

2024

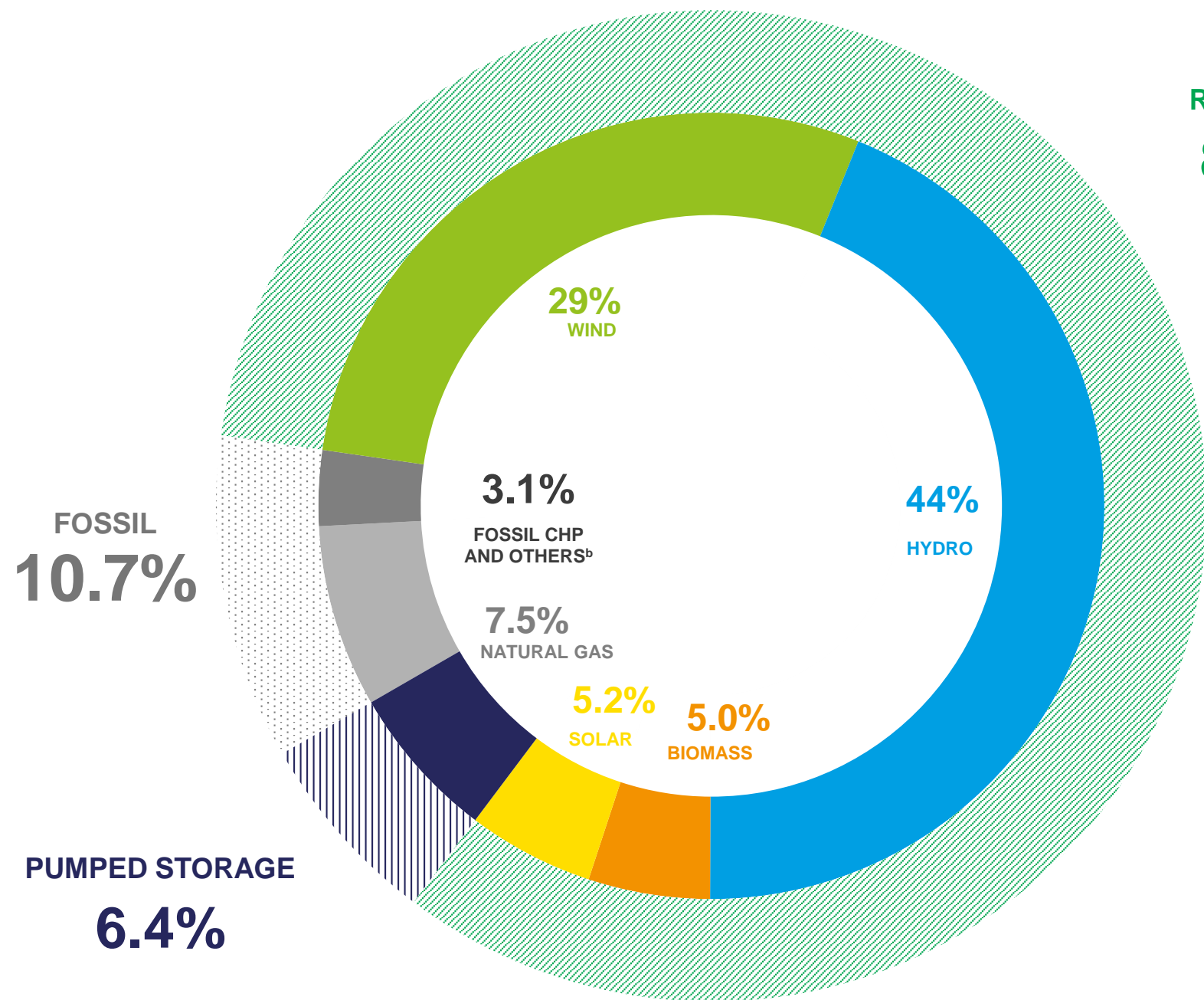
**BOLETIM
ELETRICIDADE
RENOVÁVEL
MARCH
2024**

PORTUGAL PRECISA
DA NOSSA ENERGIA.

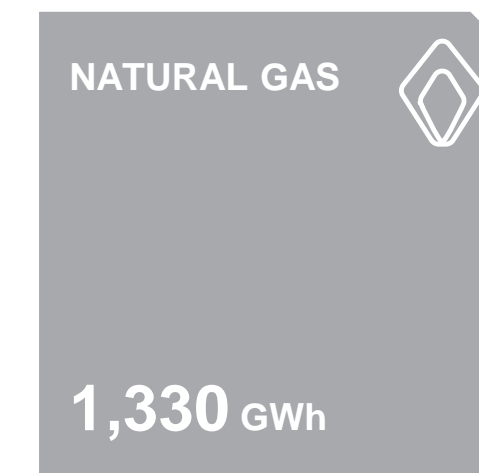
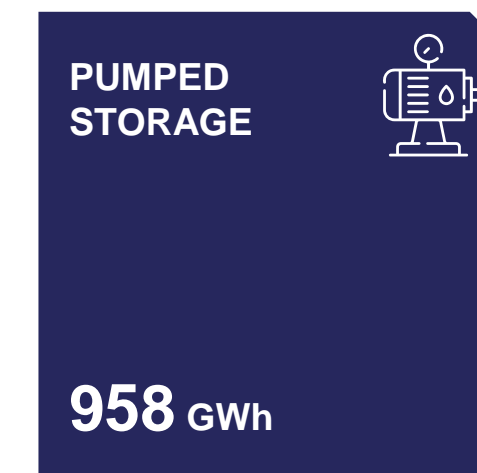
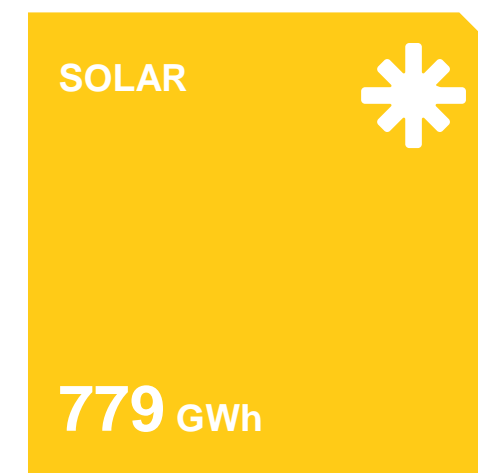
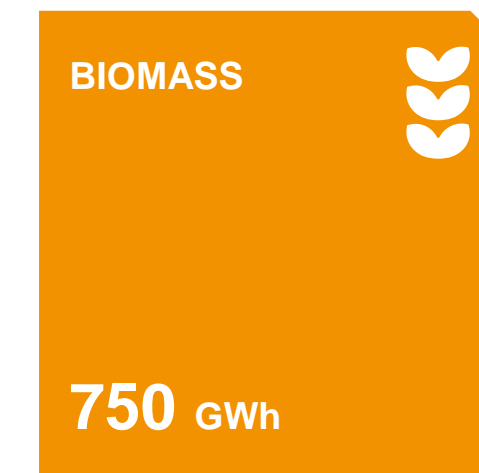
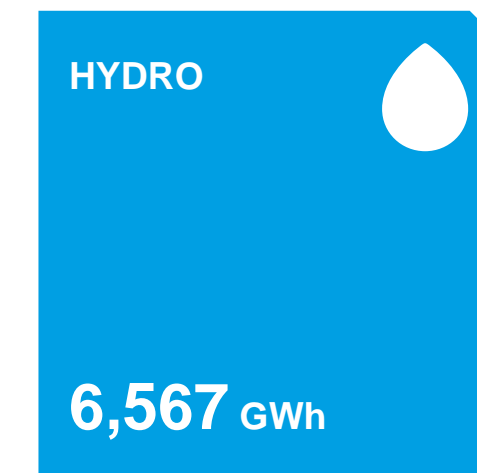
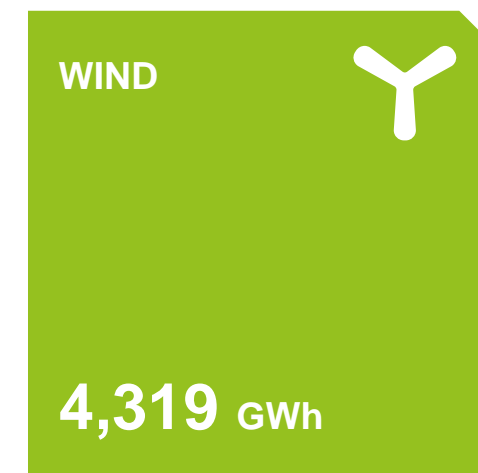


EXECUTIVE SUMMARY

GENERATION (JAN-MAR)



RENEWABLE
82,9%



MAIN INDICATORS (JAN-MAR)

GWh
14,972
Generation^a

€/ MWh
44.5
MIBEL PT Price

€/ tCO₂
59.6
CO₂ Price

MtCO₂ - eq
0.6
CO₂ Emissions

GWh
-160
Import Balance

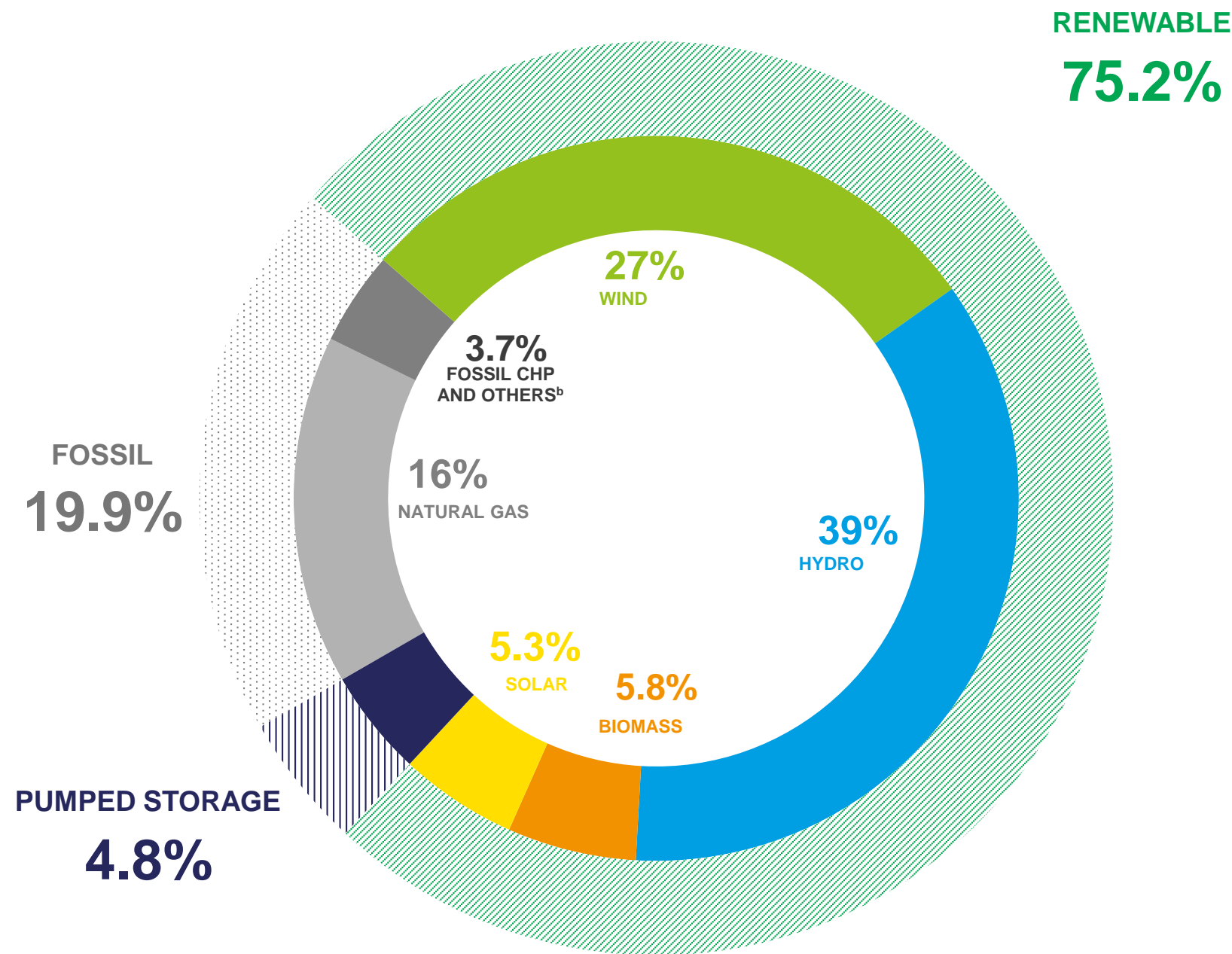
gCO₂ eq/kWh
38.2
CO₂ Specific Emissions

^a Generation refers to the net energy generation of the power stations, taking into account the pumping production recently disclosed by REN. Production from pumping is not included in the percentage of production from renewable sources

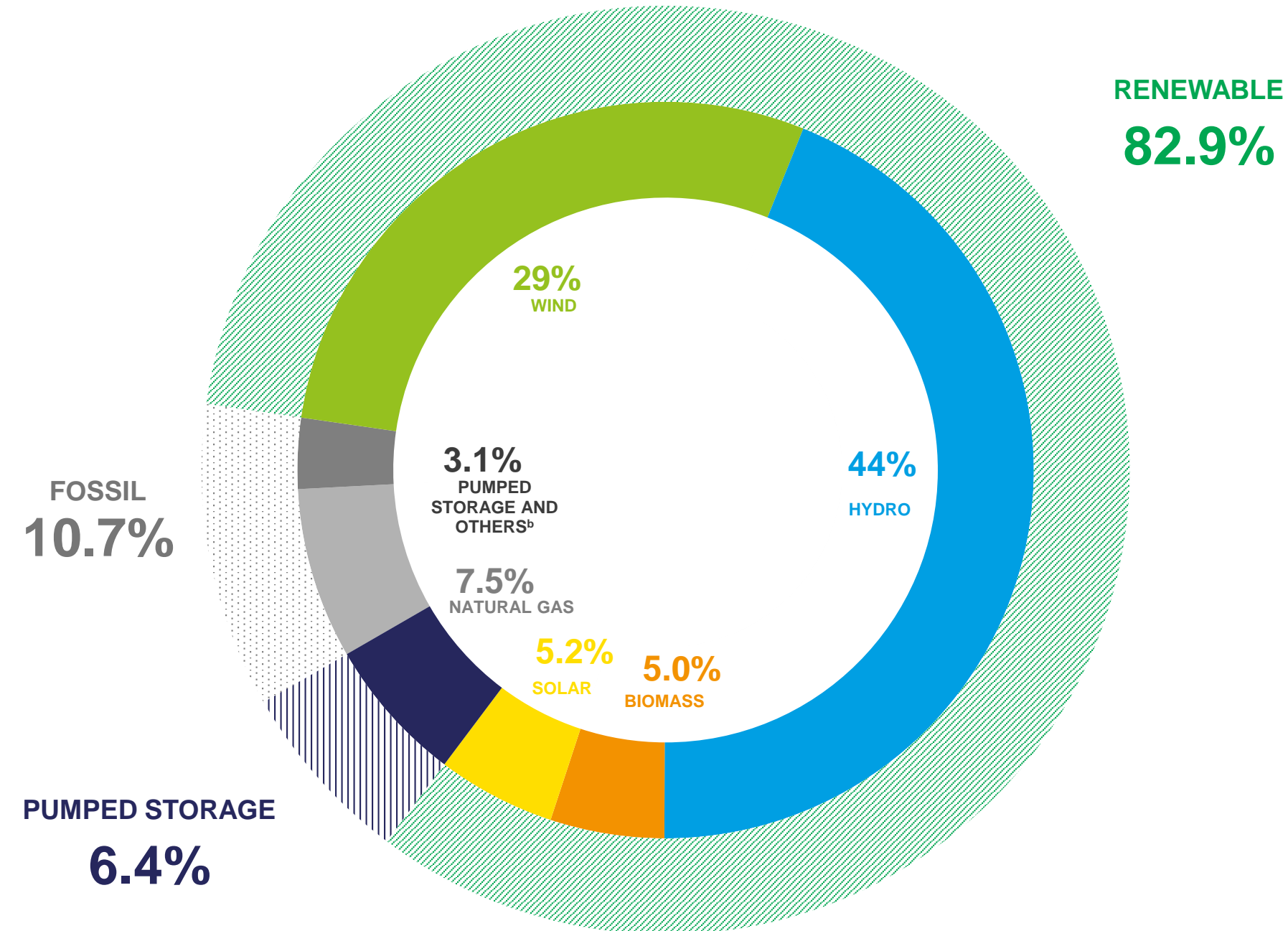
^b Includes fuel oil, diesel, the non-biodegradable fraction of MSW and new waste

EXECUTIVE SUMMARY

MARCH GENERATION 2023



MARCH GENERATION 2024



MAIN INDICATORS COMPARED TO MARCH 2023



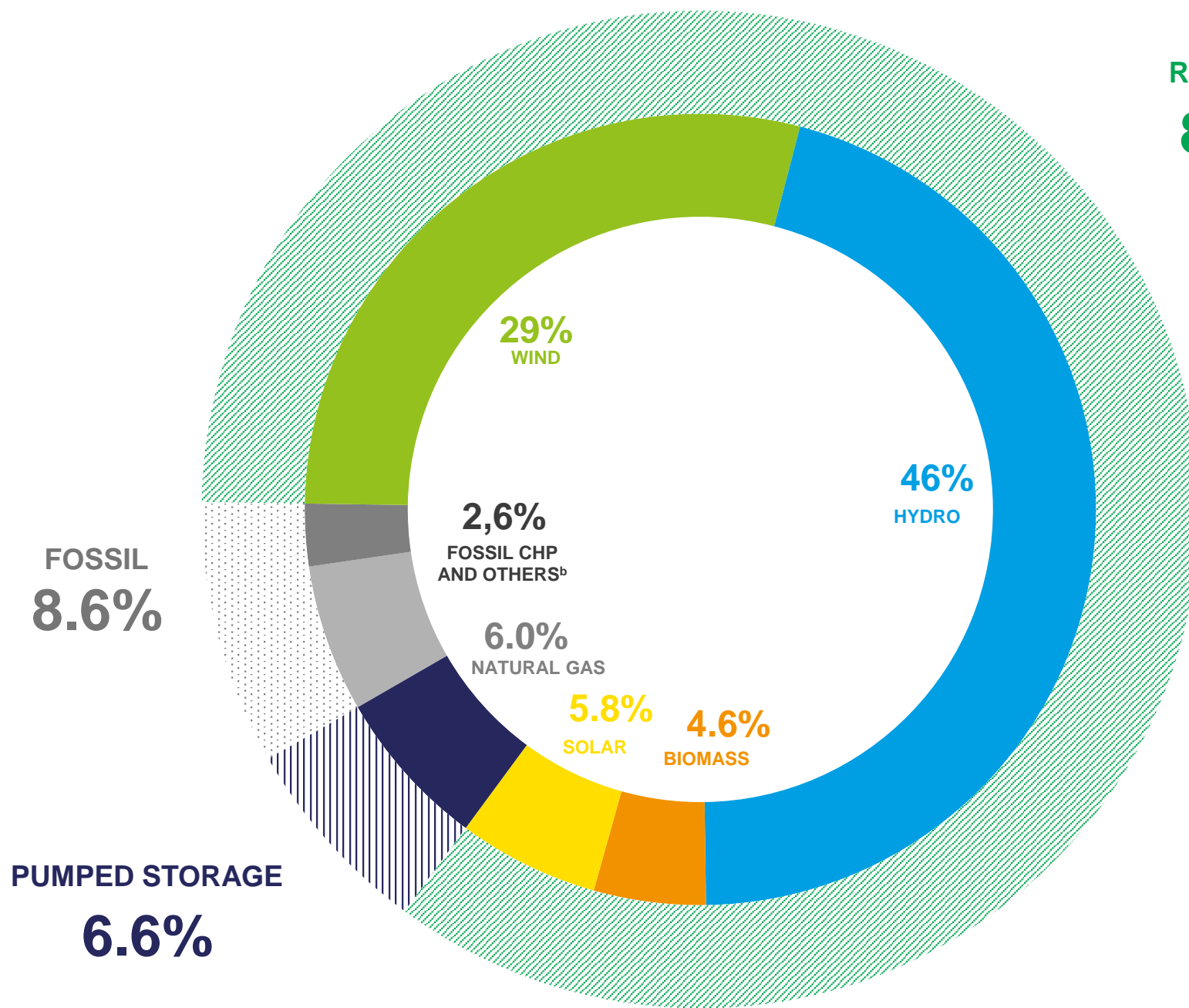
^a Generation refers to the net energy generation of the power stations, taking into account the pumping production recently disclosed by REN. Production from pumping is not included in the percentage of production from renewable sources. Source: REN, APREN Analysis

^b Includes fuel oil, diesel, the non-biodegradable fraction of MSW and new waste

^c Consumption refers to the net generation of energy by power stations, taking into account the import-export balance. Source: REN, APREN Analysis

MONTHLY ANALYSIS IN PORTUGAL MARCH

Between March 1 and 31 2024, renewable incorporation was 84.8%, with a total of 4,628 GWh produced. The 81.7 per cent increase compared to March 2023 is mainly due to the 37 per cent and 197 per cent increase in wind and hydro production, which corresponded to 1,578 GWh and 2,486 GWh respectively, compared to 1,152 GWh of wind production and 837 GWh of hydro production in March 2023.



RENEWABLE
84.8%

ELECTRICITY SECTOR'S INDICATORS (IN COMPARISON WITH MARCH 2023)

GWh
5,460
Generation^a

▲ **2.3%**

GWh
4,233
Consumption^c

▲ **1.5%**

%
84.8
Renewable incorporation

▲ **5.5%**

WIND INDEX

1.15

HYDRO INDEX

1.78

SOLAR INDEX

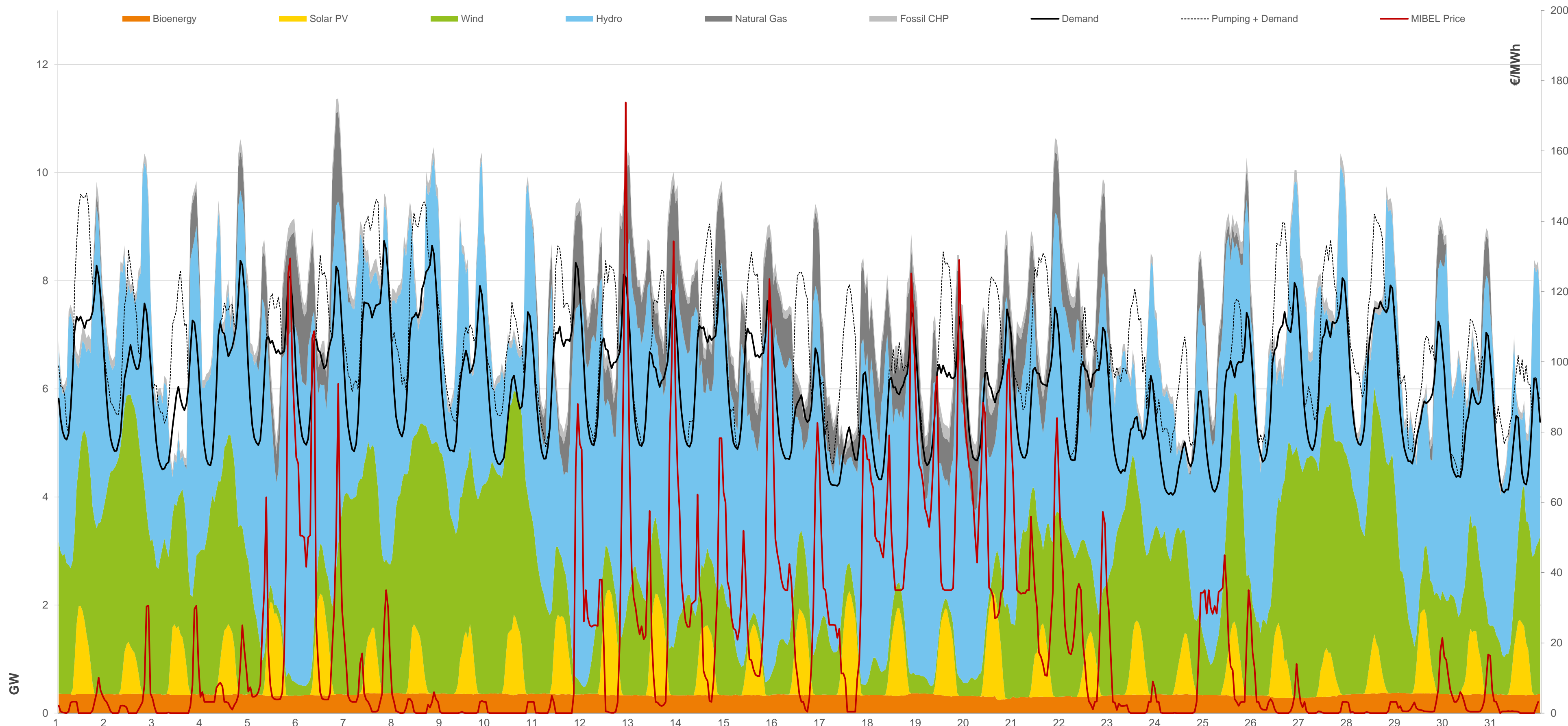
0.86

STORAGE IN DAMS

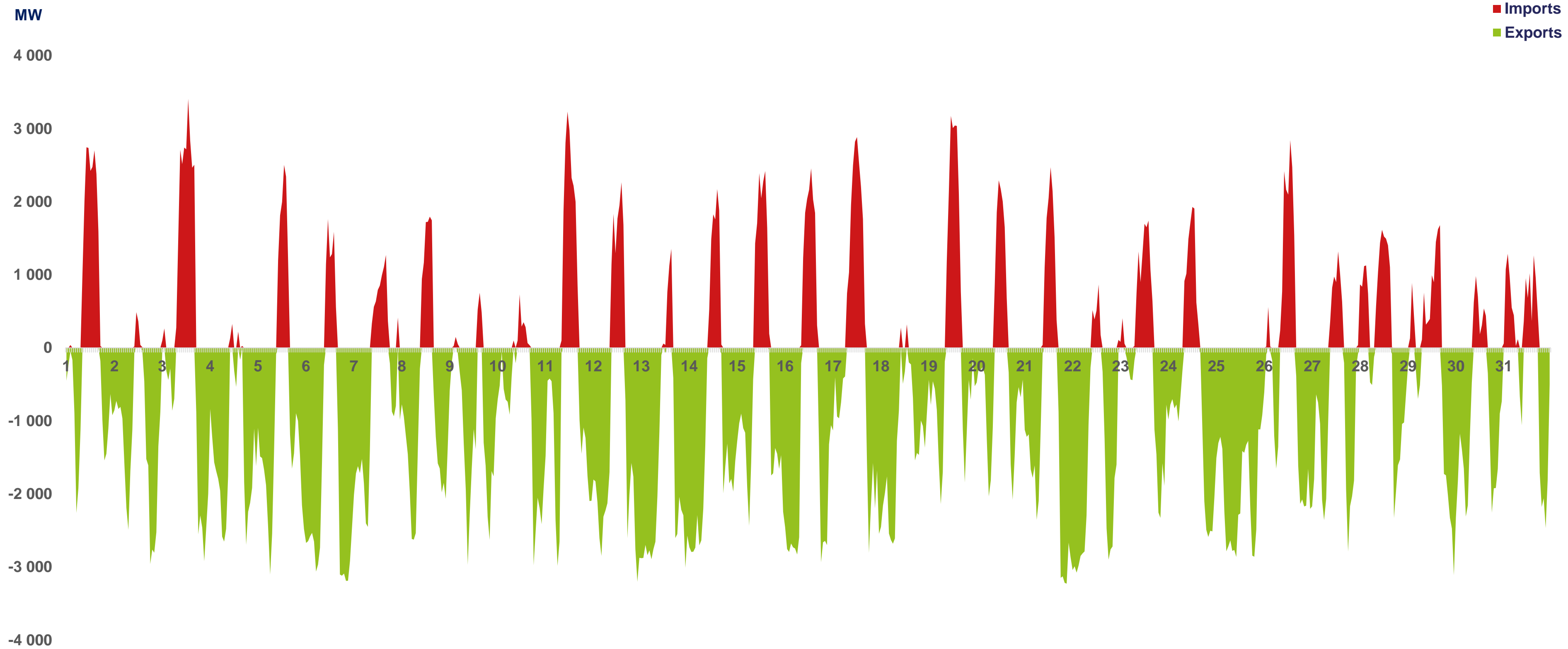
92.2%

^a Generation refers to the net energy generation of the power stations, taking into account the pumping production recently disclosed by REN. Production from pumping is not included in the percentage of production from renewable sources.
^b Includes fuel oil, diesel, the non-biodegradable fraction of MSW and new waste
^c Consumption refers to the net generation of energy by power stations, taking into account the import-export balance.
 Source: REN, APREN Analysis

MONTHLY ANALYSIS IN PORTUGAL: MARCH 2024 LOAD DIAGRAM



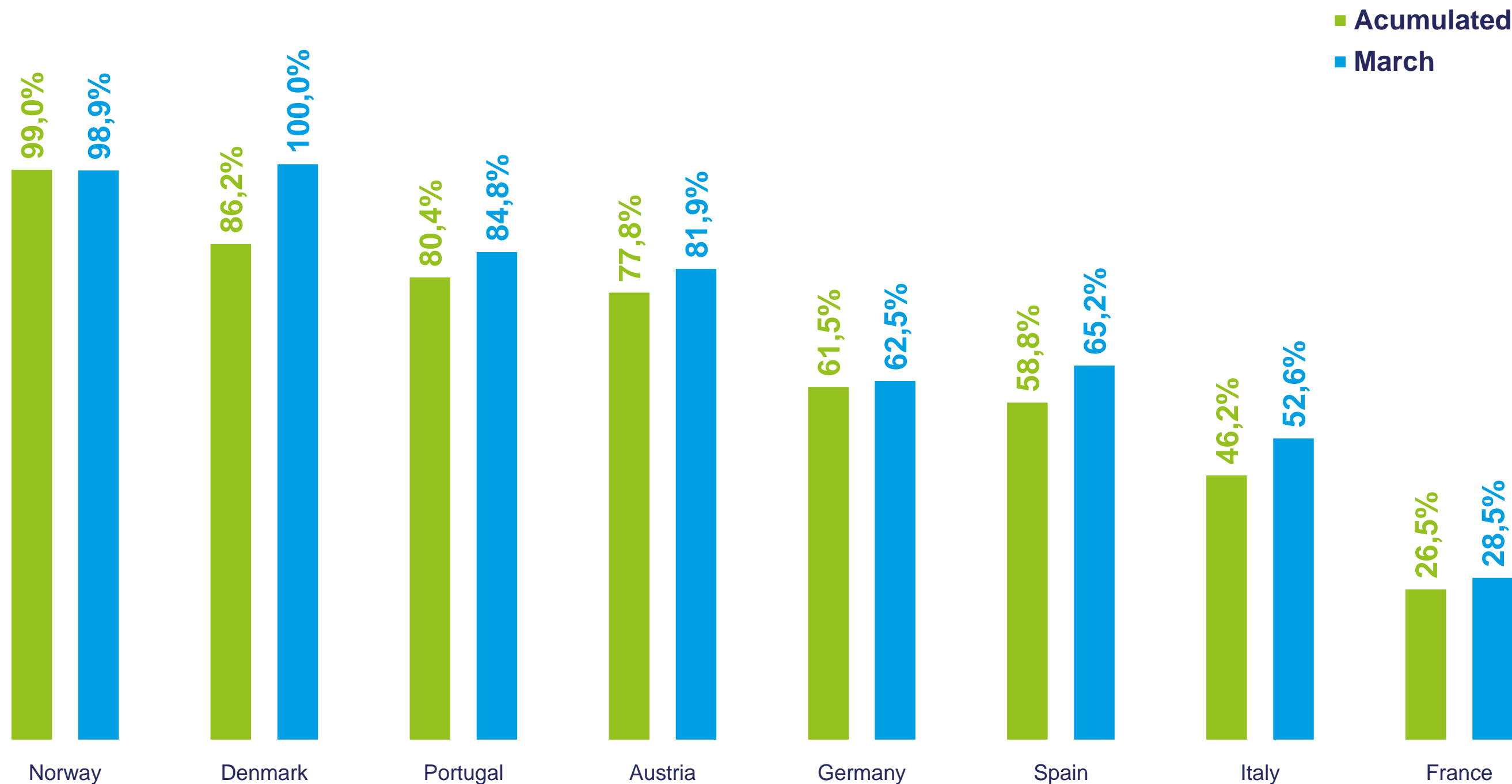
MONTHLY ANALYSIS IN PORTUGAL: DIAGRAM OF IMPORTS AND EXPORTS IN PORTUGAL



RENEWABLE ELECTRICITY EUROPE

In this analysis, only the main countries in the different European markets were considered, in order to obtain a representative panorama for comparison.

Between January 1 and March 31 2024, Portugal was the third country with the highest share of renewable energy in electricity generation, behind Norway and Denmark, which achieved 99.0% and 86.2%, respectively. From March 1 to 31, Portugal came fourth in the countries considered with the highest renewable incorporation in Europe.



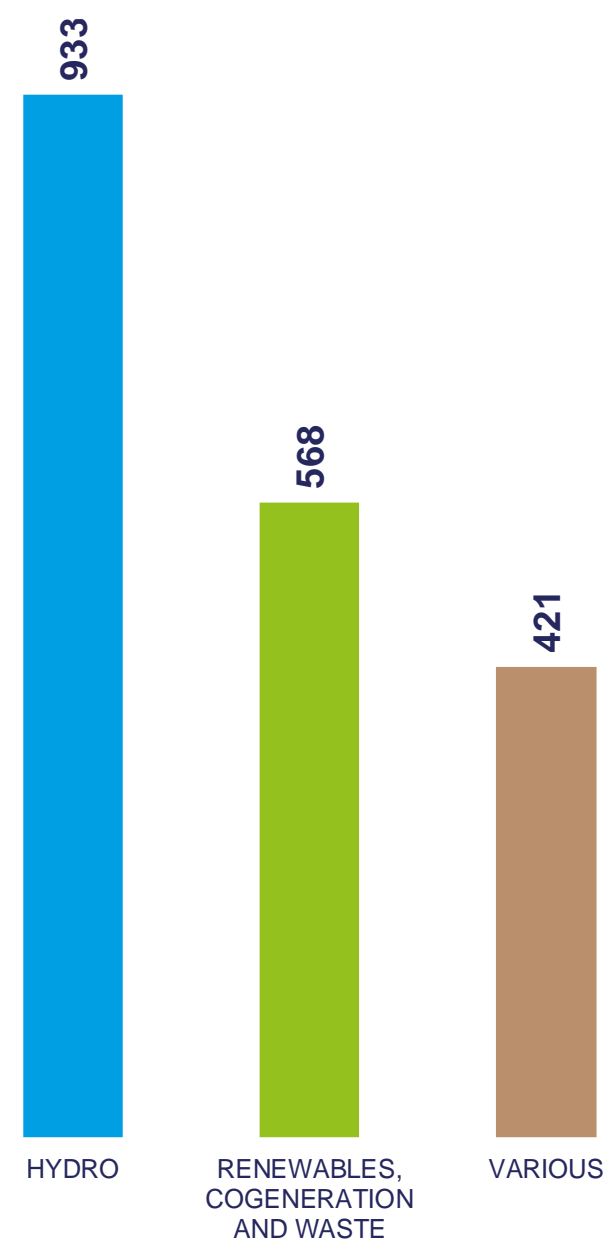
Renewable incorporation in cumulative (Jan-Mar) and monthly (Mar) electricity generation.
 Source: REN, Fraunhofer, REE, Terna, National Grid, ENTSO-E, Análise APREN

MARKET PRICE SETTING PORTUGAL

Between January 1 and March 31, the market closure technology that recorded the most hours was hydro, with 933 non-consecutive hours, followed by renewables, cogeneration and waste with 568 hours, and pumped storage with 421 hours.

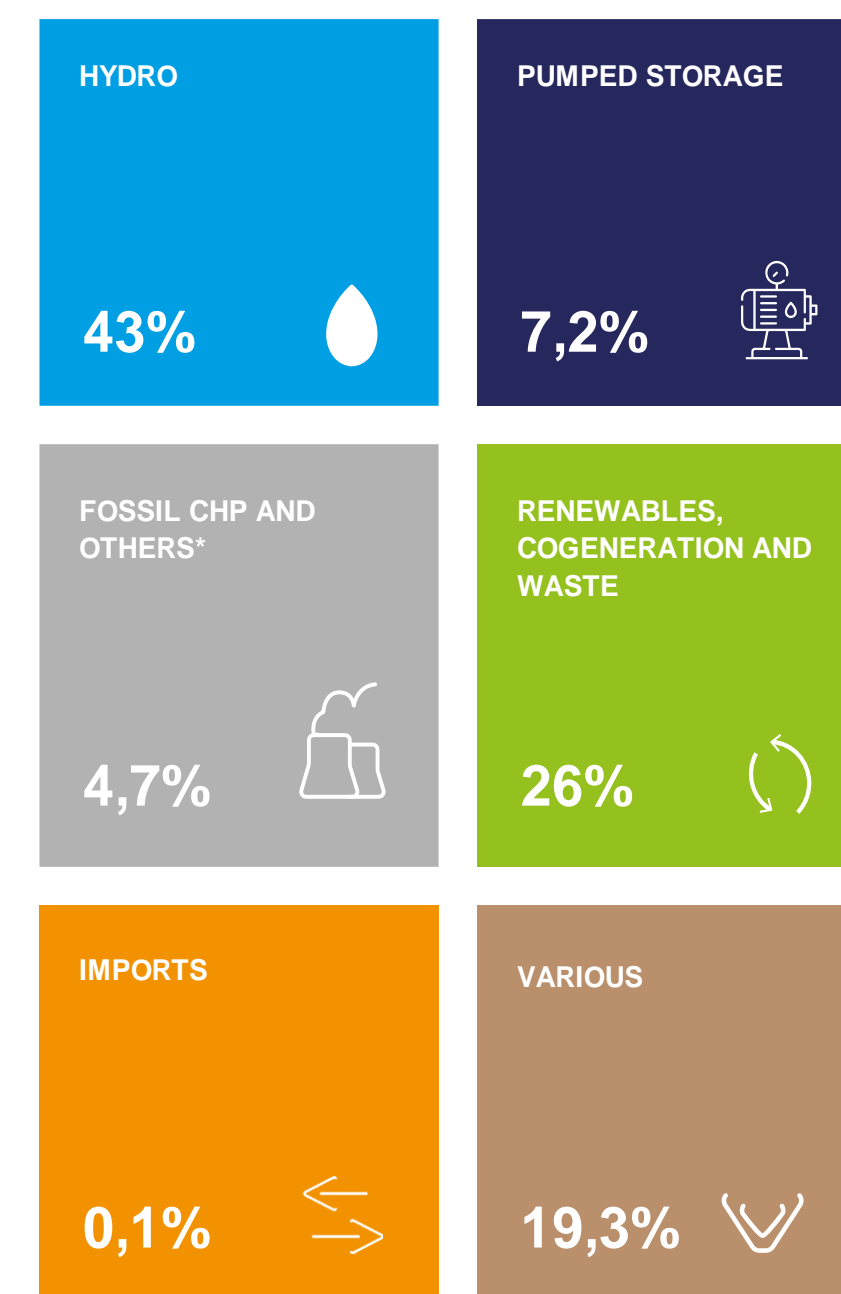


ACUMULATED MARCH 2024



Number of market closing hours (accumulated) for the three main closing technologies (Mar).
Source: OMIE, APREN Analysis

MARCH 2024

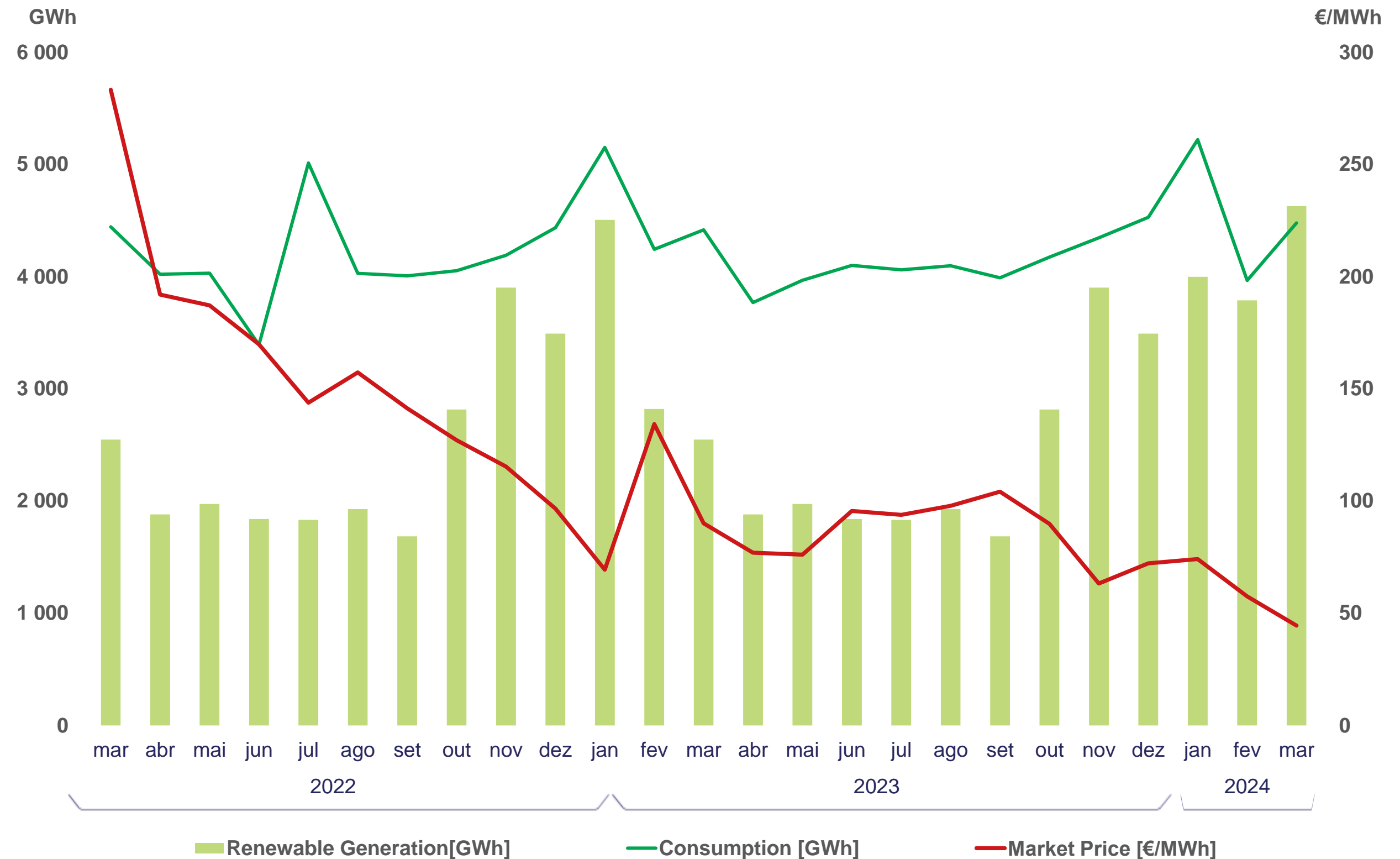


Percentage distribution of the number of hours of market closure for the various technologies, totalling 744 hours (Mar).
Source: OMIE, APREN Analysis

ELECTRICITY MARKET PORTUGAL

Between 1 January and 31 March, the average hourly price recorded in MIBEL in Portugal (44.5 €/MWh^d) represents a 54% reduction compared to the same period last year. In the same period, there were 1,074 non-consecutive hours in which renewable generation was sufficient to supply mainland Portugal's electricity consumption, with an average hourly price in MIBEL of 40.4 €/MWh.

<p>1,074 Hours</p> <p>100% RENEWABLE HOURS [Accumulated]</p>	<p>40.4 €/MWh</p> <p>MIBEL'S AVERAGE PRICE (IN 100% RENEWABLE HOURS) [Accumulated]</p>
<p>535 Hours</p> <p>100% RENEWABLE HOURS [March]</p>	<p>17.2 €/MWh</p> <p>MIBEL'S AVERAGE PRICE (IN 100% RENEWABLE HOURS) [March]</p>



^d arithmetic average of MIBEL prices.
Source: OMIE

Specific emissions from mainland Portugal's electricity sector, % use of coal and natural gas power stations (Mar-2022 to Mar-2024).
Source: REN, DGEG, ERSE, APREN Analysis

RENEWABLE ELECTRICITY EUROPE

During the month of March 2024, there was a minimum hourly price in MIBEL in Portugal of 0.0 €/MWh, where the market was closed by various technologies. The maximum hourly price was 173.82 €/MWh, where the market was closed by renewables, cogeneration and waste.

MINIMUM PRICES (MAR)

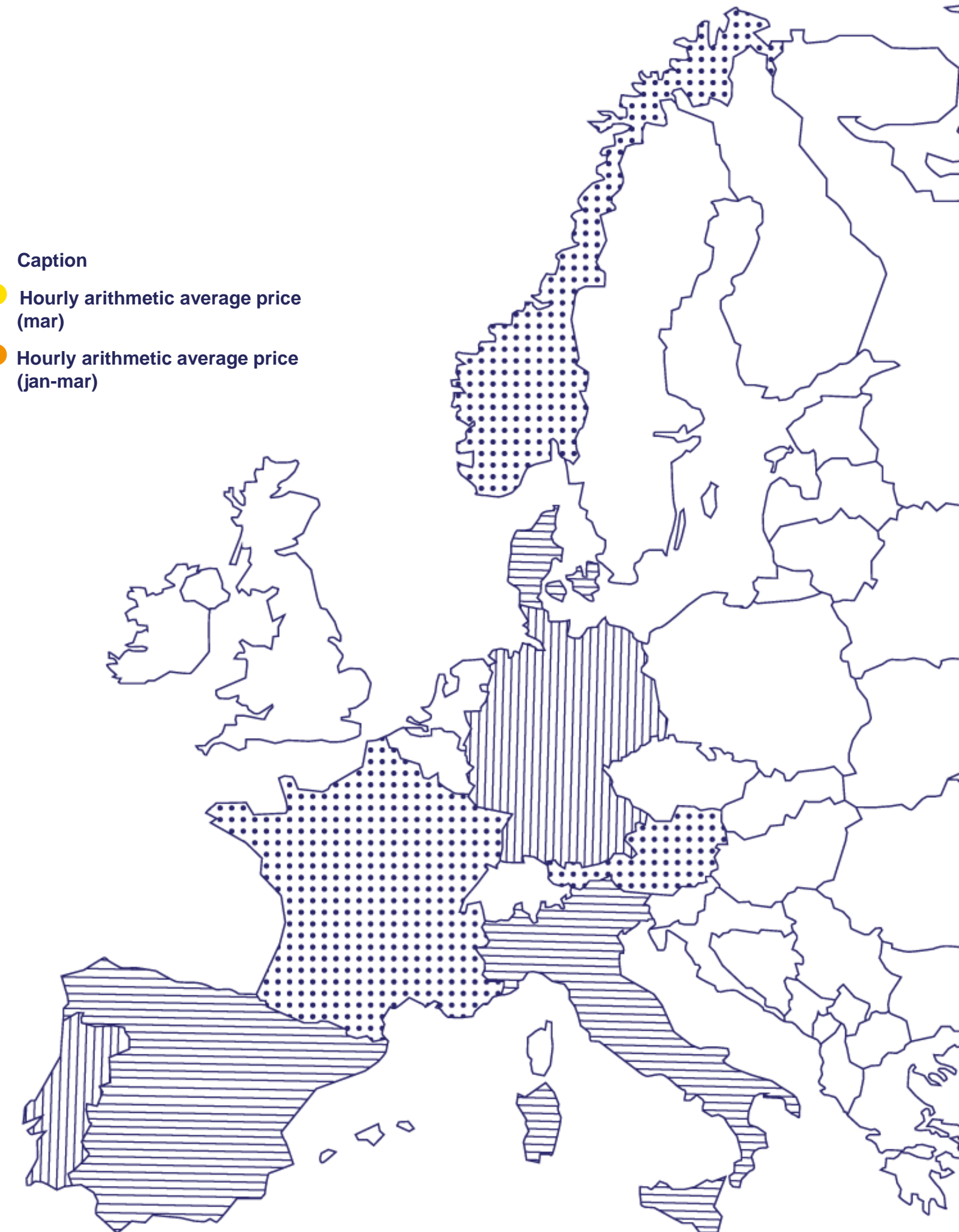
1 ^o Austria	€/MWh -31.4
2 ^o Germany	€/MWh -9.98
3 ^o France	€/MWh -7.10

MAXIMUM PRICES (MAR)

1 ^o Austria Denmark Germany Norway	€/MWh 174.7
2 ^o Italy Portugal Spain	€/MWh 173.8
3 ^o Norway	€/MWh 147.7

Portugal €/MWh	19.3	44.5
Spain €/MWh	20.3	44.9
France €/MWh	53.6	63.0
Italy €/MWh	89.4	92.2
Germany €/MWh	64.7	67.7
Austria €/MWh	63.6	70.4
Denmark €/MWh	61.1	64.9
Norway €/MWh	56.6	58.0

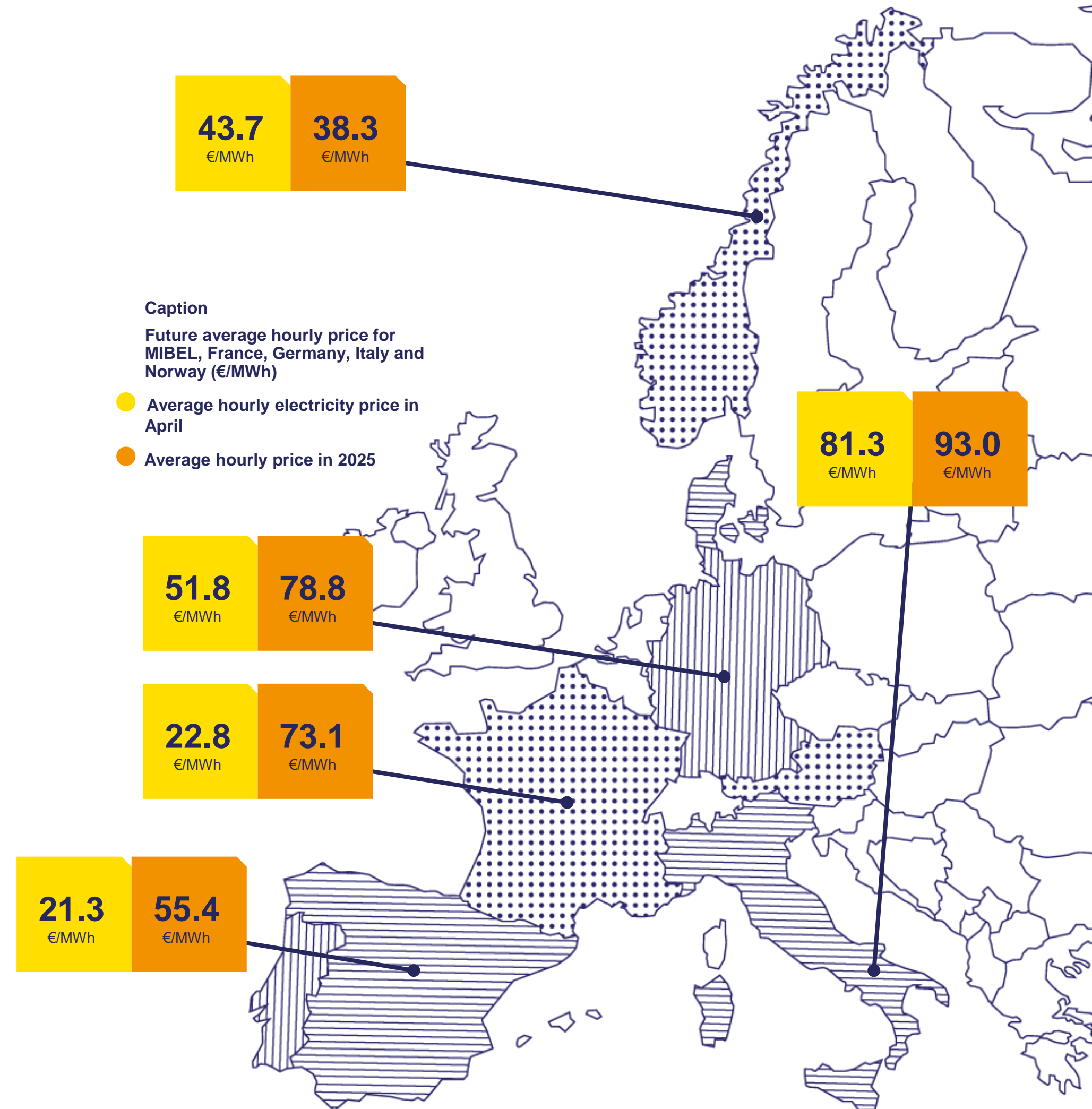
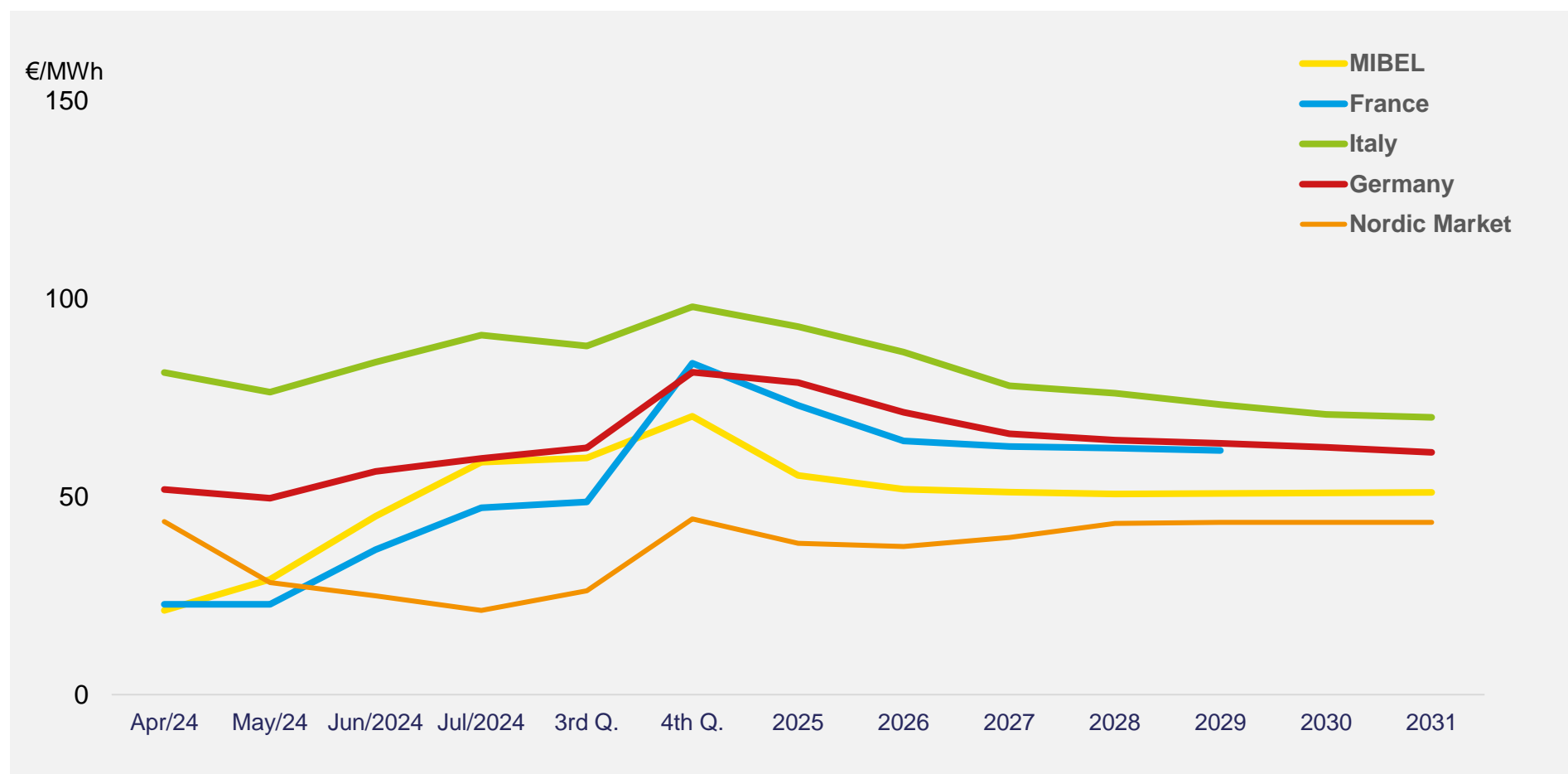
Caption
 ● Hourly arithmetic average price (mar)
 ● Hourly arithmetic average price (jan-mar)



ELECTRICITY MARKET FUTURES

The evolution of the average hourly future price shown is calculated on the basis of electricity^e purchase and sale contracts. The map on the right shows the price values for next month (April) and next year. In both cases, MIBEL and the Nordic Market have the lowest values, while the Italian market has the highest values in the analysis carried out.

MIBEL has the second lowest values until 2031, due to investment in renewable production.



Caption
 Future average hourly price for MIBEL, France, Germany, Italy and Norway (€/MWh)

- Average hourly electricity price in April
- Average hourly price in 2025

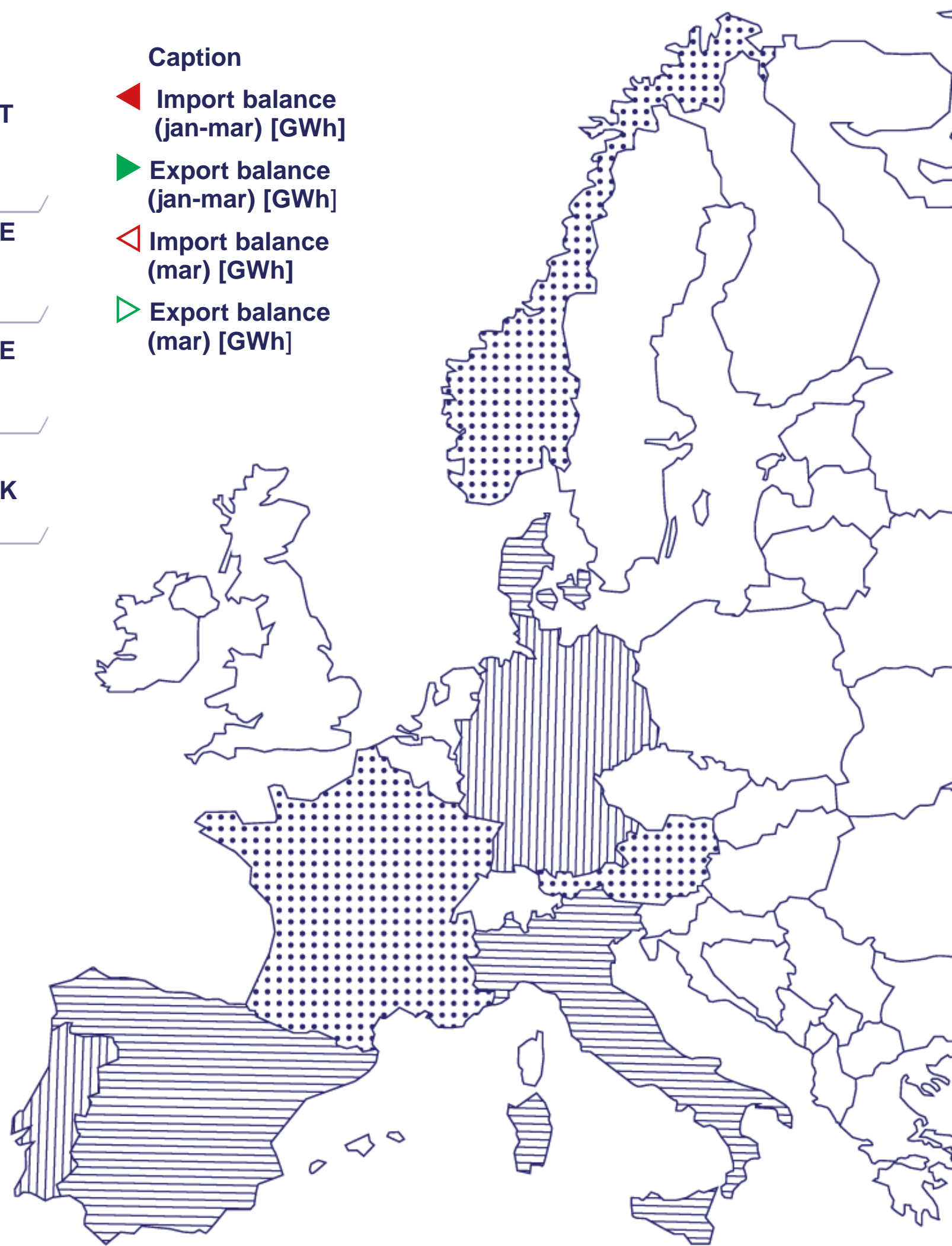
^e Updated values at April 2nd
 Source: OMIP, EEX, APREN Analysis

INTERNATIONAL EXCHANGES EUROPE

Between 1 January and 31 March 2024, mainland Portugal's electricity system registered electricity imports equivalent to 1,874 GWh and exports of 2,034 GWh, with Portugal being an exporter with a balance of 160 GWh.

PT	160	505	ES	DE	1,304	227	AT
ES	370	247	MA	DK	665	633	DE
FR	2,136	1,017	ES	NO	853	423	DE
IT	4,706	1,170	FR	NO	515	397	DK
DE	4,301	1,260	FR				

Caption
 ▲ Import balance (jan-mar) [GWh]
 ▼ Export balance (jan-mar) [GWh]
 ▲ Import balance (mar) [GWh]
 ▼ Export balance (mar) [GWh]



MAIN INDICATORS FOR PT-ES INTERCONNECTION

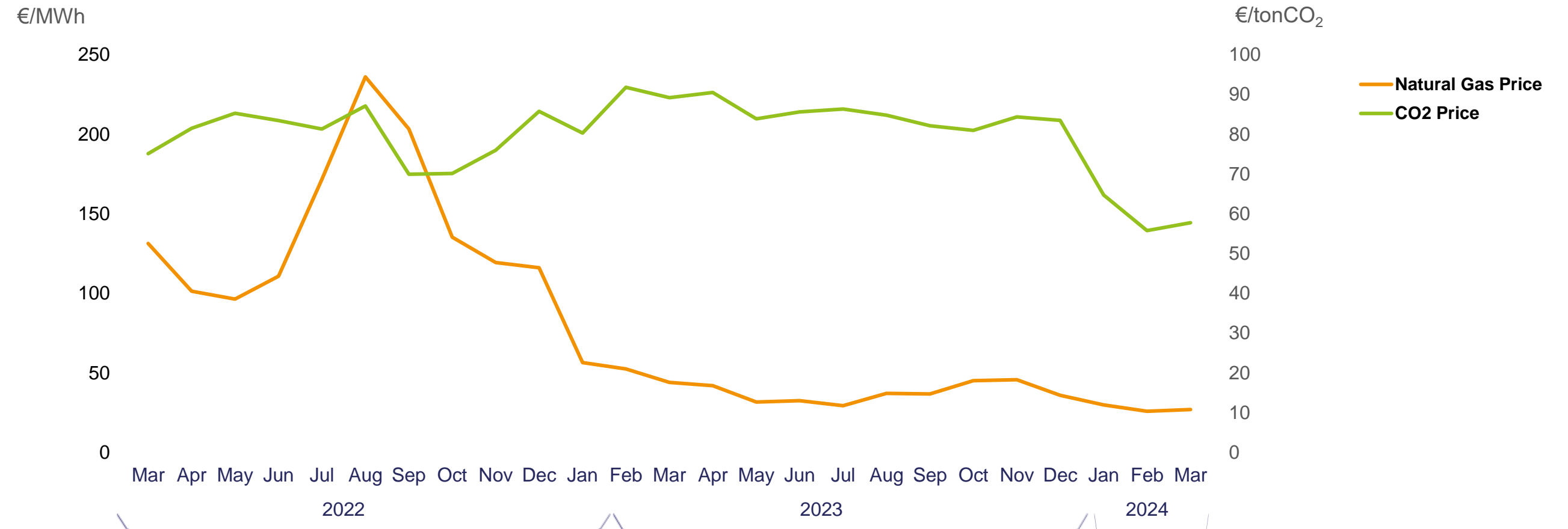
usage	45.7% (mar) PT-ES	38.8% (jan-mar)	33.6% (mar) ES-PT	37.8% (jan-mar)
congestion	10.3% (mar) PT-ES	7.0% (jan-mar)	1.9% (mar) ES-PT	2.4% (jan-mar)
market separation	5.7% (mar) PT-ES	4.3% (jan-mar)	87.0% (mar) MIBEL-FR	72.5% (jan-mar)

Source: ENTSO-E, OMIE, APREN Analysis

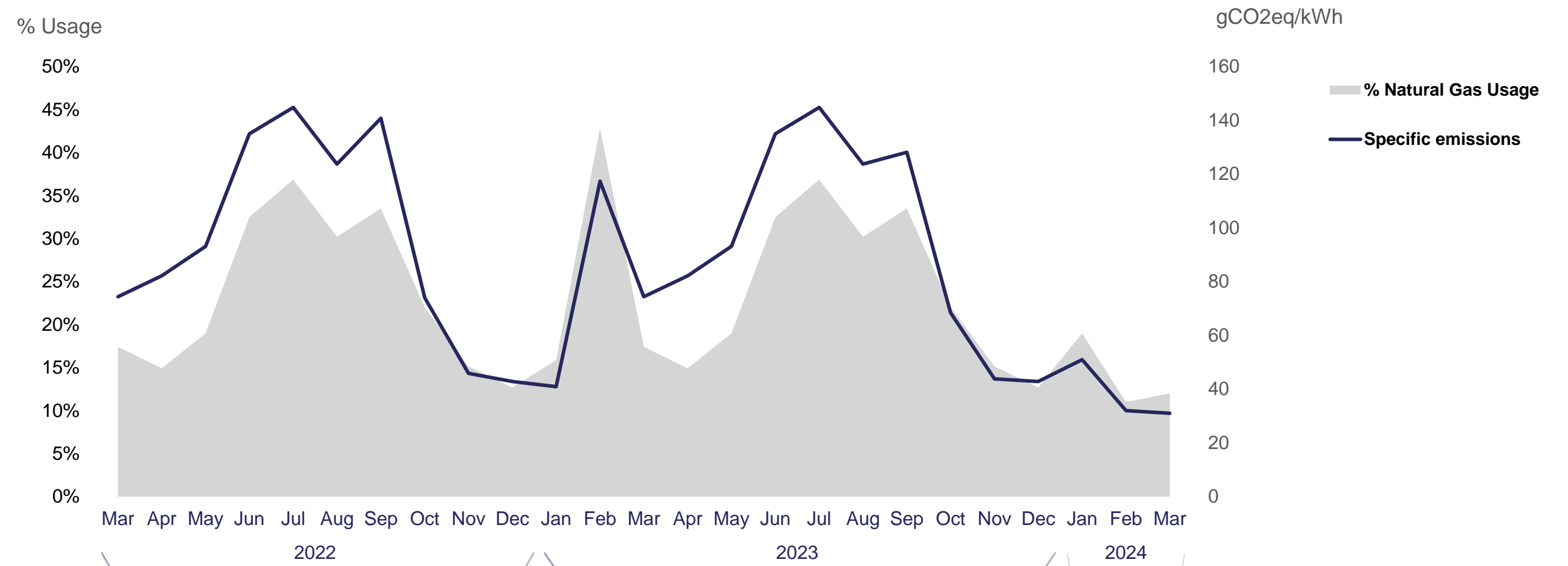
POWER PRODUCTION EMISSIONS

Between 1 January and 31 March 2024, specific emissions reached 38.2 gCO₂eq/kWh, giving total emissions from the electricity generation sector of 0.6 MtCO₂eq. The European CO₂ Emissions Trading Scheme (ETS) recorded a price of 59.6 €/tCO₂^d, a reduction of 32 per cent compared to the same period in 2023.

<p>0.6 MTOCO₂eq SECTOR'S EMISSIONS</p>	<p>59.6 €/tCO₂ AVERAGE PRICE OF LICENCES</p>
<p>39.4 % ▼ COMPARED TO MAR 2023</p>	<p>32 % ▼ FACE A MAR 2023</p>



Price of CO₂ allowances in the EU ETS and price of natural gas in Europe (Mar-2022 to Mar-2024).
Source: SendeCO₂, WorldBank.



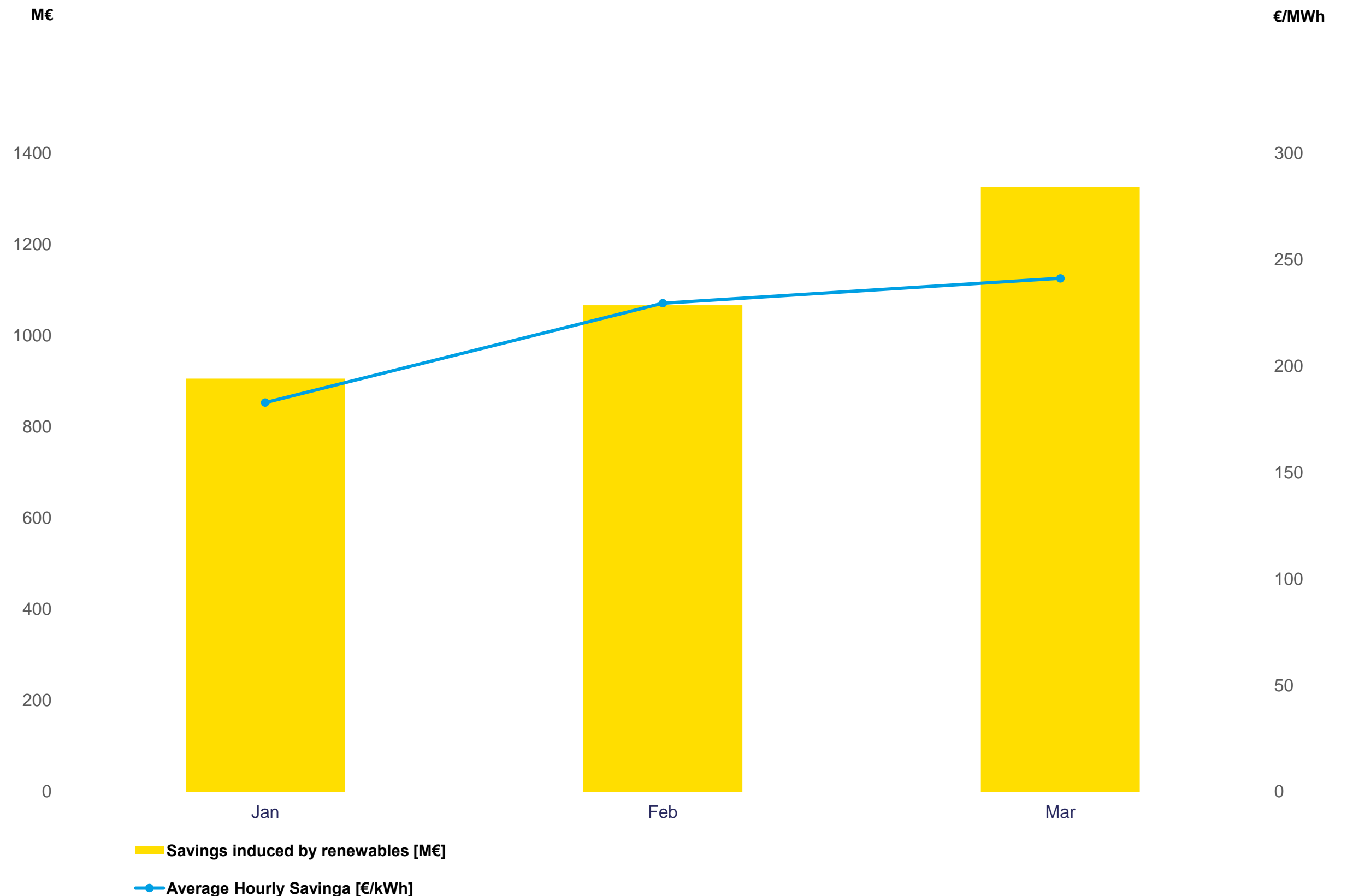
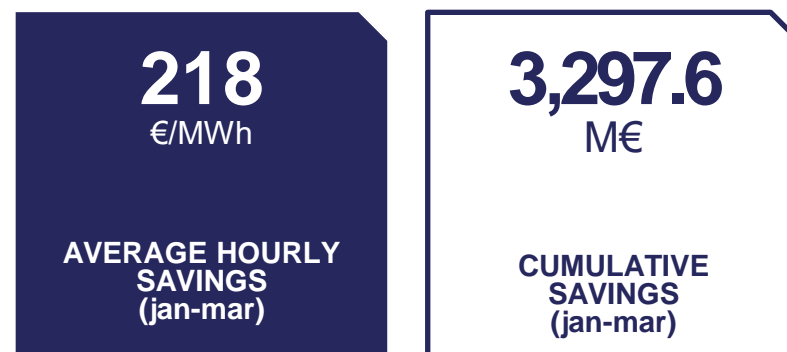
Specific emissions from the electricity sector in mainland Portugal, % use of coal and natural gas power stations (Mar-2022 to Mar-2024).
Source: REN, DGEG, ERSE, APREN Analysis

^d arithmetic average of hourly prices
Source: OMIE, WorldBank.

SIMULATION OF PRICE FORMATION WITHOUT SRP

RENEWABLES AVOIDED:

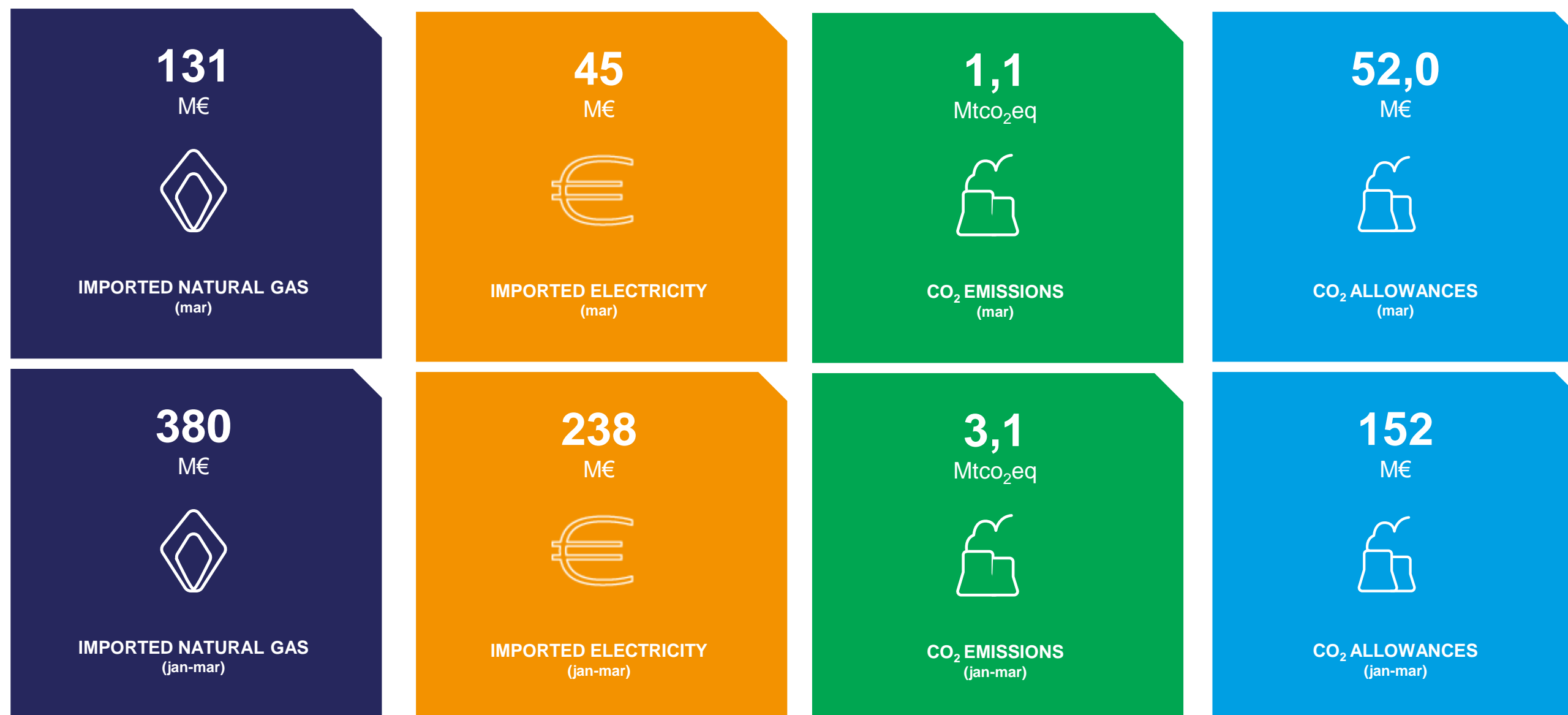
The indicators below show the savings achieved by the merit order between January 1 and March 31 2024 by the contribution of special regime production (PRE). This study is carried out for PRE, which includes all installed fossil cogeneration power. Bearing in mind that the capacity equivalent to this technology within PRE is fairly residual and that the other technologies are renewable, the figures are fairly close to the real savings generated by renewables.



ENVOIRENMENTAL SERVICE

RENEWABLES AVOIDED:

The indicators below identify the savings achieved between January 1 and March 31 2024 in natural gas, CO2 emissions and CO2 emission allowances, resulting from incorporating renewables into electricity generation. This analysis is based on the assumption that, in the absence of renewables, production would be ensured primarily by natural gas, followed by the use of imports.



Source: OMIE, APREN Analysis.

20
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