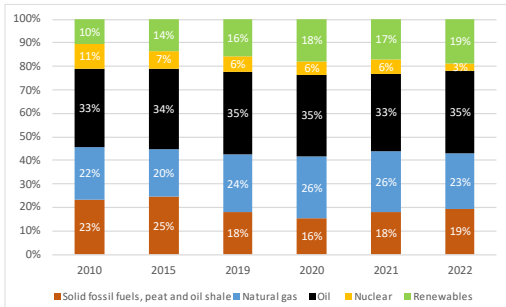


# State of the Energy Union 2024: Germany

## Key energy figures

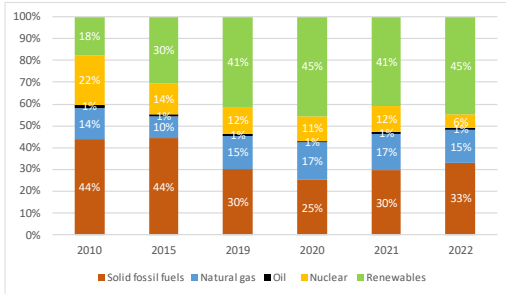
Graph 1: **Energy mix**



(1) The 2022 gross inland energy consumption was 11.9 million TJ. (21.1% of the total EU consumption).

Source: Eurostat

Graph 2: **Electricity mix**



(1) The 2022 gross electricity production was 574.3 TWh. (20.6% of the total EU production).

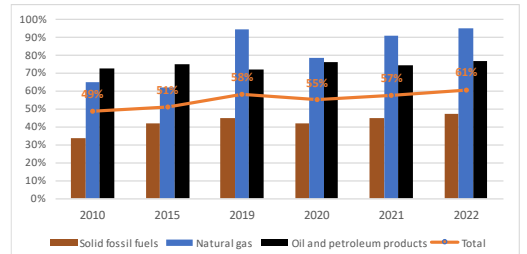
Source: Eurostat

- Fossil fuels account for 78.8% of Germany's **energy mix** (compared to 69% at EU level). The share of nuclear was 3.1% and renewables 18.7%. Nuclear was phased out in April 2023.
- The **electricity mix** of Germany is dominated by fossil fuels with 48.9% and renewable energy 44.8% (compared to EU with 39.4% and 38.6% respectively). Nuclear energy accounted for the remaining 6%.

## Security, solidarity and trust

### 1. DIVERSIFICATION OF ENERGY SOURCES AND REDUCTION OF IMPORT DEPENDENCY

Graph 3: **Import dependency on fossil fuels**



(1) The graph shows the Member States' import dependency on third countries by fuel type.

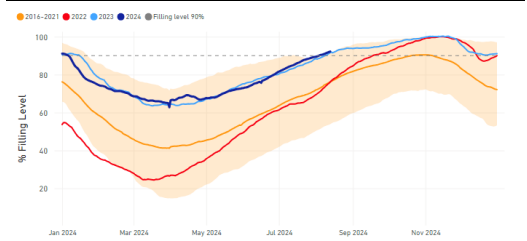
(2) Combustible renewables and electricity are excluded.

(3) The total amount takes into consideration the energy mix of the country.

Source: Eurostat

### 2. FLEXIBILITY OF THE ENERGY SYSTEM

Graph 4: **Storage levels in Germany**



Source: JRC calculation based on AGSI+ Transparency Platform, 2024

- Germany has **44 gas storage facilities** with a total capacity of **23 bcm**, representing 26% of its annual gas consumption in 2022.
- On 17 August 2024, the country's storage capacity was filled to 92.98%.

# Integrated internal energy market

## 1. ELECTRICITY INTERCONNECTIVITY

Table 1: Electricity interconnectivity

2024	2030 targets
10.6 %	At least 15%

1) The electricity interconnectivity is a ratio of electricity import capacity of a given Member State (sum of net transfer capacities of interconnectors with neighbouring Member States) and its total power generation capacity. The 2030 level represents the general interconnectivity target of 15%.

Source: European Commission's own calculations based on the ENTSO-E Winter Outlook 2023-2024 data

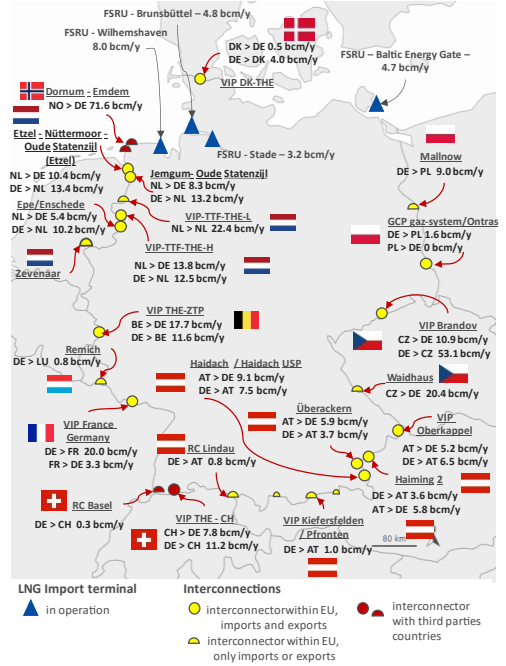
## 2. ENERGY TRANSMISSION INFRASTRUCTURE

Map 1: Cross-border electricity infrastructure



Source: DG ENER map recreation (based on ENTSO- E)

Map 2: Cross-border gas infrastructure



(1) The capacities are based on ENTSO-G 2024 capacity dataset (as of 11 January 2024) and the ENTSO-G Transparency Platform. Source: DG ENER map recreation (based on ENTSO- G)

## 3. MARKET INTEGRATION

- The single German-Luxembourgish bidding zone has considerable internal congestion, meaning that frequently transmission grid capacities within the bidding zone are not sufficient to match the results of trading on the wholesale electricity market. This results in increasing curtailment especially of offshore and onshore wind power plants with the curtailed capacities mostly replaced by coal and gas power plants. Such remedial actions not only result in inefficient use of renewables, but also in increasing costs for consumers. While costs decreased in 2022 due to lower fossil fuel prices, in 2023 they still amounted to EUR 3.1 billion<sup>(1)</sup>. Without a bidding zone configuration which more appropriately reflects available grid capacities, the costs for fulfilling the objective required by EU legislation that by 31 December 2025 at least 70% of interconnector capacity is available for electricity trading (instead of unscheduled electricity flows) will likely increase further, especially since in 2023 the average minimum hourly margin available for cross-zonal

(1) [www.smard.de/page/home/topic-article/444/213590](http://www.smard.de/page/home/topic-article/444/213590)

electricity trade was only around 40% (see figure 17 on page 27 of ACER's report on Capacities for cross-zonal electricity trade and congestion management - 2024 Market Monitoring Report<sup>(2)</sup>).

### Rollout of electricity smart meters

- At 1%, Germany has a very low smart meter roll out. Those who have a smart meter can access a near real time to consumption of data based on a 15-minute interval.<sup>(3)</sup>

### Diversification of gas supplies

- In 2023, Germany had 9 natural gas supply sources, the same as in 2021. Its three largest suppliers accounted for 86%, with Norway being the main supplier, holding a share of 40%. In 2021, Russia with 49%, Norway with 19%, and the Netherlands (11%) were Germany's biggest natural gas supply sources.<sup>(4)</sup>

## 4. ENERGY POVERTY, SOCIAL CLIMATE PLAN AND JUST TRANSITION

Table 2: Energy poverty

Indicator	%	Evolution compared to		EU average
	2023	2021	2017	
<b>EED NEECPs four main indicators</b>				
Inability to keep home adequately warm	8.2	+4.9 pp	+4.9 pp	10.6
Arrears on utility bills	5.4	+1.7 pp	+2.6pp	6.9
Share of pop. With leak, damp or rot in dwelling	16	+ 4 pp (2020)	+3.5 pp	15.5
AROP (At risk of poverty)	14.4	-1.6 pp	-1.7 pp	16.2

Source: Eurostat

### Social Climate Plan

- Member States need to submit these plans to the European Commission by June 2025.
- Maximum financial allocation for Germany: EUR 5 910 million or 8.19 % of total SCF.

### Just Transition Plan

- The German Territorial Just Transition Plans (TJTP) outline the transition away from coal in Rhenish lignite mining territory, Northern Ruhr Area, Schwedt/Uckermark, Lusatian lignite mining territory, Chemnitz and Central German lignite mining territory covering Saxony and Saxony Anhalt. The plans set out how the Just Transition Fund (JTF), with the national allocation of EUR 2.5 billion, will support the conversion of fossil fuel power

(2) [www.acer.europa.eu/monitoring/MMR/crosszonal\\_electricity\\_trade\\_capacities\\_2024](http://www.acer.europa.eu/monitoring/MMR/crosszonal_electricity_trade_capacities_2024)

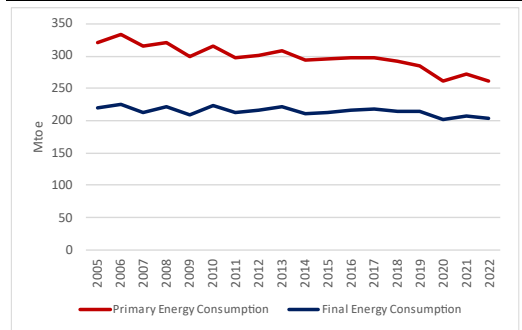
(3) ACER, 2024 Retail Market Monitoring Report, Energy retail and decarbonisation (forthcoming).

plants, workers, and local communities. Germany has decided to phase-out the use of coal and lignite for the generation of electricity by 2038, at the latest.

## Energy efficiency

### 1. ENERGY EFFICIENCY

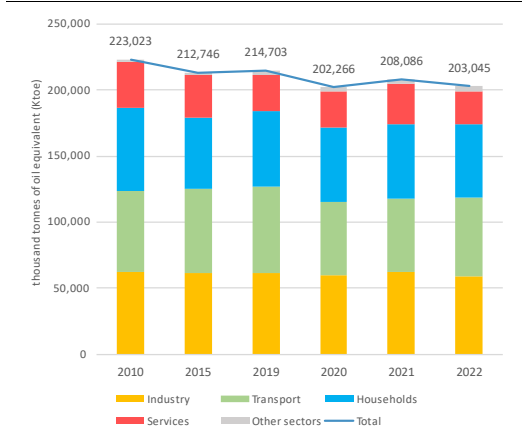
Graph 5: Primary and final energy consumption



Source: Eurostat

- In 2022, Germany's **Primary Energy Consumption (PEC)** amounted to 260.6 Mtoe, 4% lower than in 2021, while its **Final Energy Consumption (FEC)** amounted to 202.8 Mtoe, 2.5% lower than in 2021.

Graph 6: Final energy consumption by sector

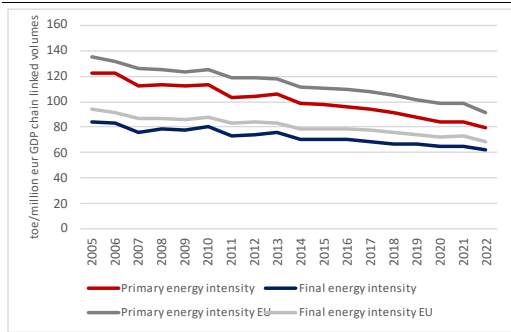


(1) Final energy consumption excludes consumption of the energy sector (including transformation and distribution losses) and non-energy use of energy carriers.

Source: Eurostat

(4) ACER-CEER Annual Report Monitoring: the Internal Gas Market in 2022 and 2023.

Graph 7: Primary and final energy intensity



Source: Eurostat

## 2. ENERGY PERFORMANCE OF BUILDINGS

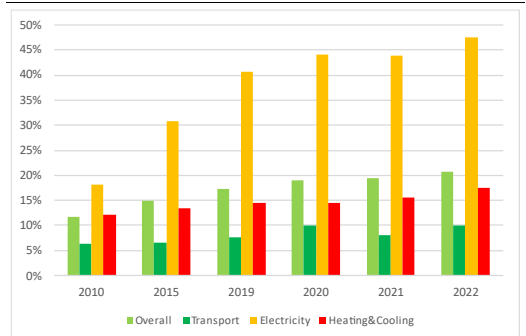
- In 2022, Final Energy Consumption (FEC) in the German **residential sector** was **55.8 Mtoe**, representing a **reduction of 1.0%** compared to 2021. In the **services sector**, FEC was **25.2 Mtoe**, with an **15.7% decrease** compared to 2021. However, climate corrected data<sup>(5)</sup> show a **residential FEC increase of 13.1%** from 2021 to 2022, indicating that the above reduction is mostly climate-related (e.g. milder winter) rather than linked with an improvement of the building stock.
- Heating and cooling account for around **83%** of the country's residential final energy consumption, with renewables supplying approximately **17%** of the gross final energy consumption for heating and cooling. Around 440,000 heat pumps were sold in 2023, representing an increase of 59% compared to the sales of the previous year, reaching a total stock of around 2.1 million installed heat pumps, as per the European Heat Pump Association (EHPA).
- In 2023, **5.4%** of the total population was experiencing difficulties on paying their utility bills while **8.2%** was not able to keep their home adequately warm over the cold periods of the year (growing from 2021, when such figures were, respectively, 3.7% and 3.3%). This underlines the importance to increase rate and depth of building renovation, specifically of worst-performing buildings.

(5) Following JRC's methodology (see for reference "Energy Consumption and Energy Efficiency trends in the EU, 2000 – 2020).

# Decarbonisation and climate action

## 1. SECTORAL SHARE OF RENEWABLE ENERGY

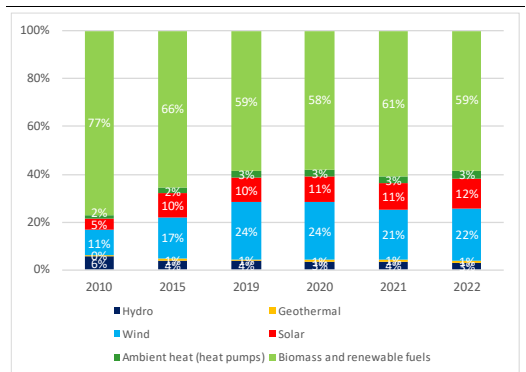
Graph 8: Share of renewable energy sources



(1) In % of gross final consumption of energy.

Source: Eurostat

Graph 9: Renewable energy mix

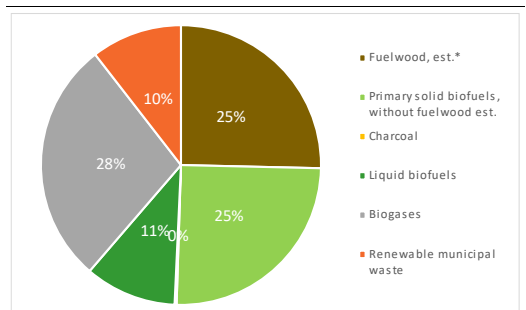


(1) In % of gross final consumption of energy.

Source: Eurostat

## 2. BIOENERGY MIX

Graph 10: Bioenergy mix



(1) In % of gross final consumption of energy (2022).

(2) \* Fuelwood estimate, based on the Primary solid biofuels consumption in Other sectors, Eurostat and industry secondary data, DG ENER estimations.

**Source:** Eurostat and DG ENER

- For more information see the dedicated [website on biomethane country fiches](#).

### 3. HYDROGEN

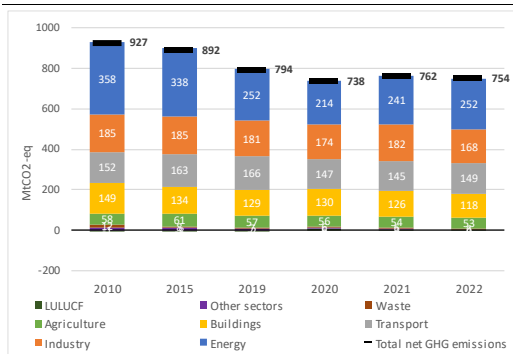
Table 3: **Operational hydrogen projects (5 MW electrolyser capacity or above)**

Name	Description
ETOGAS, Solar Fuel Beta-plant AUDI, Werlthe (Audi e-gas)	6 MW connected to the grid
Refhyne	10 MW connected to the grid
H&R Ölwerke Hamburg-Neuhof	5 MW connected to the grid
Energiepark Mainz	6 MW from onshore wind
Wunsiedel Energy Park (Phase 1)	8.8 MW online since 2022

**Source:** European Commission based on IEA data

### 4. GREENHOUSE GAS EMISSIONS

Graph 11: **Greenhouse gas emissions by sector**

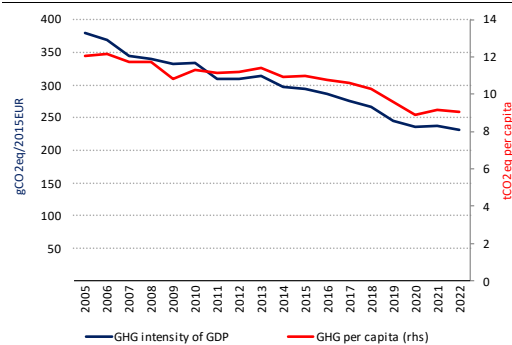


Based on UNFCCC GHG Inventory reporting as per the IPCC categories: (1) Energy sector refers to electricity and heat production and petroleum refining. (2) Industry includes fuel combustion in manufacturing and construction and emissions in industrial processes and product use. (3) Buildings include emissions from energy use in residential and tertiary buildings, and energy use in agriculture and fishery sectors. (4) Total net GHG emission including LULUCF and excluding international aviation.

**Source:** Greenhouse gas inventory 1990-2022 (EEA)

(6) Renewables, smart system, efficient systems, sustainable transport, CCUS and nuclear safety, COM(2015) 80 final ('Energy Union Package').

Graph 12: **GHG per capita and GHG intensity of GDP**



(1) Total greenhouse gas emissions, including LULUCF and excluding international aviation.

**Source:** Greenhouse gas inventory 1990-2022 (EEA). Real GDP in 2015-prices (AMECO, European Commission). Population (Eurostat).

- With 231 gCO2eq/2015EUR, Germany lies above the EU average in terms of GHG intensity of GDP.
- With 9 tonnes of CO2 equivalent per capita, Germany is above the EU average in terms of GHG emissions per capita.
- For more detailed information on country profiles see [Progress on climate action \(europa.eu\)](#).

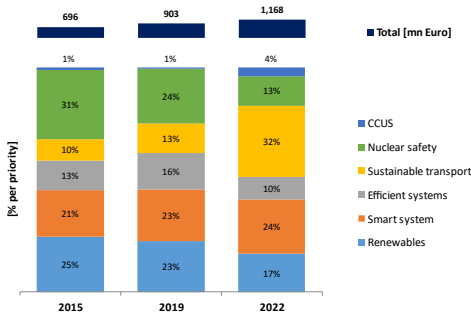
## Research, innovation and competitiveness

### 1. INVESTMENT IN R&I

- Public investment in research and innovation (R&I) in Energy Union priorities<sup>(6)</sup> increased from 0.023% in 2015 to 0.030% in 2022 (share of GDP).<sup>(7)</sup>

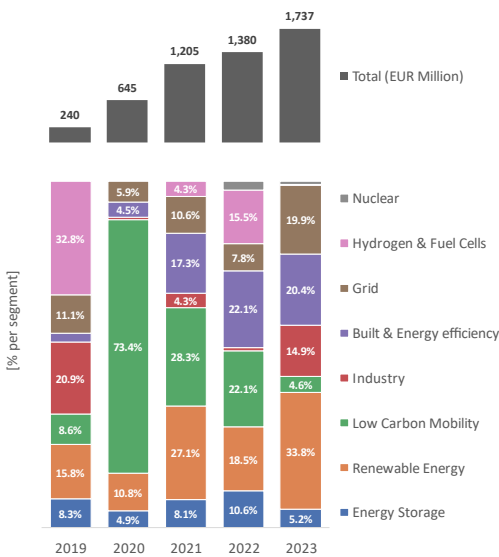
(7) Source: JRC SETIS 2024

Graph 13: **Public investment in Energy Union R&I priorities**



Source: JRC SETIS 2024

Graph 14: **Venture capital investment in net-zero energy technology (start-ups and scale-ups)**



(1) Firms typically use venture capital to expand, break into new markets, and grow faster. Venture capital is essential for the growth of innovative firms and it is key to foster the EU's competitiveness and to strengthen the EU's technology sovereignty in the net-zero energy sector.

Source: JRC elaboration based on PitchBook data (08/2024)

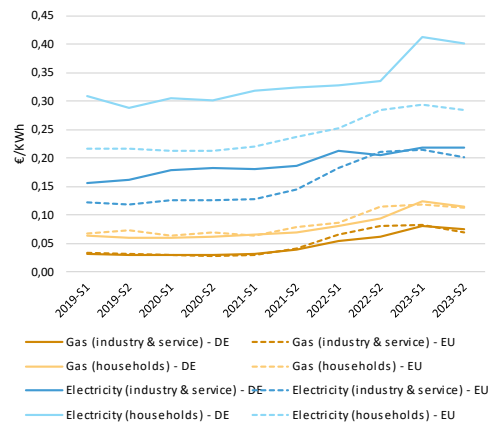
## 2. NET-ZERO ENERGY TECHNOLOGIES

- Germany has traditionally had a strong innovation performance and manufacturing base for clean energy technologies and their supply chains. But international competition is intensifying. The German PV sector, with its material producers, mechanical engineering, component manufacturers and R&D facilities still occupies a strong position in some segments of the value chain. Germany hosts the only solargrade polysilicon supplier in Europe. In modules, Germany produces mainly for its domestic market, but lacks sufficient manufacturing capacity for PV ingots, wafers

and cells. Germany has a number of manufacturing facilities for the main wind turbine components (nacelle, blades and tower). Additionally, other German companies are providing components to the main global manufacturers, such as bearings, gear boxes and transformers. In the battery sector, the leading cell producers in the EU are mostly the local subsidiaries of Far East (mainly Chinese) or US companies. EU owned companies, many of them German, are also active and/or are preparing a number of battery cell production facilities. Some of those are integrated into the value chain of German car manufacturers. In Europe, Germany is currently the country with the highest installed manufacturing electrolysis capacity, in polymer electrolyte membrane (PEM) and alkaline.

## 3. ENERGY PRICES DEVELOPMENT

Graph 15: **Germany's energy retail prices for households and industry & service**



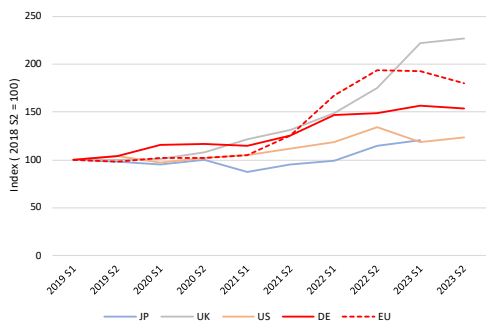
(1) For industry, consumption bands are I3 for gas and IC for electricity, which refer to medium-sized consumers and provide an insight into affordability.

(2) For households, the consumption bands are D2 for gas and DC for electricity.

(3) Industry prices are shown without VAT and other recoverable taxes/levies/fees as non-household consumers are usually able to recover VAT and some other taxes.

Source: Eurostat

Graph 16: Trends in electricity prices for non-household consumers (EU and foreign partners)



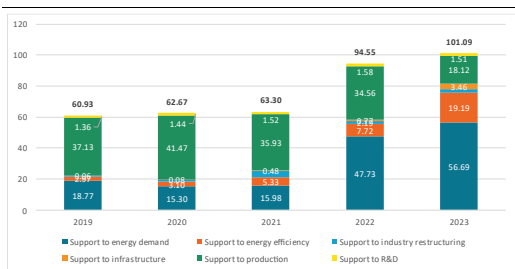
(1) For Eurostat data (EU and DE), the band consumption is ID referring to large-sized consumers with an annual consumption of between 2 000 MWh and 20 000 MWh, such as in electricity intensive manufacturing sectors, and gives an insight into international competitiveness.

(2) JP = Japan

Source: Eurostat, IEA

#### 4. ENERGY SUBSIDIES

Graph 17: Energy subsidies by purpose

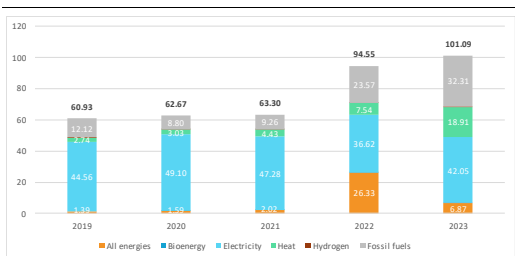


(1) Subsidies in EUR 2023 billion

(2) Some 2023 data were not fully available or validated at the time the study was completed (August 2024). For missing 2023 values, 2022 data were taken as a basis for an estimate.

Source: Enerdata. Inventory of energy subsidies in the EU27 – 2024 edition

Graph 18: Energy subsidies by carrier



(1) Subsidies in EUR 2023 billion

(2) Some 2023 data were not fully available or validated at the time the study was completed (August 2024). For missing 2023 values, 2022 data were taken as a basis for an estimate.

Source: Enerdata. Inventory of energy subsidies in the EU27 – 2024 edition

(8) Council of the European Union 11697/24.

## European Semester 2024

- **No Country Specific Recommendation for Energy**<sup>(8)</sup>
- For more information see the [2024 European Semester Country Report](#).

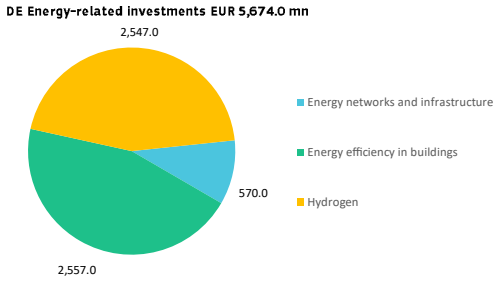
## National Energy and Climate Plan (NECP)

- Member States were due to submit their **final updated NECP by 30 June 2024**, taking into account the Commission recommendations.
- **The final updated NECP** was submitted to the European Commission in August 2024.
- For documents and information see the dedicated [webpage of the European Commission on the NECPs](#).

## Recovery and Resilience Plan (RRP and REPowerEU chapter)

- The German RRP has a total allocation of EUR 30.3 billion (only grants), with 49.5% of funds supporting climate objectives.
- **EUR 7.9 billion are allocated to energy-related measures**, with the largest amount for **energy efficiency in buildings** [EUR 4.6 billion]:
  - Focusing on support to the **energy-efficient renovation of residential buildings**, consisting of two strands i) full renovation programmes (up to 40 000 housing units) and ii) individual measures (up to 145 000 individual renovation measures);
- So far, the Commission disbursed EUR 6.25 billion to Germany, as pre-financing and for the 1<sup>st</sup> payment request. Germany's 2<sup>nd</sup> and 3<sup>rd</sup> payment requests are scheduled for Q3 2024, for pay out still in 2024.

Graph 19: **Energy-related investments in the RRP (in EUR million)**<sup>(\*)</sup>

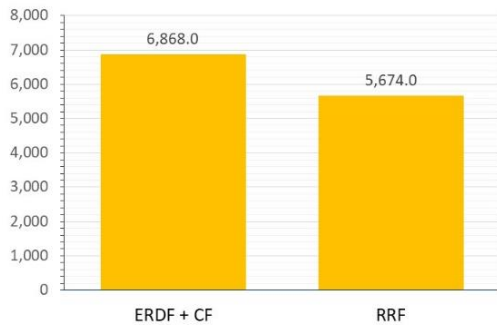


(\*) The graph refers to the RRP as approved in 2023 (without the REPowerEU chapter)

**Source:** European Commission

## EU Funds supporting energy related investments

Graph 20: **Energy-related investments across EU funds (in EUR million)** (\*)



(\*) European Regional Development Fund (ERDF) + Cohesion Fund (CF): comprise EU grants & national cofinancing; RRF: comprise grants & loans. Investment categories can also differ across funds.

**Source:** European Commission

- **Innovation Fund: EUR 1.1 billion.** For more information see the webpage [innovation-fund-projects-country\\_en](#).
- **CEF-Energy: EUR 55.5 million** (2.9% of total EU contribution, for 2021-2027). For more information see [CINEA's Project Portfolio dashboard](#).