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Abstract

Finland's Integrated Energy and Climate Plan Update includes national targets and the related policy measures to achieve the EU's energy and climate targets for 2030. The Energy and Climate Plan addresses all five dimensions of the EU Energy Union: decarbonisation, energy efficiency, energy security, internal energy market and research, innovation and competitiveness.

The EU has set Finland a national objective to reduce greenhouse gas emissions not part of the emissions trading system by 50% from the 2005 level by 2030. At the same time, emissions from the land use sector should be smaller than the calculated removals by carbon sinks. Finland aims to increase the proportion of renewable energy to at least 62% of the total final energy consumption. With regard to energy efficiency, the Plan states that final energy consumption will not exceed 239.6 TWh in 2030, in accordance with the requirements of the Energy Efficiency Directive.

Finland's Energy and Climate Plan Update outlines the impact of the confirmed policy measures on the projected development of greenhouse gas emissions, renewable energy and energy efficiency until 2040. The Plan also describes the impact of the planned policy measures on the energy system, greenhouse gas emissions and removal of carbon dioxide by carbon sinks. Moreover, the Plan assesses the impact of the planned and existing policy measures on future investment needs, thereby considering the effects of the EU's Fit for 55 package (Fit for 55) and the REPower Plan that raise the ambition of the EU's climate and energy policy and speed up the clean energy transition.

Keywords energy, energy policy, climate policy, decarbonisation, renewable energy, energy efficiency, energy security, internal energy market, research, innovation and competitiveness

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Suomen yhdennetyn energia- ja ilmastosuunnitelman päivitys

Työ- ja elinkeinoministeriön julkaisuja 2024:30		**Teema**	Energia
Julkaisija	Työ- ja elinkeinoministeriö		
Toimittaja/t	Riku Huttunen, Markku Kinnunen, Bettina Lemström, Petri Hirvonen, Petteri Kuuva		
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Tiivistelmä

Suomen yhdennetyn energia- ja ilmastosuunnitelman päivitys sisältää kansalliset tavoitteet ja niihin liittyvät politiikkatoimet EU:n 2030 energia- ja ilmastotavoitteiden saavuttamiseksi. Energia- ja ilmastosuunnitelmassa käsitellään kaikkia viittä EU:n energiaunionin ulottuvuutta: vähähiilisyyttä, energiatehokkuutta, energiaturvallisuutta, energian sisämarkkinoita sekä tutkimusta, innovaatiota ja kilpailukykyä.

EU on asettanut Suomelle vuotta 2030 koskien kansalliseksi tavoitteeksi vähentää päästökaupan ulkopuolisia kasvihuonekaasupäästöjä 50 % vuoden 2005 tasoon verrattuna. Samaan aikaan maankäyttösektorin päästöt tulee pitää laskennallisten nielujen aikaansaamia poistumia pienempinä. Suomen tavoitteena on nostaa uusiutuvan energian osuus vähintään 62 %:iin kokonaisloppuenergian käytöstä. Energiatehokkuuden osalta suunnitelmaan on kirjattu energiatehokkuusdirektiivin vaatimuksen mukaisesti, että loppuenergian kulutus ei ylitä 239,6 TWh:n tasoa vuonna 2030.

Suomen energia- ja ilmastosuunnitelmassa esitetään päätettyjen politiikkatoimien vaikutus kasvihuonekaasupäästöjen, uusiutuvan energian ja energiatehokkuuden arvioituun kehityskulkuun vuoteen 2040 asti. Lisäksi suunnitelmassa kuvataan suunniteltujen politiikkatoimien vaikutuksia mm. energiajärjestelmään, kasvihuonekaasupäästöihin ja nielujen aikaansaamiin poistumiin. Suunnitelmassa arvioidaan myös suunniteltujen ja olemassa olevien politiikkatoimien vaikutusta tuleviin investointitarpeisiin ottaen huomioon EU:n ilmasto- ja energiapolitiikan kunnianhimon nosto ja puhtaan energian siirtymän nopeuttaminen EU:n 55-valmiuspaketin (Fit for 55) ja REPower-suunnitelman vaikutusten kautta.

Asiasanat energia, energiapolitiikka, ilmastopolitiikka, vähähiilisyys, uusiutuva energia, energiatehokkuus, energiaturvallisuus, energian sisämarkkinat, tutkimus, innovaatio ja kilpailukyky

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Uppdatering av Finlands integrerade energi- och klimatplan

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Referat

Uppdateringen av Finlands integrerade energi- och klimatplan innehåller nationella mål och anknytande politiska åtgärder för att uppnå EU:s energi- och klimatmål för 2030. I energi- och klimatplanen behandlas alla fem dimensioner av EU:s energiunion: koldioxidsnålhet, energieffektivitet, energisäkerhet, den inre marknaden för energi samt forskning, innovation och konkurrenskraft.

EU har med avseende på 2030 satt upp som nationellt mål för Finland att minska växthusgasutsläppen utanför utsläppshandeln med 50 procent jämfört med nivån för 2005. Utsläppen inom markanvändningssektorn ska samtidigt hållas på en lägre nivå än de kalkylerade upptagen av växthusgaser i sänkor. Finlands mål är att höja andelen förnybar energi till minst 62 procent av den totala slutliga energiförbrukningen. Med tanke på energieffektiviteten står det i planen att den slutliga energiförbrukningen inte ska överstiga 239,6 terawattimmar 2030 i enlighet med kraven i energieffektivitetsdirektivet.

I Finlands energi- och klimatplan presenteras konsekvenserna av beslutade politikåtgärder för den uppskattade utvecklingen av växthusgasutsläpp, förnybar energi och energieffektivitet fram till 2040. Planen beskriver även konsekvenserna av de planerade politikåtgärderna för bland annat energisystemet, växthusgasutsläppen och upptag av växthusgaser i sänkor. I planen bedöms också de planerade och existerande politiska åtgärdernas inverkan på framtida investeringsbehov med beaktande av en höjning av ambitionen i EU:s klimat- och energipolitik och en snabbare omställning till ren energi genom effekterna av EU:s 55-beredskapspaket (Fit for 55) och RePower-planen.

Nyckelord energi, energipolitik, klimatpolitik, koldioxidsnålhet, förnybar energi, energieffektivitet, energisäkerhet, inre marknad för energi, forskning, innovation och konkurrenskraft

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The appendices are available as separate files at https://urn.fi/URN:ISBN:978-952-327-527-0.

SECTION A: NATIONAL PLAN

1 Overview and process for establishing the plan

1.1 Executive summary

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

The Government of Prime Minister Petteri Orpo was appointed on 20 June 2023. The Government Programme contains multiple entries about clean energy in Finland. This National Energy and Climate Plan update presents the energy and climate policy vision and goals of the Government Programme, as well as policies and measures adopted and implemented by previous governments.

Finland's energy and climate policies have been centred on ensuring energy security, reducing energy import dependency, promoting a sustainable economy and protecting biodiversity. Promoting energy markets and market-based instruments, such as EU emissions trading, are important parts of the overall strategy. Finland aims to decarbonise its economy by maintaining a high share of nuclear energy, increasing electricity generation and heat production from renewables, improving energy efficiency, and electrifying most energy demand across the economy. Greenhouse gas emissions reduction and the path towards carbon neutrality require policy measures in all areas of energy and climate policy.

Finland has made notable progress in reducing greenhouse gas emissions. In 2022, Finland's emissions (excluding LULUCF) totalled 45.7 million tonnes of CO_2 equivalent (Mt CO_2 eq.). Total emissions in 2022 were 36% below the 1990 emissions level. The emissions of the effort sharing sector have decreased 22% since 2005, whereas the corresponding figure for the emissions trading sector is as high as 46%. Finland has one of the lowest carbon intensities of electricity generation among the EU Member States. It deployed the first new nuclear reactor in Europe in over 15 years, which started full operation in April 2023, and has seen strong growth in onshore wind generation.

The general objective of Finland's energy policy is to ensure energy security at competitive prices and with the lowest possible environmental impacts. Finland uses a diversity of energy sources, about half of which are domestic (excluding energy for transport). The major trend is a steady increase in the use of renewable energy, in both absolute and relative terms.

A major focus area is the development, commercialisation and cost reduction of new and emerging energy technologies to drive energy transition in hard-to-abate sectors and end-uses, especially industry and heavy transport. Bioenergy plays a key role in Finland's climate and energy policy. Forestry biomass is a significant source of electricity and heat, and biofuels support energy transition in the transport sector.

Regarding energy security, Finland has brought its reliance on energy imports from Russia to practically zero. In 2021, before Russia's invasion of Ukraine, imports from Russia accounted for 81% of Finland's crude oil net imports, 75% of its natural gas net imports and 51% of its electricity net imports. Overall, one third of Finland's energy supply came from Russia. Following Russia's invasion of Ukraine, the Government focused strongly on reducing reliance on Russian energy imports by increasing imports from other countries and reducing energy demand through improved energy efficiency and increased use of renewable energy. Since summer 2022, energy imports from Russia have been terminated, except for small volumes of nuclear fuel to the Loviisa NPP and LNG. In addition, the ending of wood imports from Russia has also increased demand for domestic wood raw material. This has a direct impact on the LULUCF sector.

The Finnish energy and climate policy planning system

In Finland, preparation of the national energy and climate policy is conducted within the framework of parliamentary terms, meaning that each government modifies the national energy and climate policy in accordance with its own goals and with EU goals. The preparation schedules do not always coincide well with the preparation of the NECP. In the NECP, however, the latest situation is always reported, even though the NECP is not the main energy and climate policy preparation tool in Finland.

The Government's activities are based on the Government Programme and valid legislation, for example the Climate Change Act. In its Government Programme, the current Government of Prime Minister Petteri Orpo has recorded that

> *'The Government will advance Finland's position as a frontrunner by developing a new energy and climate strategy aimed at carbon negativity with a key focus on promoting the clean transition and investments in industry. The Government will achieve climate impacts through effective emissions reduction measures, increased carbon sinks and Finnish clean economy solutions. The new energy and climate strategy and technological developments will help generate investments that Finland can use to pay off its emissions debt in the 2030s.'*

On the other hand, Finland's National Climate Change Act lays down the goals and framework for planning Finland's climate policy and monitoring its implementation. The Climate Change Act provides for a climate policy planning system that covers the effort sharing sector and adaptation to climate change, as well as the land use sector. The climate policy planning system defines the goals of reducing greenhouse gas emissions, strengthening carbon sinks and adapting to climate change, as well as the actions necessary to achieve these goals in different administrative sectors. The climate policy planning system consists of the following four climate policy plans: a long-term climate plan, a national climate change adaptation plan, a medium-term climate change plan and a climate change plan for the land use sector.

According to the Climate Change Act, a medium-term climate change policy plan for the effort sharing sector must be prepared once per election term. Likewise, a climate change plan for the land use sector, which describes actions to reduce greenhouse gas emissions and increase removals in the land use sector, must be prepared at least every other election term.

The energy and climate strategy is not part of the planning system of the Climate Change Act, but it has been prepared once per parliamentary term and its impact has been assessed in a coordinated manner and using data in common with the medium-term climate change policy plan. Being an overarching energy and climate policy planning document, in addition to the emissions reduction and increasing of carbon sinks, the energy and climate strategy also includes other energy policy themes: renewable energy, energy efficiency, energy market, energy security and research, innovation and competitiveness (the very same dimensions that can be found in the NECPs).

The Government of Prime Minister Petteri Orpo is preparing a new energy and climate strategy and the third medium-term climate change policy plan. The climate change plan for the land use sector will not be updated in this government term. The preparation of these plans started in 2023 with updating the WEM projection and estimating potential gaps in energy and climate targets. New policy

measures are being assessed and dimensioned in 2024. The energy and climate strategy and the medium-term climate policy plan are expected to be completed in early 2025. Therefore, the policy measures presented in this NECP are largely the same as in the draft plan submitted in summer 2023.

In any case, Finland is committed to the goals of the Government Programme on emissions reduction and the Climate Change Act's 2035 carbon neutrality goal and is making progress in the preparation of the national policy to achieve these goals. The new energy and climate strategy and new medium- term climate change policy plan will include additional/new policy measures for reducing GHG emissions and increasing carbon sinks, as well as new policy measures and guidelines regarding the other dimensions of the energy union. New policy measures currently under preparation will be reported to the Commission in spring 2025 in connection with the NECPR reporting.

Key documents for this NECP update

Since the preparation of the energy and climate policy of Prime Minister Petteri Orpo's Government has only just begun and the Government has not yet defined the policies and measures in line with the new objectives set in the Government Programme, this NECP update is largely based on the 2022 National Climate and Energy Strategy (*Ilmasto- ja energiastrategia*), the 2022 Medium-term Climate Change Policy Plan (*Keskipitkän aikavälin ilmastopolitiikan suunnitelma*) and the 2022 Climate Plan for the Land Use Sector (*Maankäyttösektorin ilmastosuunnitelma*).

The 2022 National Climate and Energy Strategy[1] is the main basis for this updated NECP. It outlines measures with which Finland contributes to its EU climate commitments for 2030 and aims at the targets set in the 2022 Climate Change Act, namely reducing greenhouse gas emissions (excluding land use, land-use change and forestry) by 60% by 2030, 80% by 2040 and 90%–95% by 2050, and becoming carbon neutral by 2035.

The strategy focuses on the green transition and phasing out Russian fossil energy, which was urgently topical in 2022. With regard to heat production, the strategy emphasises non-combustion-based heating. The electrification of the energy system and the use of system integration are essential, especially for hard-to-abate

1 http://urn.fi/URN:ISBN:978-952-327-843-1

sectors. The strategy includes a national hydrogen strategy to promote the hydrogen economy and electrofuels and to set quantitative targets for hydrogen electrolysis capacity.

The strategy's key steering instruments are the Emissions Trading System and a predictable long-term climate and energy policy. The measures outlined in the strategy will improve business opportunities for long-term investments in advanced clean technologies.

The 2022 Medium-term Climate Change Policy Plan[2] defines the measures needed to achieve Finland's emissions reduction target according to the EU's Effort Sharing Regulation. Transport is the most important sector in which to achieve this target. The Medium-term Plan is also important for reducing emissions by 60% by 2030, a target in Finland's 2022 Climate Change Act.

The third key document for this draft updated NECP is Finland's first Climate Plan for the Land Use Sector.[3] The plan promotes the reduction of emissions from land use, forestry and agriculture, the strengthening of removals by carbon sinks and adaptation to climate change, in accordance with the Sustainable Development Goals. The annual net impact that the additional measures in the land use sector aim for is at least 3 Mt CO_2 eq. by 2035. The plan contributes to meeting Finland's target of carbon neutrality by 2035 and the climate objectives of the EU. It also sets out measures relating to land use changes, carbon dioxide emissions and sinks from agricultural lands and forests, long-lived wood products and several cross-cutting measures. Links to the Medium-term Climate Change Policy Plan and the Climate and Energy Strategy were taken into account in the plan preparation process.

1.1.2 Strategy relating to the five dimensions of the Energy Union

This integrated National Energy and Climate Plan discusses all of the five dimensions of the Energy Union on the basis of the related government reports: (i) decarbonisation, including efforts to reduce greenhouse gas emissions, as well as the sinks and efforts to increase renewable energy, (ii) energy efficiency, (iii) energy security, (iv) the internal energy market and (v) research, innovation and competitiveness.

2 http://urn.fi/URN:ISBN:978-952-361-417-8

3 http://urn.fi/URN:ISBN:978-952-366-592-7

The plan also recognises the overall development in the climate and energy sector after submission of the first NECP in 2019, and the ensuing need for more ambitious climate action and faster clean energy transition. The draft plan takes into account raising the ambition of the EU's climate and energy policy and accelerating the transition to clean energy through the EU's Fit for 55 package and the REPowerEU plan.

Country-specific recommendations issued in the context of the European Semester

The Council of the European Union adopts recommendations for Member States aimed at guiding national decision-making to ensure this supports growth and employment. The recommendations are endorsed by the European Council. In the context of the European Semester, Finland received three country-specific recommendations in 2023, one of which is specifically related to energy issues, decarbonisation and security of supply. The European Council recommends that Finland take action in 2023 and 2024 to

> *'Reduce overall reliance on fossil fuels by accelerating the deployment of renewables, including by further speeding up permitting procedures, and boost public and private investment in the decarbonisation of industry and transport, including through electrification. Develop energy infrastructure to increase security of supply by strengthening the transmission of electricity. Step up policy efforts aimed at the provision and acquisition of the skills needed for the green transition.'*

Finland has taken due steps to implement the recommendations. Concrete implementation steps for all the recommendations are described in Finland's National Reform Programme 2024.[4]

4 Finland's National Reform Programme 2024. Publications of the Ministry of Finance 2024:28. 25 April 2024. http://urn.fi/URN:ISBN:978-952-367-469-1

Concerning the fourth recommendation, many separate actions are described. For example:

- *'The Government of Prime Minister Petteri Orpo promotes Finland's position as a pioneer by preparing a new energy and climate strategy aiming at carbon negativity, the central part of which is the promotion of a clean industrial transition and investments (2023 country-specific recommendation 4.3). The Government affects the climate with effective emission reduction measures, increasing carbon sinks and Finnish clean economy solutions. With the help of the new energy and climate strategy and developing technology, it is possible to create investments that will reduce the emissions debt in the 2030s.'*
- *'In accordance with Prime Minister Petteri Orpo's Government Programme, the Government is reforming the appeals practices regarding planning, construction and environmental permit processes so that the same issue could be appealed to the administrative court only once. In addition, resources will be directed to zoning, building control, environmental and water licensing authorities, and administrative courts in order to speed up their processes, and zoning and licensing processes will be streamlined and related procedures will be facilitated (2023 country-specific recommendation 4.2).'*
- *'At the beginning of the parliamentary term, the Government of Prime Minister Petteri Orpo will prepare a long-term industrial policy strategy that will include sets of policies essential for the export industry, such as logistics. The Government's objective is to increase the number of growth-oriented and export-oriented companies that provide employment and to keep industrial jobs in Finland. An important role of the strategy is the utilization of the clean transition and the promotion of low-carbon industry and low-carbon investments (2023 country-specific recommendation 4.3).'*
- *'To reduce the need for further construction of the main grid and to mitigate bottlenecks, efforts will be made to promote the placement of large-scale electricity-consuming and electricity-generating investments close to one another without the need to connect to the main grid. Incentives will be created to locate weather-dependent production in places that are favourable with respect to the existing transmission capacity of the main grid, future construction and overall optimisation of the energy system (2023 country-specific recommendation 4.5).'*

The details of the country-specific recommendations on energy issues, decarbonisation and security of supply are in accordance with the core principles of Finland's energy and climate policy, and these issues are addressed even without a separate recommendation.

In a broader context, the country-specific recommendations are issued to support and ensure healthy development of economic growth and employment. There is no conflict between these goals and the goals of energy and climate policy in Finland, but energy and climate policy strongly supports economic growth and employment.

1.1.3 Overview table with key objectives, policies and measures of the plan

Table 1 presents a summary of the main targets of the National Energy and Climate Plan. Some of the targets have already been reported in the 2019 NECP. Tables 2 and 3 give an overview of existing energy and climate policy measures.

1.2 Overview of the current policy situation

1.2.1 National and Union energy system, and policy context of the National Plan

Finland's national energy system is described in Chapter 2 of Finland's Eighth National Communication under the United Nations Framework Convention on Climate Change.[5]

This NECP update is mainly based on the 2022 National Climate and Energy Strategy (VNS 6/2022 vp[1]) and the 2022 Medium-term Climate Change Policy Plan towards a carbon-neutral society in 2035 (VNS 4/2022 vp[2]), submitted to the Parliament of Finland, as described in Chapter 1.1.1.

5 https://unfccc.int/sites/default/files/resource/fi_nc8_final.pdf

Prime Minister Petteri Orpo's Government Programme and vision on clean energy

For the 2023–2027 government term, the Government Programme (June 2023) includes the following vision on clean energy:

> *'Finland will become a leader in clean energy while maximising its climate handprint. Finland will create clean economic growth at home and replace pollution-generating solutions around the world through technology exports. Finland will increase its share of investments, jobs and value added related to the clean economy. Finland will use its natural resources sustainably to improve its self-sufficiency.*
>
> *The Government is committed to meeting emission reduction targets and moving towards carbon neutrality followed by carbon negativity. At the same time, the Government will ensure that its decisions or policy measures do not increase everyday costs for citizens or weaken the competitiveness of business and industry.*
>
> *The Government will promote effective energy policy in a way that is predictable and takes a long-term view. Finland will strengthen its competitiveness and attractiveness as an investment target for renewable industries by doubling its production of clean electricity. The Government will ensure that electricity and products derived from it remain affordable and reliable with respect to security of supply. Smooth, predictable and legally certain permitting processes will be a competitive advantage for Finland.*
>
> *The Government aims to achieve its targets for annual net emissions by 2030. The Government pledges to draw up a programme by the end of 2024 that will reverse the emissions debt accumulated since the start of the decade.*
>
> *The Government will advance Finland's position as a frontrunner by developing a new energy and climate strategy aimed at carbon negativity with a key focus on promoting the clean transition and investments in industry. The Government will achieve climate impacts through effective emissions reduction measures, increased carbon sinks and Finnish clean economy solutions. The new energy and climate strategy and technological developments will help generate investments that Finland can use to pay off its emissions debt in the 2030s.*
>
> *Finland is committed to the objectives of the Climate Change Act. Achieving the emissions targets will require active measures. The Government will focus its climate action on generating cost-effectiveness, technology neutrality*

and sustainable business while recognising the importance of a long-term approach across parliamentary terms for attracting investments. To support the achievement of the targets, the Government will adopt a sensible and effective climate policy at the national and EU levels and with respect to international agreements.

Finland will create good conditions for sustainable investments in renewable and fossil-free energy production, energy storage and new energy solutions, such as hydrogen. Finland will become a key player in the hydrogen economy and an attractive location for hydrogen refining projects.

In the use of public funds, emphasis will be placed on achieving a competitive advantage through RDI funding, smooth permitting processes and energy transfer infrastructure. The Government will invest in research, development and innovations that increase energy and resource efficiency and reduce the need for energy.

Clean and diverse nature will become even more important as a competitive advantage and source of quality of life in Finland. Finland will halt biodiversity loss as part of a sustainable economic policy. Finland will improve its self-sufficiency and the state of nature, increase value added and advance the sustainable use of natural resources by promoting circular economy solutions.'

On the basis of this vision, the Government will develop strategies, plans, policies and measures. This process is currently ongoing in terms of drawing up policy plans, defining policy measures and calculating projections.

The Fit for 55 package's impact on Finland's climate and energy policy

The preparation of the National Climate and Energy Strategy and the Medium-term Climate Change Policy Plan has taken into account the legislative proposals issued by the European Commission in summer 2021 on tightening the 2030 targets (the Fit for 55 package). Therefore these are also included in this NECP update.

The Fit for 55 package is expected to contribute to Finland's fulfilment of the emissions reduction targets for 2030, 2040 and 2050 included in the 2022 Climate Change Act. It is assessed that the proposals in the package will entail greenhouse gas reductions. At the same time, some of the proposals may have significant financial consequences for the state, businesses and households. The impact

assessments of the National Climate and Energy Strategy took into account the emissions reduction target for the effort sharing sector for 2030 in accordance with the European Commission's Fit for 55 package.

REPowerEU

In addition to the Fit for 55 package, on 18 May 2022 the European Commission presented the 'REPowerEU' plan as a response to the rising energy prices and challenges with the security of energy supply following the Russian invasion of Ukraine. In the plan, the Commission presents a number of measures aimed at freeing the EU from Russian fossil fuels by accelerating the green transition and creating a more robust energy system.

The measures are divided into five central themes: 1) energy savings; 2) diversification of energy imports; 3) acceleration of Europe's transition to clean energy; 4) intelligent investments; and 5) expansion of preparedness.

Before the Russian invasion of Ukraine, Russia was a major source of energy imports into Finland. However, the oil and coal imports in particular were based on a competitive price and a short transport distance rather than any specific dependence on Russian energy. Crude oil imported from Russia was processed in Finland to meet the domestic demand for petroleum products as well as, in large part, for exports of petroleum products to the global market.

Following the Russian invasion of Ukraine, Russia unilaterally stopped supplying Finland with most wood products, including wood chips in March 2022 and electricity and natural gas in May 2022.

Finland deployed a floating storage regasification unit (FSRU) to meet gas needs. Wind power capacity has more than doubled in two years since the end of 2021 and the Olkiluoto 3 NPP was taken into commercial use in spring 2023. Energy companies found alternative sources for oil and coal to replace Russian imports. Since summer 2022, only small amounts of LNG have been imported from Russia.

The 2022 Climate Change Act

Finland's new Climate Change Act came into force in July 2022. The Climate Change Act lays the foundation for national work on climate change in Finland. The reformed Act sets emission reductions targets for 2030, 2040 and 2050, as well as a carbon neutrality target for 2035. The Act lays down provisions on the climate

change policy plans. The scope of the Act was expanded to cover emissions from the land use sector, i.e. land use, forestry and agriculture. For the first time, the Act also includes the objective of strengthening carbon sinks.

Table 1. Summary of the main targets of the updated National Energy and Climate Plan.

Target	Target year	Year of comparison
Reduce greenhouse gas emissions in the effort sharing sector by 50%	2030	2005
Total emissions in the LULUCF sector not to exceed the calculated sinks	Period 2021–2025 Period 2026–2030	Accounted for according to the LULUCF regulation
Renewable energy share of final energy consumption at least 62%	2030	-
Renewable energy share of final energy consumption at least 29% in road transport	2030	-
Energy efficiency target: The indicative national energy efficiency contribution of the FEC 2030 figure for Finland, by using the formula in Annex I to the EED recast, results to 20.6 Mtoe.	2030	-

1.2.2 Current energy and climate policies and measures relating to the five dimensions of the Energy Union

The existing energy and climate policy measures and their effects are listed in tabular form (Finland NECP 2024 policies and measures.xlsx). A more detailed description of the measures is given in Chapter 3. Tables 2 and 3 give an overview of the most important policy measures.

Table 2. Overview of existing energy and climate policy measures related to decarbonisation, renewable energy and energy efficiency.

Energy supply	Industry	Transport	Residential and services	Waste	Agriculture and LULUCF
Energy and carbon dioxide taxes	Energy and carbon dioxide taxes	Energy and carbon dioxide taxes	Energy and carbon dioxide taxes	Waste tax	Energy and carbon dioxide taxes
Energy Efficiency Agreements	Energy Audit Programme and Ecodesign	Distribution obligation for the use of renewable fuels in the transport sector, enhanced measures	Consumer energy advice and Energy Efficiency Agreements for service sector	Regulation on packaging, waste management	Energy Efficiency Agreement for Agriculture and other energy efficiency initiatives
Promoting wind power	Energy Efficiency Agreements	CO_2 emission performance standards for new vehicles	Ecodesign and energy labelling	Landfill regulation limiting deposit of organic waste	CAP Strategic Plan 2023–2027
Promoting forest chips and other wood based fuels (taxation)	Implementation and improved enforcement of F-gas regulations	Improving the energy-efficiency of the transport system, enhanced measures	Information dissemination and campaigns on energy efficiency	-	Activities on organic soils
Promoting solar power	Public procurement criteria, information measures, etc. concerning F-gases	Support for charging stations and hydrogen filling stations in road traffic	Building regulations (including nearly zero-energy regulation)	-	Distribution obligation for the use of bioliquids in machinery and heating
Promoting new energy technology projects	Implementation of Revision of the F-gas Regulation 517/2014/EU	-	Energy certificates for buildings	-	Promoting the production and use of biogas (investment aid)
Phasing out coal in energy production	Distribution obligation for the use of bioliquids in machinery and heating	-	Distribution obligation for the use of bioliquids in (space) heating	-	New owner policy of Metsähallitus (Climate actions in state owned forests)
-	-	-	Minimum standards for improving the energy performance of buildings undergoing renovation or alteration.	-	Actions to prevent deforestation
-	-	-	-	-	Promotion of forest fertilisation on mineral soils

Table 3. Overview of existing policy measures related to energy security, internal energy market and research, innovation and competitiveness.

Energy security	Internal energy market	Research, innovation and competitiveness
State-owned emergency stockpiles for imported fuels and peat (domestic)	Development plans of electricity distribution systems	Subsidies for green R&D and innovation
Private-owned mandatory reserve supplies	Advancing energy communities	-
Temporary obligation for industry to increase mandatory gas reserve supplies	-	-

1.2.3 Key issues of cross-border relevance

Directive on the deployment of alternative fuels infrastructure

In the context of the 'Fit for 55' package, on 14 July 2021 the European Commission proposed a new regulation for the deployment of an alternative fuels infrastructure (COM/2021/559). The new AFI Regulation was adopted in July 2023 and it repeals Directive 2014/94/EU.

The specific objectives of the new AFI Regulation are: (i) to ensure minimum infrastructure to support the required uptake of alternative fuel vehicles across all transport modes and in all EU Member States to meet the EU's climate objectives; (ii) to ensure full interoperability of the infrastructure; and (iii) to ensure comprehensive user information and adequate payment options in the alternative fuels infrastructure.

The proposed regulation sets a number of mandatory national targets for the deployment of alternative fuels infrastructure in the EU, for road vehicles, vessels and stationary aircraft.

The AFI Regulation also has significance across borders because measures are required to enable vehicles using alternative fuels, such as electricity or hydrogen, to move across the Union.

Nordic cooperation

Finland is a member of the Nordic Council of Ministers and, within this organisation, there are specific working groups concerning electricity markets, renewable energy and hydrogen, and climate and air. The cooperation also covers eco-design and energy labelling.

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 goals. This vision will be translated into multi-year cooperation programmes, which must ensure even closer cooperation on both climate and the energy sector in the years to come. It is the vision of the Nordic Council of Ministers that the Nordic region should be the world's most sustainable and integrated region before 2030.

Nordic electricity market cooperation

Norway, Sweden, Finland and Denmark have long shared a single wholesale electricity market and serve as a prime example of how to harmonise and deregulate electricity markets across national borders. The design of the common Nordic electricity market aims at promoting competition on equal terms and at the socioeconomically efficient use of production and transmission resources, and it is also key to integrating large shares of renewable energy into the system. The market price is set on the common power exchange, where supply meets demand on the day-ahead and the intraday markets.

Under the Nordic Council of Ministers, the Electricity Market Group (EMG) commissions analyses on electricity market issues for the Nordic energy ministers, and provides advice. The Group consists of experts from the ministries and energy authorities in the four Nordic countries that participate in the common Nordic electricity market. The Baltic States are regularly invited to the meetings.

Nordic electricity market cooperation seeks to advance a harmonised and integrated Nordic electricity market, where demand and production structures, flexibility measures and other relevant issues complement each other within the Nordic market area as a whole, in addition to promoting synchronised rules for all market participants, both companies and consumers. The focus is on:

- The functioning of the regional electrical system, with particular emphasis on the integration of renewable power generation, security of supply, demand flexibility and smart networks;
- Network investment and network planning;
- Representing Nordic interests in an EU context;
- Furthering retail market harmonisation;
- Taking the initiative to involve the Baltic States in electricity market development, when appropriate;
- Collaborating with market stakeholders;
- Following trends and identifying research, development and innovation (RDI) needs within the Nordic electricity market.

In addition to the official cooperation among the ministries, the Nordic Transmission System Operators, regulators, producers and other market stakeholders engage in close cooperation across borders, including with the Baltic States. As the electricity system changes, with influxes of large shares of renewables, with subsequent needs for system solutions on both the supply and demand side, and with the new European legislation, the Nordic energy ministers have decided to introduce an annual Nordic Electricity Market Forum.[6] The first such Forum was held in Stockholm in autumn 2018. The intention is to advance communication and collaboration among electricity market stakeholders, in addition to establishing common visions and roadmaps for the development of the Nordic electricity market; see Section 3.4.3.

The activities of the Electricity Market Group contribute to benefiting the Nordics through initiating Nordic collaboration on initiatives that would otherwise be undertaken at a national level, but where joint Nordic solutions can bring significant positive effects.

As such, Nordic electricity market cooperation is further transforming the market into one that is efficient and functions well, with high levels of security of supply, an equal competitive playing field, environmental friendliness, transparency and incentives for price elasticity, in accordance with the decisions of the Nordic Council of Ministers.

6 Nordic Electricity Market Forum, https://nordicelforum.org/

Nordic cooperation on renewable energy and hydrogen

The Nordic countries go to considerable lengths to develop and increase the use of renewable energy, with the aim of diversifying the energy system, becoming less dependent on imports of energy sources such as fossil fuels, and reducing CO_2 emissions.

The Working Group for Renewable Energy and Hydrogen (NAFH) consists of experts from the ministries and energy authorities in the Nordic countries and autonomous areas. It supports the Nordic countries' policy and development work in the renewable energy sector through information exchange and collaboration. In addition, NAFH disseminates information about relevant projects that it has commissioned to tackle different issues regarding renewable energy in the Nordics.

The overall objective of NAFH is to promote the use and production of renewable energy and hydrogen in the Nordic region and to support the work of the Nordic countries in the area. The aim is to have a smooth integration of renewable energy into the energy system and to create good conditions for technology development, innovation, production, infrastructure, transport and use in the area. The working group will also work to complement the national and international work on the development of the entire value chain for hydrogen-based fuels.

Nordic cooperation on ecodesign and energy labelling

Nordic cooperation on market surveillance and policy work concerning ecodesign and energy labelling is conducted in the Nordsyn working group. It involves cooperation among Nordic market surveillance authorities (MSAs) and policy agencies.

Effective regulations and efficient market surveillance are essential and Nordsyn aims to improve the efficiency of Nordic market surveillance and policy input. Nordic authorities, producers and consumers benefit from Nordsyn, while green growth and energy efficiency are supported. The results and structure of Nordsyn can also be used to improve market surveillance in EU countries.

Nordic energy research cooperation

Nordic Energy Research (NER) is a platform for cooperative energy research and analysis in the Nordic region under the auspices of the Nordic Council of Ministers. It funds research of joint Nordic interest that supports these ambitions by expanding knowledge of sustainable energy and contributing to the development of new and competitive energy solutions.

The NER governance structure is closely connected to both the national political systems of the five Nordic countries and the intergovernmental Nordic system. Its board and other committees and project steering groups consist of representatives not only from national funding agencies but also from national energy authorities, ministries and the Nordic Council of Ministers' secretariat. This creates constant interaction on research strategies, results and key technical issues on the political agenda.

Nordic climate cooperation

Nordic climate cooperation aims to help to reduce greenhouse gas emissions in the Nordic area and elsewhere, and it seeks to find synergies between initiatives related to the climate and air. Strategic focus areas in the field of climate are Nordic support for an ambitious implementation of the Paris agreement and global climate work in general, climate financing and governance, adaptation to climate change, and demonstration of Nordic solutions to mitigate climate change. A major area of emphasis of the work is to provide information to help the Nordic countries in their efforts to reach climate neutrality. This work is based on the Prime Ministers' Declaration on Climate Neutrality from January 2019.

The Nordic Working Group for Climate and Air has the mandate to implement the Programme for Nordic Cooperation on the Environment and Climate 2019–2024. The working group is fulfilling its mandate via project activity that reflects the priorities of the cooperation programme. Projects are initiated via open calls and public invitations to tender. The working group cooperates with other working groups within the Nordic Council of Ministers as well as with other international bodies, i.e. the UNFCCC and the Arctic Council.

Regional gas market cooperation

Until 2020, Finland was exempt from EU rules on unbundling and third-party access in the gas sector (Directive 2009/73/EC) due to the isolated nature of the Finnish gas market. As a result, the gas market was essentially closed to competition and fully controlled by the state-owned company, Gasum, which acted as the TSO and was the only importer and wholesale supplier. However, in January 2020, upon the commissioning of the Balticconnector pipeline that links Estonia and Finland, the Finnish gas sector became subject to EU legislation on gas market competition, and the exemptions to the Gas Directive in the Natural Gas Market Act were abolished. Price regulation of piped gas was dropped and marketplaces for gas and internal market rules were introduced. The bidirectional Balticconnector pipeline is jointly owned by the Finnish TSO, Gasgrid Finland, and the Estonian TSO, Elering.

In January 2020, Finland also joined a common regional gas market area with Estonia and Latvia (the FinEstLat gas market area). The merger of FinEstLat means the linking of the Finnish, Estonian and Latvian markets, removing the internal tariffs in the region and setting the entry tariffs in the region at the same level. The results of the operation of the FinEstLat single-entry tariff zone have been very positive.

By connecting the Finnish gas grid to the Estonian gas grid, the Balticconnector pipeline has allowed Finland to import gas from the Klaipeda LNG terminal in Lithuania and make use of the Inčukalns gas storage facility in Latvia. Following the commissioning of the Gas Interconnection Poland-Lithuania (GIPL) pipeline in May 2022, Finland also gained access to the broader EU gas market. A key addition to the cross-border gas infrastructure system is the floating LNG terminal in Inkoo, which was taken into commercial use in January 2023. The terminal is connected to the gas transmission system and has the capacity to supply several times the combined annual natural gas consumption of Finland and Estonia.

In general, Regional Gas Market cooperation and its tool, the Regional Gas Market Coordination Group (RGMCG), have been successful in helping to integrate the gas markets in Finland, Estonia, Latvia and Lithuania, as well as in the region, to reduce its dependency on Russian gas.

The Baltic Energy Market Interconnection Plan (BEMIP)

Finland actively participates in the Baltic energy market interconnection plan High-level Group and specific working groups. BEMIP aims to build an open and integrated regional electricity and gas market for the EU countries in the Baltic Sea region. From Finland's perspective, a major recent achievement under the BEMIP umbrella was the creation of the regional gas market encompassing Finland, Estonia and Latvia (FinEstLat) in 2020. In general, BEMIP has been successful in helping the region to reduce its dependency on Russian gas. Current work focuses on promoting offshore wind development in the Baltic Sea, for example.

Hydrogen cooperation

The state-owned gas TSO Gasgrid Finland is working alongside Sweden's Nordion Energi to develop the Nordic Hydrogen Route, a cross-border project aimed at building a pipeline network and an open hydrogen market in the Bothnian Bay region by 2030.

The aim of the Nordic Hydrogen Route is to drive decarbonisation and to support regional green industrialisation, economic development and European energy independence. The companies seek to develop a network of 1,000 km of new pipelines that would effectively transport energy from producers to end-users, to ensure they have access to an open, reliable and safe hydrogen market. The pipelines will serve 65 TWh of identified potential hydrogen demand in the Bothnian Bay region by 2050. The core route will be along the coastline, with a branch to Kiruna, Sweden.

The Nordic Hydrogen Route investment is estimated at EUR 3.5 billion, offering a hydrogen transportation cost of EUR 0.1–0.2 per kg. It will enable ten-fold investments of around EUR 37 billion in wind power and electrolysis. The pipeline will facilitate emissions savings of up to 20 Mt CO_2 eq. per year by 2050.

In addition to Nordic Hydrogen Route, there are also two large-scale infrastructure projects with a PCI-status under development by Gasgrid Finland: Hydrogen interconnector between Finland, Estonia, Latvia, Lithuania, Poland and Germany (currently known as Nordic-Baltic Hydrogen Corridor) and Hydrogen interconnector between Sweden, Finland and Germany (currently known as the Baltic Sea Hydrogen Collector).

The goal of the Nordic-Baltic Hydrogen Corridor project is to develop hydrogen infrastructure from Finland through Estonia, Latvia, Lithuania and Poland to Germany by 2030. Gasgrid's share is particularly related to the development of the hydrogen network covering the whole of Southern Finland and the market in the Baltic Sea region.

The Baltic Sea Hydrogen Collector (BHC) is a project to build a 1,250 km pipeline system which will connect mainland Finland and Sweden to Germany, and potentially also Denmark. Between Finland, Sweden, and Germany, the pipelines can be connected to hubs for hydrogen production on Åland, Gotland, and Bornholm islands. These production points can enable additional deployment of locally produced offshore wind power, while the collected hydrogen will be distributed throughout the Nordics and Northern Europe.

In line with article 22a paragraph 3 of RED III, Finland expects the national demand for RFNBOs to be covered by domestic production instead of imported fuels. In terms of export, Finland has significant RFNBO production potential beyond domestic demand and could export large amounts of RFNBOs. However, it is not possible to estimate the specific expected export amount at this stage of market development and policy implementation.

The position of the Sámi people

European Union regulations not only guide national legislation but also have a profound effect on Sámi traditional livelihoods, fishing, hunting, gathering, reindeer herding and Sámi handicrafts, duodji, which are fundamental pillars of the Sámi culture. In climate mitigation and adaptation policies, it is imperative that the EU recognizes and protects the rights of the Sámi as an Indigenous People according to international law and as is enshrined in Protocol No. 3 on the Sámi of the act concerning the conditions of accession (11994N/PRO/03). The Sámi Protocol serves as a crucial legal basis for securing the Sámi rights and strengthening the participation of the Sámi in the European Union. Development of the international law highlights the importance of implementing the Free, Prior, and Informed Consent, the FPIC principle, when planning economic activities in the Sámi areas across the Nordic countries.

1.2.4 Administrative structure of implementing national energy and climate policies

The Government and Parliament make all the major decisions concerning Finland's energy and climate policy.

The Climate Change Act (423/2022) lays down the general framework for the planning of climate change policy in Finland and the monitoring of its implementation. It aims to enhance and coordinate the activities of state authorities in planning measures aimed at mitigating climate change and adapting to it. It also aims to monitor the implementation of these measures. Furthermore, the Act aims to strengthen the opportunities of Parliament and the public to participate in and affect the planning of climate change policy in Finland.

Regarding the coordination and compilation of climate change policy plans, the Ministry of Economic Affairs and Employment is responsible for the long-term plan for climate change policy. The Ministry of Agriculture and Forestry is responsible for the Climate Plan for the Land Use Sector and for the National Adaptation Plan for Climate Change. The Ministry of the Environment is responsible for the Medium-term Climate Change Policy Plan as well as for compiling the annual climate change report.

The Government establishes a ministerial working group for coordinating energy and climate policy. The Ministerial Working Group on Clean Energy, the Environment and Security of Supply has representatives from each party forming the Government and it will guide and direct the implementation of the

Government Programme with regard to climate, environmental and nature policy, clean energy and the energy transition, and permit procedures for projects. In addition, the ministerial working group will guide and direct the implementation of the Government Programme with regard to food and forest policy.

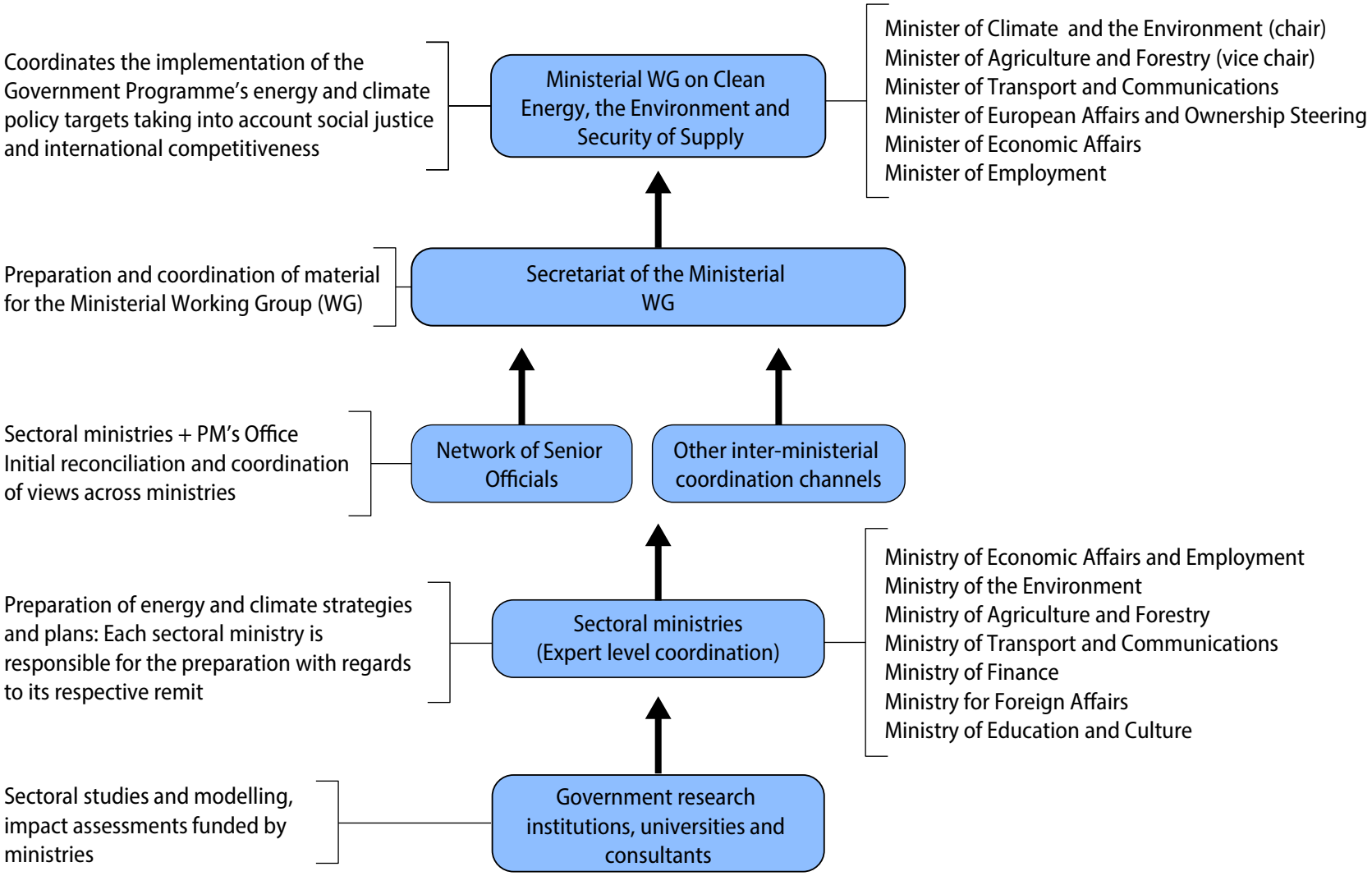
The operation of the ministerial working group concerning climate and energy policy issues is based on the government resolution concerning the organisation of official climate policy measures in the Government.[7] The resolution includes policy outlines for arranging the tasks and for cooperation of the ministries in the preparation and implementation of domestic climate policy. A working group consisting of representatives of different ministries functions as a network for public officials and helps in the coordination and preparation of the tasks.

The Ministry of Economic Affairs and Employment is responsible for the general coordination of the work on the Climate and Energy Strategy. The Ministry convenes a network of senior officials from the Ministry of the Environment, the Ministry of Transport and Communications, the Ministry of Agriculture and Forestry, the Ministry of Finance, the Ministry for Foreign Affairs and the Prime Minister's Office for consulting on the preparation of energy policy. Each sectoral ministry is responsible for the preparation and implementation of the policy measures related to their field as follows:

- Ministry of Economic Affairs and Employment: use of energy by industry, services and households; industrial processes; production and consumption of energy; renewable energy; (including the share of biocomponents in transport fuels); supply of electricity and district heating.
- Ministry of the Environment: F-gas emissions, waste management sector, building stock, energy consumption of buildings and their sources of heating, energy consumption of machinery and their emissions.
- Ministry of Transport and Communications: energy consumption and emissions of road, waterborne, air and rail traffic.
- Ministry of Agriculture and Forestry: non-energy-related emissions in agriculture; use of energy in agriculture; biomass amounts; forestry; the land use, land-use change and the forestry sector (LULUCF sector).
- Ministry of Finance: taxation, short-term economic development.

7 https://valtioneuvosto.fi/en/governments/ministerial-committees-and-ministerial-working-groups

Figure 1. Administrative framework of drafting energy and climate policy.



The preparation and implementation of energy and climate policy in central government is described in more detail as part of Finland's reporting in compliance with reporting on national systems for policies and measures and projections pursuant to Article 36 of the Commission Implementing Regulation (EU) 2020/1208.[8]

Figure 1 presents a diagram of the administrative framework of drafting energy and climate policy.

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

1.3.1 Involvement of the national parliament

The three Government reports forming the basis of this NECP (National Climate and Energy Strategy, the Medium-term Climate Change Policy Plan and the Climate Plan for the Land Use Sector) were submitted to Parliament in 2022 after the Government had adopted them. Parliament debated the reports and issued related non-binding resolutions on the two last ones. Parliament did not have time to give resolutions regarding the National Climate and Energy Strategy. The NECP itself is not sent to Parliament for consideration.

1.3.2 Involvement of local and regional authorities

The Association of Finnish Local and Regional Authorities has represented local and regional authorities in the consultations. The consultations are discussed in more detail in Section 1.3.3.

8 https://reportnet.europa.eu/public/dataflow/900

1.3.3 Consultations of stakeholders, including the social partners, and engagement of civil society and the general public

Consultations regarding the National Energy and Climate Plan update

The draft version of the National Energy and Climate Plan update was circulated for comments through public consultation. The consultation was carried out online at Lausuntopalvelu.fi service from 22 May to 10 June 2024. During this period, 57 comments were received. The aim of the consultation was to engage stakeholders in the preparation process and to hear their opinion on every section of the plan. The commentators represented ministries and other state authorities, municipalities, companies, trade or interest organizations, private citizens and other bodies. Due to the amount of comments received, this summary contains the key elements from the answers to the open-ended questions.

The stakeholders requested additional information on the With Existing Measures (WEM) projection and opined that the information on the measures included in the WEM projection was inadequate. The WEM projection is based on the "Perusskenaariot energia- ja ilmastotoimien kokonaisuudelle kohti päästöttömyyttä" (PEIKKO) -research project. At the time of the consultation, the results of the PEIKKO project had not yet been published.

Some statements pointed out that some of the fundamental measures of the WEM projection were approved and implemented during the previous government's term (before April 1, 2023), but which the current government has not continued in all respects. The WEM projection was therefore considered partly misleading. The WEM projection is based on the PEIKKO-projection which does not include all measures of the current Government. Nevertheless, where possible, most recent policy changes have been taken into account in the NECP's WEM projection, as mentioned in the NECP. The measures of the Prime Minister Petteri Orpo's Government will be evaluated in connection with the With Additional Measures (WAM) projections later in 2024.

Many remarks concerned the lack of entries regarding just transition towards climate neutrality. The general consensus was that fairness in a broad sense should be considered in the preparation of energy- and climate plans and political measures. Just transition necessitates social justice as well as equality and with different assessment procedures, the prerequisites for just transition can be ensured. Furthermore, the effects of climate policies can affect individuals and communities in a variety of ways, all of which need to be established and evaluated thoroughly before any action is taken.

Comments on regional differences in regard to equality stood out strongly. Regional differences must be taken into account especially in the transport sector as Finland has long distances. It is especially vital as the transport sector is affected by the new Emissions Trading System 2 (ETS2) and the changes in the distribution obligation of biofuels. Energy security and availability of energy in addition to the placement of renewable energy projects were the key points in evaluating the differences. The east-west as well as south-north axels have partly dissimilar qualities, which need further examination in order to find solutions. One solution suggested was to have municipalities and regions become more involved in the preparation of the measures and processes, as these stakeholders possess valuable information on the specific regional characteristics.

Just transition is connected to the prevention of energy poverty as well. The stakeholders raised concerns regarding the measures described in the plan and on the specificity regarding the reports on certain effects of energy prices, inefficient building stock and maintenance costs. It was noted that government aids on energy efficiency renovations are an effective way of supporting the transition away from oil heating. Active and efficient guidance from different authorities is one suggested way of ensuring equal opportunities for affordable housing and living. Stakeholders emphasized that adequate resources for different governmental authorities ought to be ensured.

Authorities require sufficient resources to be able to facilitate expeditious permitting processes. Fast permitting processes and predictability in governmental procedures are principal ingredients linked to strengthening competitiveness of Finland. The stakeholders stressed the importance of incentivizing investments in the energy sector by removing regulatory barriers especially concerning regulation of electricity distribution companies.

One particular area that received multiple comments was the misbalance between the distribution network and the main grid. The plans regarding the main grid were mainly considered satisfactory yet the plans to further develop the distribution network demanded elaboration. Stakeholders stressed the importance of an efficient distribution network in facilitating electrification, inducing investments and increasing the number of renewable energy projects. To that note, the answers to open-ended questions called out for more detailed plans for the development of energy and thermal storage solutions.

Hydrogen economy is recognized as an integral part of the path towards climate neutrality. The hydrogen economy needs to be developed to improve market viability of renewable energy, expanding its uses and developing the

aforementioned energy storage solutions. The potential of the hydrogen industry should be capitalized on, as it offers opportunities for growth. More detailed steps in addition to the national hydrogen strategy were called for as it is vital that Finland utilizes the potential to become the leading country in Europe's hydrogen economy. Stakeholders highlighted that the plans to develop the hydrogen infrastructure and improve the electricity infrastructure are essential and must be outlined with precision.

The connection between hydrogen technologies and CCS technologies was acknowledged. The stakeholders noted that the CCS technologies are still in their early stages and there is significant potential to be discovered. The different technologies including the capture of carbon dioxide (CO_2) and the storage and utilization can play a key role in reaching climate targets. One polarizing aspect was the promotion of BECCS technologies. The sustainability of biomass and the impact of its use to sinks must be evaluated as an irresponsible energy use of biomass can lead to significantly increased emissions. It was requested that active steps to reduce the use of biomass as well as peat are coordinated with haste.

Many answers to the open-ended questions demanded further plans to combat the already noticeable shortage of professionals with extensive skills and knowledge that can be utilized in the clean transition. Finland has funded research to analyze the skill and education requirements of clean transition and possible solutions that include allocating funds to higher education, continuous learning and academic research. The impact assessment of employment and skills required as a part of the preparation of climate policy and measure plans could help in predicting and preparing for changes in those sectors. A stronger educational and research perspective is called for, as it is recognized that research and higher education have a symbiotic role in the potential for innovation and the production of new skills in the energy sector. Research and innovations are essential in achieving emissions reduction targets in different sectors and adequate incentives and funds can facilitate the advances in technology and processes, for instance circular economy innovations and solutions within the energy sector.

The comments given during the consultation were analyzed and acknowledged when finalizing the plan. The texts of the plan have been supplemented and corrected based on the feedback received, for example, the text about the rights of the Sámi people has been added. In addition, as an observation that cuts across the whole plan, it is worth noting that in Finland, the new government has been operating just for a year. By the time the NECP plan is delivered to the Commission, the Government has not yet made decisions on new energy and climate policy measures, and that is why the plan does not present them. For the same reason,

energy and greenhouse gas emissions projections based on new policy measures (WAM projections) have not been presented in the NECP either. However, in Finland, the national energy and climate policy process continues even after the delivery of the NECP within the framework of the preparation of the national energy and climate strategy and the medium-term climate change policy plan. In connection with these processes, new policy measures will be outlined and the WAM projections modelled.

Consultations regarding the draft updated National Energy and Climate Plan

The targets and policy measures of the draft updated National Energy and Climate Plan delivered to the Commission in 2023 had been in public consultation as part of the preparations of the National Climate and Energy Strategy, the Medium-term Climate Change Policy Plan and the Climate Plan for the Land Use Sector. In the consultations and events organised for stakeholders, all relevant parties have been consulted, including authorities, organisations, labour market parties and individual citizens. Since the above-mentioned climate and energy plans also have a significant impact on this final updated National Energy and Climate Plan, a summary of the consultations organised in connection with them is also presented in this section.

In addition to the above-mentioned strategies and plans, several other climate- and energy-related documents were used in preparing Finland's draft NECP update. The consultation processes of Finland's national Roadmap to Fossil-free Transport and the EU Common Agriculture Policy (CAP) Strategic Plan are presented in this chapter as well.

Carbon Neutral Finland 2035 – the National Climate and Energy Strategy

As part of the preparation of the National Climate and Energy Strategy, several studies and events were organised, including the following:

- 18 November 2019: the Ministry of Finance appointed a working group on energy taxation reform.
- 31 March 2020: the Ministry of Economic Affairs and Employment appointed a broad-based working group on peat.
- 9 June 2020: Webinar about the results regarding sectors' low-carbon roadmaps.
- 25 September 2020: Kick-off seminar for the preparation of the climate and energy strategy.
- 16 February 2021: HIISI Stakeholder event on climate and energy projections with existing measures.
- 11 June 2021: HIISI Stakeholder event on preliminary assumptions and results of the WAM (with additional measures) projection from the perspectives of the energy and national economy and in different emission sectors.
- 30 June 2021: Publication event of the final report of the working group on sector integration.

After the strategy launch, the following events were organised to support the strategy commitments:

- 9 September 2022: Seminar on technological carbon sinks and CCUS.
- 10 February 2023: Coordination meeting on sector-specific low-carbon roadmaps.
- 29 March 2023: Publication event of the report of technological carbon sinks.

The preparation of the National Climate and Energy Strategy started officially with the kick-off seminar, organised as a webinar and aimed at stakeholders and experts. Although the work relating to the preparation of the National Climate and Energy Plan began before the kick-off seminar, several background work streams had already been initiated. In autumn 2019, four energy-intensive industries and nine other sectors began to work on low-carbon roadmaps to reduce greenhouse gas emissions significantly by 2035. The sectors presented their results at the Ministry of Economic Affairs and Employment webinar on 9 June 2020 and a summary report

of these roadmaps was published on 22 October 2020.[9] The working groups on energy taxation reform, peat and sector integration were ongoing and provided data to support the strategy's background work.

There were various other ongoing projects to support the preparation of the climate and energy strategy, including the project 'Carbon neutral Finland 2035 – measures and impacts of the climate and energy policies (HIISI)'[10] and the HIISI follow-up project.[11] The objective of the HIISI project was to produce estimates on how Finland could sustainably achieve the national and European Union climate and energy targets in 2030, 2035, 2040 and 2050. Two stakeholder events were organised in connection with the HIISI project on 16 February 2021 and 11 June 2021 (listed above). The HIISI follow-up project focused on the Government's new climate and energy policy measures (announced in autumn 2021), which could not be taken into account in the original HIISI project. Both projects produced assessments of the measures and impacts related to Finland's greenhouse gas emissions and removals, costs and the economy and the environment, but the HIISI follow-up project only presented the base assumptions and results of calculations that differed from the premises drawn up in the HIISI project.

In connection with the National Climate and Energy Strategy, the work of the Medium-term Climate Change Policy Plan (KAISU) and the Climate Plan for the Land Use Sector (MISU) began. The preparation of these plans included several stakeholder and citizen participation hearings and consultations, which are described later in this section.

Public Consultation of the National Climate and Energy Strategy

The draft version of the National Climate and Energy Strategy was circulated for public consultation and comments. Consultation was carried out online in the Lausuntopalvelu.fi service from 14 April to 18 May 2022. During this period, 149 comments were received. The consultation aimed to engage stakeholders in the strategy process and to hear their opinion on every section of the strategy. The commentators represented ministries and other state authorities, municipalities, companies, trade or interest organisations, private citizens and other bodies.

9 http://urn.fi/URN:ISBN:978-952-327-796-0

10 https://urn.fi/URN:ISBN:978-952-383-257-2

11 https://publications.vtt.fi/pdf/technology/2022/T402.pdf

In the statements, the submitted open comments especially concerned the reduction of greenhouse gas emissions, increasing sinks, the promotion of renewable energy and energy efficiency. In the area of greenhouse gas emissions and increasing sinks, the commentators submitted statements on the land use and effort sharing sector in particular and emphasised the sector-specific low-carbon roadmaps, with mainly positive feedback. Many comments supported the emissions trading system, but there were comments both in favour of and against the use of the LULUCF flexibility mechanism. Those in favour of the flexibility mechanism referred to cost-effectiveness and the mechanism's capacity to allow achievement of the emissions reduction targets set for the effort sharing system. Negative comments concerned areas such as the unfairness of the use of flexibility, or the uncertain nature of the use of the flexibility mechanism. The comments also highlighted targets for sinks in the land use sector and the targets for reducing emissions from agriculture, particularly their uncertainty, for example related to the volume of the sinks.

Concerning the promotion of renewable energy, there were comments that the energy system should be based on non-combustion energy and that technology neutrality and the magnitude of emission reductions should be a priority. The comments mainly supported the Government Decree on General Terms of Granting Energy. However, they pointed out that attention should be paid to what kind of projects are supported and the potential for the aid to distort competition in relation to the allocation of the aid. The statements also emphasised wind power-related harm and the balanced geographical distribution of wind power.

Regarding the promotion of energy efficiency, the needs to reduce energy consumption overall and to save energy were emphasised, and this should be highlighted in the strategy. In addition, the means for reducing transport sector emissions, improving energy efficiency and electrifying transport should be taken into account in the strategy. According to the statements, renewable energy sources, electricity, energy efficiency measures and energy savings were considered to strengthen the security of supply and it was stated that climate targets should not be jeopardised as a result of issues concerning security of supply. Furthermore, some comments said that there is no reason to increase dependence on a specific energy source with regard to delivery reliability and security of supply.

Regarding hydrogen and electrofuels, the need to promote the hydrogen economy actively through political measures was highlighted. Some comments stated that the targets set for hydrogen are too low and that there is potential for more substantial targets at the national level. Statements against nuclear energy point out that nuclear waste poses unresolved environmental risks, while those in favour

of nuclear energy emphasise positive views regarding zero-emissions nuclear energy. There is support for reform of the Nuclear Energy Act and a proposal of a separate decree to enable SMR plants.

The impacts of the strategy policies were commented on broadly. Regarding the achievement of the climate targets, comments stated that uncertainty concerning the carbon neutrality and carbon negativity targets should be taken into account and, if necessary, the need for additional measures should be assessed. Comments requested that the cost-effectiveness of emissions reduction measures be specified, and highlighted the importance of a just transition. In addition, opinions varied on the impacts on the energy system.

The comments given during the consultation were thoroughly analysed and taken into account when finalising the strategy. The Government adopted the National Climate and Energy Strategy on 30 June 2022. The Strategy outlines measures by which Finland will meet its EU climate commitments for 2030 and will become carbon neutral by 2035.

The Medium-term Climate Change Policy Plan

A wide range of citizens and stakeholder groups were heard during the preparation of the Medium-term Climate Change Policy Plan in 2020 and 2021. Opportunities for participation like these were mostly arranged during the early phases of the preparation. So the discussions did not revolve around the final entries in the plan, but were on a more general level. There was considerable interest in climate matters, which was demonstrated, for example, by the high respondent rate of the citizen survey. The plan was based on the principle that carbon neutrality should be achieved as cost-effectively and fairly as possible. The wide-ranging engagement of citizens produced valuable information on the impact of various climate actions.

Online survey

The Ministry of the Environment set up an online survey to collect citizens' opinions on how emissions could be mitigated effectively and fairly. The survey was open from 19 January to 19 February 2021 and proved to be very popular, with 18,000 responses. The themes in the survey were transport, food and housing, which are the primary sources of emissions from consumption. The survey contained multiple choice questions and free text fields for the respondents to assess the acceptability of different measures and their impact on the respondent's life.

Citizens' panel

The Ministry of the Environment commissioned the University of Turku to arrange a Citizens' Panel on climate action. The Panel sessions were held in April 2021. The Panel contemplated the fairness and impact of the climate action in the Climate Policy Plan and issued a statement. The Panel had 33 members selected by random sampling. The Panel's input consisted of a list prepared by the Ministry of the Environment on 14 measures regarding transport, housing and food that might be included in the Plan. The discussions in the Panel's small groups adhered to the rules of deliberative discussion, which seek to increase shared understanding.

In the general points of the statement, the Panel pointed out that, even if people are prepared to take action to slow down climate change, they are worried about the economic impacts that climate actions may have on them. The Panel considered it important to take individual and regional differences into account in the actions included in the Climate Policy Plan.

Consultation with special groups

To support the preparation of the Climate Policy Plan, young people were asked what kind of measures would help to mitigate the consumer emissions that originate from housing, mobility and food consumption. To achieve this, the Government cooperated with first-year students in the European Studies Programme at Tampereen lyseon lukio high school. The students designed surveys to collect opinions on these themes on a large scale. The surveys reached a total of 2,000 young people as well as older age groups in Tampere and its surrounding municipalities. The suggestions created by the young people contained several concrete measures, and information on the acceptability of measures in general, which supported the preparation of the Climate Policy Plan.

Sámi consultation

Pursuant to section 9 of the Act on the Sámi Parliament, the Ministry of the Environment reserved an opportunity for hearings and negotiations with the Sámi Parliament on the preliminary measures in the Climate Policy Plan. The Sámi Parliament considered the Plan important and the transition to a low-carbon community structure and transport system essential. The Sámi Parliament stated that a fair transition towards carbon neutrality should take place without the climate measures endangering Sámi livelihoods and culture.

Stakeholder consultation

In January 2021, the Ministry of the Environment held an open webinar on the launch of the preparation of the Climate Policy Plan. The webinar described the progress of the preparation and opportunities for participating in it.

The Ministry of the Environment also held a workshop in April 2021 for stakeholders to express their views on the planned measures in the Climate Policy Plan. The workshop consisted of a presentation on the preliminary emissions reduction measures regarding transport, agriculture and energy use in buildings. The participants were divided into small groups and invited to state their views on the preliminary measures and on how to reduce emissions and promote social fairness.

Written statement consultation procedure

The Ministry of the Environment requested statements on the draft Climate Policy Plan via the Lausuntopalvelu.fi web service from 8 December 2021 to 14 January 2022. Two hundred and ten statements were received, comprehensively representing the sectors affected by climate policy. Sixty-seven of the statements came from private individuals.

Most statements on the impact of the Climate Policy Plan's additional measures or action plan supported more ambitious climate measures. In particular, there was a desire for more ambition in the reduction of emissions from transport and agriculture, building-specific heating, the carbon footprint of consumption and public procurement. The stakeholders seeking more ambition were mostly associations, communities and private individuals. Many free-text responses expressed support for the targets and measures of the Climate Policy Plan, but they also presented many additional suggestions and clarifications. Some of the targets and measures were criticised as insufficient and a few respondents proposed downscaling or a review of some measures.

The Climate Plan for the Land Use Sector

Interaction with various stakeholders and actors played a key role in the preparation of the Climate Plan for the Land Use Sector. The feedback received from the interactive events was utilised in specifying the measures, and in prioritisation, the definition of information requirements, and impact assessment.

The feasibility and acceptability of measures in the plan were discussed in interactive events. In autumn 2021, the interactive events were targeted at regional actors, and a broad range of potential measures were discussed. In the

events arranged in early 2022, the discussion was based on measures that had been tentatively prioritised, and the aim was to gain feedback on how interesting the measures were, the effectiveness of the planned policy instruments, and any bottlenecks involved. Young people and landowners were the specific target group of the interactive events in the autumn and spring. During autumn 2021 and spring 2022, a total of 12 interaction events were organised. The summaries of each discussion, as well as the summaries of the discussions in autumn 2021 and spring 2022, are available in Finnish on the website of the Ministry of Agriculture and Forestry.[12]

The purpose of the interactive events was to form an understanding of the feasibility of the measures, practical viewpoints on their implementation and the acceptability of the measures for the actors concerned and for landowners. The aim was not to find a shared view, but to introduce various viewpoints into the preparation process. The interest and acceptability of various climate action measures have also been analysed in studies. At the events, the aim was to identify potential new climate measures and to collect information and viewpoints from the regional starting points of climate action.

After the draft Climate Plan for the Land Use Sector was finalised, it was circulated for comments between 14 April and 18 May 2022 in the Lausuntopalvelu.fi online service. A total of 108 comments were provided by key ministries, trade and professional organisations, interest groups, research institutions, government agencies and institutions, companies, environmental organisations and a few private individuals.

The EU Common Agricultural Policy (CAP) Strategic Plan

The national CAP Strategic Plan for 2023–2027 was prepared from 2018 to 2022. A main objective in the preparation process was broadly to involve various stakeholder groups. In September 2018, the Ministry of Agriculture and Forestry set up four sub-working groups for the national CAP preparation process. In addition to working group meetings, 29 workshops and 11 discussion events were organised for stakeholders between 2018 and 2020.[13] The workshops and discussion events provided material for the preparation of new policy measures, including evaluations on the previous CAP.

12 https://mmm.fi/maankayttosektorin-ilmastosuunnitelma/maankayttosektorin-ilmasto-suunnitelman-laatiminen (in Finnish)

13 CAP consultations between 2018 and 2020 (in Finnish).

The Ministry of Agriculture and Forestry organised a citizen survey on the CAP reform in the *Ota kantaa* web service from 12 February 2019 to 31 March 2019. Almost 2500 responses were received. The survey involved those stakeholders not attending the workshops and discussion events and offered them an opportunity to express their opinions on the future needs and objectives of agricultural policy. The survey results were used to prepare the CAP Strategic Plan. They were also published on the webpage of the Ministry of Agriculture and Forestry.[14]

The new CAP Strategic Plan was submitted to the Lausuntopalvelu.fi service for comments from 2 July to 10 September 2021. The Ministry also sent targeted requests for a statement to relevant associations and other public organisations. A total of 367 statements were received. Specifications and clarifications were made to the CAP Strategic Plan based on the comments received.

The Roadmap to Fossil-free Transport

The objectives and measures for reducing greenhouse gas emissions from transport until 2030 have been included in the government resolution on reducing greenhouse gas emissions from domestic transport (the Roadmap to Fossil-free Transport). The Government adopted the resolution in May 2021. The Roadmap's objectives and measures were included in the 2022 Medium-term Climate Change Policy Plan.

The draft resolution was circulated for comments from 15 January to 19 February 2021, and 349 comments were received. Of these, 176 were comments by private individuals and 173 by organisations. The comments were primarily collected online at lausuntopalvelu.fi. As a rule, commenters considered important the Roadmap's objective of halving emissions from domestic transport by 2030 and achieving carbon neutrality in transport by 2045. A key concern expressed in many comments was the increase in traffic and transport costs due to emissions reduction measures and the effects of the cost increases on households, businesses, workplaces, the national economy and competitiveness.

14 The results of the Ota kantaa survey on 12 February – 31 March 2019 on the reform of the EU agricultural policy (in Finnish).

1.3.4 Consultations of other Member States

Finland's updated National Energy and Climate Plan was not as such sent to neighbouring countries to undergo a written statement consultation procedure. Instead, on 16 May and 30 May 2024, Finland arranged a bilateral consultation meeting with Sweden and Estonia respectively on questions about the NECP topics that are of interest to both countries and about topics that are relevant to the energy policy of both countries. In particular, the following subjects were discussed: energy targets and aspects connected to them, RED and EED targets, Commission recommendations, aspects concerning policy and measures, consultation procedure, and cross-border aspects that are of relevance both to Sweden and Finland and to Estonia and Finland.

Finland and its neighbouring countries have engaged in close cooperation also at the ministerial level. Minister of Climate and the Environment Kai Mykkänen visited Stockholm on 13 May 2024 and met with the Swedish Minister for Climate and the Environment Romina Pourmokhtari and the Minister for Energy Ebba Busch. The purpose of the visit was to strengthen cooperation between Finland and Sweden and to build a shared climate and energy policy situational picture. The ministers discussed both countries' national climate policy plans, energy solutions and the development of the EU's climate policy.

Minister Mykkänen was also a member of President Alexander Stubb's delegation during a state visit to Estonia on 27–28 May 2024. The Minister discussed Estonia's current energy issues with the management of the Estonian Ministry of Climate and key representatives of Estonian energy companies. The discussion focused on energy transition and electricity transmission networks. Energy issues were also discussed at a later bilateral meeting with the Estonian Minister of Climate Kristen Michal.

1.3.5 Iterative process with the Commission

The Commission has offered Member States an opportunity for a bilateral meeting concerning the preparation of the NECP. For Finland, this meeting took place on 17 April 2024. The meeting was a technical bilateral meeting between DG Energy and the Finnish Authorities via the Webex. The main purpose of the meeting was to shed light on how Finland is progressing towards the final NECP and what main changes/impacts/improvements are expected, as compared to the draft update of NECP in light of the Commission recommendations on December 2023.

The special issues on the agenda covered renewable energy targets and measures, energy efficiency targets and measures, investment needs and just transition, including energy poverty, for example.

In addition, the dialogue with the EU Commission has taken place through working groups under the Energy Union Committee and the Ad-hoc Working Group of the Climate Change Committee. Finland has attended several meetings in 2023 and 2024.

1.4 Regional cooperation in preparing the plan

Regional cooperation is important in the Nordic and Baltic context. The Nordic-Baltic electricity market, which functions well, is expected to continue and even expand in the future. The common gas market between Finland and the Baltic States will increase regional cooperation in that field.

The regional aspect has been taken into consideration in the modelling of the electricity market and other energy-related assessments.

Section 1.2.3 provides more information on the regional cooperation.

2 National objectives and targets

2.1 Dimension decarbonisation

2.1.1 GHG emissions and removals

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

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

The effort sharing sector

The EU Effort Sharing Regulation (2018/842) (ESR) and its amending (2023/857) and implementing regulations (2023/1319) define the emission reduction goals of the effort sharing sector. According to the regulation, Finland should, by 2030, reduce its greenhouse gas emissions in the effort sharing sector by 50% compared to 2005 levels.

Annual emission allocations have been determined for all Member States for 2021–2025 according to the implementing regulations (2023/1319). In 2021, emissions from the Finnish effort sharing sector were 27.2 Mt CO_2 eq., or about 1.6 Mt CO_2 eq. below the allocation, and in 2022, 26.5 Mt CO_2 eq. and about 1.4 Mt CO_2 eq. below the allocation. The annual emissions allocations for 2026–2030 will be calculated according to the regulation (2018/842) and its amending (2023/857) and implementing regulations (2023/1319).

The EU evaluates and reports annually on progress towards achieving the targets and on the implementation of the obligations of the effort-sharing sector every five years (2021–2025 and 2026–2030). The final emissions data used in the review of the achievement of the target obligation will be reported in 2027 and 2032. A formal compliance check will be organised every five years: in 2027 for 2021–2025 and in 2032 for 2026–2030.

Finland will use the 2% one-off flexibility mechanism to cancel ETS allowances towards the target in the effort-sharing sector. The maximum annual flexibility set for Finland is 0.7 Mt CO_2 eq. It does not seem likely that the LULUCF flexibility mechanism included in the Effort Sharing Regulation could be utilised by Finland. Finland may use the other flexibility mechanisms such as transfers between years and between the Member States, as appropriate.

LULUCF

Under the regulation concerning the land use, land-use change and forestry (LULUCF) sector (EU 2018/841), a Member State must ensure that the accounted total emissions in the sector will not exceed the accounted sinks over the period 2021–2025. The accounting is applied to the following land accounting categories: deforestation, afforestation, managed forest land, managed cropland and managed grassland. By 15 March 2027, Finland will submit the LULUCF compliance report, including the balance of total accounted emissions and removals for the 2021–2025 period and, where applicable, details on the use of, or intention to use, the flexibilities and related amounts. Over the period 2021–2025, Finland may use the country-specific flexibility of 5 Mt CO_2 eq. to reach the target.

During the period 2021–2025, for the managed forest land category, Member States shall calculate a Forest Reference Level (FRL), against which the net removals or accounted emissions from managed forest land are accounted. The FRL consists of a projection of the managed forest land sink, assuming that the forest management practices of the reference period (2000–2009) are continued during the compliance period. Based on the feedback from the LULUCF Expert Group and the recommendations of the Commission (Commission Staff Working Document SWD(2019) 213 final), Finland recalculated its FRL and revised its National Forestry Accounting Plan (NFAP) submission, paying particular attention to the consistency of the model estimate with the data in the GHG inventory. The FRL for managed forest land for the period 2021–2025, as confirmed by the European Commission (Commission Delegated Regulation (EU) 2021/268) in 2020, is -29.39 Mt CO_2 eq. including harvested wood products (HWP). Finland will make technical corrections to the FRL due to methodological improvements in the GHG inventory, of which the most important concerns the drained organic forest soil GHG balance estimation. However, Finland has already made preliminary technical corrections to the FRL for national decision-making purposes. According to the most recent correction, the FRL for managed forest land is -19.29 Mt CO_2 eq. including HWP.

The revised LULUCF regulation (EU 2023/839) sets a net sink target for Finland, which according to the 2020 GHG inventory submission would be -17.8 Mt CO_2 eq. for Finland in 2030, or equal to an increase in the sink of 2.9 Mt CO_2 eq. compared to the average level in 2016–2018. It is not yet possible to estimate the sink budget formed as a cumulative sum of the removals for 2026–2029, since it would require the data from 2023.

Other objectives and targets

The objectives and measures for promoting the use of transport biofuels and other renewable energy sources in transport have been included in the Roadmap to Fossil-free Transport, the National Climate and Energy Strategy, the Medium-term Climate Change Policy Plan and in Finland's plan compliant with the Directive on the Deployment of Alternative Fuels Infrastructure (2014/94/EU). Under the previous Government, the target was to increase the share of transport biofuels in road transport fuels consumed in Finland to 34% by 2030. Another objective was to bring the number of electric-powered cars in Finland to at least 750,000 and the number of gas-powered cars to 130,000 by 2030.

For the target for agriculture, see Section 5.5.

Regarding the use of peat as a source of energy, Finland does not have a legally-binding target in force for its reduction. Nevertheless, it is clear that the price tag on energy peat from the EU ETS will inevitably phase it out. Based on preliminary statistics, the current consumption level is already at the previous Government's non-binding target of halving it (compared to the level in the 2010s). The target was originally set to be achieved by 2030, which is also the basis for Finland's implementation of the Just Transition Fund (JTF). The target is, however, not included in the latest Government Programme.

Carbon capture and storage

Carbon capture and storage (CCS) is an option for reducing CO_2 emissions. It can involve capturing CO_2 from fossil fuels or bioenergy (BECCS) or directly from the atmosphere (DACCS). In Finland, no geological storage sites have been identified. The closest available potential storage sites are in the North Sea, and a possible ship transport of CO_2 has been planned in the few CCS projects. The most recent project was the company Neste's plan to make blue hydrogen and ship the captured CO_2 to the North Sea for storage. Neste, however, cancelled this blue hydrogen project following Russia's attack on Ukraine and the subsequent termination of Russian natural gas imports to Finland.

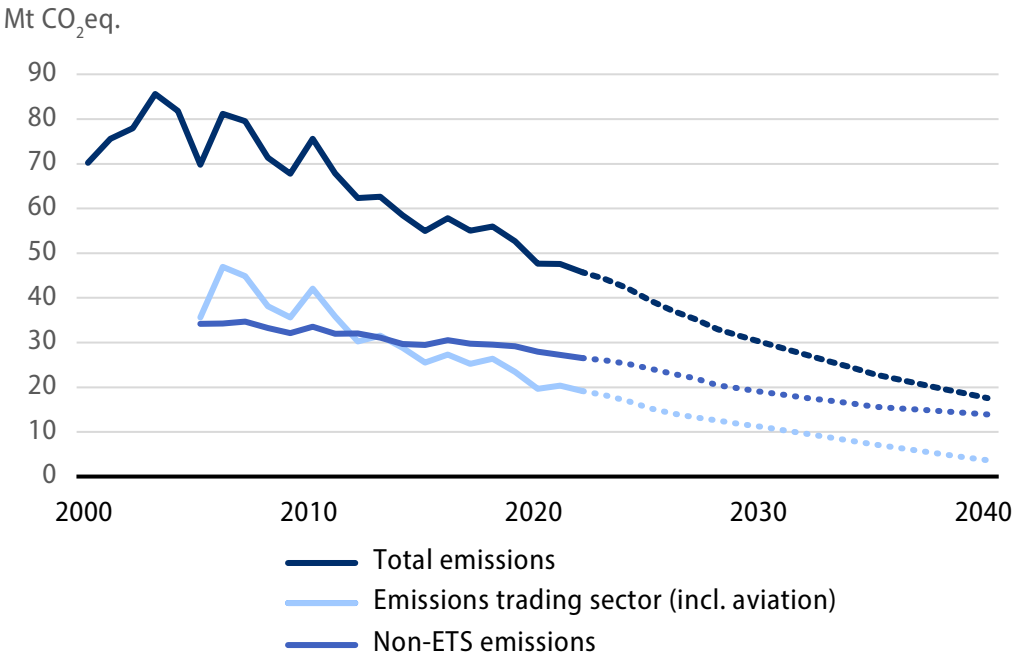
There are no active CCS projects in Finland, nor are there any large fossil CO_2 point sources with the potential to emit for decades and thus suitable for capture. The largest fossil point source in Finland is the Raahe steel plant, but SSAB, the owner, has firm plans to convert the plant to green steel production. One CCS option could be the capture and storage of biogenic CO_2 (BECCS). It has been studied, but not implemented, in Finland, as it does not currently offer economic benefits for the emitter or for the state. Many of the biogenic CO_2 sources are located inland, and for CCS the CO_2 needs to be transported to harbours. Moreover, many biogenic CO_2 sources are seen as feedstock for CCU, so there is not that much interest in CCS. There is strong research into BECCUS by VTT and universities. In the longer term, Finland is looking for technical sinks with storage or binding in longer-lasting goods (concrete etc).

Other possibilities for CO_2 usage have been studied and investigated, and although the sector is attracting wide attention, no concrete projects have been implemented so far. The utilisation of captured CO_2 is a focus area, and several projects that combine CO_2 mainly from biological origin with clean hydrogen to make synthetic methane for the transport sector will be operational from 2024. There are also state-supported projects to produce synthetic methanol and ammonia.

Projected development of emissions

Figure 2 shows Finland's greenhouse gas emissions in 2000–2022 and the projected development in the With Existing Measures (WEM) projection until 2040. The WEM projection includes all the measures implemented by the 2019–2023 Government. The measures are largely in line with the latest Climate and Energy Strategy and the Medium-term Climate Change Policy Plan. So far, only a couple of the new Government's measures have been adopted or implemented and, consequently, included in the projections.

Figure 2. Actual greenhouse gas emissions 2000–2022 and the projected development in the WEM projection until 2040.



Adaptation to climate change

Key tools in defining adaptation measures for climate change in Finland are national adaptation plans. The National Climate Change Adaptation Plan is part of the climate change policy planning system complying with the Climate Act. The Government Report on the most recent plan, the National Climate Change Adaptation Plan to 2030 (NAP2030),[15] was adopted in 2022. Preparation of the National Adaptation Plan to 2030 took account of international and European Union obligations concerning adaptation. NAP2030 implements Finland's international climate obligations, in particular the Paris Agreement (Paris Agreement 2015) and the European Climate Law (EU) 2021/1119. The EU Strategy on Adaptation to Climate Change has also been taken into account.

15 Government Report on Finland's National Climate Change Adaptation Plan until 2030 : Wellbeing, Safety and Security in a Changing Climate http://urn.fi/URN:ISBN:978-952-383-814-7

The vision of the National Adaptation Plan is "Wellbeing, safety and security in a changing climate". It aims for societal actors to have 1) a strong will to adapt to climate change, 2) access to efficient means to assess, prevent and manage climate change-related risks to nature and society, and 3) capacity to prevent, prepare for and manage climate change-related risks to nature and society. The NAP2030 sets 24 targets and outlines measures to achieve them under 10 themes: 1) National level strategic planning and foresight; 2) Comprehensive security and general security of supply work; 3) Food and nutrition security; 4) Infrastructure and the built environment; 5) Natural resources, biodiversity, nature-based solutions and drought risk management; 6) Health; 7) Cultural heritage and cultural environment; 8) Climate risk management at the regional and local levels; 9) International cooperation; and 10) Knowledge base, communication and monitoring.

A key principle in Finland's adaptation policy is to integrate climate risk management into each sector's planning, decision making and activities. The NAP2030 stipulates that more detailed adaptation measures should be planned at sectoral level, either as part of sectoral adaptation plans or through steering adaptation as part of other guidance documents (action 2.1). In the energy sector, climate risks and adaptation needs are assessed as part of regular sector planning and activities as detailed below.

Adaptation to climate change has also been considered in the energy modelling efforts related to policy preparation. Climate change is expected to increase rainfall and average outdoor temperatures. Higher precipitation will lead to somewhat increased potential for hydropower production. Heavy precipitation events could become more frequent in the summer, resulting in more flooding. The projections assume a hydropower production increase of 3% in 20 years due to higher precipitation. On the other hand, long periods of very low precipitation are likely, causing hydrological drought that reduces hydropower production. This matters in Finland because hydropower plays a central role as a regulating power source, and more widely because Scandinavian precipitation largely determines the electricity price on the Nordic power exchange.

Estimates on the impact of climate change on wind and solar energy production vary. According to recent projections of climate change in Finland, wind conditions are not expected to change significantly. However, incoming solar radiation is anticipated to increase slightly over the next few decades.

In relation to bioenergy production, it is essential to examine the changes and risks to its availability. In Finland, the energy use of forest biomass is significantly linked to the procurement of wood for the forest industry. Thus, the availability of

industrial raw wood and energy biomass is affected by the same factors; climate change is expected to increase the prevalence of heavy rain and shorter periods of snow and frost, which affect forest management. As a whole, varying weather conditions pose challenges to forest harvesting. Variable weather conditions may also affect the availability and transport of wood for energy. Similarly, weather conditions might affect, for example, the quality, i.e. moisture content, of forest chips used in energy production. From the point of view of preparedness, the adequacy and availability of solid wood fuels is particularly important in winter, when the demand for heating is greatest.

Average temperatures continue to rise in the future as winters become milder and summers become hotter. On average, it is estimated that heating energy needs will decrease more than cooling energy needs will increase. The consequences of rising temperatures on space heating needs have been estimated by the VTT Technical Research Centre of Finland[16] and are included in the projections. In total, for the whole building stock, the net heating energy need is projected to decrease by 0.3–0.4% per year, declining by 3.6% from 2020 to 2030 and by 6.7% to 2040.

Section 3.3 on energy security describes one measure to adapt to climate change, namely making the electricity distribution network more resilient to extreme weather conditions. Whereas climate risks do pose a challenge to energy security, no specific issues regarding the possible effect of climate risks on other NECP objectives have been identified.

The various roles of local authorities are identified as a part of the adaptation plan. At the regional level, the Centres for Economic Development, Transport and the Environment (ELY) have a key role as experts in adaptation to climate change. The Centres are responsible for industrial and commercial activity, transport and the environment. As authorities their role is to produce and manage relevant information on climate change and to implement national plans regionally. The Centres play a significant role as authorities granting EU funding and as drivers of regional development. They ensure that both regions and their residents can enjoy equal opportunities and prevent social exclusion.

16 Energiajärjestelmän ja kasvihuonekaasujen kehitykset: Hiilineutraali Suomi 2035 – ilmasto- ja energiapolitiikan toimet ja vaikutukset, http://urn.fi/URN:ISBN:978-952-383-318-0

In 2023, Finland strengthened the mandate of the North Ostrobothnia ELY Centre (POP-ELY)[17] on adaptation matters nationally. The POP-ELY Centre is coordinating and providing support for the regions and regional actors, including local authorities, on implementing the NAP2030.

Local authorities have many ways of promoting climate change adaptation among municipal residents, companies, communities and other stakeholders. For example, local authorities are responsible for town planning, land use, transport planning, ownership steering of municipality-owned energy companies, heating choices for many buildings and public procurement within their own municipalities.

Adaptation to climate risks and related specific issues relevant to NECP objectives are identified in other national plans. The general principles and strategic tasks for society's preparedness are laid out in the Security Strategy for Finnish Society. The Government Report on Security of Supply in Finland outlines the key policies for development by 2030.[18]

2.1.2 Renewable energy

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

Finland has set a target of 62% for the share of renewable energy (gross final consumption), in compliance with the Renewable Energy Directive. The recent development in the renewable energy sector has been very good and the trend is expected to continue. Therefore, Finland expects the share of renewable energy to increase much faster than anticipated in the original NECP submitted in 2019, where the target was set to 51%. According to the current energy and climate projections, the share of renewable energy could rise as high as 62% by 2030, as the Commission's formula suggests.

In addition, Finland endeavours to reach an indicative target 5% of innovative renewable energy for newly installed renewable energy capacity by 2030.

17 https://www.ely-keskus.fi/pohjois-pohjanmaa-ilmastotyö-maankaytossa-ja-ilmaston-muutokseen-sopeutuminen

18 Government Report on security of supply (in Finnish). Valtioneuvoston julkaisuja 2022:59. http://urn.fi/URN:ISBN:978-952-383-803-1

Table 4 shows the indicative minimum levels for intermediate years concerning the current renewable energy target, until 2030.

Table 4. Renewable energy targets and minimum levels for the intermediate years [share of gross final consumption of energy].

Target	2020	2022	2025	2027	2030
Finland's EU obligation	38%	-	-	-	-
Finland's RES target for 2030 and the minimum level for the intermediate years	-	NA	49%	54%	62%

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

Figure 3 and Table 5 show the estimated development in the WEM projection in the 2020s of the overall renewable energy share (RES overall) as well as the sector-specific shares of final energy consumption for the electricity (RES-E), heating and cooling (RES-H&C) and transport (RES-T) sectors. For the calculation of the numerator as well as the denominator of the indicator RES-T, renewable electricity supplied to road vehicles is considered to be four times its energy content and 1.5 times when supplied to rail transport. Likewise, the amount of biofuel for transport produced from feedstock, as listed in Annex IX of the Renewable Energy Directive, is considered to be twice its energy content. As stipulated in the Renewable Energy Directive for indicator RES-T, the average share of electricity from renewable sources in the two years prior to the year in question is used in the calculation of the share of renewable electricity in the electricity supplied to road and rail vehicles.

As shown in Figure 3 and Table 5, the share of renewable energy was already relatively high (59%) in the heating and cooling sector in 2022. The threshold of 60% of the share of renewable energy is expected to be reached soon, which will allow Finland to count any share as fulfilling the average annual increase according to RED III, Art. 24. Finland is striving, however, to increase the share of renewables in the heating and cooling sector annually by means of the additional top-ups set in Annex Ia of the directive. Finland is planning to count waste heat and cold in the average annual increase.

In 2022, the previous Government increased the 2030 target for the quota obligation of liquid and gaseous biofuels in road transport to 34%.[19] However, the target was reduced to 12% and 13.5% for 2022 and 2023 following the energy crisis and the need to limit the costs of transportation fuels. The 10% sub-target can be met with biofuels and biogas produced from Annex IX feedstock and with renewable fuels of non-biological origin (RNFBO). The minimum share of advanced biofuels must be 3.5% in 2030. In addition, RefuelAviation requires that, in 2030, sustainable aviation fuels should make up 6% of the total of aviation fuels in the EU. This aviation fuel requirement is, however, not yet included in the WEM projection and in the trajectories in Figure 3. The current Government, in office since 20 June 2023, may revise these national targets and quotas.

Finland is planning to maintain the energy-based target in transport, but the final decision has not yet been made. However, new sub-targets for renewable fuels of non-biological origin (RNFBO) must be set and, as the directive requires, it should be at least 1% in 2030. Also, a credit mechanism for economic operators that supply renewable electricity to electric vehicles through public recharging will be included in the national quota/distribution obligation.

Long-term trajectories (i.e. until 2040) for the expansion for renewable energy with existing policy measures are presented in Figure 13.

19 Laki uusiutuvien polttoaineiden käytön edistämisestä liikenteessä annetun lain muuttamisesta (1134/2022)

Figure 3. Estimated trajectories for the overall and sectoral shares of renewable energy in gross final energy consumption from 2021 to 2030 in the WEM projection.

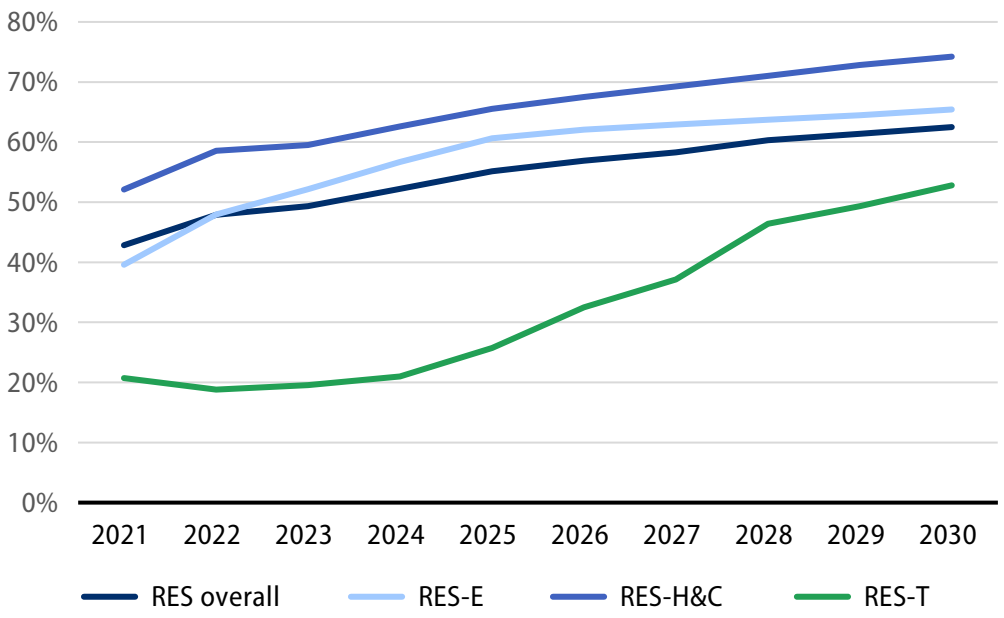


Table 5. Overall and sectoral shares of renewable energy in gross final energy consumption in the WEM projection.

Indicator	2020	2022	2025	2027	2030
RES overall	44%	48%	55%	58%	62%
RES-E	40%	48%	61%	63%	65%
RES-H&C	58%	59%	66%	69%	74%
RES-T	14%	19%	26%	37%	53%

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

Table 6 describes the production and use of renewable energy, grouped by technology and by sector. The figures in the table represent the estimated amounts of gross final energy consumption in the WEM projection, not that of total primary energy or fuel amounts. The estimates for the transport sector correspond to the actual energy content of the energy source without any coefficients. Table 6 also shows the estimated development of bioenergy in the heating, electricity and transport sectors.

The electricity and heating markets are competitive industries, so central government does not have a plan on how the installed capacity of each technology will develop. However, assuming 3,200 peak load hours, the wind power volume in the WEM projection in 2030 would equal an installed capacity of 10,000 MW. Equally, assuming 900 peak load hours for solar power, the WEM projection generation volume in 2030 would equal an installed capacity of 5,800 MW, which is almost sixfold the current installed capacity. The installed hydropower capacity is currently 3,200 MW and no significant change is expected in the years to come.

Table 6. Renewable energy per sector and technology in the WEM projection [TWh of gross final consumption].

Indicator	2022	2025	2027	2030
RES Overall				
Hydropower	15	15	15	15
Wind power	17	25	28	33
Solar energy	1	2	4	6
Bioenergy	99	111	114	116
Heat pumps	10	11	11	12
Total	**141**	**164**	**171**	**181**
RES-E				
Hydropower	15	15	15	15
Wind power	17	25	28	33
Solar energy	1	2	4	6
Bioenergy	12	14	14	14
Total	**44**	**56**	**61**	**67**
RES-H&C				
Solar energy	0	0	0	0
Bioenergy	81	91	91	91
Heat pumps	10	11	11	12
Total	**91**	**101**	**102**	**103**
RES-T (excl. coefficients)				
Liquid biofuels	5	6	8	10
Biogas	0.4	0.7	0.8	1.1
Renewable electricity	0.6	1.1	1.9	3.0
Total	**6**	**8**	**10**	**14**

Finland has set, according to the TEN-E Regulation, non-binding targets for offshore wind in the context of the BEMIP Offshore Wind Working Group. The non-binding targets are 1 GW for 2030, 5 GW for 2040 and 12 GW for 2050. The Government is planning to set an ambitious target for offshore wind capacity in 2035. In October 2023, the Ministry of Economic Affairs and Employment appointed a working group with the task of finding ways to promote offshore wind power in Finland.

In 2019, the Ministry of Economic Affairs and Employment appointed a working group to prepare a national biogas programme for the medium term. The working group was tasked with describing the current state of biogas production, the most significant factors slowing down or preventing large-scale production and use of biogas, and measures for resolving these issues, as well as with implementing the measures included in the Government Programme regarding biogas. The report, which includes policy measure suggestions, was published in January 2020. Several new measures were introduced, including the inclusion of biogas in the distribution obligation, setting up schemes for nutrient recycling, additional investment aid for farm-scale projects, and promoting biogas-fuelled vehicles. Most of the measures had already been implemented by the end of 2022. However, there are some major barriers for wider uptake of biogas production because of the uncertainty of the regulation concerning the sector as well as restrictions in state aid regulation.

Finland does not have binding targets for hydrogen production in force, but the latest Government Programme states that Finland aims to account for 10% of the EU's clean hydrogen production and for at least the same percentage of hydrogen use.

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

In Finland, bioenergy has a key role in the production of renewable energy. Bioenergy production is largely integrated into forestry and forest industries. In recent years, energy derived from wood fuels has typically accounted for a quarter to a third of Finland's total energy consumption. A major share of wood fuels is derived from forest industry wastes and residues, including black liquor originating in the chemical pulp-making process, and bark, sawdust and other industrial wood residues. Forest chips – or, in other words, logging residues or other low-value biomass from silvicultural and harvesting operations – are also used for energy production.

Table 7 shows the volumes of biomass by type used as primary energy in the WEM projection. It is expected that the use of biomass will peak around 2025–2030 and, after that, will start to decline.

Generally, increased wood use in the forest industries results in more wastes and residues (black liquor, sawdust, bark, etc.) being available for energy production. In recent years, the consumption of wood fuels in Finland has been relatively steady as newer renewable energy technologies are becoming more common.

Wood-based fuels will consist of black liquor and other concentrated liquors, sawdust, bark and other industrial wood by-products from forest industries and wood processing. Based on this, the share of imported wood-based fuels in all wood-based fuels in Finland is projected to remain small, at only a few per cent.

In the energy and climate projections for 2030, the volume of forest chips in heat and electricity production will rise to about 22 TWh, or about 11 million cubic metres per year, which is slightly above the current level. Most of the forest chips will be small-diameter stems gathered in connection with the management of young forests. The remainder is expected to consist of logging residues from regeneration felling and, to a minor extent, of stumps.

Table 7. Biomass by type in the WEM projection [TWh of primary energy consumption].

Type of biomass	2020	2025	2030
Black liquor and other concentrated liquors	40	45	45
Industrial wood residue and forest chips	47	50	52
Small-scale combustion of wood, pellets, etc.	16	14	12
Waste (biodegradable fraction)	4	5	4
Total	**106**	**113**	**113**

As most of the wood-based energy comes from industrial wood wastes and residues, as well as from harvesting and harvest residues, its impact on the LULUCF sector sink is relatively small. Use of sawdust, bark, black liquor and other sidestream products for bioenergy has no impact on carbon removal levels directly. In the event that biomass-based bioenergy use increases, it may negatively affect

the LULUCF net sink level if the removed total amount of wood biomass increases and the harvest residues are collected extensively. LULUCF accounting in the 2021–2030 period is based on IPCC guidelines, which assumes instant oxidation (release of CO_2 to the atmosphere) of harvest residues that are directly used as energy feedstock.

However, it is expected that a large share of the feedstock used for biofuel production will be imported.

v. Where applicable, other national trajectories and objectives, including those that are long term or sectorial (e.g. share of renewable energy in district heating, renewable energy use in buildings, renewable energy produced by cities, renewable energy communities and renewable self-consumers, energy recovered from the sludge acquired through the treatment of wastewater)

Article 24 in the Renewable Energy Directive encourages Member States to increase the share of renewable energy and waste heat and cold in district heating and cooling. Figure 4 District heat by energy type (renewable energy, waste heat and non-renewable energy) in the WEM projection. shows the historical as well as projected development of district heat from renewable energy sources and waste heat. In 2023, renewable fuels produced 53% and waste heat 14% of the district heat.

Article 24.10 states that a Member State shall not be required to apply paragraphs 2 to 9 of Article 24 if efficient district heating and cooling systems account for more than 90% of total district heating and cooling sales. According to current calculations, this will be the case in Finland, and therefore Finland will be obliged to implement only paragraph 1 of Article 24. However, Finland still has to assess carefully whether the Energy Efficiency Directive recast will have an impact on this. Finland considers the aim of increasing the share of renewable and waste heat in district heating to be important and devises measures to this end. In addition, district heating companies are actively seeking opportunities to reduce their use of fossil fuels.

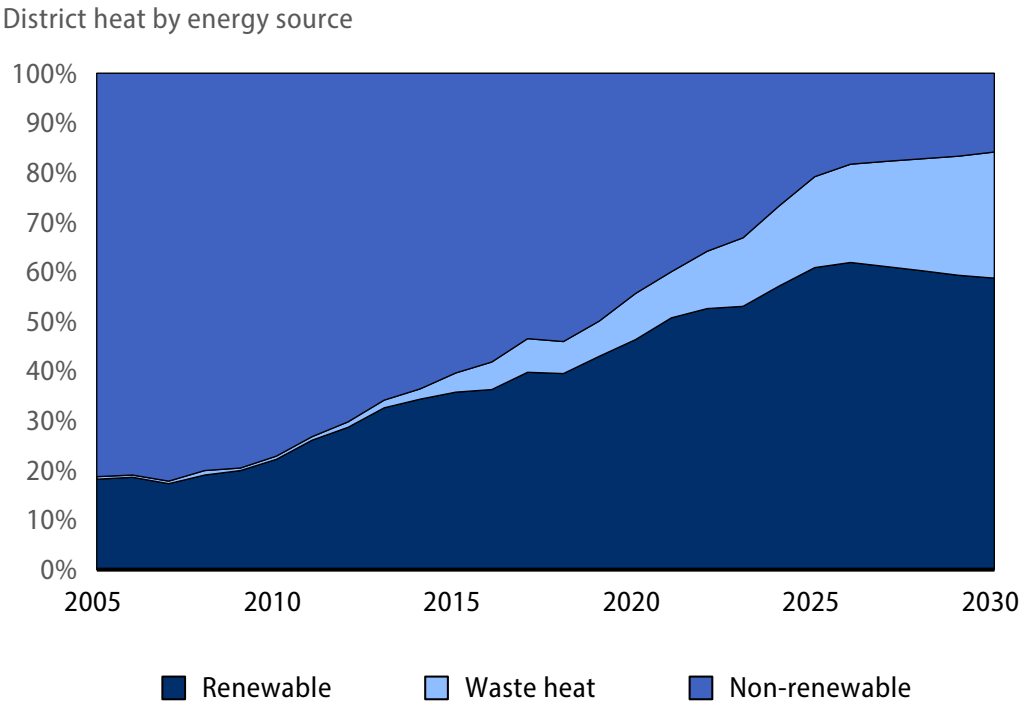
A renewable distribution obligation has been introduced for light fuel oil used for space heating. The obligation for bioliquids will increase to 10% share in 2030. No other sector-specific targets exist for heating and cooling from renewable energy.

The 2019–2023 Government Programme set a target of phasing out fossil fuel oil in space heating by the beginning of the 2030s. Financial support is available for moving away from oil to clean energy in heating in the 2020s.

Since December 2021, based on the amended Land Use and Building Act (132/1999), it has been required that at least 38% of the commercial energy used in buildings come from renewable sources. This minimum requirement for renewable energy applies to new buildings and existing buildings that are subject to major renovation. The share of renewable energy is determined from the calculated delivered energy of the building. The requirement level for renewable energy will be updated in connection with the implementation of the EPBD.

Together with the measures that already exist, Finland will increase the share of renewable energy and waste heat in the heating and cooling sector in line with Article 23 in RED II.

Figure 4. District heat by energy type (renewable energy, waste heat and non-renewable energy) in the WEM projection.



Section 3.1.2 discusses energy communities in more detail.

2.2 Dimension energy efficiency

i. The elements set out in point (b) of Article 4 of EED

1. *The indicative national energy efficiency contribution in Article 4 of EED*

Calculation of the indicative national energy efficiency contribution of the FEC 2030 figure for Finland, using the formula in Annex I to the EED recast, gives a result of 20.60 Mtoe (239.6 TWh). Calculation of the indicative national energy efficiency contribution of PEC 2030 for Finland, using the formula in Annex I to the EED recast, gives a result of 29.78 Mtoe (346.3 TWh). The assessment and preparation of the implementation of the EED recast is ongoing. Finland's national energy and climate strategy will be completed in spring 2025. The exact values of FEC and PEC in 2030, as well as the information on the measures and the impacts, will be defined in connection with preparation of the strategy.

2. *The cumulative energy saving obligation in Article 8 of EED*

Finland's national cumulative energy saving obligation in accordance with Article 7 of the EED (2018) was 49 TWh_{cum} for the period 2014–2020 and the total cumulative energy savings achieved 91.1 TWh_{cum}. The annual final energy consumption, as defined in Article 2(6) of the EED (2023) and averaged over the period 2016–2018 is 296 TWh. Finland's new cumulative energy savings target for the period 2021–2030, based on this average and on stepwise increasing target levels of Article 8(1), is 187.5 TWh_{cum}.

Table 8 lists alternative energy efficiency policy measures that, it is estimated, will result in total cumulative savings of 199 TWh_{cum} during the period 2021–2030, including the 10% surplus from cumulative end-use energy savings achieved in the period 2014–2020.

Table 8. Alternative energy efficiency policy measures 2021–2030.

Nr	Alternative Policy Measures
1	Energy Efficiency Agreements
2	Energy Efficiency Agreements/Customer Advice Services
3	Heat pumps for detached and terraced houses
4	Energy grant for residential buildings in 2021–2023
5	Renovation Construction Regulations
6	Transport fuel taxation/Car traffic
7	Down a Degree – campaign
8	Tax exemption for fully electric cars
9	Subsidised Energy Audit Programme
10	Energy efficiency measures in agriculture Sector
11	Mass and measure modifications in truck transport

3. *Target on reducing the total final energy consumption of public bodies EED Art. 5(5)*

In Finland, the amount of energy consumption reduction to be achieved by all public bodies is 139 GWh per year. The amount is disaggregated by energy consumption in buildings, 108.3 GWh, energy consumption in processes, 15.7 GWh, and energy consumption in mobility services, 14.9 GWh. Finland excludes public transport and the armed forces from the obligation and the baseline. However, Finland still counts the energy consumption reduction of public transport in fulfilment of the obligation, as allowed by Article 5(1). During the transitional period 2023–2027, consumption data are based on statistics maintained by authorities.

The measures that Finland plans to adopt for the purpose of achieving these reductions are presented in the National Energy and Climate Strategy and the Medium-term Climate Change Policy Plan. Related to energy consumption in buildings, the measures are also considered in the Long-Term Renovation Strategy LTRS.

4. *Requirement to ensure the exemplary role of public bodies' buildings EED 6(6)*

In accordance with Article 6(6), Finland notified the Commission in December 2023 about the alternative approach. The projected energy savings to be achieved by 31 December 2030 were stated as 330.8 GWh. Finland notes that the notification was made conditionally, which means that Finland reserves the right to decide to apply the 3% renovation obligation rather than the alternative approach of Article 6(6). Finland will report the chosen mechanism in accordance with Article 36 by 10 October 2025.

In compliance with Article 5 of the EED (2012/27/EU), Finland has opted for the alternative approach for the period 2021–2030. Finland is continuing the implementation of the alternative approach with the Energy Efficiency Agreement Scheme, and the ongoing agreement period will last until 2025. Negotiations for the new period of energy efficiency agreements in 2026–2035 have started. Finland's understanding is that implementation of the alternative approach of Article 6(6) could be feasible, and that the necessary level of savings would be achieved by the Energy Efficiency Agreements Scheme.

Energy Efficiency Working Group 2023

In May 2023, the Ministry of Economic Affairs and Employment appointed an Energy Efficiency Working Group 2023, consisting of representatives from several ministries, to prepare the national implementation of the Energy Efficiency Directive recast. The group also prepares the necessary legislation.

ii. The indicative milestones for 2030, 2040 and 2050, the domestically established measurable progress indicators and their contributions to the Union's energy efficiency targets as included in the roadmaps set out in the long-term renovation strategies for the national stock of residential and non-residential buildings, both public and private, in accordance with Article 2a of Directive 2010/31/EU

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

Energy efficiency in the transport sector

According to the updated energy efficiency directive, total energy consumption in Finland must be reduced. This goal also applies to the transport sector.

The national implementation of the energy efficiency directive is still in progress in Finland. The work will be completed by the end of 2024.

The objectives and measures for improving the energy efficiency of transport have been included in the Roadmap to Fossil-free Transport (2021), the Medium-term Climate Change Policy Plan (2022) and the National Climate and Energy Strategy (2022). These measures concern improving the energy efficiency of both vehicles and the entire transport system. Improving the energy efficiency of vehicles reduces vehicle-specific consumption and greenhouse gas emissions, while improving the energy efficiency of the transport system reduces total mileage and, consequently, fuel consumption and greenhouse gas emissions across the transport sector.

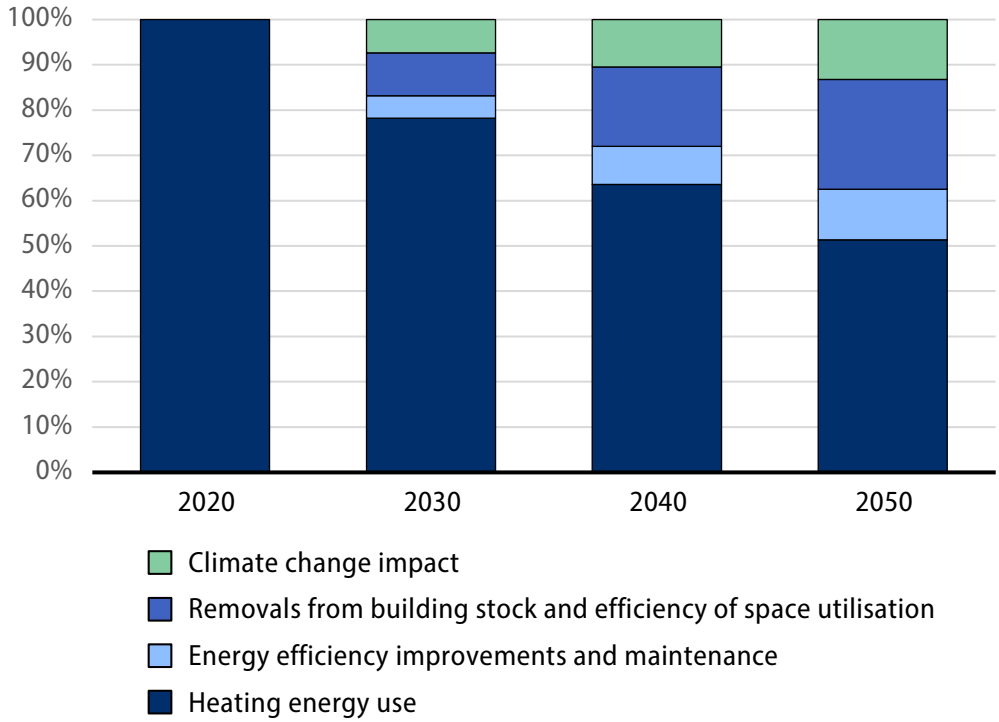
Long-term Renovation Strategy

The Finnish long-term renovation strategy aims at decarbonising the current building stock by 2050. The strategy includes the 2020 building stock description as well as initial targets for 2030, 2040 and 2050 regarding the heating consumption in buildings and the related greenhouse gas emissions. The targets take into consideration the existing policy measures as well as additional policy measures required to decarbonise the Finnish building stock (phasing out oil heating and fossil fuels in district heating production as well as renovation subsidies). The strategy also includes the tracking of energy efficiency levels of the Finnish building stock now and in the future. The building types included in the strategy are detached buildings, terraced houses, residential apartment blocks and service buildings.

The long-term renovation strategy sets a reference of the heating energy use of the Finnish building stock in 2020 at about 71 TWh, of which purchased energy is 65 TWh. In recent years, heat pumps have become more common in both existing and new buildings: in 2020, they provided about 6.4 TWh of space heating. In 2021, the Finnish building stock used about 80 TWh for heating (2021 was colder than 2020), of which heat pumps provided 8.1 TWh.

The initial target levels for heating energy use of buildings are 56 TWh in 2030, 45 TWh in 2040 and 36 TWh in 2050, including the energy harvested by heat pumps. This corresponds to an energy saving of 22% in 2030, 36% in 2040 and 49% in 2050 from the baseline year 2020. Energy savings from heating energy in buildings come from three main sources: climate change, energy efficiency improvements and maintenance, and removals from the building stock and efficiency of space utilisation. Figure 5 shows the total heating energy savings compared to the baseline year 2020, allocated to these three sources of energy savings.

Figure 5. The total heating energy use and saving in the 2020 building stock compared to the energy use in the base year 2020 (heating energy use of 2020=100%).

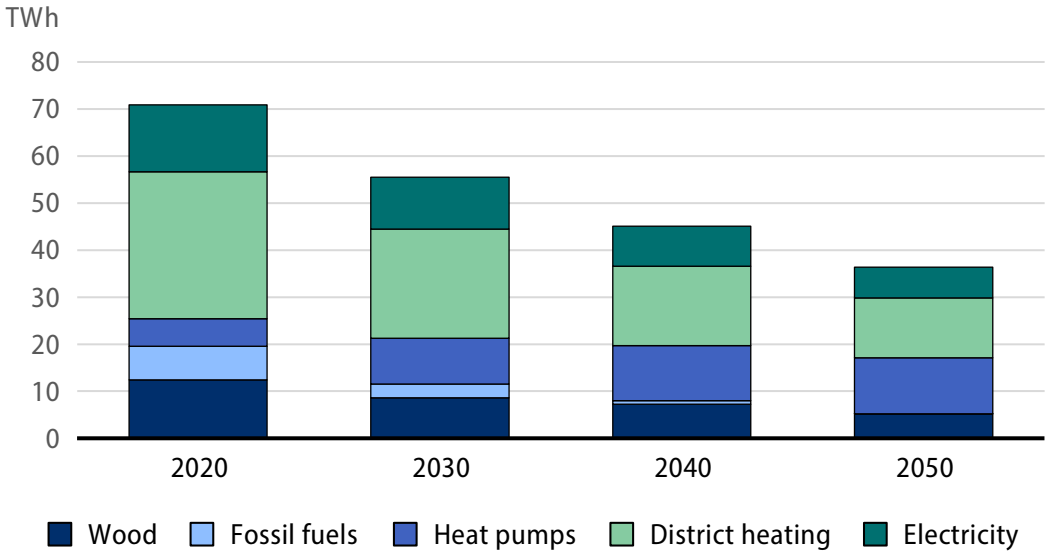


In the long-term strategy, the greenhouse gas emissions of the building stock in 2020 are 7.8 Mt CO_2 eq. The corresponding emissions are 2.9 Mt CO_2 eq. for 2030, 1.5 Mt CO_2 eq. for 2040 and 0.7 Mt CO_2 eq. for 2050. This equals total emissions reductions from the baseline year 2020 of 63% in 2030, 81% in 2040 and 92% in 2050.

Four factors explain the emissions reductions in building energy use: energy efficiency improvements and maintenance, which include the energy efficiency improvements in renovations as well as improved building maintenance and automation practices; decarbonisation of heating at the building level, which includes changes in heating sources (removal of oil-fired heating boilers and installation of heat pumps); removals from building stock and efficiency of space utilisation; and finally decarbonisation of centralised energy production (district heating and electricity).

The impacts of decarbonisation policies on energy use vary by energy source. The largest decrease is in fossil fuel use (almost entirely heating oil), and the largest increase is in heat pump use. Figure 6 shows the impacts of the decarbonisation policies on the use of different heating energy sources.

Figure 6. Heating energy sources of the remaining 2020 building stock in 2020–2050 (TWh).



No need for a quick update has been detected and the goals for 2030, 2040 and 2050 will be updated when the national building renovation plan is drawn up.

2.3 Dimension energy security

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

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

The Government Decision on the Targets of Security of Supply (1048/2018) states that the security of energy supply must be based on diverse energy sources and fuels, sufficient and decentralised energy production and reliable transmission and supply systems. The security of energy supply is based on energy markets that function well, a clear long-term energy policy that encourages investments, and energy efficiency. The Decision is being revised to take into the crises of recent years and new threats. The new Decision is planned to enter into force in 2024.

The Government Decision, which concerns Finland's preparedness for disruptions in the availability of energy and to meet the commitments under international agreements, requires the National Emergency Supply Agency to hold imported fuels in (privately and) state-owned reserves, to last for five months. The implementation of this obligation is constantly monitored and, as necessary, the quantities, qualities and locations of imported fuels are changed to align to the situation prevailing at any given time.

The Government Decision on the targets of security of supply also states that the use of biomass and peat in combined power and heat generation must be secured. Domestic solid fuels play a key role in heat production during the transition period before switching to a new energy system.

International cooperation is constantly developing and intensifying. Recently, there has been significant development in cooperation with the EU, the IEA, the Nordic countries and NATO. In the Nordic countries, Finland has security of supply agreements with Sweden and Norway. The relationships with the security of supply authorities in Estonia have also been strengthened. Together with the Ministry for Foreign Affairs, the National Emergency Supply Agency has invested in the personnel resources for international cooperation in the field of security of supply.

NATO sets certain requirements for preparedness in the energy sector. In general, the Finnish preparedness approach is highly appreciated within NATO. Finland complies well with the NATO baseline requirements for energy.

According to the Finnish Energy Authority,[20] the total installed power generation capacity in Finland was estimated at 21,600 MW at the end of 2023. However, the entire capacity is not available during the peak load periods. The Energy Authority estimated in autumn 2023 that 12,800 MW of Finnish electricity generation capacity (only market-based capacity) was available for the consumption peaks in winter 2023–2024. This is due to the unavailability of thermal power plants and the unpredictable nature of wind power. Consumption peaks occur during the winter months and they are highly affected by outdoor temperatures and the length of cold spells.

Table 9 below shows the highest hourly electricity demand per year for 2018–2024, the actual electricity generation during the peak demand hour and the highest hourly generation per year for 2018–2024. The record peak consumption of 15,105 MW was in January 2016. During last winter (2023–2024), the highest hourly load was 14,993 MWh/h. The demand peak is closely related to the weather conditions. In winter 2022–2023, electricity customers' measures to save energy significantly reduced electricity demand, especially during the peak hours, and in winter 2023–2024 the new Olkiluoto 3 power plant was already in operation.

Table 9. The peak hourly electricity consumption in Finland 2018–2024.

Winter season	2018–2019	2019–2020	2020–2021	2021–2022	2022–2023	2023–2024
Peak demand (MWh/h)	14,542	12,388	14,267	14,175	12,192	14,993
Generation during peak demand (MWh/h)	10,978	9,849	11,191	10,169	11,240	12,112
Highest annual generation (MWh/h)	11,195	10,264	11,409	11,704	13,122	14,246

Source: Finnish Energy Authority[21]

20 https://energiavirasto.fi/documents/11120570/13026619/S%C3%A4hk%C3%B-6n+toimitusvarmuus+vuonna+2023.pdf/74a1194f-91cb-d28b-06bb-d5df-663b06e1/S%C3%A4hk%C3%B6n+toimitusvarmuus+vuonna+2023.pdf?t=1701326930016

21 Fingrid Sähköjärjestelmän toiminta talvella 2023–2024, https://www.fingrid.fi/ajankohtaista/tiedotteet/2024/yhteenveto-sahkojarjestelman-toiminnasta-talvella-20232024/

Since May 2022, Finland has not imported electricity from Russia.

The floating LNG terminal (FSRU) in Inkoo started its commercial operations in January 2023. The objective of the terminal is to open a new supply route for natural gas from the international LNG market. The LNG terminal will help Finland permanently phase out its dependency on Russian gas. The vessel has an annual regasification capacity of 40 TWh, which far exceeds Finland's annual need for natural gas. The LNG terminal also enables gas deliveries to the Baltic States and even to Poland through the Balticconnector pipeline.

In October 2022, a small-scale LNG terminal in Hamina was connected to the Finnish gas system and started its commercial operations. The injection capacity of the Hamina LNG terminal is 6 GWh/d.

Gas consumption in Finland has plummeted as a market-based response to high gas prices since 2021. In 2022, the annual gas consumption was roughly half the level of consumption in 2021. In 2023, gas consumption appears to be even lower than in 2022, thanks to fuel switching and energy saving. Daily gas consumption data is available on the website of Gasgrid Finland, the gas TSO.[22]

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

National targets to reduce greenhouse gas emissions by replacing fossil fuels are closely related to energy self-sufficiency targets. The policy also includes the decision to ban the use of coal in energy production by May 2029.

In addition, the opening of the gas market from the beginning of 2020, the construction of the Balticconnector gas pipeline and the related objective of creating a regional gas market comprising Finland and the Baltic States were at the time aimed at reducing the dependency on natural gas imported from Russia.

In addition to the EU's common objectives, Finland has so far not set a separate official national target to phase out Russian gas. As a result of several factual events and decisions, Finland has been decoupled from the use of Russian pipeline gas since May 2022, while small volumes of LNG of Russian origin may have been

22 https://gasgrid.fi/en/gas-market/market-information/

imported since then. However, Finland is going to introduce an act that would forbid all imports of Russian gas for a fixed period and thus cut off the supply of the remaining LNG.

The pipeline gas imports from Russia were completely stopped in May 2022 by the Russian exporter Gazprom. Gazprom cut off the gas flow to Finland due to Gasum's decision not to pay pipeline gas supplies in roubles. Later, the Finnish and Russian gas systems were physically disconnected by the Finnish gas TSO Gasgrid Finland.

On 7 May 2022, the Cabinet Committee on Economic Policy decided on measures to lease a large-scale floating LNG terminal in cooperation with Estonia. The rental of a floating LNG terminal aimed at enabling Finland to detach itself from dependence on Russian pipeline gas. The final political decisions and the commercial agreements were completed in spring and summer 2022. The floating LNG terminal in Inkoo started its commercial operations in January 2023.

In October 2022, a small-scale LNG terminal in Hamina was connected to the Finnish gas system and started its commercial operations. The injection capacity of the Hamina LNG terminal is 6 GWh/d.

In January 2023, Gasgrid Finland also expanded the capacity of the Finnish gas system in Inkoo, enabling a supply of gas corresponding to Finland's peak consumption from the western direction.

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

As of June 2023, the national legislation sets a quota obligation to increase the share of renewable fuels to 34% of fuels used in road transport and to replace 10% of light fuel oil use with bioliquids by 2030. At the moment, the domestic production of renewable fuels exceeds the demand. It is expected that, with the current production capacity and announced investments, the production capacity will cover the majority of the higher levels of the distribution obligation. The raw materials for biofuels and bioliquids mainly include wastes and residues from forest and other industries and, in addition to domestic sources, are imported. Finland has also promoted biogas for transportation. The raw material for biogas is almost totally domestic and thus the increase in biogas use for transportation will also increase the share of domestic sources. In addition, RFNBO-fuels will most likely be based on domestic production.

As for the transport sector, the objective in the Medium-term Climate Change Policy Plan (2022) is to increase the number of electric cars to at least 750,000, the number of electric lorries and buses to at least 8,000 and the number of gas-powered lorries and busses to at least 7,400 by 2030. Most of the gas used in road transport is domestic biogas (approximately 98% in 2022). Domestic energy sources also account for a large share in Finland's electricity production.

Finland has not set specific objectives for the diversification of deliveries from third countries. National objectives mainly concern reducing the dependency on imports from third countries (see the next section). Regarding imported fuels, the oil and coal markets are global, so it is possible to switch supply sources even within a short period of time. To prepare for possible supply disruptions, compulsory stockpiles related to the security of supply of oil products and coal are held. As regards natural gas, the completed LNG terminals in Inkoo and Hamina, as well as two off-grid LNG terminals in Pori and Tornio, plus the Balticconnector gas pipeline, enable a decentralised supply of gas. In addition, since May 2022 Finland has not imported electricity from Russia.

Decentralised electricity and heat production based on renewable energy will be promoted. An effort will be made to increase decentralised small-scale production, mainly on market terms and through economic incentives through the electricity markets and taxation. The interest of citizens, companies and the public sector in utilising renewable sources in the energy solutions for individual buildings will be encouraged through guidance with information and local reference sites.

Finland has been at the forefront of promoting real-time price signals for electricity consumers. As required by legislation, smart electricity meters were effectively installed for all customers as early as in 2013. All customers have the option of choosing an electricity contract with dynamic pricing. According to information from the Energy Authority, 14% of retail customers had a dynamic electricity price contract at the end of 2022.[23]

Consumer protection and competitiveness in the retail sector are reflected in measures aimed at curbing hefty single price increases, such as the legislation restricting annual increases of electricity transmission charges. During the energy crisis, Finland carried out several measures to alleviate the very high electricity prices for consumers.

23 https://energiavirasto.fi/en/-/national-report-on-electricity-and-natural-gas-markets-in-2022

The role of flexibility and demand response was further emphasised in the National Climate and Energy Strategy. Based on the strategy, the Ministry of Economic Affairs and Employment tasked a large working group (the Smart Grid Working Group) with finding ways to promote further customer participation in the electricity markets and resource adequacy in 2016. The working group completed its work in October 2018 and gave concrete proposals on how to improve the situation.[24] The Ministry of Economic Affairs and Employment has been implementing these proposals in parallel with the Clean Energy Package implementation.

Pursuant to Regulation (EU) No 2022/1032 of the European Parliament and of the Council, Finland is obliged to ensure that, by 1 November, national market actors have arrangements with underground gas storage operators, or with other market actors located in Member States with underground gas storage, to ensure an annual gas storage volume of at least 15% of Finland's average annual gas consumption over the previous five years. From 20 February 2023, the Act on Obligation Storage of Import Fuels is supplemented with a fixed-term obligation on market participants under Regulation (EU) No 2022/1032 to ensure gas storage arrangements. The additional storage obligation will apply from 2023 to 2025.

In accordance with Council Regulation No 2022/1854 on an emergency intervention to address high energy prices, the Member States had to determine the peak electricity consumption hours in the winter season and implement measures to reduce electricity consumption during these hours by at least 5% (Article 4). In Finland, the peak consumption times were determined to be between 8–10 a.m. and 5–8 p.m. on weekdays, and the main measure was an energy saving campaign and counselling. Electricity consumption during peak hours decreased by 8.3% compared to a situation in which electricity saving measures were not implemented. Compared to the average of the reference period (Article 3), monthly gross electricity consumption declined as follows:

- November 2022: 731,812 MWh (a decline of 9.95%)
- December 2022: 638,071 MWh (8.00%)
- January 2023: 992,478 MWh (11.86%)
- February 2023: 1,052,214 MWh (13.80%)
- March 2023: 588,405 MWh (7.46%)

24 Flexible and customer-centred electricity system; Final report of the Smart Grid Working Group 2018 http://urn.fi/URN:ISBN:978-952-327-352-8

Nordic cooperation in the field of energy security

Nordic cooperation on energy security is extensive. In 2023, the Nordic Council of Ministers (the official body for intergovernmental cooperation in the Nordic region) published a report with the title The Nordic Energy Trilemma – Security of Supply, Prices and Just Transition,[25] which reviews the factors that drove the most severe energy crisis in recent memory, with an emphasis on electricity markets, the preparedness of the Nordic countries, and how they responded. The report identifies risks to the Nordic energy transition and assesses current measures to mitigate them. Where no such measures exist, it proposes actions to address the gaps. The recommendations herein define national, Nordic and international actions to increase energy security and emergency preparedness, such that our societies are ready for the energy crises of the future.

2.4 Dimension internal energy market

2.4.1 Electricity interconnectivity

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

> ***(1) Price differential in the wholesale market exceeding an indicative threshold of EUR 2 /MWh between Member States, regions or bidding zones;***
>
> ***(2) Nominal transmission capacity of interconnectors below 30% of peak load;***
>
> ***(3) Nominal transmission capacity of interconnectors below 30% of installed renewable generation.***
>
> ***Each new interconnector shall be subject to a socioeconomic and environmental cost-benefit analysis and implemented only if the potential benefits outweigh the costs***

25 https://www.nordicenergy.org/publications/the-nordic-energy-trilemma-security-of-supply-prices-and-just-transition/

The level of electricity interconnectivity is defined as the commercial transmission capacity to neighbouring EU countries, excluding connections to third countries, divided by the installed power plant capacity. Finland's electricity target for 2030 is to keep the level of interconnectivity above 15%.

According to estimates for 2023, the installed power plant capacity in Finland is about 21,600 MW and commercial transmission connections, excluding connections to Russia, are about 3,400 MW. Therefore in spring 2024, the level of interconnectivity stands at 16%. The peak load in Finland has varied between 12,400 and 15,100 MW in the period 2016–2024.[26] The current total transmission capacity to neighbouring EU countries is thus 23%–27% of the historical peak load. Notably, electricity trade between Finland and Russia has been suspended since May 2022.

Fingrid Oyj (the Finnish transmission system operator) and Svenska Kraftnät (the Swedish transmission system operator) are constructing a 400 kV alternating current connection of 800 MW between northern Finland and northern Sweden, to be completed by the end of 2025. The project is called the Aurora Line. The project has received EUR 127 million in EU PCI funding. The project has shown strong socioeconomic benefits in both countries, especially in Finland.[27] With the Aurora Line, commercial transmission connections to neighbouring EU countries in 2025 will be 4,200 MW and the installed power plant capacity around 21,000 MW. This equals an interconnectivity level of 20%. The predicted peak load in 2025 is around 15,700 MW.[28] Thus, the transmission capacity is predicted to be approximately 27% of the peak load in 2025.

The Finnish Government is fully committed to the delivery of the Aurora Line project between Finland and Sweden. Swift project delivery is a key target for developing the regional electricity markets. The importance of the project has also been acknowledged in the National Climate and Energy Strategy for 2030.

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26 https://energiavirasto.fi/documents/11120570/13026619/S%C3%A4hk%C3%B6n+toimitusvarmuus+vuonna+2023.pdf/74a1194f-91cb-d28b-06bb-d5df-663b06e1/S%C3%A4hk%C3%B6n+toimitusvarmuus+vuonna+2023.pdf?t=1701326930016

27 For more information, see ENTSO-E 10-year network development plan 2018, https://tyndp.entsoe.eu/tyndp2018/projects/projects/111#cba-results

28 https://tem.fi/documents/1410877/2132100/S%C3%A4hk%C3%B6ntuotannon+skenaariolaskelmat+vuoteen+2050+%E2%80%93+selvitys+22.2.2019/8d83651e-9f66-07e5-4755-a2cb70585262/S%C3%A4hk%C3%B6ntuotannon+skenaariolaskelmat+vuoteen+2050+%E2%80%93+selvitys+22.2.2019.pdf

The EU's aim is to bring the level of interconnection in the Member States to at least 15% by 2030. Finland's interconnection capacity will exceed these targets.

The electricity price difference between Finland and the Nordic electricity market has fluctuated in recent years. The price differences declined to very low levels in 2018–2019, but have increased somewhat since then, reflecting the developments in broader European electricity markets. The significant increase in domestic generation capacity in 2023 reduced the price difference relative to Sweden, as well as relative to the system price

Table 10 shows the price differences between Finland, its neighbouring bidding zones and the Nordic System Price.

Table 10. Yearly average price difference between Finland (FI), Sweden (bidding areas SE1 and SE3), Estonia (EE) and Nordic System Price in EUR/MWh in 2015–2023.

Price difference in EUR/MWh

Year	SE1-FI	SE3-FI	EE-FI	SYS-FI
2023	-16.5	-4.8	34.3	0.0
2022	-95.0	-24.8	38.8	-18.2
2021	-29.9	-6.3	14.4	-10.0
2020	-13.6	-6.8	5.7	-17.1
2019	-6.1	-5.7	1.8	-5.1
2018	-2.6	-2.3	0.3	-2.8
2017	-2.4	-2.0	0.0	-3.8
2016	-3.5	-3.2	0.6	-5.5
2015	-8.5	-7.7	1.4	-8.7

Source: Calculated from the market data by NordPool.

The total installed renewable generation capacity at the end of 2022 was around 11,000 MW in Finland, so the share of nominal transmission capacity to the neighbouring EU countries was 31% of the installed renewable generation.

Altogether, the additional indicators accompanying the interconnection target show that Finland is already very close to, or above, the targeted levels, and will be above the target levels after 2025 when the Aurora Line interconnector between Finland and Sweden is expected to be commissioned.

2.4.2 Energy transmission infrastructure

i. Key electricity and gas transmission infrastructure projects, and, where relevant, modernisation projects, that are necessary for the achievement of objectives and targets under the five dimensions of the Energy Union Strategy

ii. Where applicable, main infrastructure projects envisaged other than Projects of Common Interest (PCIs)

Electricity

Fingrid, the electricity TSO, lists the key transmission infrastructure projects in its current ten-year network development plan for 2024–2033.[29] Overall, it foresees a significant need for transmission grid expansion and has plans to add 3,800 km of 400 kV lines and 2,300 km of 110 kV lines by 2033. The current transmission grid length is around 14,500 km.

By 2033, Fingrid plans to invest around EUR 4 billion in transmission system expansion and maintenance. These plans are closely aligned with Finland's energy and climate goals. Fingrid lists three main challenges for the grid: decreasing generation from co-generation plants in southern Finland; integrating higher shares of generation from nuclear, wind and solar PV; and meeting increased electricity demand resulting from electrification. It therefore plans to build additional transmission lines between the south of Finland (demand centres) and the north and west (the main sites for wind generation and interconnections with Sweden). Beyond 2033, it also has plans to expand interconnections between Finland and Estonia.

29 https://www.fingrid.fi/globalassets/dokumentit/fi/kantaverkko/kantaverkon-kehittaminen/fingrid_kehittamissuunnitelma_syksy23_en.pdf

Gas

As outlined in the NCES and the Roadmap to Fossil-free Transport, the Government is pursuing policies aimed at reducing natural gas consumption in industry, decarbonising gas supply, enhancing regional gas market cooperation, supporting increased gas consumption in transportation and diversifying gas supply sources.

The Government has sought to increase gas supply from alternative sources and intends to maintain a more diversified range of supply sources in the future. Major infrastructure projects to assist in these efforts include the Balticconnector pipeline connecting Finland with Estonia, in use since 2020, and the floating LNG terminal in Inkoo, in commercial use since January 2023. The terminal is connected to the gas transportation system and has the capacity to supply up to four times Finland's annual natural gas consumption. Other infrastructure projects include the three small LNG terminals which were taken into use between 2016 and 2022 (see point 4.5.2).

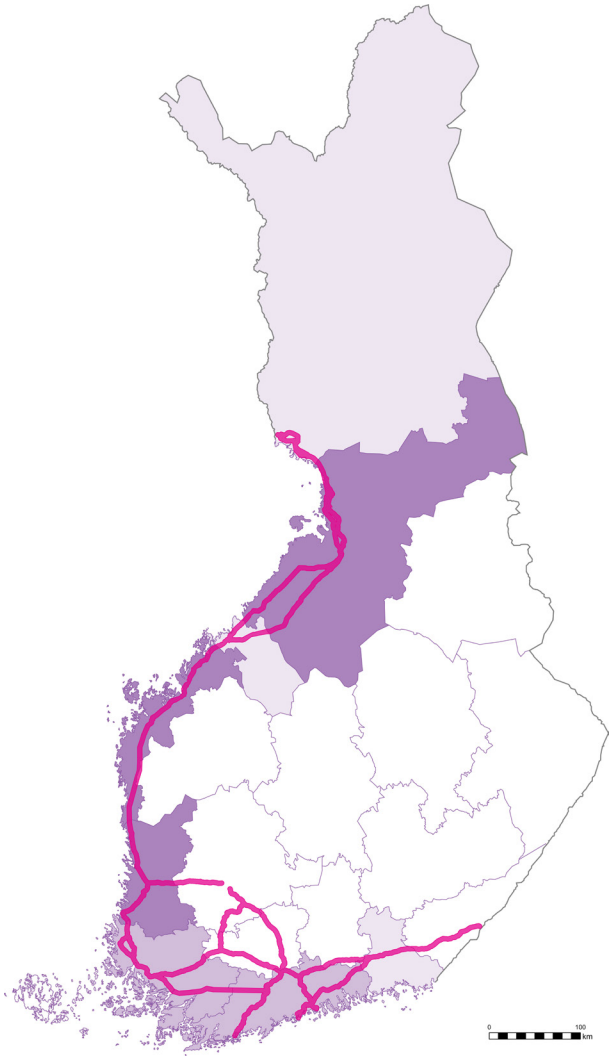
In January 2023, Gasgrid Finland also expanded the capacity of the Finnish gas system in Inkoo, enabling a supply of gas corresponding to Finland's peak consumption from the western direction.

Specifically for hydrogen, the government objective is to make Finland the leader in the European hydrogen value chain by 2030, building on a secure supply of abundant, inexpensive clean electricity and other competitive advantages. This involves a large-scale construction of hydrogen production and transportation capacity and adopting legislation on the hydrogen market. More details are outlined in the February 2023 Government Resolution on Hydrogen.

In June 2022, the Government tasked Gasgrid Finland to develop the transport infrastructure for hydrogen and its gaseous derivatives.

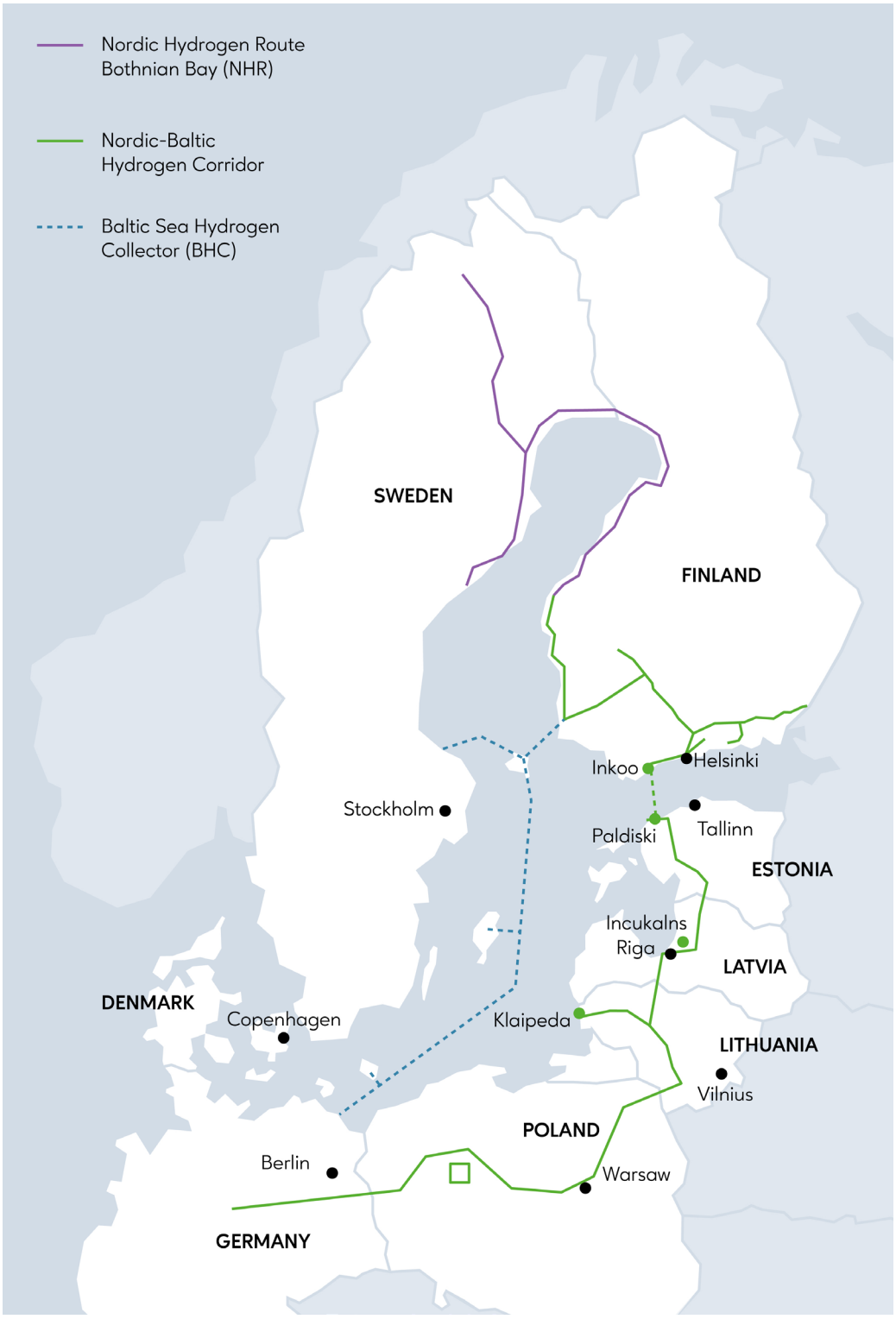
Gasgrid Finland is working to accelerate the development of hydrogen infrastructure in Finland. Gasgrid Finland aims to complete a large national hydrogen infrastructure in the 2030s.

Figure 7. Preliminary alternative hydrogen transmission network route plans, to be specified as the design progresses. (Source: Gasgrid Finland)



Gasgrid Finland is involved in three hydrogen infrastructure projects, which have been given PCI status. The Nordic-Baltic Hydrogen Corridor project is planning hydrogen infrastructure to be built from Finland via Estonia, Latvia, Lithuania and Poland to Germany. The Nordic Hydrogen Route project is exploring hydrogen infrastructure between Finland and Sweden on the coast of the Bay of Bothnia. The Baltic Sea Hydrogen Collector project is developing offshore hydrogen infrastructure that will connect Finland and Sweden to Central Europe. Gasgrid Finland is promoting these hydrogen projects together with eight other gas transmission system operators operating in the Baltic Sea region and two industrial companies.

Figure 8. Gasgrid Finland's hydrogen projects with PCI status. (Source: Gasgrid Finland)



Gasgrid Finland is working alongside Sweden's Nordion Energi to develop the Nordic Hydrogen Route, a cross-border project aimed at building a pipeline network and an open hydrogen market in the Bothnian Bay region by 2030.

The aim of the Nordic Hydrogen Route is to drive decarbonisation and to support regional green industrialisation, economic development and European energy independence. The companies seek to develop a network of 1,000 km of new pipelines that would effectively transport energy from producers to consumers to ensure they have access to an open, reliable and safe hydrogen market. The pipelines would serve 65 TWh of identified potential hydrogen demand in the Bothnian Bay region by 2050. The core route will be along the coastline, with a branch to Kiruna, Sweden.

The Nordic Hydrogen Route investment is estimated at EUR 3.5 billion, offering a hydrogen transportation cost of EUR 0.1–0.2 per kg. It would enable ten-fold investments of around EUR 37 billion in wind power and electrolysis. The pipeline could facilitate emissions savings of up to 20 Mt CO_2 eq. per year by 2050.

2.4.3 Market integration

i. National objectives related to other aspects of the internal energy market such as increasing system flexibility, in particular related to the promotion of competitively determined electricity prices in line with relevant sectoral laws, market integration and coupling, aimed at increasing the tradable capacity of existing interconnectors, smart grids, aggregation, demand response, storage, distributed generation, mechanisms for dispatching, re-dispatching and curtailment, and real-time price signals, including a timeframe for when the objectives shall be met

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 timeframe for when the objectives are to be met

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

Electricity

Effective regional and European electricity markets and sufficiently strong cross-border connections are the most efficient and cost-effective way of guaranteeing competitive electricity prices and security of supply. The objective in accordance with the National Climate and Energy Strategy is therefore to develop Finland's electricity market as part of the regional electricity markets of the Nordic countries and the Baltic States, and more widely as part of the internal electricity market in Europe. A European-wide electricity market with a common set of rules is the best way to ensure competitive electricity prices and security of supply and to provide incentives for flexibility in the electricity system.

The Nordic electricity markets are characterised by a substantial share of hydro capacity accompanied by CHP and other thermal units, and a growing share of wind power generation. The electricity generation portfolios of the Nordic countries complement each other. The dynamics of the electricity market are affected by the new transmission capacity from Norway to Central Europe and the UK, which tends to increase electricity exports to Central Europe and subsequently to raise the Nordic system price. The effect of price fluctuation in the Central European market is also more strongly transmitted to the Finnish electricity market. Wholesale price increases across borders in autumn 2022 proved this point well.

Regarding the wholesale market, the electricity market is already coupled to the Baltic market. The transmission capacity between Finland and Estonia (EstLink 1 & 2) is currently 1,000 MW. The installed net capacity of the Estonian electricity system was around 2,300 MW in 2021, so the connection is very robust. Price levels in the Estonian and Finnish wholesale markets have often greatly converged in recent years (see Section 2.4.1). The Baltic States already represent an integral part of the Nordic electricity market.

The Nordic electricity market has become further integrated with the Central European market, thanks to the recent commissioning of the Nordlink (NO2-DE) and North Sea Link (NO2-UK) connections. Higher connection capacity with Central Europe and the increasing share of intermittent renewable energy, particularly wind energy, requires strengthening of the interconnector capacity within the Nordic market area. The closer market integration with Central Europe is estimated to contribute to higher price volatility during the winter months in Finland, given the high prices of fuels and emissions allowances.

Gas

Until 2020, Finland was exempt from EU rules on unbundling and third-party access in the gas sector (Directive 2009/73/EC) due to the isolated nature of the Finnish gas market. As a result, the gas market was essentially closed to competition and fully controlled by the state-owned company, Gasum, which acted as the TSO and was the only importer and wholesale supplier.

However, in January 2020, upon the commissioning of the Balticconnector pipeline that links Estonia and Finland, the Finnish gas sector became subject to EU legislation on gas market competition, and the exemptions to the Gas Directive in the Natural Gas Market Act were abolished. Price regulation of piped gas was dropped and gas marketplaces and internal market rules were introduced.

In line with the Gas Directive, the Natural Gas Market Act legislated the separation of gas transmission and sales activities, resulting in the creation of the new TSO, Gasgrid Finland, which was unbundled from Gasum. Gasgrid Finland remains fully state-owned. The Natural Gas Market Act also legislated open access to the natural gas transmission and distribution networks, as well as to Finland's LNG terminals.

In January 2020, Finland also joined a common regional gas market area with Estonia and Latvia (the FinEstLat gas market area). The merger of FinEstLat means the linking of the Finnish, Estonian and Latvian markets, the removal of internal tariffs in the region and the setting of entry tariffs in the region at the same level. The results of the operation of FinEstLat single entry tariff zone have been very positive. The final objective is to create a regional gas market comprising Finland and the three Baltic States, including Lithuania.

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

Finland has defined a national target for the reliability standard as 2.1 hours of loss of load expectation in accordance with Article 25 of Regulation 943/2019.[30] If the markets do not fulfil this target, Energy Authority is tasked with procuring strategic reserve capacity for this purpose.

30 Government decision on reliability standard 17 March 2022, https://valtioneuvosto.fi/delegate/file/103732

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

Finland does not have quantitative objectives to protect energy consumers and to improve the competitiveness of the energy retail market.

The requirements related to consumer protection have been included in the Electricity Market Act (588/2013) and the Natural Gas Market Act (587/2017), currently in force.[31] On 1 February 2019, an amendment came into force regarding a centralised information exchange database called Datahub to provide each party in the electricity retail market with all relevant information on electricity trading. Today, the Datahub stores information on around 3.8 million electricity points of use. Approximately 80 distribution system operators (DSOs) responsible for electricity transmission and 80 electricity suppliers have switched to the Datahub. The system provides secure, fair and up-to-date access to data for all authorised parties. The Datahub enables a more efficient and consistent transfer of data, which is essential for developing the electricity retail market. It is also vital to developing other opportunities, such as services for enabling significantly better demand flexibility, even at an individual consumer level. Datahub is administered by Fingrid Datahub Oy, which is a subsidiary of Fingrid, the TSO.

2.4.4 Energy poverty

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

In Finland, energy poverty is treated as part of social policy. Due to our northern location, it is critical to safeguard the basic needs of households, such as energy supply and adequate indoor temperature.

The definition of vulnerable customers referred in Directive (EU) 2019/944

The definition of vulnerable customers is included in section 19 of the Constitution of Finland, from which the right to social security is derived. According to Section 19 of the Constitution, anyone who is unable to provide the security required for a decent life has the right to essential subsistence and care. The Constitution

31 http://www.finlex.fi/fi/laki/ajantasa/2013/20130588 ; http://www.finlex.fi/fi/laki/ajantasa/2017/20170587

guarantees everyone the right to subsistence during unemployment, illness, incapacity for work and old age, and on the basis of the birth of a child and loss of a custodian. The definition is supplemented by the provision of section 2 of the Act on Social Assistance (1412/1997), according to which everyone has the right to social assistance if he or she is in need of assistance and cannot earn a living through his or her gainful employment, entrepreneurial activity, other benefits securing his or her livelihood, other income or resources, the care or otherwise of the person liable for maintenance towards him or her. The authorities in Finland may use the definition of vulnerable customers in reference to energy poverty and, inter alia, to the prohibition of disconnection of electricity to such customers in critical times.

Energy poverty

Finland does not have a significant number of households suffering from lack of access to essential energy services. This is due to several specific national circumstances. Firstly, the Social Security System provides safeguards for those in need of protection against energy poverty. The report Energy Poverty in Finland (2024) provides comprehensive information on the Social Security System and the other instruments in place to prevent energy poverty.[32]

Secondly, there is a long history of subsidies targeted at new construction of residential buildings for low-income households (the ARA system). The state supports social and affordable housing by providing interest rate subsidies and state guarantees for loans taken to create social and affordable housing, as well as various starting and investment grants for projects. In 2022, the ARA subsidies were EUR 277 million (EUR 183 million in 2019) and its interest subsidy and guarantee loan entitlements totalled EUR 2,335 million (EUR 1,795 million in 2019). In Finland there are also subsidies for renovation for households, and more comprehensively for the elderly, with the aim of lowering overall housing costs. Also, cost-free energy advisory services are available in every region in mainland Finland that help with energy efficiency and give advice on the subsidies.

32 Korvenmaa, L, et al. Energy Poverty in Finland. 2024. Gaia Consulting Ltd. https://energiavirasto.fi/documents/11120570/209788025/Energy+Poverty+in+Finland_report_2024.pdf/abe48e9a-f847-63b9-c6fa-4acae25fa88a/Energy+Poverty+in+Finland_report_2024.pdf?t=1714373079979

Thirdly, there is a principal difference in relation to the drivers that have been identified to be the root causes to energy poverty: inefficient building stock and high energy prices. In Finland the level of energy efficiency in the building stock is high and the level of energy prices, both prior to and after the energy crises, are at the EU average or even lower.

The fourth significant difference is the gross rent or maintenance chart principle covering all housing costs, including heating, in the apartment buildings. Nearly half of Finnish households live in apartment buildings. Thus, it is not possible to live in an apartment without heating. An inability to keep the home adequately warm is therefore irrelevant for the majority of Finnish low-income households. In Finland, the temperature that is considered adequate during the heating season is relatively high (22–23°C), whereas the minimum threshold for healthy indoor air conditions is set to 18°C.[33] It has also been concluded that in Finland there are large differences between occupant self-reported satisfaction and thermal comfort by tenure status, even when the differences in measured parameters are relatively small.[34]

Regardless of the safeguards provided by the Social Assistance System and policy measures targeted at residential buildings, there are households that for various reasons suffer occasionally, e.g. during winter time,[35] or in the longer term from a lack of access to essential energy services. This would identify them, by definition, as a group of energy poor. The safety net for vulnerable households does not cover all situations. The most significant barrier against an individual benefiting from the social security system is lack of information about all the benefits the individual is entitled to and how to apply for these benefits. It is important to improve the sharing of knowledge about social security system benefits that prevent anyone from suffering from a lack of access to essential energy services.

33 https://www.finlex.fi/fi/laki/alkup/2015/20150545

34 The influence of tenure status on housing satisfaction and indoor environmental quality in Finnish apartment buildings, Building and Environment, Volume 89, July 2015

35 https://jukuri.luke.fi/bitstream/handle/10024/554571/Lehtonen_et_al_2024.pdf?sequence=1&isAllowed=y

Number of energy poor and vulnerable households

At this point, the indicator used to estimate the number of households suffering from energy poverty in Finland is the number of non-payment records regarding electricity bills. The pre-crisis level based on Q1–Q2/2022 data was 5,600 per year. The latest number of those with a non-payment record, between Q4/2022 and Q3/2023, was 7,200 persons.[36]

The households who are eligible for the housing allowances (the Housing Allowance for Pensioners or the General Housing Allowance) and/or Social Assistance are viewed as vulnerable households. The total number of households receiving housing allowances was 552,501 in 2023, of which the Housing Allowance for Pensioners 147,839 households (206,975 persons), the General Housing Allowance 404,662 households and Social Assistance 250,493 households. Of the persons that receive Social Assistance, about 85% also receive housing allowances (in November 2023[37]). Taking this overlap into account, the total number of vulnerable households in Finland was 590,075 in 2023. The policy measures to prevent energy poverty are voluntary energy efficiency agreements. In Finland these agreements are in place to fulfil the EU energy efficiency directive requirements. Finland has shown that the voluntary agreements are working and reach the targets. The current agreements are valid until the end of 2025 and negotiations for the future are ongoing. A total of 147 municipalities in Finland have signed the agreement, alongside over 700 companies. The energy consumption of all sectors covered by the agreements accounts for around 60% of Finland's total energy consumption, and the population of the municipalities that have signed up is as high as 82% of Finland's total population. The savings in energy use, 12.5 TWh, are the result of more than 24,500 individual energy efficiency measures and investments in energy efficiency made by the signatories over a six-year period between 2017 and 2022.

Related to vulnerable households, under the Energy Efficiency Agreement for the Property Sector is the Rental Housing Property Action Plan. A total of 40 rental housing companies with 45 locations and nearly 280,000 apartments are signatories to the Action Plan. During the period 2017–2022 there have been more than 3,000 energy efficiency actions in rental houses. These actions have saved

36 Tuorila, Helena. Finnish Competition and Consumer Authority. Means of consumer protection in combating energy poverty. https://www.kkv.fi/blogit/kkv-blogi/kylmia-huon-elampotiloja-ja-maksuvaikeuksia-katsaus-suomalaiseen-energiakoyhyyteen/

37 The Social Insurance Institute of Finland.

231 GWh per year. The investments in energy efficiency amount to EUR 41 million. In addition, the Municipal Sector Energy Efficiency Agreement covers the rental apartments of 9,451 households.

Transport poverty

There is scientific research on transportation poverty in Finland.[38] The academic literature defines transport poverty as a phenomenon that consists of mobility poverty, transport affordability, accessibility poverty and exposure to transport externalities. According to the research, groups that are especially exposed to transport poverty are: 1) low-income households; 2) households without a motorised vehicle; 3) persons too young or old to drive a car; 4) persons with physical or cognitive limitations; 5) minority households; and 6) immigrants.

Transport poverty occurs due to personal features such as needs, resources, attitudes, physical well-being and capabilities, and also due to housing location and choices that are linked with, for example, housing costs, transport costs and distance to workplace and services. Transport poverty has also a strong association with transport services and services near homes. In larger cities, transport poverty is linked to the availability and service level of public transport, whereas in rural areas, car dependency is the major explanatory factor. In Finland, there are various financial aids to support the mobility of people (e.g. income support) and the needs of special groups are considered (e.g. services for the disabled).

However, Finland has not yet assessed the number of households in transport poverty and has not provided the methodology and indicators to identify future recipients of the Social Climate Fund (SCF), considering the distributional effects arising from the future ETS2. Finland intends to use nationally available information (e.g. Data room) and previous research, as well as the Commission's Technical Support Instrument, to identify vulnerable groups and activities suitable for the programme. In addition, the MaaElli-research project is currently deploying surveys and interview-methods on energy and transportation poverty in rural areas. The project will provide policy recommendations on the topic in early 2025.[39] Finland's plan for using the Social Climate Fund will be completed in the summer of 2025.

38 https://research.tuni.fi/uploads/2020/03/807f5072-verne_tutkimusraportti94.pdf

39 https://cris.vtt.fi/en/projects/maaseudun-energia-ja-liikenneköyhyys-ilmiöinä

2.5 Dimension research, innovation and competitiveness

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

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

iii. Where applicable, National objectives with regard to competitiveness

In 2021, Finland set a goal to increase total spending on R&D (public and private) to 4% of GDP by 2030 (compared with 3% of GDP in 2021). Finland is also committed to supporting a target for EU-wide spending on R&D of 3% of EU-wide GDP by 2030 (versus 2.2% in 2018). The R&D Funding Act, which entered into force at the start of 2023, set increasing levels of annual government R&D funding to ensure that government R&D funding reaches 1.2% of GDP by 2030. This is intended to drive an increase in private-sector R&D funding, to reach the 4% goal. The R&D Funding Act does not require specific allocations to energy R&D, but the Government is committed to reaching carbon neutrality by 2035 and sees a major role for R&D in driving the clean energy transition. To complement the R&D Funding Act, a parliamentary working group on R&D and innovation is drafting a long-term plan to set the main guidelines for allocating public R&D funding, but it will not decide on allocations across themes or sectors. A more detailed plan will be prepared during this parliamentary term. There are no national long-term targets for 2040 or 2050.

The energy sector is undergoing a sizeable transformation which involves a huge number of new business opportunities for companies. Constant renewal is expected in the energy sector, which is reflected especially in many system-level developments. The transforming energy system will create new business opportunities while changing existing ones. New, more comprehensive service concepts will be created. R&D&I funding is being allocated to efforts to deal with this transformation and to develop related new business models. For experimentation and development purposes, cooperation networks (ecosystems) are to be established where the parties produce added value in the form of products, services and information in close interaction, both for each other and for

customers outside the ecosystem. Exact programmes and R&D&I funding cannot be given for 2030 and beyond. Government planning consists of one year of budget planning and four years of action and economy planning.

In Finland, digitalisation has constantly been making market-based progress and is an integral part of the existing technology and operating markets. For example, in electricity and district heating consumption, almost all meters are read automatically and the Datahub, the centralised information exchange system for the retail electricity market, was set up in 2022. Some consumers of electricity (mainly the largest) already have smart meters capable of a 15-minute resolution and the rest are expected to receive smart meters with a 15-minute resolution by 2028. In addition to industry and service sectors, an increasing proportion of households (currently 29%) are opting for an electricity contract with dynamic pricing based on the day-ahead market prices, and in all sectors, price-driven consumption control systems are becoming more and more common.

Finland is also active in the SET Plan and is chairing the Bureau, which is composed of active Member States and Association Countries. In the Implementation Working Groups (IWG), Finland is co-chairing three of them and participating in many others. The revamping of the SET Plan during the period 2022–2023 provides an extra push for the Green Deal and transformation of the energy system. Better alignment and integration of clean energy technology promotion and funding at the Member State and EU levels is needed.

EU regional and structural policy programme

Innovation and Skills in Finland 2021–2027 supports innovation, competence development and inclusion in line with sustainable development. The programme supports business, energy, climate and innovation policies with the European Regional Development Fund (ERDF) and the Just Transition Fund (JTF) through development and investment actions. The ERDF and JTF actions enhance research and innovation capacities and the uptake of advanced technologies, promote energy efficiency and the reduction of greenhouse gas emissions, promote climate change adaptation, risk prevention, and disaster prevention and resilience, and promote the transition to a carbon-neutral circular economy.

3 Policies and measures

3.1 Dimension decarbonisation

3.1.1 GHG emissions and removals

i. Policies and measures to achieve the target set under Regulation (EU) 2018/842 as referred in point 2.1.1 of this Section and 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 Union's climate-neutrality objective set out in Article 2(1) of Regulation (EU) 2021/1119

ii. Where relevant, regional cooperation in this area

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

Under the Union's Effort Sharing Regulation, Finland must reduce the sector's emissions by 50% from 2005 to 2030, while the national 2022 Climate Change Act sets the objective of making Finland carbon-neutral by 2035. The current measures are not sufficient to attain these objectives. The 2022 Medium-term Climate Change Policy Plan investigates the actions needed to close the gap and how the emissions of the effort-sharing sector can be reduced to meet the 2030 target and reach carbon-neutrality by 2035. A more detailed description of the measures defined in the 2022 Medium-term Climate Change Policy Plan is provided below.

Transport

In the effort-sharing sector, transport offers the greatest potential for reducing emissions. The goal is to reduce transport emissions by at least half by 2030 compared to 2005 levels. The objectives and measures to reduce traffic emissions in Finland are included in the Roadmap to Fossil-free Transport (2021), the Medium-term Climate Change Policy Plan (2022) and National Climate and Energy Strategy (2022). The Roadmap to Fossil-free Transport is also one of the reforms included in the Finnish Recovery and Resilience Plan (the original plan and the revised plan). Milestones and targets have been set for this reform in the plan and their achievement is linked to the payments from the RRF instrument.

Measures will be focused on road transport where, with existing measures (WEM), emissions could be reduced by approximately 51%, or 6.0 Mt CO_2 eq., by 2030 compared to 2005. In the period 2005–2022, the emissions fell by approximately 2.7 Mt. The emissions reduction measures fall into three categories:

1. *Replacing fossil fuels with alternative transport fuels*
   The main measure in this category is the biofuel distribution obligation (see Section 3.1.2). The current legally binding target is for biofuels to account for 34% of all fuels consumed in road transport in 2030. This would help avoid around 3 million tonnes of CO_2 emissions in 2030. However, Finland has revised the gradually rising distribution obligation several times. From the beginning of 2024, the target is 13.5% instead of 28% as stipulated by the legislation previously in force. The current Government Programme foresees further changes in the period 2025–2027. The potential increase in emissions as well as the possible substitutionary and complementary measures will be assessed in the WAM projection, which will be completed by early 2025.

   Other measures included in this category are the promotion of the infrastructure for electricity and biogas used in transport. In February 2024, the Ministry of Transport and Communications launched work to prepare a national distribution infrastructure plan. The programme will give an up-to-date picture of the state of the distribution of alternative means of transport in all modes of transport. It lists the necessary, feasible actions to promote the development of the market in Finland. The programme will be used in the development of the distribution infrastructure, and the monitoring of such, as well as in the reporting required by the AFIR regulation. The programme will be completed by the end of 2024.

   Regarding the support mechanisms in place, there is a state-funded infrastructure support programme for alternative fuels infrastructure (electricity, biomethane, hydrogen). A total of approximately EUR 35 million was allocated to subsidies for 2022–2023. A total of EUR 10 million has been reserved for 2024. Decisions on further continuation of the programme have not yet been made.

   In Finland, the construction of electric car charging points in housing associations has also been supported since 2018. From the beginning of 2022, subsidies began to be granted not only to housing associations, but also for electric car charging devices installed at workplaces. A total of EUR 32.5 million was allocated to charging subsidies for housing associations and workplaces for 2022–2023. There is no allocation for 2024 for this purpose.

VTT Technical Research Centre of Finland (2020) estimates that, in 2030, public charging infrastructure subsidies could reduce emissions by approximately 0.01–0.02 Mt CO_2 eq. and recharging grants for housing companies and workplaces by approximately 0.02–0.1 Mt CO_2 eq.

2. *Renewal of the car fleet*
   According to the new WEM projection, there will be a total of approximately 925,000 electric cars (BEV + PHEV) and 2400 electric trucks in Finland in 2030. The main measure in this category is the binding CO_2 threshold values applicable to automotive manufacturers at the EU level. The regulation strengthening CO_2 standards for cars and vans was adopted in 2023 and the regulation strengthening CO_2 standards for heavy-duty vehicles (HDVs) in 2024.

   According to an estimate by VTT Technical Research Centre of Finland (in 2021 and 2023), the updated regulation on CO_2 emission performance standards for cars and vans will reduce greenhouse gas emissions from transport by approximately 0.21 Mt CO_2 eq. in 2030 (compared to the previous WEM projection). The updated regulation on CO_2 emission performance standards for heavy-duty vehicles will reduce emissions by approximately 0.127 Mt CO_2 eq. (compared to the previous WEM projection).

   In 2018, Finland introduced a purchase subsidy for battery electric vehicles and a conversion subsidy for converting an old car into an ethanol- or gas-powered car. The purchase subsidy for a battery electric car was EUR 2000. The conversion subsidy for a gas-powered car was EUR 1,000 and the subsidy for an ethanol-powered car was EUR 200. These subsidies expired at the end of 2022. During the period 2018–2022, a total of EUR 37 million have been directed to purchase and conversion subsidies in Finland. In 2024, the Ministry of Transport and Communications prepared a bill according to which it is still possible to apply for conversion subsidies during 2024.

   A subsidy for purchasing gas-powered trucks was introduced in December 2020, and one for purchasing electric trucks and electric and gas-powered vans from the beginning of 2022. The purchase subsidy for a gas-powered truck is EUR 2,000–14,000 per vehicle and a subsidy for an electric truck is EUR 6,000–50,000 per vehicle. The subsidy for an electric van is EUR 2,000–6,000 per vehicle and the subsidy for a gas-powered van is EUR 2,000 per vehicle. During the period 2022–2024, a total of EUR 12 million have been directed to these subsidies.

From the beginning of 2024, it is also possible to apply for a purchase subsidy (EUR 6,000–50,000 per vehicle) for hydrogen-powered trucks.

According to an estimate by VTT Technical Research Centre of Finland (2021), the subsidy for purchasing electric cars will reduce greenhouse gas emissions from transport by approximately 0.019 Mt CO_2 eq. in 2030. Purchase subsidies for electric and gas-powered trucks and vans would reduce emissions by around 0.009 Mt CO_2 eq. in 2030.

Finland also supports the electrification of transport through tax changes. The taxable value of zero-emission and low-emission company cars has been temporarily reduced until the end of 2025. In the spring of 2024, the Government decided to extend this reduction for zero-emission vehicles benefit into 2026–2029 while increasing the daily vehicle tax of battery electric vehicles and plug-in hybrids. The car registration tax on battery electric vehicles was abolished as of 1 January 2022, and this was compensated for by increasing the daily vehicle tax for battery electric vehicles. The total net effect of these tax changes on emissions is probably modest.

In 2027, a new emissions trading system for distributors (ETS2) will start in the EU. According to estimates made in Finland, the new emissions trade will guide consumers towards electric transport and reduce traffic emissions by approximately 0.04–0.4 Mt CO_2 eq. in 2030.

In Finland, the high obligation to distribute renewable fuels also increases fuel prices and thereby reduces traffic emissions. When the distribution obligation is reduced during this government term, this emission reduction effect will decrease.

3. *Improving the energy efficiency of the transport system*
   A measure included in this category is participation in the coordination of transport and land use in urban regions. Another is participation in work concerning transport systems through, for example, agreements on land use, housing and transport (MAL). Other measures to improve the energy efficiency of the transport system include the investment programme for walking and cycling, discretionary government grants for public transport, making use of vehicles with greater sizes and weights in goods transport by road, and comprehensive EU-level emissions trading in road transport.

There is no separate assessment of the emissions reduction impacts of the MAL agreements. According to an estimate by the Finnish Transport and Communications Agency (2020), an investment programme for walking and cycling could reduce emissions by around 0.004 Mt CO_2 eq. per year and public transport subsidies by around 0.008 Mt CO_2 eq. per year. Further, HCT transport could reduce emissions by 0.06 Mt CO_2 eq. in 2030. In addition, the new emissions trading system (ETS2) will probably affect the number of kilometres driven and thereby reduce emissions.

In Finland, the update of the National Transport System Plan (Traffic 12 plan) was launched in autumn 2023. The Traffic 12 plan is a strategic plan for the development of Finland's transport system for 12 years according to the Act on the Transport System and Roads (503/2005). The plan includes an assessment of the current state of the transport system and changes in the operating environment, goals for the national transport system, and measures to achieve the goals of the programme. In addition, the plan includes a state funding programme and an impact assessment of the plan. The updated objectives are functionality, safety and sustainability. The action plan is currently under preparation and the agreements on land use, housing and transport are being negotiated. In the national transport system plan, sustainability will most probably be promoted by maintaining existing structures and networks, and making their use more efficient.

Building-specific heating

Emissions from building-specific heating have been declining in recent years, but annual variation occurs due to, for example, heating needs. The reason for the declining trend in emissions from separate heating is the decrease in oil heating and improvements in the energy efficiency of buildings. The majority of emissions from separate heating derive from oil heating. In 2021, emissions from separate heating amounted to 2.2 Mt CO_2 eq. In 2021, residential buildings accounted for 41% of emissions from building-specific heating, commercial and service buildings for 40% and agriculture for 19%. Emissions from building-specific heating have decreased by 55% from the 2005 level.

In the oil sector, the Government has concluded a heating fuel distribution energy efficiency agreement HÖYLÄ IV, the purpose of which is to improve the energy efficiency of oil-heated buildings and promote renewable forms of energy in oil heating. The agreement covers the period 2017–2025.

Emissions are expected to decrease further as a result of the renewal of the building stock, renovation building and changes in heating systems. The obligation to distribute biofuel oil and the replacement of fossil oil heating with other forms of heating will have a significant impact on reducing emissions.

Greenhouse gas emissions from oil heating of residential buildings amounted to 0.8 Mt CO_2 eq. in 2019. Around 80%–90% of this comes from detached and semi-detached houses. Oil heating accounts for about 40% of all emissions from detached and semi-detached houses. According to the 'Finland in 2019' survey, 133,000 single-family houses used oil boilers in 2019, on average around 2,220 litres of oil per year per house.

According to the Finnish Gas Association, in 2019 Finland had around 4,800 natural gas-fired residential buildings, of which around 4,000 were detached houses and around 750 terraced houses and blocks of flats. The total number of natural gas stoves in the household and service sectors is around 25,400. Around 13,000 households are heated with natural gas, a small fraction of Finland's 2.8 million household-dwelling units. In the service sector, around 1,200 buildings are heated with natural gas.

The phasing out of oil in residential properties will be promoted with the aid introduced. Subsidies for detached houses may be granted for costs arising from the removal and modification of the oil heating system of detached houses in year-round residential use, and replacement with other heating systems. In summer 2022, the subsidy system for detached houses was extended to apply to phasing out natural gas heating.

The subsidy for phasing out oil heating has significantly activated the replacement of heating systems. By June 2023, a total of 28,357 owners of detached houses had applied for aid for switching away from oil heating, of which more than 24,101 had received a favourable decision. A total of 951 owners of detached houses had applied for grants for phasing out gas heating, of which 889 had received a favourable decision. So far, when those who have received a favourable decision implement a heating method change, the estimated impact on annual emissions is approximately 0.14 Mt CO_2 eq.

An alternative form of support for owners of detached houses to renew their heating system is income tax credit for household expenses, including the labour costs of phasing out oil heating. In 2022–2023, the credit was up to EUR 3,500 per person per year, or EUR 7,000 per household with two adults.

Efforts will also be made to reduce emissions from residential buildings by means of energy subsidies for projects that improve energy efficiency. The estimated impact on annual emissions is approximately 0.16 Mt CO_2 eq. The impacts will affect emissions from all residential buildings and not just oil-heated properties. Therefore, some of the emissions reduction impacts will be directed at the emissions trading sector.

The phasing out of oil heating in municipality-owned buildings and the transition to other forms of heating have been accelerated with grants since October 2020. Around 9,300 oil-heated buildings are owned by municipalities and municipal enterprises in Finland, of which around 4,300 are in use and around 5,000 are empty. Even empty buildings often have to be heated. The grant accounts for 30% of the costs approved and incurred in the grant decision. The grant will be increased by 5 percentage points if the municipality has acceded to a Voluntary Energy Efficiency Agreement.

By 2030, the combined impact of the measures in the building-specific sector will be approximately 0.7 Mt CO_2 eq.

Machinery

Emissions from machinery can be reduced by increasing the energy efficiency of machinery or by switching to alternative fuels or power sources. An act to promote the use of biofuel in heating, machinery and stationary engines entered into force on 1 April 2019 (laki biopolttoöljyn käytön edistämisestä 418/2019). The act sets an obligation to distribute light fuel oil with bioliquids so that the share of biofuels will increase from 3% in 2021 towards 10% in 2028.

The Ministry of the Environment and the Association of Finnish Technical Traders have a Green Deal for 2019–2025 on non-road mobile machinery to increase the share of fully electric and low-emission machinery. Through voluntary commitments made under this agreement, those operating in the sector will aim to increase the supply of fully electric and other low-emission non-road mobile machinery and encourage its wider use. The Ministry of the Environment, Senate Properties and the Cities of Espoo, Helsinki, Turku and Vantaa have a voluntary Green Deal for 2020–2030 to reduce emissions at construction sites. As part of the implementation of the voluntary Green Deals, in 2021 Motiva created a training package for non-road mobile machinery with funding and coordination from the Ministry of the Environment. The training package is freely available for operators in the non-road mobile machinery sector and it was further developed and updated in 2022–2023.

The conversion of tractors to use biogas is supported as an environmental investment through agricultural investment subsidies. Subsidies are available for modifications to enable biogas use and for the equipment involved, but not for purchasing the tractor itself. Modifications of diesel engines and accessory purchases to convert tractors and other agricultural machinery to use biogas are eligible for a subsidy as environmental improvement measures. The subsidy covers 35% of eligible costs, including the cost of purchasing and installing new equipment.

There are also continuous efforts to improve the knowledge base of emissions calculations from non-road mobile machinery.

Industrial fuel use

The industry sector in Finland is highly energy intensive. The industry sector energy demand has fluctuated in line with economic activity. Between 2011 and 2022, there has been a progressive decrease in the shares of oil (15% to 10%), coal (9% to 8%) and peat (2% to 1.0%) in the industry sector. At the same time, the share of bioenergy and waste has increased (32% to 44%). Finland is notable for the relatively low use of natural gas, just 5% of industry total final consumption in 2022.

The largest industrial energy-consuming sector in 2022 was pulp and paper, accounting for 57% of industry total final consumption. The other main sectors in terms of energy demand were chemical and petrochemical (16%), iron and steel (14%) and food and tobacco (4%).

In supporting the goal to achieve carbon neutrality by 2035, in 2019 the Government announced its intention to prepare sectoral low-carbon roadmaps for key industrial energy sectors in cooperation with companies and organisations in each sector. The roadmaps are prepared on voluntary bases and present each sectors own vision of their low-carbon path. By 2021, 13 industrial sectors had prepared their roadmap, supported by the Ministry of Economic Affairs and Employment.[40] These roadmaps provide the Government with estimates of anticipated sectoral development, include GHG emissions and energy consumption, and indicate the investment needs of various sectors. The main conclusions from these roadmaps include a recognised need for investments in research and new technologies, including energy and materials efficiency;

40 https://www.climate2035.fi/, http://urn.fi/URN:ISBN:978-952-327-796-0

alternative energy sources (biofuels, hydrogen and electrification); the increased exploitation of waste heat; and the implementation of CCUS. The roadmaps will be updated in 2024.

Finland financially supports the industry sector in decarbonisation. A special Energy Aid grant is available for energy efficiency projects. Finland also introduced a support scheme in 2022 that provides payments to offset increased electricity costs resulting from ETS allowance prices. The payments can cover 25% of ETS-related electricity costs, up to a maximum of EUR 150 million per year. Any company receiving the payments must use at least half of the subsidy for activities to reduce emissions, improve energy efficiency and increase the use of renewables. Industries across most sectors are eligible for the support, but they must demonstrate that they have performed an energy audit or that they are exempt from conducting one and that at least 30% of their energy consumption is electricity produced from carbon-free sources. The investments must be completed by the end of 2028.

The measures for reducing emissions from industrial oil use are the obligation to distribute light fuel oil with bioliquids (10% of the total distribution in energy), promoting the replacement of fuel oil-fired boilers with boilers fired with solid fuel and enhancing energy audit activities.

Energy taxes

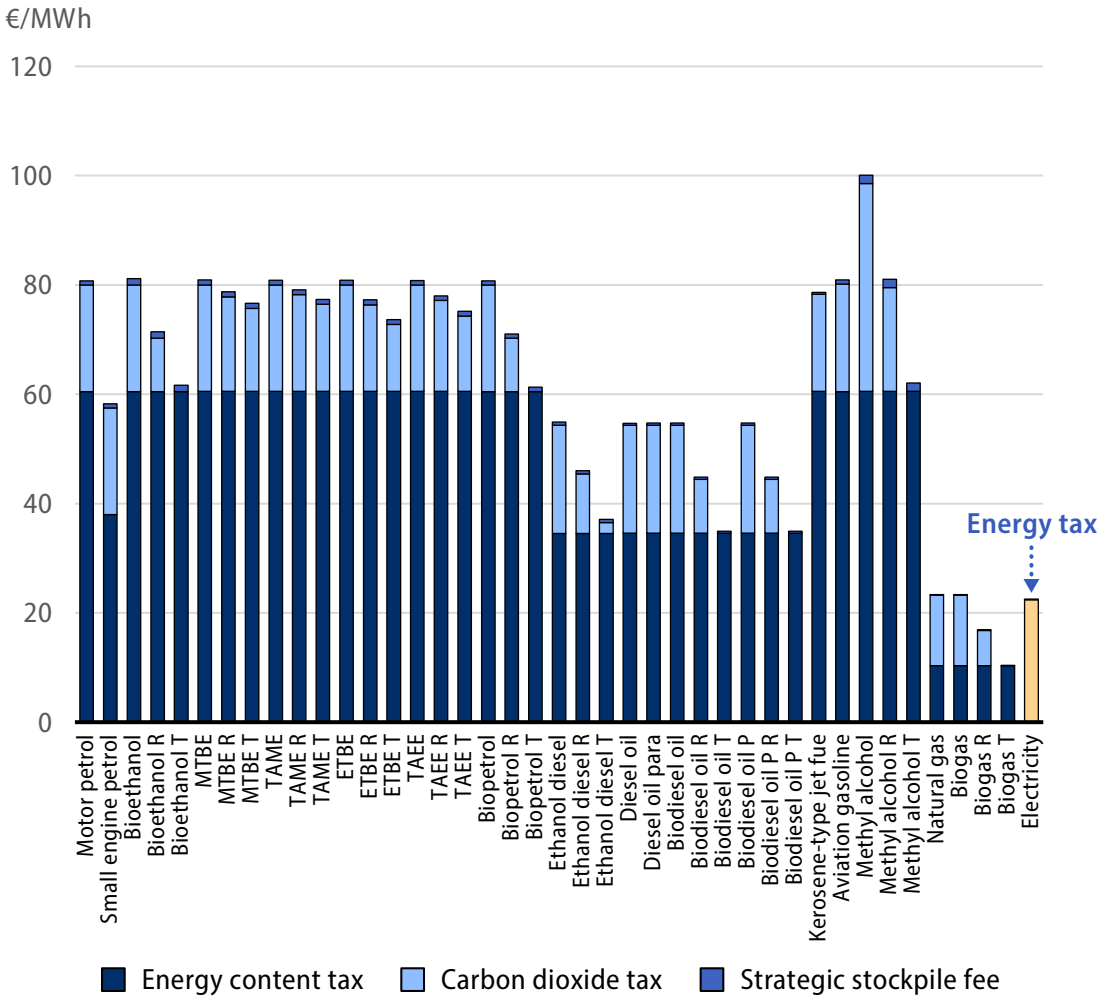
Energy taxation is aimed at mitigating climate change and improving energy efficiency.

The excise duty on energy consists of an energy content tax, a carbon dioxide tax and a strategic stockpile fee. The energy content tax is based on the heat value of the fuel and the carbon dioxide tax on its specific life-cycle carbon dioxide emissions. A strategic stockpile fee is collected on both fossil and bio-based transport fuels in connection with the excise duty. The current energy tax structure for energy used in transportation is illustrated in Figure 9. The energy content tax for gasoline is approximately EUR 60.5 per MWh (the benchmark rate) and the carbon dioxide tax for life-cycle emissions is EUR 62 per tCO_2.[41] For gas oil, the energy content tax is reduced by EUR 25.95 per MWh compared to the benchmark rate. Tax rates for gaseous fuels used in transportation are also lower than the

41 This equals approximately a tax rate of EUR 74–75 per tCO_2 applied to emissions of fuel combusted. The carbon dioxide was reduced from EUR 77 to EUR 62 per tCO_2 from the beginning of 2024.

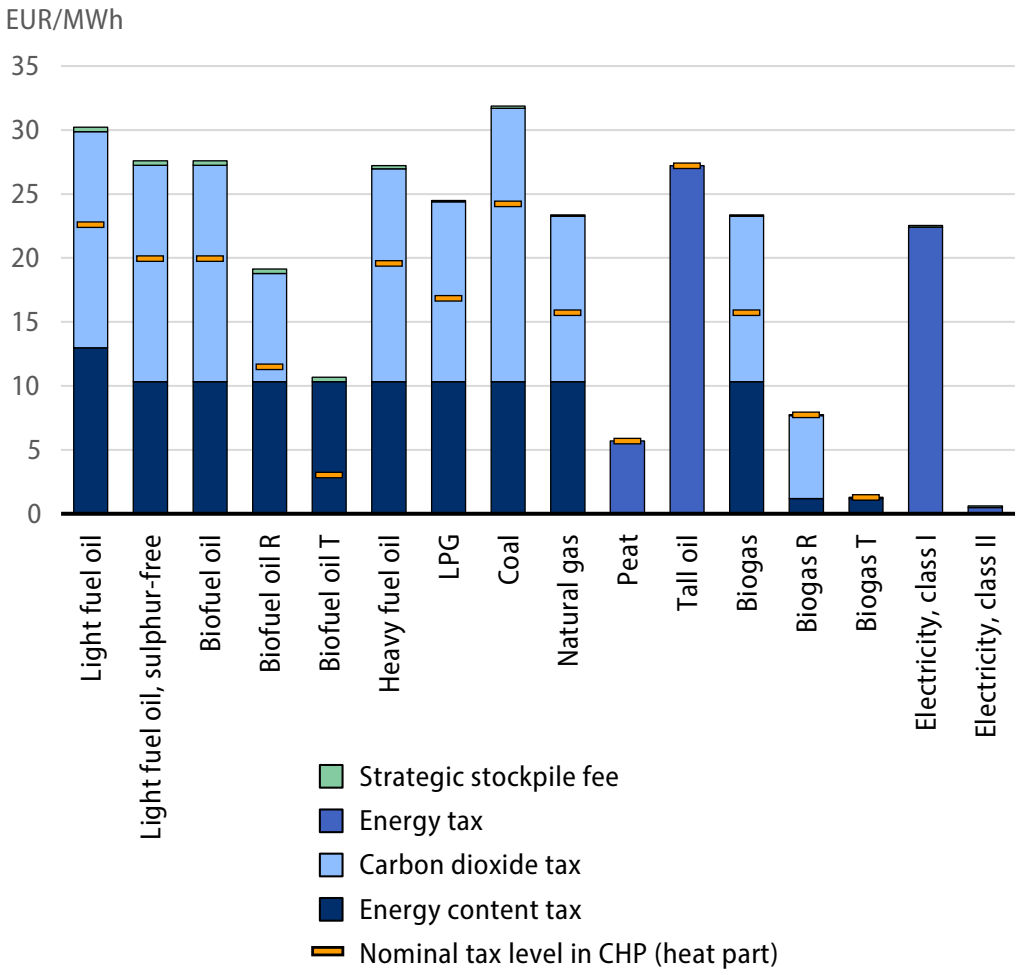
benchmark rates for transport use, as gaseous fuels are taxed with benchmark rates of heating use. Also, the energy tax rate of electricity used in road transportation is lower. For passenger cars, lower taxation of diesel, gaseous fuels and electricity is compensated for by an annual propelling force tax, which is part of the vehicle tax, so that lower taxation effectively applies mostly to commercial vehicles. According to the General Government Fiscal plan, the taxation of liquid fuels used for transportation will be reduced by a total of EUR 100 million by 2027.

Figure 9. Current energy tax structure and rates for energy used in transportation.



The energy tax structure for fuel used for heating and mobile machinery and for electricity is illustrated in Figure 10. The energy content tax for separate heating and mobile machinery is EUR 10.33 per MWh and the carbon dioxide tax is EUR 53 per tCO_2. Energy content tax rates for fuels used in combined heat and power production are reduced by EUR 7.63 per MWh (see Figure 10). The energy content tax for oil products used in professional agriculture (excluding transport use) is rebated. The tax rebate for fuels used by energy intensive businesses in manufacturing, mining and greenhouse cultivation will be phased out by the end of 2024. The energy tax on electricity for manufacturing, mining, certain data centres and certain heat pumps and agriculture is at the EU minimum level, EUR 0.5 per MWh (class II). For households, services etc. the energy tax of electricity is EUR 22.4 per MWh. Small-scale production of electricity for own use is exempt.

Figure 10. Tax rates for fuels used in heating and mobile machinery [EUR/MWh]



Waste management

Emissions from waste management originate from landfill, composting, digestion, the treatment of wastewater and the incineration of waste. Emissions from waste treatment have decreased steadily since the 1990s. Since 2005, emissions have decreased around 45% most of which is attributed to landfills. The placement of organic waste in landfills is restricted and in practise all municipal waste is incinerated. The recovery of landfill gas has also reduced emissions. On the other hand, carbon dioxide emissions from waste incineration are growing because of increased incineration capacity. National measures to reduce emissions from waste incineration have not been implemented. Instead, it seems likely that the sector will be included in the EU's emissions trading scheme in the coming years.

F-gases

Fluorinated greenhouse gases, or F-gases, are emitted by various appliances that use these industrial gases, which are highly harmful to the climate. From the peak year 2008, emissions have by now decreased by around 40%. Existing measures will reduce F-gas emissions efficiently. As additional measures to speed up the emissions reductions, accelerated transition to natural refrigerants and the lifecycle management of refrigerants will be promoted through information and regulatory policies. The measures will include the recently implemented new F-gas regulation, updating the criteria for public green procurement, promoting the harmonisation of norms and standards related to building services and building regulations in a direction that enables natural refrigerants. In addition, a report for a national plan for the lifecycle management of refrigerants will be prepared and opportunities to promote producer responsibility and systemic promotion of the circular economy will be explored. By 2030, an additional emissions reduction of 0.1 Mt CO_2 eq. will be achieved in relation to the existing measures.

Agriculture

Agricultural greenhouse gas emissions come from dispersed biological emission sources, which makes reducing them more complicated than in many other sectors. It is worth noting, though, that agricultural land is not just a source of greenhouse gas emissions, but may also sequester atmospheric carbon into soil. Favourable cultivation practices, such as plant cover in winter, perennial grassland and reduced soil tilling, make this possible.

The current measures in the agricultural sector are mainly related to the implementation of the EU's Common Agricultural Policy (CAP). The new CAP period from 2023 to 2027 began in January 2023. The main tasks of Finland's CAP

Strategic Plan (CSP) include safeguarding active food production, climate and environmental sustainability in agriculture and strengthening the vitality of the renewing rural areas. However, in its CAP strategic plan, each EU country is obliged to display a higher ambition on environment and climate action compared to the previous programming period. Each country is also required to update the plan when climate and environmental legislation is modified. The aim is that 40% of the total EU funding for CAP measures will be allocated to climate measures at the EU level. Member States are obliged to allocate 35% of the rural development funds to environmental and climate measures at the national level. In addition to this, at least 25% of the budget for direct payments is allocated to eco-schemes, providing stronger incentives for climate- and environment-friendly farming practices and approaches.

Hence, compared to the previous programming period, the Finnish CAP Strategic Plan has increased the environmental and climate ambition. According to the environmental impact assessment of Finland's current CSP, greenhouse gas emissions from agriculture would decrease by around 0.8 million tonnes CO_2 eq. per year compared to the previous CAP funding period.

Finland's CAP Strategic Plan includes measures that, in addition to their impacts on water bodies, also contribute to increasing and preserving carbon in soil. The emission reduction impact will affect both the land use sector and the agricultural sector. These measures include turning cleared areas permanently into grassland, catch crops, soil improvers and renovation plants, subsidies for grasslands and fallows (including grasses on peat fields), investments in controlled subsurface drainage and their management, and establishing and managing wetlands (including climate wetlands). An investment subsidy is also available for more efficient storage, treatment and use of manure and for investments in energy efficiency and sustainable energy, such as biogas plants. The advisory services in the programme offer advice on energy efficiency and issues related to the mitigation of and adaptation to climate change.

When finalising the CAP Strategic Plan in 2022, the guidelines of the new LULUCF and effort sharing regulation for reducing greenhouse gas emissions were already known. For this reason, the amendments in these regulations have been taken into account in Chapter 2 of the CSP and in the coherence section of the plan in Chapter 3.1.4. The CAP Strategic Plan responds to these needs through measures in accordance with articles 31, 70, 74 and 77. In addition, the conditionality requirements related to reducing greenhouse gas emissions have been listed in

Chapter 3.10.1 of the CSP. A few small technical corrections will be made to the CSP in June 2024. However, these technical corrections will not affect the objectives, measures or financing plan of the CSP.

Since it is neither possible nor appropriate to implement all climate change mitigation or adaptation measures in agriculture through the EU's Common Agriculture Policy, national measures are also required. These measures are identified in the Medium-term Climate Change Policy Plan and in the Climate Plan for the Land Use Sector.[42] The emissions reduction measures proposed in the Medium-term Climate Change Policy Plan related to land use change include restricting the clearing of fields, restricting the transfer of previous peat production areas into agricultural use, the afforestation of wasteland and the conversion of agricultural land into climate wetlands. Measures related to arable land use include the cultivation of wet peatlands (paludiculture), adding carbon to fields by cultivating grass instead of annual crops, and introducing precision farming methods. In addition, efforts are made to reduce methane emissions from dairy cows through feeding methods.

The Medium-term Climate Change Policy Plan has also highlighted a number of measures that are likely to reduce greenhouse gas emissions from agriculture in the future but for which the emission impact cannot be calculated at the moment. Such measures include improving the real estate composition of fields, changes in the age structure of cattle, increasing use of gender-selected semen, improving carbon sequestration with various soil improvers, increasing compliance with nutrition recommendations, reducing food waste, developing public procurements, promoting carbon markets, and deepening cooperation between stakeholders in the food system.

The Climate Plan for the Land Use Sector complements the climate measures targeted at agricultural peatlands. Alternative measures include raising the groundwater level on peaty arable land to prevent peat decomposition, the promotion of perennial grasslands without tilling and converting agricultural land into managed wetlands (when the area would no longer be used for agricultural production). These measures targeted at agricultural soils also reduce CO_2 emissions in the land use, land-use change and forestry (LULUCF) sector. The potential EU restoration law would also set new targets and requirements for rewetting peatlands. The concrete policy measures would be identified in the national restoration plan.

42 http://urn.fi/URN:ISBN:978-952-366-592-7

Finland does not have a separate strategy for reducing methane emissions, but addresses them as part of the sectoral strategies. Agriculture is the biggest source of methane emissions in Finland (in 2020, approximately 49% of CH_4 emissions in Finland originated from agriculture, including enteric fermentation and manure management).[43]

In the agriculture sector, methane emissions mostly depend on the number of domestic animals. The expected reduction in the number of bovine animals also reduces the methane emissions from their digestion. In addition, the reduction in the number of bovine animals and pigs will reduce the emissions from manure processing.

Enteric methane emissions from ruminants can be reduced by changing the feeding practices for dairy cows. Using rapeseed cake in the feeding of dairy cows can reduce methane emissions by approximately 10% per litre of milk if the cows are fed predominantly roughage, i.e. grass. However, as more than 40% of the feed of dairy cows is concentrated feed, rapeseed cake would mostly replace the currently widely used rapeseed meal, and the actual reduction in methane emissions would probably be 3% to 5% per cow.

Of the feed additives that reduce enteric methane production, research has advanced furthest with regard to 3-NOP (3-nitrooxypropanol), which has been approved in the EU as a feed additive for dairy cows and cows for reproduction. In the best-case scenario, this additive may reduce methane emissions from dairy cows by up to 25%, but at the same time, it entails a permanent cost to farmers.

The Ministry of Agriculture and Forestry is funding studies and projects to develop feeding solutions applicable for Finnish grass roughage-based feeding that reduce greenhouse gas emissions from the enteric digestion of bovines. The projects aim to find solutions for reducing greenhouse gas emissions related to cattle feeding in Finnish feeding systems and, in particular, enteric methane emissions produced in rumen fermentation. The projects also aim to enhance knowledge about the means for reducing emissions that are already available or will be introduced within the next 5–10 years, as well as incentives and steering instruments through which the introduction and use of such means can be promoted. The projects started in autumn 2022.

43 Finland Methane Action Plan: https://www.ccacoalition.org/sites/default/files/resources/Finland%20Methane%20Action%20Plan_0.pdf

The Government has strongly highlighted the role of manure management and nutrient recycling as part of the overall sustainability of agricultural production. Various incentive schemes are available for research, experiments, advice and investments in streamlining manure management and nutrient recycling. The purpose is to create the conditions for an organic fertiliser market that functions well and thereby to ensure efficient recycling and use of nutrients. An experimental nutrient recirculation programme has run since 2016. The support scheme for biogas investments and new manure processing techniques was launched in December 2020. Another subsidy scheme for the production of biogas based on nutrient cycles is also being prepared.

Ammonia is to some extent involved in greenhouse gas emissions because part of the ammonium nitrogen landing on the ground is transformed into nitrous oxide. International treaties and EU legislation oblige Finland to reduce its ammonia emissions into the air. Approximately 90% of Finland's ammonia emissions originate from agricultural sources. The most effective measures for reducing ammonia emissions from agriculture involve manure, its storage and its application. Ammonia emissions can also be reduced by measures involving the feeding of domestic animals, but these measures are more difficult to regulate, and their impact more difficult to assess, than measures related to the management of manure.

In addition to the measures referred to above, many other factors may help reduce greenhouse gas emissions from agriculture by 2035. However, the magnitude remains difficult to estimate. For example, gender-selected semen is a relatively new technology. The goal is to reduce the number of male dairy calves and increase the share of faster-growing dairy–beef crossbreed calves among dairy cattle. More research is needed on the use and effects of gender-selected semen, but the method is already rapidly gaining popularity.

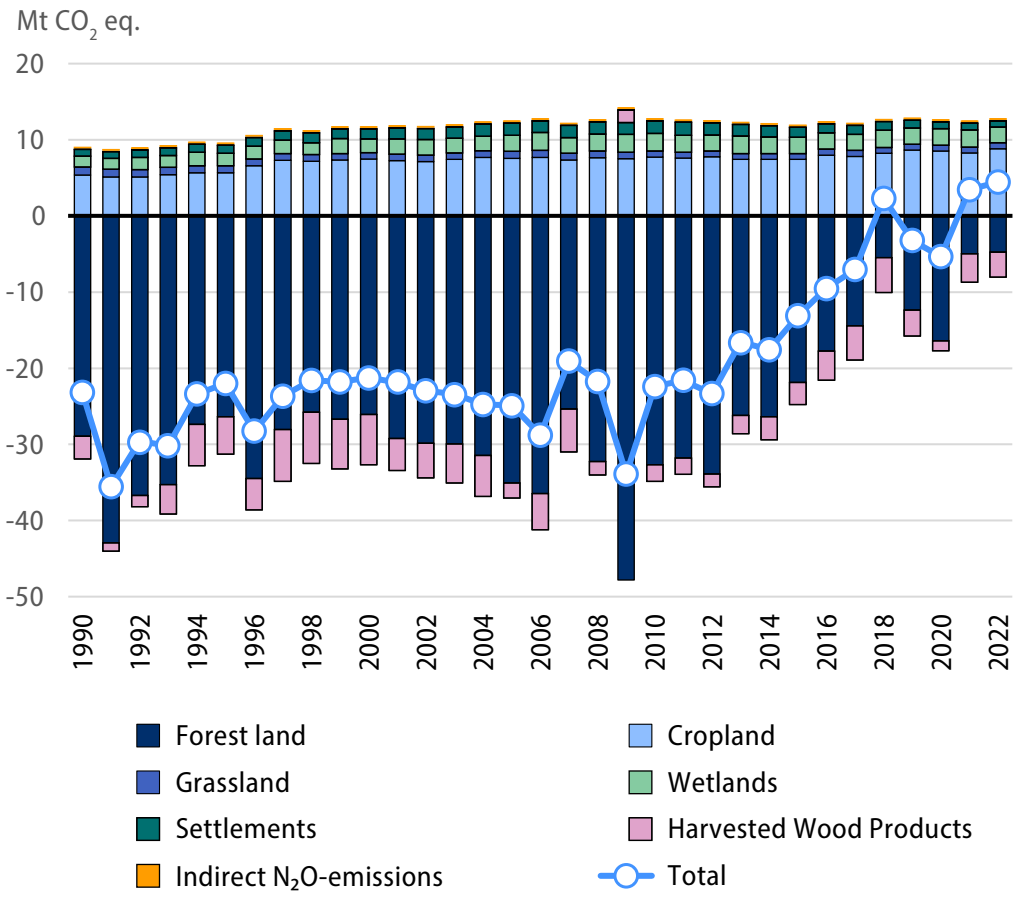
The land use, land-use change and forestry (LULUCF) sector

Forests are Finland's largest carbon sink. Forest stand biomass growth binds more carbon than is released into the atmosphere as a consequence of felling and natural drain. The size of the net sink of forests varies from year to year, particularly due to felling, whereas factors that influence felling volumes include the market situation of forest industry products, and demand for energy wood. The highest emissions come from the soil of drained peatlands in forests and on cropland. In addition, smaller emissions are generated by treated wetlands, including peat production areas or unsuccessfully drained forest areas or drained forest areas without drainage

repair that have transformed into wetlands again. Forest fires, prescribed burning and restoration burning, as well as nitrogen fertilisation of forests, generate minimal emissions.

The overall LULUCF sector has for many years been a net sink in Finland because its emissions have been smaller than the removals. However, this net sink from the LULUCF sector can vary a lot from one year to the next. The first indicators regarding the LULUCF sector turning into a source of emissions instead of a net sink were seen in the Statistics Finland's preliminary data in spring 2022. In December 2023, the national inventory data revealed that the LULUCF sector had been a source of emissions for the first time as long ago as in 2018 (Figure 11 below). These changes in the net sink level compared to previous knowledge about the LULUCF situation can be explained by improvement of GHG inventory calculation methods, and by decreased growth of forests and changes in logging. Ending wood imports from Russia has also increased the demand for domestic wood raw material.

Figure 11. The LULUCF sector in Finland from 1990–2022.



The Climate Plan for the Land Use Sector was prepared in 2022 and it specifies how climate emissions from the land use, land-use change and forestry sector can be reduced, and carbon sinks and reservoirs strengthened. The aim of the additional measures in the land use sector is to achieve an annual net impact of at least 3 Mt CO_2 eq. by 2035. To ensure that this target is achieved, The Natural Resources Institute Finland Luke was commissioned to produce a new estimation with updated inventory numbers at the beginning of 2024, and this indicated that the target of three million tonnes would be achieved.[44] This will also contribute to Finland's LULUCF target for 2030. A monitoring system for the Climate Plan for the Land Use Sector will be introduced during 2024. The aim of this monitoring system is to measure and identify the concrete amount of emission reduction achieved per year under the Climate Plan for the Land Use Sector. The monitoring systems also ensure that the effect of policy measures will be visible in the GHG inventory.

The Climate Plan for the Land Use Sector brings together ongoing measures such as the updated ownership policies of the State Forests (Metsähallitus), the ash fertilisation of peatland forests, and the Act on Fixed Term Support for Afforestation, the latter having ended in December 2023. It also outlines additional measures in four categories: resource-efficient land use and land-use change; climate-resilient use of peatlands; other measures to promote carbon sequestration and carbon storage; and crosscutting measures. In addition to the ongoing measures presented above, the new measures focus on, for example, actions in peatland fields and forests, the development of carbon markets, swift and timely forest regeneration, increasing the amount of dead wood for climate and biodiversity perspectives, promoting training and expertise, and communication. The most effective measures have been identified in halting deforestation and promoting actions in peatlands. Preliminary climate impacts of the measures presented in the Climate Plan for the Land Use Sector are presented in Table 11. However, it should be noted that currently there is no national funding outside CAP measures for paludiculture/rewetting peatlands. Also, the national funding for fixed-term support for afforestation ended in December 2023. A mid-term assessment of the Climate Plan for the Land Use Sector is planned to start in 2025.

44 Natural Resources Institute Finland (LUKE) 2024: http://urn.fi/URN:ISBN:978-952-380-869-0

Table 11. Preliminary climate impacts in 2030 and 2035 of the measures presented in the Land Use Sector Climate Plan (million tonnes of carbon dioxide equivalent). Source: Natural Resources Institute Finland 2022.

Measure	Area	Climate impact in 2030	Climate impact in 2035
New ownership policy decisions concerning Metsähallitus	-	0.4 Mt CO_2 eq.	0.7–0.9 Mt CO_2 eq.
Preventing the conversion of forests into fields	About 1,700–1,900 ha per year	-	0.5 Mt CO_2 eq.
Act on fixed-term support for afforestation	3,000 ha per year, of which 40% in peat production areas	0.09 Mt CO_2 eq.	0.11 Mt CO_2 eq.
Afforestation of low-yield arable land	9,000 ha in 2024–2028	0.08 Mt CO_2 eq.	0.09 Mt CO_2 eq.
Raising the groundwater level in peaty agricultural lands (grasslands) -30 cm	2030: 20,000 ha 2035: 32,500 ha	0.132 Mt CO_2 eq.	0.215 Mt CO_2 eq.
Paludiculture, groundwater level -30 cm	2030: 5,000 ha 2035: 10,000 ha	0.046 Mt CO_2 eq.	0.093 Mt CO_2 eq.
Paludiculture, groundwater level -5 – -10 cm	2030: 2,500 ha 2035: 5,000 ha	0.052 Mt CO_2 eq.	0.105 Mt CO_2 eq.
Managed wetlands (no longer in agricultural use)	2030: 4,000 ha 2035: 7,500 ha	0.081 Mt CO_2 eq.	0.151 Mt CO_2 eq.
Perennial grasslands without tilling	2030: 40,000 ha 2035: 40,000 ha	0.081 Mt CO_2 eq.	0.081 Mt CO_2 eq.
Rewetting of low-yield, thick peaty arable land into wetlands	2030: 10,000 ha 2035: 10,000 ha	0.202 Mt CO_2 eq.	0.202 Mt CO_2 eq.
Comprehensive planning of peatland forest management (avoidance of remedial ditching)	-	-	-
Comprehensive planning of peatland forest management (continuous cover forestry)	6,000 ha per year	0.21 Mt CO_2 eq.	0.21 Mt CO_2 eq.

Measure	Area	Climate impact in 2030	Climate impact in 2035
Ash fertilisation of peatland forests	26,000 ha per year	0.18 Mt CO_2 eq.	0.40 Mt CO_2 eq.
Promotion of forest fertilisation on mineral soils	25,000 ha per year	0.46 Mt CO_2 eq.	0.28 Mt CO_2 eq.
Increasing carbon stocks of decaying wood in commercially utilised forests by leaving trees for biodiversity and climate reasons	-	-	-
Total	-	**2.01 Mt CO_2 eq.**	**3.14–3.34 Mt CO_2 eq.**

As a result of the changed situation in the LULUCF sector in July 2022 when the Finnish Government approved the Climate Plan for the Land Use Sector, the following additional actions were decided upon:

- Start legislative work to prepare for a land use change fee.
- Set as one of the objectives of the National Forestry Strategy 2035 the maintenance and increase of the carbon sink. Also set as an objective the promotion of the achievement of the carbon sink and emission targets of the Climate Change Act and the EU's LULUCF targets.
- Implement the METKA (Fixed-term Act on the Financing of Sustainable Forestry) scheme, which supports climate-friendly forest management. The act came into force at the beginning of 2024.
- Carry out a climate assessment study of the Forest Act and identify measures in the Forest Act that could promote sink growth in the short and long term.
- Analyse the reasons why the land use sector has become a net source of emissions and what this means in terms of meeting the 2021–2025 EU LULUCF target.

To tackle the challenging ongoing situation in the LULUCF sector, the Prime Minister Petteri Orpo's Government has carried out an impact assessment of a proposal for a fee for land use change. According to the assessment, a potential fee for land use changes could decrease land clearing by around 2,000 hectares in agriculture

and 1,000 hectares in the built environment. The potential emissions reduction by 2030 would be 0.59 Mt CO_2 eq. and 0.74 Mt CO_2 eq. by 2035. However, no political decision has been made on implementation or on continuation of the preparation.

In line with Prime Minister Petteri Orpo's Government Programme, a package of forestry measures ('First Aid Kit for Forest Growth') will be prepared during 2024 by the Ministry of Agriculture and Forestry to strengthen the growth of forests and carbon sequestration. The aim of the package is to gather and define actions that have already been initiated and that are to be initiated by industry and government actors, as well as to propose new measures. The goal is to find possible and acceptable additional measures, so that the goals of Finland's Climate Act and the LULUCF obligations can be achieved, and so that the conditions for the sustainable use of forests can be ensured. In addition, the package includes an assessment of the cost-effectiveness and climate effectiveness of the measures in different time spans to the extent possible. No quantitative goal has been set for the package.

Organic soils are the main source of CO_2 emissions in the LULUCF sector. The CAP Strategic Plan for 2023–2027 and the Climate Plan for the Land Use Sector both include measures for climate-resilient use of peatland fields, such as raising the water level in peatland fields to prevent the decomposition of peat, establishing managed climate wetlands and perennial grassland on peatland. One of the policy measures in the Climate Plan for the Land Use Sector is the preparation of a roadmap for the use of peatland fields. The roadmap is currently under preparation and it will be published by the end of 2024. In addition to these measures, the Ministry of Agriculture and Forestry is currently piloting market-based competitive tendering for rewetting peatlands and performance-based funding models for carbon sequestration. These new measures are part of Finland's increased contribution to meet the EU's climate targets.

The size of the managed forests sink depends mainly on the forest growth and harvesting rates, which result from the global demand for housing and packaging, for example. The National Forest Strategy was revised in 2022 (National Forest Strategy 2035) and implementation of it began at the beginning of 2023. The National Forest Strategy 2035 is a coordinating strategy for the whole sector that brings together people, the environment and the economy. The strategy takes into account the principle of comprehensive sustainable development and the important role of forests in climate change mitigation and adaptation. The objectives of forest use have been reconciled in the National Forest Strategy 2035. Active forest management and use will maintain the forests' health and ability to grow, which is a basic requisite for their capacity to bind carbon. The National Climate and Energy Strategy emphasised the importance of enhancing the

implementation of the National Forest Strategy, especially of maintaining good forest health and strengthening the growth and carbon capture capacity of the forests in the long term.

A significant source of emissions in the land use sector is the clearance of forest for other land use purposes, mainly as a result of civil engineering, construction and clearing land for agricultural use. Finland is the most forested country in the EU, and estimates indicate that the potential for reforestation is limited. The EU Deforestation Regulation entered into force in June 2023. It will help decrease deforestation caused by agriculture, especially as it hinders the clearing of forest for grazing. Public financing for private forest owners, around EUR 45–60 million annually, is based on the Act on the Financing of Sustainable Forestry (34/2015), which states the general objectives of forestry financing: increase the growth of forests, maintain road networks for forestry purposes, secure forest biodiversity and promote the adaptation of forests to climate change. Nature management in commercial forests is promoted through environmental support and forest nature management projects. Private forest owners themselves invested EUR 174 million in 2021 for forest management and improvement work.

The Catch the Carbon government programme is a concrete example of an innovative policy instrument advancing climate measures in the LULUCF sector since its launch in 2020. The programme is due to close by the end of 2024. More than 150 individual research, development and innovation projects have been funded under this programme. The aim of the overall programme has been to reduce greenhouse gas emissions both in the LULUCF sector and in agriculture and also to enhance carbon sinks and reservoirs. The final climate impact of these projects is difficult to assess. The project results and lessons learnt will be a large input into Finland's future policy preparation concerning agriculture, forestry and land use changes. The Ministry of Agriculture and Forestry is currently funding a few separate projects that aim to improve the national greenhouse gas inventory.

3.1.2 Renewable energy

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

The objective is that the majority of the renewable energy investments in Finland are funded without State Aid. Due to high EU ETS prices and high energy taxes for fossil fuels, new investments in renewables are, in most cases, more competitive than investments in new fossil fuel plants. For example, the majority of the new electricity capacity is wind power, which is being built in Finland without aid. Therefore Finland has been able to phase out operating aid schemes and is not planning for new auctions or other operating aid schemes.

Production aid for electricity from renewable energy sources

The sliding feed-in tariff system for the production of electricity from renewable energy sources came into force in Finland on 25 March 2011. The aid scheme concerns government support for electricity production based on wind power, biogas and small-scale CHP (wood fuels). The aid scheme has been phased out. It was closed for new wind power plants from 1 November 2017 and for new biogas and small-scale CHP plants from 1 January 2019. However, the plants under the scheme will receive the aid for up to 12 years from the start of production.

In May 2018, Parliament approved the Act on the Amendment of the Act on Production Aid for Electricity from Renewable Energy Sources (laki uusiutuvilla energialähteillä tuotetun sähkön tuotantotuesta annetun lain muuttamisesta 441/2018), which lays down provisions on the premium system. The premium system was based on a competitive tendering process in which renewable energy technologies competed with each other on the basis of cost-effectiveness. The only auction was held in 2018 and the decisions were made in March 2019. The aid was granted for seven projects within total of 1.36 TWh worth of annual electricity production.

Finland is not planning to introduce any new operating aid schemes or auctions.

Aid for the use of forest chips

Finland promotes the use of forest chips in combined heat and power generation (CHP), mainly with taxation combined with EU ETS. In addition, Finland introduced an operating aid for electricity generation from forest chips in 2011. The aid is to compensate for the higher production costs of generating electricity from forest chips compared to using fossil fuels. The maximum aid for electricity produced from forest chips has been EUR 18/MWh. However, the aid depends on the price of the EU ETS emissions allowance and has thus been in decline since the beginning of 2018. When the price of the allowance is above EUR 23.7/CO_2 tonne, no aid is paid, which has recently been the case. The aid scheme was closed for new power plants in March 2021. The aid is paid for up to 12 years from the start of production.

Energy Aid Scheme

Renewable energy is also promoted through the Energy Aid Scheme (investment subsidy) (Valtioneuvoston asetus energiatuen myöntämisen yleisistä ehdoista vuosina 2023–2027, 262/2023). Aid is primarily targeted at the commercialisation of new technologies and for the non-ETS sector. Aid is paid at up to 30% for mature technologies and up to 40% for new technology projects. However, aid levels are typically much lower, especially for mature technologies. The objective is that aid for a given technology will be phased out as the technology develops, the costs decrease and competitiveness improves. The annual budget will be EUR 14.1 million for small-scale projects. Finland is currently phasing out a separate funding for large-scale demonstration projects. However, decisions concerning the state budget are made annually.

Finland also allocated EUR 537.17 million of European Union Recovery and Resilience Funds to renewable energy, energy infrastructure and electrification projects (see point 5.3).

Promotion of the use of renewable fuels

The Act on Promoting the Use of Renewable Fuels in Transport (laki uusiutuvien polttoaineiden käytön edistämisestä liikenteessä 446/2007) has been in force since 2008. Under the Act, the share of the energy content of renewable fuels in the total energy content of the petrol, diesel oil, natural gas and renewable fuels delivered by distributors for consumption (i.e. the quota obligation) will steadily increase to 34% by 2030 (without double counting). The biofuels and biogas included in the quota obligation must meet EU sustainability criteria. In addition, RFNBOs have to comply with the rules laid down in the renewable energy directive and the delegated act

concerning the additionality principle for hydrogen. The Government Programme of 16 June 2023, however, sets a lower target for renewable fuels in transport for 2024–2027.

In addition to the overall target, there is a minimum quota for advanced biofuels, biogas and RFNBOs. The level is currently at 2% (2021–2024), will be 3% in 2025 and will increase to 10% by 2030. Biofuels and biogas produced from the feedstock in Annex IX A has to be at least 1% in 2025 and 3.5% by 2030.

Currently the legislation only covers road transportation and there is no credit system for charging. The revised renewable energy directive will be transposed into national legislation in 2024.

Furthermore, there is a separate quota obligation for light fuel oil used in heating and machinery. The share of bioliquids increases annually and must be at least 10% in 2030.

Transport

The measures in transport have been listed above (Promotion of the Use of Biofuels) and in Section 3.1.1 under the heading 1) 'Replacing fossil fuels with renewable and low-emission fuels and power sources'.

National legislation complementing the ReFuelEU Aviation and FuelEU Maritime regulations is under preparation, with anticipated entry into force on 1 October 2024 and 1 January 2025, respectively. The national legislation is foreseen to contain provisions on competent authorities and penalties under the two regulations, as well as other necessary provisions on the so-called island exemption under Article 2 of FuelEU Maritime. As part of the implementation of these two regulations, no measures to support or accelerate the production and deployment of sustainable fuels is foreseen. Rather, this will be considered as part of the implementation of AFIR and RED.

Regarding the implementation of the targets for the supply of electricity to stationary aircraft and shore-side electricity supply in ports under AFIR, two legislative projects are under preparation. They are expected to enter into force on 1 October 2024 and 1 January 2025, respectively. The preparations have started on the basis of obliging certain actors to ensure that the electricity supply in the ports and airports is within the scope of the AFIR, as well as including certain provisions on competent authorities and administrative sanctions in the national legislation. Regarding the supply of electricity to stationary aircraft, the national legislation

is foreseen to use the flexibility for exempting TEN-T network airports with fewer than 10,000 commercial flight movements per year from the obligation to supply electricity to stationary aircraft at all aircraft remote stands.

Energy advisory services

Energy advice to promote the use of renewable energy is provided as part of the government-funded national energy advisory network, which is explained in Chapter 3.2.

Industry

In accordance with revision of the Renewable Energy Directive, Finland aims to increase the share of renewable energy in the industry sector by an average of at least 1.6 percentage points annually for the periods 2021–2025 and 2026–2030. Finnish industry sectors completed their low-carbon roadmaps in 2020. Thirteen sectors have prepared low-carbon roadmaps coordinated by the Ministry of Economic Affairs and Employment. The preparation was based on the principle that each sector knows their own sector best. The sectors were therefore responsible for the preparation and implementation of their roadmaps themselves. Increasing the share of renewable energy is an important measure for industry in contributing to the national target of carbon neutrality by 2035. The Government Programme states that the low-carbon roadmaps will be updated. The work on updating the roadmaps has begun, with the expected completion in summer 2024.

Finland has used part of the EU's Recovery and Resilience funds to accelerate the electrification of industry. In addition, the need to replace natural gas from Russia has driven industrial companies to look for alternative energy sources such as renewable gases and the utilisation of waste heat, as well as energy efficiency investments. Other key drivers for the increase of renewable energy in industry are the EU ETS price and national energy taxation, which favour renewable energy sources and electricity.

In industry in Finland, hydrogen is used mainly for intermediate products in the production of conventional transport fuels and biofuels. It is excluded when calculating the RFNBO target for industry according to the revision of the Renewable Energy Directive. The hydrogen use included in the RFNBO target is low and the achievement of targets in 2030 and 2035 is highly dependent on new investments that are under development at the moment. There are several hydrogen production facilities in the planning phase in Finland and two projects are already under construction. Finland has granted investment aid to several to

RFNBO production facilities. The main aim has been to promote RFNBOs in the transport sector, but at least part of the production could be used in the industry sector. Finland is currently assessing the need for complementary measures such as legislation concerning an obligation to use RFNBOs and other alternative policy measures to reach the RFNBO target in industry. These measures will be implemented together with other RED III implementation and the deadline for transposition is in 2025.

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

Finland has agreements on statistical transfers with Belgium concerning the years 2020 and 2021.

Finland and Luxembourg have also agreed on a EUR 40 million aid scheme for solar energy projects in Finland through the new Renewable Energy Financial Mechanism. Finland is interested in new rounds concerning the mechanism. Otherwise, Finland has not planned new agreements on joint projects or statistical transfers.

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

See Section 3.1.2.i.

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

Finland has not planned any new aid schemes for electricity from renewable energy sources, nor any revisions to the old ones.

v. Specific measures to introduce one or more contact points, streamline administrative procedures, provide information and training, and facilitate the uptake of power purchase agreements.

In line with Article 16 of RED II, Finland has designated a contact point to facilitate the administrative permit application and granting process. The contact point has been established by designatingthe contact point authority (the Centre for Economic Development, Transport and the Environment of South Ostrobothnia) and launching a digital contact point. The digital contact point enables contact between applicants, competent authorities and the contact point authority, and the submission of a permit application.

Swift permit-granting processes that function well are of key importance in accelerating the clean energy transition. Finland has worked hard and successfully over many years to speed up and streamline permit-granting processes for renewable energy production facilities, with especially positive results in permitting wind power. Solar energy and heat pumps typically only require simple municipal building inspection procedures. The state permit-granting authority gives priority status (by request) to renewable energy projects that require an environmental permit or a water resources management permit and that take into account the Do No Significant Harm Principle. This also applies to possible water resource management permits that some larger scale heat pumps may require.[45]

For household and medium-sized solar energy projects, simple municipal building inspection procedures are usually sufficient. Factors such as the characteristics of the area, the planning situation and the project will determine whether it is possible to set up an industrial-scale solar power plant in the planned area and which planning and construction permits may be required. The Ministry of the Environment is preparing guidance to harmonise the practices applied in the planning and construction of industrial-scale solar energy projects by:

- exploring and compiling the most significant environmental impacts of solar power plants, in particular from the point of view of land use planning and building permits,
- presenting a view on the planning and permit procedures for the operation of solar power plants, taking into account the different locations of solar power plants; and
- by ensuring interaction with key actors and stakeholders.

45 https://avi.fi/en/services/businesses/licences-notices-and-applications/water-and-the-environment/green-transition-2023-2026

It is also of great importance that permit-granting processes guarantee that environmental impacts have been taken into account thoroughly, which is essential for local acceptance of renewable energy production.

The 2022 Climate and Energy Strategy sets an objective for the permit-granting authorities to limit the duration of the licensing process for priority investments to 12 months. Finland has accelerated licensing procedures for green transition investments by allocating more resources to permit-granting authorities. Green transition investments may apply for priority in some permit-granting processes in several authorities during the period 2023–2026 and courts during the period 2023–2028. Grants to municipalities and regional councils to speed up permit and planning procedures for green transition investments and wind power construction have been awarded by the Ministry of the Environment.

Mapping of the areas necessary in order to achieve the national contributions towards the EU's 2030 renewable energy target will be conducted as part of transposition of RED III. Opportunities for acceleration areas according to RED III will be assessed and national legislation will be revised to match the updated requirements of the directive, for example regarding the timelines for permit-granting processes. Finland has conducted a study on wind power potential for 2030. Project developers and municipalities have been very active in locating suitable sites for renewable energy production. At the end of 2023, nearly 70 GW of offshore wind power and nearly 10 GW of solar PV were in the pipeline. By 2030, new renewable energy production facilities will mainly be wind power and solar PV. Offshore wind is expected to be commissioned mainly after 2030. The mapping will be carried out based on renewable energy projects that are under development. In mapping, Finland will assess the probability of the projects under development being realised.

Finland has a functioning certification scheme for installers of renewable energy production devices. The scheme will be revised and the required measures will be implemented, especially to broaden the scope of the certification scheme to designers and to set up a framework to ensure a sufficient number of trained and qualified installers according to RED III.

The uptake of power purchase agreements has increased in Finland, in particular concerning new wind power projects. In line with the implementation of RED III, the Ministry of Economic Affairs and Employment ordered a study concerning PPAs in Finland. The study was finished in autumn 2023 by AFRY. According to the study, PPAs have had a significant role in the increase of renewable electricity and it is likely that the role of the PPAs will remain strong in the future. In addition, PPAs

could in future be agreed for renewable energy other than electricity (e.g. RFNBOs). The study did not recognise legislative or other administrative barriers concerning wider uptake of PPAs. However, due to the information gap and counterparty risks, for example, small and medium-sized companies are not as active in the markets. Possible new measures, such as additional guidance or risk-sharing measures could be decided in the upcoming national Energy and Climate Strategy,

Summary of the policies and measures under the enabling framework Member States have to put in place pursuant to Article 21(6) and Article 22(5) of Directive (EU) 2018/2001 to promote and facilitate the development of renewable self-consumption and renewable energy communities

The key concepts to promote energy communities were identified in the work of the Smart Grid Working Group in 2018 set up by the Ministry of Economic Affairs and Employment. They include an energy community within one property, typically an apartment block, an energy community crossing property limits, a virtual energy community and enabling energy communities to connect their own electricity production to the grid.

To advance energy communities even more, the Working Group on Energy Communities finalised its report in April 2023. The task of the Working Group was to examine and assess the benefits of distributed energy communities and to propose concrete measures by which distributed energy communities can promote active participation in the electricity market. The Working Group recommended facilitating the distribution of energy by decentralised energy communities and active customers throughout Finland. Decentralised energy communities can better serve consumers' opportunities to participate actively in the electricity market through the netting of electricity within the balance period. The Working Group also judged that information on energy communities, such as information on different types of communities, the establishment of an energy community and operating practices, should be improved.

In essence, all of the above-mentioned concepts are already enabled in Finland, although some amendments still remain to be introduced. For example, the applicability of tax legislation to decentralised energy communities must be examined and aligned with the overhaul of the EU's energy tax directive. The EU's EMD will also bring certain changes to the regulation of energy communities. On a national level, the authorities are preparing new safety guidelines regarding energy communities that have multiple grid connection points and placement of

batteries outside of properties. Finally, the latest Government Programme mentions an intention further to advance energy communities' own grid building and other demonstration projects.

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

District heating is the most common heating form in Finland. District heat is produced in combined heat and power production or solely as heat. A decision to invest in the construction of new district heating or district cooling infrastructure is typically based on demand. In Finland, district heating networks have been built at almost all sites where it is economically viable to do so. Even very small networks have been built to connect, for example, public buildings in small built-up areas. New investments are mainly related to the development of entirely new areas. The share of renewable fuels and waste heat has risen in district heating significantly during the last decade. In 2023, the share of renewables in district heating reached 53% and the share of waste heat 14%.

District cooling production in 2023 was 340 GWh (mainly heat pump and free cooling). The same heat pumps often produce both heat and cooling energy (district cooling water is cooled and district heating water is warmed up in the same process). District cooling also utilises ambient energy from the sea, lakes and rivers as well as outdoor air and ground, when possible.

Finland sees carbon-neutral heating, including district heating and cooling, as a key component of GHG emissions reduction. Going forward, geothermal heat and other non-combustion solutions, such as heat pumps and hybrid solutions, are preferred over solid biomass, as the availability of sustainably produced biomass is limited. The Government plans to promote new non-combustion district heating production and storage, as well as to continue to support the growing use of waste heat from industrial facilities. Finland is a pioneer in the utilisation of thermal storage, and several new projects have recently started operations or been planned. In addition, studies on low-temperature networks and lowering the temperature of the district heating network have been conducted. Decreasing the temperature of the district heating network and storing heat have been recognised as the best ways to increase the efficiency of district heating systems.

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 biomass uses by other sectors (agriculture and forest-based sectors); as well as measures for the sustainability of biomass production and use***

The annual increment of the growing stock in Finnish forests is about 103.5 million cubic metres (National Forest Inventory 13). According to preliminary data from the Natural Resources Institute Finland, in 2023 the annual roundwood removals and drain totalled about 82 million cubic metres. As the annual increment of the growing stock was higher than removals, the total volume increased by more than 20 million cubic metres. Roundwood removals totalled about 68.6 cubic metres, of which about 85% was used by the forest industry and about 14% as energy wood, i.e. forest chips for heat and power plants or fuelwood for private households.

Energy wood removals for heat and power plants totalled 5.5 million cubic metres, of which roundwood, i.e. whole trees and pruned stems, accounted for 3.2 million and logging residues and stumps for 2.2 million cubic metres.

The principle is that all bioenergy used in power plants, which must demonstrate compliance, is sustainable. Implementation of the revised RED is in progress and will be finalised within the timeline set by the directive.

The use of wood-based fuels in Finland is mainly based on industrial side streams and residues from forest management work and felling for which there is no demand in the forest industry processes. The aim is to direct these biomass fractions to power and heat generation and to the production of transport biofuels. In Finland, the use of wood-based fuels as a whole is promoted by the emissions trading system, the operating aid for electricity from forest chips, the taxation of fossil fuels, electricity and peat, and the aid schemes encouraging forest management, such as the sustainable forestry aid scheme designed for private forest owners. About one tenth of the raw materials used in the forest industry is imported, so a corresponding proportion of the generation of renewable energy based on industrial side streams is based on imported wood. Imports are not expected to account for a significant share of the total amounts of wood-based fuels in the future, either.

The cascading principle of biomass use aims at ensuring that biomass is used according to its highest economic and environmental added value. Finland does not intend to set out new support schemes for the usage of forest biomass for energy. If seen necessary, further measures to ensure the application of the biomass cascading principle need to be decided upon.

The sustainability of biomass production is regulated in the Renewable Energy Directive. Finland implemented RED II for the sustainability criteria for forest biomass in June 2021. Finland has legislation and monitoring systems in place to minimise the risk of unsustainable forest biomass production. The most important law ensuring the sustainability of forest management in Finland is the Forest Act. The requirements concerning the legality of harvesting operations and forest regeneration of harvested areas are included in the Forest Act. Other relevant acts are the Forest Damages Prevention Act, the Timber Measurement Act and the Act on the Placing on the Market of Timber and Timber Products, which implements EU Timber Regulation No 995/2010 in Finland. Concerning the objectives to minimise negative impacts on biodiversity and soil and protection of forests, environmental legislation also has a key role. Roughly 2.7 million hectares of forests are protected or under restricted use, which is 12% of the total forest area in Finland. The sustainability of forest management is assessed and monitored on the basis of Pan-European Criteria and Indicators for Sustainable Forest Management. The National Forest Inventory (NFI), the monitoring system for forests and forest resources, produces diverse information on Finnish forests. NFI data are widely used in assessing the sustainability of forest management.

In agriculture, the potential for energy production lies especially in utilising biomass-based agricultural waste and residue streams for CHP generation and for transport fuel, and there is also potential for solar electricity investments. The majority of the biogas potential is associated with farming. There has been wide interest in increasing biogas production on farms or from agricultural biomasses for some time. While farms have plenty of biomasses suitable for biogas production, these biomasses have so far only been utilised to a minor extent. The reason for this is that yield/cost analyses have been unable to identify adequate numbers of cost-effective applications. In addition, profitable concepts for costly plants have been hard to find. Achieving profitability is particularly difficult if costs are incurred for the raw material. Typically, biogas production on farms has advantages that are not directly associated with energy economy, including more efficient nutrient recycling, cutting greenhouse gas emissions, improved hygiene and reduced odour nuisances. Circular economy-related benefits often have a key role.

In terms of transport fuels, the share of biofuels and biogas produced from food and feed crops is limited in the distribution obligation to 2.6 percentage points (the Energy Authority's administrative decision no. 2140/750/2021).

The distribution obligation also sets a gradually lowering limit for high indirect land-use change-risk biofuels and biogas produced from food and feed crops for which a significant expansion of the production area into land with high-carbon stock is observed (hereinafter 'high-ILUC risk biofuels and biogas'). In 2024–2029 their share must be lowered to 50% of their share in 2019 and to zero percent from 2030 onwards. However, the share of high-ILUC risk biofuels and biogas was already zero in 2019, which means that high-ILUC risk biofuels and biogas are capped at 0%.

3.1.3 Other elements of the dimension

i. Where applicable, national policies and measures affecting the EU ETS sector and assessment of the complementarity and impacts on the EU ETS

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

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

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

Activities related to technology-neutral support for electricity production and energy taxation are described in Section 3.1.2 above. In addition, in 2019, Finland banned the use of coal for power and heat by law from May 2029 on. No new power plants burning hard or brown coal will be built, nor will any replacement investments for coal use be made. Once the existing plants using pulverised fuel combustion have been decommissioned, coal will only be used as a backup fuel in exceptional situations.

The ban will reduce the use of coal by an estimated 3 TWh compared to market-based development without the ban. Early phase-out by 2025 is eligible for special incentives to support replacement investments.

The measures in transport have been listed in the Section 3.1.1 under the headings 2) 'Improving the energy efficiency of vehicles and other means of transport' and 3) 'Improving the energy efficiency of the transport system'.

The main aid schemes concerning renewable energy in Finland have been the operating aid scheme and the energy aid scheme. The operating aid scheme consists of a feed-in tariff for renewable electricity, aid for the use of forest chips and a premium system, which are explained in more detail in Section 3.1.2. The feed-in tariff scheme concerning wind power, biogas and small-scale CHP has been phased out and closed for new power plants. Aid for the use of forest chips has not been paid since December 2018 due to the current level of EU ETS prices. No decisions to continue aid for the use of forest chips after 2021 have been made. In the premium system, there was only one auction round, and according to the current plan, there will be no new rounds. All power plants within the above-mentioned schemes may receive aid for up to 12 years.

Energy tax expenditure by type of tax is reported in Table 12. The benchmark rates depend each time on the tax expenditure concerned and are not fully comparable with each other. The figures are based on actual data or estimates for 2022 and 2023.

Table 12. Energy tax expenditure 2022–2023 [EUR million].

Type	Benchmark rate	2022	2023
Lower tax rate for diesel compared to the benchmark rate of transport use	Energy content tax of transport use (per EUR/MJ, as for gasoline)	695	672
Tax reduction on paraffinic diesel (ended at the beginning of 2023)	Energy content tax of regular diesel (per EUR/MJ, as for diesel)	30	0
Lower tax rate for gas used in transport compared to the benchmark rate of transport use	Energy content tax (per EUR/MJ, as for gasoline) and CO_2 tax of transport use	15	18
Lower tax rate for electricity used in transport compared to the benchmark rate of transport use	Energy content tax of transport use (per EUR/MJ, as for gasoline)	14	24
Tax reduction on fuel used for diesel engines in rail transport	Energy content tax (per EUR/MJ, as for gasoline) and CO_2 tax of transport use	12	12
Tax exemption for electricity used in rail transport	Electricity class I	16	16

Type	Benchmark rate	2022	2023
Lower tax rate for gasoil used in mobile machinery compared to the benchmark rate in transport	Energy content tax (per EUR/MJ, as for gasoline) and CO_2 tax of transport use	472	465
Energy tax exception for CHP production	Energy content tax of heating fuels in non-CHP use	106	64
Tax exemption on peat up to 10,000 MWh/year (before 2022 and after 2029 5,000 MWh/year; 2027–2029 8,000 MWh/year)	Energy content tax (per EUR/MJ) and CO_2 tax (EUR/tCO_2) as for other fossil fuels	46	46
Lower excise tax on peat compared to the benchmark rate of heating use	Energy content tax (per EUR/MJ) and CO_2 tax (EUR/tCO_2) as for other fossil fuels	98	76
Tax reduction for biogas used in heating	Energy content tax of heating fuels	3	2
Tax exemption for wood-based fuels	Energy content tax (per EUR/MJ) of fossil fuels (other than peat)	440	440
Tax exemption for waste incineration	Energy content tax of heating fuels	32	32
Reduced electricity tax for industry, greenhouse cultivation and data centres	Electricity class I	759	744
Energy tax refund for energy intensive industry (phased out by 2025)	The amount of refund	66	36
Energy tax refund for professional farmers and professional greenhouse growers	The amount of refund	78	46

There is no established definition of a fossil fuel subsidy in the energy tax categorisation. The tax rates for renewable fuels are the same or lower than for fossil fuels for the same use. Thus, there are no clear subsidies for fossil fuels in the tax system. The effective rates for fossil fuels are the highest, or among the highest, in the EU. Many tax expenditures on fuel use will fall over time as fuel use declines. Some tax expenditures will fall due to reduction in the benchmark rate

(for example, the benchmark rate on mobile machinery declines as the taxation of transport fuels is reduced). In addition, the tax refund for energy-intensive businesses will be phased out by 2025.

Policies and measures to achieve low-emission mobility (including the electrification of transport)

In May 2021, the Ministry of Transport and Communications launched a Roadmap to Fossil-free Transport to reduce greenhouse gas emissions from transport (the government resolution on the reduction of greenhouse gas emissions in domestic transport). The Roadmap formed the basis for planning and sizing the emissions reduction measures for transport in the 2022 Medium-term Climate Change Policy Plan. Preparation of the new climate plan started in Finland in 2023 and it is expected to be completed at the end of 2024 or the beginning of 2025.

In May 2022, the Ministry of Transport and Communications appointed a working group to prepare a distribution infrastructure programme and study the use of electricity, renewable methane and hydrogen as power sources in road transport to replace fossil fuels. The programme to improve the distribution infrastructure for new fuels in road transport in Finland by 2035 was completed in March 2023. The programme sets targets related to both vehicles and the distribution infrastructure in order to promote the use of these power sources. The programme also defines the measures necessary for achieving the targets.

At the end of 2023, the Ministry of Transport and Communications started the preparation of the national distribution infrastructure plan for new fuels for all means of transport. The project utilises the above-mentioned distribution infrastructure programme for road transport. The programme will be condensed and updated, and sections on sea, air and rail transport will be added to it in cooperation with stakeholders and experts. The distribution infrastructure programme aims to ensure that the requirements of the AFIR Regulation are met and that the energy transition in transport is promoted as nationally appropriate. The national programme will be completed by the end of 2024.

3.2 Dimension energy efficiency

Planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 as well as other objectives referred to in point 2.2, including planned measures and instruments (also of financial nature) to promote the energy performance of buildings, in particular as regards the following:

i. Energy efficiency obligation schemes and alternative policy measures under Articles 7a and 7b of Directive 2012/27/EU and to be prepared in accordance with Annex II

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

iii. Description of policy and measures to promote energy services in the public sector and measures to remove regulatory and non-regulatory barriers that impede the uptake of energy performance contracting and other energy efficiency service models

iv. Other planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 as well as other objectives referred to in point 2.2 (for example, measures to promote the exemplary role of public buildings and energy-efficient public procurement, measures to promote energy audits and energy management systems, consumer information and training measures, and other measures to promote energy efficiency)

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

vi. Description of measures to utilise energy efficiency potentials of gas and electricity infrastructure

vii. Regional cooperation in this area, where applicable

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

The Energy Efficiency Directive has entered into force and national efforts are being carefully assessed to define and specify the policies and measures needed for the period 2021–2030. This work is being carried out by the Energy Efficiency Working Group 2023, appointed by the Ministry of Economic Affairs and Employment in May 2023. The group consists of representatives from different ministries with the support of a large group of sectoral experts. While the need for new measures is being assessed, the systematic work and effort to promote energy efficiency continues in Finland. Finland's energy and climate strategy will be completed in spring 2025.

Voluntary Energy Efficiency Agreements

Energy savings and energy efficiency have been improved through Voluntary Energy Efficiency Agreements drawn up between the Government and industrial/municipal associations since the 1990s. The current agreement period is 2017–2025 and negotiations on a new agreement period of 2026–2035 have already started. The agreements have had an important role in meeting Finland's cumulative energy saving targets set for the period 2021–2030 in Article 7 of the EED 2012/27/EU. The agreements will also have an important role in meeting the new energy saving targets in Article 8 of the EED recast (EU)2023/1791.

The agreements are intended to guide companies and municipalities towards continuous improvement in energy efficiency. The participants set a quantitative target to improve their energy efficiency and take action to reach the target.

The Government grants energy subsidies to support the deployment of new energy-efficient technologies and, case by case, conventional energy efficiency investments and energy audits of the participant municipalities and small companies.

The agreement scheme also supports the meeting of obligations set out in other EED articles and also the implementation of the Energy Performance of Buildings Directive (EPBD). The Voluntary Energy Efficiency Agreements cover industries (industry, energy and private-sector services), the property sector, the municipal sector and the oil sector (distribution of liquid heating fuels).

The municipalities and companies signing the agreement undertake to:

- promote energy efficiency in a goal-oriented and systematic manner, for example, through the deployment of an energy management system;
- explore opportunities to save energy by carrying out energy audits;
- explore financing solutions (e.g. PPP, EPC and ESCO) and use them as necessary when financing is an obstacle to investing in energy efficiency;
- train their personnel and inform the personnel about promoting energy efficiency;
- monitor and report their energy consumption on an annual basis;
- improve energy efficiency and report on energy savings on an annual basis; and
- comply with the Energy Efficiency First Principle, which means that cost-effective energy efficiency measures are taken into account as closely as possible in investment decisions and energy policies.

Transport fuel taxation

Energy savings are created as a result of Finland's higher transport fuel taxation (including the energy content tax, carbon dioxide-based tax, strategic stockpile fee and value added tax) compared with the EU's minimum requirements for the level of fuel taxes and value added tax.

Road transport

The measures in transport are listed in Section 3.1.1 under the headings 2) 'Improving the energy efficiency of vehicles and other means of transport' and 3) 'Improving the energy efficiency of the transport system'.

Energy audits

Along with the Energy Efficiency Act (energiatehokkuuslaki 1429/2014), which entered into force at the beginning of 2015, energy audits have been divided into voluntary audits involving support and compulsory energy audits carried out in large companies every four years. Energy aid for energy audit activities is granted to voluntary audits. The total number of large companies was 2,448 at the end of 2023. The total number of reported energy audits for the period 2019–2022 was 726. The number of large companies and the number of reported energy audits are not linked, due to different timelines and data sets.

Energy performance of buildings

Finland has adopted an energy subsidy scheme designed especially for housing companies to support energy efficiency improvements and measures aiming towards smart, flexible energy consumption. The principle of the subsidy scheme is that the assistance will be paid in proportion to the energy efficiency benefits achieved. The projects must be cost-effective and appropriately designed.

Finland will phase out the use of fossil fuel oil in heating by the start of the 2030s. A heating system using fossil oil can no longer be installed in new buildings.

The Land Use and Building Act (132/1999) was amended in 2017 in order to transpose the nearly zero-energy (NZEB) provisions of the Energy Performance of Buildings Directive. The amendment came into force on 1 January 2017.

Minimum requirements for all new buildings are issued in the National Building Code of Finland. The requirements are set out in the Decree of the Ministry of the Environment on the Energy Performance of New Buildings (1010/2017). The requirements came into force on 1 January 2018. The same requirements apply to both private and public buildings. These regulations set the level for NZEB in Finland. Under the Decree, the overall energy consumption (E-value) of a building must not exceed the given limits. The E-value includes the energy consumption of the heating, ventilation, domestic hot water and cooling, as well as system auxiliary units, consumer equipment and lighting. The Decree also sets out requirements for heat losses, summertime temperatures, specific fan power of ventilation and AC, as well as for energy consumption metering.

The minimum requirements for existing buildings are set out in the Decree of the Ministry of the Environment on Improving the Energy Efficiency of Buildings in Conjunction with Repair and Modification Work (4/2013). The requirements came into force on 1 June 2013. The Decree was supplemented with the Decree of the Ministry of the Environment on Amending the Decree of the Ministry of the Environment on Improving the Energy Performance of Buildings Undergoing Renovation or Alteration (2/2017). The requirements must always be fulfilled in the case of repairs and modifications where energy efficiency improvements are technically, functionally and financially feasible.

Under Decree 4/2013 of the Ministry of the Environment, the requirements set for the energy efficiency of renovation projects can be met in three alternative ways. A party engaging in a building project subject to a permit must select one of the

following alternatives: 1) energy efficiency requirements for each building element; 2) E-value requirements of a building; or 3) energy consumption requirements for a building. The Decree also sets out requirements for the technical systems.

According to the Cost-optimal Reports of Finland, submitted to the Commission in 2023, the minimum requirements for new buildings and for existing buildings are on a cost-optimal level. As regards buildings, the most important current energy efficiency measures are promoting the installation/use of heat pumps in terraced and single-family houses (RA-04-TEM), the energy efficiency agreement on the distribution of heating fuel oil, and the energy efficiency regulations for new buildings, which set out the minimum level of building requirements. See NEEAP IV,[46] Section 3.6.1 and RA-no-YM measures.

Long-term renovation strategy

The Finnish National Long-Term Renovation Strategy 2020–2050 (EC, 2020) was published in 2020. It aims to reduce the energy consumption by 49% and emissions of the building stock by 90% by 2050 in relation to 2020 levels. It contains three pillars:

1. building loss and efficiency of space utilisation;
2. maintenance and renovations; and
3. decarbonising heating.

The first pillar aims to accompany the ongoing long-term domestic migration that is concentrating the Finnish population in large urban areas: energy efficiency is easier to attain in the denser urban areas, combined with the demolition of older buildings in rural zones. Policies support this strategy through demolition subsidies and spatial planning. As part of the second pillar, property owners are encouraged to prepare a property-specific strategy or a strategy for the entire building stock on repair actions for the next 15–20 years, involving a gradual improvement of buildings towards the nearly zero-energy level, or preparation for demolition. With respect to heating, the third pillar of the strategy includes a target to phase out fossil oil by 2030. Fossil oil will be phased out in state-owned buildings by 2024, and a subsidy for phasing out oil heating in family houses has been in place since 2020.

46 https://www.motiva.fi/files/12745/Suomen_neljas_kansallinen_energiatehokkuuden_toimintasuunnitelma_NEEAP-4.pdf

Promotion of energy efficiency at a system level

Energy efficiency has been taken into consideration in the planning of networks and in tariffs and regulations (Electricity Market Act 588/2013).

Maintaining the prerequisites for combined heat and power generation

Efficient cogeneration works in an open energy market and competes with other generation methods. The energy efficiency measures in efficient cogeneration encompass improving the overall efficiency of primary energy use and the overall efficiency of energy production within the scope of Voluntary Energy Efficiency Agreement activities.

District heating and cooling

Energy efficiency measures in the field of district heating and cooling concern improving the efficiency of primary energy use, more efficient utilisation of waste heat and the overall efficiency of energy production within the scope of Voluntary Energy Efficiency Agreement activities.

Communication and training to promote energy efficiency

An extensive energy advisory service, sharing information and best practices, and training services are the means of information guidance to promote energy efficiency, save energy and increase the use of renewable energy, and to promote demand response and energy communities.

A government-funded national energy advising network is at the core of energy advisory services in Finland. In practice, it is a one-stop shop service. It is coordinated and led by Motiva and the Energy Authority of Finland. The steering group covers the ministries in the fields of energy, transport, environment, buildings, construction, agriculture and finance. Municipalities and energy companies have an active role in the national energy advice network. This network offers free guidance to all Finns. Consumers, companies and housing associations can contact either national or regional energy advisors. The advising activities are versatile and include web services, active information and knowledge sharing, webinars, workplace activities, newsletters, online courses, information campaigns, announcements, media cooperation, podcasts, videos and social media utilisation.

Active sharing of best practices and updated information on improving energy efficiency in companies and municipalities is done in a network that covers all parties in energy efficiency agreements. Additional targeted advice (partly financed by certain trade unions) on improving energy efficiency is given to small- and medium-sized companies that have signed the energy efficiency agreement.

Special attention in energy advising is aimed at vulnerable consumers and consumers who are at risk of falling into energy poverty by, for example, active collaboration between regional energy advisors and social workers, and with pensioner organisations. Special counsel by regional energy advice is aimed at municipalities on, for example, information about energy performance contracting, the Energy Efficiency First Principle and funding of energy efficiency investments.

The national energy advisory service is complemented by online courses that contain learning materials about, for example, energy efficient construction, housing and procurement. It is also complemented by online services that contain all recent comprehensive information and various web pages about the national energy advisory service. The most essential are listed below.

- Energy Advice for Consumers – Motiva[47]
- Regional energy counselling | Energiavirasto[48]
- Kuluttajien energianeuvonta – Motiva[49]
- Motivan muut verkkopalvelut – Motiva[50]
- Motivan verkkokurssit – Motiva verkkokurssit[51]

Energy efficiency in public contracts

In compliance with the Directive, the Energy Efficiency Act (energiatehokkuuslaki 1429/2014) lays down provisions on the energy efficiency requirements concerning central government authorities with regard to public procurements.

47 https://www.motiva.fi/en/home_and_household/energy_advice_for_consumers

48 https://energiavirasto.fi/en/regional-energy-councelling

49 https://www.motiva.fi/koti_ja_asuminen/asiaa_energiasta_-_kuluttajien_energianeuvonta

50 https://www.motiva.fi/motiva/motivan_muut_verkkopalvelut

51 https://motiva-verkkokurssit.fi/

Annual training events focusing on the energy efficiency requirement of public procurement are organised by Motiva Ltd. The energy efficiency of procurements is also promoted by the Competence Centre for Sustainable and Innovative Public Procurement, established in 2017. The aim of the Competence Centre is to increase procurements that promote the sustainable development goals from both the social and the environmental perspectives.

Energy Aid Scheme

Energy aid (explained in more detail in Section 3.1.2) may also be granted to investments for companies that have signed energy efficiency agreements. For new energy technology projects, aid may be granted to companies outside the energy efficiency agreements. In addition, energy aid is granted for voluntary energy audits. The total budget for energy efficiency investments has traditionally been EUR 20 million of the total Energy Aid Scheme budget. However, from 2024 onwards the allocation for energy efficiency projects will be approximately EUR 10 million.

In addition, energy aid will be used to promote non-ETS investments related to decentralised energy production, the utilisation of waste heat, the promotion of electrification and renewable fuels in transport.

RRF funding for energy projects is covered in Sections 4.6 and 5.3.

Regional cooperation

Regional cooperation is carried out with Sweden, Denmark, Norway and Iceland in the networking group on energy efficiency. The group has also worked in cooperation with the Baltic States.

Funding

Energy efficiency financing has been systematically promoted by Motiva since 2017 as a part of the Energy Work Programme financed by the Energy Authority/Ministry of Economic Affairs and Employment.

In October 2021, Motiva launched a three-year project to create an information service hub on sustainable financing and on increasing competence and knowledge related to financing. The project is carried out in cooperation with

the Ministry of the Environment, the Energy Authority and the Federation of Finnish Local and Regional Authorities, the Federation of Finnish Commerce, the Confederation of Finnish Industries, RAKLI and the Federation of Finnish Enterprises.

The project compiles an information service on sustainable financing where both companies and municipalities can easily find relevant information on financing and support, especially in connection with improving energy efficiency and the renovation of buildings. The information service has been developed in cooperation with stakeholders so that it meets the needs of users and supports their work in the implementation of energy efficiency and renovation projects, for example. The implementation of the information service is one of the measures of Finland's long-term renovation strategy 2020–2050 in the Roadmap 2021–2030, published in spring 2021.

One of the project results is the roundtables for sustainable financing, which, twice a year since 2022, have brought together actors from several fields to discuss, share information and experiences, and develop sustainable financing. Examples and experiences are used to help disseminate information on good practices, methods and financing opportunities beyond sectoral boundaries.

Sustainable Energy Investment Forums (SEIF) have been organised in Finland in 2020 and 2021, with EC support. The forums (roundtables) provided in-depth information on financing energy efficiency in Finland. The first SEIF in 2020 significantly contributed to the launch of the aforementioned sustainable financing project.

Finland does not have a National Energy Efficiency Fund or any plans to establish a fund.

The Energy Efficiency First Principle

Improved energy efficiency throughout the whole energy system, from production and transmission to distribution and end-use, makes a major contribution to the national goals of a competitive low-carbon economy and security of energy supply.

The future energy system will be flexible and intelligent. Continuously adjusting energy consumption according to the supply situation is becoming increasingly feasible. Hybrid systems that combine various forms of production will become more widespread. Flexibility of demand will change the role of the consumer. An active consumer will simultaneously consume, produce, save and store energy. Digitalisation and the Industrial Internet will help to improve the efficiency of

energy use everywhere. Energy efficiency is a cost-effective way of reducing greenhouse gas emissions, and a circular economy approach will further increase the efficient use of resources.

Finland aims to benefit from a 'smart and efficient integrated energy system' approach to implement the idea of the 'energy efficiency first' principle. Combined generation of heat and power, and related district heating and cooling with smart demand response mechanisms improve energy efficiency, help to increase the share of renewables and link heating with electricity to provide flexibility.

For decades, Finland has realised the potential for aligning energy efficiency and renewable energy policies, linking heating with electricity for flexibility, integrating more renewables in both heating and electricity, and utilising waste heat and waste cold. Bearing in mind the benefits from greater sector coupling through electrification as the energy system decarbonises, the heating/cooling sector is critical and the use of more renewable sources will be encouraged. Considering overall cost-efficiency at the whole energy-system level from supply to end use of energy will help to facilitate the 'energy efficiency first' principle in practice.

To ensure efficient and comprehensive implementation of the Energy Efficiency First Principle in Finland, a study has been launched. The aim of the study is to ensure that existing policies and regulations are in line with the Energy Efficiency First Principle and to identify new actions to take it into account across all sectors.

Energy communities

See Section 3.1.2.i.

Circular economy

The strategic governmental programme was first initiated in 2019 in close collaboration with government ministries as well as with over 200 stakeholders in tens of workshops and meetings. The programme was published in 2021 as the governmental resolution, and the current Government decided to continue it in 2024. It outlines several key measures to promote the transition towards the circular economy.

The circular economy programme sets ambitious targets for the use of natural resources: in 2035, our total domestic consumption of primary raw materials should not exceed the 2015 level. Resource productivity and circular material use rate should be doubled by the mid-2030s. The programme also emphasises the key role

of industries, companies, regions and municipalities in accelerating the circular economy. The key actions are the Circular Economy Green Deal with stakeholders, the Circular Design education programme for companies and the Circular Economy Finland competence centre.

Key ministries (of the Environment, and of Economic Affairs and Employment), together with research institutes and stakeholders, have prepared scenarios on the opportunities offered by a circular economy to promote environmental objectives and economic interests. According to the results, ambitious circular economy measures can halt and reverse the growth of natural resource consumption while having a slightly positive impact on the economy. Combining these scenarios and calculations helps local government, companies and other operators to identify the most impactful actions and draft the Circular Economy Strategic Green Deal commitments during 2024. Over 80 regions, cities, associations and companies have already made the preliminary agreement and have participated in scenario work together with research institutes.

The Circular Economy Finland (KiSu) competence centre gathers a network of experts in the circular economy, which includes companies, research and training organisations, municipalities, regions and various networks and interest organisations. The aim is to connect actors in the competence network who can, on the one hand, utilise information, know-how or solutions related to the circular economy, or, on the other hand, offer and develop them. The work is highlighting concrete piloted and profitable circular economy measures and finding ways to scale them. The centre also supports the participants of the Circular Economy Strategic Green Deal.

In addition, the Circular Design education programme has been implemented with 50 companies. This is the first national training programme thoroughly exploring circular design principles and focusing on generating concrete product/service concepts in order to secure a competitive advantage for companies in the largest market transition of our time. In addition, this programme has prepared companies for the forthcoming Ecodesign Directive requiring product durability, reliability, reusability, upgradability, repairability, ease of maintenance/refurbishment/recycling, and energy and resource efficiency, to mention but a few. The one-year programme was government funded.

As a key measure, Finland is implementing the Plastics Roadmap to improve the efficiency of plastics recovery, recycling and product design, creating conditions for investments and innovations in the circular economy and reducing the dependency on fossil raw ingredients by increasing bio-based and biodegradable solutions. The waste and chemical strategies have also implemented circular economy actions.

The World Circular Economy Forum (WCEF) is a landmark event that brings together business leaders, policymakers and experts to present the world's best circular economy solutions. WCEF is a global initiative of Finland and the Finnish Innovation Fund Sitra. They are working with partners to lead the way in the transition to a fair and competitive carbon-neutral circular economy.

3.3 Dimension energy security

Policies and measures related to the elements set out in point 2.3

Point 2.3 not only describes the national objectives with regard to energy security but also includes some of the measures applied to energy security. In energy security, it is not always easy to separate the objectives from the respective measures.

The measures mentioned and described in point 2.3 include:

- The National Emergency Supply Agency holds imported fuels in state-owned reserves to last for an average of five months' consumption in crises.
- Of the Nordic countries, Finland has security of supply agreements with Sweden and Norway.

In addition to the measures described in point 2.3, some further measures are listed below.

Electricity

Finnish generation adequacy is affected by the development of regional electricity markets. Regarding ensuring generation adequacy in the light of the renewable energy contribution, including demand response and storage, the Finnish strategic reserve system played a significant role earlier. National legislation concerning

the strategic reserve[52] was renewed in 2022 based on regulation 943/2019. The approach the Commission has taken for strategic reserves does not allow Member States to be prepared for exceptional situations, such as cold winter days or interruption of the electricity supply from third countries. For the period November 2022 – October 2023, the Energy Authority did not receive any offers that fulfilled the tendering criteria. For the period 2023–2024, the Energy Authority deemed that no reserve capacity is needed. This is mostly due to Olkiluoto 3 NPP starting its operation during spring 2023 and the approach which prevents Finland from sizing the reserves based on, for example, a cold winter day.

The strategic reserve system is open to participation from demand response facilities and storage. The power reserve system (strategic reserve) ensures security of electricity supply in Finland in situations in which the market-driven production of electricity does not cover consumption. The system has been in use since the beginning of 2007. Both power plants and facilities capable of demand-side flexibility can participate in the power reserve. The Energy Authority defines the size of the power reserve required in Finland, organises the competitive tendering process for plants to be included in the reserve, confirms the terms of the reserve and monitors the operation of the system and compliance with the law. The Government has defined the target for the security of electricity supply associated with the adequacy of electric power according to the EU's Electricity Regulation. Demand response and storage are further promoted by applying the proposals by the Smart Grid Working Group, as discussed in Section 3.4.3. These initiatives include the definition of the improved functionalities of next-generation smart meters and the discontinuation of the flexibility implemented by distribution network operators to encourage market-based initiatives. Overall, the proposals by the Smart Grid Working Group highlight the significance of market-based solutions for demand response and storage.

Finland has imposed binding reliability standards on distribution system operators to ensure resilience in electricity distribution networks, especially in severe weather conditions. The Electricity Market Act (588/2013) sets out limits for power outages following extreme weather conditions. Under the Electricity Market Act, distribution networks must be designed and built in such a way that the longest permitted interruptions in electricity supply are a maximum of 6 hours in urban areas and 36 hours in rural areas. The electricity distribution companies are free to choose the measures they employ to meet these obligations. One possible measure is to

52 The act on the power reserve ensuring balance between generation and consumption of electricity (117/2011). http://finlex.fi/fi/laki/ajantasa/2011/20110117

replace overhead power lines with underground power cables. These requirements are to be met stepwise by 2028 (and by 2036 for electricity distribution companies with a low degree of cabling). By the end of 2023, 75% of the distribution network had to be within the time limits provided by the Electricity Market Act. A significant decrease in outage durations and the number of customers affected by outages has already been observed.

Electricity transmission power lines are built to withstand storms and snow, and thus to avoid disruptions to power transmission.

Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2019 on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC is also an integral part of the energy security dimension. The Regulation sets out the rules governing cooperation between Member States to prevent, prepare for and manage electricity crisis situations. Cooperation is carried out in the spirit of solidarity and transparency, taking fully into account the requirements of the competitive market for electricity. The Regulation includes provisions related to risk assessments of the security of electricity supply, risk-preparedness plans in case the risks are realised, the management of electricity crisis situations, ex-post evaluation of the crisis situations and various types of monitoring.

The Regulation obliges the competent authority in each Member State to publish a preparedness plan based on national electricity crisis scenarios. The preparedness plan must include all planned or introduced measures to prevent, prepare for or mitigate an electricity crisis situation. The preparedness plan must also include regional and bilateral measures to ensure that electricity crises with cross-border effects are appropriately prevented and managed. Finland has prepared and published its own preparedness plan according to the timetable defined in the Regulation.

The National Emergency Supply Agency has been actively promoting cybersecurity in the energy sector by carrying out sector-specific cybersecurity exercises, programmes and sharing best practices. One example is the KYBER-ENE project,[53] carried out jointly with energy sector companies and VTT Technical Research Centre of Finland Ltd.

53 https://www.huoltovarmuuskeskus.fi/energia-ala-kehitti-yhteiset-toimintatavat-kyberuhkia-vastaan/

Gas

In 2019, the National Emergency Supply Agency, as the competent authority, prepared plans for the prevention of risks in the security of supply of natural gas (prevention plan) and for actions to be taken in supply disruptions (emergency plan). The Gas Pool, a part of Finland's security of supply organisation, was also engaged in the work. The plans are based on the repealed regulation of the European Parliament and of the Council concerning measures to safeguard security of gas supply (994/2010). Concerning the implementation of the risk preparedness regulation and the preventive action and emergency plans for gas, Finland is part of the risk group which includes Estonia, Latvia and Lithuania. The preventive action and emergency plans have been actively prepared by the group.

The Commission informs the Gas Coordination Group (GCG) of notifications concerning the prevention plans and emergency plans and publishes them on the Commission's website. The plans were published[54] and the Commission was informed on 30 October 2019. The plans were prepared in close cooperation with the Baltic States.

The security of natural gas supply in Finland has been good and there have been no significant disruptions in the supply over the past twenty years (even Russia's termination of gas exports to Finland in May 2022 and the damage to the Balticconnector pipeline in October 2023 did not disrupt gas supply to consumers). In the event of a disruption in Finland's largest single gas infrastructure, the remaining infrastructure will be able to satisfy the total demand for gas for 24 hours during peak consumption.

Balticconnector, the gas pipeline connecting the gas networks of Finland and Estonia, was commissioned on 1 January 2020. It was damaged and subsequently out of order between October 2023 and April 2024.

There are three onshore LNG import terminals in Finland: Pori, Tornio and Hamina. Of these, Hamina is connected to the natural gas network, and the others are off-grid terminals. In January 2023, the FSRU in Inkoo was commissioned (see section 4.5.2).

54 https://www.huoltovarmuuskeskus.fi/files/dd39b2c2275f8ace9da8b573345fd85db-c7f693e/finland-gas-preventive-action-plan-and-emergency-plan.pdf

Most of the natural gas consumption can be replaced quickly by alternative forms of energy or by switching to an alternative fuel. Fuels that can replace natural gas primarily include light and heavy fuel oil and, for gas-specific use, liquefied petroleum gas, LNG and biogas that is injected into the natural gas network. One option in disruptions to gas availability may also be to adapt gas-using production or to interrupt it. In Finland, a large share of natural gas is used in CHP, and if the gas supply for CHP is disrupted, other fuels can be used or the CHP production can be replaced with production at other plants.

Users of natural gas, except for consumer customers and essential social and health care, are primarily responsible for their own preparedness plans. They are also responsible for the operability of their possible reserve fuel systems, the buffer stocks of reserve fuel and the organisation of the required transports.

To prepare for any disruptions to energy imports and to meet its commitments under international obligations, Finland maintains reserves of imported fuel covering an average of 5 months' normal consumption. This amount does not include natural gas consumption by industry. As regards natural gas, the reserves comprise compulsory stocks by companies (industrial stocks) and state-owned stocks (public stocks).

Nuclear energy

Security of supply relating to nuclear materials, fuels and services

In Finland, Fortum's Loviisa nuclear power plant has been relying on Russian fuels. On 21 December 2023, Fortum Power and Heat Oy submitted to the Ministry of Economic Affairs and Employment a report on the procurement of fuel for the Loviisa power plant. The submission of the report was a licence condition when, on 16 February 2023, the Government granted Fortum's Loviisa power plant units operating licences for energy production until the end of 2050 in accordance with the Nuclear Energy Act. According to the licence condition, Fortum should ensure that the fuel supply of the Loviisa power plant no longer relies exclusively on the Russian manufacturer.

Fortum had already announced on 22 November 2022 that it had signed an agreement with Westinghouse Electric Company to supply a new type of fuel to the Loviisa power plant. However, the introduction of a new fuel is a multi-year project that requires official approvals.

According to its report, Fortum will tender the production of fuel for the period after 2027/2030. The current contract with Westinghouse and the fresh fuel in stock ensures the power plant's fuel supply until the tender.

In addition, Fortum announced that it will investigate the possibilities of another Western fuel supplier to develop a fuel type suitable for the VVER-440 reactor in order to improve fuel supply security and the competitive situation.

Regarding regulatory processes, the introduction of new nuclear fuel necessitates the permits required by the Radiation Protection Agency.

In addition, uranium production is expected to start in Finland in the summer of 2024.

Additional electricity production capacity, taking into account Fennovoima's decision to cancel the construction licence application

The Finnish electricity market is a market-based system where investors independently decide on their investments. A power plant for which construction is not being finalised is not replaced by any specific investments or measures. However, in recent years, significant new power production capacity has been built in Finland, reducing the effect of such an event.

In recent years, new wind power with an output of several thousand megawatts has been built in Finland, as well as Europe's largest nuclear power plant unit, Olkiluoto 3. In Finland, plans are currently being made to increase wind and solar power, for example, as well as nuclear energy production.

With regard to nuclear power production, Teollisuuden Voima Oyj (TVO) is investigating the extension of the service life of the OL1 and OL2 plant units from 2038 to 2048 or 2058. In addition, TVO is also investigating the possibility of uprating the power of the plant units. The planned increase in power production capacity is 80 MW for both plant units, which would increase the power output from 890 MW to approximately 970 MW. The annual increase in electricity production would thus be approximately 1.2 TWh.

Liquid fuels

Finland is investigating the future development of the energy system, especially electrification, and the effects of that on energy system emissions and security of supply. In Finland, liquid biofuels are produced that partially replace the use of fossil

oil products. Finnish companies are also investigating the production and use of renewable fuels of non-biological origin and the use of recycled materials for the production of fuels.

Finland has sufficient oil-related infrastructure in place. However, Finland is investigating non-fossil fuel storage solutions to ensure security of supply even in the event of declining usage of fossil liquid fuels.

ii. Regional cooperation in this area

Regional cooperation in the field of energy security is carried out in the Electricity Market Group under the Nordic Council of Ministers. Among other things, the working group monitors the estimations ENTSO-E and the Nordic transmission system operators make of the adequacy of electric power.

Cooperation on the security of gas supply is carried out between the authorities in Finland and the Baltic States. The authorities have drawn up contingency plans for gas supply.

General cooperation related to the security of energy supply is carried out between the Nordic emergency supply organisations (NordBER, Nordisk Beredskapsforum).

Solidarity arrangements under the Solidarity Mechanism among Member States as per the EU Gas SoS Regulation and the new Council Regulation (EU) 2022/2576 between Finland and Estonia were signed on 25 April 2022.

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

The emergency stockpiling of imported fuels is financed through a strategic stockpile fee. No specific requirements regarding the security of supply are related to biofuels. However, a strategic stockpile fee is also levied on biofuels.

3.4 Dimension internal energy market

3.4.1 Electricity infrastructure

i. Policies and measures to achieve the targeted level of interconnectivity as set out in point (d) of Article 4

The National Climate and Energy Strategy outlines that regional and European electricity markets that function well, and sufficiently strong cross-border connections, are the most efficient and cost-effective ways of guaranteeing competitive electricity prices and security of supply. The Electricity Market Act (588/2013) requires the transmission system operator Fingrid to improve its grid according to the reasonable needs of its users. It also requires Fingrid to develop the transmission grid in a way such that Finland remains one bidding zone. Based on this requirement, Fingrid is also developing interconnectors to neighbouring countries, with one new interconnector to Sweden under construction and two interconnectors being planned (one to Sweden and one to Estonia).

ii. Regional cooperation in this area

The Nordic transmission system operators work in close cooperation to develop the electricity infrastructure. They publish a common Nordic Grid Development Plan every two years. The latest joint plan was launched in October 2023. Furthermore, the ministries in the Nordic countries cooperate in the electricity market field through the Electricity Market Group of the Nordic Council of Ministers, and the national regulatory authorities cooperate through NordREG.[55] Cooperation between the Nordic countries in the electricity market has been intensified by establishing a cooperation forum, the Nordic Electricity Market Forum,[6] for the ministries, regulatory authorities, transmission system operators and market participants.

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

The transmission system operator Fingrid finances its infrastructure investments out of its profits and through national and international money and capital markets. The company's long-term credit rating is AA- (by both Fitch Ratings and S&P Global

55 NordREG, http://www.nordicenergyregulators.org/

Ratings). The cross-border Aurora Line, a joint project of Fingrid and Svenska kraftnät to be commissioned in 2025, received EUR 127 million of CEF funding in 2022.

3.4.2 Energy transmission infrastructure

i. Policies and measures related to the elements set out in point 2.4.2, including, where applicable, specific measures to enable the delivery of Projects of Common Interest (PCIs) and other key infrastructure projects

The Electricity Market Act (588/2013) requires the transmission system operator Fingrid to improve its grid according to the reasonable needs of its users. The investments made in the projects described in Section 2.4.2 are based on this obligation.

The Natural Gas Market Act (maakaasumarkkinalaki 587/2017) obliges natural gas system operators to develop the network. The system operator must maintain, use and develop its natural gas network and connections to other networks in accordance with customers' reasonable needs and, for its part, secure the supply of natural gas to customers. The transmission system operator must also build sufficient cross-border transmission capacity for the integration of the European transmission system. This is the case if building transmission capacity is, from the financial point of view, required to satisfy reasonable and technically feasible demand for natural gas and to ensure the security of supply of natural gas.

Until 2022, Finland sourced the vast majority of its natural gas from Russia by pipeline. However, following Russia's invasion of Ukraine, Russia terminated pipeline gas deliveries to Finland in May 2022. The loss of Russian gas prompted major gas consumers to use alternative fuels (primarily coal, biomass and propane) and to implement efficiency measures. As a result, natural gas consumption declined by over 50% in Finland in 2022. The Government succeeded in securing a long-term gas supply, essentially to substitute Russian gas with increased LNG imports through a floating storage regasification unit (FSRU). The FSRU was installed at the Port of Inkoo in December 2022 and began commercial operations in January 2023.

ii. Regional cooperation in this area

Regional cooperation in the electricity market is described above in Section 3.4.1.

Regional cooperation in the gas market is described above in Section 1.2.3.

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

The Balticconnector gas pipeline project on the Project of Common Interest list received EUR 187.5 million through the EU's CEF funding instrument. Finnish Baltic Connector Oy and Estonian Elering As financed the remaining costs of the project.

3.4.3 Market integration

i. Policies and measures related to the elements set out in point 2.4.3

The regional electricity market formed by the Nordic and the Baltic States is promoted through cooperation of the ministries, regulatory authorities, transmission system operators and market participants.

Nordic cooperation has been further strengthened by the Nordic Council of Ministers' decision to establish a Nordic Electricity Market Forum. The first Nordic Electricity Market Forum was held in Stockholm in November 2018 and resulted in a new and ambitious vision for the Nordic electricity market.[56] The vision states that

> *In 2030, the Nordics should have the world's most competitive, innovative and consumer-oriented electricity market that contributes to reaching the Nordic climate goals.*

56 2030 Vision for the Nordic Electricity Market https://nordicelforum.org/wordpress/wp-content/uploads/2019/06/Vision-for-the-nordic-electricity-market-EN_2.pdf

At the first forum, the participants agreed that there are grounds for annual Nordic Electricity Market Forums as a venue for:

- Communication, collaboration and creating synergies among the different types of electricity market stakeholders (e.g., producers, consumers, TSOs, regulators, etc.);
- Interactions between electricity market policymakers and non-policy stakeholders;
- Input on joint Nordic standpoints on electricity market issues, e.g. in relation to new EU regulations on electricity markets;
- Discussions on forward-looking themes, such as visions and long-term strategies specific to the Nordic electricity market, as well as preparation of relevant action plans.

This work was further strengthened by the Nordic Prime Ministers´ Declaration on Nordic Carbon Neutrality,[57] adopted in January 2019. The vision was also further discussed and endorsed by the Nordic Energy Ministerial meeting in June 2019.

The 2019 Nordic Electricity Market Forum continued to address the vision and the action points formulated in the roadmap.[58] Stakeholders presented news and priorities for the electricity market – giving an overview of the status quo in the Nordic region. The forum is also a place for discussion – and working together; the participants can contribute to setting the scene and helping the Nordic countries achieve the 2030 electricity market vision. The roadmap was updated in 2021 with input from the online sessions of the 2021 Electricity Markets Forum on the topic of flexibility. The update takes into account the increased Nordic and European ambition for a carbon neutral 2050, following the European Green Deal and the Paris declaration to reach the target of 2 degrees Celsius.

57 https://www.norden.org/en/declaration/declaration-nordic-carbon-neutrality

58 Roadmap For Reaching The Nordic Electricity Market Vision https://nordicelforum.org/wordpress/wp-content/uploads/2019/06/Handlingsplan-for-at-opn%C3%A5-2030-visionen-FINAL.pdf

Gas

Until 2020, Finland was exempt from the EU rules on unbundling and third-party access in the gas sector (Directive 2009/73/EC) due to the isolated nature of the Finnish gas market. As a result, the gas market was essentially free from competition and fully controlled by the state-owned company, Gasum, which acted as the TSO and was the only importer and wholesale supplier.

However, in January 2020, upon the commissioning of the Balticconnector pipeline that links Estonia and Finland, the Finnish gas sector became subject to EU legislation on gas market competition, and the exemptions to the Gas Directive in the Natural Gas Market Act were abolished. Price regulation of piped gas was abolished and gas marketplaces and internal market rules were introduced.

In line with the Gas Directive, the Natural Gas Market Act legislated on the separation of gas transmission and sales activities, resulting in the creation of the new TSO, Gasgrid Finland, which was unbundled from Gasum. Gasgrid Finland remains fully state-owned. The Natural Gas Market Act also legislated on open access to the natural gas transmission and distribution networks, as well as to Finland's LNG terminals.

In January 2020, Finland also joined a common regional gas market area, together with Estonia and Latvia (the FinEstLat gas market area). The merger of FinEstLat means the linking of the Finnish, Estonian and Latvian markets, removing the internal tariffs in the region and setting the entry tariffs in the region at the same level. The results of the operation of the FinEstLat single entry tariff zone have been very positive.

By connecting the Finnish gas grid to the Estonian gas grid, the Balticconnector pipeline has allowed Finland to import gas from the Klaipeda LNG terminal in Lithuania and make use of the Inčukalns gas storage facility in Latvia. Following the commissioning of the Gas Interconnection Poland-Lithuania (GIPL) pipeline in May 2022, Finland also gained access to the broader EU gas market.

The floating LNG terminal (FSRU) in Inkoo started its commercial operations in January 2023. The objective of the terminal is to open a new supply route for natural gas from the international LNG market. The vessel has an annual regasification capacity of around 40 TWh, which far exceeds Finland's annual need for natural gas. The LNG terminal also enables gas deliveries to the Baltic States and even to Poland through the Balticconnector pipeline.

ii. Measures to increase the flexibility of the energy system with regard to renewable energy production such as smart grids, aggregation, demand response, storage, distributed generation, mechanisms for dispatching, re-dispatching and curtailment, real-time price signals, including the roll-out of intraday market coupling and cross-border balancing markets

Increasing the level of flexibility is part of the regional cooperation described above. As regards the electricity markets, the countries already have a single day-ahead market and an intraday market. On 9 March 2018, five Nordic transmission system operators concluded a cooperation agreement on the development of a new Nordic balance service model.

See also sub-point v below.

Smart meters

Nearly 100% of electricity consumers in Finland have had a smart meter with hourly measurement resolution since 2013. Most of the current smart meters will come to the end of their lifetime in 2025–2030. Finland transitioned the retail market to 15-minute balance settlement in May 2023. All large consumers (over 3 x 200 A fuse) now have a second-generation smart meter with a 15-minute resolution and all consumers whose smart meter can be remotely updated have had it adjusted to the 15-minute resolution. All customers will receive smart meters with a 15-minute resolution by 2028.

All customers may choose an electricity contract with dynamic pricing based on the day-ahead market prices. Almost all retail suppliers offer dynamic contracts. At the end of 2023, approximately 29% of retail consumers had a dynamic electricity price contract. Many service providers, including aggregators, offer small consumers the option to participate in the balancing markets.

The Datahub, the centralised information exchange system for the retail electricity market, went live in February 2022. In accordance with the Electricity Market Act, it will store information related to electricity accounting points, such as customer and consumption data. The system is intended to speed up information exchange between parties, with the data being available to everyone entitled to it at the same time in an impartial and up-to-date manner.

In addition to electricity companies' customer service portals, the information stored in the Datahub has been available for viewing through the Datahub's own customer service portal after the system's introduction in 2023. The service

displays the user's personal data and customer information for their accounting point. Logging into the service uses the Suomi.fi strong authentication. Through the service, electricity consumers can also authorise a third party to act on their behalf in the Datahub. The launch of the customer service portal will be announced separately.

Demand side response

DSR is already well developed in Finland. The Government estimates that around 1,000 MW of DSR participated in the day-ahead market in September 2022 and January 2024. The level is expected to increase going forward. Based on Fingrid's estimations, up to 200 MW of DSR is in the intraday markets, up to 530 MW of DSR up-regulation and 100 MW of DSR down-regulation in the balancing markets, 410 MW of DSR up-regulation in FCR-D, 10 MW of DSR in FCR-N, and 80 MW of DSR in the fast-frequency reserve markets.

In 2018, the Smart Grid Working Group proposed a programme to increase DSR capacity and the opportunities for consumers to provide DSR to participate. The working group's key proposals were to:

1. clarify the roles of actors in the market-based implementation of DSR (e.g. principles for the storage of electricity, discontinuation of the load control implemented by distribution networks);
2. improve the operating prerequisites for energy communities and aggregation models;
3. define the functionalities of next-generation smart meters;
4. enable flexibility in the operation of grid companies; and
5. enable joint invoicing for all suppliers.

All of the above, together with defining the interface for load control, are either already in legislation or on track to be implemented in the near future. In addition, requirements regarding DSR in the electricity market directive (2019/944) are already in force and the Electricity Market Design, soon to be implemented, will require assessment of the need for DSR or flexibility.

These measures improve conditions for DSR, together with the Electricity Market Act that requires distribution system operators to consider DSR as an alternative to conventional grid expansion.

Energy storage

Finland deploys limited energy storage. No statistics are compiled but the estimate for the megawatt-scale capacity stands at 250 MW. In 2022, the largest energy storage projects were all battery projects and included 30 MW/30 MWh in Lappeenranta, 6 MW/6.6 MWh in Ii, 4 MW/1.5 MWh in Lempäälä, 2 MW/2.1 MWh in Espoo, 2 MW/1 MWh in Järvenpää and 1.2 MW/0.6 MWh in Helsinki. Also, several battery-storage and pumped hydroelectric energy storage projects are under development. For example, in spring 2023, plans for up to 4 GW of pumped hydro projects were presented by Kemijoki Oy which owns several hydropower plants in the Kemijoki river in Lapland. The estimated combined capacity of planned projects is approximately 5 GW.

The Energy Authority has taken the approach that DSOs should not own or operate storage facilities. The Electricity Market Act requires DSOs to consider demand response, electricity storage and other alternatives to grid expansion in their development plans. Some DSOs have procured services from electricity storage facilities.

There are no specific targets for energy storage capacity, but the Government's strategy is to increase the deployment of energy storage. Some partial investment subsidies are available through the Energy Aid programme, but generally new projects are based on market revenues. The taxation of electricity storage was reformed at the beginning of 2019 to eliminate double taxation for storing and discharge or large and mid-size batteries. The regulation concerning the definition of equipment used in independent electricity generation was specified on 14 September 2020. The National Battery Strategy 2025, published in January 2021, presents a roadmap for Finland to become a major player in the international battery industry.

In general, Finland's national view is that the current energy taxation already takes into account energy storage and does not inhibit development of small-scale generation. In addition, energy taxation is an EU-wide harmonised policy, the overhaul of which needs to be carried out through the energy taxation directive.

iii. Where applicable, measures to ensure the non-discriminatory participation of renewable energy, demand response and storage, including via aggregation, in all energy markets

Specifically for hydrogen, the Government objective is to make Finland the leader in the European hydrogen value chain by 2030, building on the secure supply of abundant, inexpensive clean electricity and other competitive advantages. This involves large-scale construction of hydrogen production and transportation capacity and adopting legislation on the hydrogen market. More details are outlined in the February 2023 Government Resolution on Hydrogen.

The eventual implementation of the EU's Gas Package will prompt the drafting of a Hydrogen Market Act. The Government Bill for new gas market legislation is expected to be given to Parliament in 2025 or 2026.

iv. Policies and measures to protect consumers, especially vulnerable and, where applicable, energy poor consumers, and to improve the competitiveness and contestability of the retail energy market

The requirements related to consumer protection have been included in the Electricity Market Act (sähkömarkkinalaki 588/2013).[59] On 1 February 2019, an amendment came into force regarding a centralised information exchange database (the Datahub), which will provide each party in the electricity market with all relevant information on electricity trading. The Datahub will enable even more efficient and consistent transfer of data, which will be essential in the future electricity retail market. This kind of common platform is also vital to developing other opportunities, such as services for enabling significantly better demand flexibility even at an individual consumer level. The Datahub has been in use since in 2022.

To improve the competitiveness of the retail market, the Energy Authority publishes on its website an independent electricity price service, www.sahkonhinta.fi, in which electricity consumers can compare the electricity offers of different suppliers. The service is free of charge and available to all electricity users and suppliers.

59 https://www.finlex.fi/fi/laki/ajantasa/2013/20130588

Starting in late 2021, global energy prices began to rapidly increase, especially in Europe. Price spikes and high volatility persisted until early 2023, driven by the Russian invasion of Ukraine. In February 2022, Finland announced a range of measures to reduce the impact of higher energy prices, particularly for household electricity and heating and for transportation and agricultural companies. The Government estimated that these measures reduced tax revenue by EUR 450 million in 2022, with no increase in government spending.

In early 2022, the Electricity Market Act was amended to reduce retail electricity prices by limiting the allowed profits for distribution system operators (DSOs) and the allowed increase in distribution network tariffs. The rate of return for DSOs was reduced from 5.73% to 4%, the lowest level ever. The limit for the maximum annual tariff increases was reduced from 15% to 8%. These changes are expected to reduce DSO charges to consumers by EUR 350 million.

The 2023 budget also included several measures to limit the impact of high electricity and heating costs, especially for low-income families with children. Increased electricity prices can be taken into consideration when granting social assistance. A fixed-term four-month income tax credit for electricity costs (which was estimated to reduce tax revenue by EUR 265 million) was introduced. The Government also prepared a separate financial support scheme for electricity available to households unable to make full use of the fixed-term income tax credit. This scheme was estimated to increase spending by EUR 85 million. In addition, the Government lowered the value-added tax (VAT) on electricity from 24% to 10% from December 2022 to April 2023 (estimated to reduce tax revenue by EUR 290 million). The Government also increased funding for housing allowances to help cover higher heating costs and to support the renovation of single-family houses. The Government estimated the cost to be around EUR 6.3 million in 2023. On top of these measures, a compensation scheme was introduced in early 2023. This scheme compensated, directly on their bills, household consumers facing a high electricity price. The compensation applied to consumption in the winter months retrospectively and thus it did not affect the consumption. The estimated budget expenditure was EUR 400 million.

The Government prepared a windfall profit tax on electricity producers to offset the cost of aid to consumers, while ensuring that clean energy investments continue. According to the legislation, the tax was to be 30% of the company's net profits exceeding a 10% return on capital in 2023. The act entered into force at the beginning of 2023 and the tax was paid in early 2024. The Government amended the Electricity Market Act to increase consumer awareness of electricity supply contracts that use spot pricing. Consumers will now be required expressly to

consent to spot pricing. When offering an electricity supply contract that uses spot pricing, the supplier must provide information on the opportunities, costs and risks of the contract.

v. Description of measures to enable and develop demand response, including those addressing tariffs to support dynamic pricing

In terms of the adequacy of electric power, it is also important that the prerequisites for combined power and heat generation remain part of an energy-efficient and low-emission energy system with a high degree of security of supply.

In October 2018, the Smart Grid Working Group set up by the Ministry of Economic Affairs and Employment proposed an extensive operational programme to increase the demand-side response of electricity and the opportunities for customers to participate. The working group's key proposals[60] were to:

- Clarify the roles of actors in the market-based implementation of demand-side response (e.g. principles for the storage of electricity, discontinuation of the flexibility implemented by distribution networks);
- Improve the operating prerequisites for different energy communities and aggregation models;
- Define the functionalities of next-generation smart meters;
- Enable flexibility in the operation of grid companies;
- Enable joint invoicing for all suppliers.

The Ministry of Economic Affairs and Employment is implementing these proposals in parallel with the Clean Energy Package implementation. Implementation is well under way in Finland. Many elements of the flexibility requirements, such as fully deregulated retail markets, balancing responsibility, customers' ability to choose dynamic tariffs and 100% roll-out of smart meters, already exist in the Finnish electricity market legislation.

All customers may choose an electricity contract with dynamic pricing based on the day-ahead market prices. Almost all retail suppliers offer the option of dynamic contracts to their customers. At the end of 2023, approximately 29% of

60 http://urn.fi/URN:ISBN:978-952-327-346-7

retail consumers had a dynamic electricity price contract. Many service providers, including aggregators, offer small consumers the option to participate in the balancing markets.

3.4.4 Energy poverty

i. Where applicable, policies and measures to achieve the objectives set out in point 2.4.4

Finland has several national goals to prevent energy poverty:

- To ensure that all households have access to essential energy services as stated in section 19 of Finland's constitution: 'anyone who is unable to secure a decent life has the right to the necessary means of subsistence and care.' This means that households in a weak financial position can apply to the Social Insurance Institution of Finland (KELA) for either housing allowance and/or social allowance for an apartment/detached house for rent or utility expenses, e.g. water, heating or household electricity costs. The Wellbeing Services Counties (local authorities) also organise social services under the Social Welfare Act, among other provisions, to support people in coping with everyday life, provide housing-related support, give financial support and prevent social exclusion. These services also prevent and alleviate energy poverty. An additional goal is to improve knowledge-sharing of the benefits of the social security system, e.g. through cooperation between energy advisors and social services by means of the Wellbeing Services Counties.
- The Long-Term Renovation Strategy of Finland sets a goal to reduce the amount of F and G energy efficiency classes of housing buildings nearly zero by 2030.[61]
- Finland has set a national goal of reducing the number of people at risk of poverty or marginalisation by 100,000 by 2030.[62]

61 https://ym.fi/documents/1410903/38439968/Suomen-EPBD-2a-ilmoitus_final_10-03-2020-242AE19E_F497_4A38_8DF2_95556530BA53-156573.pdf/37a549e9-b330-5f8c-d863-2e51f2e8239a/Suomen-EPBD-2a-ilmoitus_final_10-03-2020-242AE19E_F497_4A38_8DF2_95556530BA53-156573.pdf?t=1603259873424

62 https://stm.fi/-/toimintasuunnitelma-kokoaa-yhteen-toimet-koyhyyden-ja-syrjaytymisen-vahentamiseksi

- Regional energy advisory services funded by the Energy Authority help to improve energy efficiency among vulnerable households. Finland has energy advisors in all regions in mainland Finland. Cooperation, for example with social workers, is essential to reach the vulnerable households who would benefit the most from the advisory services.[63]
- To encourage energy saving among vulnerable households and people living in social housing.
  - To maintain and develop further the policy measure: The Rental Housing Property Action Plan of the Energy Efficiency Agreement for the Property Sector.
  - To maintain and develop further the policy measure: rental housing under the Municipal Sector Energy Efficiency Agreement.[64]
- Finland has several energy renovation subsidies, and the most relevant in preventing energy poverty is the repair subsidy for the renovation of housing for elderly and disabled people (ARA).[65]
- To improve the knowledge and methods for data analysis (both quantitative and qualitative) in relation to vulnerable households and energy poverty.

Regarding the network of experts required for supporting decision-makers in implementing measures to alleviate energy poverty, Finland expands the existing group of experts in strategic energy advice run by the Finnish Energy Authority. This group will be complemented by experts from sectors that support the targets of the group.

The total cumulative energy saving target of Article 8 of the EED for the period 2021–2030 is 187.5 TWh (cumulative). The total number of households in Finland was 2,919,000 in 2022. The percentage of cumulative energy savings required by Article 8, point 3 is therefore 0.25%, which equals 0.49 TWh in total cumulative energy savings for the period 2021–2030 and respectively 8.5 GWh/a in average annual energy savings. The energy efficiency policy measure aimed at generating energy savings among vulnerable customers and people living in social housing is the Rental Housing Property Action Plan of the Energy Efficiency Agreement for the Property Sector (2017–2025). Total eligible annual new energy savings under Article 8 are 32.3 GWh (2021) and 35.3 GWh (2022), amounting to 0.1 TWh

63 www.energiavirasto.fi/energianeuvonta

64 https://energiatehokkuussopimukset2017-2025.fi/en/agreements/

65 https://www.ara.fi/fi/henkiloasiakkaat/avustukset-henkiloasiakkaille/korjausavustus-iakkaiden-ja-vammaisten-asuntoihin

in total cumulative energy savings. The coverage of the RHP Action Plan was 279,852 households in 2022. In addition, the Municipal Sector Energy Efficiency Agreement covers the rental apartments of 9,451 households. Municipal rental housing companies are established as social rental companies that rent apartments to those in the most urgent need for housing, i.e. to the poorest and the lowest-income people. Combined, the agreements cover 10% of all Finnish households. Negotiations on the next agreement period (2026–2035) are ongoing.

While building on the decarbonisation policies and measures identified in the NECP, there are additional criteria for the national Social Climate Plan (SCP). The process is underway to use all available information to gather an evidence base for the most appropriate measures to be included in the SCP. The main focus is on the vulnerable groups and how to address concomitantly decarbonisation and energy efficiency most effectively, mainly through structural changes. Finland is also part of a multi-country TSI project for the development and stakeholder engagement of the national SCP. Internal communications and cooperation with NECP and other decarbonisation experts are ongoing to ensure the policies and measures are well aligned.

Support mechanisms for Sámi people

Support mechanisms and emergency funding for all Sámi livelihoods have been identified in a climate change adaptation program for Sámi people. Its implementation ensures the continuity of the Sámi traditional livelihoods, the Sámi languages, culture, and way of life, which face an existential threat as climate change proceeds in the Arctic. Furthermore, research related to Arctic and Sámi region climate change is crucial for informing adaptation strategies and preserving Sámi cultural heritage and traditional knowledge.

3.5 Dimension research, innovation and competitiveness

i. Policies and measures related to the elements set out in point 2.5

ii. Where applicable, cooperation with other Member States in this area, including, where appropriate, information on how the SET-Plan objectives and policies are being translated to a national context

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

Finland supports research, innovation and competitiveness in energy technology with a number of measures, of which energy aid has been crucial. Based on project assessments, the Ministry of Economic Affairs and Employment and Business Finland have granted energy aid to companies, municipalities and other organisations for investment and research projects that promote renewable energy or energy efficiency.

The National Roadmap for Research, Development and Innovation (adopted in 2020 and updated in 2021) is the main document guiding overall technology innovation policy. It details the measures to boost funding to reach the goal of R&D funding of 4% of GDP. The Roadmap notes that encouraging increased innovation (especially in the private sector) requires a credible long-term commitment to public funding. It also notes that the unpredictability of public funding is a weakness of Finland's innovation system. The Roadmap introduces a new partnership model to facilitate better coordination between the public and private sectors through the development of innovation ecosystems and new operating models for testing, piloting and scaling innovations. The partnership model will also more effectively group national programme financing with EU and other international funding, as well as ensuring that the funding targets key growth areas and ecosystems and that it is awarded on a competitive basis.

In 2021, Finland set a goal to increase total spending on R&D (public and private) to 4% of GDP by 2030 (compared with 3% of GDP in 2021). Finland is also committed to supporting a target for EU-wide spending on R&D of 3% of EU-wide GDP by 2030 (compared with 2.2% in 2018). The R&D Funding Act, which entered into force at the start of 2023, set increasing levels of annual government R&D funding to ensure that government R&D funding reaches 1.2% of GDP by 2030. This is intended to drive increased private-sector R&D funding to reach the 4% goal. The Government Programme (June 2023) is committed to the national target of increasing Finland's research and development (R&D) expenditure to 4% of GDP by 2030.

The purpose of energy aid is particularly to promote the introduction of new energy technologies and their placement on the market. The role of energy aid in the innovation chain has been particularly important for technologies at an advanced state of development, i.e. technologies seeking first commercial targets. Energy aid can be granted to companies, municipalities and other communities. The aid is not granted, for example, to housing companies, residential properties or farms.

The primary purpose of the aid is to enhance the profitability of early-stage investment and to minimise the risks associated with the introduction of new technology.

In 2022, total government energy research and development (R&D) spending was EUR 101 million. The budget authority for energy aid is established annually in the central government budget. In recent years, aid has also been granted for certain specific purposes through separate budget reserves. In future, the Energy Aid programme will have an annual budget of EUR 14.1 million. Business Finland awards the smaller grants, while the funding decisions for large projects are made by the Ministry of Economic Affairs and Employment.

The development of new business and new solutions requires opportunities for experimentation. Test platforms provide an opportunity to conduct experiments and pilots, and to implement research and development projects in the programme focus areas. These include smart networks, renewable energy, energy efficiency, sustainable and smart energy solutions and systems, their related products and services, and resources-wise solutions based on user needs. Instead of developing an individual technology, the intention is to develop ecosystems and integrate technology into a smart system. The aim is to create several test platforms in Finland that are internationally attractive and will also bring investments to Finland.

Business Finland, the Finnish funding organisation for innovation, is actively advancing ecosystems promoting low-carbon business, for example by funding so-called Growth Engines. The name 'Growth Engine' describes cooperation networks – ecosystems – aimed at new business activities amounting to more than EUR 1 billion. Growth Engines are implemented through an enterprise-driven partnership model between companies, research organisations and public actors, which strive to find solutions to global market disruption and create new growth sectors in Finland.

Growth Engine funding enables collaboration between companies of different sizes, research organisations and public actors to achieve a common concrete business goal, launching a new operator, a platform company to achieve a business goal and the construction of the platform company's business.

The Government allocated EUR 60 million of capital funding for Growth Engines in 2018 (EUR 30 million) and 2019 (EUR 30 million). In addition, Business Finland channels its normal funding (about EUR 200 million 2018–2019) and services to projects that meet the ambitions and funding criteria of companies, research organisations and communities operating in Growth Engines, aiming at achieving a Growth Engine's business objective.

Growth Engines currently operate in the fields of carbon compensation, smart port and marine services, artificial intelligence and new solutions for a societal scale model of renewable energy production.

Business Finland launched a Smart Energy programme in 2018. It develops test platforms and innovation ecosystems that boost the competitiveness of Finnish companies and exports of Finnish expertise in the growing international markets and also attracts investments to Finland. The ecosystems will also open up opportunities for SMEs to enter energy markets, in which large investments are necessary.

During this four-year parliamentary term (2023–2027), the Government will draw up an eight-year plan on R&D funding and other aspects related to RDI policy. The Ministry of Education and Culture and the Ministry of Economic Affairs and Employment will prepare the plan, broadly engaging research and business actors in the preparation process. The Research and Innovation Council will lead the preparation of the plan.

Technology neutrality is one of the objectives of the Climate Change Act. Best-practice examples for different technologies/areas are shared through various channels, such as webpages. There are several mechanisms and measures in use. Co-creation activities and collaboration between different stakeholders contribute to increasing the resilience of the supply chains.

The EU and international collaboration

Finland's public and private R&D and innovation entities are highly active in international cooperation on energy topics. This includes cooperation through EU initiatives and international organisations, including the IEA technology

collaboration programmes, Mission Innovation and the Clean Energy Ministerial. The National Climate and Energy Strategy notes that the Government's focus areas for international R&D advocacy and cooperation include energy system integration, hydrogen and the circular economy.

Finland has been actively involved in the operation of the EU SET-Plan. Finland is chairing the Bureau, which is helping the Commission in the running and functioning of the SET-Plan. The SET-Plan combines the promotion and better coordination of energy technology in the EU and the EEA countries. A total of 14 implementation plans were prepared in the SET-Plan between 2016 and 2018. Finland has participated actively in the preparation and introduction of these implementation plans. Finland has chaired and co-chaired the preparation of two implementation plans (Action 6 and Action 8), continues to chair the related Implementation Working Groups and is also co-chairing the Implementation Working Group on Nuclear Energy. In October 2023, the Commission issued a Communication on the revision of the SET-Plan.

A good example of the flexibility of the SET-Plan is the eBattery plan. Finland participates in the implementation of the plan and has also strengthened its own activities, for example through Business Finland's 'Batteries from Finland' 2018–2020 activation programme. Finland has launched an ecosystem type of consortium named BatCircle, involving more than 30 companies, universities and research institutes. Finland is also active in Set-Plan key action no 7 'Batteries for e-Mobility and Stationary Storage', in which Finland is leading the working group related to battery recycling. This is a good example of how SET-Plan objectives and policies are translated into national use.

Finland participates in the IEA technology collaboration programmes, which are multilateral mechanisms that support global collaboration to advance cooperation on research and the use of specific energy technologies. As of October 2022, 10 Finnish entities (the Ministry of Economic Affairs and Employment, Business Finland, VTT, Finnish Energy Industries, the Finnish Heat Pump Association, Tampere University of Technology, Aalto University, Åbo Akademi Process, Kemijoki Oy and Lappeenranta University of Technology) were participating in 22 TCPs (equality in energy transitions, energy technology systems analysis, buildings and communities, district heating and cooling, energy storage, heat pumping technologies, user-centred energy systems, smart grids, high-temperature superconductivity, industrial technologies and systems, advanced fuel cells, advanced motor fuels, advanced materials for transportation, clean and efficient combustion, hybrid and electric vehicles, fluidised bed conversion, GHG programme, bioenergy, hydrogen,

hydropower, PV power systems, wind energy). The Finnish Government sponsors participation in two TCPs (industrial technologies and systems, and advanced fuel cells).

Finland is part of the Clean Energy Ministerial (CEM), a high-level global forum that promotes policies and programmes to advance the deployment of clean energy technologies. Finland participates in numerous CEM initiatives (EVs, biofuture platform, long-term scenarios for the energy transition, international smart grid action network, regional and global energy interconnection, equality in energy transitions, 21st century power partnership, and hydrogen) and campaigns (global commercial vehicle drive to zero, EV30@30, power system flexibility and biofuture).

Finland also participates in the Mission Innovation initiative. When joining in 2016, Finland committed to doubling public innovation funding for clean energy by 2020 and was well on track toward reaching the doubling target of EUR 109.4 million in 2021. Finland participated in seven of the eight innovation challenges of the first phase of Mission Innovation, which ended in 2020 (smart grids, off-grid access/energy storage, CCUS, sustainable biofuels, converting sunlight, clean energy materials, and affordable heating and cooling). Mission Innovation 2.0 was launched in 2021. Finland is participating in the areas of clean hydrogen, net zero industries and the innovation platform.

Finland–China (Business Finland – MoST) Joint Call-related clean energy collaboration commenced at the end of 2018. The Joint Call in Smart Energy theme with Germany was launched and 10 joint projects were funded.

In Finland, a total of 10–20 small modular reactors (SMR) are currently being investigated for the production of both electricity and heat with nuclear energy. The total thermal output of the projects is estimated to be around 1000–3000 MW. There is also an ongoing study taking into account large reactors. Finland's Government Programme has a positive attitude towards new nuclear energy projects, especially SMR projects, in terms of their development, construction and research. Finland supports nuclear energy research in various ways. Nuclear safety is promoted with the SAFER 2028 research programme and innovations related to SMR technologies can be financed by Business Finland. Finnish actors are involved in several EU-funded research projects promoting SMR technologies and are actively seeking to join new European joint projects regarding SMR technologies.

EU Funding

Research and innovation actions to promote energy efficiency and carbon neutrality in the regions can be funded from the European Regional Development Fund (ERDF) and the Just Transition Fund (JTF) under the Innovation and Skills Finland 2021–2027 programme. The funded actions are targeted at R&D&I activities promoting energy efficiency and the use of renewable energy linked to it, and to promoting energy and material efficiency in business operations. They can be development projects or investments. The goal is carbon neutrality and reduction of greenhouse gas emissions. The EU funding received by Finland from the ERDF and JTF, combined with national public and private funding, will indicatively add up to over EUR 0.5 billion of funding for these actions in the regions.

SECTION B: ANALYTICAL BASIS

4 Current situation and projections with existing policies and measures

4.1 Projected evolution of main exogenous factors influencing energy system and GHG emission developments

The projections presented in this chapter are integrated energy and climate projections based on comprehensive modelling and assessments conducted by experts from various research fields. The projections were modelled in an extensive project 'Perusskenaariot energia- ja ilmastotoimien kokonaisuudelle kohti päästöttömyyttä' (PEIKKO)[66] financed by the Government's analysis, assessment and research activities. A fairly large number of models are applied for the energy balance and greenhouse gas emission projections; see Finland's National Communication for a description.[67] The modelling covers the energy system and all GHG sources and sinks that are included in the GHG inventory. The projections of the PEIKKO project include those policy measures that have been implemented by the previous Government or earlier than that, i.e. before 1 April 2023. For the NECP, the projections of the PEIKKO project have been updated with information and data on a few recently adopted or implemented policy measures. The resulting projection is called the WEM projection.

The Covid-19 pandemic and its assumed effects on the economy were considered in the modelling. Contrary to the draft NECP submitted in 2023, the energy crisis and changed energy scene following Russia's unprovoked and unjustified invasion of Ukraine are now included in the projections. For the LULUCF sector, the most recent results from the national forest inventory on a decline in tree growth now form the base for the projection work.

66 Perusskenaariot energia- ja ilmastotoimien kokonaisuudelle kohti päästöttömyyttä (PEIKKO), to be published in June 2024

67 Finland's Eighth National Communication under the United Nations Framework Convention on Climate Change, 2022. https://unfccc.int/NC8

i. Macroeconomic forecasts (GDP and population growth)

The economic outlook provided by the Ministry of Finance forms the basis for the estimate regarding the development of the Finnish economy in the near future, whereas longer-term development assumptions are based on a macro-economic study for the ministries by Merit Economics. The macro-economic projections are described in the Finnish Labour Review.[68] Table 13 and Table 14 show the assumptions for GDP and the average annual increase in national economic output during the period 2020–2040.

The population growth in the projections is based on the population forecast drawn up by Statistics Finland in 2021. Table 15 shows the population development. The population will increase only slightly from 5.56 million (end of 2022) to 5.60 million in 2030. In 2033, the population will start to decrease. The population's age structure will change significantly over the next couple of decades as the proportion of older age groups increases.

Table 13. GDP in the WEM projection [million EUR in 2023 prices].

2023	2030	2040
277,625	306,215	361,288

Table 14. Average annual increase in national economic output in the WEM projection [% per year].

2020–2030	2030–2040
1.3%	1.7%

Table 15. Population [mill. inhabitants].

2020	2025	2030	2035	2040
5.53	5.58	5.60	5.60	5.59

68 Työpoliittinen aikakauskirja – Finnish Labour Review, 1/2024. https://urn.fi/URN:ISBN:978-952-327-822-6

ii. Sectoral changes expected to impact the energy system and GHG emissions

The energy sector is strongly affected by policy measures to reduce emissions, enhance energy efficiency and increase the share of renewable energy sources. Both the supply and demand sides have faced significant changes in the last decade, partly from policy measures, and partly from developments in the energy and fuel markets and energy technology. The transition is only half complete and the emissions will decline further in the energy sector.

District heating, power generation and industrial energy use are strongly affected by the increase in the EU ETS price, which makes the use of fossil fuel increasingly uncompetitive and, together with energy taxation, efficiently cuts emissions in these sectors. This trend will lead to increased electricity demand replacing some fossil fuel consumption, which is also reflected in the low-carbon roadmaps prepared by all major industries and sectors.[40] In power generation, the supply has shifted from fossil fuels (especially coal and natural gas) and peat to renewables and more nuclear power. In district heating and industry, fossil fuels are increasingly being replaced with renewables and waste heat recovery. Electrification is a major trend in the industrial sector and in heating and cooling, bringing more electric boilers, heat pumps and electricity-based industrial processes. In specific industrial sectors, electrolysis-based hydrogen production is also expected to take off, although the exact timing is difficult to predict. Carbon capture in its various forms (such as CCS, CCSU, BECCS) can reduce emissions even further.

iii. Global energy trends, international fossil fuel prices, EU ETS carbon price

Assumptions for fossil fuel prices in the world market correspond to the EC recommended harmonised values for key supra-nationally determined parameters provided by the Commission in 2022 for the 2023 greenhouse gas emission projections. It is exogenously assumed that neither fuel nor electricity is imported from Russia in the future.

The carbon price is an output of the modelling, not an input. It is not possible to reproduce the EC recommended parameters exactly. Table 16 shows the fossil fuel and EU ETS prices of the WEM projection.

Table 16. Price of EU ETS emission allowances and fossil fuels [EUR, 2020 prices].

Product	2020	2025	2030	2035	2040
EU ETS, EUR/t CO_2	24	80	80	82	105
Crude oil, EUR/GJ	6.4	15.4	15.4	15.4	16.3
Coal, EUR/GJ	1.6	3.1	3.1	3.1	3.3
Natural gas, EUR/GJ	3.1	13.2	11.3	11.3	11.3

iv. Technology cost developments

Assumptions for technology cost development are presented in Table 17.

Table 17. Assumptions for technology cost development [EUR per kW, 2020 prices].

Technology	Investment cost, EUR/kW				Fixed O&M cost, EUR/kW			
	2020	2030	2040	2050	2020	2030	2040	2050
Solar PV, utility-scale	617	485	375	355	11	9	8	7
Solar PV, commercial	804	632	498	441	11	9	8	8
Solar PV, residential	1128	815	679	587	13	11	10	9
Wind onshore	1049	965	926	888	23	21	19	17
Wind nearshore	1586	1394	1253	1202	40	32	31	26
Wind offshore	1910	1800	1680	1640	46	38	34	33
Bio-CHP, medium	3389	3165	3059	2956	121	111	106	102
NG CCGT, large	750	731	727	723	27	27	27	27
Hard coal, supercrit., large	1743	1743	1743	1743	46	39	35	34

4.2 Dimension decarbonisation

4.2.1 GHG emissions and removals

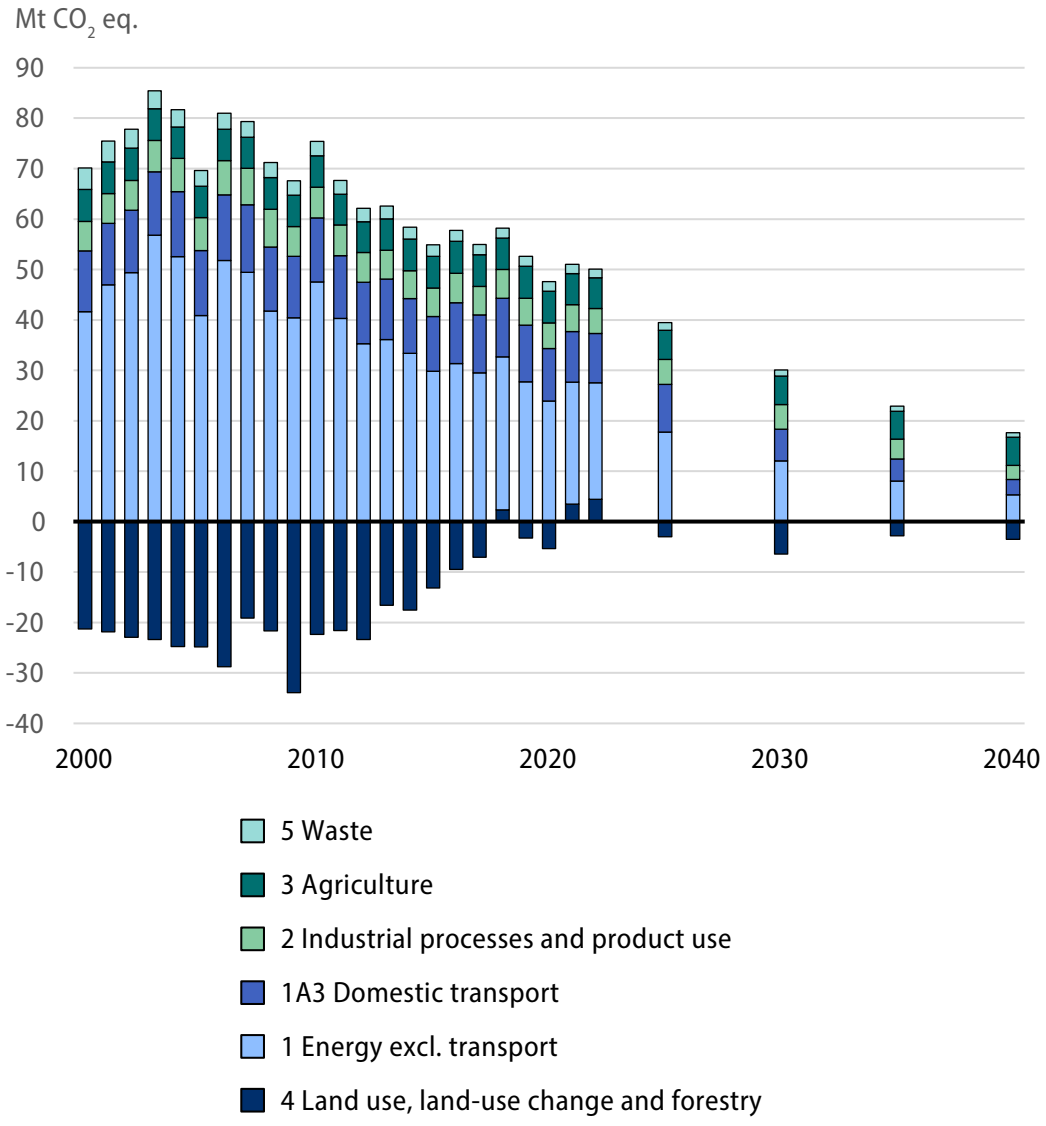
i. Trends in current GHG emissions and removals in the EU ETS, effort sharing and LULUCF sectors and different energy sectors

The historical trend and the development in the WEM projection of GHG emissions in the EU ETS and effort sharing sectors are shown in Figure 2. Net removals of the LULUCF sector and GHG emissions in transport and other energy use are shown in Figure 12.

ii. Projections of sectoral developments with existing national and Union policies and measures at least until 2040 (including for the year 2030)

Figure 12 shows the historical development of greenhouse gas emissions and removals by sector up to 2022 and the estimated development based on current national and EU policies and measures until 2040.

Figure 12. The historical development of greenhouse gas emissions and removals in 2000–2022 and the estimated development until 2040 based on current national and EU policies and measures.



Transport

Greenhouse gas emissions from domestic transport (without domestic air traffic) totalled 9.8 Mt CO_2 eq. in 2022. Transport emissions account for approximately a fifth of Finland's total greenhouse gas emissions and some 36% of the emissions in the effort sharing sector. Greenhouse gas emissions from domestic transport have mainly been decreasing since 2008. From 2005 to 2022, greenhouse gas emissions from transport dropped by some 2.7 million tonnes in total, or by 22%.

The new WEM projection of greenhouse gas emissions from traffic was completed at the end of 2023. The WEM projection for transport is based on the traffic performance projected until 2030 by the Finnish Transport and Communications Agency Traficom. In road transport, the transport performance of passenger cars is increasing as a result of the strong increase in the number of electric cars. This is due to the reduction in the cost of driving. By 2030, it is estimated that passenger car performance will grow by 6.3% from 2021. Truck performance is estimated to grow by 8.3% in the same time. Other key assumptions in the WEM projection are the replacement rate of cars and technologies and the average CO_2 emissions of new vehicles, which are projected by VTT Technical Research Centre of Finland Ltd. In the WEM projection, the annual replacement rate of cars is estimated at approximately 5%. In 2030, the specific emissions of new cars would be close to the limit that the EU has established for car manufacturers, and in 2035, sales of combustion engine cars will stop completely. The third factor having a substantial impact on transport greenhouse gas emissions in the WEM projection is the share of biofuels in the total consumption of fuel in road transport. The distribution obligation for 2024 has already been lowered by the current Government from what the previous Government decided. It is also very likely that further reductions in the share of biofuels will take place. Therefore, the WEM projection of greenhouse gases was revised to include these reductions according to the latest Government Programme, which results in an increase of the emissions from transport.

The agricultural sector

The emissions reported by Finland in the agricultural sector in 2022 totalled about 6.1 Mt CO_2 eq. Agricultural sector is the second most significant source of greenhouse gas emissions in Finland, accounting for approximately 13% of Finland's total emissions and some 23% of emissions from the effort sharing sector. Emissions from the agricultural sector remained approximately at the same level between 2005 and 2021. Agriculture projections were updated in spring 2024. In the WEM projection, the total emissions from the agricultural sector are expected to decrease by around 0.5 million tonnes of CO_2 eq. by 2030 compared to the 2022 level. After this, emissions from agriculture are expected to remain between 5.6 and 5.5 Mt CO_2

eq./year until 2055. This is because the number of animals will remain more or less at the 2025 level or decrease very slowly, and the effect of the measures targeted at peatlands will abate after 2035. The minor decrease in livestock numbers will reduce emissions from manure processing and manure application by around 0.14 Mt CO_2 eq. by 2030 and around 0.19 Mt CO_2 eq. by 2055. The N_2O emissions from agricultural soils are expected to decrease by around 0.52 Mt CO_2 eq. by 2035 and remain at that level until 2055. Energy-related emissions related to agriculture are reported in the energy sector.

Building-specific heating

Emissions from heating buildings are divided between the EU ETS sector and the effort sharing sector. In the effort sharing sector, the main source of emissions is building-specific oil heating. Emissions from certain small heating plants are also included in statistics concerning the effort sharing sector. In 2022, the emissions from building-specific heating amounted to 1.5 Mt CO_2 eq. in the effort sharing sector, which is about 6% of the sector's total emissions. The majority of these emissions were generated by oil heating.

Emissions from building-specific heating have declined in recent years, but there has been some fluctuation because of year-to-year temperature variations. The majority of emissions from building-specific heating come from the heating of residential buildings followed by the heating of commercial and public buildings. In the WEM projection, the emissions from building-specific heating of residential and commercial buildings will decrease from the recent 1.5 million tonnes CO_2 eq. to 0.6 million tonnes CO_2 eq. in 2030.

Waste management

Greenhouse gas emissions from waste management (excluding incineration) totalled 1.7 Mt CO_2 eq. in 2022, or 6% of Finnish emissions in the effort sharing sector. The most significant greenhouse gas produced in waste management is methane emitted from landfills. Waste management emissions in the effort sharing sector also include the greenhouse gases produced in the biological treatment of waste and in the disposal and treatment of wastewater: CO_2, methane and nitrous oxide. These emission sources are of limited importance and their emission volumes are stable. Greenhouse gas emissions from waste management have reduced by approximately 45% from 2005 to 2022. The greatest reductions have been achieved in methane emissions from landfills following a decrease in the landfilling of organic waste. The increased use of digestion in the biological treatment of waste has slightly reduced CO_2 emissions from biological treatment. However, CO_2 is still

being emitted from the digestion residue that will be composted and the remaining compost windrows. According to the WEM projection, emissions from the waste management sector will decrease by around 60% by 2030 compared to 2005 levels.

Emissions from facilities that burn municipal waste are mainly calculated for the effort sharing sector, while emissions from co-incineration plants belong to the EU ETS. The waste incineration emissions of the effort sharing sector have increased significantly since 2005. The increase in emissions is due to the increase in the energy utilisation of municipal waste. About 55% of the municipal waste generated in 2022 was used as energy, while in 2008 only about 17% of the municipal waste was incinerated. In 2008, emissions from municipal waste incineration were lower than 0.1 Mt CO_2 eq. and, in 2022, 0.7 Mt CO_2 eq. Emissions from waste incineration are still expected to increase slightly in the next few years, but level off after that.

F-gases

In 2022, fluorinated greenhouse gas emissions totalled 0.8 Mt CO_2 eq., which currently equals approximately 3% of emissions in the effort sharing sector. Emissions peaked in 2008 at approximately 1.4 Mt CO_2 eq. Since the peak year of 2008, emissions have decreased by more than 40%. F-gases are used as refrigerants and extinguishing agents and in plastic foaming, for example.

Measures in the WEM projection, the F-gas Regulation (517/2014) and the Mobile Air Conditioning Directive (MAC Directive), are estimated to reduce F-gas emissions to 0.33 Mt CO_2 eq. by 2030 and further to 0.20 Mt CO_2 eq. by 2040.

Machinery

Various types of machinery currently account for a total of 9% of emissions in the effort sharing sector. In 2022, total emissions from machinery were 2.5 Mt CO_2 eq. per year.

Machinery is used in industry and construction, trade, services, the public sector, households, agriculture and forestry. Machinery is usually equipped with combustion engines. Quantitatively, the most common fuel is gasoil, but petrol is also used. Among machinery emissions, CO_2 is the most significant greenhouse gas, but machinery also emits small quantities of methane and nitrous oxide.

Industry

Energy- and process-related emissions from industry (machinery excluded) totalled 8.9 Mt CO_2 eq., of which 1.4 Mt CO_2 eq. originated from non-ETS activities in 2022. Energy-related emissions are mainly CO_2 emissions and originate from all branches of industry. These days, the EU ETS also covers more than 90% of industrial process emissions. According to the WEM projection, industrial activities continue to grow but the energy-based and process emissions will slightly decrease, amounting to approximately 7.2 Mt CO_2 eq. in 2030. This is because industry is becoming more energy efficient and produces fewer emissions, which will offset the increase in emissions due to growth in industrial activities.

The energy industry

Greenhouse gas emissions from the energy industry were 12.9 Mt CO_2 eq. in 2022. Although the emissions somewhat vary from year to year, the trend is a steady decline. District heating emissions vary according to heating demand (cold or warm winters), whereas emissions from thermal power generation vary depending on the hydro situation in the Nordic-Baltic electricity market. The projections assume future years to be standard years with respect to heating demand, hydro levels (i.e. the long-term average plus the impact of climate change) and wind conditions.

Emissions from the energy industry mainly fall within the scope of the EU emissions trading system (EU ETS). In addition to the EU ETS, the energy industry is strongly affected by other policy measures to reduce emissions, enhance energy efficiency and increase the share of renewable energy sources.

In the WEM projection, the most significant future changes in electricity and heat production are the significant increase in the use of renewable energy sources, mainly wind power, biomass in CHP plants, waste heat recovery in district heating and solar power. All these changes reduce GHG emissions and strengthen energy supply self-sufficiency together with the new Olkiluoto 3 nuclear power unit (1,600 MW_e) that has recently been commissioned.

Small power plants and boilers are not included in the EU ETS. The total emissions of these plants, excluding waste incineration plants, amounted to 0.7 Mt CO_2 eq. in 2022. In the WEM projection, the emissions from these plants are expected to decrease slightly in the future.

Other fuel consumption

Emissions from the greenhouse gas inventory category *1.A.5 Other non-specified emissions of fuels* amount to 0.8 Mt CO_2 eq. (2022). The unknown consumption of light and heavy fuel oil, LPG and natural gas account for the largest share of consumption in this subcategory. In practice, the amounts consumed are determined as the difference between total sales and known consumption. The subcategory also includes the fuels consumed by the Finnish Defence Forces, statistical adjustments and smaller emission sources, such as helicopters. According to the greenhouse gas inventory report, uncertainty regarding emissions in this subcategory may be up to ±10%–50%, depending on the fuel, which is substantially higher than in other energy subcategories. In the WEM projection, emissions from this subcategory are expected to stay roughly at the current level or slightly decrease.

The LULUCF sector

In 2022, the LULUCF sector as a whole acted as a source of 4.4 Mt CO_2 eq. because the total removals resulting from the sector were smaller than the total emissions. The net emissions in 2022 were 10% of the total national emissions, which did not include the LULUCF sector. The change to the 2022 net emissions from the 1990 net removals was 119% and from the 2021 net emissions 28%.

The LULUCF sector was a net sink from 1990 to 2017. Starting from 2018, the sector has been either a net sink or a net source of emissions. Forest land has been a net sink during the whole time series, whereas the other land-use categories have been net sources. Harvested Wood Products have overall been a net sink, except for the year 2009. The low levels of roundwood fellings at the beginning of the 1990s and mid-2000s, and again after the financial crisis in 2008/2009, are the cause of the high removals of the LULUCF sector during those periods of time. There are several reasons why the sector has moved from being a net sink to becoming a net source. The main reasons are that commercial fellings have increased, and at the same time, the tree volume increment has decreased according to the National Forest Inventory. Since 2007, wood export duties from Russia have gradually increased. This has put pressure on domestic wood harvests in Finland. Also, the emissions from organic soils have increased considerably, but the carbon sink of mineral soils has decreased. This meant that the forest land net sink has decreased so that the sum of emissions from the other land categories is larger than the forest land net sink.

For forest land, the largest sink was tree biomass, with -12.6 Mt CO_2 of net removals in 2022. Harvested wood products were a net sink of -3.25 Mt CO_2 eq. Mineral soils on forest land were a sink of -4.8 million tonnes of CO_2, whereas organic forest soils were a source of 10.1 million tonnes of CO_2. Other emission sources in the forest land category are methane and nitrogen oxide emission from drained organic forest lands (2.43 Mt CO_2 eq.), and minor emissions from nitrogen fertilisation (0.005 Mt CO_2 eq. in 2022) and biomass burning in forest fires and in controlled burning (0.001 Mt CO_2 eq. in 2022). Croplands are also a source of emissions in the LULUCF sector with 8.83 Mt CO_2 eq. in 2022. Other emission sources in the LULUCF sector include grasslands (0.77 Mt CO_2 eq. in 2022) and wetlands (2.09 Mt CO_2 eq. in 2022), of which peat production areas accounted for 1.82 Mt CO_2 eq. in 2022.

In Finland's greenhouse gas inventory, some of the requirements of Part 3 of Annex V to Regulation (EU) 2018/1999 are already met. For example, the land monitoring system is based on geographically explicit datasets such as the National Forest Inventory (NFI), multisource-NFI (Landsat satellite data), digital maps provided by the National Land Survey of Finland (topographic database), the Finnish georeferenced soil database and data provided in the Land Parcel Identification System. The available Finnish data on land units listed in Annex V, in points (a) to (e), were collected. The next steps are to make the available information more detailed, evaluate the usefulness and applicability of them in the GHG inventory, identify data gaps and fill them, and finally to incorporate those land units into the monitoring and reporting system as separate estimation units. This work will take two to three years before it is ready to be implemented in the GHG inventory.

Two new monitoring systems are under preparation: data on land mitigation activities and on soils. The GHG inventory will employ these data in the years to come. The whole monitoring system (in the greenhouse gas inventory) will be improved, aiming to better reflect the annual land-use changes. This will be demanding since the timeliness of external data sources is a challenge, there being several data providers.

The sink and source categories, the methods of which do not meet the requirements of the LULUCF Regulation on tiers, have been identified. To the source and sink categories and carbon pools, for which an assumption of 'no change' is used, at least a tier 1 method will be applied in the 2025 greenhouse gas submission. Based on the LULUCF Regulation, higher tier methods will be developed for pools, sources and sinks, for which tier 1 or tier 2 methods are currently used. The importance of the category and pool for Finland's total GHG inventory emissions and the LULUCF sector is taken into account to prioritise the development work. Method development is first concentrated on emissions and

removals estimation in protected and restored areas. The aim is to report emissions and removals from some restored (rewetted) drained peatlands in the 2025 or 2026 submission. This work will be completed in 2027 for tier 2 methods and 2029 for tier 3 methods (Annex V land use units).

The LULUCF WEM projection was updated as a part of PEIKKO projection work during spring 2024. The LULUCF sector as a whole is projected to be a net sink in the WEM projection from 2025 onwards. In 2025, the net sink is estimated to be -3.02 Mt CO_2 eq. and -2.83 in 2035. After this, the LULUCF net sink is expected to increase to the level of -10.03 Mt CO_2 eq. by 2050 and to -12.36 Mt CO_2 eq. by 2055.

Table 18. WEM projection for the LULUCF sector until 2055 [Mt CO_2 eq.].

Category	2022	2025	2030	2035	2040	2045	2050	2055
LULUCF total	**4.4**	**-3.0**	**-6.4**	**-2.8**	**-3.5**	**-8.2**	**-10.0**	**-12.4**
Forest land	-4.8	-8.5	-11.1	-8.3	-9.2	-14.3	-16.4	-18.7
Cropland	8.8	6.4	5.8	6.0	6.5	6.6	6.5	6.2
Grasslands	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.6
Wetlands	2.1	1.8	1.6	1.2	1.0	1.0	1.2	1.2
Settlements	0.8	1.3	1.2	1.0	0.8	0.8	0.8	0.8
HWP	-3.3	-4.7	-4.6	-3.5	-3.3	-3.0	-2.7	-2.5

Forest land remains as a net sink in the WEM projection; the net sink of forest land is projected to increase from -4.77 Mt CO_2 eq. in 2022 to -8.28 Mt CO_2 eq. in 2035 and -18.68 in 2055. In the WEM projection, the surface area of forest land decreases by only around 7,000 ha until 2055. In 2023–2055, the area of deforestation will be around 300,000 hectares, slightly more than the afforestation area. Deforestation is mainly caused by construction. Most of the new forest land comes from grassland (around 105,000 hectares), but also from other land use categories, such as peat production areas (53,000 hectares) and cropland (24,000 hectares). The area to be cleared as arable land from forest land is relatively small, totalling approximately about 26,000 hectares over the period 2023–2055.

In the WEM projection, the estimate of annual roundwood removals is 77.3 million cubic metres in 2019–2028. In 2029–2038, the estimated roundwood removals will average 81.9 million cubic metres per year, which will slightly decrease, reaching a level of 81.1–81.4 million cubic metres in 2049–2058.

Cropland and grassland are a net source of greenhouse gas emissions in Finland. The CO_2 emissions in 2022 have been 8.83 Mt CO_2 eq. for cropland and 0.77 Mt CO_2 eq. for grasslands. In the WEM projection, the emissions are projected to decline to 6.03 Mt CO_2 eq. for cropland and 0.71 Mt CO_2 eq. for grasslands by 2035. The WEM projection estimates that the area of arable land will decrease by approximately 80,000 hectares by 2055.

The Harvested Wood Products (HWP) pool was a net sink of 3.25 million tonnes of CO_2 in 2022. HWP was a net sink over the period 1990–2020, except in 2009. The annual fluctuations in the time series are generally due to changes in the economic situation and the demand for wood products. In the WEM projection, the sink of HWP decreases over time during the reference period. As the production increases, the sink also grows, but as production remains at the same level, the removal of the old carbon stock starts to reduce the sink. As the lifetime of paper and paperboard is considerably shorter than that of solid wood products, the category is more sensitive to changes in production and produces net emission in some years.

The total emissions from wetlands were 2.09 Mt of CO_2 eq. for 2022. The emissions have increased by 0.64 Mt CO_2 eq. compared to 1990, when they were 1.45 Mt CO_2. In the WEM projection, the emissions from wetlands are expected to decrease to the level of 1.18 Mt CO_2 eq. by 2055. The most significant source of emissions is the peat extraction areas. The decreasing trend in emissions from wetlands is due to the decreasing energy use of peat, resulting in a smaller area being needed for peat extraction.

Finland is preparing to use the existing flexibilities under LULUCF regulation for both compliance periods in order to achieve its targets. The main flexibilities for the period 2021–2025 will be the forestland flexibility and additional compensation for Finland. The initial assessment for the period 2026–2030 is that Finland will be considering the use of available flexibilities. Finland has recognised the possibility of transferring units between Member States in the event that there are units available.

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

ii. Indicative projections of development with existing policies for the year 2030 (with an outlook to the year 2040)

Finland is one of the world's leading users of renewable energy sources. The most important renewable energy sources are bioenergy wood and wood-based fuels in particular. In addition, hydropower, wind power, air- and ground-source heat pumps and solar power are also used. Renewable energy is one of the most significant means of reaching Finland's energy and climate targets. The current high level of wood utilisation in the forest industry forms a backbone for meeting renewable energy targets.

The share of renewable energy in the gross final consumption of energy was 47.9% in 2022 (no statistical transfers were made to other countries). The EU 2020 target for the share of renewable energy in Finland in 2020 was 38% of gross final energy consumption and this was reached for the first time in 2014. The share of renewable energy in Finland's gross final consumption is the second highest in the EU.

Table 19 shows the share of renewable energy in the gross final consumption of energy in 2010, 2015, 2020, 2021 and 2022. The shares have been calculated using coefficients and normalisations compliant with the ILUC and RED II Directives.

Table 19. Overall and sector-specific share of renewable energy in the gross final consumption of energy. Source: Eurostat ShaRES.

Indicator	2010	2015	2020	2021	2022
RES	32.2%	39.2%	43.9%*	42.9%*	47.9%
RES-E	27.2%	32.2%	39.6%	39.6%	47.9%
RES-H&C	44.0%	52.6%	57.6%	52.1%	58.6%
RES-T (with coefficients)	4.4%	24.6%	14.3%	20.7%	18.8%

*Statistical transfers to other countries have been deducted

Table 20 shows the amounts of energy from renewable sources as final consumption in 2010, 2015, 2020 and 2022. The figures for hydropower and wind power have been normalised using the utilisation periods of maximum load over 15 and 5 years, respectively. The figures in the transport sector correspond to actual figures without coefficients. Only the compliant bioenergy is included in the figures.

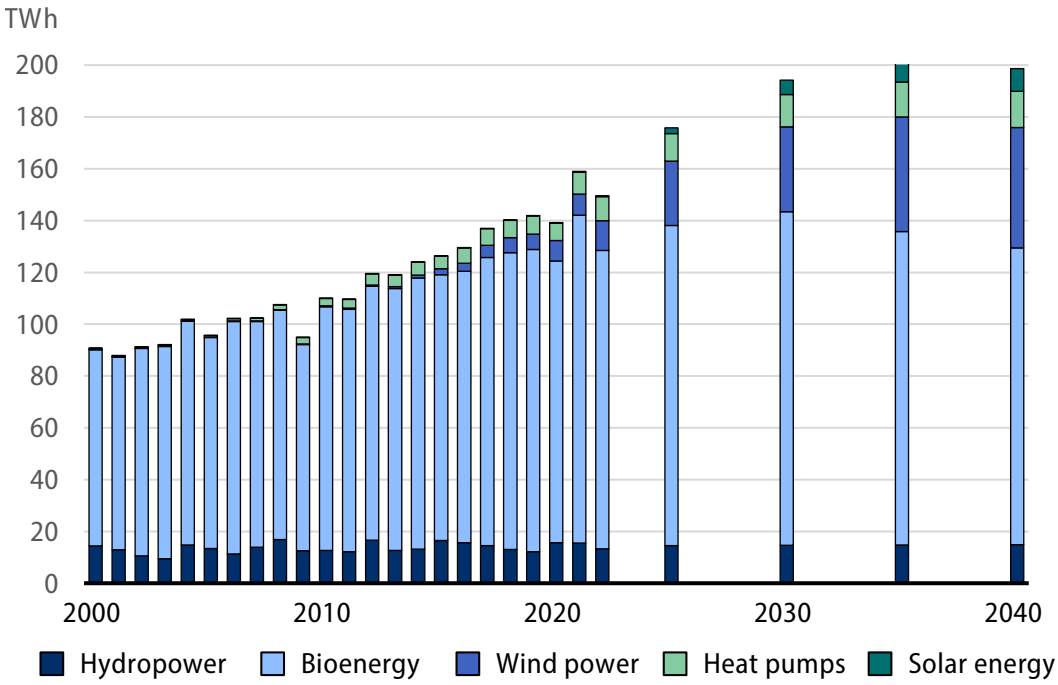
Table 20. Amount of renewable energy as final consumption by energy source in different sectors [TWh]. Compliant fuels only. Source: Eurostat ShaRES.

Energy source	2010	2015	2020	2022
RES Overall				
Hydropower	13.5	13.9	14.5	14.7
Wind power	0.3	2.0	6.9	12.9
Solar power	0.0	0.0	0.2	0.4
Bioenergy	85.7	94.6	99.5	102.7
Heat pump energy	2.7	4.7	6.1	7.6
Total	**102.2**	**115.3**	**127.2**	**138.3**
RES-E				
Hydropower	13.5	13.9	14.5	14.7
Wind power	0.3	2.0	6.9	12.9
Solar power	0.0	0.0	0.2	0.4
Bioenergy	11.0	11.4	11.6	12.6
RES-H&C				
Solar power	0.0	0.0	0.0	0.0
Bioenergy	73.0	77.4	83.3	83.8*
Heat pump energy	2.7	4.7	6.1	7.6
RES-T (actual contribution without coefficients)				
Liquid biofuels	1.7	5.7	4.4	6.0
Biogas	0.0	0.0	0.1	0.3
Renewable electricity	0.2	0.2	0.3	0.4

*Preliminary estimation of compliant bioenergy

Figure 13 shows the historical development of renewable energy between 2000 and 2022, as well as the projected development based on existing policies to 2030 and an outlook to 2040. The corresponding shares of renewable energy in gross final energy consumption are presented in Figure 3.

Figure 13. Historical development of renewable energy between 2000 and 2022, as well as the projected development based on current policies until 2030 and an outlook until 2040.



4.3 Dimension energy efficiency

i. Current primary and final energy consumption in the economy and per sector (including industry, residential, service and transport)

ii. Current potential for the application of high-efficiency cogeneration and efficient district heating and cooling

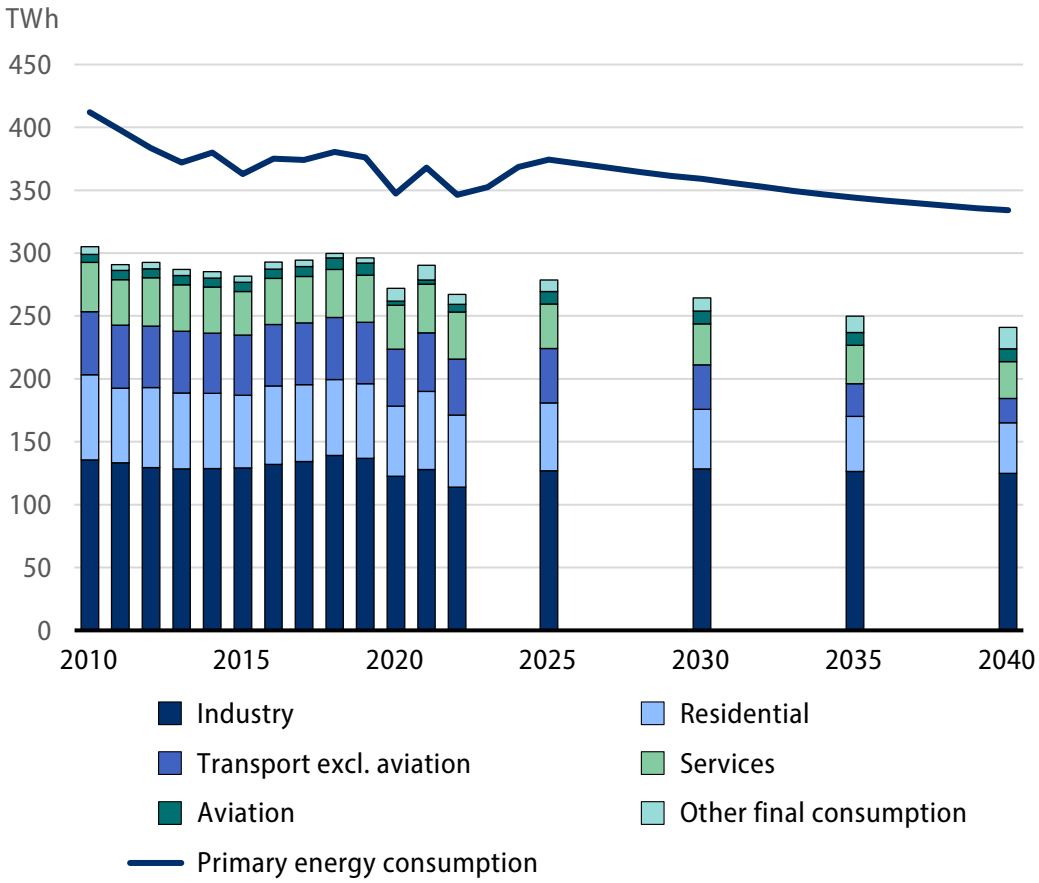
iii. Projections considering existing energy efficiency policies, measures and programmes as described in point 1.2.(ii) for primary and final energy consumption for each sector at least until 2040 (including for the year 2030)

iv. Cost-optimal levels of minimum energy performance requirements resulting from national calculations, in accordance with to Article 5 of Directive 2010/31/EU

Final energy consumption as defined in the Energy efficiency directive, FEC (Europe 2020–2030), has varied between 271 and 309 TWh in the 2000s. Corresponding primary energy consumption, PEC (Europe 2020–2030), is 348–427 TWh. The trend of both is moderately downward.

In the WEM projection, the primary energy consumption in 2030 is 357 TWh and the final consumption of energy 265 TWh. A sector-specific examination of the WEM projection shows that the final energy consumption in 2030 will be about 128 TWh for industry, 47 TWh for the residential sector, 35 TWh for the service sector, 36 TWh for transport, 10 TWh for international aviation and 9 TWh for other sectors together. Final energy consumption figures exclude distribution losses, power plants' own use and ambient heat from heat pumps, but include international aviation. There is no estimation of primary energy consumption by sector. Figure 14 shows historical development for 2010–2022 and projections to 2040 for primary energy consumption in total and final energy consumption for each sector.

Figure 14. Historical development of primary energy in total and final energy consumption by sector between 2010 and 2022, as well as the projected development based on current policies until 2030 and an outlook until 2040.

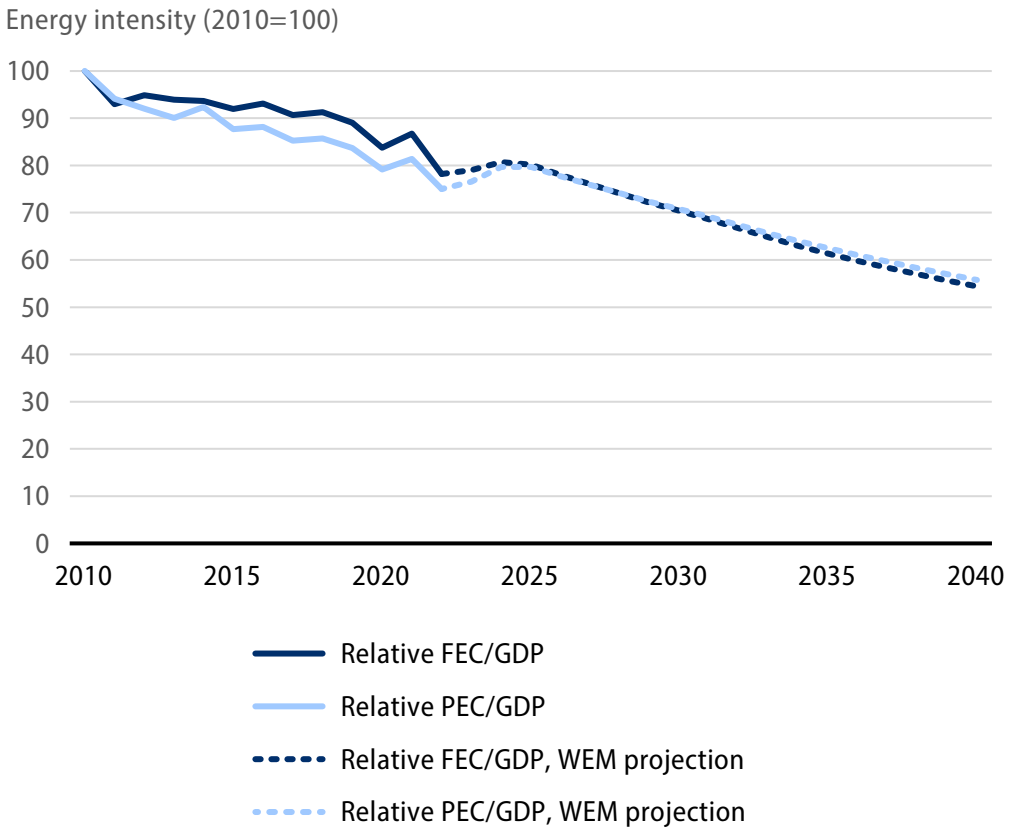


The EU energy efficiency target for 2030 is indicated in terms of final energy and primary energy consumption. When considering early actions, anticipated GDP growth, its structure – based heavily on energy intensive industries – and the changes in energy supply, it is very challenging for Finland to contribute in quantity to the declining projection of energy use in 2021–2030.

Finland started active energy efficiency policies and measures as long ago as after the 1973 oil crisis. The Government launched the first comprehensive Energy Efficiency Action Plan in 1993 and established the sustainable development company Motiva Ltd to implement many of the plan's activities, including the Energy Audit Programme. This long history of energy efficiency policies and measures in Finland means that there is no silver bullet or low-hanging fruit to improve energy efficiency.

Economic growth in the 2020s will come partly from relatively energy-intensive sectors: the forest industry (pulp production based solely on virgin fibre, new products and biorefineries), data centres and hydrogen production. Without these, both primary and final energy consumption would decrease more rapidly along with increasing energy efficiency. The increase in economic activity partly offsets the energy efficiency gains achieved at the same time. Thus, a more descriptive indicator for energy efficiency is energy intensity with regard to GDP. Figure 15 shows the relative primary and final energy consumption per GDP in 2010–2022 and the estimated development of the indicators in the WEM projection. Improved energy technology and energy efficiency actions have disconnected economic growth from the energy consumption volume.

Figure 15. Relative energy intensity (primary and final energy consumption per GDP, 2010 = 100) for the WEM projection.



Finland has been utilising high-efficiency combined heat and power (CHP) production for decades. Today, efficient cogeneration and efficient district heating and cooling operate in open energy markets and compete more and more with other generation, heating or cooling methods, such as small-scale heat pumps. Nevertheless, thanks to the fact that the district heating sector is investing heavily in new production methods such as large-scale heat pumps, district heating and cooling are feasible options, especially in towns, cities and densely populated municipalities. In these areas, a significant part of the heated building stock has been connected to district heating. Statistics indicate that district heating accounts for almost 90% of the heat use in apartment blocks, 34% in all residential buildings, 43% in industrial buildings and more than 60% in commercial and public buildings (in the service sector). The share in single-family houses is about 7%. District heating has a total market share of 45% in residential, commercial and public (service sector) buildings.

In 2022, sales of district heating were 33.0 TWh. With temperature correction, the consumption equals 34.5 TWh. In the same year, the generation was 36.8 TWh. The consumption of district heating is projected to be 32 TWh in 2025 and 29 TWh in 2030. The share of cogeneration is expected to fall, but at the same time, the share of renewables and waste heat recovery (currently almost 70% of the total generation) will increase. This is also reflected in a study published in 2020, in which the technical potential of waste heat not yet utilised in Finland was estimated at 35 TWh compared to the currently utilised 5 TWh. Although not all of the potential is feasible, it is clear that there are still many waste heat streams that are not yet harnessed, especially in industry. Ambient heat will also increasingly be extracted.

In 2023, 12 companies sold district cooling and their sales amounted to over 300 GWh. In 2030, sales of district cooling are projected to be 490 GWh. Approximately 20% of the current generation comes in the form of free cooling (e.g. cool enough lake water) which does not require additional heat pumps.

Energy efficiency of buildings

Requirements for the energy efficiency of buildings have been implemented in Finland for decades. Along the way, the requirements have been made stricter, through both national measures and implementation of the EU's policies such as the EPBD. The new policies have also induced a need to create regulations for nearly zero-energy buildings, the latest of which are listed below.

NZEB definition in new buildings

The requirements for new buildings are in accordance with the following regulations:

- Decree of the Ministry of the Environment on the Energy Performance of New Buildings (1010/2017)[69]
- Decree of the Ministry of the Environment on the Indoor Climate and Ventilation of New Buildings (1009/2017)[70]
- Decree of the Ministry of the Environment on Water and Sewerage Systems of Buildings[71]

NZEB definition in renovated buildings

The cost-effective deep renovation of buildings, including the staged deep renovation requirement level in connection with repairs is in accordance with the following regulations:

- Ministry of the Environment Decree on Improving the Energy Performance of Buildings Undergoing Renovation or Alteration (4/2013)[72]
- Decree of the Ministry of the Environment on Amending the Decree of the Ministry of the Environment on Improving the Energy Performance of Buildings Undergoing Renovation or Alteration (2/2017)[73]

The EPBD is being recast, and after its entry into force, the previously mentioned decrees will be reviewed.

69 https://www.finlex.fi/fi/laki/alkup/2017/20171010
70 https://www.finlex.fi/fi/laki/alkup/2017/20171009
71 https://www.finlex.fi/fi/laki/alkup/2017/20171047
72 https://www.finlex.fi/fi/viranomaiset/normi/700001/40799
73 https://www.finlex.fi/fi/viranomaiset/normi/700001/43242

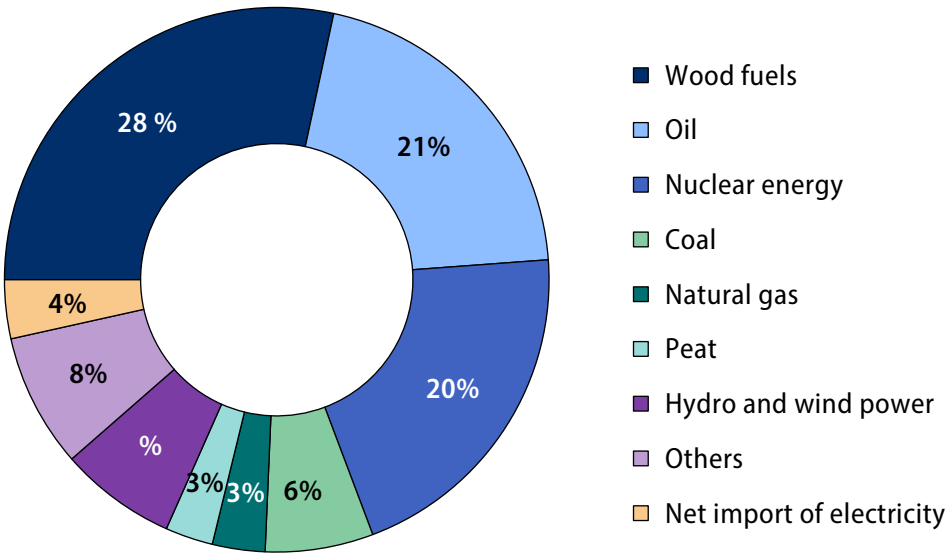
4.4 Dimension energy security

i. Current energy mix, domestic energy resources, import dependency, including relevant risks

Finland is dependent on imported fuels. Accordingly, the cornerstones of Finnish energy policy are a diversified and reliable supply of energy and improved self-sufficiency. Energy-intensive basic industries, the cold climate and long distances underline the significance of energy for the wellbeing of Finland's inhabitants and competitiveness.

In 2022, the total energy supply was 360 TWh. Finland's domestic energy sources are wood-based fuels, hydropower, wind power, solar energy, waste and peat. The energy import dependency, calculated as the proportion of imported net energy in the gross available energy, was 41% in 2022. Since summer 2022, Finland has not imported energy from Russia except for uranium and small amounts of LNG. Figure 16 shows the current distribution of the energy sources in the total energy supply.

Figure 16. The distribution of different energy sources in the total energy supply in 2022. Source: Statistics Finland.



Domestic electricity generation was 69 TWh in 2022. This consisted of nuclear power (35%), combined heat and power production (24%), both in connection with district heat production and by industry for its own use, hydropower (19%), wind power (17%) and conventional condensing power (4%). Total electricity consumption was 82 TWh.

The power system is interconnected with the power systems of Russia, Sweden, Norway and Estonia but no electricity has been imported from Russia since May 2022. Net imports from the Nordic and Baltic countries (and Russia in the past) vary considerably from year to year, mainly due to variations in hydropower production in the Nordic countries. Between 1990 and 2022, maximum net imports were 20.4 TWh (2017) while minimum net imports were 3.7 TWh (1996).

The share of net imports of electricity has grown in recent years, as about 2,000 MW of thermal power generation capacity has been shut down since 2010. However, the share has already decreased and will be significantly lower going forward, thanks to the recent commissioning of the Olkiluoto 3 nuclear power unit (1,600 MW) in April 2023. Generally, a high share of net imports is not a problem in itself. Regional and European electricity markets that function well and sufficiently strong cross-border connections are the most efficient and cost-effective way of guaranteeing competitive electricity prices and security of supply. Despite the significant change on an annual level, Finland will remain dependent on electricity imports during winter peak hours.

In Finland, renewables accounted consistently for around 30% of gross final energy consumption for the period 2000–2007, but the figure has increased in recent years, reaching almost 48% in 2022. In 2010, an extensive package of specific targets concerning different renewable energy sources was launched in order to reach the EU 2020 renewable energy target set for Finland, i.e. 38% of its gross final energy consumption. The package promotes the use of forest chips and other wood-based energy in particular, alongside wind power, the use of transport biofuels and increased utilisation of heat pumps. Since 2010, measures have been strengthened and adjusted when needed, and the 2020 target was exceeded by a wide margin.

For several decades, the use of primary energy as well as electricity increased, and they reached their peak values in 2006–2007. Demand rose faster than GDP until 1994. Since then, both the energy intensity and the electricity intensity of the economy have decreased. The decrease reflects the structural change in the economy from basic industry towards services and less energy-intensive industry.

Furthermore, increased energy efficiency has helped reduce energy intensity (Figure 15). Figure 17 shows the historical development of energy supply by source from 2000 to 2022.

As Finland does not produce any fossil fuels, all supplies of crude oil, natural gas and coal are imported. Oil and coal can be easily procured from various sources on the global market. Also, the gas infrastructure has been improved to diversify supply channels, especially after the floating LNG terminal in Inkoo came online in January 2023. Finland does not import Russian energy, except for uranium and small amounts of LNG to smaller terminals, which the Government is planning to ban, and is not significantly dependent on any one country in terms of energy security.

ii. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

As described in Section 4.2, the most significant future changes in the WEM projection in electricity and heat production are the recently commissioned nuclear power plant unit (Olkiluoto 3) and the increase in renewable energy supply, mainly wind power and biomass. District heat production from heat-only plants (both boilers and newer technologies such as heat pumps) is expected to grow slightly at the expense of combined heat and power production, which is struggling with feasibility under low average electricity prices, despite the period of higher prices from 2022 to early 2023. Figure 17 outlines the primary energy supply by energy source in the WEM projection until 2040.

Figure 18 shows the projected development of self-sufficiency in total energy supply. Self-sufficiency is roughly 60% today and is expected to approach 80% toward the end of the 2020s, mainly due to increased use of domestic renewable energy and new nuclear power, which reduce the need to import fossil fuels and electricity.

Figure 17. Historical development (2000–2022) and WEM projection of the primary energy supply until 2040.

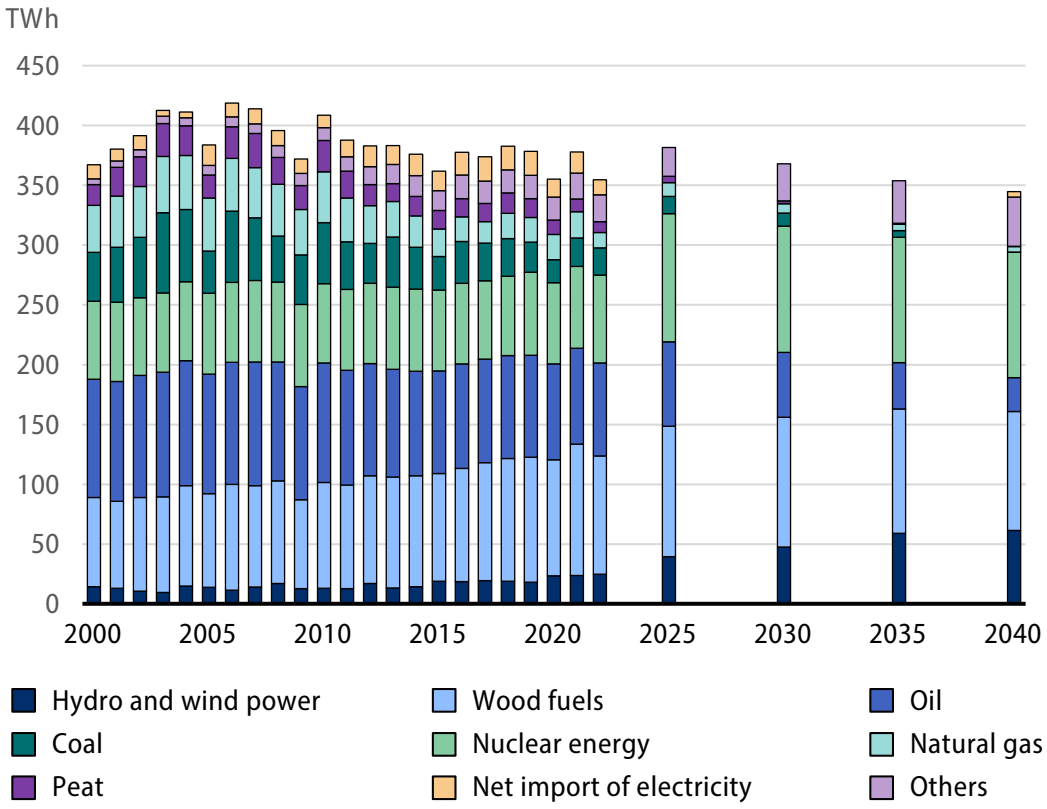


Figure 18. Historical self-sufficiency in energy supply 2000–2022 and the projected development in the WEM projection until 2040.

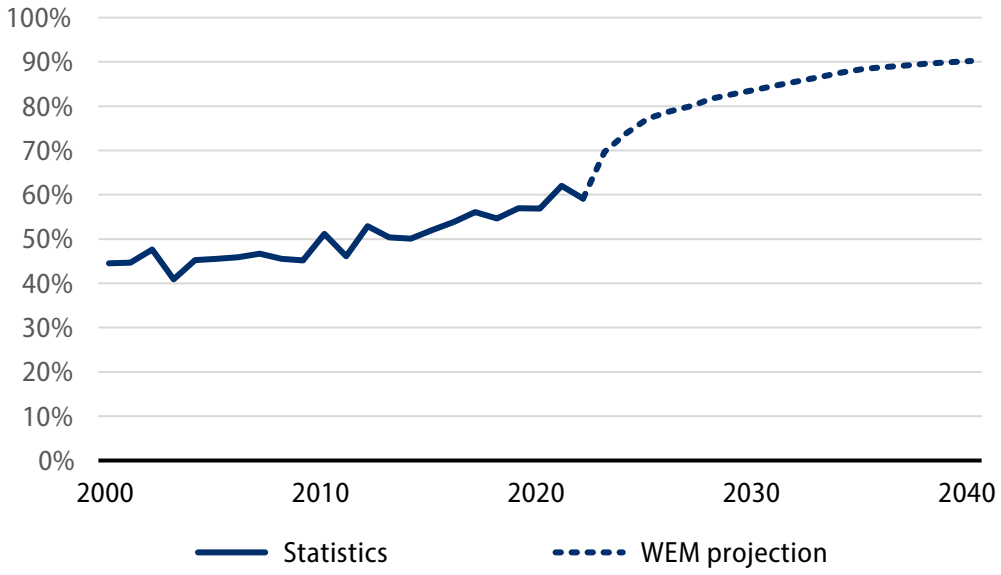


Table 21 shows the projected development of peak load demand for electricity and available generation and interconnector capacity in peak load situations in 2023, 2030 and 2040. However, the figures contain significant uncertainties, as the industrial demand is extremely difficult to predict (it depends on when hydrogen production takes off, for example). In any case, a strong increase is expected in the renewable capacity (especially wind and solar) whereas the number of conventional CHP plants will likely decrease. However, the generation capacity estimates in the table below includes intermittent renewable capacity to a very limited extent, since that production is uncertain during peak hours. Finland will continue to import the required deficit during such hours from neighbouring countries through the common Nord Pool electricity market.

Table 21. Projection of demand, generation capacity and interconnector capacity in peak load situations [MW]. [74, 75]

Component	2023	2030	2040
Peak demand	14,400	17,000	18,000
Generation capacity *	12,900	15,300	15,300
Deficit	**1,500**	**1,700**	**2,700**
Interconnector capacity	3,400	4,350	4,350

* Including strategic reserves and the estimated wind power production on a calm winter day, but excluding solar PV capacity.

74 https://www.fingrid.fi/en/news/news/2022/fingrid-has-updated-its-estimate-of-the-adequacy-of-electricity-in-the-coming-winter-electricity-consumption-has-decreased--energy-saving-measures-must-continue/

75 https://energiavirasto.fi/documents/11120570/158131816/AFRYn+selvitys+s%C3%A4hk%C3%B6j%C3%A4rjestelm%C3%A4n+resurssien+riitt%C3%A4vyydest%C3%A4+vuoteen+2033.pdf/33b8021d-5b91-5c5b-1ec0-29c00ab04911/AFRYn+selvitys+s%C3%A4hk%C3%B6j%C3%A4rjestelm%C3%A4n+resurssien+riitt%C3%A4vyydest%C3%A4+vuoteen+2033.pdf?t=1682512099666

4.5 Dimension internal energy market

4.5.1 Electricity interconnectivity

i. Current interconnection level and main interconnectors

Section 2.4.1 describes the current interconnection levels and its development in the near future. Table 22 lists the main interconnectors.

Table 22. List of main interconnectors.

To country	Type	Export	Import	Name of interconnector
Sweden SE1	AC	1,100 MW	1,500 MW	-
Sweden SE3	HVDC	1,200 MW	1,200 MW	FennoSkan 1 & 2
Estonia EE	HVDC	1,000 MW	1,000 MW	EstLink 1 & 2
Norway	AC	100 MW	120 MW	-
Russia (connections not in use since May 2022)	AC	350 MW	1,400 MW	-
Total (without RU)	-	**3,400 MW**	**3,820 MW**	-

ii. Projections of interconnector expansion requirements (including for the year 2030)

Table 23 shows planned interconnector investments.

Table 23. Planned interconnector investments.

To country	Type	Export	Import	Information
Sweden SE1	AC	+900 MW	+800 MW	Expected completion in 2025

4.5.2 Energy transmission infrastructure

i. Key characteristics of the existing transmission infrastructure for electricity and gas

Electricity

The Finnish electricity system is part of the Nordic synchronous power system, along with the Swedish, Norwegian and Eastern Denmark systems. Finland is also connected to the Russian and Estonian power systems by direct current connections. The Nordic synchronous system is connected to the Central European power system and the Baltic power systems through direct current connections.

The main grid is the primary electricity transmission network and includes the 400, 220 and 110 kV lines that are most important for power transmission, and substations. Table 24 shows the size of the main grid operated by Fingrid. Local transmission to small users takes place in distribution grids.

The main grid serves electricity producers and consumers by enabling a functional electricity market throughout the country, as well as cross-border trade. The majority of electricity consumed in Finland is transmitted via the main grid. Fingrid is responsible for main grid operation, planning and supervision.

Table 24. Current size of the main grid operated by Fingrid (2023).

Component	Length/number
400 kV transmission lines	5,400 km
220 kV transmission lines	1,000 km
110 kV transmission lines	7,600 km
HVDC cables	320 km
Total transmission lines	**14,500 km**
Substations	> 120

Gas

Gasgrid Finland is Finland's natural gas TSO. It operates a 1,150 km high-pressure transmission pipeline network, confined to the south of the country. Finland's natural gas transmission system also encompasses two cross-border interconnections, four compressor stations, three small-scale LNG terminals and, since January 2023, a floating storage regasification unit (FSRU) in the southern port of Inkoo. However, the physical connection between Finnish and Russian gas systems was disconnected in 2022.

The gas system mainly supplies industrial users and natural gas co-generation plants which receive gas directly from the transmission network. In addition to natural gas, small quantities of biogas are injected into the gas transmission network from four biogas plants (Espoo, Kouvola, Lahti and Riihimäki).

Until Russia suspended gas imports to Finland in May 2022, natural gas was supplied to Finland mostly from Russia through a 1,310 km pipeline that enters Finland at the Imatra interconnection point. The Imatra interconnection had a total capacity of 22 mcm/d, far in excess of Finland's average daily gas consumption of 7.1 mcm in 2021, and also comfortably above the 2021 daily peak consumption of 18 mcm.

The bidirectional Balticconnector pipeline was commissioned in early 2020. The 77 km offshore pipeline runs between Inkoo in southern Finland and Paldiski in northwest Estonia; it is jointly owned by the Finnish TSO, Gasgrid Finland, and the Estonian TSO, Elering. The nominal transmission capacity between Estonia and Finland is around 8 mcm/d. However, the available capacity from south to north is currently 5.5 mcm/d due to constraints in the Baltic States' gas systems.

By connecting the Finnish gas grid to the Estonian gas grid, the Balticconnector pipeline has allowed Finland to import gas from the Klaipeda LNG terminal in Lithuania and make use of the Inčukalns gas storage facility in Latvia. Following the commissioning of the Gas Interconnection Poland-Lithuania (GIPL) pipeline in May 2022, Finland also gained access to the broader EU gas market.

The LNG terminal capacity is very recent. The capacity is as follows:

- The Pori terminal (in use since 2016; off-grid): 30,000 m^3
- The Manga terminal in Tornio (in use since 2019; off-grid): 50,000 m^3
- The Hamina terminal (in use since October 2022): 30,000 m^3
- The Floating Storage Regasification Unit (FSRU) in Inkoo (in use since January 2023): 151,000 m^3

The FSRU alone has a regasification capacity of around 5 bcm/year, or almost four times Finland's annual gas consumption.

ii. Projections of network expansion requirements at least until 2040 (including for the year 2030)

Electricity

Fingrid's Development Plan 2024–2033 includes around EUR 4 billion of investments aligned with Finland's energy and climate goals. The plan indicates that the main upcoming challenges are: the decreasing generation from co-generation plants in southern Finland; integrating higher shares of generation from nuclear, wind and solar PV; and meeting increased the electricity demand resulting from electrification. The plan notes that additional transmission lines are needed between the south of Finland (demand centres) and the north and west (the main sites for wind generation and interconnections with Sweden). The Development Plan 2024–2033 suggests investments for 6,100 km of new transmission lines (3,800 km of 400 kV and 2,300 km of 110 kV), 46 new substations and the modernisation of 44 existing substations.

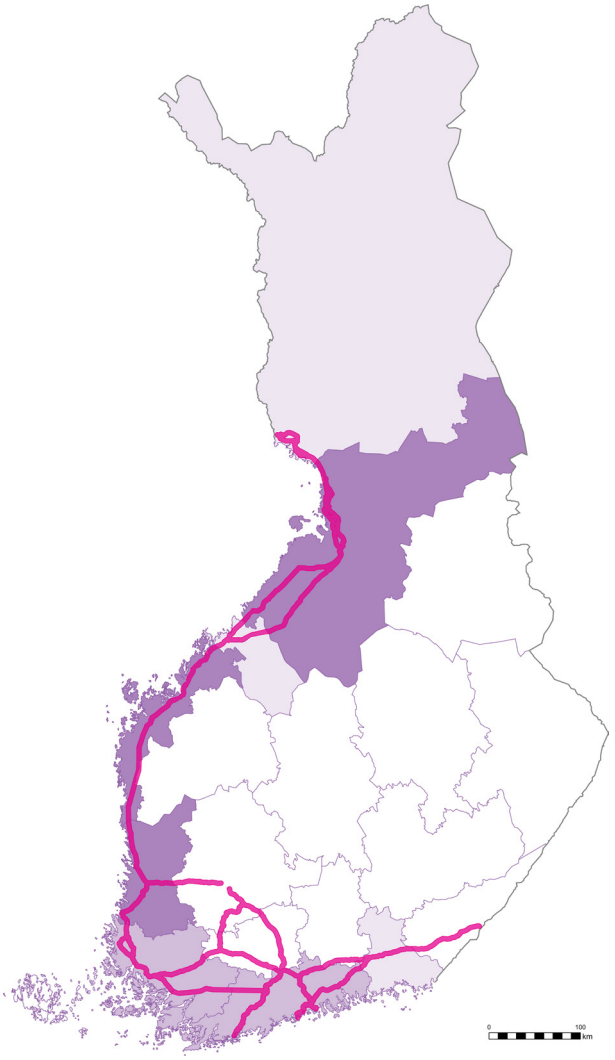
Gas and hydrogen

Following the commissioning of the Inkoo floating LNG terminal and the expansion of the capacity of the transmission network in Inkoo, Finland no longer has any need to expand the transmission infrastructure for natural gas.

In June 2022, the Government tasked Gasgrid Finland to develop the transport infrastructure for hydrogen and its gaseous derivatives.

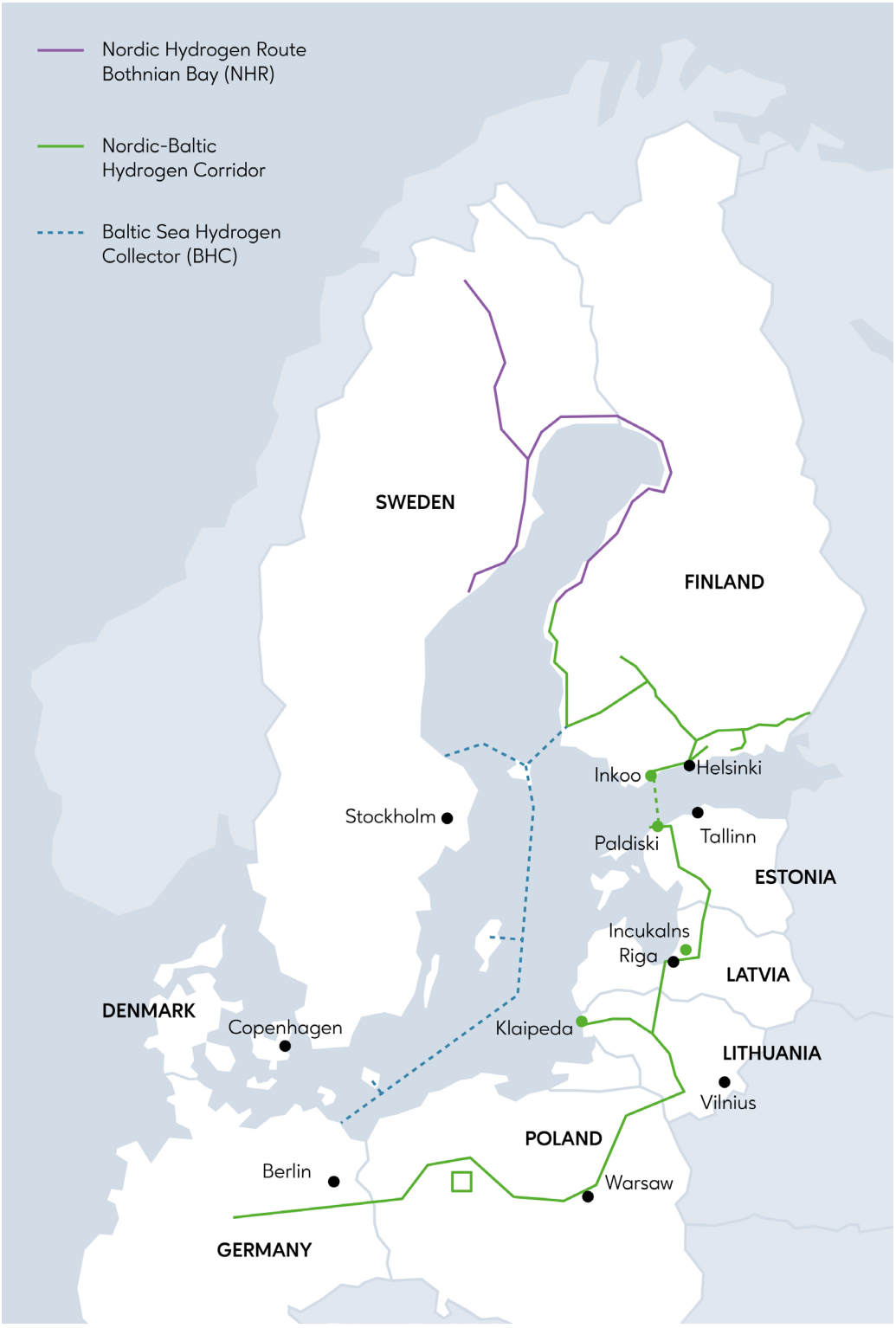
Gasgrid Finland is working to accelerate the development of hydrogen infrastructure in Finland. Gasgrid Finland aims to complete a large national hydrogen infrastructure in the 2030s.

Figure 19. Preliminary alternative hydrogen transmission network route plans to be specified as the design progresses (Source: Gasgrid Finland)



Gasgrid Finland is involved in three hydrogen infrastructure projects which have been given PCI status. The Nordic-Baltic Hydrogen Corridor project is planning a hydrogen infrastructure to be built from Finland via Estonia, Latvia, Lithuania and Poland to Germany. The Nordic Hydrogen Route project is exploring the hydrogen infrastructure between Finland and Sweden on the coast of the Bay of Bothnia. The Baltic Sea Hydrogen Collector project is developing the offshore hydrogen infrastructure that will connect Finland and Sweden to Central Europe. Gasgrid Finland is promoting these hydrogen projects together with eight other gas transmission system operators operating in the Baltic Sea region and two industrial companies.

Figure 20. Gasgrid Finland´s hydrogen projects with PCI status (Source: Gasgrid Finland)



Gasgrid Finland is working alongside Sweden's Nordion Energi to develop the Nordic Hydrogen Route, a cross-border project aimed at building a pipeline network and an open hydrogen market in the Bothnian Bay region by 2030.

The aim of the Nordic Hydrogen Route is to drive decarbonisation and support regional green industrialisation, economic development and European energy independence. The companies seek to develop a network of 1,000 km of new pipelines that would effectively transport energy from producers to consumers to ensure they have access to an open, reliable and safe hydrogen market. The pipelines would serve 65 TWh of identified potential hydrogen demand in the Bothnian Bay region by 2050. The core route will be along the coastline, with a branch to Kiruna.

The Nordic Hydrogen Route investment is estimated at EUR 3.5 billion, offering a hydrogen transportation cost of EUR 0.1–0.2 per kg. It would enable ten-fold investments of around EUR 37 billion in wind power and electrolysis capacity. The pipeline could facilitate emissions savings of up to 20 Mt CO_2 eq. per year by 2050.

4.5.3 Electricity and gas markets, energy prices

i. Current situation of electricity and gas markets, including energy prices

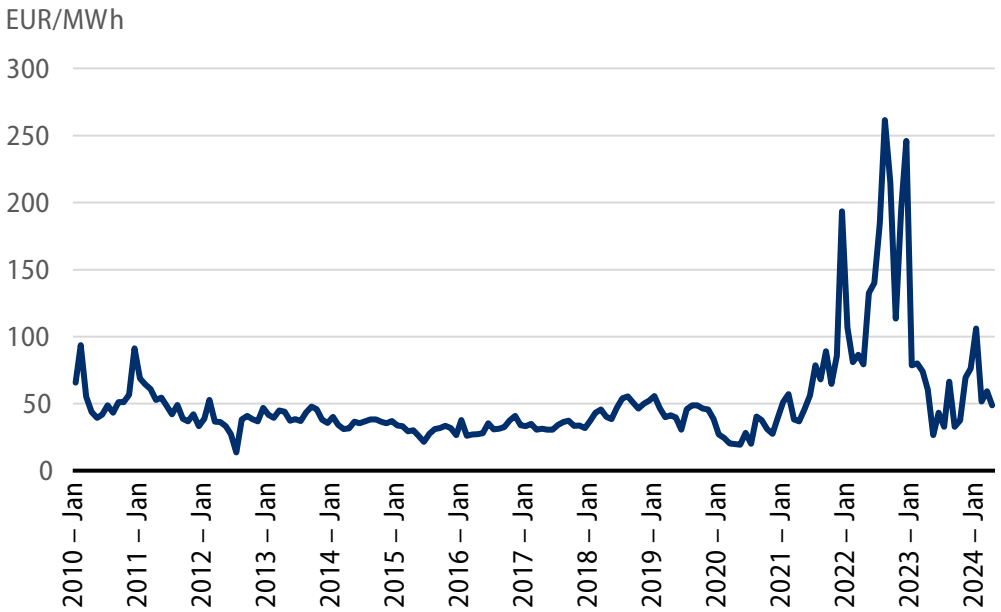
Electricity

Finland forms an integrated wholesale electricity market with Denmark, Norway, Sweden, Estonia, Lithuania and Latvia. The Nordic-Baltic market has been price-linked to the northwestern European electricity market since 2013. There are currently two power exchanges active in the Nordic market: Nord Pool AS and EPEX SPOT. In 2022, 74% of the electricity supply in Finland was traded through the Nord Pool day-ahead market. Day-ahead wholesale prices have experienced notable volatility in recent years, dropping to a historic low in 2020 (annual average price 28.02 EUR/MWh) as pandemic restrictions reduced demand, and surging to all-time high in 2022 (154.04 EUR/MWh) as a result of the energy crisis. The volatility is demonstrated by the fact that the average spot price for May 2023 (26.61 EUR/MWh) was 90% lower than the average for August 2022 (261.49 EUR/MWh). Figure 21 shows the monthly average day-ahead price for Finland from January 2010 to April 2024.

Finland has been heavily dependent on integrated European electricity markets to fill the significant deficit in generation capacity compared to peak load. In recent years, Finland has imported over 20% of its annual electricity supply and around

30% of power demand during winter peaks. This import dependency, however, has already declined with the commissioning in 2023 of the 1.6 GW Olkiluoto NPP and several GWs of wind power capacity. In light of the significant volume of planned generating capacity additions, the Government foresees Finland becoming self-sufficient in electricity supply at the annual level in the course of this decade.

Figure 21. Monthly average prices in price area Finland from January 2010 to April 2024. Source: Nord Pool



Gas

Until 2020, Finland was exempt from EU rules on unbundling and third-party access in the gas sector (Directive 2009/73/EC) due to the isolated nature of the Finnish gas market. As a result, the gas market was essentially closed to competition and fully controlled by the state-owned company, Gasum, which acted as the TSO and was the only importer and wholesale supplier.

However, upon the commissioning of the Balticconnector pipeline in January 2020, the Finnish gas sector became subject to EU legislation on gas market competition, and the exemptions to the Gas Directive were abolished from the Natural Gas Market Act.

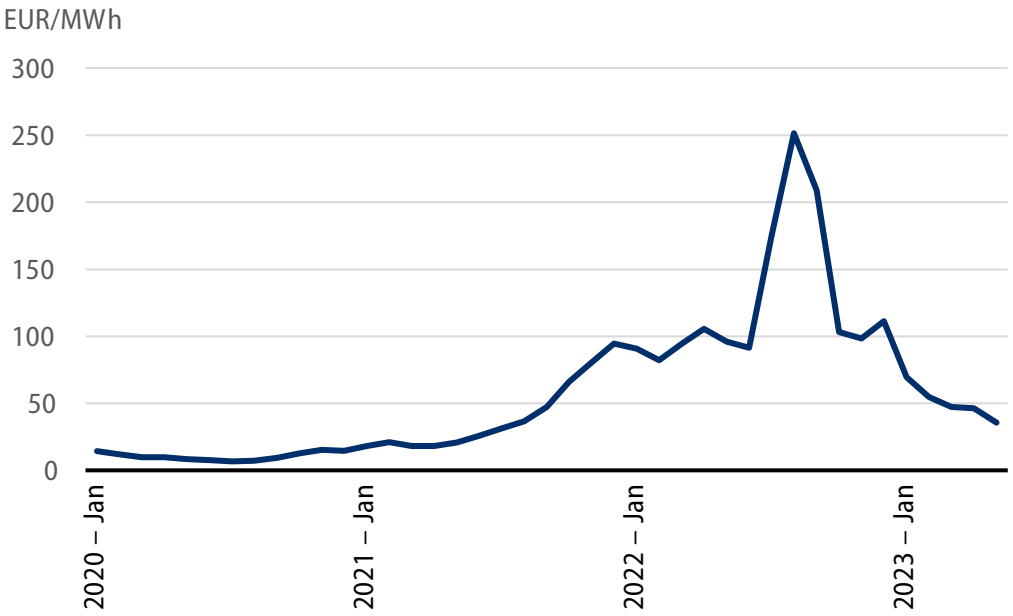
In line with the Gas Directive, the Natural Gas Market Act legislated for the separation of gas transmission and sales activities, resulting in the creation of the new TSO, Gasgrid Finland, which was unbundled from Gasum. Gasgrid Finland remains fully state-owned. The Natural Gas Market Act also legislated for open access to the natural gas transmission and distribution networks, as well as to Finland's LNG terminals.

Gas wholesale and retail markets

Finland has been actively involved in creating a regional gas market within the Baltic countries. The common natural gas market, known as the FinEstLat market, came into operation in 2020, becoming Europe's first multi-country gas market connecting more than two countries.

In 2022, there were 49 registered wholesale gas suppliers in Finland. However, the Finnish wholesale market remains concentrated, with the state-owned Gasum holding a market share of around 60%. Since the beginning of 2020, gas trading services have been provided by the GET Baltic exchange. GET Baltic administers an electronic trading system for spot and forward natural gas products with physical delivery across Finland, Estonia, Latvia and Lithuania. GET Baltic daily market wholesale gas price is shown in Figure 22.

Figure 22. GET Baltic monthly market wholesale gas price, January 2020 – April 2024.



Source: https://www.getbaltic.com/en/market-data/.

The Finnish retail gas market is very small, with around 24,000 retail consumers in total. Retail consumers mainly consist of households that use gas for cooking purposes only. In 2022, there were 14 registered gas retailers in Finland.

ii. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

Electricity

Currently the market is under great uncertainty. The prices in the years to come depend heavily on, on the one hand, the speed of increase in new generation capacity, especially wind power, and on the other hand, on the speed of increase in new demand, especially electrolysis capacity. In addition, if the new demand and generation capacities are not flexible, it will have a significant negative effect on prices. Depending on these factors, prices are estimated to stay relatively modest up to 2030, after which there can be more fluctuations.

Gas

A roadmap establishing a process for regional gas market integration of the FinEstLat gas market area with Lithuania was agreed in 2020 by the energy ministries, national regulatory authorities (NRAs) and gas transmission system operators from Estonia, Finland, Latvia and Lithuania. The initial plan was for the FinBalt single entry tariff system to enter into force in October 2023, but this has been postponed until at least October 2024 because of the circumstances resulting from Russia's aggression against Ukraine.

The eventual implementation of the EU's Gas Package will imply some changes to the Natural Gas Market Act. More importantly, it will prompt the drafting of a Hydrogen Market Act. The Government Bill for new gas market legislation is expected to be given to Parliament in 2025 or 2026.

The National Climate and Energy Strategy of 2022 focuses on the green transition and the phasing-out of Russian fossil energy, which has become increasingly topical since spring 2022. The strategy includes a national hydrogen strategy to promote the hydrogen economy and electrofuels, and to set quantitative targets for hydrogen electrolysis capacity. The target for electrolyser capacity in the Strategy is 200 MW in 2025. This will not be achieved by 2025, as the start of clean hydrogen production is delayed in the whole of the EU. The Government Programme from 2023 sets a goal for Finland to produce 10% of the EU's clean hydrogen. The measures for this will be set out in the energy and climate strategy in 2024–2025.

Furthermore, the Government's objective is to make Finland the leader in the European hydrogen value chain by 2030, building on the secure supply of abundant, inexpensive clean electricity and other competitive advantages. This involves large-scale construction of hydrogen production and transportation capacity, and the adoption of legislation on the hydrogen market. More details are outlined in the February 2023 Government Resolution on Hydrogen.

4.6 Dimension research, innovation and competitiveness

i. Current situation of the low-carbon-technologies sector and, to the extent possible, its position on the global market (that analysis is to be carried out at Union or global level)

ii. Current level of public and, where available, private research and innovation spending on low-carbon-technologies, current number of patents, and current number of researchers

iii. Breakdown of current price elements that make up the main three price components (energy, network, taxes/levies)

iv. Description of energy subsidies, including for fossil fuels

Finland makes major investments in developing new technologies and commercialising innovations. In recent years, Finland has invested in research and innovation far above the EU and OECD averages, measured as a share of GDP. The Finnish Research and Innovation Council has set a target for Finland to be the most attractive and competent environment for innovation and experimentation by 2030. Finland has invested particularly heavily in speeding up the introduction of clean and smart energy systems and associated products and services, and also more extensively in speeding up resource-smart solutions that are based on user needs and required by communities. For example, the innovation funding agency Business Finland has invested hundreds of millions in energy-related projects.

The competitiveness of low-carbon technologies compared with the alternatives has improved considerably over the past few years. The competitiveness of intermittent renewable forms of energy (solar and wind power) has improved. Finland's traditional strengths include bioenergy solutions. Finland is also a significant importer of energy technology. Finland imports solar energy systems (both solar power and heat), among others.

In addition to national funding, energy technology innovation in Finland is supported by EU funding, including through the EU Framework Programme for Research and Innovation, the European Union's main mechanism for directing innovation funding to Member States. Horizon 2020, the framework programme from 2014 to 2020, provided EUR 80 billion for R&D through a competitive process open to all EU public and private entities and designed to increase public-private partnerships and international cooperation. Horizon 2020 provided a total of EUR 1.52 billion of funding to Finland, with around EUR 400 million going to energy and climate projects, including EUR 126 million for secure, clean and efficient energy; EUR 112 million for climate action, environment, resource efficiency and raw materials; EUR 77 million for smart, green, integrated transport; EUR 75 million for advanced manufacturing and processing; and EUR 8 million for nuclear energy.

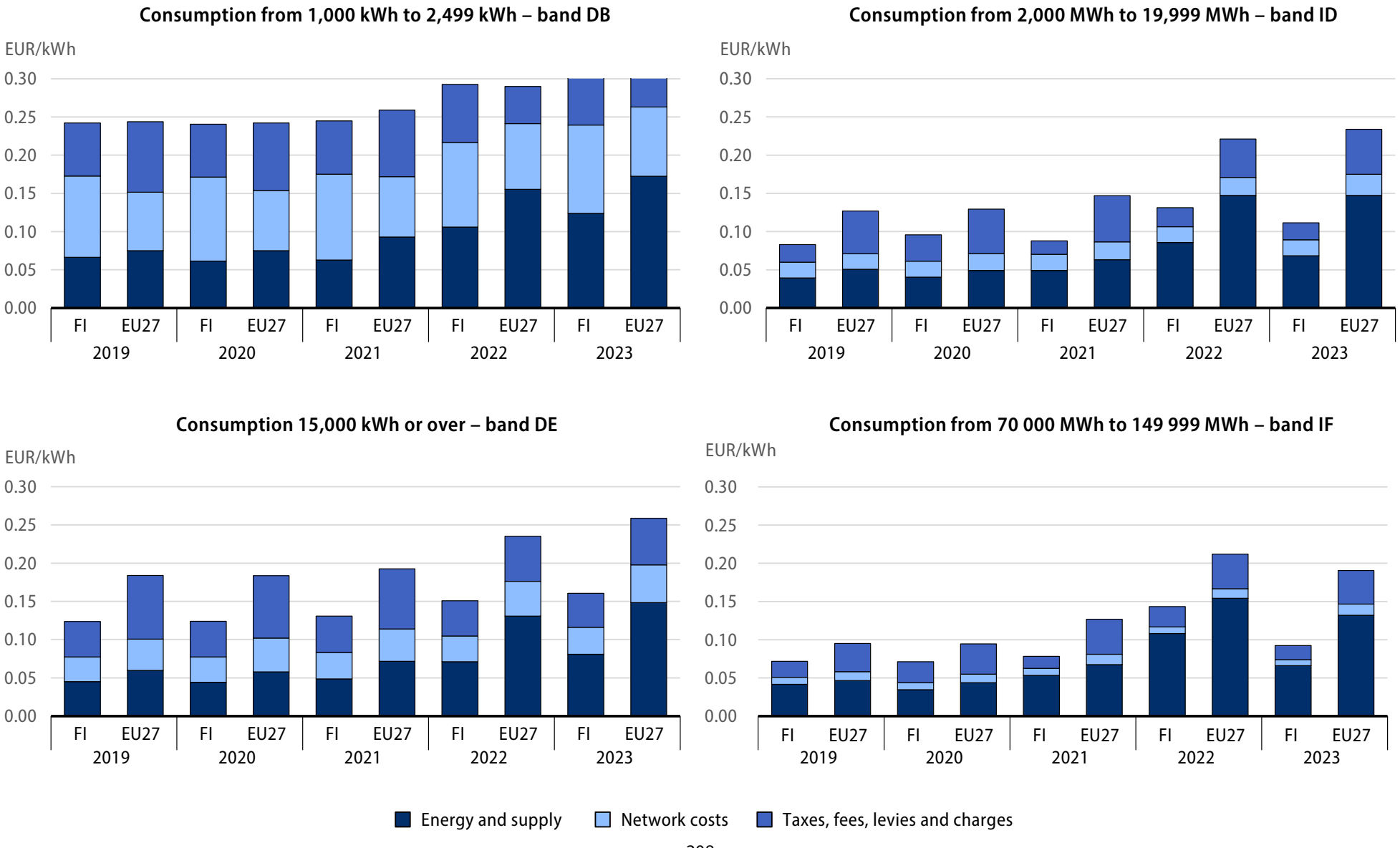
Horizon Europe, launched in February 2021, is the EU Framework Programme for Research and Innovation for 2021–2027. It aims to provide EUR 95.5 billion in innovation funding and will continue to support energy-related technology innovation and to set goals to increase international R&D cooperation. Business Finland hosts the national liaison office for Horizon Europe in Finland, which offers free services to support Finnish R&D actors in applying for Horizon Europe funding. The EU Innovation Fund commercial demonstration of innovative low-carbon technologies is funded by ETS revenues. The Finnish company Neste received EUR 88 million from the EU Innovation Fund for a project to produce and use low-carbon hydrogen at one of its refineries.

In 2022, Finland introduced the Energy Investment Aid scheme to award funding from the EU Recovery and Resilience Facility (RRF), using a method similar to the Energy Aid programme (see 3.1.2). The scheme will provide around EUR 540 million in funding for energy investments, including energy infrastructure, the deployment of new energy technology, hydrogen, CCU and the electrification of industries. The funding is granted in 2021–2024 and the funded projects must be finished by 2026. This has accelerated the implementation of clean energy technology.

Regarding the electricity price and its components, except for customers with very small consumption, the consumer price of electricity in Finland is below the EU average when all three price components are taken into account (see Figure 23). For all customer groups in Finland, the electrical energy and its supply costs are lower for all customer groups in Finland than in the EU on average, whereas network costs and/or taxes and levies are often higher. The relatively cheap electricity improves Finland's competitiveness. With the energy crisis, electricity prices became very high in the whole of Europe during the autumn and winter of 2022–2023. The spring brought the prices down, and in Finland and Northern Sweden the wholesale

day-ahead prices have been the lowest in Europe. In 2023, Finnish households paid an average of 32 eurocents per kWh for electricity (band DB, a yearly consumption of 1,000–2,500 kWh). Households with a consumption of 15,000 kWh or more (band DE, a typical size for electrical heating) paid 16 cents/kWh. Industrial customers paid on average 9–11 cents/kWh (band ID, IF). Corresponding EU average prices were 32 cents/kWh (band DB), 26 cents/kWh (band DE) and 19–23 cents/kWh (band ID, IF).

Figure 23. Electricity price by price component in Finland and the EU for three different customer groups. Source: Eurostat



5 Impact assessment of planned policies and measures

5.1 Impacts of planned policies and measures described in section 3 on energy system and GHG emissions and removals, including comparison to projections with existing policies and measures (as described in section 4)

i. Projections of the development of the energy system and GHG emissions and removals as well as, where relevant, of emissions of air pollutants in accordance with Directive EU 2016/2284 under the planned policies and measures at least until ten years after the period covered by the plan (including for the last year of the period covered by the plan), including relevant Union policies and measures.

The Government, including a ministerial working group, has been planning new policy measures compared to the measures in the WEM projection. These measures will be assessed and, whenever feasible, included in a new WAM (With Additional Measures) projection. The process has already commenced but is still in its early stages. Therefore, no analysis is available of impacts of the planned policies and measures at this point in time. However, Finland aims to present a new WAM projection the next time the biennial NECPR reporting is carried out (in March 2025).

The situations regarding some sectors are described in more detail below.

Agriculture

The preparation of a new WAM (with additional measures projection) for agriculture will begin during summer 2024. A political decision about additional policy measures to be implemented has not been made.

In December 2021, Prime Minister Sanna Marin's Government set an ambitious emissions reduction target of 29% for Finnish agriculture (including agricultural emissions in the effort sharing sector and land use, land-use change and forestry

sector) by 2035. This means emissions from agriculture should decrease by 4.6 Mt CO_2 eq. by 2035 (measured with GWP AR4). This national target is in line with the EU's climate neutrality objective.

The potential measures to achieve the 29% emission reduction target are specified in the Carbon Euro Programme.[76] Most of these measures are also mentioned in the WEM projection, but the scale and parameters vary. Controlled subsurface drainage, the promotion of paludiculture, the reduction and replacement of one-year cereal cultivation with grassland, the removal of poorly productive arable land from agricultural production and the afforestation of low-yield arable land are considered the most effective means to reduce emissions from agriculture in organic soils. For mineral soils, carbon sequestration and afforestation have been identified as potential measures for emissions reduction in the conditions in Finland.

The above-mentioned measures reduce emissions in the agricultural sector, as well as in the land use, land-use change and forestry sector. Other measures that could help to achieve the 29% emissions reduction target in agriculture are more precise nitrogen fertilisation and the use of additives in feeds for bovines, as well as a decrease in the number of bovines and utilising renewable energy in agriculture.

Achieving the challenging 29% emissions reduction target is unlikely to be possible with public guidance and incentives alone. Hence, private emissions compensation payments, food industry climate and responsibility programmes, and farm-level solutions and goals, including yield targets, will be needed.

LULUCF

The preparation of new WAM (with additional measures projection) for the LULUCF sector will begin during summer 2024. A political decision about additional policy measures to be implemented has not been made.

At the beginning of 2024, the Ministry of Agriculture and Forestry carried out an impact assessment of a proposal for a fee for land use change.[77] The purpose of the impact assessment was to support future decision-making, to illustrate how a

76 https://mmm.fi/documents/1410837/1516663/HERO_selvitys_2022.pdf/fd751aad-a2f2-a31a-396a-872d034f823b/HERO_selvitys_2022.pdf?t=1650519685134 (in Finnish)

77 Maankäytön muutosmaksun käyttöönoton vaikutusten arviointi; http://urn.fi/URN:ISBN:978-952-366-756-3 (in Finnish, abstract in English)

possible fee would complement the existing policy instruments for the land use sector and to consider what the potential climate impact of the possible fee would be. The emissions reduction potential of the possible fee, together with other policy instruments, would be as much as 0.7–0.9 million tonnes CO_2 eq. per year. Even a relatively small fee would have a significant impact on land use change from forests to agricultural purposes. The impact related to the clearing of forest for agriculture would be greater than that of mitigating deforestation due to construction. The implementation of a possible fee for land use changes would require further preparation and development of information systems and databases. The land use change fee as a policy measure will not be included in the upcoming LULUCF WAM projection.

Transport

The new baseline projection (WEM) for greenhouse gas emissions from transport was completed in December 2023. Greenhouse gas emissions increase in the projection in 2022–2023 due to a temporary lowering of the obligation to distribute renewable fuels, but decrease from 2023 onwards due to increases in the obligation. Changes in the obligation to distribute renewable fuels will have the most significant impact on reducing greenhouse gas emissions in the 2020s, and the impact will decrease from the 2030s onwards as the number of battery electric vehicles increases, i.e. as the absolute consumption of fuels decreases. In particular, the stricter CO_2 performance standards for passenger cars and vans under the EU directive will significantly reduce the WEM emissions trajectory. Greenhouse gas emissions from domestic transport will decrease by approximately 51% compared to the 2005 emissions, which means that the emissions sharing sector's 50% target for reducing greenhouse gas emissions will be reached in terms of road traffic.

The new WAM (with additional measures) projection for transport is under construction and will be completed in late 2024 or early 2025.

Relationship between the NECP and the NAPCP

GHG emissions reduction measures usually also reduce air pollution emissions and thus improve air quality. In other words, the NECP supports national efforts to reduce air pollution emissions.

In 2019, Finland published the National National Air Pollution Control Programme 2030 (NAPCP),[78] in accordance with the National Emission Ceilings Directive (NECD). Finland updated NAPCP in 2023.[79] There are no binding emission reduction measures in NAPCP or its update, as calculations indicate that Finland will achieve its emissions reduction commitments for air pollutants through measures in accordance with the WEM projection.

When WEM projections for air pollutants were calculated for the NAPCP update, the calculation was based on the so-called HIISI[80] projection from 2022. The HIISI projection was also the basis for the NECP draft for 2023.

When completed in 2023, the NAPCP update was thus in line with the NECP draft at the time. After the completion of the NAPCP update, projection work related to NECD has continued, but these new projections could naturally not be taken into account in the already-completed NAPCP update. The next NAPCP update will take place in 2027. At that time, up-to-date projections behind NECP will be taken into account so that the NAPCP and NECP continue to be as coherent as possible, regardless of the different updating cycles.

Energy security

As for the rest of the dimensions, Finland's National Emergency Supply Agency is planning on increasing the number of wood fuel terminals all around the country. This would ensure better availability of biomass than currently, thus contributing to energy security.

ii. Assessment of policy interactions (between existing policies and measures and planned policies and measures within a policy dimension, and between existing policies and measures and planned policies and measures of different dimensions) at least until the last year of the period covered by the plan, in particular to establish a robust understanding of the impact of energy efficiency / energy savings policies on the sizing of the energy system and to reduce the risk of stranded investment in energy supply.

78 http://urn.fi/URN:ISBN:978-952-361-020-0

79 http://urn.fi/URN:ISBN:978-952-361-426-0

80 https://publications.vtt.fi/pdf/technology/2022/T402.pdf (in Finnish)

As almost all of the planned measures are currently expressed only as goals; the actual impacts of the policy measures are not yet known, as explained at the beginning of Section 5. Therefore, it is not possible to carry out a credible assessment of their interactions for this version of the NECP update. Better impact assessments will only become available closer to implementation of the policy measures, typically in connection with preparing new legislation.

iii. Assessment of interactions between existing policies and measures and planned policies and measures, and Union climate and energy policy measures.

All the measures implemented and planned in all the five dimensions that Finland has indicated in this report are either related to the implementation of EU legislation or a contribution to achieving the EU's energy and climate targets. The policy measures will ensure that Finland takes care of its own share and contributes adequately to the EU's common energy and climate goals. The policy measures also ensure that Finland is also on the path to achieving long-term goals by 2050.

5.2 Macroeconomic and, to the extent feasible, the health, environmental, employment and education, skills and social impacts including just transition aspects (in terms of costs and benefits as well as cost-effectiveness) of the planned policies and measures described in section 3 at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures.

Finland currently has only preliminary goals for transport and agriculture in the category of planned policies and measures. The transport sector aims at complete decarbonisation whereas the emissions from agriculture would be reduced by 29%, but there are no decisions yet on their implementation. At this point, no estimates are available of additional emissions reductions compared to the WEM projection, but further impact assessments will be available only closer to implementation, such as in connection with preparing new legislation. The general principle of planning and preparing new policies and measures is that emissions reductions should be implemented in a way that is socially and regionally fair and in consultation with many sectors of society.

Just transition

In 2023, the Finnish Government funded research on the education and skills needed in just transition (Vihreän siirtymän osaamis- ja koulutustarpeet VISIOS, Skills and education needs in the green transition VISIOS).[81]

According to this research, there is a need to strengthen skills in relation to investments in new technologies and real capital. In addition, the labour needs of the green transition will focus on energy efficiency, energy supply, construction and transport investments. At this phase of the transition, the green skills required of the employees do not significantly differ from their current skills profiles. This highlights the need for continuous learning services. In the longer term, the green transition will affect a wide range of professions, as well as solutions in citizens' everyday lives and their experience of societal development. Responding to these developments will require strengthening sustainability skills at all levels of education, in all forms and programmes. In particular, there is a need to emphasise the role of transformative learning, challenging current practices, skills and structures, as part of building a knowledge base for the green transition.

The EU Just Transition Fund is one of the topical policy instruments that are implemented in Finland. In Finland, the JTF aims to halve the energy use of peat by 2030. There are 14 different regional plans on implementing the JTF. In Finland, the JTF measures are based on the objective of halving the use of peat as energy by 2030 (compared to 2019). The JTF offsets the adverse socioeconomic and environmental impact caused by halving the use of peat as energy. The JTF will be implemented in 14 JTF regions through regional transition plans. The regions are South Karelia, South Ostrobothnia, South Savo, Kainuu, Central Ostrobothnia, Central Finland, Kymenlaakso, Lapland, Ostrobothnia, North Karelia, North Ostrobothnia, North Savo, Satakunta and four municipalities in Pirkanmaa, namely Punkalaidun, Virrat, Parkano and Kihniö. The JTF provides support for the diversification of livelihoods, revitalising economic structures and boosting employment by reskilling and upskilling the workforce working in peat extraction and related sectors, especially young people. Furthermore, peat fields will be restored back to carbon sinks where possible.

Finland's EU funding from the JTF is approximately EUR 466 million. Public national funding, including some EUR 665 million, can be allocated to projects during the 2021–2027 programme period.

81 http://urn.fi/URN:ISBN:978-952-383-463-7

In addition, Finland has prepared an equality assessment in relation to the mid-term climate change plan (Medium-term Climate Change Policy Plan: Towards a carbon-neutral society (hankeikkuna.fi), p. 193), justice assessment, human rights assessment and gender impact assessment in relation to the energy and climate plan (Ilmasto- ja energiastrategian sukupuolivaikutusten arviointi – Valto (valtioneuvosto.fi), Hiilineutraali Suomi 2035 – kansallinen ilmasto- ja energiastrategia – Valto (valtioneuvosto.fi), p. 99–111). All of these assessments are of relevance in relation to the NECP. For example, the gender impact assessment in relation to the energy and climate strategy covered six sectors: energy production, construction and buildings, transportation, industry, the service sector and agriculture. The research shows that the climate policy measures mostly concern male-dominated sectors. Male-dominated jobs in relation to fossil fields will disappear, but at the same time the overall impact on economic activity and employment is positive in male-dominated sectors. The research also found that women and young people are more prepared to make and support climate-friendly decisions. However, the proposed measures emphasise men's inclusion in climate policy because they mainly target male-dominated sectors, influence men's consumer habits and include technical solutions that are interesting to men. In addition to technical solutions, more focus should be put on measures that increase women's inclusion in climate policy. This could lead to higher emissions reductions.

Preparation of the Social Climate Plan and links to the NECP

Since the Social Climate Fund regulation came into force in the summer 2023, Finland has actively sought to strengthen the knowledge base on the definitions on energy and transport poverty, and to identify through numbers, regional distribution and type the households, transport users and microenterprises impacted by the commencement of ETS2. This is done via several avenues, namely through active participation in the Commission CCEG-SCF discussions and workshops and through an SCF-ETS2-TSI project. It is also done through national efforts in further clarifying the scope and spread of energy poverty in Finland in studies conducted by Gaia Consulting[82] and Data room[83]. The issue of energy poverty in particular is equally linked to the ETS2 and NECP processes, and it is investigated in close coordination across the different policy preparation streams. The cross-cutting preparation of the NECP and the SCF is greatly facilitated by the already close ties between the Ministry of the Environment and the Ministry of

82 https://energiavirasto.fi/-/uusi-selvitys-avaa-nakyman-energiakoyhyyden-ehkaisemiseen-suomessa

83 https://vatt.fi/en/data-room

Economic Affairs and Employment, as the Minister post for Environment and Energy is shared between these ministries. Furthermore, the co-preparation of mutually important policy documents such as the long-standing NECP is standard procedure, and now the new SCP preparation follows in these footsteps.

While the coordinating authority for the SCP has not yet been formally selected, the work to coordinate efforts across ministries and to obtain a sufficient database for the preparation of the plan has already commenced. Since the preparation of the SCF regulation, an informal cross-ministerial expert group has been at work. Efforts have intensified in the SCP preparation since then, with close collaboration with research organisations and the Ministry of the Environment and Ministry of Transport and Communications in particular, due to the sectoral focus of the impacts of ETS2. Close ties between the Ministry of the Environment and the Ministry of Economic Affairs and Employment are a given. Indicators to support a more detailed definition of transport poverty and the identification of vulnerable transport users is under way nationally. Efforts will also be supported by the SCF-TSI that is expected to commence around June 2024. For earlier research on the topic, see: https://research.tuni.fi/verne/tutkimus/liikennekoyhyys/. Also see Chapter 2.4.4.

Labour market and employment impacts

Around 17% of all employed persons worked in green occupations in Finland in 2020. However, there is still a significant potential to transit to so-called green occupations. So far, the impact of this shift on the creation of entirely new jobs has been minor for the labour market. According to the survey[84], 15% of employers had plans to hire personnel due to the green transition and 8% had plans to reduce workforce in 2020. The changes in job descriptions has been slightly greater.

The green transition is anticipated to create a need for additional employees, especially in expert work, product development, installation work and primary production of renewable raw materials. On the other hand, the pressure of polluting sectors on the green transition is increasing further. Anticipating changes and taking social impacts are essential in order to make transitions in the labour market as smooth and fair as possible.

84 Pellervon taloustutkimus PTT ja MDI Public Oy (2023): Vihreän siirtymän vaikutukset työmarkkinoille ja ammattirakenteeseen. Valtioneuvoston selvitys 2023:1. http://urn.fi/URN:NBN:fi-fe2023042138025

Large companies act as drivers of the green labour market. Unlike large companies, small companies have not had much intention or even possibilities of hiring or reducing employees in the near future due to the green transition. There have been more intentions to hire in medium-sized enterprises and especially in energy and water supply enterprises.

Finland has top expertise in various sectors. However, competence is not crosscutting in the labour market but, on the other hand, skills gaps have been identified. However, the labour market and occupations have a good opportunity to adapt to the green transition, but targeted support measures related to job seeking and employment may be needed locally. The demand for specialist work and other occupations requiring a high level of competence will increase, which will make it easier for the population to adapt to changes in the labour market. Responding to the changes requires also diverse and adjustable educational provision as well as companies' own investments in competence development. Workplace learning will play a key role in green transition.

5.3 Overview of investment needs

i. Existing investment flows and forward investment assumptions with regards to the planned policies and measures

RRF funding for energy projects

A total of EUR 537.7 million has been reserved for energy investment aid under Finland's Recovery and Resilience Plan. The total amount includes the added REPowerEU chapter which was approved by the Commission and the Member States in December 2023. Funding is available for the following types of projects

- Investments in energy infrastructure (P1C1I1): EUR 154.35 million;
- Investments in new energy technology (P1C1I2): EUR 154.35 million;
- Low-carbon hydrogen and carbon capture and utilisation (P1C2I1): EUR 127 million;
- Direct electrification and decarbonisation of industrial processes (P1C2I2): EUR 47.5 million;
- REPowerEU: Investments for clean transition (P5C1I1): EUR 54.5 million.

The Ministry of Economic Affairs and Employment made the first aid decisions under Finland's Recovery and Resilience Plan in October 2022. At that time, aid of EUR 99,827,863 was granted to six projects. In December, the Ministry granted investment aid to 16 projects at a total of EUR 119,196,068, while 14 projects

received funding of EUR 108,730,715 in February 2023. In November and December 2023, the Ministry granted further investment aid to 30 projects at a total of EUR 50,220,326. In 2024, the Ministry will be making the grant decision for the added REPowerEU chapter. The application round for these closed in February 2024 and the grant decisions will be made during 2024. A final call for applications for energy investment projects under the Finnish RRP was open from April until May 2024. The final call consists of previously unused aid that will be allocated to projects in order to use the full amount of aid reserved. In total, by April 2024 the Ministry had made grant decisions representing a total amount of EUR 378 million. In addition, Business Finland has granted aid to two low-carbon hydrogen projects, in total around EUR 66 million.

The projects that have received aid represent a total investment (of eligible costs under the RRF) in the energy sector of approximately 1.63 billion. Projects that have been granted aid include increases in solar electricity capacity, offshore wind capacity, hydrogen capacity, recovery of waste heat, biogas production and energy-saving measures.

Planned investments in clean energy transition

The investments needed to implement a clean transition are estimated and mapped by several parties. Estimates of total investment needs and planned investment amounts vary and are updated all the time. The necessary investments are aimed at several different areas, energy production, industrial processes and energy networks. The vast majority of investments are made by private operators and the state's role is merely to maintain a stimulating operating environment for the necessary investments. In 2023, for example, the Prime Minister's Office published a report on the effects of clean energy investments: 'Transition to carbon neutrality: Implications for productivity, competitiveness and investments'.[85]

The table below contains figures on planned clean energy investments up to 2030 and beyond by sector. The figures are based on announcements by individual business enterprises. They are indicative and mostly include projects at the planning and preliminary study stages. Their total volume, EUR 257 billion, is substantial (Finland's 2023 GDP was around EUR 277.6 billion) and even if only a fraction of them were to be built, they would still significantly help decarbonise Finland's economy.

85 http://urn.fi/URN:ISBN:978-952-383-019-6

Labour market and employment impacts

Around 17% of all employed persons worked in green occupations in Finland in 2020. However, there is still a significant potential to transit to so-called green occupations. So far, the impact of this shift on the creation of entirely new jobs has been minor for the labour market. According to the survey[86], 15% of employers had plans to hire personnel due to the green transition and 8% had plans to reduce workforce in 2020. The changes in job descriptions has been slightly greater.

The green transition is anticipated to create a need for additional employees, especially in expert work, product development, installation work and primary production of renewable raw materials. On the other hand, the pressure of polluting sectors on the green transition is increasing further. Anticipating changes and taking social impacts are essential in order to make transitions in the labour market as smooth and fair as possible.

Large companies act as drivers of the green labour market. Unlike large companies, small companies have not had much intention or even possibilities of hiring or reducing employees in the near future due to the green transition. There have been more intentions to hire in medium-sized enterprises and especially in energy and water supply enterprises.

Finland has top expertise in various sectors. However, competence is not crosscutting in the labour market but, on the other hand, skills gaps have been identified. However, the labour market and occupations have a good opportunity to adapt to the green transition, but targeted support measures related to job seeking and employment may be needed locally. The demand for specialist work and other occupations requiring a high level of competence will increase, which will make it easier for the population to adapt to changes in the labour market. Responding to the changes requires also diverse and adjustable educational provision as well as companies' own investments in competence development. Workplace learning will play a key role in green transition.

86 Pellervon taloustutkimus PTT ja MDI Public Oy (2023): Vihreän siirtymän vaikutukset työmarkkinoille ja ammattirakenteeseen. Valtioneuvoston selvitys 2023:1. http://urn.fi/URN:NBN:fi-fe2023042138025

Table 25. Volume of planned clean energy investments up to 2030 and beyond, by sector.

Energy technology sector	EUR, million
Offshore wind power generation	103,000
Clean hydrogen production	14,000
Onshore wind power generation	95,000
Battery minerals, chemicals and materials production	7,400
Low-carbon steel production	6,100
Bio refinery	5,800
Solar power generation	4,300
Electricity transmission grid expansion and reinforcement	4,000
Energy storage (pumped hydro generation)	3,100
Heat pumps	3,000
Fuel switch to non-fossil sources (in industry and power plants)	2,800
Mineral sector	2,600
Bio products	1,900
Data center	1,600
Circular economy	800
Biogas production	600
Waste heat recovery	460
Carbon capture	200
Total	**256,660**

Source: Confederation of Finnish Industries, Fingrid, Finnish Wind Power Association

The Confederation of Finnish Industries maintains information on green/clean transition investments in Finland.[87] The data window shows the overall estimate of investments (EUR 268 billion, June 2024 data) and the distribution of investments across different sectors and locations in Finland. In addition, an estimate of

87 https://ek.fi/en/green-investments-in-finland/

the years of completion of the investments, the employment effects and the project phase of the investments (from the planning phase to implementation) is presented.

On 16 May 2024, Finnish Energy, an industry organisation representing companies in the energy sector, published a vision of a successful energy future for Finland.[88] The vision presents two alternative scenarios, in which the annual energy investments in clean energy are either EUR 6.9 billion or EUR 2.7 billion, depending on how high a level of energy transition Finland is expected to achieve in 2040.

Investment needs for public recharging points for electric vehicles

The investment costs of the distribution infrastructure for alternative fuels in Finland were assessed as part of evaluating the Commission's proposal for a regulation on the deployment of alternative fuels infrastructure. The minimum requirements under the regulation would result in significant additional investment needs, especially for heavy-duty vehicles. The estimated costs of achieving the objectives set in the regulation would be approximately EUR 65 million for the electric charging pools for heavy-duty vehicles in 2030, whereas the cost of hydrogen refuelling stations would total around EUR 14–42 million. While the construction of charging infrastructure for light vehicles would also result in additional investment needs, it is likely that the targets for 2025 will at least be achieved, as the pace of constructing public high-power charging stations is accelerating. This development is also promoted by the current subsidies. The costs for 2030 will largely depend on whether the increasing recharging point and pool criteria are taken into account in current investments.

Other transport investments

No estimates have so far been produced on the private investments needed to renew the vehicle fleet. However, the minimum goal set in the Roadmap to Fossil-free Transport is 700,000 battery electric vehicles in Finland in 2030, which would mainly enter the Finnish fleet as new vehicles. The average price of a battery electric vehicle was around EUR 50,000 in April 2022, which would mean that the investment that needs shouldered by private consumers, companies and other actors would, as a rough estimate, be as high as EUR 35 billion. However, in the WEM projections, the number of electric vehicles is 926,000 in 2030. The investment

88 https://energia.fi/wp-content/uploads/2024/05/energiavisio2040.pdf

need for this amount is EUR 46 billion. The investment needs in new engine energy technologies for the heavy-duty vehicle fleet will also be in the range of billions of euros.

To reach the objective of halving transport emissions, substantial investments will also be necessary in sustainable mobility infrastructure. In 2018, the ILMO45 report estimated that the investment costs of sustainable mobility could cumulatively amount to around EUR 17 billion in total by 2045. Measures for developing a sustainable transport system for the years to come were identified in the National Transport System Plan, on the basis of which an investment programme was drawn up for the transport network. The measures will be promoted as permitted by the estimated annual central government appropriations.

Investment subsidies under the CAP Strategic Plan 2023–2027

Finland's CAP Strategic Plan for 2023–2027 includes the majority of investment subsidies for agriculture and rural enterprises as well as other measures promoting renewable energy, resource efficiency, environmental protection, climate change mitigation and adaptation, and air quality in farms and rural areas. Climate issues are one of the cross-cutting themes of the entire plan. Farms can receive investment subsidies for investments that promote renewable energy and energy efficiency and the state of the environment. The CAP plan also offers investment subsidies to rural enterprises producing renewable energy.

ii. Sector or market risk factors or barriers in the national or regional context

No significant sector or market risk factors are recognised.

iii. Analysis of additional public finance support or resources to fill identified gaps identified under point (ii)

No gaps have been identified.

5.4 Impacts of planned policies and measures described in section 3 on other Member States and regional cooperation at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures

i. Impacts on the energy system in neighbouring and other Member States in the region to the extent possible

ii. Impacts on energy prices, utilities and energy market integration

iii. Where relevant, impacts on regional cooperation

As almost all of the planned measures are currently expressed only as goals; the actual concrete policy measures are not yet known. Therefore, it is not possible to carry out a credible assessment of their interactions for this version of the NECP update. Better impact assessments will only become available closer to the implementation of the policy measures, typically in connection with preparing new legislation.

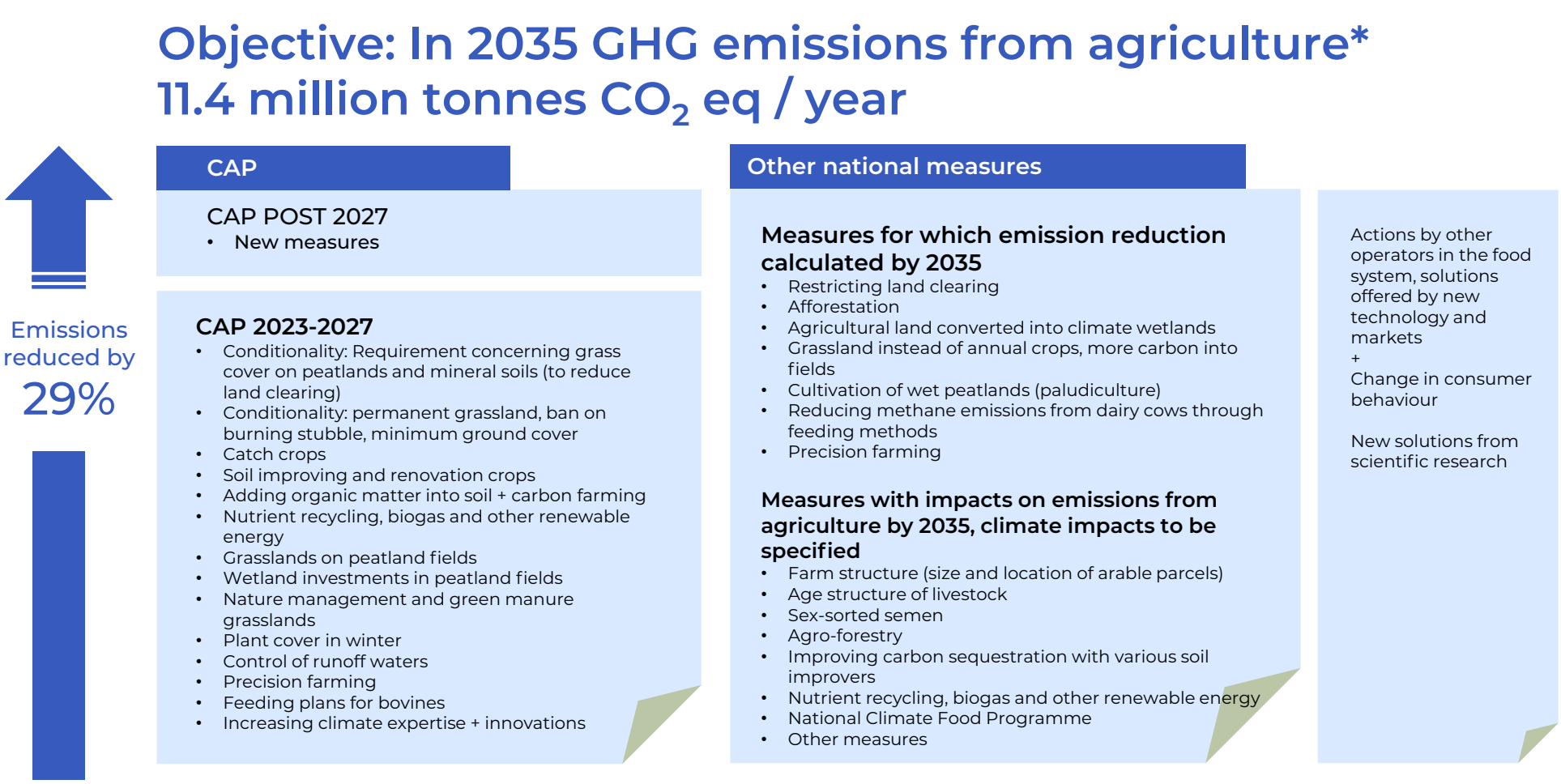
5.5 The contribution of planned policies and measures to the achievement of the Union's climate-neutrality objective set out in Article 2(1) of Regulation (EU) 2021/1119

Agriculture

In December 2021, Prime Minister Sanna Marin's Government made a political decision on an emissions reduction target of 29% for Finnish agriculture (including agricultural emissions in the effort sharing sector and land use, land-use change and forestry sector) by 2035. This national target is in line with the EU's climate neutrality objective and it has been included in Finland's CAP Strategic Plan as well. According to the emissions reduction target of 29%, emissions from agriculture should decrease by 4.6 Mt CO_2 eq. by 2035 (measured with GWP AR4). The potential measures to achieve the 29% emissions reduction target are specified in the Carbon Euro Programme.[75] However, the 29% emission reduction cannot be achieved by

CAP measures alone; additional national measures are also needed. A potential pathway to 29% emissions reduction is described in Figure 24 (below). Due to the current financial situation, there is no funding for additional policy measures. The focus has been placed on information guidance. For example, to strengthen the national vision and enhance the appreciation of agricultural producers, a long-term strategy for domestic food production will be drawn up in parliamentary cooperation within the current government period, 2023–2027.

Figure 24. Emission reduction target for agriculture and potential measures.



Transport

According to the Climate Act, Finland will be carbon neutral by 2035. The targets for reducing or compensating emissions from transport must be in line with this goal. By 2030, Finland will reduce emissions from domestic transport by at least 50% compared to the 2005 level. In the Roadmap to Fossil-free Transport, the aim is to achieve an entirely fossil-free transport sector by 2045.

Energy sector

With regard to improving the supply of renewable fuels, the National Emergency Supply Agency is planning the measure of increasing the number of wood fuel terminals in Finland, which is expected to make wood fuels somewhat more storable on average. This would increase their availability to energy utilities in case of temporary supply disruptions and thus decrease the use of peat and other fossil fuels as secondary fuels.

Other new measures have been considered but no credible impact assessment is available yet, as explained at the beginning of Chapter 5. Generally, the goal of new measures is to reduce greenhouse gases to the extent that Finland achieves its own climate targets in line with the Union's climate-neutrality objective.

Annex 1: Separate documents submitted to the commission

1. List of policies and measures
   (Finland NECP 2024 policies and measures.xlsx).
2. List of parameters and variables
   (Finland NECP 2024 parameters.xlsx).
3. GHG emissions by IPCC sector, by gas and policy sector
   (Finland NECP 2024 GHG projections.xlsx).
4. Assessment of national heating and cooling potentials
   (Finland EED Art 25.1 Kattava arviointi.pdf) (in Finnish).

The appendices are available as separate files at
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