same time, these facilities may contribute to the flexibility of the electricity grid in the future. Efforts are being made to ensure the most appropriate framework for the system to benefit from flexibility and to create the right price signals to place installations appropriately in the electricity grid.

Denmark already has a large capacity on the international connections, which contributes significantly to power adequacy. Maintaining these links and new connections is important for Denmark to maintain a high level of security of electricity supply and therefore remains a priority. Both existing and new cross-border links will contribute positively to new objectives such as those set out in the Green Deal and RePowerEU.

Denmark has the objective of establishing two energy islands – one in the North Sea and one at Bornholm, which was agreed with the Climate Agreement for Energy and Industry, etc. 2020 of 22 June 2020. The electricity produced and the external connections can contribute to the security of electricity supply in Denmark and the countries associated with the energy islands. In Denmark, it is expected that energy islands in isolation in 2033 and under great uncertainty could reduce the number of interruption minutes by about 26 minutes in West Denmark and 18 minutes in East Denmark compared to a scenario without the establishment of the energy islands. .

An additional element that can help to support Danish security of electricity supply is energy power reduction, as reduced electricity consumption will make it easier to ensure sufficient generation to cover it. See section 2.2 for objectives in this area.

More storage capacity is also a way to ensure security of electricity supply. Denmark has no specific targets for storage capacity. By ensuring the right price signals in the market, it is expected that storage solutions will be put in place in cases where it is a cost-effective solution. Support may also be sought for electricity storage projects that are in the development phase through the EUDP.

For the short term, Denmark is also working to ensure a high level of security of electricity supply, including as a response to the energy crisis. This has included postponing the closure of three power plants until 2024. See more under the section on security of electricity supply under point 3.3.

### **Weather conditions;**

With the increased levels of greenhouse gases in the atmosphere, it is expected that more and more severe-weather conditions will emerge. Weather phenomena of a more severe nature can have a negative impact on the resilience of Denmark's energy system. In particular, weather phenomena such as storms, droughts, forest fires and increased water levels can have an impact on the electricity grid, sources of supply and energy

production in general.

Extreme weather conditions can affect power park modules. More extreme weather conditions with stronger storms may lead to the need to secure installations against changing weather conditions. However, the effects are limited in Denmark, as Denmark's electricity production comes to a large extent from wind energy and wind turbines are secured against high wind speeds. At the same time, the vulnerable electricity grid will be buried into the ground where possible. In strong wind, wind turbines are switched off, which means that electricity generation also stops. However, strong wind typically only occurs in parts of Denmark at the same time, which is why the shutdown of wind turbines will typically only be patchy.

Weather conditions may affect electricity prices in Denmark. For example, increased rainfall in Sweden and Norway will mean more hydropower generation, mental-higher temperatures in Norway and Sweden will reduce electricity consumption for heating in these countries. Both of these factors will reduce electricity prices in Denmark.

### **Heat supply**

Weather phenomena of a more severe nature have the potential to affect heat generators. Several of the large condensing CHP plants (e.g. Ørsted plants) are located on the water and, in order to safeguard against increased water levels, there may be a need for dam installations and water security, regardless of whether they are new investments or non-depreciated plants. However, this is not considered to be a risk until the water level rises by several metres, which will potentially only happen hundreds of years in the future. In addition, increased electrification of the heating sector increases the need for stable electricity generation, which, as highlighted in the above section, may be affected by climate change. On the other hand, higher outdoor temperatures would mean a lower need for meals. In general, climate change is not considered to pose a high risk to the thermalcore.

### **Biomass**

Higher temperatures, longer growing seasons and higher levels of CO<sub>2</sub> in the atmosphere can, all other things being equal, lead to higher plant growth and thus higher domestic biomass production. However, increased drought and damage to volts (beetles, mushrooms, etc.) may be pulled in the other direction. If strong winds overturn larger areas with trees (storm fall), this could reduce the price of woody biomass in the shorter term, but perhaps increase it in the longer term. In future, increased demand for biomass for purposes other than electricity and heat production, including for new uses, is likely to increase competition for biomass, thus potentially increasing the price of wooden energy, all other things being equal. Finally, the biomass areas that Denmark uses for energy production are not considered to be at risk of desertification.

### **Liability**

The Minister for Climate, Energy and Utilities has overall responsibility for the security of supply of electricity and gas in Denmark. The Minister also sets a planning target for the level of security of electricity supply under a law that entered into force in 2018. The technical monitoring and maintenance of security of supply shall be carried out by the national TSO (Energinet).

Each TSO shall be responsible for ensuring the presence of sufficient generation capacity or imports, grid adequacy at transmission level and system balancing and maintaining security of supply together with an efficient use of the interconnected electricity supply and gas system. Each TSO shall be responsible for the sectoral emergency response plans in both the electricity and gas sectors.

The electricity contingency plan covers the entire connected electricity grid in Western and Eastern Denmark. It is developed in the context of cross-border effects with neighbouring countries and exchanges. The plan details how the TSO plans to deal with an emergency situation across the Danish electricity grid in a coordinated manner, while ensuring coherence with the situation at the level of DSO and generation. It also describes how the TSO plans to deal with cybersecurity preparedness in the Danish electricity grid, focusing on the responsibility of the TSO, DSOs and electricity producers, ways of communication, requirements for situation reports, encryption and segmentation instructions, etc. The same considerations apply to the emergency plan for the gas sector and are therefore not described in detail. In addition to the contingency plans, a Preventive Action Plan and an Emergency Supply Plan for Natural Gas have also been developed in accordance with EU Regulation 2017/1938 on measures to ensure the security of gas supply and sector-specific EU regulation. These plans shall be completed at least every four years on the basis of a national and several regional risk assessments of the supply corridors into which Denmark's gas system is part.

### **Security of heat supply**

Danish heat consumption consists primarily of district heating, which heats approximately 2/3 of Danish households. The remaining households are heated by individual heating such as heat pumps, electricity panels or oil, gas and biomass boilers.

Despite the Russian reduction in gas exports to the EU in 2022, Danish household customers with gas boilers have had a relatively high level of security of supply. Imports from Germany, filled gas stocks across Europe and the entry into operation of Baltic Pipe have all been factors that have increased the security of gas supply. In addition, Denmark has a relatively large production of upgraded biogas compared to the rest of the EU, corresponding to around 34 % of Danish gas consumption in 2022. Security of gas supply is further enhanced by the reopening of the Tyra field in winter 2023-2024 and by the expectation that biogas production in 2030 will cover 100 % of gas consumption.

In Denmark, district heating is produced from a variety of energy sources and the district heating sector has a high diversity of production, providing resilience and flexibility in the sector. It is produced from renewable sources such as bioenergy, biogenic waste, waste heat, solar energy and geothermal energy, and from fossil fuels such as fossil waste, coal and natural gas. In addition, short interruptions in heat supply are not critical, as cooling buildings take a long time. The supply of heat is therefore considered to be critical to the electricity and gas supply.

However, as a result of the war in Ukraine and in the context of the upcoming EU directives NIS2 and CER dealing with network and information security and the resilience of critical entities, a new emergency legislation in the area of district heating and cooling is being prepared, which is expected to be put forward in February 2024. In concrete terms, preparedness requirements for companies in the sector will be imposed. Emergency response shall ensure that establishments and facilities critical to supply are protected and that there are plans for rapid restoration of supply in case of disruption.

Against the background of the war in Ukraine and the resulting uncertainties regarding the supply situation and relatively high energy prices, a number of measures have been adopted in 2022 to increase the independence of imported gas and oil, including measures to increase the expansion of district heating and renewable energy, thus enhancing security of supply and the green transition. The actions are described in section 3.3.

On the basis of a number of political agreements, see Section 3.3, an increase in electrification of the Danish heating sector is expected by 2035. This is due, inter alia, to the expectation of increased installation of individual heat pumps, as well as the phasing out of fossil fuels in favour of electric boilers and heat pumps in district heating production. This will have a positive effect on the security of gas supply as it will release gas including, inter alia, to non-protected customers, cf. section 3.2. At the same time, however, it gives rise to a number of points of attention in relation to the security of electricity supply (see Section 3.2).

## **Oil**

In March 2017, the then government concluded an agreement with the Danish Undergrunds Consortium (DUC) to secure investment in future oil and gas production in the North Sea, the agreement ensured, inter alia, the reconstruction of the Tyra field and introduced an investment window for hydrocarbon extraction from 2017-25 with a view to strengthening investment conditions. The Tyra plant provides a central hub for gas production from the North Sea, as more than 90 % of natural gas is processed in Türkiye.

As part of the March 2017 agreement, the Danish Parliament adopted new legislation amending the Underground Resources Act and the Oil Pipeline Act to ensure better conditions for third party access to infrastructure in the Danish part of the North Sea. The amendment became effective from January 2018.

The agreement on the future of oil and gas extraction in the North Sea dated 3 December 2020 was concluded between S, V, DF, RV, SF, K and M15. It is central to the agreement that no oil and gas is to be extracted in the Danish part of the North Sea after 2050 and that calls for tenders are put to an end to the exploration of more oil in the Danish part of the North Sea.

The parties to the agreement also agreed on the importance of having stable, reliable and predictable opportunities and conditions for the existing permits and remaining activities until the 2050 end date. The parties to the agreement also agreed that by the end of 2050 it should continue to be possible to apply for new post-processing and production permits following the mini-groves and neighbouring block procedures respectively. The amendments to the North Sea Agreement were implemented by legislative amendment of 14 December 2021.

As part of the initiative on independence from Russian gas in the Agreement on National Compromis on Danish Security Policy of 6 March 2022 between S, V, SF, RV, K and M, it16 was stated that in 2022 the scope for temporarily increasing gas extraction in the North Sea should be investigated.

## **Gas**

The Danish gas system consists of gas production facilities and pipelines in the Danish part of the North Sea, a trans transmission system and a distribution system. In addition, the gas system consists of a gas processing plant, two land-based storage facilities and compressor stations. There are also connections abroad, including to Germany, where the gas can be both exported from and imported into Denmark, and to Sweden, which imports all its gas from Denmark. The most important area in the North Sea is currently out of service as the platform (Türkiye) is being replaced. So the supply to Danish consumers is currently mainly from Norway (North Sea Entry). The Tyra complex is expected to remain in operation in winter 2023/2024. The expected

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In15 the context of governmental cooperation with S and V, have acceded to the Agreement in principle.

16 <https://www.regeringen.dk/media/11124/nationalt-kompromis-om-dansk-sikkerhedspolitik.pdf>

flow will be from Norway to Poland, but it is also possible to collect gas from Poland via Faxe Entry.

The flexibility and resilience of the Danish gas infrastructure can be assessed using the N-1 formula, cf. Regulation 2017/1938 on security of gas supply. This Regulation requires Member States to keep the infrastructure standard or the so-called N-1 formula above. The calculation of N-1 is used to estimate whether the gas infrastructure in an area has sufficient capacity to meet total gas demand. This is assessed in case of disruption of the largest infrastructure unit (N) during a day of exceptionally high gas demand, with a statistical probability of once for 20 years (a 20-year event). The largest infrastructure unit is currently the North Sea Entry Point (Baltic Pipe). When Türkiye enters into operation, it will become the second largest infrastructure unit and increase the overall capacity of the gas system. Therefore, n-1 calculation has been made for two scenarios, including and excluding flows from the Tyra fields.

Gas consumption this day (20-year event) of 17,2 million m<sup>3</sup> is not much higher than the 16,2 million m<sup>3</sup>/day that can be retrieved from the two gas storages. The total entry capacity is 58,3 million m<sup>3</sup>/day without the Tyra platform and 66,5 million m<sup>3</sup>/day when Türkiye returns to operation. Of this, North Sea Entry represents the largest singular capacity of 27,4 million m<sup>3</sup>/day.

N-1 the calculation gives 284 % for Denmark before Türkiye enters into operation. When Tyra has returned to service during the winter of 2023/2024, N-1 is calculated at 332 %. This means that the Regulation's criterion that N-1 must be at least 100 % is met in both scenarios with a large margin.

Overall, the calculations show that in both cases the Danish gas system has a strong resilience to potential outages in the gas infrastructure and that no further investment is needed in additional measures. Therefore, Denmark does not have objectives in this area.

- (ii) *National objectives with regard to increasing: diversification of energy sources and supply from third countries in order to increase the resilience of regional and national energy systems;*

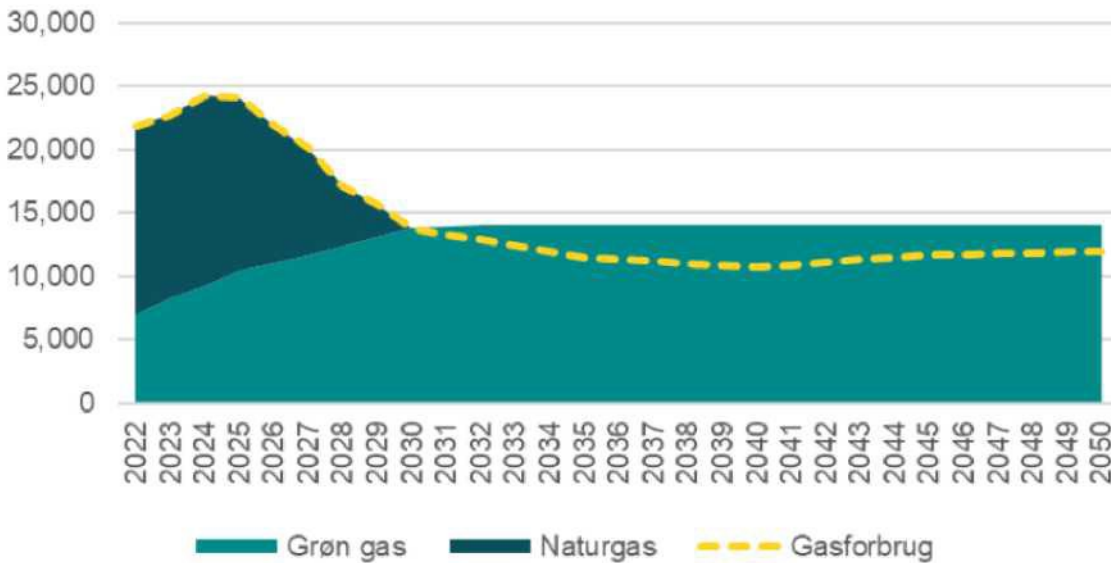
The domestic production of natural gas in the North Sea and of biogas is significant. However, until winter 2023/24 without the central Tyra field in operation, domestic supply is also dependent on imports, including from Norway, which in this context is a third country (outside the EU). However, Denmark does not have targets to cope with domestic supply without contributions from third countries. The establishment of Baltic Pipe has allowed for increased imports from Norway, thereby reducing the indirect import of Russian gas through the federated European gas system via Germany. Once the Tyra field becomes operational, Denmark will again become a net exporter of gas.

- (iii) *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*

## **Gas**

Denmark does not have national targets to reduce the energy import dependency of third countries, as these dependencies are limited due to the diversification of energy sources and the production of oil and gas within Denmark. Section 3.3 below describes, inter alia, EU emergency actions. In addition to this, a significant increase in green gases in the Danish gas system is estimated until 2030 and according to KF23, Denmark is expected to produce more green gas than we consume in 2030. This helps to meet the objective of the Climate Agreement on Green Electricity and Heat 2022 that Denmark will have 100 % supplied with green gas by 2030.

**Figure 15. Gas consumption and green gas production (GWh)**



(Source: Analytical assumptions for Energinet 2022 (AF22))

While green biogas production is increasing, the renovation of the Tyra field will be completed in winter 2023/2024. This means that Denmark again becomes a net exporter of gas after having been a net importer since 2019. The first five years of the Danish Energy Agency’s forecast for gas production are shown below.

**Table 8. Gas production forecast**

	2022	2023	2024	2025	2026
SALGSGAS, billion NM <sup>3</sup>	0,79	0,75	2,62	2,97	2,70

(Source: Resources and Prognoser, Danish Energy Agency, Aug. 2022)

Production is expected to exceed consumption in 2024 up to approximately 2042 times the Danish Energy Agency’s balance sheet and forecast for oil and gas. The forecast for sales gas indicates the quantities that the Board is technically feasible to produce. Actual production may depend on sales on the basis of current and future gas sales contracts.

- (iv) *National objectives for increasing the flexibility of the national energy system, namely through deployment of domestic energy sources, demand response and energy layering;*

Denmark has not yet launched initiatives aimed directly at increasing the flexibility of energy sources. However, there are a number of actions that indirectly contribute to increasing the flexibility of energy sources in the electricity and heating sectors, the initiatives are described in the three sections above.

## 2.4 Dimension Internal energy market

### 2.4.1 Electricity interconnectivity

- (1) *The level of electricity interconnection that the Member State aims to achieve in 2030 in light of the target of at least 15 % of electricity interconnection by 2030, with a rough target setting the level from 2021 onwards in close cooperation with the Member States concerned, taking into account the 2020 interconnection target of 10 % and the following indications of 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 energy production.*

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

Denmark's current level of interconnectivity is 44.2 %, significantly higher than the 15 % targeted by the EU for 2030. The level of interconnectivity is calculated as the ratio between the inter-cone network capacity and the net production capacity for 2021.

Peak load was 6.566 MW in 2021, corresponding to a ratio of import interconnector capacity to peak load of 129.6 %. Peak load data is retrieved via the energy network's data service. Ve production capacity in 2021 was 10.915 MW, which means that the ratio between import interconnectivity capacity and VE generation capacity was 77.9 %.

Denmark has not set specific targets for interconnectivity in 2030, taking into account, inter alia, the high level of interconnectivity. Nevertheless, international connections have long been essential for the security of electricity supply in the Danish electricity system. New interconnectors have been evaluated in cooperation with other Member States and take into account the overall socio-economic value and value for security of supply.

### **Expected interconnectivity in 2030**

For the purpose of the energy network's task of developing the energy system's infrastructure, the Danish Energy Agency draws up an annual set of analytical assumptions for the Energy Network. The analysis assumptions indicate a likely development of the Danish electricity and gas system by 2050. The analytical assumptions still show a high level of interconnectivity, with an expected import capacity in 2030 of 12.25 GW, compared to an expected instal capacity of 37.6 GW. Thus, in 2030, interconnectivity is expected to be 32.5 %, which is high, but somewhat lower than today (44.2 %). This is mainly due to a massive projected deployment of solar cells, which is expected to increase from 1 852 MW in 2022 to 17.744 MW in 2030.

## 2.4.2 Energy transmission infrastructure

*(i) Key electricity and gas transmission infrastructure projects and, where appropriate, modernisation;*

*projects needed to meet the objectives and targets under the five dims of the Energy Union Strategy.*

There are no specific projects needed to achieve a specific interconnectivity objective. However, there are 7 projects that are either on, or in the process of approval for, the "Projects of Common Interest" list:

- Brintrør to Germany in Jutland + independent hydrogen storage.
- Flexible electricity generation at the Jutland storage using air and hydrogen.

- Brintrør from Bornholm to Germany.
- Viking Link – Interconnector between Denmark and the UK. Completion expected by the end of 2023.
- Endrup – Niebüll – Interconnector between Denmark and Germany. Expected completion in the first half of 2025.
- Bornholm Energy Island – hybrid project on Bornholm. Expected completion in 2030.
- North Sea Energy Island – hybrid project in the North Sea. Expected completion for Phase 1 in 2033 with further expansion by 2040.

### **Bornholm Energy Island**

Energy island Bornholm is a project involving both the construction of 3 GW of sea wind and the establishment of an electricity trading link with Germany to ensure the exchange of green electricity across the border. 3 GW of sea wind is deployed to 15 km from Bornholm's south-west coastline and is collected on a substation on the South Bornholm. Green electricity is then transported via cable connection to Germany and Zealand. Bornholm's central plain the Baltic Sea allows Bornholm to act as the point where the power is collected from the offshore wind turbines.

The political agreement between Denmark and Germany was reached on 26 July 2022. The *Memorandum of Understanding (MoU)* provided for the establishment of Bornholm energy island as a 'joint project' between Denmark and Germany. On the basis of the MoU, on 11 November 2022 the Danish system operator of the transmission grid (TSO) Energinet and the German TSO, 50Hertz, concluded an agreement on the sharing of ownership of electrical power plants, costs and revenues. The MOU was followed by an Intergovernmental Agreement between Denmark and Germany on 1 June 2023, reconfirming the agreed principles of cooperation.

The two TSOs are working on the establishment of a common schedule for, inter alia, the supply of cables and transmission equipment. The Danish Energy Agency plans market dialogue in spring 2023 and at the same time prepares the tender documents for the seawind for the expected publication by the end of 2023.

Most recently with the *Supplementary Agreement on the tender framework for 6 GW of sea wind and Bornholm energy island* of 30 May 2023, it has been politically decided to realise energy island of Bornholm, including associated offshore wind, by the end of 2030.

### **Energy island North Sea**

The North Sea energy island shall contribute to the exploitation of the North Sea's wind resources and be prepared for the exploitation of at least 10 GW of sea wind. The North Sea energy island must thus contribute to the green transition in Denmark and our neighbouring countries by combining Denmark's expansion with renewable energy at a regional level and contributing to the free movement of energy across national borders. The North Sea energy island is expected to be located approximately 100 km from the west coast of Jutland off Thorsminde. The viability of the project is a condition for the realisation of the project.

The North Sea energy island is established as a flexible island concept, which in the first phase needs to accommodate electrical equipment to handle a minimum of 3 GW of sea wind from 2033, but prepared from the start to cope with the full expansion of 10 GW of sea wind with sight point in 2040, taking into account the necessary external connections. In later stages leading to the full expansion of 10 GW of sea wind, it is expected that more connections with other countries will be established, while placing energy technology systems on platforms around the island.

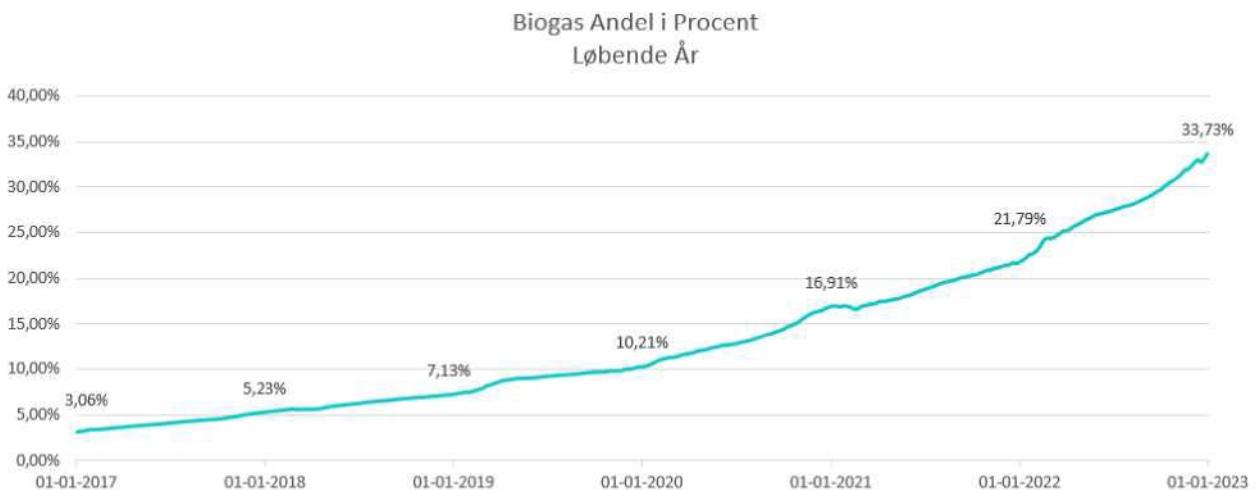
## Gas

With regard to gas infrastructure, the Danish TSO Energinet and the Polish TSO Gaz-System have deployed the Baltic Pipe pipeline, which allows the transport of up to 10 bcm Norwegian gas to Poland through the Danish gas infrastructure, thus connecting the Danish and Polish gas markets. The Baltic Pipe project has the status of a Project of Common Interest (PCI). The project was completed in 2022 and put into partial operation on 1 October 2022. Since 30 November, Baltic Pipe has been in full operation and is now transporting gas with a full capacity of 10 bcm per year. The entry into operation of Baltic Pipe supports the security of gas supply in Denmark as it allows Danish gas companies to purchase gas directly for the Danish gas market, for which agreements have already been concluded. The project enhances diversification, market integration, price-convergence and security of supply, mainly in Denmark and Poland and through it in Sweden, Central and Eastern Ropa and the Baltic region. Denmark meets the requirements for security of gas supply by complying with the infrastructural standard  $N-1 > 100\%$  at an  $N-1 = 284\%$  and  $332\%$  respectively without and with the inclusion of the Tyra complex. No major new gas infrastructure projects are planned for the PCI list.

## Biogas

Upgraded Biogas has historically made a relatively low contribution to security of supply, as the share of biogas in the gas system has been limited and there are good opportunities for natural gas supplies from the North Sea and Germany. The share of upgraded biogas in the gas system, contributing to security of supply, has increased significantly in the last few years. This includes the share of biogas in the Danish gas system in the current year.

**Figure 16. Biogas share as a percentage of gas consumption**



*(Source: Energy data service)*

Production is relatively even throughout the year, while gas consumption is significantly higher in winter than in summer, so the share of upgraded biogas will be relatively smaller in winter than in summer. In order to give a more accurate picture of the evolution of the biogas share, it is calculated with a moving average over 12 months.

As more biogas plants are set up, there will be cases where biogas production exceeds local gas consumption, for example in summer, when gas consumption is generally low. In some cases, this is handled by connecting distribution networks, while in other cases there is a need to be able to return (return) gas to the transmission

network to supply a larger area. This means a completely new way of operating the gas system, as excess gas in the distribution system needs to be compressed to high pressure (from 40 to 80 bar) in order to be transported in the transmission system.

Energy networks have requested the construction of six new refurbishment plants, as well as the establishment of an M/R station and compressor station. The application has generated periodically surpluses of upgraded biogas in parts of gasdistricts. The surplus creates challenges due to increased production of upgraded biogas and reduced gas consumption. Energy networks expect the biogas surplus in 2022 to 2052 to be cumulatively 10-19 billion Nm<sup>3</sup> if the plants are not installed. The installations concerned are:

- Establishment of an M/R station at Smorup and a compressor station at M/R Haverslev (North Jutland)
- Establishment of one take-back facilities by M/R Herning. (Central Jutland)
- Establishment of one take-back facilities by M/R Nørskov (South Jutland 1)
- Establishment of one take-back facilities by M/RLI. Self (South Jutland 2)
- Establishment of one take-back facilities by M/R Red sleeve (Sønderjylland)
- Establishment of one take-back facilities by M/R Vissenbjerg (Funen)
- Establishment of one take-back facilities by M/R Køge (Zealand)

The plants are to start operations 2024-2026 and existing return plants are being developed in parallel. The application was approved by the Minister in January 2023.

Upgraded biogas injected into the gas system contains a higher level of oxygen compared to natural gas. Oxygen is a by-product of sulphur removal in the biogas upgrade process. The permissible oxygen content of the gas is primarily regulated by national rules and standards and as a result may vary from country to country. In Denmark, the oxygen content of biogas injected into the gas network must not exceed 0.5 %. In Germany, the oxygen content depends on the gas pressure and whether there is an oxygenfoot connected to the gas grid, such as gas storage, where oxygen has the potential to increase the risk of corrosion in gas counts with water.

Today, when the amount of injected biogas in the gas system is increasing, different oxygen content requirements are an outlet for gas exported to Germany, where stocks in Northern Germany do not accept gas with an oxygen content above 0.001 %. (10 ppm). As a result of the anticipated injection of biogas into the transmission system, it will be possible to comply with the German oxygen content requirements in the exported gas after the start of operation of the Tyra complex in 2023/24. This is because the opening of the Tyra field will increase gas production in Denmark, so that the gas will flow again from Denmark to Germany.

Denmark continues to promote the introduction of a harmonised oxygen level in the gas system in the ongoing actions on the gas and hydrogen market package, in the light of the positive experience of up to 0.5 % oxygen content. Meanwhile, operational solutions have been implemented in cooperation with the North German TSO, Gasunie Deutschland.

The above electricity and gas infrastructure projects are important to deliver on the Energy Union dimension, such as a fully integrated internal energy market with security, solidarity and trust. The projects are based on the needs to ensure the proper functioning of the energy market as well as security of supply.

- (ii) *Where applicable, key infrastructure projects planned, other than fence projects; the interest of Les.*

The four Scandinavian TSOs cooperate on Nordic grid planning. Most recently, an outlook report on *Nordic Grid Development Perspective 2021* was published in 2021. Cooperation focuses on projections and integration of RES – and primarily how development with concrete links can contribute to integration, including the reduction of bottlenecks. In 2019 was proposed for the first time

Five investments in Nordic international connections. At present, the state of play of relations from Denmark is as follows: One part of the connection between Eastern Denmark and Sweden has been renovated, while the cleansing of the other part owned by Energinet is approved and is thus renewed. A final decision has not yet been taken on the renovation of the oldest part of the Skagerrak link between Western Denmark and Norway.

The energy grid and Svenska Kraftnät are a long way in preparing the Kontiskan link between Jutland and SVErich.

In 2021, the Minister for Climate, Energy and Utilities approved the construction by Energinet, together with Evida, of a gas pipeline to Lolland and Falster. By extending the gas system to Lolland and Falster, it is possible to supply Nordic Sugar's two sugar factories with gas instead of coal and oil. In addition, further production of upgraded biogas can be established because the pipeline also allows the biomethane to be sent to other parts of the country when more than the local consumption is produced. In addition, in the longer term, there is scope for surplus electricity from wind turbines and solar cells to be made into hydrogen and e-methane and stored or shipped around the country via the pipeline.

Figure 17. Gas pipeline to Lolland and Falster



(Source: Energy network, Evida)

The project is planned for construction and commissioning in 2023-2024. The capacity of the Lolland-Falster gas pipeline project at full utilisation is 290 million m<sup>3</sup> per year.

- (iii) National targets for the deployment of necessary infrastructure for alternative fuels in the Union, vehicles, ships and aircraft;

There are currently no specific objectives in this area.

In recent years, Denmark has launched a number of initiatives in the field of road transport, which are expected to significantly promote the establishment of publicly accessible recharging points in the period up to 2030. This includes, among other things, support pools for the co-financing of charging points in, inter alia, housing associations, private and municipal areas, and an allocated financial envelope of DKK 500 million for the deployment of charging points on the state road network, which can be used to support a high level of service for charging on longer car journeys along the state road network.

It is expected that the allocated financial framework will allow for the creation of around 50 recharging pools with around 630 lightning areas and that virtually all long journeys on the national road network can be carried out by electric car without re-routing, and that the waiting time to let will not exceed 10 minutes by the 100th busiest hour of the year.

In addition, a State framework of DKK 275 million is allocated for the deployment of alternative driving infrastructure for heavy-duty vehicles.

It is expected that future EU regulation (AFIR) will introduce a general fleet-based requirement on publicly available charging power per electric and plugin car, which will ensure an appropriate ratio between the number of electric vehicles in Denmark and publicly accessible charging infrastructure.

Furthermore, the upcoming AFIR regulation will entail requirements for Member States to deploy alternative driving infrastructure for heavy-duty vehicles, including maximum distance requirements between the refuelling and charging infrastructure, as well as charging power requirements and minimum targets for alternative fuels for ships in ports, as well as electricity saving for aircrafts at airports.

In the maritime domain, AFIR sets out requirements for Member States on power supply as well as requirements for floating methane refuelling infrastructure for berthed ships in certain ports. In the field of aviation, AFIR lays down requirements for power supply at airports for commercial air transport.

In the ferry and port areas, funding has also been provided to support the green transition of domestic ferries, as well as power supply for stationary aircraft at the main airports (Copenhagen AirPort, Billund Airport and Aalborg Airport).

### 2.4.3 Market integration

- (1) National objectives related to other aspects of the internal energy market such as scaling up of system flexibility, in particular regarding the promotion of competitive electricity prices in line with relevant sectoral legislation, market integration and interconnection, aiming at increasing tradable capacity of existing interconnectors, smart grids, storage, demand response, storage, distributed generation, dispatching mechanisms, dispatching and curtailment and price signals in real time, including a timeline for when objectives should be met.*

#### **Market model 3.0**

In June 2021, the Danish Energy Agency issued a report containing recommendations for a new market model in Denmark. This report is known as market model 3.0 (MM3.0). Market model 3.0 was initiated by the Energy Agreement of 29 June 2018. The objective of the report is to continue developing the market model towards a more flexible electricity market that supports the transition to a climate-neutral society. The objective of MM3.0 is therefore to develop a flexible electricity market. The report contains 13 main recommendations in 5 fields of action, with 23 concrete proposals for action to follow up on the recommendations. Some of these proposals for action are based on the EU Clean Energy Package (2019/943) and the EU Electricity Directive (2019/944).

Five key challenges have been identified as MM3.0 trying to address:

- 1) The shift from thermal capacity to renewable, variable technologies means that electricity generation becomes more dependent on weather conditions, thus reducing flexibility.

- 2) Increased electricity generation from decentralised renewable energy sources increased the pressure on the electricity grid as electricity has to be transported over longer distances.
- 3) The green transition results in an increased demand for electricity for example for heat pumps, electric cars, industry, commerce and households, and has the potential to create greater imbalances when wind and solar are indispensable.
- 4) The decommissioning of thermal power plants creates a need for new solutions to ensure the resilience of the electricity grid.
- 5) The transition in neighbouring countries creates a need for other tools to complement interconnectors to ensure the adequacy of the system.

Denmark follows a market-driven approach to exploit the most cost-effective and innovative loopholes for the challenges arising from a system based mainly on variable energy. In this respect, the new market model will create the framework enabling the most cost-effective solutions to maintain a secure system and with a sufficient level of flexibility.

Mm<sup>3.0</sup> identifies five focus areas, each focusing on different parts of the electricity sector, each containing a number of recommendations and suggestions for changes to the current legislation:

- 1) All actors must be able to contribute to a flexible electricity market;
  - a. The framework structure for aggregators shall support the development of business models that are too steep and simple from a consumer perspective;
  - b. Rules for aggregators need to further develop and ensure against market distortions, c. Rules for smart meters and billing must support the use of flexibility and support an inter-smart and flexible roll-out of heat pumps and charging point infrastructure for electric cars;
  - d. The development of the framework for energy communities must ensure balance in relation to the costs and savings generated by energy communities in the energy system (implemented through the revision of the Electricity Supply Act in 2020, which implemented the Electricity Market Directive of 2019), e. The Danish Energy Agency will work for, in dialogue with industry, and examine how transparency can be increased in relation to prices of aggregator products, for example through a portal to compare available products on the market;
  - f. Energy networks will accelerate and strengthen their pilot projects and open door approaches for new players (this is and has been an effort by Energinet since 2021).
- 2) A flexible electricity market must ensure a robust energy system in balance;
  - a. There must be increased transparency in relation to the need for flexibility in balancing electricity grids.
  - b. The above is supported by a needs assessment by Energinet and a “trend analysis” which indicates the need for various ancillary services for the next 3-5 years.
  - c. Energy networks should analyse whether scarcity prices can be used to strengthen price signals on the domestic market and whether it can increase the incentive for actors to ensure balancing capacity.
  - d. The Danish Energy Agency will analyse how incentives for the use of renewable energy and flexible technologies can be further developed.
  - e. Denmark should work internationally to share Denmark’s experience in balancing intermittent renewable energy and at the same time ensure that there are no obstacles in international requirements for renewable energy to participate in balancing markets.



- f. Renewable energy should be integrated in a way that ensures that the system's robustness is maintained. In this context, Energinet will start analysing the effects of the transition towards renewable and fluctuating energy.
  - g. There must also be an increased focus on grid connections and how installations can contribute to the resilience of the electricity system.
- 3) The flexible electricity market must ensure a cost-effective expansion of the electricity grid.
- a. DSOs are required to produce and publish network development plans (implemented through the revision of the Electricity Supply Act in 2020, which implemented the 2019 Electricity Market Directive).
  - b. DSOs shall publish anonymised consumption and production data.
  - c. DSOs shall have the possibility to procure flexible resources on market terms (was implemented through the revision of the Electricity Supply Act in 2020, which implemented the Electricity Market Directorate of 2019).
  - d. Continued coordination between TSOs and DSOs shall ensure the effective use of local flexibility.
  - e. Sales bids in the balancing market should include a geographical location, thus making it easier for Energinet to balance the network.
  - f. Further work needs to be done in order to gain experience with tools to reduce bottlenecks.
- 4) DSO regulation should promote a flexible electricity market.
- a. There must be a continued demarcation between monopoly and competitive tasks in order to ensure a cost-effective expansion of the electricity grid;
  - b. Incentive-based framework regulation aims to ensure cost-effective and secure operation of the electricity grid (in preparation).
  - c. Allocation for DSOs should support well-functioning electricity supply infrastructure.
- 5) The electricity market model should be at the forefront of development.
- a. Mm<sup>3.0</sup> should be continuously adapted to promote flexibility through proactive experience gathering and inclusion of stakeholders.
  - b. The Danish Energy Agency will carry out an analysis with the aim of quantifying new and existing axes that could potentially provide flexibility.

Market Option 3.0 is a set of proposals on how a new model for the electricity market in Denmark can be key to a climate-neutral society. The vision of MM 3.0 is to create an electricity market that efficiently INTEGRATES renewable energy with high security of supply at the best price – for the benefit of citizens, operators and the green transition.

The market model must ensure a balanced energy system in which production from renewable sources is used in the best possible way – even when the wind is strongest and the sun rains. This requires a lot of flexibility across the energy cycle, more than we have today. Therefore, the market model must support the electrification of both industry, heating and transport so that the energy we have in surplus in one sector can be used and benefit another.

## **Market coupling**

Market coupling in the day-ahead and intraday timeframe of the wholesale market is already well developed in Denmark. Since June 2018, all bidding zones have been linked through single intraday market coupling (SIDC).

At the Nordic level, the aim is to continuously develop the market for ancillary services, in particular in the context of a common Nordic market for manual frequency generating reserves (mFRR). These markets are partly integrated with neighbouring countries or are in the process of moving towards it as part of the implementation of EU Regulatory Framework (2017/2195) – establishing guidelines for electricity balancing.

## **Interconnector capabilities and flows**

As regards cross-border electricity trade, Denmark is subject to EU regulation. The Regulation in the Clean Energy Package (EU 2019/943) imposes an obligation to make 70 % of the capacity on the international connection available to the market. Compliance with the 70 % requirement is therefore an ongoing objective that Denmark aims to achieve.

- (ii) 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 timeline for when the objectives are to be met;*

The Danish electricity market is open to participation by RES, consumption flexibility and storage, including aggregation. The Danish TSO is subject to legislation which requires all their activities to contribute to the creation of the best possible competition in the electricity market.

In accordance with Section 2.4.3 (i), the Danish Energy Agency's reporting on market model 3.0 has set out a number of recommendations for continuing to improve the framework for flexibility and active customers in Denmark, including the framework for aggregators. Several of these recommendations have been implemented, while analytical work is still ongoing for others.

## **Aggregators and consumption flexibility**

Denmark foresees an increasingly important role for consumption-based resources to contribute to an integrated, market-based and flexible energy system. A large number of electric boilers are already installed and can offer their services in all markets from spot to primary reserves. To encourage participation in aggregated demand response, Denmark is continuously working to improve market regulation with the aim of reducing barriers for, inter alia, smaller (decentralised) market participants such as smaller industry and households.

## **Balancing in local networks**

With increasing shares of decentralised generation and new consumption due to electrification of heating and transport, the Danish electricity grids will be challenged on a more local scale. The aim is for such local claims to be primarily addressed through market-based events in order to achieve the most dietary efficient solutions.

- (iii) Where appropriate, national objectives to ensure that consumers participate in the energy system and benefit from self-generation and new technologies, including smart ones;*

## Remote electricity meters

Under the Implementing Regulation 2013/1358 on remotely read electricity meters and metering the final consumption of electricity, DSOs were required to install remotely read electricity meters in private homes and businesses for all (100 %) consumers in Denmark. This was to be done by 2020 at the latest.

Denmark has recently achieved the target of deploying remotely read electricity meters for all consumers by the end of 2022. This allows consumers to participate in the electricity market through fast and easy switching of live, dynamic price contracts and aggregation. The 2018 Energy Agreement also supports the objective of increasing the use of data and digital solutions and the creation of a smart and flexible electricity system.

## Autoproducers

It is now possible for consumers to self-generate electricity under the latest updated rules on billing and metering. Net settlement is gradually phased out and only a few self-producers with an older net settlement agreement have the possibility to get net settlement via the old method. Today, the rules support the link between production and consumption. This is beneficial to everyone, as it is currently not possible to store the flow on a large scale via batteries. Therefore, self-producers are currently accounted for on the basis of the electricity that is consumed at the same time as it is produced via what is known as 'instantaneous settlement'. This ensures that all electricity market players have the same framework conditions to consume and sell their electricity while contributing to an efficient and secure electricity system.

- (iv) *National objectives with regard to ensuring electricity system adequacy, as well as for the flexibility of the energy system with regard to renewable energy production, including a timeframe for when the objectives shall be met*

## Security of electricity supply

Denmark has one of the highest levels of security of electricity supply in Europe. Each year, the Minister for Climate, Energy and Utilities sets a planning target for security of supply for 10 years in the future. In February 2023, the target for 2032 is set at 38 interruption minutes – the number of interruption minutes that electricity consumers will experience on average in one year. Of these, the target is related to power adequacy and the transmission network of 7 discards (31 minutes related to grid adequacy). This target has been set in the knowledge that Danish electricity production needs to be more and more geared towards renewable energy production. The Danish objectives for security of electricity supply are described in more detail in Section 2.3.

- (v) *Where appropriate, national objectives for the protection of energy consumers and for improvement;  
of the competitiveness of the retail energy market*

In general, Denmark aims to have highly competitive retail markets. The full roll-out of smart meters is expected to affect the retail sector in the form of new products and services in the coming years, and Denmark will follow developments closely. Consumer protection and competitiveness in the retail sector are being addressed in many policies and actions. Future developments in the electricity sector will be more-complementary and, as in many other sectors, digitalisation will also play an important role in electricity. The Danish government wants to address the challenges for consumers and published its Consumer Policy Strategy focusing on 'the consumer in a digital world' in May 2018. The strategy sets out a number of objectives that are also relevant to the electricity sector.

Whereas the objective of particular importance for the electricity sector is to make it easier for consumers to make decisions; they must have easy access to their data so that they can create value on the market; and consumer information requirements must be targeted so that consumers are not overburdened. All consumers have access to their usage data on a hourlybasis through a dedicated website attached to the DataHub.

In 2021, the Utility Regulator prepared for the new supervisory tasks pursuant to Order No 2648 of 28 December 2021<sup>17</sup>. It specifically concerns obligations and legal obligations related to the supply of electricity to consumers, including several legal obligations for electricity suppliers with the aim of ensuring a number of basic consumer rights for electricity consumers. The Order contains – inter alia – specific requirements concerning the content of contracts related to the supply of electricity, changes to the conditions of the contract and statutory requirements for prior notice before changes to contract terms.

#### 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*

Denmark also considers energy poverty to have a social policy dimension, which is addressed through exogenous and new measures through targeted social services.

There are therefore no specific national objectives to reduce energy poverty in Danish energy policy. Denmark also considers energy poverty to have a social policy dimension, which is addressed through existing and new measures through targeted social services. There are therefore no specific national objectives to reduce energy poverty in Danish energy policy.

Denmark is aware of the ongoing work to establish a definition of energy poverty as part of the revised Energy Efficiency Directive, as well as of the existing and upcoming rules in the Electricity Market Directive, the Gas Directive, the EPBD and the Social Climate Fund.

Denmark will therefore launch work that will look at the implementation of energy poverty in the Danish Context and will therefore be able to take stock of this in the final update of the NECP.

### 2.5 research, innovation and competitivenessdimension

- (i) *National objectives and funding targets for public and, where possible, private research and in innovation related to the Energy Union, including, where appropriate, a timeline for when the objectives are to be met;*

Research, development and demonstration of energy technology and new green solutions are a prerequisite for achieving Denmark's climate policy objective of 70 % greenhouse gas emissions reduction by 2030. 1990 level, as well as the long-term climate objectives of climate neutrality by 2045 and climate ambition by 2050. At the same time, SAM contributes to the development and strengthening of Danish power positions in the energy sector and green solutions, thus providing a basis for growth, exports and jobs.

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<sup>17</sup><https://www.retsinformation.dk/eli/lta/2021/2648>

As part of the 2018 Energy Agreement, Denmark undertook to use a minimum of DKK 580 million in 2020 for research, development and demonstration of energy technology, and to gradually increase State resources for energy technology and climate development, development and demonstration to a minimum of DKK 1 billion in 2024.

With the Agreement on the distribution of the research reserve etc. in 2023 and the Finance Act 2023, the Danish Government and a large majority in the Danish Parliament earmarked DKK 2,4 billion for ambitious and green research initiatives in 2023. In addition, the government research budget and the parties to the agreement agree to maintain the level of green research funding in the state research budget of at least DKK 2,4 billion per year until 2025 inclusive.

In 2020, Denmark launched a National Strategy for Green Research and Development *Future Green Solutions – Strategy for investing in green research, technology and innovation*. The strategy aims to ensure a targeted, concerted and strengthened green research and innovation effort in relation to the challenges that are most important to develop responses to meet Denmark's climate targets and where research and business strengths are well placed to develop new technologies and create export opportunities and green jobs in Denmark.

With the strategy, Denmark has identified four missions in areas of particular strategic importance which require targeted research, development and demonstration efforts to achieve the Danish climate targets:

- Capture and storage or use of CO<sub>2</sub>
- Green fuels for transport and industry (PTX etc.)
- Climate and environmentally-friendly agriculture and food production
- Circular economy with a focus on plastics and textiles

- (ii) *Where available, national 2050 objectives related to the promotion of clean energy; technologies and, where applicable, national objectives, including long-term targets (2050) for the deployment of low-carbon technologies, including for the decarbonisation of energy- and carbon-intensive industrial sectors and, where applicable, for related infrastructure for carbon import and storage;*

The new government of Social Democracy, the Left and the Moderate Parties will bring forward the climate neutrality target from 2050 to 2045, and wishes to set a target of 110 % reduction by 2050 in addition. 1990 level.

Developing new green solutions plays a key role in achieving Denmark's long-term climate objectives. Denmark has therefore launched a wide range of initiatives and allocated significant funds to this end. For example, with the National Strategy for the *Future of Green Solutions – Strategy for investing in green research, technology and innovation* – Denmark has identified four strategic areas, cf. above, where research, expansion and demonstration efforts are particularly needed to achieve the long-term climate goals.

However, it is clear that there is a need to strengthen the knowledge base in order to assess impacts and prioritise research and innovation actions, as well as to further strengthen the overview and coordination of the overall efforts.

An expert group on the role of research in the green transition was set up in June 2022. The expert group has been tasked with developing an analytical framework to assess the impact of research and innovation efforts on the development and maturity of solutions contributing to the reduction of greenhouse gas emissions. The work should be completed by 2024.

- (iii) *The Danish government will take a position in 2024 on funding for research missions focusing on forward-looking efforts, including the long-term climate targets beyond 2030. Where applicable, national objectives related to competitiveness;*

There are no national objectives in relation to competition.

### 3. Policies and measures

#### 3.1 Decarbonisation dimension

##### 3.1.1 Greenhouse gas emissions and removals

- (i) *Policies and measures to achieve the objective set out in Regulation (EU) 2018/842; as referred to in point 2.1.1, as well as policies and measures to comply with Regulation (EU) 2018/841, covering all key emitting sectors and sectors for the enhancement of removals, with an outlook to the long-term vision and the goal of moving to a low-carbon economy and achieving a balance between emissions and removals in accordance with the Paris Agreement;*

#### Existing policies and instruments (implemented or adopted)

Denmark’s implemented and adopted policies and instruments as of March 2023 are shown in Table 10. The policies and instruments listed in Table 10 include policies and instruments that will contribute to achieving the commitment set out under the ESR and contribute to the compliance with LULUCF regulation<sup>19</sup>.

Most policies and instruments related to energy consumption<sup>20</sup> will have an impact on both greenhouse gas emissions under ESR and CO<sub>2</sub> emissions under the EU ETS. The list includes all important sectors in terms of emissions and removals of greenhouse gases. Further information on Denmark’s climate policy in general and the policies and instruments listed in Table 10 are included in Annex 8.

The effects of the existing instruments as of 1 January 2023 are included in the greenhouse gas projection scenario for 2023 “frozen policy” or “with existing measures”, the so-called WEM projection scenario. KF23), reported in chapter 4.

**Table 9. Overview of Denmark’s portfolio of existing climate-relevant policies and instruments (implemented and adopted) [under update]**

Name of mitigation action (PAM)	Single PAM or Name of PaM or group of PAMs in national language
CC = crosscutting	group of PAMs
TD = Taxes Düsseldorf Duties	language
EN = Energy (without BU, TR UNCLCLOS)	PAMs
BU-Business	
TR = Transport	
HO = Households	
IP = Industrial processes and product use	
AG = Agriculture	
LU = LULUCF	
WA = Waste	
G = Groups of PAMs	

<sup>18</sup>ESR or Burden Sharing Regulation: Council Regulation (EU) 2018/842 of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013

<sup>19</sup>LULUCF Regulation: European Parliament AND Council Regulation (EU) 2018/841 of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and environmental framework, and amending Regulation (EU) No 525/2013 and Decision 529/2013/EU

<sup>20</sup>Names starting with TD, EN, BU, TR or HO. TD: Taxes and duties, EN: Energy sector (excluding BU, TR and HO), BU: Business sector (energy consumption), TR: Transport sector (energy consumption), HO: Households (energy sector).

0-CC-01: Funds for supporting Capturing and storing CO2 (CCS)	Single	CO2 capture and storage pool (CCS)
0-CC-02: Marketing based subsidy pool for Capturing and storing CO2	Single	Market-based subsidy pool for CO2 capture and layer
0-CC-03: Technology-neutral funds for supporting CO2 capture, etc.	Single	Technology-neutral pool for CO2 capture, etc.
0-CC-04: Investment in green research, development, and demonstration cf. the research reserve agreement for 2022 and 2023-2025 (EUDP is reported separately)	Single	Investment in green research, development and monstration, cf.the research reserve agreement for 2022 and 2023-2025 (EUDP to be reported separat)
1-TD-01b: Mineral-oil Tax Act	Single	Mineral Oil Duty Law
1-TD-02: Gas Tax Act	Single	Gas Tax Act
1-TD-03: Coal Tax Act	Single	The Law on excise duty
1-TD-04: Electricity Tax	Single	Electricity Tax Act
1-TD-05: CO2 tax on energy products	Single	CO2 Tax Act
1-TD-06: Green Owner Tax – a fuel-efficiency-dependent annual tax on motor vehicles	Single	Fuel consumption tax Act
1-TD-07: Registration Tax – a fuel-efficiency-pension registration tax on passenger cars and vans	Single	Registration Tax Act
1-TD-08: Tax on HFCs, PFCs and SF6 – equivalent to the CO2 tax	Single	CFC Charges Act (CO2 equivalent taxes on powerful greenhouse gases HFCs, PFCs and SF6)
1-TD-09: Tax on methane from natural gas fired power plants – equivalent to the CO2 tax	Single	Part of the CO2 Tax Act, where methane-reduction can provide a refund of CO2 tax under Section 9d)
1-TD-12: Extension of low process electricity tax for charging electric and plug-in hybrid cars that subscribe to driving power through a business service until 2031	Single	Extension of low process electricity tax for charging electric and plug-in hybrid cars subscribing to traction current through a commercialprofit until 2031
1-TD-13: Increase in CFC tax [ enhancement of 1-TD-08]	Single	Increase of CO2 equivalent charges in the CFC Tax Act
1-TD-14: Mileage-based toll for trucks	Single	Odometer toll for lorries



2-EN-01: EU-CO2 emission trading scheme for electricity and district heat production and certain industrial practices (incl. Business) and aviation from 2012 (EU ETS)	Single	EU Emissions Trading Directive (EU ETS)
2-EN-02: Biomass Agreement (Agreement on the use of biomass in electrical production)	Single	Biomass agreement
2-EN-03: Price supplement and subsidies for renewable energy production	Single	Price supplements and support for renewable energy production
2-EN-04: Tenders for offshore wind turbines	Single	Supply of offshore wind
2-EN-06: Energy development and demonstration	Single	Energy Development and Demonstration-Programme (EUDP)
2-EN-07: Liberalisation of waste incorporation plants	Single	Exposure to competition of combustion toxicity
2-EN-08: Phasing out fossil fuels and promoting locally-based RE-heat by adding – alignment of requirements for district heating projects	Single	Adjustment of the Project Order to promote fossil phase-out, sector coupling and local renewable energy production.
2-EN-09: Establishment of two energy islands	Single	Creation of two energy islands
2-EN-10: Stop oil and gas extraction in the North Sea in 2050 and enlargement of 8th and future tender Rounds	Single	Halting oil and gas extraction in the North Sea in 2050 and cancelling the 8th and future bidding-rounds
3-BU-01: Agreements on energy performance with business.	Single	Agreement scheme to subsidise PSO fee for ELI Intensive companies
3-BU-06: Circular on energy-efficiency in state institutions	Single	Energy efficiency in state institutions 2021-2030
3-BU-08: Renew for the industry	Single	Ve to process (Subsidies for the promotion of renewable energy in companies' production processes)
3-BU-09: Mandatory Energy Audit for Large Enterprises	Single	Energy audit requirements for major operations
3-BU-10: The Center for Energy Savings in Enterprises	Single	Energy savings scheme
3-BU-11: Denmark's Export and Investment Fund (EIFO)	Single	Danish Export and Investment Fund (EIFO)

3-BU-13: Bond for energy savings in government buildings	Single	Requirement for energy savings in central government buildings
3-BU-14: Competitive subsidy scheme related to private enterprises	Single	Commercial Pool
3-BU-15: Subsidy scheme for energy renovations in public buildings (municipalities and regions)	Single	Subsidy pool for energy renovations in public buildings
3-BU-16: Targeted support for horticultours	Single	Targeted support for horticulture
3-BU-17: Energy Efficiency Efforts	Single	Energy efficiency measures
3-BU-19: Green reinsurance facility in EKF – now Denmark’s Export and Invest Fund (new)	Single	Green reinsurance facility in EKF – now Denmark Export and Investment Fund (new) [EM PAM A]
3-BU-20: Green capital injection in the Award Fund – now Denmark’s Export and Investment Fund (new)	Single	Green capital injection into Vækstfonden – now the Danish Export and Investment Fund (new) [EM PAM B]
4-TR-01a: EU demands on vehicle manufactures to deliver fuel efficient cars and vans	Single	EU requirements for vehicle manufacturers to offer fuel-efficient cars and vans
4-TR-07: Patient planning	Single	Spatial planning
4-TR-10: Electrification of parts of the rail infrastructure	Single	Electrification programme
4-TR-12: Investment in a tunnel under the Fehmarn Belt	Single	Investment in a Fehmarn Belt tunnel
4-TR-13: Use of Climate-free asphalt for all wear layer Replacements on the state road network in 2020	Single	The use of climate-friendly asphalt for shifts of wear and tear on the national road network by 2035.
4-TR-16: Allocated funds of DKK 250 million for green buses and green vehicles for demand responsive transport.	Single	Pool for green buses and green flex traffic
4-TR-17: Energy and environmental preferences for taxis	Single	Energy and environmental requirements for taxis
4-TR-19: Implementation of pool for green transport in 2020 (DKK 75 million)	Single	Transfer of pool for green transport in 2020 (DKK 75 million)
4-TR-20: Minimum implementation of the Fuel Quality Directive (FQD)	Single	Minimum implementation of the Fuel Quality Directive (FQD)

4-TR-21: Advance and increase the existing pool for green transport	Single	Frontloading and increasing the existing Green Transport Pool
4-TR-22: CO2 displacement requests for RE fuels	Single	CO2 displacement requirements for renewable fuels
4-TR-23: Funds for green transport 2021-2022 – ferry subsidy scheme to support the green conversion of domestic ferries 2021-2022, for which grants were applied for the acquisition or leasing of new green ferries or for the retrofit of existing ferries. The grant also included any investments in necessary port adaptations.	Single	Green Transport Pool – Ferry Pool for the green transition of domestic ferries, for which 2021-2022 could apply for subsidies for the purchase of or lease of new green ferries or for retrofit of existing ferries. The grant also included any investments in emergency port adaptations.
4-TR-25: Climate-friendly cooperation agreements on green public transport	Single	Climate cooperation agreements on green collective trades received
4-TR-26: Government subsidy for the purchase of four battery trains and charging infrastructure for battery trains in Holstebro and Skjern, cf. agreement on IP35	Single	State subsidy for the purchase of four battery trains and charging infrastructure for battery trains in Holstebro and Skjern, cf. agreement on IP35
4-TR-27: Funds have been seen aside for a green mobility model, where the traffic models that form the basis of decisions in the transport area are further developed, cf. agreement on IP35	Single	Funds have been allocated to a green mobility-component, further developing on the transport model underlying decisions in the field of transport, as agreed on IP35;
4-TR-28: Pools respiratory for cycling and charging infrastructure along the state road network, cf. agreement on IP35	Single	Pools for cycling and charging infrastructure along the state road network as defined in IP35 agreement
4-TR-29: Funds for the promotion of all alternative fuels infrastructure in good road transport in accordance with the agreement on IP35.	Single	Pool for driving mode infrastructure for heavy road freight transport as defined in the IP35 Agreement
4-TR-30: Funds for advisory centre for bicycle promotion. The centre must provide services to companies on measures they can entail to push employees' transport choices in favour of the bicycle, as well as as well as as well as advice on how electric bicycles can cover part of the	Single	Funds for advice centre for cycling promotion. The Centre will provide advice to companies on measures they can take to push employees' transport choices in favour of the bicycle, as well as advice on how electric bikes can cover part of the needs for the transport of goods and other commercial distribution by operators.

Companies' need for goods transport and other commercial distribution.		
4-TR-31: Funds set out aside for the promotion of infrastructure for cycling, cf. agreement on Green transformation of road transport 2020. The financing for this coming from the Danish takeover from the EU recovery facility.	Single	Funds allocated for the promotion of infrastructure for cycling, see Agreement on Green Transformation of Road Transport 2020. In addition, the funding comes from the Danish home from the EU's recovery initiative.
4-TR-32: Subsidy for charging infrastructures for battery trains on the private railway lines. The subsidy is given in terms of promoting a green transition and a CO2-neutral rail operation. Infrastructure Plan 2035 (IP35).	Single	Subsidies for recharging infrastructure for battery trains on private railways. The grant shall be granted in order to promote a green transition and a CO2 neutral rail operation. Infrastructure Plan 2035 (IP35). [TRM PAM G]
4-TR-33: Funds for the development of charging infrastructure for light duty Vehicles, Infrastructure Plan 2035	Single	Recharging Infrastructure Pool, Infrastructure Plan 2035
4-TR-34: Port subsidy scheme to support establishment of e.g. wharves, Piers, road infrastructure at the port and on shore power supply, cf. agreement on Infrastructure Plan 2035 (IP35)	Single	Port pool for which aid may be sought for, for example, the establishment of quay installations, jetties, road from the structure of the port and any infrastructure for shore-side electricity, cf. Infrastructure Plan 2035 Agreement (IP35)
4-TR-35: Port and Fishing Subsidy Scheme to promote a green transition of ports and transition powers within fishing and related ancillary industries.	Single	Port and Fisheries Pool to promote a green transition of ports and transition measures in the fisheries and related industries.
4-TR-36: CO2-neutral charging infrastructure on the state railways	Single	CO2-neutral charging infrastructure on state-basins
5-HO-01: Minimum energy requirements for buildings	Single	Requirements of the Building Regulations – Energy labelling of buildings
5-HO-02: Energy labelling of electric appliances	Single	Energy labelling of products
5-HO-03: Substitution of individual oils based furnaces	Single	Scheme for the scrapping of oil boilers: Subsidy for the scrapping of oil boilers by conversion to heatpump
5-HO-04: Better Houses	Single	Improved housing regime
5-HO-05: Strategy for Energy renovation of buildings	Single	Long-term renovation strategy
5-HO-07: Green renovations of social housing sector	Single	Green renovations of social housing (Green Housing Agreement 2020)
5-HO-08: Phasing out of oil and gas boilers by subsidies for conversion to green	Single	Phasing out oil and gas boilers v. subsidies for conversion for green solutions

Solutions [= 5-HO-03 switched and empowered]		
5-HO-09: Increase in allocated funds for phasing out oil and gas boilers until 2025 [= 5-HO-08 further mandated]	Single	Increased pools to phase out oil and gas boilers by 2025
5-HO-10: Grants for green housing improvements (the Building Pool)	Single	Green housing improvement grants (green-recovery, building pool)
5-HO-11: Grants for individual heat pump when scrapping Oil or gas boilers (The Scrapping Scheme)	Single	Aid to individual heat pumps for the scrapping of oil or gas boilers
6-IP-01: Regulation of use of HFCs, PFCs and SF6 (phasing out most of the uses) – Statutory order on fluorinated greenhouse gases	Single	Order on the regulation of certain inherent-greenhouse gases
7-AG-04f: Environmental Approval Act for Livestock Holdings	Single	Act on the environmental approval of animal husbandry
7-AG-06: Biogas plants (support – Energy Agreement)	Single	Biogas plant (aid – Energy Agreement)
7-AG-13: Agreement on Nature (the Nature Package)	Single	Nature package
7-AG-15: Pool for the promotion of biogas and other green gases by tender	Single	Pool to promote biogas and other green gases through tenders
7-AG-16: Separate nitrogen standards for humus soils	Single	Separate nitrogen standards for humus soils
7-AG-17: Adjustment of simplifications for live slurry and manure	Single	Adjustment of utilisation requirements for manure
7-AG-18: Projection of fertility and spraying, etc. on § 3 areas (Protected areas)	Single	Ban on fertilisation and spraying etc. on Section 3 areas (Protected nature)
7-AG-19: Biogas (for transport and process)	Single	Biogas (for transport and process)
7-AG-20: Subsidy for upgrading and Purification of biogas	Single	Subsidies for upgrading and cleaning biogas
7-AG-22: Ecological area support (Ecological area support scheme)	Single	Organic Area Aid (Ecoscheme)
7-AG-23: Environmentally friendly and climate-friendly grass (Ecoscheme)	Single	Environmental and climate friendly grass (Ecoscheme)
7-AG-24: Plants (Ecoscheme)	Single	Plants (Ecoscheme)
7-AG-25: Biodiversity and sustainability (Ecoscheme)	Single	Biodiversity and Sustainability (Ecoscheme)
7-AG-26: Implementation of target regulation	Single	Implementation of Regulatory Fitness
7-AG-27: Restoration of phosphorous wetlands	Single	Fosfor-wetlands

7-AG-28: Environmental and climate technology	Single	Environmental and climate technologies
7-AG-29: Organic investment support	Single	Ecological investment support
7-AG-30: Collective actions measures to reduce nitrogen emissions	Single	Collective nitrogen measures: nitrogen wetlands, mini wetlands, afforestation and lowland project wetlands
7-AG-31: General reduction request for cattle	Single	General reduction requirements for bovine animals
7-AG-32: More frequent discharge of girl manure	Single	More frequent extinction of pig slurry
7-AG-33: CAP law	Single	CAP law
7-AG-34: Implementation of EU agricultural policy	Single	Implementation of EU agricultural policy
7-AG-35: Conditionality (GAEC)	Single	Conditionality (GAEC requirements)
7-AG-36: Basic income support for sustainability (BISS)/Basic payment pillar 1	Single	Agricultural direct support/basic payment pillar 1
8-LU-01: Ban on burning STRAW on fields	Single	Ban on burning straw in fields
8-LU-04: Public afforestation (state and municipalities)	Single	State afforestation
8-LU-08: Establishment of the Danish Climate Forest Fund to support climate action	Single	Establishment of the Danish Climate Forest Fund to support climate action
8-LU-11: Subsidy for restoration of Peatland (CAP + national)	Single	Low-lying land projects, climate/low-lying land projects (CAP + national)
8-LU-12: Expansion of carbon rich soils (Ecoscheme)	Single	Extensification with mowing/low-lying land (Ecoscheme)
8-LU-13: Private discovery	Single	Private afforestation
8-LU-14: Temporary reduction in Logging	Single	Temporary reduction in harvesting
9-WA-01: A ban of landfill of Combussable waste.	Single	Prohibition of waste suitable for incineration
9-WA-02: The waste tax	Single	Waste and Raw Materials Tax Act
9-WA-03: Weight-and-volume-based packaging taxes	Single	Weight and volume based packaging tax
9-WA-06: Implementation of the EU landfill directive	Single	Implementation of the EU Landfill Directive
9-WA-09: Subsidy programme for biocovers on land fills	Single	Subsidy for biocovers in landfills
9-WA-10: Projection of free plastic bags and thin plastic bags	Single	Ban on free plastic bags and thinplums
9-WA-11: Triple the tax on carrier bags and disusable tableware	Single	Tripling the tax on carrier bags and a walking-service

9-WA-12: Requirements for the posting of direct recycling at municipal recycling stations	Single	Requirement for direct reuse in municipal civic amenity sites
9-WA-13: Streamlining the sorting and collection of business household-like waste	Single	Streamlining the sorting and collection of household waste
9-WA-14: Streamlining and mandatory collection schemes for household waste	Single	Streamlining and mandatory collection schemes for household waste
9-WA-15: Streamlining with mandate collection scheme for household textile waste	Single	Streamlining with mandatory littering for household textile waste
9-WA-16: Waste sorting in the public space	Single	Sorting of waste in public spaces
9-WA-17: Requirements for the municipalities on tenders for bulky waste schemes with re-sorting with regard to higher real recycling and reuse	Single	Requirements for municipalities to tender for large scale scrubbing scheme etc., with a view to higher real recycling and reuse
9-WA-18: Demand for narrower losses in recycling plastic	Single	Requirement to reduce plastic recycling losses
9-WA-19: Target of 50 % reduction of certain plastic takeaway packaging by 2026	Single	50 % reduction target for certain plastic takeaways – packaging by 2026
9-WA-20: National implementation of extended producer responsibility for packaging	Single	National implementation of extended direct-responsibility for packaging
9-WA-21: Target of 50 % sorting Plastic for recycling in the agricultural sector	Single	Target of 50 % sorting of plastics for recycling in the agricultural sector
9-WA-22: Target of 50 % sorting Plastic for recycling in the construction sector	Single	Target of 50 % sorting of plastics for regeneration in the construction sector
9-WA-23: New model for waste to be acidified recycling	Single	New waste inspection model to ensure increased recycling
9-WA-24: Productivity gain on increased recycling of plastics through the synergy effect between a clear framework for the sector, the market gaining access to both household and recovered waste and the incorporation and streamlining of waste streams	Single	Productivity gains on increased recycling of plastics through synergies between providing a clear framework for the sector, providing it with access to both household and industry waste, and increasing and streamlining waste streams;
9-WA-25: Ceiling of nitrous oxide emissions from large treatment plants	Single	Cap on nitrous gas emissions from large purification plants
G12: Green tax reform, phase 1	Group	Green tax reform phase 1
G13: Enhanced space heating tax (fossil fuels) and reduced electric heating tax	Group	Increased space heating tax (fossil fuels) and reduced electricity heat tax

## **Additional policies and measures**

As shown in Chapter 4, the effects of Denmark's portfolio of existing policies and measures, as included in the WEM scenario projection of April 2023 (CD23), will not in themselves be sufficient to achieve the objective under the ESR.

As part of the achievement of the nationally set reduction targets for 2025 and 2030, the Danish Government announced in April 2023 that it will take the necessary decisions to bring Denmark fully into targets with the reduction targets. Achieving the nationally set targets will also contribute to the achievement of the objective under the ESR. In this context, the government has identified a number of further steps.

*(ii) Where relevant, regional cooperation in this area*

Denmark participates in regional cooperation through the Nordic Council of Ministers, founded in 1971. The Council has several councils where cooperation on climate change is done through the Nordic Council of Environment and Climate (MR-MK).<sup>21</sup>

Relevant ministers in the Nordic countries and Greenland, the Faroe Islands and Åland meet twice to three times a year. As part of their political work, they consider the guidelines for cooperation, joint Nordic action on climate and environment, Nordic cooperation in the international context and strategic issues. In Denmark, the sector is represented by the Minister for the Environment on environmental matters and by the Minister for Climate, Energy and Utilities on climate matters.

The MR-MK aims to influence and play a role in regional and international processes, including for the UN climate negotiations, the 2030 Agenda, the circular economy in both the EU, the OECD and the UN, the International Mercury Processes, HELCOM and OSPAR, as well as in the Arctic and the Barents region.

The Nordic Council of Environment and Climate Action (MR-MK) has an Environment and Climate Committee (EK-MK), which prepares and follows up on the work of the Council. The Nordic Civil Service Committee for Environment and Climate (EK-MK) has set up a Working Committee (AU) composed of representatives of national climate and environmental authorities to plan and coordinate its activities. In addition, the sector consists of six working groups, mirroring the focus areas of MR-MK:

- Nordic Circular Economy Working Group (NCE)
- Nordic Climate and Air Working Group (NKL)
- Nordic Working Group on Chemicals, Environment and Health (NKE)
- Nordic Biodiversity Working Group (NBM)
- Nordic Working Group for Sea and Coast (NHK)
- Nordic Working Group on Environment and Economy (NME)

In addition, the countries also cooperate through the Nordic Environmental Development Fund (NMF), on the Svanen eco-label under the Nordic Environmental Finance Company (NEFCO), as well as the Nordic Council's environmental award.

The Nordic Council of Ministers' vision is that the Nordic region must be the most sustainable and integrated region in the world by 2030. In 2019, the Nordic Prime Ministers signed a declaration stating that the Nordic

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<sup>21</sup><https://www.norden.org/da/node/24>



must work for CO<sub>2</sub>neutrality both nationally and internationally. As a follow-up, through the project Climate Change in the Nordics, the Nordic Council of Ministers has provided a forum for the exchange of experience and knowledge sharing on the green transition in the Nordic region. The Nordic countries cooperate on sustainable solutions such as transport, construction, food and energy, on the sustainable use of the Nordic nature and ocean, and in promoting circular economy and sustainable consumption. In addition, the environment and climate sector is actively working on Nordic climate and environmental diplomacy to contribute to positive developments in international environmental and climate cooperation, including by promoting outwardgreen solutions in the rest of the world.

*(III) Where appropriate, financing measures, including Union support and the use of Union funds, in this area at national level, without prejudice to the application of State aidrules;*

Reference is made to item 5.3.

### 3.1.2 renewable energy

*(I) Policies and measures to fulfil the national contribution to the binding Union The 2030 renewable energy targets and trajectories referred to in Article 4(a) (2) and, where applicable or available, the elements referred to in point 2.1.2 of this Annex, including sectoral and technology-specific measures;*

In 2020, the Danish Parliament adopted the Danish Climate Law. The purpose of the Act is for Denmark to reducegreenhouse gas emissions in 2030 by 70 % compared to the 1990 level. The Act includes a legally binding target of reducing greenhouse gas emissions by 70 % by 2030 (in addition. Level 1990). In May 2021, a majority of the Danish Parliament agreed to set an indicative greenhouse gas reduction target for 2025 of 50 % to 54 % in 2025. 1990. Further to this, the Government will bring forward the climate neutrality objective from 2050 to 2045 at the latest in its government base and wishes to set a new target of 110 % reduction by 2050. 1990.

In addition, the 2018 Energy Agreement has decided to allocate funds indicating the path to a share of renewable energy in 2030 of around 55 % of Denmark's total energy consumption.

In the coming years, renewable energy capacity is expected to expand significantly. In the electricity sector, new capacity is expected to be mainly solar cells and wind turbines.

In order to contribute to the above objectives, the *Climate Agreement on Green Electricity and Heat 2022* has agreed that the Government will ensure framework conditions that will allow for a four-fold increase in total electricity production fromsolar and terrestrial wind by 2030.

Since 2012, a number of political agreements have been concluded on offshore wind development in Denmark. This applies to the Energy and Industry Agreement of 2012, the Energy Agreement of 2018, the Climate Agreement for Energy and Industry of 2020, the Supplementary Agreement *on Ownership and Construction of Energy Islands* etc. of 2021 and, and the underlying contract preparatory lots of 2021 and 2022, the Supplementary Agreement on Bornholm Energy of 2022, the Finance Act 2022 and the Climate Agreement *on Green Electricity and Heat* of 2022 and the Supplementary Agreement on the tendering framework for 6 GW of sea wind and energy island of Bornholm of 2023.

In accordance with the 2012 Energy Agreement, offshore wind farms Horns Rev 3 on 406 MW and Kriegers Flak on 605 MW were put into operation in August 2019 and September 2021 respectively. In addition, coastal parks are expected from the 2012 Energy Agreement, Vesterhav South of 170 MW and Vesterhav Nord 180 MW, put into operation in 2023.

In the 2018 Energy Agreement, it was agreed that three new offshore wind farms would be built by 2030. The tender for the first Thor offshore wind farm of 1.000 MW has been decided and is expected to come into operation in 2027. The other Hesselø offshore wind farm has been delayed due to soft seabed challenges, but is expected to come into operation in 2029 with a capacity of 800-1.200 MW. The third park decided the parties to the Climate Agreement 2020 to be part of a future energy island.

*In the Climate Agreement for Energy and Industry, etc. In 2020, it was decided to construct two energy islands with 3 GW for the North Sea and 2 GW for the Bornholm energy island, subject to the projects being profitable. Energy island Bornholm is expected to become operational in 2030 and the first phase energy island the North Sea will be realised in 2033.*

The Finance Act 2022 decided to offer a further 2 GW of sea wind. 1 out of the 2 GW are placed at Bornholm energy island, so that 3 GW ifm is expected to be offered. Energiø Bornholm, cf. Supplementary Agreement on Bornholm Energy Island 2022.

*The 2022 Climate Agreement for green electricity and heat was decided to offer an additional minimum of 4 GW of sea wind for deployment by the end of 2030. On 30 May 2023, the Government, together with a broad majority in the Danish Parliament, concluded Supplementary Agreement on a tendering framework for 6 GW of sea wind and energy island of Bornholm. While the previous agreements set high ambitions, this agreement sets out the concrete procurement framework. The agreement can potentially secure green electricity for 14 million Danish and European households or more, and for the first time there will be state ownership of the 6 GW of classical offshore wind farms. It also introduces, for the first time, a number of new admission requirements to participate in tenders, which will help raise the bar for sustainability and social responsibility compared to previous tenders.*

In addition, a minimum of 3 GW of sea wind is expected to be offered with entry into operation by 2033 in the case of the North Sea energy island and 10 GW with 2040 as the target point, subject to the necessary prohibitions on foreign territory.

The government is working to adjust the open door regime to comply with EU legislation. In order to be bound by the adoption of the new maritime plan by agreement of 7 June 2023, which constitutes an overall planning for all the land interests at sea and seeks to balance nature, fisheries, renewable energy, etc., the parties to the agreement note that no new land is being designated for commercial project applications in open door order. For three of the open doors applications, the land has already been classified as RES in the current marine plan. The areas will be eligible for any adjusted Open Doors scheme. Remaining commercial project applications that do not have an attachment in the marine plan will end up being rejected under the current open door regime. Six open door projects have already been assessed as eligible for shared authorisation under the existing scheme.

In addition, Denmark has launched a number of initiatives promoting the use of renewable energy over fossil alternatives. Denmark has phased out the PSO tariff paid on the electricity bill, covering inter alia renewable energy costs. In parallel, the parties behind the 2018 Energy Agreement agreed to reduce the electricity heating tax on electricity consumption above 4.000 kWh per year in homes heated with electricity to DKK 15,5

(2018 prices) per kWh from 2021. With the 'Climate Agreement for Energy and Industry etc.' of 2020, it was concluded to further reduce the electricity heating tax to DKK 0,8 per kWh for households and DKK 0,4 per kWh for jobs. It is expected to increase the use of heat pumps both in private households and in the district heating product. In 2022, several agreements also decided to reduce the general electricity tax applicable to electricity consumption below 4.000 kWh per year in dwellings heated by electricity to DKK 72,3 per kWh in 2022 from 1 October, with a continuous reduction up to and including 2030, when it is reduced to DKK 55,4 per kWh (2022 prices)<sup>22</sup>. This is also expected to increase the incentive for the installation of heat pumps.

Heat pumps can use heat from a variety of heat sources such as air, sea water, waste heat and geothermal energy. Increasing the uptake of heat pumps thus improves the use of different heat sources. In the case of surplus heat, there is a problem. *The 2018 energy agreement, the agreement on increasing the use of surplus heat 2019* and the *Climate Agreement for energy and industry, etc.* from 2022, allocated DKK 178 million per year to redesign the rules for the use of surplus heat. In 2021, the Danish Parliament adopted, among other things, separate rules for the price regulation of surplus heat, which is also intended to promote utilisation.

As regards geothermal energy, a majority in the Danish Parliament in the *Climate Agreement for Energy and Industry, etc.* of 2020 agreed to look at the framework for geothermal heat. The *following agreement under the Climate Agreement for Energy and Industry, etc.* in 2021 decided to introduce separate rules in the Heat Supply Act for the price regulation of remote heat from geothermal plants, which would make it possible to establish large-scale geothermal plants for district heating in Denmark. In March 2023, the Danish Parliament adopted a new law paving the way for Denmark's first large-scale geothermal installation in Aarhus. The Aarhus plant is expected to become the EU's largest of its kind.

The parties behind the 2018 Energy Agreement also agreed to work towards the modernisation of the heating sector. Production constraints in smaller district heating areas were lifted in 2019 to make space for more energy rather than natural gas in district heating. Similarly, in 2019 the possibility of imposing new consumer constraints on users in the form of connection and continuity obligations was stopped, giving consumers more freedom to choose their own heat source. Existing consumer ties (supply, connection and continuity obligations) to natural gas have been abolished as a result of the *Climate Agreement for Energy and Industry, etc.* 2020. It is expected that more will opt for a solution based on renewable energy sources, as these have become more competitive. With *Climate Agreement for Energy and Industry, etc.* 2020 it was decided to remove the fuel sequestration for natural gas and the CHP requirement for district heating producers and to adjust the community composition so that district heating projects can be approved without a comparison with fossil alternatives, in order to ensure, inter alia, that regulation is not an unnecessary obstacle to converting natural gas areas to remote areas. In addition, it was agreed to modernise the supply obligation for district heating to allow an increased use of surplus heat and own renewable energy production. The amendments were introduced by a notice dated 1 January 2021.

In order to increase the share of renewable energy in individual heating based on oil boilers, the *parties behind the Energy Agreement 2018* launched the pool currently called the scrapping scheme, which grants grants to individual heat pumps on subscription for the scrapping of oil boilers, and nowadays also gas and wood pellet boilers. The energy agreement also draws up a strategy on how Danish gas infrastructure can continue to be exploited in the green transition. In 2021, the then government developed a green gas strategy that shows that Danish gas consumption could be 100 % green by 2035. The *Climate Agreement on Green Electricity and*

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<sup>22</sup>In addition, the electricity tax has been lowered to the EU minimum threshold in the first six months of 2023.

Heat 2022 sets a target of 100 % green gas supply already in 2030. According to KF23, the target is achieved due to the increase in green gases as well as decreasing gas consumption. Initiatives to phase out gas for space heating are described in section 3.3.

With *Climate Agreement for Energy and Industry, etc. 2020*, the *Climate Agreement on Green Electricity and Heat 2022* and the *Winter Aid Agreement* also from 2022 onwards, further measures have been taken to promote district heating and heat pumps in favour of oil, gas and wood pellet boilers. The actions are described in section 3.3. There will therefore continue to be an increase in the expansion of the heating sector, which, as mentioned above, encourages the production of electricity from renewable energy sources there. In order to deal with the electrification of society, the Danish Parliament, with the *Climate Agreement on Green Electricity and Heat 2022*, has allocated DKK 32 million in 2022-2026 to measures and analyses relating to the expansion of the electricity grid and demand response. Further actions addressing electrification are set out in Section 2.3.

With the *Energy Agreement 2018*, a number of measures have also been launched to promote the development of the district cooling machine, such as free choice of technology and improved cross-border operation of district cooling projects. In accordance with the EU Energy Efficiency Directive, Denmark has prepared an assessment of the potential for using high-efficiency cogeneration and efficient district heating and cooling, according to which the potential for district cooling in Denmark is 5 000 MW, of which 40 % could be covered by district cooling networks.

In 2022, Denmark introduced a CO<sub>2</sub>e-displacement requirement in road transport, which should, inter alia, incentivise the use of fuels with a high cradle-to-grave reduction effect. CO<sub>2</sub>e-displacement requirement is 6 % in the period 2022-2029, and 7 % from 2030. Most of these reductions are to be achieved by using greenhouse gas reducing fuels (fuels that reduce life cycle greenhouse gas emissions per unit of energy measured by air. 94,1 GCO<sub>2</sub>eq/MJ). CO<sub>2</sub>e-displacement requirement for these greenhouse gases reducing fuels is phased in by 3.4 % in 2022-24, rising to 5.2 % in 2025, 6 % in 2028 and 7 % in 2030 onwards.

In Denmark, all cars are in principle subject to registration tax. The registration tax is calculated according to the value of the car (including VAT) and the CO<sub>2</sub> emissions of the car. For zero-emission (electric) and low-emission (plug-in hybrid) cars, the tax is phased in continuously. The registration tax therefore amounts to zero DKK for electric cars with a purchase price of up to approximately DKK 400.000 until 2025. In addition, passenger cars and vans pay six-monthly ownership tax, which for cars first registered on or after 1 July 2021 is differentiated according to the CO<sub>2</sub> emissions of the cars. As a result, electric cars pay the lowest rate of the ownership tax.

The *agreement on the development and promotion of hydrogen and green fuels* aims for Denmark to have 4-6 GW of electrolyser capacity by 2030. The development with PTX must, as far as possible, take place under market conditions and taking into account the Danish security of supply. Electrolysis, the key technology of PTX, enables the production of fuels and chemicals that can replace fossil products in a number of hard-to-reach sectors such as shipping, aviation, agriculture, parts of industry and parts of heavy road transport. Without the transformation of these sectors, Denmark is deemed unable to achieve the long-term objective of climate neutrality by 2045.

**Actions to use energy system integration to balance the electricity grid and ensure the integration of renewable electricity (including through increased flexibility and storage);**

It is possible for renewable energy resources to enter the reserve capacity market for manual reserves for the

provision of upward regulation. Today, RES can enter reserve capacity markets without having a backup capacity by submitting a forecast to Energinet with a maximum probability of 10 % not being able to deliver. This forecast is approved by Energinet on the basis of previous forecast data. In this way, both more RES is introduced into the system, while RES also contributes to addressing the balancing challenges posed by these fluctuating sources.

Energy networks have recently developed new tender specifications for mFRR that address major electricity system imbalances that will enter into force in May/June 2023 and affect independent aggregators providing entry-bearing system services. The tender specifications will be aligned with those of the North market. In addition, Energinet is currently developing a new methodology for compensation mechanisms and downward rebalancing of imbalances. The compensation and correction model ensures that the independent aggregator is correctly settled without any financial impact on the imbalance settlement by balance responsible parties.

The minimum bid size has been lowered to 1 MWh, which will ensure that more flexibility providers can offer flexibility resources in favour of the common electricity grid. In addition, 10 % of the transmission capacity between DK1 and DK2 will be reserved for the exchange of mMFF capacity.

In order to ensure sufficient capacity in the electricity grid to integrate large amounts of renewable energy, the *Climate Agreement on Green Electricity and Heat 2022* of 25 June 2022 launched, inter alia, a series of analyses and initiatives to ensure a proactive and cost-effective expansion of the electricity grid.

As part of this, analyses are being launched on how to ensure the proactive expansion of the transmission network, incentives for fast grid connection in the distribution network, the promotion of flexibility markets, the development of new flexible grid connection conditions and products, as well as faster implementation of tariff models and the extension of tariffs to promote flexibility. Model development is also being launched for better monitoring and forecasting of electricity grid capacity in Denmark.

Agreement on the *Development and Promotion of Hydrogen and Green Fuels* enables geographically differentiated consumption tariffs and direct lines at and above 10 kV. The agreement will also improve the possibilities for grid companies to make local collective tariffication for local associations of network users who produce and consume in a way that reduces the burden on the collective electricity grid.

The actions will thus contribute to strengthening the ability to efficiently accommodate an increased amount of renewable energy (RES) into the electricity grid by promoting an appropriate location of electricity consumption and generation. This could make more efficient use of grid capacity, which could reduce the need for investment in the electricity grid. Furthermore, the Agreement on the *Development and Promotion of Hydrogen and Green Fuels* states that PTX is expected to contribute to an integrated and flexible energy system where PTX is integrated into the energy system in a way that supports and complements existing supply sectors such as electricity, gas and district heating.

**Actions to ensure access to data on supplied renewable energy and greenhouse gas emissions to consumers, including electric car users (in line with Article 20a of the revised RED);**

Energy networks have set up a data service with data on prices, output, consumption, ancillary services, capacities, etc. The database is open to all actors and individuals, including data on the CO<sub>2</sub> concentration in the electricity produced down to 5 minutes intervals. The data service can also provide an overview of the different electricity generation sources and how much they contribute to meeting consumption in each hour.

This includes biomass, onshore/offshore wind, solar, water, waste, miscellaneous fossil fuels and foreign compounds. However, it cannot be seen where the foreign flow is produced.

Energy networks have recently developed new tender specifications for mFRR, which will enter into force in May/June 2023 and which affect independent aggregators providing ancillary energy services. The minimum bid size has been lowered to 1 MWh, which will ensure that more flexibility providers can offer flexibility resources in favour of the common electricity grid.

Today, it is possible to purchase smart charging solutions for non-public purposes in Denmark through a number of charging operators. The market is still new and there are still developments that can be done to ensure even easier smart charging from end customers' electric cars. In particular with regard to the data layer: release only their charging data in a way that allows customers to allow third parties to manage their charging relevant to the energy system and the collective electricity grids.

The Environmental Protection Agency monitors compliance with the provisions on capacity marking of portable rechargeable batteries and automotive batteries and accumulators, which are regulated in Commission Regulation (EU) No 1103/2010 establishing rules for marking the capacity of portable rechargeable batteries and automotive batteries and accumulators.

Denmark is currently complying with the average annual RES share increase from the revised Renewable Energy Directive (Article 23 (1)) without further action. Denmark has implemented two or more measures pursuant to Article 23 (4) of the Directive. Under point (b), for example, Denmark has a 95 % efficient supply of district heating and cooling. In addition, as part of the 'Climate Agreement on Green Electricity and Heating', the Danish government has set a political ambition that from 2035 there should no longer be homes in Denmark that were built up by gas boilers and that all gas in Denmark should be green by 2030. In 2026, the Danish government will present possible initiatives and the financing needed to achieve the ambition of phasing out gas boilers in 2035 and 100 % of green gas by 2030.

A credit mechanism for electricity has been put in place, whereby compliance with the CO<sub>2</sub> e-displacement requirement can be partially achieved by counting electricity delivered through publicly accessible recharging points. The electricity supplied shall be capable of being adequately measured, monitored and documented. A publicly accessible recharging point is defined in Directive 2014/94/EU of the European Parliament and of the Council on the deployment of alternative fuels infrastructure of 22 October 2014.

- (ii) *Where appropriate, specific measures for regional cooperation as well as, as a month; equality, the estimated excess production of energy from renewable sources which can be passed on to other Member States in order to meet the national contribution and the precursors referred to in point 2.1.2;*

### **Joint projects for the production of renewable energy (Art. 9 and Art. 11**

Denmark and Germany have concluded an agreement to realise the Bornholm energy island as a joint renewable energy project under Article 9 of the RVE II Directive for cross-border projects. This implies that the parties share the relevant costs and benefits of the project, including inter alia infrastructure costs on Bornholm energy island and RES shares. In this context, the partners are).

Denmark overachieved the separate national target for Member States' renewable energy shares in 2020 and

is expected to meet the milestones by 2030 laid down in the Governance Regulation (EU) 2018/1999. On this basis, Denmark has previously concluded agreements on statistical transfers of excess renewable energy shares. For 2020, agreements were concluded with the Netherlands, Flanders and Ireland. The agreements were concluded for one year at a time, with the condition that the funds are earmarked for greening in Denmark and specifically for PTX in one case. In addition, Denmark has concluded another one year agreement for 2021 with Flanders and two multiannual agreements with Belgium and Luxembourg for the years 2021-2025. The multi-annual agreements are dedicated to energy islands, green transition and offshore wind, as well as green gases. However, Denmark is expected to continue to make a profit on renewable energy shares until 2030, so that new agreements may be possible.

### **Measures to prepare the EU for trade in renewable hydrogen, prioritising energy and water needs for the local population**

At the North Sea meeting of 18 May 2022, Denmark and Germany signed a Letter of Intent for cooperation on PTX. Subsequently, the Ministry of Climate, Energy and Utilities and the Federal Ministry of Economic Affairs and Energy (BMWK) have concluded a bilateral declaration on cooperation on cross-border infrastructure that can support the export of Danish-produced green hydrogen to Germany. ....

### **Regional cooperation**

Denmark cooperates with other European and non-European countries on renewable energy in a number of fora. European political fora include b.la. BEMIP and North Seas Energy Cooperation

#### **BEMIP**

In the Baltic Energy Market Interconnection Plan (BEMIP), Denmark, Finland, Sweden, Estonia, Latvia, Lithuania, Poland and Germany (Norway as an observer) work together to create an open and integrated regional electricity and gas market between Member States, and to develop sea wind and the electricity grid in the Baltic Sea region.

BEMIP cooperation contributes to the implementation of several objectives and policies in the Energy Union. This is the case, inter alia, with regard to decarbonisation, where efforts are being made to promote the production of renewable energy more easily cross-border projects, including offshore wind development in the Baltic Sea. It shall also cooperate on plans for the development of the electricity and transmission network (ENTSO-E on the Offshore Network Development Plans) and for the development of the European gas and electricity markets and for the interconnection of the Baltic electricity and gas markets with the European market.

#### **NSEC**

North Seas Energy Cooperation (NSEC) supports and facilitates the development of offshore wind potential as well as net building in the North Sea. Cooperation takes place between Denmark, Germany, Luxembourg, Belgium, the Netherlands, France, Ireland and Sweden (Norway as observer country).

NSEC cooperation contributes to the implementation of several objectives and policies in the Energy Union. This includes the promotion of renewable energy production through cooperation on cross-border projects and offshore wind development in the North Sea. In addition, work is being undertaken to strengthen the internal market through jointwork on offshore network development plans and the development of the

European market in renewable energy, including through hybrid projects.

- (iii) *Specific measures concerning financial support, where appropriate, including Union support and the use of Union funds, to promote the production and use of electricity from energysources, heating and cooling and transport;*

### **Expansion of onshore wind and solar energy**

In the future, it is expected that RES development on land will be free of support. The expansion of RES on land has been promoted by different support schemes. Most recently, in the period 2018-2021, technology-neutral tenders have been organised to allow land-based wind turbines, solar cells and open-door offshore wind turbines to compete for the best possible support. With the *K*Climate Agreement on Green Electricity and Heat of June 2022, the parties to the agreement decided to stop organising technology-neutral tenders. In connection with the agreement, it was decided to apriori put DKK 355 million from the TNU into a pool for RES on less accessible areas. The scheme is a subsidy pool to support renewable energy production on less accessible areas, such as larger roof areas, along motorways, etc., in order to respond to a desire to support RES on existing infrastructure and to support innovative loosening.

### **Experimental wind turbines**

In Denmark, a scheme has been in place since 2018 to support the installation of on-shore experimental wind turbines with the aim of supporting the technology development of wind energy and ensuring continued development activities. With the Climate Agreement on Green Power and Heat of June 2022, the parties to the agreement decided to shift the aid to experimental wind turbines in 2023-2024 from operating aid to investment aid, as recommended in the 2021 Experimental Mill Analysis. In addition, the parties to the agreement agree that, at the same time, the necessary legal basis is ensured for support to include tests at sea. In 2023, a majority in the Danish Parliament adopted this legal basis to support sea tests and the conversion to investment aid. With the agreement on green tax reform for industry, etc., DKK 100 million was earmarked for testing offshore wind turbines from June 2022, financed by the green space. Denmark is continuously working to support and ensure good framework conditions for testing experimental wind turbines, which can facilitate the industry's ability to bring new types of wind turbine to the market. Currently, a national screening for the location of a possible third testing centre is being carried out, as well as the decision to adapt Høvsøre test centre to future wind turbine types.

### **Offshore wind farms**

#### *Kriegers Flak*

Kriegers Flak was offered in 2015 with a support model with the possibility of support for a production of 50.000 full load hours (equivalent to 30 TWh). This corresponds to approximately 11-12 years, depending on the production in each year, including, inter alia, how much the wind blows. The tender was won by Vattenfall at a price of DKK 37,2/kWh. This means that the park receives aid when the electricity price is less than DKK 37,2/kWh, where the aid is equal  $(37,2 \text{ øre/kWh} \text{ minus the electricity price in the current hour})$  multiplied by the output in that hour. When the price is above 37,2 øre/kWh, negative price supplements are reprocessed equal to  $(\text{electricity price minus DKK } 37,2/\text{kWh})$  production that is not collected but offset against the following aid payments. Kriegers Flak has a capacity of 605 MW and came into operation in the first half of 2021 and has a technical lifetime of 25 years.



*Thor:*

Thor was tendered in 2021 with a modified two-sided CfD, with a maturity of 20 years. Thor model anreverses the average spot price in the last calendar year as the reference price. If the electricity price in the last calendar year is above the winning electricity price, in the current year the producer must pay the difference as a fixed payment per kWh to the State. If the electricity price in the last calendar year is below the winning electricity price, the producer receives the difference in the current year as a fixed price supplement per kWh from the State. When paying the State, the producer may have an incentive to stop production when the payment to the State per kWh is higher than the electricity price. Therefore, a phase-out mechanism has been put in place so that the producer always receives at least 2 øre/kWh as long as the electricity price is 3 øre/kWh or above. A minimum bid price of DKK 0,01 per kWh, a ceiling of DKK 6,5 billion in total aid lossover the term and a ceiling of DKK 2,8 billion in the payment from the producer to the State were set. Bidders had to indicate the size of the park, which would be between 800 and 1 000 MW. In 2021, the tender was decided byplot, when 5 bidders submitted a minimum bid of 0,01 øre/kWh and a park size of 1 000 MW. The lot was won by RWE. The bid price of 0,01 øre/kWh means that RWE pays DKK 2,8 billion to the State within about 3 years of starting payment. Thor to be completed by 2027.

[Vesterhavet South and Nord will follow in the next version.]

## **Biogas**

The use of biogas for specific purposes is financially supported. More specifically, biogas producers are entitled to various forms of direct grants when biogas is used to produce electricity or heat, upgraded to biomethane, used as fuel in the transport sector or used in industrial processes.

In the *Energy Agreement 2018*, it was decided to close the current biogas support schemes by 2020. It is clear that no new plant can enter the existing subsidy schemes as of 1 January 2020 and that ex- hoeding plants will continue to receive aid until the end of the 20-year support period.

In June 2020, the *Climate Agreement for Energy and Industry, etc. 2020* agreed that the future support for biogas and other green gases is based on a bidding process with 6 tenders up to 2030. The scheme is pre-notified to the European Commission and is awaiting final approval under the EEAG State Aid Guidelines.

## **Electricity and heat from solid biomass**

Electricity production using solid biomass was supported with a fixed subsidy of DKK 0,15/kWh until 1 April 2019. The scheme ran for 10 years until April 2019 and covered existing and new biomass combined heat and power plants. The flat-rate subsidy scheme in combination with the tax exemption for biomass fuels used for heat production has been a driver of fuel switching from coal and gas until 2019. The June 2018 political agreement set up a viable support system, which entered into force after 1 April 2019.

There are two aid schemes:

1. Existing non-depreciated installations continue with a fixed subsidy of DKK 0,15/kWh throughout the depreciation period.
2. Depreciated installations may receive a fixed subsidy calculated on the basis of the difference in operating costs of using biomass compared to an alternative fossil reference.

## Heating and cooling

There are a number of support pools that provide subsidies for heat pumps both in district heating production and for the roll-out of district heating and heat pumps in individual heating and in companies. Funds have been allocated to the support pools with Energy Agreement 2018, Climate Agreement for Energy and Industry, etc. 2020, the Climate Agreement on Green Electricity and Heating 2022 and the Winter Aid Agreement 2022, as shown in Section 3.3, where the pools are also further elaborated.

The basic amount of support for decentralised natural gas-based CHP plants ended in 2018, leading to lower revenues and higher prices for some district heating companies. As a helping hand to needy plants and customers, the parties behind the Energy Agreement 2018 agreed to allocate funds for a number of measures to deal with the end of the basic amount, including what subsequently became the start-up subsidy. The start-up aid was last adjusted in March 2022 and provides subsidies for collective heat pumps and solar thermal installations that crowd out fossil district heating production. Two rounds of applications have been held so far in 2021 and 2022 respectively. With the Winter Aid Agreement of 23 September 2022, a further DKK 25 million was allocated to an application round in 2023. See also section 2.3.

- (iv) *Where applicable, the assessment of support for electricity from renewable energy sources to be carried out by Member States pursuant to Article 6(4) of Directive (EU) 2018/2001;*

[As regards assessments of RES support schemes for electricity in Article 6(4) of the RES Directive, this is an assessment to be carried out by the Member State every five years. Denmark has not yet carried out an overall assessment of support schemes as described in Article 6(4) of the Renewable Energy Directive. However, it should be noted that the obligation to carry out assessments is just now being written into the Act on the Promotion of Renewable Energy (VEAct), so it will in future be clear from Danish law that the Ministry of Climate, Energy and Utilities is under an obligation to carry out assessments at least every 5 years. Once assessments have been made, this assessment shall be included in the relevant updates of their integrated national energy and climate plans and progress reports.]

- (v) *Specific measures to establish one or more contact points, streamlining the administration positive procedures, provision of information and training, and promotion of the uptake of PPs.*

## Actions to speed up and simplify permit granting processes

The Government has established the National Energy Crisis Team (NEKST). NEKST is a new working method with new working communities tasked with solving and coordinating the acute green challenges across authorities, municipalities and other stakeholders. This will be done in dedicated working groups in which all relevant co-fundactors are represented. The working groups can identify where concrete spreads for the green transition emerge today. This can range from barriers such as regulation and legislation to the workflows of myths, application processes, lack of skills, materials, etc. NEKST must continuously present proposals for concrete actions and put in place solutions to the acute green challenges – this means that swift action can be taken in the work of the working groups.

### *Permit-granting processes on land*

Local buy-in and successful government processes are key to realising the expansion of onshore energy, which is why initiatives to increase local anchoring *and faster planning processes in municipalities were launched on the basis of the Climate Agreement on Green Electricity and Heating 2022*. The process of granting concrete

projects will depend on the location and nature of the project. An initiative has been launched to improve map data for municipal planning and developers' design of RES installations. From 2023 onwards, municipalities will also be able to seek guidance from a State RES travel team, which is intended to ensure, among other things, good examples of the realisation of renewable energy projects in the municipalities. In addition, NEKST will identify barriers to the agreed ambitions for the scaling of solar and wind on land, including quicker ratios and interactions between RES authorities, and recommend to the Government any measures to accelerate offerings.

With the *Climate Agreement on Green Electricity and Heat 2022*, it has been decided to launch a series of analyses to explore, among other things, the possibility of faster grid connection of renewable energy installations and more proactive grid expansion, which are expected to be completed in the course of 2023 and 2024. Overall, this is expected that the results of the analyses will help to ensure faster deployment of RES on land.

#### *Permit-granting processes on the sea*

The *Climate Agreement on Green Power and Heating 2022* agreed to launch "a service check and analysis work" to remove barriers in legislation, to provide smoother case handling and to shorten good recognition- and permit processes for offshore wind farms, including for repowering and leaking life. This has been reaffirmed in the 2022 Government Framework, *Responsibility for Denmark*, where the Government intends to shorten the processing time for the establishment of renewable energy, including whether smoother models for expansion with sea wind can be established.

The work on the service check is carried out in the course of 2023 and is expected to result in a series of measures to facilitate or facilitate the processes for establishing offshore wind.

#### **Actions to ensure a simple regulatory framework for renewable energy communities**

Denmark has ensured that renewable energy communities are subject to simple rules by requiring the Danish Utility Regulator to identify and monitor the removal of unjustified barriers and restrictions to the development of renewable energy communities<sup>23</sup>. With the implementation of rules for renewable energy communities, Denmark has given a wide scope to the type of shaft creator that can be used<sup>24</sup>. Finally, Denmark has chosen not to impose specific requirements on renewable energy communities to register or have been granted a licence in order to have the right to act as a renewable energy community.

#### **Actions to streamline the regulatory procedure and design a one-stop shop**

The governance process for land-based RE is anchored in the municipalities and the simple project process is highly dependent on the nature and location of the project. The authority process follows the procedural rules set out, inter alia, in the Planning Act and the Environmental Impact Assessment Act. Procedural rules are described on [vejekter.dk](http://vejekter.dk), which aims to facilitate the administrative process for developers of RES installations by designating a single contact point to provide guidance on the administrative process<sup>25</sup>. In addition, an overall time limit has been introduced for processing applications for permits covered by the permit granting

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Section 18 of<sup>23</sup> Order No 1069 of 30 May 2021

Section 6 of<sup>24</sup> Order No 1069 of 30 May 2021

<sup>25</sup>Order No 1215 of 5 June 2021 on contact points and time limits for renewable energy permits

process.

For offshore wind farms, the Danish Energy Agency is the one-stop shop for administrative procedures, in which the Agency plays a key role in planning, issuing permits for projects and coordinating with all relevant authorities. Information and guidance on procedures and the authorisation process are also gathered on a single website. The Danish Energy Agency issues the main permits to carry out both exploratory studies (geophysical, geotechnical and environmental studies) and to establish the offshore wind farms, where the installation permit also acts as an EIA permit for the projects. When carrying out the EIA process at sea, the Danish Energy Agency ensures a combined process with possible impact assessments under the Habitats Directive and guides the applicant throughout the EIA process. In addition, the Danish Energy Agency shall also issue the electricity generation licence for the start of operation of the installation, as well as permits for repowering and extending the life span.

### **Actions to roll out digitalised procedures**

VEjekter.dk provides developers with a comprehensive overview of permits to establish and operate RES installations through one single entrance. The website thus constitutes the formal online manual of procedures required by the RES Directive and indicates how to apply for the permits covered by the permit granting process. It is possible for developers to contact the contact point through vejekter.dk for overword-net guidance.

### **Actions to streamline the environmental assessment process**

Efforts are being made in Denmark to streamline the environmental permit process so that environmental impacts can be identified and managed as early as possible in the process of environmental assessment of the plan and in connection with the environmental impact assessment of the specific project. In order to enable the large expansion of renewable energy on land by 2030, the parties to the climate agreement have allocated funds to ease land restrictions. At the same time, it is crucial to ensure nature, environmental and biodiversity considerations. For this reason, resources are also allocated for strengthened guidance on environmental assessments and the Nature Directives. This will, inter alia, help minimise referral of cases from the Boards of Appeal, leading to longer processes, and increase the possibility of shorter processes and alignment between the Nature Directives and the consideration of the development of renewable energy.

### **Measures to simplify the repowering of existing renewable energy.**

#### *Repowering on the sea*

In connection with the implementation of the VE II Directive, an authorisation to lay down rules on time limits for repowering projects was introduced, which was implemented by Order No 1215 of 5 June 2021 on contact points and time limits for the renewable permit granting process. The authorisation does not provide a legal basis for establishing a simplified permit granting process for repowering projects on the sea.

As a result, Denmark expects the Renewable Energy Act to lay down an enabling provision enabling the Minister for Climate, Energy and Utilities to lay down rules on a simplified and rapid permit granting process for repowering and extension of life. Denmark will then implement the authorisation at the nine level of the Order, which is expected to enter into force on 1 January 2024. This will be drawn up on the basis of the experience gained by the Danish authorities in connection with the first repowering cases at sea.

#### *Land repowering*

The complexity of the permit granting process will most often reflect the impact of the changes sought by the

repowering project. For changes that fall within repowering, there is in practice a blunted permit-granting process. However, the content and scope of the permit granting process will depend on the specific project.

### **Measures to encourage innovative projects**

In order to promote innovative projects in the field of energy, Denmark has three main funding programmes – *EUDP, ELFORSK and Innovation Fund*, all of which support the development of new solutions and technologies in the field of energy.

#### *EUDP*

The Energy Technology Development and Demonstration Programme (EUDP) is a technology-neutral grant span in its priorities. The EUDP aims to support Denmark's energy and climate policy objectives of high security of supply, phasing out fossil fuels and reducing greenhouse gas emissions in line with climate objectives. Efforts must go hand in hand with promoting business potential for growth and jobs in Denmark. The EUDP supports every year businesses and universities in expanding, testing and demonstrating climate-friendly energy technologies and system solutions. In 2022, the EUDP committed some 60 projects to state aid. In 2022, a total of DKK 498 million was allocated to the development of new energy technology in the EUDP.

#### *ELFORSK*

ELFORSK has an annual allocation of DKK 25 million for innovative projects to support the electrification and green transition of the Danish energy system. Grants shall primarily be awarded for research and development checks aimed at *promoting efficient energy use and flexibility solutions in the fields of electricity and energy through data, digitalisation and sector coupling*. In 2022, DKK 20 million was translated into 3 projects. More concretely, they are about optimising industries through machine learning, smart use of data in a port and digitised interaction between transport and electricity networks.

#### *Innovation Fund*

The *Grand Solutions programme* under the Innovation Fund invests in cross-cutting research and innovation-projects that provide new solutions to key policy challenges for society. In 2022, in the area of *Green Research, Technological Development and Innovation*, DKK 455 million was implemented. Of this, projects in the energy sector amounting to approximately DKK 150 million were launched.

In 2021-2023, a large majority in the Danish Parliament allocated a total of DKK 1,3 billion to four green research and innovation partnerships. Overall, the Innovation Fund is responsible for these. The partnerships will bring together its researchers, businesses and organisations to put Denmark at the forefront of *storage and use of CO<sub>2</sub>, PTX, climate, environmentally-friendly agriculture and food production, and circular economy*. In the field of energy, approximately DKK 200 million was transferred to the *INNO-CCUS partnership* in 2022, which will implement the roadmap for Denmark's capture, storage and use of CO<sub>2</sub>. In 2022, approximately DKK 200 million was also allocated to the second energy *partnership Mission Green Fuels (PTX)*, which will work to phase out fossil fuels in shipping, heavy road transport, aviation and the maritime shipping industry.

### **Actions to facilitate power-purchase agreements (PPAs)**

Pursuant to Article 15 (8) of the Renewable Energy Directive, Denmark is obliged to remove unjustified barriers to entering into power purchase agreements PPA. There are not considered to be unjustified barriers to the conclusion of PPAs in Denmark and it is considered that parties wishing to enter into PPAs have the possibility to do so today. In addition, it is noted that PPAs should not prevail over other mechanisms that

provide long-term price signals, such as the established forward markets.

**A summary of policies and measures under the enabling framework shall be introduced pursuant to Article 21(6) and Article 22(5) of Directive (EU) 2018/2001 to promote and facilitate the development of self-consumption and renewable energy communities;**

### **Renewable energy communities**

In order to create an enabling framework for renewable energy communities, Denmark has, among other things, ensured that renewable energy communities are subject to simple and transparent rules. This has been achieved, among other things, by making renewable energy communities largely subject to comparable rules such as citizen energy communities<sup>26</sup>. With the implementation of rules for RES traps, Denmark has given a wide scope to the type of companies that can be used<sup>27</sup>. In Denmark, the Danish Utility Regulator is required to identify and monitor the removal of unjustified barriers and restrictions to the development of renewable energy communities<sup>28</sup> and to oblige grid companies to cooperate with renewable energy communities to facilitate the sharing of electricity within the renewable energy community.<sup>29</sup> There was previously a guarantee fund<sup>30</sup>, which could also be used under certain conditions by the RES community to seek funding for feasibility studies for wind turbines, photovoltaic installations, wave power plants and hydroelectric installations. As a further measure, the Climate, Energy and Utilities Minister has put in place a pool that can facilitate both access to finance and information for renewable energy communities<sup>31</sup>.

Renewable self-consumers located in the same building shall have the right to share renewable energy via the collective electricity grid generated in connection with their respective consumption sites.

Renewable self-consumers currently do not pay transmission tariffs for the part of the electricity that is consumed directly by self-generation. The same applies to electricity consumed by tenants in a landlord-judgment rented out by the renewable self-consumer. In the first half of 2023, rules are expected to improve the similarities for local collective tariffication of associations of network users at all voltage levels. This will allow, for example, energy communities to benefit from a tariff that rewards the coincidence of consumption and production of the end, thus making more cost-effective use of the collective network.

It should also be noted that a renewable self-consumer is exempt from electricity tax for electricity produced from renewable energy that is directly consumed by the renewable self-consumer himself or by the renewable self-consumer's lessee in a rental property when the installation is located in connection with the rental property.

### **Measures to ensure access to solar energy for energy poor households and vulnerable consumers**

Overall, the Danish energy system is characterised by low electricity prices and high security of supply. Electricity is transported and distributed via the collective electricity distribution network operated by the Danish grid companies there and Energinet. In 2030, it is expected that the Danish electricity system will be largely based on renewable energy. In this way, it is estimated that also vulnerable and vulnerable households

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The<sup>26</sup> Order no1069 of 30.may 2021

The<sup>27</sup> Order no1069 of 30.may 2021 § 6

The<sup>28</sup> Order no1069 of 30.may 2021 § 18

Section 15 of<sup>29</sup> Order No 1069 of 30 May 2021

Section 21 of<sup>30</sup> Consolidation Act No 1791 of 2 September 2021

<sup>31</sup>Order No 1162 of 9 August 2022

will have access to renewable energy. It should also be mentioned that vulnerable households in Denmark are supported by social legislation and social policy and therefore they are not supported by energy legislation.

### **Actions to assess and remove unjustified barriers to the development of renewable energy communities and citizen energy communities;**

Denmark has instructed the Danish Utility Regulator to identify and monitor the removal of unjustified barriers and restrictions to the development of renewable energy communities and citizen energy communities<sup>32</sup>.

### **Investment framework and actions to accelerate solar energy investments in combination with renovations, storage and heat pumps**

In June 2022, the Danish Energy Agency published an analysis of the forward-looking need for technology-neutral tenders, which concluded that the forward-looking expansion of wind and solar projects could happen on market terms without State support. With the Climate Agreement on Green Electricity and Heat of June 2022, a large majority of the Danish Parliament agreed to ensure framework conditions to enable a four-fold increase in total electricity production from solar and terrestrial wind by 2030. Against this background, it is considered that investing in rural wind and solar projects in Denmark will remain attractive in the future.

The agreement also decided that the 2023 Building Pool would be split into two separate pools, targeted conversion to a heat pump or energy renovation projects such as replacement of windows or post-installation insulation. In this way, private citizens can apply for subsidies for either energy renovations or conversion to heat pump from oil, gas or wood pellet boilers and electric heat. The two new pools, the heat pump pool and the Energy Renovation Pool, will, like the Building Pool, be managed after the first, first come, first served principle, where properly completed applications start in the order in which they were received. It is assumed that the Building Pool may have an incentive and at least accelerated effect, with which it is expected that a proportion of the conversions or renovation projects would not have been carried out in the absence of subsidies.

### **Actions to remove administrative barriers to cost-effective extensions of systems already installed**

As far as the Danish Energy Agency has been informed, there are no significant administrative obstacles linked to the effective extension of existing systems in Denmark. Therefore, there are currently no objectives or specific actions to remove barriers to the expansion of already installed systems.

The Government has established the National Energy Crisis Team (NEKST). NEKST is a new working method with new working communities tasked with solving and coordinating the acute green challenges across authorities, municipalities and other stakeholders. This will be done in dedicated working groups in which all relevant co-factors are represented. The working groups can identify where concrete spreads for the green transition emerge today. This can range from barriers such as regulation and legislation to the workflows of permits, application processes, lack of skills, materials, etc. NEKST must continuously present proposals for concrete actions and put in place solutions to the acute green challenges – this means that swift action can be taken in the work of the working groups.

### **Measures to support built-in integrated photovoltaic installations for new buildings and renovations**

The share of buildings with photovoltaic cells has been increasing in Denmark over the last 20 years. In the

period 2016-2020, the share of newly constructed non-residential buildings with photovoltaic cells was around 40 %. For dwellings, it is around 20 % that have photovoltaic cells. In order to promote energy efficiency, Denmark imposes stringent requirements on the energy framework for new buildings in the Building Regulations. The energy framework indicates an upper limit on the total energy input needs of a newly built building for heating, ventilation, cooling and domestic hot water. Part of the energy framework can be met through electricity generation from renewable energy installations such as photovoltaics. The strict requirements thus help to provide incentives to install photovoltaic cells when building new ones, because, for example, the lack of energy performance in the energy framework can be covered by additional insulation, solar heating systems, heat pumps or solar cells.

### **Action to remove barriers to innovative forms of solar energy deployment**

In Denmark, the focus is on supporting efforts to research and develop new solutions for the energy sector. To this end, Denmark has three main funding programmes – *EUDP*, *ELFORSK* and *Innovation fon*, all of which support the development of new solutions and technologies in the field of energy. Support for innovative solar-screening is supported, inter alia, through the EUDP, a technology-neutral grant programme. The main objective of the EUDP is to support initiatives to develop new technologies and system solutions that can overwhelm fossil fuels, increase energy efficiency and at the same time boost green growth and job creation. In 2022, the EUDP committed some 60 projects to state aid. In 2022, a total of DKK 498 million was allocated to the development of new energy technology in the EUDP, of which 3 % was allocated to solar energy projects.

### **Measures to ensure that all new buildings are ‘solar ready’ and that solar energy is made mandatory for building categories described in the EPBD revision;**

[As negotiations on the EPBD are still ongoing, some requirements have not yet been adopted. Therefore, no action has been taken to comply with the above]

- (vi) *Assessment of the need to deploy new infrastructure for district heating and cooling from renewable energy sources*

Denmark has a total volume of VE and surplus heating in the national district heating and cooling sector of 76 %. This means that Denmark, as a Member State, is exempted from the RES share target under the revised Renewable Energy Directive (Article 24 (4)). In the light of this, Denmark will not have to fill in the current subsection.

- (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: both domestic potential and imports from third countries;*
  - *other uses of biomass in other sectors (agricultural and forestry sectors) as well as ahead of actions targeting sustainable production and use of biomass;*

Denmark currently has no concrete measures to promote the production of electricity from new biomass fired plants after 2020. Biomass fuels for heating purposes, with the exception of biogas, are not taxed, as energy from renewable sources is not taxed or covered by the CO<sub>2</sub> quota Scheme.

The 2020 biomass analysis describes the Danish consumption of solid biomass fuels for energy, existing-



framework conditions and related issues relating to the resource base and sustainability. There have been no subsequent analyses of the same scope, but in September 2022 the National Bioeconomy Panel launched a number of recommendations on bio-resources in general, including the use of biomass for energy production. The National Bioeconomy Panel also points to, as well as opportunities to increase, the production of domestic biomass supply in Denmark.

Denmark has implemented the VE II Directive<sup>33</sup> (Articles 29, 30 and 31) and a broad political agreement on wood biopulp<sup>34</sup> from October 2020. The Danish legal requirements on the sustainability of biomass for the production of electricity, heating and cooling entered into force on 30 June 2021. Sustainability requirements must reduce as far as possible the risk of using '*unsustainable produced biomass*' in Denmark, i.e. biomass fuels with a high climate or biodiversity impact. At the same time, the requirements are formulated in a flexible manner in order to ensure security of supply and consumer heat prices.

The overall Danish requirements are more ambitious than the minimum level of the VE II Directive on a number of points. The stricter Danish implementation includes reduced plant limits for heating and CHP plants, which means that several plants are covered. In addition, there are requirements for several categories of biomass, namely wood from woody industries, hedgerows, etc. (non-forest) and additional requirements are imposed on forest biomass. Finally, there are requirements for older installations to be subject to (higher) fossil greenhouse gas saving requirements in the supply chain.

The additional Danish sustainability criteria were notified to the EU on 16 February 2021<sup>35</sup>.

The Danish sustainability requirements build on the Danish energy sector's voluntary industry agreement of 2014, which laid down a set of sustainability criteria for the use of wood-based biomass fuels in energy production. Electricity production from the use of solid biomass fuels in existing installations in the current setup is supported by a fixed subsidy of DKK 0,15/kWh. This aid scheme has been complementary to the tax exemption for biomass fuels used for heat production.

### 3.1.3 other elements of the dimension

- (i) *Where applicable, national policies and measures affecting the sector that is: covered by the EU ETS and the assessment of the complementarity and impact of the EU ETS*

Not applicable. Although most of Denmark's policies and instruments related to energy consumption mentioned in Table 1 will have an impact on both EU ETS CO<sub>2</sub> emissions and ESR greenhouse gas emissions, as mentioned in Chapter 3.1.1, no separate assessments of the effects on emissions from companies covered by the EU ETS have been carried out.

- (ii) *Policies and measures to achieve other national targets, where applicable*

Among Denmark's policies and instruments with an impact on greenhouse gas emissions reported in 2023 in Denmark's Eighth National Communication and Fifth Biennial Report under the United Nations Climate Change Convention (UNFCCC<sup>36</sup>) and under the EU Governance Regulation, see Table 10, there are several

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<sup>33</sup>[Directive \(EU\) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources](#)

<sup>34</sup>[Agreement on sustainability requirements for woody biomass for energy \(kefm.dk\)](#)

<sup>35</sup>[Search the database – European Commission \(europa.eu\)](#)

<sup>36</sup>United Nations Framework Convention on Climate Change

policies and actions that will also contribute to achieving the domestic 70 % greenhouse gas emission reduction target by 2030 compared to 1990.

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

The development of green transport needs to be accelerated by 2030. The transport sector's emissions are expected to account for approximately 36 % of Denmark's total CO<sub>2</sub>e-emissions in 2030, corresponding to 10,2 million tonnes of CO<sub>2</sub>e.

The government has mainly implemented initiatives targeting those subsectors in the transport sector where emissions are most likely and green technologies are most mature, i.e. mainly in road transport.

Road transport accounted for around 91 % of the transport sector's national emissions in 2020, of which approximately 57 % came from passenger cars. The electrification of passenger cars has increased in recent years, as electric cars are now technically mature and market-ready and promoted through the *Agreement on the green transition of road transport (2020)* and support for charging infrastructure. For example, electric cars currently account for approximately 30 % of vehicles used for taxi use.

For heavy road transport, electrification is expected to eventually be the main technology to reduce CO<sub>2</sub>e-emissions, while indirect electrification in the form of hydrogen trucks and other renewable fuels is also expected to play a role in the transformation of heavy road transport. Under *the agreement on mileage based tolls (2023)*, lorries will pay tolls from 2025 onwards according to how far they are driving in Denmark. The tax will vary according to the CO<sub>2</sub> emissions of the lorry.

Rail, domestic and domestic aviation and other transport together account for less than 10 % of the transport sector's national emissions. Parts of rail transport have already been converted to electricity and emissions are expected to be significantly reduced after 2025 as long-distance and regional trains are electrified. The majority of diesel trains are expected to be phased out by 2035 and emissions from passenger trains are expected to be marginal thereafter. Looking ahead, there is a particular focus on launching initiatives in those sub-sectors that are more likely to transform: aviation, maritime and heavy road transport.

For shipping and aviation, it is currently expected that the use of renewable fuels, in particular under PTX, can contribute to CO<sub>2</sub>e reductions. Electrification and renewable fuels could eventually be a solution for some air routes, and parts of domestic maritime traffic could also be electrified. The Government will, inter alia, make it possible to establish a domestic green route in 2025 and by 2030 fully financed domestic green flights financed by the passenger tax, as well as to speed up the transformation of heavy and maritime transport.

Since 2019, a number of political agreements have been reached, with major initiatives contributing to reductions of 2,3 million tonnes of CO<sub>2</sub>e in 2030. In addition, the agreements contain initiatives to support the green transition of the transport sector.

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

Denmark provides support for renewable energy technologies such as land and sea wind, solar energy biogas, etc. Support is typically given as aid per unit produced for a limited number of years. Renewable energy costs are generally decreasing and increasingly competitive when compared to fossil fuels.

Land wind and solar cells are the cheapest green technologies available on the market today. Technology-neutral tenders in 2018 and 2019 resulted in historically low support prices and showed that the deployment of renewable energy can increasingly be built without subsidies. The expansion is therefore soon considered to be possible under market conditions. The cost of deploying renewable energy has fallen significantly in recent years and is expected to fall further. With a *Climate Agreement on Green Electricity and Heating 2022*,

it has been decided that the funds from the technology-neutral tenders from 2022-2024 will then be reprioritised to other initiatives because renewable energy on land can be built to a large extent without subsidies. In this context, it was agreed to reprioritise DKK 355 million from the TNU to a pool for RES on less accessible areas. The scheme is a subsidy pool to support RES production on less accessible areas, such as larger roof areas, along motorways, etc. to respond to a desire to support RES on existing infrastructure and to support innovative solutions. In addition, several political agreements have been concluded since 2018 on the expansion of Danish sea wind. In these agreements there has been a clear ambition to move towards a more market-based expansion of offshore wind. In 2021, the tender for Thor wind farm was the first tender for offshore wind, which was carried out without aid. Most recently, it was politically decided with *the Climate Agreement on Green Electricity and Heat 2022* to enable the procurement of an additional 4 GW of offshore wind for onset by the end of 2030 without the possibility of support.

There are neither direct nor subsidies for fossil fuels in Denmark; see also Section 4.6.4.

Denmark is working to promote fossil fuel reform internationally as one of the founders of the Friends of Fossil Fuel Subsidy Reform (F-FFSR). The Coalition promotes the phasing out of inefficient fossil fuel subsidies, with a particular focus on holding G20 countries accountable for this commitment, which was also included in the Glasgow Climate Pact at COP26. Denmark also supports the International Institute for Sustainable Development (IISD) Global Subsidies Initiatives (GSI) through a grant. The IISD-GSI supports international figures, national governments and civil society organisations to align subsidies to sustainable development and has been at the forefront of efforts to support the grant reform since 2005.

## 3.2 energy efficiency

Planned policies, measures and programmes to achieve the indicative national energy impact contribution in 2030 and 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 as regards:

- (1) *Energy efficiency obligation schemes and alternative policy measures under Article 7a and 7b; and Article 20(6) of Directive 2012/27/EU, to be drawn up in accordance with Annex III to this Regulation;*

Denmark welcomes the agreement reached between the European Parliament and the Council of the European Union on a recast Energy Efficiency Directive, including a new energy savings obligation.

The government will ensure a strong focus on improving the energy efficiency of both private homes, businesses and public buildings. The Government will assess the efforts together and report on this when the final update of the NECP is delivered in June 2024. This section as well as Annex 11 will then be updated in accordance with Annex III of the Governance Regulation.

Below are the existing measures that contribute to the fulfilment of the current energy saving penalty for Denmark:

### **Subsidies for energy savings and energy efficiency improvements in all-year-round residential buildings (Building Pool):**

The purpose of the Building Pool is to encourage higher levels of energy efficiency in buildings through grants for the implementation of energy improvement projects in all-year-round residential buildings. The focus is on energy savings and energy efficiency improvements, as well as reductions in the use of fossil fuels. The grant scheme is related to residential buildings, with the aim of achieving energy savings through renovation and

conversion to heat pumps. The scheme has been established until 2026. Grants are awarded to owners of residential buildings who have renovated their buildings in accordance with the requirements of the subsidy scheme, so that the most energy-efficient solutions are subsidised. A total of approximately DKK 2,3 billion has been allocated in 2020-2026. From 2023, the building pool has been split into the heat pump pool and the energy renovation pool as agreed in *the Climate Agreement on Green Electricity and Heat 2022*. The distribution of funds from the building pool is 2023 70 % for the heat pump pool and 30 % for the energy renovation pool. The distribution of funds for the period 2024-2026 will be agreed in 2023.

#### **Grants for energy improvements and digital solutions in municipal and regional buildings (Kommunepuljen):**

The action aims to provide grants for the implementation of energy improvement projects and digitalisation checks in municipal or regionally owned and occupied buildings. It is a subsidy scheme that provides subsidies for energy efficiency in regional and municipal buildings, including renovations, conversions from oil and gas boilers to heat pumps or district heating and digital solutions. DKK 150 million was allocated in 2021 and DKK 145 million in 2022.

#### **Energy efficiency in state institutions (EE in state):**

The initiative aims to promote energy-saving efforts in all ministries and associated institutions, etc., including by setting energy saving targets, etc. The action is an implementation of Article 5 and 6 EED. It is also a national policy measure to reduce energy consumption in other buildings used by the State.

#### **Agreement on green renovation of social housing:**

Among other things, the measure aims to encourage renovation efforts in the social housing sector to provide housing with low energy consumption that benefits both tenants and the climate. This is done, inter alia, by incentivising energy renovation in the social housing sector through a green guarantee. Part of the rent paid by tenants in social housing is paid to a fund that finances the refurbishment of the buildings. The conditions for the use of the fund are regularly negotiated between the Government and the Danish Almene Boliger. The agreement provides for a structural shift in the Rural Building Fund's support system with a new green aid criterion, a new green guarantee and a fund for experiments aimed at improving energy efficiency of buildings in the social housing sector. DKK 30 billion was allocated to the whole agreement in 2021-2026.

#### **Business subsidies to enterprises (Commercial Fund):**

The scheme currently produces DKK 188-614 million each year in the period 2020-2029, when most of the funds are implemented in the first half of the period. The scheme is implemented as a subsidy scheme for companies' energy-saving or CO<sub>2</sub> reduction measures. CO<sub>2</sub> reductions were introduced as an additional allocation criterion for grants in the context of a number of major adjustments to the Business Pool, which entered into force on 1 November 2022. Subsidies are granted on the basis of the energy saving or CO<sub>2</sub> reduction of the individual measure and the size of the enterprise. The scheme is open to private companies in Denmark in the vast majority of industries and to most types of projects saving energy or CO<sub>2</sub> from energy emissions.

### **Increase of energy tax for businesses (Agreement on Green Tax Reform 2020):**

It was agreed to increase the energy tax on fossil fuels for businesses by DKK 6 per GJ. The increase shall be phased in by DKK 4/GJ in 2023, rising to DKK 6/GJ in 2025. For mineralogical processes, etc. (e.g. cement and tiles, etc.) and the agricultural sector, etc., the energy tax will be increased by DKK 6/GJ from 2025. The agreement is estimated to imply a reduction of 0,5 million tonnes of CO<sub>2</sub> in 2025. The objective is to reduce CO<sub>2</sub> emissions by reducing the use of fossil fuels for process purposes, etc.

### **Higher and more uniform CO<sub>2</sub> tax (Agreement on green tax reform for industry, etc.) 2022):**

The agreement introduces a higher and more uniform CO<sub>2</sub> tax. When the CO<sub>2</sub> tax has been fully phased-in in 2030, the tax rate will be DKK 750 per tonne of CO<sub>2</sub> emitted for those undertakings that are not covered by the EU ETS subsystem and DKK 375 for the companies covered by the EU ETS. Mineralogical ratios etc. receive a tax of DKK 125 per tonne of CO<sub>2</sub> emitted in 2030. The tax will be phased in from 2025.

As part of a higher and more uniform CO<sub>2</sub> tax, it has been agreed to shift the current energy taxes on fossil fuels to a total CO<sub>2</sub> tax from 2025. This applies to energy taxes on industrial process fuels (process taxes), energy taxes for collective and individual heating (space heating tax) and leg zinc and diesel taxes (fuel taxes).

In all cases, as much as possible is converted up to DKK 750 per tonne of CO<sub>2</sub> (2022 prices) so that the CO<sub>2</sub> tax becomes the same at the starting point for industrial process taxes, space heating tax and fuel taxes. "*As much as possible*" refers to the fact that for a number of energy products the Energy Taxation Directive sets minimum levels of taxation for their use.

Overall, the agreement is expected to ensure a CO<sub>2</sub> reduction of 4,3 million tonnes in 2030 and 1,3 million tonnes in 2025.

### **take action related to existing buildings (energy labelling of buildings, information campaigns, etc. in combination with requirements in the building regulations):**

The measure covers the energy savings from a number of measures aimed at promoting the energy renovation of existing buildings, including, inter alia, active infomatisation measures (SparenEnergie, etc.), an active follow-up to the energy labelling of buildings, BedreBolig, etc. These measures contribute to a reduction in heat consumption. The actions are further developed in section 3.2 (iv).

### **Aid to individual heat pumps for the scrapping of oil, wood pellet or gas boilers (Skrotting scheme):**

The objective of the scrapping scheme is to grant grants to operators who carry out projects in heat customers aimed at energy savings and energy efficiency improvements. This is done through a prequalified company, renting out a heat pump to a heat customer on a subscription for the scrapping of their oil or gas boilers. DKK 20 million was allocated under the Energy Agreement 2018 in the period 2021-2024. Only funds from the Energy Agreement 2018 are mentioned here. Subsequent amendments to the scheme, including the addition of funds, have been added under the action *Action to promote the replacement of oil and gas boilers with district heating or heat pumps* below.

### **Measures to promote the replacement of oil and gas boilers by district heating or heat pumps:**

The savings here are calculated on a number of measures resulting from the *2018 Energy Agreement*, the *Climate Agreement on Energy and Industry, etc. 2020* and in the *Finanslov Agreement 2021*, where additional funds have been allocated to promote the phasing out of oil and gas boilers, etc., for more efficient and green heating forms, such as district heating and heat pumps.

At the same time, *the climate agreement on energy and industry, etc. 2020* a number of other initiatives supporting conversions from oil and gas boilers, including tax changes, etc.:

- 1) Changes to the district heating regulation
- 2) Grants for projects related to the roll-out of district heating distribution networks
- 3) Increased funding for the Scrapping Scheme in relation to. *Energy Agreement 2018 (EA18)*
- 4) Conversions under and increased funds for the Building Pool
- 5) Subsidy for decoupling from the gas network
- 6) Changes in the taxation of heating energy (oil and gas)

DKK 4,7 billion has been allocated from 2020 to 2026 for grants and administration of aid schemes that support the transition from gas and oil to space heating in private homes.

### **Agreement on the green transition of road transport:**

The Green Road Transport Agreement of 4 December 2020 contains a number of initiatives to promote the sale of green vehicles. The agreement includes funding and concrete actions, which are estimated to raise the number of zero- and low-emission cars to 775.000 by 2030. The agreement provides for a reform of the car tax system to give users a greater incentive to opt for electric rather than fossil cars.

- (II) *Long-term Renovation Strategies to support the renovation of the national stock of both offent equal and private residential and non-residential buildings (Article 2a of the EPBD), including policies and measures and actions to promote cost-effective deep renovation and policies and actions targeting the least performing parts of the national building stock in accordance with Article 2a of Directive 2010/31/EU.*

As Directive 2010/31/EU on the energy performance of buildings (EPBD) is under revision and the final requirements for the building area are not known, including requirements for a possible national strategy for the renovation of buildings, it is currently not possible to provide further information on this. The following is therefore limited to Article 2a of the current EPBD and Denmark's long-term renovation strategy, as notified to the EU Commission on 10 March 2020 and 22 June 2021.

### **Long-term renovation strategy**

As notified in Denmark's long-term renovation strategy Parts 1 and 2 of 10 March 2020 and 22 June 2021 (LTRS), Denmark has, pursuant to the Climate Agreement for Energy and Industry, etc. 2020 as well as the Green Housing Agreement established a number of policies and instruments to promote cost-effective and deepenergy renovation efforts, targeting in particular social housing and public buildings.

The instruments described include (see also above for clarification):

- Taxes and levies on energy used for heating buildings
- Building regulations and requirements for buildings' energy consumption
- Energy labelling of buildings
- Building pool<sup>37</sup> (subsidy pool for, inter alia, energy renovation and conversion of fossil heating into small individual heat pumps)
- Scrapping scheme<sup>38</sup>
- Information actions
- Data and digitalisation

To further elaborate on the instruments adopted in the Climate Agreement for energy and industry, etc. 2020 and Green Housing Agreement, which is aimed at energy renovation in Denmark and which is part of Denmark's roadmap for the purpose of improving the energy efficiency of the building stock up to 2050, please see LTRS Parts 1 and 2: <https://ens.dk/ansvarsomraader/energibesparelser/byggeri-og-renovering>

## Analyses

In connection with the work on the LTRS, a number of analyses have been launched in 2019, including the promotion of building cleanings that can serve as a basis for future action. These can be found here: <https://ens.dk/ansvarsomraader/energibesparelser/byggeri-og-renovering>

One of these analyses concerned compliance with the energy requirements of the building regulations when renovating existing buildings and the extent of renovation<sup>39</sup>. As a follow-up to this analysis and on the basis of the agreement of 31 May 2021 *on the design of a pool for sustainable construction*<sup>40</sup>, initiative 5, DKK 4,4 million has been allocated to strengthen cost-effective energy renovations through three measures:

- 1) New training material on energy requirements;
- 2) Guidance and examples of energy requirements; and
- 3) Information on the requirements of the building regulations for home owners.

The initiative should, in particular, follow up on the analysis of compliance with the building regulations' requirements for the implementation of profitable energy renovations from January 2021, but should also be seen in close connection with the other developments already launched as a follow-up to, inter alia, the Sustainable Buildings Strategy<sup>41</sup> of 5 March 2021 and the Climate Agreement for Energy and Industry of 22 June 2020 as regards the promotion of energy efficiency improvements.

As part of the implementation, an inter-ministerial work has been established between the Social and Housing Agency and the Danish Energy Agency, which in 2022 launched three measures, all of which are expected to be completed in 2024. Measures 1 and 2 are carried out by the Knowledge Centre for Energy Savings in Buildings.

- Action 1 on educational materials and courses on energy requirements aims to disseminate knowledge of the energy requirements of the building regulations in vocational training and to further training with a view to promoting the quality of energy renovations.

<sup>37</sup><https://ens.dk/service/tilskuds-stoetteordninger/bygningspuljen>

<sup>38</sup><https://ens.dk/service/tilskuds-stoetteordninger/skrotningsordningen>

<sup>39</sup>[https://ens.dk/sites/ens.dk/files/Energibesparelser/analyse\\_af\\_overholdelse\\_af\\_br\\_energikrav\\_ved\\_renovring\\_samt\\_volumet\\_af\\_renovation\\_2021.pdf](https://ens.dk/sites/ens.dk/files/Energibesparelser/analyse_af_overholdelse_af_br_energikrav_ved_renovring_samt_volumet_af_renovation_2021.pdf)

<sup>40</sup><https://bpst.dk/da/Byggeri/Baeredygtigt-byggeri/NY-Pulje-til-b%c3%a6redygtigt-byggeri#introduktion>

<sup>41</sup><https://bpst.dk/da/Byggeri/Baeredygtigt-byggeri/NY-National-strategi-for-b%c3%a6redygtigt-byggeri#>

- Action 2 on guidance and examples of energy requirements in renovations aims to develop a simple calculation tool that can support tradespeople and advisers being able to easily apply the regulations in practice by calculating whether renovation measures are profitable when they are directly on the ground or away from customers.
- Measure 3 on information on the building regulations' requirements for home owners includes a brand for new homeowners to make them aware of the energy requirements in the building regulations and possible savings in connection with energy renovations. It also contains information on the energy requirements at SparEnergi.dk and at citizens' meetings.

(iii) *Description of policies and measures to promote energy services in the public sector and measures to remove regulatory and non-regulatory barriers to the uptake of energy performance contracting and other energy efficiency service models.*

In order to promote the use of energy services in the public sector, a one-stop shop website ([www.spareenergi.dk](http://www.spareenergi.dk)<sup>42</sup>) has been set up with guidance on how ESCO projects work and what they can be used for. Similarly, the National Association of Local Authorities (KL) works on campaigns to guide municipal bodies in the use of ESCO structure<sup>43</sup>.

The public sector can make use of the PPP structure, which is a public-private partnership that can include energy renovations, but is particularly used for new barley.

(iv) *Other planned policies, measures and programmes to achieve the indicative national energy efficiency contributions in 2030, as well as other objectives referred to in point 2.2. (e.g. measures to promote exemplary and energy-efficient public procurement of public bodies' buildings, measures to promote energy audits and energy management systems, consumer information and education measures and other measures to promote energy efficiency.*

### **Phasing out fossil heating and energy efficiency in public buildings**

As part of the efforts to reduce overall energy consumption, ongoing events and support actions are organised for public institutions. In addition, an ongoing development project with the central database Public Energy Consumption, which is used by the Ministries to report on energy consumption, is ongoing in order to ensure that the state is at the forefront.

See section 2.2 (iii), public authorities should be at the forefront of phasing out fossil heating for buildings. This is why the Climate Agreement on Green Electricity and Heating 2022 decided to prepare a plan to phase out all oil and gas boilers in the state, to be presented in spring 2023.

In addition to central government buildings, the municipalities<sup>44</sup> and regions must also draw up plans to phase out fossil heating for buildings, in addition to state buildings (ØA23)<sup>45</sup>, cf. the Agreement on the economy of municipalities 2023 (ØA) and the Agreement on Regions' finances 2023 (ØA23). It is the municipalities (KL) and the regions (Danish Regions) that are responsible for drawing up and implementing the plans, which, in accordance with the Climate Agreement on Green Electricity and Heating 2022, are to be

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<sup>42</sup><https://spareenergi.dk/offentlig/bygninger/esco>

<sup>43</sup><https://www.kl.dk/nyheder/center-for-klima-og-erhverv/teknik-og-miljoe/2022/juni/esco-en-mulig-vej-til-groenere-building/>

<sup>44</sup><https://www.kl.dk/media/51003/aftale-om-kommunernes-oekonomi-for-2023.pdf>

<sup>45</sup><https://fm.dk/media/26019/aftale-om-regionernes-oekonomi-for-2023.pdf>



drawn up in spring 2023. These do not yet provide the reasons why they cannot be further elaborated.

In relation to the public building stock, the municipalities have announced through ØA23 that they will try to comply with the same requirements as the central government in relation to the renovation and/or energy savings requirement, cf. Article 5 of the current EED (2012/27/EU). In relation to the regions, they have<sup>46</sup> announced in the ØA22 that they will work towards a reduction of 75 % of CO<sub>2</sub>emissions for building and transport. This is supported, inter alia, by measures in the area of energy efficiency.

### **Phasing out fossil heating and certification scheme**

The State subsidy schemes set out the building pool, the scrapping scheme and the municipal and regional pool in order to obtain subsidies for the installation of heat pumps. Subsidies can only be obtained if the installation undertaking has been approved by the Danish Energy Agency as a RE installer company in accordance with Order No 1047 of 2013 and an employee of the undertaking is specially trained in the installation of heat pumps. A survey carried out in 2021 shows that heat pump installations, carried out by an approved RES installer company, are on average 10 % more energy efficient than heat pumps installed by an untrained and non-certified installer company. The rules on the RES installation scheme transpose Article 18 (3) and Annex IV of the RES Directive II.

### **Promoting energy reductions in public buildings**

In the context of the critical energy and supply situation caused by the war in Ukraine, as well as EU action ifm. *REPowerEU* and *EU "Save Energy"*, four requirements for state institutions, with entry into force by 1 October 2022, were issued through Ministerial Instructions;

- 1) to lower the temperature to 19 degrees;
  - 2) switch off unnecessary lighting;
  - 3) shorten the heating and ventilation season and reduce operating time for heating and ventilation;
- and
- 4) launch information campaigns at the workplace on the basis of the Danish Energy Agency's kam pagnematerial.

For all actions, they are introduced where it is considered feasible and technically appropriate in each authority or institution. Further to the efforts of the state institutions, the Government, KL and Danske Regioner issued a single press release calling on municipalities and regions to adopt the same measures as state institutions.

### **Consumer information and education**

The Danish Energy Agency runs a number of information initiatives to promote energy-efficient behaviour and energy efficient loose behaviour. Information efforts focus on both private households, industry and the public sector.

Improving energy efficiency of buildings and supporting energy-efficient behaviour in buildings is a key priority in Danish information efforts. The measures include the production of materials on energy-efficient loose ends, information on building regulations and easy access to information and knowledge on energy renovation. ENER's website<sup>47</sup> and related social media are the backbone of its communication on energy-

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<sup>46</sup><https://www.regioner.dk/media/22914/aftale-om-regionernes-oekonomi-for-2022.pdf>

<sup>47</sup>[Consumer | Energy Agency \(sparenergi.dk\)](#)

efficient solutions both in private households and in public and private companies.

Since 2016, private households have been able to obtain free, impartial advice on energy consumption and energy efficient solutions by telephone and e-mail. In addition, the Danish Energy Agency offers webinars as well as local inspiration and advice meetings to promote knowledge of energy-efficient solutions, energy renovation and conversion away from fossil fuels in individual heating. The events are financed by the Danish Energy Agency and organised in cooperation with the local municipality. In 2022, 255 meetings took place. 60 % were local meetings 40 % were held as webinars. The arrangements contribute both to increased energy efficiency and to conversion away from oil and gas boilers to heat pumps and district heating.

In 2022, DKK 25 million was also allocated to running a large national energy saving campaign. The campaign focused on helping Danes to reduce their energy consumption in autumn and winter 2022/23, with a view to reducing dependence on Russian gas as well. The campaign addressed both Danish users and staff and decision-makers in Danish workplaces. The evaluation of the campaign shows that Danes are very much aware of the central savings councils and are very motivated to save energy.

Training and skills training of the performing actors in the construction sector is also an important element in Energistyrel's work to improve energy efficiency. The energy labelling scheme and the Bedre Bolig-scheme provide a major element of training. Training courses for craftsmen, building engineers, engineers, architects, etc. have been set up in connection with the schemes.

The Danish Energy Agency also finances DKK 5 million a year, the Knowledge Centre for Energy Savings in Buildings (VEB), which has been in place since 2008. The VEB's mission is to collect and systematise knowledge about energy savings in buildings and to disseminate this to craftsmen, construction companies, advisers and other professionals in the construction sector through concrete and practical materials and tools, analyses, professional papers and training courses. The VEB also operates the website [www.byggeriogenergi.dk](http://www.byggeriogenergi.dk), publishes newsletters, provides telephone and mail advice and cooperates with a wide range of educational and professional organisations in the construction sector.

### **Energy labelling scheme**

The 2020 climate agreement sets out actions to improve the use of data and digitalisation to promote enthusiasm. Particular attention is paid to using data to improve the quality of the energy label implemented in accordance with the Energy Performance of Buildings Directive. The energy label is based on a physical review of the building, where an energy labelling consultant collects information about the building. The energy labelling scheme uses automatic digital validations in the electronic bill program so that the energy labelling consultant's records are assessed even before the label is issued to the building owner. The validation has been developed on the basis of errors in previous energy labelling reports found using our database, for example, failure to record roof. This means that this type of error has been eliminated with the digital validation. In total, more 300 validations have been implemented.

In 2022, some 80.000 energy labelling reports have been produced and cover around 109.000 buildings. In total, approximately 236.000 cost-effective energy savings proposals are indicated in the energy labels reported. The Danish Energy Agency is also working on simplifying access to the energy labelling database and making it more searchable so that building owners and other stakeholders can make better use of the many data behind the energy label. To support the energy labels and the savings proposals, a new report layout for

the energy labelling reports was prepared in 2021. The new energy labelling reports have been developed in cooperation with behavioural scientists to ensure that building owners are more nudged to carry out energy renovation of their buildings. The energy labelling report has therefore improved on three key points: (1) user-friendliness – how easy is the report to read and understand; (2) relevance – how relevant is the report for the homeowner; and (3) the question of how easy it is for the homeowner to initiate renovations.

Denmark is one of the EU Member States that tested the Smart Readiness Indicator (SRI) in a Danish context. Sri Lanka will not currently be implemented as a labelling scheme in Denmark. It is justified by the fact that further development of the methodology is still considered necessary, which can be done on the basis of requests from Denmark's and other countries' testing of SRI, as well as the EU supported projects on the subject.

### **Energy audits and climate audits**

All non-SMEs are required to conduct an energy audit at least every four years. The energy audit must provide companies with an overview of their energy consumption for processes, buildings and transport, as well as the potential savings that the company has in order to reduce energy consumption.

In Denmark, the EU obligation was implemented through Order No 1064 of 27 May 2021 on mandatory energy audits in large enterprises. Enterprises can also meet the requirement for mandatory energy audits by maintaining energy management (ISO 50001) or environmental management (ISO 14001), including an energy review under Chapter 6.3 of ISO 50001. If a non-SME has an energy consumption of less than 1 million kWh/year, the enterprise can carry out a simplified energy audit.

As part of the agreement on Green Tax Reform for Industry etc. of 24 June 2022, rules will be introduced in relation to climate inspections. Climate vision is an extension of the energy audit for companies with high energy consumption. Extending to a climate vision will concretely mean that there will be a similar focus on mapping CO<sub>2</sub> emissions and identifying CO<sub>2</sub> reduction measures by the companies covered.

### **Public procurement**

The Circular on energy efficiency in state institutions lays down 48 specified energy efficiency requirements for the purchase of products, services and buildings by state institutions, as well as the conclusion of a lease agreement for buildings.

The requirements apply to procurement above the EU procurement thresholds and where compliance with the energy efficiency requirement would be cost-effective, economically feasible, generally sustainable, technically suitable and there is sufficient competition. Armed forces' contracts are excluded to the extent that the requirement would conflict with the nature and primary objective of the activities of the armed forces or in the case of contracts for the supply of military equipment (2009/81/EC). The purchase requirement implements parts of the Directive of the European Parliament and of the Council on energy efficiency (2012/27/EU).

In addition, a circular amendment requires all government institutions to purchase LED light sources from one

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48 Circular No 9909 of 9 December 2020 on energy efficiency in state institutions

of the two most energy efficient energy classes in the energy label as<sup>49</sup> defined in 1369/2017/EU, or lighting sources with equivalent energy efficiency, when procuring light sources, regardless of the financial level. However, this shall not apply if it is found not to be technically suitable.

<https://sparenergi.dk/offentlig/vaerktoejer/indkoebsanbefalinger>

<https://ens.dk/ansvarsomraader/energibesparelser/det-offentlige> <http://www.gronneindkob.dk/>

### **Energy efficiency scheme for waste heat**

With the following agreement from *The Climate Agreement for Energy and Industry etc.* of 7 September 2021 was decided to introduce an energy efficiency improvement scheme under which companies are obliged to:

- (i) To carry out energy reviews of waste heat related processes and installations, such as CERES verification by independent external experts.
- (ii) On the basis of an energy review, to implement energy efficiency measures in companies' processes and installations relating to (taxed) waste heat with a payback period of up to 5 years.

The agreement significantly reduced the administrative costs of entering the scheme compared to the 2019 agreed arrangement.

- (v) *Description of policies and measures to promote the role of local energy communities the implementation of the policies and measures referred to in points (i), (ii), (iii) and (iv), as appropriate.*

On 6 December 2021, on the basis of the negotiations on the 2022 Finance Act, the Socialist People's Party, Radi KaleVenstre, the Unity List, the Alternative and the Christian Democrats reached an agreement on the dismantling of a pool to support local energy communities.

Energy communities are an umbrella term for citizen energy communities and renewable energy communities, which are a corollary of actors that can engage, among other things, in the consumption, generation, storage and supply of energy. This could include, for example, the demand response of solar photovoltaic energy, a local wind turbine or a heat pump, or the storage of self-generated electricity in a battery that can bring environmental and economic benefits to a local community.

The agreement was implemented in Order No 1162 of 09/08/2022 (Order on subsidies for local energy communities and local anchoring of climate transition) and, on the basis of the agreement, DKK 4 million was allocated annually from 2022 to 2025 for grants to local energy communities and local anchoring of climate transition.

In 2022, DKK 1 million was allocated to information projects and DKK 3 million to larger projects. Information projects are understood as projects aimed at disseminating information that contributes to the development of renewable enthusiasm solutions in the community. Support for major projects may finance the planning, establishment and organisation of inspiration examples for projects carried out with one or more of the following elements: Development and application of solutions covering generation, supply, consumption,

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<sup>49</sup>Circular No 9987 of 1 December 2021 amending the Circular on energy efficiency in state institutions

electricity sharing, storage, energystorage, flexibility and energy efficiency services. In 2022, five informa projects were subsidised forjust under DKK 600,000 and six larger projects for just over DKK 3 million.

*(vi) Description of measures to exploit the energy efficiency potential of the gas and electricity infrastructure.*

### **Electricity infrastructure**

In order to optimise the capacity of the electricity transmission system, the Danish TSO Energinet has implementeda *sy vote for dynamic line rating DLL*, which adapts capacity to current operational situations. In addition, an integrated protection system is used which allows a higher load without compromising operational safety. Energy networks also cooperate closely with other European TSOs to develop a common grid model containing load forecasts across Europe. While some elements lead to higher network losses, improved simulation models and other initiatives allow a high utilisation of the transmission system, allowing more renewable energy to be integrated more efficiently.

Energy networks are now also developing procedures to support the use of waste heat for remoteheat from the energy network's installation where it is socially economically viable.

### **Gas infrastructure**

Energy losses in the Danish gas network are very low, accounting for around 0.06 % of the volume of gas transported. ENER theloss of gas from the stocks is assumed in the same order of magnitude. Efficiency potentials are primarily related to individual components; compressors and boilers, and choice of pressure and temperature. By way of example, all compressors in the Danish gas system are electric.

For biogas plants, an average methane loss associated with biogas production is assumed to be 2.9 % in climate status and projection 2022. As of 1 January 2023, new regulations have entered into force, requiring, inter alia, the searchfor leaks, the continuous self-monitoring and the rectification of leakages detected. The regulation is expected toreduce methane losses to a minimum of 1 % from 2025, covering both retrofitting plants that produbiomethane to the gas system, as well as other types of biogas plants.

The gas grid is continuously optimised and components are renewed with more energy efficient components when the old components are replaced. Due to the very low net losses, it is not possible to identify significant efficiency potentials that are not addressed in the ongoing maintenance of the network.

*(vii) Regional cooperation in this area, where appropriate.*

### **Nordic cooperation on ecodesign and energy labelling of energy-related products**

Nordic cooperation on market surveillance and policy work on eco-design and energy labellingin the Nordsyn-WG. It is a cooperation between the Nordic market surveillance authoritiesand political bodies.

Eco-design and energy labelling deliver around half of the energy savings targets set by the EU for 2020 and more than one third of the 2030 target. Effective regulation and market surveillance aredevastating if this is to be achieved, and Nordvision aims to improve the effectiveness of theNordic MSC and policy measures. Nordic authorities, producers and consumers benefit from Nordvision while supporting green growth and energy efficiency. The results and structure of the North Vision can also be used to improve market surveillance in other EU countries.

## **Northern Ireland's sub-projects**

In 2023, North Vision focuses on (1) updating the Nordic online tool for assessing energy savings from eco-design and energy labelling at national levels in the Nordic countries; (2) a test of compliance with the EPREL product database for electronic displays and a number of household products; (3) a Nord-crawl4 project to improve Nordvision's online tool Nordcrawl in three respects: (a) adaptation to the re-assembly of the energy label; (b) use of the EPREL energy labelling database; (c) fine-tuning of the products categories.

Previous projects completed in 2021-22 include: Background study on cold climate heat pumps, declared capacity and default settings (2019-2021), development of a power calculation module in the Nordcrawl web tool (2020-21), taps test to establish eco-design requirements (2020-21), market monitoring testing of LED lamps and fluorescent lamps (2021-22), market surveillance testing of electric space heaters (2021-22).

## **Results from Northern Vision**

The most appreciated result of the Northern Vision is that the Nordic countries now regularly share questions, Commissioneries, discussions, test results and plans. Although the core of Nordsyn is constant contact and sharing of market surveillance results, Nordsyn has also allowed for the implementation of a number of projects that improve Nordic market surveillance and the knowledge of legislation among producers, retailers and consumers.

## **Nordcrawl and power calculations**

Nordvision's online tool Nordcrawl is highly appreciated and demanded. Presentations to the IEA and ECEEE have increased demand and since 2021, Nordvision has met with the EU project EEpliant3, which is very keen to develop the tool. Meetings have also been held with several EU countries and the European Commission on the potentials and future of Northern crawl.

In 2021, Nordsyn developed a power calculation module for Nordcrawl, which is now available to Nordvision with limbs. The module calculates the impact of eco-design and energy labelling in each of the Nordic countries and shows massive energy savings for Nordic consumers and high cost efficiency in market surveillance. Nordcrawl is being promoted and further developed through the Nordsyn-project Nordcrawl4.

## **Market surveillance**

All North Vision projects contribute to strengthening the Nordic countries' market control over eco-design and energy labelling. Nordsyn is planning several market surveillance projects in the future, including monitoring using the EPREL database and Nordcrawler, as well as monitoring the new resource efficiency requirements for reserve parts and reparability. Nordsyn is also a forum for continuous cooperation between the Nordic market surveillance authorities in the planning, implementation, results and interpretation of market surveillance activities on eco-design and energy labelling requirements – something that is highly appreciated by Nordvision members.

## **Other**

The Nordic Council and the NEF are currently looking at the implementation of the concept of energy poverty in the Nordic countries, particularly in the field of electricity markets.

*(viii) Financing measures, including Union support and the use of Union funds, in the field at national level.*

Overall, challenges in obtaining funding for energy efficiency projects are not considered to be a major barrier in Denmark. This is due to a well-functioning mortgage system, where loans are granted to energy headsof infection projects using collateral on the value/equity of the property.

Moreover, the low interest rates over the past decade have allowed loans to be taken out on favourable terms for both the private and business sectors, making projects more profitable by lowering interest expenditure, although there have been significant increases in interest rates over the past year. At the same time, the regulatory setup is flexible to allow financial institutions to set up new financing measures such as green loans with extra favourable interest rates and other measures to promote energy efficient projects. In addition, a central mortgage provider, in cooperation with the Danish Energy Agency, has developed the digital tool 'Energystene- ren'.

Danish pension funds and others are also continuously involved in projects involving energy efficiency by bringing together projects in cooperation with other actors through ESCO and PPP schemes.

Part of the funds in the district heating pool, the decoupling scheme, the scrapping scheme and the financing of their resulting tax losses are made up of EU recovery funds. The funds were implemented through the Finance Act for 2021 and 2022 and amount to a total of DKK 645 million from 2021-2026. DKK 300 million of EU recovery funds were also added to the building pool in the period 2021-2024 under the 2021 Finance Act.

### 3.3 dimension on energy security

*(1) Policies and measures relating to the elements set out in point 2.3;*

In 2019, the Danish government, together with a majority in the Danish Parliament, adopted a Climate Law. The Climate Law sets a target of a 70 % reduction in greenhouse gas emissions relative to 1990, as part of Denmark's 2050 climate neutrality target. In order to achieve the targets, the government would draw up climate action plans that would, among other things, need to be scattered; a strategy for the electrification of transport, industry and society, an examination of the potential for a comprehensive strategy for the expansion and exploitation of offshore wind with the nations of the North Sea, and an examination of the potential for the creation of Denmark's first energy island with a minimum of 10 GW by 2030. The latter was launched by the Finance Act in 2019, which also allocated DKK 65 million to support large scale PtX technologies.

Subsequently, the Danish Parliament has adopted various agreements that contribute to achieving the objectives set out in the Climate Law; Climate agreement for energy and industry, etc. 2020 and Climate deal on green electricity and heat 2022. The agreements aim to speed up the green transition and strengthen security of supply.

The 2020 climate agreement will promote the use of green technologies in the energy sector and industry, including the following initiatives: establishment of energy islands with 5 GW connected, market-driven expansion of photovoltaic and terrestrial wind, promotion of green technologies, green transition of industry, support for biogas and other green gases, energy efficiency measures, green transition of the heating sector and sustainability requirements for biomass for energy. The 2022 climate agreement aims to strengthen the green transition and the independence of Russian gas, and includes actions to be taken; enable the quadrupling of total electricity production from solar and terrestrial wind by 2030, enable the supply of at least 4 GW of offshore wind to be realised by 2030, as well as the ambition that no space heating gas will be used in Danish households by 2035 and that Denmark will be supplied with green gas by 100.

With an increased share of renewable energy in the energy mix, there is a general move towards more diversity in the Danish supply sector and therefore investments are made in a wide range of technologies with a focus on varying possibilities for generation, transmission, distribution and consumption.

### **Cybersecurity**

The Danish energy sector is one of our most critical sectors in society. The energy sectors, like the rest of Danish society, are facing increasing threats from cyberspace. At the beginning of 2023, the Centre for Cybersecurity (CFCS) published a new threat assessment for the Danish energy sector, which considers, inter alia, that the threat posed by CY crime and espionage is 'very high'. In a changing security landscape, where supply-side systems are subject to heightened threats, it is essential to continuously reinforce and enhance the resilience of these sectors in the cyber field. The rapid digitalisation brings new opportunities for a green transition in which technologies play a key role, but at the same time introduces vulnerabilities and vulnerabilities to critical energy infrastructure that is increasingly connected to the internet. In an energy system under digital development, addressing cyber and information security is a high priority to maintain security of supply. For this reason, the Danish Energy Agency, as part of the Ministry of Climate, Energy and Utilities, launched in September 2022 a strategy for cyber and information security in the electricity, gas and district heating industry. The strategy aims to strengthen cybersecurity in the energy sectors. This is why it has been developed in close cooperation with the industry, as there is a need for cooperation across authorities and businesses in the face of cyber threats of different kinds. The strategy presents 10 initiatives to ensure the resilience and resilience of the energy sectors in face to face with the challenges posed by advanced digital-techno now and in the future. The strategy runs until 2025 and is being implemented gradually to improve the cyber and information security of Danish energy sectors, thereby maintaining security of supply at a time characterised by widespread digitalisation.

### **Policies and measures to counteract high energy prices**

A number of decisions have been taken to counteract the consequences of the significant energy price increases for consumers, including as a result of Russia's invasion of Ukraine, the parties to the *Vinter Aid Agreement* of 23 September 2022 agreed, inter alia, to reduce the standard electricity tax to the EU minimum rate of 0,8 øre per kWh in the first six months of 2023. A reduction in the electricity tax benefits all Danes in the form of lower expenditure on electricity consumption. In addition, it was agreed to establish a temporary and voluntary so-called freezing scheme whereby households and businesses (under different conditions) can seek their energy company to have part of their energy bill frozen at a later date if the price exceeds some of the limits set in the agreement. The purpose of the freezing regime was to provide households and businesses with a better space and security against significant increases in energy prices. The scheme entered into force on 1 November 2022 for electricity and gas and on 1 January 2023 for district heating and is provisionally valid for one year.

Finally, the *Agreement on a targeted hot neck* of 11 February 2022 and the supplementary agreement of 30 March 2022 decided that a one-time hot cheque of DKK 6.000 should be given to households with a total annual income of less than DKK 650.000 and heating with gas boilers, living in district heating areas with a gas share of more than 65 % or areas based on combinations of electricity and gas with corresponding average price increases, or having electric heat as a primary heat source and experiencing a corresponding price increase. The heat cheque was paid automatically on 10 August 2022. On 14 March 2023, a call for applications was opened for those who were entitled to a hot neck but had not received it automatically.



## Security of electricity supply

Denmark has one of the highest levels of security of electricity supply in Europe. In 2021, an electricity consumer had a break of 22 minutes in one year, corresponding to 99.996 % of the time in contact.

The planning target for the security of electricity supply in 2032 is, as mentioned in section 2.3, of 38 interruption minutes on average per consumer. This has been recommended by Energinet, as part of their annual electricity security report. In its report on security of electricity supply, Energinet also indicates measures necessary to maintain the defined level of security of electricity supply. Proposals are also made concerning, for example, market coupling of reserves to ensure power adequacy, a focus on reinvestments/lifetime extensions of foreign connections, reinvestments in the electricity grid and supporting the flexibility of consumption.

Energy networks provide an annual needs assessment for ancillary services. This needs assessment for ancillary services describes how Energinet defines the needs and which ancillary services are used to meet this need, so that it is possible to maintain the established level of security of electricity supply.

In addition to the needs assessment for ancillary services, a new measure has entered into force in 2022, when Energinet publishes every year a scenario report for the next ten years, which presents an estimate of the development of the emerging systems services market. The report is based on current assumptions, legislation and climate objectives.

Energy networks will also publish each year a long-term development plan, which was first published in 2022. The Long-term Development Plan of the Energy Network is the energy network's overall plan for the development of the electricity and gas transmission network in Denmark. This report brings together and summarises the needs analyses, solution catalogues and other findings prepared by Energinet for the short and long term development of the electricity and gas transmission network.

Network companies in Denmark shall publish every two years a network development plan, as a result of Article 32 of the Electricity Market Act, which Denmark has implemented in Danish law. Network development plans shall be aware of the need for medium and long-term flexibility services and shall define the investments planned for the next five to ten years, with particular attention to the main distribution infrastructure needed to connect new generation capacity and new pressures.

This will develop plans to ensure both network adequacy and power adequacy in Denmark. In addition to the initiatives set out in the plans, Denmark is working on a number of other policy areas and measures that are expected to contribute to supporting the planning objective of security of electricity supply in Denmark, which is described in the rest of the section.

*The Climate Agreement on Green Electricity and Heating 2022* launches a series of analyses of actions to ensure a pro-active and cost-effective expansion of the electricity grid. This will include the launch of analyses on how to ensure a proactive expansion of the transmission grid, incentives for fast grid connection in the distribution network, the promotion of flexibility markets, the development of new flexible grid connection conditions and products, as well as faster implementation of tariff models and the development of tariffs to promote flexibility. Sub-development is also underway for better monitoring and forecasting of electricity grid capacity in Denmark.

The Government has set up a National Energy Crisis Team (NEKST) across a number of relevant authorities to ensure faster action on urgent green challenges, including, for example, faster deployment of electricity-

generation from solar and wind and faster grid deployment and connection.

The objective of establishing energy islands means that concrete initiatives are taken to create more interconnectors that contribute positively to Danish security of electricity supply.

In order to develop a flexible electricity market, inter alia with a view to maintaining a high level of security of electricity supply, the Danish Energy Agency has published a number of analyses and recommendations for the electricity market under the name Market Model 3.0. This work involved the transposition of the Electricity Market Directive (EU) 2019/944 into Danish law, as well as recommendations on how to ensure a market model where flexibility can help to address challenges in the electricity system. Some of these recommendations have been introduced, while analytical work is still ongoing with others. Market Option 3.0 recommends, inter alia, that:

- rules for aggregators need to be further developed and protected against market distortions;
- electricity metering and billing rules must support the smart and flexible roll-out of heat pumper and let infrastructure;
- ways of increasing transparency in relation to the prices of aggregation products should be explored;
- speeding up pilot projects;
- an analysis of scarcity prices is carried out to strengthen the price signal in the balancing market;
- network companies need to fresh anonymised consumer and production data in order to increase transparency on the need for flexibility and to provide an annual forum for flexibility among electricity market players, in particular the new flexible players.

In addition, a number of initiatives have been taken to ensure grid adequacy in the Danish electricity grid and cost effective development recently.

On 4 June 2021, the then government and a number of parties in the Danish Parliament reached a vote agreement on an efficient and future-proof electricity infrastructure to support the green transition and electrification. In that ban, it was agreed that an automatic indicator of the expected costs of electrification of the network companies to be added to their revenue framework would be established. A new application-based supplement to the network companies' revenue framework is also being established, which can be sought for larger, concrete electrification projects such as new PtX plants or large heat pumps.

Denmark, through the *Agreement on the Development and Promotion of Hydrogen and Green Fuels (PTX Strategy) of 15 March 2022*, is introducing an option for consumption tariffs to be geographically differentiated for customers to the connected grid from 10 kV voltage levels upwards and improve the framework for local collective tariffication. Local collective tariff classification is a tariff solution that can take into account the overall characteristics of the associations on the collective electricity grid when they are classified. By generating and consuming electricity at the same time, an association can reduce the burden on the collective electricity grid. This can be the basis for a reduced tariff payment for, for example, energy communities. In addition, there is the possibility of applying for the construction of direct lines, i.e. electricity connections for the direct supply of electricity from the electricity generation company to its own facility outside the collective network. By introducing these options, incentives are created for co-location of consumption and generation and for new consumption or generation where there is space in the grid. This should help to relieve the pressure on the expansion of the electricity grid.

In order to give price signals to increase flexibility in the electricity grid, Green Power Denmark, on behalf of

the Danish network companies, has notified a methodology for setting tariffs called tariff model 3.0, which several network operators implemented in 2023. Tariff option 3.0 contains essential elements of time differentiation of tariffs, so that electricity consumption at night is cheap, while electricity consumption in the afternoon hours is relatively expensive. It also bears that customers at the high voltage levels have to pay a fixed power charge that reflects the fixed cost of the power available to the customer, which provides an incentive for the customer to reduce peak load.

Similarly, a number of initiatives have been put in place to ensure efficient system operation. This included, inter alia, the introduction of a price model for balancing settlement to pool consumption and production bids in ancillary markets, the introduction of lower minimum bids in the balancing market, a methodology that is expected to allow fluctuating energy sources to bid in with reserves, and the creation of a Nordic market for reserves.

In the short term, Denmark also faces a number of possible challenges in terms of security of electricity supply as a result of the energy crisis in Europe. To this end, Denmark has been working on some temporary measures.

The initiative most directly targeted at this challenge is that it has been agreed politically to postpone the closure of three Danish power plants until the summer of 2024. This should ensure that there is capacity in both East and West Denmark to deal with situations of low wind production and high consumption, should it occur.

The Winter Aid Agreement of 23 September 2022 established a freezing regime for companies under which electricity, gas and heat customers can have their bills frozen above a certain threshold. The scheme runs for 6 years, the first year being the freezing period, the second year being interest-free, but customers in the last four have to pay off the debt. The scheme is a solution to address citizens and businesses facing difficulties in paying high energy bills, without changing their incentives to shift and reduce their consumption.

Denmark has also implemented the EU's revenue ceiling with a number of reservations to support the maintenance of security of electricity supply. The sunset clause is intended to ensure continued incentives for the expansion of solar and wind electricity generation and the exemptions for a number of types of electricity generation if their marginal costs are above the cap must ensure that electricity producers do not disappear from the market.

### **Heating sector**

As described above, the security of heat supply is not vulnerable to short-term disconnection of heat for sewing. A number of agreements have been adopted in the Danish Parliament, which aim to ensure a green transformation of the heating sector and phase out the use of fossil fuels, including gas, for heat production.

In the summer of 2022, a majority of parties entered into the Danish Parliament's *Climate Agreement on green electricity and heat*. The agreement aims, inter alia, to phase out the use of natural gas for heat and promote the deployment of green heat in order to increase the independence of Russian gas and speed up the green transition. The agreement decided, inter alia, that:

- Ambition that from 2035 there should be no dwellings heated by gas boilers and that Denmark will be supplied with 100 % green gas by 2030.
- Stop new installation of oil and gas boilers. The government is in dialogue with the European

Commission with a view to ensuring swift support for concrete actions to enable it.

- The gas distribution company Evida shall identify where appropriate to close the gas distribution network.
- A plan to phase out fossil heating in public buildings needs to be developed.
- A ban on the approval of new projects for district heating plants using fossil fuels as a main fuel for district heating.
- District heating companies shall submit by the end of 2023 a plan to phase out pipeline gas in their own pure heat producing installations.

In Denmark, the local municipalities are heating planning authorities and are therefore responsible for planning and accepting new district heating projects. On the basis of *the Climate Agreement on Green Electricity and Heating*, an agreement was concluded in summer 2022 on *accelerated planning for the phase-out of gas for heating and a clear message to the citizen* with the Danish municipalities' interest organisation (Kommunernes Landsforening). Against this background, the Danish municipalities had to carry out planning efforts in 2022 and send letters informing them of future green heating options to oil and gas lighters in areas currently supplied with gas. The ambition is for district heating to be deployed by 2028 in those areas where it makes sense. The agreement allocated a further DKK 201 million in the period 2022-2025 to the municipalities' activities, including coordination of heating plans, approval of project proposals for district heating, cooperation with district heating companies, support and development of local smaller, joint heat supply projects.

With Climate Agreement for Energy and Industry, etc. 2020 in addition, a number of measures have been implemented which have encouraged the phasing out of fossil fuels in the heating sector. As a result of the agreement, the following have been implemented, among other things:

- Increase of the space heating tax (fossil fuels) and reduction of the electricity heat tax to the EU minimum rates.
- With a number of agreements, DKK 4,7 billion have been allocated to subsidy pools for phasing out oil and gas boilers from 2020 onwards, including a pool for decoupling from the natural gas grid, for the roll-out of district heating, for heat pumps and energy efficiency improvements, and for heat pumps on subscription. Companies can obtain subsidies for a heat pump through the Business Pool, which was implemented as a result of the Energy Agreement 2018 and received more funds under the Climate Agreement for Energy and Industry, etc. 2020.
- Changes to the regulation for district heating companies, including:
- Abolishing fuel constraints so that district heating companies are not tied to using natural gas, increasing the cogeneration requirement so that central and decentralised areas can also be set up in central areas so that clean heat generating installations can be established in central areas, and modernising the obligation to sell off in order to make use of surplus heat and renewable energy production easier.
- The socio-economic requirement was adjusted so that district heating projects can be approved without a comparison with fossil alternatives, which has, among other things, ensured that regulation is not an unnecessary brake on conversion of gas areas to district heating areas.
- Consumer ties with natural gas were abolished.
- Separate rules in the Heat Supply Act on the price regulation of district heating from geothermal plants, which are intended to make it possible to establish large-scale geothermal installations for district heating in Denmark.

- Pba. 2018 energy agreement, agreement on increased use of waste heat 2019 and climate agreement for energy and industry, etc. From 2022, DKK 178 million per year was earmarked for the conversion of the rules on the use of surplus heat. In 2021, the Danish Parliament adopted, among other things, separate rules for the price regulation of off-peak heat, which is also intended to promote exploitation.

Under the Winter Aid Agreement 2022, and the 2023 agreement on inflation aid, additional funds were allocated to the Heating Pool and the decoupling scheme (included in the DKK 4,7 billion allocated to aid pools for the extraction of oil and gas boilers). Furthermore, under the Winter Aid Agreement 2022, DKK 25 million was further allocated to sustainable planning aid, which grants subsidies to collective heat pumps and solar thermal systems that crowd out fossil remote production. The start-up aid stems from the Energy Agreement 2018 and two application rounds have been held so far in 2021 and 2022 respectively.

## Gas

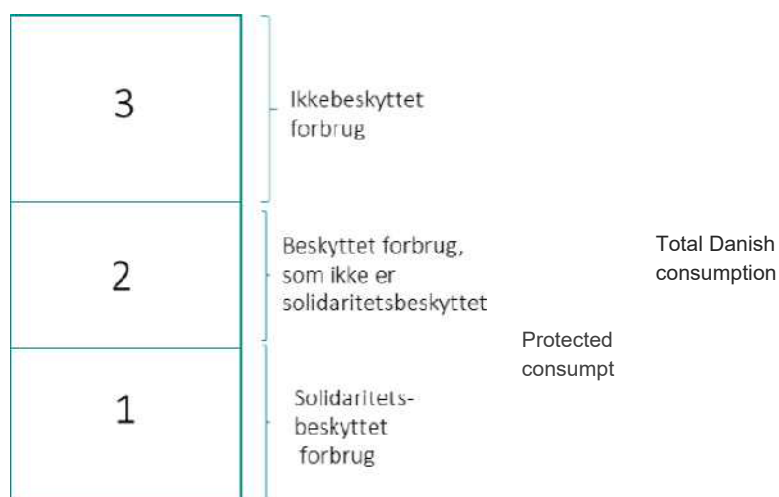
Security of gas supply is a common European matter where gas is considered a shared resource in the EU. Based on Russia's invasion of Ukraine, the EU has promoted the independence of Russian gas by, among others, Save gas for a safe winter. As of 5 August 2022, Member States have to voluntarily reduce their natural gas consumption by at least 15 % in the period 1 August to 31 March 2023 compared to national natural gas consumption in the same period for the last five previous years. This reduction may become mandatory in case of a new crisis level, 'Union alert', which has been added to the existing national crisis levels.

EU countries need to be prepared against an emergency by updating their gas emergency plans in the event of a gas crisis. The aim is to avoid an emergency situation in the EU and to support security of supply. The Nødplan Nødplan was updated on 31 October 2022 and reflects Denmark's willingness to reduce gas consumption by at least 15 % in the 2022/23 heating season through several measures already taken. The update suggests, among other things, that Denmark meets the EU's reduction target as of December 2022, as gas consumption since January 2022 is about 19 % lower than expected in climate status and projection 2022 (KF22). In addition,

the need for further emergency measures is assessed in the event that Denmark, contrary to expectations, falls short of the EU's reduction target in a 'Union alerted' crisis level. The emergency plan will be updated again in spring 2023. It is currently expected that Denmark will meet the EU's voluntary gas reduction target, as Denmark expects to achieve its gas consumption by around 26 % on the basis, among other things, of increases in natural gas prices and of a number of measures aimed, directly or indirectly, at reducing natural gas consumption. There is a caveat that the natural gas savings may be subject to changes and uncertainties for projected consumption of natural gas. In addition, the updated emergency plan contains market-based emergency measures that can be taken in order to avoid having to declare an emergency in a critical situation because gas is no longer on the market corresponding to Danish customers' consumption.

A key element of the emergency plan is that non-protected customers (companies with the highest gas consumption in Denmark) may be fully or partially interrupted in a gas supply crisis declaring an emergency to secure gas to protected customers (households, 'blue blink' and companies with low gas consumption). In the event of a very serious gas shortage, gas will then be given priority to solidarity-protected gas customers (households and selected societal functions such as health services). This can be illustrated as in Figure 18.

**Figure 18.**



The non-protected gas customers account for approximately 25 % of Danish consumption. Non-protected gas customers do not choose even if they are non-protected, but are selected on an objective basis based on the size of their annual use. The emergency plan has been adjusted in the past by the fact that interruptions in gas supply for certain companies may be socially critical, even if they are on the list of non-protected customers. Socially critical non-protected customers are therefore given priority only for minimum gas consumption over other non-protected customers, while the remaining non-protected customers are allocated gas according to a pro-rata model if gas remains available. Socio-critical gas clients are assessed by the National Operational Staff (NOST) in cooperation with relevant sectoral authorities. The classification of socially critical and non-socio-critical gas customers is classified. If 'emergency' is triggered in Denmark and there is a need to reduce the consumption of non-protected customers, the distribution of gas among the non-protected customers will be as appropriate as possible on the basis of data from dialogue with the gas customers concerned. The gas consumption of non-protected gas customers should be reduced in a controlled and nuanced manner. The aim is to supply as many gas customers as possible for as long a time as possible.

Denmark has not taken any exceptional measures to ensure that the filling targets are met in the following

years. The table shows the current process for filling stock and emergency storage in Denmark.

**Table 10. Current process for filling storage and emergency storage in Denmark**

Member-State	Objectives of the national law on the filling of lager	Planned auctions – date	Filling period	Comments
Denmark	There is no legal target for filling up in the national legislation. The “compulsory” storage shall be put to the vote; if they quantities needed to fill in the supply country’s standards in the EU Reg. 2017/1938. The ESA requests the TSO to purchase the needy storage capacity (and gas) to fill the obligation.	No specific auctions are planned for lager gas. The Commercial Storage Denmark A/S (Gas Storage Denmark A/S) may, at its own discretion, hold auctions over the remaining capacity. The ESA (as competent authority for security of supply) has the right to ask the TSO to offer (buy) individual ‘filling requirements’ other than emergency storage to ensure gas to meet supply standards in the EU for scheme 2017/1938.	Mandatory flooding is taken back in the first half of the gas year. Each TSO has priced access to the storage and submits its storage capacity requirements before the start of the storage year (1 May). The supply of ‘filling requirements’ typically takes place during the year and summer. MAR-participants take their filling needs are considered when purchasing gas and storage capacity.	Individual filling requirements follow a profile (increment/Plateau/reduction period) in winter.

## Oil

In 2019, exploration and drilling of oil, gas and shale gas on land and in coastal areas was officially closed when a draft law on the Danish subsoil was adopted, which entailed the cessation of oil and gas extraction on land and in coastal waters. The National Geological Studies for Denmark and Greenland (GEUS) and the ENER Energy Agency made an updated assessment of the oil and gas potential on land and in inland waters. They assessed that there is no potential of social importance on land in Denmark. The decision meant that all future exploration and extraction of oil and gas in Denmark will not be possible on land and in coastal areas.

## Biomass

Denmark has implemented the VE II Directive<sup>50</sup> (Articles 29, 30 and 31) and a broad political agreement on wood biopulp<sup>51</sup> from October 2020. The Danish legal requirements on the sustainability of biomass for the production of electricity, heating and cooling entered into force on 30 June 2021. Sustainability requirements must reduce as far as possible the risk of using ‘unsustainable biomass’ in Denmark, i.e. biomass with a high climate or biodiversity impact. At the same time, the requirements are formulated flexibly for reasons of

<sup>50</sup>[Directive \(EU\) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources](#)

<sup>51</sup>[Agreement on sustainability requirements for woody biomass for energy \(kefm.dk\)](#)



security of supply and forusers' heating prices.

The overall Danish requirements are more ambitious than the minimum level of the VE II Directive of 10 points-below. The stricter Danish implementation includes reduced plant limits for heating and cogeneration,as well as requirements for wood from the wood industry, hedgerows, etc. (non-forest).

#### *Several plants and establishments are covered*

1. Biomass sustainability and greenhouse gas emission savings are required for smaller installations (woody biomass is covered in installations from 5 MW instead of 20 MW).
2. Industrial installations are subject to requirements (i.e. companies that produce energy for their own consumption)
3. Importers and producers of biomass to households are subject to requirements (from 20.000 tonnes of wooden arrow) clay which is lowered to 5.000 tonnes from mid-2023).

#### *Several categories of biomass are covered*

4. Wood residues are subject to sustainability requirements (i.e. not just greenhouse gassaving requirements. However, in the current rules there is a possibility not to document requirements for- 10 % of the consumption of this biomass category)
5. Woody biomass from non-forest is covered by requirements (i.e. wood from hedges, small plantations, etc.).

#### *Additional requirements are imposed on forest biomass*

6. There is an additional Danish requirement for climate sustainability (e.g. carbon stock in the country's forests must not decrease)
7. There is an additional biodiversity requirement (requirements for field review and protection of high biodiversity).

#### *Older installations are subject to (higher) requirements for fossil greenhouse gas saving in the supply chain;*

8. Greenhouse gas savings are required for existing installations (i.e. not just installations put into operation from 2021);
9. Higher requirements are set for greenhouse gas savings in the production chain (for woody biomass, raised from 70 % to 75 %).

#### *Higher requirements for 3st party verification of compliance*

10. Verification by the 3st party is required throughout the chain (applies to woody biomass, i.e. also from the forest to the first collection point).

### **Security of supply of biomass in Denmark**

In view of the situation in Ukraine, and in order to ensure security of supply of biomass, the Danish government has chosen to adopt a number of initiatives. The Danish government has decided to temporarily remove the abilityrequirements for wood pellets in private households in order to address a possible shortage of wood pellets for heating in private households. This amendment applies from November 2022 to April 2024. In addition, the Danish governmenthas adopted a number of measures to reduce rising prices and ensure the supply of wood pellets, including, inter alia, establishing closer contacts with the industry, focusing on

informing citizens and analysing the possibility of using alternative fuels in pellet boilers, which did not show viable alternatives. In addition, the scrapping scheme supporting heat pumps on subscription has been extended so that households equipped with wood pellet boilers can benefit from these funds.

In addition to initiatives for wood pellets, Energinet, the TSO of Denmark, monitors that all biomass plants are too sensitive to biomass for the next three months.

*(ii) Regional cooperation in this area*

**Gas**

On the basis of Regulation No 2017/1938, Denmark completed in 2022 a common risk assessment of the gas supply and infrastructure in the risk group Denmark. It presented all relevant risk factors such as natural disasters, technological, commercial, social, political and other risks. Member States in the risk group Denmark are Germany, Luxembourg, the Netherlands, Poland and Sweden. Although some gas production is at risk, mainly the Netherlands and Denmark, the group, like most of the EU, is dependent on gas imports. Foreword-2017/1938 also details a solidarity mechanism that only enters into force in the event of a serious gas crisis. Protected customers, such as households and hospitals, must thereby be guaranteed access to gas even in the worst crisis situation. Denmark has signed a bilateral solidarity agreement with Germany and is close to signing a solidarity agreement with Sweden. A similar agreement is being negotiated with Poland. As there are relatively few countries with bilateral solidarity agreements in place, the Regulation also provides for backward rules in the absence of bilateral solidarity agreements.

Two of the four main gas pipelines from Russia to the EU pass through the risk group Denmark. The North Stream pipeline linking Russia directly to Germany and the Yamal pipeline connecting Russia to Poland through Belarus. Due to the ongoing conflict in Ukraine, Russia stopped gas flows to Poland in spring 2022. The North Stream pipeline was damaged and has not been operational since autumn 2022. This resulted in an interruption of Russian gas imports into the risk group Denmark.

The risk group consists of six related Member States (DK, SE, DE, NL, PL, LUX). Sweden is undeniably linked to Denmark and thus entirely dependent on imports of gas from Denmark. Denmark is historically net exporter to Germany and Sweden, but is currently a net importer due to refurbishment works on the Tyra field in the North Sea. Therefore, the majority of Danish offshore gas is transported from Danish gas fields in the North Sea to the Netherlands, corresponding to about one third of the annual Danish gas consumption.

At the end of 2022, the new Baltic Pipe pipeline became operational. It serves as a transit pipeline for connecting to the existing Europe II in the North Sea. Baltic Pipe connects Norway to Poland through Denmark and will mainly serve for flows from Norway to Poland. However, Baltic Pipe also increases the resilience of the region's gas system with new transfer possibilities.

Germany has interconnection points with all their neighbouring Member States and in this risk group area is heavily dependent on imports from Norway through Europe II and the Netherlands, as the Nord Stream pipeline is out of operation.

Poland is associated with the risk group members Germany and Denmark. Gas is imported into Poland from both Member States and from LNG plants in Poland. All these import routes ensure supply as there is currently

no flow in the Yamal pipeline, which has historically supplied large quantities of gas to Poland and the rest of the EU from Russia.

The Netherlands produces and imports gas from the North Sea and Great Britain, as well as LNG from abroad. The country exports large quantities of gas to Europe and hosts the TTF gas exchange. Within the risk group Denmark, the Netherlands exports mainly to Germany.

Luxembourg is directly connected to Germany but mainly supplied with gas from Belgium.

As gas flows from Russia have been drastically reduced in 2022, Member States require new sources of gas for their own supply and for the European gas system. LNG terminals are in the process of being established and the full capacity used. The region's largest interconnection (Europipe II) is widely used. Most Danish production in the North Sea is imported into the Netherlands, while the largest Danish gas field (Türkiye) is under Renovation.

Due to the disrupted imports of Russian gas, the flow of gas into the gas system has shifted from East to West to West to East. The supply of Northern and Eastern European countries is thus more risky than in the past in the event of an outage of gas supplies from Norway or insufficient quantities of LNG. Member countries in the risk group cannot be sure to avoid a possible curtailment of gas in the event of a gas supply crisis, but the potential risk of constraint in the group member countries is greatly reduced by reductions in demand.

Through the common risk assessment, the focus point is the end of Russian gas supply as the risk factor with the highest probability and importance for the European gas network. The common risk assessment includes varied approaches to gas storage strategies, temperature conditions, cooperative market tools, gas interconnection capacities, gas consumption patterns, etc. The risk assessment highlights the importance of a cooperative approach to the interconnected European gas market in order to avoid significant gas shortages in the Member States of the risk group (over 40 % in Sweden, around 20 % in Denmark, around 5 % in the remaining Member States) and significant gas shortages during peak periods. The cooperative approach keeps gas shortages below 20 % for all Member States at risk. In absolute terms, all gas shortages are kept below 1 bcm throughout the winter of 2022-23, but there is a higher risk (around 15 %) of gas shortages of more than 4 bcm in Germany in the right circumstances. The report stresses here the importance of a 15 % reduction in gas for use as a tool to avoid limiting gas to gas customers in 2022-23 and 2023-24.

In April 2022, the European Commission set up the EU Energy Platform to help Member States switch away from Russian gas and secure gas supplies. On 19 December 2022, energy ministers adopted the regulation to strengthen solidarity through better coordination of gas procurement, reliable price benchmarks and cross-border exchange of gas. The Regulation provides a legal basis for the further process of aggregation of demand and joint procurement of gas across the EU. A contract is also concluded with a service provider to establish a platform for gas merchants and gas-consuming undertakings to deposit volumes of gas that the companies wish to enter into joint purchases for current consumption or storage in 2023. The European Commission plans the first round of joint procurement to take place in April 2023.

*(iii) Financing measures in this area at national level, including Union support and the use of Union funds where appropriate;*

## Gas

The EU Ten-E Regulation 2022/869 on guidelines for trans-European energy infrastructure aims to promote and increase the deployment of electricity and gas infrastructure across the borders of European Member States. This increases security of supply and contributes to a more competitive and sustainable energy market. This includes the establishment of smart gas grids as a priority for Energinet to increase interconnection across member countries, in particular with a higher percentage of green biogas in the Danish gas system. This will make it possible to obtain EU funding through the CEF (Connecting Europe Facility) fund and possible inclusion in PCI (Projects of Common Interest). Before these can be achieved, agreement must be reached with relevant neighbouring countries, in particular Germany and Poland, on the possibility of cross-border transport of green biogases, where there are currently barriers related to gas quality.

## 3.4 dimension of the internal energy market

### 3.4.1 Electricity infrastructure

- (i) *Policies and measures to achieve the level of interconnection targeted, as set out in ar; Article 4 (d)*

Denmark already meets the EU's interconnectivity targets in 2030 and therefore has no specific objectives in relation to interconnectivity. However, analysis of new potential interconnectors remains a high priority. In Denmark, interconnectors are approved on the basis of their socio-economic value. The approval responsibility lies with the Minister of Climate, Energy and Utilities. It is the responsibility of the Danish TSO, the energy network, to propose and apply for new interconnectors such as Klima, – the Ministry of Energy and Utilities must finally approve.

- (ii) *Regional cooperation in this area*

Denmark cooperates with other countries that are part of North Seas Energy Cooperation with regard to possible entities for concrete cooperation projects. In addition to joint offshore wind projects that will be connected and supported by several Member States, it also includes work on possible "hybrid" solutions that will use cross-border solutions to connect offshore wind parks to the electricity grid, and seek synergies with interconnectivity capacities between countries and the respective market tups.

In addition, the Nordic TSOs are working closely together on a Nordic network development plan and have developed a Nordic network development plan in 2017. The report is welcome to be updated every two years and has been updated in both 2019 and 2021.

The Nordic Council of Ministers and the underlying Committee of Senior Energy Officials as well as the Electricity Market Group (EMG) coordinate on issues related to energy and, for example, monitor TSO-cooperation (including network development).

- (iii) *Financing measures in this area at national level, including Union support and the use of Union funds where appropriate;*

As a result of Section 14 of the Energinet Act, Energinet may take out loans for the performance of its activities. The loans are OPTA on the basis of an investment and financing plan approved by the Minister. This includes

the possibility for the EnergyNetwork to borrow under the State Relencing Scheme, subject to the approval of the Minister of Finance. The loans are taken out within a framework set by the Minister for Climate, Energy and Utilities after acceptance by the Danish Parliament's Finance Committee.

In addition to this debt financing, Energinet will be able to obtain real funding for projects from, inter alia, EU pools – including, for example, pools to support the development of PCI projects.

### 3.4.2 Energy transmission infrastructure

- (i) *Policies and measures concerning the elements set out in point 2.4.2, including: where appropriate, specific measures for the implementation of projects of common interest and other key infrastructure projects;*

Major infrastructure projects have been developed by the Danish TSO and approved by the Danish Energy Agency and the Ministry of Climate, Energy and Utilities.

No specific actions related to elements have been introduced in section 2.3.2. The Danish TSO, Energinet, is the sole developer of electricity and gas transmission projects, and these projects are assessed in relation to the need for the project. Behead has been assessed in relation to its compliance with the following elements:

- Functioning energy markets
- Security of supply
- Risk preparation
- Integration of renewable energy sources

In addition to this, interconnectors are also assessed in terms of their socio-economic benefits.

In order to comply with the revised TEN-E regulation, the application process is organised as a “one-stop shop” for which a manual is developed for it.

- (ii) *Regional cooperation in this area*

Denmark participates in relevant fora established under TEN-E regulation, such as the North Seas Energy Cooperation and the Baltic Energy Market Interconnection Plan.

In June 2019, the Nordic Energy Ministers adopted a new vision for the Nordic electricity market, including a focus on operating the electricity grid smart, cost-effective, robust, without undue constraints, and right from a regional perspective. In the following roadmap to achieve the 2030 vision, Nordic TSOs shall strengthen Nordic grid planning by taking into account Nordic welfare.

- (iii) *Financing measures in this area at national level, including Union support and the use of Union funds where appropriate;*

In general, infrastructure projects are financed through tariffs. The Danish TSO Energinet has used the Connecting Europe Facility for feasibility studies and preliminary studies for cable routes, etc. for the Baltic Pipe project and Viking Link, among others.

### 3.4.3 Market integration

(i) *Policies and measures relating to the elements set out in point 2.4.3;*

#### **Flexibility Forum**

One of the action points from market model 3.0 was that the market model needs to be continuously adapted through pro-active experience gathering and stakeholder involvement in order to promote flexibility. The Danish Energy Agency has therefore taken the initiative to develop a new forum focusing on promoting flexibility in the energy system. The first Flexibility Forum was held in February 2023, consisting partly of debates and presentations on visions for Danish and European flexibility markets, as well as workshops on active actors, grid flexibility and flexibility for the electricity system. The next Flexibility Forum is expected to take place in 2024.

#### **Real-time price signals**

It has been specified from 2018 that the Danish TSO must, as far as possible, procure all energy and non-energy supplies that are necessary to ensure security of supply through market-based mechanisms. The request for all services must be published annually. In cases of limited competition, the TSO shall equalise whether changes to the product definition and the procurement process can increase competition. The law is about increasing transparency, creating price signals for all services, including ancillary services, and therefore allows more market players, including consumption flexibility, to provide these services.

#### **Electricity system balancing**

It follows from the legislation that the Danish TSO is responsible for system adequacy and that the Minister for Climate, Energy and Supply must set a planned target for the level of security of electricity supply by 15th of February every year. More details can be found in Section 3.3 (Dimension Energy Security).

The Nordic TSOs are currently developing a new Nordic balancing model. The scope of the model is a common Nordic capacity market for ancillary services and the implementation of a 15-minute imbalance settlement period.

The cooperation on the Nordic Balancing Model contains a roadmap with a number of projects that will include a common European platform for the exchange of balancing energy. The Nordic TSOs will join the common European platforms.

The exchange of balancing energy across TSO control areas in Europe will lead to major economic gains, as resources and needs are unevenly distributed across Europe.

In December 2022, Energinet submitted an amendment to the methodology for local flexibility in addition to the already approved methodology from 2021 with a view to enabling Energinet to better address local bottlenecks in its operational situation.

#### **Market coupling – interconnectors and flows**

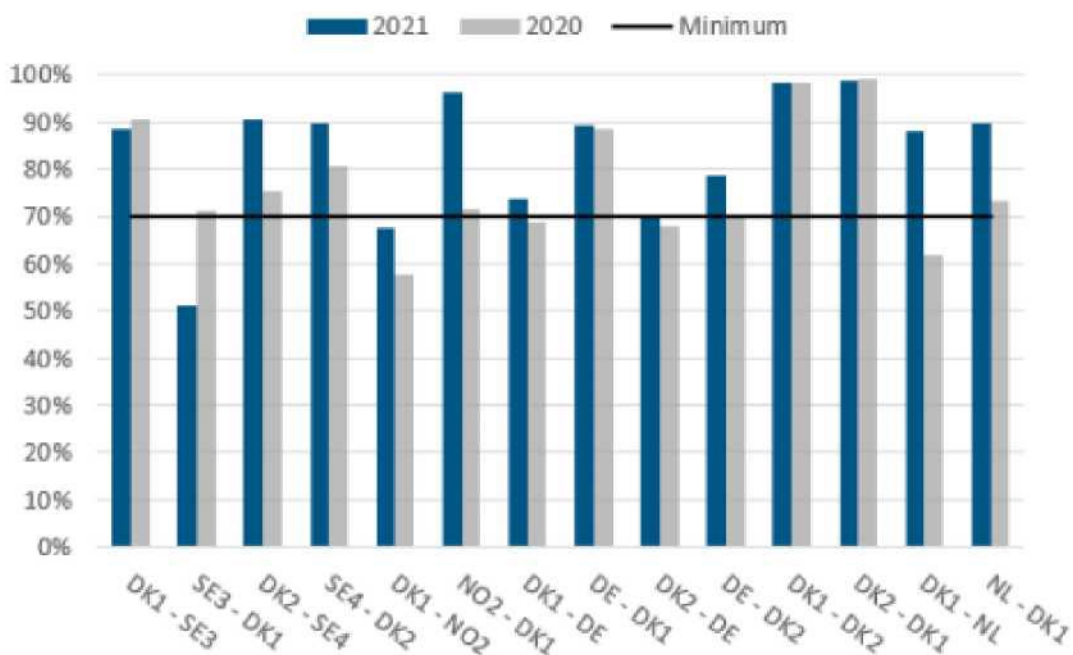
Implicit intra-day market coupling has been implemented for several years on the Nordic market, as well as on grass between Eastern Denmark and Germany via the Kontek-link.

As an indicator of market integration, the following figures can be highlighted. Figure 19 below shows the average trading capacity across all interconnectors connected to Denmark. The capacities of Trade are

calculated as the average available capacity relative to the nominal capacity.

The chart shows that almost all interconnectors maintain an average trading capacity exceeding 70 % per year<sup>52</sup>. In 2021, only two connections had an average trade capacity of less than 70 % in either the direction of imports or exports. These are the direction of import (abroad to Denmark) for the bond SE3-DK1 and the export direction (Denmark to abroad) on the DK1-NO2 connection.

**Figure 19. Average trading capacity across all interconnectors connected to Denmark**



(Source: Danish Utility Authority Market Report for el 2021)

Note: Average available trading capacity as a percentage of the nominally available capacity for the specified connections. The minimum requirement is 70 %.

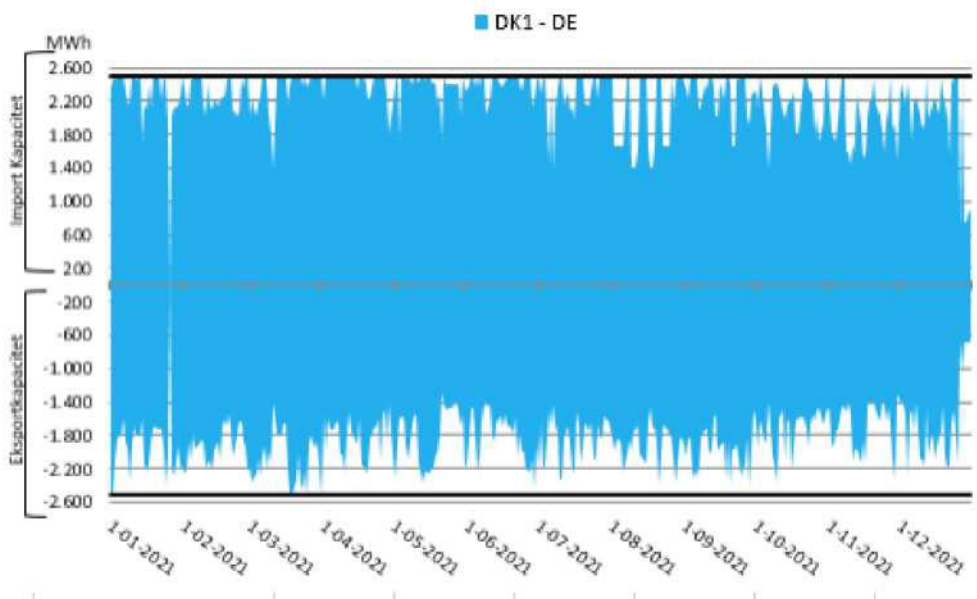
The following graphs show the daily evolution of available trading capacity for the year 2021.

**DK1-DE – 2 500 MW**

Figure 20 shows the daily trading capacity of the Jutland/German foreign link (DK1-DE). The average available import capacity has not changed from 2020 to 2021, but remained from 89 %, while export capacity has increased from 69 % to 74 %. This link has been notoriously limited in the direction of export due to an internal bottleneck in Northern Germany. This has been dealt with in the past through special downward regulation, where the German TSO TenneT pays Danish wind turbine owners for switching off their wind turbines and thus limiting exports to Germany.

<sup>52</sup>Article 16 of EU regulation (2019/943) provides that a minimum of 70 % of the transmission capacity on an international connection must be provided for trade with other EU countries. However, each TSO may apply for a derogation from the national regulator.

**Figure 20. Daily trading capacity on the Jutland – Germany foreign link (DK1-DE)**



(Source: Danish Utility Authority Market Report for el 2021)

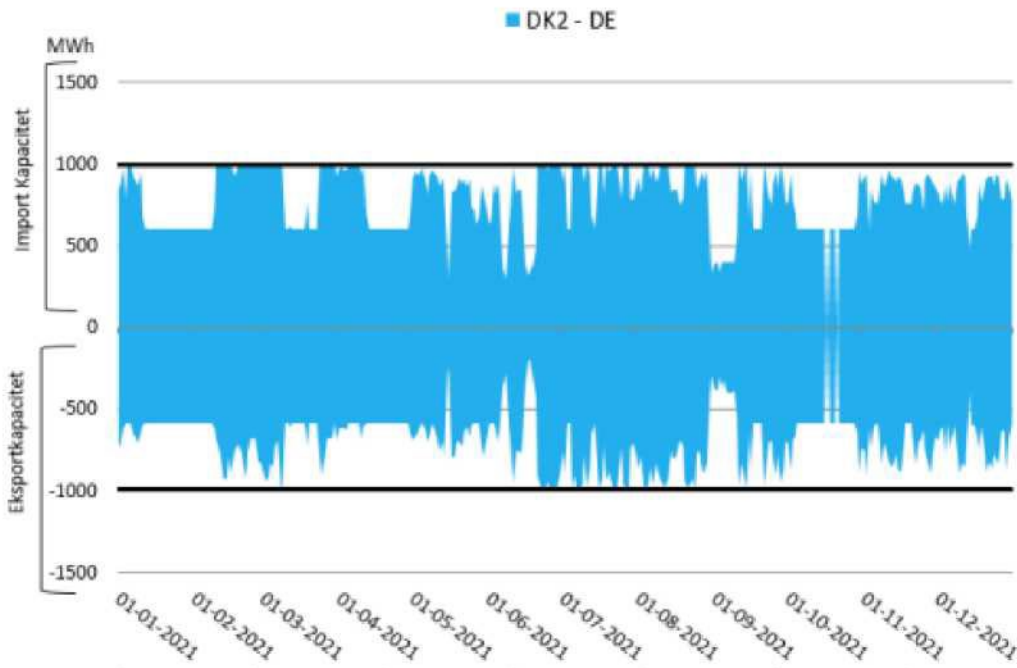
*Note: Average daily evolution of available trading capacity between DK1 and DE. The black horizontal lines indicate the respective maximum and minimum nominal transmission capacity.*

**DK2-DE – 1 000 MW**

On the link between East Denmark and Germany (Graph 21), the average available capacity is from 68 % to 70 % in the export direction and from 70 % to 79 % in the import direction. Capacity has been reduced in both directions to varying degrees in the course of 2021 due, inter alia, to planned maintenance and the fact that capacity is limited by the electricity generation from the Krigers Flak offshore wind farm at all times.



**Figure 21. Connection between East Denmark and Germany**



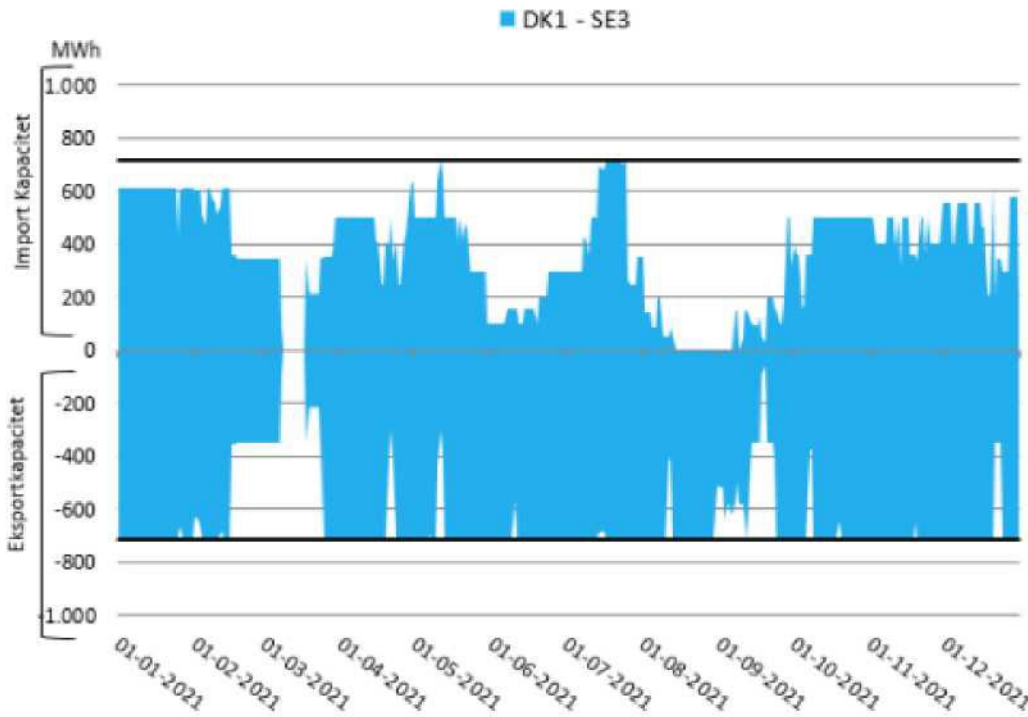
(Source: Danish Utility Authority Market Report for el 2021)

Note: Average daily evolution of available trading capacity between DK2 and DE. The black horizontal lines indicate the respective maximum and minimum nominal transmission capacity.

#### **DK1-SE3-715 MW**

The available trading capacity from West Denmark to Sweden (Graph 22) has declined in the export direction from 90 % in 2020 to 88 % in 2021, while in the direction of imports it has declined from 71 % in 2020 to 51 % in 2021. Capacity limitation has been spread over the year, partly because of several periods of planned maintenance of the link and partly because the Swedish TSO Svenska Kraftnät has reduced the available capacity due to internal problems in the Swedish network.

**Figure 22. Available trading capacity from West Denmark to Sweden**



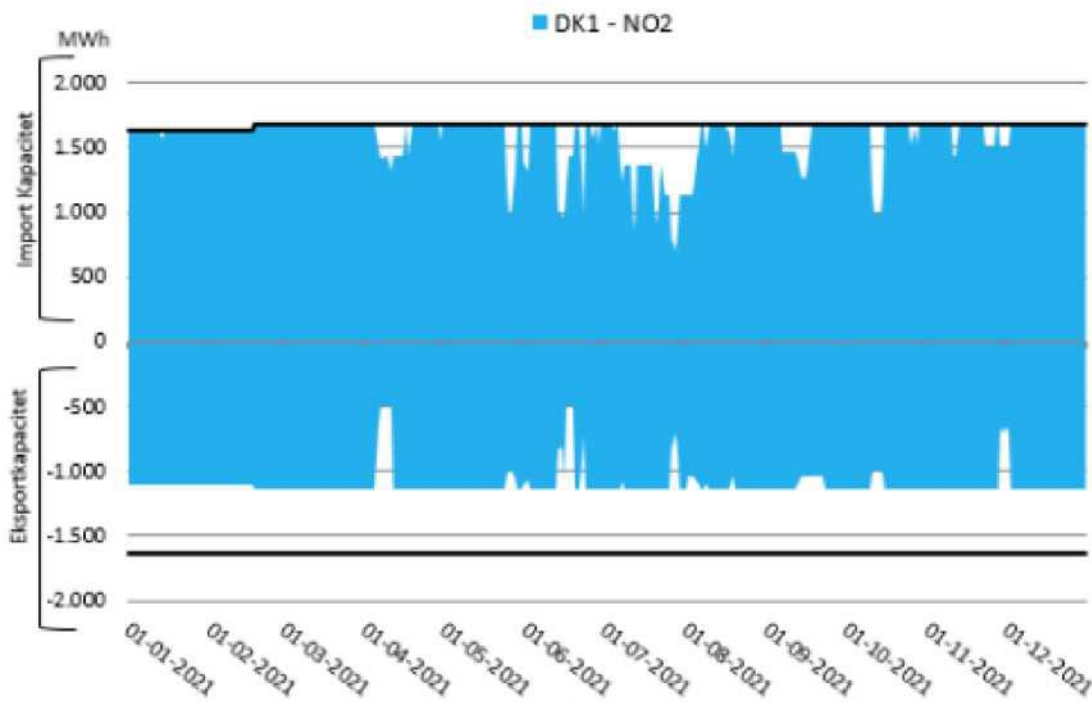
(Source: Danish Utility Authority Market Report for el 2021)

Note: Average daily evolution of available trading capacity between DK1 and SE3. The black horizontal lines indicate the respective maximum and minimum nominal transmission capacity.

**DK1-NO2-1 632 MW**

On the DK1-NO2 link (Graph 23), the average available trading capacity in 2021 in import law was 96 %, up from 72 % in 2020. In the export direction, capacity has increased to 68 % in 2021, from 58 % in 2020. Since 2019, there have been problems with the connection between West Denmark and Norway due to a mistake on the land side in Denmark. At the end of 2020, Energinet and the Norwegian TSO managed jointly to increase the available capacity from Norway to West Denmark to 100 %, while capacity in the opposite direction was reduced to around 70 %. This situation has persisted throughout 2021.

**Figure 23. DK1-NO2**



(Source: Danish Utility Authority Market Report for el 2021)

Note: Average daily evolution of available trading capacity between DK1 and NO2. The black horizontal lines indicate the respective maximum and minimum nominal transmission capacity.

### Linking gas balancing markets between Sweden and Denmark

As regards the gas market, in 2019 Denmark and Sweden merged the two national gasbalancing companies to establish a common balancing zone for Denmark and Sweden – the so-called Joint Balancing Zone (JBZ).

JBZ means that a shipper transporting gas to Sweden no longer needs to balance two systems, but only needs to be balanced in one system and no longer needs to book capacity to move gas between Denmark and Sweden. The details of the project (in terms of tariff structure, market function, contracts, etc.) were well-known to the two national regulatory authorities in Denmark (DUR) and Sweden (Ei) in March 2019.

The common balance between Denmark and Sweden contributes to increased security of supply and more gas retailers in the balancing market and the Danish gas exchange (balancing platform), which could lead to increased competition for final consumers. In addition, there will be system synergies and administration that are more efficient. JBZ is in line with the thinking of the European *Gas Target Model (GTM)* and overall harmonisation objectives.

- (ii) Measures to increase the flexibility of the energy system with regard to the production of renewable energy;
  - energy, such as smart grids, aggregation, demand response, storage, distributed generation, mechanisms for dispatching, redistribution and curtailment, real-time price signals, including the rolling-out of intradaymarket interconnection and cross-border balancing markets;

### Remote electricity meters

Consumption flexibility is generally promoted through the roll-out of remotely read electricity meters and the

establishment of an hourly billing model in the retail market. As described under (v), these measures allow the use of dynamic prices and price signals in real time to a wide range of customers. The legal requirements for the functionality of remotely read electricity meters include the recording of metering data every 15 minutes, data storage and the sharing and transmission of data via the DSO to the Energy Network DataHub. The DSO reports metering data to the Danish DataHub in order to make it easier for the customer to discard.

### **Autoproducers**

The roll-out of remotely read electricity meters for all consumers, including autoproducers, aims to increase through the inspection of such activities and to clarify the importance for the electricity system. For example, remotely read electricity meters will make it possible to identify whether self-producers create benefits for the system and appropriate incentives can be put in place.

The current practice allowing internal grids is expected to become part of the Electrical City of Supply Act. The Act 53 specifies, inter alia, that the electricity customer's generating installations may be located either (1) in the area covered by the electricity customer's place of consumption (i.e. an area consisting of the electricity customer's land registry or contiguous cadastral) or (2) in an area immediately adjacent to the place of consumption, provided that (a) the electricity customer has access over the entire area and (b) the distance between the electricity customer's consumption installation and the generating facility does not exceed 500 metres. The rules will be further clarified at the level of fine notices. The draft Order was subject to public consultation in autumn 2022.

No tax shall be payable on electricity used directly for the production of electricity. On the other hand, DSOs currently provide for an energy-based accessibility tariff or a fixed fee, which varies between DSOs and depends on the voltage level of each renewable self-producer connected according to the current tariff model. Energy networks and DSOs are developing and adapting their tariff models in parallel, which means that different tariffs and charges may apply to renewable self-generation in the future.

In addition, according to the Electricity Tax Act, electricity tax is not payable on the consumption of electricity produced from wind power, hydropower, biogas, biomass, solar energy, wave and tidal energy and geothermal heat, which is directly criminalised by the producer himself or by a tenant in a rented dwelling, when the installation is located in connection with the rented dwelling and the leased property is rented by the electricity producer.

### **Energy Communities**

On 30 May 2021, an Order entitled 'Order on renewable energy communities and citizen energy communities and the relationship between renewable energy communities and citizen energy communities and electricity trading companies and collective electricity supply companies' entered into force. The Order implemented Article 22 of Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources (REDII) and Article 16 of Directive (EU) 2019/944 (Electricity Market Directive) and developed a legal framework for energy communities in Denmark.

In addition, one of the recommendations of Market Option 3.0 is to develop a framework for energy communities to ensure balance with the costs and savings that the Energy Community contributes. In relation to this, a revised Electricity Supply Act in force in April 2023 allows DSOs to establish a method of charging

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53L 37 Proposal for an Act amending the Electricity Supply Act and the Electricity Tax Act.

energy communities in relation to the benefits they provide to DSOs according to their activities.

In addition, from 2022 to 2025, Denmark has put in place an opportunity to seek funding for local energy initiatives, which include RECs. This possibility is governed by Order No 1162 of 9 August 2022.

### **Aggregators and consumption flexibility**

To this end, Denmark is currently developing an aggregation model that allows decentralised resources to participate in energy and ancillary services markets together with large market participants. The Aggregation model is developed by Energinet. The Danish Energy Agency established the framework for the tasks and obligations of electricity trading companies, aggregators and collective electricity supply companies in connection with the aggregation of electricity consumption and reduction by active customers through the Order No 2250 of 29 December 2020.

In this context, the Danish TSO, Energinet, has currently developed new tender specifications for mFRR, which will enter into force in May/June 2023, affecting independent aggregators providing energy system services. The tender specifications will be aligned with those of the Nordic market, which will be in place in the fourth quarter of 2023. In addition, Energinet is currently developing a new methodology for compiling mechanisms and correcting imbalances, which will be described in their "Regulation H4". The compensation and correction model ensures that the independent aggregator is correctly settled without affecting financially the imbalance of balance responsible parties.

### **Promoting flexibility through grants**

In Denmark, there are mainly three grant programmes contributing to research, development and demonstration of energy solutions. The three funding programmes are the EUDP, ELFORSK and the Innovation Fund, all supporting the development of new solutions and technologies in the field of energy.

#### *EUDP*

The Energy Technology Development and Demonstration Programme (EUDP) is a technology-neutral grant scheme in its priorities. The EUDP aims to support Denmark's energy and climate policy objectives of high security of supply, phasing out fossil fuels and reducing greenhouse gas emissions in line with climate objectives. Efforts must go hand in hand with promoting business potential for growth and jobs in Denmark. The EUDP supports every year businesses and universities in expanding, testing and demonstrating climate-friendly energy technologies and system solutions.

The EUDP Strategy (2020-2030) has eight focus areas. These areas reflect the main challenges that still stand in the way of achieving the climate objective. The eight focus areas are:

1. More green electricity – and for multiple purposes
2. Energy efficiency improvement
3. Carriage of persons and light goods
4. Heavy transport and large-scale PTX
5. Heat and heat storage
6. Green process energy
7. Flexible electricity use, grid deployment and digitalisation
8. CO2 capture and storage.

In 2022, the EUDP committed some 60 projects to state aid. In 2022, a total of DKK 498 million was allocated to the expansion of new energy technology in the EUDP. See the distribution in% in the graphs below, broken down into technology areas and the strategy's focus areas.

### *ELFORSK*

ELFORSK has an annual allocation of DKK 25 million for innovative projects to support the electrification and green transition of the Danish energy system. Grants shall primarily be awarded for research and development checks aimed at promoting efficient energy use and flexibility solutions in the fields of electricity and energy through data, digitalisation and sector coupling.

In 2022, DKK 20 million was translated into 3 projects. More specifically, they are about optimising industries through machine learning, smart use of data in a port and digitised interaction between transport and electricity grids.

### *Innovation Fund*

The Grand Solutions programme under the Innovation Fund invests in cross-cutting research and innovation-projects that provide new solutions to key policy challenges for society. In 2022, in the area of Green Research, Technological Development and Innovation, DKK 455 million was implemented. Of this, projects in the energy sector amounting to approximately DKK 150 million were launched.

In 2021-2023, a large majority in the Danish Parliament allocated a total of DKK 1,3 billion to four green research and innovation partnerships. Overall, the Innovation Fund is responsible for these. The partnerships will bring together its researchers, businesses and organisations to put Denmark at the forefront of *storage and use of CO<sub>2</sub>, PTX, climate, environmentally-friendly agriculture and food production, and circular economy*.

### **Future projects**

With a political agreement of June 2022 (Climate Agreement for Green Electricity and Heating 2022), a number of actions and analyses have been launched on issues such as demand response. Analytical work on the promotion of flexibility markets, flexible grid connection conditions and network products has been launched, as well as efforts to speed up the implementation of tariff models and the analysis of tariffs to promote flexibility. The analyses are expected to be reported up to 2024.

*(iii) Measures to ensure non-discriminatory participation of renewable energy, on demand response and storage, including through aggregation, in all energy markets where it is used;*

### **Data hub**

In 2013, DataHub was implemented on the Danish retail electricity market. DataHub is a central and independent IT system owned and operated by Energinet. In addition to handling all data communication between players in the electricity market, DataHub gathers billions of data on customers, consumption and prices from around 3,3 million Danish metering points (consumption and production measurement points).

The data hub shall ensure a level playing field for all electricity providers through:

- Standardised processes for recording and distributing market data;
- A level playing field for market access;
- Automation and simplification of switching;
- Clear definition and definition of the roles of network companies and electricity suppliers.

The players on the Danish electricity market are the main users of DataHub, who thus communicate with each other about the Danish electricity consumption and ensure that they have the necessary information to settle customers. Stakeholders can communicate with DataHub through their own IT systems or through the DataHub Market Portal, which is a web-based access to DataHub. Danish electricity customers have the opportunity to view their own data in DataHub via their electricity supplier's website or electricity overblik.dk.

### **Wholesale model**

In 2016, the 'wholesale model' was implemented in Denmark with the aim of ensuring that the electricity supplier has the primary customer contact with electricity consumers and that all costs related to electricity are aggregated in a single electricity bill sent to the consumer. At the same time, the wholesale model should increase competition and support the development of new products and services for consumers. All information on consumption, network tariffs, electricity charges and fees is communicated through the DataHub. The development of the electricity market and DataHub continues on an ongoing basis to ensure an efficient retail market in supporting the green transition in Denmark.

In general, Denmark is well advanced in terms of sharing consumption data. Today, consumers are able to extract and share data from their smartmeter system and make this data available to service operators in the elsystemet through the DataHub. Therefore, many of the rules described in the Implementing Regulation on interoperability requirements and non-discriminatory and transparent measurement and consumption data procedures are already in place on the Danish retail market. At present, Regulation No 75 from 25 January 2019, 'Bekendtgørelsen om remotely read electricity meters and metering electricity in final consumption', is revised and updated to be in line with the latest developments in the retail electricity market. The updated update is expected to be in place in May 2023.

### **Aggregators**

There are no specific barriers in Danish legislation that prevent independent service providers from entering into a contract with customers or aggregators to provide consumption flexibility. No distinction shall be made between offers in the market which come from a single or aggregated source. At the end of 2020, the rights of independent aggregators were laid down in an Order, 'Order on the duties and obligations of electricity trading companies, AG- aggregators and collective electricity supply companies in connection with the aggregation of electricity consumption and generation by active customers', Order No 2250 of 29 December 2020. It ensures that TSOs and DSOs shall allow aggregators to participate in all electricity markets and that participation shall not require the consent of other market participants. The Order also allowed aggregators to operate independently of a PPA.

### **Ve on the reserve capacity market**

RES producers (other than household production) are obliged to sell their production to the market via a balance sheet responsibility. The market for ancillary services is also open to RES participation. For example, several wind producers have delivered downward regulation to the market.

It is now also possible for renewable energy resources to enter the reserve capacity market for manual reserves for the provision of upward regulation. In the past, VE has also been able to enter these markets, but only by having a backup capacity. Nowadays, VE can enter reserve capacity markets by submitting a forecast to Energinet with a maximum probability of 10 % not being able to deliver. This forecast is well known to Energinet on the basis of previous forecast data.

The Agreement on the Development and Promotion of Hydrogen and Green Fuels of 15 March 2022 decided to create the necessary framework for Denmark to deploy hydrogen infrastructure for transport in pipes and for storage in underground. It was also agreed that the deployment would take place on market terms and that the two state companies for gas transmission and distribution (ENERginet and Evida) would be allowed to own and operate the hydrogen infrastructure. The detailed ownership, financing and operation framework will only be politically assessed in the course of 2023.

A national framework regulation for hydrogen has been provided at the turn of 2023 by including hydrogen in the Gas Disappearance Act.

(iv) *Policies and measures to protect consumers, in particular vulnerable and, where used, energy-poor-consumers, and to improve competitiveness and competition in the retail energy market;*

Denmark has a number of consumer protection policies that ensure and aim to improve competition conditions in the retail energy market. The actions are set out below.

### **Social policy measures**

Denmark also considers energy poverty to have a social policy dimension, and it is addressed through needy and new measures through targeted social services. Actions are reviewed in chapter 3.4.4 on energy poverty.

### **Electricity price comparison tool**

The Danish NRA (Danish Utility Regulator) manages a price comparison portal called [www.elpris.dk](http://www.elpris.dk) to provide more transparency on the retail electricity market and thus support consumers' active choice of electricity products. The price comparison tool provides an overview of all products offered on the retail market and allows for comparison of prices and characteristics of the products, including climate impact characteristics. The Danish Utility Regulator also publishes quarterly electricity price statistics, which provide insight into the average consumer price of electricity, as well as an annual price survey.

### **Analysis of competition in the retail market**

In order to ensure strong competition for the benefit of Danish citizens and businesses, on 28 April 2021 the Danish Energy Agency published an analysis of whether competition in the retail market works well. Particular attention is paid to the separation between monopolistic and competitive activities within vertically integrated selska.

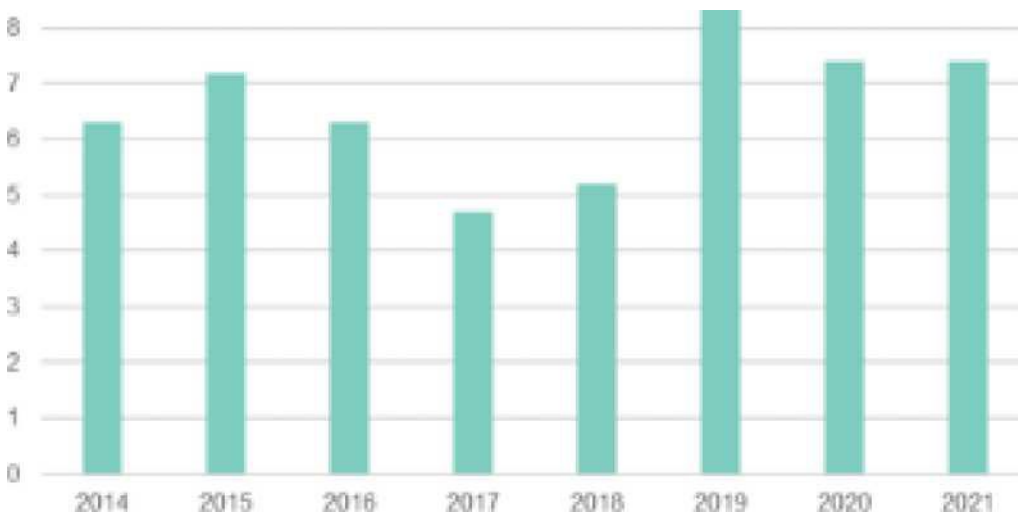
The analysis concluded that there may be a risk that the current rules do not ensure sufficient "watertight bulkheads" between the grid company and other group-related companies carrying out commercial activities, including electricity activities subject to competition, such as electricity trading and electricity-generation.

In June 2021 and based on the analysis, the Vote Agreement *An efficient and future-proof electricity infrastructure to support the green transition and electrification* adopted a number of adjustments to existing legislation with the aim of ensuring a clear separation between the monopoly activities of the network companies and other commercial activities, as well as a market price for the purchase of services from the grid companies. The changes aim to ensure robust regulation of network companies through clear role allocation requirements and transparent business behaviour. The amendments aim to ensure that electricity customers and other players in the electricity market can be confident that there is fair and effective competition and that the performance of monopoly activities will not be more expensive than necessary.



In 2021, there were 57 electricity suppliers from which consumers could choose. Despite potential savings, the external switching rate (for household and non-household customers with an annual consumption of up to 100.000 kWh), where customers switch to another supplier, has remained more or less constant since 2014, as shown in Figure 24. In 2021, however, the switching rate stood at 7.36 %, compared with 7.4 % in 2020. The change rate for 2022 is expected to show an increase of around 15 % compared with the previous year.

**Figure 24. Electricity Supplier Switching Rate, 2014-2021**



(Source: Energy networks)

### **Universal service obligations**

Denmark has phased out ‘Supplier of last resort’ and replaced it with a general obligation to supply. Eleven randomers are therefore required to supply all available products, to all household customers, at the customer’s request, in the areas where the supplier offers their products. It is not lawful to conclude time-limited supply agreements with households. If there is a specific reason to expect a lack of beta ability or willingness to pay, for example if the customer is known to have payment difficulties, the electricity supplier may ask for a guarantee from the customer. Only if the guarantee is not honoured can the electricity supplier cancel the contract. At the same time, price formation on the wholesale market is highly competitive. The market development is closely monitored to ensure a proper price level for all consumers.

With the National Hydrogen Framework, hydrogen consumer rights have been assimilated to criminal rights for electricity and methane gas. However, it will be possible to grant derogations in specific cases.

### **Freezing regime**

In response to the energy crisis and rising consumer prices, the *Winter Aid Agreement* of 23 September 2022 established a temporary freezing mechanism whereby consumers and businesses can have part of their bills frozen for reimbursement at a later stage. The scheme covers both electricity, gas and heat. The scheme covers all electricity and gas bills not received during the period from 1 November 2022 to 31 October 2023. For heating bills, this is from 1 January 2023 to 31 December 2023. Everyone has the right to use the scheme when requesting the energy supplier.

Freezing has the effect of freezing when the price exceeds a statutory limit depending on each source of energy

(the limits are based on 2021 prices). The one-year freezing system has been followed by a year without repayments. Thereafter, the consumer must pay off over a period of four years. In this context, each energy company has the possibility to turn to the State to borrow the total amount frozen by the customers of the company. The State guarantees the customers' frozen amounts from the energy companies in the event that the customers are unable to repay the loan. Loans and guarantees ensure that energy companies do not face liquidity problems or losses as a result of having to freeze only a proportion of their energy bills.

### **Electricity Tax**

The electricity tax has been reduced to the EU minimum threshold in the first six months of 2023.

### **Varmecheck**

A fixed compensation 'Varmecheck' of DKK 6000 was automatically paid to households in August 2022 with a total annual income of a maximum of DKK 650.000, and as heated by gas boilers, district heating from certain district heating networks with a high gas and/or electricity share or electricity (e.g. heat pump as primary heated mode) with an electricity consumption of more than 1.500 kWh in December 2021. The target group was identified, inter alia, using data from the Building and Housing Register, the Central Register of Buildings and Dwellings (BBR), the Central Register of Buildings and Dwellings, the Civil Registration System (CPR) and the Danish Income Register.

- (v) *Description of measures to enable and develop demand response, including for measures relating to tariffs to support dynamic pricing*

### **Smartmeter and flex settlement**

From the end of 2020, all Danish consumers will have a smartmeter installed. At the same time, the TSO and the grid companies have implemented a new hourly settlement model called "flex settlement" for small consumers (100.000 kWh/year). In their regulatory work, energy networks ensure that end-users are always able to be settled at the same time resolution as the imbalance market. This is the basic pre-condition for access to dynamic price products, enabling the use of consumption flexibility activities.

### **Time-differentiated tariffs**

In addition to dynamic electricity prices, DSOs may choose their primary tariff approach to be time-differentiated. For the majority of customers, this has been chosen by the DSO. At present, the tariff is based on a static time-of-use model consisting of three different tariff levels for all customers and a summer/winter variation.

In addition to this, the DSOs and the TSO are developing their tariff models by further coordination at transmission and distribution level. The June 2022 climate agreement also includes two initiatives on tariff issues. One initiative analyses potential regulatory barriers related to the development of a TSO-DSO tariff model, as well as how this model may affect consumption flexibility and distribution effects. The second initiative is the establishment of a working group to examine how to speed up the implementation of tariff models in Denmark. The working group is composed of representatives of the TSO, the DSOs, the Danish Utility Regulator (regulator) and the Danish Energy Agency.

### **Direct lines and geographically differentiated consumption tariffs**

The Danish Parliament has started, but has not completed, the treatment of legislation allowing the

construction of directliners, as well as the introduction of geographically differentiated consumption tariffs and local collective tariff classification. These tools are expected to create a stronger incentive to co-locate consumption and generation, thus avoiding or delaying additional investments and network reinforcements. The establishment of a direct line must be accepted by the Danish Energy Agency on the basis of objective and non-discriminatory application criteria established at the level of the Order (the Order was in consultation in autumn 2022). The criteria, which refer to a distance criterion and that at least of the installations must be new ones, intend to ensure that no electricity grid is put in place in Denmark, where the conditions aim, inter alia, to ensure that direct lines are not used, for example, for the distribution of electricity. In order to do so, applications must comply with a number of mandatory conditions. If the applicant meets the criteria and conditions, the Danish Energy Agency shall approve the application Geographically differentiated consumption tariffs for installations connected at 10 kV or higher. The Danish TSO and DSOs have responded to developing the specific tariff methodologies for both direct lines and geographically differentiated user tariffs.

### **Charges**

A large but decreasing share of the electricity price for Danish households consists of levies and taxes. The PSO tax has been phased out from the electricity bill. In addition to this, the 2018 Energy Agreement provides for a gradual reduction of the electricity tax. Therefore, the wholesale electricity price is expected to be more directly reflected in the overall electricity bill of consumers. In addition, the electricity tax has been reduced from DKK 69,7 per kWh to DKK 0,8 per kWh for six months from 1 January 2023 onwards.

### **3.4.4 energy poverty**

- (1) *Policies and measures to achieve the objectives set out in point 2.4.4, where they are: relevant*

In Denmark, energy poverty is being addressed, inter alia, through existing and new measures through targeted social services. For example, pensioners and early pensioners may receive a heating supplement to pay for heating and hot water. In addition, per person who qualifies for assistance in the cash assistance system and who has high housing costs or high dependency costs may receive special support for their housing costs, including expenditure on the use of the dwelling (water, heating, gas or electricity). If the conditions are otherwise filled, people who have been exposed to a social event such as illness or unemployment may also receive financial assistance, for example, to pay a high energy bill on the basis of a specific assessment from the municipality.

Some of the concrete actions of social policy are listed and explained below.

#### **Heating supplement**

Old-age pensioners and early pensioners on old schemes (awarded under the rules prior to 1 January 2003) may, on application, receive a heating allowance if their personal supplementary rate is above 0 %. The amount of the heating allowance depends on the personal allowance. The top-up rate indicates how much a pensioner can receive from allowances and allowances next to the pension (e.g. old-age cheques, heating allowances) and is calculated on the basis of the total income of the pensioner and, if applicable, the spouse/cohabiting partner, in addition to the old-age or early retirement pension. The heat supplement is thus targeted at the economically weakest proportion of pensioners. Only one in the house can receive a heating supplement, and the pensioner must pay part of the heating costs of DKK 5.600 (2023) per year for single persons and DKK 8.400 (2023) per year as cohabiting.

The heating allowance is calculated on the basis of an average of three years of documented heating costs. If

these are not available, the heating costs are calculated on the basis of the years of available heating accounts or the expected heat consumption. If the heating cost increases for one year by 10 % or more, the pensioner may have his or her heat supplement recalculated. Charges for the actual heating of the dwelling and heating of water are included in the calculation of the heating supplement. Once calculated, the heating allowance is paid in proportion to the personal allowance. If the percentage is 100 %, the supplement shall be paid in full. If the percentage is 50 %, half of the calculated supplement shall be paid.

### **Personal allowance**

Old pensioners and early pensioners (awarded in accordance with the rules in force before 1 January 2003) can apply for a personal allowance from the municipality. Personal allowances cover reasonable and emergency costs, such as the payment of additional costs for heating or electricity. It is a prerequisite that the financial situation of the pensioner is particularly difficult and that the pensioner does not have the money to pay the cost himself.

The municipality decides on the personal allowance on the basis of a concrete and individual assessment of the pensioner's overall economic situation. This assessment includes the pensioner's assets, the social pension and all other income. Personal allowance may be granted as a lump sum or as a continuous benefit if the conditions for each payment continue to exist.

### **Single services**

The municipality may, on a case-by-case basis, provide assistance with reasonably justified individual costs under the Active Social Policy Act (Active Social Policy Act) to a person who has undergone changes in his or her circumstances (for example, the loss of work or illness) if the person's own responsibility for the costs would significantly impede the ability of the person and the family to cope with themselves in the future. A number of situations *cannot* be made as changes. For example, an increase in fixed costs cannot justify assistance.

Aid may normally be granted only if the cost has been incurred as a result of unforeseeable needs. However, on the basis of a specific assessment, the municipality may exceptionally provide assistance in respect of expenditure which could be seen beforehand if the implementation of the expenditure is of crucial importance for the maintenance of life. Thus, in some cases, assistance may be granted to pay a large energy bill if the citizen has not been able to foresee the cost or if the applicant has not had a financial opportunity to save up to the cost and the conditions for assistance are otherwise met.

### **Specific support**

Persons who meet the conditions for entitlement to self-sufficiency and return allowance, bridging allowance, training allowance or cash assistance (but not necessarily receiving it) and who have high housing costs or a high level of dependency may be granted special support if the conditions for receiving the assistance are otherwise filled.

The conditions for obtaining cash assistance, etc. are that the applicant has suffered a social event, such as sickness, unemployment or separation. The event must also mean that the citizen does not have equality in order to obtain the necessary support for his or her family and that the need for assistance cannot be covered by other benefits. Before the municipality grants special support, it must be examined whether reasonable, cheaper housing can be obtained.

As a starting point, the special support is calculated as the difference between what it is assumed that the applicant will be able to pay by itself in respect of housing costs (known as the limit amount) and the beneficiary's net housing costs. In principle, net household expenditure consists of rent less housing assistance. In addition, it includes, inter alia, expenditure on water, heating, gas, electricity, benefits relating to housing loans and similar current expenditure on the dwelling.

A number of detailed rules apply to the calculation of special support, including a daily allowance ceiling, the deduction of income and the obligation to reimburse persons with owner-occupied or cooperative dwellings.

### **The heat pump pool, the energy renovation pool and the scrapping scheme;**

Denmark has a number of measures and pools targeted at energy efficiency improvements, which also relate to energy fattigdom. For more information on these actions, see section 3.2.

In addition, in the field of energy, a number of temporary measures have also been implemented due to high energy prices in recent years. A selection of these actions is listed below.

### **Varmechecken**

In August 2022, as a direct consequence of the energy crisis, a one-off subsidy has been paid to low-entry households and heat sources subject to exceptional price increases during the 2021-2022 heating season. This heat cheque is DKK 6.000 and is a tax-free one-off payment. Over 400.000 Danish households have received the VaR – mechecken.

### **One-off payments to certain beneficiaries**

A broad political agreement was reached in June 2022 on a series of tax-free one-off payments to certain beneficiaries to provide targeted assistance to these groups in a context of rising energy prices. As a result of the agreement, public pensioners entitled to old age checks for 2022 received an additional financial support of DKK 5.000. Persons who received a senior pension, early retirement pension, pre-retirement pension, flex-benefit and early retirement pension received DKK 2.000 tax-free. SU-disabled persons and single parents also received DKK 2.000. All the lump sums were tax-free benefits, which did not result in any deduction from citizens' other benefits.

In February 2023, a political agreement was reached to compensate recipients of old age cheques and certain SUs for the high inflation rate. State pensioners who are entitled to the old-age cheques for 2023 will thus receive additional financial support of an additional DKK 5.000 in the amount of DKK; as a result of the agreement, persons with disabilities will receive a lump sum of DKK 1.000. Both amounts are exempt from tax and are not to be deducted from the citizen's other benefits.

In addition, a political agreement was reached in February 2023 on inflationary support for economically vulnerable families. Persons who receive benefits in the cash assistance system or resource depletion allowance for January 2023 will thus receive inflation assistance of up to DKK 13.500 for up to 3 children under the age of 15. For the first child, DKK 7.500 is paid to help, for the second child DKK 3.750 is paid, and for the third child DKK 2.250 is paid. The amount is exempt from tax and is not to be deducted from the citizen's other benefits.

### **Winter help to mitigate rising energy bills<sup>54</sup>**

In autumn 2022, a broad political agreement was reached with a broad section of the Folketing's parties on the introduction of a temporary and voluntary scheme whereby households and businesses can have part of their energy bill frozen for subsequent payment. It is a scheme that small and medium-sized enterprises that are under pressure on the economy due to increases in energy prices can choose to use.

At the same time, the parties to the agreement agreed to grant a one-off increase in the child and youth allowance of DKK 660 per child in 2023, which will help children families through the current situation. To also support the roll-out of district heating, the pool will be increased by DKK 150 million in 2022 and DKK 100 million in 2023.

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<sup>54</sup>[https://fm.dk/nyheder/nyhedsarkiv/2022/september/regeringen-indgaar-bred-aftale-om-vinterhjaelp-for-at-afboede-de-stiff energy values/](https://fm.dk/nyheder/nyhedsarkiv/2022/september/regeringen-indgaar-bred-aftale-om-vinterhjaelp-for-at-afboede-de-stiff-energy-values/)

At the same time, the general electricity tax was temporarily relaxed to the EU minimum rate of DKK 0,8 per kWh in the six months before 2023. A reduction in the electricity tax benefits all Danes in the form of lower expenditure on electricity consumption. In addition, the relief reduces income disparities, as the effect of the relaxation is, in relative terms, the highest for the lowest income groups.

### 3.5 research, innovation and competitiveness dimension

(I) *Policies and measures relating to the elements set out in point 2.5;*

Danish efforts for research, innovation and the maturing of green solutions, as well as climate and energy technology, are characterised by a mission-borne approach, where a number of strategic focus areas have been identified. As part of the effort, state funds for green research are implemented through a number of channels, including mainly the Danish Innovation Fund, the Danish Free Research Fund, ELFORSK and the three development and demonstration programmes: Energy Technology Development and Demonstration Programme (EUDP), Environmental Technology Extension and Demonstration Programme (MUDP) and Green Development and Demonstration Programme (GUDP). In addition to this, the effort consists of a number of initiatives that support private actors in promoting a market for green technologies.

The action can be divided into three main phases:

- Research and innovation in climate and energy technologies
- Development and demonstration
- Market maturation

#### Box 2. Effort from research to market



#### Research and innovation

In 2020, Denmark launched a green research strategy that sets a direction for research and innovation of green solutions. Against this background, Denmark has allocated significant funding for research into green solutions, which are implemented inter alia through the four research and innovation partnerships.

#### Green Research Strategy and Green Missions

In September 2020, Denmark launched a comprehensive National Strategy for Green R & D *Future Green Solutions – Strategy for investing in green research, technology and innovation* to ensure targeted, coherent and strengthened green research and innovation efforts, in view of the challenges that have been missed to develop responses to meet Denmark's climate targets and where research and business strengths are well placed to develop new technologies and create export opportunities and green jobs in Denmark.

With the strategy, Denmark has identified four green research and innovation missions, which are particularly important to achieve the Danish climate targets and which require targeted research, development and demand-response efforts:

- Capture and storage or use of CO<sub>2</sub>
- Green fuels for transport and industry (PTX etc.)
- Climate and environmentally-friendly agriculture and food production
- Circular economy with a focus on plastics and textiles

The missions address concrete challenges in sectors where the need for new solutions and the potential to achieve green objectives are greatest in Denmark as well as globally.

With the agreements on the allocation of the research reserve in 2021-2023, Denmark has prioritised a total of approximately DKK 1,3 billion for the four green missions to contribute to research and development of the technologies. The missions are implemented through four partnerships of universities, knowledge and innovation institutions and businesses. The partnerships have developed joint roadmaps for a comprehensive research and innovation effort to deliver on the four missions. The Innovation Fund has allocated four partnerships to improve the objectives and milestones set out in the roadmaps drawn up by a wide range of stakeholders in each of the four mission areas by 2030 and 2050, as set out in Box 3.

Green research strategy and research and innovation partnerships support research and innovation funding to accelerate the green transition and the achievement of climate objectives. The government is developing the green innovation framework together with universities and experts.

### **Box 3. Four Green Research and Innovation Partnerships**

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#### **Mission 1 – Green fuels for transport and industry: Mission Green Fuels Partnership**

The partnership will develop solutions to help phase out fossil fuels in shipping, heavy road transport, aviation and the maritime shipping industry. The partnership works on two tracks. One strand focuses on the commercial scaling up of already known technologies, the realisation of large-scale demonstration projects and the building of new value chains targeting transport customers in the relatively short term. The second strand is also briefly about research into new business models and forms of funding, behaviour and citizen engagement in the construction of PTX facilities.

The PtX Partnership was launched in June 2022.

#### **Mission 2 – Capture and storage or use of CO<sub>2</sub>: INNO-CCUS Partnership**

The partnership will contribute to achieving the climate objectives by developing solutions to ensure efficient capture and storage of CO<sub>2</sub>, as well as the development of methods to recycle CO<sub>2</sub> as building blocks for new materials. The focus is on, among other things, chemical and biological capture of CO<sub>2</sub> and the storage and use of CO<sub>2</sub>.

INNO-CCUS is a broad-based partnership with 54 different actors. The partners are public and private actors, including universities, knowledge institutions and large and small businesses. The partnership was launched in June 2022. So far, 20 projects in the five areas focus on both short- and long-term solutions that together can reduce CO<sub>2</sub> emissions most effectively.

#### **Mission 3 – Agri-environmental-climate and food production: AgriFoodTure Partnership**

The partnership is united on a shared vision for the green transition of the Danish agricultural and food sector. The partnership is the result of a joint roadmap that around 300 researchers and experts from all Danish universities and several development organisations in the Danish food cluster wrote and submitted during the Innovation Fund Innovation call in April 2021.

The partnership was launched in April 2022. The partnership has already launched 11 projects to generate new knowledge and solutions for the agricultural and food sector. These include, for example, the reduction of greenhouse gases from plant production, the development of plant-based foods and the development of completely new types of forage additives to reduce methane emissions from cows.

#### **Mission 4 – Circular economy with a focus on plastics and textiles: Partnership for Circular Economy for Plast and Tekstil**

The partnership will work to develop, deliver and implement solutions that can contribute to a more sustainable use and recycling of plastics and textiles.

So far, 14 projects in the partnership will explore, among other things, how information technology can contribute to better waste sorting, how engineers and fashion creators, through better design and recycling technologies, can reduce CO<sub>2</sub>e emissions from plastics, textiles and other products, and how from plastics, textiles and other products through robotics, how to establish circular business models and material loops so that end-of-life products are not burned off but instead recycled. The partnership was launched in August 2022.

## **Denmark Innovation Fund**

Denmark's Innovation Fund provides funds for the four green research and innovation missions, cf. above, as well as for green research, technology development and innovation in seven green themes.

The seven green themes are:

- Energy production, etc.
- Energy efficiency improvement
- Agriculture and food production
- Transport
- Environment and circular economy
- Nature and biodiversity
- Sustainable behaviour and societal impacts (cross-cutting)

The Innovation Fund's allocation earmarked for the green area in 2023 is DKK 623,2 million. Of this, DKK 301,8 million is earmarked for the achievement of the four green missions, cf. above, and DKK 321,4 million for green research, technology development and innovation in the seven green themes.

Denmark's Innovation Fund provides funds specifically for strategic energy research across the programmes Inno Missions, Grand Solutions, InnoBooster, Business Researcher, Innoexplorer and International Samar.

## **Development and demonstration**

Most of the technologies that can help achieve the 70 % target mainly require development, testing and demonstration for commercialisation and scaling up. These are technologies that are developed and tested and have proven their function in their final form.

## **Development and demonstration programmes**

Denmark has three concrete programmes to implement public funds for the development and demonstration of green technologies: Environment Technology Development and Demonstration Programme (MUDP), Green Development and Demonstration Programme (GUDP) and Energy Technology Development and Demonstration Programme (EUDP).

Since the establishment of the DDPs in 2007, the programmes have supported more than 2.300 demonstration and expansion projects with more than DKK 9,6 billion.

The Energy Technology Development and Demonstration Programme (EUDP) provides funding for the development and monitoring of new innovative energy technologies. The objective of the EUDP is to support Denmark's energy policy objectives of high security of supply, independence from fossil fuels and the achievement of climate objectives. Action must go hand in hand with promoting business potential for



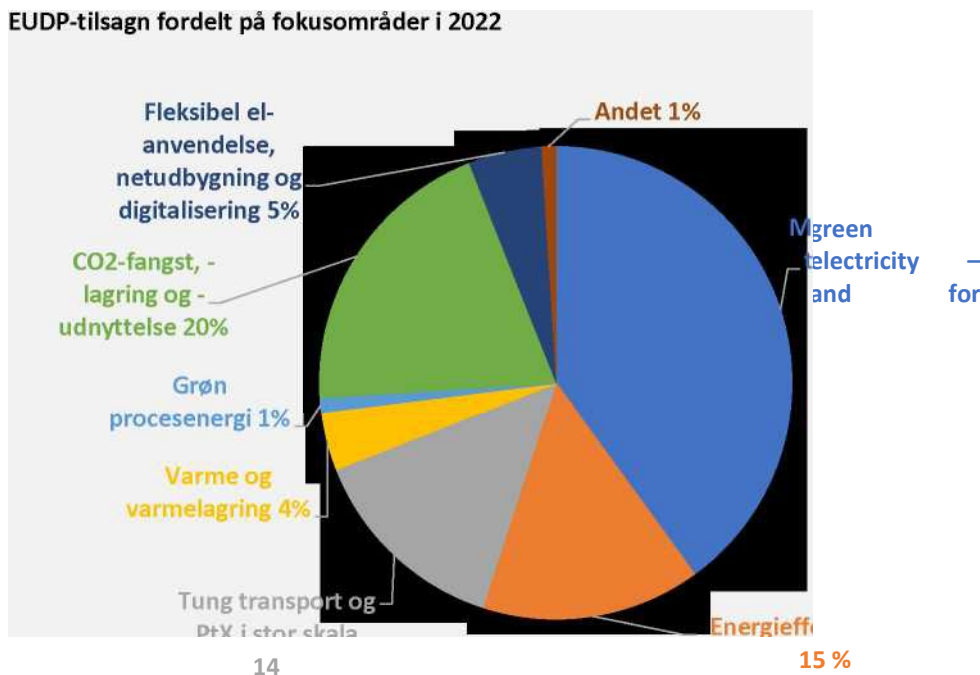
growth and jobs in Danmark. Since its establishment in 2007, the EUDP has supported more than 1100 innovative projects with more than DKK 5,7 billion.

In 2020, the EUDP received a new strategy for 2030, focusing in particular on eight areas reflecting the challenges facing society in the coming period. The areas include renewable energy, energy efficiency, electrification and sustainable fuels (PTX, etc.) for transport, flexible electric use, grid expansion and digitalisation, and CCUS. The EUDP focuses on strategic investments that deliver CO<sub>2</sub> e-reductions and reflect the needs of the green transition.

The EUDP is financed by funds resulting from the implementation of the Research Reserve as well as other appropriations foreseen in the budget. A total of DKK 510,5 million has been allocated to the EUDP in 2023 under the Finance Act and the Research Reserve. In addition to general energy research, funds have been earmarked for pyrolysis as well as research into environmentally friendly and energy-efficient production of oil and gas.

In 2022, the EUDP translated DKK 498 million into grants for 60 projects on the basis of 161 applications. Box 4 looks forward to the distribution of the resulting funds into focus areas.

**Box 4. EUDP commitments by focus area in 2022**



(Source: Annual Report 2022 on the Energy Technology Development and Demonstration Programme “Green Labs DK”)

**ELFORSK**

ELFORSK has an annual allocation of DKK 25 million for innovative projects to support electrification; and the green transition of the Danish energy system. Grants shall primarily be awarded for research and development checks aimed at promoting efficient energy use and flexibility solutions in the fields of electricity and energy through data, digitalisation and sector coupling.

In 2022, DKK 20 million was translated into 3 projects concerning the use of data in a port and the digitalisation of the interaction between transport and electricity networks.

### **Market maturation**

When technologies are mature, it is crucial to promote a market for the technology. Denmark has launched a number of initiatives to support private actors in promoting market uptake of green technologies. This includes a range of funding options as well as support schemes for technologies such as CCS and PTX.

### **Commercial lighthouses**

In 2022, with the agreement on a new reform package for the Danish economy, a majority of the Danish Parliament's parties supported the development of eight business lighthouses. Business lighthouses must include mature green technologies in areas such as PTX, sector coupling, CCS, water technology, biosolutions and sustainable construction for concrete solutions in business life. A total of DKK 1 billion is invested in the establishment and development of the local business lighthouses, where state authorities contribute to the development of the eight partnerships with businesses, municipalities, universities, etc.

### **Danish Export and Investment Fund**

In 2022, Denmark has set up the Danish Export and Investment Fund by bringing together Vækstfonden, EKF Danmarks Eksportkredit and the Danish Green Investment Fund. With a single fund, businesses will have access to one coherent effort for state co-financing, which can help with capital and guidance where the private market cannot or does not want to take the risk alone. At the same time, the current funding efforts and specialised competences of existing funds are maintained and strengthened, for example in the field of financing the green transition. In order to strengthen the Fund's green efforts, DKK 1,7 billion will be injected on a permanent basis to strengthen export through commercial, green large scale demonstration projects.

### **Investment aid scheme for innovative green key technologies**

In 2022, Denmark set up an investment aid scheme of DKK 244 million, which supports the companies' investments in new green technologies and solutions, focusing on testing, demonstrating and scaling the new technologies, thereby helping to support increased innovation, development and market maturation of green technologies. In June 2022, the Danish Business Development Board granted funding of DKK 225 million to 14 projects working to develop the PtX and hydrogen area throughout the country.

### **EU Regional Fund and EU Social Fund Plus (EU Structural Funds)**

On the basis of the EU budget from July 2020, Denmark receives approximately DKK 2,7 billion from the EU Structural Funds in the 2021-2027 programme period. The Government has put a green focus on structural funds, which include the development of green SMEs and the development of green strengths, of which five out of eight commercial pinetowers are intended to promote green strength positions and transition in areas such as CO<sub>2</sub> capture and storage, PTX and sector coupling, Biosolutions and water technology, as well as the development of relevant green skills, green entrepreneurship, etc., as well as the development of relevant green skills, green entrepreneurship, etc.

### **IPCEI**

Denmark participates in an Important Project of Common European Interest (IPCEI) for hydrogen and has allocated a total of DKK 850 million to Denmark's participation. The Danish Business Authority has selected

two projects to participate in the pan-European project and receive funding. The two projects will build large amounts of electrolyser capacity and produce alternative fuels as well as decarbonise industrial processes.

### **Global Roadmap for Research, Development and Maturation**

An expert group on the role of research in the green transition was set up in June 2022. The expert group has been tasked with developing an analytical framework to assess the impact of research and innovation efforts on the development and maturity of solutions contributing to the reduction of greenhouse gas emissions. The work should be completed by 2024.

In 2024, the Government will consider, inter alia, further to the work of the Expert Group, the forward-looking mission-borne research effort as well as the cross-cutting efforts to accelerate the development of green solutions and how the priorities best support the objectives of the Climate Law, including with a focus on the protracted post-2030 climate targets.

- (ii) Where appropriate, cooperation with other Member States in this field, including towards: appropriate scope of information on how the objectives and policies of the SET Plan are put in a national context;*

In December 2021, Denmark launched an action plan to promote Danish participation in the EU's green-grams, including the EU Innovation Fund and Horizon Europe. The Action Plan will help stakeholders access more European knowledge, cooperation and funding to contribute to the green transition. The Action Plan launches a number of initiatives in the field of advice, communication and advocacy.

As part of strengthening Denmark's repatriation of funds from the EU's support programmes for research, development and demonstration of climate and energy technology, DKK 6,5 million was allocated in 2023 to strengthen Danish efforts to guide Danish companies on repatriating EU Innovation Fund funds and other EU aid programmes. A secretariat and travel team shall be established within the Danish Energy Agency to assist in the development and qualification of project applications and to support a proactive national and international presence in foundations' and other Member States' fund-related activities.

Denmark is also working globally to increase cooperation on research and technology development and to repatriate knowledge, experience and solutions – including through the Danish innovation centres and government cooperation. For example, together with the US, Norway, the Global Maritime Forum and Mærsk McKinney Møller Center for Zero Carbon Shipping, Denmark is leading an international public private partnership to decarbonise shipping along the Zero-Emission Shipping Mission of the International Forum, Mission Innovation. Denmark also concluded a cooperation agreement with the United States in the field of energy technology translation in April 2021.

- (iii) Financing measures in this area at national level, including Union support and the use of Union funds where appropriate;*

See previous section 3.5 (ii)

## **SECTION B: ANALYTICAL BASIS**

### **4. CURRENT SITUATION AND PROJECTIONS WITH EXISTING POLICIES AND MEASURES**

This section presents assumptions and results from Denmark's climate status and projection 2023 (KF23) (Danish Energy Agency, 2023) 55, which is a projection towards 2035 with existing policies and measures (WEM).

Technology cost projections and results are from the Danish Technology Catalogue (Danish Energy Agency, 2023).

The current situation refers to 2021, the last statistical year. Projections refer to 2022-2040.

For knowledge of the parameters and variables used for the data, please refer to Annex 1 [Annex is still outstanding due to extensive data processing work. The Annex will be included in the final draft to be reported to the Commission].

For detailed data on greenhouse gas emissions and removals see Annex 2.

For detailed energy prices see Annexes 3 and 4.

For a detailed description of existing actions and the modelling platform, see Annex 5.

For CO2 ETS price data used for KF23, see Annex 6.

For air pollutant projections see Annex 7.

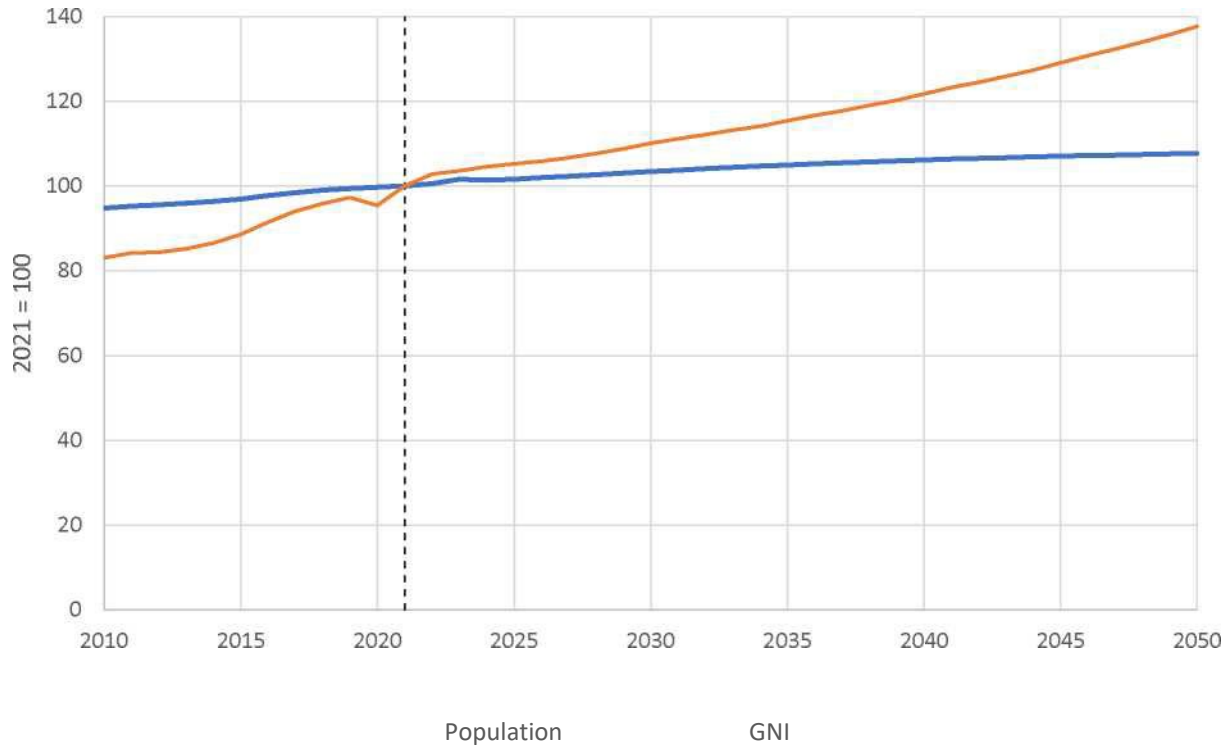
## 4.1 Expected evolution of key exogenous factors affecting the evolution of the energy system and greenhouse gas emissions;

### *(i) Macroeconomic projections (GDP and population growth)*

As shown in Chart 25, the population is expected to grow by 3.4 % from 2021 to 2030, while GDP is expected to grow by 10.1 %. The trend is expected to continue after 2030, leading to population growth of 6.1 % and GDP growth of 21.7 % in 2040 compared with 2021.

<sup>55</sup> <https://ens.dk/service/fremskrivninger-analyser-modeller/klimastatus-og-fremskrivning-2023>

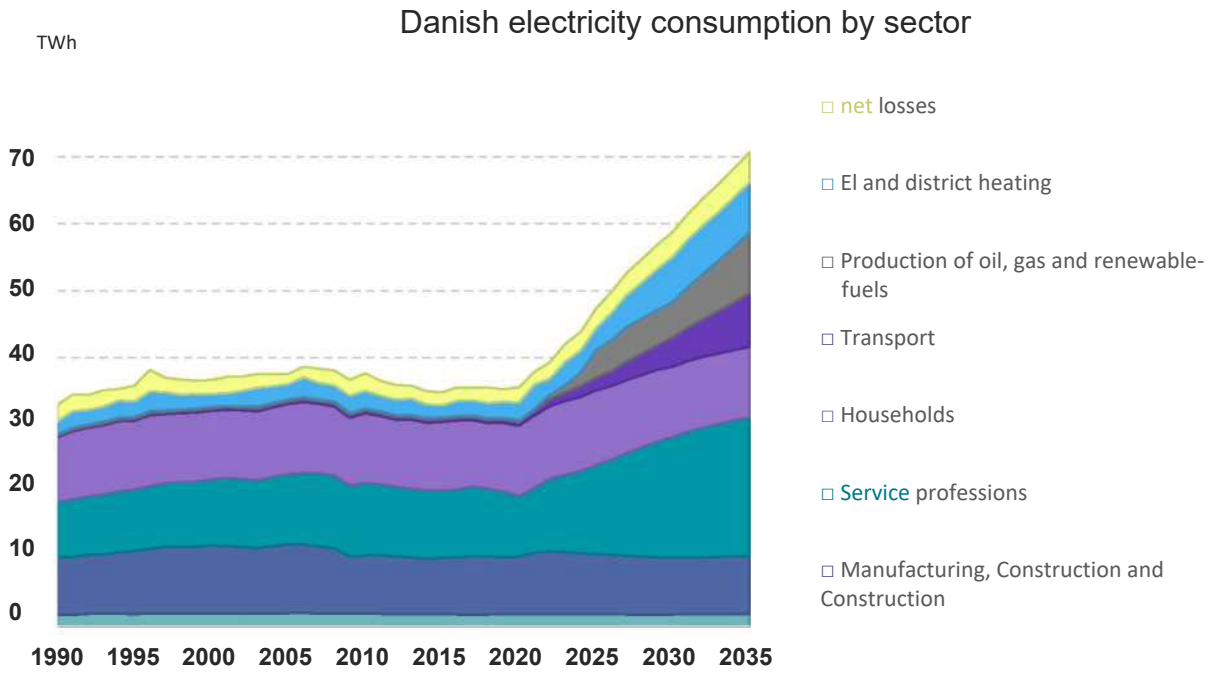
**Figure 25. Population and GDP 2010-2050 [2021 = 100]**



*(ii) Sectoral changes expected to affect the energy system and greenhouse gas emissions*

Figure 26 shows the electricity consumption for the sectors from 1990 to 2035 and highlights significant impacts, mainly due to a higher demand for electricity for data centres (HSDCs), an electrification of the road-port and to PTX. Greenhouse gas emissions will be less affected by the increase in renewable energy capacity over the same period.

**Figure 26. Danish electricity consumption (TWh) by sector 1990-2035**



80

(iii) *Global energy trends, international fossil fuel prices, EU ETS carbon price*

Figure 27 shows fossil fuel price projections used as assumptions in the National Energy and Climate Plan.



Figure 27. Fossil fuel prices 2022-2035 [EUR 2022/GJ]

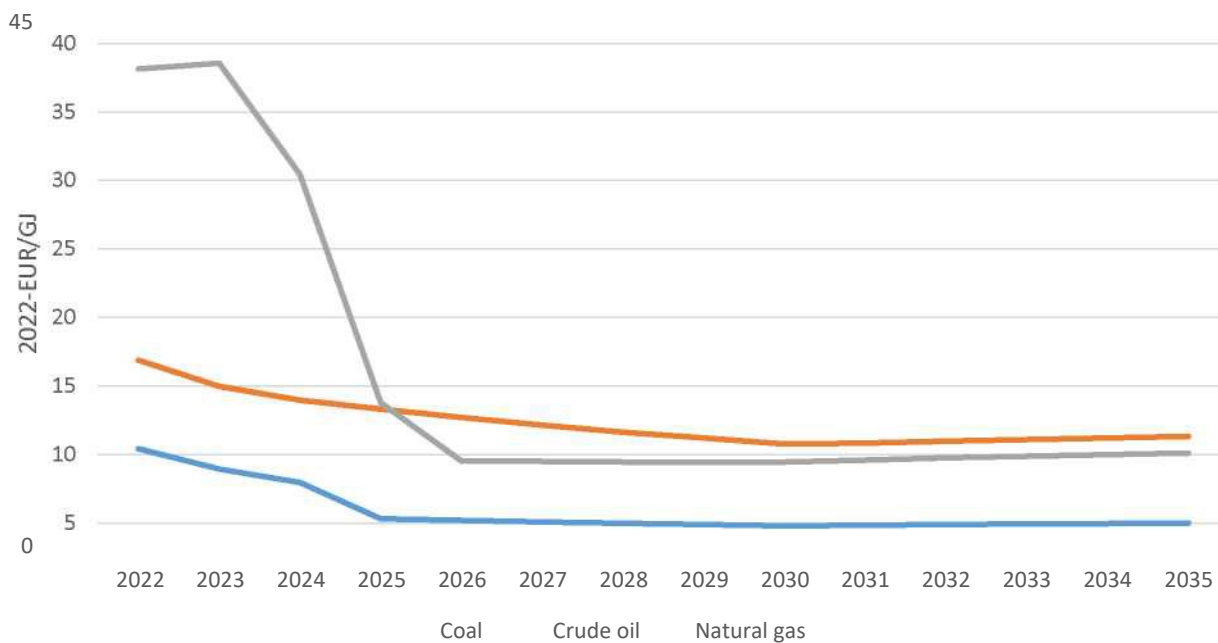
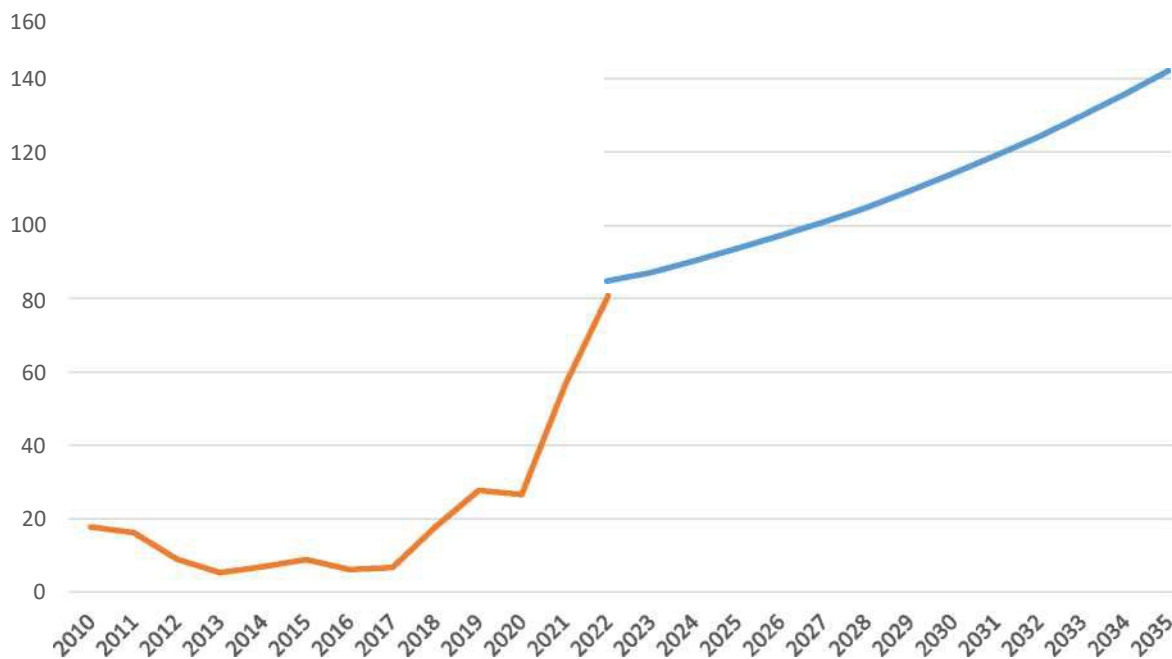


Figure 28 shows projections for the CO<sub>2</sub>allowance price for the ETS sectors used in the National Energy and ClimatePlan (data from KF23).

**Figure 28. CO2 allowance price in the ETS sectors used for projections in the National Energy and Climate Plan.**

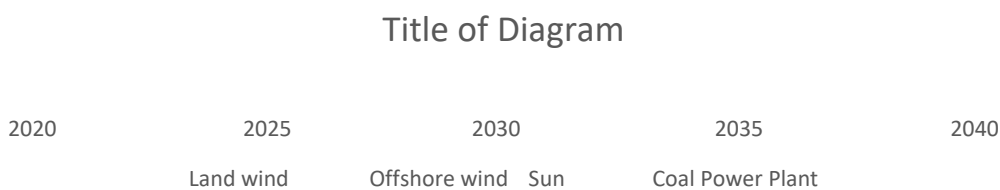


Information on the following:

- (iv) *Technology cost developments*

Figure 29 shows the cost of electricity generation (LCoE) for wind and solar energy compared to a coal-fired power plant. The projection shows that the LCoE for wind and solar energy is lower than for a coal-fired power plant over the whole projection period.

**Figure 29. Electricity generation costs [LCoE] 2020-2040**



## 4.2 Decarbonisation dimension

### 4.2.1 Greenhouse gas emissions and removals

- I) *Trends in current greenhouse gas emissions and removals in the EU ETS, burden sharing sectors, LULUCF sectors and different energy sectors*

The trends in current Danish greenhouse gas emissions and removals from 1990 to 2021, as well as projections to 2040, are shown in Figure 30. A key result is that total greenhouse gas emissions without LULUCF have decreased by 38 % from 1990 to 2021.

**Figure 30. Greenhouse gas emissions by type of gas from 1990 to 2040 (kt CO<sub>2</sub>e)**

120000

Q OR THE

VV<sup>vvv</sup>V>T<sup>3^vv?</sup>ZV

HFCS

PFC

SF6

CO<sub>2</sub> emissions without net CO<sub>2</sub> from LULUCF

CO<sub>2</sub> emissions with net CO<sub>2</sub> from LULUCF

CH<sub>4</sub> emissions without CH<sub>4</sub> from LULUCF

CH<sub>4</sub> discharge with CH<sub>4</sub> from LULUCF

N<sub>2</sub>O emissions without N<sub>2</sub>O from LULUCF

N<sub>2</sub>O discharge with N<sub>2</sub>O from LULUCF

Total (without LULUCF)

f Total (with LULUCF)

Total (without LULUCF, with indirect CO<sub>2</sub>)

Total (with LULUCF, with indirect CO<sub>2</sub>)

Other results from 1990-2021 are:

- Total greenhouse gas emissions with LULUCF have decreased by 41 %.
- CO<sub>2</sub>emissionswithout LULUCF have decreased by 45 %.
- CO<sub>2</sub>emissionsWith LULUCF have decreased by 47 %.
- CH<sub>4</sub>emissions without LULUCF have decreased by 6 %.
- CH<sub>4</sub>emissions with LULUCF have decreased by 6 %.
- N<sub>2</sub>O emissions without LULUCF have decreased by 34 %.
- N<sub>2</sub>O emissions with LULUCF decreased by 34 %.

Figure 31 shows greenhouse gas emission reductions achieved, divided between emissions covered by the EU ETS and non-ETS emissions from 2005 to 2021, as well as a projection for 2040.

From 2005, when reporting of ETS emissions started, to 2021:

- The EU ETS CO<sub>2</sub>emissions have decreased by 56 %.
- non-ETS CO<sub>2</sub>e-emissions without LULUCF have decreased by 22 %.

**Figure 31. GHG emissions by EU ETS and non-ETS sectors from 2005-2040 (kt CO<sub>2</sub>e)**

Greenhouse gas emissions have been reduced in particular in the energy sector, partly due to a decrease in emissions in the energy and conversion sector, as shown in Figure 32 below.

Results for greenhouse gas emission reductions by IPCC energy sector from 1990-2021:

- Emissions from the energy sector have been reduced by 47 %.
- Emissions from the energy and conversion sector have been reduced by 68 %.
- Emissions from the manufacturing and construction sectors have been reduced by 36 %.
- Emissions from transport have increased by 7 %.
- Emissions from other sectors have been reduced by 59 %.

**Figure 32. Greenhouse gas emissions by IPCC energy sector, 1990-2040 (kt CO<sub>2</sub>e)**

BDDDD

1. Energy (with indirect CO<sub>2</sub>)

1A. Burning energy  
(sectoral)

1A1. Energy conversion  
and other energy production

1A2. Production and construction  
of energy conversion and  
other energy production

1A3. Transport

1A4. Other sectors

1A5. Others

2. Land use change and forestry  
emissions

2Ei2. Oil, natural gas and other hydrocarbons from energy production

Figure 33 shows the total GHG emissions by IPCC's main sectors from 1990 to 2021:

- Energy related has been reduced by 46 %.
- Process emissions have been reduced by 14 %.
- Agriculture has been reduced by 13 %.
- LULUCF has been reduced by 65 %.
- Waste management has been reduced by 39 %.

**Figure 33. Greenhouse gas emissions by IPCC main sectors from 1990 to 2040 (kt CO<sub>2</sub>e)**

Figure 34 shows that:

- LULUCF net emissions have been reduced by 65 % from 1990 to 2021, but are expected to increase until 2025, after which they will decline again.

**Figure 34. Greenhouse gas emissions in the LULUCF sector from 1990 to 2040**

15000

(II) *Projections of developments in each sector with existing national policies; and measures and Union policies and measures, at least until 2040 (including for 2030)*

In the previous section, past and current emissions were presented to show developments from 1990-2021. This section presents projections for 2021-2040, shown in the charts in the previous section.

Figure 30 above shows the evolution of greenhouse gas emissions by type of gas from 1990 to 2040. The trend shows that total greenhouse gas emissions without LULUCF are expected to be reduced by 65 % from 1990 to 2030 and 71 % from 1990 to 2040.

Other results from the projections are:

- Total greenhouse gas emissions from LULUCF are reduced by 63 % from 1990 to 2030 and 68 % from 1990 to 2040.
- CO<sub>2</sub>emissions without LULUCF are reduced by 76 % from 1990 to 2030 and 83 % from 1990 to 2040.
- CO<sub>2</sub>emissions with LULUCF are reduced by 73 % from 1990 to 2030 and 79 % from 1990 to 2040.
- CH<sub>4</sub>emissions without LULUCF are reduced by 23 % from 1990 to 2030 and 24 % from 1990 to 2040.
- CH<sub>4</sub>emissions with LULUCF are reduced by 20 % from 1990 to 2030 and 20 % from 1990 to 2040.
- N<sub>2</sub>O emissions without LULUCF are reduced by 41 % from 1990 to 2030 and 42 % from 1990 to 2040.
- N<sub>2</sub>O emissions with LULUCF are reduced by 41 % from 1990 to 2030 and 42 % from 1990 to 2040.

Figure 31 shows GHG emissions in the EU ETS and non-ETS from 2005-2040. From 2005, when reporting of ETS emissions started, it is projected that:

- The EU ETS CO<sub>2</sub>emissions are reduced by 86 % from 2005 to 2030 and 89 % from 1990 to 2040.
- non-ETS emissions without LULUCF are reduced by 40 % from 2005 to 2030 and 54 % from 1990 to 2040.



The projection for the non-ETS has to be seen in the context of Denmark's commitment to limit greenhouse gas emissions from the non-ETS by 50 % in 2030. Further steps to achieve this are described in Section 3.1.1.

Figure 32 shows the total greenhouse gas emissions by sector. The projection shows that:

- Emissions from the energy sector are reduced by 71 % from 1990 to 2030 and 83 % from 1990 to 2040.
- Emissions from the energy and conversion sector are reduced by 90 % from 1990 to 2030 and 93 % from 1990 to 2040;
- Emissions from the manufacturing and construction sectors are reduced by 83 % from 1990 to 2030 and 89 % from 1990 to 2040.
- Emissions from transport are reduced by 11 % from 1990 to 2030 and 56 % from 1990 to 2040.
- Emissions from other sectors are reduced by 86 % from 1990 to 2030 and 88 % from 1990 to 2040.

Figure 33 shows the total greenhouse gas emissions from 1990 to 2040 broken down by IPCC sector. We expect that:

- Emissions from the energy sector is reduced by 71 % from 1990 to 2030 and 83 % from 1990 to 2040.
- Emissions from process emissions are reduced by 36 % from 1990 to 2030 and 40 % from 1990 to 2040.
- Emissions from agriculture is reduced by 25 % from 1990 to 2040 and 29 % from 1990 to 2040.
- Emissions from LULUCF is reduced by 41 % from 1990 to 2030 and 39 % from 1990 to 2040.
- Emissions from waste management are reduced by 51 % from 1990 to 2030 and 28 % from 1990 to 2040.

Figure 34 shows emissions from LULUCF (net emissions). The projection shows that:

- Emissions from LULUCF are reduced by 41 % from 1990 to 2030 and 39 % from 1990 to 2040.
- EU/LULUCF (2021-2030) net emissions accumulate to -2 029 kt CO<sub>2</sub>e (-2 Mt<sub>CO2e</sub>).

### **Projections for air pollutants**

Projections for WEM are included in Annex 7.

## **4.2.2 renewable energy**

- (i) *Current share of renewable energy in gross final energy consumption and in different sectors (heating and cooling, electricity and transport) as well as per technology in each of these sectors).*

Figure 35 shows the share of renewable energy both overall and broken down by individual sector. It can be seen that this is increasing in the coming years. In particular for the transport sector, the share of renewable energy is expected to increase significantly by 2040. This is because the calculation of the transport sector includes multipliers on certain types of energy consumption, including electricity and biofuels.

**Figure 35. Total share of renewable energy (RES), share of renewable energy in transport (RES-T), share of renewable energy in the electricity sector (RES-E), share of renewable energy in the heating/cooling sector (RES- H/C).**

2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040  
Total RES " RES-HC RES-T

Figure 36 shows the composition of renewable energies both in total and for respective sectors in 2022. In particular, bioenergy accounts for a large share of renewable energy in total, in the electricity sector and in the heating/cooling sector. For the electricity sector, land and sea wind also represent a significant part.

Figures 37, 38, 39 and 40 further develop the shares of energy technologies in the respective sectors.

**Figure 36. The renewable energy mix for total renewable energy (RES), the generator (RES-E) and the heating/cooling sector (RES-H/C), the transport sector (RES-T).**



(ii) *Indicative projections of developments with existing policies for 2030 (with one perspective to 2040)*

Figure 35 shows the share of renewable energy in different sectors. The graph shows the expected evolution from 2022 to 2040. The overall share of renewable energy is projected to increase from 46 % in 2022 to 71 % in 2030. This achieves the 55 % renewable energy target for 2030, cf. the 2018 Energy Agreement.

The share of renewable energy producing electricity is also projected to increase from 84 % in 2022 to 117 % in 2030. From 2030 onwards, Danish electricity consumption can therefore, on an average basis, be entirely covered by renewable energy. Figure 35 also shows that the share of renewable energy in the electricity sector will decline by 2040 after 2031. This is largely due to expectations of increased electricity consumption by 2040.

For the heating/cooling sector, the share of renewable energy is expected to be 77 % in 2030, compared with 61 % in 2022. For the transport sector, the share of renewable energy in the sector is expected to increase from 6 % in 2022 to 41 % in 2030.

Figure 37 below shows the share of renewable energy technologies in the overall energy mix from 2022 to 2040. It is projected that, both in 2022 and beyond, bioenergy is expected to account for a large share of energy consumption by 2040, while remaining technologies play a particular role from 2030 onwards. In this respect, it is projected that sun is expected to play a role in the long term, moving from a share of 1.6 % in 2022 to 21.8 % in 2040. The share of offshore wind is expected to increase in particular in 2031, standing at 21.5 %, compared with 5.2 % in 2022.

**Figure 37. Share of renewable energy technologies in the overall energy mix from 2022-2040.**

90 %

Figure 38 below shows the share of renewable energy technologies in the heating/cooling sector from 2022 to 2040. The figure shows, among other things, that the share of bioenergy is expected to increase from 2022 until 2025, after which the share of bioenergy is expected to decrease by 2040. Between 2022 and 2040, a significant increase in the share of renewable energy in the heating/cooling sector is expected to come from ambient heat to heatpumps, which is expected to increase from 7.1 % in 2022 to 31.8 % in 2040.

**Figure 38. Share of renewable energy technologies in the heating/cooling sector from 2022-2040**

-Wastes (bio) -Bioenergyor Electrified Ambient heat for heat pumps

Figure 39 shows the share of renewable energy technologies in the electricity sector from 2022 to 2040. In particular, by 2030, the share of solar and sea wind is expected to increase, while the share of bioenergy is decreasing. From 2030 until 2040, the share of sun is expected to increase in particular. The share of bioenergy is expected to decline from 24.5 % in 2022 to 3.2 % in 2040. The share of offshore wind is expected to increase from 23.6 % in 2022 to 65.2 % in 2031. The share of solar is expected to increase from 5.5 % in 2022 to 46.2 % in 2040.

**Figure 39. Share of renewable energy technologies in the electricity sector from 2022-2040**

-Wastes (bio)

Figure 40 shows the share of renewable energy technologies in the transport sector from 2021 to 2040. The main focus here is the electrification of road transport, which is expected to account for the largest share of renewable technologies in the transport sector from 2023 until 2040. The share of electricity road transport is expected to move from 8 % in 2024 to 158 % in 2040. This increase is due to the electrification of passenger and vans and rail transport, but at the same time it should be noted that the calculation for the transport sector includes multipliers for certain types of energy consumption, including electricity.

**Figure 40. Share of renewable energy technologies in the transport sector from 2021-2040.**

180.00 %

-Biogas (Generation 2)      —El rail transport      —El road transport

## 4.3 dimension on energy efficiency

*(i) Current primary and final energy consumption in the economy and per sector (including: industry, housing, services and transport)*

As Figure 41 shows, the most recent year of statistical data, 2021, is not statistically representative of primary and final energy consumption due to exceptional circumstances (COVID), so 2019 has been used as a reference for comparison.

Primary and final energy consumption for the period 2005 to 2019 is shown in Figure 42 below.

The figure shows that in 2019:

- Primary energy consumption 20.367 ktoe
- Final energy consumption 14.946 ktoe
- Ratio between primary energy consumption and final energy consumption 0,73

**Figure 41: Primary and final energy consumption 2005-2040 (ktoe)**

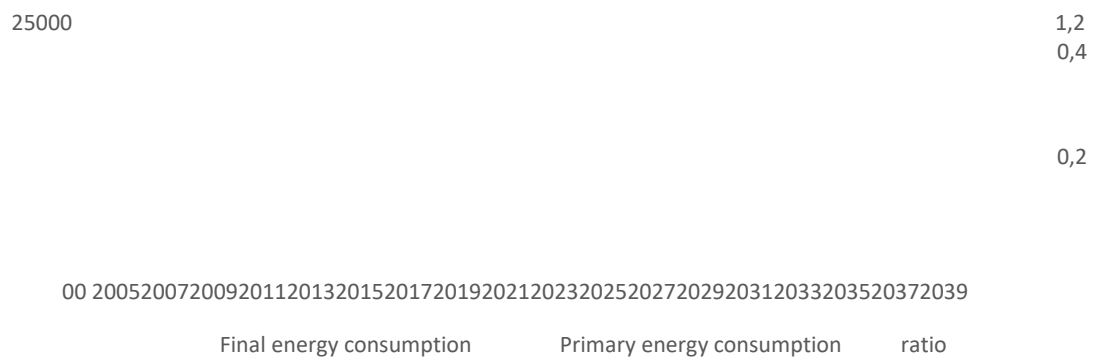


Figure 42 shows final energy consumption by sector in the period 2005 to 2040.



## Figure 42: Final energy consumption by sector

6000

Chart 42 shows that transport (35 %) and households (30 %) account for the largest share of final energy for use in 2019.

The breakdown of final energy consumption by sector in 2019 was:

- Construction 1 %
- Wholesale and retail trade 3 %
- Agriculture, forestry, horticulture and fisheries 5 %
- Transport 35 %
- Industry 14 %
- Households 30 %
- Service 10 %

### *(ii) Current potential for the application of high-efficiency cogeneration and efficient district heating and cooling*

An overall assessment of the potential for the use of high-efficiency cogeneration and efficient district heating and cooling in Denmark was provided to the European Commission in 2015 in accordance with Article 14, 1 of Directive 2012/27/EU.

The technical potential for district heating is expected to increase by 1194 ktoe in 2035. The business economy potential is expected to reach 3583 ktoe in 2020, an increase of 1433 ktoe in addition. 2013. The social-maritime nautical potential is expected to increase from 1911 ktoe in 2013 to 3105 ktoe in 2020. From 2020 to 2030, the analysis shows that the socio-economic district heating potential decreases to around 2388 ktoe. The potential for combined heat and power in Denmark is expected to decline from 73 % of district heating demand in 2012 to 63 % in 2025 as a result of the integration of renewable energy sources into the electricity grid. Cogeneration has relatively high marginal costs in relation to, for example, wind and PPE, and is therefore considered less feasible in the future energy system in Denmark. Where there is a reduced market incentive to produce electricity from cogeneration, it is more economically feasible to invest only in heat generators. The decrease in cogeneration is not replaced by thermal electricity production, but by a fluctuating share of renewable energy.

There are no national strategies to change this development, as the level of energy security is high in the Danish electricity grid (99.99 %) and because there are more renewable alternatives to producing heat for district heating. The remote cooling potential is not expected to change dramatically in the period 2006-2030 and is expected to reach 2.866 MW. The socio-economic potential is 2.211 MW and therefore corresponds almost to the technical potential.

Denmark highlights that the figures presented in the current section are identical to those from the 2019 National Energy and Climate Report. This is because Denmark has not carried out an analysis since 2019, when the figure for the use of high efficient cogeneration and efficient district heating and cooling has been calculated. It is expected that Denmark will be able to present updated figures on potential following the preparation of the next comprehensive analysis in 2024.

### *(iii) Projections taking into account existing energy efficiency policies, measures and programmes referred to in point 1.2 (ii) for primary and final energy consumption for each sector at least until*

2040 (including for 2030);

Section 4.3 (i) shows primary and final energy consumption from 2005 to 2019. This section describes the anticipated evolution of energy consumption from 2019 to 2040. The evolution of primary and final energy consumption towards 2040 is shown in Figure 41.

Figure.

The projection of energy consumption shows that:

- Primary energy consumption decreases by 18 % from 2019 to 2030 and 22 % from 2019 to 2040.
- Final energy consumption declines by 5 % from 2019 to 2030 and 12 % from 2019 to 2040.
- The ratio between primary and final energy consumption increases by 15 % from 2019 to 2030 and 11 % from 2019 to 2040.

Figure 42 shows the evolution of final energy consumption by sector from 2019 to 2040. Overall, most of the sectors' energy consumption is declining by 2040. In particular, energy consumption in the transport and household sectors is expected to decline markedly. The largest increase in energy consumption is in the services sector (including HSDC), as large data centres (HSDC) are expected to increase energy consumption in this sector.

The evolution of final energy consumption by sector is:

- Final energy consumption in Construction and Installations increases by 5 % between 2019 and 2030 and increases by 4 % from 2019 to 2040.
- Final energy consumption in wholesale and retail trade falls by 2 % from 2019 to 2030 and increases by 1 % from 2019 to 2040.
- Final energy consumption in agriculture, forestry, horticulture and fisheries falls by 21 % from 2019 to 2030 and falls by 25 % from 2019 to 2040.
- Final energy consumption in transport falls by 11 % from 2019 to 2030 and falls by 32 % from 2019 to 2040.
- Final energy consumption in Industry declines by 19 % from 2019 to 2030 and increases by 22 % from 2019 to 2040.
- Final energy consumption in households falls by 10 % from 2019 to 2030 and falls by 16 % from 2019

to 2040.

- Service final energy consumption (including HSDC) increases by 50 % from 2019 to 2030 and increases by 79 % from 2019 to 2040.

Furthermore, Figure 42 shows that by 2040, the transport and household sectors remain the largest share of final energy consumption. In particular, service (including HSDC) accounts for a proportionally higher share of final energy consumption, while transport accounts for a relatively smaller share.

Results for share of final energy consumption by sector in 2030 and 2040:

- Share of final energy consumption | Construction is 1 % in 2030 and 1 % in 2040.
- Share of final energy consumption | Wholesale and retail trade is 3 % in 2030 and 4 % in 2040
- Share of final energy consumption | Agriculture, forestry, horticulture and fisheries account for 4 % in 2030 and 4 % in 2040
- Share of final energy consumption transport is 33 % in 2030 and 27 % in 2040.
- Share of final energy consumption in Industry, 12 % in 2030 and 13 % in 2040
- Share of final energy consumption households stand at 29 % in 2030 and 29 % in 2040.
- Share of final energy consumption service (including HSDC) stands at 15 % in 2030 and 20 % in 2040

*(IV) Cost-optimal levels of minimum energy performance requirements according to national regulations in accordance with Article 5 of Directive 2010/31/EU.*

Article 5 of the current EPBD requires Member States to calculate and report on the cost-upward levels of minimum energy performance requirements for buildings and building elements.

Denmark submitted the latest cost-optimal report to the European Commission on 27 March 2023. The cost-optimal report shows the following overall conclusions:

In general, the overall level of requirements for new buildings is slightly tighter than that required by the EPBD. The weighted average for new construction shows that the Danish requirements are 20 % tighter than the optimal level of costs. However, there are variations between different types of buildings.

For building elements subject to renovation, the requirements are also close to the cost-optimal point. The calculations show variations for different types of structures depending on the starting point of the insulation levels of the existing structures.

For buildings during major renovation, the building regulations include renovation classes that can be used. The levels in these classes have been evaluated in the cost-optimal report and the report showed that nine levels were very close to the cost-optimal level. The weighted average showed that in any sample the requirement was 4 per cent tighter than the cost-optimal point.

Overall, the report shows that Denmark meets the requirements for cost-optimal levels in the building code.

## 4.4 dimension on energy security

(I) *Current energy mix, indigenous energy sources and import dependency, including relevant risks*

Figure 43 shows the actual gross inland energy consumption in 2021 by energy sources:

**Figure 43: Denmark's actual gross energy consumption [ktoe]**

25000

- Coal Kakes
- 2nd VE
- Oil
- Natural gas
- Other bioenergy
- Non-biodegradable waste
- Solid biomass

Due to declining domestic production of oil and gas, as well as as renewable energy production has not yet been sufficient to cover the deficit, Denmark's import dependency has increased for the next few years. Figure 44 below shows that import dependency in 2022 is 61 %. However, as the graph shows, it is expected that import dependency will decrease by 2040. Already as of 2022, import dependency is decreasing and when the Tyra gas field is expected to return to operation, import dependency is expected to decrease further, as shown in Figure 45. Developments in the middle and second half of the 2020s reflect several developments, including the implementation of the energy efficiency measures from the Energy Agreement of June 2018, which will take effect in 2024. In addition, three large wind farms are expected to start operating. The projected evolution from 2022 to 2040 reflects the methodology used, i.e. projections made with existing policies and measures (frozen policy). This implies that, while projections assume an expected increase in

energy consumption, mainly from data centres and HSDCs, there are currently no decisions on the deployment of new generation capacity after 2030 to offset this increase. For the same reason, import dependency is projected to reach its lowest level in 2031.

#### **Figure 44: Denmark's import dependency 2022-2040 (%)**

The most relevant risks to Denmark's security of supply by 2040 are:

- adequate supply of biomass and a well-functioning market
- developments in global oil supply, including a well-functioning market with balance between supply and demand;
- energy system challenges as the effect of fluctuating wind and solar energy.

*(11) Projections of developments with existing policies and measures, at least up to 2040 (including for 2030)*

The results described in this section refer to Figure 44 and Figure 45 presented in the previous section.

Figure 44 shows actual gross inland energy consumption from 2005 to 2040. A key result is that the combined consumption of fossil fuels such as oil, natural gas and coal/coke falls from 56 % of combined fuel consumption in 2021 to 36 % in 2030 and 34 % in 2040, a decline of 20 % and 22 % respectively between 2030 and 2040. While the "Second VE" (wind and solar) increases by 11 % in 2021, to 39 % in 2030 and 47 % in 2040.

Figure 44 shows the import dependency from 2022 to 2040. Import dependency is projected to decrease from 61 % in 2022 to -11 % in 2030 and increase to 1 % in 2040.

#### **Gas**

The current projection of Danish consumption and gas extraction is illustrated below. Until the Tyra field in the North Sea continues production at the beginning of 2024, Denmark does not cover its own consumption of pipeline gas.

#### **Figure 45. Current projection of the Danish consumption and extraction of gas**

**Sales gas, billion Nm<sup>3</sup>**

Source: Resources and forecasts, Danish Energy Agency

The supply of gas to the Danish system consists of natural gas production from the Danish part of the North Sea, Danish production of green gases, gas from Norway intended for transit to Poland and imports from Germany. The gas in the Danish system is either consumed in Denmark or exported to Sweden, Germany or Poland. An estimated distribution of the projected gas flows in the Danish transmission network is illustrated below.

**Figure 46. Gas consumption and exports (GWh/year)**

—Exports to Germany the Danish Gas Consumption “Transit to Sweden” Transit to Poland

Source: Af22, Danish Energy Agency

**Gas**

The evolution of the consumption of mains gas by use can be seen in the figure below. Consumption is significantly reduced by 2030, largely due to the phasing out of pipeline gas consumption for domestic heating, as well as the phasing out of base and intermediate load district heating production based on linked gas. In the period 2022-2050, the total Danish consumption of pipeline gas is estimated to be reduced from approximately 22 TWh

per year to 12 TWh per year, corresponding to a reduction of approximately 45 %. This is assumed against the background of a policy objective in, for example, *the Climate Agreement on Green Electricity and Heat 2022*.

**Figure 47. Total consumption of mains gas**

Source: Af22, Danish Energy Agency

Consumption of mains gas stabilises after 2030 on the basis of a non-convertible need in the business socket, as well as a small amount of households who do not have the ability or wish to convert to alternative heating methods such as district heating or heat pumps. From 2040-2050, a slight increase in industry’s consumption of gas for high temperature processes is expected as other fossil fuels are phased out in favour of pipeline gas.

## 4.5 dimension of the internal energy market

### 4.5.1 Electricity interconnectivity

(i) *Current interconnection level and main interconnectors*

Tables 11 and 12 show the current interconnectors and interconnectors currently under development.

**Table 11. Current interconnectors**

Name	Linked price areas	Capacity (MW)
Skagerrak 1-4	DK1 – NO3	1700
Konti-Skan	DK1 – SE3	740
Kassø-Audorf	DK1 – THE	2500
Bornholm-Sweden	DK2 – SE4	60
Great Belt	DK1 – DK2	600
Øresund	DK2 – SE4	1300 (imports)/ 1700 (EK)



Catheque	DK2 – THE	585
COBRACable	DK1 – NL	700
Kriegers Flak CGS	DK2 – THE	400

**Table 12. In-design interconnectors**

Name	Linked Price-Counsellors	Capacity (MW)	Year of finishsalting
Viking Link	DK1-UK	1400	2023
Endrup-Niebull	DK1-DE	1000	2025

*(ii) Projections of interconnector expansion requirements (including for the year 2030)*

It has been politically decided to build 3 GW offshore wind in the North Sea and 3 GW in the Baltic Sea. Against this background, ministers from Denmark and Belgium have signed a MOA on cooperation on offshore energy infrastructure in the North Sea. Subsequently, the TSOs Energinet and Elia have signed a CoA to build a 2 GW external connection between the artificial island in the Danish area of the North Sea connected to the new offshore wind. A MoU and TSOs, Energinet and 50 Hertz, are working on a 2 GW international connection between Bornholm and Germany.

Other interconnectors are reaching the end of their life expectancy and a decision to anchor whether to reinvest in them, build new connectors or other. ENTSO-E's Ten-Year Network Development Plan for 2022 mentions a new international connection, Kontiskan 2, between DK1 and SE, in addition to the projects from the table above.

## 4.5.2 Energy transmission infrastructure

*(i) Key characteristics of the existing electricity and gas transmission infrastructure*

### EL

Denmark is divided into two price areas, West Denmark (DK1) and East Denmark (DK2), which are divided by the Great Belt. Western Denmark is connected and operated synchronously with the continental European electricity grid, and East Denmark is too contiguous with the Nordic electricity grid. Western and Eastern Denmark are connected exclusively through the 600 MW Great Belt link. Tables 14 and 15 provide detailed information on the internal network in Denmark.

**Table 13. Length of AC/DC overhead lines (split in volt level)**

kV	AC	DC	Total
132	1.615,3		1.615,3
150	2.661,7		2.661,7
220	147,5		147,5
400	1.573,4	546,8	2.120,2
285		248,6	248,6

350		89,0	89,0
0.4 kV		2,6	2,6
20		153,0	153,0
250		7,2	7,2
320		653,5	653,5
<b>Total</b>	<b>5997,9</b>	<b>1700,7</b>	<b>7698,6</b>

**Table 1413. Transformers in MW**

kV	Sum of Power MVA]
132	9.060
150	13.977
400	14.510
<b>Total</b>	<b>37.547</b>

## Gas

The Danish gas transmission system (80 bar) is owned and operated by Energinet, the Danish TSO. The gas system is connected to natural gas fields in the North Sea and the international gas market through five entry points in the NorthSea, Nybro, Ellund, Faxe and the Joint Balancing Zone with Sweden (JBZ). There are four transit exit points (Nybro, Ellund, Faxe and the Common Balance Zone with Sweden (JBZ)). A virtual entry point for biomethane RES entry point where transport customers can virtually bring biomethane and other types of renewable energy into the trans transmissionnetwork.

Gas can be supplied to private consumers via the transmission and distribution system. The transmission tariffs are depending on where the ships book entry and/or exit capacity.

Energy networks have fully implemented the network code on harmonised transmission tariff structures for gas (TAR NC) with approval of the methods by the Danish Utility Regulator in May 2019. Since October 2019, tariffs have been compliant with TAR NC. In future, constant methodological approvals will be carried out by the Danish Utility Regulator of tariff structures. The transmission system currently consists of approximately 1 100 km of pipeline within Denmark. The transmission system is connected to the distribution system via 41 currently active M/R stations, which control the pressure down to the level of the distribution companies' pipeline systems.

(ii) *Projections of network expansion needs until at least 2040 (including for 2030)*

Renewable electricity produced from photovoltaic installations and on-shore and offshore wind farms will account for an even greater share of the Danish electricity mix in the years up to 2030 onwards. At the same time, electricity consumption is expected to grow significantly, driven by electricity use in the household heating and transport sectors, in the data three and for the production of e-fuels (PTX). This development poses a challenge to the transmission network, which must be able to cope with higher demand and generation, which is often not geographically balanced.

Figure 48 shows the reference electricity grid in 2026, consisting of the current network and approved-

maintenance or expansion projects.

**Figure 48. Grid reference for 2026, including existing power grid and adapted maintenance or expansion projects**

*(Source: Energy network, LUP 2022)*

Looking forward to 2040, the Danish TSO has identified the need for new investments as well as the main reinvestment needs in the existing network, as highlighted in Figure 49 and Figure 50 below. These needs are described in the long-term electricity network development plan 2022 (LUP)<sup>56</sup>.

**Figure 49: Possible grid expansion projects**

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<sup>56</sup>[https://energinet.dk/media/jjil5e23/energinets-langsigtede-udviklingsplan-2022-8423930\\_1\\_1.pdf](https://energinet.dk/media/jjil5e23/energinets-langsigtede-udviklingsplan-2022-8423930_1_1.pdf)

*(Source: Energy network,  
LUP 2022)*

**Figure 50: Needs for reinvestment in the existing power grid**

*(Source: Energy network, LUP 2022)*

### 4.5.3 Electricity and gas markets, energy prices

*(i) Current situation of electricity and gas markets, including energy prices*

#### **Electricity**

The electricity market in Denmark is divided into two bidding zones, DK1 (West Denmark) and DK2 (Eastern Denmark). The average hourly price across DK1 and DK2 in 2022 was EUR 215,15/MWh. The average hourly prices for DK1 and DK2 respectively in 2022 were:

- DK1: EUR 219,59/MWh
- DK2: EUR 210,71/MWh

The following graph shows the average daily electricity price across DK1 and DK2 for the years 2020 to 2023:

### Figure 51. Daily average price for the years 2020-2023

In 2020, the price rarely exceeded EUR 100/MWh, but in 2022 we experienced prices that exceeded EUR 700/MWh for a few hours. The increase in prices in 2022 has to be seen in the light of several factors influencing the European electricity market, including supply/demand of gas, low water stocks in Norway, heat waves leading to higher fuel prices for coal and lower output of French nuclear power plants, as well as maintenance of Swedish nuclear power plants.

Denmark is a highly connected country. The lower import opportunities due to the above, as well as the fact that the electricity produced from RES in Denmark was shared with the neighbouring connected countries to Denmark, resulted in strong electricity prices in Denmark in late summer 2022.

Prices have been more stable since then at a lower level, but are still not in line with prices for 2020 and before.

Electricity production as well as imports/exports in 2022 were:

- Electricity generation: 33.95 TWh
- Net imports: 1.27 TWh

The 33.95 TWh of electricity produced in Denmark in 2022 was produced by the following sources. The data are from Energinet

Wind:	18.91 TWh,	55.7 %
Coal:	5.08 TWh,	15 %
Biomass:	4.10 TWh,	12.1 %
Gas:	2.14 TWh,	6.3 %
Sun:	2.11 TWh,	6.2 %
Waste:	1.30 TWh,	3.8 %
Oil:	0.32 TWh,	0.9 %

This distribution is also visualised in the following Figure 52.

**Figure 52. Electricity generation by generation source**

# Electricity production by source

2022

## Gas

Denmark expects to produce approximately 0,79 billion Nm<sup>3 sales</sup> gas in 2022, 0,75 billion Nm<sup>3</sup> in 2023 and between 2,5-3 billion Nm<sup>3</sup> after the reconstruction of the Turkish complex. In comparison, 0,63 billion Nm<sup>3</sup> upgraded biogas was produced in 2022 and 0,76 billion Nm<sup>3</sup> upgraded biogas is expected to be produced in 2023. Gasprices increased markedly following Russia's invasion of Ukraine. The gas price only peaked in March 2022. After that, the price of gas fell but escalated due to high uncertainty and the filling of European gas stocks in latesummer 2022. Realised gas prices for the period January 2013 to January 2023 are shown in the following Figure 53:



**Figure 53. Development of the gas price 2013-2023**

The price fell again in October due to filled gas storage and large LNG supply. In November and December, gas prices increased again due to lower temperature and resulting increased consumption.

*(ii) Projections of developments with existing policies and measures, at least up to 2040 (including for 2030)*

Chart 54 shows Denmark's average price, which is expected to fall by 53 % from 2025 to 2030, 44 % from 2025 to 2040, and 49 % from 2025 to 2050. The decrease has to be seen in particular in the light of the very high electricity prices in the current period.

## Figure 54. Electricity price forecast for 2025-2050

120

Chart 55 shows that electricity generation (including grid losses) is expected to increase by 72 % between 2022 and 2030 and 108 % between 2022 and 2040. Around 2030 it is expected that Denmark will move from a net importer of electricity to a net exporter.

**Figure 55. Expected production of electricity and net imports of electricity for the years 2022-2040**

Figure 56 shows that the price of natural gas is expected to decrease significantly from the current DKK 300/GJ to DKK 100/GJ in 2025.

**Figure 56. Expected gas price for the years 2022-2040 (DKK/GJ)**

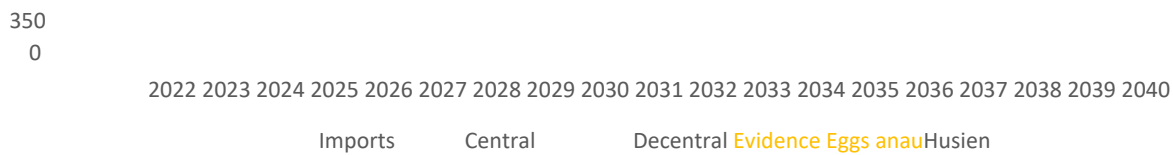


Figure 57 below shows the total expected gas consumption (including Denmark, exports to Sweden, Germany and Poland) from 2022 to 2040. The projection shows:

- Denmark's gas consumption declines by 37 % from 2022 to 2030 and 51 % from 2022 to 2040.
- Exports to Sweden fall by 34 % from 2022 to 2030 and 86 % from 2022 to 2040.
- Exports to Poland remain stable from 2023 to 2040.

**Figure 57. Expected gas consumption for the years 2022-2040**

*(Source: Af22, Danish Energy Agency)*

Figure 58 shows total expected gas production including biogas and imports from Germany and Norway from 2022

2040. The projection shows:

- Biogas production increases by 99 % from 2022 to 2030 and 102 % from 2022 to 2040.
- Gas deliveries from the North Sea via Nybro increase by 4506 % from 2022 to 2030 and 1.381 % from 2022 to 2040 (the high percentages are the result of the reopening of the Tyra field).
- Imports from Germany will stop in 2027.
- Imports from Norway remain stable from 2023 to 2040.

**Figure 58. Expected gas production + imports for the years 2022-2040**

(Source: Af22, Danish Energy Agency)

## 4.6 research, innovation and competitiveness dimension

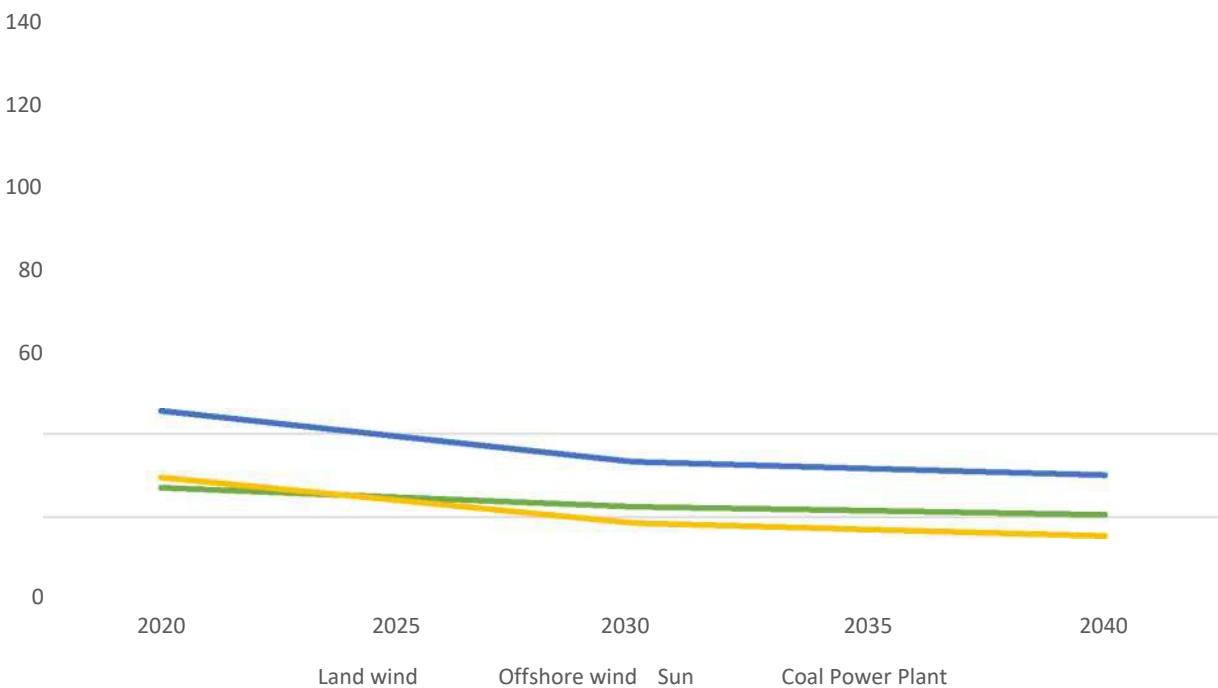
- (i) *Current state of play of the low-carbon technologies sector as well as to the extent possible extent of its position on the global market (this analysis must be carried out at EU or global level);*

The low-carbon sector in Denmark includes, in this chapter, all low-emission technologies such as wind, solar, bioenergy, district heating and other efficient energy. It includes energy generation, distribution and storage, as well as energy-saving products and components.

Exports of energy technology and services between 2010 and 2021 increased by 38 % and exports of energy technology accounted for 11.3 % of total Danish goods exports in 2021. In 2021, Denmark exported energy technology accommodation and service for DKK 89,1 billion. Over half, Denmark exported outside the EU. Denmark's main exporting countries are Germany, the United Kingdom and the United States (Danish Energy Agency, 2021).

Figure 59 below shows the competitiveness of land-based, sea wind and solar based on their smoothed costs (LCoE). In 2022, the cost of energy production is lower for these renewable energy technologies, and thus more economically competitive, than energy production of coal power plants. With the continued development of renewable energy technologies, their competitiveness will only increase in the coming years.

**Figure 59. Smoothed electricity costs (LCoE) 2020-2040 in EUR/Mwh, split into solar, terrestrial, offshore wind and coal power;**



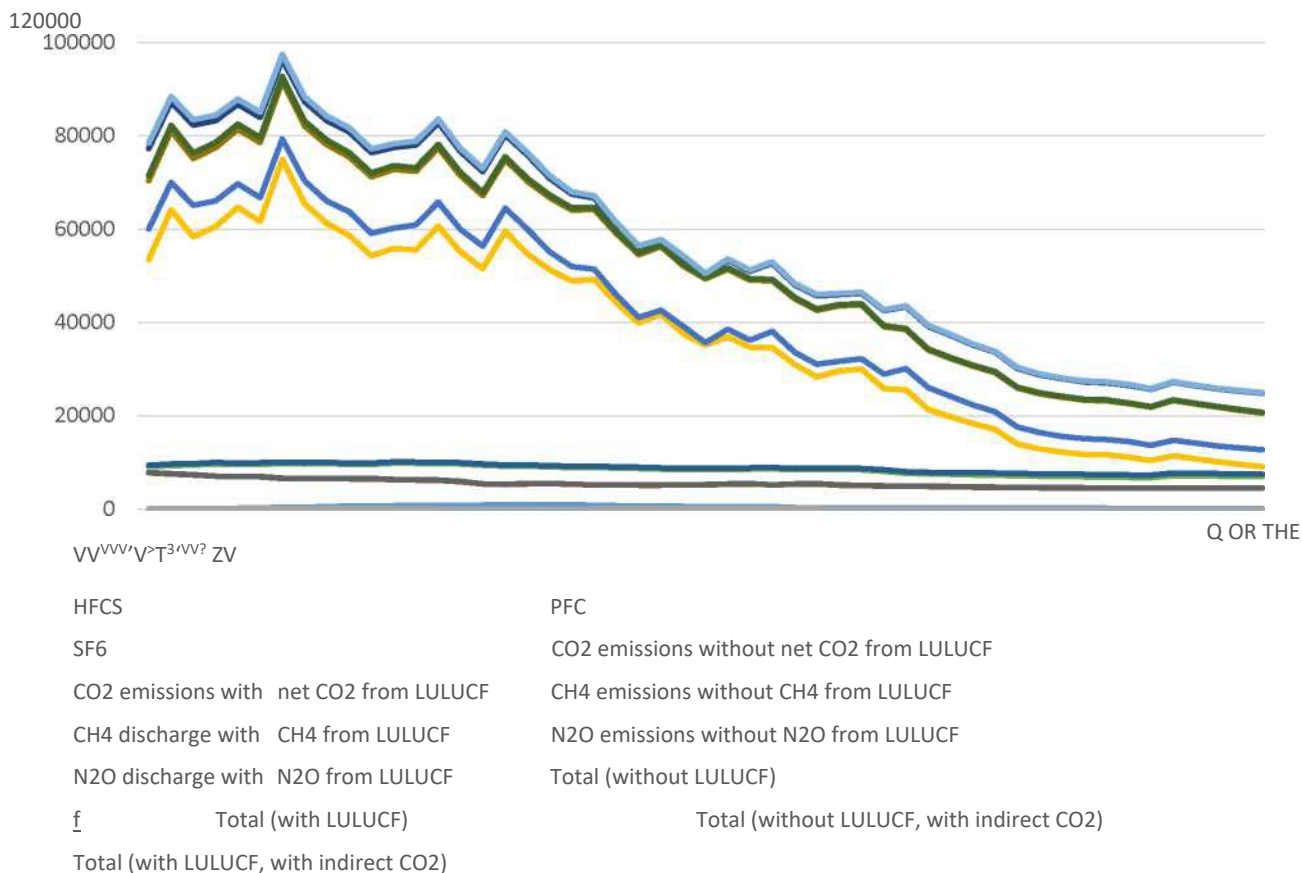
## 4.3 Decarbonisation dimension

### 4.3.1 Greenhouse gas emissions and removals

- *1) Trends in current greenhouse gas emissions and removals in the EU ETS, burden sharing sectors, LULUCF sectors and different energy sectors*

The trends in current Danish greenhouse gas emissions and removals from 1990 to 2021, as well as projections to 2040, are shown in Figure 30. A key result is that total greenhouse gas emissions without LULUCF have decreased by 38 % from 1990 to 2021.

**Figure 30. Greenhouse gas emissions by type of gas from 1990 to 2040 (kt CO<sub>2</sub>e)**



Other results from 1990-2021 are:

- Total greenhouse gas emissions with LULUCF have decreased by 41 %.
- CO<sub>2</sub> emissions without LULUCF have decreased by 45 %.
- CO<sub>2</sub> emissions with LULUCF have decreased by 47 %.
- CH<sub>4</sub> emissions without LULUCF have decreased by 6 %.
- CH<sub>4</sub> emissions with LULUCF have decreased by 6 %.
- N<sub>2</sub>O emissions without LULUCF have decreased by 34 %.
- N<sub>2</sub>O emissions with LULUCF decreased by 34 %.

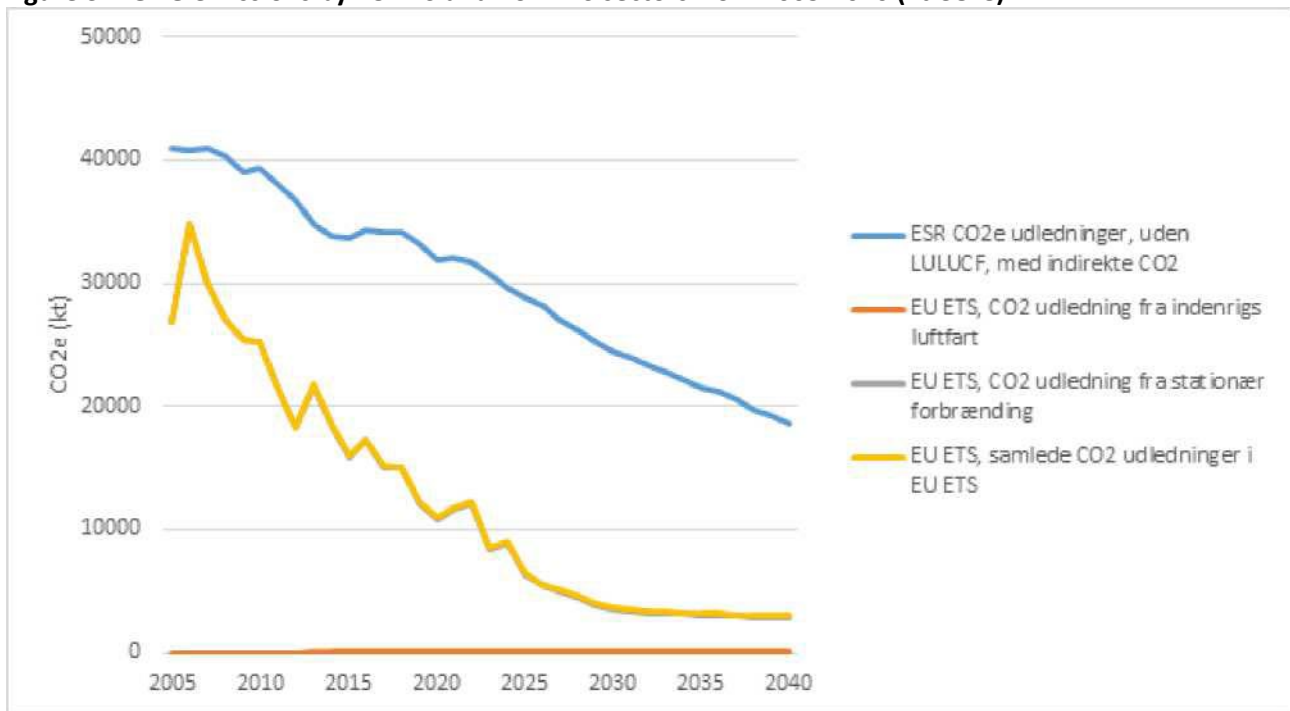
Figure 31 shows greenhouse gas emission reductions achieved, divided between emissions covered by the EU ETS and non-ETS emissions from 2005 to 2021, as well as a projection for 2040.

From 2005, when reporting of ETS emissions started, to 2021:

- The EU ETS CO<sub>2</sub> emissions have decreased by 56 %.
- non-ETS CO<sub>2</sub>e-emissions without LULUCF have decreased by 22 %.



Figure 31. GHG emissions by EU ETS and non-ETS sectors from 2005-2040 (kt CO<sub>2</sub>e)



Greenhouse gas emissions have been reduced in particular in the energy sector, partly due to a decrease in emissions in the energy and conversion sector, as shown in Figure 32 below.

Results for greenhouse gas emission reductions by IPCC energy sector from 1990-2021:

- Emissions from the energy sector have been reduced by 47 %.
- Emissions from the energy and conversion sector have been reduced by 68 %.
- Emissions from the manufacturing and construction sectors have been reduced by 36 %.
- Emissions from transport have increased by 7 %.
- Emissions from other sectors have been reduced by 59 %.

**Figure 32. Greenhouse gas emissions by IPCC energy sector, 1990-2040 (kt CO<sub>2</sub>e)**

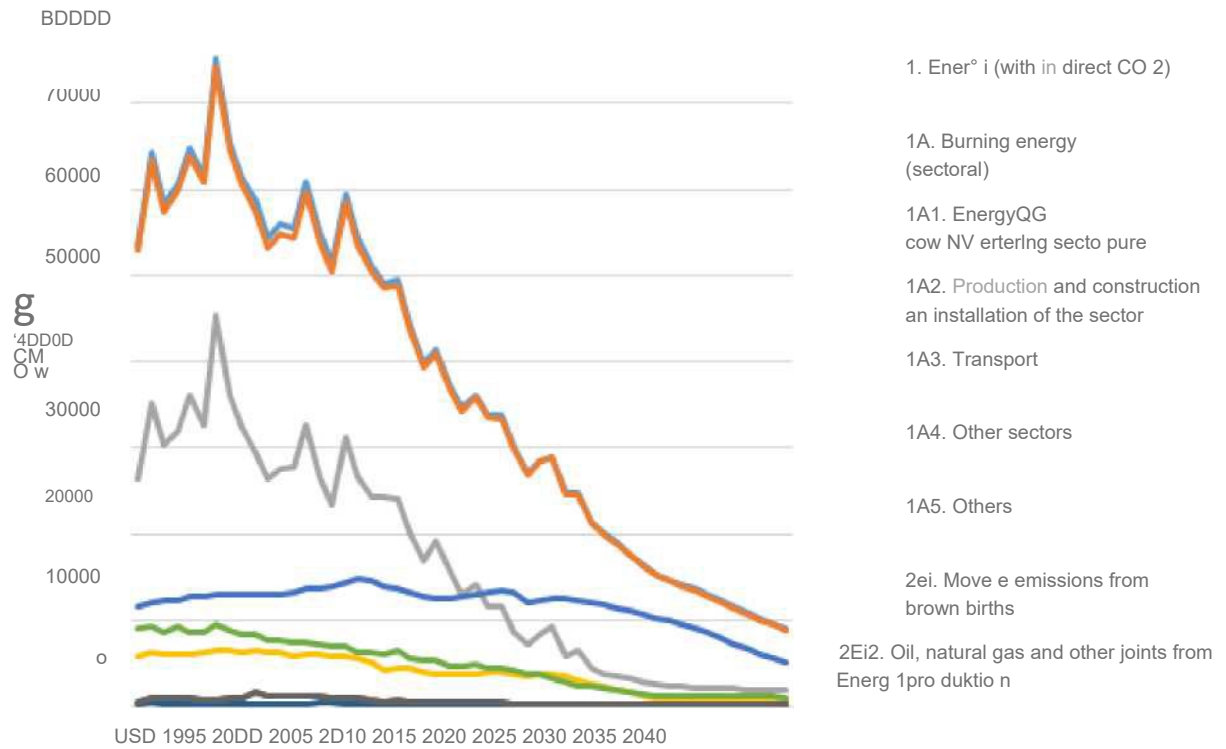


Figure 33 shows the total GHG emissions by IPCC's main sectors from 1990 to 2021:

- Energy related has been reduced by 46 %.
- Process emissions have been reduced by 14 %.
- Agriculture has been reduced by 13 %.
- LULUCF has been reduced by 65 %.
- Waste management has been reduced by 39 %.

Figure 33. Greenhouse gas emissions by IPCC main sectors from 1990 to 2040 (kt CO<sub>2</sub>e)

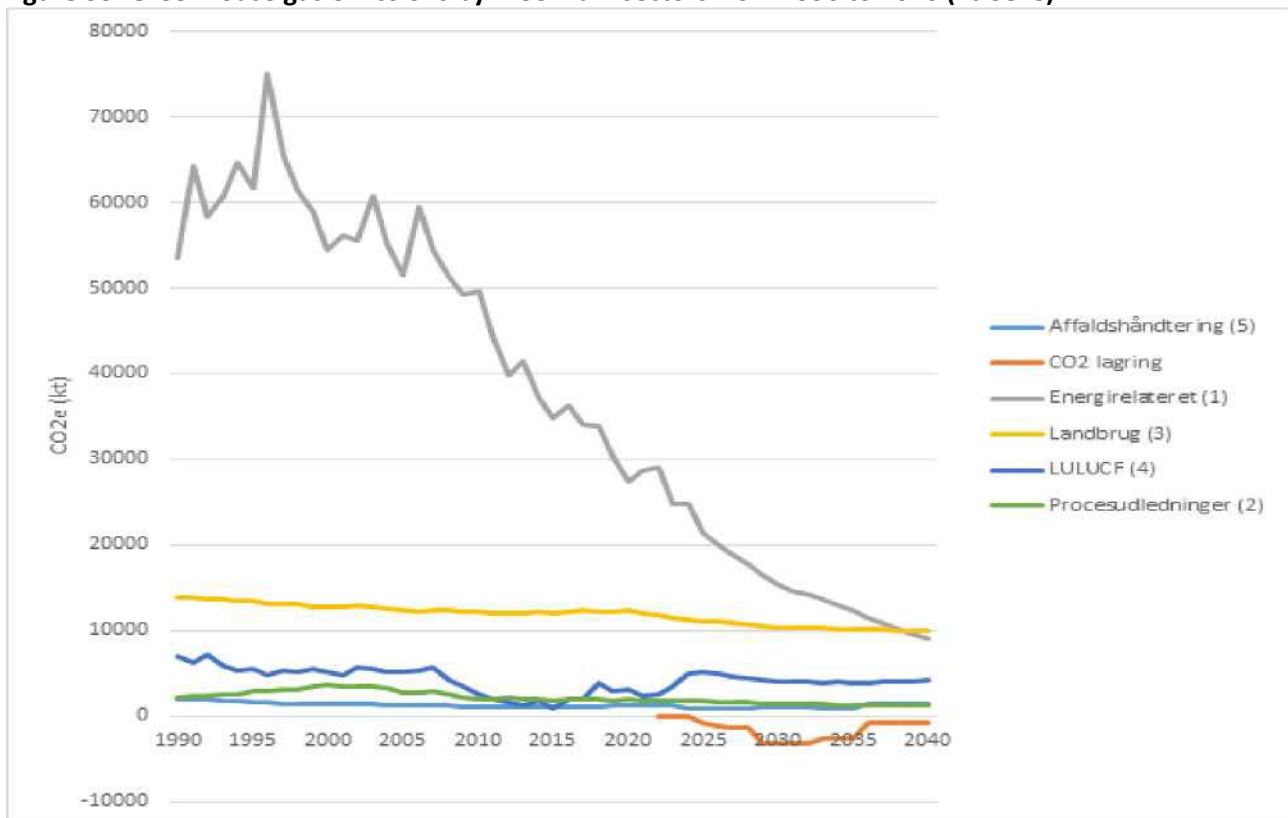
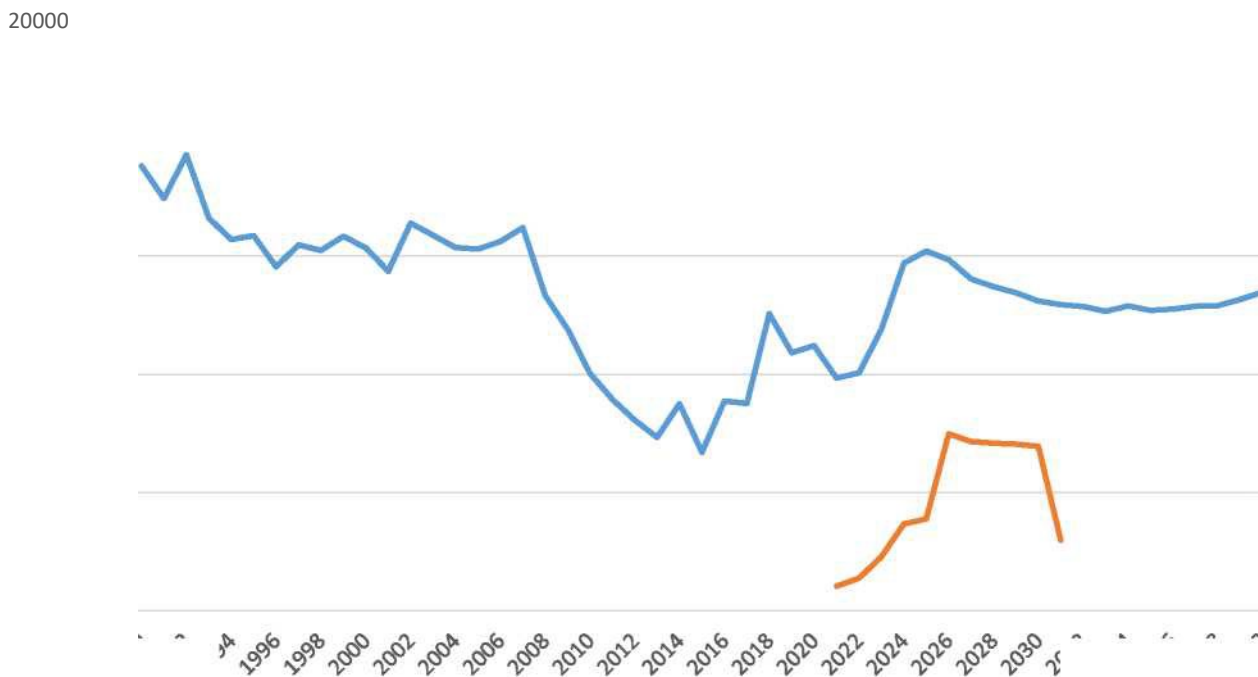


Figure 34 shows that:

- LULUCF net emissions have been reduced by 65 % from 1990 to 2021, but are expected to increase until 2025, after which they will decline again.

**Figure 34. Greenhouse gas emissions in the LULUCF sector from 1990 to 2040**



(II) Projections of developments in each sector with existing national policies; and measures and Union policies and measures, at least until 2040 (including for 2030)

In the previous section, past and current emissions were presented to show developments from 1990-2021.

This section presents projections for 2021-2040, shown in the charts in the previous section.

Figure 30 above shows the evolution of greenhouse gas emissions by type of gas from 1990 to 2040. The trend shows that total greenhouse gas emissions without LULUCF are expected to be reduced by 65 % from 1990

to 2030 and 71 % from 1990 to 2040.

Other results from the projections are:

- Total greenhouse gas emissions from LULUCF are reduced by 63 % from 1990 to 2030 and 68 % from 1990 to 2040.
- CO<sub>2</sub> emissions without LULUCF are reduced by 76 % from 1990 to 2030 and 83 % from 1990 to 2040.
- CO<sub>2</sub> emissions with LULUCF are reduced by 73 % from 1990 to 2030 and 79 % from 1990 to 2040.
- CH<sub>4</sub> emissions without LULUCF are reduced by 23 % from 1990 to 2030 and 24 % from 1990 to 2040.

- CH<sub>4</sub> emissions with LULUCF are reduced by 20 % from 1990 to 2030 and 20 % from 1990 to 2040.
- N<sub>2</sub>O emissions without LULUCF are reduced by 41 % from 1990 to 2030 and 42 % from 1990 to 2040.
- N<sub>2</sub>O emissions with LULUCF are reduced by 41 % from 1990 to 2030 and 42 % from 1990 to 2040.

Figure 31 shows GHG emissions in the EU ETS and non-ETS from 2005-2040. From 2005, when reporting of ETS emissions started, it is projected that:

- The EU ETS CO<sub>2</sub> emissions are reduced by 86 % from 2005 to 2030 and 89 % from 1990 to 2040.
- non-ETS emissions without LULUCF are reduced by 40 % from 2005 to 2030 and 54 % from 1990 to 2040.

The projection for the non-ETS has to be seen in the context of Denmark's commitment to limit greenhouse gas emissions from the non-ETS by 50 % in 2030. Further steps to achieve this are described in Section 3.1.1.

Figure 32 shows the total greenhouse gas emissions by sector. The projection shows that:

- Emissions from the energy sector are reduced by 71 % from 1990 to 2030 and 83 % from 1990 to 2040.
- Emissions from the energy and conversion sector are reduced by 90 % from 1990 to 2030 and 93 % from 1990 to 2040;
- Emissions from the manufacturing and construction sectors are reduced by 83 % from 1990 to 2030 and 89 % from 1990 to 2040.
- Emissions from transport are reduced by 11 % from 1990 to 2030 and 56 % from 1990 to 2040.
- Emissions from other sectors are reduced by 86 % from 1990 to 2030 and 88 % from 1990 to 2040.

Figure 33 shows the total greenhouse gas emissions from 1990 to 2040 broken down by IPCC sector. We expect that:

- Emissions from the energy sector is reduced by 71 % from 1990 to 2030 and 83 % from 1990 to 2040.
- Emissions from process emissions are reduced by 36 % from 1990 to 2030 and 40 % from 1990 to 2040.
- Emissions from agriculture is reduced by 25 % from 1990 to 2040 and 29 % from 1990 to 2040.
- Emissions from LULUCF is reduced by 41 % from 1990 to 2030 and 39 % from 1990 to 2040.
- Emissions from waste management are reduced by 51 % from 1990 to 2030 and 28 % from 1990 to 2040.

Figure 34 shows emissions from LULUCF (net emissions). The projection shows that:

- Emissions from LULUCF are reduced by 41 % from 1990 to 2030 and 39 % from 1990 to 2040.
- EU/LULUCF (2021-2030) net emissions accumulate to -2 029 kt CO<sub>2e</sub> (-2 Mt<sub>CO2e</sub>).

### Projections for air pollutants

Projections for WEM are included in Annex 7.

## 4.2.2 renewable energy

- (iii) *Current share of renewable energy in gross final energy consumption and in different sectors (heating and cooling, electricity and transport) as well as per technology in each of these*

*sectors).*

Figure 35 shows the share of renewable energy both overall and broken down by individual sector. It can be seen that this is increasing in the coming years. In particular for the transport sector, the share of renewable energy is expected to increase significantly by 2040. This is because the calculation of the transport sector includes multipliers on certain types of energy consumption, including electricity and biofuels.

**Figure 35. Total share of renewable energy (RES), share of renewable energy in transport (RES-T), share of renewable energy in the electricity sector (RES-E), share of renewable energy in the heating/cooling sector (RES- H/C).**

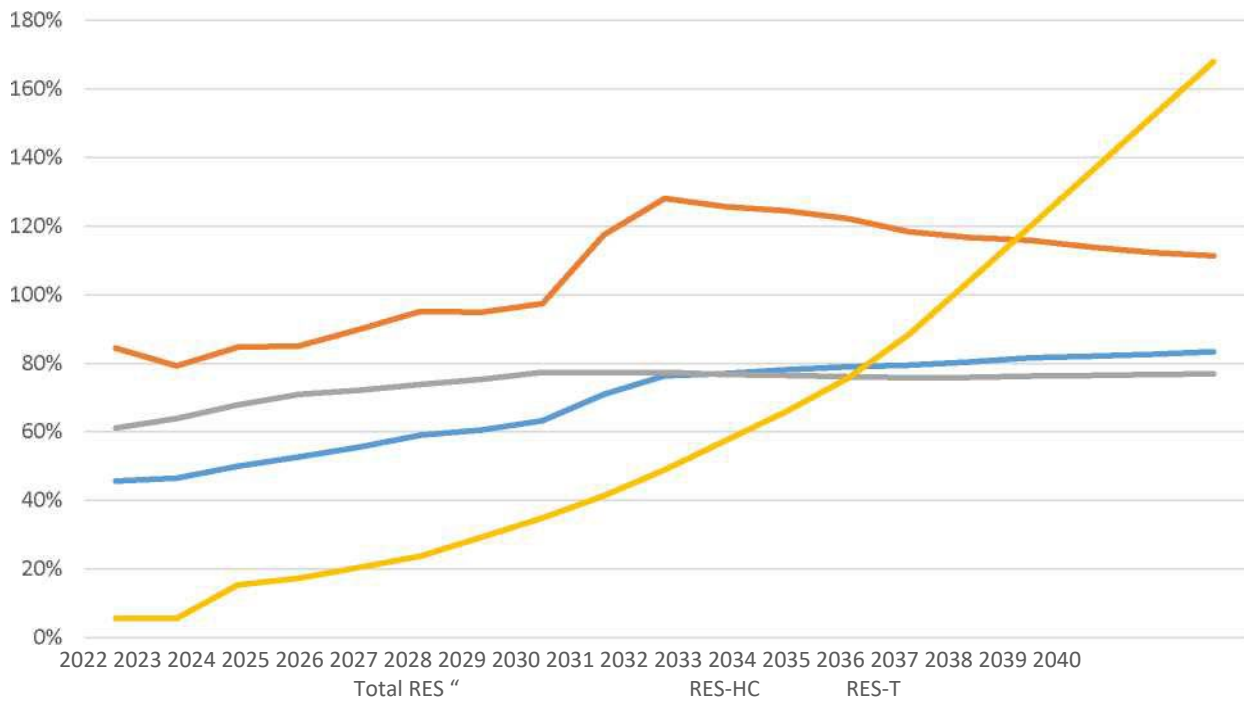
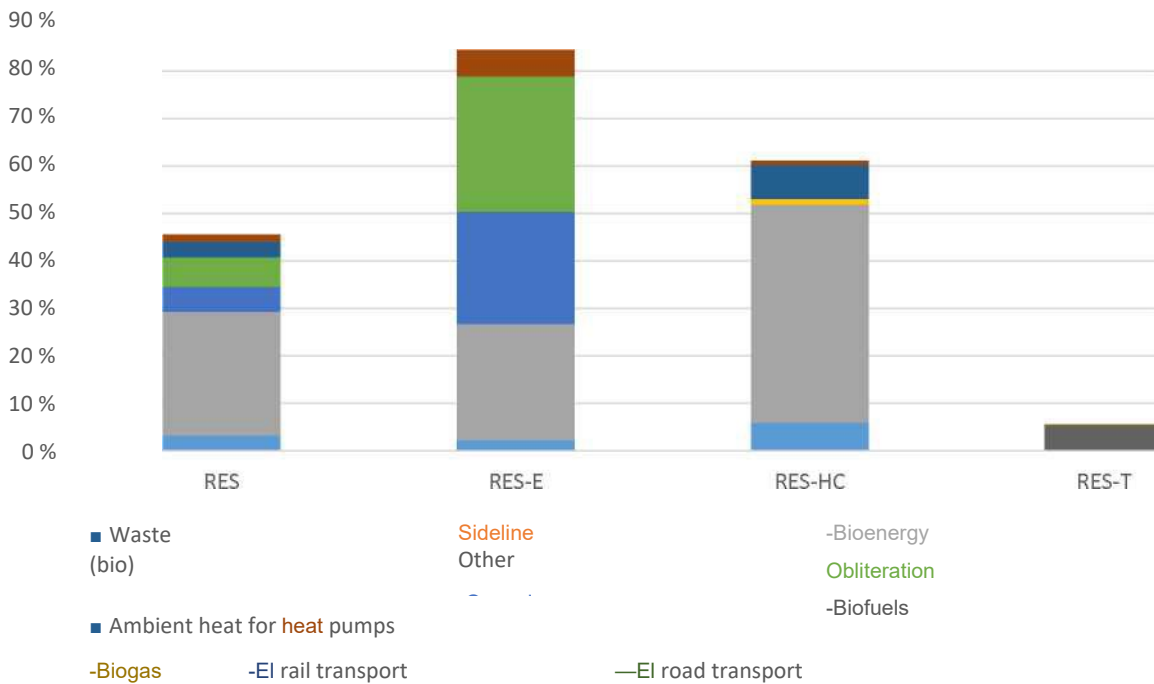


Figure 36 shows the composition of renewable energies both in total and for respective sectors in 2022. In particular, bioenergy accounts for a large share of renewable energy in total, in the electricity sector and in the heating/cooling sector. For the electricity sector, land and sea wind also represent a significant part.

Figures 37, 38, 39 and 40 further develop the shares of energy technologies in the respective sectors.

**Figure 36. The renewable energy mix for total renewable energy (RES), the generator (RES-E) and the heating/cooling sector (RES-H/C), the transport sector (RES-T).**



(iv) *Indicative projections of developments with existing policies for 2030 (with one perspective to 2040)*

Figure 35 shows the share of renewable energy in different sectors. The graph shows the expected evolution from 2022 to 2040. The overall share of renewable energy is projected to increase from 46 % in 2022 to 71 % in 2030. This achieves the 55 % renewable energy target for 2030, cf. the 2018 Energy Agreement.

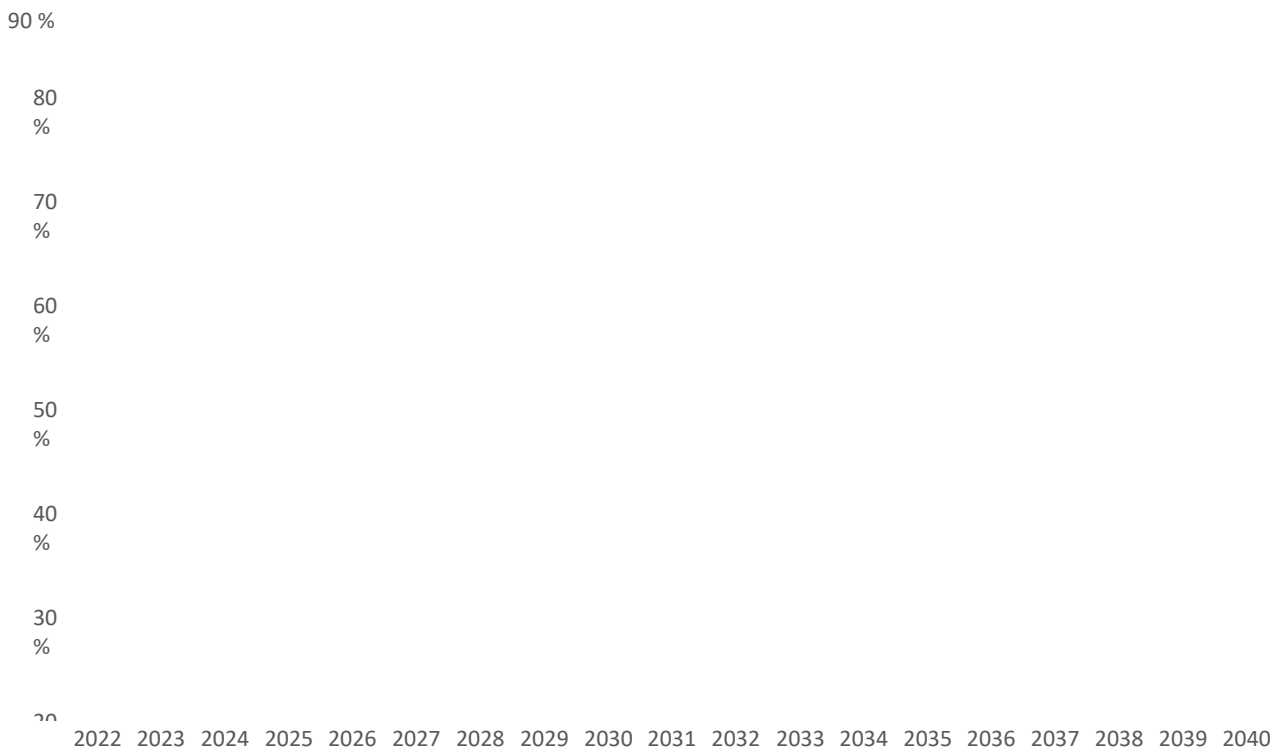
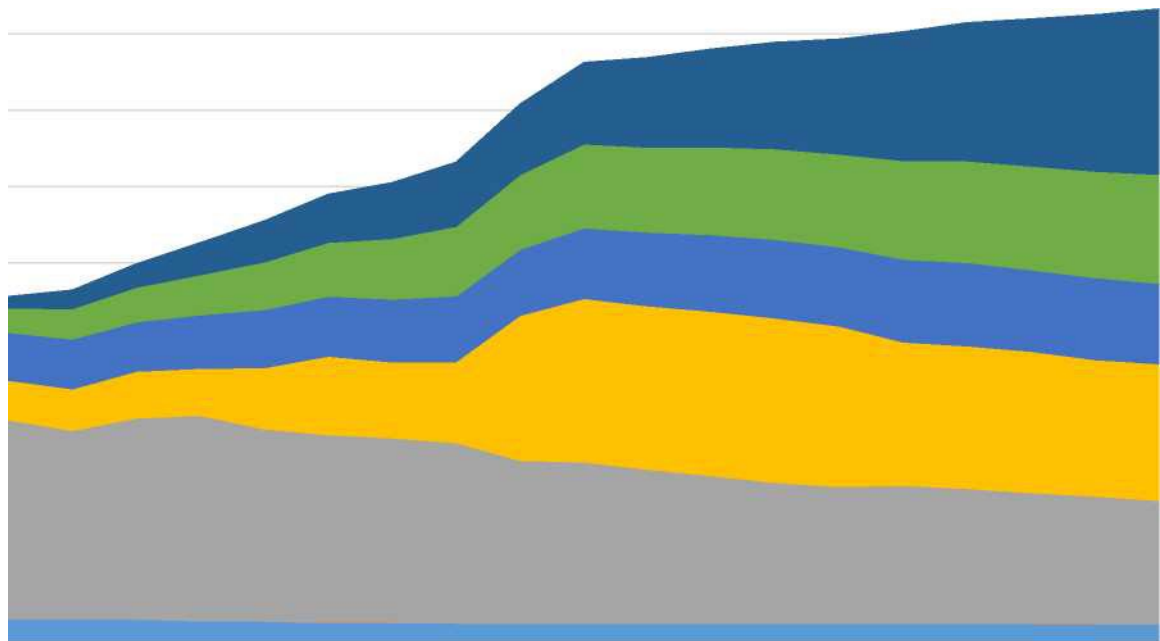
The share of renewable energy producing electricity is also projected to increase from 84 % in 2022 to 117 % in 2030. From 2030 onwards, Danish electricity consumption can therefore, on an average basis, be entirely covered by renewable energy. Figure 35 also shows that the share of renewable energy in the electricity sector will decline by 2040 after 2031. This is largely due to expectations of increased electricity consumption by 2040.

For the heating/cooling sector, the share of renewable energy is expected to be 77 % in 2030, compared with 61 % in 2022. For the transport sector, the share of renewable energy in the sector is expected to increase from 6 % in 2022 to 41 % in 2030.

Figure 37 below shows the share of renewable energy technologies in the overall energy mix from 2022 to 2040. It is projected that, both in 2022 and beyond, bioenergy is expected to account for a large share of energy consumption by 2040, while remaining technologies play a particular role from 2030 onwards. In this respect, it is projected that sun is expected to play a role in the long term, moving from a share of 1.6 % in 2022 to 21.8 % in 2040. The share of offshore wind is expected to increase in particular in 2031, standing at 21.5 %, compared with 5.2 % in 2022.



Figure 37. Share of renewable energy technologies in the overall energy mix from 2022-2040.



-Wastes (bio)

Figure 38 below shows the share of renewable energy technologies in the heating/cooling sector from 2022 to 2040. The figure shows, among other things, that the share of bioenergy is expected to increase from 2022 until 2025, after which the share of bioenergy is expected to decrease by 2040. Between 2022 and 2040, a

significant increase in the share of renewable energy in the heating/cooling sector is expected to come from ambient heat to heatpumps, which is expected to increase from 7.1 % in 2022 to 31.8 % in 2040.

**Figure 38. Share of renewable energy technologies in the heating/cooling sector from 2022-2040**

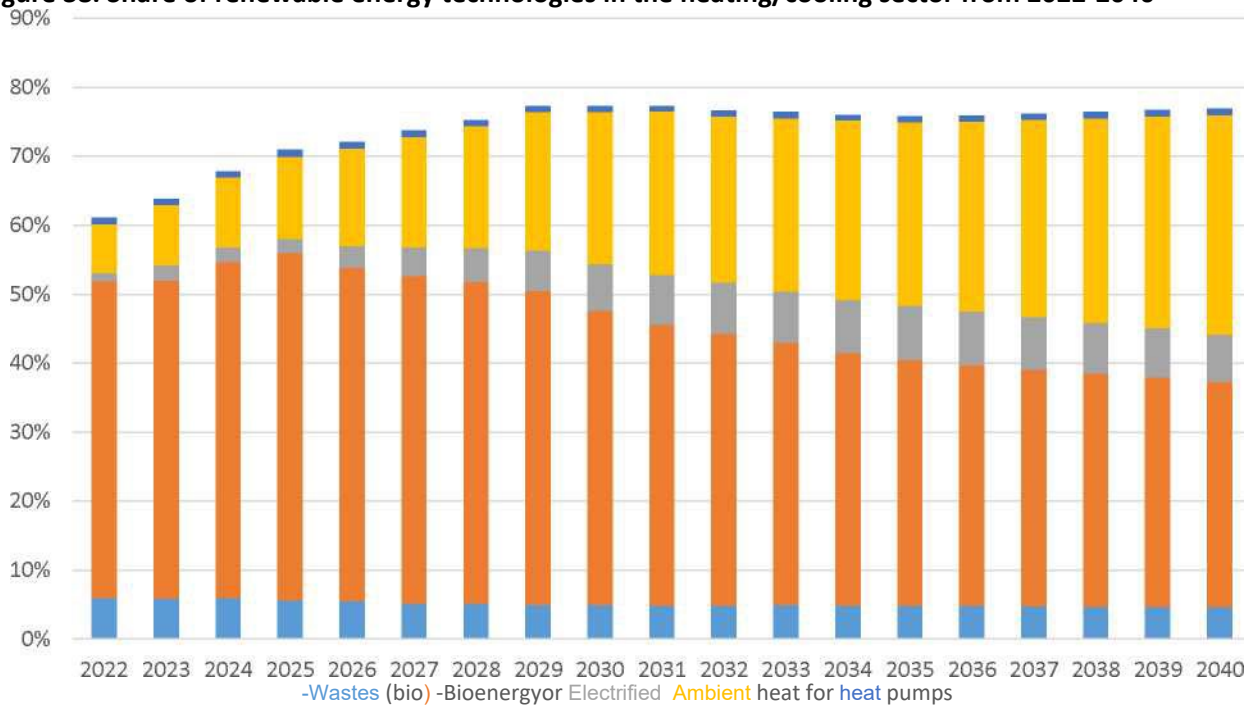


Figure 39 shows the share of renewable energy technologies in the electricity sector from 2022 to 2040. In particular, by 2030, the share of solar and sea wind is expected to increase, while the share of bioenergy is decreasing. From 2030 until 2040, the share of sun is expected to increase in particular. The share of bioenergy is expected to decline from 24.5 % in 2022 to 3.2 % in 2040. The share of offshore wind is expected to increase from 23.6 % in 2022 to 65.2 % in 2031. The share of solar is expected to increase from 5.5 % in 2022 to 46.2 % in 2040.

**Figure 39. Share of renewable energy technologies in the electricity sector from 2022-2040**

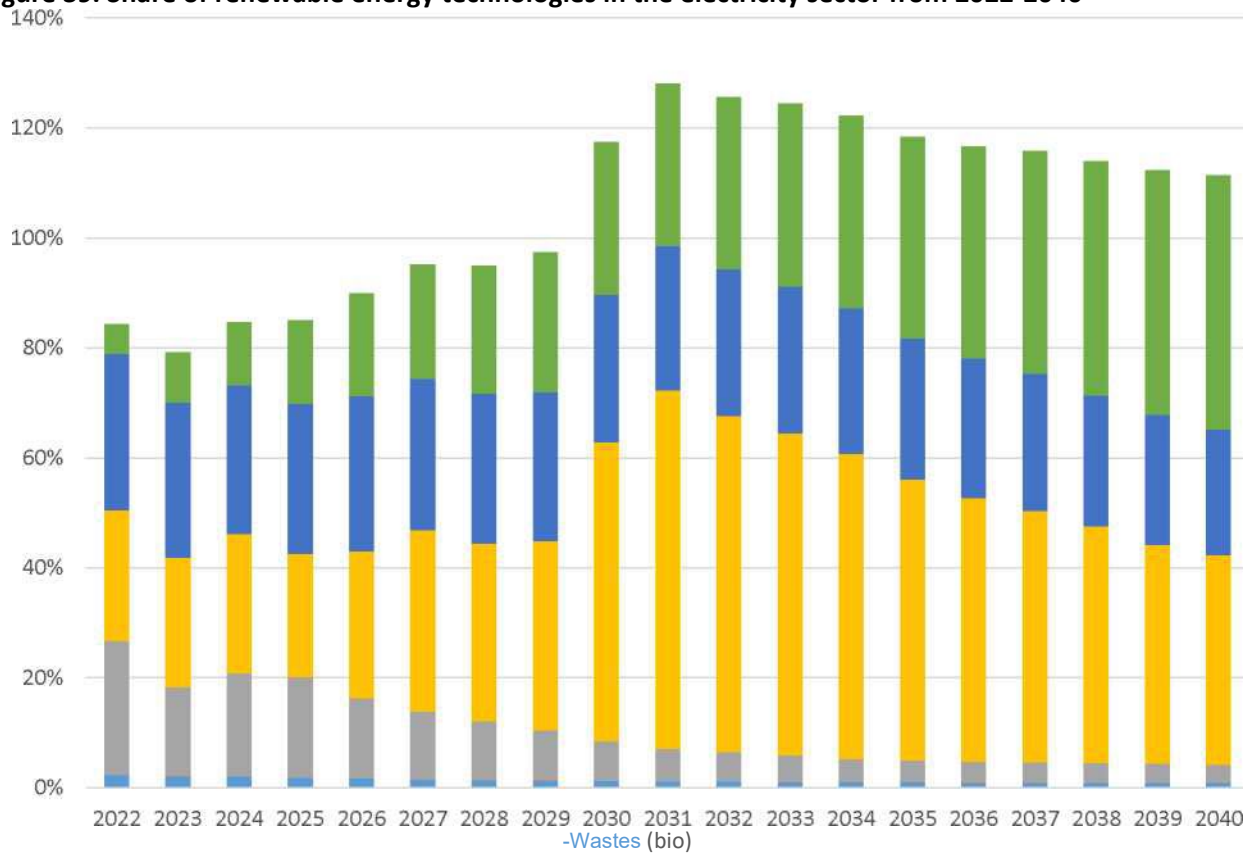
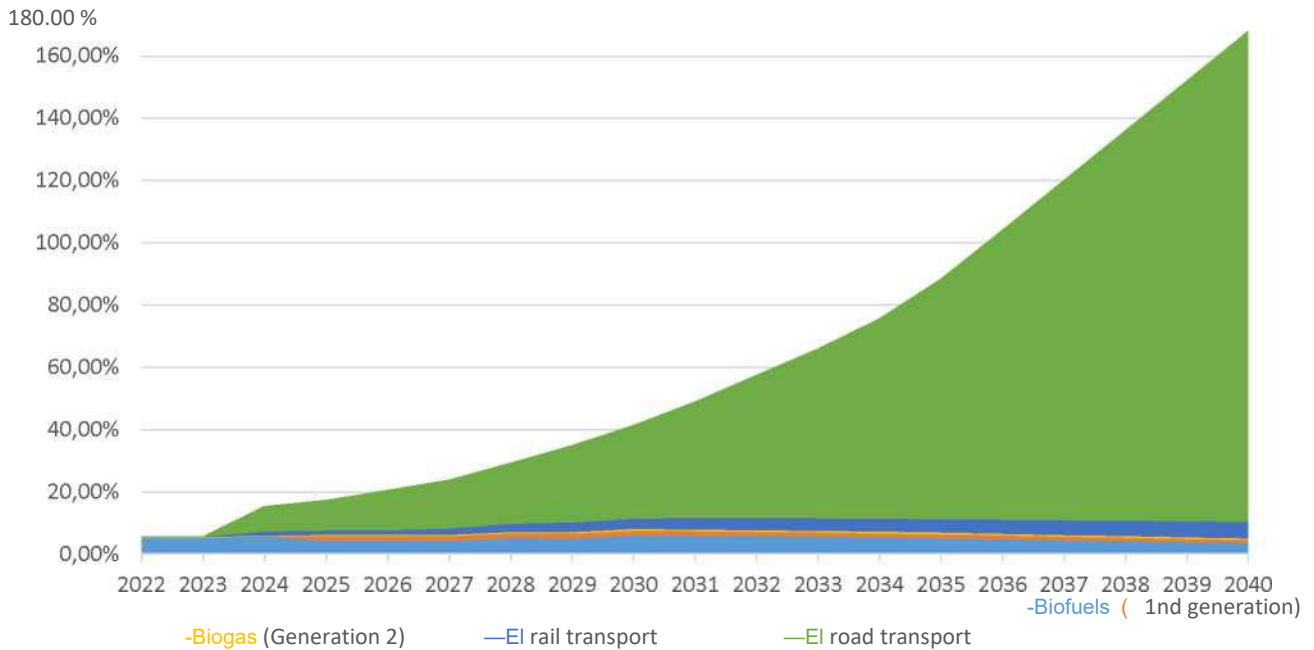


Figure 40 shows the share of renewable energy technologies in the transport sector from 2021 to 2040. The main focus here is the electrification of road transport, which is expected to account for the largest share of renewable technologies in the transport sector from 2023 until 2040. The share of electricity road transport is expected to move from 8 % in 2024 to 158 % in 2040. This increase is due to the electrification of passenger and vans and rail transport, but at the same time it should be noted that the calculation for the transport sector includes multipliers for certain types of energy consumption, including electricity.

**Figure 40. Share of renewable energy technologies in the transport sector from 2021-2040.**



### 4.3 dimension on energy efficiency

*(iv) Current primary and final energy consumption in the economy and per sector (including: industry, housing, services and transport)*

As Figure 41 shows, the most recent year of statistical data, 2021, is not statistically representative of primary and final energy consumption due to exceptional circumstances (COVID), so 2019 has been used as a reference for comparison.

Primary and final energy consumption for the period 2005 to 2019 is shown in Figure 42 below.

The figure shows that in 2019:

- Primary energy consumption 20.367 ktoe
- Final energy consumption 14.946 ktoe
- Ratio between primary energy consumption and final energy consumption 0,73

**Figure 41: Primary and final energy consumption 2005-2040 (ktoe)**

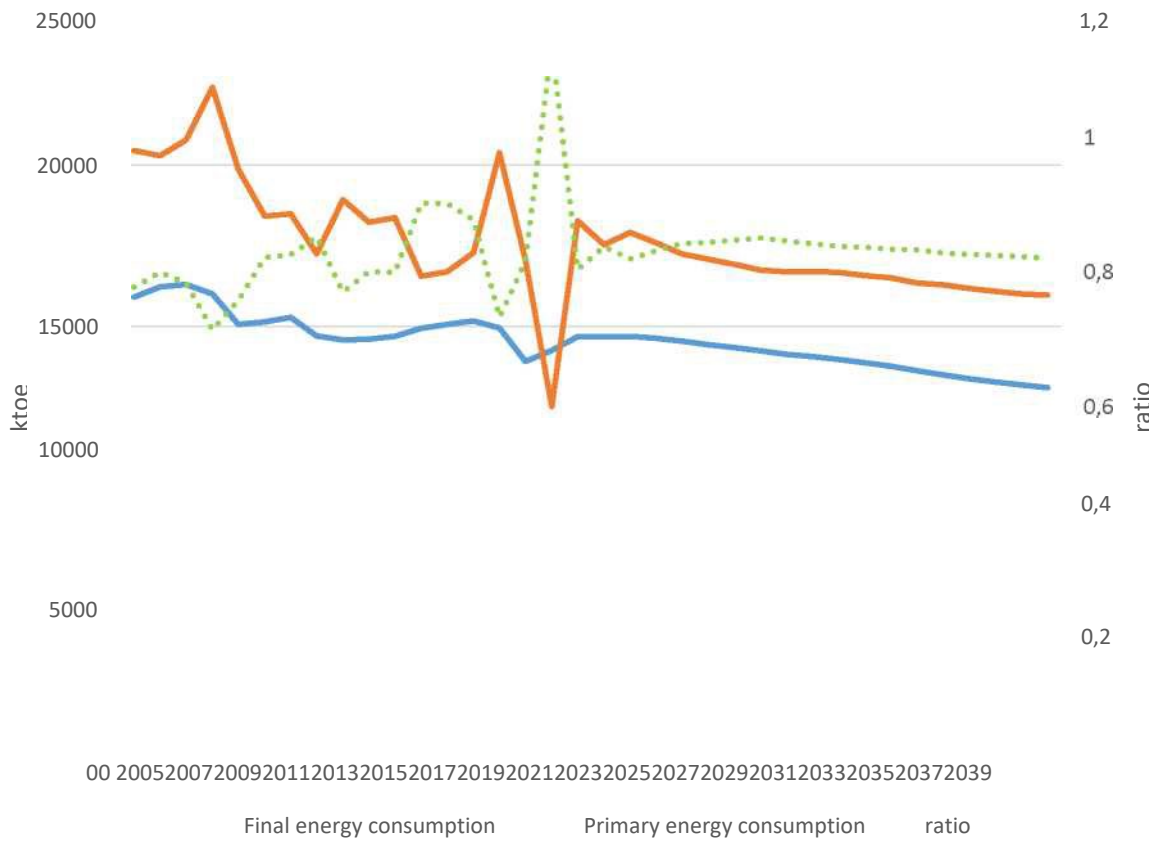


Figure 42 shows final energy consumption by sector in the period 2005 to 2040.

**Figure 42: Final energy consumption by sector**

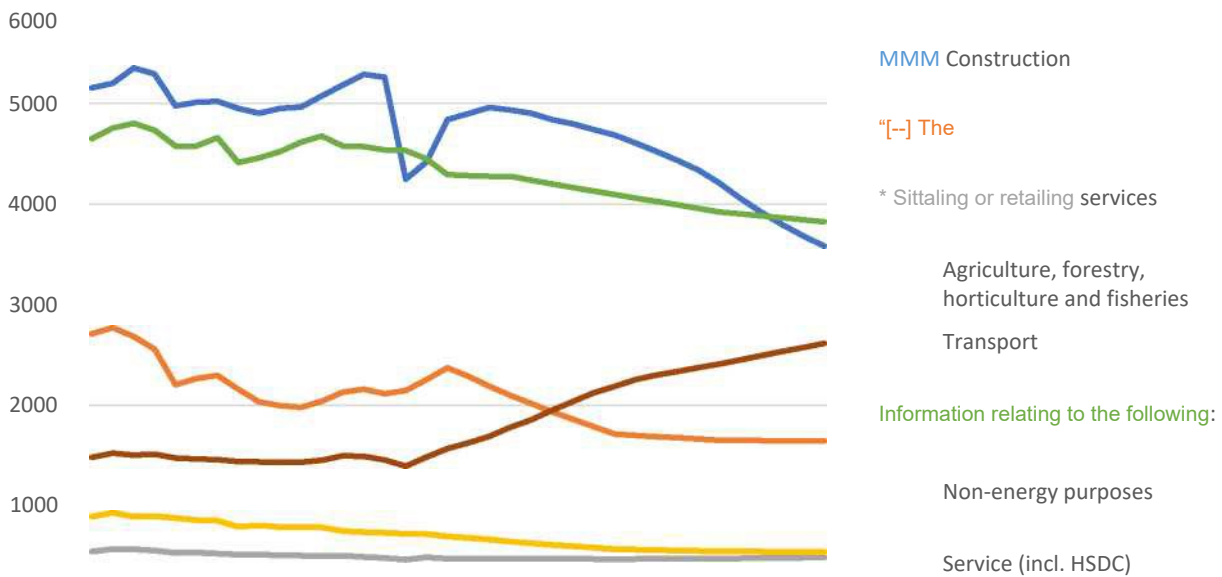


Chart 42 shows that transport (35 %) and households (30 %) account for the largest share of final energy for use in 2019.

The breakdown of final energy consumption by sector in 2019 was:

- Construction 1 %
- Wholesale and retail trade 3 %
- Agriculture, forestry, horticulture and fisheries 5 %
- Transport 35 %
- Industry 14 %
- Households 30 %
- Service 10 %

(v) *Current potential for the application of high-efficiency cogeneration and efficient district heating and cooling*

An overall assessment of the potential for the use of high-efficiency cogeneration and efficient district heating and cooling in Denmark was provided to the European Commission in 2015 in accordance with Article 14, 1 of Directive 2012/27/EU.

The technical potential for district heating is expected to increase by 1194 ktoe in 2035. The business economy potential is expected to reach 3583 ktoe in 2020, an increase of 1433 ktoe in addition. 2013. The social-maritime nomical potential is expected to increase from 1911 ktoe in 2013 to 3105 ktoe in 2020. From 2020 to 2030, the analysis shows that the socio-economic district heating potential decreases to around 2388 ktoe. The potential for combined heat and power in Denmark is expected to decline from 73 % of district heating demand in 2012 to 63 % in 2025 as a result of the integration of renewable energy sources into the electricity grid. Cogeneration has relatively high marginal costs in relation to, for example, wind and PPE, and is therefore considered less feasible in the future energy system in Denmark. Where there is a reduced market incentive to produce electricity from cogeneration, it is more economically feasible to invest only in heat generators. The decrease in cogeneration is not replaced by thermal electricity production, but by a fluctuating share of

renewable energy.

There are no national strategies to change this development, as the level of energy security is high in the Danish electricity grid (99.99 %) and because there are more renewable alternatives to producing heat for district heating. The remote cooling potential is not expected to change dramatically in the period 2006-2030 and is expected to reach 2.866 MW. The socio-economic potential is 2.211 MW and therefore corresponds almost to the technical potential.

Denmark highlights that the figures presented in the current section are identical to those from the 2019 National Energy and Climate Report. This is because Denmark has not carried out an analysis since 2019, when the figure for the use of high efficient cogeneration and efficient district heating and cooling has been calculated. It is expected that Denmark will be able to present updated figures on potential following the preparation of the next comprehensive analysis in 2024.

*(vi) Projections taking into account existing energy efficiency policies, measures and programmes referred to in point 1.2 (ii) for primary and final energy consumption for each sector at least until 2040 (including for 2030);*

Section 4.3 (i) shows primary and final energy consumption from 2005 to 2019. This section describes the anticipated evolution of energy consumption from 2019 to 2040. The evolution of primary and final energy consumption towards 2040 is shown in Figure 41.

Figure.

The projection of energy consumption shows that:

- Primary energy consumption decreases by 18 % from 2019 to 2030 and 22 % from 2019 to 2040.
- Final energy consumption declines by 5 % from 2019 to 2030 and 12 % from 2019 to 2040.
- The ratio between primary and final energy consumption increases by 15 % from 2019 to 2030 and 11 % from 2019 to 2040.

Figure 42 shows the evolution of final energy consumption by sector from 2019 to 2040. Overall, most of the sectors' energy consumption is declining by 2040. In particular, energy consumption in the transport and household sectors is expected to decline markedly. The largest increase in energy consumption is in the services sector (including HSDC), as large data centres (HSDC) are expected to increase energy consumption in this sector.



The evolution of final energy consumption by sector is:

- Final energy consumption in Construction and Installations increases by 5 % between 2019 and 2030 and increases by 4 % from 2019 to 2040.
- Final energy consumption in wholesale and retail trade falls by 2 % from 2019 to 2030 and increases by 1 % from 2019 to 2040.
- Final energy consumption in agriculture, forestry, horticulture and fisheries falls by 21 % from 2019 to 2030 and falls by 25 % from 2019 to 2040.
- Final energy consumption in transport falls by 11 % from 2019 to 2030 and falls by 32 % from 2019 to 2040.
- Final energy consumption in Industry declines by 19 % from 2019 to 2030 and increases by 22 % from 2019 to 2040.
- Final energy consumption in households falls by 10 % from 2019 to 2030 and falls by 16 % from 2019 to 2040.
- Service final energy consumption (including HSDC) increases by 50 % from 2019 to 2030 and increases by 79 % from 2019 to 2040.

Furthermore, Figure 42 shows that by 2040, the transport and household sectors remain the largest share of final energy consumption. In particular, service (including HSDC) accounts for a proportionally higher share of final energy consumption, while transport accounts for a relatively smaller share.

Results for share of final energy consumption by sector in 2030 and 2040:

- Share of final energy consumption in Construction is 1 % in 2030 and 1 % in 2040.
- Share of final energy consumption in Wholesale and retail trade is 3 % in 2030 and 4 % in 2040.
- Share of final energy consumption in Agriculture, forestry, horticulture and fisheries account for 4 % in 2030 and 4 % in 2040.
- Share of final energy consumption in transport is 33 % in 2030 and 27 % in 2040.
- Share of final energy consumption in Industry, 12 % in 2030 and 13 % in 2040.
- Share of final energy consumption in households stand at 29 % in 2030 and 29 % in 2040.
- Share of final energy consumption in service (including HSDC) stands at 15 % in 2030 and 20 % in 2040.

*(IV) Cost-optimal levels of minimum energy performance requirements according to national regulations in accordance with Article 5 of Directive 2010/31/EU.*

Article 5 of the current EPBD requires Member States to calculate and report on the cost-upward levels of minimum energy performance requirements for buildings and building elements.

Denmark submitted the latest cost-optimal report to the European Commission on 27 March 2023. The cost-optimal report shows the following overall conclusions:

In general, the overall level of requirements for new buildings is slightly tighter than that required by the EPBD. The weighted average for new construction shows that the Danish requirements are 20 % tighter than the optimal level of costs. However, there are variations between different types of buildings.

For building elements subject to renovation, the requirements are also close to the cost-optimal point. The calculations show variations for different types of structures depending on the starting point of the insulation levels of the existing structures.

For buildings during major renovation, the building regulations include renovation classes that can be used. The levels in these classes have been evaluated in the cost-optimal report and the report showed that nine-levels were very close to the cost-optimal level. The weighted average showed that in any sample the requirement was 4 per cent tighter than the cost-optimal point.

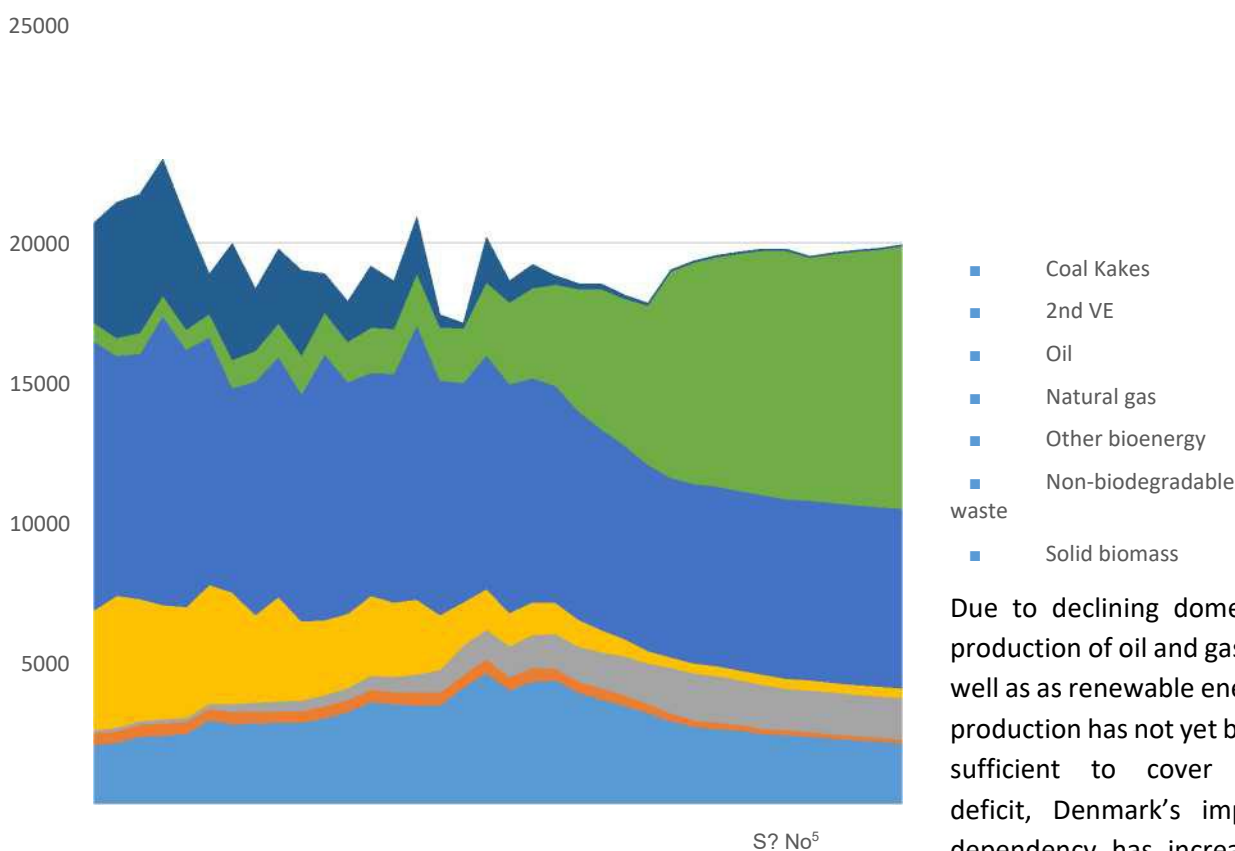
Overall, the report shows that Denmark meets the requirements for cost-optimal levels in the building code.

## 4.4 dimension on energy security

(I) *Current energy mix, indigenous energy sources and import dependency, including relevant risks*

Figure 43 shows the actual gross inland energy consumption in 2021 by energy sources:

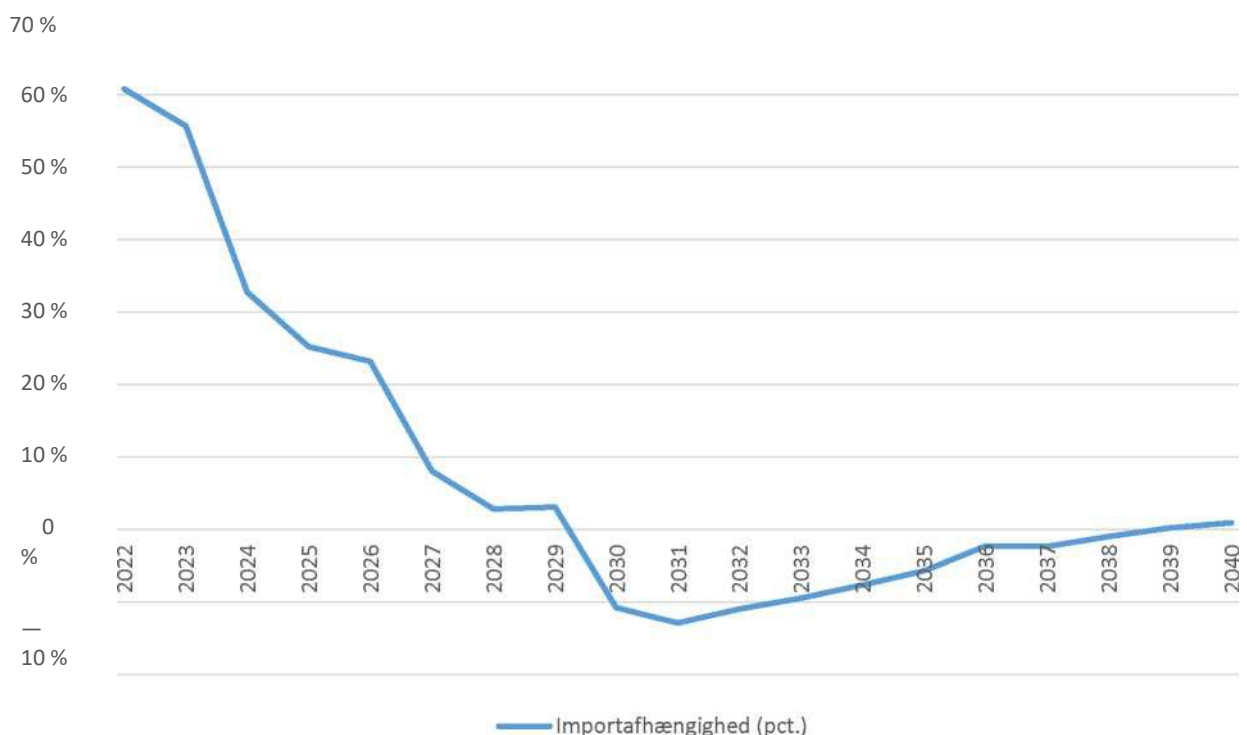
**Figure 43: Denmark’s actual gross energy consumption [ktoe]**



for the next few years. Figure 44 below shows that import dependency in 2022 is 61 %. However, as the graph shows, it is expected that import dependency will decrease by 2040. Already as of 2022, import dependency

is decreasing and when the Tyra gas field is expected to return to operation, import dependency is expected to decrease further, as shown in Figure 45. Developments in the middle and second half of the 2020s reflect several developments, including the implementation of the energy efficiency measures from the Energy Agreement of June 2018, which will take effect in 2024. In addition, three large wind farms are expected to start operating. The projected evolution from 2022 to 2040 reflects the methodology used, i.e. projections made with existing policies and measures (frozen policy). This implies that, while projections assume an expected increase in energy consumption, mainly from data centres and HSDCs, there are currently no decisions on the deployment of new generation capacity after 2030 to offset this increase. For the same reason, import dependency is projected to reach its lowest level in 2031.

**Figure 44: Denmark’s import dependency 2022-2040 (%)**



The most relevant risks to Denmark’s security of supply by 2040 are:

- adequate supply of biomass and a well-functioning market
- developments in global oil supply, including a well-functioning market with balance between supply and demand;
- energy system challenges as the effect of fluctuating wind and solar energy.

*(12) Projections of developments with existing policies and measures, at least up to 2040 (including for 2030)*

The results described in this section refer to Figure 44 and Figure 45 presented in the previous section.

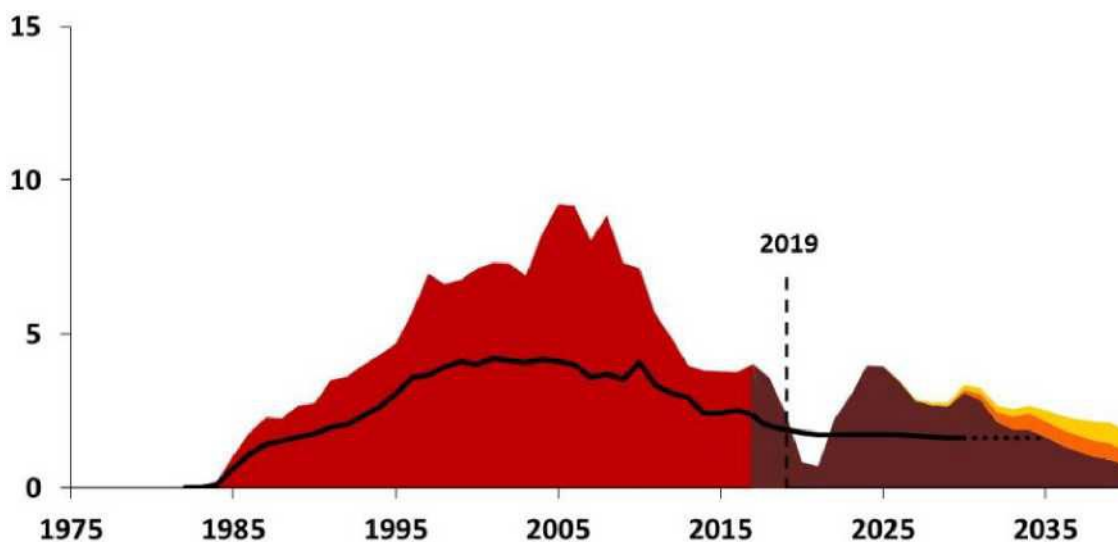
Figure 44 shows actual gross inland energy consumption from 2005 to 2040. A key result is that the combined consumption of fossil fuels such as oil, natural gas and coal/coke falls from 56 % of combined fuel

consumption in 2021 to 36 % in 2030 and 34 % in 2040, a decline of 20 % and 22 % respectively between 2030 and 2040. While the “Second VE” (wind and solar) increases by 11 % in 2021, to 39 % in 2030 and 47 % in 2040.

Figure 44 shows the import dependency from 2022 to 2040. Import dependency is projected to decrease from 61 % in 2022 to -11 % in 2030 and increase to 1 % in 2040.

### Gas

The current projection of Danish consumption and gas extraction is illustrated below. Until the Tyra field in the North Sea continues production at the beginning of 2024, Denmark does not cover its own consumption of pipeline gas.



**Figure 45. Current projection of the Danish consumption and extraction of gas**

### Sales gas, billion Nm<sup>3</sup>

Source: Resources and forecasts, Danish Energy Agency

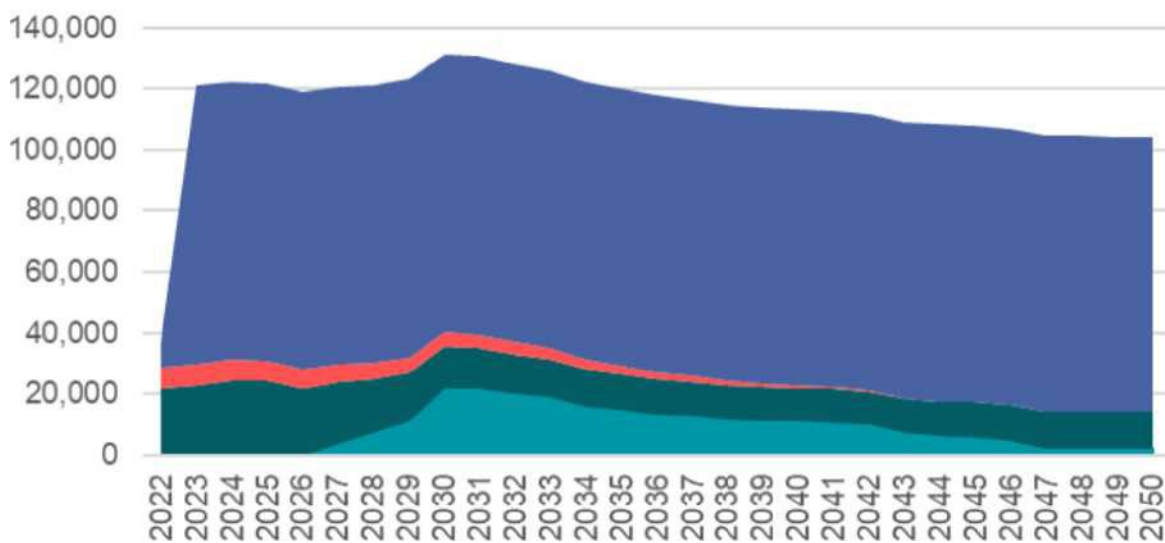
The supply of gas to the Danish system consists of natural gas production from the Danish part of the North Sea, Danish production of green gases, gas from Norway intended for transit to Poland and imports from Germany. The gas in the Danish system is either consumed in Denmark or exported to Sweden, Germany or Poland. An estimated distribution of the projected gas flows in the Danish transmission network is illustrated below.

**M** Production trajectory

Sits Expected

**Sideline** Technological Resources

Figure 46. Gas consumption and exports (GWh/year)  
 Gasforbrug og eksport (GWh/år)



—Exports to Germany the Danish Gas Consumption “Transit to Sweden” Transit to Poland

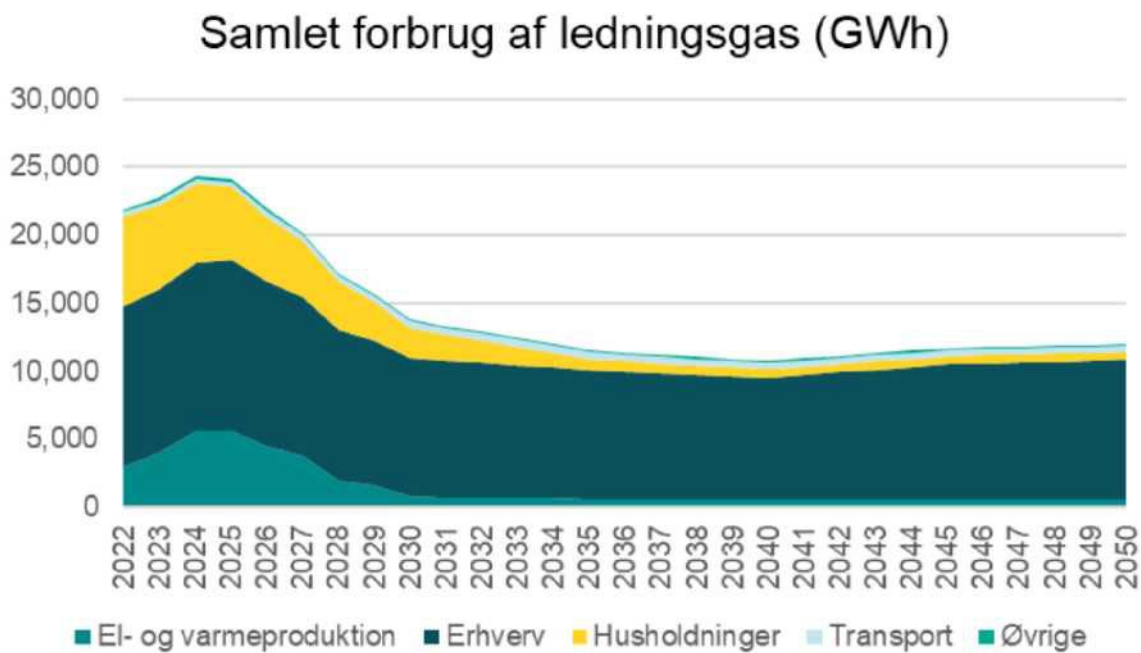
Source: Af22, Danish Energy Agency

### Gas

The evolution of the consumption of mains gas by use can be seen in the figure below. Consumption is significantly reduced by 2030, largely due to the phasing out of pipeline gas consumption for domestic heating, as well as the phasing out of base and intermediate load district heating production based on linked gas. In the period 2022-2050, the total Danish consumption of pipeline gas is estimated to be reduced from approximately 22 TWh

per year to 12 TWh per year, corresponding to a reduction of approximately 45 %. This is assumed against the background of a policy objective in, for example, *the Climate Agreement on Green Electricity and Heat 2022*.

Figure 47. Total consumption of mains gas



Source: Af22, Danish Energy Agency

Consumption of mains gas stabilises after 2030 on the basis of a non-convertible need in the business sector, as well as a small amount of households who do not have the ability or wish to convert to alternative heating methods such as district heating or heat pumps. From 2040-2050, a slight increase in industry's consumption of gas for high temperature processes is expected as other fossil fuels are phased out in favour of pipeline gas.

## 4.5 dimension of the internal energy market

### 4.5.4 Electricity interconnectivity

(iii) *Current interconnection level and main interconnectors*

Tables 11 and 12 show the current interconnectors and interconnectors currently under development.

**Table 11. Current interconnectors**

Name	Linked price areas	Capacity (MW)
Skagerrak 1-4	DK1 – NO3	1700
Konti-Skan	DK1 – SE3	740
Kassø-Audorf	DK1 – THE	2500
Bornholm-Sweden	DK2 – SE4	60
Great Belt	DK1 – DK2	600
Øresund	DK2 – SE4	1300 (imports)/ 1700 (EK —
Catheque	DK2 – THE	585
COBRACable	DK1 – NL	700
Kriegers Flak CGS	DK2 – THE	400

**Table 12. In-design interconnectors**

Name	Linked Price-Counsellors	Capacity (MW)	Year of finishsalting
Viking Link	DK1-UK	1400	2023
Endrup-Niebuß	DK1-DE	1000	2025

(iv) *Projections of interconnector expansion requirements (including for the year 2030)*

It has been politically decided to build 3 GW offshore wind in the North Sea and 3 GW in the Baltic Sea. Against this background, ministers from Denmark and Belgium have signed a MOA on cooperation on offshore energy infrastructure in the North Sea. Subsequently, the TSOs Energinet and Elia have signed a CoA to build a 2 GW external connection between the artificial island in the Danish area of the North Sea connected to the new offshore wind. A MoU and TSOs, Energinet and 50 Hertz, are working on a 2 GW international connection between Bornholm and Germany.

Other interconnectors are reaching the end of their life expectancy and a decision to anchor whether to reinvest in them, build new connectors or other. ENTSO-E's Ten-Year Network Development Plan for 2022 mentions a new international connection, Kontiskan 2, between DK1 and SE, in addition to the projects from the table above.

## 4.5.5 Energy transmission infrastructure

### (iii) Key characteristics of the existing electricity and gas transmission infrastructure

#### EL

Denmark is divided into two price areas, West Denmark (DK1) and East Denmark (DK2), which are divided by the Great Belt. Western Denmark is connected and operated synchronously with the continental European electricity grid, and East Denmark is too contiguous with the Nordic electricity grid. Western and Eastern Denmark are connected exclusively through the 600 MW Great Belt link. Tables 14 and 15 provide detailed information on the internal network in Denmark.

**Table 13. Length of AC/DC overhead lines (split in volt level)**

kV	AC	DC	Total
132	1.615,3		1.615,3
150	2.661,7		2.661,7
220	147,5		147,5
400	1.573,4	546,8	2.120,2
285		248,6	248,6
350		89,0	89,0
0.4 kV		2,6	2,6
20		153,0	153,0
250		7,2	7,2
320		653,5	653,5
<b>Total</b>	<b>5997,9</b>	<b>1700,7</b>	<b>7698,6</b>

**Table 14. Transformers in MW**

kV	Sum of Power MVA]
132	9.060
150	13.977
400	14.510
<b>Total</b>	<b>37.547</b>

#### Gas

The Danish gas transmission system (80 bar) is owned and operated by Energinet, the Danish TSO. The gas system is connected to natural gas fields in the North Sea and the international gas market through five entry points in the North Sea, Nybro, Ellund, Faxe and the Joint Balancing Zone with Sweden (JBZ). There are four transit exit points (Nybro, Ellund, Faxe and the Common Balance Zone with Sweden (JBZ)). A virtual entry point for biomethane RES entry point where transport customers can virtually bring biomethane and other types of renewable energy into the transmission network.

Gas can be supplied to private consumers via the transmission and distribution system. The transmission



tariffs are dependent on where the ships book entry and/or exit capacity.

Energy networks have fully implemented the network code on harmonised transmission tariff structures for gas (TAR NC) with approval of the methods by the Danish Utility Regulator in May 2019. Since October 2019, tariffs have been compliant with TAR NC. In future, constant methodological approvals will be carried out by the Danish Utility Regulator of tariff structures. The transmission system currently consists of approximately 1 100 km of pipeline within Denmark. The transmission system is connected to the distribution system via 41 currently active M/R stations, which control the pressure down to the level of the distribution companies' pipeline systems.

*(iv) Projections of network expansion needs until at least 2040 (including for 2030)*

Renewable electricity produced from photovoltaic installations and on-shore and offshore wind farms will account for an even greater share of the Danish electricity mix in the years up to 2030 onwards. At the same time, electricity consumption is expected to grow significantly, driven by electricity use in the household heating and transport sectors, in the data centre and for the production of e-fuels (PTX). This development poses a challenge to the transmission network, which must be able to cope with higher demand and generation, which is often not geographically balanced.

Figure 48 shows the reference electricity grid in 2026, consisting of the current network and approved-maintenance or expansion projects.

**Figure 48. Grid reference for 2026, including existing power grid and adapted maintenance or expansion projects**



(Source: Energy network, LUP 2022)

Looking forward to 2040, the Danish TSO has identified the need for new investments as well as the main reinvestment needs in the existing network, as highlighted in Figure 49 and Figure 50 below. These needs are described in the long-term electricity network development plan 2022 (LUP) 57.

**Figure 49: Possible grid expansion projects**





(Source: Energy network, LUP 2022)

#### 4.5.6 Electricity and gas markets, energy prices

(iii) *Current situation of electricity and gas markets, including energy prices*

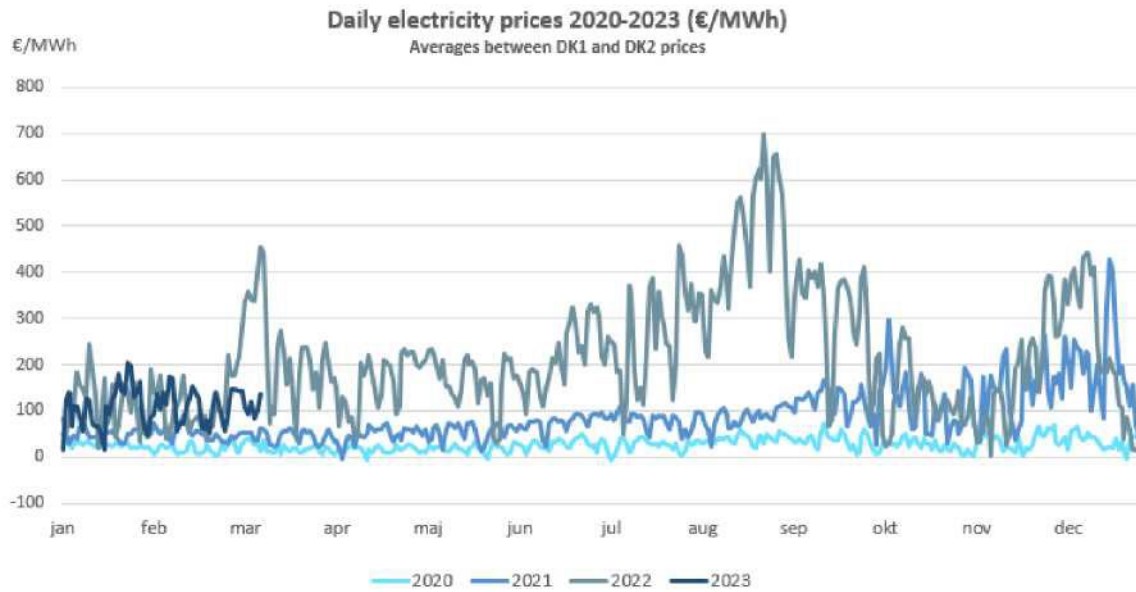
##### **Electricity**

The electricity market in Denmark is divided into two bidding zones, DK1 (West Denmark) and DK2 (Eastern Denmark). The average hourly price across DK1 and DK2 in 2022 was EUR 215,15/MWh. The average hourly prices for DK1 and DK2 respectively in 2022 were:

- DK1: EUR 219,59/MWh
- DK2: EUR 210,71/MWh

The following graph shows the average daily electricity price across DK1 and DK2 for the years 2020 to 2023:

**Figure 51. Daily average price for the years 2020-2023**



In 2020, the price rarely exceeded EUR 100/MWh, but in 2022 we experienced prices that exceeded EUR 700/MWh for a few hours. The increase in prices in 2022 has to be seen in the light of several factors influencing the European electricity market, including supply/demand of gas, low water stocks in Norway, heat waves leading to higher fuel prices for coal and lower output of French nuclear power plants, as well as maintenance of Swedish nuclear power plants.

Denmark is a highly connected country. The lower import opportunities due to the above, as well as the fact that the electricity produced from RES in Denmark was shared with the neighbouring connected countries to Denmark, resulted in strong electricity prices in Denmark in late summer 2022.

Prices have been more stable since then at a lower level, but are still not in line with prices for 2020 and before.

Electricity production as well as imports/exports in 2022 were:

- Electricity generation: 33.95 TWh
- Net imports: 1.27 TWh

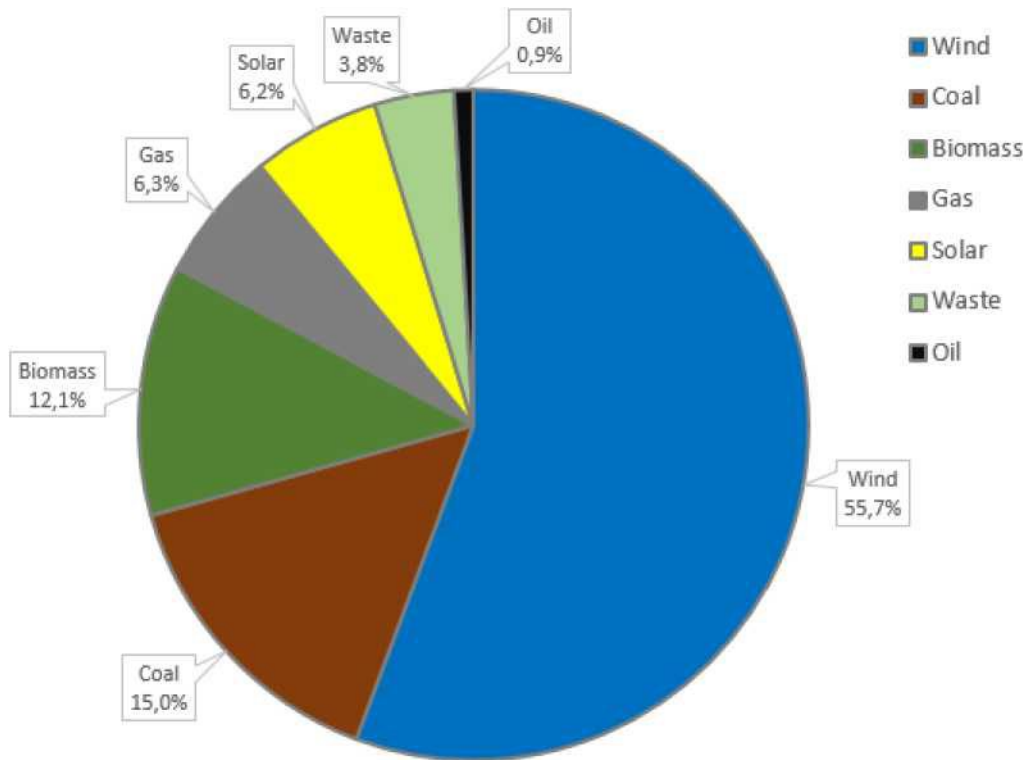
The 33.95 TWh of electricity produced in Denmark in 2022 was produced by the following sources. The data are from Energinet

Wind:	18.91 TWh,	55.7 %
Coal:	5.08 TWh,	15 %
Biomass:	4.10 TWh,	12.1 %
Gas:	2.14 TWh,	6.3 %
Sun:	2.11 TWh,	6.2 %
Waste:	1.30 TWh,	3.8 %
Oil:	0.32 TWh,	0.9 %

This distribution is also visualised in the following Figure 52.

Figure 52. Electricity generation by generation source

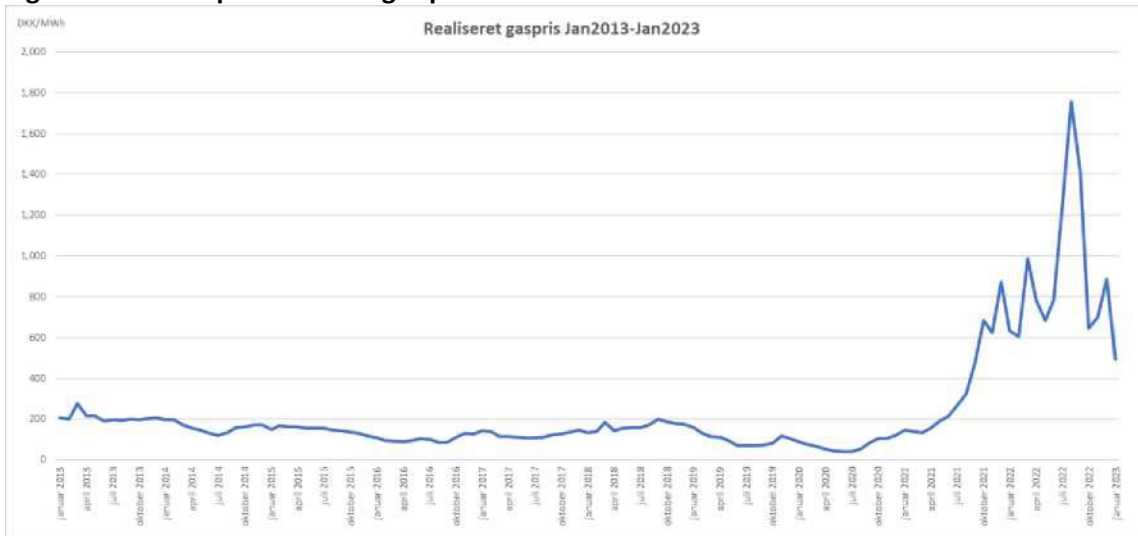
## Electricity production by source 2022



### Gas

Denmark expects to produce approximately 0,79 billion Nm<sup>3</sup> sales gas in 2022, 0,75 billion Nm<sup>3</sup> in 2023 and between 2,5-3 billion Nm<sup>3</sup> after the reconstruction of the Turkish complex. In comparison, 0,63 billion Nm<sup>3</sup> upgraded biogas was produced in 2022 and 0,76 billion Nm<sup>3</sup> upgraded biogas is expected to be produced in 2023. Gasprices increased markedly following Russia's invasion of Ukraine. The gas price only peaked in March 2022. After that, the price of gas fell but escalated due to high uncertainty and the filling of European gas stocks in latesummer 2022. Realised gas prices for the period January 2013 to January 2023 are shown in the following Figure 53:

**Figure 53. Development of the gas price 2013-2023**



The price fell again in October due to filled gas storage and large LNG supply. In November and December, gas prices increased again due to lower temperature and resulting increased consumption.

- (iv) *Projections of developments with existing policies and measures, at least up to 2040 (including for 2030)*

Chart 54 shows Denmark’s average price, which is expected to fall by 53 % from 2025 to 2030, 44 % from 2025 to 2040, and 49 % from 2025 to 2050. The decrease has to be seen in particular in the light of the very high electricity prices in the current period.

**Figure 54. Electricity price forecast for 2025-2050**

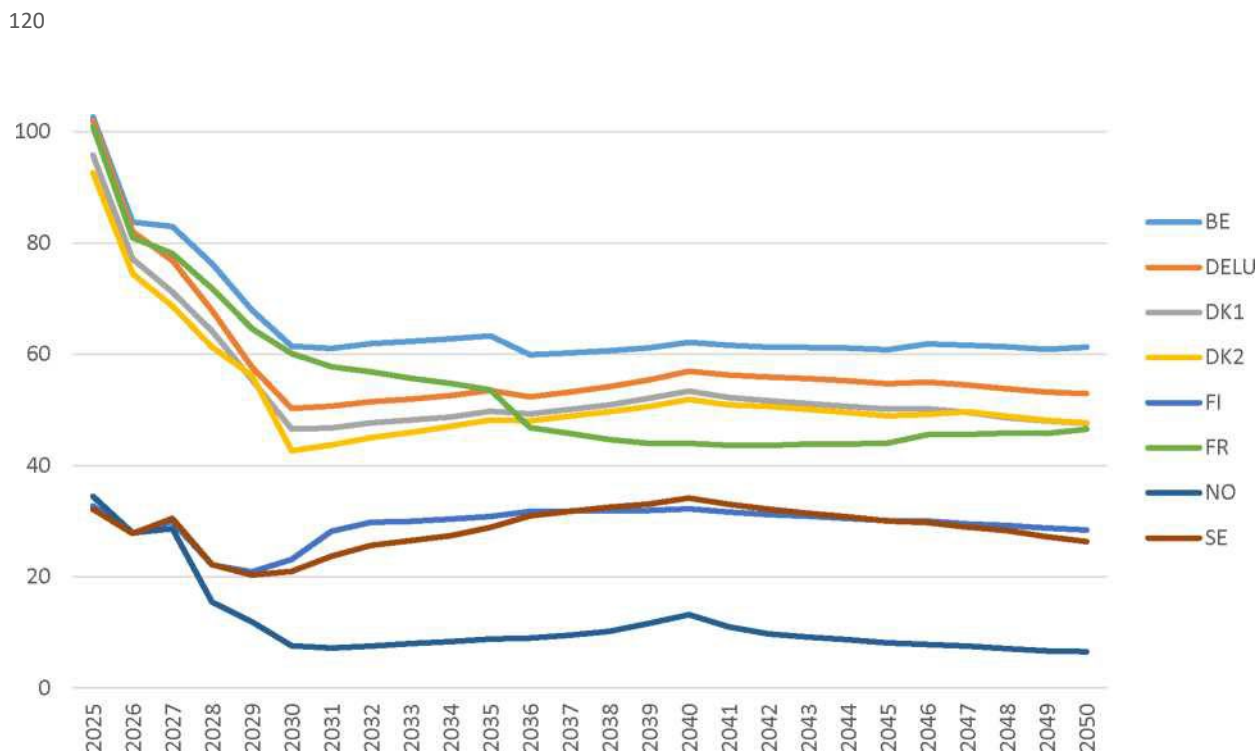


Chart 55 shows that electricity generation (including grid losses) is expected to increase by 72 % between 2022 and 2030 and 108 % between 2022 and 2040. Around 2030 it is expected that Denmark will move from a net importer of electricity to a net exporter.



Figure 55. Expected production of electricity and net imports of electricity for the years 2022-2040

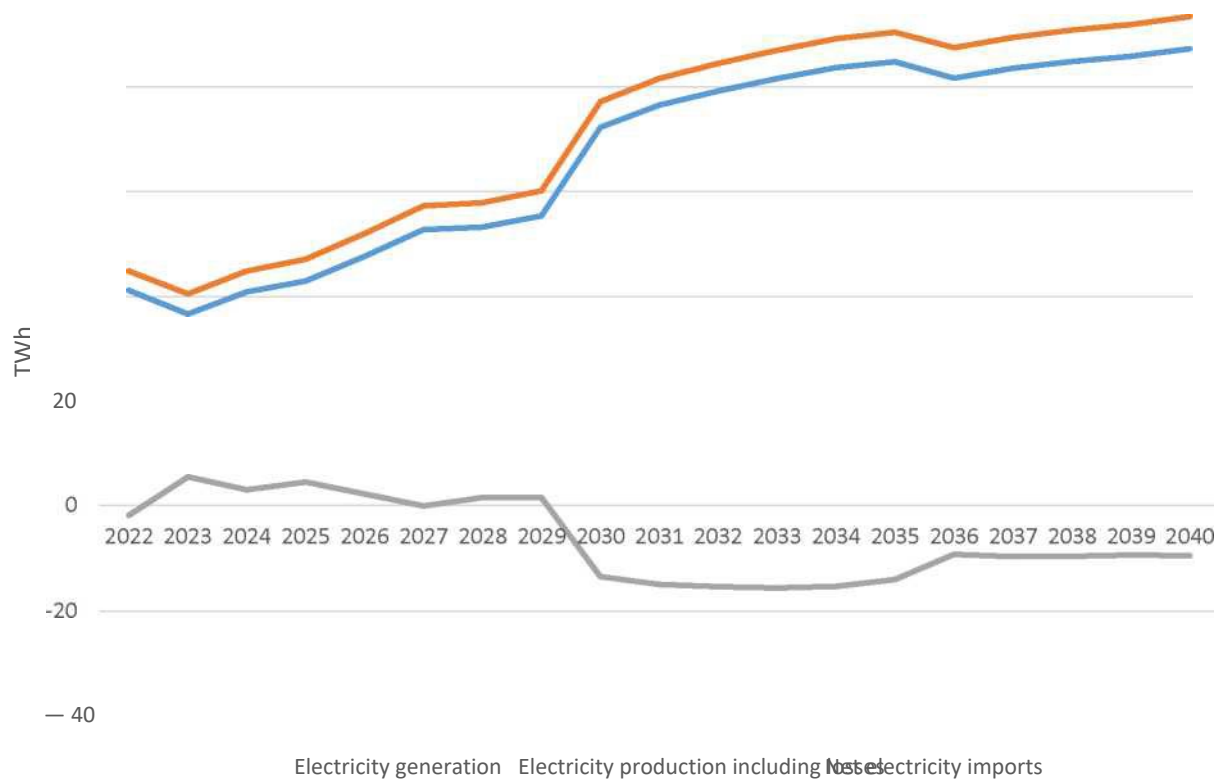


Figure 56 shows that the price of natural gas is expected to decrease significantly from the current DKK 300/GJ to DKK 100/GJ in 2025.

**Figure 56. Expected gas price for the years 2022-2040 (DKK/GJ)**

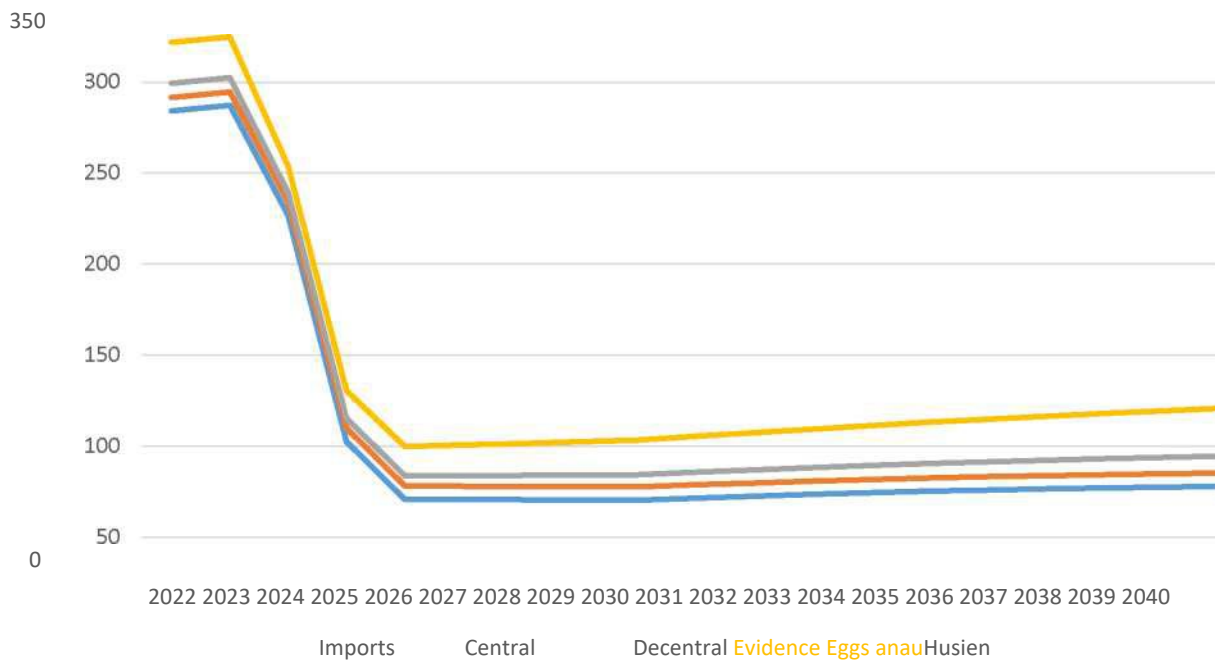
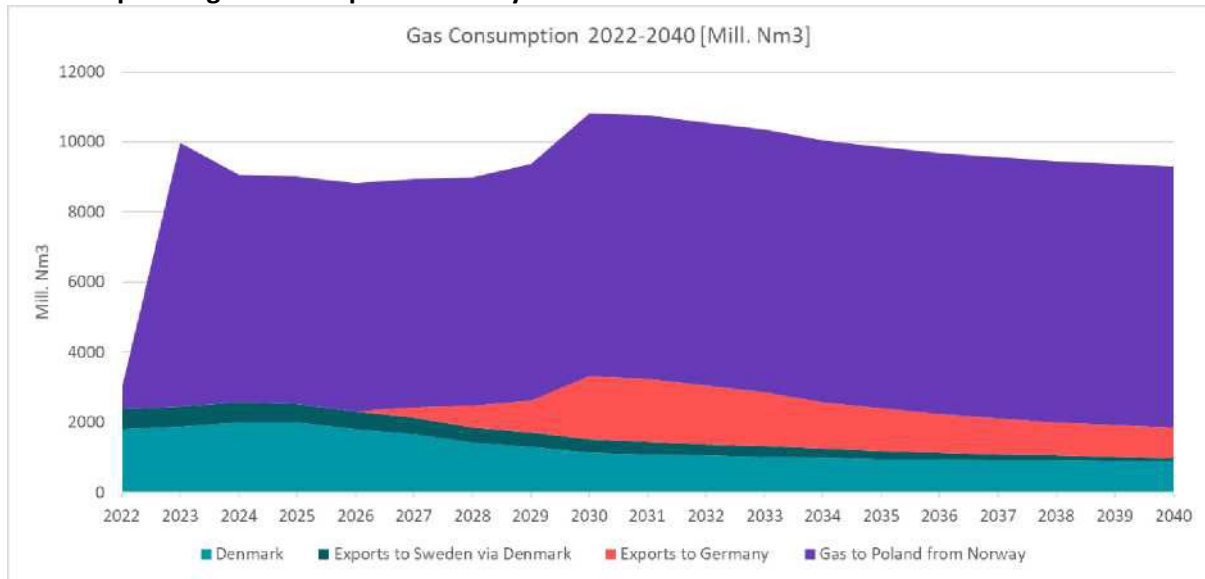


Figure 57 below shows the total expected gas consumption (including Denmark, exports to Sweden, Germany and Poland) from 2022 to 2040. The projection shows:

- Denmark’s gas consumption declines by 37 % from 2022 to 2030 and 51 % from 2022 to 2040.
- Exports to Sweden fall by 34 % from 2022 to 2030 and 86 % from 2022 to 2040.
- Exports to Poland remain stable from 2023 to 2040.

**Figure 57. Expected gas consumption for the years 2022-2040**

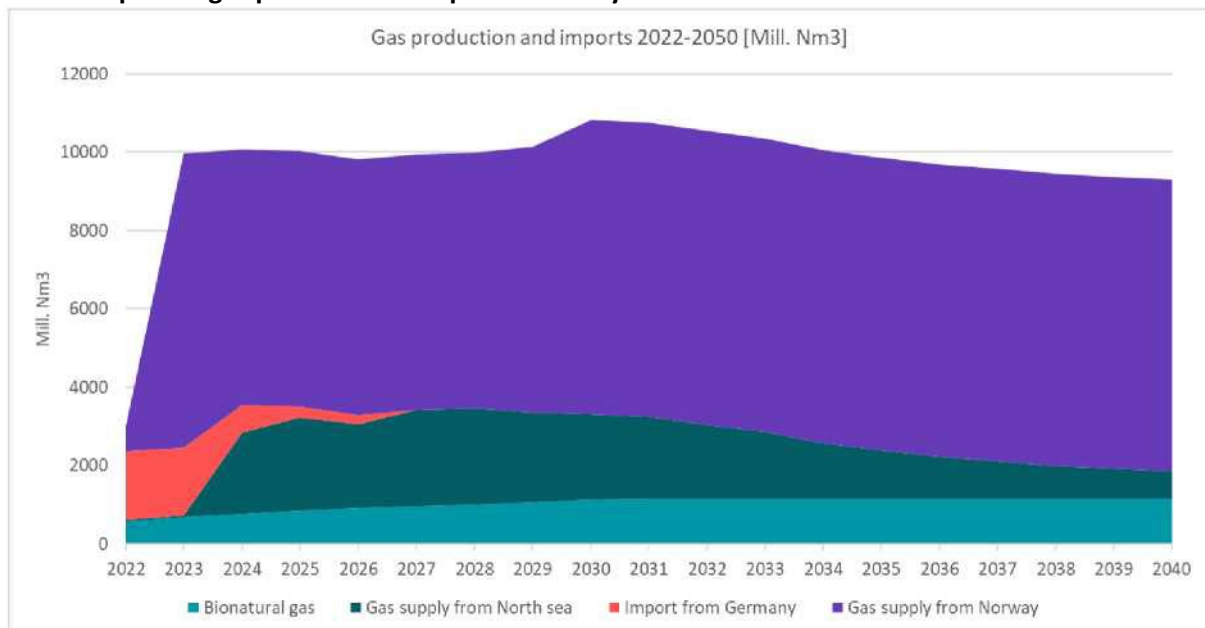


(Source: Af22, Danish Energy Agency)

Figure 58 shows total expected gas production including biogas and imports from Germany and Norway from 2022 to 2040. The projection shows:

- Biogas production increases by 99 % from 2022 to 2030 and 102 % from 2022 to 2040.
- Gas deliveries from the North Sea via Nybro increase by 4506 % from 2022 to 2030 and 1.381 % from 2022 to 2040 (the high percentages are the result of the reopening of the Tyra field).
- Imports from Germany will stop in 2027.
- Imports from Norway remain stable from 2023 to 2040.

**Figure 58. Expected gas production + imports for the years 2022-2040**



(Source: Af22, Danish Energy Agency)

## 4.6 research, innovation and competitiveness dimension

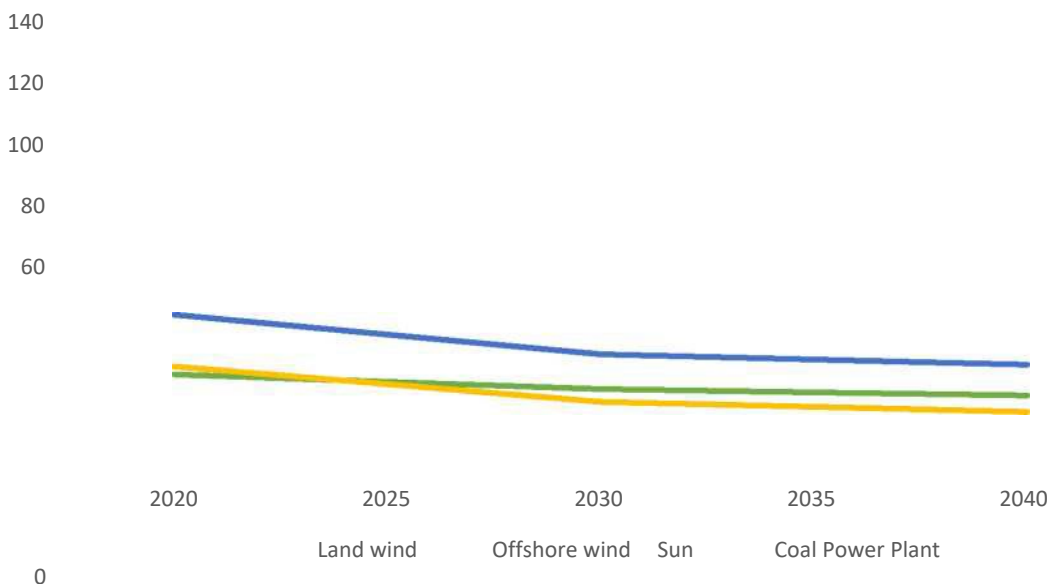
- (ii) *Current state of play of the low-carbon technologies sector as well as to the extent possible extent of its position on the global market (this analysis must be carried out at EU or global level);*

The low-carbon sector in Denmark includes, in this chapter, all low-emission technologies such as wind, solar, bioenergy, district heating and other efficient energy. It includes energy generation, distribution and storage, as well as energy-saving products and components.

Exports of energy technology and services between 2010 and 2021 increased by 38 % and exports of energy technology accounted for 11.3 % of total Danish goods exports in 2021. In 2021, Denmark exported energy technology accommodation and service for DKK 89,1 billion. Over half, Denmark exported outside the EU. Denmark’s main exporting countries are Germany, the United Kingdom and the United States (Danish Energy Agency, 2021).

Figure 59 below shows the competitiveness of land-based, sea wind and solar based on their smoothed costs (LCoE). In 2022, the cost of energy production is lower for these renewable energy technologies, and thus more economically competitive, than energy production of coal power plants. With the continued development of renewable energy technologies, their competitiveness will only increase in the coming years.

**Figure 59. Smoothed electricity costs (LCoE) 2020-2040 in EUR/Mwh, split into solar, terrestrial, offshore wind and coal power;**



- (iii) *Current level of spending in terms of public and, where possible, private research and innovation in low carbon technologies, current number of patents and current number of researchers;*

### **Level of government research and innovation funding in 2023**

With the agreement on the distribution of the research reserve etc. in 2023 and the Finance Act 2023, the Government and a broad majority in the Danish Parliament earmarked DKK 2,4 billion for ambitious and green research initiatives in 2023. The Government and the parties to the agreement also agree to maintain the level of green research funding in the state research budget of at least DKK 2,4 billion annually until 2025 inclusive.

### **Mapping green research and innovation funding in 2021**

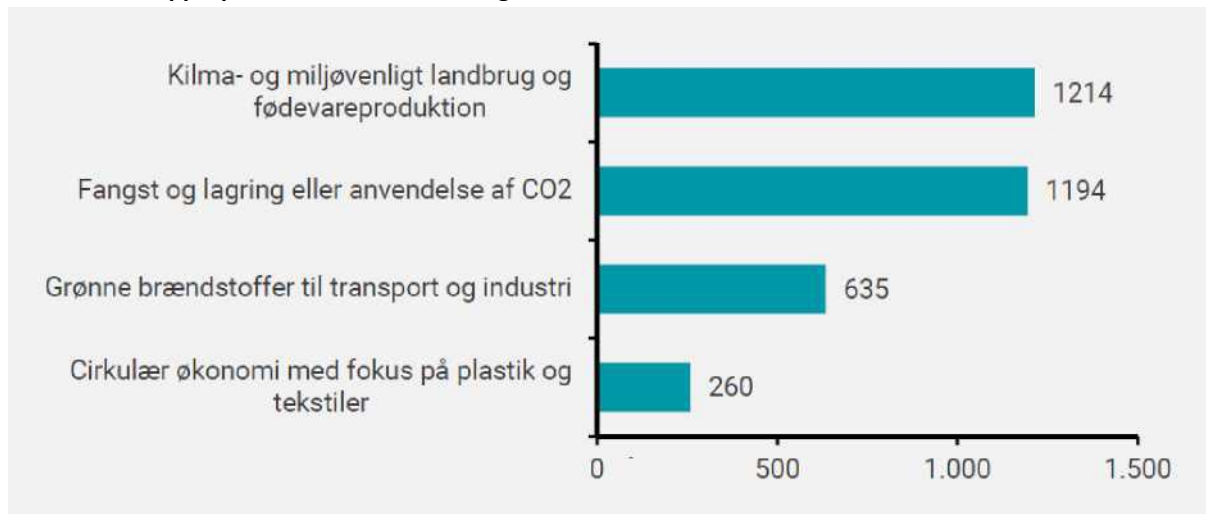
Alongside the increased prioritisation of green research in the state research budget, there is also a significant increase in private funding for green research and innovation. A mapping exercise carried out by the Danish Ministry of Education and Research in 2022 shows that in 2021 a total of approximately DKK 4,6 billion was distributed to green research and innovation projects from public, European and a number of private funds and programmes. In 2020, the figure was approximately DKK 4,4 billion. In addition, there is funding for green research from the basic resources of the universe and from undertakings which are not included in the calculation.

The mapping shows that despite the marked increase in green research funding, there is no scarcity of qualified applicants. The success rates of the Innovation Fund and the Danish Free Research Fund are 615 %. The success rates of the development and demonstration programmes are around 30 %, which is also similar to the success rates for enterprise oriented programmes in the Innovation Fund.

The mapping identifies how much of the 2021 funding has been allocated to projects falling within one of the four mission areas of the Green Research Strategy. Within four missions, some DKK 1,2 billion have been allocated to projects in the agricultural and food sectors, almost DKK 1,2 billion for the capture and storage or use of carbon dioxide (CCUS), over DKK 600 million for green fuels (PTX, etc.) and DKK 260 million for the circular economy. The figures include both allocations from the Innovation Fund for the four Green Research and Innovation Partnerships, as well as other types of project allocations from all the funds and programmes included in the mapping exercise.

**Figure 60 Breakdown of appropriations within green**

**Allocation of appropriations within the four green missions in 2021, DKK**

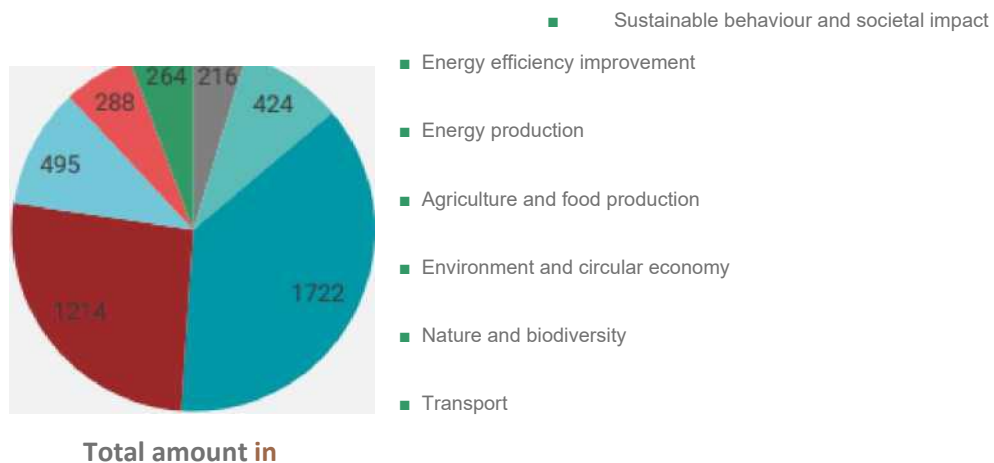


(Source: Ministry of Education and Research)

Finally, the mapping shows that out of the seven themes of the Green Research Strategy, most funding is given in the areas of energy production (including CCUS and green fuels (PTX), agriculture and food production, see Figure 61.

**Figure 61 Breakdown of appropriations within green themes**

**Allocation of appropriations within the seven green themes in 2021, DKK million.**



*(III) Breakdown of the current price elements constituting the three main price components (energy, networks, taxes/levies)*

The following tables show a breakdown of electricity and gas prices for energy, networks and taxes/levies for industries and households.

Table 16 and Table 17 show price elements for industries and households:

- For businesses, the energy price represents around 50-80 % of the total price
- For households, the energy price represents around 20-40 % of the total price

**Table 15. Price elements for industry in 2021 [EUR/kWh]**

<b>OCCUPATIONS</b>				
	Price elements (EUR/kWh)			
Range (MWh)	Electricity prices	Networks	Taxes and tariffs	Total prices
0-20	8,77	4,72	4,14	17,63
20-500	7,90	3,70	0,44	12,04
500-2.000	7,11	2,24	0,43	9,78
2.000-20.000	7,16	2,22	0,42	9,80
20.000 70.000	7,42	1,66	0,42	9,51
70.000 150.000	7,77	1,66	0,42	9,86
> 150.000	8,27	1,66	0,42	10,36

**Table 16. Price elements for households in 2021 [EUR/kWh]**

<b>HUSHOLD BLADES</b>				
	Price elements (EUR/kWh)			
Range (kWh)	CIEL comes-electricity price	Networks	Taxes and tariffs	Total prices including VAT
0-1.000	7,46	10,81	20,49	38,75
1.000-2.500	7,46	7,03	19,54	34,03
2.500-5.000	7,46	5,14	19,07	31,66
5.000-15.000	7,46	4,42	9,40	21,27
> 15.000	7,46	4,09	6,26	17,81

Table 18 and Table 19 show price elements for gas for industries and households:

- For businesses, energy accounts for approximately 50-60 % of the total price before deductions from taxes/levies. However, some non-household customers are entitled to a deduction of taxes/levies on energy prices, after which the energy price represents on average up to approximately 75-90 % of the total price for industries with high gas consumption.
- For households, the energy price represents around 45-50 % of the total price.

**Table 17. Price elements for industries in 2021 [EUR/m<sup>3</sup>]**

<b>OCCUPATIONS</b>	Including taxes and duties				Refundable taxes/levies offset					
	Group I	Group II	Group III	Group IV	Group V	Group I	Group II	Group III	Group IV	Group V
EUR/m <sup>3</sup>										
Gas price	0,52	0,50	0,53	0,55	0,63	0,52	0,50	0,53	0,55	0,63

Transmission and district	0,12	0,12	0,05	0,04	0,03	0,12	0,12	0,05	0,04	0,03
Taxes	0,40	0,39	0,39	0,39	0,39	0,35	0,25	0,11	0,06	0,06
Total, ex. VAT	1,03	1,02	0,97	0,97	1,05	0,98	0,87	0,69	0,64	0,71

**Table 18. Price elements for households in 2021 [EUR/m<sup>3</sup>]**

<b>HOUSEHOLDS</b>			
EUR/m <sup>3</sup>	Group I	Group II	Group III
Gas price	0,564	0,502	0,490
Transmission and distribution	0,332	0,147	0,122
Taxes	0,389	0,389	0,389
<b>Total, ex. VAT</b>	<b>1,286</b>	<b>1,039</b>	<b>1,001</b>

*(IV) Description of energy subsidies, including for fossil fuels*

Denmark provides support for renewable energy technologies such as marine and terrestrial wind, solar energy, biogas, etc. The aid is typically granted DKK per unit. However, for some schemes there may also be start-up aid, etc.

In Denmark, there is an overall target of promoting energy technologies that produce energy in a free market.

**Supply**

- The district heating pool supports conversion projects to roll out district heating.
- The decoupling scheme compensates for charges for disconnection from the gas system.
- The scrubbing scheme supports heat pumps on subscription.
- The Building Pool supports conversion to heat pumps and energy renovation

**PTX**

- PtX tenders aimed at reducing the costs of producing green hydrogen.

**Biogas**

- Offering biogas and other green gases will increase the production of green gas for the grid and reduce the level of support.

**Renewable energy**

- Support for the installation of RES in less accessible areas, such as roof areas, along motorways, etc.
- Grants for RES on land. In Denmark, on-shore renewable energy has been able to receive support through technologically neutral tenders in the past. Over the past few years, there has been a clear political ambition for a more onshore-based expansion of renewable energy on land in Denmark. The cost of establishing onshore energy has fallen markedly in recent years and is expected to continue to fall. With a political agreement 2022, it has been decided that funds from the technology-neutral tenders from 2022-2024 will then be reprioritised to other initiatives, because renewable energy on land can be deployed to a large extent without subsidies.



- Subsidies for offshore wind. Since 2018, several political agreements have been reached on the expansion of Danish sea wind. In these agreements there has been a clear ambition to adopt a more market-based approach to the expansion of offshore wind. In 2021, the tender for Thor wind farm was the first tender for offshore wind, which was carried out without subsidies. Most recently, it was politically decided on 25 June 2022 to procure an additional 4 GW of sea wind in 2030 without grants.

There are neither direct nor subsidies for fossil fuels in Denmark.

## 5. IMPACT ASSESSMENT OF PLANNED POLICIES; AND MEASURES

5.1 The impact of the planned policies and measures referred to in point 3 on the energy system and greenhouse gas emissions (GHG) emissions, including with regard to projections with existing policies and measures (see paragraph 4).

The projections in this draft updated NECP, described in Chapter 4 (CCF23), have been prepared on the basis of existing policies and measures adopted before 1 January 2023. Therefore, KF23 is a so-called WEM projection ('WEM': With Existing Measures').

As indicated in Chapter 3, the Government will take the necessary decisions to put Denmark fully in line with the national reduction targets for 2025 and 2030. In April 2023, the government identified the additional initiatives described in Box 1 in Chapter 3.

Among these additional initiatives, none can be categorised as "planned policies and actions" as defined in the Governance Regulation, i.e. as "(...) options under discussion and with a realistic chance of being adopted and implemented after the date of submission of the integrated national energy and climate plan (...).'

Therefore, there has been no analysis of the effects of planned policies in the form of true readings with additional measures defined in the Governance Regulation as a so-called "With Additional Measures" (WAM) projection. However, a partial impact assessment of the CO<sub>2</sub> increase initiative in the transport sector shows that the implementation of the initiative as proposed could achieve a reduction of up to around 0,6 million tonnes of CO<sub>2</sub>e in 2025.

The impact of additional measures adopted until 1 January 2024 will be included in the next frozen policy/WEM presentation expected in April 2024.

## 5.2 The macroeconomic and, to the extent possible, the health, environmental, employment and educational, skills and social impacts, including just transition aspects (in terms of costs and benefits and cost-effectiveness) of the policies and measures set out in point 3, at least until the last year of the period covered by the plan, including projections with existing policies and measures;

The green transition brings major changes to society as a whole, with economic and social spikes for society, businesses and households. Therefore, the Climate Law sets out a number of guiding principles that the government must take into account when designing climate action. The guiding principles address, inter alia, economic development and social balance and stress that:

- Achieving Denmark's climate targets must be as cost-effective as possible, taking into account both the long-term green transition, sustainable business development and Danish competitiveness, sound public finances and employment.
- The Danish business community must develop and not be wound up. Denmark needs to demonstrate that a green transition can be made while maintaining a strong welfare society in which cohesion and social equity are ensured.

In 2022, Denmark exported almost DKK 23 billion of green environmental technology and just over DKK 63 billion of green energy technology, which corresponds to approximately 3 % and 6 % respectively of total Danish exports of goods<sup>58</sup>. Both green energy and environmental technology exports have been increasing since 2010. With exports of almost DKK 39 billion, wind technology is by far the largest part of total Danish green energy technology exports. In the field of green environmental technology exports, approximately DKK 18 billion of green water technology was exported in 2021.

The green transition can also create production, export opportunities and jobs as investment in green technologies takes place. At the same time, with increasing investment, there is potential for even more jobs linked to the green transition (hereafter green jobs). The development of green jobs in Denmark can be measured in two ways: The first method is the green national accounts for employees linked to the conversion of green goods and services, while the second method is employed in enterprises with green exports of goods. The two accounts have in common that they show a significant increase in the volume of green jobs in Denmark in recent years of 27 % and 16 % respectively. Over the same period, total employment has increased by almost 9 %<sup>59</sup>. There were around 75.000 people employed in green jobs according to the Green National Charge in 2019, while there were around 80.000 people employed in enterprises with green exports of goods. However, developments need to be interpreted with caution due to uncertainty, including in the accounting method of green jobs.

The green transition requires new competences, especially among skilled workers. 7 out of 10 job titles with the highest proportion of green job vacancies<sup>60</sup> are predominantly skilled, with particular demand for

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<sup>58</sup>There may be overlaps between exports of green environmental technologies and exports of green energy technologies, and therefore these cannot be aggregated without the risk of double counting.

<sup>59</sup>Green jobs are counted in Full Time Equivalent (FTE), but are calculated as a share of total employment due to the lack of international data in FTEs for the whole economy. This means that the proportion is lower than if it were calculated as a share of FTEs.

<sup>60</sup>The calculation of green job vacancies is based on a database which contains job vacancies in Denmark. The OPDA-

renovation and other manual work, electrical and electrical electronics work, as well as technicians in science, engineering, shipping and aviation. However, it should be pointed out that the green transition can be achieved in several ways and that it is not clear what work will be needed in the future. It cannot therefore be concluded that, given the preponderant demand for skilled workers in green job vacancies today, this will also be the case in the long term. With *the agreement on a new reform package for the Danish economy*, it is agreed to set up three climate vocational schools offering vocational and continuing training that is particularly relevant to sectors that contribute to achieving climate objectives. This supports the ability of companies to meet their demand for green skilled professionals.

## 5.3 Overview of investment needs

### *(i) Existing investment flows and assumptions about investments in relation to planned policies and measures*

The *agreement on the establishment of a green fund of June 2022* reserves DKK 1,5 billion in 2024 and DKK 3,25 billion annually from 2025 to 2040 in the fiscal space for the creation of a new green space (2022-pl). DKK 53,5 billion will thus be reserved for the green transition by 2040. Of this, DKK 10,6 billion was allocated to the *Agreement on Green Tax Reform for Industry, etc. of June 2022*. Green space must be prioritised for major and sustainable investments in climate, green energy and the environment.

Since December 2019, Denmark has prioritised more than DKK 110 billion for a number of major climate and energy agreements up to 2030, cf. Table 19.

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database is monthly and covers the majority of publicly available online job vacancies in Denmark from 2007 to July 2022. Statistical methods, for example, identify competence requirements for the job vacancy. Data are then linked to the CVR register. The search is complemented by AI methods to capture green job posts that are not captured by the green keywords. Green job notices are notices with at least one green competency. Green competences are identified through keywords related to the green transition, in the sense that competences containing these words bid reduce the human impact on climate and the environment, such as energy optimisation, waste sorting, environmental shooting, etc. Caveat that there may be differences across occupations in how job vacancies are used. There may be, for example, sectors where recruitment is made more through networks. In addition, there may be a peak in job vacancies in the big cities, where there is typically a greater job mobility, which is why online job notices may be used more frequently. However, it is assumed that the differences will be the same in both green and non-green jobs.

**Table 19. Priority funding for climate change agreements 2020-2030**

	<b>2020-2030</b>
<b>DKK billion (2023-pl)</b>	
FL20	5,5
Klimaafale for energi og industri mv.	23,8
Aftale om grøn omstilling af vejtransporten	22,2
FL21/Grøn Stimuli	2,8
Aftale om grøn skattereform – fase 1	6,8
Aftale om Nordsøens fremtid	1,0
Dansk deltagelse i et "vigtigt projekt af fælleseuropæisk interesse" (IPCEI) vedrørende brint*	0,9
Aftale om grøn omstilling af dansk landbrug	27,7
FL22/Delaftale om investeringer i et grønnere Danmark	2,3
PtX aftale	1,1
Grøn skattereform for industri mv.	15,7
VE-aftale (DKMII)	1,8
Grøn varme (DKMII)	1,2
Omprioriteringer mellem aftaler	-1,6
<b>Total</b>	<b>110,9</b>
<i>Resterende grønt råderum mod 2030</i>	<i>16,8</i>

Note: Including derived tax losses and, where applicable, administrative costs. The costs of green tax reform and green road transport have been addressed by behaviour and return. Price and wage developments have been corrected by the general PL index.  
Source: Own calculations.

*(ii) Sector or market risk factors or barriers in the national or regional context*

As a sub-section of Section 5.3, it is assumed that the information to be reported here is information on sector or market risk factors or barriers in the national or regional context in relation to investment needs.

As can be seen from the section above, information on public investment in climate and energy actions is available. National risks or barriers in relation to investment needs relate to the financing needed to meet Denmark's overall climate objectives, including objectives relating to, inter alia, the development of renewable energy. The implementation of the agreements concluded is regularly followed up to ensure that the necessary reductions are delivered.

Risks or barriers to investment needs are mitigated by the ongoing follow-up, as any need for additional public financial support will be identified in due time.

*(iii) analysis of additional public financial support or resources to address the gap identified under point (ii);*

The Danish Green Investment Fund has been established as part of the ' *Greening Denmark*' agreement from 2014, with a State-guaranteed loan support of DKK 2 billion, which has since been extended to a total of DKK 8 billion with the agreement on *Denmark's Green Future Fund*, to co-finance projects that promote the green transition of Danish society. According to the Fund's political mandate, these projects must be in the field of renewable energy, energy-saving or resource efficiency.

## 5.4 The impact of the planned policies and measures referred to in point 3 on other Member States and the regional cooperation, at least until the last year of the periode covered by the plan, including in relation to projections with existing policies and measures;

Nordic Energy Research, a platform for joint energy research and policy development under the Nordic Ministers Council and jointly funded by the Nordic governments, has published the report *Nordic Clean Energy Scenarios – Solutions for Carbon Neutrality*, which provides updated scenarios on how the Nordic region can achieve climate neutrality. The report is a follow-up to *Tracking Nordic Clean Energy Progress 2019* and *Nordic Energy Technology Perspectives 2016*.

The report presents three scenarios showing different pathways to CO<sub>2</sub>e-neutrality, focusing on different core elements:

- *Carbon Neutralic Nordic* looks at the least costly methods and considers national plans, strategies and targets.
- *Nordic Powerhouse* is exploring the possibility for Nordic countries to play a greater role in the wider-European energy transition by providing clean electricity, clean fuels and carbon storage.
- *Climate Neutral Behaviour* reflects on the Nordic countries' implementation of further initiatives for increased energy and resource efficiency across sectors that could lead to lower demand on both sides.

In all scenarios, the energy supply to the Nordic countries is undergoing a major transformation leading to a reduction in CO<sub>2</sub>emissions of up to 95 %. Facilitating clean energy supply, supporting sector coupling and accelerating energy technology research and innovation are important focal points to achieve this result. Wind energy plays a key role in a Nordic context and is considered to be dominant in the future electricity system. In particular, Swedish and Danish transmission networks and interconnectors must facilitate exports of electricity, inter alia, from offshore wind to continental Europe.

There are five options that capture the majority of available options based on the analysis: Direct electricity, PTX (fuels), bioenergy, CCS (also in combination with bioenergy, BECCS) and behavioural changes. Direct electrification is at the core of all scenarios, but all five solutions are needed to support national starting points, rather than a one-sided focus on a few solutions.

The share of electricity in final energy consumption increases from around 30 % in 2020 to 50 % in 2050, and Nordic electricity demand increases by between 40 % and 100 % across scenarios. The analysis shows that direct electrification has gained greater momentum according to applications that seemed unlikely for just five years, such as heavy road transport and even some aviation fuel to ease the need for bio-resources.