

Decarbonising heating and cooling in the European Union

An analysis of
national energy and
climate plans

Annex 3: Country files

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[International Network for Sustainable Energy - Europe \(INFORSE-Europe\)](#), is an NGO established at Earth Summit in 1992.

Cool Heating Coalition works together to make decarbonised, renewable, and affordable heating and cooling a reality across the EU.

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AUSTRIA

The following analysis is based on [Austria - Final updated NECP 2021 - 2030 \(submitted 2024\) - European Commission](#) published 20 December 2024. Page numbers refer to the English translation of the National energy and climate plan (NECP).

1. TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For Austria the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3), including national indicative increase (the total RED 3 target) is 1.8%-point increase per year 2021-2030. The minimum binding target for all EU countries is 0.8%/year increase 2021-2025 and 1.1% 2026-2030.

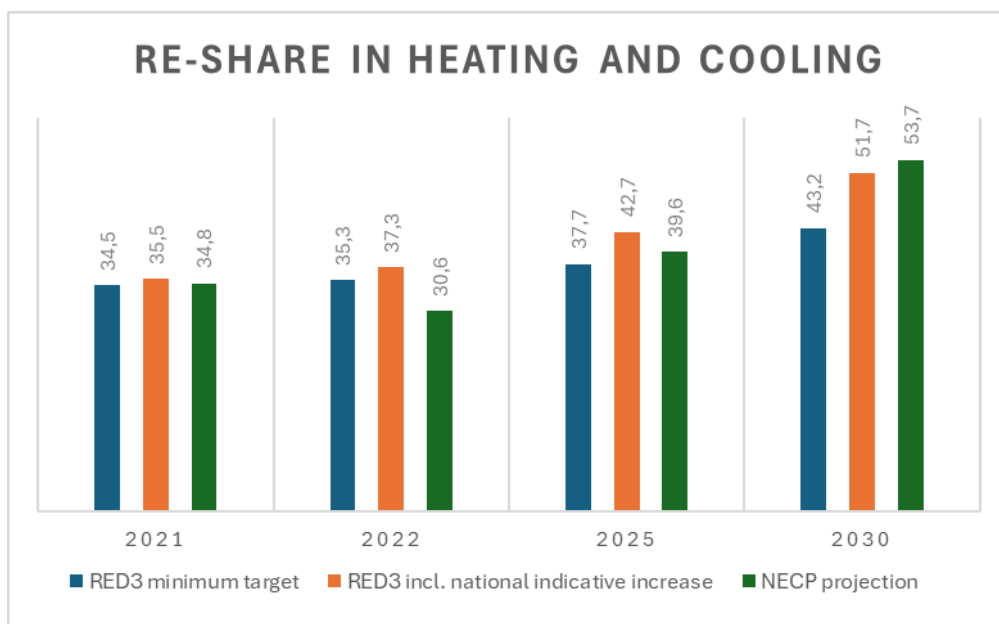


Figure 1. Renewable share in % of heating and cooling, RED 3 binding share, RED 3 including national indicative increase and projection for WAM-scenario (with additional measures) in NECP for 2025 and 2030 compared with latest statistics from 2021 and 2022 (p. 83). RED 3 targets are based on a RE-share of 35.5 % in 2021.

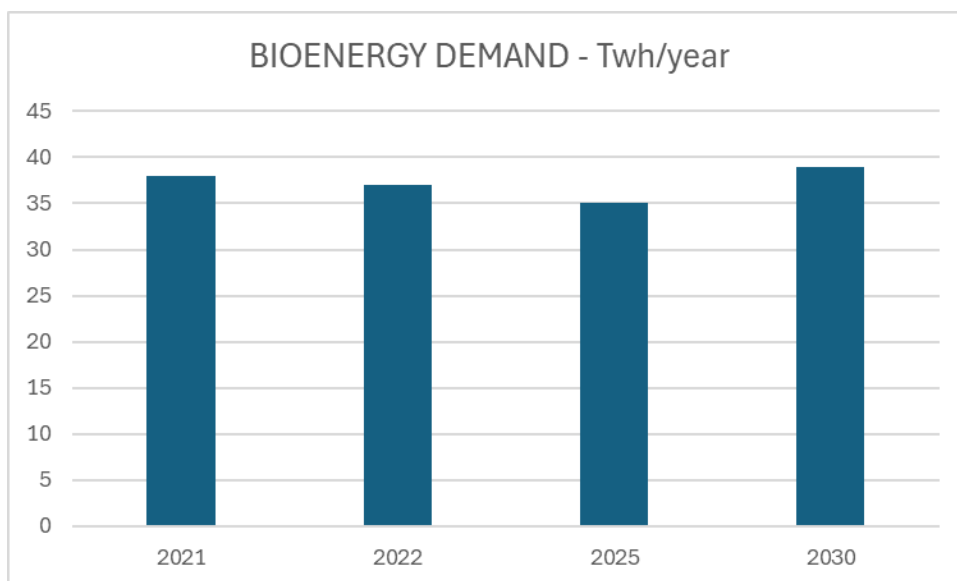


Figure 2. Bioenergy demand for heat for the WAM scenario (scenario with additional measures), TWh/year (p. 84).

The amount of bioenergy needed for heat will decrease a little until 2025 and increase between 2025 and 2030. The demand in 2030 is slightly higher than the demand in 2021.

Other national targets from policies in the Austrian NECP are:

- 100 % RE in electricity by 2030 (p. 94).

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS

For Austria, the target is a reduction of 48 % greenhouse gases (GHGs) between 2005 and 2030 of the emissions not covered by the current EU Emission Trading Scheme (ETS1) or by the Land-Use, Land -use Change and Forestry (LULUCF) regulation (p. 69). This is following the revised EU effort sharing regulation, (EU) 2023/857. The regulation also sets annual emission limits for the years 2021-2030 with a budget approach, so each country has to keep the sum of emissions for the period within the budget of annual emission limits.

Under the WAM scenario and implementation of Carbon Capture and Storage (CCS) projects 46 % reduction will be achieved. Austria will fill the remaining gap of 2 %-points by using the ETS flexibility under article 6 in the Effort Sharing Regulation (p. 71).

1.3. ENERGY IMPORTS TARGETS AND DEPENDENCY OF IMPORTS

Austria has not set a specific target, but generally aims to reduce imports, diversifying gas supply sources (p. 94) and replacing Russian gas as soon as possible (p. 29).

To reduce dependency, biomass, solar thermal and ambient heat will be developed (p. 83).

Dependency of imports into EU for energy use in buildings

There is only data available for total import of energy into Austria showing a high dependency on import of fossil fuels. In 2022, the dependency of oil, gas and coal was close to 100 % (p. 211). However, there was no net biomass import in 2022.

1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

Austria has introduced the following targets to support decarbonisation of heating and cooling:

- Ban on new oil and coal boiler installations starting in 2020 (p. 82).
- Ban on all fossil heating systems in new buildings (The Federal Act on renewable heating in new buildings, EWG)(p. 82).
- The federal states of Austria have the possibility to ban gas heaters (p. 82).
- Fossil-Fuel Heating Phase-Out by 2040: Austria is working towards a complete phase-out of fossil-fuel-based heating systems by 2040 (p. 82).

The federal and state governments have proactively encouraged the adoption of eco-friendly alternatives. Substantial budgets have been allocated to support these efforts, including the "Get out of oil and gas" subsidy program. The federal government will continue funding, with additional funding available for low-income households (p. 82).

55,000 new heat pumps were installed in 2023, a decrease of 5,340 compared to 2022 ([Executive-summary_EHPA-heat-pump-market-and-statistic-report-2024-2.pdf](#)).

1.5 TARGETS ON ENERGY EFFICIENCY COMPARED TO THE EE TARGET IN EED

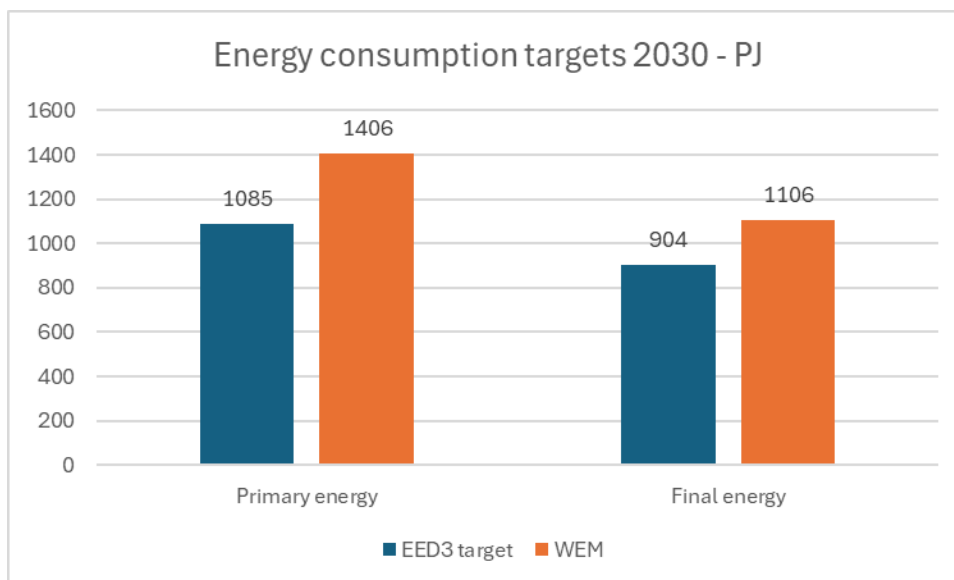


Figure 3. National target for energy consumption according to EED 3 and the projection of consumption in the NECP based on a scenario with existing measures (WEM)(p. 87, 206).

With additional measures (WAM), Austria has set an energy savings target of 650 PJ for final energy consumption in the period 2021-2030. According to the revised Energy Efficiency Directive (EU/2023/1791)(EED 3) the energy saving target should be set at 717 PJ (p. 88).

The measures and assumptions submitted in the NECP do not yet achieve a sufficient reduction in energy consumption by 2030 (p. 86). Therefore, to reach the EED 3 energy efficiency targets further reduction efforts are needed.

2. POLICIES TO ACHIEVE THE HEATING TARGETS

The Austrian government has presented the following policies in the NECP to achieve its heating and cooling targets, and it will secure funding for a shift to non-fossil heating systems:

“A switch from existing fossil heating systems to climate-friendly systems will be achieved through appropriately upgraded and optimised incentive instruments. To this end, the relevant federal funding is being adapted in terms of content and with an improved incentive effect, and the budget is extended to the extent necessary. Additional funding will be made available for low-income households, making the switch-over of heating affordable and thus feasible in these populations too” (p. 82).

In 2022, the Federal Act on National Emissions Trading introduced a CO₂-tax in non-ETS sectors, e.g. in the building sector. From the first of January 2025, the tax amounts to 55 € per tonne (p. 113).

The most important activities in the heating sector are the federal government programme; a heat strategy (with measures and instruments discussed between the federal government and the federal states); and the strategies of the federal states (p. 130). The Federal Energy Efficiency Act (EEffG) is the main act to improve energy efficiency in the building sector (p. 171).

To avoid the installation of further fossil fuel heating, installing oil and coal appliances in new buildings has been prohibited since 2020. “The Federal Act on renewable heating in new buildings (EWG) extended the ban on installation in new buildings to all fossil heating systems.” (p. 82).

The Phase out fossil fuels in new buildings (EEC) was adopted in February 2024. The existing support systems will be expanded and made more attractive for the replacement of existing fossil heating systems. The necessary legal bases for the first phase until 2027 have been adopted (p. 130).

When it comes to district heating, the Environmental Support Act (UFG 2023-2027), a total of 751 million € will be used to support the transition from fossil district heating to renewable and efficient district heating (p. 131). The existing gas-fired district heating must be decarbonized, and climate-neutral district heating should be expanded to supply buildings that are currently heated by individual gas heating (p. 166).

The UFG 2023-2027 also supports heating conversions in private households with 2.445 billion €. An additional 1 billion € is available for heating conversions between 2024 and 2026. Further funds are available for low-income households (p. 131, 163). In addition, the Federal Renovation Plan “Out of Oil and Gas” supports the transition of fossil fuel heating systems (p. 171).

By the end of 2027, public buildings owned by the federal government must have space heating and hot water provided by district heating or renewable energy sources, where technically feasible (p. 131).

There will be long-term federal funding for thermal energy renovation coordinated with the federal states. The quality of refurbishment will be improved by creating a comprehensive renovation concept for each planned major renovation measure (p. 132).

Moreover, there will be information and awareness-raising activities, as well as an improvement of the quality of energy certification (p. 133).

According to Austria's NECP, possible legal barriers to heating replacement and renovation in housing laws will be identified and dismantled (p. 133).

To adapt to climate change and avoid extra energy consumption for cooling buildings, new energy-efficient cooling technologies should be implemented (p. 134).

By 2030, at least 9.75 % of the gas currently used should be replaced by renewable gas, according to the Renewable Gas Act (EGG). As the availability of renewable gas is limited, renewable gas should mainly be used in sectors that cannot be electrified (p. 157).

Energy poverty

In Austria, specific support for low-income households is made available to combat energy poverty.

Energy poverty is also addressed in various social policies (p. 185).

As part of the 2022 Eco-social Tax Reform Act, tax relief and specific compensation measures have been agreed in relation to CO2 pricing (p. 114).

Conversion of heating systems in low-income households are supported with an additional total of 1.6 billion € until 2030, allowing the lowest-income third of Austrian households to cover the costs of the measures up to a technology-specific ceiling (p. 131). Funding is provided under the "Clean Heating for All" program (p. 171).

Since 2022, the support action '*Climate-fit buildings for vulnerable persons*' has covered 100 % of the net costs of thermal insulation and the switch to climate-friendly heating for low-income households (p. 186).

Furthermore, easy-to-use information on energy efficiency and heating is provided (p. 185). People at risk of high energy bills can receive personalized information on energy efficiency and on how to switch supplier (p. 186). For favoured households, obligated energy suppliers must provide free and personalized advice (p.188).

"In order to receive funding from the (Social Climate) Fund from 2026, Austria has to submit a Social Climate Plan to the Commission by mid-2025, consisting of a coherent package of existing or new national measures and investments. In line with the NECP, Austria intends to clarify further measures to combat energy poverty or to further develop existing measures towards the target groups of the KSF" (p. 189).

Electricity-to-gas price ratio

No projection of gas and electricity prices for households is included in Austria's NECP, while the historical prices are given in figure 4.

Gas and electricity prices are available at Eurostat, and we have looked at data for the last four years.

Austria	2021	2022	2023	2024
Gas price (cent/kWh)	6.36	7.67	15.60	13.79
Electricity price (cent/kWh)	19.44	19.98	26.09	27.85
Electricity-to-gas price ratio	3.1	2.6	1.7	2.0

Figure 4. Average gas and electricity prices in cent/kWh for private consumers (first half of the year) and the respective price ratio. The price includes taxes. The gas price is for consumers with a consumption of 20-200 GJ/year, and the electricity price is for consumers with a consumption of 5.000-15.000 kWh/year. Source: Eurostat, nrg_pc_202 and nrg_pc_204.

Since 2021, the electricity price is getting closer to the price of gas, which makes heat pumps economically more attractive. At the current ratio heat pumps are already the cost-efficient option.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

The Austrian NECP is on track to meet the targets for reduction of GHG emissions outside the EU emission trading scheme, but only by using the flexibility in the effort sharing regulation. To achieve the target, heating and cooling only play a smaller part.

The Austrian NECP is meeting the renewable energy target in heating and cooling. By 2030, Austria will reach 53.7 % renewable energy in heating and cooling with additional measures, which is 2 %-point above the target. Furthermore, Austria has banned fossil boilers in new buildings and plans a complete phase-out of fossil-fuel-based heating systems by 2040. This is supported by substantial funding for heating conversions.

A large part of Austria's renewable energy comes from biomass, and the bioenergy demand for heating will slightly increase between 2021 and 2030. There is no information in the NECP about how large the share of biomass is in heating. In 2022, Austria did not have a net import of biomass, but there is no information, whether it will stay the same in the future.

Finally, Austria is not on track to meet the EU energy efficiency targets. Primary energy consumption in 2030 is projected to be 30% higher than the EED 3 primary energy consumption target. Therefore, Austria needs to do more to reduce energy consumption.

According to our local contact, Austria has a budget deficit, and the parliament will soon approve a budget that will have a lot of cuts on subsidies for climate and energy transition. So, the budget values mentioned in the Austrian NECP will soon no longer be actual (22 May 2025).

We have the following suggestions to improve Austria's policies and measures:

- Use of biomass for heating and cooling should be reduced.
- Support for efficient and renewable heating and cooling should include a special facility for community heating and cooling initiatives, like energy communities with electricity production for members' heat pumps, and for local district heating schemes based on renewable energy and excess heat use.
- Support natural refrigerant cooling and heating equipment, including in heat pump subsidy schemes.

BULGARIA

The following analysis is based on [Bulgaria – Final updated NECP 2021-2030 \(submitted in 2025\)](#), published January 15, 2025. Page numbers refer to the National energy and climate plan (NECP), English version, printed page numbers).

Some clarifications should be made for better understanding of Bulgaria's energy sector and heating and cooling sectors:

1. The NECP includes two scenarios: WEM (with existing policies and measures) and WAM (with additional policies and measures). Nevertheless, the paper doesn't always provide comparative data for goals and targets, so we cannot clarify which of them belongs to which scenario. Wherever is possible it's indicated. Moreover, there is no legal decision which of the pathways Bulgaria will follow. To make things even more complicated, not all the targets in the text are set up against 2030, e.g. some are for 2035 or 2040, but not for 2030.
2. Together with the Czech Republic, Finland, Hungary and Slovak Republic, Bulgaria imports nuclear fuel from Russia. In fact, these imports cannot be labelled "domestic fuel", but in Eurostat's methodology, it is counted as such.
3. Recently, several Members of the Government reported in a public statement that the National Recovery and Resilience Plan (NRRP) is facing difficulties. The NRRP must be significantly revised in order to secure that projects are implemented until the end of August 2026. The revised program might revise programs for the integration of new renewable energy capacity, creation of a framework for tackling energy poverty, installing photovoltaic systems in social service buildings and more (<https://bnr.bg/en/post/102144516/>). Moreover, the envisaged Road-map for Bulgaria's climate neutrality by 2050 is not yet approved by the Parliament due to strong opposition from populist parties and the coal lobby.
4. There are about two million dwellings in Bulgaria with more than 60% in rural areas. About one fourth of the houses are not inhabited while about one fifth of the flats are also vacant. Almost all homes - over 97% - are privately-owned.

1. TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For Bulgaria, the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3), including national indicative increase (the total RED 3 target), is 1.5%-point increase per year between 2021 and 2030.

The Renewable Energy Act (ZEVI) foresees an increase in the share of renewable energy in the heating and cooling sector by an annual average of 1.3% in the periods 2021-2025 and 2026-2030, compared to the renewable energy share in 2020. This should be achieved by raising the share of renewable energy as well as waste district heating and cooling by at least 1% on average per year. (p. 28)

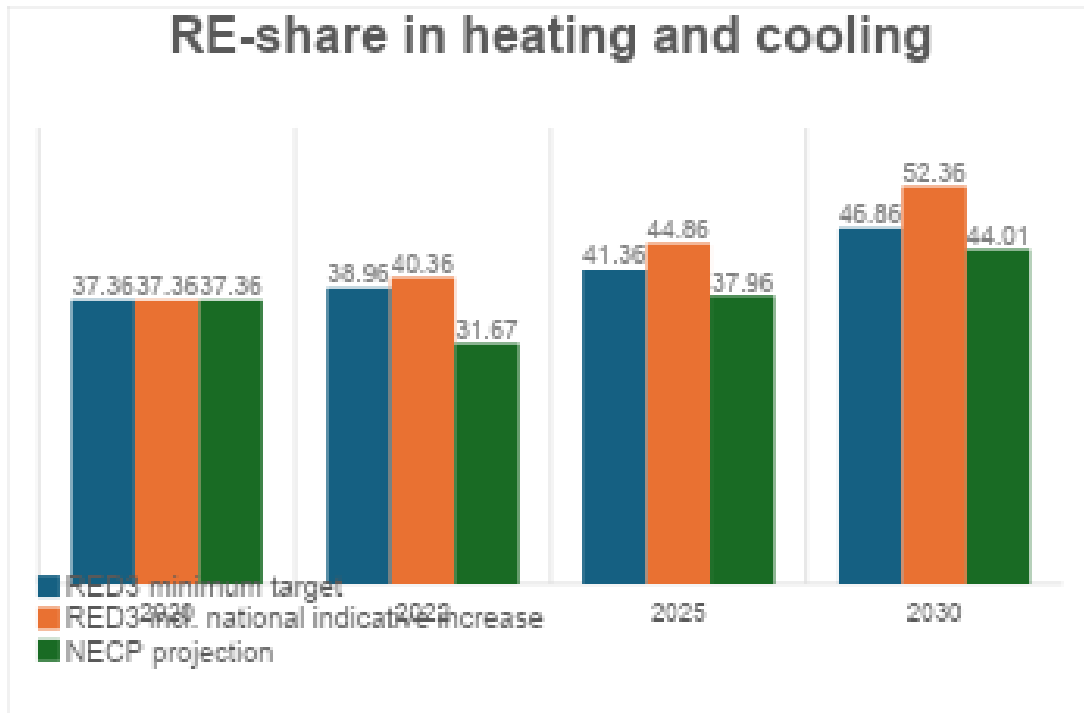


Figure 1. Renewable share in % of heating and cooling for Bulgaria, RED 3 binding share, RED 3 including national indicative increase and projection with policies and measures in NECP for 2025 and 2030 compared with base year 2020 and latest statistics from 2022. (figure 6, p. 72-73).

While the use of biomass for heating and cooling (H&C) in households is decreasing in the long term, its use in the industry, transport and service sector is going up. These sectors are expected to account for over 50% of the final consumption of solid biomass, biogas and waste in Bulgaria between 2030 and 2050 (p. 78).

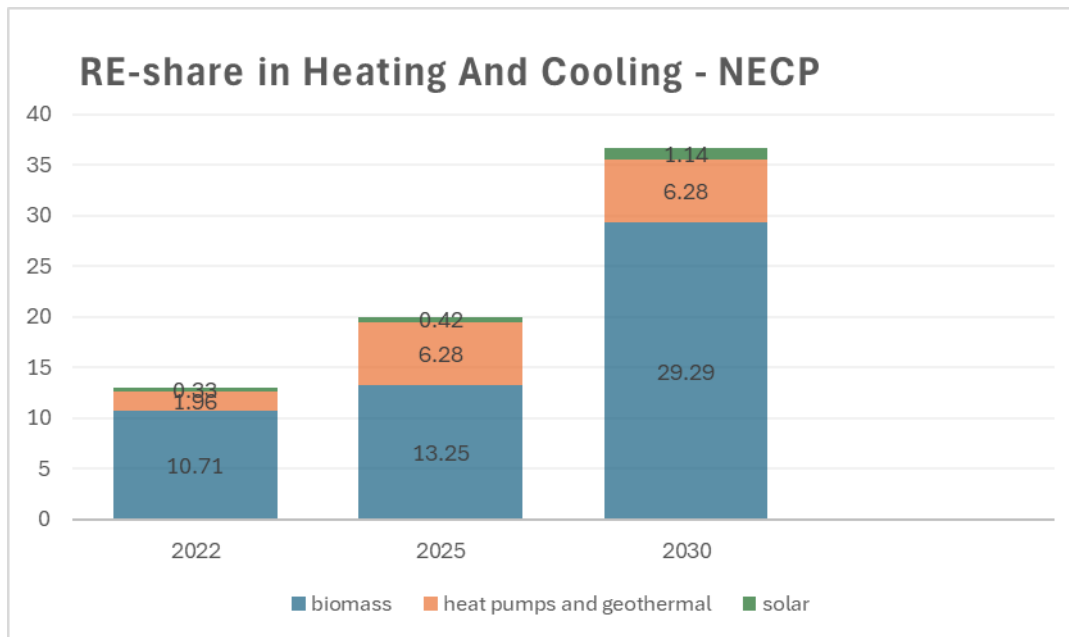


Figure 2: Renewable share in % of heating and cooling for NECP projections divided by source of energy, and latest available statistics (2022). (figure 53/p. 271 and figure 118/p. 339/340).

By 2030, there will be a demand for biomass fuel import. Of the total biomass demand of 1,459 ktoe in 2030, import is forecasted to be 12 ktoe (0,8%) increasing to 154 ktoe out of 957 ktoe totally in 2050 (16,1%). In the same period, biomass from the agricultural sector for energy will fall from 194 ktoe in 2022, trough 158 ktoe in 2030 to only 34 ktoe in 2050 (10%, 10,83% and 3,55% respectively)(Fig. 54, p. 272).

The Bulgarian NECP also includes a national target of 49.34% renewables in the electricity sector by 2030 (p. 69).

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS

For Bulgaria, the EU Effort Sharing Regulation (ESR)(EU) 2023/857 sets a 10% GHG reduction between 2005 and 2030 for emissions not covered by the EU Emission Trading Scheme (ETS1) or by the Land-Use, Land -use Change and Forestry (LULUCF) regulation (Table 1, p. 25). The old target under ESR was 0% (set in 2018). Under the WAM scenario, total net GHG emissions in 2030 decrease by 82% compared to 1988 (p. 65). The share of the households only in the total net GHG emissions in 2030 is 1,4% (1,3% in 2025)(WAM, Figure 3, p. 64).

Emissions under the Emissions Sharing Regulation (ESR) in 2030 with additional policies and measures are reduced by 11.06% compared to the baseline year 2005 (p.64). If these additional measures are implemented, Bulgaria will reach the non-ETS ESR target.

1.3. ENERGY IMPORTS TARGETS AND DEPENDENCY OF IMPORTS

In the heating and cooling sub-sector, Bulgaria uses much less fossil gas than many other EU countries. It is mainly used in Sofia where the central heating system is fully relaying on fossil gas. The gas use for private heating systems in households is less than 3%. However, coal – mainly in the forms of lignite – remains commonly used in heating plants, including combined

heat and power (CHP) plants. In 2022, coal power and CHP plants held the largest share of Bulgaria's total power capacity, accounting for 4.77 GW, or 36% of the national capacity (p.314. fig. 92). Illegally imported waste from other EU countries is also used for heating.

The 2030 target for energy import is 43,8% (p. 83) according to the WAM scenario.

Bulgaria aims at diversification of energy imports to minimize supply risks (p. 81, 291).

Dependency of imports into EU for energy use in buildings

NECP provides only data for Bulgaria's total import of energy or data for fuels consumption. Not separately for energy use in buildings or for heating.

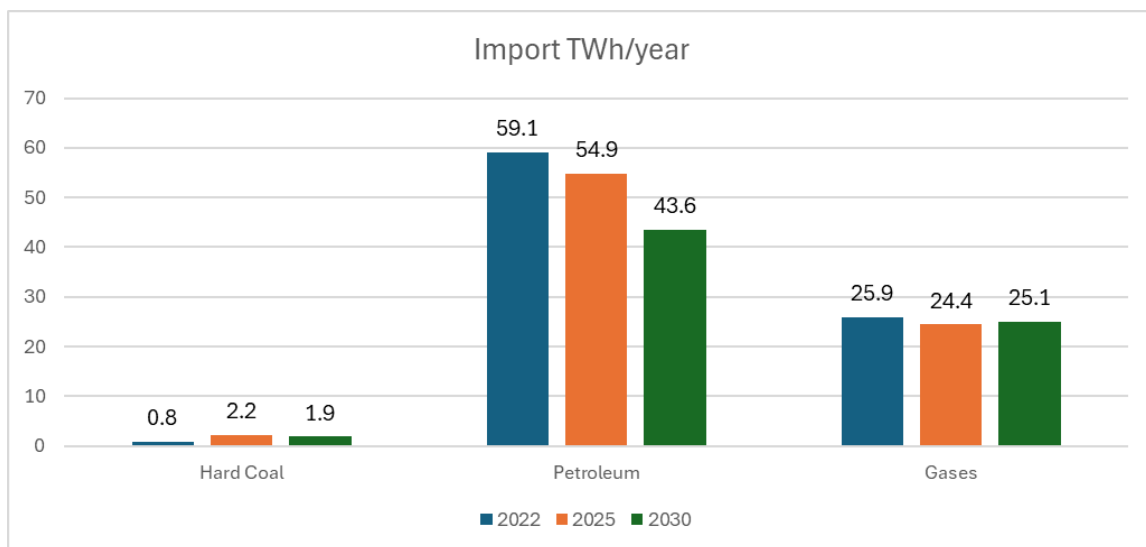


Figure 3 Dependency on import for total primary energy consumption (p.87, fig. 14)

The NECP does not give specific figures for the development of import dependencies for fossil fuels, but the current dependency ratio of the fossil fuels are according IEA web-site data for 2022, in percentages:

- Oil 99,9
- Gas 99,4
- Coal 11,6

1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

- No ban on installations of gas and oil (fig. 118)
- Ban on coal for H&C is not yet introduced. The expected date for closure of coal mining is 2038, but there is no legal decision by the Parliament.
- No legal commitments for heat pumps or solar installations for H&C.

- Calculations of the data from Fig. 9 (p. 76) show that the share of heat pumps within all renewables in 2030 is 21,19%, while the share of solar energy is 3,76%. The projection for the renewable share in H&C for 2030 is 44,1% (same page). Thus, the share of the heat pumps in total projection for H&C is 9,34% and the share of solar energy – 1,66%.

1.5 TARGETS ON ENERGY EFFICIENCY COMPARED TO THE EE TARGET IN EED

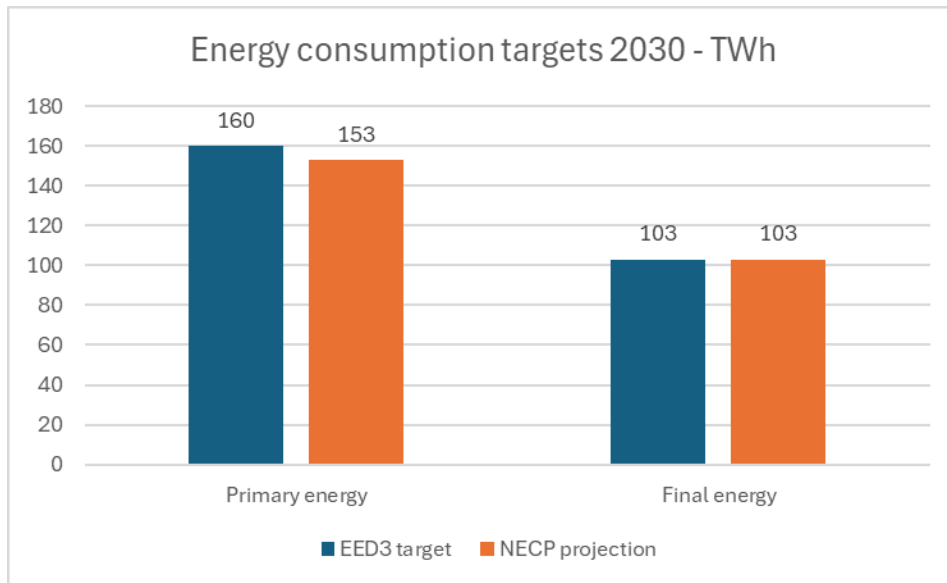


Figure 4: National target for energy consumption according to EED 2 and the projection of consumption in NECP based on additional measures scenario (p.25).

The Bulgarian NECP as currently proposed with additional measures will meet the energy consumption targets of the Energy Efficiency Directive 2023/1791 (EED 3).

2. POLICIES TO ACHIEVE THE HEATING TARGETS

Both - the National Plan for Buildings with Near-Zero Energy Consumption and the national fund for improving the energy performance of public and private buildings - expired in 2020. The national long-term program to promote the use of biomass has also expired without replacement.

The long-term national strategy to support the renovation of residential and non-residential buildings with an implementation horizon of 2050 is quite well developed, including analyses, data, proposed measures (p.82), but it lacks targets.

Looking at biomass, one has to note that there is no recent data available. Updating the National Forest Biomass Energy Action Plan 2018-2027 is needed (p.148).

While the Energy Act (ZE) provides measures for the heating sector – mainly covering district heating systems – definitions and obligations for Independent Energy and Water Regulator (KEVR), there are no concrete targets for H&C.

ZEVI envisages:

- a set of obligations for the Mayors of Municipalities in the area of H&C (art. 10) to promote renewable energy with information centres and management of state programs (p.149, p.163);
- a minimum target of 15% renewables in total energy use of buildings for H&C for new buildings or major renovation or conversion of buildings “when this is technically possible and economically feasible” (art. 20).

Some definitions are also drafted.

The legislation on energy efficiency has been aligned with European legislation, the main document ensuring the implementation of the energy efficiency policy is the Energy Efficiency Act (ZEE). However, most of the main priorities and objectives of the Bulgarian EE policies are declarations of intend or not clearly quantifiable. Only the following two are measurable:

- Achieving cumulative end-use energy savings for the period 2021-2030 equivalent to new annual savings of at least 0.8% of final energy consumption.
- Take measures to improve the energy performance of at least 5% of the total floor area of all heated and/or cooled state-owned buildings used by the public administration (p. 29).

There are a number of programs that financially support the implementation of energy efficiency measures. However, only few programs intend to address renewables and/or storage. They are funded by the state budget and EU funds (ERDF, RRM, JT, etc.). However, the recent status quo of implementation of Bulgarian NRRP puts in question further funding for renewable energy and energy efficiency, including these for buildings.

While the total EU funding is quite high for the country, there are a number of deficiencies that prevent good results and achievement of the goals. Some of them are:

- The authorities do not provide final verified data for energy efficiency performance of the renovated buildings. Although such verification by physical measurement is obligatory, it is rarely done;
- No “Deep Renewal” approach, just insulation of the buildings instead of a comprehensive energy renovation with large energy demand reductions;
- No joint schemes “energy efficiency plus renewables/storage”;
- 100% grants, money goes to municipalities and they select business companies that do the work. This approach is often associated with poor implementation, money misuse and lack of involvement of the home owners, which are not very interested in the quality of the works because they do not pay for it;
- Time-consuming procedures, and late implementation – mainly in EU-funded programs;

Energy poverty

With legislation amending the Energy Act adopted mid-November 2023, some subsequent modifications were made including:

“(4) definitions and criteria have been introduced to define ‘households in energy poverty’ and ‘vulnerable electricity customers’ for the purpose of liberalizing the electricity market and implementing measures to support households in energy poverty, including their priority treatment when implementing energy efficiency improvement programs in residential buildings” (p.39).

Further, a Regulation that describes the arrangements and mechanisms for the operation of an information system to determine this status, as well as the modalities for assessing the number of households in energy poverty, was drafted. The Regulation was addressed within the shortened deadline adopted by the Council of Ministers by Decree No 267 of 7 December 2023 and promulgated in State Gazette No 103 of 12 December 2023 (p. 39, 117, 118).

With references to energy poverty, the Government tries to find a mechanism to compensate households after the first of July 2025, when the electricity market should be fully liberalized. However, one might criticize that the provision includes all households - not only energy poor. Thus, the effect for them will be counter-balanced with more public support for higher-income groups.

There are no specific regulations or measures to protect tenants against unfair treatment in relation with energy consumption or bad energy performance of the buildings. The issue is not treated in the NECP.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

Even if Bulgaria implements the additional policies and measures outlined in the NECP (WAM), it is not in line to meet the 2030 minimum target for renewable energy in heating and cooling. Bulgaria is on track to meet the non-ETS ESR emissions target and the EED 3 energy consumption targets.

Bulgaria is highly dependent on energy imports, particularly for oil, gas, and for uranium, where import dependence exceeds 99%.

Although energy efficiency programs are in place, their implementation faces challenges.

Energy poverty programs are changing with the market liberalisation of electricity. There is some uncertainty regarding the new program.

To meet renewable energy targets and reduce energy imports, Bulgaria should step up policies and measures for renewable energy as proposed below. The policies and measures should include, but also go beyond the additional measures in the NECP. They should support heat pumps, solar heating, district heating rather than biomass that is the largest RE-source for H&C.

We have the following suggestions to improve Bulgaria’s policies and measures:

- The expected increase of biomass use for energy, including for heating, should be reconsidered given the resource limits and the need for sustainable use of forests etc.

- The import of waste for energy generation should be avoided.
- The government and parliament should improve both Energy Act and Renewables Energy Act and respective secondary legislation to facilitate small-scale RES and energy communities using renewable sources in order to boost both energy and heating/cooling supply especially in rural and mountain regions.
- In addition to better legislation, the support for efficient and renewable heating and cooling should include a special financial facility for community heating and cooling initiatives, including energy communities with electricity production for members', heat pumps and for local district heating schemes based on renewable energy and excess heat use.
- The NECP should address alternative renewable heating sources such as solar collectors, geothermal energy and heat pumps by developing special programs for state-supported construction of small-scale RES facilities to decrease the dependence of households on energy subsidies.
- Improving the "Long-term national strategy to support the renovation of the national stock of residential and non-residential buildings with an implementation horizon of 2050".
- Develop municipal heating and cooling plans.
- The National Forest Biomass Energy Action Plan 2018-2027 should be fully re-written to ensure sustainable forest use and extended with recent data and targets.
- The use and expansion of nuclear power should be reconsidered given the high costs and uncertainties of nuclear power. The priority for nuclear energy involves the risks of making electricity unnecessarily expensive and of prolonging the use of fossil fuels due to the long construction periods of nuclear power plants. Given the current widespread reliance on electric heating and the plans for heat pumps, high electricity prices will pose a challenge for many households.

CZECHIA

The following analysis is based on [Czechia - Final updated NECP 2021-2030 \(submitted in 2024\) - European Commission](#) published 20 December 2024. Page numbers refer to the English translation (an automatic machine translation) of the National energy and climate plan (NECP).

1. TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For Czechia, the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3) including national indicative increase (the total RED 3 target) is 1.6%-point increase per year 2021-2030. The minimum binding target for all EU countries is 0.8%/year increase 2021-2025 and 1.1% 2026-2030.

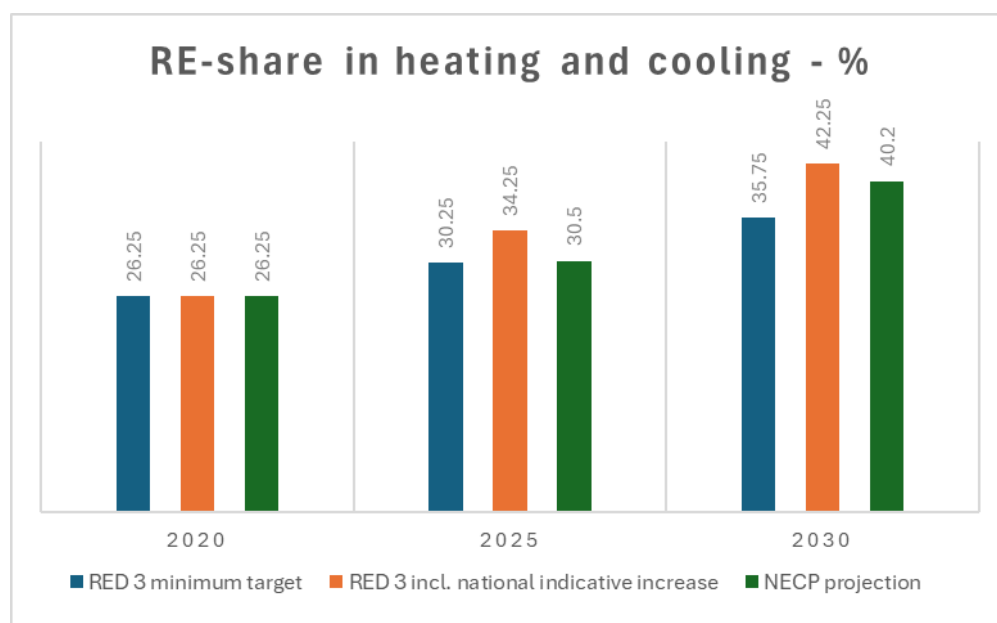


Figure 1. Renewable share in % of heating and cooling for Czechia, RED 3 binding share, RED 3 including national indicative increase and projection with policies and measures in NECP for 2025 and 2030 compared with base year 2020 (p. 42, table 17).

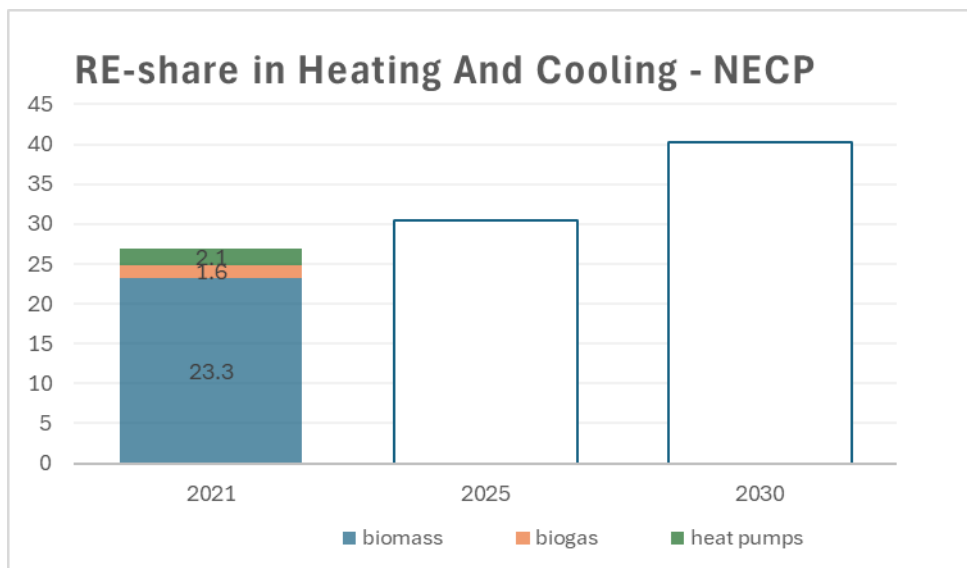


Figure 2. Renewable share in % of heating and cooling for NECP projections divided in sources, for 2021 (calculated from p.226, fig.52).

The Czech NECP does not include a split of the renewable energy into sources for future heating and cooling, only until 2021. In 2021, biomass accounted for approximately 20.4% of the total fuel used in district heating systems (p. 226, figure 52). In the same year, household biomass consumption reached 87,5 PJ, with an estimated useful energy utilization of 65.6 PJ, representing around 45% of total household heating energy consumption. (This data was extracted from another document of the Czechia called: Posouzení trajektorií udržitelného využívání bioenergie v ČR). For district heating, the forecast in the NECP indicates continued biomass use alongside the replacement of fossil fuels with large heat pumps, which are expected to cover half of district heating supply by 2030. However, since district heating only met 13% of total heat and cold demand in 2021, its transition will have a relatively limited impact on the overall shift in heating and cooling supply.

In spite of the increase in bioenergy use, Czechia continued to be a net exporter of bioenergy with a net export of 12.7 PJ (4,6% of production).

Share of energy from RE in buildings:

- The indicative EU goals from RED 3 is 49%.
- Czechia's share in 2030 is 40% according to NECP WAM scenario and 35% according to NECP WEM scenario (p. 359 table 105).

Other national targets from the Czechia NECP are:

- Increase the share of heat from renewable energy sources in heat supplied (district heating) in accordance with the Czechia's international obligations within the European Union (p. 28)

- Reduce the share of fossil fuels used without carbon capture technology in primary energy consumption to 50% by 2030 and completely phase out by 2050. The use of coal for electricity and heat production should be fully phased out by 2033 (p. 28)
- Keeping share of heat from cogeneration in heat sold above 70% in the medium term (p. 28)
- 31% RE in electricity in gross production (23% in primary energy) by 2030 (p. 26, table 9)

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS,

For Czechia, the target is a reduction of 26% greenhouse gases (GHGs) between 2005 and 2030 of the emissions not covered by the current EU Emission Trading Scheme (ETS1) or by the Land-Use, Land -use Change and Forestry (LULUCF) regulation. This is an improvement compared to the previous target of 14% and is following the revised EU effort sharing regulation (ESR), (EU) 2023/857. The regulation also sets annual emission limits for the years 2021-2030 with a budget approach, so each country has to keep the sum of emissions for the period within the sum (the budget) of annual emission limits.

With the Czech scenario for climate and energy, emissions covered by ESR are estimated to decrease by 34% 2005-2030 and with this Czechia can expect to meet the target. It is a condition for reaching the 34% reduction that Czechia is setting ambitious policies and measures (p. 3), but these policies and measures are not sufficiently described in the NECP. To reach the target, residential buildings and transport are the biggest emitters, and also the sectors with the highest investment needs to reach the target (p. 37). See below for policies and measures included in the scenario.

1.3. ENERGY IMPORT TARGETS AND DEPENDENCY OF IMPORTS

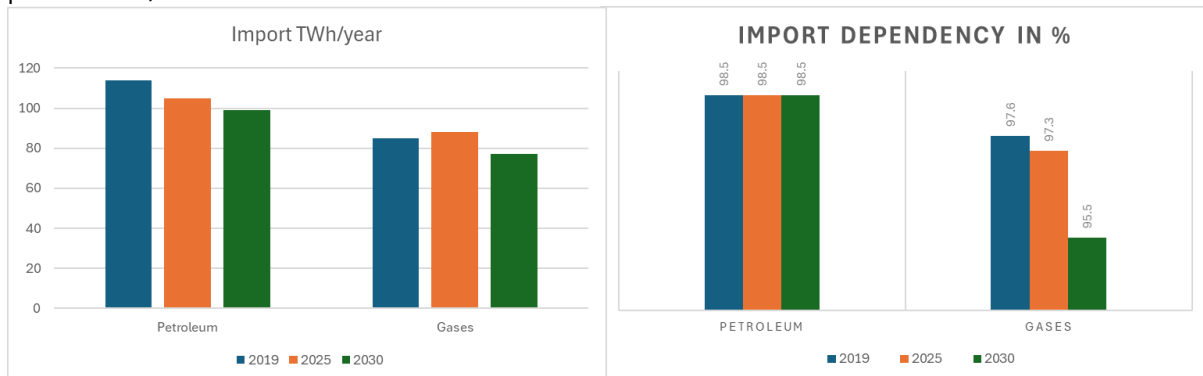
The Czechia aims to keep import dependence below 65% by 2030 and 70% by 2040. For this target, nuclear fuel is included as energy import.

The overall energy import dependency increased over the past decade. From a share of 25.3% in 2012, it rose to 41.8% in 2022 (without nuclear fuel). Still, compared with the other EU countries, the Czechia ranks among the nations with low energy import dependency. However, if the nuclear fuel import is included, the current energy import dependency is considerably higher than the 41.8% stated in the NECP. The Czechia remains entirely dependent on imports of natural gas, crude oil, and nuclear fuel (uranium)(p. 243).

Changes in energy source diversification during 2022, driven by Russia's war of aggression against Ukraine, led to a year-on-year decrease in the Czechia's energy import dependency from Russia, from 25.4% to 20.4%. However, the import dependency on solid fossil fuels gradually increased from -12.0% in 2012, when Czechia was an exporter, to 14.0% in 2022.

The NECP primary energy consumption plan for 2030 shows a 68% overall dependency, - broken down into imports of natural gas (21%), oil (25%), and nuclear (22%), which is above the target of 65%.

Figure 3: Evolution of the primary energy import per year and Import dependency for gas including biogas and oil products (developed from p.243, graph 65 and information on biogas and domestic oil production)



The projection for 2050 foresees a share not exceeding 65% of the primary energy consumption imported (p. 59).

1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

- Czechia set clear goals to heating security (p. 62):
 - Create the conditions for the operation of heat energy supply systems to the extent possible and economically efficient.
 - Create the conditions to maintain the stability of heat supply in the context of a shift away from the use of coal for energy production.
 - Support an increase in the share of thermal energy supply systems using a multi-fuel or energy mix with the possibility of rapid fuel switching if short-term lock-in is needed.
 - Support an increase in the importance of heat sources in addressing electricity crisis situations, including their involvement in flexibility mechanisms and in the operation of islands in the electricity system.
- The Czechia indicative benchmark from EU is a 33% share of renewable energy sources (RES) in final energy consumption by 2030, but Czechia sets a contribution of 30.1% as its target, equal to the RES share calculated in the WAM scenario (p.41, p.359 tabel 105).
- The heating and cooling sector will contribute significantly to this goal, with increased deployment of biomass, biogas, solar thermal, and heat pumps.
- The government aims to reduce energy intensity by 30% compared to 2005 levels by 2030, focusing on heating efficiency improvements.
- Use of nuclear power in heat generation to achieve emission reductions with heat pipelines to Brno and other towns (p. 40, 91).

- Domestic homes and public buildings heat energy consumption are forecasted to decrease by 66 PJ until 2030 and by 166 PJ until 2050 (baseline 2019 ->372 PJ)(p. 56 table 21)
- Constantly decrease the specific heat demand for heating in the residential and non-residential sector with the following indicative milestones:

[MJ/(m ² year)]	2030	2040	2050
Specific heat demand for heating	386	292	246
<i>Residential sector</i>	433	306	246
<i>Non-residential sector</i>	320	272	246

(p. 56)

- Completely phase out the use of coal for electricity and heat production by 2033 (p. 3)
- Integrate heat pumps and solar into the DH systems (p. 138)
- The reliance on natural gas in the heating sector will be reduced, with increased use of biomass, HP and solar energy, with big amount of CHP in the DH system.
- District heating networks will be modernized, prioritizing low-carbon and renewable energy sources while phasing out coal (by 2033).

1.5 TARGETS ON ENERGY EFFICIENCY IN NECP COMPARED TO THE EE TARGET IN EED

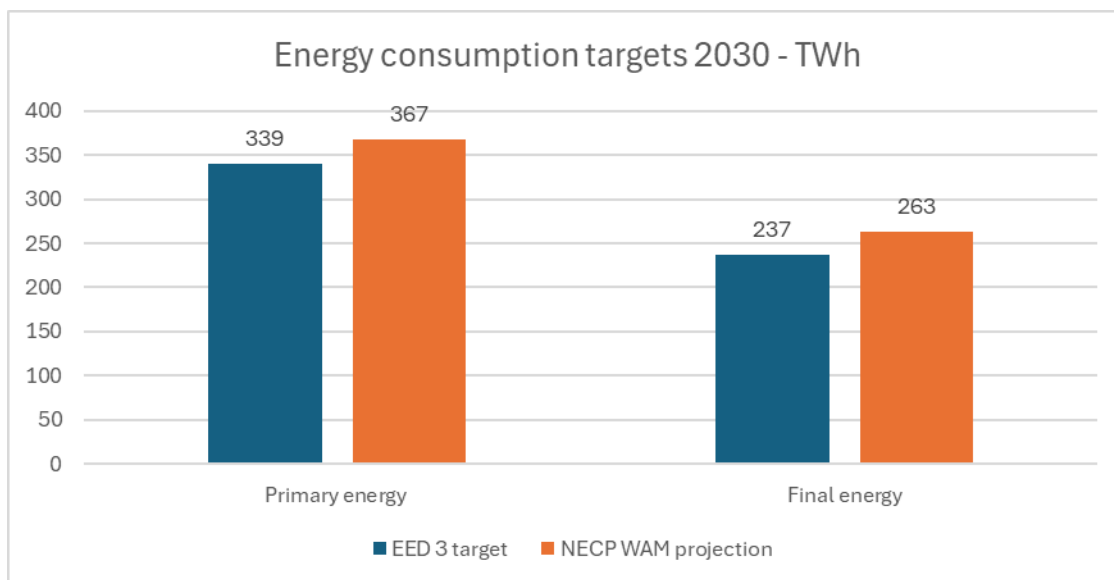


Figure 4. National indicative contributions for energy consumption according to EED 3 with updated 2020 reference scenario and projection of consumption in the NECP based on a scenario with additional measures (WAM), (p.3, p. 23 table 6 + own calculations, p. 50).

The scenario WAM in the NECP does not include reductions of energy use to reach the energy efficiency indicative targets of the EED 3 with the updated 2020 reference scenario. If Czechia had used the 2020 un-updated reference scenario, its indicative target would have been 1%

higher, but still 7% lower than the projection. Further energy reduction efforts are needed to reach the EED 3 indicative energy consumption targets.

2. POLICIES TO ACHIEVE THE HEATING TARGETS

Policies and Plans for Heating & Cooling

Modernization of District Heating (p. 114-128)

- The strategy supports a transition from coal to biomass, waste heat recovery, and natural gas as a transitional fuel.
- Key projects focus on cogeneration units with biomass and biogas integration.
- Waste heat (excess heat) utilization from industrial processes will be promoted, requiring investment in heat distribution infrastructure.

Heat Pumps and Decentralized Heating (p. 114-128)

- Support schemes will encourage the use of heat pumps in residential and commercial sectors.
- Regulatory incentives will facilitate electricity-grid integration and flexible pricing models for heat pump users.

Smart Energy Management (p. 141-147)

- Investment in smart metering and energy monitoring tools to optimize heating energy consumption.
- Digitalization of district heating management for real-time adjustments based on demand.

Financial Resources and Support Mechanisms

EU & National Funding (p. 384-424)

- Modernization Fund:
 - 1.99 billion € (CZK 50 billion) allocated for renewable energy heating and industrial decarbonization.
 - Minimum 80-90% of funds directed to priority clean energy projects.
- Operational Program "Technology and Applications for Competitiveness" (2021-2027):
 - Supports industrial energy efficiency and renewable heating solutions.
- Emission Trading System (ETS) Revenues:
 - Part of the income is redirected to funding renewable heating projects.

Grants & Subsidies (p. 398-424)

- New Green Savings Program (CZ: Nová Zelená Úsporám):
 - Offers subsidies for insulation, biomass boilers, solar thermal, and heat pumps.

- Focus on low-income households to ensure fair access to clean heating technologies.
- Program EFEKT:
 - State-funded initiative for energy efficiency improvements in district heating.
- EU Just Transition Fund:
 - Supports coal-dependent regions transitioning to clean heating technologies.

Energy poverty

An **expert group on energy poverty was set up** under the Ministry of Industry and Trade. The objective of the expert group is to propose a definition of energy poverty for the Czechia, to set appropriate indicators for measuring energy poverty and the related definitions and indicators for vulnerable households, stemming from the EU Directive 2024/1275 on the energy performance of buildings (p. 77).

In the long run, the Czechia performs better than the EU average regarding combatting energy poverty (see *Figure 7-8*). In 2022, around 2.9% of households were unable to maintain sufficient heating comfort and only 1.9% experienced difficulties in paying their energy bills. In the following year, the inability to heat sufficiently deteriorated to 6.1% - probably caused by the Russia's war of aggression in Ukraine and the subsequent price rise for fossil fuels). Still, energy poverty in Czechia remains below EU average. Also in 2023, 1.9% said they would be unable to pay their energy bills, placing the Czechia second in the EU ranking (p. 78) while the families with debt on energy bills is just below 2% compared to an EU average of 6% in 2019 (p. 78, graph 16)

Indicators in the household sector show that energy poverty in the Czechia is foremost a problem for tenants, seniors and single parents. There is correlation to the type of dwelling or the place of living. (p. 79)

The Czechia currently does not have policies or measures specifically aimed at reducing energy poverty (p. 158), but the following programs are assisting people in energy poverty to save energy.

New Green Savings Light Programme (CZ: "Nová zelená úsporám Light")

The program is aimed at seniors and low-income households. It is designed to minimize the need for personal financial contributions for energy-saving renovations. The scheme provides upfront financing, covering up to 100% of eligible costs, and targeting households in energy poverty.

Currently, funds can be used for:

- Insulation of facades, roofs, ceilings, and floors
- Replacement of windows and doors
- Installation of solar water heating

Consultation Services

A nationwide advisory network has been established, including trained and certified specialists. Free consulting services are provided at various levels, including Energy Consulting Centres (EKIS), mobile EKIS, local energy advisors, and personal consultations.

Support includes:

- Identifying suitable measures
- Document preparation and application submission
- Navigating financial assistance and implementation
- Assistance throughout the renovation process

The government planned to establish five one-stop energy advisory centres by the end of 2024 to provide comprehensive consulting on energy efficiency, financial support, and legal matters (p.159).

Social Climate Fund

The EU established the Social Climate Fund (Regulation (EU) 2023/955). From 2026 to 2032, it will provide financial resources addressing the social impacts of climate measures on vulnerable households, and small businesses. The fund aims to reduce reliance on fossil fuels through targeted investments. (p. 159) The support will be addressed to:

- Temporary income support for vulnerable groups
- Measures with investments for: (a) energy efficiency; (b)

buildings renovation; (C) zero- and low-emission mobility and transport; (p. 390, table 107)

Boiler Replacement Grants for Low-Income Households

As the use of Class 3 or lower emission boilers is banned in the since September 2024, the program will fund the replacement of outdated coal boilers. A funding scheme of 1.7 billion € was launched in 2023 to help low-income households replace inefficient boilers. The program prioritizes the elderly and people with disability aiming to fund up to 15,000 boiler replacements. It supports both heating system upgrades and home energy efficiency improvements (p.159-160).

Building Renovation

The Czechia prioritizes building renovations as a key strategy to reduce energy poverty. High energy consumption in buildings is a major contributing factor to energy poverty. The plan aims to decrease the number of people living in energy poverty through comprehensive building renovations. In accordance with the EU Energy Efficiency Directive Article 3, deep renovations are integrated into the National Energy and Climate Plan to reduce energy demand in residential buildings and assist vulnerable households. (p.160)

Energy Communities

“Particular emphasis will be placed on renewable energy communities (“community energy”), which are behind economic, environmental and social benefits at local and national level. The

participation of citizens and local authorities (e.g. municipalities) in community energy projects creates significant added value in terms of local acceptance of renewables and access to private capital.” (p. 45)

“The Energy Community shall be entitled to:

- Consume electricity at its consumption point for self-consumption
- Generation of electricity
- Sale of electricity produced in a power-generating facility operated by a community or a member of a community to share electricity produced in a power-generating facility operated by a community to the demand point of its member” (p. 101-102)

Active Customer: Self-generating customers can use the distribution system to access electricity they produce at another location. They can also share electricity with other customers in the same building (without using the distribution system) and are allowed to sell their surplus electricity to an electricity trader. (p. 102)

Support for the creation of energy communities: (p. 102-103)

- Modernisation Fund
 - The resource component of energy communities (i.e., "common" resources outside the housing sector).
 - The integration elements of energy communities, including:
 - Connecting individual RES into larger units.
 - Smart metering and advanced energy networks.
 - Local energy sharing.
 - Increased energy storage capabilities.
- National Recovery Plan/New Green Savings
 - Supports the development of community energy in the residential sector.
 - New Green Savings 2030 programme:
 - Support the installation of new RES to enable future participation in energy communities.
 - Fund small-scale, shared energy storage for multi-house residences.
 - Encourage the creation of energy communities within apartment buildings, helping to address administrative barriers to renovations.
 - Finance other investment measures related to community energy.
 - Non-investment measures include:
 - Support for the establishment of energy communities.
 - Awareness-raising, education, and outreach efforts to promote community energy.

Electricity-to-gas price ratio

No projection of electricity prices for households is included in Czechia's NECP, while the historical prices are given in Figure 4.

Czechia	2021	2022	2023	2024
Gas price (cent/kWh)	5.62	6.96	11.38	10.85
Electricity price (cent/kWh)	13.89	19.81	26.33	28.39
Electricity-to-gas price ratio	2.5	2.8	2.3	2.6

Figure 4. Average gas and electricity prices in cent/kWh for private consumers (first half of the year) and the respective price ratio. The price includes taxes. The gas price is for consumers with a consumption of 20-200 GJ/year, and the electricity price is for consumers with a consumption of 5,000-15,000 kWh/year. Source: Eurostat, nrg_pc_202 and nrg_pc_204.

Compared to the price of gas, electricity is becoming more expensive. This does not favour the economic attractiveness of heat pumps. Fortunately, the energy efficiency of the heat pumps can compensate for the higher electricity prices, if investment subsidies can reduce the investment costs.

The NECP include a forecast of gas prices with slightly reduced prices until 2035 and then increases.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

Czechia has a very high energy current import dependence for oil and gas as well a projected 68% overall energy import dependency in 2030.

While Czechia meet the ESR emission targets, but not the energy consumption indicative reduction targets with its WAM scenario. It only reaches the minimum renewable energy target for heating and cooling, not the higher indicative target with its WAM scenario. At the same time, large amounts of financial support is directed towards coal-to-gas conversions of district heating, contrary to the NECP goals of lowering dependency on fossil fuels.

While several plans are in place to reduce fossil fuel use, not all of them are followed by implemented policies. A full implementation of the plans in the WAM scenario should be a priority.

Energy communities are supported according to the NECP.

The energy import dependent nuclear power sector is a matter of concern, as it continues to sustain dependency on Russia.

Czechia has relatively low energy poverty rates compared to EU average, but the energy poverty rates increased significantly during the energy crisis. Some financial support schemes have been implemented successfully, but more resources and more targeted measures are needed.

Suggestions

- To realise the strong focus on heat pumps, subsidies must be in place that make it attractive to invest in heat pumps instead of gas heating. Subsidies should be strengthened and support of fossil fuels should be excluded.
- The solar heating can be better supported, following the stated priority in the NECP. A dedicated solar heating strategy could be used with focus on dwellings, district heating and institutions.
- Strengthen the focus on energy efficiency, combining the subsidies with more low-interest loans.
- Strengthen the efforts to reduce energy poverty. Implement targeted financial support schemes for energy renovations for the most vulnerable households to make sure renovations and other improvements are available to them.
- The proposed one-stop shops should be realised in sufficient numbers.
- Replacing fully import-dependent nuclear power generation with other energy sources that are less or not at all dependent on imports (preferably renewable).
- Include detailed information on renewable energy sources by type in the NECP, including projections for 2030, 2040, and 2050.

DENMARK

The following analysis is based on [Denmark - Final updated NECP 2021-2030 \(submitted in 2024\) - European Commission](#) published 1 July 2024. Page numbers refer to the English version of the National energy and climate plan (NECP).

1. TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For Denmark, the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3), including national indicative increase (the total RED 3 target), is 1.6%-point increase per year 2021-2030. The minimum binding target for all EU countries is 0.8%/year increase 2021-2025 and 1.1% 2026-2030.

As the renewable energy share in Denmark is above 60% in the heating and cooling sector, the Danish target is lowered to zero.

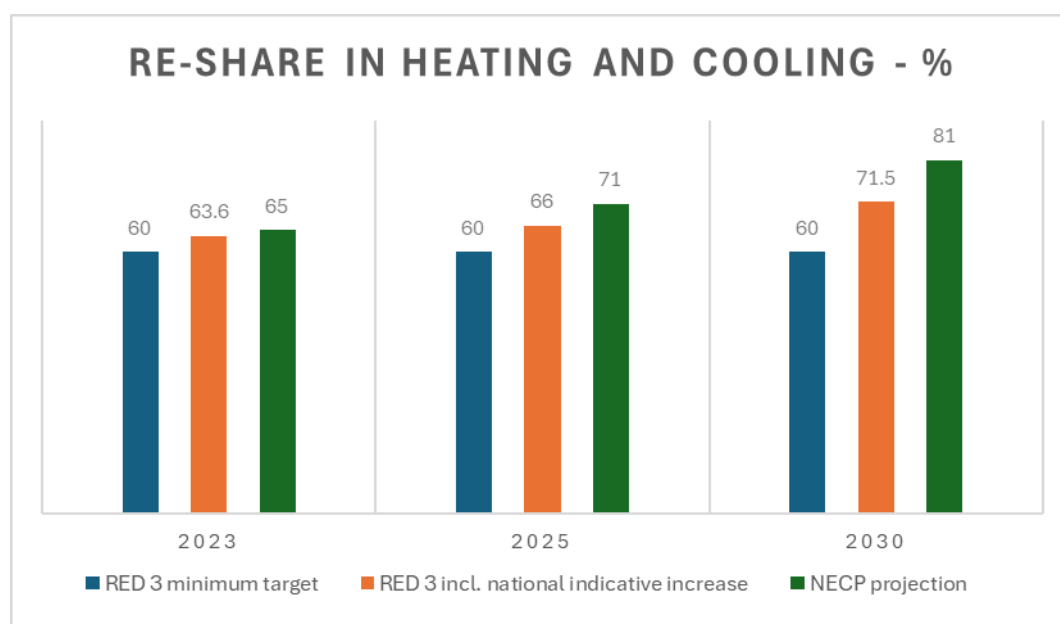


Figure 1. Renewable share in % of heating and cooling for Denmark, RED 3 binding share, RED 3 including national indicative increase and projection with policies and measures in NECP for 2030 compared with latest statistics from 2023 (p. 41).

In 2023, the renewable energy share in the heating and cooling sector was already above 60%, and it is projected to reach 71% by 2025 and 81% by 2030. This expected increase is 2%-points per year.

In 2022, Biomass accounted for 63% of the renewable energy consumption (p. 41).

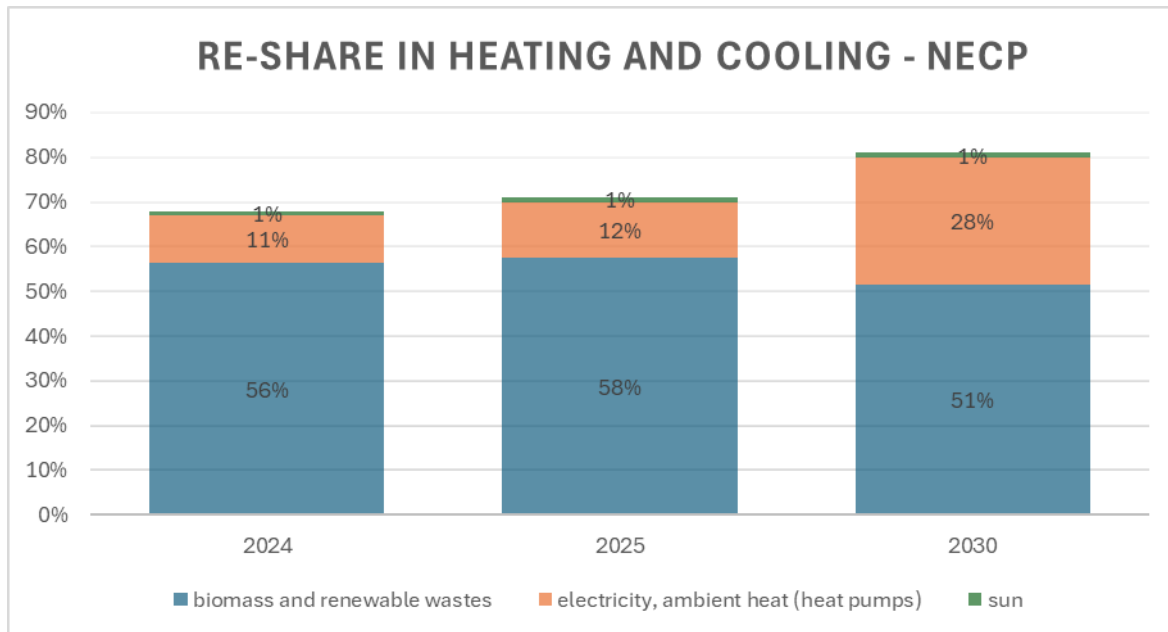


Figure 2. Estimated projection of Renewable Energy share in the heating and cooling sector following technology 2024 – 2030. (p. 49 in the Danish version of the NECP, not available in the English version).

The share of biomass increases slightly at the beginning of the period but then declines. Other bioenergy is estimated to peak in 2026 with a consumption of 3,733 ktoe and then to decrease to a consumption of 3,045 ktoe by 2030 (p. 53).

The RED 3 EU-wide target for RE in the building sector is 49%.

Denmark's share of renewable energy in the building sector expects to reach 77% by 2024 and 87.3% by 2030 according to the NECP (p. 45, 46).

Other national targets from policies in the Danish NECP are:

- 90% of district heating is based on other forms of energy than coal, oil and gas according to Danish energy agreement 2018 (p. 26).
- More than 100% RE in electricity by 2030 according to Danish energy agreement 2018 (p. 26). This would mean net electricity export.
- The political ambition is that biogas production covers 100% of Denmark's gas use in 2030 (p. 48).

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS

For Denmark, the target is a reduction of 50% greenhouse gases (GHGs) between 2005 and 2030 of the emissions not covered by the current EU Emission Trading Scheme (ETS1) or by the

Land-Use, Land -use Change and Forestry (LULUCF) regulation (p. 23). This is following the revised EU effort sharing regulation, (EU) 2023/857.

With already adapted policies, Denmark's accumulated shortfall in the effort sharing agreement 2021-2030 is estimated to be approx. 1.9 million tonnes of CO₂e. Including estimated effects of a diesel and road tax the shortfall will be 0.1 million tonnes of CO₂e, which is expected to be covered by additional policies and instruments. However, final decisions have not been taken on all concrete instruments (p. 24).

1.3. ENERGY IMPORTS TARGETS AND DEPENDENCY OF IMPORTS

Denmark does not have targets on reduction of energy import dependency. Denmark's focus is on diversification and electrification. There is domestic oil and gas production. In the future, thermal power plants will be phased out in favour of new solar and wind power generation plants. The aim is for Danish biogas production to correspond to 100% of Denmark's total gas consumption by 2030 (p. 64, 70).

Dependency of imports into EU for energy use in buildings

There is only data available in the NECP for total energy import dependency and for biofuels.

In 2022 the import dependency stood at 22% and is projected to decrease with existing measures. In 2030, Denmark plans to be a net energy exporter. After 2031 the import dependency will increase (the net export will decrease), and by 2040, Denmark's import dependency will be -0.3% (p. 188).

In 2022, imports of mainly wood pellets and wood chips accounted for 38% of the biofuel consumption in Denmark (p. 41, p. 58 figure 16). There is no projection in the NECP of the future origin of biofuels, but in the near future, imports will still cover part of the consumption.

1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

- Denmark aims to stop using gas for space heating in households by 2035 (p. 14).

57,000 new heat pumps were installed in 2023, which was 32,020 less than in 2022 ([Executive-summary_EHPA-heat-pump-market-and-statistic-report-2024-2.pdf](#)).

1.5 TARGETS ON ENERGY EFFICIENCY COMPARED TO THE EE TARGET IN EED

By 2030, Denmark's indicative target is set at 575 PJ for final energy consumption and 648 PJ for primary energy consumption. These objectives are determined using the formulae in the EED and the old 2020 reference scenario. Based on this, Denmark will reach the EED 3 targets.

If the updated 2020 reference scenario had been used, the indicative targets would be respectively 531 PJ for FEC and 614 PJ for PEC. Consequently, the targets will not be met with the updated reference scenario and further measures will be needed.

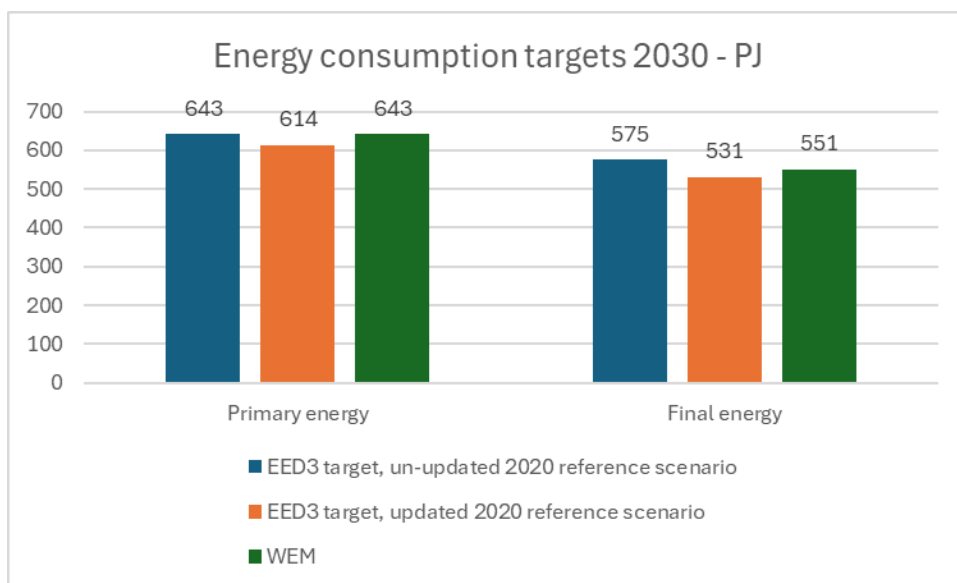


Figure 3. National target for energy consumption according to EED 3 (un-updated and updated 2020 reference scenario) and the projection of consumption in NECP based on WEM scenario (without additional measures), (p. 61, 182, 185).

2. POLICIES TO ACHIEVE THE HEATING TARGETS

In its NECP, the Danish government has presented the following measures to achieve the heating targets.

“The use of biomass for heat production is exempted from energy and CO₂ taxes. A large proportion of biomass use for heat production takes place in large CHP plants” (p.41).

Several political agreements have been made to phase out fossil fuels in the heating and cooling sector over the last years in Denmark, among others the *Energy Agreement 2018*; the *Climate Agreement on Energy and Industry, etc. 2020*; and *Climate Agreement on Green Power and Heat 2022* (p. 101).

The *Climate Agreement on Green Power and Heat 2022* sets the goal of phasing out the use of gas for space heating in Danish households by 2035. Where possible, households must convert to district heating or, otherwise, convert to alternative green solutions, e.g. a heat pumps (p. 14).

Measures to phase out individual oil and gas include (p. 101):

- **Grant schemes:** From 2020-2026, 5 billion DKK (670 million €) was allocated to 4 subsidy pools to phase out oil and gas furnaces. These schemes support the development of new district heating, the disconnection from the gas grid, and households’ investments in heat pumps.
- **Loan schemes:** There are two schemes for green loans for the replacement of oil and gas boilers in place which are free of fees and property tax. A state-guaranteed loan scheme to replace oil and gas boilers in areas without access to district heating was implemented in spring 2023.

- **Tax changes:** In 2021, the space heating tax (fossil fuels) was increased to 62.3 DKK/GJ (8.36 €/GJ) while the electricity heating tax for households was reduced to 0.008 DKK/kWh (0.1 €/GJ), corresponding to the EU minimum rate.
- **Regulatory changes:** Since the adjustment of the Heat Supply Act in 2021, district heating projects can be approved without socio-economic comparison with fossil alternatives. The regulation no longer prevents the conversion of natural gas areas to district heating areas.
- **Planning efforts:** The municipalities are the planning and approval authorities for district heating. In order to speed up the process, the planning basis was established in 2022-2023 so that district heating can be introduced by 2028 where it is practical to do so.

The number of gas furnaces in households has significantly decreased since the end of 2020.

District heating covers 70% of space heat consumption in Denmark.

The Danish district heating sector is governed by the *Heat Supply Act*. Regulatory changes are made to further the phase-out of fossil fuels and to ensure the framework for new green technologies, including (p.101):

- Removal of fuel ties for natural gas for district heating producers, and “modernisation of the cooling obligation for district heating to allow for an increased use of surplus heat and own renewable energy production”. It was introduced on 1 January 2021.
- Separate rules for price regulation to promote use of surplus heat.
- Since 2023, there are separate rules for the price regulation of district heating and geothermal installations in place to enable large-scale geothermal installations for district heating.

Looking at biogas, price supplements were in place to support the production. These support schemes were closed by 2020, meaning no new plants could enter the schemes. The *Climate Agreement for Energy and Industry etc. 2020* agreed that future support for biogas and other green gases should be based on a tendering process with 5 tenders up to 2030 (p. 108).

The Scrapping Scheme (Energy Agreement 2018) grants subsidies to energy service providers renting a heat pump on subscription to households replacing their oil, gas or wood pellet furnaces. 210 million DKK (28 million €) has been allocated to the scheme in the period 2020-2026 (p. 120).

Earlier the building pool and now the energy renovation pool supports energy efficiency such as windows, insulation etc. in residential buildings (p. 120).

The *Green Housing Agreement 2020* earmarks approximately 600 million DKK (80 million €) for energy saving measures in the social housing sector for the period 2021-2026 (p. 121).

The *Climate Agreement on Green Power and Heat 2022* stipulates that the authorities should take the lead in phasing out fossil heating in the public building stock. Plans for the gradual abolition were submitted by the state, municipalities and regions in June 2023 (p. 123).

Moreover, energy renovation of existing buildings is promoted through energy labelling and information activities. The Danish Energy Agency runs awareness campaigns for private households, businesses and the public sector on energy-efficient solutions, energy renovation and building regulations. These campaigns include information material, the website SparEnergi.dk, and free independent consultancy on the telephone or in writing. A new layout of the energy labelling reports has been developed in cooperation with behavioural scientists, to encourage building owners to carry out energy renovations (p. 124).

Support for local energy communities and local anchoring of the climate transition. Between 2022 and 2025, DKK 4 million per year was made available to inform about renewable energy community projects, and to finance the planning, organization and establishment of larger pilot projects (p. 127).

All municipalities have carried out heat plans, dividing areas for district heating and areas for heat pumps 2022-2023. Following the planning, all households with gas and oil heating were informed about how they could replace gas and oil heating with fossil free alternatives (p. 133).

Energy poverty

According to the Danish NECP, there are 7,000 – 29,000 low-income households (0.2 – 0.9 % of households) with a high energy consumption and living in low energy performing buildings. In Denmark there are no specific energy policies related to energy poverty or special funding for vulnerable groups. Policies towards low-income households are part of the social policies (p. 83).

Pensioners covered by the regulation in force before 2003 can apply for a heating supplement.

In 2022, additional financial support was made available to help low-income households cover the high cost of heating (p. 155).

Electricity-to-gas price ratio

No projection of gas and electricity prices for households is included in Denmark's NECP, while the historical prices are given in figure 4.

Gas and electricity prices are available at Eurostat, and we have looked at data for the last four years.

Denmark	2021	2022	2023	2024
Gas price (cent/kWh)	8.95	15.09	16.55	12.23
Electricity price (cent/kWh)	12.26	29.05	36.47	22.09
Electricity-to-gas price ratio	1.4	1.9	2.2	1.8

Figure 4. Average gas and electricity prices in cent/kWh for private consumers (first half of the year) and the respective price ratio. The price includes taxes. The gas price is for consumers

with a consumption of 20-200 GJ/year, and the electricity price is for consumers with a consumption of 5.000-15.000 kWh/year. Source: Eurostat, nrg_pc_202 and nrg_pc_204.

Between 2021 and 2024, the price ratio between gas and electricity fluctuated. At the current ratio HPs are already the cost-efficient option.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

The Danish NECP is not on track to meet the targets for reduction of GHG emissions outside the EU emission trading scheme but is expecting to reach the target by introducing additional measures. To achieve the target, heating and cooling only plays a smaller part.

The Danish NECP is meeting the renewable energy target in heating and cooling. By 2030, Denmark will reach 81% RE in the heating and cooling sector. In Denmark, District heating constitutes a large part of the heat supply, and by 2030, 90% of district heating should be based on non-fossil sources. Denmark aims to phase-out of gas heating systems by 2035. This is supported by funding for heating conversions.

For now, a large share of the renewable energy is biomass but the bioenergy demand for heating is expected to decline from 2022 to 2030. In 2022, biomass imports covered 38% of the consumption. Currently, there is no information, whether this will change in the future.

Denmark is on track to meet the EU energy efficiency targets, but only by referring to an old 2020 reference scenario. The reference scenario for 2020 should be updated, and Denmark needs to do more to reduce energy consumption.

We have the following suggestions to improve Denmark's policies and measures:

- A ban on installation of new oil and gas boilers should be introduced, also in areas without district heating.
- Biomass imports for energy should be avoided.
- Support natural refrigerant cooling and heating equipment, including for heat pump subsidy schemes.

FINLAND

The following analysis is based on [Finland - Final updated NECP 2021-2030 \(submitted in 2024\) - European Commission](#) published 1 July 2024. Page numbers refer to the English translation of the National energy and climate plan (NECP).

1. TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For Finland, the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3), including national indicative increase (the total RED 3 target), is 1%-point increase per year 2021-2025 when it reaches 60% and then only 0.5% per year until 2030. The minimum binding target is 0.4%/year 2021-2025 for countries like Finland with 50-60% renewables in heating and cooling in 2020. When a country reaches 60%, the minimum target is not increased more, so for Finland the minimum target is 60% for 2030.

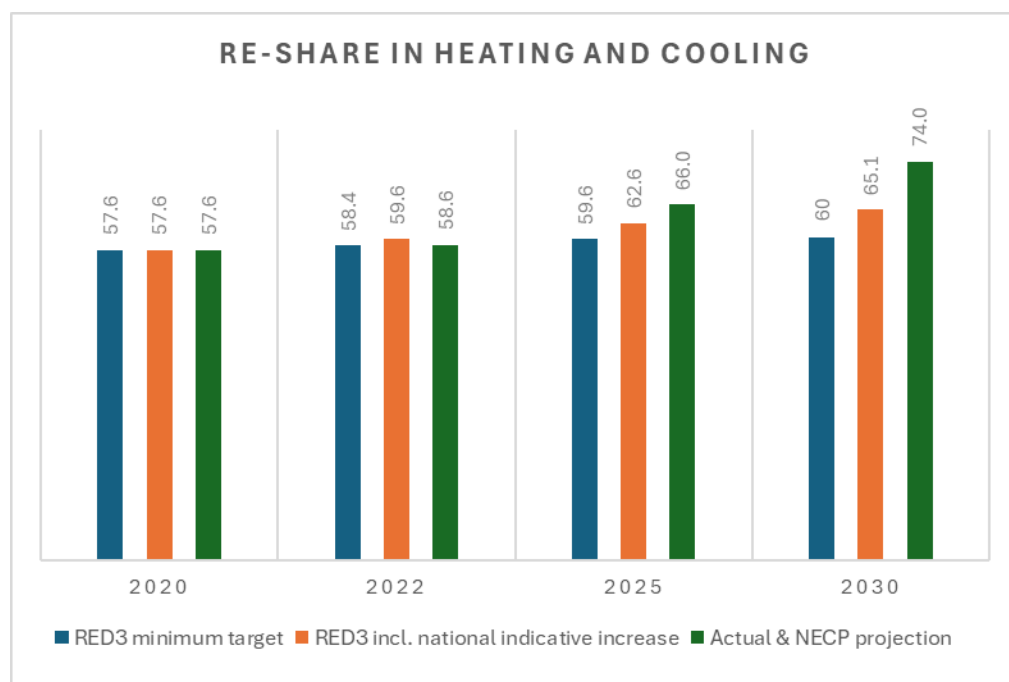


Figure 1. Renewable share in % of heating and cooling for Finland, RED 3 binding share, RED 3 including national indicative increase and projection with policies and measures in NECP for 2025 and 2030 compared with base year 2020 and latest statistics from 2022 (page 183).

The share of renewable energy was relatively high (59%) in the heating and cooling sector in 2022, ranking 4th in this respect among the EU countries. Finland aims to achieve the national indicative increase of renewable energy (top-up target) by increasing the share of renewables in the heating sector. Finland plans to use the opportunity in RED 3 to include waste heat and cooling in the RE-share (not shown on fig. 1).

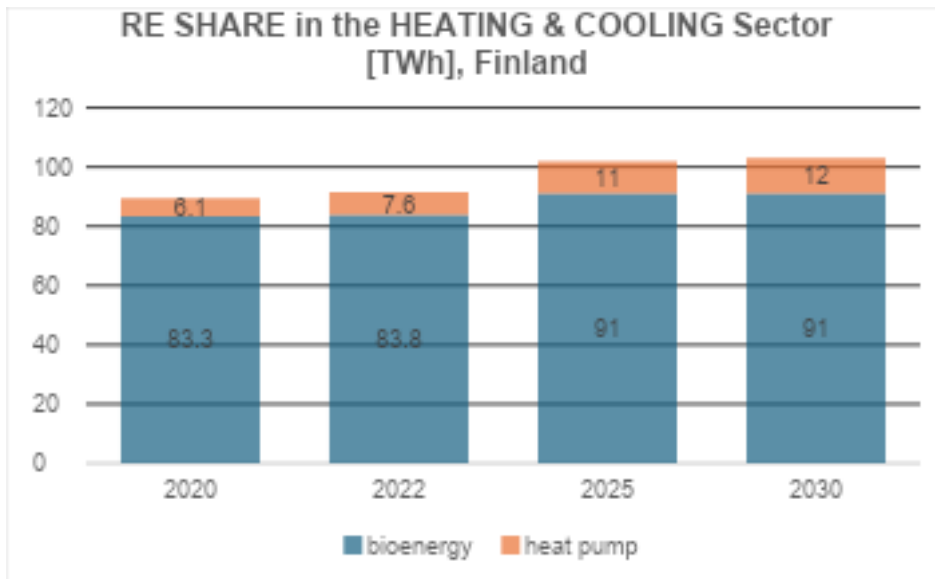


Figure 2. Renewable share of heating and cooling for NECP projections divided on sources, compared with the base year (2020) with existing measures (WEM). (p.59 table 6 and p.183 table 20)

According to the NECP projections, both the use of heat pumps and biomass will increase until 2025 and then remain stable. For heating and cooling of buildings, direct fossil fuel use was already limited to 10% in 2020. The biggest heating source is district heating which itself is sourced mainly from biomass. The direct fossil fuel use will be gradually phased out until 2040.

Bioenergy plays a key role in the production of renewable energy and 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. Much of the wood fuel is derived from forest industry wastes and residues, including black liquor from the chemical pulp-making process, and bark, sawdust and other industrial wood residues. Forest chips – in other words, logging residues or other low-value biomass from silvicultural and harvesting operations – are also used for energy production (p.60).

Biomass use is expected to peak around 2025-2030 and then start to decline. In recent years, the consumption of wood fuels has been relatively steady while other renewable energy technologies are becoming more common (p.61). This is in particular heat pumps.

The total biomass use shows the same tendency as the biomass for heating and cooling (p.62, table 7).

With almost 50% of Finnish heat supply coming from district heating, the decarbonisation of district heating is important for overall heating decarbonisation. In 2023, renewable fuels produced 53% and waste heat 14% of the district heat. These shares are expected to steadily

grow. There is focus on utilisation of more waste heat from the industry as part of the voluntary agreement (p. 63, fig.4).

1.2. GHG EMISSION TARGETS FOR NON-ETS1 SECTORS

For Finland, the target is a reduction of 50% greenhouse gases (GHGs) between 2005 and 2030 of the emissions not covered by the current EU Emission Trading Scheme (ETS1) or by the Land-Use, Land -use Change and Forestry (LULUCF) regulation. This is an improvement compared to the previous target of 39% and is following the revised EU effort sharing regulation, (EU) 2023/857. The regulation also sets annual emission allocations for the years 2021-2030 with a budget approach, so each country has to keep the sum of emissions for the period within the sum (the budget) of annual emission limits (EU).

The Finish Climate Change Act (2022), aims to reduce GHG (excluding land use, land-use change and forestry - LULUCF) by 60% by 2030, 80% by 2040 and 90%-95% by 2050. Finland is also aiming for GHG neutrality by 2035 including the LULUCF sectors.

Finland is on track to meet its 2030 ESR target of 50% reduction.

Annual emission allocations have been determined for all EU Member States for the period 2021-2025 according to the implementing regulations (2023/1319). In 2021, emissions from the Finnish effort sharing sector were 27.2 Mt CO₂ eq., or about 1.6 Mt CO₂ eq. below the allocation, and in 2022, 26.5 Mt CO₂ eq. and about 1.4 Mt CO₂ eq. below the allocation. With the trend from these emissions to the 2030 target, Finland will be in line to meet keep emissions below the allocations and thus also meet the budget target for 2021-2030 with existing measures (WEM) (p.51, figure 2).

1.3. ENERGY IMPORTS TARGETS AND DEPENDENCY OF IMPORTS

Finland has no domestic fossil fuel production (p.192). Its energy and climate policies have been centred on ensuring energy security, and reducing energy import dependency (p.10). Fossil fuel Imports from Russia reduced to almost zero (p.10, 11, 19). 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. Since summer 2022, energy imports from Russia have been terminated - except for nuclear fuel to the Loviisa NPP and also smaller amounts of LNG. The Russian gas is replaced with imports via LNG terminals and via Baltic countries, where much of the gas also comes via LNG terminals.

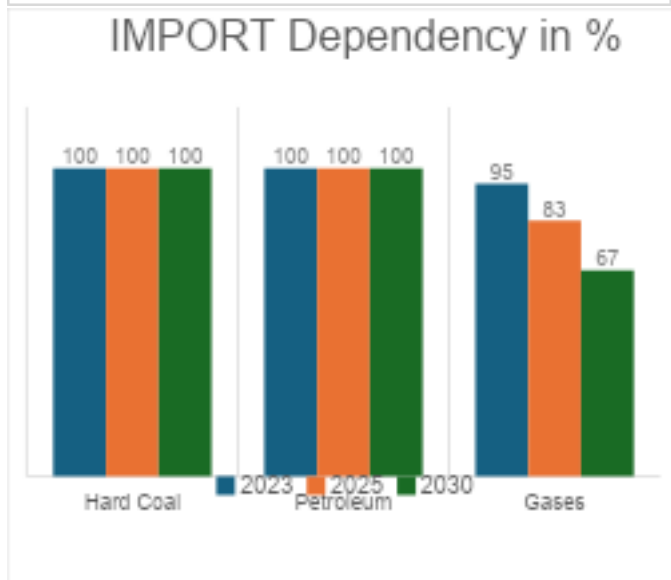
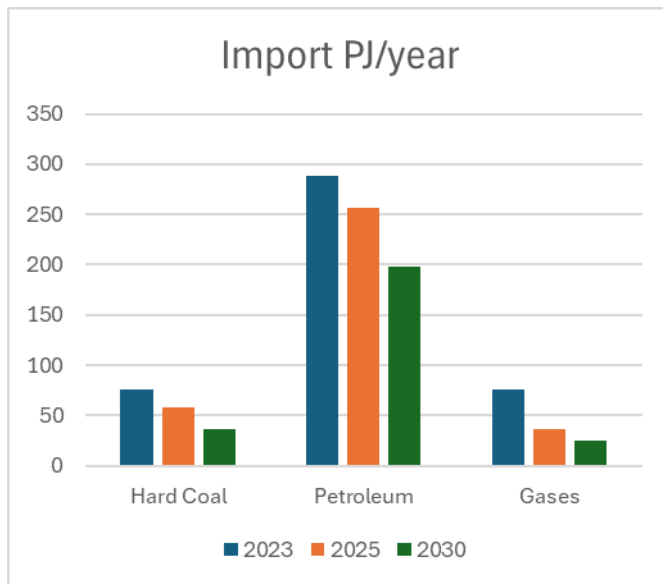


Figure 3 Dependency on import for total fossil primary energy consumption. Import dependency of gas includes biogas (p.193, fig. 17), combined with figures for biogas production 2020 and 2030 excluding unspecified “new techniques” from “National biogas roadmap: Finland” by Finnish Biocycle and Biogas Association and others.

Finland imports a few percent of its biomass for energy and it is expected that it will continue to do so (p.61). Much of this import is linked to imports of wood for the large, Finnish wood processing industry.

For several years, Finland has consistently imported electricity, but the forecast in the NECP indicates that this will change from 2025 and onwards (p.193, fig.18).

Finland also imports nuclear fuels for its nuclear power plants. This import is expected to continue.

1.4. TARGETS SUPPORTING THE DECABONISATION OF HEATING AND COOLING

Finland will phase out the use of fossil fuel oil for heating by the early 2030s. Already now, heating systems using fossil oil cannot be installed in new buildings (p.133).

Fossil oil was to 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 (p. 134).

By May 2029, the use of coal for power and heat will be banned. No new power plants burning hard or brown coal should be built, nor will any replacement investments for coal use be made. This also includes CHP plants that supply district heating. 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 is estimated to reduce the use of coal by 3 TWh compared to a market-based development without the ban. Early phase-out by 2025 is being encouraged with special incentives to support replacement investments (p 126).

1.5 TARGETS ON ENERGY EFFICIENCY COMPARED TO THE EE TARGET IN EED

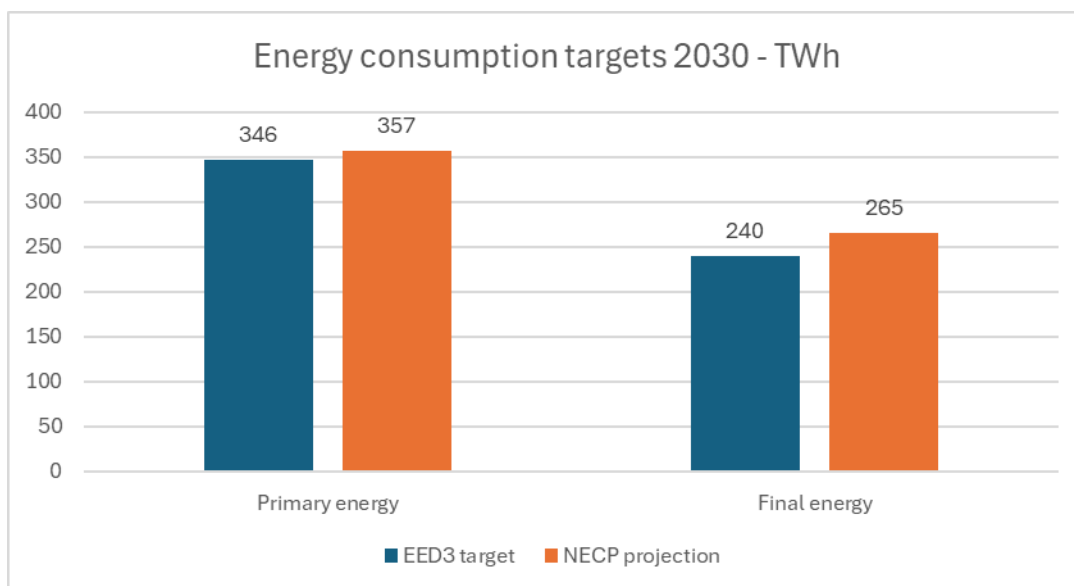


Figure 4. National target for Final energy (FEC) and Primary energy consumption (PEC) according to EED 3 and WEM projection of NECP (p.185).

The assessment and preparation of the implementation of the EED3 is ongoing. Finland's national energy and climate strategy will be completed in spring 2025. The exact values of FEC and PEC by 2030, as well as the information on the measures and the impacts, will be determined during the preparation of the strategy.

2. POLICIES TO ACHIEVE THE HEATING TARGETS BY 2030

Energy and climate policy with existing measures (WEM) related to decarbonisation, renewable energy and energy efficiency for the Residential Sector (based on p.21, table and text):

1) Building Regulations: Minimum standards for new buildings, and existing buildings undergoing renovation or alteration. Energy certificates for buildings, Ecodesign and energy labelling (p. 133-134).

2) Voluntary Energy Efficiency Agreements (Municipalities, Industry) incl. targets, energy management plan, monitoring. Supporting the agreement: Subsidies for Energy efficient investments and Energy Audit. Compulsory energy audit for big companies (p.131).

3) Consumer energy advice service. Information dissemination and campaigns on energy efficiency and renewable energy. In practice, it is a one-stop shop service. The aim is 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 (p.135).

4) Energy and carbon dioxide taxes (p.126 including table 12). In 2022 - 2023, the following heating related tax exemptions did apply: Tax reduction for biogas used in heating (2 mill. €). Tax exemption for wood-based fuels (440 mill. €, not only for heating). Tax exemption for waste incineration (32 mill. €). Energy tax exception for CHP production (64 mill. €). In addition to renewables and efficiency, Finland also subsidised peat use (122 mill. €). The values in brackets are state budget expenses for 2023, the expenses vary from year to year (p.128, table 12).

5) Distribution obligation for the use of bioliquids in (space) heating. This obligation requires oil supply companies to blend liquid biofuels into heating oil.

Additional measures (WAM) include:

6) The Finnish National Long-Term Renovation Strategy 2020-2050 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 (p.134):

- i. Subsidies for demolition of older buildings in rural zones and spatial planning to accompany the migration for rural to urban areas.
- ii. Maintenance and renovations; 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.
- iii. Decarbonising heating. 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.

7) Promotion of decentralised electricity and heat production based on renewable energy (p.74) (newly added). 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. Guidance to consumers with information and local reference sites.

8) Promoting the installation/use of heat pumps in terraced and single-family houses (activity RA-04-TEM). According to the government this is one of the most important current energy efficiency measures for buildings (p.134).

The national energy and climate policy process continues after the delivery of the NECP with 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 (p. 35-36).

Finland's energy efficiency policy measures are estimated to result in total cumulative savings of 199 TWh cum in the period 2021-2030 to fulfil the EED cumulative energy savings obligation in article 8 of EED. This includes a 10% (4,1 TWh) surplus from cumulative end-use energy savings achieved between 2014 and 2020 that can be used to fulfil this obligation. Finland's obligation is to archive energy savings of 187.5 TWh. With the cumulative savings of 199 TWh, cumulative savings are 6% above the target obligation.

Energy Poverty

In Finland, energy poverty is treated as part of social policy. There is direct financial support for people in need and also subsidies for the construction of new residential buildings for low-income households. The state supports the construction of these housing projects with interest rate subsidies and state guarantees for loans (mortgages). These loans with state subsidies and guarantees totalled 2,336 mill. € in 2022. There are also subsidies for the renovation for households, and more comprehensive schemes for the elderly (p.87).

The number of energy poor can be estimated as the number of household consumers that fail to pay electricity bills, a number ranging from 5,600 per year to 7,200 during the year of the energy crisis, Q4 2022 to Q3 2023. A total of 552,501 persons received public support for their housing costs in 2023 (housing allowances). These people might be in energy poverty or homeless without this support (p.89).

In Finland, the energy counselling service pays special attention to vulnerable consumers and consumers at risk of energy poverty, for example through active cooperation between regional energy counsellors and social workers or pension organisations (p.136).

"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" (p.88).

Additional policy measures to prevent energy poverty are voluntary energy efficiency agreements. Through these agreements, municipalities collaborate with housing companies to support energy-saving efforts, particularly aimed at helping vulnerable populations. This has led to 24,500 energy efficiency measures and energy savings of 12,5 TWh in the years 2017-2022 (p.89).

To guide the policies, Finland has set targets of reducing the F and G energy classes of building to nearly zero and of reducing the number of people at risk of poverty or marginalisation by 100,000 by 2030.

Electricity-to-gas/oil price ratio

Since natural gas is not used in Finnish households, we look at the electricity-to-oil price ratio instead of the electricity-to-gas price ratio.

Finland	2021	2023
Oil price (€cent/kWh)	14	14
Electricity price (€cent/kWh)	15.28	16.81
Electricity-to-oil price ratio	1.1	1.2

Figure 5. Average oil and electricity prices in €cent/kWh for private consumers (first half of the year) and the respective price ratio. The price includes taxes. The electricity price is for consumers with a consumption of 5.000-15.000 kWh/year. Source: Eurostat, nrg_pc_202 and nrg_pc_204, Globalpetrolprices.com. Gas is not used for heating in Finland, so here electricity is compared with oil.

Electricity has become more expensive in recent years (10% increase 2021-2023). This makes heat pumps more economical favourable compared with direct electric heating because of the lower electricity consumption of heat pumps. Oil heating is being phased out in the coming decade and already banned in new buildings, making it no longer a viable alternative. Additionally, with oil prices roughly on par with electricity—and considering the added costs of installing and maintaining an oil boiler—oil is not an economically competitive option.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

The Finnish NECP is on track to meet the EU GHG reductions and RE targets. Finland is well on its way to phase out fossil fuel from heating and cooling with complete phase out of direct fossil fuel heating until 2040. The use of fossil fuel for district heating is also being reduced.

However, Finland uses peat for heating and supports its use through tax reductions. These CO₂ emissions contribute to global warming, hampering the decarbonisation of heating.

A large share of Finnish renewable energy comes from biomass. The biomass use is gradually being reduced, but there are no plans to phase out the limited biomass import. A large part of Finnish biomass use is made up of black liquor that has less alternative use than other, woody biomass.

Finnish energy imports are being reduced. The uses of fossil fuel and biomass imports for heating and cooling are almost phased out. Import of nuclear fuel, also from Russia, contributes to heating and cooling through electricity generation. There are no plans to reduce this import.

The NECP WEM projection shows that Finland will not meet the EED3 reduction targets for 2030, neither for primary nor final energy. This is despite the forecast that Finland will reach the cumulative energy saving obligation 2021-2030. The additional measures that are under consideration by the government could make Finland reach the EED3 reduction targets, reducing Finnish energy consumption by at least 3% in addition to the reductions with the actions already implemented WEM.

Finland has comprehensive policies in place to reduce energy poverty.

The NECP is giving an overview of the status and projections of Finnish energy use, also for heating and cooling. The effective use of the NECP is hampered by the practice that some data are only available in graphs not in tables, also not in annexes.

Suggestions

The long-term renovation strategy is projecting higher energy savings in the building sector than the present NECP. If this strategy is realised, it can enhance the decarbonisation of heating. This can include measures described in the NECP in the WAM parts as well as additional plans expected in the spring of 2025.

Other measures for Finland to consider:

- Subsidies for energy efficiency renovation investment and energy audits in the residential sector similar to existing subsidies for industry/municipalities in Finland.
- Better conditions for solar electricity installations on dwellings coupled with the subsidy for heat pumps and as part of support schemes for decentralised renewable-energy production. This can be for instance be in form of feed-in and tariff schemes, tax reductions for local, or renewable energy investments. Promotion and information activities are already planned, but more incentives are recommended.
- Phase out of tax reductions for peat use and a plan for phasing out peat use.
- Increased support for prosumers, and energy communities, in addition to the existing information activities.
- Reduce dependency on natural gas/LNG import, phase down gas use until the demand can be covered with biogas.
- The strategy and subsidies to demolish old buildings in the rural areas has a high risk accelerating/forcing urban migration. This can be especially badly affecting the Sami people's communities. Instead, the old buildings should be renovated, including installation of small-scale renewable installations (solar, small wind).

Some of the stakeholders' suggestions to the NECP (p.35):

- *Active and efficient guidance* from different authorities to ensure equal opportunities for affordable housing and living (incl. advice on energy efficiency renovations) and ensure adequate resources for different governmental authorities for the implementation. This will require improved advisory services.
- Providing sufficient resources for authorities to be able to facilitate expeditious permitting processes.
- Regional differences need to be taken into account to a greater extent, by involving municipalities and regions more closely in the preparation of measures and processes.
- Incentivizing investments in the energy sector by removing regulatory barriers especially concerning regulation of electricity distribution companies.
- Stakeholders also proposed active steps to reduce the use of biomass as well as peat. They are concerned with the use of unsustainable biomass for energy.

FRANCE

The following analysis is based on [France - Final updated NECP 2021-2030 \(submitted in 2024\) - European Commission](#) published 10 July 2024. Page numbers refer to the English translation of the National energy and climate plan (NECP).

1.TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For France, the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3), including national indicative increase (the total RED 3 target), is 2.1%-points increase per year 2021-2030. The minimum binding target for all EU countries is 0.8%/year increase 2021-2025 and 1.1% 2026-2030.

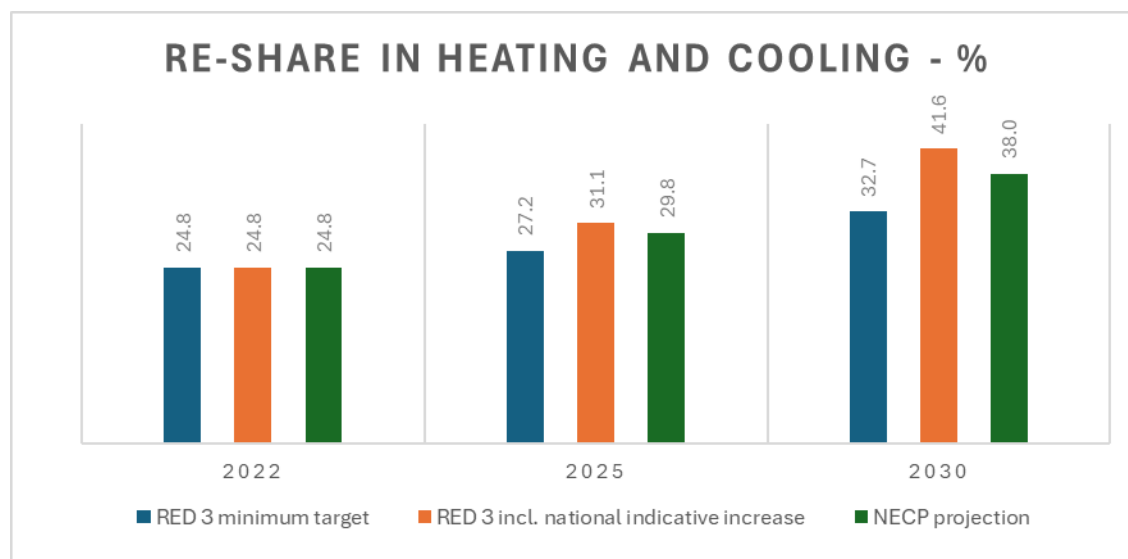


Figure 1. Renewable share in% of heating and cooling for France, RED 3 binding share, RED 3 including national indicative increase and projection with policies and measures in NECP for 2025 and 2030 compared with latest statistics from 2022 (Eurostat: nrg_ind_ren).

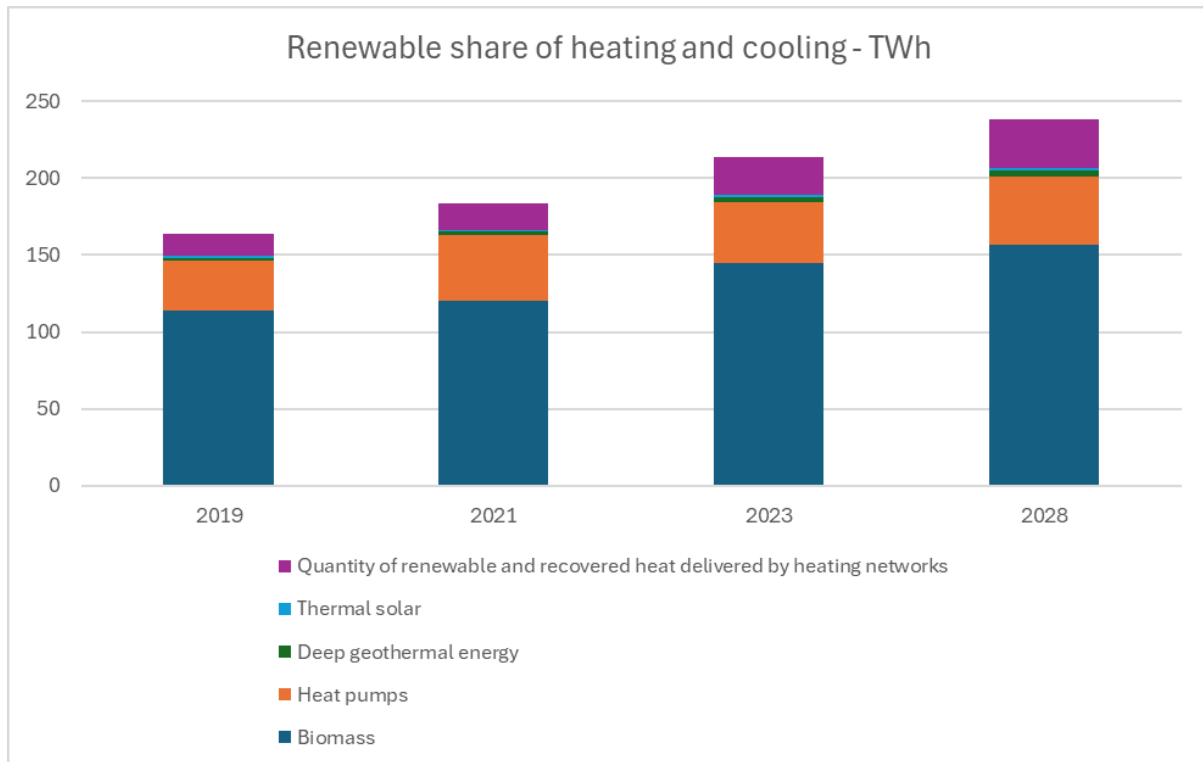


Figure 2. Renewable share in TWh of heating and cooling for NECP projections divided on sources, compared with the base year (2019)(p.36).

Renewable energies are first used for heating (56%)(p.26).

“Despite the limited nature of the resource, given France's biomass production potential (1st largest utilized agricultural area and 4th largest forest area in the EU), it seems reasonable to aim for an overall balance between domestic biomass supply and demand in France over the long term. Currently, imported biomass represents less than 10% of the biomass used in France (all uses combined)” (p.81).

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS

For France, the target is a reduction of 47.5% greenhouse gases (GHGs) between 2005 and 2030 of the emissions not covered by the current EU Emission Trading Scheme (ETS1) or by the Land-Use, Land -use Change and Forestry (LULUCF) regulation. This is an improvement compared to the previous target of 37% (p. 51) and is following the revised EU effort sharing regulation, (EU) 2023/857.

The French NECP states that France is on track to meet the new target (p. 10, p. 59).

1.3. ENERGY IMPORTS TARGETS AND DEPENDENCY OF IMPORTS

France has not set a specific target, but projections indicate a significant reliance on energy imports, particularly fossil fuels.

As far as import independence is concerned, France is performing quite poorly. It imports almost all its natural gas, with national production accounting only for around 1% of consumption (p.27). In addition, France has an increasing production of biogas. The aim is to inject 15% of biogas into the gas networks by 2030 (p. 77). While the Netherlands can cover 38% of its gas consumption with domestic production, the figure for Germany is a mere 5%. As of 2023, Norway is the main supplier of natural gas to France (32%), followed by the United States (24%), Russia (12%), and Algeria (12%). Russia's war of aggression in Ukraine has disrupted the supply of gas and oil imports, emphasizing the need for energy diversification. This shift has led to a rise in imports of liquefied natural gas (LNG) and reinforced storage capacity (p.99).

Additionally, France is the largest importer of diesel in Europe and heavily reliant on foreign oil, with Russia historically being a significant supplier (p.205). However, since the end of 2022, Russia has ceased to supply oil, and France now imports 47% of its diesel from Saudi Arabia. Similarly, crude oil imports from Russia stopped in September 2022 (p.206). By 2030, 15% of gas in the networks is supposed to be biogas, which will help reduce the country's dependency on imported fossil fuels (p.18-p.81).

When it comes to biomass, France produces more than 90% domestically. However, imports are expected to increase, especially in the context of EU energy diversification strategies.

A significant portion of France's electricity (63% in 2022) is generated by nuclear power, reducing dependence on fossil fuels for electricity production (p.99), but raising other problems, notably dependence on uranium-producing countries.

1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

With 3 million heat pump units installed in 2022 alone in Europe, the objective is to install at least 10 million additional heat pumps by 2027.

With the goal to decarbonize heating systems by 2030, the number of dwellings using a heat pump as the main heating source is projected to increase from 2.5 million to 9 million in France - mainly in urban areas. In 2023 alone, more than 300,000 air/water heat pumps were installed (p.164, p.249).

In addition, France plans to significantly decarbonize housing by expanding district heating networks. The number of annual connections is set to increase rapidly, reaching 300,000-360,000 new connections by 2030. By 2030, these networks will deliver 68 TWh of heat, with 75% of coming from renewable sources and 80% for 2035 (p.76).

France aims to phase out coal-fired electricity generation by 2027 and achieve the complete exit from fossil fuels by 2050. Reducing reliance on gas boilers is another priority, with a target of replacing 75% of gas-fired boilers with decarbonized systems by 2030 (p.206, p.250).

1.5 TARGETS ON ENERGY EFFICIENCY COMPARED TO THE EE TARGET IN EED

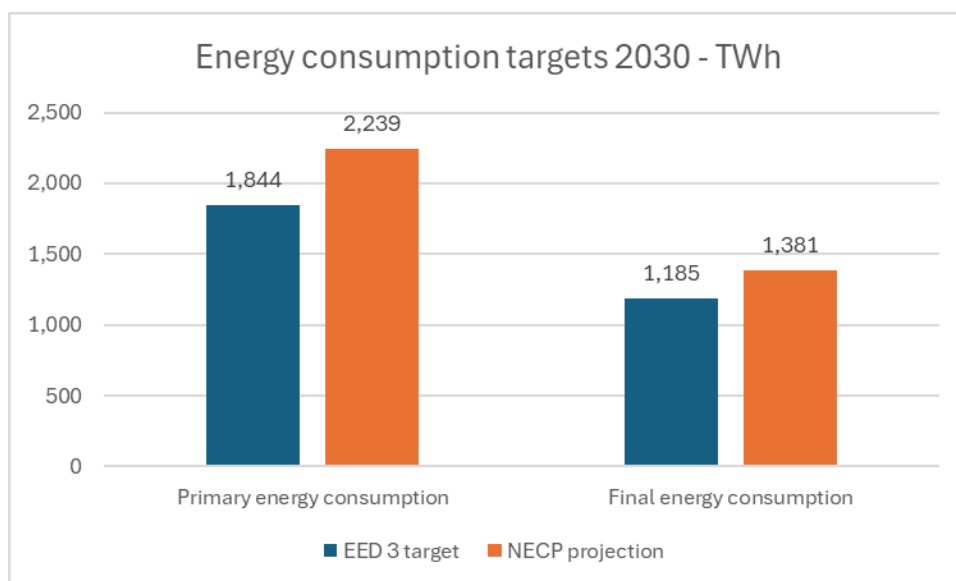


Figure 3. National target for energy consumption according to EED 3 and the projection of consumption in NECP based on additional measures scenario (p. 8).

The measures submitted in the NECP do not yet achieve a sufficient reduction in energy consumption by 2030. Therefore, to reach the EED 3 energy efficiency targets further reduction efforts are needed.

2. POLICIES TO ACHIEVE THE HEATING TARGETS

Regulatory Policies

France has implemented several regulatory policies to achieve its heating decarbonization goals, focusing on stricter building regulations, gradual bans on fossil fuel heating, and improved energy efficiency standards (p.76).

The first objective is a gradual ban on oil and coal boilers. Since July 2022, the installation of new oil or coal boilers has been prohibited in residential and tertiary buildings. The government aims to phase out these applications by 2030, with incentives for replacement (p.123).

Moreover, the Environmental Regulation 2020 (RE2020) - which came into effect in January 2022 - sets stricter energy performance requirements for new buildings. It encourages the adoption of low-carbon heating solutions such as heat pumps, sustainable biomass, and district heating networks using renewable energy (p.122).

As of January 2025, under the Energy Renovation for Energy-inefficient Buildings system, rental properties classified as "G" on the energy performance scale can no longer be leased, pushing landlords to improve insulation and switch to cleaner heating systems. By 2028, this measure will be extended to properties classified "F" (p.96).

In addition, France is prioritizing biomass for industrial uses and high-efficiency district heating while discouraging inefficient residential wood heating. New standards for domestic wood stoves require higher efficiency and lower particulate emissions, for better health.

Municipal and regional heating plans have been introduced in 2023, providing local heating and cooling plans in municipalities with a total population of more than 45,000 inhabitants to provide an estimate and mapping of the potential to increase energy efficiency, low temperature district heating, waste heat recovery, and renewable energy for heating and cooling (p.169)

Financial Support Policies and Plans

1. Investments and Financial Support

The Energy Efficiency Certificates (EEC) is a mechanism obliging energy suppliers to finance energy efficiency projects, incentivising energy savings (p.103).

"MaPrimeRénov" (MPR), has been introduced to accelerate the efficient renovation of residential buildings. Since its launch in 2020, 2 million dwellings have been renovated, mobilising 8.6 billion € in support schemes (p. 33).

The government aims to increase renewable district heating production from 30 TWh in 2020 to 90 TWh by 2035. "The Fonds Chaleur" (Heat Fund), which came into force in 2018, supports this expansion with an annual budget. The Heat Fund is mainly oriented toward large scale urban schemes. The budget increased by 40% in March 2022 to 520 million € for the year 2022 and 601 million € for 2023, it increased again in 2024 to 820 million € (p. 36, 76, 168).

Moreover, the "éco-PTZ" (Zero-interest Eco-loan) allows homeowners to access loans of up to 50,000 € for energy renovation projects, thereby addressing the high upfront costs (p.198).

2. Continued Investment in Fossil Fuels and Unsustainable Biomass

Public support for the development of the French heat pump sector will make it possible to produce and install one million heat pumps each year by the end of 2027. Air-water heat pumps will mainly be installed as a substitute for gas or oil boilers. However, biomethane and hydrogen-blended gas are being promoted as interim solutions (p.123). With the oil heating phase-out plan, the government aims to replace 75% of the installed oil boilers by 2030 - equivalent to 300,000 replacements per year (p.246).

Wood energy, which accounts for almost all solid biomass remains the largest source of renewable energy consumed in France. It is almost exclusively dedicated to heating (p.20).

Energy Poverty

France shall set a target of reducing the energy poverty indicator based on the energy effort rate of 0.5% compared to 2022 by 2030. The energy effort indicator considers a household in energy poverty when its energy expenditure in the household exceeds 8% of its income, and its income per consumption unit (UC) is less than 3 decimal places per unit of income (p.109). In 2022, 5.8 million low-income households received energy vouchers ranging from 48 € to 277 € mainly to help pay for heating costs or fund energy renovations (p.109-116).

To protect vulnerable households from rising energy prices, the government also capped gas price increases at 15% in February 2023 and increased this cap by a further 10% in August 2023.

In April 2023, a ban on power cutoffs for unpaid bills was implemented. Thus, electricity providers can no longer completely disconnect households for non-payment. Instead, a minimum supply of 1 kVA is guaranteed for up to 60 days (p.10).

Facilitating Access to Low-carbon Heating Solutions

Regional and municipal governments have set up advisory centers (one-stop shops) to help homeowners navigate subsidies and renovation options. "France Rénov'", launched on the first of January 2022, is the national platform providing guidance. In 2024, "MaPrimeRénov'" underwent a major reform to streamline application processes, ensuring better accessibility and faster disbursement of funds (p.33).

France aims to make it easier to finance the energy transition with subsidies that cover up to 90% of renovation costs for low-income households and is extending access to subsidized loans for low-income families (p.203).

Electricity-to-gas price ratio

No projection of gas and electricity prices for households is included in France's NECP, while the historical prices are given in figure 4.

Gas and electricity prices are available at Eurostat, and we have looked at data for the last four years.

France	2021	2022	2023	2024
Gas price (cent/kWh)	6.91	8.59	10.44	11.81
Electricity price (cent/kWh)	17.90	19.28	20.88	25.57
Electricity-to-gas price ratio	2.6	2.2	2.0	2.2

Figure 4. Average gas and electricity prices in cent/kWh for private consumers (first half of the year) and the respective price ratio. The price includes taxes. The gas price is for consumers with a consumption of 20-200 GJ/year, and the electricity price is for consumers with a consumption of 5.000-15.000 kWh/year. Source: Eurostat, nrg_pc_202 and nrg_pc_204.

Since 2021, the electricity price is getting closer to the price of gas, which makes heat pumps economically more attractive. At the current ratio heat pumps are already the cost-efficient option.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

The French NECP is not on track to meet the targets for reduction of GHG emissions outside the EU emission trading scheme, and further measures are needed. To achieve the target, heating and cooling only plays a smaller part.

Neither is the French NECP meeting the renewable energy target in heating and cooling. By 2030, France will reach 38% renewable energy in heating and cooling, which is 3.6 %-point below the target including national indicative increase - though the minimum target is met.

Despite various French policies and programs supporting the decarbonisation of heating and cooling, additional activities are needed.

A large part of France's renewable energy comes from biomass, and this demand will increase between 2023 and 2028. Import accounts for less than 10% of the biomass consumption, but these imports are expected to increase.

Finally, France is not on track to meet the EU energy efficiency targets. Therefore, France also needs to do more to reduce energy consumption.

We have the following suggestions to improve France's policies and measures:

- The re-evaluation of biomass use, with encouragement to favour more sustainable and efficient solutions than biomass. In addition, it could be recommended to ban imports of biomass that do not meet strict sustainability criteria.
- To strengthen policy on fossil fuel phase-out, a legally binding date could be set for the full ban on fossil fuel boilers, including gas boilers, ideally before 2035. Currently, gas boiler reduction is a "target" without enforceable restrictions. Moreover, end subsidies for any fossil-based interim solutions, such as hydrogen-blended gas or biomethane for heating, unless clearly proven sustainable and low-carbon.
- Expand and secure long-term financial support by introducing performance-based incentives (e.g., bonus for energy savings >50%) to reward deep renovation could be set up. France could as well scale up support for collective renovations in apartment buildings, especially social housing and home owners.
- These policies could be strengthened by ensuring increasing reliability of energy labels by professionals.
- In addition to the large-scale heat networks in development, in particular in new construction, there should be a more systematic policy of developing heat distribution in small towns.
 - In some cases, the State should intervene to end long term gas contracts and debts that block these developments with a lock-in position for gas distribution.
 - More experiments should concern smaller scale heat network with regard to summer cooling. Cold water distribution in historic or old town centres could be needed to avoid anarchic developments of air-conditioning, both unesthetic and inefficient.
 - Only a few cities monitor the decrease of gas heating in domestic and tertiary buildings. Such an indicator should be mandatory beside the rate of renewable energy in heat distribution (this latter indicator is de-facto mandatory for fiscal reasons).
- To strengthen policy planning and ensure accountability, France should include forward-looking projections of electricity and gas prices in its NECP. This would enable

a clearer assessment of the economic attractiveness of electrified heating solutions such as heat pumps, particularly in comparison to fossil alternatives.

- Additionally, the government should publish annual progress reports detailing the advancement toward key heating transition targets. These should include metrics on heat pump deployment, boiler replacements, and district heating network connections, allowing stakeholders to track progress and adjust strategies as needed.
- Finally, it is important to go beyond counting the number of homes renovated by incorporating indicators on the depth of renovations—for example, energy savings achieved per dwelling or the transition from fossil to renewable heating. This would provide a more accurate picture of the impact and quality of energy renovation efforts.

GERMANY

The following analysis is based on [Germany - Final updated NECP 2021-2030 \(submitted in 2024\) - European Commission](#) published 29 August 2024. Page numbers refer to the English translation of the National energy and climate plan (NECP).

1. TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For Germany, the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3), including national indicative increase (the total RED 3 target), is 1.8%-point increase per year 2021-2030. The minimum binding target for all EU countries is 0.8%/year increase 2021-2025 and 1.1% 2026-2030.

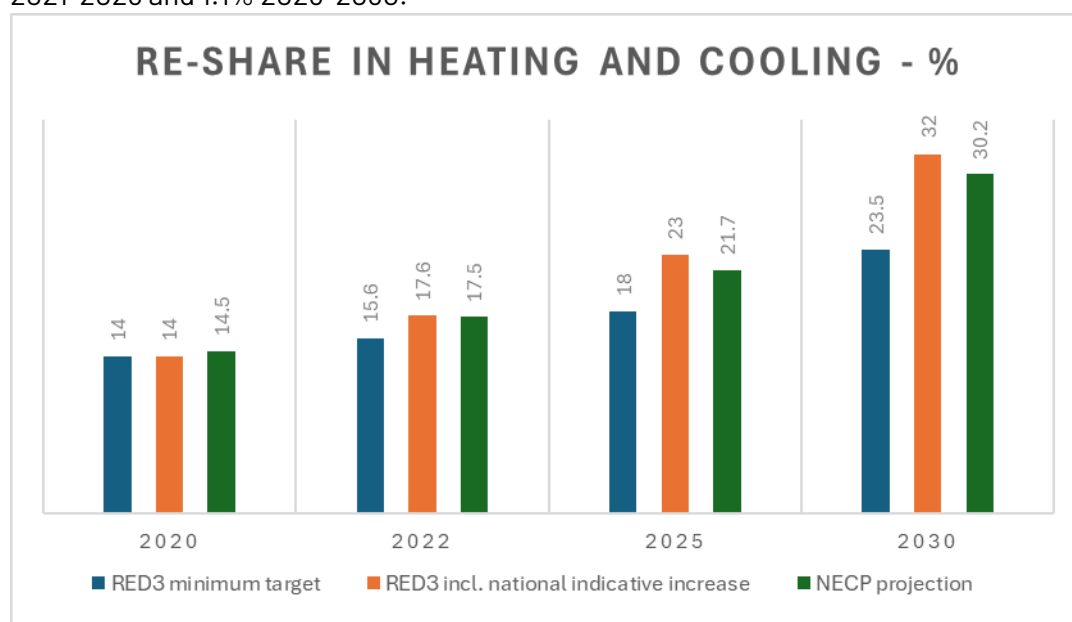


Figure 1. Renewable share in % of heating and cooling for Germany, RED 3 binding share, RED 3 including national indicative increase and projection with policies and measures in NECP for 2025 and 2030 compared with base year 2020 and latest statistics from 2022. (p. 280-283).

Germany intends to include waste heat and cooling as well as RE in electricity in the calculation, this will result in higher targets. "The necessary legal and data basis for this is currently being created so that it can be recognised for the period from 2026 to 2030." (p. 64).

In Germany, the building sector accounts for approximately 2/3 of the energy use in the heating and cooling sector (p. 63), the remaining is industrial-related.

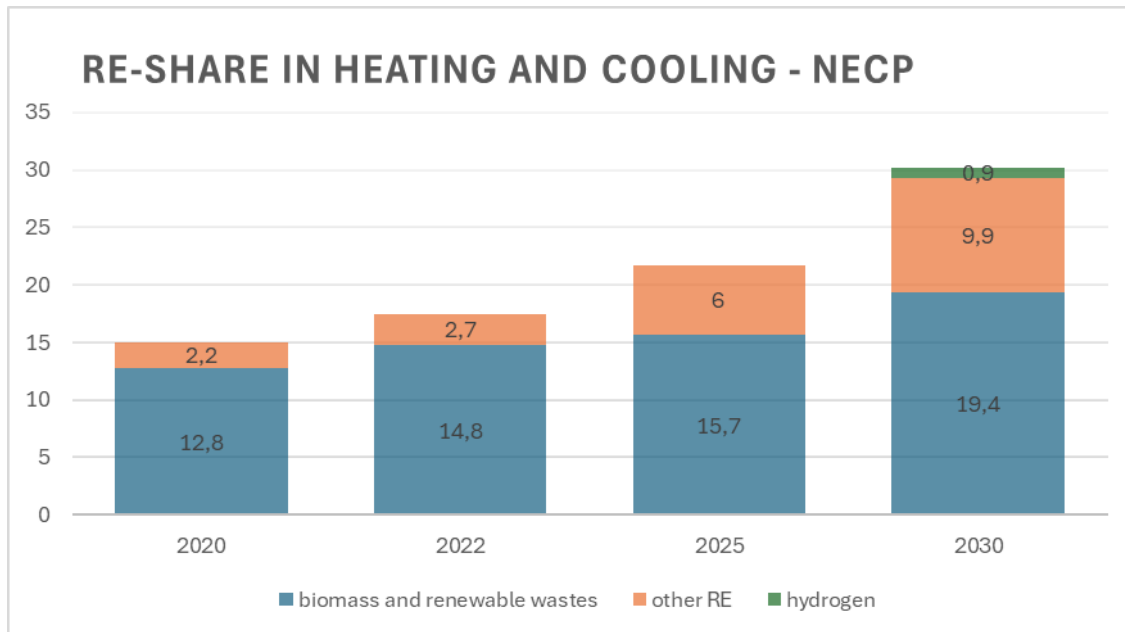


Figure 2. Renewable share in % of heating and cooling for NECP projections divided on sources, compared with the base year (2020) and latest available statistics (2022)(p. 281-283).

There will be a need for biomass fuel import in 2030. Of the total biomass demands of 1,195 to 1,232 PJ in 2030, 837 to 838 PJ can be supplied from domestic sources, resulting in an import demand of 395 to 357 PJ (p. 66).

The RED 3 EU-wide target for RE in the building sector is 49%. Germany has set an indicative target of 46-50% (p. 71).

Other national targets from policies in the German NECP are:

- 50% RE in heating networks by 2030, according to the German 2024 Act on Heat Planning and the Decarbonisation of Heating Networks (p. 70).
- a share of 80% RE in electricity generation by 2030, according to the German 2023 Renewable Energy Sources Act (p. 62).

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS

For Germany, the target is a reduction of 50% greenhouse gases (GHGs) between 2005 and 2030 of the emissions not covered by the current EU Emission Trading Scheme (ETS1) or by the Land-Use, Land -use Change and Forestry (LULUCF) regulation. This is an improvement compared to the previous target of 40% (p. 56) and is following the revised EU effort sharing regulation, (EU) 2023/857.

No information about the reduction of GHGs between 2005 and 2030 is available in the German NECP.

1.3. ENERGY IMPORTS TARGETS AND DEPENDENCY OF IMPORTS

Germany hasn't set any targets for energy import reduction. However, the above-mentioned projection shows a substantial import of biomass in 2030 compared to today's situation with minimal biomass (renewable energy) import according to 2023 statistics (table B17, p. 292).

Germany seeks to diversify energy imports to minimize supply risks (p. 81, 291).

Dependency of imports into EU for energy use in buildings

Data are only available for overall energy imports into Germany showing a high dependency on import of fossil fuels, with the exception of lignite (p. 292).

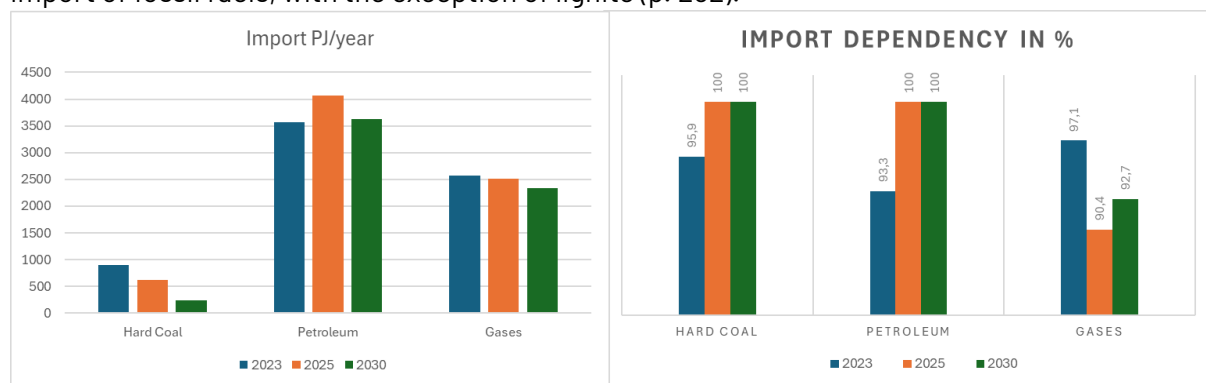


Figure 3 Import dependency for total primary energy consumption (p. 292, 294)

1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

Germany has introduced the following targets to support decarbonisation of heating and cooling:

- Ban on installations of mono-fuel oil/coal boilers from 2026/2028 in new and existing buildings and regional use of obligations for renewable heating (p. 137).
- From 2024, a share of 65% RE in heating in all new installations (p. 137).
- From 2045, all fossil fuel heating would be banned as part of Germany's target to become "climate neutral by then (p. 137).
- Connection of at least 100,000 new buildings to heating networks every year.
- From 2024, at least 500,000 new heat pumps are supposed to be installed every year (p. 65).

437,000 new heat pumps were installed in 2023, an increase of 161,400 compared to 2022 ([Executive-summary_EHPA-heat-pump-market-and-statistic-report-2024-2.pdf](#)). Thus, it is realistic that Germany fulfilled the target of at least 500,000 new heat pumps in 2024 and will continue to do that the following years.

1.5 TARGETS ON ENERGY EFFICIENCY COMPARED TO THE EE TARGET IN EED

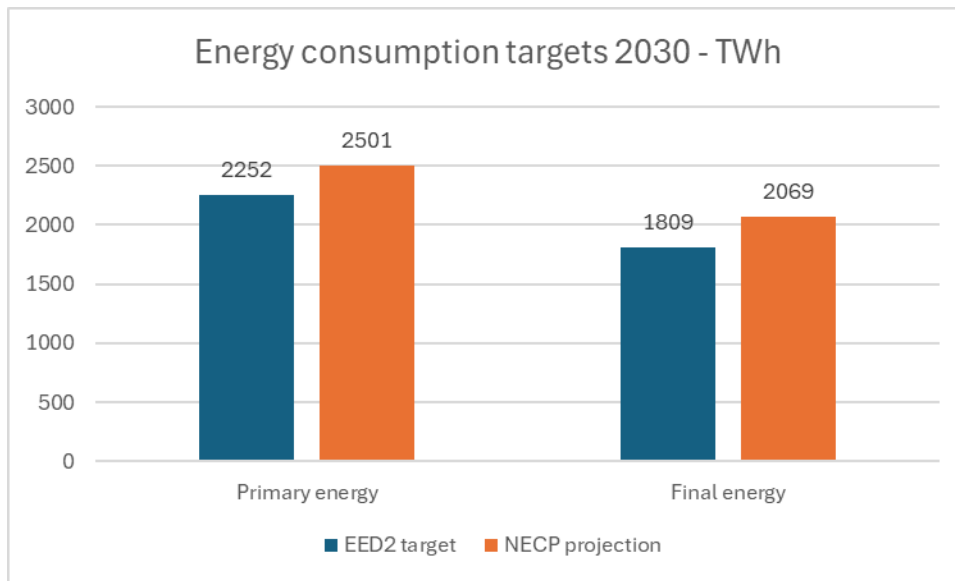


Figure 4. National target for energy consumption according to EED 2 and projection of consumption in the NECP based on a scenario with additional measures (WAM)(p. 72, 176).

The German NECP, as currently proposed, does not reach the target of the amending Energy Efficiency Directive 2018/2002 (EED 2), with heating and cooling accounting for more than 1/3 of the final energy consumption. Therefore, further reduction efforts are needed to reach the energy efficiency targets.

2. POLICIES TO ACHIEVE THE HEATING TARGETS

In Germany, significant legislative changes have been made to promote sustainability and energy efficiency in the building sector. The Buildings Energy Act (latest amendment came into act on the first of January 2024) mandates that all newly installed heating systems in both new and existing buildings must derive a minimum of 65% of their energy from renewable sources, starting from 2024 (p. 137, 182).

The Act on Heat Planning and the Decarbonisation of Heating Networks (Heat Planning Act – WPG) entered into force on the first of January 2024. A nationwide average share of 50% of renewable energy and waste heat must be reached by 2030. “Each individual heating network must achieve a share of 30% in renewable energy or waste heat by 2030 and 80% by 2040. The complete decarbonisation of the heating networks is planned for 2045” (p. 70). Municipalities must develop heat plans that outline how climate-neutrality is reached by 2045 (p. 157).

“Since September 2022, the expansion and conversion of heat networks to achieve a climate-neutral heating supply has been supported financially by the Federal Funding for Efficient Heat Networks” (p. 186).

In spring 2022, the Federal government “launched a heat pump initiative together with stakeholders, with the aim of installing at least 500,000 heat pumps annually from 2024 onwards” (p. 186).

Furthermore, the Federal government is funding 1,000 energy advice centres that provide individual energy advice for consumers through personal meetings, on-line consultations or phone service, on energy efficiency, heating systems, heat and electricity consumption or the use of renewable energy (p. 180-181).

Moreover, the government offers tax relief for energy-efficient renovation measures, such as replacing heating systems, upgrading windows, and insulating roofs or external walls. This tax relief will remain in effect until the end of 2029, reducing the tax payable by 20% of the renovation costs, which can be spread over three years. It's important to note that this tax relief applies specifically to owner-occupied residential properties (p. 186).

From 2020, property owners have been eligible for a grant of up to 45% under the Market Incentive Program (Marktanreizprogramm, MAP) for replacing outdated oil heating systems with more energy-efficient alternatives. In 2021, this program was replaced by the Federal Funding for Energy-Efficient Buildings (Bundesförderung für effiziente Gebäude - BEG), which applies to both residential and non-residential buildings. The BEG was updated on the first of January 2024. In case of an early replacement of an old fossil fuel heating system with a heat pump, households can receive 55% subsidy on the investment cost (including 20% speed bonus available until the end of 2028). Low-income households can receive an extra bonus. "A new supplementary loan is also available – with an interest-rate reduction of up to 90,000 € of taxable annual household income – for replacing heating systems and other individual efficiency measures" (p. 184).

Currently, the German government is developing the National Biomass Strategy (NABIS) in order to create the framework conditions for climate-friendly and resource-efficient production and use of biomass. Here, priority is to be given to the material use of biomass over its use as an energy source (p. 71).

The costs of the measures in the NECP are to be included in the German budget, where they are subject to approval as part of the process for adopting the German Federal budget. This is specified in this way:

"All the measures and strategies mentioned in the NECP or resulting from it are subject to funding as well as the financial constitutional competence/responsibility of the Federal Government. They neither contain a (preliminary) determination with regard to the budget nor do they constitute any prejudice for the budget legislator. Any additional requirements in terms of personnel and material resources resulting from the plan for the Federal Government must be fully and permanently financed within the framework of the applicable budget and financial planning in the respective individual plan or special fund" (p. 18).

From 2023 to 2030, additional investments of close to 630 billion € will be made to implement existing measures and about 690 billion € if planned measures are included (p. 332). The building sector accounts for about one third of this budget.

Energy poverty

Since 2022, the German government has introduced several measures to reduce the burden on low-income households. For example, minimum salaries have been raised as well as basic tax-free allowances and child benefits (p 106).

Since 2021, tenants receiving housing benefits have received a supplement to support heating costs. These benefits have improved with the Housing Benefit Plus Act on the first of January 2023. The number of people eligible for the subsidies is expanded by introducing a heating cost

component, and a climate component. In general, the level of benefits has increased. “The Housing Benefit Plus reform will more than double the housing benefit of the previous recipient households from around €180 to around €370 per month, and the number of households receiving housing benefit will increase from around 600,000 to around 2 million”, which is nearly 5% of all households (p. 245-246).

The Carbon Dioxide Cost Allocation Act stipulates that the cost of emitting carbon dioxide is shared between the landlord and tenant. Prior to 2023, landlords could pass on the full cost of the CO₂ tax to their tenants. In the future, the cost of CO₂ for residential buildings will be allocated based on how climate-friendly the building is - the less climate-friendly, the higher the cost for the landlord (p. 114, 192). This will encourage the landlord to invest in non-fossil heating systems.

Furthermore, customers with poor payment records are protected against sudden supply disruptions. There are thresholds that must be reached before they can be disconnected. Most recently, in the face of rising electricity and gas prices, legal adjustments have been made to strengthen protection against supply disruptions due to non-payment of the bill. Moreover, there is a possibility of obtaining a loan if at risk of getting disconnected. (p. 244-245)

Electricity-to-gas price ratio

Germany	2022	2023	2030	2045
Gas price (cent/kWh)	9.88	12.14	10.06	12.08
Electricity price (cent/kWh)	30.19	34.19	27.24	25.13
Electricity-to-gas price ratio	3.1	2.8	2.7	2.1

Figure 5. Average gas and electricity prices in cent (2022)/kWh for private consumers with existing measures in NECP and the respective price ratio. The price includes taxes and for electricity the effect of ETS 1 that covers power plants as one of the sectors. The gas price is for consumers with a consumption of 20-200 GJ/year, and the electricity price is for consumers with a consumption of 5.000-15.000 kWh/year.

As the electricity-to-gas price ratio falls, heat pumps are getting economically more attractive. At the current ratio heat pumps are already the cost-efficient option.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

It is not possible to determine if Germany is on track to meet the targets for reduction of GHG emissions outside the EU emission trading scheme, since no information on the reduction between 2005 and 2030 is available in the German NECP.

What is clear: Germany is not on track to meet the renewable energy target in heating and cooling. By 2030, Germany lies 1.8 %-point below the target. To meet the RED 3 target, Germany intends to include RE in electricity and waste (excess) heat and cooling in the calculations. So far, only in new buildings oil and coal boilers have been partially banned. A complete phase-out of fossil heating is scheduled for 2045.

To make things worse, a growing share of heating will come from biomass, and in 2030, approximately 30% of the total German biomass demand is expected to be imported. This is the case, even though Germany is promoting heat pumps and providing subsidies for heat pumps.

Finally, Germany is not on track to meet the EU energy efficiency targets. Both primary and final energy consumption in 2030 is projected to be more than 10% higher than the EED 2 primary energy consumption target – for the scenario with additional measures (WAM). Therefore, Germany needs to do more to reduce energy consumption.

We have the following suggestions to improve Germany's policies and measures:

- The expected increase in biomass use for energy, including for heating, should be critically reconsidered and limited.
- Biomass should be required to meet higher sustainability standards.
- Biomass imports for energy should be avoided.
- A ban on the installation of new gas boilers should be introduced.
- The support for efficient and renewable heating and cooling should have a special facility for community heating and cooling initiatives, including energy communities with electricity production for members' heat pumps and for local district heating schemes based on renewable energy and excess heat use.

GREECE

The following analysis is based on [Greece - Final updated NECP 2021-2030 \(submitted in 2025\) - European Commission](#) published 7 January 2025. Page numbers refer to the English translation of the National energy and climate plan (NECP).

This chapter has not been checked by a national reviewer.

1. TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For Greece, the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3), including national indicative increase (the total RED 3 target), is 2.1 %-point increase per year 2021-2030. The minimum binding target for all EU countries is 0.8 %/year increase 2021-2025 and 1.1% 2026-2030.

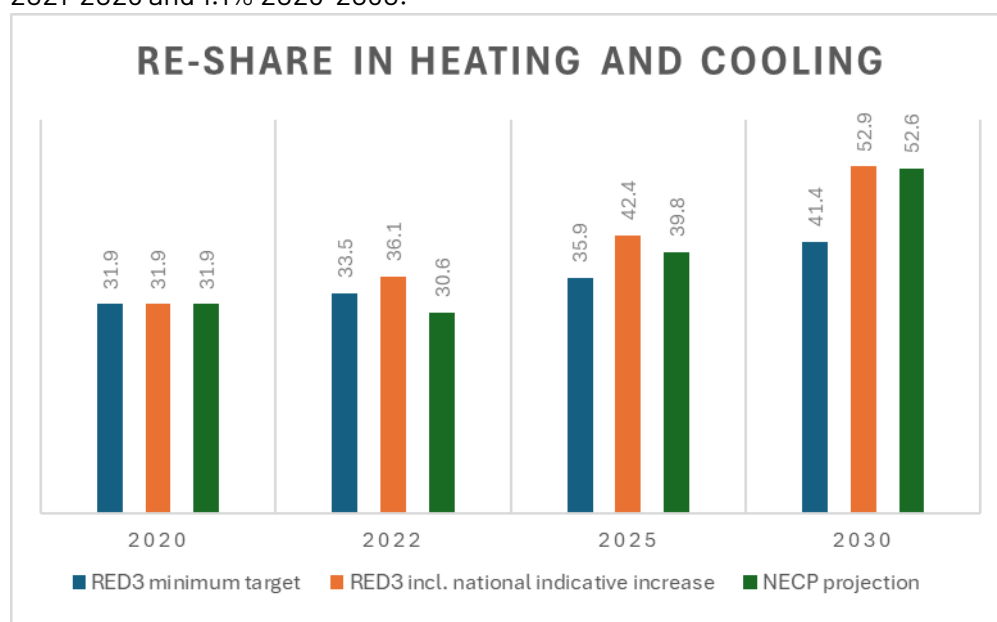


Figure 1. Renewable share in % of heating and cooling in Greece, RED 3 binding share, RED 3 including national indicative increase and projection with policies and measures in NECP for 2025 and 2030 compared with base year 2020 and latest statistics from 2022. (p. 122, p. 377-78).

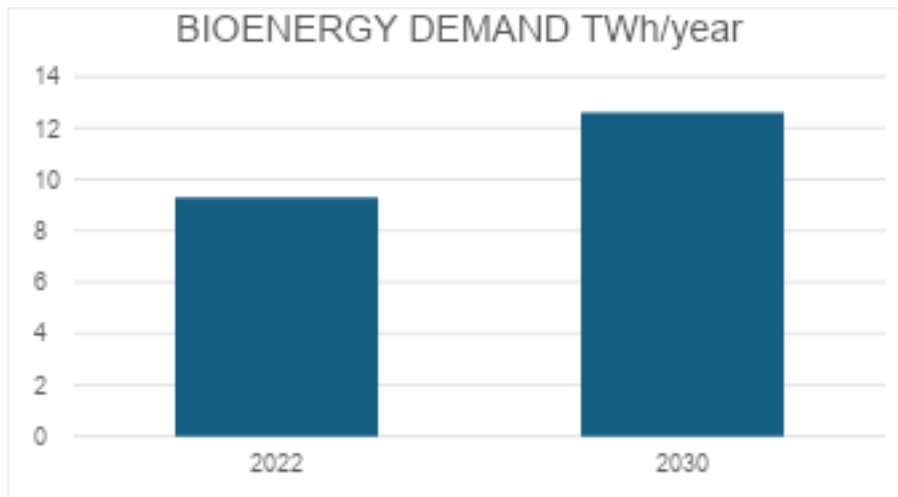


Figure 2. Bioenergy demand for the residential, public/commercial and industrial sectors.

The bioenergy demand is expected to increase up to 2030.

The RED 3 EU-wide target for RE in the building sector is 49%.

Greece has set an indicative target of 72% (p. 121).

Other national targets from policies in the Greek NECP are:

- 76% RE in electricity by 2030 (p. 414, 120).
- 34% RE in the industry sector (p. 121)

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS

For Greece, the target is a reduction of 22.7% greenhouse gases (GHGs) between 2005 and 2030 of the emissions not covered by the **current** EU Emission Trading Scheme (ETS 1) or by the Land-Use, Land -use Change and Forestry (LULUCF) regulation. This is an improvement compared to the previous target of 16% and is following the revised EU effort sharing regulation, (EU) 2023/857.

1.3. ENERGY IMPORTS TARGETS AND DEPENDENCY OF IMPORTS

Greece has not set a specific target on energy imports.

Dependency of imports into EU for energy use in buildings

There is no information in the NECP on import dependency for energy use in buildings.

The total energy dependency was 76% in 2022, and the NECP projects that the import dependency will decrease by 10 %-points from 2022 to 2030 (p.404).

There is a high dependency on fossil fuel imports, except for solid fuels like lignite.

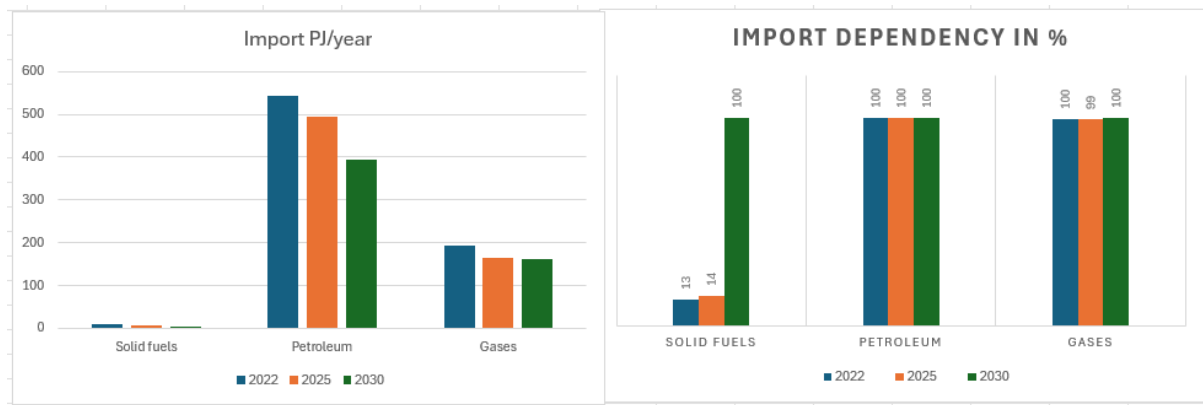


Figure 3 Dependency on import for total primary energy consumption (p. 387–388).

The import of biomass/biofuels was 13 PJ in 2022, and it is expected to increase to 22 PJ by 2030.

1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

Greece has set the following targets to support the decarbonisation of the heating and cooling sector:

- Investing 5.36 billion € up to 2030 in heating pumps to substitute oil and gas heating (p.444).
- Investing 0,85 billion € in solar thermal energy (p.444).
- A share of 72% of RE in the final energy consumption of the building sector.
- Energy upgrading of residential, industrial and public buildings (p.286).
- Decreasing the primary energy in the residential buildings by 16% by 2030 (p. 145).
- Renovating 16% of the worst performing buildings by 2030 (p. 145).
- Ban on the sale of new oil burners from 2025 (p.30).
- All new residential and non-residential buildings must have zero on-site fossil fuel emissions. (From 1 January 2028 for public buildings and from 1 January 2030 for all other new buildings.)(p. 279)
- Withdrawal of lignite power plants in 2028 (p.406).

1.5 TARGETS ON ENERGY EFFICIENCY COMPARED TO THE EE TARGET IN EED

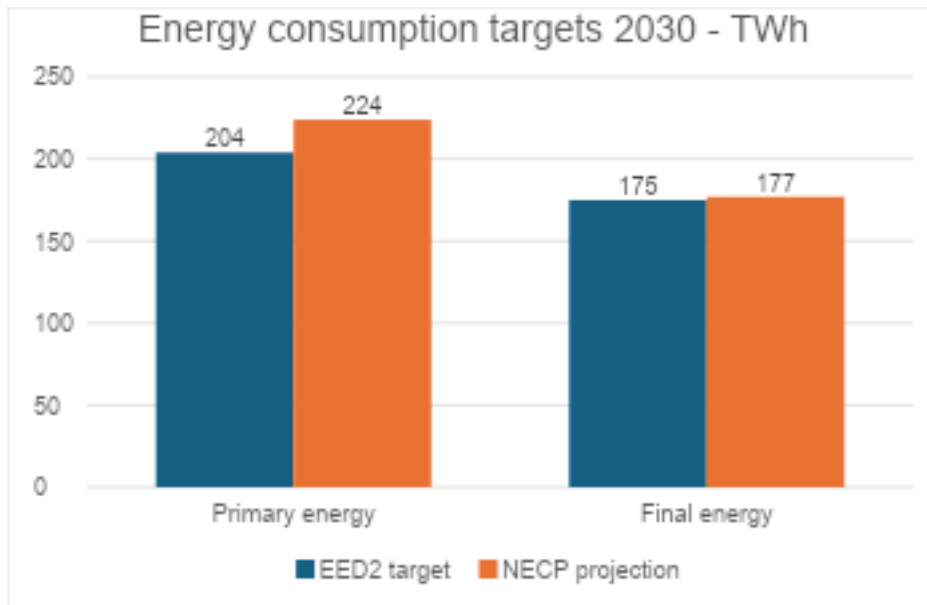


Figure 4. National target for energy consumption according to EED 2 and the projection of consumption in NECP based on additional measures scenario. (p. 336).

The currently proposed Greek NECP falls short of the EED target, with heating and cooling accounting for about 30% of final energy consumption (p.377). Therefore, further reduction efforts are needed to reach the EED 2 energy efficiency targets.

2. POLICIES TO ACHIEVE THE HEATING TARGETS

The Greek government is in the process of introducing measures to increase the share of renewable energy for heating.

In the residential sector, energy renovation programmes have contributed to a 67% increase in energy renovated dwellings compared to 2019. In 2022, applications for 95,000 dwellings were approved, while the total interventions in residential buildings in 2023 amounted to 86,545. The 2020-2022 protocols for the renovation of dwellings offered the possibility to cover energy efficiency improvements for 126,000 potential beneficiaries. The budget of the program for 2021 totalled 2 billion €, while the budget for the 2023 program came to 973 million € (p. 145).

In parallel with the use of green and sustainable energy sources, it is planned to expand programs for the gradual upgrading of vulnerable households to improve the energy efficiency of their dwellings. Promoting heat pumps is an important part. "This will reduce the need for heating and cooling, thus reducing dependence on heating and cooling allowances" (p. 219-220).

The use of RES systems for heating and cooling will be enhanced by combining different policy instruments and financial support mainly for heat pumps and solar thermal systems. (p.280).

"In addition, local heating and cooling plans will be drawn up in municipalities with a total population of more than 45 thousand inhabitants, and specific financial tools and technical support actions will be provided for to promote efficient heating and cooling systems to be integrated into them" (p. 280).

Moreover, it is envisaged to provide subsidies for energy efficiency renovations as well as for the installation of clean heating, cooling or hot water systems (e.g. heat pumps or thermal solar systems)(p. 290).

Research into the optimization of heating and cooling technologies is to be promoted, for example more cost-effective heat pumps (p.359).

The deployment of heat pumps for consumption is expected to increase by 5.6 TWh/year from 2022 to 2030 in the residential and commercial/public sectors. Whereas the use of solar thermal energy for consumption is expected to increase by 0.4 TWh/year in the same period (p.53-54).

No extension of the use of biomass for combustion in city buildings is foreseen (p. 120). Natural gas, however, is to be replaced by electricity for the heating of buildings and in industry sectors (p. 131).

It is expected that bioenergy will be promoted to cover the heating and cooling needs of households. Here, programs will be put in place to develop an efficient supply chain of biomass.

Awareness raising activities will be implemented, and the energy certificates will be upgraded into customized road maps for energy renovation of buildings (p. 280). Further, it is considered establishing one-stop shop services (p. 291).

Decarbonisation of electricity production

Greece plans to withdraw lignite plants by 2028 and replace them with solar, wind and hydro energy systems. The installed capacity of onshore wind and photovoltaic farms is projected to increase by 10 GW by 2030 (from 12.5 GW in May 2024 to 22.4 GW in 2030)(p.123). Together with solar and wind energy systems there will also be a focus on electricity storage systems (p.128-129).

There are plans to upgrade existing biogas plants to biomethane plants - at least those adjacent to natural gas distribution or transmission networks. Estimates suggest that about half of today's biogas plants could be transformed into biomethane plants. It is intended to feed around 2.1 TWh of biomethane into the gas grid in 2030. (p. 120).

The GRECO Island initiative (2021-2027) plans the decarbonization of the Islands of Greece and at the same time make them more self-sufficient (p.220).

Energy poverty

Greece plans to implement some measures for low-income households (p. 288).

One provides for a reduced electricity tariff for low-income households for the amount of electricity needed to meet minimum heating and cooling comfort conditions throughout the year (p.289).

Further, low-income households cannot be disconnected if their electricity consumption is below a certain threshold, and under certain circumstances it is possible to get support for payment of electricity bills (p. 289).

The energy bills will be redesigned, to enhance clarity while also including information on how to overcome energy poverty (p. 289).

Vulnerable households with oil or gas heating receive a heating subsidy in Greece. Since 2024, this allowance is extended to electric heating, making the heating subsidies more environmentally friendly and economically viable. For the first quarter of 2024, a heating subsidy was paid for around 400,000 electric fans at a total cost of 38 million €. Additionally, it is planned to gradually reduce subsidies for fossil fuels, thereby increasing support for clean and efficient heating technologies (p. 220).

Subsidies for energy renovations are planned, including efficient renewable energy heating, cooling, and hot water systems, e.g. heat pumps and solar thermal energy (p.290).

Renewable energy communities will be supported to reduce energy poverty. The “Apollon” program will install new renewable energy plants in households and communities to cover 90% of their own consumption, thus lowering energy costs. (p.291).

Electricity-to-gas price ratio

No projection of gas and electricity prices for households is included in Greece's NECP, while the historical prices are given in figure 5.

Gas and electricity prices are available at Eurostat, and we have looked at data for the last four years.

Greece	2021	2022	2023	2024
Gas price (cent/kWh)	4.49	8.21	11.87	7.22
Electricity price (cent/kWh)	17.69	25.92	24.57	22.13
Electricity-to-gas price ratio	3.9	3.2	2.1	3.1

Figure 5. Average gas and electricity prices in cent/kWh for private consumers (first half of the year) and the respective price ratio. The price includes taxes. The gas price is for consumers with a consumption of 20-200 GJ/year, and the electricity price is for consumers with a consumption of 5.000-15.000 kWh/year. Source: Eurostat, nrg_pc_202 and nrg_pc_204.

Since 2021, the electricity price is getting closer to the price of gas, which makes heat pumps economically more attractive. But at the current ratio heat pumps are not the cost-efficient option.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

It is not possible to determine if Greece is on track to meet the targets for reduction of GHG emissions outside the EU emission trading scheme, since no information on the reduction between 2005 and 2030 is available in the Greek NECP.

The Greek NECP is very close to meet the renewable energy target including the national indicative increase in heating and cooling. By 2030, Greece will reach 52.6% renewable energy

in heating and cooling, which is 0.3 %-point below the target. Furthermore, the biomass consumption will increase in the building sector, and biomass import will also increase between 2022 and 2030.

Greece is promoting heat pumps, which leads to growing electricity consumption. To counter this, decarbonisation of electricity production is a priority – with focus on solar, wind and hydro energy.

Finally, Greece is not on track to meet the EU energy efficiency targets. Primary energy consumption in 2030 is projected to be 10% higher than the EED 2 primary energy consumption target. Therefore, Greece needs to do more to reduce energy consumption.

We have the following suggestions to improve Greece's policies and measures:

- The expected increase in biomass use for energy, including for heating, should be reconsidered.
- Biomass imports for energy should be avoided.
- A ban on the installation of new gas boilers should be introduced.
- Support natural refrigerant cooling and heating equipment, including in heat pump subsidy schemes.
- One-stop shops should be introduced.

HUNGARY

The following analysis is based on [Hungary - Final updated NECP 2021-2030 \(submitted in 2024\) - European Commission](#) published 16 October 2024. Page numbers refer to the English version of the National Energy and Climate Plan (NECP).

1. TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For Hungary the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3) including national indicative increase (the total RED 3 target) is 1.7%-point increase per year from 2021-2030. The minimum binding target for all EU countries is 0.8% per year increase 2021-2025 and 1.1% 2026-2030.

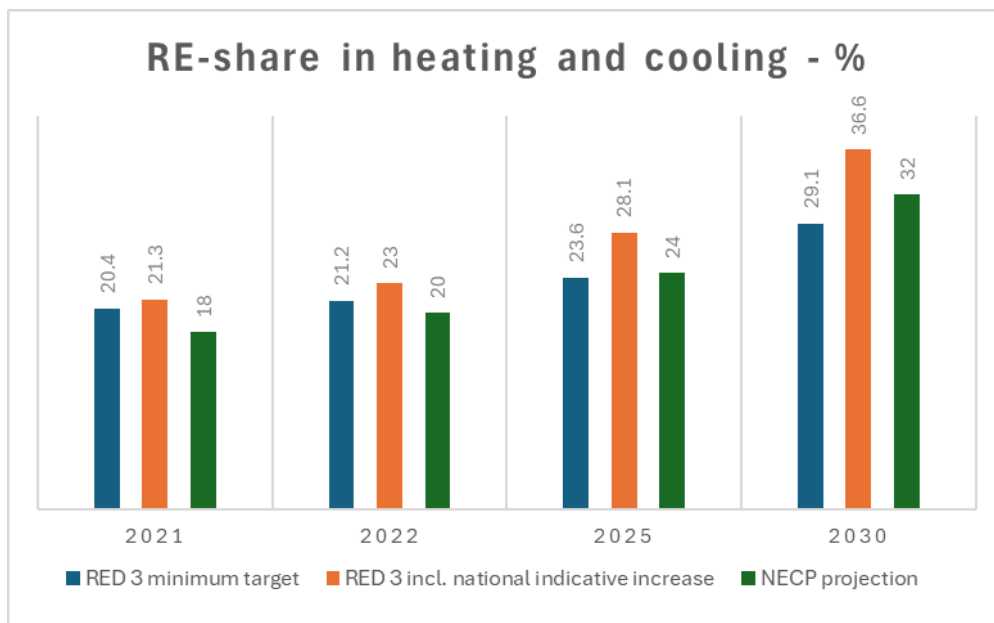


Figure 1. Renewable share in % of Heating and Cooling for Hungary, RED 3 targets and projection with additional measures (WAM) scenario (p. 51, table 3)

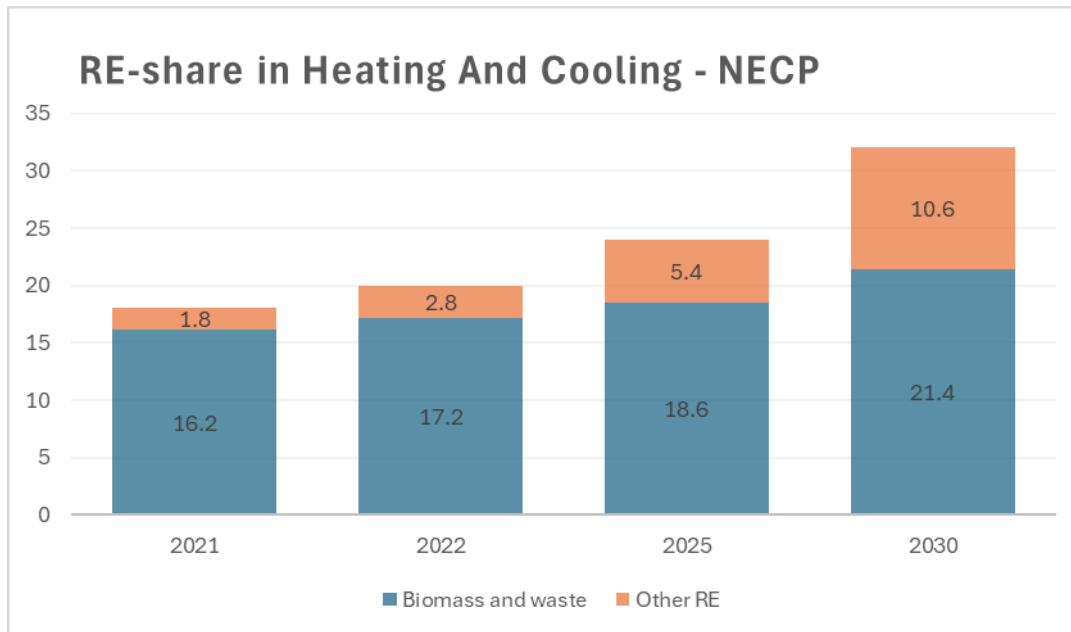


Figure 2. Summary chart about the renewable share in % of heating and cooling for NECP projection WAM (p. 54, table 7).

Hungary has a high share of biomass in renewable energy for heating and cooling (H&C), 85% in 2022, but Hungary is a net **bioenergy** (biomass, biogas, biofuels) **exporter** according to the bioenergy resources. All the bioenergy demands of H&C, 2.2 Mtoe in 2030, are suppliable from the resources in the country (p. 56, table 9).

Hungary has set a RE target of 33% (WAM) for heating and cooling in 2030 (p. 243, fig. 99).

The RED 3 EU-wide target for RE in the building sector is 49%.

The RED 3 has set an indicative target for Hungary of 43.5% in the building sector

Other national targets from the Hungarian NECP are:

- 39 PJ of district heating with a 57.6% RE share by 2030 (WAM)(p. 238, fig. 93)
- 32% RE in electricity by 2030 (p. 241, fig. 97)

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS

The Hungarian target in the Effort Sharing Regulation (ESR, regulation (EU) 2023/857) is 18.7% GHG reduction between 2005 and 2030 (p. 22). This covers emissions from combustion on facilities too small to be under the EU Emissions Trading Scheme (ETS) including cars. It also covers other emissions, excluding emissions caused by land-use, land-use change and forestry (LULUCF sectors) This is an improvement from the previous ESR target of 7%, EU effort sharing regulation, 28 June 2023).

In the WAM scenario ESR emissions are projected to decrease by more than 20% compared to 2005, almost 22%, exceeding the 18.7% ESR target (p. 234).

1.3. ENERGY IMPORT TARGETS AND DEPENDENCY OF IMPORTS

Hungary's ability to be energy self-sufficient was 33.7% in 2021, and year-on-year growth is intended though no specific figures are given (p. 63).

Hungary's self-assessment of its energy security situation is as follows:

"Hungary has made significant progress in enhancing energy security through international network connections but must further strengthen energy independence, reduce import dependence, increase system flexibility, and diversify its supply portfolio by improving energy efficiency, expanding renewables and nuclear capacity, optimizing power generation, and advancing energy storage and market integration." (p. 63)

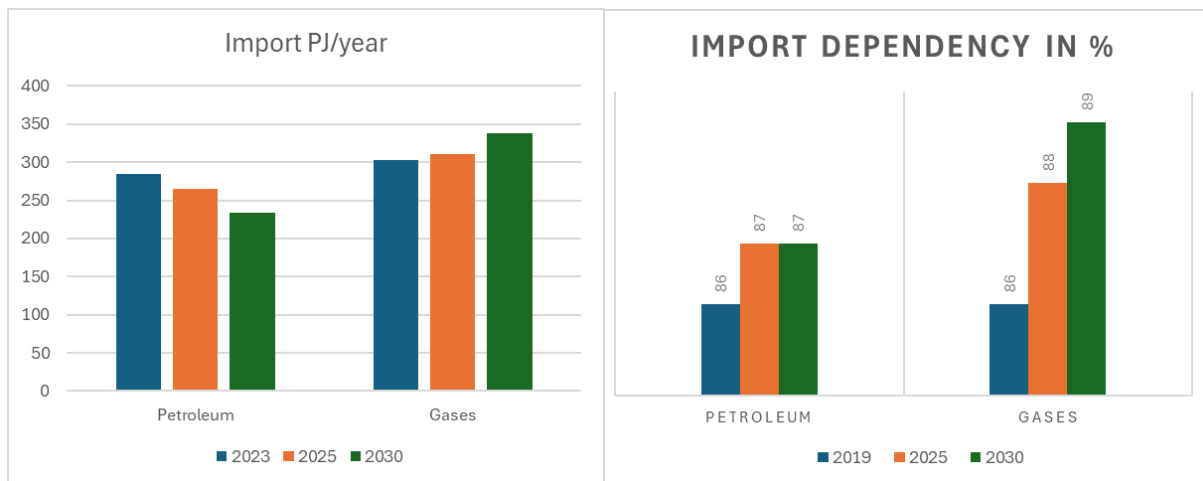


Figure 3. Natural Gas and Petroleum Net Import (PJ) and Net Import Share (%), (WEM Scenario)(p. 197, estimated and calculated from fig. 53)

The Hungarian NECP does not include a WAM scenario about future petroleum or natural gas import.

The Hungarian NECP does not consider hard coal as even mentionable import (~10 PJ/year).

There is a high dependency on import of fossil fuels (p. 197).

Since the depletion of Hungarian uranium reserves, uranium for nuclear power generation is 100% imported.

The import exposure of primary energy supply (adjusted exposure with nuclear) was 74% in 2022 (p. 194, fig. 50).

1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

- Solid biomass: 27% increase in heat generation from 2019 to 2030, followed by a decline due to efficiency improvements and biomass resource constraints. (p. 243).
- Geothermal energy: Expected to double by 2030. (p. 2543).
- Heat pumps: Their contribution to renewable energy use in heating/cooling will reach 19% by 2030 and could increase to 79% by 2050. (p. 243).
- The share of renewable energy, waste heat, and renewable-based cooling in district heating will increase by an average of 2.2 percentage points per year. (p. 53).

- The reliance on natural gas in district heating will be reduced, with increased use of biomass and geothermal energy, including cascade systems where possible. (p. 53).

1.5. TARGETS ON ENERGY EFFICIENCY COMPARED TO THE EE TARGET IN EED

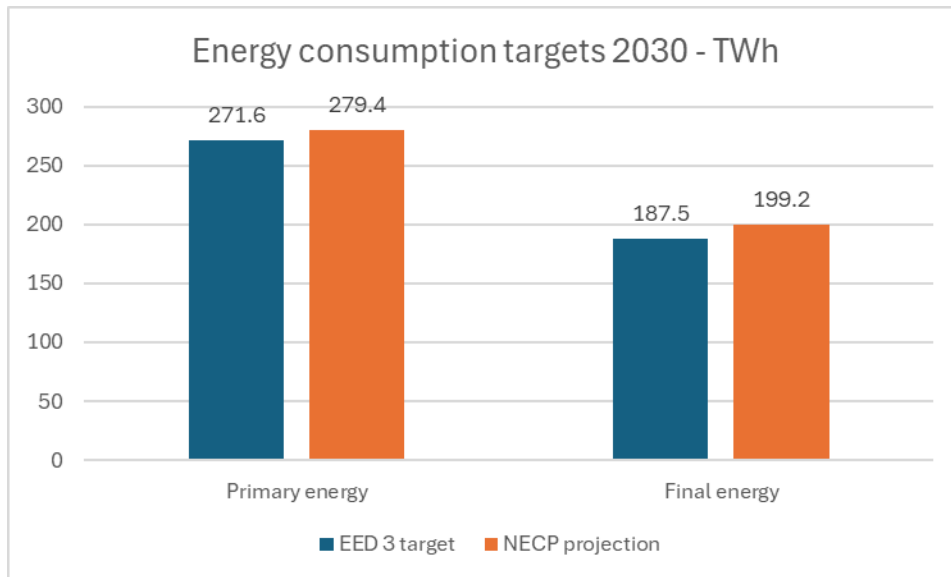


Figure 4. National target for energy consumption according to EED 3 using the updated EU reference scenario and the projection of consumption in NECP based on WAM scenario in TWh (p. 247 & 249, fig. 105 & 107).

The Hungarian NECP, as currently proposed, does not achieve the EED 3 targets, even with the WAM scenario. The primary energy scenario is missed by 6% and the final energy by 3%. Therefore, to reach the EED 3 energy efficiency targets, further reduction efforts are needed.

2. POLICIES TO ACHIEVE THE HEATING TARGETS

The below is an overview of the policies to achieve the heating targets that Hungary proposes in its NECP.

Promotion of biomass, geothermal energy in the H&C sector, use of ambient heat and ground heat (shallow geothermal) through heat pump, continue to provide incentives (replacement) for the use of

heat pumps and more efficient biomass boilers. District heating will fall into “efficient district heating and cooling”, reducing natural gas use in DH. Increase RE in DH like geothermal, biomass, waste heat utilization supported by the implementation of the Earth Heat Concept (p. 24-25).

“In the heating and cooling sector, in line with the Renewable Energy Directive (RED 3), we will increase the share of renewable energy (RES-H&C) by 1% point between 2021 and 2025 and by at least 1.3% point per year between 2026 and 2030.” “For DH, the share of renewable energy, including renewable electricity, waste heat and cold increased by an average of 2.2% per year”.

Use of preferably cascade-based DH networks and encourage heat pumps use in DH. Continue to provide incentives for the deployment of heat pumps (and supplementary small-power plants, mostly PV) and encourage other renewable heating technologies (p. 53).

Development of district heating and industry geothermal supply where possible. Use of waste heat and domestic waste incineration as non-weather dependent heat sources in DH. Increase the possibility of 5th generation DH networks (p. 91).

TOP Plus program to local and municipal energy developments – e.g. energy efficiency upgrading of municipal buildings and spas and increasing the use of renewable energy (p. 94).

DIMOP Plus program to the developments of, among others, at the digitalisation of building energy devices and systems (p. 94-95).

Recovery and Resistance Plan to fund, among others, the modernisation of the residential heating systems, supporting energy efficiency investments in public buildings, businesses and citizens, industrial decarbonization with geothermal based industrial heating (and other) (p. 95-96).

Swiss Fund to enhance the geothermal subsidies and overall utilisation. Help to implement the Earth Heat Concept (p. 96).

Modernisation Fund to provide the necessary resources to finance investments related to the expansion of renewables (in the heating sector, among others). Estimated to have a 1.83 billion € (750 billion HUF) in available finance resources in 2023-2030. Support energy communities, energy efficiency of district heating and increasing the share of renewable energy. Support for residential solar systems and electrification of heating systems in combination with photovoltaic systems (RRF-6.2.1-2021), announced in 2021 (aimed to make renewable energy available to as many families with lower incomes than the national average income, and to convert their heating into a system with lower emissions) (p. 96-97).

“The Long-Term Renovation Strategy (Hun: HTFS) lays the foundations for achieving a sustainable, energy-efficient and cost-effective domestic building stock by 2050.” Examples from the strategy like Home Renovation Support the radiator exchange program helps with the heating targets or the Family Homebuilding Allowance (Hun: CSOK) (p. 104).

“The definition of the energy performance of buildings 9/2023 ÉKT regulation provides that the “nearly-zero energy building” level (‘BB’) requirement, characterised by a specific primary energy consumption of 76 kWh/m²/year and an emission of 20 kg CO₂ e/m²/year, is to apply after 2024 to new buildings and properties undergoing major renovation, which encourages the further expansion of renewable energy production close to consumption. Accordingly, and with a view to streamlining and clarifying energy performance certificates, Government Regulation 176/2008 on the certification of the energy performance of buildings has been amended.” (p. 104-105)

“The Long-term Renovation Strategy adopted in 2021 laid the foundations for achieving a sustainable, energy-efficient and cost-effective domestic building stock by 2050. The strategy, which includes thirty-five policy measures, aims to achieve a 20% saving in the energy use of the domestic residential building stock by 2030, a 60% reduction in the CO₂ emissions related to the energy use of buildings by 2040, from the average level in 2018-2020, and a 90% share of “nearly zero-energy buildings” by 2050.” (p. 104)

Revision of the Long-term Renovation Strategy in 2025, which is thus replaced by the so-called National Building Renovation Plan. Exploiting the energy savings potential of public buildings, around 10% saving over 5 years (p. 107).

The Social Climate Fund: Hungary will receive 2.816 billion € from 2026 to 2032 to improve building energy efficiency, decarbonize H&C systems, and provide direct income support (p. 111).

According to the plans, the development of the fundamental regulatory framework for energy communities was completed by 2024 (p. 73).

(More acts on NECP page 105-106, table serial numbers 9-25)

Energy poverty

The below is an overview of the policies to address energy poverty that Hungary proposes in its NECP.

Energy poverty includes/effects high energy costs, poor energy efficiency in buildings, and limited access to basic energy services, home is connected to the natural gas network, participation in the social firewood program (p. 77).

In Hungary, approximately 300,000 people (about 3% of the total population) are affected by energy poverty (p. 77).

“The most important public transfer is the official pricing of energy costs. To regulate energy prices, 8 out of 10 households are entitled to use electricity at the cost of the official tariff. The same rate is 92% for gas and 100% for district heating. Thus, 3.95 million households benefit from the official tariff for electricity, 3.05 million for gas and 0.65 million for district heating.” (p. 131)

Social Firewood Program: Provides free firewood through local municipalities in settlements with fewer than 5,000 residents, benefiting 200,000 households annually (p. 131).

Reliance on fossil fuels: 71% of Hungarian households use natural gas for heating, making them vulnerable to fluctuations in import prices (p. 131).

Outdated building stock: More than 50% (2.6 million) of residential buildings require energy efficiency upgrades, particularly prefabricated panel apartments and small socialist-era family homes (p. 131).

Housing and energy efficiency grants plans: Programs support insulation, heating system modernization, and building renovations to help households reduce energy consumption and costs (p. 131).

Development of a National Social Climate Plan to enhance support for vulnerable populations (part of the Social Climate Fund)(p. 132).

Social dimension

The below is an overview of the energy policy changes affecting the Hungarian citizens and the support Hungary is providing to its citizens.

Hungary has emphasis on education, counselling and awareness-raising: for instance, the National Energy Network and the Hungarian Chamber of Engineers provide free consultation for residents and small and medium-sized enterprises (p. 108).

The transition to sustainable heating has been hindered by several shortcomings in energy planning, in particular the politically motivated emphasis on ‘residential price protection scheme’ or ‘utility cost-protection/cutting’ (Hungarian: ‘rezsicsökkentés’). This prioritisation has prevented household investment in insulation and renewable energy solutions until 2022.

“In 2022, the residential price protection scheme (utility cost-protection/cutting) was restructured due to the significant increase in wholesale gas prices: from August 2022, a two-element tariff system was introduced for residential consumers, with a price of almost 7.5 times the basic price for the volume consumed above a given consumption threshold (currently 1729 m³/year). The tariff system introduced in 2022 will therefore provide a strong price signal for households with higher-than-average gas consumption. Monthly price statistics from the Hungarian Central Statistical Office (KSH) suggest that in the fourth quarter of 2022 and the first quarter of 2023, consumers paid higher prices for 15-20% of consumption.” (p. 204)

There is a similar two-element tariff for electricity with low tariff for consumption below the average. Because of this subsidy, Hungary has the lowest household consumer electricity-tariffs in Europe (p. 216).

Hungary has the lowest consumer natural gas prices in Europe (p. 230).

Electricity-to-gas price ratio

Gas and electricity prices are available at Eurostat, but for electricity there us a special heat pump tariff with the current tariff structure in place since September 2022. The electricity and gas prices and their ratio are shown in figure 5.

Hungary	2021	2022	2023	2024
Gas price (€cent/kWh)	3.07	2.91	3.37	2.75
Electricity price (€cent/kWh)	n.a.	n.a.	6.4	6.4
Electricity-to-gas price ratio	n.a.	n.a.	1.9	2.3

Figure 5. Average gas and electricity prices in cent/kWh for private consumers (first half of the year) and the respective price ratio. The price includes taxes. The gas price is for consumers with a consumption of 20-200 GJ/year, and the electricity price is for consumers with the heat pump tariff (H-tariff), using 25% of heat including hot water per day during May-September compared with annual daily average and not using more than 2523 kWh for the heat pump during May-September. Sources: Eurostat, nrg_pc_202 and nrg_pc_204 and MVM - VILLAMOSENERGIA-DÍJAK AZ EGYETEMES SZOLGÁLTATÁSBAN LAKOSSÁGI ÜGYFELEKNEK 2022. AUGUSZTUS 1-JÉTŐL

With above ratio, heat pumps are more economic attractive than gas boilers and gas stoves in operation. Given that the consumer price is low for both gas and for electricity for heat pumps, to make investments in heat pumps attractive, a substantial subsidy is still needed.

This comparison does not include the special reduced gas tariff for families with many family members.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

The projection is that Hungary will meet the mandatory 2030 EU target for renewable energy in buildings with its WAM scenario, but not the higher indicative national target. 85% of the renewable energy for heating and cooling was biomass in 2022. The projection is that most of the growth in renewable energy for H&C is other renewables than biomass, but the total consumption of biomass for H&C is also increasing. Hungary is an exporter of biomass and projections are that the increase until 2030 of biomass can be covered from domestic resources.

The projection is also that Hungary will meet the non-ETS (ESR) target for 2030, but not the 2030 indicative energy consumption targets. The primary energy consumption is projected to be 6% above the target while the final energy consumption is projected to be 3% above the target, even WAM.

Hungary is highly dependent on energy imports with 74% of its primary energy being imported. The imports are mainly oil and gas, where imports cover 85-90% of demand. For biomass, Hungary is a net exporter.

Hungary has policies in place for energy efficiency and renewable energy, but for energy communities, there are only intentions to improve the conditions.

Hungary has a medium level of energy with 3% in energy poverty. Hungary also has policies in place to reduce energy poverty.

Suggestions

Hungary should decide to adopt the additional policies in the WAM scenario in order to reach energy targets and should also do more for renewable energy to meet the target for renewable energy in heating and cooling including heat pumps as well as do more for energy conservation to meet the energy consumption targets. This will also reduce the high fossil fuel import.

Despite the pressure from the EU, the legal framework in Hungary remains a hindrance to the operation of energy communities for electricity and entirely prohibits such communities for heat. The government has yet to enact the necessary legislation in this regard. It is crucial to ensure that the country's legal framework, at a minimum, does not impede the establishment and effective functioning of community projects.

Notably, the NECP-2024 lacks data to establish a 2030 target for solar thermal production. It is evident from the document that the Hungarian government does not prioritize this area. As the Hungarian NECP states: 'In the case of capacities required for renewable-based heat supply, we encourage new deployment for all technologies, however, we expect solar thermal capacities to decrease, considering that its efficiency is questionable compared to other systems.' (p. 55). Instead, in the NECP is focus on geothermal heating and heat pumps.

The NECP energy-mix forecast mentions wind energy, although it has a marginal role in the future energy production. The role of wind energy in the future energy-mix may need to be re-evaluated.

(p. 228-229 figure. 77-78).

Regarding the totally import-dependent nuclear energy production, re-evaluation for the future energy production is recommended based upon the huge amount of import share (~74%).

IRELAND

The following analysis is based on [Ireland - Final updated NECP 2021-2030 \(submitted in 2024\) - European Commission](#) published 22 July 2024. Page numbers refer to the National energy and climate plan (NECP).

1. TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For Ireland, the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3) including national indicative increase (the total RED 3 target) is 3.1%-points increase per year 2021-2030. The minimum binding target for all EU countries is 0.8%/year increase 2021-2025 and 1.1% 2026-2030.

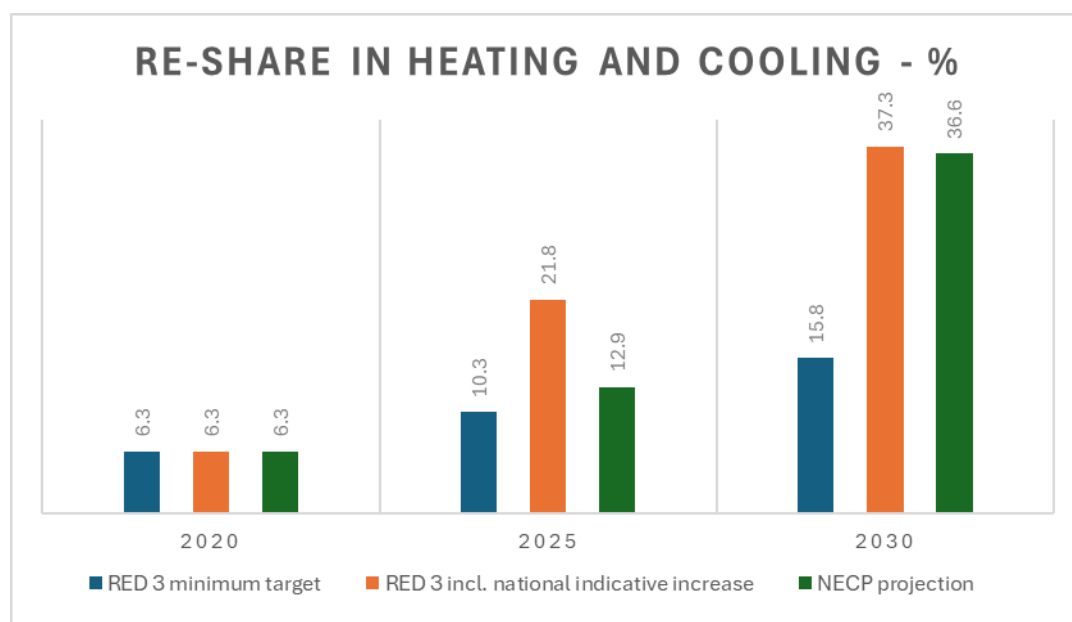


Figure 1. Renewable share in % of heating and cooling for Ireland, RED 3 binding share, RED 3 including national indicative increase and projection with policies and measures in NECP for 2025 and 2030 compared with base year 2020 (p. 67, table. 9).

Ireland has set a target of 36.6% (with additional measures, WAM) for heating and cooling in 2030 (p. 67, table. 9).

As visible below on figure 2 most (at least half) of the renewable energy (RE) share in heating and cooling (H&C) comes from biomass and ambient heat (heat pumps).

In 2020, out of a total 6.3% RE-share in heating and cooling, 3% comes from biomass and 1.8% from ambient heat. In 2025, of a total 12.9% RE-share, 5.7% comes from biomass and 5.4% from ambient heat. In 2030, out of a foreseen 36.6% RE-share, 8.8% comes from biomass and 12.8% from ambient heat.

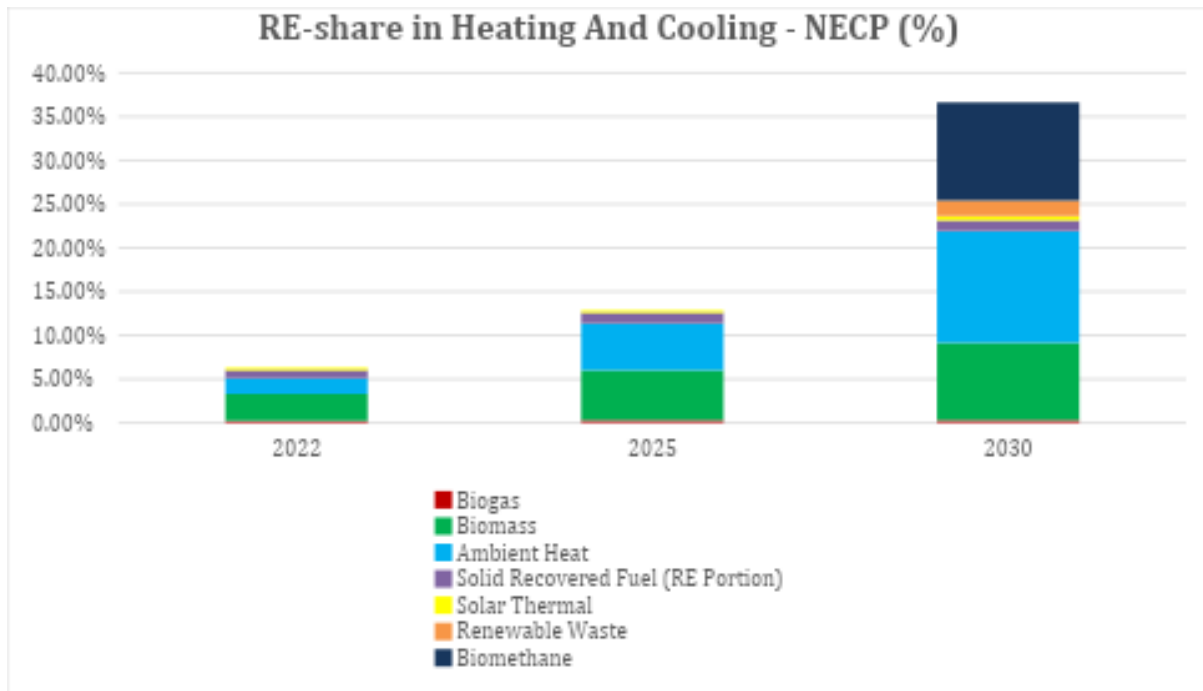


Figure 2. Renewable share in % of heating and cooling for NECP projections, divided in sources, compared with 2022 statistics (p. 73-74, p.90 table. 11)

The biomass final consumption for H&C is 170 ktoe in 2022. This consumption forecast is 261 ktoe in 2025, 385 ktoe in 2030, 895 ktoe in 2040, and 1084 ktoe to 2050) according to the NECP WAM scenario (p. 75, table 14).

The exact numbers are unclear about the import share of the biomass for H&C, but according to the NECP WAM scenario, the biomass supply in 2030 will be 45% import (including electricity and H&C).

The import share in biomass supply in 2040 and 2050 will gradually increase to 54% (2040) and 67% (2050). The overall biomass use (in all sector sum) increases as well, from 638 ktoe in 2030 to 1139 ktoe in 2050 (p. 76, table 15).

Other national targets from the Irish NECP are:

- 2.7 TWh of district heating (DH) in 2030 (CAP trajectory)(p. 348)
 - 2022 National Heat Study highlights potential up to 54% of heat in buildings supplied by DH (p. 348)
- 80% RE in electricity by 2030 (p. 67, table 9)

The RED 3 EU-wide target for RE in the building sector is 49%.

The Irish climate action plan sets out a detailed roadmap for the period 2021-2030 with the objective of reducing CO₂e emissions from the built environment by 40%-45% relative to 2030 projections (p.100).

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS

For Ireland, the target is a reduction of 42% greenhouse gases (GHGs) between 2005 and 2030 of the emissions not covered by the current EU Emission Trading Scheme (ETS1) or by the Land-

Use, Land-use Change and Forestry (LULUCF) regulation. This is an improvement compared to the previous target of 30% and is following the revised EU effort sharing regulation (ESR), (EU) 2023/857. The regulation also sets annual emission limits for the years 2021-2030 with a budget approach, so each country has to keep the sum of emissions for the period within the sum (the budget) of annual emission limits.

The current non-ETS ESR emissions are above the annual part of the budget target with emissions 8% above this target in 2022 (p.339). The forecast is that with the WEM scenario and without flexibilities, Ireland will miss the non-ETS ESR target for 2021-2030 with 22% (80.1 MtCO_{2e}). For the WAM scenario, Ireland will miss the target with 14% (p.54).

To meet the non-ETS ESR target, Ireland will use the flexibility to move 4% emission allocations from the ETS system to fulfil the non-ETS target equal to 1.9 MtCO_{2e} annually (p.52) and also use the expected flexibility to move 2.68 MtCO_{2e} annual LULUCF emissions allocations to fulfil the non-ETS ESR target. Using these flexibilities and the WAM scenario, the forecast is that Ireland will miss the non-ETS ESR budget target with 5% for the period 2021-2030 (p.54). Given that Ireland's non-ETS ESR emissions in the start of the period are higher than the 5% average overshoot, emissions in 2030 will be close the 2030 target using full flexibilities and the WAM scenario. How close is not specified in the NECP.

1.3. ENERGY IMPORT TARGETS AND DEPENDENCY OF IMPORTS

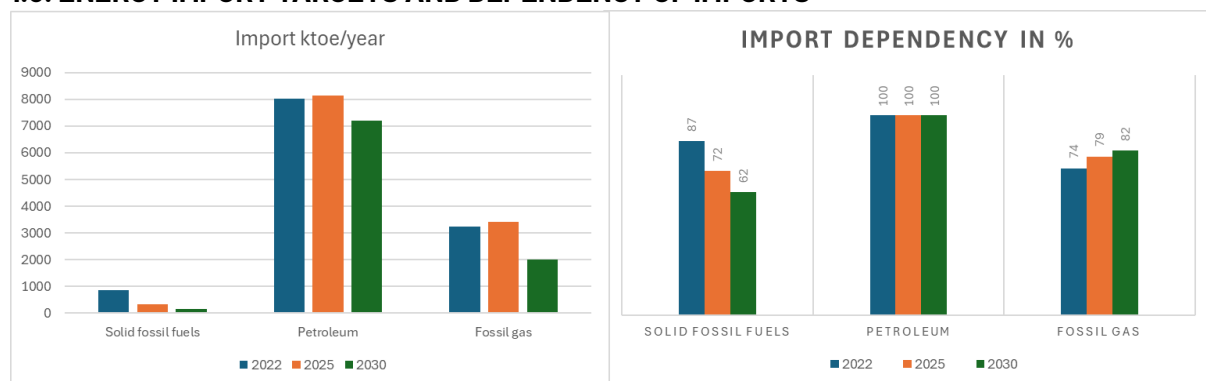


Figure 3. Evolution of the primary energy import per year and Import dependency for fossil energy consumption (p. 358 table 53).

Ireland has a large energy import with approximately 80% (156.56 TWh) of primary energy imported in 2022 and a long history of 75% or more import share of total, primary energy (p. 354).

Oil and natural gas are the highest imports with 66.0% and 24.6% of total imports in 2022 respectively, furthermore, Ireland imported 7.1% of the coal and 1.3% of the RE (as bioenergy) (p. 354).

Petroleum products will remain part of Ireland's energy mix in the medium term (p. 356).

100% oil import dependency will remain unless there is a commercial oil find (p. 357).

As mentioned above also the import of bioenergy will remain with a forecast of 45% import of bioenergy in 2030 and increasing.

1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

Introduction of a Renewable Heat Obligation (RHO)

- The RHO will also contribute towards the delivery of **Ireland's target of up to 5.7 TWh** of indigenously produced **biomethane by 2030**

Buildings (p. 85)

- The plan sets out targets for the significant improvement of energy efficiency in the building stock with a target to retrofit the equivalent of 500,000 existing dwellings to a B2 level on Building Energy Rating (BER) or cost-optimal equivalent by 2030.
- Electricity heating systems, the majority of which are heat pumps, were installed in 97% of new dwellings in 2023.

Heating (p. 85-86)

- The Irish Climate Action Plan (CAP) commits to the publication of a National Heat Policy Statement in 2024. A shift to alternative heating sources for residential heating is also set out in the Plan, with a target of 680,000 heat pumps installed over the period 2021-2030, with 400,000 of these in existing dwellings:
- Effectively ban the installation of oil boilers from 2022 and the installation of gas boilers from 2025 in all new dwellings through the introduction of new regulatory standards for home heating systems.
- Progressively phase out oil and gas boilers in existing dwellings through a combination of incentives, information, and regulatory measures and the development of a Roadmap for the Phase Out of Fossil Fuel Heating Systems.
- Under the CAP, the retrofit target for local authority owned homes is to retrofit 36,500 to B2 building energy class (BER) /cost optimal Equivalent by 2030.
 - As part of this new scheme over the period 2021-2023, 5,766 Local Authority homes have been retrofit to B2/Cost Optimal Equivalent. Furthermore, retrofit works were completed on over 74,000 local authority owned dwellings since 2013 to the end of 2021 under the previous scheme.

1.5 TARGETS ON ENERGY EFFICIENCY IN NECP COMPARED TO THE EE TARGET IN EED

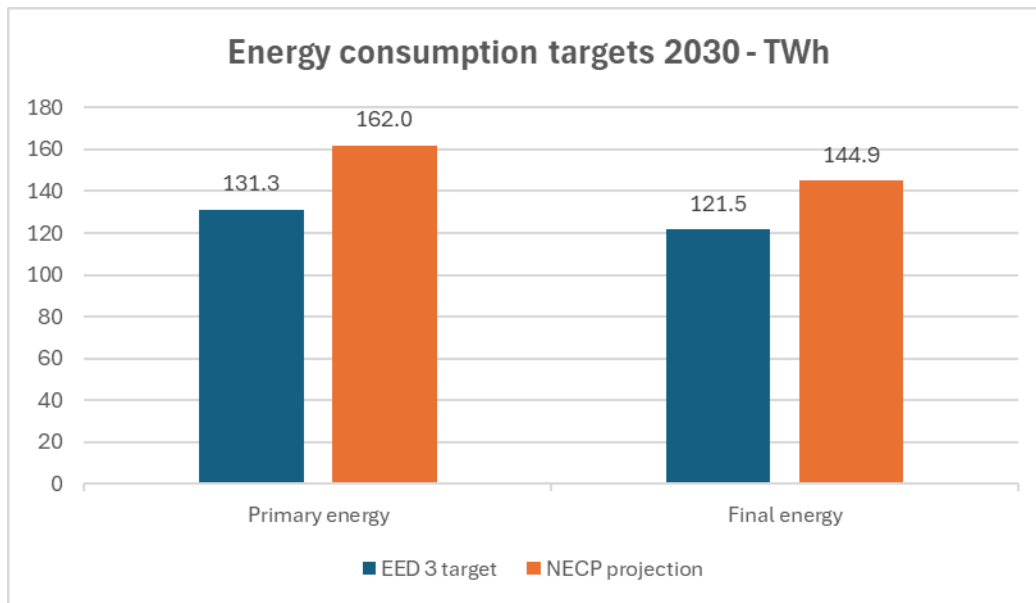


Figure 4. National target for energy consumption according to EED 3 with updated 2020 reference scenario and the projection of consumption in NECP based on WAM scenario (p. 78-79, table 17 &18).

The Irish NECP as currently proposed does not achieve the EED 3 targets. Heating and cooling contribute more than 1/3 of the final energy consumption. Therefore, to reach the EED 3 energy efficiency targets further reduction efforts are needed, also for heating and cooling.

2. POLICIES TO ACHIEVE THE HEATING TARGETS

The Irish government has presented the following policies in its NECP on achieving the heating targets. An important part of the policies is included in the Irish Climate Action Plan (CAP)

Heating(p. 85-86)

- The CAP commits to the publication of a National Heat Policy Statement in 2024 that will draw on the evidence of the National Heat Study and set out the overarching approach to decarbonising the heat sector in Ireland.
- A shift to alternative heating sources for residential heating is also set out in the Plan, with a target of 680,000 heat pumps installed over the period 2021-2030, with 400,000 of these in existing dwellings:
- Effectively ban the installation of oil boilers from 2022 and the installation of gas boilers from 2025 in all new dwellings through the introduction of new regulatory standards for home heating systems.
- Progressively phase out oil and gas boilers in existing dwellings through a combination of incentives, information, and regulatory measures and the development of a Roadmap for the Phase Out of Fossil Fuel Heating Systems.

- Local authorities in their administration of the social housing retrofit programme select homes for inclusion and measures to be implemented to contribute to the overall target of 36,500 dwelling retrofit to B2 BER/cost optimal levels (p. 100).
- Under the CAP, the retrofit target for local authority owned homes is to retrofit 36,500 to B2 BER/Cost Optimal Equivalent by 2030.
 - As part of this new scheme over the period 2021-2023, 5,766 Local Authority homes have been retrofit to B2/Cost Optimal Equivalent. Furthermore, retrofit works were completed on over 74,000 local authority owned dwellings since 2013 to the end of 2021 under the previous scheme.

Renewable Heat Obligation (RHO)(p. 168-169)

- Will incentivise suppliers of fossil fuel used for heat to ensure a certain portion of the energy they supply is from a renewable source.
- The RHO will support an increased use of renewable energy in the heating sector and contribute to a reduction in emissions in line with Ireland's climate ambitions.
- The RHO will also help reduce reliance on imported fossil fuels and strengthen energy security due to greater diversification of our energy streams.

District Heating (p. 169-170)

The 2022 National Heat Study highlighted the potential up to 54% of heat in buildings supplied by DH (p. 348). The CAP includes an objective of delivering up to 0.8 TWh of district heating by 2025 and 2.7 TWh of district heating by 2030. The policies and measures are:

- Developing a legislative and regulatory framework and establishing a district heating centre of excellence.
- Modification of Ireland's Support Scheme for Renewable Heat (SSRH).
- Providing a national-level assessment of the size and location of potential candidate areas for district heating
- The Climate Action Fund provided support of approximately 5 million € to the Tallaght District Heating Scheme (a suburb of Dublin).
- The Decarb City Pipes 2050 Project. The project resulted in the production of a Transition Map for Dublin city, which identifies the steps needed to drive the transition towards decarbonising the heat sector. The Transition Map contains a suite of Actions designed to support capacity building in the context of district heating.

As part of the CAP is formed a District Heating Steering Group to advise the government in the context of strategic targets for the sector and the strategic aim of decarbonising the built environment

Geothermal Energy (shallow and deep geothermal heat)(p. 171)

The Government's July 2023 Policy Statement outlines a comprehensive strategy to develop Ireland's geothermal energy as a natural resource for a circular economy. Key points include:

- Regulatory Framework:
 - Legislation will license and regulate geothermal exploration and utilization.
 - Integration with policies for district heating and integrated energy networks.
- Data & Research:
 - An Assessment of Geothermal Energy for District Heating in Ireland" (made by DECC in 2020) gave valuable insights in the potentials for deep geological geothermal energy use
 - Existing research and data are being consolidated into a National Geothermal Database by Geological Survey Ireland.
 - The database aims to de-risk investment in geothermal exploration.
- Decarbonization & Targets:
 - Establishing metrics and targets for geothermal energy's role in decarbonizing building heating/cooling, industrial processes, and power generation.
 - Aligning with NECP targets, including the installation of 600,000 heat pumps through 2021-2030, with specific targets for ground source heat pumps.
- Support Measures:
 - Assessing the potential for financial incentives to encourage geothermal deployment.
 - Focusing on building necessary skills, capacity, and regulatory frameworks.
 - Enhancing public engagement and information dissemination.

The Support Scheme for Renewable Heat (SSRH) incentivises (p. 175-176)

- Operational support for biomass and biogas heating systems
- An installation grant for a commercial heat pump.

National Retrofit Plan (p. 343)

- In February 2022, the new National Home Energy Upgrade Scheme was amended to provide grant levels of up to 50% of the cost of a typical B2 home energy upgrade with a heat pump (up from the 30-35%).
- In February 2022, the SEAI launched a national awareness and demand generation campaign for residential retrofit and a network of one stop shops were established to offer a start-to-finish project management service, including access to financing, for home energy upgrades.
- Also in February 2022, enhanced grant levels were announced across SEAI schemes including increasing the grants for heat pumps from 3,500 € to 6,500 €. Additional

changes were made to the terms and conditions of the grant schemes to encourage and allow more people to install heat pumps with Government support.

- In November 2022, a new tax deduction was announced for small-scale landlords who undertake retrofitting works of up to 10,000 € per property.
- From 2022 to the end of 2023, six retrofitting centres of excellence in retrofit skills training had been established.

Roadmap for the Decarbonisation of Industrial Heat (published in June 2024)(p. 68-69)

- This Roadmap advises manufacturers about what to expect from the Government in the coming years and what the operating environment for decarbonised manufacturing will look like up to the end of the decade
 - including: support available for businesses, policies that will facilitate decarbonisation and regulations that will incentivise decarbonisation

Other policies and measures

- Under the Local Authority Efficiency Retrofitting Programme, during 2022 and 2023, 4,113 heat pumps were installed (p. 343).
- Ireland has published a National Biomethane Strategy partly for heating purposes (p. 192).
- Scale-up and improve the Sustainable Energy Communities and Community Energy Grants (CEG) programmes and enlist a wider range of organisations to anchor its collective approach (p. 39).

Energy poverty

Energy Poverty Action Plan since 2022 (p.119)

- Energy Poverty Stakeholder forum in 2023 (p. 289)
- Near-term actions that were implemented: (p. 290)
 - income support (with a total of 2.9 billion € being allocated to the three Electricity Costs Emergency Benefit Schemes -1.57 billion € in 2022 and 1.2 billion € in 2023)
 - targeted social protection (through 1.2 billion € of social protection lump sum payments in 2022 and 2023)
 - consumer protection (through a package of strengthened obligations on suppliers and network operators mandated by the CRU)
- Longer-term measures: establishment of an Energy Poverty Observatory (p. 292)

Ireland established a cross-departmental and inter-agency Steering Group to develop, implement, and oversee the policies and measures detailed in the Action Plan (p. 121).

The 4 most important areas: meeting the cost of energy, energy efficiency research, governance and communications (p. 121).

“Improving the efficiency of homes, supporting lower-income households with their energy costs, minimising the costs to consumers associated with action on climate change and ensuring security of supply.” (p. 121)

“The strategy is underpinned by empirical research undertaken within the department and by the Economic and Social Research Institute of Ireland (ESRI).” (p. 121)

ESRIs main actions: recommending a methodology for measuring energy poverty in Ireland, commencing a survey which would provide the data required to inform this measurement and enable tracking over time, carrying out analysis on the policies in place to determine which can best alleviate energy poverty, allowing Ireland to achieve compliance with the requirements set out in EU legislation in relation to measuring, tracking, and publishing levels of energy poverty (p. 289).

“Energy poverty has been measured as a household having to spend more than 10% of its income on energy.” (p. 121)

“The ESRI has estimated, on this basis and with unprecedented energy inflation, 29% of households in Ireland are in energy poverty and that this will rise with increases in energy costs.” (p. 121)

Warmer Homes Scheme delivers a range of energy efficiency measures free of charge to lower income households vulnerable to energy poverty (p. 223).

Local authorities in their administration of the social housing retrofit programme select homes for inclusion and measures to be implemented to contribute to the overall target of 36,500 dwellings retrofit to B2/Cost Optimal levels (p. 231).

Government funds several energy efficiency support for the residential sector: (p. 231)

- Free upgrades are provided for households at risk of energy poverty under the Warmer Homes scheme.
- Grants for households taking a step-by-step approach to upgrading the energy performance of their home and moving away from fossil fuel heating are provided under the Better Energy Homes Scheme.
- A One Stop Shop service for households undertaking a whole-house upgrade project including switching to a heat pump. This scheme requires homes to achieve a minimum uplift in energy performance, thereby incentivising poorer performing homes to avail of the supports.
- A Community Energy Grants scheme is available for homeowners seeking to carry out their deep retrofit as part of a community project.
- Social Housing Retrofit Programme is administered by the Department of Housing and Local Government, under which the social housing stock is undergoing a programme of energy efficiency renovation.

Existing Housing Upgrade Energy Efficiency Measures: (p. 292-293)

- Better Energy Warmer Homes Scheme – free energy efficiency home upgrades for lower-income households, including deeper measures and heating upgrades where appropriate.

- One Stop Shop Service – increased grants are available for houses owned by Approved Housing Bodies who rent to lower-income tenants.
- Community Energy Grant Scheme – increased grant amounts available for home upgrades for lower-income households.
- Energy Efficiency Obligation Scheme – Under SI 522/2022 5% of an obligated party's annual EEOS target must be delivered in an eligible energy-poor home.
- Local Authority housing upgrade programme – programme to upgrade the social housing stock
- Housing Assistance for Older People – support for older people to upgrade their home, can include insulation and heating upgrades in some cases.
- Housing Adaptation Grant – support for adaptations to the home which can include insulation and heating upgrades in some cases.
- Split Incentive – SEAI grants are available to smaller private landlords as well as a new tax incentive for landlords upgrading their rented properties. The new Home Energy Upgrade Loan is also available to smaller private landlords.

Planned Measures: (p. 296)

- Funding ESRI Research Programme to develop better indicators of energy poverty and conduct further research on the theme.

Warmth and Wellbeing Scheme: aims to objectively measure and validate the health and wellbeing impacts of improving the living conditions of vulnerable people living in energy poverty with chronic respiratory conditions (p. 411).

Social dimension

Social dialogue to ensure impacted citizens and communities are empowered and are core to the transition process (p.222):

- National Dialogue on Climate Action (NDCA): co-creates the annual CAP, informs communications and strategies across Government, and lays the foundations for a future that is fair, equitable, and accessible to all.

The consumer protection obligations on suppliers: (p. 293)

- A winter moratorium on disconnections for all domestic electricity and gas customers was implemented from 1st December 2023 until 31st January 2024
- Extended debt repayment periods of 24 months minimum
- Reduced debt burden on pay-as-you-go top-ups – a maximum of 10% of a single customer vend can be put against debt
- Increase of PAYG emergency credit from 10 € to 20 €
- Better value for customers on financial hardship meters – by being automatically placed on the most economic tariff
- Promotion of the Vulnerable Customer Register, which has seen an increase in registration of 30%

Suppliers are also required to ensure that all registered vulnerable customers are on the most economic tariff available for their chosen payment method and billing format (p. 294)

Other Consumer Protections Measures (p. 294)

- Emergency Costs Electricity Benefits Scheme III – The delivery of three electricity credits to every household worth 137.64 € each in the billing cycles of December 2023, January/February 2024, and March/April 2024
- Household Benefits Package – monthly income support to assist eligible households with their electricity and gas bills
- Lump Sum Payment – additional payments to cost-of-living recipients to help with the cost-of-living crisis of which energy costs are the largest portion
- Fuel Allowance – weekly income support paid during the winter months to assist households in receipt of eligible social protection payments with their energy costs

Electricity-to-gas price ratio

No projection of gas and electricity prices for households is included in Ireland's NECP, while the historical prices are given in figure 5.

Gas and electricity prices are available at Eurostat, and we have looked at data for the last four years.

Ireland	2021	2022	2023	2024
Gas price (cent/kWh)	6.20	8.47	14.65	12.71
Electricity price (cent/kWh)	21.38	22.87	29.90	33.18
Electricity-to-gas price ratio	3.4	2.7	2.0	2.6

Figure 5. Average gas and electricity prices in cent/kWh for private consumers (first half of the year) and the respective price ratio. The price includes taxes. The gas price is for consumers with a consumption of 20-200 GJ/year, and the electricity price is for consumers with a consumption of 5,000-15,000 kWh/year. Source: Eurostat, nrg_pc_202 and nrg_pc_204.

Electricity prices are fluctuating but overall getting less expensive compared to gas, which favours the economy for heat pumps. Hopefully, the overall decrease in the ratio will remain in place and make heat pumps a more economically attractive option. Even the 2024 ratio will only make heat pumps economically favourable if the investments are subsidised.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

While Ireland has a positive development of renewable energy for heating and cooling and a diversified portfolio of renewable energy sources for heating, it is not on track to meet the EU indicative target for renewable energy in heating and cooling, the non-ETS ESR emission target nor the energy consumption targets in EED 3.

Given the challenges to achieve the EU climate and energy targets, Ireland should do more for energy efficiency and renewable energy, also for heating and cooling. That include both realisation of measures in the WAM scenario as well as additional policies and measures.

The increasing import share of bioenergy according to the NECP projections is likely not to be sustainable. The future use of bioenergy should be re-evaluated for heating and cooling and for all other sectors.

As for the solar heat target, the target is 21 ktoe (0.5% share) by 2030, ranking low on the EU level. While this lower commitment can partly be attributed to Ireland's oceanic climate, recent trends indicate a substantial upsurge in solar PV systems (627 ktoe in 2030) in the country. This suggests that Ireland may possess untapped potential for a more ambitious solar thermal commitment.

Remarkably, the NECP lacks ambitious commitments for heat pumps (beyond the 680,000 unit target). Drawing upon Denmark's ambitious targets and similar climate conditions, one would expect a more substantial target of around 2000-3000 kWh per capita for heat pumps in Ireland. The current electricity/gas ratio for consumers make only heat pumps economic attractive if they are subsidised.

Ireland has an impressive program to reduce energy poverty, but it seems to be needed.

Suggestions

- Increase the ambition and target for heat pumps.
- Make subsidies and low-interest loans available for heat pumps and solar thermal.
- Consider spatial planning to minimise competition between local heat pumps and district heating.
- Consider to tax gas without increasing energy poverty.
- Reconsider the bioenergy strategy to reduce or eliminate bioenergy imports.
- Make low-interest loans available for heating renovations and extend the programs for energy renovation subsidies for vulnerable families.
- Consider to extend the functions of one stop shops to special advises for vulnerable families.

ITALY

The following analysis is based on [Italy – Final updated NECP 2021-2030 \(submitted in 2024\)](#), published July 1, 2024. Page numbers refer to the English translation of the National energy and climate plan (NECP).

In the NECP there are two scenarios: the Reference scenario and the Policy scenario. The NECP doesn't always provide comparative information on goals, targets and policies, so we cannot clarify which belongs to which scenario. Wherever is possible it's indicated.

1. TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For Italy, the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3) including national indicative increase (the total RED 3 target) is a 1.9%-point increase per year for the 2021-2030 period. The minimum binding target for all EU countries is 0.8%/year increase 2021-2025 and 1.1% 2026-2030.

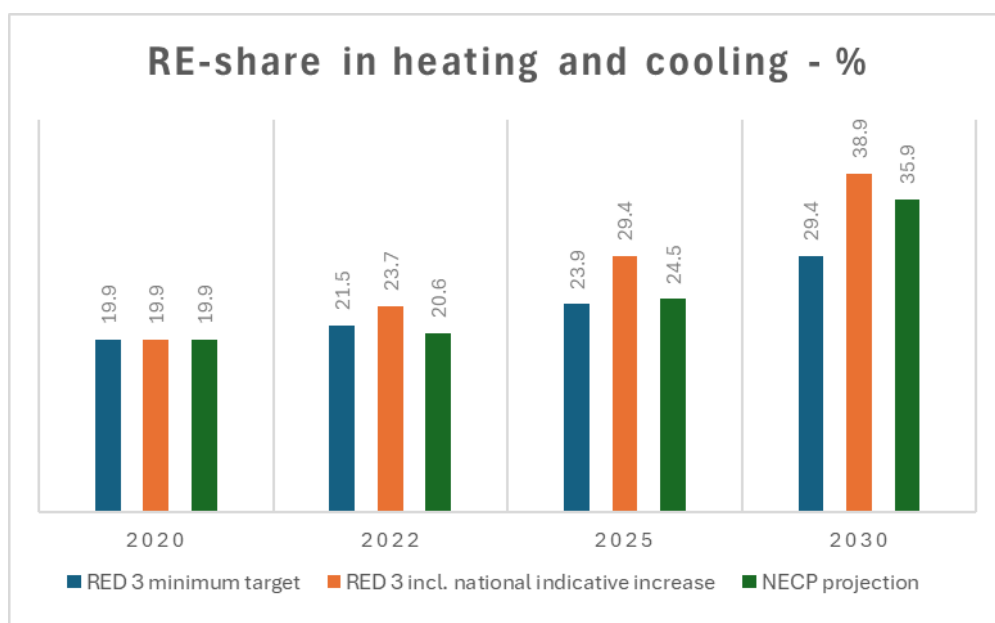


Figure 1. Renewable share in % of heating and cooling for Italy, RED 3 binding share, RED 3 including national indicative increase and projection with policies and measures (policy scenario) in NECP for 2025 and 2030 compared with base year 2020 and latest statistics from 2022. (p. 95, fig. 12).

In order to achieve the target of RED 3 with the indicative increases, Italy intends to include waste heat and cooling and the renewable part of electricity used for heating and cooling (p. 93).

If Italy follow the reference scenario, RE-share in heating and cooling will only be 24% (p.16, table 1).

In Italy, the use of biomass for heating and cooling (H&C) in households is growing in the long term. Its use in transport also is going up, while in the electricity sector the trend is opposite (Figure 18, p. 110).

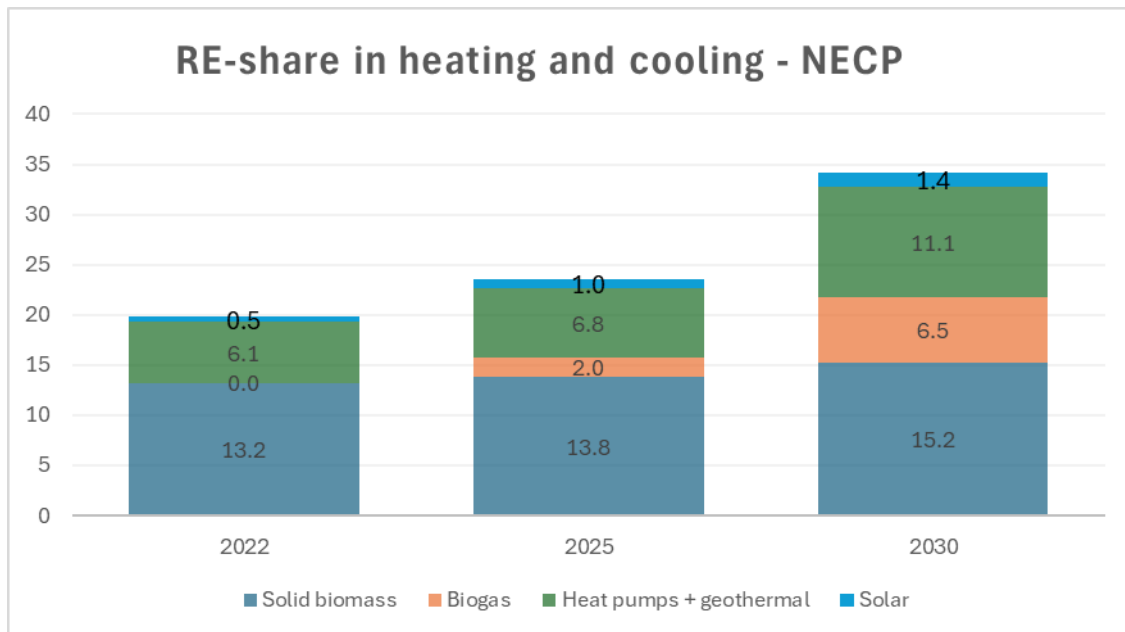


Figure 2: Renewable share in % of heating and cooling for NECP policy scenario, divided in sources, compared with the latest available statistics (2022)(p. 102, table 13). Biomass includes biomethane in gas grid and other and biogas.

The most used renewable source in the H&C sector is solid biomass (6,8 Mtoe), mainly used in the household sector in the form of firewood and pellets (p. 28).

“The development of the thermal RES-sector is influenced by the particulate emissions impacts of existing solid biomass heating systems. Therefore, the installation of new biomass heating systems will need to be guided in such a way as to favour high environmental quality and high-efficiency plants, also considering the possibility of introducing restrictions on ex-novo installations in areas where air quality situations are critical. In order to stimulate the renewal of old installations with efficient and low emission technologies, strict performance requirements for access to incentives for biomass boilers and heat generators will be maintained in the short term” (p. 100).

Other national targets in the Italian NECP includes with the policy scenario 39.4% RE in total final energy consumption by 2030 and 63.4% in electricity production by 2030 (p.16, table 1).

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS

Italian emission reduction target in the effort sharing regulation (ESR, regulation (EU) 2023/857) is 43.7% reduction between 2005 and 2030 of GHG emissions not covered by the current EU Emission Trading Scheme (ETS1) or by the Land-Use, Land -use Change and Forestry (LULUCF) regulation. The old target under the ESR was 33% (set in 2018). The target is a budget target with an emission trajectory 2021-2030.

According to Table 1 (p. 16) "GHG reduction vs 2005 for all ESR sectors" in 2030 is 29.3% in the Reference case (scenario) and 40.6% reduced in the Policy scenario. Thus, even with the Policy scenario, the non-ETS ESR target will not be met. Under certain conditions, Italy can use the flexibility to move a limited amount (5.75 MtCO₂e for the years 2026-2030 combined) from the LULUCF sectors to the ESR sectors (p. 75), but that is not enough to meet the ESR target. In order to meet the target (comply with the 2021-2030 emissions trajectory), it will be necessary to start a significant reduction in emissions of more than 30 % compared to 2021 levels immediately, to be achieved mainly in the transport, civil (housing and service), and agriculture sectors (p. 9).

One reason for the Italian challenges in reducing ESR emissions is the continued high reliance on natural gas in the H&C sectors with forecasted reductions from 2022 of only 3% in 2030 and 5% in 2040 of gas use in final energy consumption, with existing measures (from p.382, table. 69). Most of gas use in final energy is in the heating sectors for heating in buildings and industry.

1.3. ENERGY IMPORTS TARGETS AND DEPENDENCY OF IMPORTS

The progressive impact of RES and the reduction in energy intensity have contributed, in recent years, to reducing Italy's dependence on foreign sources of supply. However, the share of national energy needs met by net imports remains high at 73.3 % (2021), but 8% lower than in 2011 and 0.2 % lower than in 2020 (p. 28, p. 140).

The dependence (from Russia) in natural gas sector will be decreased using two options:

- Substitution of supply sources via pipelines and LNG ships (mainly via Trans Adriatic Pipeline and from Egypt, Algeria and other Asian and African countries)(p.146 table 34, p. 306);
- Substitution of gas with electricity (incl. renewables) and decrease of the consumption via energy efficiency measures (in heating and cooling sector).

Compared with 2021, Italy is planning in 2025 to have reduced fossil gas consumption with 10.9 billion m³ (bcm) (around 16%), increased domestic fossil gas production with 1.4 bcm and diversified 23.2 bcm of gas imports from Russia to African and Asian sources. This will reduce Russian gas import with 35.5 bcm and make Italy practically independent of Russian gas. The large reductions in fossil gas use will be achieved with renewable energy to replace gas in power production (7.2 bcm), energy savings (2 bcm), and increased biogas and other biofuels production (1.6 bcm)(p.146, table 34).

For oil sector the NECP envisages substitution with biofuels and biomethane and new synthetic fuels as well as more efficient use of oil products, thus decreasing the needs (p. 14, 28, 73, 309, etc.).

Dependency of imports into EU for energy use in buildings

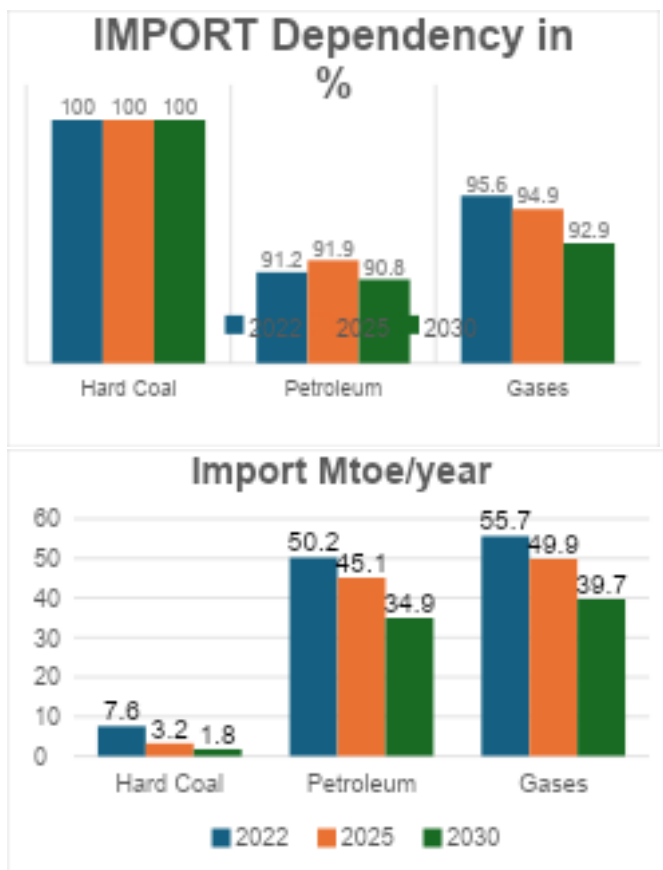


Figure 3: Dependency on import for total primary energy consumption (table 73 and 74, p. 392; table 90 and 91, p. 451)

Despite the high rates of import dependence for individual fuels, the total energy dependence of Italy goes down to 61% in 2030 due to overall decrease of the amounts of import and the increase of renewables in total primary energy (p. 451, tables 90, 91).

The total final consumption of energy also drops from 111.7 Mtoe in 2020 to 101.7 Mtoe in 2030 (p. 452).

Italy is not only a big importer of fossil fuel, it is also a big importer of electricity, in 2023 Italy imported 51 TWh of electricity (20%) of its electricity demand of 254 TWh (p.39). The import is forecasted to be reduced to 43 TWh in the Reference scenario and 34 TWh in the Policy scenario (p. 452).

Italy imports renewable energy (bioenergy) and is expected to import 1.4 Mtoe in 2025 (around 10% of bioenergy consumption) and the forecast is that this will increase to 1.5 Mtoe in 2030 and 1.8 Mtoe in 2040 (p.294, table 76).

Italy does not import hydrogen today, but the forecast is that Italy will develop a hydrogen economy with renewable hydrogen use of 0.25 Mton/year in 2030 of which up to 30% is to be imported (p.109). This is part of a larger plan, where Italy would be transit country for hydrogen imports from African countries to Austria and Germany (p.233).

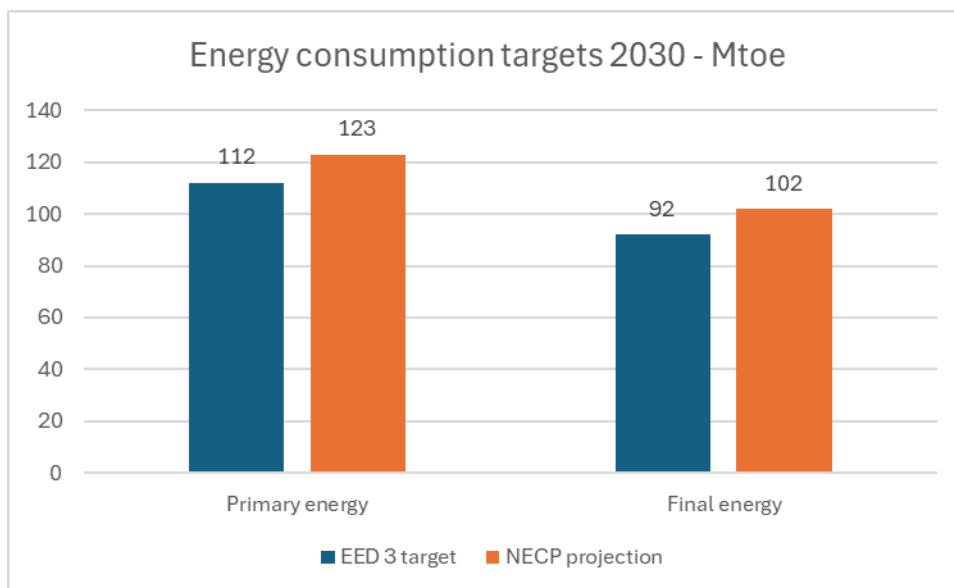
1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

Italy has only a few own and not very specific targets for the decarbonization of heating and cooling:

- The import of coal will be drastically decreased from 7,6 to 1,8 Mtoe by 2030 as part of the commitment for gradual phase-out of coal. The coal phase-out is included in the NECP Table 2 (p. 23). Italy does not produce own solid fossil fuels.
- There is a strong promotion of heat pumps and solar installations for H&C, but there are no legal commitments for their expansion.
- Obligation to increase the renewable share of energy sold in the form of heat for heating and cooling for district heating companies since 2024 (no information of the RE-level) (p.17).

1.5 TARGETS ON ENERGY EFFICIENCY COMPARED TO THE EE TARGET IN EED

Figure 4: National target for energy consumption according to EED 3 and the projection of consumption in NECP based on additional measures scenario (Policy scenario)(p. 16 table 1, p.113 fig. 19).



The Italian NECP as currently proposed does not achieve the energy consumption targets in the amended Energy Efficiency Directive 2023/17921 (EED 3). To reach the energy efficiency targets further reduction efforts are needed. Since heating and cooling are using more than 40% of the final energy consumption, also these sectors should reduce consumption.

2. POLICIES TO ACHIEVE THE HEATING TARGETS

The main policies and measures to promote the use of renewable thermal sources are often integrated with those for energy efficiency and are already operational. These are:

- Tax deductions for energy efficiency measures and building recovery of existing building stock, both of which are also used for thermal renewable energy;

- The Termico account that is supporting the change to energy efficiency installations including heat pumps;
- Mechanism of Bianchi [White] Certificates, including the promotion of High Performance Cogeneration;
- Obligation to increase renewable thermal energy in heat sales for heating and cooling (OIERT Ministerial Decree);
- Support for district heating
- Large thermal auctions (pursuant to Article 10 of Legislative Decree No 199/2021), supporting renewable energy in district heating production;
- Obligation to integrate renewable sources into buildings;
- Contributions to municipalities for investments in energy efficiency and sustainable territorial development;
- Promotion of biomethane fed into the natural gas network;
- Hydrogen support measures;
- Promotion of energy communities and self-consumption, as part of the budget for "Mission 2 "Green Reform and Ecological Transition" (p.32, p.225, p.228).

"Accordingly, in order to promote the best energy and environmental performance, Annex IV to Legislative Decree No 199/2021 (to transpose the RED 2 directive) laid down the minimum technological and performance requirements to be met by plants producing thermal energy from renewable sources which require incentives of any kind". (p. 225)

"Article 27 of Legislative Decree No 199/2021 provides that, from 1 January 2024, companies selling heat in the form of heat for heating and cooling to third parties for quantities exceeding 500 TEP (toe) per year are to ensure that a share of the energy sold is renewable. The provision refers to a decree of the Minister for defining and implementing the obligation. In particular, the current draft decree defines:

- The obligation to increase renewable thermal energy in the sale of energy according to annual trajectories consistent with the INECP targets;
- How to comply with: Go, physical RES production, compensatory contribution expressed in terms of EUR/toe;
- Notifications for compliance with the obligation and related checks;
- The allocation of the resources transferred to the fund set up at CSEA (large thermal auctions)". (p. 228)

"Article 10 of Legislative Decree No 199/2021 provides that, in the context of the update of the Decree of the Minister for Economic Development of 16 February 2016 (the 'Termico Account 2.0'), a framework is to be introduced to encourage interventions for the production of thermal energy from large renewable sources through competitive access mechanisms. In this respect, it was considered appropriate, given the complexity of the measure to be introduced and given that the purpose of the heat account is to encourage measures to produce thermal energy from

renewable sources and small energy efficiency measures, to proceed with a separate measure from the aforementioned Decree of 16 February 2016. The technical investigation is currently ongoing” (p. 229).

“Annex 3 to Legislative Decree No 199/2021 identifies obligations for the integration of renewable sources into new buildings or buildings undergoing major renovation.

These buildings must be designed and constructed in such a way as to ensure, through the use of renewable installations, the simultaneous coverage of 60% of the expected consumption of domestic hot water and 60% of the sum of the expected consumption for the production of domestic hot water, winter air conditioning (heating) and summer air-conditioning. The obligations described above cannot be fulfilled through installations from renewable sources which produce only electricity which, in turn, feed for the production of heat with Joule effect.” (p. 229)

In the heating and cooling sector, the provisions for air-conditioning and heating systems will be updated with the specific aim of progressively replacing highly emitting installations (such as diesel boilers and non-efficient biomass installations) with low emission and high efficiency technologies.

The introduction of new limits on the use of cooling installations will then be considered, through the definition of constraints (e.g. days of use, timetables, minimum temperatures) to be adopted in relation to the reference climate zone (update of Presidential Decree No 74/2013, referred to above).

Decree-Law No 34 of 30 April 2019 (Decree Law on Growth) established a contribution to municipalities, up to a maximum of 500 million € for 2019 from the Development and Cohesion Fund (FSC) for measures relating to investments in the field of energy efficiency and sustainable territorial development. The contribution shall be allocated to each municipality on the basis of the resident population on the date of 1 January 2018. (p. 230).

There are plans for support of energy communities with better legislative framework, an incentive tariff for produced and shared renewable energy, and with information. This support is being introduced (p. 205).

“Finally, it will be crucial to raise consumers’ awareness and active role, for example by exploiting the technologies of home use, digitalisation of networks and smart metering, the promotion of which will be assessed by means of appropriate tools. Implementation of the provisions already laid down in Legislative Decree No 102/2014 (implementing EED 1 and others) on metering and billing systems for energy consumption in the residential sector will be completed and, where appropriate, strengthened in order to provide consumers with correct and timely information on their energy consumption, which is necessary to promote corrective or otherwise more efficient behaviour. To this end, increasing digital connectivity (ultra-wideband) and the development of applications for remote control of dwellings will be best exploited, while also fostering a different role for electricity and gas sellers, who will be able to develop commercial propositions aimed not only at the sale of the commodity, but also for the provision of consumer management services” (p. 299).

Italy does not have nuclear power today, but in the the *Green Powered Future Mission* programme is allocated 135 million € for a Nuclear Programme (p. 348). Assessment of nuclear power is ongoing in the National Platform for a Sustainable Nuclear (p. 427). In the NECP is presented a scenario with 400 MW nuclear power in 2035 and 2 GW in 2040 (p. 87, fig. 6).

Energy poverty

The NECP reports that “As regards energy poverty, as a complement to the measures described below, in-depth work has been undertaken to introduce efficiency measures and installation of self-consumed renewable energy installations” (p. 14).

“In order to ensure institutional coordination of the analysis and fight against the energy poverty, and following the provisions of the INECP 2019, Decree No 131 of 29 March 2022 established in Italy the *National Energy Poverty Observatory (ONPE)*, an interinstitutional body promoted and led by the Ministry of the Environment and Energy Security, which has among its tasks the monitoring of the energy poverty and the development of a law enforcement strategy.”

At the time this plan is drawn up, a legislative definition of energy poverty (EP) has not yet been introduced in Italy; this definition is planned to be formalised in the national decree transposing the new Energy Efficiency Directive (EU) 2023/1791 (p. 170).

At the same time NECP states, that “[A]s regards the EP’s measurement, until the introduction into national law of an official definition of energy poverty when transposing the new EED, it is not considered appropriate, when this version of this plan is drawn up, to formally adopt composite or innovative indicators compared to what has already been suggested in the recommendations of the European Commission. This choice is made in view of the need to have an official definition of the EP at national level, so that it can identify indicators that are fully consistent with it and thus be capable of realising hopefully all the multidimensional characteristics, including the three mentioned above” (p. 171).

In the meantime, on the basis of the indicators, set in the document SWD (2023) 647 final related to Recommendation (EU) 2023/2407, Italy is carrying out “as a preliminary point, until the introduction into national law of a definition of energy poverty and related indicators” (p. 171) monitoring of some of these indicators (see p. 172). These preliminary indicators show that 9.9% of Italian households could not keep their home warm in 2022 (up from 8.6% in 2021) and 13.6% of the population lived in households using more than 10% of household income in heating alone. The energy poverty has reduced from an all-time high of 22% of households that could not keep their homes warm in 2012.

Today, the main specific measure to reduce energy poverty is social bonuses for electricity and natural gas, paid as a discount on the bill. “regardless of their actual consumption; the electricity bonus covers around 30 % of the annual expenditure of an average household; the gas bonus accounts for 15 % of annual expenditure”. The bonuses are differentiated according to the household size and for the gas bonus also according to the climate zone. The bonus is paid to families with household income below a threshold that is set with the indicator ISEE (Indicator of the Equivalent Economic Situation), which is used at national level to access other social benefits as well. The bonus is paid to families with an ISEE below 15,000 € (2023 level) and up to 30,000 € for households with at least 4 dependent children. In 2021 4 million households received the bonus for at least one form of energy and with the high energy prices in 2022, this increased to 6.2 million (p.339-340).

The programs for energy renovations also contribute to reduce energy poverty, in particular for the programs covering public housing as poverty is more widespread among tenants than among families owning their dwelling (p.240-242).

In August 2023 was established a revolving fund for the construction of photovoltaic installations in self-consumption, in favour of households in a state of economic distress. It pursues the objective of combating energy poverty, reducing energy spending and promoting the development of photovoltaic self-consumption. It will be addressed in particular to the regions of the Mezzogiorno (Southern Italy). The beneficiary shall not bear the initial investment cost but will pay for the generated electricity (p. 218). This fund follows in addition to a program from 2022 in the National Energy Income Fund with a budget of 200 million € to subsidise low-income families' investments in solar PV on dwellings (p. 342).

Several temporary emergency measures were introduced to support households and businesses during the energy crisis following Russia's war of aggression in Ukraine, including:

- Energy bills in instalments for final customers: the measure provides that final customers may request their suppliers to charge their energy bills in instalments and;
- Reduction of tariff charges: the measure entails zero or reduction of tariff components to cover so-called system charges which finance public policies;
- Reinforcement of energy bonuses for persons suffering from economic distress or severe health conditions that require the use of life-saving electrical equipment;
- Electricity price cap: two separate provisions have been adopted to introduce a cap on the revenues of producers of electricity from renewable sources.
(p.335)

Electricity-to-gas price ratio

No projection of gas and electricity prices for households is included in Italy's NECP, while the historical prices are given in figure 5.

Gas and electricity prices in figure 5 are from Eurostat.

Italy	2021	2022	2023	2024
Gas price (cent/kWh)	7.03	9.86	9.81	11.4
Electricity price (cent/kWh)	20.97	29.14	35.53	31.13
Electricity-to-gas price ratio	3.0	3.0	3.6	2.7

Figure 5. Average gas and electricity prices in cent/kWh for private consumers (first half of the year) and the respective price ratio. The price includes taxes. The gas price is for consumers with a consumption of 20-200 GJ/year, and the electricity price is for consumers with a consumption of 5.000-15.000 kWh/year. Source: Eurostat, nrg_pc_202 and nrg_pc_204.

The electricity-to-gas price ratio makes heat pumps less economically attractive than gas heating, except if there is a large subsidy for the investments at least large enough to make investments in heat pumps equal to investments in gas boilers.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

Italy has a relative low use of renewable energy in heating and cooling today, but if Italy follows its Policy scenario, it will have substantial increases. This will make Italy meet the RED 3 minimum target for RE in heating and cooling, but not the national indicative target. If Italy follows the reference scenario, it will not even reach the minimum target. Most of the renewable energy increase is with heat pump use and biogas, but all forms of renewable energy will increase including solid biomass.

Italy is not on track to reach the non-ETS ESR target with the policies in the NECP and need to step up reductions of emissions, in particular from fossil fuel use, to reach this target. A large part (26%) of these emissions is from energy use in buildings, emissions that should also be reduced.

Italy is a very energy import depending country with over 90% of all fossil fuel being imported. According to the NECP the high import share will continue, but the fossil fuel consumption will be reduced. The NECP forecast is a 30% reduction of use of fossil oil and gas use while coal will be almost phased out. Part of the fossil energy will be replaced with renewable energy (the other part with energy efficiency). Of renewable energy use, a smaller part (around 10%) of biomass is imported. This import will continue with a small increase in both the Reference and the Policy scenario.

Italy is also not on track to reach the primary or final energy consumption targets in the EED with the policies in the NECP and need to step up energy conservation, also in the heating and cooling sector that consumes more than 40% of the final energy.

In conclusion, Italy would need more policies and actions for energy conservation to reach the EU energy consumption targets and to reach renewable energy and emissions targets, combine stronger energy conservation policies with stronger renewable energy policies.

Italy already has several policies in place for energy efficiency and renewable energy, policies that could be enhanced, including with higher budgets.

There are large potentials for energy communities in Italy, and ongoing improvements in legislation and support.

Italy is considering to restart nuclear power, which will maintain or increase its dependence of energy imports.

Italy has an energy poverty problem with close to 10% of households not able to keep their homes warm. One support scheme is in place, but a comprehensive policy is only under development.

The Italian NECP has a wealth of information, but information is lacking on which policies are included respectively in the Reference scenario and in the Policy scenario.

SUGGESTIONS

Italy should step up its climate and energy policies in line with the "Policy scenario" in the NECP, and introduce additional measures to reach climate and energy targets, and to reduce its high energy import dependence.

There is a need for the rapid increase of heat pumps and solar in H&C sector, including through legally binding goals and targets as well as with more economic favourable conditions for

change from gas heating to heat pumps and district heating. The favourable conditions can be made with subsidies and with climate taxes on fossil fuels as well as with low-interest loans.

The expected increase in biomass for energy, including for heating, should be reconsidered. A reduction of biomass use would increase sustainability, both by reducing imports of biomass and by enabling a more sustainable domestic production of biomass for energy. This will also make it easier for Italy to reduce emissions and increase removals of CO₂ from the atmosphere in the LULUCF sectors (where Italy is also not on track to meet its EU 2030 targets).

The use of solid biomass, biogas and bioliquids should comply with sustainability requirements. In order to stimulate the renewal of old installations with efficient and low emission technologies, strict performance requirements for access to incentives for biomass boilers and heat generators shall be maintained.

Support for energy efficiency including energy renovations of houses should be increased and the subsidies can be supplemented with low-interest loans. A special program should focus on rented homes that need special measures as existing measures (subsidies) do not work so well for them.

Regarding energy communities, the improved legislation and support should be followed to ensure that it in practice supports a large expansion of energy communities that contribute to the energy transition with renewable energy, energy flexibility, and others.

The plans for developing nuclear energy as part of the solution for decarbonisation should be avoided. It would trap Italy into the constantly increasing costs of new nuclear reactors. In addition, the global geopolitical vulnerability imposes new risks for nuclear countries, related to potential troubles with production of uranium and nuclear fuel from one side and spent fuel management from other.

Plans for CCS should be reconsidered and potentially abandoned.

Italy also should make fast improvements in dealing with the energy poverty. More concrete, a legally binding definition is needed to be imposed and further monitoring and measures for poverty alleviation to be implemented in practice. The poverty alleviation should be linked to energy efficiency improvements with substantial support for low-income families to reduce consumption with increasing energy efficiency.

LITHUANIA

The following analysis is based on [Lithuania - Final updated NECP 2021-2030 \(submitted in 2024\) - European Commission](#) published 7 October 2024. Page numbers refer to the English version of the National energy and climate plan (NECP).

1. TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For Lithuania, the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3) including national indicative increase (the total RED 3 target), is 2.1 %-point increase per year 2021-2030. The minimum binding target for all EU countries is 0.8 %/year increase 2021-2025 and 1.1% 2026-2030.

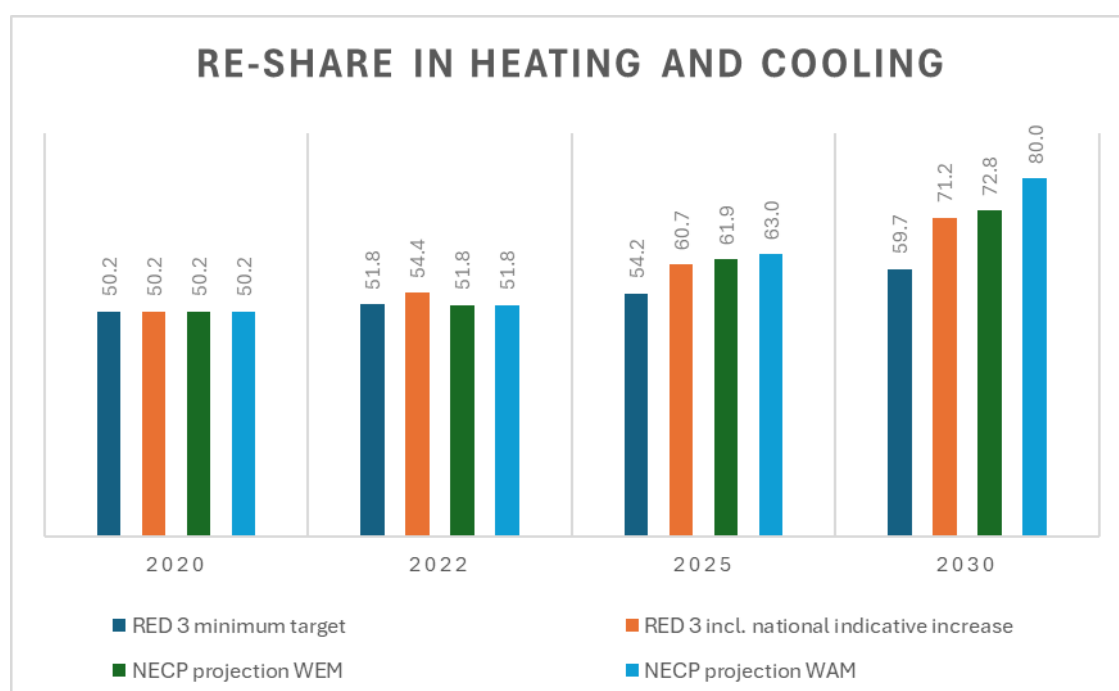


Figure 1. Renewable share in % of heating and cooling for Lithuania, RED 3 binding share, RED 3 including national indicative increase and projection with policies and measures in NECP for 2025 and 2030 compared with base year 2020 and latest statistics from 2022. The NECP projection is with existing measures (WEM) and with additional measures (WAM)(p. 36, 233).

Lithuania intends to include waste heat and cooling in the calculation, this will result in higher targets. (p. 37).

The main part of the renewable energy share comes from biofuels both in district heating and individual heating. All biofuels are from local resources, and there is no biomass import for heating purposes (p. 247). The amount of energy consumption in the heating and cooling sector is heavily decreasing due to improved energy efficiency. Thus, biomass consumption will also decrease between 2022 and 2030 (p. 42).

Only looking at district heating, the biomass consumption will increase a little – and the biomass share (RE share) will increase to 90% by 2030, due to new biofueled combined heat and power plants (CHP).

Other national targets from policies in the Lithuanian NECP are:

- 100% RE in electricity by 2030 according to the Lithuanian 2023 Renewable Energy Sources Act (p. 62).

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS

For Lithuania, the target is a reduction of 21% greenhouse gases (GHGs) between 2005 and 2030 of the emissions not covered by the current EU Emission Trading Scheme (ETS1) or by the Land-Use, Land -use Change and Forestry (LULUCF) regulation (p. 32).

With additional policies and measures, Lithuania will reach the target (p. 254-55).

1.3. ENERGY IMPORTS TARGETS AND DEPENDENCY OF IMPORTS

Lithuania has not set a specific target for energy imports.

Following the National Strategy for Energy Independence (NENS), Lithuania plans a transition to an electricity economy to enhance energy security (p. 10).

There are very little data available about import in the Lithuanian NECP, but there is close to 100% import of fossil fuels. Lithuania plans to reduce import of fossil fuels by switching to renewable energy (biomass, wind, etc.)(p. 242).

1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

Lithuania has introduced the following targets to support decarbonisation of heating and cooling:

- Eliminating the consumption of fossil solid and liquid fuel for heating before 2050 (2,5 TWh in 2020)(p. 146).
- Significant reduction of natural gas consumption in heating before 2050 (6,7 TWh to 0,4 TWh)(p. 146).
- eliminating inefficient sources of biofuel production before 2050 (2.3 TWh in 2020)(p. 146).
- Seven times increase of ambient heat before 2050 (heat pumps or waste heat)(from 0,8 TWh to 5,9 TWh)(p. 146).
- Renovation of 5000 multi-apartment buildings or 75.000 m² before 2030, with energy savings of around 5.5 TWh (p. 56).
- Refurbishment of 510.000 m² government buildings, and 450.000 m² municipal buildings before 2030 (p. 56).
- 90% RE in Heat from District heating before 2030 (p.146).
- By 2030, 11,300 boilers will be replaced by heat pumps in households, leading to annual savings of 1,22 TWh (p. 163).

- Installed around 40 MW heat pumps in the district heating sector before 2030.

1.5 TARGETS ON ENERGY EFFICIENCY COMPARED TO THE EE TARGET IN EED

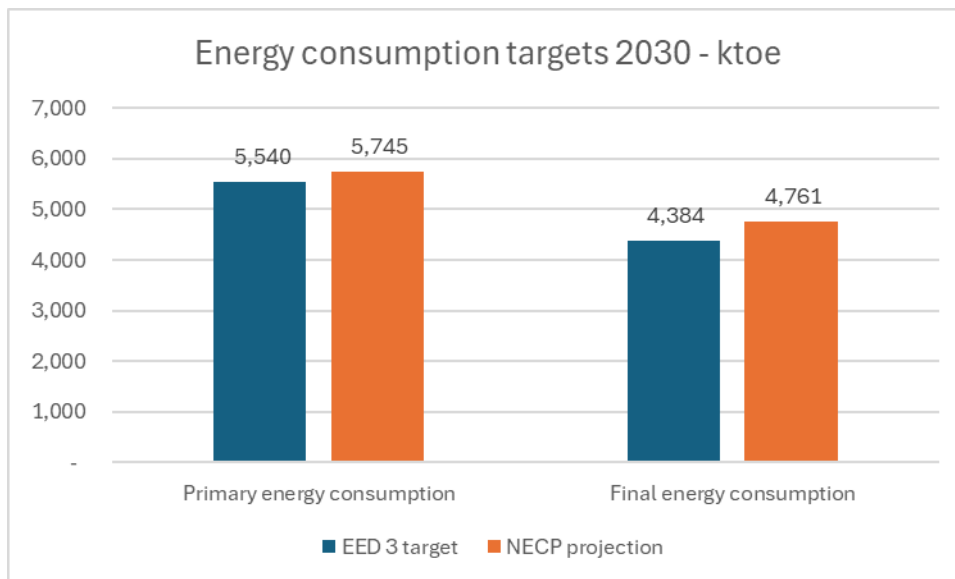


Figure 2. National target for energy consumption according to EED 3 and the projection of consumption in NECP based on scenario with existing measures (WEM)(p. 239).

The Lithuanian NECP, as currently proposed, does not achieve the revised Energy Efficiency Directive (EU/2023/1791)(EED 3) targets, with heating and cooling approximately 47% of the final energy consumption. Therefore, to reach the energy efficiency targets further reduction efforts are needed.

2. POLICIES TO ACHIEVE THE HEATING TARGETS

“Lithuania’s primary objective for the heat sector is the decarbonisation of the heat sector and the coherent and balanced renewal (optimization) of DH, ensuring efficient heat consumption, reliable, economically attractive (competitive) supply and production, enabling the deployment of modern and environmentally friendly technologies using local and renewable energy sources, ensuring flexibility of the system and enabling investment environment” (p. 41).

District heating (DH) plays an important role in Lithuania, with about 57% of heating being supplied by DH. All cities have DH systems, where 80% of all buildings are supplied. It is planned that renewable energy in district heating will be 90% in 2030 (p. 41-42).

Lithuania has made a National Strategy for Energy Independence (NENS). NENS aims for the development of district heating by introducing new technologies, such as industrial size heat pumps, use of waste heat, and electrode boilers (p. 72).

To increase renewable energy in district heating, Lithuania is planning a range of measures (p. 147):

- Installation of small-scale biofuel cogeneration plants, suitable for logging residues. Up to 20 MW before 2030.
- Installation of heat pumps.

- Installation of thermal storage tanks, in order to meet the peak needs of the heating system by biofuel produced heat.
- Installation of solar collector systems to supply district heating.
- Use of waste heat from hydrogen production

Biofuels for district heating will continue to play an important role, but it is planned that biomass for heating will meet the sustainable requirements.

Energy renovation of multi-apartment buildings and introduction of new technologies (heat pumps, efficient biofuel boilers, etc.) will have the greatest impact on the increase of RE in energy consumption for heating.

Lithuania is planning to replace obsolete biofuel boilers with heat pumps and efficient biofuel boilers. Lithuania will financially support households to make the replacement (p.126).

Lithuania plans to reduce subsidies on fossil fuels used for heating. Following the Law on Excise Duties May 2023) tax benefits are reduced, and 13 energy subsidies will be phased out by 2026 (p. 156).

Energy poverty

Lithuania is already facing energy poverty. Many Lithuanians faced difficulties in paying for energy and heating even before the energy crisis was more pronounced. "According to the EU survey on income and living conditions in 2018, more than a quarter (27.9 %) could not afford to keep their home adequately warm due to lack of funds." Though Lithuania has reduced energy poverty, it is still much higher than the EU average, and further measures are still required (p. 69).

Lithuania is focusing on reducing the root causes of energy poverty, by reducing high energy costs compared to the household budget, increasing income and improving the energy performance of buildings (p.71)

To counteract increasing energy prices, Lithuania is increasing social benefits like pensions and child benefits, as well as increasing tax-free income. Further there is financial support for households to pay heating bills (p. 70).

Lithuania has a target to decrease the share of households that spend a significant part of their income on energy expenditure from 17.1% in 2016 (baseline) to 15% in 2025, and 8.6% in 2030 (p. 71).

Energy efficiency campaigns, including tailored advice provided by one-stop shops, will be directed towards low-income households (p. 69).

The Social Climate Fund plan will focus on the most vulnerable groups. The following measures will be eligible for funding: connection to district heating, energy efficiency solutions, change to renewable energy, and energy communities, a.o. The Social Climate Fund will be implemented between 2026 and 2032. (p. 13).

Lithuania has the following existing and planned measures to combat energy poverty (p. 194):

EXISTING MEASURES

- EN1- Compensation for the cost of heating the dwelling
E
- EN2- Payment of credit taken out for the renovation (modernisation) of a multi-apartment building and interest for persons entitled to compensation for heating costs of the dwelling
E
- EN3- Encourage deprived persons to purchase solar power plants and/or replace fossil fuel heat installations
E
- REI6- Create energy resource communities in municipalities, with a share of built power plants being allocated to the poor (energy poor)
E

MEASURES PLANNED

- EN4- Information on compensation and energy savings for hard-to-reach consumers (not using information technology tools)
P
- EN5- Create an information hub for information on energy savings, compensations and energy communities
P

Electricity-to-gas price ratio

No projection of gas and electricity prices for households is included in Lithuania's NECP, while the historical prices are given in figure 3.

Gas and electricity prices are available at Eurostat, and we have looked at data for the last four years.

Lithuania	2021	2022	2023	2024
Gas price (cent/kWh)	2.79	5.87	18.49	7.39
Electricity price (cent/kWh)	12.87	14.27	28.09	20.12
Electricity-to-gas price ratio	4.6	2.4	1.5	2.7

Figure 3. Average gas and electricity prices in cent/kWh for private consumers (first half of the year) and the respective price ratio. The price includes taxes. The gas price is for consumers with a consumption of 20-200 GJ/year, and the electricity price is for consumers with a consumption of 5.000-15.000 kWh/year. Source: Eurostat, nrg_pc_202 and nrg_pc_204.

The electricity-to-gas price ratio is fluctuating. At the current ratio close to 3 heat pumps are not the cost-efficient option.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

The Lithuanian NECP is on track to meet the targets for reduction of GHG emissions outside the EU emission trading scheme. The target is reached when additional measures (WAM scenario) are taken into account.

The Lithuanian NECP is meeting the renewable energy target in heating and cooling with existing measures. By 2030, Lithuania will reach 72.8% renewable energy in heating and cooling with existing measures (WEM), and 80% with additional measures (WAM, which both are above the target.

A large part of Lithuania's renewable energy comes from biomass, but the bioenergy demand for heating will strongly decrease towards 2030, due to higher efficiency in the heating sector. Furthermore, all Lithuanian biomass consumption comes from own resources.

Finally, Lithuania is not on track to meet the EU energy efficiency targets. Primary energy consumption in 2030 is projected to be 4% higher, and final energy consumption nearly 10% higher than the respective EED 3 consumption targets. Therefore, Lithuania needs to do more to reduce energy consumption.

At the same time, Lithuania faces a high degree of energy poverty, which also needs to be tackled.

We have the following suggestions to improve Lithuania's policies and measures:

- Biomass use for heating should be further reduced by focusing on other renewable energy sources.
- Clear and high targets for heat pumps should be introduced.
- The support for efficient and renewable heating and cooling should have a special facility for community heating and cooling initiatives, including energy communities with electricity production for members' heat pumps and for local district heating schemes based on renewable energy and excess heat use.
- Support natural refrigerant cooling and heating equipment, including in heat pump subsidy schemes.

NETHERLANDS

The following analysis is based on [Netherlands - Final updated NECP 2021-2030 \(submitted in 2024\)](#), published on 26 June 2024. Page numbers refer to the National energy and climate plan (NECP), English version.

Annexes are available in Dutch

at https://www.tweedekamer.nl/kamerstukken/brieven_regering/detail?id=2024Z11105&did=2024D26463. Annex 6. Potential Analysis Heating and Cooling, 2024 (data on 2022)- (<https://www.tweedekamer.nl/downloads/document?id=2024D26466>)

1. TARGETS

1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For the Netherlands, the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3), including national indicative increase (the total RED 3 target), is 1.9%-point increase per year 2021-2030. The minimum binding target for all EU countries is 0.8%/year increase 2021-2025 and 1.1% 2026-2030.

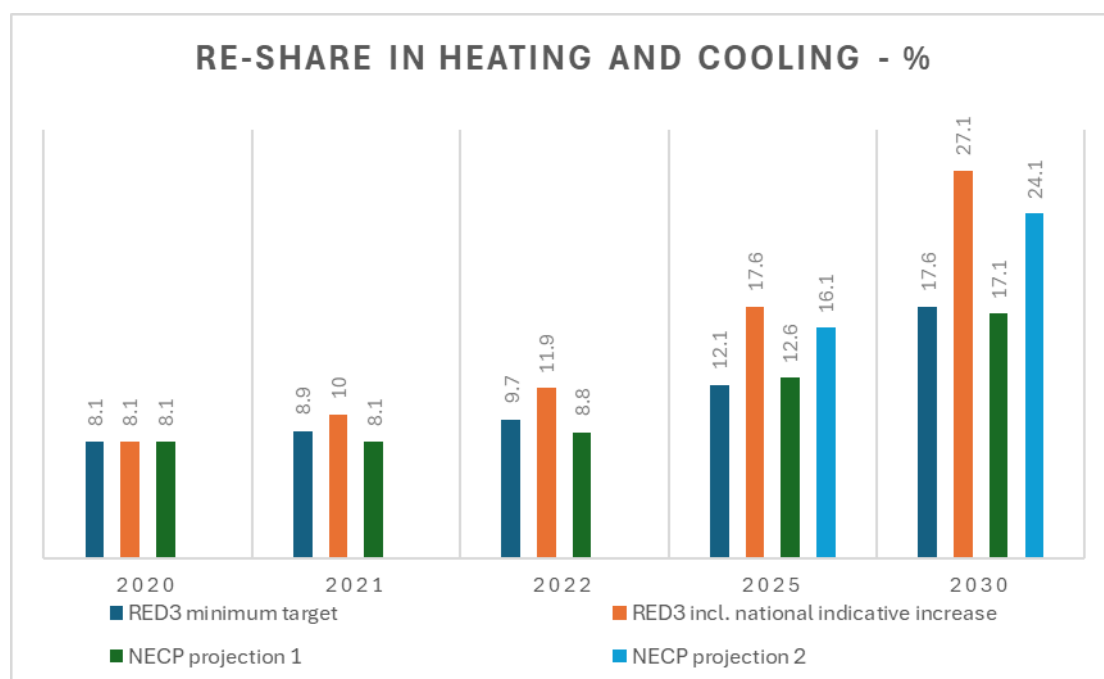


Figure 1. Renewable share in % of heating and cooling for Netherlands, RED 3 minimum binding share, RED 3 including national indicative increase and two projections (see below) with policies and measures in NECP for 2025 and 2030 compared with base year 2020 and latest statistics from 2021 and 2022 (p.183).

The big variations between the two forecasts are due to uncertainty of the successful implementation of the climate plan. The number of installed heat pumps, and the energy savings which also contribute to the increase of the share. Forecasts are from the Climate and Energy Outlook 2023 (KEV2023), but the KEV2023 includes effects of policies that were not defined (p.6, p.183). With additional climate plans in KEV2023, the minimum 2030 target is within reach, but the indicative target is not to be reached with current policies or plans (p.183).

The NECP does not include a forecast of renewable energy shares in heating and cooling divided in sources, but in fig. 2 is give this division with the latest available statistics.

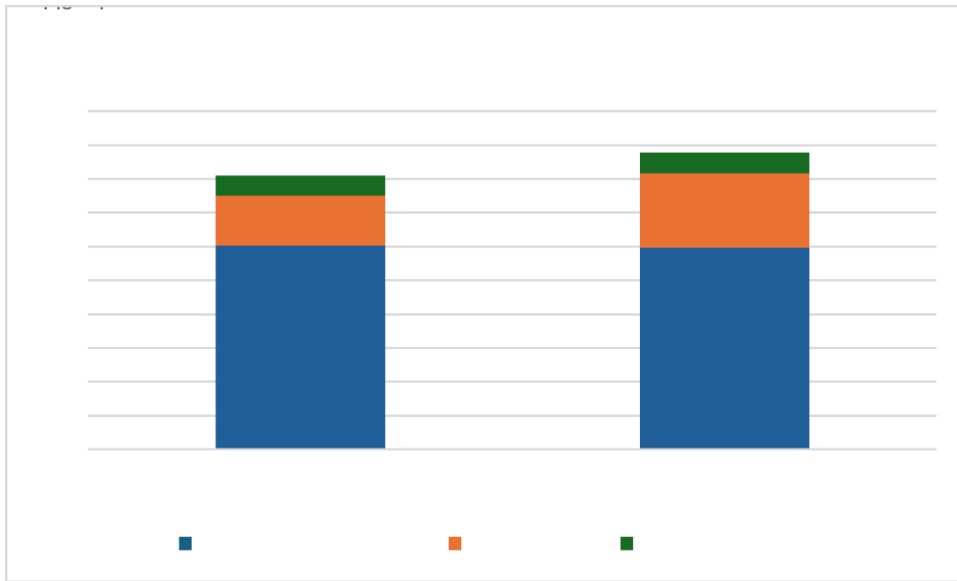


Figure 2. Renewable share in % of heating and cooling divided in sources for base year (2020) and latest available statistics (2023), not including renewable electricity (calculated from Statistics Netherlands, quoted p.206).

The Netherlands imports the majority of its biomass consumption, also of woody biomass used for heating. The biomass use has been reduced since 2020, which reduces the import, but the import is not likely to be phased out in the coming years.

Renewables & waste heat in district heating

RED 3 includes an indicative national target of annual increase of the *share of energy from renewable sources and from waste heat* in district heating of at least 2,2% per year in 2021-2030 compared to 2020. In the Netherlands in 2020, the *share of renewable energy in total heat* produced was 36.5% and the share of waste heat 8%, together 44.5% in the large heat grids. According to KEV2022, the renewable energy share will increase to 51% and the share of waste heat increase to 13%, together 64% by 2030, an increase of 2% per year. (page 183). The present share of district heating of dwellings is small, only 6.7% (2022). (Page 140)

The RED 3 EU-wide target for RE in the building sector is 49% in 2030. Netherlands can reach this target with policies included in KEV2023. The additional policies in KEV2023 will increase the share of renewable energy in the built environment from 41% to 49 % by 2030 (p. 183). This will be a large increase from 17% in 2021 and policies mentioned in KEV2023 are not all in place to reach the target.

Other national targets/forecasts from policies in the Dutch NECP are:

- Use of ambient heat with heat pumps is expected to double from just over 20 petajoules in 2022 (CBS, 2023c) to 38.2 petajoules in 2030 and 57.6 petajoules in 2040 (KEV2022). Deep geothermal heat is expected to increase from 6.8 petajoules in 2022 (CBS, 2023c) to 15.9 petajoules in 2030 and 28.3 petajoules in 2040 (KEV2022).

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS

For the Netherlands, the target is a reduction of 48% greenhouse gases (GHGs) between 2005 and 2030 of the emissions not covered by the current EU Emission Trading Scheme (ETS1) or by the Land-Use, Land-use Change and Forestry (LULUCF) regulation. This is an improvement compared to the previous target of 38%, following the revised EU effort sharing regulation (ESR), (EU) 2023/857.

The forecast is that Netherlands will reach this target (p.130, fig.4.4).

ESR also sets maximum cumulative GHG emissions for the non-ETS sector allowed for the Netherlands for the period 2021-2030. This is expected to be 833 MtCO_{2e}. Based on updated estimate in KEV2023, the cumulative estimated non-ETS emissions for 2021-2030 amount to 794-834 MtCO_{2e}. (p.27). Thus, the expectation is that the Netherlands will reach this target.

The projected contribution of the built environment is an emission reduction of 4.7 MtCO₂ from 24.3 MtCO₂ in 2021 to 19.6 MtCO₂ in 2030. Industry, the other main heat and cold using sector, is forecasted to decrease emissions from 4.4 MtCO_{2e} from 53.6 to 49.2 MtCO_{2e} (p.128, table 4.7).

1.3. ENERGY IMPORTS TARGETS AND DEPENDENCY OF IMPORTS

There is no domestic production of oil, coal or uranium in Netherlands. Also, biomass and gas are imported as domestic production is not sufficient. Biomass and gas are major energy sources for heating. Coal and uranium contribute to heating via electricity production with electricity used in heat pumps and for direct electric heating. A small part of the coal import is used for industrial heating.

Netherlands is a big importer of energy and also a big transit country in particular for gas and oil with over 70% of the imported gas and over 90% of the imported oil being exported. The Netherlands import gas both via pipelines and via LNG terminals that have been expanded in recent years.

In 2030, it will no longer be allowed to generate electricity from coal, resulting in a phase out of coal for heating (via electricity and district heating).

There are restrictions and partial bans on use of gas and oil for heating, see below section 1.4 on domestic target and section 2 on policies.

There are policies to reduce fossil fuel consumption and an ambition also to reduce biomass consumption for energy as well proposals to increase gas production from the North Sea. All of this will reduce Netherlands' energy import demands. There are, however, no specific forecasts or targets for the reductions of energy important, except for the coal phase out mentioned above.

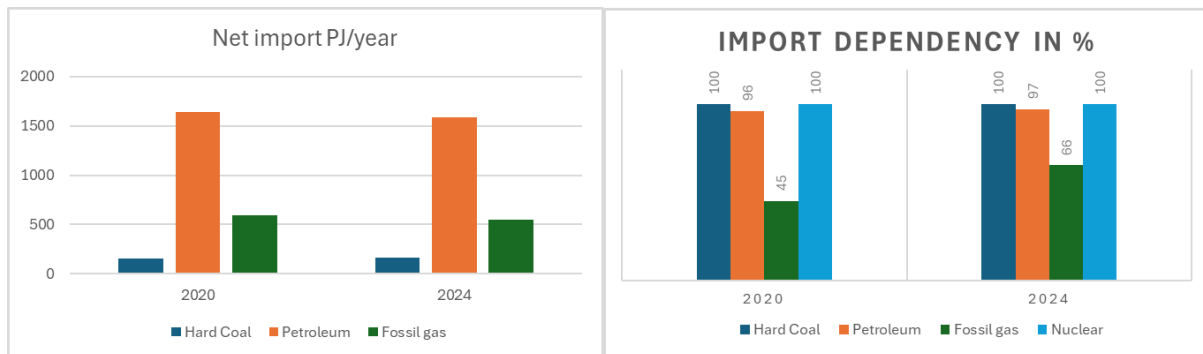


Figure 3. Dependency on import for total fossil primary energy consumption. (for 2020 calculated from NECP Annex 4 for 2020 and for 2024 from Statistics Netherlands - cbs.nl.

1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

The Netherlands has introduced several bans, targets, and restrictions in the building sector to phase out fossil fuel heating and transition to sustainable alternatives.

- Heat Pump target: 1 million installed heat pumps including hybrid heat pumps in the existing construction by 2030 (p. 75). (149,000 heat pumps sold in 2023 (55% Growth Since 2021, but only sold 110,000 in 2024 according to Milieudefensie, NL).
- Energy Efficiency Targets (p.75). Insulate 2.5 million dwellings until 2030, including 1.5 million poorly insulated dwellings (label E, F, G). 750,000 of the dwellings shall be with vulnerable families.
- Insulate 15% of G-labelled buildings by 2027 and insulate 60,000 F-labelled buildings to label C until 2030.
- Connect 500,000 houses to district heating by 2030.
- Blending 1.1 bcm (44 PJ) green gas into the gas network for use by ETS2 costumers (mainly dwellings and smaller SME business) Ban on Coal for Electricity Generation from 2030/2025.
- According to the Coal Prohibition Act (2022), from 2030, coal-fired power plants can no longer generate electricity using coal (p. 156). The Amercentrale power plant must stop using coal by 2025, while Rotterdam, Eemshaven, and Onyx plants must stop by 2030. (S 4.2). As heat pumps use 1/3 electricity, it is important that the electricity comes from renewables. (1 kW electricity gives 3 kW heat)(4.2: Energy Sector Decarbonization)

1.5 TARGETS ON ENERGY EFFICIENCY COMPARED TO THE EE TARGET IN EED

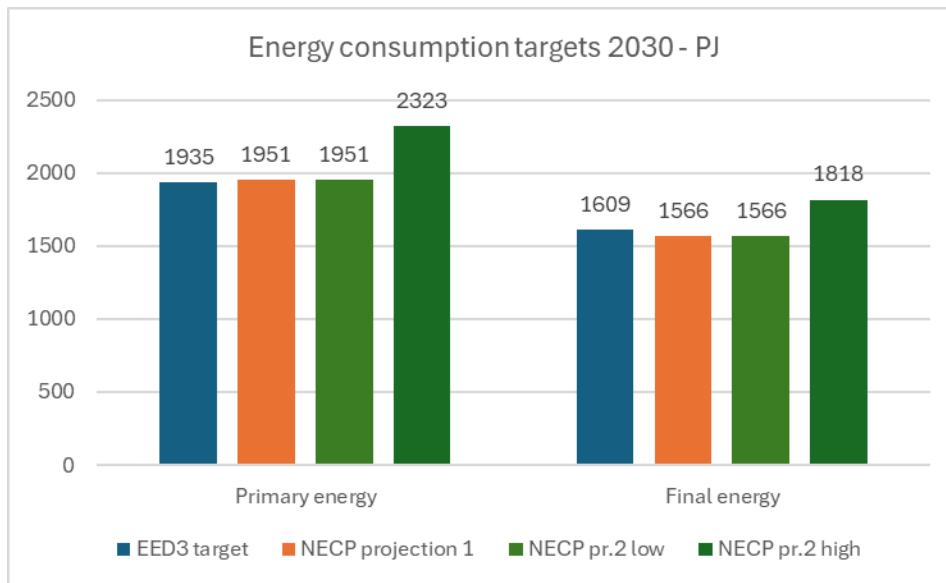


Figure 4. National target for final energy and primary energy consumption according to EED 3 and the projection of NECP.

According to EED 3, the indicative Final Energy Consumption (FEC) target is 1,609 PJ for 2030. The projection in KEV2023 is a FEC of 1,566 - 1,818 PJ. Thus, the target is achievable with full policy implementation such as strong promotion of (hybrid) heat pumps, realizing all the energy efficiency targets, moving towards soft and electric mobility, and tailor-made arrangements in industry. However, there is a range given in KEV2023, of which a part is due to non-controllable influences such as energy prices and the weather (p.183).

According to EED 3, indicative Primary Energy Consumption (PEC) Target is 1,935 PJ for 2030. The projection in KEV2023 is a PEC of 1,951 - 2,323 PJ. Thus, the target is not to be achieved with the measures planned. To reach the target, additional energy efficiency efforts are needed. It is noted however that the target is within reach if the implementation of the climate plan maximises its impact and that energy savings can be substantiated through monitoring reports (p. 184).

The heating and cooling share of the final energy consumption is about 50% in Netherlands. Of the heat consumption 35% is in households, and 15% services, 40% is in industry, and 10% in agriculture. (annex INEK-2024-3 "Potentieel Analyse Warmte & Koude 2024" (p. 6 and 8).

The EED 3 also includes a binding energy savings obligation on cumulative final energy consumption through national policies for the period 2021-2030 (Article 8). This target is 1,285 petajoules for the Netherlands. With the policies included in the KEV2023, cumulative savings of 1,168-1,415 petajoules are expected. The objective is therefore within reach, provided that the implementation of the climate plans maximises impact and that energy savings can be substantiated through monitoring in the reports to the European (p. 184).

2. POLICIES TO ACHIEVE THE HEATING TARGETS BY 2030

Policies to mainly to transition away from fossil fuels

- Ban on New Natural Gas Grid Connections for New Buildings
Since 2018, it is not allowed to connect new residential buildings to the natural gas grid. New buildings must use district heating, heat pumps, or other renewable heat sources instead. (Gas network policy).
- Phase-Out of Natural Gas in Existing Buildings
The government is gradually phasing out natural gas for heating as part of the Municipal Heat Transition Plans. Local authorities are responsible for transitioning neighbourhoods off gas by implementing alternatives like district heating and hybrid heat pumps. (Built environment).
- Strong Restrictions for Oil Boilers, and support schemes for alternatives. There is a no ban yet, but there is a plan for a ban of fossil fuels in heating at extensions, new buildings. (p.194).
There are requirements for new boilers and there is a ban on new sales of (stationary) fossil combustion engines in 2035 (p. 7, 194).
- Mandatory Hybrid Heat Pumps (from 202) → *Tighten the requirements for the efficiency of heating installations*. In doing so, *the (hybrid) heat pump becomes the standard for heating homes, shops, schools and offices*. This standard applies at the natural replacement times of the boiler and contributes to the upscaling of the (hybrid) heat pump in the built environment (p. 74). (After the NECP was finalized, the government changed the policies and stopped the requirement of hybrid heat pumps. This change makes the target of one million heat pumps unlikely to be achieved unless new, strong support is introduced for replacing gas boilers with heat pumps, information from Milieudefensie, NL).
- Additional stimulation of hybrid heat pumps installation in existing construction (KEV 2023).
- Standardization of heating installations (KEV 2023).
- Heat Fund & Low-income household support (0% interest loans for heat pumps & insulation)(p.75).
- Promoting Geothermal and green gas with Climate Fund (p. 90).
- Stricter Renewable Energy Requirements for Heat Networks under the upcoming Collective Heat Act (p. 93).
- Tax exemption for dual use of coal in industry will be abolished by 2027 (p. 194).
- Planned Ban on Fossil Fuels in Industrial Heating Processes
The government *plans to ban* on the use of fossil fuels in heating processes in new and replacement industrial production facilities (p. 194).
- SDE ++ Scheme for Renewable Heat Technologies in industry (p. 97).
- Phase-Out of Fossil Fuel Subsidies
 - Energy tax benefits for fossil fuels are being phased out, including:
 - End of reduced energy tax for greenhouse horticulture (2025).

- Limitations on tax exemptions for natural gas in combined heat and power (CHP) plants (p. 179).

- Expansion of National district heating network, to realise the target of 500,000 new connections by 2030 (p. 75) and supported by heat network investment subsidies (*Heat Network Investment Subsidy* – WIS of 600 million € from 2023 with a reservation of 1 billion € from 2025)(p. 76).
- Subsidy scheme for Cooperative Energy Generation (SCE) for a cooperative, housing associations or Association of Home Owners (VvE), which generates renewable electricity. (500 million € in 2022, but zero in 2023, and 2024.) (p. 90, p. 176 table 4.11).
- Blending obligation for green gas: About 1,1 bcm of green gas into the gas supply to ETS2 Energy customers (p. 76).

Policies to mainly to Improve Energy Efficiency (EED Compliance)

Building Renovation Strategy - Energy Efficiency and Insulation Programs:

- Residential Insulation Plan to Insulate 2.5 million dwellings by 2030. The focus is on the 1.5 million poorly insulated dwellings (energy labels E, F and G). More than 4 billion € is available for this purpose. Out of these 2.5 million dwellings:
- 750,000 dwellings owned by *vulnerable households* insulated through a local approach together with municipalities.
- 1 million rented dwellings insulated by landlords to the Standard for Housing insulation.
- 750,000 owner-occupied dwellings accelerated on their own initiative through, inter alia, subsidies like ISDE, SVVE and the *Heat Fund* (p. 75).
- Additional energy savings are also made with low-threshold measures and the deployment of energy fixers. This helps alleviate energy poverty and make vulnerable households more resilient to high energy prices (p. 75).

Energy labelling & Renovation Obligations. Phasing out poorly insulated buildings (Energy labels E, F, G by 2027-2029):

- *Renovation obligation of public institutions* to phase out poor energy labelled in non-residential public buildings (label F, G) (p. 38) (*EED 3 targets: 3%/yr annual target for renovation of public buildings above 250m², and 1.9% annual reduction*) (p. 38.)
- Making the 15% of buildings with worst energy performance more sustainable by 2027, energy label G according to the new label classification to a minimum C energy label (60,000 buildings) (p. 75).
- Make buildings with energy label F more sustainable in 2030 according to the new label classification to a minimum C energy label (60,000 buildings) (p. 75).
- Public institutions have to be renovated to NZEB standards (Article 6, Article 9 of Directive 2010/31/EU) (p. 38).

- Additional Renovation Performance Agreements with housing corporations, phasing-out of rented dwellings labels EFG as of 2029, and rent regulation (see section on energy poverty). (KEV 2023).

Other policies for building renovations

- Subsidy schemes for sustainability/energy renovation of owner-occupied dwellings,
- Subsidy scheme DUMAVA (Sustainable Social Real Estate) to public buildings (schools, theatres, gyms, etc.) to sustainable renovations (p. 179).
- Energy efficiency requirements. All new buildings must meet Nearly Zero-Energy Building (NZEB) standards (since 2021) (p. 140), requiring minimal fossil fuel use. Existing buildings undergoing renovations must improve energy efficiency and consider renewable heating. Homeowners are encouraged to switch to heat pumps and solar thermal systems through financial incentives. (Section on Energy Performance Requirements).
- Tightening of energy performance requirements in 2025 based on reports to be made every five years on the cost-optimal nature of the minimum energy performance requirements, implementation of EU EPBD (p. 141).
- Mandatory Energy Labelling & Phasing Out Inefficient Buildings
 - Ban on renting out poorly insulated homes (Label E, F, G) from 2029 (p. 84).
 - Ban on worst-performing commercial buildings (15% lowest energy labels) from 2027.
 - Ban on renting out poorly insulated homes (Label E, F, G) from 2029 (p. 84).
 - Ban on worst-performing commercial buildings (15% lowest energy labels) from 2027.
- New methodology and energy performance requirements for buildings (NTA 8800). Published in June 2019 and designated in the building regulations as of 1 January 2021. The energy labels of dwellings and buildings are also generated on the basis of the NTA 8800 and the recording protocols (p. 140).
- Sustainable Built Environment Program (PVGGO) includes financial measures to improve the cost-effectiveness of interventions in buildings and increase the investment capacity and willingness of building owners. Key instruments include: Construction Flows Programme; Municipal heat plans and standards for buildings; Pooling public and private money into the Heat Fund, enabling attractive financing for building owners: Public sector roadmap. A revolving fund is also being set up to help finance investments in public buildings (p. 74).

Public Awareness Campaigns for Awareness and Behaviour Change:

- Campaign "Zet de Knop Om" ("Turn the Switch") launched in 2022. It helps citizens, businesses and institutions. In 2023-24 the focus was widened to climate and energy transition, and focuses on both How? and Why? (p. 16).

- Annual National Climate Week showcasing sustainable initiatives. The aim is to encourage behavioural change by making the movement from society towards sustainability visible and inspiring to take additional steps (p. 16).
- One-stop shop for building owners on their sustainable investment decisions, e.g. the platform “Upgrade” (verbeterjehuis.nl) and with care arrangements. This provides building owners with a one-stop shop and support the sustainability of buildings (p. 60).

Cost of the policies in the NECP

The Dutch government have estimated the state budget expenditure of its climate policy, ranging from 5.1 billion € in 2022 to 7.9 billion € in 2026 and then decreasing to 7.3 billion € in 2028. The expenditure within the built environment is given in the table below.

Year	2022	2023	2024	2025	2026	2027	2028
Million €	608	1,240	1,696	1,510	982	729	598

(p.195 table 5.10)

Available funding from European funds for climate and energy projects in the Netherlands

Part of the government’s climate and energy spending is financed by European funds. In addition, direct funding is also available from European funds for local authorities, businesses and citizens. The most relevant EU funding sources for decarbonization of heating and cooling in the built environment are:

- European Regional Development Fund (ERDF) 124 million € for climate or energy
- JUST Transition Fund: 623 million € for 2021-2027
- Social Climate Fund 720 million € for 2026-2032
(p. 197 table 5.12)

Besides there are: Horizon, Life, Interreg, EIB, Invest Europe, Connecting Europe facility, European Local Energy Assistance. There is also a Renewable Energy Financing Mechanism that Netherlands has not used yet.

Energy poverty and Just Transition

The Netherlands has several policy orientations that contribute to reducing energy poverty and is working on strategic policy on this (see Ch. 3.4.4). In particular, in the built environment, there is care and support for vulnerable households. Some of the energy poverty reduction measures overlap with above-mentioned energy efficiency measures (p. 74, p. 83). The measures include:

Rent Ceiling included in the Supplementary Agreements with housing corporations (National Performance Agreements) that the insulation costs will not be allowed to be passed on to higher rents at the 450,000 dwellings which will be natural gas free and 675,000 homes, which will be insulated. The agreement with landlords is to accelerate the sustainability of all social rental housing with the lowest labels (E, F and G) until 2028. Landlords of private rented dwellings will have to comply with this requirement until 2030. In order to allow tenants to benefit from this

sustainability, it has been agreed that they will not receive any rent increase following insulation measures leading to a better energy label. This has helped lower incomes in particular because they are relatively more likely to live in rented dwellings (p. 83)

Insulation of 750,000 dwellings owned by vulnerable households is planned through a local approach together with municipalities as part of the 2.5 million dwellings (part of 4 billion € mentioned above).

Heat Fund & Low-Income Household Support

0% interest loans for heat pumps & insulation for low-income households.

Through the Heat Fund, the government is also investing extra in making vulnerable neighbourhoods and villages facing a high share of energy poverty more sustainable. The Heat Fund, is ensuring accessible funding for low and (low) middle-income earners. The 0% interest rate is widened to cover incomes up to 60,000 €. For Apartment Owners Association (VvE), there will be a *rebate on interest rates*.

Investment Subsidy Sustainable Energy and Energy Savings (ISDE) to support the investment in, inter alia, insulation and heat pumps.

Measures to facilitate the construction of solar panels in the rental sector strengthens vulnerable neighbourhoods in the rental sector.

Subsidizing Energy fixers. Making funds available for DIY vouchers, deployment of energy fixers who make low-threshold energy-saving measures. This helps to save energy, decrease the energy bills, alleviate energy poverty and make vulnerable households more resilient to high energy prices.

Price cap. In 2023, a temporary price cap for retail consumers for gas, electricity and heat was occasionally introduced, as the energy market had high prices with high volatility during that period. In order to provide timely support and certainty to households, the price cap intervened in energy bills. The mechanism with volume limits of 1,200 m³ gas and 2,900 kilowatt-hour of electricity per household does maintain a full marginal price incentive for a part of households, leaving – albeit more limited – market forces and an incentive to become more sustainable (p. 48).

A National Energy Poverty Research Programme launched in 2022 and commissioned the Central Statistical Office (CBS) to develop annual Energy Poverty Monitor, which was published for 2022, and 2023 (p. 161).

The **energy poverty monitor** program is introduced. It defines energy poverty as lack of access to affordable modern forms of home energy. Energy-poor households often have high energy costs compared to their income, as they often live in poorly insulated homes. The monitor defines 4 types of indicators for energy poverty in households:

- HEQ: High energy bills (more than 10% of income used for energy).
- LIHE: The combination of low income and high energy bills.
- LILEK: Poor dwelling.
- LEKWI: low-energy quality dwellings and little space for investment to improve dwellings. A household is considered to have little investment space, if its financial capacity to invest is below 40,000 €.

Of the indicators, the most widespread is poor housing and low investment space (LEKWI) covering 16% of the households. Of these, more than 456,000 households struggle to pay their energy bills (p. 162, graph). The vast majority of this group live in rented dwellings (88.7%). Around 11% have owner-occupied dwellings (p. 162).

Electricity-to-gas price ratio

No projection of gas and electricity prices for households is included in the Netherlands NECP, while the historical prices are given in figure 5.

Gas and electricity prices are available at Eurostat, and we have looked at data for the last four years.

Netherlands	2021	2022	2023	2024
Gas price (cent/kWh)	9.61	12.44	19.88	16.26
Electricity price (cent/kWh)	17.45	14.52	48.49	29.32
Electricity-to-gas price ratio	1.8	1.2	2.4	1.8

Figure 5. Average gas and electricity prices in cent/kWh for private consumers (first half of the year) and the respective price ratio. The price includes taxes. The gas price is for consumers with a consumption of 20-200 GJ/year, and the electricity price is for consumers with a consumption of 5.000-15.000 kWh/year. Source: Eurostat, nrg_pc_202 and nrg_pc_204.

Electricity got very expensive in the first half year of 2023, also more expensive compared to gas. In 2024 the ratio fell to the same level as it was in 2021. With the 2024 ratio between gas and electricity, heat pumps have an economic advantage, if low-interest loans or similar funding is available.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

With the plans presented in the Dutch NECP, the minimum target for renewable energy in heating and cooling in 2030, the EED 3 final energy consumption target, and the non-ETS ESR target are within reach. The indicative national target for renewable energy in heating and cooling as well as the EED 3 primary energy consumption targets are not within reach, even if all measures are implemented in the KEV2023 climate and energy plan.

To meet the target on renewable for heating and cooling, additional measures are needed, in addition to the measures in the KEV2023. To reach the primary energy target, the Netherlands can save final energy, for instance in heating and cooling, or can reduce energy losses in the conversion between primary and final energy.

The Netherlands is very dependent on energy imports of all forms. It has a security of supply issue with the large imports. Reduced imports of nuclear fuel, oil, coal, gas, and biomass would reduce this vulnerability. This requires increased focus on energy efficiency and more use of non-biological forms of renewable energy.

Energy poverty is a problem for a relatively large part of the families for a rich country like the Netherlands, but there is a comprehensive program to reduce it. The Netherlands is on track with annual energy poverty monitoring, and with support schemes.

The use of energy communities to enhance the development of renewable energy is not considered with the NECP, except for the support scheme “Cooperative Energy Generation” (SCE) that can be used by energy cooperatives which generates renewable electricity.

The NECP is not giving many details regarding the forecast of energy productions and demand, but policies and finance are well described.

Nuclear power is included in parallel with renewable energy and energy efficiency with an unrealistic optimism regarding the speed of developing of new nuclear power plants, in particular with small reactors (SMR)(p. 51).

Suggestions

Given the risk of missing the renewable energy target in heating and cooling, it is important to increase support programs for solar heating, heat pumps and renewable-energy based district heating. Support should combine subsidies, low-interest loans, and advice.

The introduction of renewable energy via energy communities is not mentioned in the NECP. Since there is a big interest in energy communities in the Netherlands and a support program, a strategy and more supporting policies for energy communities could with small additional efforts increase the deployment of renewable energy.

Increased measures to reduce energy use, including the renovation of residential buildings, can help the Netherlands achieve its energy consumption targets. These measures should combine subsidies and expert advice with low-interest loans. To improve effectiveness, greater awareness and promotion of the existing Heat Fund (Warmtefonds) is essential.

The priority on nuclear power is slowing down the phasing out of fossil fuels. A reorientation of attention and funding towards renewable energy and energy efficiency could increase rate of phase out of fossil fuels, also in heating and cooling. Reduction of nuclear power will reduce primary energy consumption because of the large energy losses in nuclear power plants.

PORTUGAL

The following analysis is based on Portugal - [Final updated NECP 2021-2030 \(submitted in 2024\) - European Commission published 10 December 2024](#). Unfortunately, the English version page numbers are corrupted, therefore, **page numbers refer to the Portuguese version** of the National Energy and Climate Plan (NECP).

1. TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For Portugal, the target for heating and cooling (H&C) in the Renewable Energy Directive 2023/2413 (RED 3) including national indicative increase (the total RED 3 target) is 1.5%-point increase per year 2021-2030. The minimum binding target for all EU countries is 0.8%/year increase 2021-2025 and 1.1% 2026-2030.

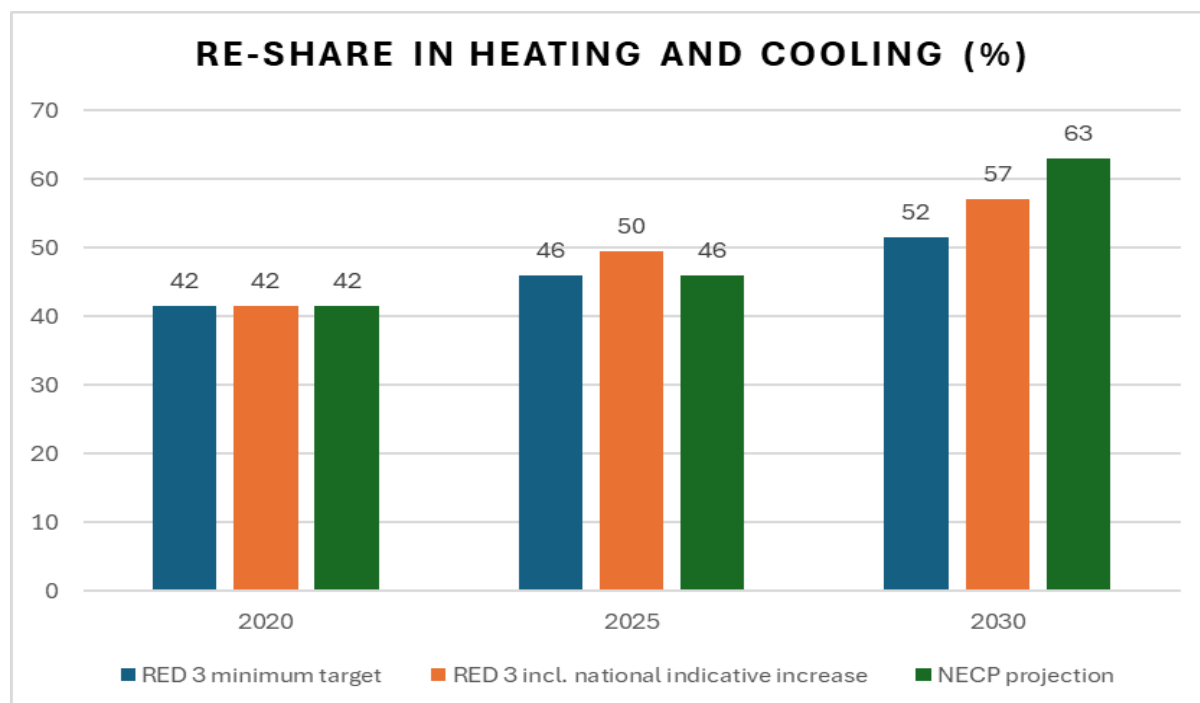


Figure 1. Renewable share in % of heating and cooling for Portugal in development with additional measures, RED 3 minimum binding share, RED 3 including national indicative increase and projection for 2025 and 2030 compared with base year 2020 (p. 51, table 10).

Portugal has ambitious targets. Biomass is part of the renewable energy use for heating and cooling. The projected biomass demand for 2030 is 893 ktoe. The Portuguese NECP projects a small increase in biomass use by 2030 for heating in the WAM scenario (p. 63, table 14).

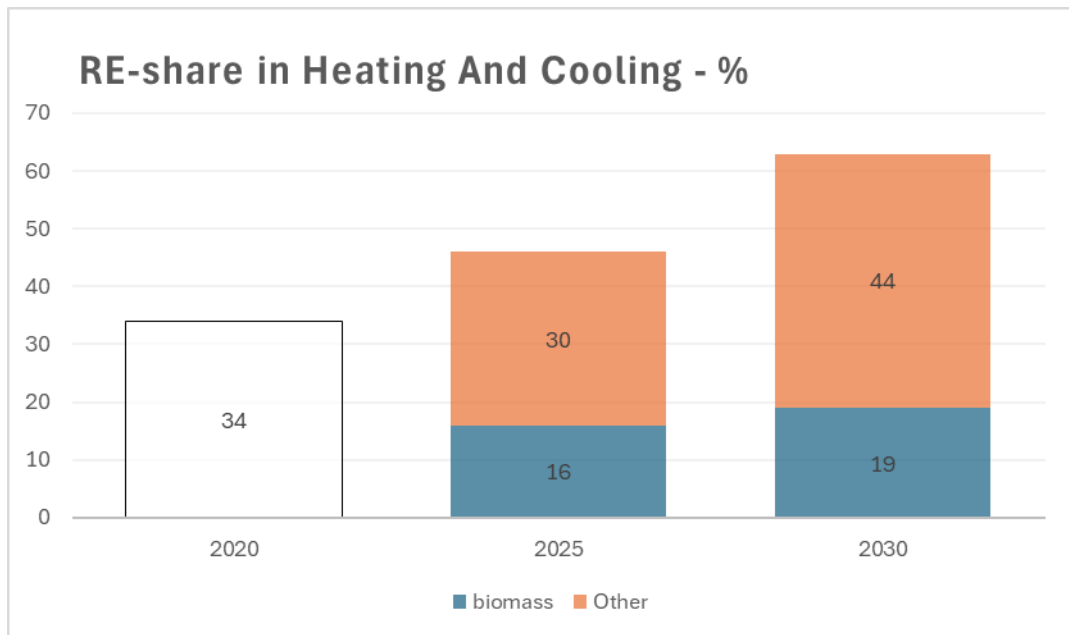


Figure 2. Renewable energy share for heating and cooling divided in the biomass share and other RE from NECP projections (p. 51 table 10, p.63 table 12).

Portugal plans for very mixed renewable energy portfolio for heating in 2030 with 36% of RES from heat pumps, 34% of RES (19% of total H&C) as biomass, 19% of RES from CHP (which can also be with biomass or for instance geothermal), 6% of RES as solar heating and 4% of RES as renewable gases (which can be biomass based or hydrogen from electrolysis)(p. 227, table 45).

The NECP has no information on the import of biomass for energy.

The RED 3 EU-wide target for RE in the building sector is 49%.

The RED 3 has set an indicative target for Portugal of 76.3% in the building sector (RED 3, annex C), but this is not mentioned in the NECP.

Other national targets from the Portuguese NECP are:

- Renewables in gross final energy consumption 2030: 51% (p. 50, table 9)
 - Electricity: 93% (p. 51, table 10)
 - H&C: 63% (p. 51, table 10)
 - Transport: 29% (p. 51, table 10)

Decarbonize the national economy:

"Ensure a trajectory of reducing national greenhouse gas (GHG) emissions in all sectors of activity, namely energy and industry, mobility and transport, agriculture and forests, and waste and wastewater. Promote the integration of mitigation objectives into sectoral policies (mainstreaming)."

Prioritize energy efficiency:

"Reduce primary energy consumption across various sectors within a framework of sustainability and cost-effectiveness. Invest in energy efficiency and efficient resource use, prioritize the rehabilitation and renovation of buildings, and promote zero-emission buildings."

Strengthen renewable energy and reduce the country's energy dependence:

"Enhance the diversification of energy sources through the increasing and sustainable use of endogenous resources. Promote the electrification of the economy and encourage research and innovation (R&I) in clean technologies."

Ensure supply security:

"Maintain a resilient and flexible system with diversification of energy sources and origins.

Strengthen, modernize, and optimize energy infrastructures, develop interconnections, promote integration, reconfigure and digitalize energy networks, maximizing their flexibility."

Ensure a just, fair, democratic, and inclusive transition:

"Reinforce the role of citizens as active agents in decarbonization and energy transition. Create equitable conditions for all, combat energy poverty, establish mechanisms to protect vulnerable citizens, and promote active citizen engagement and territorial valorisation." (p. 23, fig. 10)

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS

For Portugal, the target is a reduction of 28.7% greenhouse gases (GHGs) between 2005 and 2030 of the emissions not covered by the current EU Emission Trading Scheme (ETS1) or by the Land-Use, Land-use Change and Forestry (LULUCF) regulation. This is an improvement compared to the previous target of 17% and is following the revised EU effort sharing regulation, (EU) 2023/857. The regulation also sets annual emission limits for the years 2021-2030 with a budget approach, so each country has to keep the sum of emissions for the period within the sum (the budget) of annual emission limits.

In order to reach the target, Portugal has set sectorial targets for the non-ETS sectors. The target for the residential sector is -35% and for the service sector -70% in 2030 compared with 2005. Portugal is not in line to reach the overall non-ETS target, but rather reductions of 15-20% (read from graph p. 58, fig. 14). The NECP states "Given the current state of play and the respective sectoral targets set for 2030, there is still a need to strengthen policies and measures in some sectors, with a particular focus on the transport sector." (p. 58). The reason for the focus on the transport sector is that it is the highest emitting non-ETS sector. Transport sector emissions are at least five times as high as the residential and service sectors combined.

1.3. ENERGY IMPORT TARGETS AND DEPENDENCY OF IMPORTS

Portugal's energy dependency was 71.2% in 2022 and the forecast is a 65% dependency in 2030 (p. 77, table 26).

"Portugal does not exploit or produce coal, crude oil or natural gas. This means that the supply of these energy sources to the Portuguese market is made exclusively through imports from third countries." (p. 240) This assumes a 100% import rate of all fossil fuels for Portugal.

Domestic energy production in Portugal has shown an overall upward trend in the past decade, reaching 6,778 ktoe in 2022. The main driver for the increasing domestic production is increase of RE capacity (p. 241).

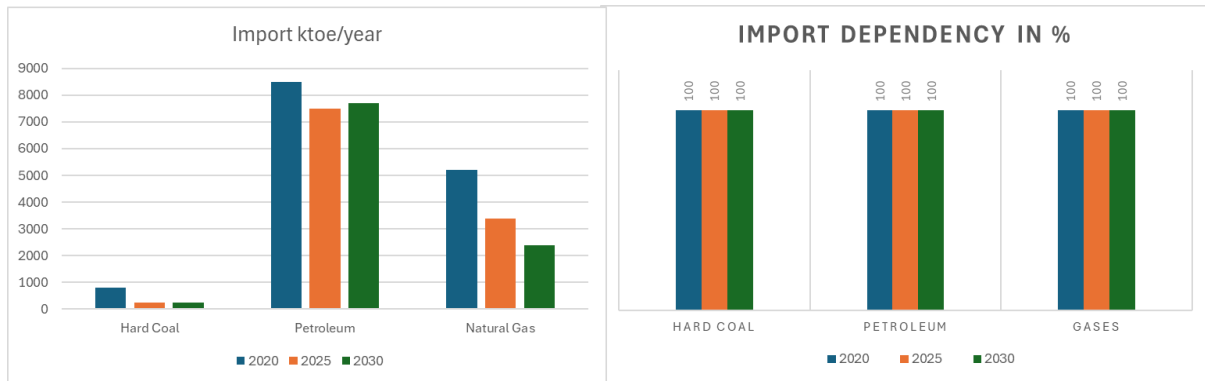


Figure 3: Evolution of the primary energy import per year and the import dependency for fossil energy consumption. The yearly import was calculated from the primary energy consumption (p. 237, fig. 44).

1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

In the realm of heating and cooling, Portugal anticipates a decline in the consumption of fossil fuels as a result of heightened energy efficiency measures and an increased focus on electrification, furthermore with the use of renewable energy sources. This shift will facilitate an expansion in the utilization of solar thermal energy, renewable gases and greater adoption of heat pumps.

Regarding district heating, Portugal's DH potential is very low according to the NECP. One of the barriers is the very low construction density in inland areas with more climatic extremes, in contrast to the mild climate in coastal areas that support denser urban areas. However, in active geothermal areas, small geothermal heat distribution network projects have been developed, essentially aimed at the hotel sector, which has constant thermal needs throughout the year (p. 147).

1.5 TARGETS ON ENERGY EFFICIENCY IN NECP COMPARED TO THE EE TARGET IN EED

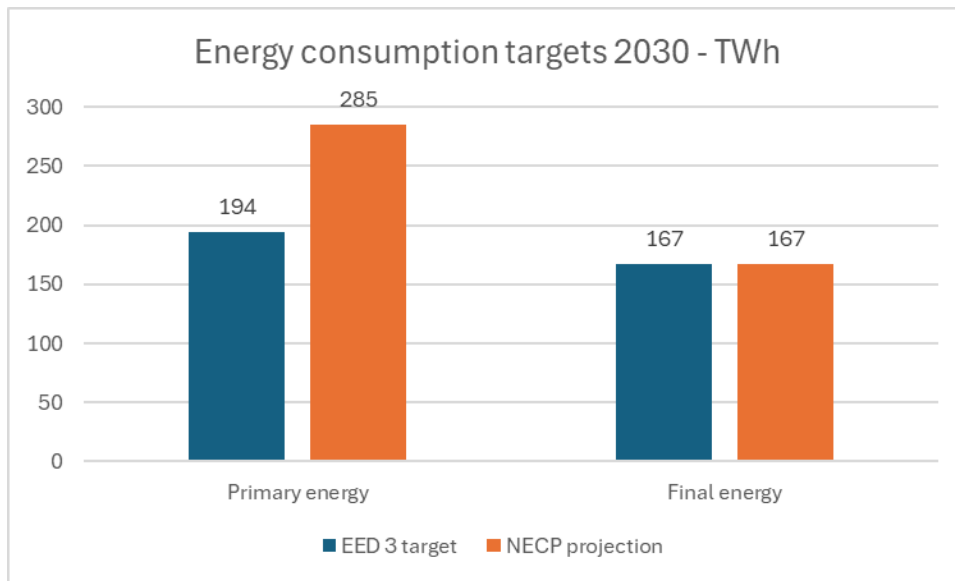


Figure 4. National target for energy consumption according to EED 3 and the projection of consumption in NECP (WAM) projection (p. 64 table 15, p. 65 table 16, p. 269 fig. 62, p. 271 fig 65)

Portugal is not in line to reach the primary energy target while it can reach the final energy target if it follows the WAM development. The forecast is that Portuguese energy consumption will reach a low point in 2025 and then increase, both WEM and WAM.

2. POLICIES AND ACTS TO ACHIEVE THE HEATING TARGETS

(p.106-107, 136-137, 146-147, 162-173)

In the residential sector, Portugal's aim is to increase the thermal comfort of households in heating and cooling, focusing on passive insulation, sun protection, and ventilation solutions, and continuing with the trend towards electrification of the sector and the use of renewable energy sources.

Ban natural gas use for electricity production from 2040, if security of electricity supply is ensured.

Long Term Strategy for the Renovation of Buildings (ELPRE), which aims to meet European and national objectives to achieve carbon neutrality and promote energy efficiency in existing buildings, with a view to transforming them into NZEB (Near Zero Energy Building) buildings. Implementation of a National Plan for the Renovation of Buildings. Update of the Energy Certification System for Buildings (SCE). Provide a new version of the Energy Certificate. (More information and details on p. 166-169).

Promote more efficient equipment: It aims to make the current equipment park more efficient either by direct replacement or by discouraging the purchase of new equipment with significantly lower energy and environmental performance than the best practices already existing on the market, or by stimulating a change in energy purchasing and consumption behaviour.

- Promote the replacement of inefficient household equipment.

- Promote the appropriate dissemination of information and communication of the energy label, in particular the new generation of labels resulting from the implementation of Regulation (EU) 2017/1369 of the European Parliament. Affirming and expanding the use of the energy label.

Ensure better energy management and consumption in various sectors: Significantly improving the monitoring and management of energy consumption. Reducing the consumption and costs associated with running businesses and managing the domestic economy contributes significantly to increasing the competitiveness of the economy and sectors. Freeing up resources to boost domestic demand and new investments.

- Promote the establishment of an Energy Consumption and Efficiency Management System (SGCEE).
- Promote the development of a cross-cutting Monitoring System.

Promoting vocational training for the energy efficiency sector

- Promote new training of specialist technicians for the energy efficiency and renewable energy sector.
- Promote training for near zero energy building (NZEB) and zero energy building (ZEB) building technicians and specialists.

Encourage smarter use of biomass for energy (p. 144)

Promote the production and consumption of renewable gases (p. 140-143)

“Develop climate action plans, at municipal and regional level, with a view to contributing to the objectives and targets set out in the national policy planning instruments for climate action, including those set out in the Climate Law. These plans should be linked to other planning instruments relevant to the territory concerned, in particular, territorial management tools, and should use existing information from other previously developed local or regional plans. They should also be compatible with the Local Heating and Repair Plans under the Energy Efficiency Directive, Article 26.” (p. 111)

One-stop shops

- “Support and promote one-stop shops in support of citizens, supported by digital platforms and/or physical spaces, as information dissemination tools and catalysts for small and major renovations of buildings aiming at resource efficiency and the use of alternative sources.” (p. 107)
- The CasA + Portal exemplifies a digital one-stop shop that streamlines the adoption of energy and water efficiency measures in households. By integrating with systems like the Energy Certification System for Buildings and the AQUA+ water efficiency classification, it simplifies the translation of identified improvement opportunities into concrete actions. Strengthening interoperability between such platforms enhances their role as centralized hubs - connecting consumers with trusted technical and financial solution providers and facilitating quick access to available incentives. This makes digital one-stop shops key enablers in advancing both the digital and energy transitions. (p. 107-108)

- The redesigned Portal for Self-Consumption and Renewable Energy Communities will serve as a digital one-stop shop, streamlining and automating licensing through interoperability with grid operators and authorities. Integrated into the broader renewables licensing system, it speeds up approvals and enhances transparency. The operationalisation of this one-stop shop will reduce permitting times and simplify information access for developers and citizens. A dedicated project manager will lead the process—resolving issues, managing licensing, coordinating stakeholders, mitigating risks, and ensuring interoperability with platforms like Single Environmental Licensing and the Maritime Electronic Point. (p. 135&138)
- Creating and disseminating the network of Citizen Energy Spaces - Points of Single Contact for Citizens as a one-stop shops for energy efficiency for citizens offering services. (p. 169)

Energy poverty

Portugal has a National Long-term Strategy for Combating Energy Poverty (ELPPE) 2023-2050 and a National Energy Poverty Observatory (p. 32)

ELPPE's aims are a just, democratic and cohesive energy and climate transition, reduction of the number of households struggling to pay for essential energy services, a protection of vulnerable consumers, strengthening the action of local structures, increasing energy literacy, etc. (p. 90).

ELPPE's main targets (p. 92 table 36):

- Improve knowledge of energy poverty by seeking the best response to the problem and to create a structural change to mitigate it (p. 197-198)
- Reduce the population living in households that are unable to keep their home adequately warm from 17.5% in 2020 to 10% in 2030, 5% in 2040 and below 1% in 2050
- Reduce the population living in not uncomfortably cool dwellings during summer from 35.7% in 2012 to 20% in 2030, 10% in 2040 and less than 5% in 2050
- Reduce the population living in dwellings with infiltration, moisture or impoverished features from 25.2% in 2020 to 20% in 2030, 10% in 2040 and less than 5% in 2050
- To eliminate by 2050 situations where energy expenditure represents more than 10% of total household incomes. 1,202,567 households were in this situation in 2016, ELPPE aims at a reduction to 700,000 by 2030, and 250,000 in 2040.

ELPPE's 4 strategic axes: promoting the energy and environmental sustainability of housing, promoting universal access to essential energy services, promoting integrated territorial action, promote knowledge and informed action (p. 197).

ELPPE's main action lines: increase the energy performance of housing, decarbonise energy consumption in housing, reduce the number of households struggling to pay for essential energy services, ensure the protection of vulnerable consumers in energy poverty, strengthen the action of local structures in supporting citizens, strengthen the supply of high energy performance public housing, increase the capacity to identify households in energy poverty,

increasing energy literacy, stimulating research and innovation, stimulate the training of professionals (p. 197).

Other actions: promoting an integrated network of Citizen Energy Spaces, promoting the integration of combating energy poverty into local public policies, facilitating the development of municipal renewable energy communities (p. 199).

National Energy Poverty Observatory (ONPE-PT): actively monitors national levels of energy poverty, enhances territorial information and contributes to the design, implementation and evaluation of public policies (p. 197).

"Valley Efficiency" programme:

- Started in October 2023, this is an instrument to finance the investment by economically vulnerable households in improving the thermal comfort of their housing, either through interventions in the environment (building insulation) or through the replacement or purchase of energy-efficient equipment and solutions.

These support mechanisms will be developed together with municipalities to better match reality and promote closer proximity to energy poor consumers (p. 199).

- Measures to be taken into consideration: urban regeneration, the promotion of energy efficiency and renewable energy, creating new clusters and assessing the sectors most affected, develop policies to respectively create the conditions for their development, anticipate appropriate territorial or social responses in education, training and re-skilling to ensure a just transition (p. 195).

Social dimension

Social Climate Fund (Fundo Social para a Ação Climática or FSAC): (p. 297)

- Will support households, micro-enterprises and public transport users that are most vulnerable to the expected rise in energy and public transport prices following the extension of the ETS scheme to the transport and buildings sector
- Implementation of this fund will take place between 2026- 2032. According to the NECP the support for Portugal will be approximately 1.22 million € (which is a mistake, other sources cite 1.2 - 1.22 **billion** €)
- Increasing the energy efficiency of buildings, decarbonising their heating and cooling systems and promoting low-emission or even zero emission mobility solutions

The country aims also at establishing energy community projects, with a particular focus on inland municipalities and those with a higher prevalence of energy poor consumers in social housing projects (p.134)

Social Energy Tariff (since 2010):

- It aims at ensuring universal access to quality services at affordable prices
- It protects final consumers who are economically more vulnerable by means of a tariff model that guarantees them a stable tariff, including using discounts (p. 258-259)
- E.g.: in 2023 there was a 33.8% discount on the transitional tariffs for electricity and 31.2% discount on natural gas excluding VAT, other applicable taxes, levies, fees and interest on late payments (p. 259)

Electricity-to-gas price ratio

No projection of gas and electricity prices for households is included in Portugal's NECP, while the historical prices are given in figure 5.

Gas and electricity prices are available at Eurostat, and we have looked at data for the last four years.

Portugal	2021	2022	2023	2024
Gas price (cent/kWh)	7.62	8.37	14.06	11.92
Electricity price (cent/kWh)	20.02	21.01	20.05	23.21
Electricity-to-gas price ratio	2.6	2.5	1.4	1.9

Figure 5. Average gas and electricity prices in cent/kWh for private consumers (first half of the year) and the respective price ratio. The price includes taxes. The gas price is for consumers with a consumption of 20-200 GJ/year, and the electricity price is for consumers with a consumption of 5.000-15.000 kWh/year. Source: Eurostat, nrg_pc_202 and nrg_pc_204.

The ratio between electricity and gas price is on a downward trend, but the fluctuation of the ratio makes the impact uncertain for the economy of heat pumps versus gas. Fortunately, the energy efficiency of the heat pumps will provide enough of a 'counterforce' to make the technology a viable source of heating and cooling despite the price difference.

Additional effects in favour of heat pumps are that the costs of the most popular type in Portugal, the air-air heat pump, has a relatively low investments cost and is also popular because it can be used as air-conditioner – a big benefit in a country where cooling is as important as heating. Further, gas is only available in some areas of Portugal and as oil heating is more expensive than gas heating. This makes heat pumps more attractive in these areas.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

Portugal is on its way to decarbonise the entire economy including the heating sector and if it realises the scenario with additional measures (WAM), it will have increased renewable energy to 63% in heating and cooling in 2030, an increase from 42% in 2020.

With additional measures, Portugal is on its way to reach a renewable energy share in heating and cooling well above the indicative target for 2030. It is planning to do this with a relatively small reliance on bioenergy of 34% (or up to 58% if CHP and renewable gases are all biomass based).

The high renewable energy share is needed for security of supply given that Portugal is very dependant on imports for its fossil fuel use.

It seems that Portugal is not in line with reaching the non-ETS emissions target, but the NECP is not specific on this point, so it is unclear how far it is from the target. Heating and cooling contribute relatively little to this target as transport is by far the dominant sector in emissions included in this target.

With additional measures, Portugal is on line to meet the final energy consumption target, but not the primary energy consumption target.

Energy communities are only mentioned in the NECP in connection with a plan for municipal energy communities as part of Portugal's strategy to reduce energy poverty.

Although the NECP highlights solar thermal as an important energy source in the energy sector, it does not pay sufficient attention to it and only marginal growth is projected.

It is crucial for reaching the targets that Portugal realise the additional measures in the WAM scenario, and it should even do more, if it should meet all the targets.

Portugal has a comprehensive strategy to reduce energy poverty, but also large energy poverty problems as 17.5% of the population are not able to keep the home adequately warm during winter (2020).

Suggestions

- Portugal must adopt a clear roadmap and allocate sufficient financial and human resources to ensure the full implementation of the WAM scenario in the NECP. A dedicated monitoring mechanism should be established to regularly assess progress and recalibrate actions where necessary.
- As part of the roadmap, Portugal should strengthen support for renewable heating solutions. Specifically, Portugal should introduce support for solar heating and increase support for heat pumps, also high-efficient air-air heat pumps. The support should include advice and low-interest loans.
- Energy renovation should be higher on the agenda with more advice and low-interest loans for energy renovations. This should also address energy poverty including the inability to keep homes warm, integrating energy poverty measures, and embedding social justice in the plans.
- Portugal should prioritise deep and holistic energy renovations.
- Energy communities should be supported within a more comprehensive strategy than the initiative mentioned in the NECP. In addition to financial support, the support should include strong legislation and proper full transposition into national frameworks of EU legislation for energy communities. It is also essential to ensure the autonomy and empowerment of communities, while addressing administrative, bureaucratic, informational, and economic barriers.
- Portugal should boost technical capacity and workforce development for the transition.
- Portugal should aim for diversified funding, including support programmes not only for the most vulnerable but also for the middle class, to ensure that everyone has access to technology and renovations as well as technical assistance.
- Portugal should improve data collection and territorial granularity of data.

ROMANIA

The following analysis is based on [Romania – Final updated NECP 2021-2030 \(submitted in 2024\)](#), published October 16, 2024. Page numbers refer to the National energy and climate plan (NECP), English version.

1. TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For Romania, the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3), including a national indicative increase (the total RED 3 target), is a 1.6%-point increase per year 2021-2030. The minimum binding target for all EU countries is 0.8%/year increase 2021-2025 and 1.1% 2026-2030.

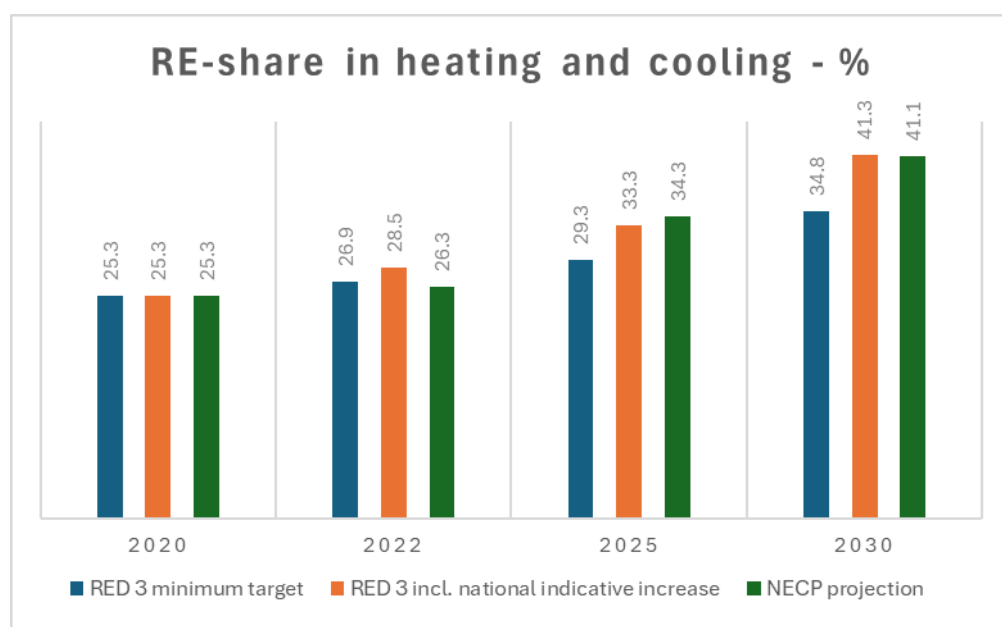


Figure 1. Renewable share in % of heating and cooling for Romania, RED 3 binding share, RED 3 including national indicative increase and projection with policies and measures in NECP for 2025 and 2030 compared with base year 2020 and latest statistics from 2022. (p. 63 and p.64, fig. 16).

With the development with policies and measures in the NECP, the forecast in the NECP is that Romania will meet the RED 3 minimum target for heating and cooling for 2030, and will almost meet the national indicative target, missing 0.5%.

Despite the general trend of slow decrease of biomass in heating - from 56% in 2022 to 34% in 2030, biomass will continue to have a dominant role in the total RES share (p. 62).

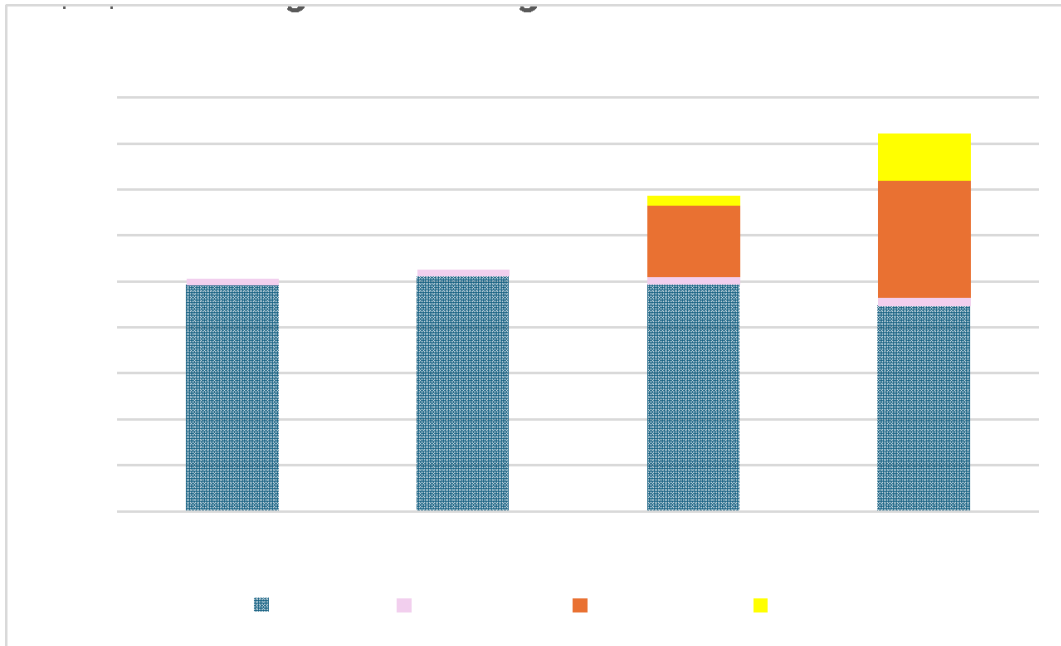


Figure 2: Renewable share in % of heating and cooling for NECP projections divided by sources, compared with 2020 and the latest available statistics (2022)(p.65, fig. 19). Heat pumps and solar were 0% in 2020 and 2022. "Other" include solar, direct biogas use, and hydrogen.

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS

The Romanian reduction target in the effort sharing regulation (ESR, regulation (EU) 2023/857) is 12,7% reduction between 2005 and 2030 of GHG emissions not covered by the current EU Emission Trading Scheme (ETS1) or by the Land-Use, Land -use Change and Forestry (LULUCF) regulation. The old target under the ESR was 2% (set in 2018). The projection is that Romania is in line to reach the ESR target. According to the projection, Romania will decrease emissions of the sectors covered with 15.2% (p. 61, fig. 13).

1.3. ENERGY IMPORTS TARGETS AND DEPENDENCY ON IMPORTS

Overall, the Romanian net energy import dependence was 32% in 2022, but the forecast is that after 2025 it will be reduced to just 8% in 2030 due to a number of changes in fuel use and domestic production.

Romania has a high energy import dependency on crude oil, and some import dependence of natural gas and solid fossil fuels (p. 225, figure 88). Uranium is also imported. In 2021, imported crude oil was at 68%, rising in just one year to 75% (2022). According to CNSP projections, domestic crude oil production will decline further in the coming years. Due to reduced oil consumption, particularly in the transport sector, the objective for 2030 is to maintain the import dependency on crude oil at the 2022 level. After 2030, this dependency is expected to decrease to 33% by 2045 (p.73).

The goal for the share of import of solid fossil fuels for electricity and heat production for 2030 is to be at 0%. This will be a result of the decommissioning of coal power plants, so that there

will be no need for imports. In addition, coal consumption in other sectors will decrease over time and in 2050 it is projected to be almost zero.

Due to the opening of the “Neptun” gas field and new gas infrastructure, Romania's net import share of natural gas is expected to be low in 2030 and negative in 2040.

While the dependency of coal and petroleum in percentage would stay high by 2030 the total net import of all three fossil fuels combined will drop drastically 2025-2040 (p.74, fig. 32, 33, 34 and 35).

79% of the import of crude oil is from Kazakhstan and the Russian Federation and 75% of the imported natural gas comes from the Russian Federation. Romania is seeking to reduce its dependence from Russia and therefore the goal is to diversify the countries from which the crude oil and natural gas are imported. (p. 73-74, 225-226).

Romania is 100% depending on uranium import for its nuclear fuel.

Dependency of imports into Romania for energy use in buildings

There is only data available for total import of energy into Romania, but oil is not used in buildings in the country, so the import dependence for heating and cooling is moderate with some imports of gas and hard coal, but no import of renewable energy for heating and cooling.

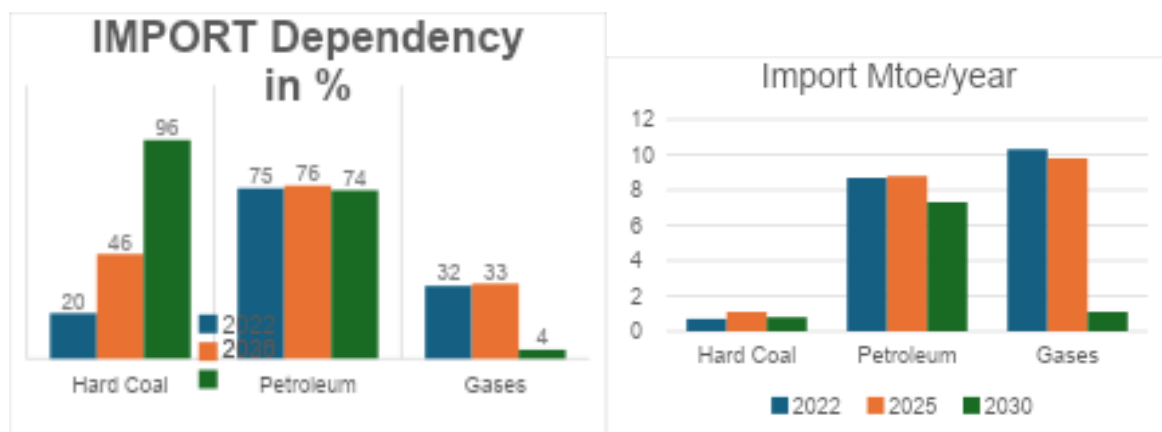


Figure 3. Dependency on import for total primary energy consumption for all sectors (p.74, fig. 32, 33, and 35, calculated from primary energy and net import energy figures, the figure for net import share in fig. 35 seems wrong for 2030).

1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

- Heat pumps: Romania gives an important role to heat pumps in its decarbonisation policy for the heating and cooling sector. It is targeting a 19% reduction in GHG emissions from the buildings sector in 2030 compared to 1990 through improved buildings performance and increased use of heat pumps and solar thermal collectors (p. 24). Air source heat pumps are expected to become a dominant technology, maintaining a high level of adoption with a forecast to cover 27% of residential heat demand in 2030 and above 50% from 2045 (calculated from p. 256, fig. 141, calculated as fraction of final

energy consumption for heating in the residential sector).

The stated target for heat pumps is a 25% share of the useful energy demand for heating and cooling in 2050, well below the forecast of over 50%. The short-term targets are 1 GW heat pumps in residential building and 50% share in commercial buildings by 2030 (p.139) In addition, heat pumps are projected to give a substantial contribution to district heating (p. 68).

- Solar for H&C: “Solar thermal energy is projected to have significant growth, indicating a substantial contribution to district heating needs” (p.68).
- Coal: The goal for the share of solid fossil fuels for electricity and heat production for 2030 is to be at 0% with phase out of all coal power plants. In addition, the coal consumption in other sectors (as industrial heating) will decrease over time and in 2050 it is projected that it will be almost zero (p. 74, 93). This goal is supported through various activities envisaged in the Romanian Recovery and Resilience Plan and Romania's Just Transition Programme (p. 44 and 45).
- Hydrogen: Larger gas power plants including CHP plants for district heating shall be ready for 50% hydrogen by 2036 (p.95).
- High-efficiency cogeneration: envisaged high-efficiency cogeneration installed with a total capacity of 880 MW in the period 2024 – 2030.
- Improve energy performance of public buildings at central level, aiming for at least 3% annual renovation rate until 2030 (p.131).
- Improve energy performance of public buildings at local level, aiming for at least 3% annual renovation rate until 2030 (p.132).
- Renovation of residential buildings, assuming an increase of annual renovation rate from 0.7% in 2021 to 3.4% in 2030 with a target value of energy savings of 771 ktoe in 2030 (p.133).
- Renovation of commercial buildings assuming an increase of annual renovation rate from 0.7% in 2021 to 3.4% in 2030 with a target value of energy savings of 128 ktoe in 2030 (p.133).
- A special measure for increasing the energy efficiency for the buildings in the transport sector, aiming at energy savings of 5.3 ktoe by 2030.
- An energy poverty target of reducing the inability to keep homes adequately warm from 15.2% of households in 2022 to 9.8% in 2030 (p.189, 191).

1.5 TARGETS ON ENERGY EFFICIENCY COMPARED TO THE EE TARGET IN THE EED

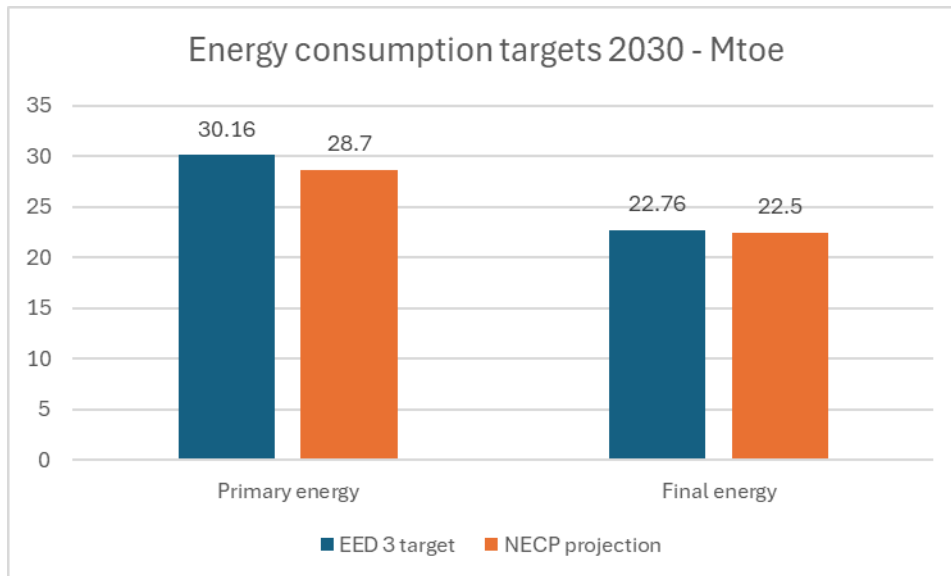


Figure 4: National indicative contribution (target) for energy consumption according to EED 3 (un-updated reference scenario) and the projection of consumption in NECP based on additional measures scenario (p.56, Figures 129 and 132, WAM scenario).

Figure 4 shows that when Romania chooses to use the un-updated 2020 reference scenario, both primary energy consumption (PEC) and Final energy consumption (FEC) targets are reached in EED 3 (Directive (EU) 2023/1791 on energy efficiency). With EED 3, each country can choose to set its target according to the un-updated or the updated 2020 reference scenario. The projections are a 9% reduction of PEC and a 6% reduction of FEC in 2030 compared with 2022 (latest available statistics)(p.70, fig. 28 and 29).

2. POLICIES TO ACHIEVE THE HEATING TARGETS

Law establishing the system for the promotion of energy production from renewable energy sources: This law establishes a legal framework to expand renewable energy use by attracting investments in these resources that will enhance energy security, foster local and regional sustainable development and employment, reduce pollution, ensure possibilities for co-financing. The provisions of this law regulate the guarantees of origin, administrative procedures related to renewable energy projects, set grid connection rules, and establish sustainability criteria for biofuels and bioliquids. Additionally, the law introduces a system to promote electricity generated from renewable sources.

Law on Energy Efficiency: The purpose of this law is to create the legal framework for the development and application of the national policy in the field of energy efficiency in order to achieve the national objective of increasing energy efficiency. Policy measures in the field of energy efficiency are applied to the entire chain: primary resources, production, distribution, supply, transport and final consumption. The national indicative contribution regarding energy efficiency for the year 2030 shall be established in the integrated national plan in the field of energy and climate change 2021 - 2030.

Law on the energy performance of buildings: The law establishes minimum energy performance requirements for building renovation, minimum performance requirements for buildings with almost zero energy consumption (p. 33, table 3 and text).

The NECP includes 91 policies and measures (PAM's) of which some are contributing to decarbonization of heating and cooling, directly or indirectly, and/or to reduce energy poverty. The relevant ones are listed here:

- Phase out of coal use in power and heat production (PAM1) with closure of 4920 MW of coal power plants 2021-2032 will both directly contribute to heating decarbonisation in the district heating networks supplied with heat from some of these power plants and indirectly via electricity for heat pumps (p.93).
- Introduction of hydrogen into the energy system (PAM 2) with preparing gas power plants including CHP plants for 50% hydrogen by 2036 and the production of green hydrogen (PAM3) will allow a less carbon intensive power and district heating production, depending on the availability of green hydrogen (p.95-96).
- Promotion of high-efficiency cogeneration capacities (PAM 5) including CHP plants will allow a less carbon intensive power and district heating production (p.98).
- Improvement and efficiency in the industrial processes (PAM 8) will reduce industrial heat demand, primarily high-temperature heating with a focus on cement, glass, lime, and ceramics production facilities (p.102).
- Installation of solar thermal collectors in the residential sector (PAM 27) assuming that the share of solar thermal collectors can be increased to 28% in urban areas and 16% in rural areas by 2030. This will in particular reduce external energy demands for hot water (p.122).
- Facilitate the establishment of energy communities (PAM 28). This measure shall create/modify the specific legislation to enable the establishment of energy communities. This will (if successful) support the establishment of energy communities that can help households and small businesses in the transition to renewable energy and energy efficiency, also for heating and cooling (p.123).
- Increase of the domestic generation capacity of biomass and biogas CHP and PP (PAM 29, PAM30). This will both directly contribute heating in the district heating networks and indirectly via electricity for heat pumps (p.124).
- Improve energy performance of public buildings at central level (PAM 35) and at local level (PAM36), to realise the EU target of 3% renovation per year of public buildings (p.130-132).
- Renovation of residential buildings (PAM 37) and of commercial buildings (PAM38), increasing the renovation rate from 0.7%/year in 2021 to 3.4%/year in 2030.
- Development of energy services/market, ESCO (PAM40) which will contribute to energy savings also for heating and cooling with a total target of 227 ktoe of primary energy savings until 2030 (p.136). This target is not fully additional to the targets mentioned in section 1.4.

- Energy audit and energy management (PAM 42) with mandatory energy audits for large companies to reduce energy consumption in the industrial sector, including industrial heating and cooling.
- Increased share of heat pumps (PAM 43) in residential and commercial buildings, starting with drafting a strategy (p.139).
- Increased use of efficient technologies in the residential sector (PAM44) including subsidies for replacing old stoves with new stoves (p.140).
- Replacement of conventional fuels with RES (PAM45) and increase technology efficiency in manufacturing industries (PAM 46). This will contribute to decarbonising industrial heating and cooling (p.141-142).
- Increasing the energy efficiency for the buildings in the transport sector (PAM 57) using EU and state funds (p.153).

In addition, a number of PAMs will indirectly contribute to decarbonisation of heating and cooling with decarbonisation of electricity. This includes promotion of wind power, solar electricity with PV including roof-top PV, small hydropower, incineration of waste with energy utilisation, and others. Further, PAMs to develop the electricity grid can indirectly contribute to decarbonising heat and cooling with more security of supply of electricity for heat pumps.

There is also a proposal for construction of small and medium sized nuclear power reactors (SMR's)(PAM60) with a 452 MW target for new nuclear power capacity until 2030 (p.157).

The Romanian end-use energy efficiency measures are expected to lead to cumulative energy savings of 10.12 Mtoe 2021-2030 and much larger energy savings after 2030, in particular in buildings (p.71).

These cumulative energy savings expected until 2030 are much higher than the minimum required according to EED 3, article 8.

Energy poverty

The 2021-2030 NECP is the most relevant policy and planning document that deals with the subject matter. It notes the progress of Romania in combating energy poverty and outlines the need to overcome the distance still to overcome, compared to the EU average. The national objective is thus to reduce the energy poverty rate and to ensure the protection of vulnerable consumers in order to safeguard human rights, considering that the EU average rate for 2015 was achieved.

“The trans-sectoral policies and measures in the 2021-2030 NECP foresee:

- Regulating and defining vulnerable consumers and means for their financing, which prior to the adoption of the present NECP was already done through the Government Emergency Ordinance No. 1/2020 regarding certain fiscal-budgetary measures and amending and supplementing certain legislative acts, and ANRE's Order No. 235/2019 approving the regulation for supply of electricity to final consumers;
- Collaboration between Ministry of Energy and Ministry of Labor and Social Solidarity for drafting the national action plan on energy poverty situations, which will define critical situations and categories of consumers that cannot be disconnected from the national grid, as well as procedures for reimbursing electricity operators;

- Providing non-financial support for vulnerable low-income consumers by providing for the possibility of payment rescheduling (staggered payment of the electricity bill instead of a standard bill);
- Implementing the National Social Assistance Computer System;
- Granting aids for home heating for all the four heating systems: heat, natural gas, electricity and wood, coal and oil fuels, to vulnerable consumers;
- Subsidies for heat without differentiating consumers under vulnerability criteria, which are applied directly to the electricity price (See below GEO 27/2022); and
- Granting aids to reduce energy poverty that consist of social benefits granted from the State budget through the budget of the Ministry of Labour and Social Protection and the family maintenance allowance, and aids to secure the minimum income guaranteed for families and single persons under poverty.”
(p. 47)

The implementation of protection against energy poverty includes a law, budget allocations and several PAMs. In addition, there were two pieces of temporary legislation to protect consumers against the high energy prices 2022-2023.

The scope of LAW 226/2021 on establishing social protection measures for vulnerable energy consumers is to protect vulnerable consumers from increases in energy prices by granting subsidies for heating homes, for energy consumption, for purchasing products and services for the improvement of the energy performance of buildings or for connection to the energy network. Under the Law, vulnerable consumers are defined as single people or families who, due to illness, age, insufficient income or isolation from energy sources, would benefit from social protection measures and additional services ensuring their minimum energy needs. The Law establishes further criteria for inclusion in the category of vulnerable energy consumers. An estimated 500,000 households will receive up to RON 500 (EUR 100) per month to pay bills during the cold season. The includes both financial and non-financial measures (p.48).

GEO no. 27/2022 regarding the measures applicable to final customers in the electricity and natural gas market in the period April 1, 2022 – March 31, 2023, as well as for the modification and completion of some normative acts in the field of energy. This law was the basis for subsidies for consumers in the period of high energy prices 2022-2023 (p.48).

GEO no. 186/2022 regarding some implementing measures of the Regulation (EU) 2022/1854 regarding an emergency intervention to address the problem of high energy prices (p.49). This law supplemented GEO no. 27/2022.

Development and use of a fully-fledged national social assistance IT system (PAM 87) to process support to vulnerable consumers (p.187).

Ensure the access of energy consumers to diversified, sustainable and accessible sources of energy for lighting, heating and cooling (PAM89) including subsidies for residential renewable energy and energy efficiency with an aim of reducing the inability to keep homes adequately warm from 15.2% in 2022 to 9.8% in 2030 (p.189).

Develop one stop shops (PAM 90), 42 one stop shops for targeted measures to decrease the energy poverty level and protect the vulnerable consumers (p.190).

Coordinated inter-ministerial committee regarding protecting vulnerable consumers and addressing energy poverty (PAM 91) with the main objective to consolidate an energy poverty governance system to measure, monitor and update the energy poverty reduction objectives periodically. This PAM shall contribute to decrease by 1/3 the number of citizens unable to keep their homes warm (15,2% in 2022 to 9,8% in 2030)(p. 191).

Electricity-to-gas price ratio

No projection of gas and electricity prices for households is included in the Romanian NECP, while the historical prices are given in figure 5.

Gas and electricity prices are available at Eurostat, and we have looked at data for the last four years.

Romania	2021	2022	2023	2024
Gas price (cent/kWh)	3.17	6.11	5.48	5.81
Electricity price (cent/kWh)	15.10	23.26	22.10	20.01
Electricity-to-gas price ratio	4.8	3.8	4.0	3.4

Figure 5. Average gas and electricity prices in cent/kWh for private consumers (first half of the year) and the respective price ratio. The price includes taxes. The gas price is for consumers with a consumption of 20-200 GJ/year, and the electricity price is for consumers with a consumption of 5.000-15.000 kWh/year. Source: Eurostat, nrg_pc_202 and nrg_pc_204.

Since 2021, the electricity price is getting closer to the price of gas, which makes heat pumps economically more attractive. At the current ratio heat pumps are still not the cost-efficient option.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

The Romanian NECP indicate the Romania is well on its way to decarbonize heating and cooling within the framework set with EU legislation including RED 3 and EED 3. The background is a starting point with relatively low energy efficiency and renewable energy as well as a high consumption of biomass in the renewable energy. The reduction of biomass use for energy including for heating, is appropriate but further reductions could be considered.

The NECP includes an impressive number of policies and measures for decarbonizing heating and cooling, now implementation is key. For instance, the ambitious plans for increase of heat pumps require a good national plan for deploying heat pumps both for residential and commercial heating and cooling, but when the NECP was written, the plan was still to be drafted.

The proposal for nuclear power is problematic, both because of the problems with nuclear power and because it is unrealistic to have new nuclear power plants in operation in 2030, risking the decarbonization targets for 2030 not to be met.

The NECP is in many ways well structured, but there is lack of information of the status of many of the policies and measures presented. It is not always clear whether Romanian institutions made a formal political decision on which scenario is preferred and would be followed, when more scenarios are mentioned.

Romania has a general problem with public bureaucracy that limits the implementation of the above-mentioned policies and measures and that can be an obstacle for reaching targets (Arin, RO).

Public acceptance of energy solutions is depending on affordable prices, which must be low due to the low income in Romania (Arin, RO)

Suggestions

Strong focus on efficient implementation of the policies and measures for decarbonising heating and cooling, in particular:

- speeding up the energy renovation rate,
- finalise and implement the heat pump strategy, covering both residential and commercial heating and cooling, and
- introduce supportive regulation and finance for energy communities.

Overall, Romania should develop national and municipal plans for heating and cooling.

One-stop shops should be started not only to tackle energy poverty, but for all actors involved in improving energy performance of building and energy renovations.

The continued large use of biomass for energy should be reconsidered, setting a target of reducing biomass use to a level that is sustainable using domestic resources.

Increase the use of excess heat from industry and other sources (derived heat). This will probably require expansion of district heating networks.

Renovate district heating network, to reduce losses and reduce operational costs.

The use of hydrogen for power and CHP plants should also be reconsidered, at least regarding the level. Instead, biogas could be used to replace fossil gas for power and CHP plants that operate when wind and solar power is not providing enough power.

Romania should also reconsider its plans for increasing nuclear as plans are both problematic and with unrealistic timing.

Also, the proposal to rely more on waste incineration for heating and electricity should be reconsidered. Import of waste for energy should be avoided.

SPAIN

The following analysis is based on [Spain - Final updated NECP 2021-2030 \(submitted 2024\) - European Commission](#) published 26 September 2024. Page numbers refer to the English version of the National energy and climate plan (NECP).

1. TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For Spain, the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3) including national indicative increase (the total RED 3 target) is 1.7 %-point increase per year 2021-2030. The minimum binding target for all EU countries is 0.8 %/year increase 2021-2025 and 1.1% 2026-2030.

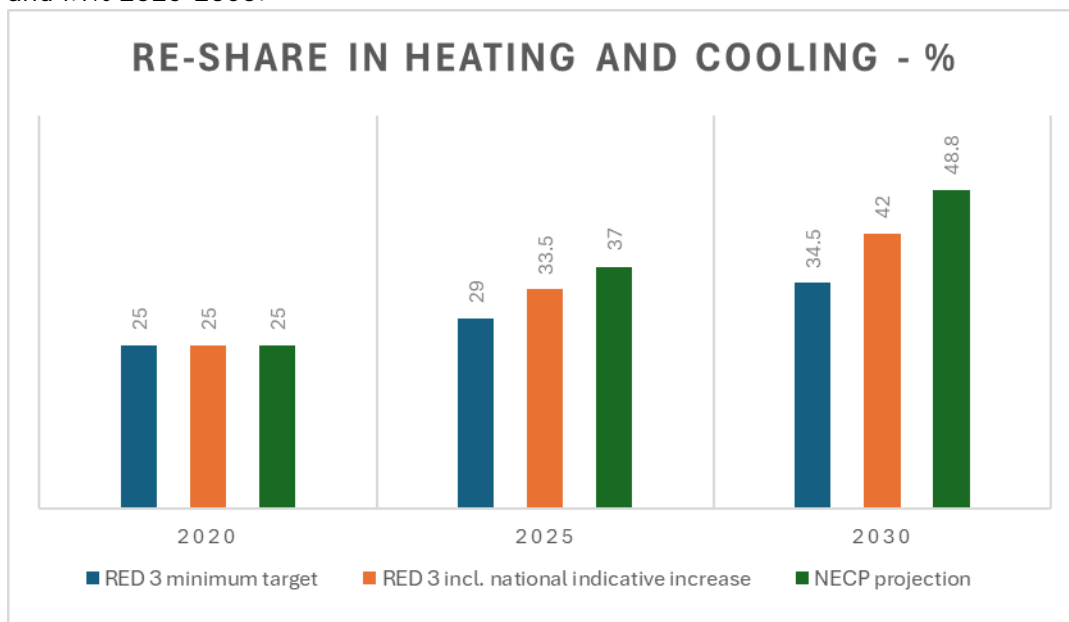


Figure 1. Renewable share in % of heating and cooling for Spain, RED 3 binding share, RED 3 including national indicative increase and projection with policies and measures in NECP for 2025 and 2030 compared with base year 2020. (p. 506).

In the Spanish NECP, there is no information about the share of different renewable energy sources in the heating and cooling sector.

For gross electricity production the main renewable sources are wind and solar. Biomass contributes with a smaller part, but the production from biomass is increasing towards 2030 (p. 512).

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS

For Spain, the target is a reduction of 37.7% greenhouse gases (GHGs) between 2005 and 2030 of the emissions not covered by the current EU Emission Trading Scheme (ETS1).

With the measures proposed in the NECP, Spain will reach a reduction of about 42% between 2005 and 2030 (p. 197). The objective is then to turn Spain into a carbon-neutral economy by 2050. (p. 20)

1.3. ENERGY IMPORT TARGETS AND DEPENDENCY OF IMPORTS

Spain is highly dependent on energy imports, with an import dependency of 73% in 2019, well above the EU average (p.87). This reliance primarily stems from natural gas and petroleum imports, which are still used for heating and cooling in buildings.

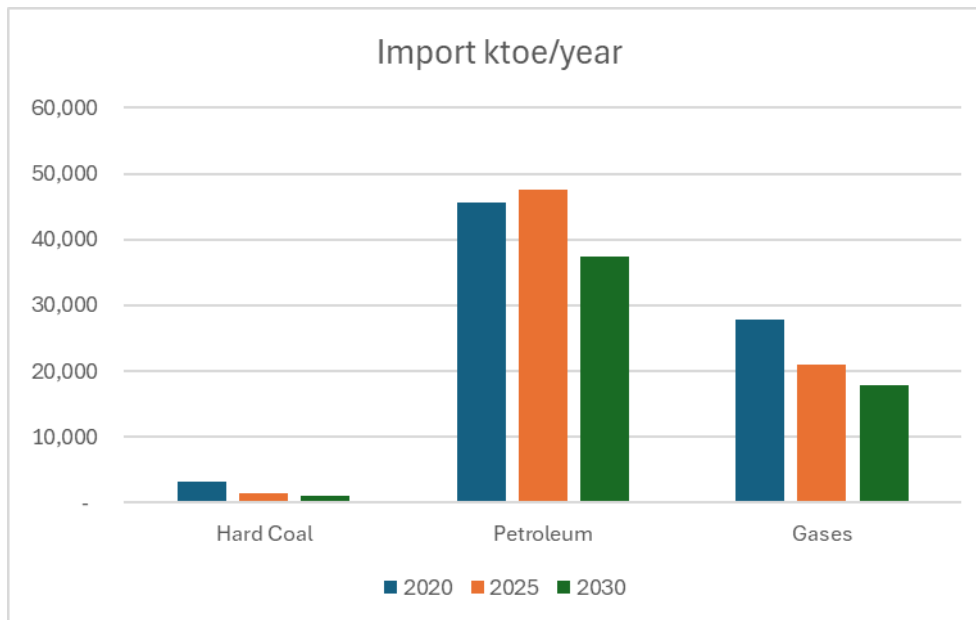


Figure 2. Evolution of the primary energy import per year (ktoe)(p.88).

The import dependency for coal, petroleum and gases is 100%.

To reduce import dependency, Spain aims to improve external energy independence from 27 % in 2019 to 50 % in 2030 through renewable and efficiency actions. These actions, in addition to improving national energy security, will have a very favourable impact on the trade balance, assuming savings of more than 86,000 billion € in imports (p. 31).

1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

- 599 ktoe of cumulative energy savings are expected from district heating expansion by 2030 (p. 255).
- The total number of energy renovations planned for existing housing stock is 1,377,000 by 2030, largely supported by the Recovery, Transformation, and Resilience Plan (p. 30).
- Heat pump penetration is projected to increase by 167% by 2030, compared to 2020 levels (p.505).
- 1,506 ktoe of renewable energy will be used in 2025 for energy supplied by heat pumps, and 2,561 in 2030 (compared with 849 in 2019)(p. 505).

210,000 new heat pumps were installed in 2023, an increase of 25,000 compared to 2022 ([Executive-summary_EHPA-heat-pump-market-and-statistic-report-2024-2.pdf](#)).

1.5. TARGETS ON ENERGY EFFICIENCY COMPARED TO THE EE TARGET IN EED

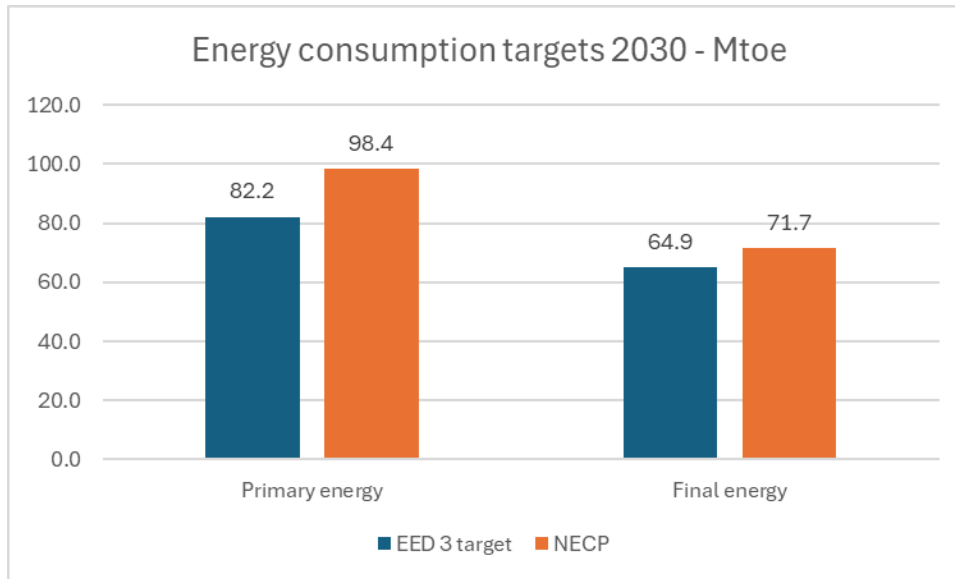


Figure 3: National target for energy consumption according to EED 3 and the projection in the NECP (p. 79).

The Spanish NECP for primary and final consumption, as currently proposed, does not reach the target of the revised Energy Efficiency Directive (EU/2023/1791)(EED 3). Therefore, to reach the EED 3 energy efficiency targets further reduction efforts are needed.

2. POLICIES TO ACHIEVE THE HEATING TARGETS

Regulatory Policies

Building Energy Regulations

- The Regulation on Thermal Installations in Buildings (RITE), updated in 2021, introduces new energy efficiency standards for heating, cooling, and ventilation systems. It mandates that all new buildings and major renovations integrate renewable heating systems and ensures that new thermal installations are energy-efficient and compatible with waste heat recovery. RITE sets out the energy efficiency and safety requirements, namely reducing primary energy consumption by 39.5 % in 2030 and final energy consumption by 36.809,3 ktoe (p. 154).
- Through the rehabilitation programme for economic and social recovery in residential settings, Spain is investing heavily in building renovations, with a 3.42 billion € budget for residential energy efficiency improvements (p. 248).
- The Technical Building Code (CTE), amended in 2019, establishes limits on total primary energy consumption for new buildings (p.154). It requires a minimum renewable energy contribution for domestic hot water production and encourages the adoption of high-efficiency heating and cooling systems (p.155).
- All new public buildings must be Zero-Emission Buildings (ZEB) by 2028 (p. 85).

- Energy Performance Certification (EPC), which must contain a description of the building's energy characteristics as a starting point for an energy diagnosis, is being expanded, encouraging homeowners to retrofit their properties (p.243). In addition, the maximum validity period of the Energy Efficiency Certificate is reduced to 5 years when the energy rating is G, instead of 10 years for all other cases (p. 247).

Heating and Cooling Networks Expansion

To further decarbonize heating and cooling in urban areas, Spain has implemented policies promoting district heating and cooling networks:

- Municipalities with over 45,000 inhabitants (164 cities) are required to develop local heating and cooling plans to integrate renewable energy sources into heating infrastructure (p. 253).
- Spain is prioritizing the expansion of district heating networks, with a focus on heat pumps, biomass, and solar thermal energy (p. 254).

Financial Support Policies and Plans

Spain has allocated significant financial resources to accelerate the transition to clean heating technologies and improve energy efficiency in buildings.

Public Investment in Clean Heating

- The Spanish government has implemented substantial funding programs to promote energy renovations, renewable heating installations, and district heating expansion.
- A 3.42 billion € fund has been allocated to residential building renovations, targeting 477,300 buildings by 2030. These renovations focus on improving insulation, installing efficient heating systems, and integrating renewable energy (p.244). Low-income households receive higher subsidies to ensure equitable access to energy-efficient solutions (p.249).
- A 250 million € investment in heat pump deployment supports agrivoltaics, floating solar, and collective self-consumption projects for vulnerable consumers (p. 137).
- The government is also funding district heating and cooling expansion, aiming for 599 ktoe energy savings by 2030 through improved heating networks (p. 255).

Tax Incentives and Low-Interest Loans

To further encourage clean heating adoption, Spain is revising its tax framework and financial aid programs:

- The government is reforming tax incentives to promote electrification and phase out fossil fuel subsidies (p. 155). New energy renovation tax credits have been introduced to accelerate the transition.
- Under Spain's Plan + SE (More Energy Security Plan), households and businesses can access 100% interest-free loans for heating system upgrades and energy efficiency improvements (p. 267).

Investment in Fossil Fuels and Biomass

Spain is gradually reducing its reliance on fossil fuels in heating while maintaining a strategic role for biomass and geothermal energy in the transition.

In 2019, heating and cooling accounted for 35% of Spain's total final energy consumption, with only 16.7% of this demand covered by renewables (p.153). The government aims to double this share by 2030 (p. 505).

The Energy Security + Plan prioritizes the replacement of natural gas and other fossil fuels with renewables in heating systems (p. 153).

Biomass remains an essential part of Spain's heating strategy, particularly in rural areas and district heating networks. However, new regulations restrict inefficient residential biomass use and promote higher-efficiency biomass boilers (p. 174).

The Mining Law 22/1973 has been modified to encourage geothermal energy development, expanding its use in district heating and individual buildings (p. 256, p. 263).

Social Dimension: Supporting Energy-Poor Households

To ensure a just transition, Spain has implemented social policies that protect vulnerable consumers from energy poverty while improving access to clean heating solutions.

The National Energy Poverty Strategy (2019-2024) provides higher subsidies for low-income households to finance insulation, efficient heating, and energy-saving measures (p. 249).

The expansion of collective self-production and consumption of renewable energy (energy communities) allows vulnerable households to share surplus renewable electricity, making self-consumption more accessible. The same generation facility can be shared by different self-consumers, creating significant opportunities in terms of economies of scale and reducing barriers to access self-consumption. It is particularly key in areas with multi-family housing, which correspond to more than 70 % of main dwellings in Spain. Since 2018, Spain has facilitated shared self-consumption projects, reducing energy costs for communities through economies of scale (p.147). Spain is planning several policy measures to support energy communities (p. 180-181)

The Social Climate Plan (PSpC), expected to be implemented in 2026, will provide direct financial support to low-income households for energy efficiency improvements, heating system decarbonization, and building renovations (p. 387).

Rehabilitation Offices and Information Campaigns have been expanded to help citizens access financial aid and technical support for energy renovations. By 2022, Spain had already launched social media campaigns and awareness programs to educate the public on energy savings and renovation benefits (p. 249).

Electricity-to-gas price ratio

No projection of gas and electricity prices for households is included in Spain's NECP, while the historical prices are given in figure 4.

Gas and electricity prices are available at Eurostat, and we have looked at data for the last four years.

Spain	2021	2022	2023	2024
Gas price (cent/kWh)	6.91	8.97	10.77	8.19
Electricity price (cent/kWh)	18.69	27.57	23.02	22.14
Electricity-to-gas price ratio	2.7	3.1	2.1	2.7

Figure 4. Average gas and electricity prices in cent/kWh for private consumers (first half of the year) and the respective price ratio. The price includes taxes. The gas price is for consumers with a consumption of 20-200 GJ/year, and the electricity price is for consumers with a consumption of 5.000-15.000 kWh/year. Source: Eurostat, nrg_pc_202 and nrg_pc_204.

In Spain, the electricity-to-gas price ratio is close to 3, and heat pumps are not the cost-efficient option.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

Spain is well on track to meet the targets for reduction of GHG emissions outside the EU emission trading scheme. The target is a reduction of 37.7% between 2005 and 2030, and Spain aims at a reduction of about 42%.

Spain is meeting the renewable energy target in heating and cooling. By 2030, Spain will reach 48.8% renewable energy in heating and cooling, which is 6.8 %-point above the target. There is no information in the NECP about how large the share of biomass is in heating & cooling. The amount of biomass used for electricity generation will increase from 2020 to 2030. There is no information about biomass import.

Finally, Spain is not on track to meet the EU energy efficiency targets. Primary energy consumption in 2030 is projected to be 20% higher than the EED 3 primary energy consumption target. Therefore, Spain needs to do more to reduce energy consumption.

We have the following suggestions to improve Austria's policies and measures:

- Integration of energy communities and support for district heating networks, which may not be sufficiently developed at present.
- Reassessing the use of biomass, encouraging the use of more efficient and sustainable biomass, and banning biomass imports if they do not meet strict criteria.
- The introduction of vocational training programs for green technologies in the heating and cooling sector, an area that could benefit from increased support.
- Support for the adoption of natural refrigerants for heat pumps and other heating and cooling systems, an area that still needs further exploration in Spain.
- The introduction of carbon pricing mechanisms specific to the heating and cooling sector, which would complement current EU efforts.

SWEDEN

The following analysis is based on [Sweden - Final updated NECP 2021-2030 \(submitted in 2024\) - European Commission](#) published 1 July 2024. Page numbers refer to the English translation of the National energy and climate plan (NECP).

1. TARGETS

1.1. TARGETS ON RENEWABLE ENERGY IN THE HEATING AND COOLING SECTOR

For Sweden the target for heating and cooling in the Renewable Energy Directive 2023/2413 (RED 3) including national indicative increase (the total RED 3 target) is a 0.7%-point increase per year, 2021-2030. This is below the minimum annual increase in RED 3 art. 23.1 because Sweden has above 60% renewable energy in the entire period and is using the option in RED 3, art. 23.2b to count the high share of renewable heating and cooling as fulfilling the increase target.

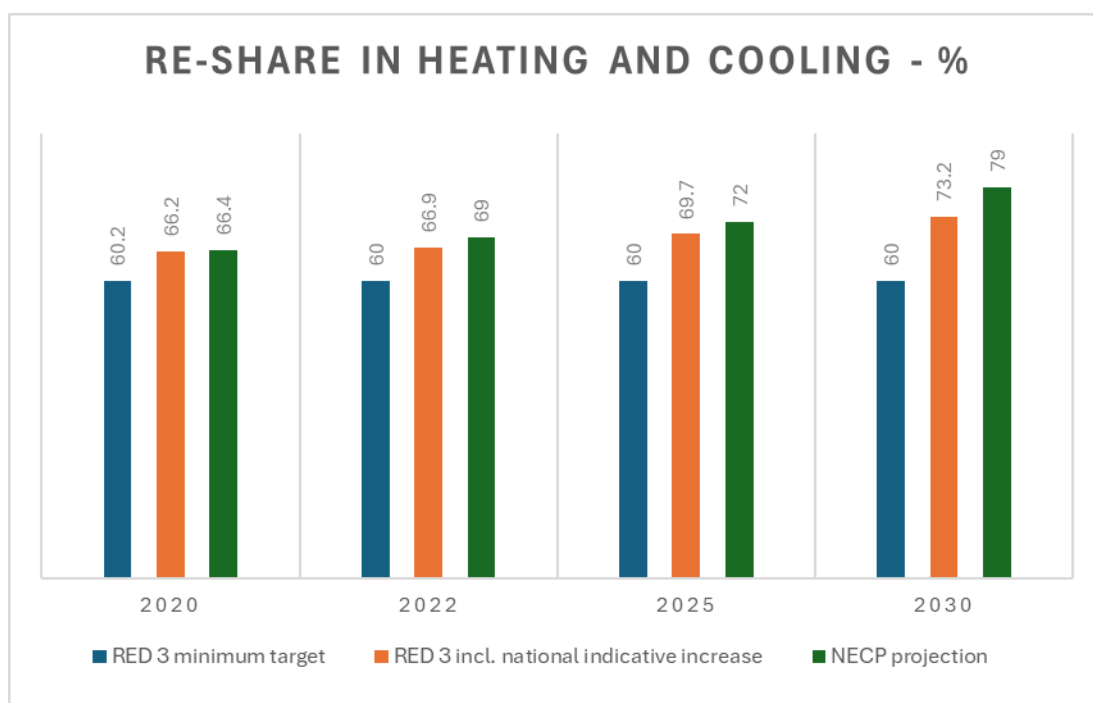


Figure 1. Renewable share in % of heating and cooling for Sweden, RED 3 binding share, RED 3 including national indicative increase and projection with policies and measures in NECP for 2025 and 2030 compared with base year 2020 and latest statistics from 2022. (p.188, table 31 and p. 197, table 32).

Sweden is not including waste (excess) heat and cooling nor RE in electricity in the calculations.

The building sector accounts for approximately half of the heating and cooling excluding electricity, (calculated from p. 212, fig.32, and above numbers), the rest is for the industrial sector.

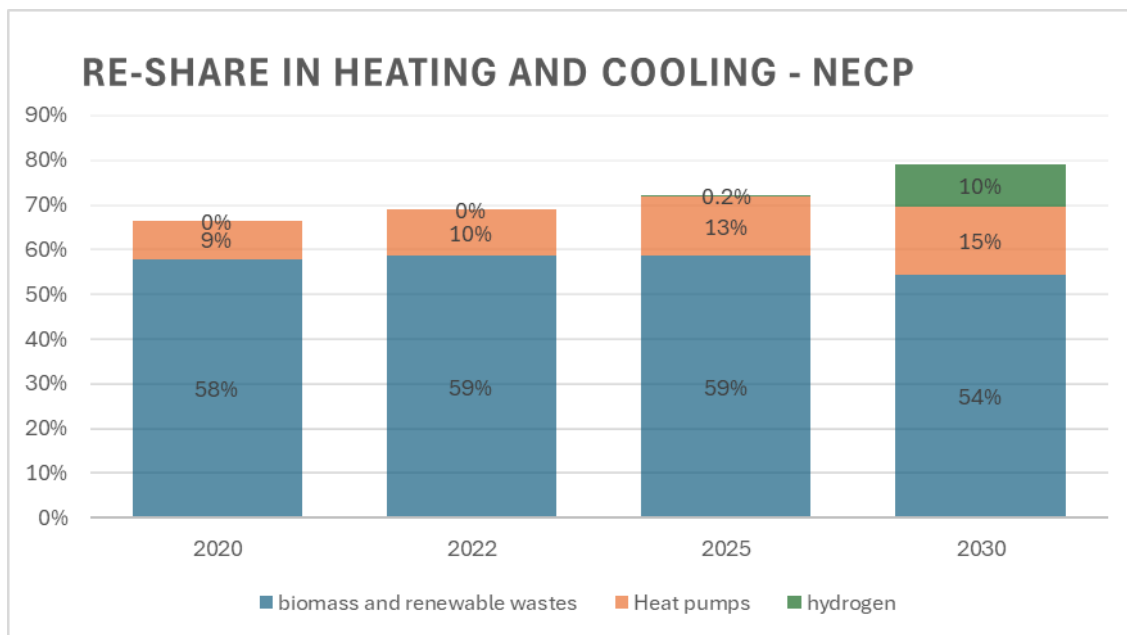


Figure 2. Renewable share in % of heating and cooling for NECP projections divided in sources, compared with the base year (2020) and latest available statistics (2022)(calculated from p.195 fig.23, p.209 fig.30, and p.181).

Sweden had a net import of solid wooden biomass, varying between 2.1 and 5.9 TWh in the period 2020–2023. The biomass import is equal to 2–5% of total demand for heating, cooling, and electricity. With the expected slightly reduced demand for solid biomass until 2030 in buildings and industry, it is likely that the net imports will be reduced (no number given)(above graphs and p. 193, p.210), and *Energimyndigheten, Statistikbas, table "Import and export of disintegrated unprocessed wood fuels"*). Sweden is also importing waste for incineration

30% of Swedish heating and cooling demand is covered by district heating (calculated from p.43 and p.213, fig.33). Since only half of Swedish heating and cooling demand is for buildings and most district heating is for buildings, the share of district heating in heat supply for buildings is much higher. Almost 30% of the heat for district heating (17.3 TWh/year in 2023 according to <https://www.avfallsverige.se>) come from incineration of waste (renewable + non-renewable parts).

With the large consumption of biomass, mostly in the form of wood, the forecast in the NECP is that Sweden will not meet its LULUCF target of removing 49 million ton CO₂e in 2030 from the atmosphere, but will miss the target with 7 million ton CO₂e. With the forecast, Sweden will have lower removal of greenhouse gases in 2030 than the average of the removals in the base years 2016–2018 (p. 3.4).

The RED 3 EU-wide target for RE in the building sector is 49% in 2030. Sweden expects to reach 89% in 2030. This is an increase of around 9%-point from 80% in 2022 and around 13%-point from 76% in 2020 (p.199, table 33).

Other national targets/forecasts from policies in the Swedish NECP are:

- 80% RE in district heating networks by 2030 according to the forecast (p.212). Because the level is higher than 60%, there are no requirements for further increases according to RED 3, art.24.4a.

- 81% RE in electricity by 2030 according to the forecast, which is actually a reduction compared to 83% in 2022. The reason for this reduction is that the use of electricity is growing at a faster pace than renewable electricity generation (p.201).

1.2. GHG EMISSION TARGETS FOR NON-ETS 1 SECTORS

For Sweden, the target is a reduction of 50% greenhouse gases (GHGs) between 2005 and 2030 of the emissions not covered by the current EU Emission Trading Scheme (ETS1) or by the Land-Use, Land-use Change and Forestry (LULUCF) regulation. This is an improvement compared to the previous target of 40% (p. 37) and is following the revised EU effort sharing regulation, (EU) 2023/857. The regulation also sets annual emission limits for the years 2021-2030 with a budget approach, so each country has to keep the sum of emissions for the period within the sum (the budget) of annual emission limits.

Sweden is not in line to reach the targets, neither the 2030 target nor the budget target for 2021-2029. The 2030 target is 21,6 MTCO_{2e}, while the forecast is that emissions will be 25,3 MTCO₂, or 24,3 MTCO₂ if a low emission scenario for transport is followed (p. 185). This is an overshoot of respectively 17% and 13%. For the budget target for 2021-2030, the forecast is an overshoot in the range of 1-9 MTCO₂. This overshoot is in spite of the decision by Sweden to use the flexibility in the revised effort sharing regulation to count ETS quotas of 5,2 MTCO₂ towards the budget target instead of auctioning them into the ETS system.

1.3. ENERGY IMPORT TARGETS AND DEPENDENCY ON IMPORTS

No target set, all Swedish fossil fuel is imported, and also enriched uranium is imported (29% of Swedish power supply is nuclear). The fossil fuel imports will continue, but gradually be reduced through the reduction in fossil fuel use. Fossil fuel use will be reduced by 18% in the period 2022-2030 (p.185 table 30).

Sweden also imports waste for energy, 2.92 million tons in 2022 (<https://www.naturvardsverket.se>), equal to around half of waste incineration in Sweden and with a contribution to Swedish heating close to 9 TWh/year. The import of waste for energy is not mentioned in the NECP, but the forecast is that the use of waste for energy will continue at the current level, at least until 2040 (p.213, figure 33). As the domestic waste for energy is not expected to increase, the continued high level of incineration can only continue with continued waste import for energy. The waste import is a good source of income for the district heating companies.

Sweden's dependency on energy imports for use in buildings

There is no data available for import of energy for use in buildings into Sweden, but with the target of reducing fossil fuel use in building to below 1% in 2030, limited biomass imports and the 98% fossil fuel free power production in Sweden, the import dependency of energy to Swedish buildings will primarily be enriched uranium that is imported to produce nuclear fuels.



Figure 3. Dependency on import for total fossil primary energy consumption. Import dependency of gas includes biogas, there is no domestic production of fossil gas in Sweden (p.219, fig. 36), combined with figures for biogas production.

1.4. TARGETS SUPPORTING THE DECARBONISATION OF HEATING AND COOLING

- 63% reduction of emissions outside ETS1 by 2030 and 75% by 2040, compared with 1990 (p.8).
- Climate neutrality 2045 for the entire economy including LULUCF (p.8).
- Fossil free electricity production by 2040 (p.8).
- 50% increase of energy efficiency related to GDP by 2030, compared with 2005 (p.9).
- Lower energy consumption in kWh/m² in existing buildings than previous milestones in 2030, 2040, 2050 (lower consumption per m² than 10 years earlier for each milestone year, but no target for how much lower)(p.53).
- Higher share of buildings in energy class A-C in 2030-2050 than previous milestones in the 2020's (more buildings in class A-C, but no target for how many more)(p.53).
- Share of fossil fuel used in buildings should not exceed 1% in 2030 and 0% in 2040 (p.53).

1.5 TARGETS ON ENERGY EFFICIENCY COMPARED TO THE EE TARGET IN THE EED

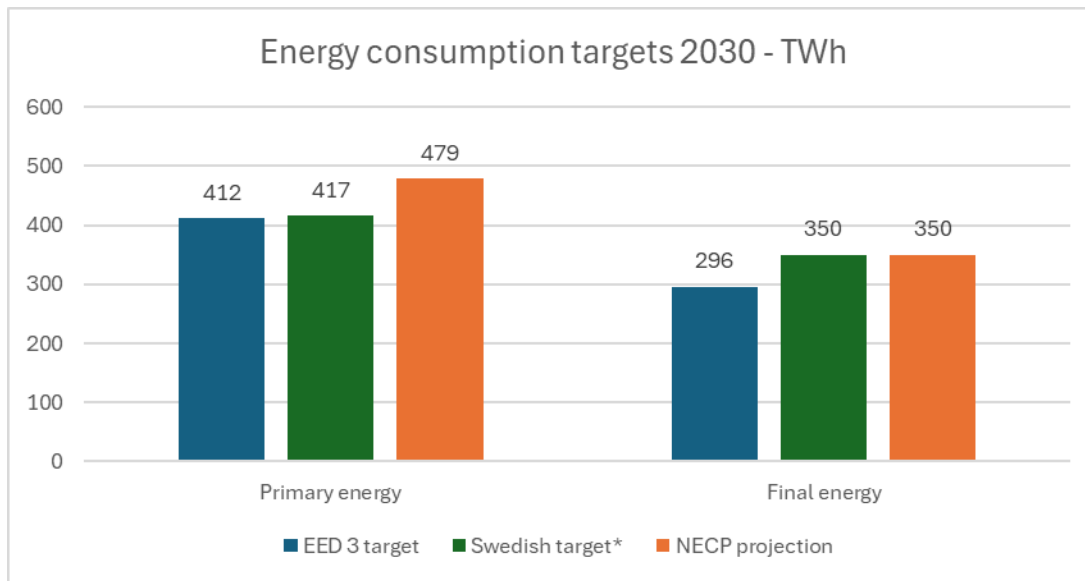


Figure 4. National target for energy consumption according to EED 3 and the projection of consumption in NECP based on additional measures scenario (p. 48-49 text and tables 5 and 6).

The “Swedish targets” in figure 4 are for final energy, the target communicated by Sweden to EC, and for primary energy, the EC calculation with proposed corrections by Sweden.

While total Swedish energy consumption will increase according to the scenarios (basis scenario and scenario with additional measures) because of the expected industrial development, the energy consumption in buildings is decreasing in the scenarios. For the dwelling and service sector, the energy consumption is expected to decrease 27 TWh (18%) 2021-2030, resulting in a consumption of 139,3 TWh in 2030 (p.214 table 35 and p.239 table 42).

2. POLICIES TO ACHIEVE THE HEATING TARGETS

Sweden’s NECP proposes no significant legislative changes to promote sustainability and energy efficiency in the building sector.

Energy and CO₂ taxes are major policy measures to reduce fossil energy use and to save energy in general. There are taxes on electricity (0,428 SEK = 0,039 € per kWh), heating oil, gas, and coal. Energy used within sectors covered by the EU ETS and energy used for electricity production is exempted from taxes. Instead of taxing fuels for electricity production, the electricity is taxed. (p.73).

A competitive support program “klimatklivet” supports reductions of GHG emissions, through the replacement of oil with biomass or district heating, construction of new, smaller district heating networks, as well as certain measures in transport, health and biogas plants. The support program is currently running until 2028. The total budget in 2024 was 4,9 billion SEK (445 million €)(p.74).

Swedish house owners can get a tax rebate of 30% on the wage costs for renovation and reconstruction of dwellings (program Rotavdrag) with an annual maximum of 50,000 SEK (4,500 €) per person (p.133).

The Swedish building regulations require energy efficient buildings, both for new buildings and for renovations of existing buildings. The requirements are maximal consumptions of 90-100 kWh/m² for single and double houses, 75 kWh/m² for multi-family houses.

Sweden has a law on planning and construction (Plan - och bygglagen) which requires that climate aspects are taken into account in urban planning.

The Swedish energy agency (Energimyndigheten) informs citizens about energy efficiency, gives advice on energy savings and sustainable energy supply. It uses, among other channels, its website.

Sweden has a "National Renovation Centre" to build knowledge and information to support actors in the construction and building sector (p.134).

Sweden has an information centre for sustainable construction that collects information and makes it available, mainly via its database (p.134).

The Swedish state started in 2014 the initiative "Fossil Free Sweden", where now 500 actors, including companies and municipalities, have agreed to a declaration and work together to reduce GHG emissions. The initiative has developed 5 strategies including a strategy for the efficient use of energy.

Sweden has an energy-efficiency council "Energieffektiviseringsrådet" to advise the state on energy efficiency (p.136).

The Swedish regions have their own regional climate and energy strategies.

The Swedish energy efficiency measures are not leading to the energy savings expected in the EED 3 in the period 2021-2030. The gap is 70,4 TWh, equal to 30%. Most of the savings are in dwellings and service sector (126,1 out of 166,6 TWh)(p.132 table 18).

Cost of the policies in the NECP

Only investments in power production and electricity networks are included in the NECP. For households, there is a calculation of the effects of ETS2 if it is capped at 45 €/ton of CO₂. The calculation shows a reduction of household incomes of 0,15 - 0,22% in 2030 with the lowest effect in households above median income living in larger towns and the highest effect for households below the median income living in rural areas and small towns. The effect is not divided into effects on building energy costs and on transport costs, but the text indicates that most effects are from increased transport costs.

Energy poverty

Sweden has a social security system that supports low-income families that have difficulties to cover costs, also energy costs.

In 2022, there was special state support to mitigate the effects of the high energy costs. The support was given both for electricity and gas use for the months November and December 2022. This support was not limited to low-income families. In parallel the energy agency (Energimyndigheten) made an information campaign on energy efficiency with focus on electricity use and on small houses (such as single-family houses)(p.138-139).

Electricity-to-gas price ratio

No projection of gas and electricity prices for households is included in Sweden's NECP, while the historical prices are given in figure 5.

Gas and electricity prices are available at Eurostat.

Sweden	2021	2022	2023	2024
Gas price (€cent/kWh)	14.38	22.16	21.89	17.60
Electricity price (€cent/kWh)	16.95	17.70	21.66	20.34
Electricity-to-gas price ratio	1.2	0.8	1.0	1.2

Figure 5. Average gas and electricity prices in cent/kWh for private consumers (first half of the year) and the respective price ratio. The price includes taxes. The gas price is for consumers with a consumption of 20-200 GJ/year, and the electricity price is for consumers with a consumption of 5.000-15.000 kWh/year. Source: Eurostat, nrg_pc_202 and nrg_pc_204.

Electricity has become more expensive in recent years (20% increase 2021-2024) which favors heat pumps over direct electric heating. Gas is hardly used for heating in Sweden, so it is not a real alternative. Besides that, since gas is around the same price as electricity, it is not an economical favorable alternative to heat pumps, and also not to direct electric heating, when the cost of a gas boiler is included.

3. CONCLUSION AND SUGGESTIONS TO IMPROVE POLICIES AND MEASURES IN THE NECP

The Swedish decarbonization of heating and cooling is well on its way regarding the transition to renewable energy with an impressive forecast for 2030 of 79% renewable energy in this sector, even without including the renewable part of electricity for heating. Unfortunately, most of the renewable energy (59% of the 72% in 2025) is from biomass and in spite of large forest resources, Sweden is importing biomass for energy and is reducing its removal of CO₂ from the atmosphere by its own forests and land use. The forecast for CO₂ removals in 2030 is lower than in the average of the removals in the base years 2016-2018. The forecast is a reduction in the share of biomass in heating and cooling to 54% in 2030. Part of the reduced share of biomass in heating and cooling is because of a plan to cover 10% of heating and cooling with hydrogen, but this is for industrial processes, not for buildings.

Sweden is not on track to meet the EU energy efficiency targets, neither the consumption target in 2030 nor the target for energy savings expected in the EED 3 in the period 2021-2030. This is partly because of expected increase in industrial production, partly the limited actions for energy savings, missing this EED 3 target with 30%. Sweden could certainly do more to reduce energy consumption, also to reduce biomass imports (see suggestions below).

Sweden is phasing out import of fossil fuels for heating, almost to zero by 2030, but Sweden will remain dependent on uranium imports for electricity, also to be used for heating and cooling. Sweden will also continue to import large amounts of waste for energy via incineration.

The Swedish climate actions are not on track to meet the targets for reduction of GHG emissions outside the EU emission trading scheme. For this target, heating and cooling only

plays a smaller part, given that emissions from biomass combustion are not included in the EU target setting.

The Swedish NECP has most of the information needed for analysis, but some parts are only in graphs, not with specific figures. Costs of climate actions are not documented for heating and cooling.

Suggestions

- Biomass use for energy, including for heating, could be reduced more than in the forecast. Imports of biomass for energy should be avoided, and use of domestic biomass should be reduced in order to increase removals of CO₂ from forest, at least to the level set by the LULUCF target for Sweden for 2030.
- The continued use of waste for energy, both imported and domestic, should be reduced to allow for more reuse and recycling that has a higher value and lower emissions than incineration.
- The support for efficient and renewable heating and cooling should be more permanent and predictable than the "Klimatklivet", where projects compete with many other types of climate measures.
- Support should also be targeted to those in need including long term solutions supporting vulnerable citizens towards the transition to clean heating.
- Sweden should have a strategy to support local energy communities with electricity production for members' heat pumps and other energy use.
- Develop and update national, regional, and municipal heating and cooling plans.
- Strengthen energy renovation in public buildings with a strategy and budget allocations.
- Subsidies and tax rebates for building renovation (including Rotavdrag) should focus on energy renovations and building integrated renewable energy.
- Support natural refrigerant cooling and heating equipment, including in heat pump subsidy schemes.