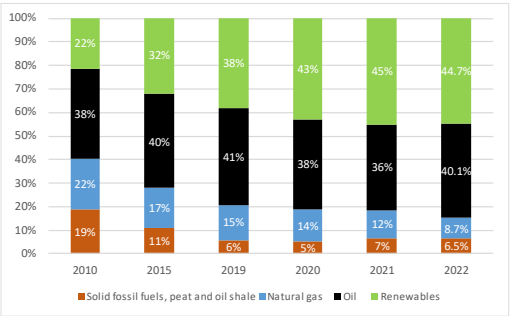
State of the Energy Union 2024: Denmark

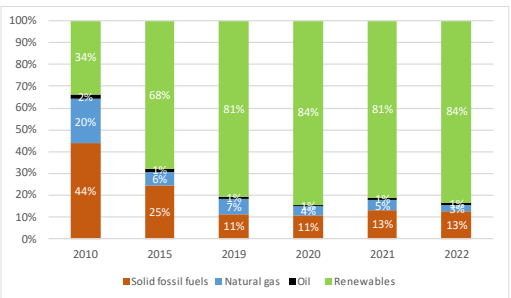
Key energy figures

Graph 1: **Energy mix**



(1) The 2022 gross inland energy consumption was 692 433 TJ. (1.2% of the total EU consumption).
Source: Eurostat

Graph 2: **Electricity mix**



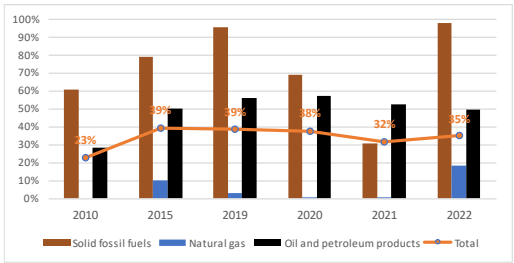
(1) The 2022 gross electricity production was 35.1 TWh. (1.3% of the total EU production).
Source: Eurostat

- Fossil fuels account for more than the half (55.3%) of Denmark´s **energy mix** (compared to 69% at EU level). The remaining 44.7% are renewables.
- The **electricity mix** of Denmark is dominated by renewable energy sources with 83.6% (compared to 39.4% at EU level). Fossil fuels account for the remaining 16.4% (compared to 38.6% at EU level).

Security, solidarity and trust

1. DIVERSIFICATION OF ENERGY SOURCES AND REDUCTION OF IMPORT DEPENDENCY

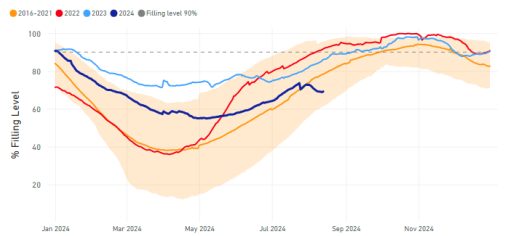
Graph 3: **Import dependency on fossil fuels**



(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 Denmark**



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

- Denmark has **two gas storage facilities** with a total capacity of **0.85 bcm**, representing 36% of its annual gas consumption in 2022.
- On 17 August 2024, the country's storage capacity was filled to 70.93%.

Integrated internal energy market

1. ELECTRICITY INTERCONNECTIVITY

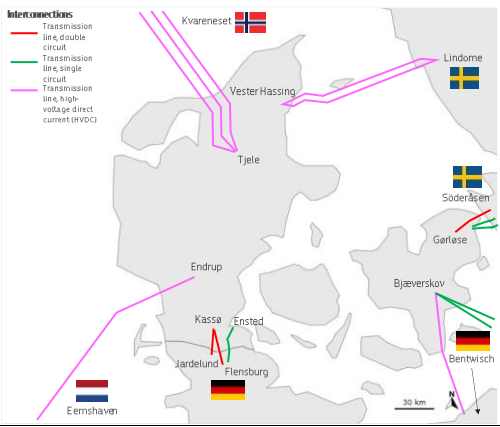
Table 1: **Electricity interconnectivity**

2024	2030 target
36.0 %	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

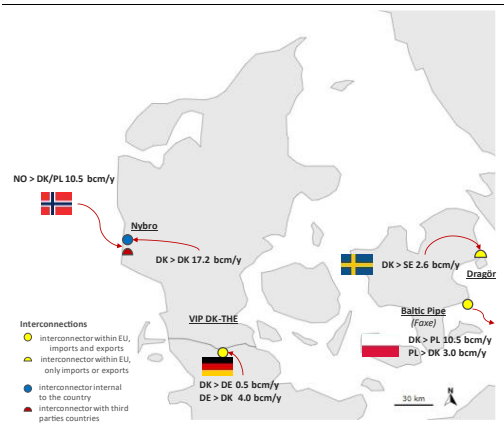
2. ENERGY TRANSMISSION INFRASTRUCTURE

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

Rollout of electricity smart meters

- Denmark has 100% smart meter rollout, and all consumers have almost real time access to consumption data. (1)

Diversification of gas supplies

- In 2023, Denmark had 3 natural gas supply sources, compared to 2 in 2021. Its three largest suppliers accounted for 99%, with Norway being the main supplier, holding a share of 51%. In 2021, Germany with 66% and its own domestic production (34%) were Denmark's biggest natural gas supply sources.(2)

4. ENERGY POVERTY, SOCIAL CLIMATE PLAN AND JUST TRANSITION

Table 2: **Energy poverty**

Indicator	%	Evolution compared to		EU average
EED NECPs four main indicators	2023	2021	2017	
Inability to keep home adequately warm	6.9	+4.1 pp	+4.2 pp	10.6
Arrears on utility bills	4.7	+1.8 pp	+1.2pp	6.9
Share of pop. With leak, damp or rot in dwelling	15.0	- 1.8 (2020)	+0.1 pp	15.5
AROP (At risk of poverty)	11.8	-0.5 pp	-0.6 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 Denmark: EUR 361 million or 0.5 % of total SCF.

Just Transition Plan

- Denmark's Territorial Just Transition Plan (TJTP) outlines the transition towards climate neutrality in the carbon-intensive regions of North and South Jutland. The plan with an allocation of EUR 88 million from the EU Just transition Fund (JTF) supports development of green technologies, including carbon capture, green fuels production and skills development for the local workforce. In its updated final NECP, Denmark committed to phase out from coal before 2030.

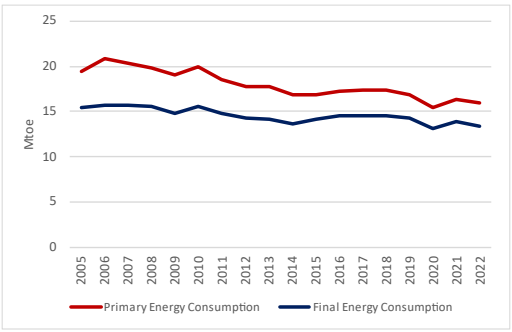
(1) ACER, 2024 Retail Market Monitoring Report, Energy retail and decarbonisation (forthcoming).

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

Energy efficiency

1. ENERGY EFFICIENCY

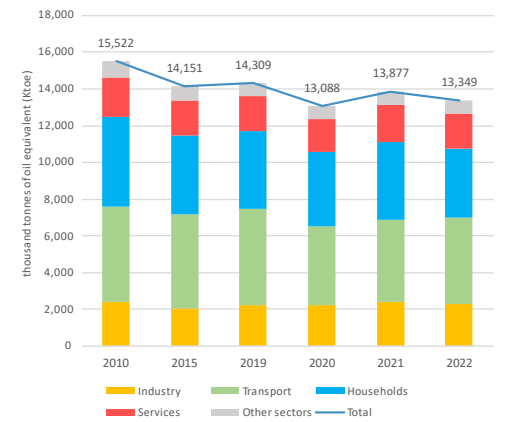
Graph 5: **Primary and final energy consumption**



Source: Eurostat

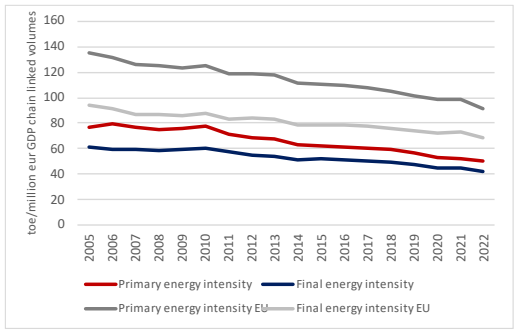
- In 2022, Denmark's **Primary Energy Consumption (PEC)** amounted to 16 Mtoe, 2.2% lower than in 2021, while its **Final Energy Consumption (FEC)** amounted to 13.3 Mtoe, 3.8% lower than in 2021.

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

Graph 7: **Primary and final energy intensity**



Source: Eurostat

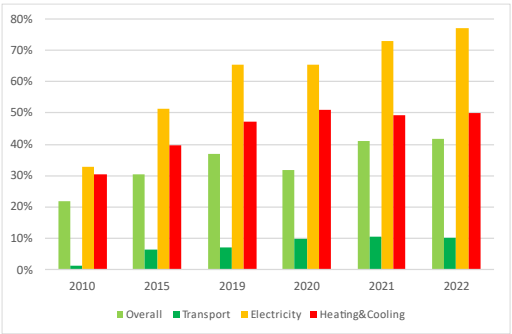
2. ENERGY PERFORMANCE OF BUILDINGS

- In 2022, Final Energy Consumption (FEC) in the Danish **residential sector** was **3.7 Mtoe**, representing **a reduction of 12.7%** compared to 2021. In the **services sector**, FEC was **1.9 Mtoe**, with an **6.6% decrease** compared to 2021.
- Heating and cooling account for around **82%** of the country's residential final energy consumption, with renewables supplying approximately **50%** of the gross final energy consumption for heating and cooling. Around 57,000 heat pumps were sold in 2023, representing a decrease of 36% compared to the sales of the previous year, reaching a total stock of around 656,000 installed heat pumps, as per the European Heat Pump Association (EHPA).
- In 2023, **4.7%** of the total population was experiencing difficulties on paying their utility bills while **6.9%** was not able to keep their home adequately warm over the cold periods of the year (growing from 2021, when such figures were, respectively, 2.9% and 2.8%). This underlines the importance to increase rate and depth of building renovation, specifically of worst-performing buildings.

Decarbonisation and climate action

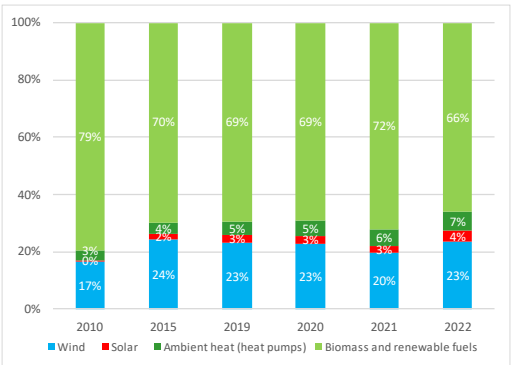
1. SECTORAL SHARE OF RENEWABLE ENERGY

Graph 8: **Share of renewable energy sources**



(1) In % of gross final consumption of energy.
Source: Eurostat

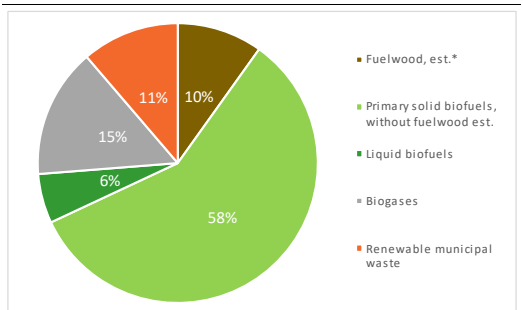
Graph 9: **Renewable energy mix**



(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

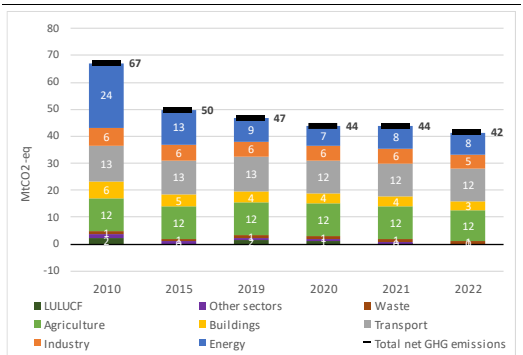
Table 3: **Operational hydrogen projects (up to 10)**

Name	Description
Power2Met	0.25 MW connected to the grid
HyBALANCE	1.5 MW from onshore wind
P2G-Biocat - Continued	0.5 MW online since 2015
H2 Logic HRS with onsite electrolysis Aalborg	200 kg H2/d connected to the grid
H2KT - Hydrogen Energy Storage in Nuuk	19m3 H2/h online since 2010
H2 Logic HRS with onsite electrolysis in Vejle	200 kg H2/d connected to the grid
H2 Logic HRS with onsite electrolysis Holstebro	200 kg H2/d connected to the grid
H2 Logic 3 HRS with onsite electrolysis in Copenhagen	3x200 kg H2/d connected to the grid
H2RES - Orsted offshore wind	2MW from offshore wind
HRS Aalborg	0.25 MW connected to the grid

Source: European Commission based on IEA data

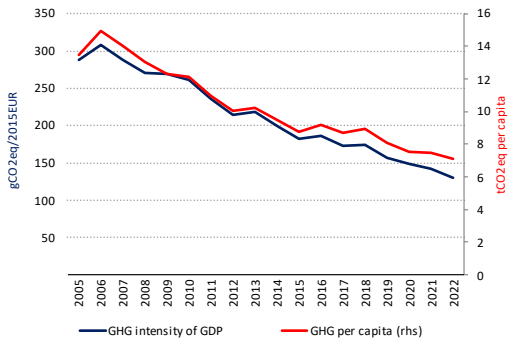
4. GREENHOUSE GAS EMISSIONS

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



Based on UNFCC 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)

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).

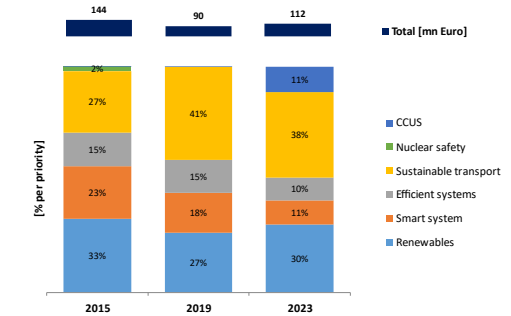
- With 130 gCO2eq/2015EUR, Denmark lies below the EU average in terms of GHG intensity of GDP.
- With 7 tonnes of CO2 equivalent per capita, Denmark is at the EU average in terms of GHG emissions per capita.
- For more detailed information on country profiles see Progress on climate action (europa.eu).

Research, innovation and competitiveness

1. INVESTMENT IN R&I

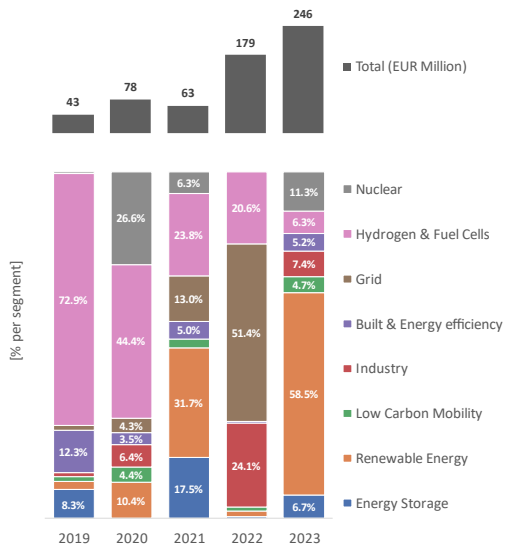
- Public investment in research and innovation (R&I) in Energy Union priorities[3] decreased from 0.053% in 2015 to 0.030% in 2023 (share of GDP).[4]

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

- Denmark is a global leader in producing wind based electricity, and aims to remain at the forefront of the development of clean technologies. Generally, it has a traditionally strong manufacturing base of low-carbon technologies and components, especially in the wind energy sector, where it continues to be the global leader in integrating wind power into the electricity grid. Denmark is home to one of the world's leading HVDC cable manufacturers and the country has the highest number of wave energy device developers in the EU. Despite not having domestic producers of large solar collectors, the country is the leading player in the largescale solar district heating market in the EU, in terms of total installed capacity and system size. Favourable policy and market conditions have led to booming sales of heat pumps, a trend that is likely to continue with the implementation of the REPowerEU plan. Denmark is home to promising initiatives in the green hydrogen supply chain, including a 400 MW/y alkaline electrolyser manufacturing

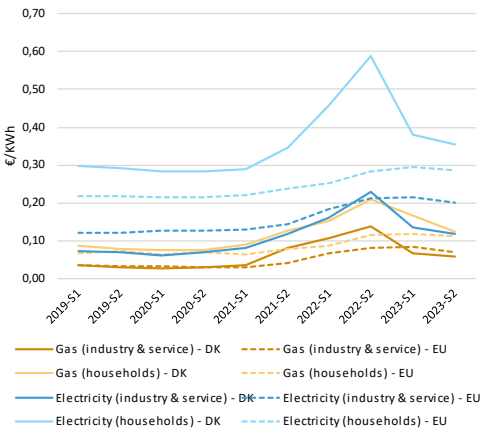
[3] Renewables, smart system, efficient systems, sustainable transport, CCUS and nuclear safety, COM(2015) 80 final ('Energy Union Package').

[4] Source: JRC SETIS 2024

plant in Kolding and a large-scale manufacturing unit for hydrogen refuelling stations, operated in Herning by a leading Norwegian player. Supported by an EUR 94 million grant from the EU Innovation Fund, a Danish-operated 500 MW/y Solid Oxide Electrolyzer Cell (SOEC) manufacturing facility is expected to come online in Herning in 2024. The reported expansion plans of both companies could raise Denmark's electrolyser manufacturing capacity to over 1.5 GW per year by 2030.

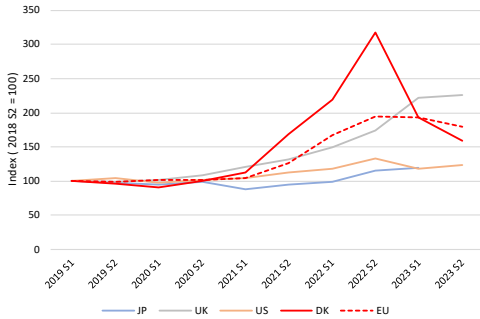
3. ENERGY PRICES DEVELOPMENT

Graph 15: **Denmark'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

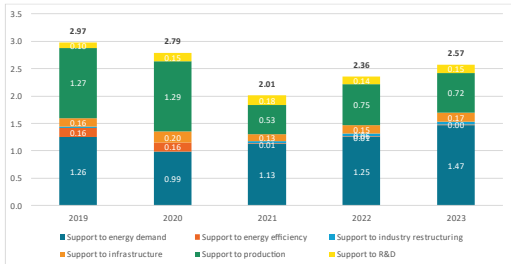
Graph 16: **Trends in electricity prices for non-household consumers (EU and foreign partners)**



(1) For Eurostat data (EU and DK), 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

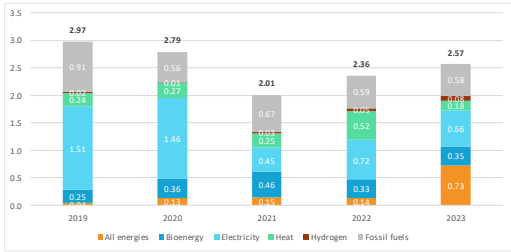
4. ENERGY SUBSIDIES

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

European Semester 2024

- **No Country Specific Recommendation for Energy** [5]
- For more information see the 2024 European Semester Country Report.

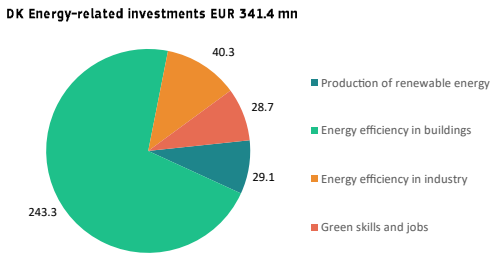
National Energy and Climate Plan (NECP)

- 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 July 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 Danish RRP has a total allocation of EUR 1.6 billion (only grants), with 68.8% of available funds supporting climate objectives.
- **EUR 341.4 million are allocated to energy-related measures,** with the largest amount for **energy efficiency in buildings** [EUR 243.3 million]:
  - **Investments and reforms for both private and public buildings**, with a focus on replacing 21 200 oil burners and gas furnaces with heat pumps or the expansion of district heating. The plan supports energy renovations of at least 6 125 housing units, namely insulation and the optimisation of the operation of the building.
- After Denmark satisfactorily fulfilled milestones and targets, including some referred to energy related measures, the Commission disbursed the first two payments. Overall (including also pre-financing), the Commission disbursed EUR 964 million to Denmark. The 3rd payment request is expected in Q4 2024.

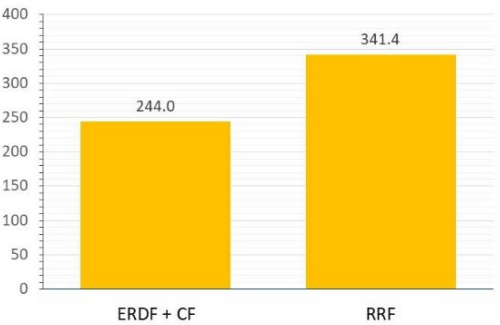
Graph 19: **Energy-related investments in the RRP (in EUR million)**



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 128.3 million.** For more information see the webpage innovation-fund-projects-country_en.

[5] Council of the European Union 11696/24.