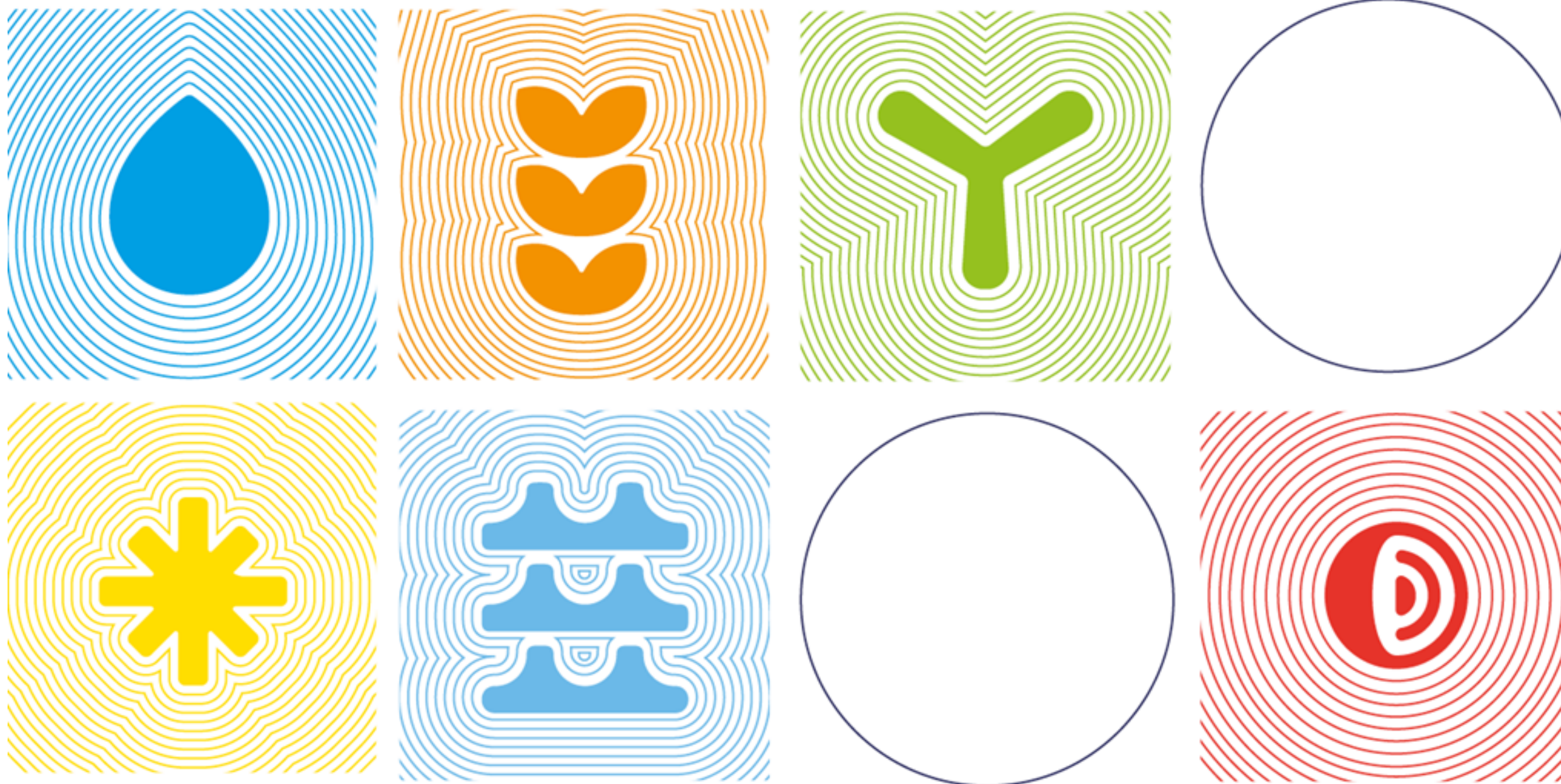


Renewable Electricity Bulletin

January 2023

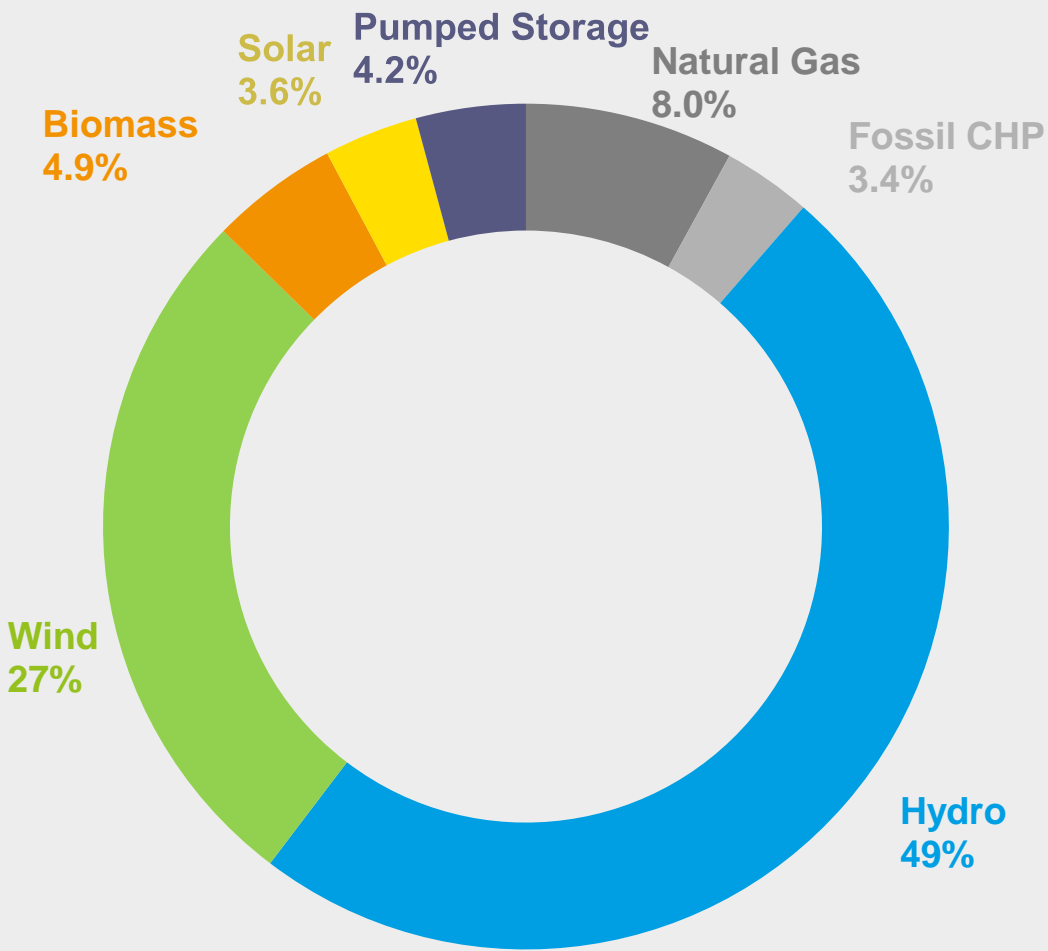


2023

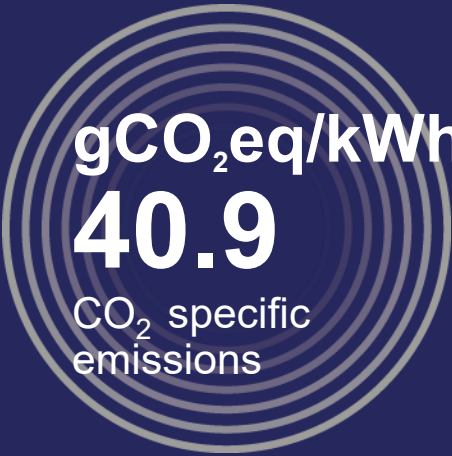
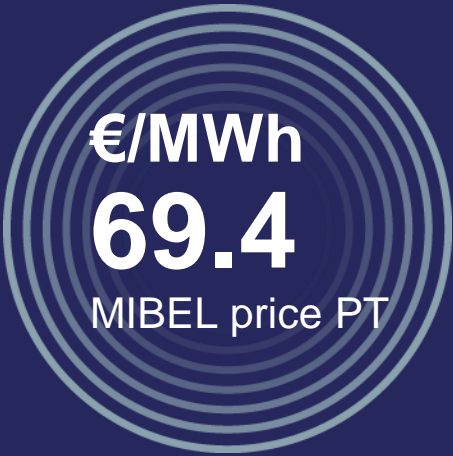
PORTUGAL NEEDS OUR
ENERGY

Executive Summary

Monthly Generation (Jan)



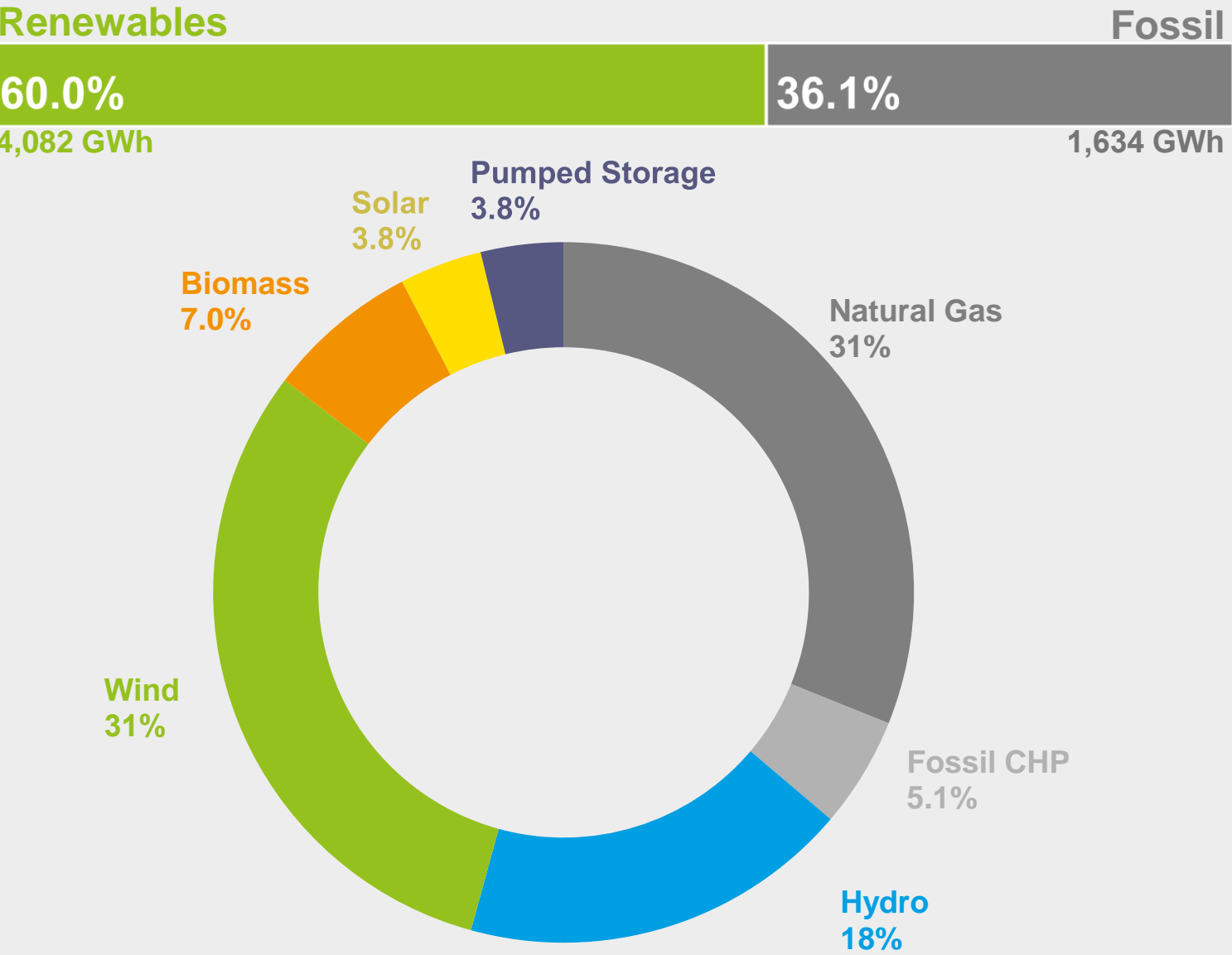
Electricity sector indicators (Jan)



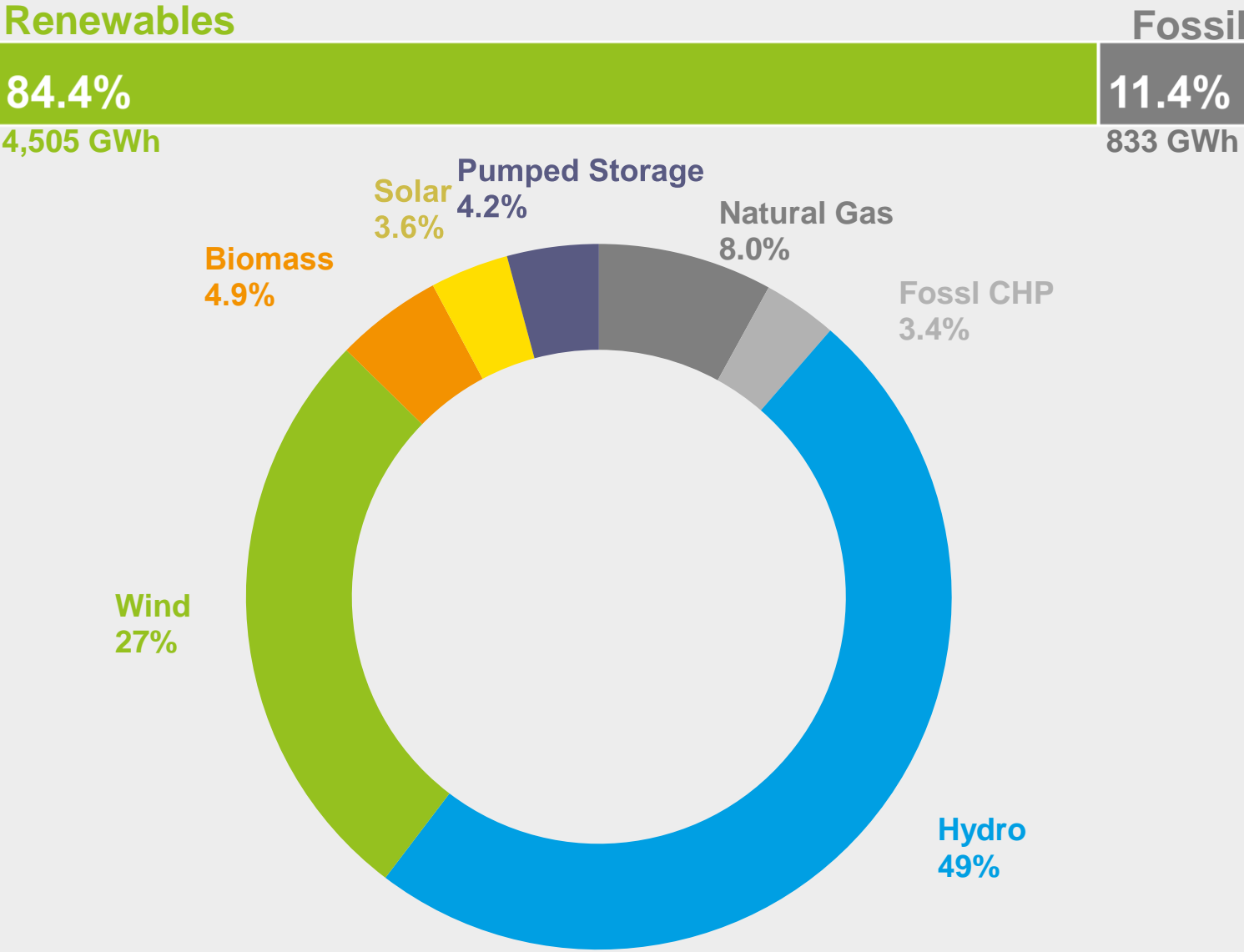
^aGeneration refers to the net power generation of the power plants, considering the production by pumping recently disclosed by REN. Pumping production is not accounted for in the percentage of production from renewable sources.
Source: REN; Analysis APREN.

Executive Summary

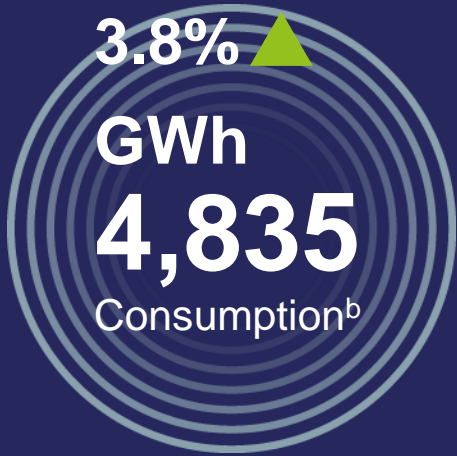
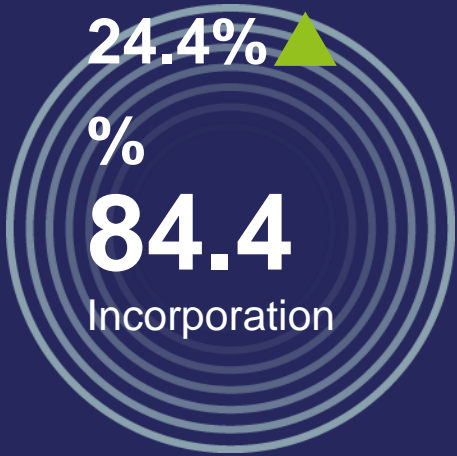
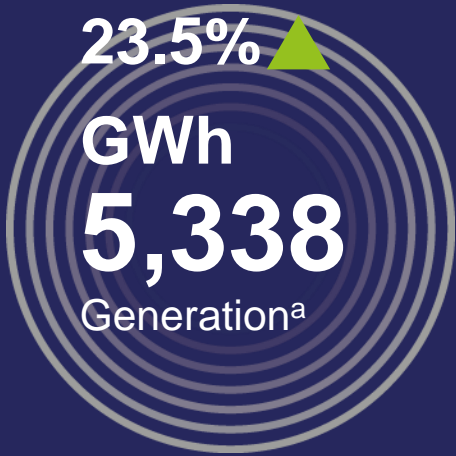
January 2022 (Jan)



January 2023 (Jan)



Main indicators In comparison to Jan 2022

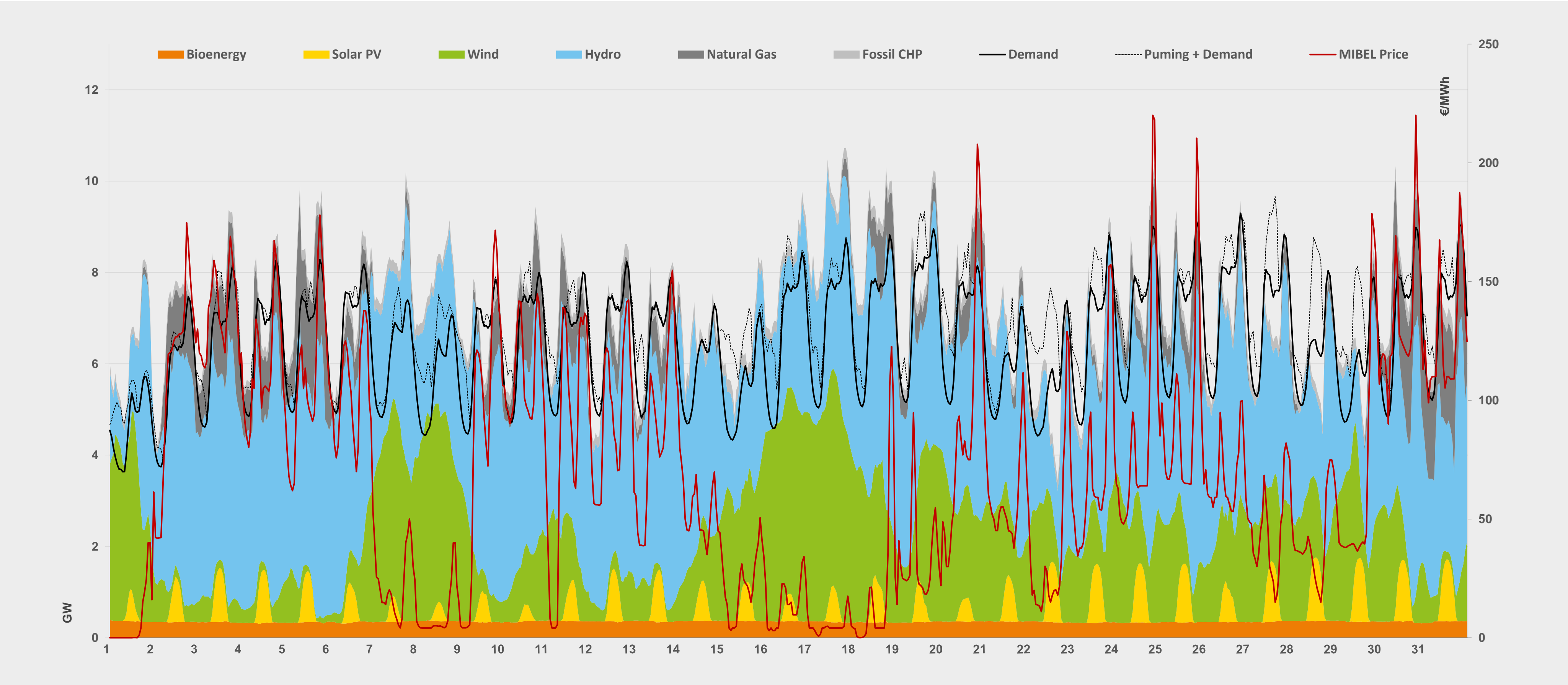


^a Generation refers to the net power generation of the power plants, considering the production by pumped storage recently disclosed by REN. Pumping production is not accounted for in the percentage of production from renewable sources.
Source: REN; Analysis APREN.

^b Consumption refers to the liquid generation of power of the plants, considering the import-export balance.

Monthly analysis in Portugal: January

Load diagram for the month of January 2023



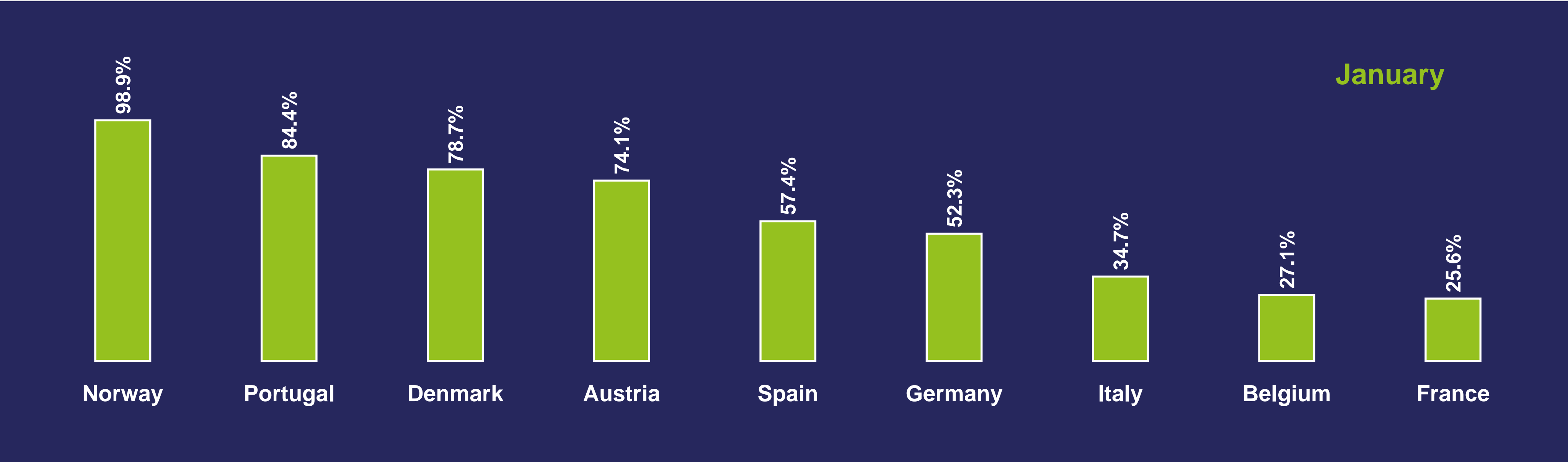
Source: REN, Analysis APREN

Renewable Electricity

Europe

The present analysis considers only the main countries from the different European markets, in order to obtain a representative framework of comparison.

Between January 1 and 31, Portugal was the second country with the highest renewable incorporation in electricity generation, behind Norway, which obtained 98.9% from RES.



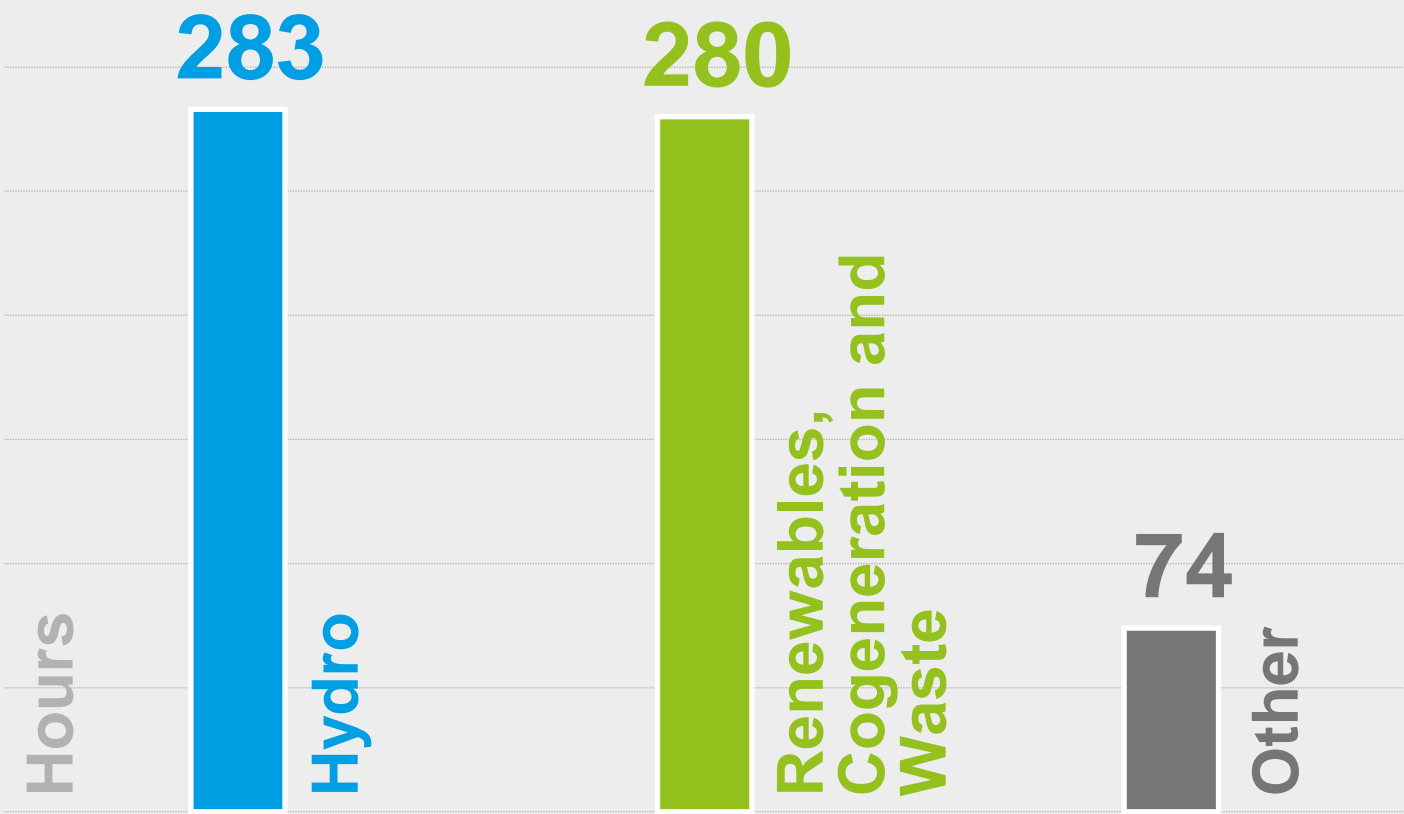
Renewable incorporation in accumulated electricity generation (Jan).
Source: REN, Fraunhofer, REE, Terna, National Grid, ENTSO-E. Analysis APREN.

Market price setting: Portugal

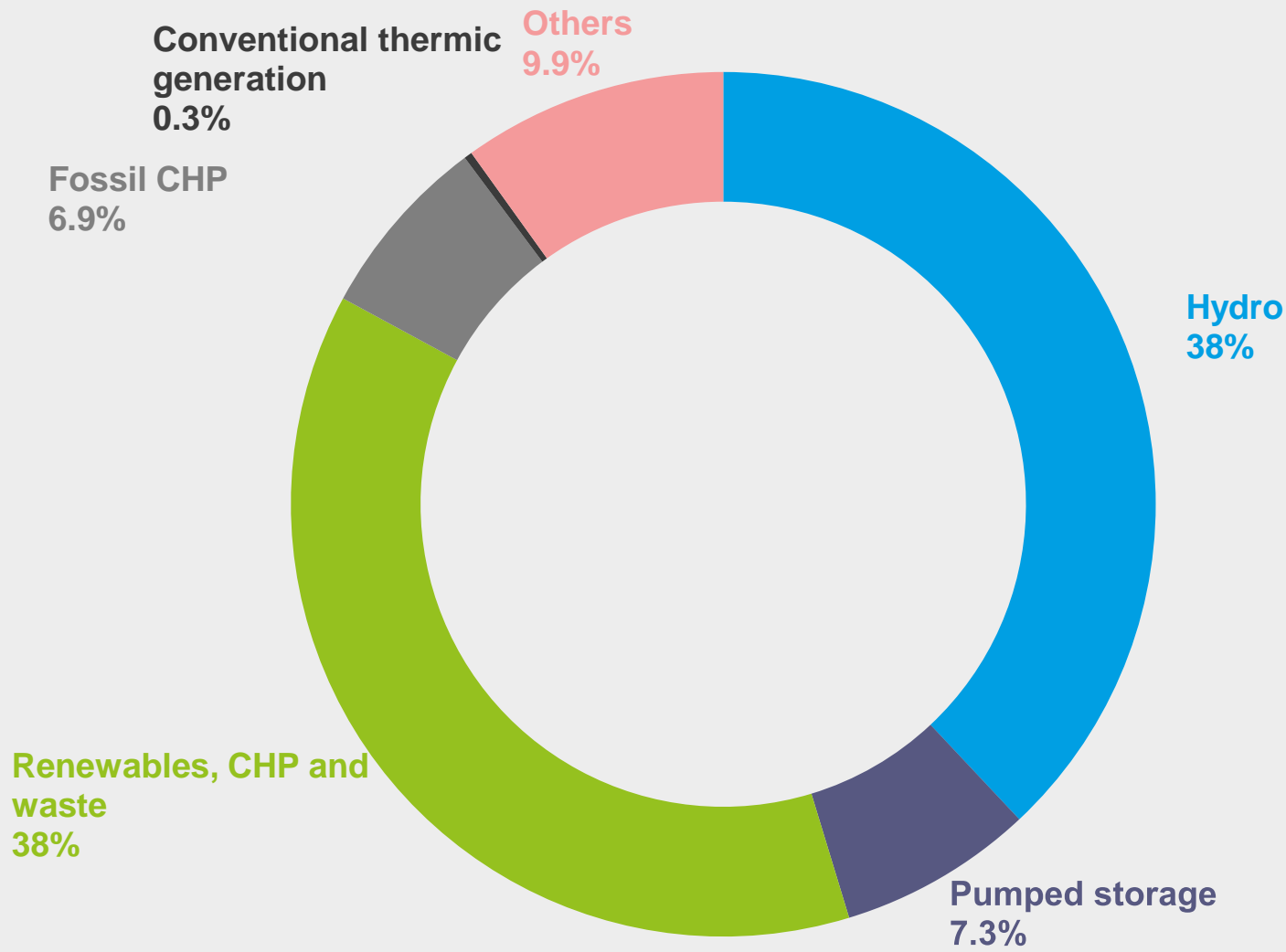
During January, hydro was the market price setting technology that recorded the most hours, with 283 non-consecutive hours, followed by renewables, cogeneration and waste with 280 hours and an aggregate of various technologies with 74 hours.



January 2023



Number of market price setting hours of the three main market setting technologies (Jan).
Source: OMIE, Analysis APREN

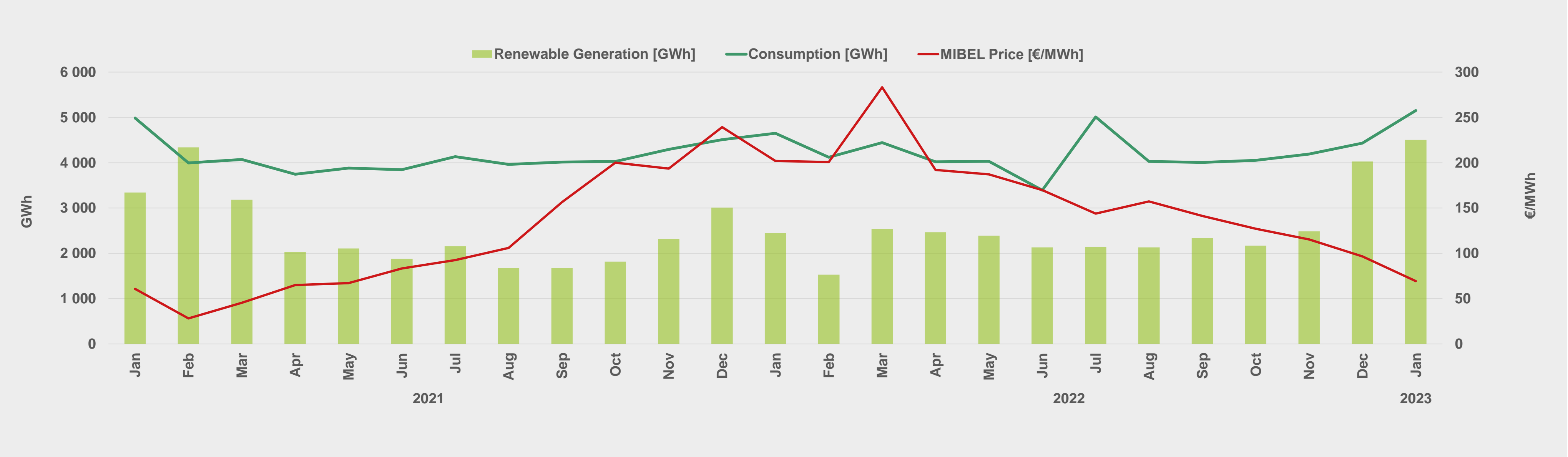


Percentage distribution of the number of market price setting hours of the various technologies, in a total of 744 hours (Jan).
Source: OMIE, Analysis APREN

Electricity Market Portugal

Between January 1 and 31, the average hourly price recorded in MIBEL in Portugal was €69.4/MWh^c, which represents a decrease to less than half compared to the same period last year.

In the same period, 327 non-consecutive hours were recorded in which renewable generation was sufficient to supply the electricity consumption of Mainland Portugal, with an average hourly price at MIBEL of €41.2/MWh.



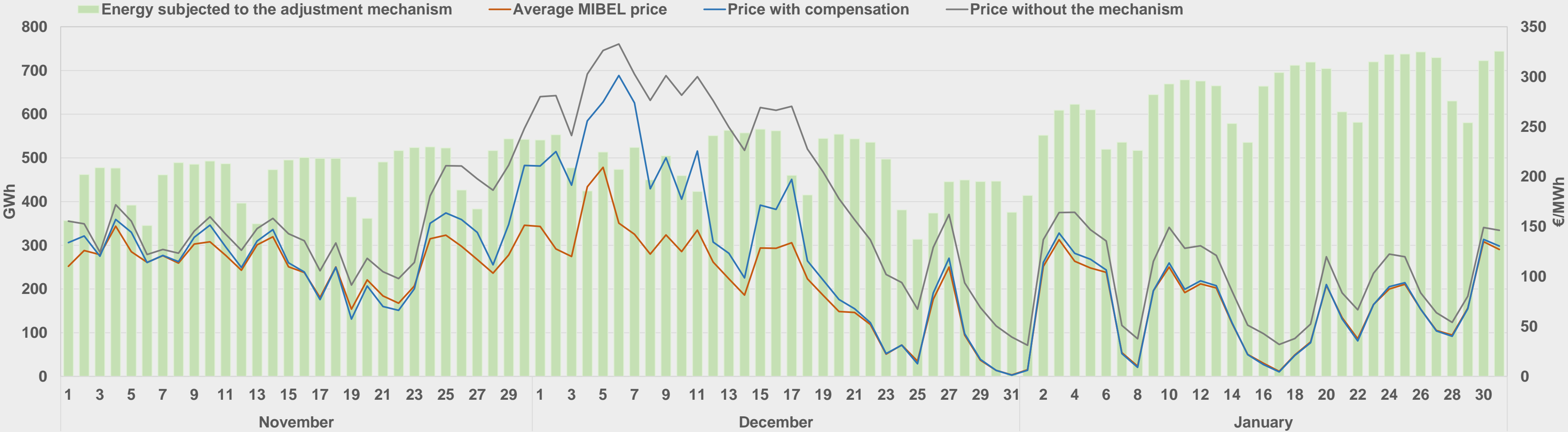
^c Arithmetic average hourly prices
Market price, electricity consumption and renewable generation (Jan-2021 to Jan-2023).
Source: OMIE, Analysis APREN

Electricity Market

Iberian gas price limit mechanism

Since June 15, 2022, when the Iberian natural gas price limit mechanism came into operation, until 31 January 2023, the mechanism generated savings of €42.8/MWh^c, which amounted to an 18.4% reduction in the average hourly price at MIBEL.

The savings due to the price limit of natural gas, corresponding to the difference between the price without the mechanism and the price with the compensation to be paid to natural gas plants, reached a maximum value of €157.2/MWh^c, and a minimum of €0/MWh^c. In total, 109.9 of the 193.2 TWh produced were subject to the consumer adjustment mechanism in the Iberian Peninsula.



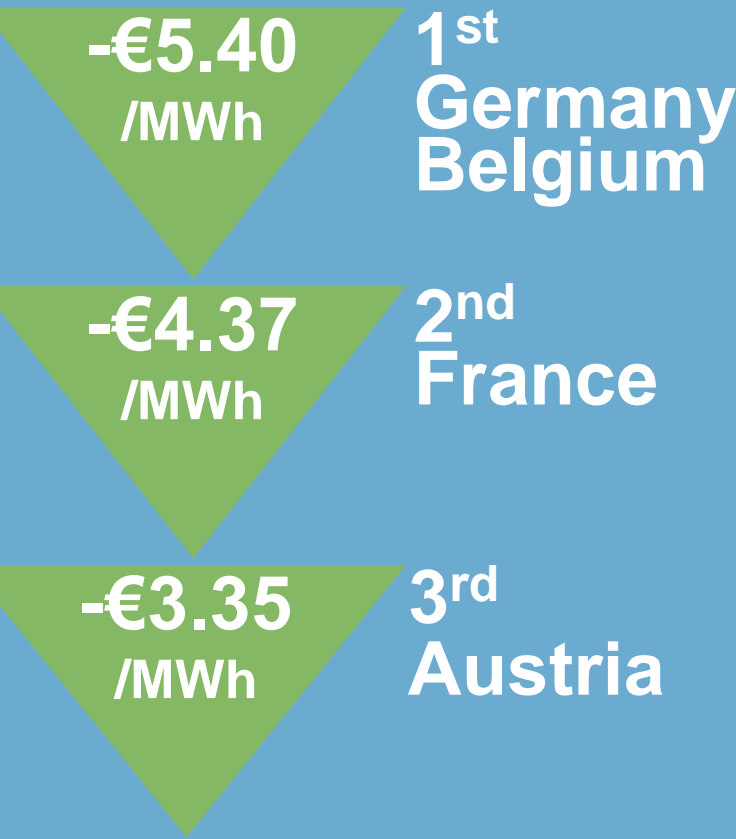
^c Arithmetic average hourly prices
Source: OMIE, Analisis APREN

Renewable Electricity Europe

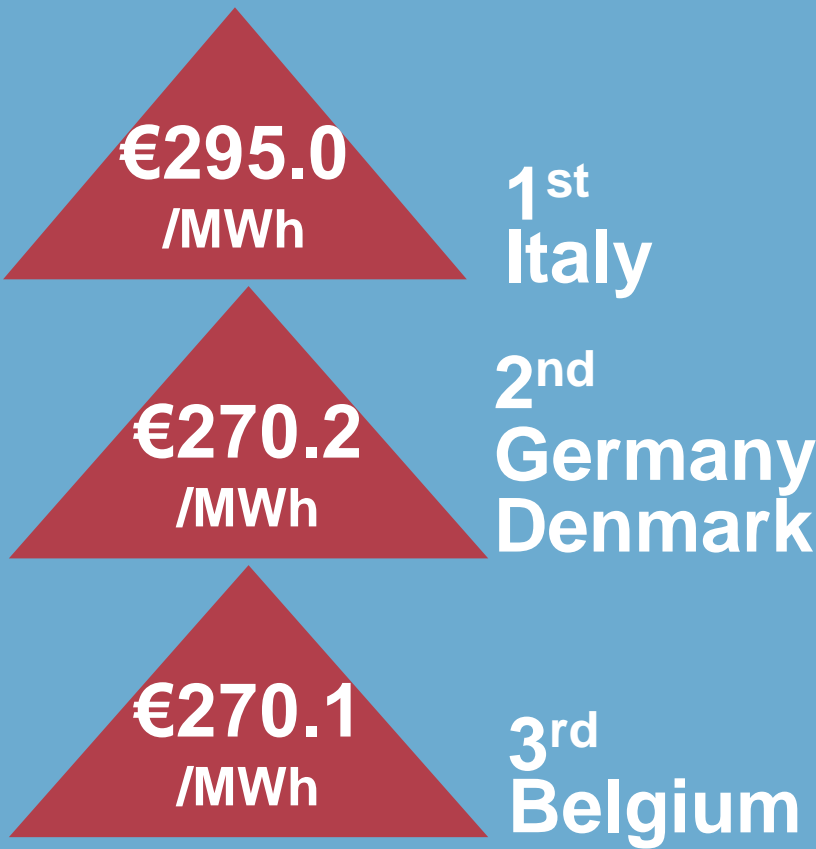
During January 2023, there was a minimum hourly price at MIBEL in Portugal of €0.0/MWh for thirteen hours, in which the market setting was due to several technologies. The maximum hourly price reached €220.0/MWh for two hours, where the market set with thermal generation combined cycle, and hydro, respectively.

Regarding prices in Europe, it should be noted that average values decreased compared to the previous month, as well as maximum prices, except for MIBEL.

Minimum Prices (Jan)



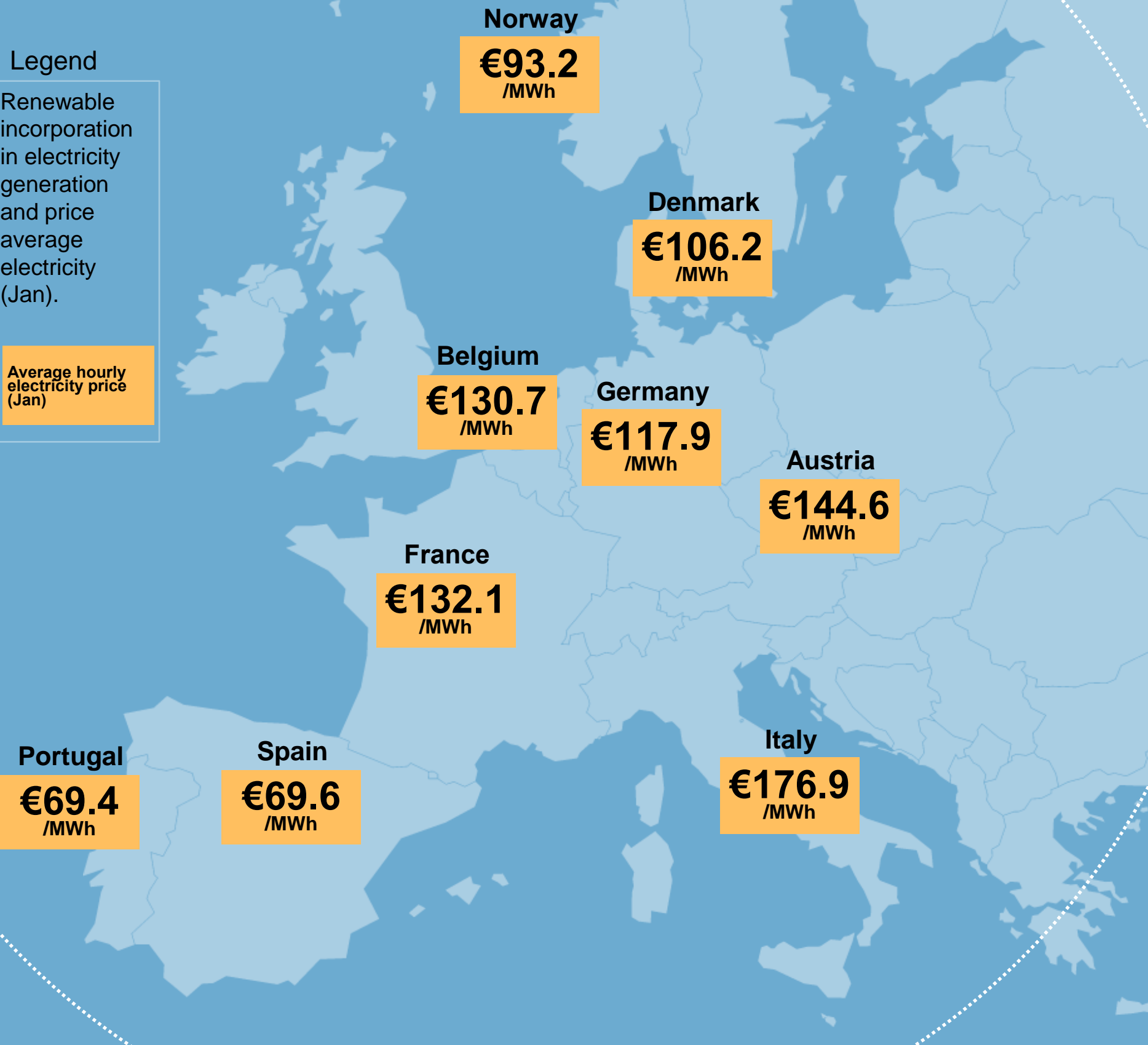
Maximum Prices (Jan)



Legend

Renewable incorporation in electricity generation and price average electricity (Jan).

Average hourly electricity price (Jan)



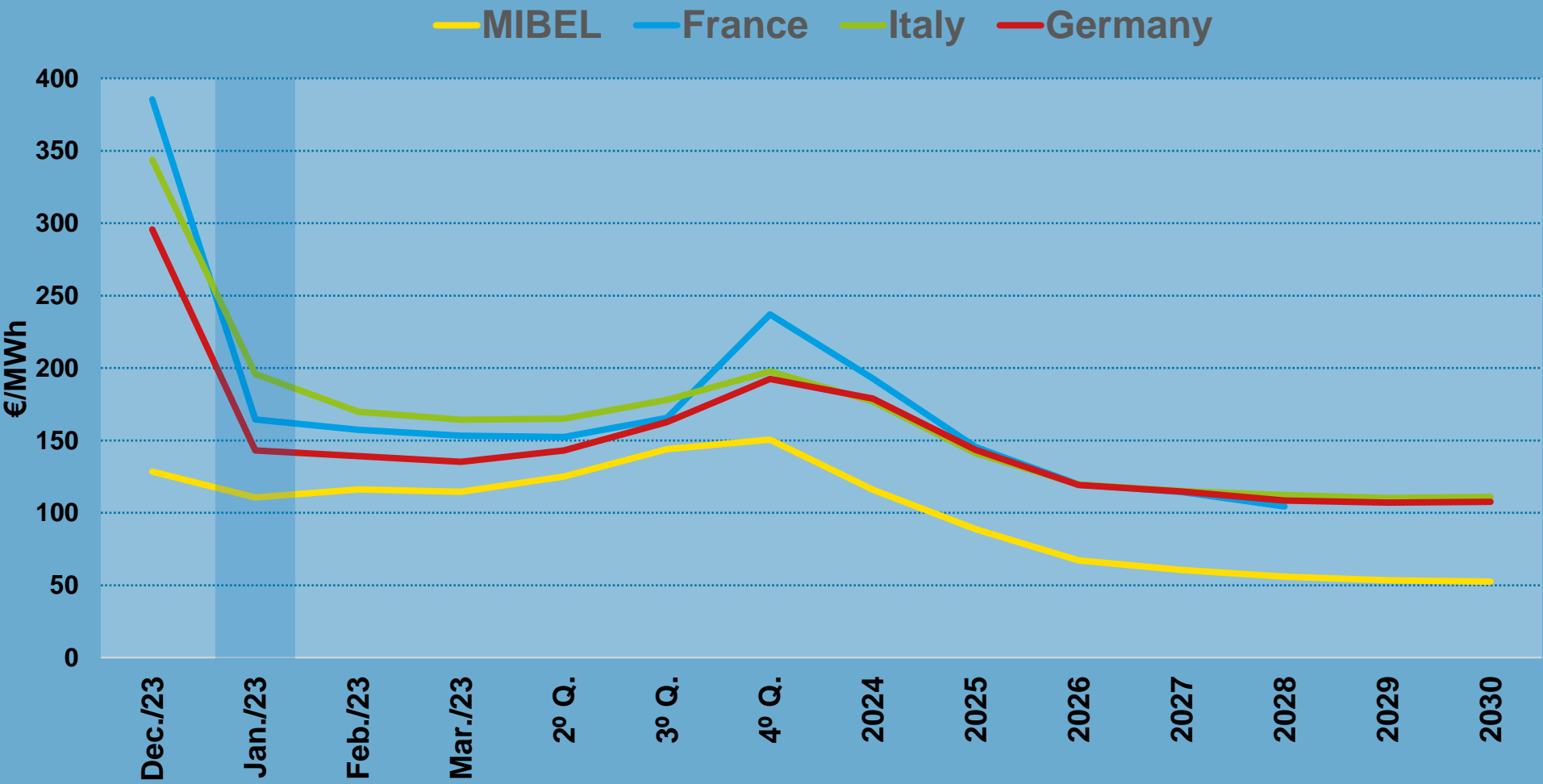
Source: ENTSO-E, OMIE, Analysis APREN

Future Electricity Market

The evolution of the average future hourly price is calculated based on the contracts for the purchase and sale of electricity^d.

The map on the right displays the price values for the next month (February) and for the next year. In both cases, MIBEL has the lowest values, while the French and Italian markets have the highest.

MIBEL also has the lowest figures by 2030, coming from the Iberian gas price limit mechanism by June next year, and from investment in renewable production.

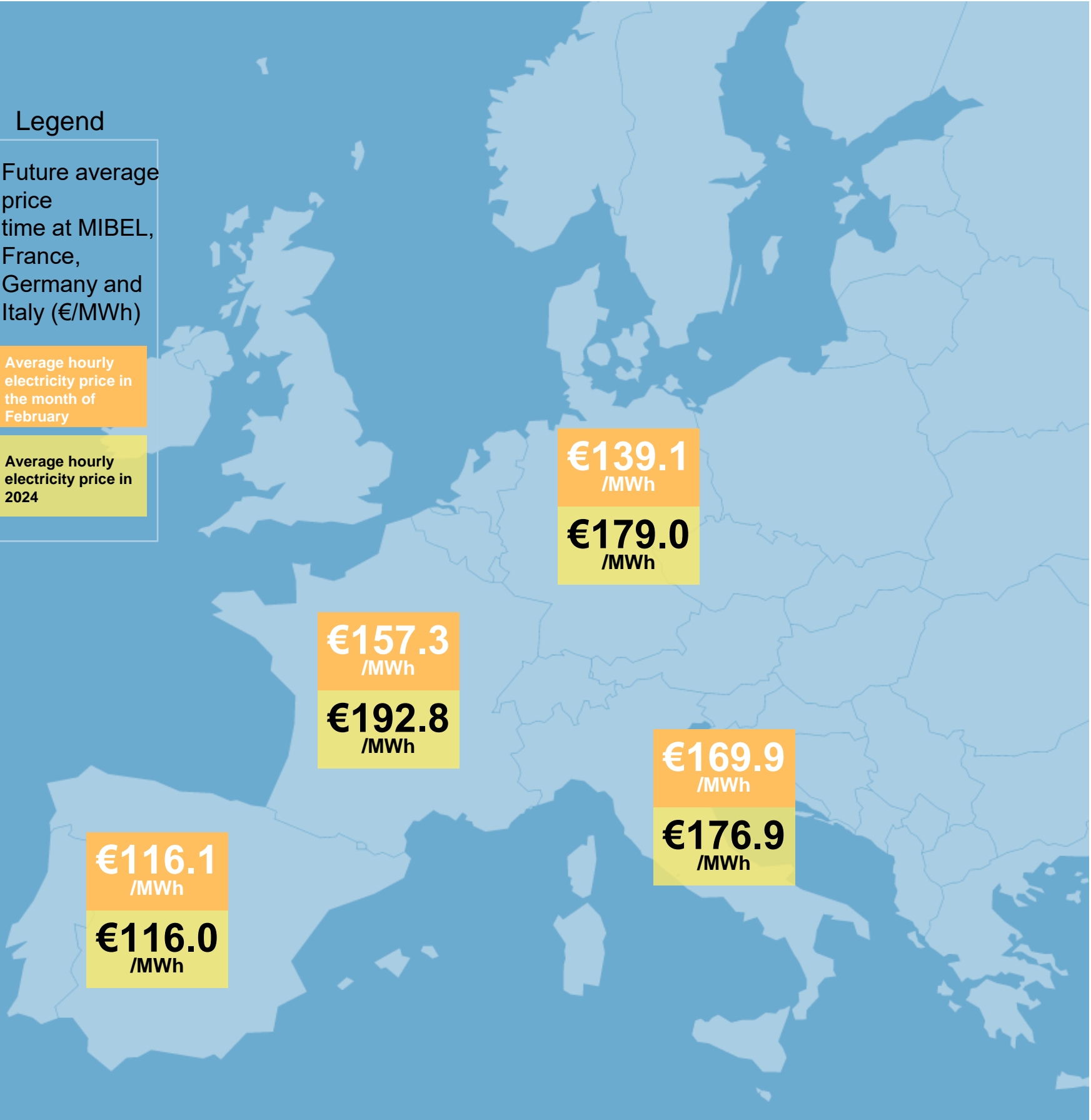


Legend

Future average price time at MIBEL, France, Germany and Italy (€/MWh)

Average hourly electricity price in the month of February

Average hourly electricity price in 2024



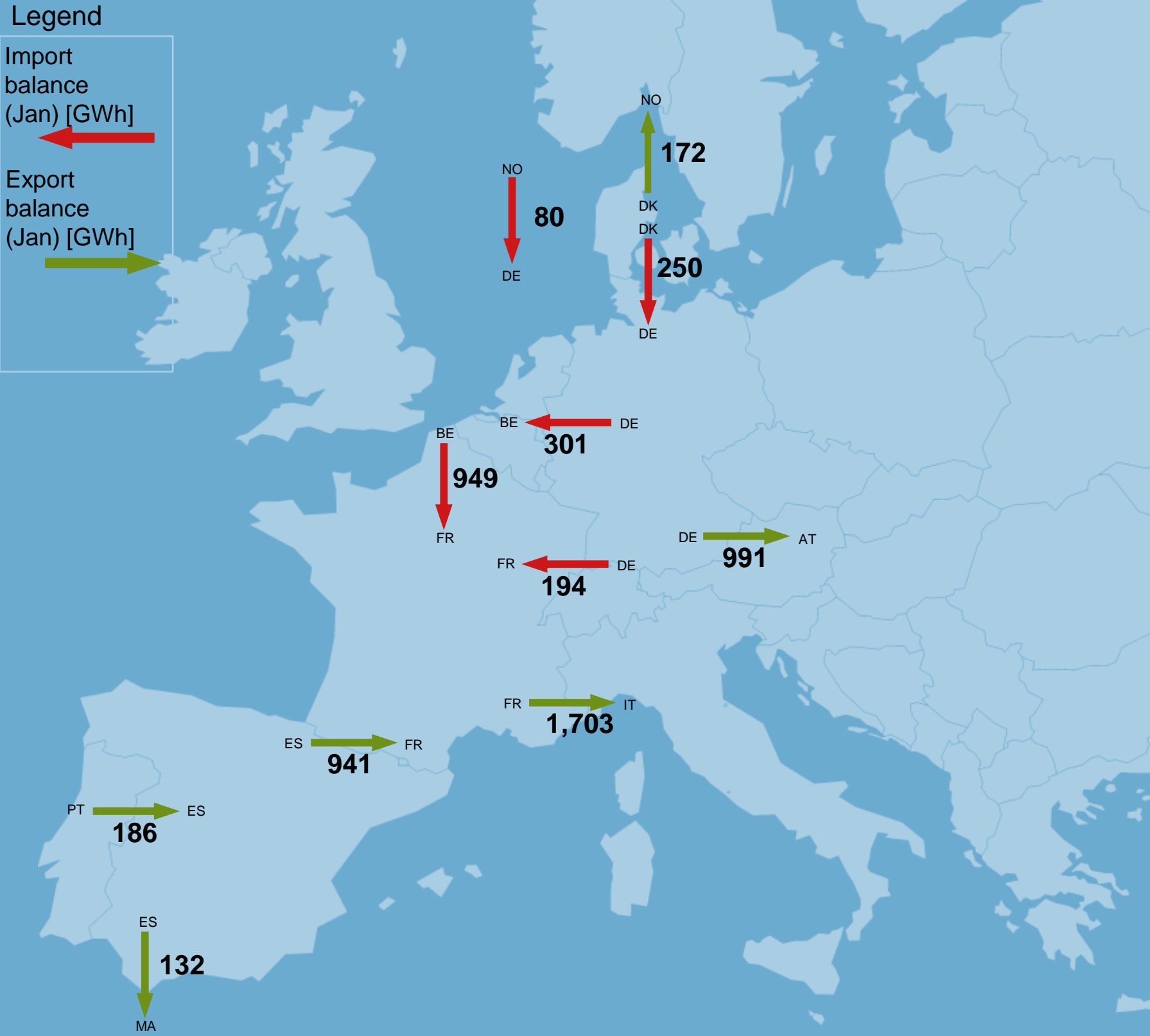
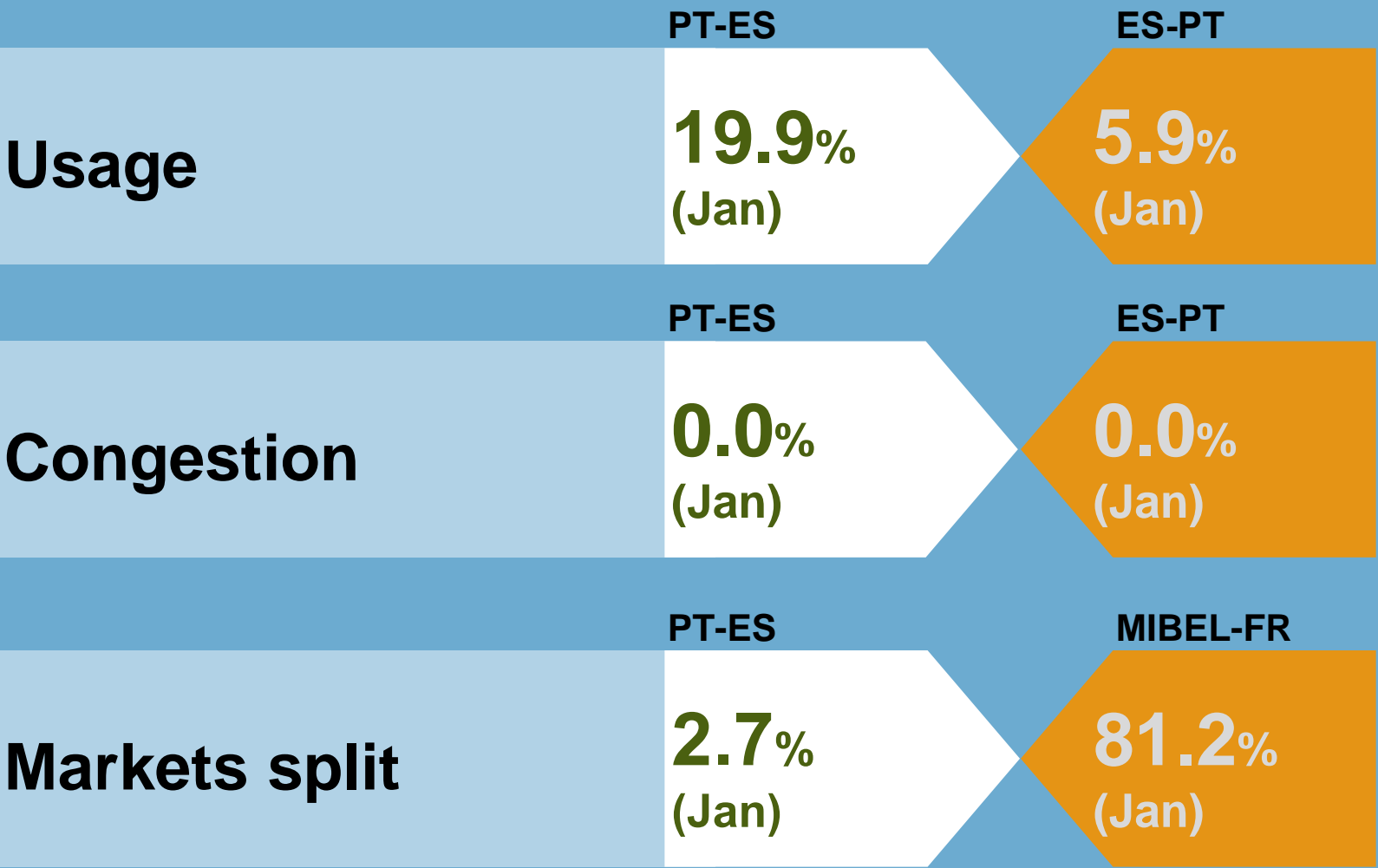
^dValues updated February 6.
Source: OMIP, EEX, Analysis APREN

International trade

Europe

Between January 1 and 31, 2023, the electricity system of Mainland Portugal recorded electricity imports equivalent to 380 GWh and exports of 566 GWh, with Portugal being an importer with a balance of 186 GWh.

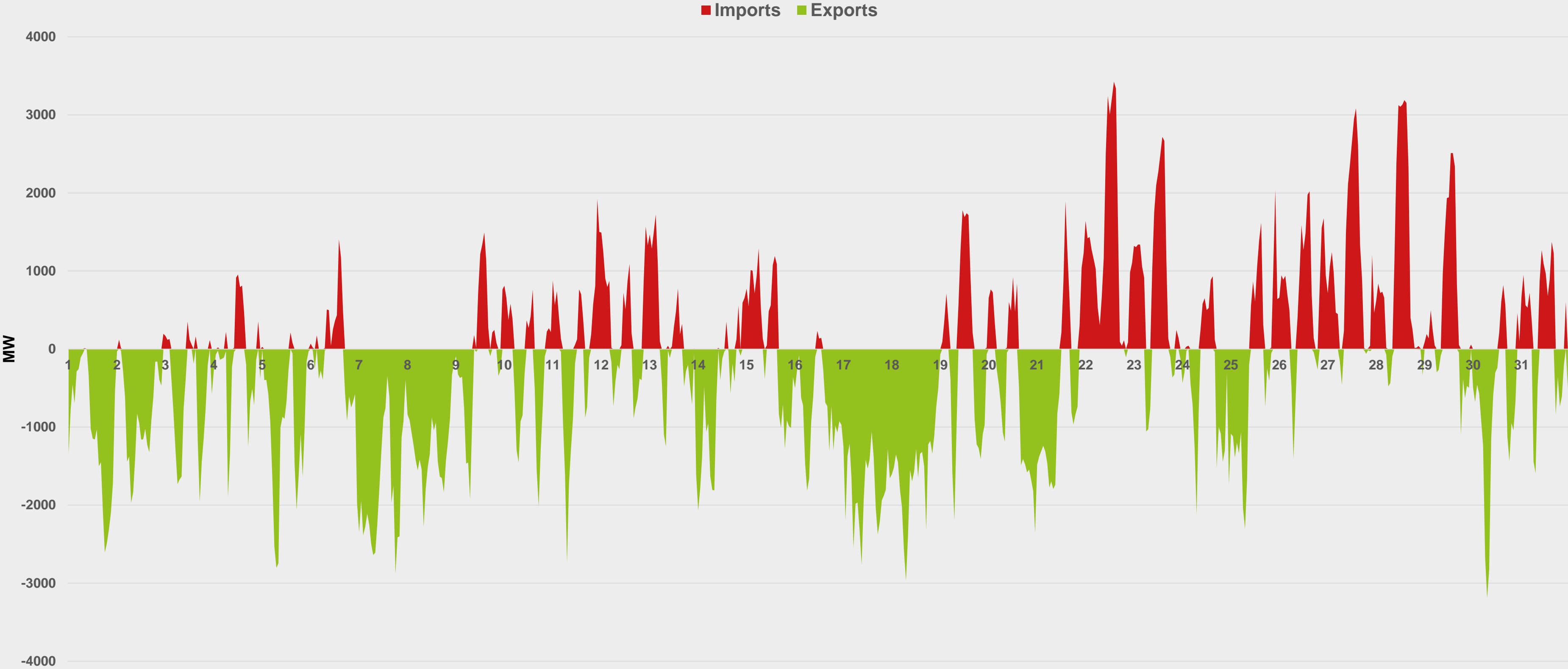
Main Interconnection Indicators PT-ES



Source: ENTSO-E, Analysis APREN

International trades: January

Diagram of imports and exports in Portugal



Source: REN, Analysis APREN

Power sector emissions

Between January 1 and 31, 2023, specific emissions reached 40,9 gCO₂eq/kWh, while the total emissions from the power sector reached 0.2 MtCO₂eq.

The European Emissions Trading System (EU-ETS) recorded an average price of €69.3/tCO₂^c, a reduction compared to the same period in 2022.

Sector emissions

0.2

MtCO₂eq

64%

In comparison to Jan 2022

Allowances average price

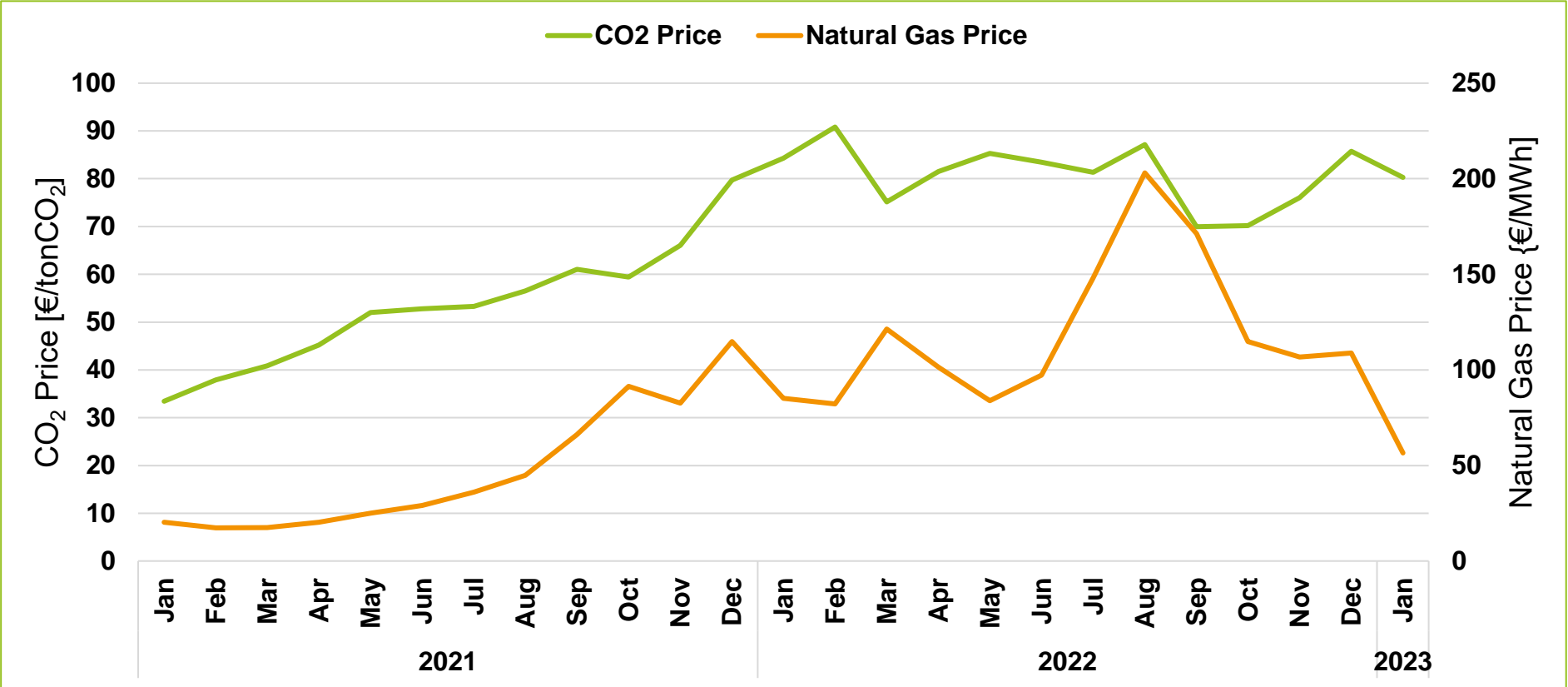
€69.3

/tCO₂

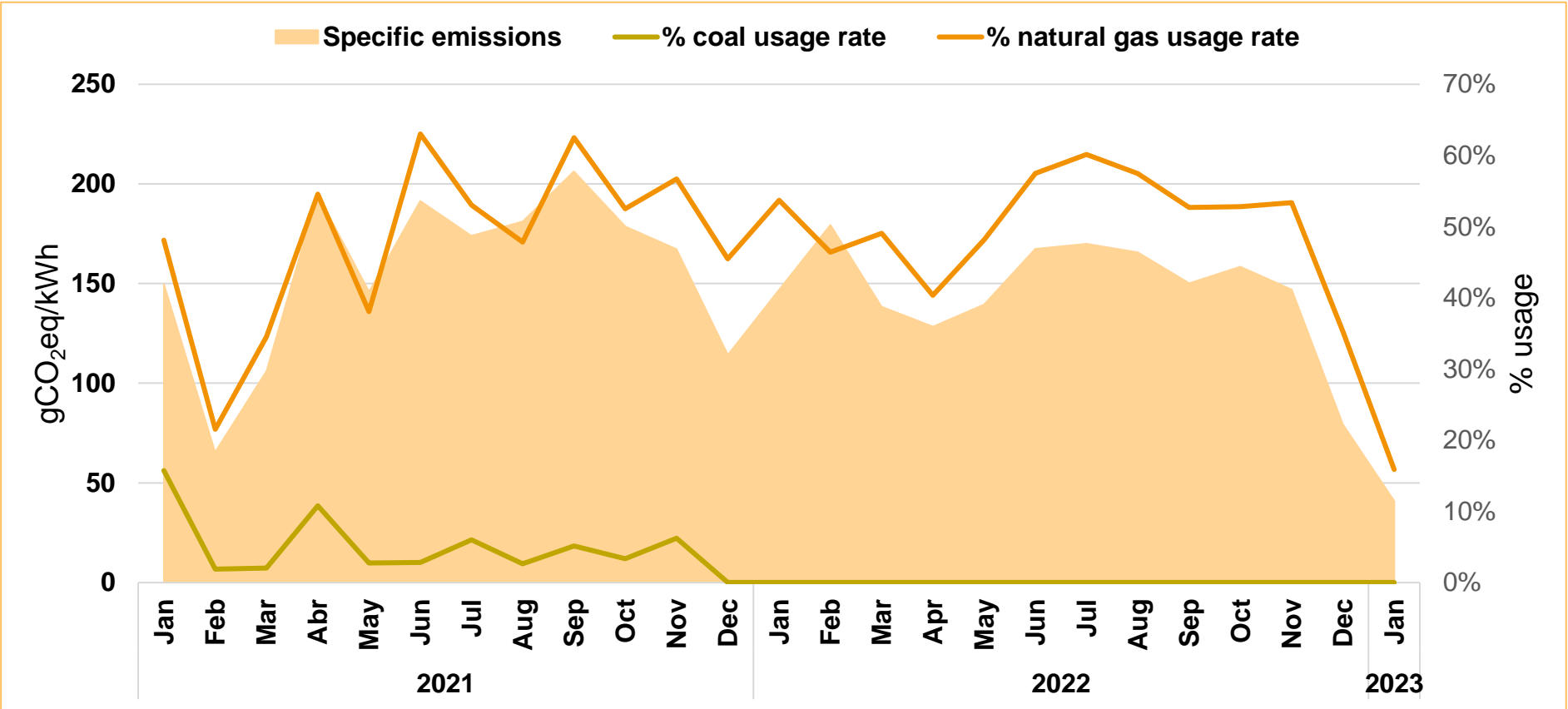
5%

In comparison to Jan 2022

^c Arithmetic average hourly prices
Source: OMIE, Analiysis APREN



Price of CO₂ allowances in EU-ETS and natural gas price in Europe (Jan-2021 to Jan-2023).
Source: SendeCO₂, WorldBank



Specific emissions from the power sector of Mainland Portugal, % use of coal-free power plants and natural gas (Jan-2021 to Jan-2023).
Source: REN, DGEG, ERSE, Analysis APREN

Simulation of price formation without SRP

SRP estimated savings:

The indicators below identify the savings achieved between January 1 and 31, 2023, by the contribution of production under special regime (SRP).

This study is conducted for SRP and includes all installed power of fossil cogeneration. Given that the capacity equivalent to this technology within the SRP is quite residual and that the other technologies are renewable, the figures are very close to the real savings that renewables have generated.



€156.9/MWh
Monthly savings (Jan)



€837.6 M
Monthly savings (Jan)

Note: This analysis is prepared using a program developed by APREN, based on Deloitte's calculation method.

Environmental Service

The figures below identify the savings achieved between January 1 and 31, 2023, in natural gas, CO₂ emissions and CO₂ emission allowances resulting from the renewable incorporation in electricity generation.

This analysis assumes that, in the absence of renewables, production would be ensured primarily by natural gas, followed by imported electricity.

Renewables
have avoided:



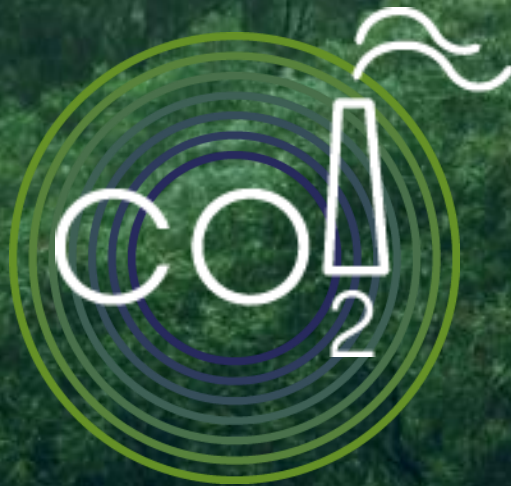
€263 M

Imported Natural Gas
(Jan)



€151 M

Imported Electricity
(Jan)



0.9 MtCo₂eq

CO₂ emissions
(Jan)



€69 M

CO₂ allowances
(Jan)

Source: REN, REE, SendeCO2, WorldBank, DGEG, ERSE, Analysis APREN.
Note 1: For the estimate of the savings in imported natural gas, the price of natural gas in Europe indicated in the WorldBank has been considered.
Note 2: For the estimation of savings in imported electricity, the average price on the MIBEL market has been considered.



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