

2024

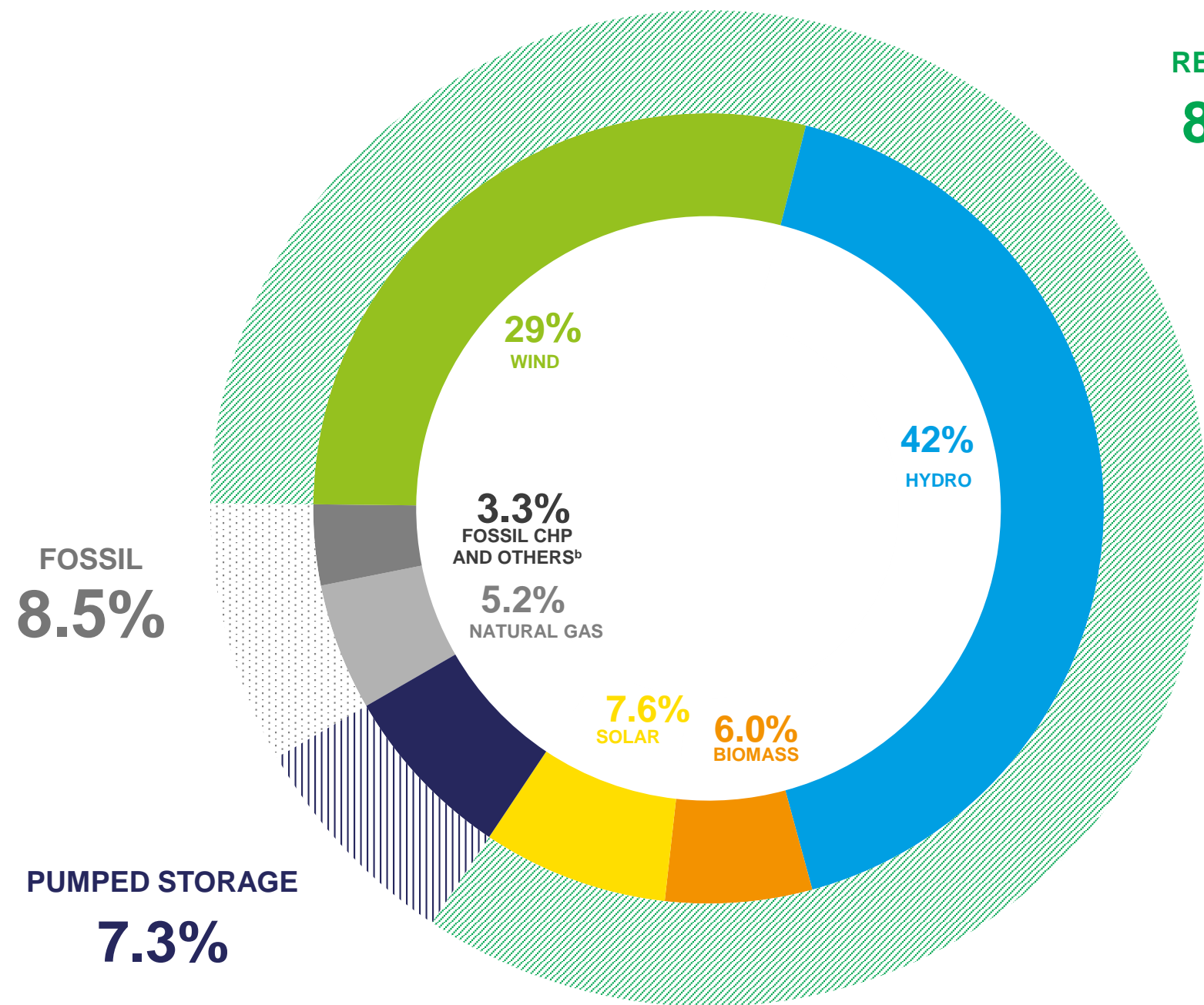
BOLETIM ELETRICIDADE RENOVÁVEL MAY 2024

PORTUGAL PRECISA
DA NOSSA ENERGIA.

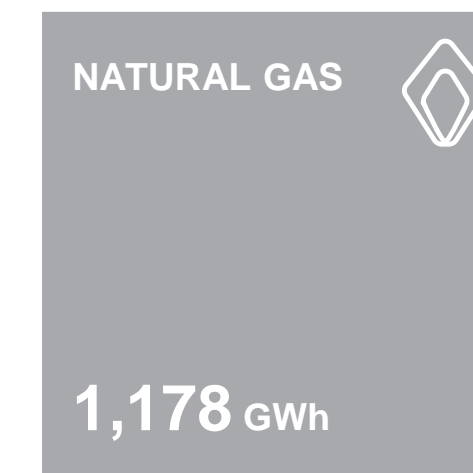
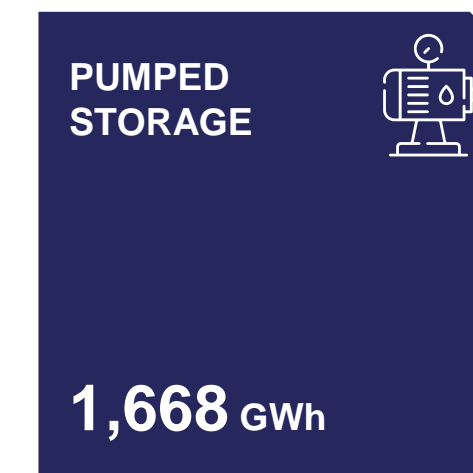
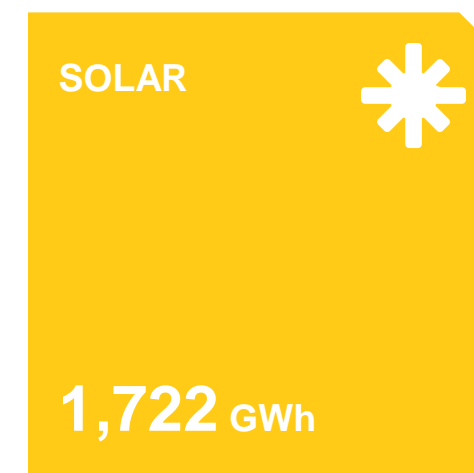
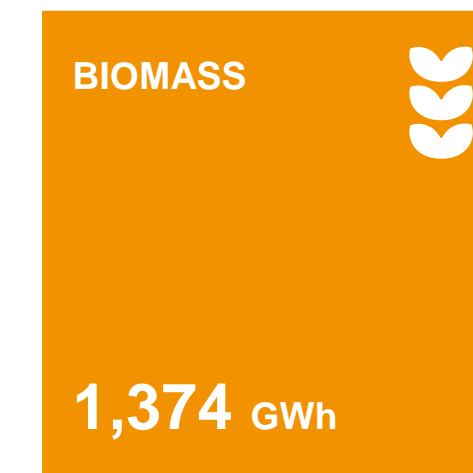
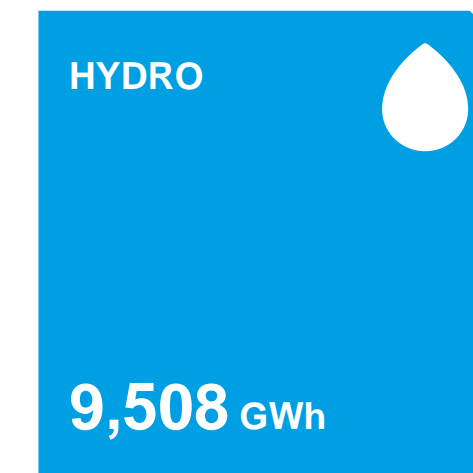


APREN Associação
de Energias
Renováveis

EXECUTIVE SUMMARY GENERATION (JAN-MAY)



RENEWABLE
84.2%



**MAIN INDICATORS
(JAN-MAY)**

GWh
22,754
Generation^a

€/ MWh
35.5
MIBEL PT Price

€/ tCO₂
62.8
CO₂ Price

MtCO₂ - eq
0.7
CO₂ Emissions

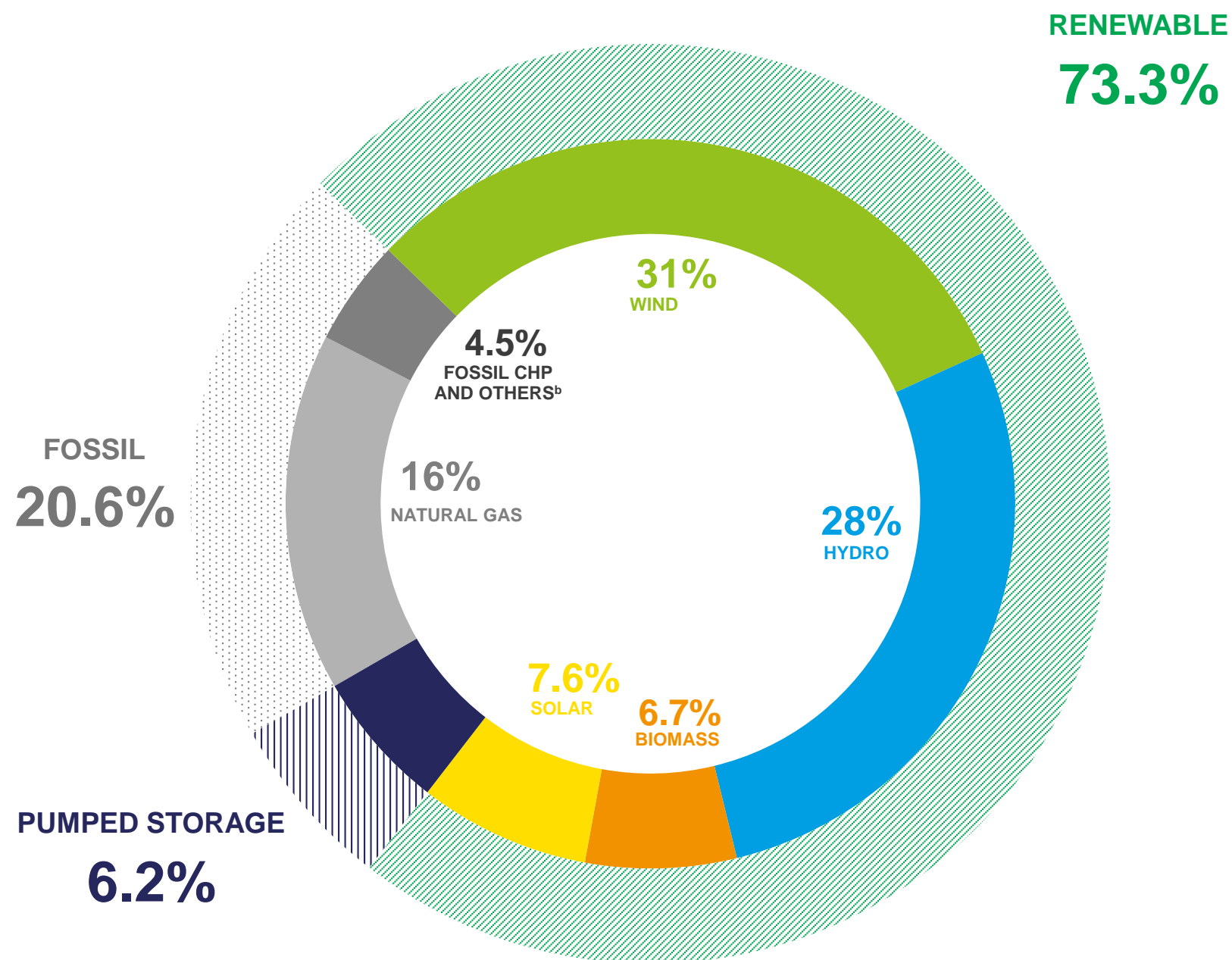
GWh
1,000
Import Balance

gCO₂ eq/kWh
30.1
CO₂ Specific Emissions

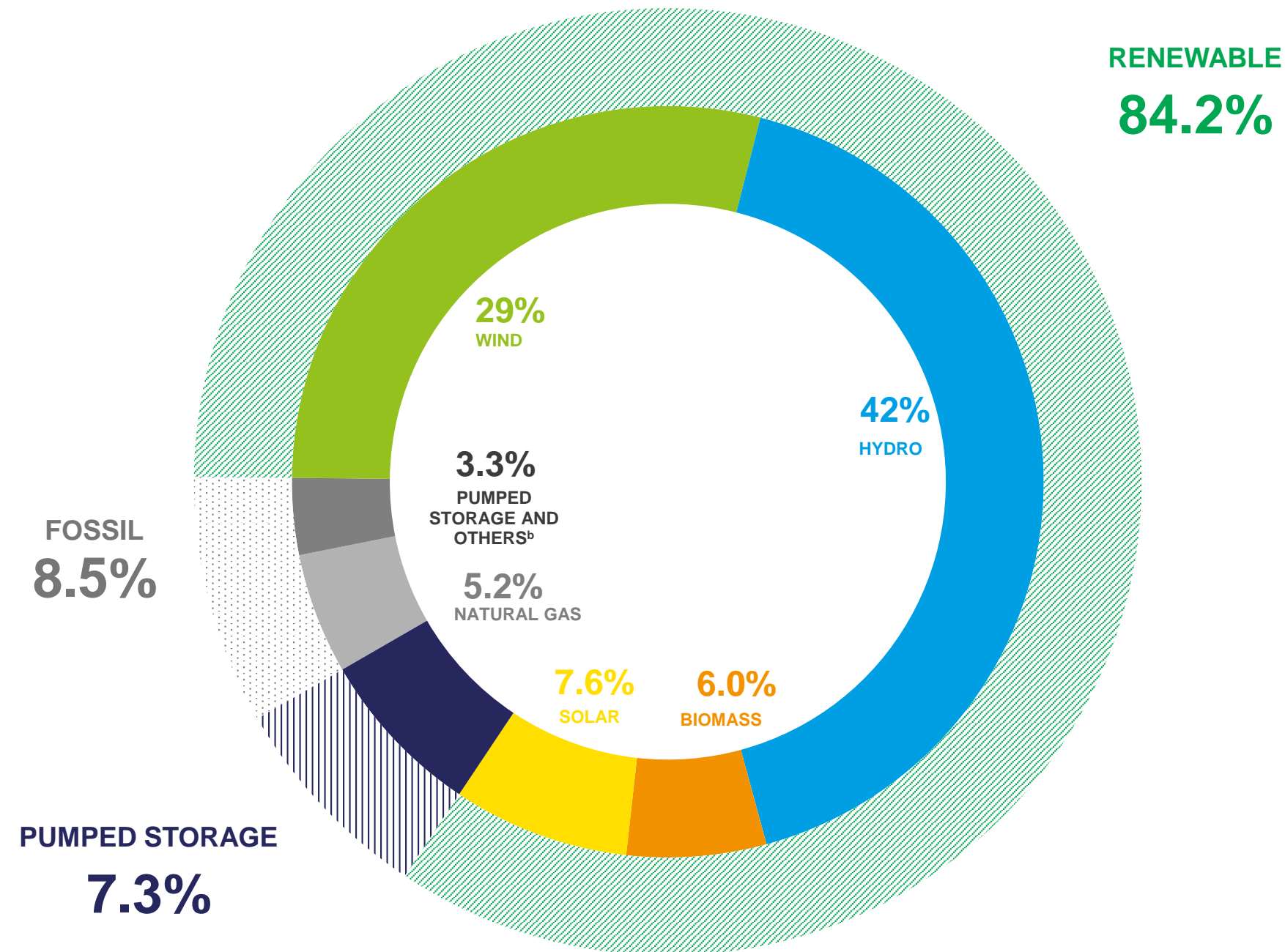
^a Generation refers to the net energy generation of the power stations, taking into account the pumping production recently disclosed by REN. Production from pumping is not included in the percentage of production from renewable sources
^b Includes fuel oil, diesel, the non-biodegradable fraction of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

EXECUTIVE SUMMARY

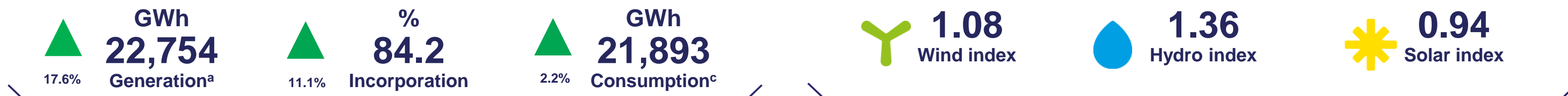
MAY ACUMULATED GENERATION 2023



MAY ACUMULATED GENERATION 2024



MAIN INDICATORS COMPARED TO MAY 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

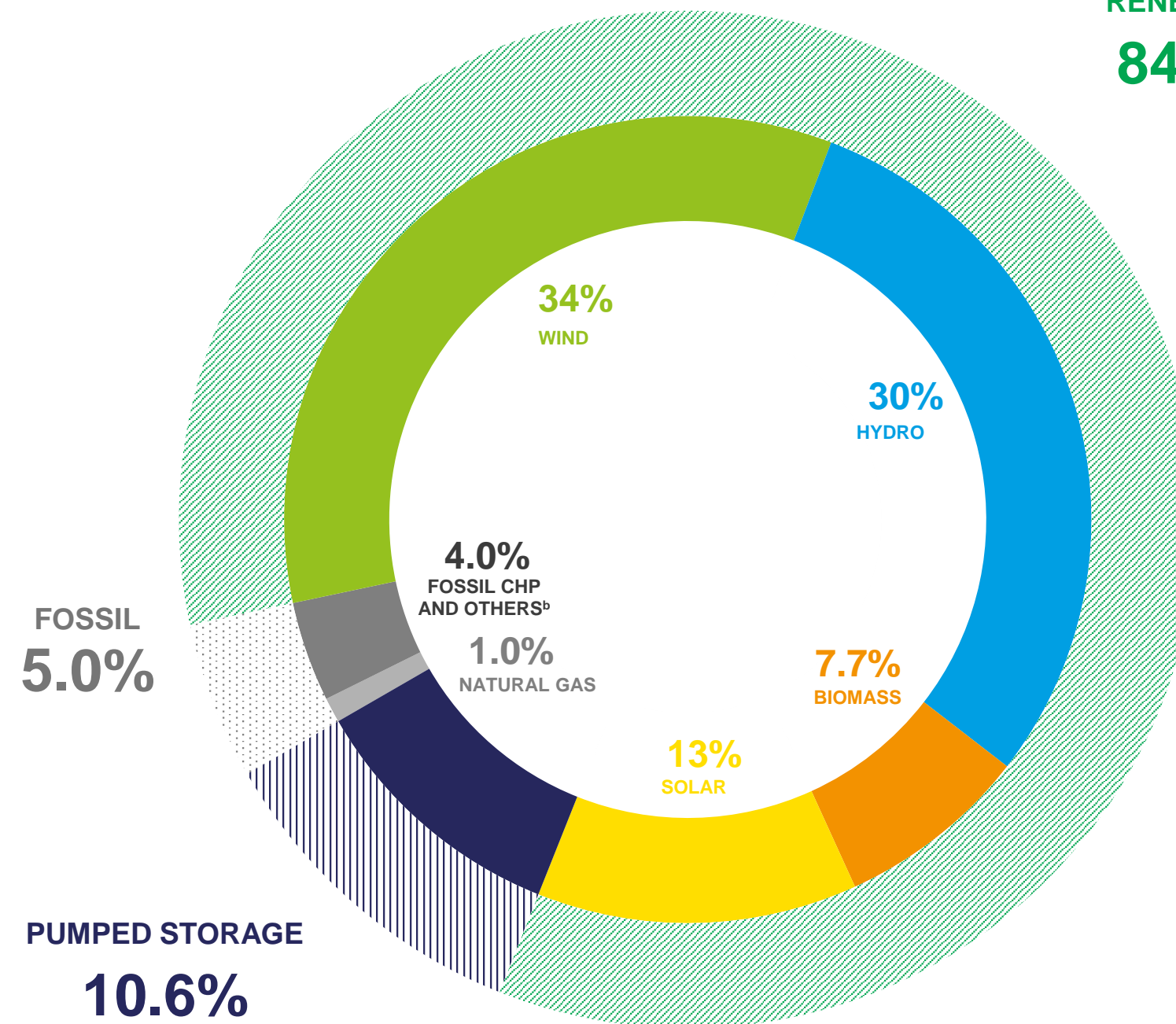
^b Includes fuel oil, diesel, the non-biodegradable fraction of MSW and new waste

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

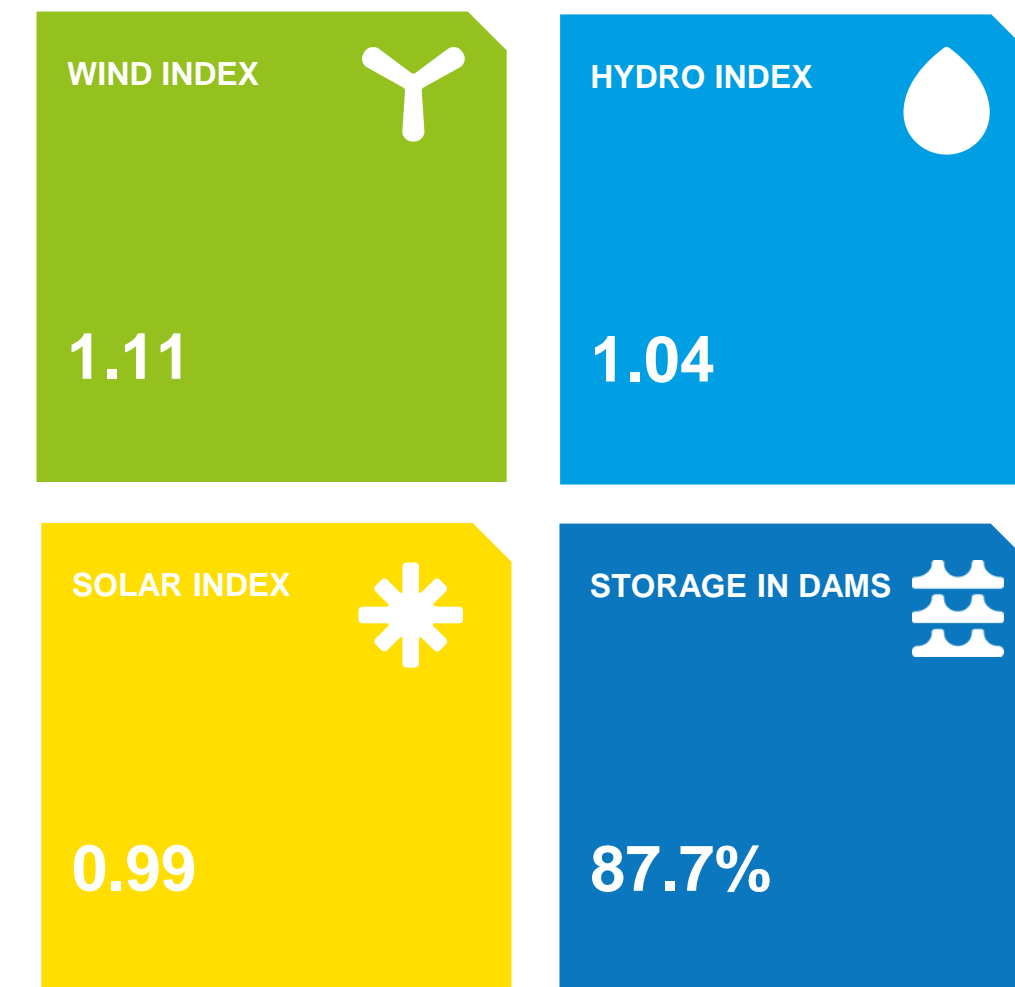
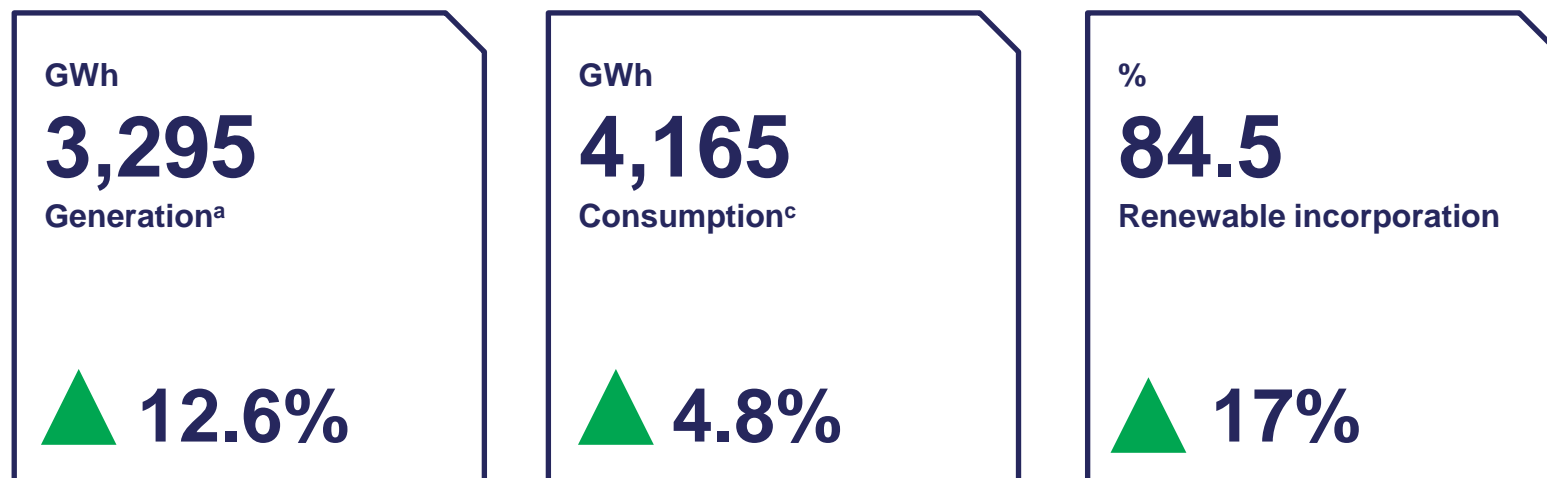
MONTHLY ANALYSIS IN PORTUGAL MAY

Between 1 and 31 May 2024, renewable incorporation was 84.5%, making up 2,784 GWh of the 3,295 GWh produced in the month under review. The 17 percentage points (p.p.) increase compared to May 2023 is partly due to the 21.6 p.p. point increase in hydroelectric production, with 243 GWh produced by this technology in May 2023, and 976 GWh in May 2024; and, on the other hand, to the 19 p.p. reduction in electricity produced by fossil fuels, from 698 GWh in May 2023 to 162 GWh in May 2024.

RENEWABLE
84.5%



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



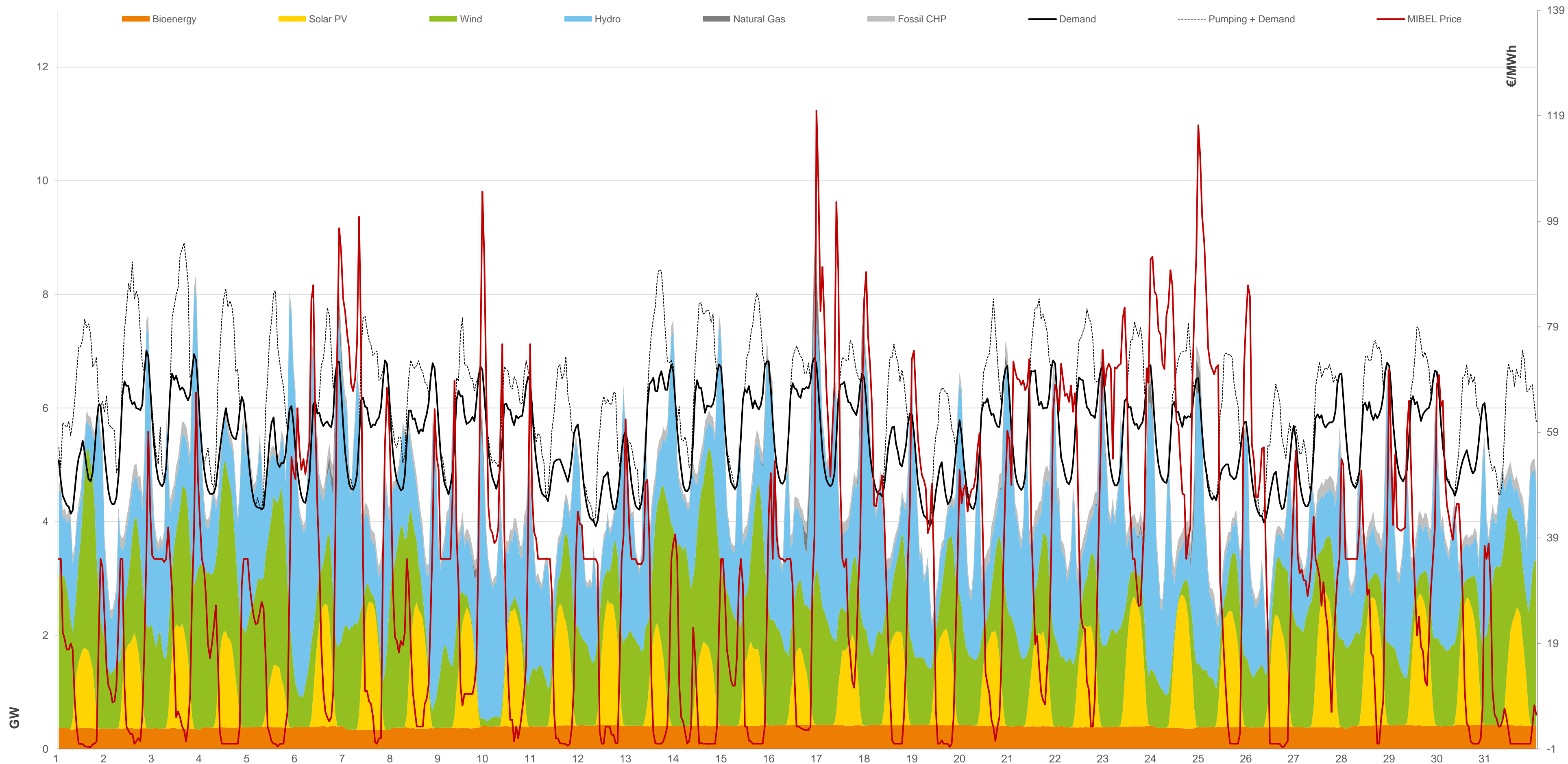
^a Generation refers to the net energy generation of the power stations, taking into account the pumping production recently disclosed by REN. Production from pumping is not included in the percentage of production from renewable sources.

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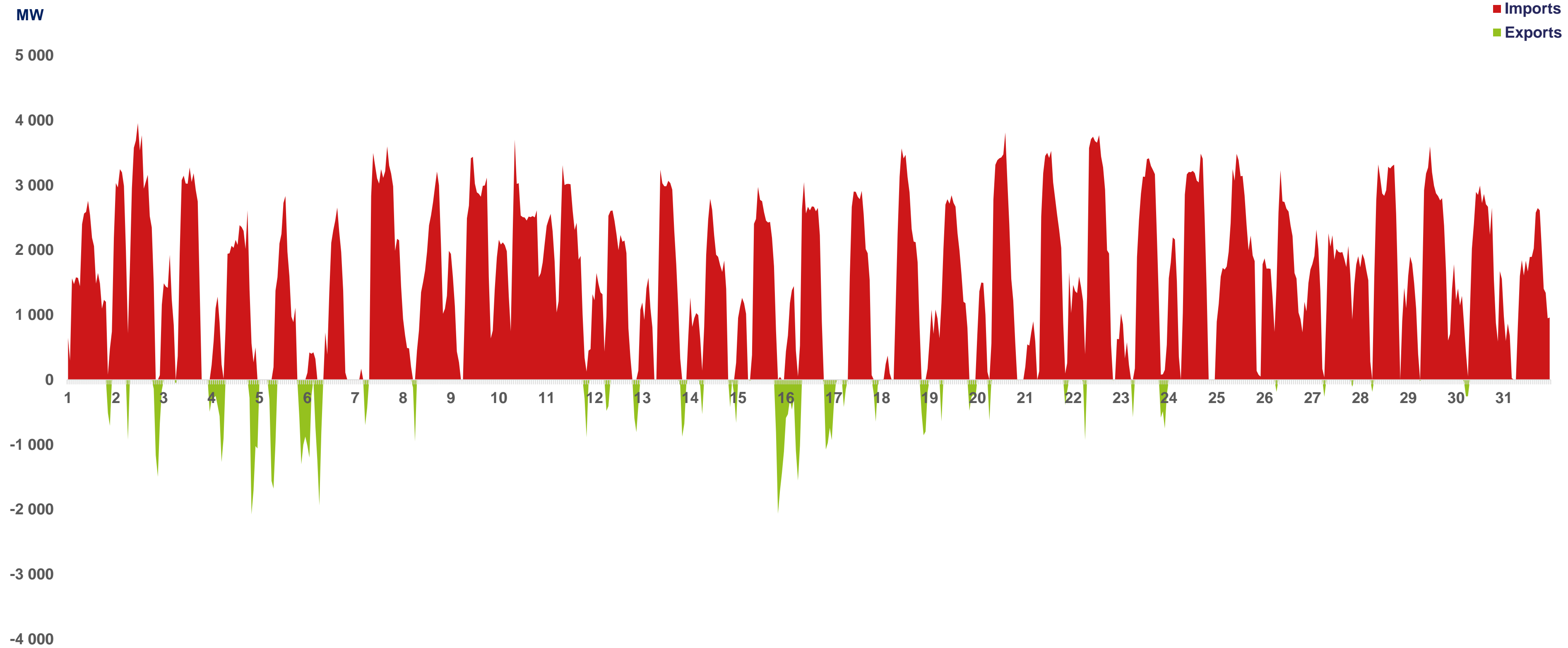
^c Consumption refers to the net generation of energy by power stations, taking into account the import-export balance.

Source: REN, APREN Analysis

MONTHLY ANALYSIS IN PORTUGAL: MAY 2024 LOAD DIAGRAM



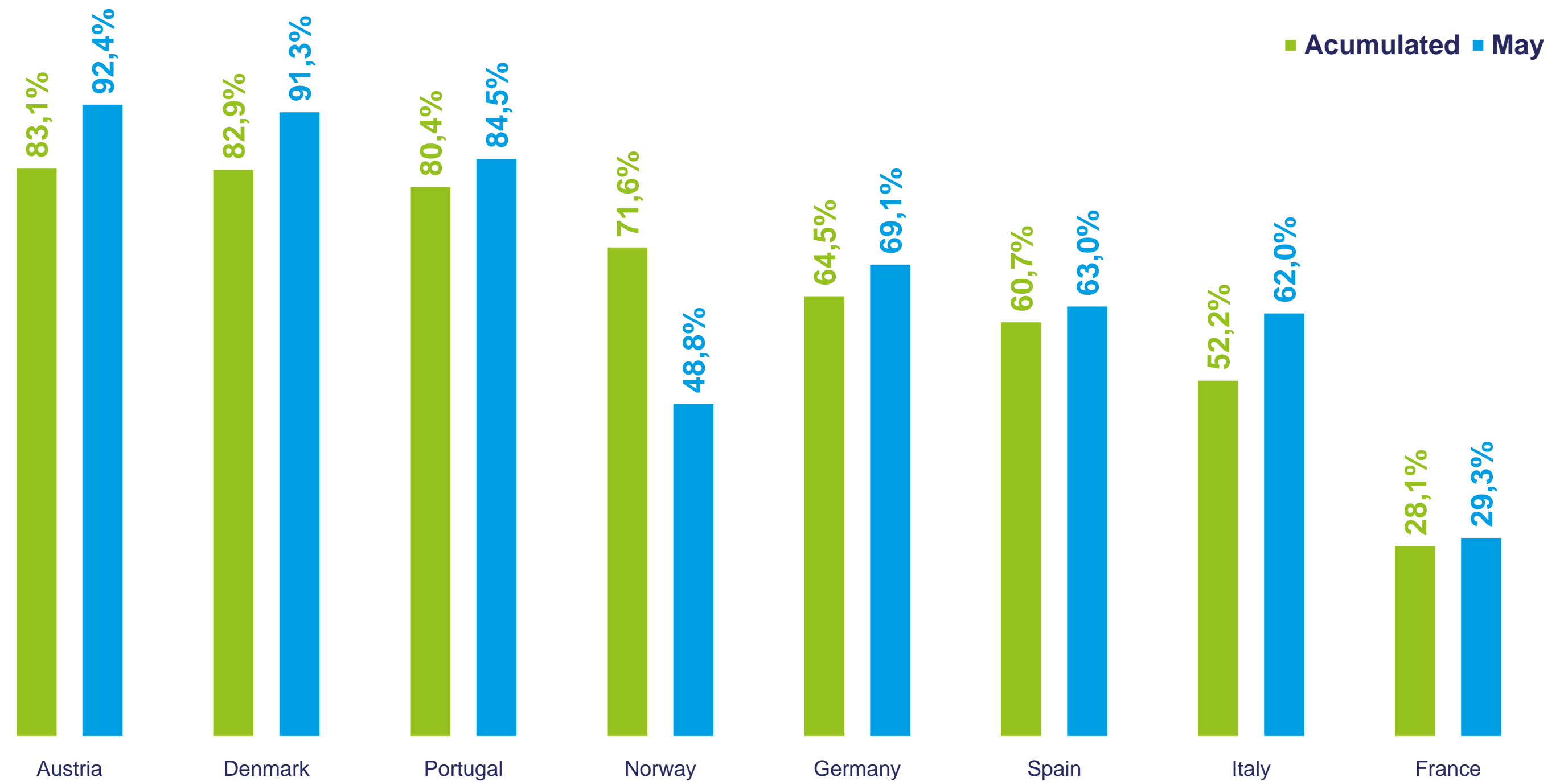
MONTHLY ANALYSIS IN PORTUGAL: DIAGRAM OF IMPORTS AND EXPORTS IN PORTUGAL



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 1 January and 31 May 2024, Portugal was the third country with the highest share of renewable energy in electricity generation, behind Austria and Denmark, which achieved 83.1% and 82.9% respectively. From 1 to 31 May, Portugal came third in the countries considered with the highest renewable incorporation in Europe.

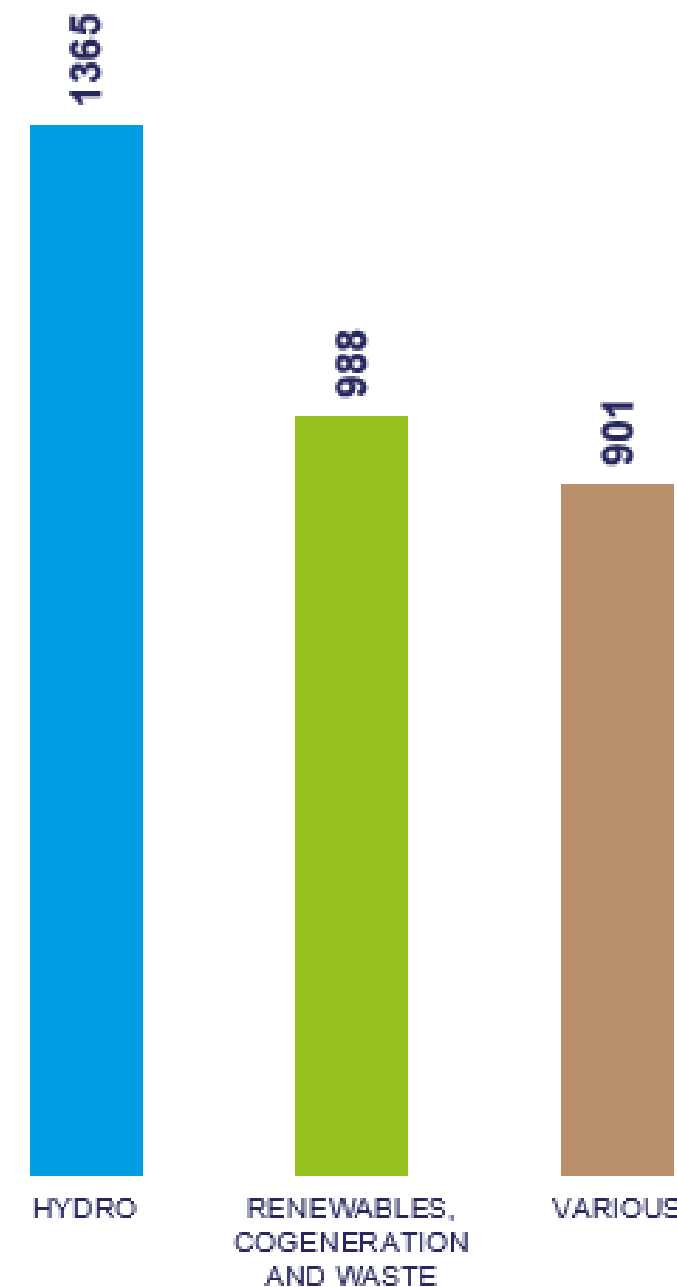


MARKET PRICE SETTING PORTUGAL

Between 1 January and 31 May, the closing technology that recorded the most hours was hydro, with 1,365 non-consecutive hours, followed by renewables, cogeneration and waste with 988 hours, and various technologies with 901 hours.

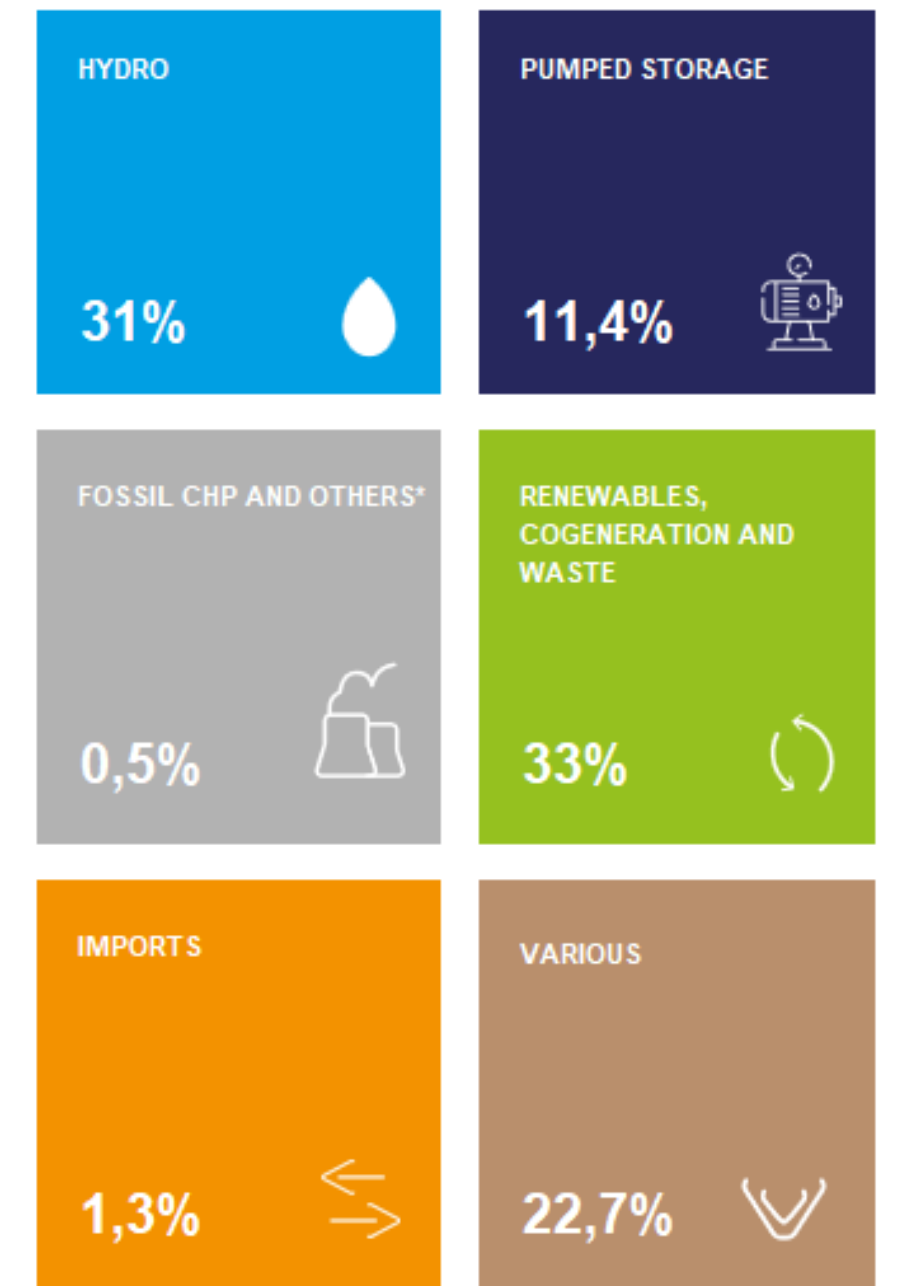


ACUMULATED MAY 2024



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

MAY 2024

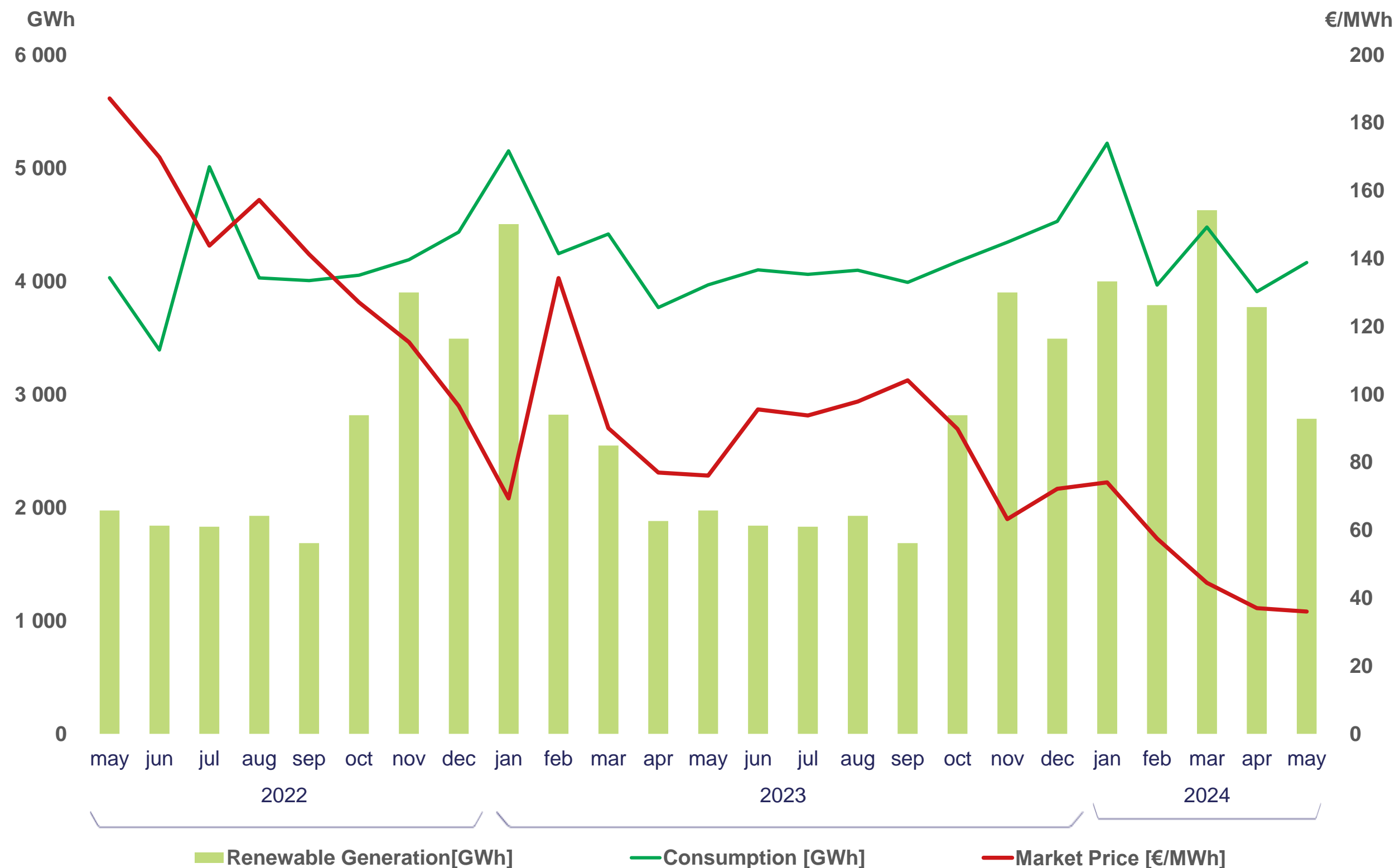


Percentage distribution of the number of hours of market closure for the various technologies, totalling 744 hours (May).
Source: OMIE, APREN Analysis

ELECTRICITY MARKET PORTUGAL

Between January 1 and May 31, the average hourly price recorded in MIBEL in Portugal (35.5 €/MWh^d) represents a 59.8% reduction compared to the same period last year. In the same period, there were 1,605 non-consecutive hours in which renewable generation was sufficient to supply mainland Portugal's electricity consumption, with an average hourly price in MIBEL of 37.7 €/MWh.

<p style="font-size: 24px; font-weight: bold;">1,605</p> <p>Hours</p> <p style="font-size: 12px; font-weight: bold;">100% RENEWABLE HOURS [Accumulated]</p>	<p style="font-size: 24px; font-weight: bold;">37.7</p> <p>€/MWh</p> <p style="font-size: 10px; font-weight: bold;">MIBEL'S AVERAGE PRICE (IN 100% RENEWABLE HOURS) [Accumulated]</p>
<p style="font-size: 24px; font-weight: bold;">100</p> <p>Hours</p> <p style="font-size: 12px; font-weight: bold;">100% RENEWABLE HOURS [MAY]</p>	<p style="font-size: 24px; font-weight: bold;">48.5</p> <p>€/MWh</p> <p style="font-size: 10px; font-weight: bold;">MIBEL'S AVERAGE PRICE (IN 100% RENEWABLE HOURS) [MAY]</p>



^d arithmetic average of MIBEL prices.
Source: OMIE

Electricity market analysis, renewable generation, consumption and market price (may-2022 a may-2024)
Source: OMIE, APREN analysis

RENEWABLE ELECTRICITY EUROPE

During the month of May 2024, there was a minimum hourly price in MIBEL in Portugal of -0.66 €/MWh, where the market was closed by renewables, cogeneration and waste. The maximum hourly price was 120 €/MWh, where the market was closed by hydro.

MINIMUM PRICES (MAY)

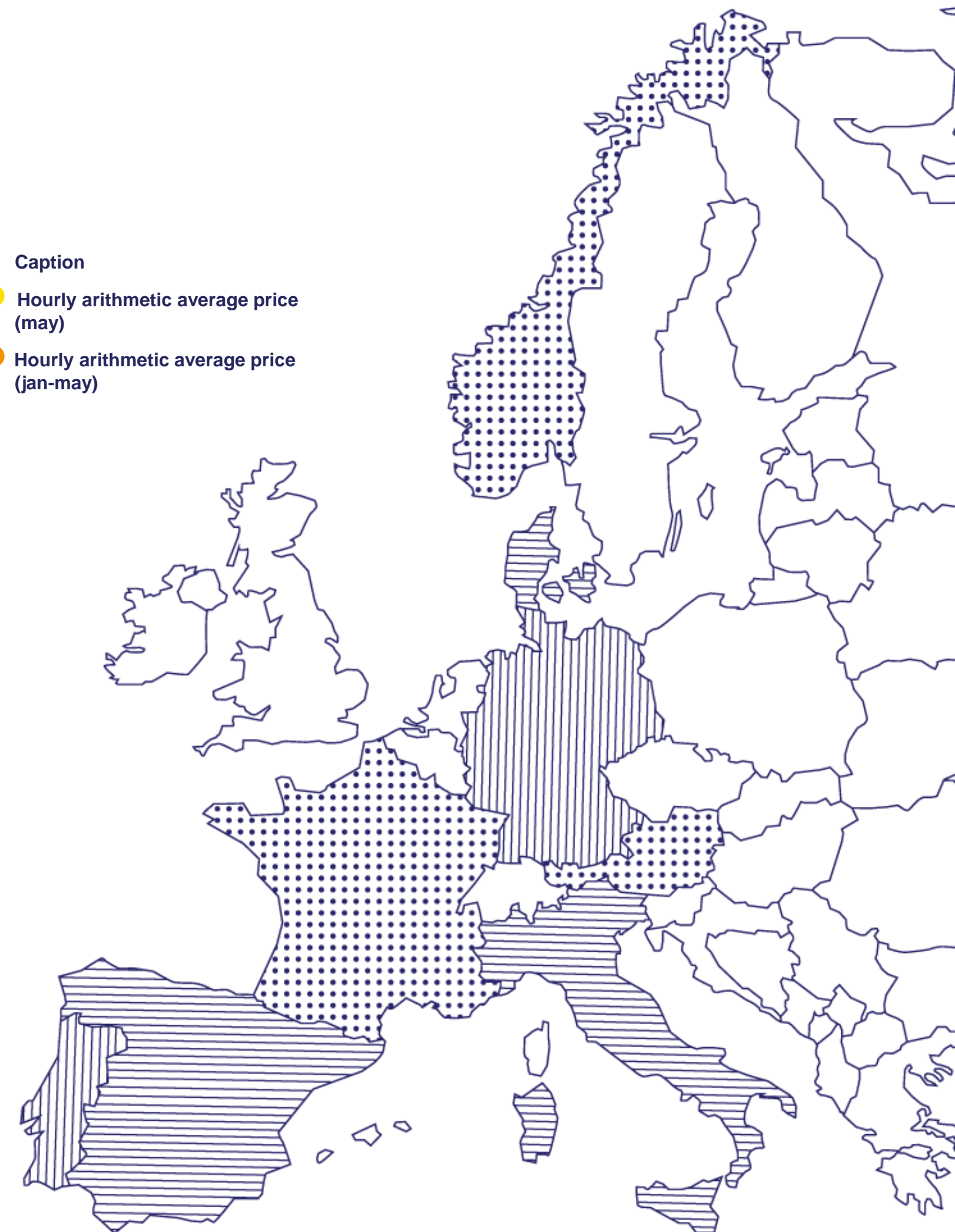
1 ^o	Germany	€/MWh	-135.45
2 ^o	Austria	€/MWh	-126.42
3 ^o	France	€/MWh	-87.29

MAXIMUM PRICES (MAY)

1 ^o	Germany	€/MWh	221.46
2 ^o	Austria	€/MWh	210.84
3 ^o	Denmark	€/MWh	188.04

Portugal €/MWh	30.8	35.5
Spain €/MWh	30.5	35.8
France €/MWh	27.3	48.8
Italy €/MWh	94.2	91.6
Germany €/MWh	67.2	66.5
Austria €/MWh	64.1	66.8
Denmark €/MWh	58.3	62.6
Norway €/MWh	28.8	50.4

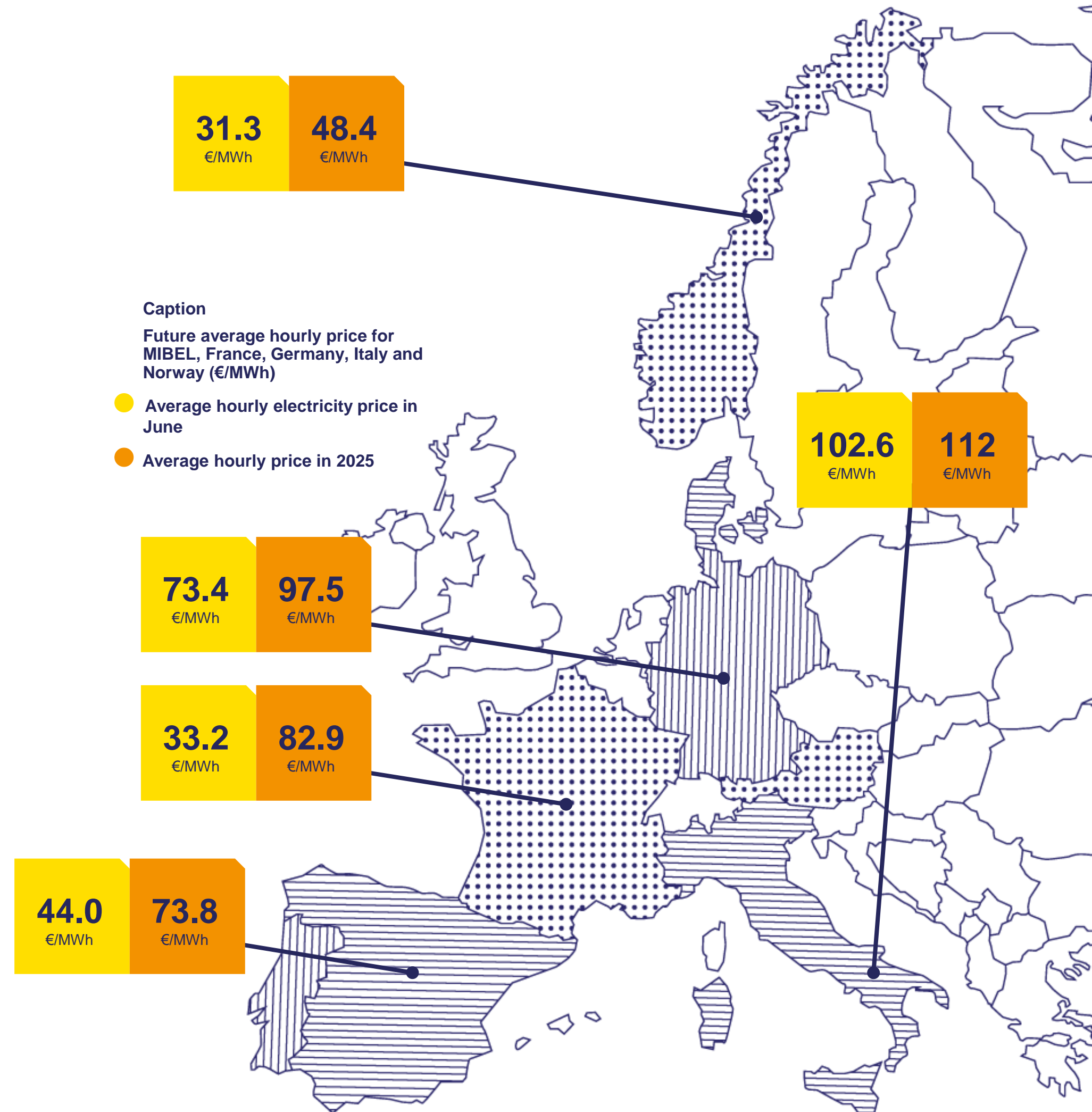
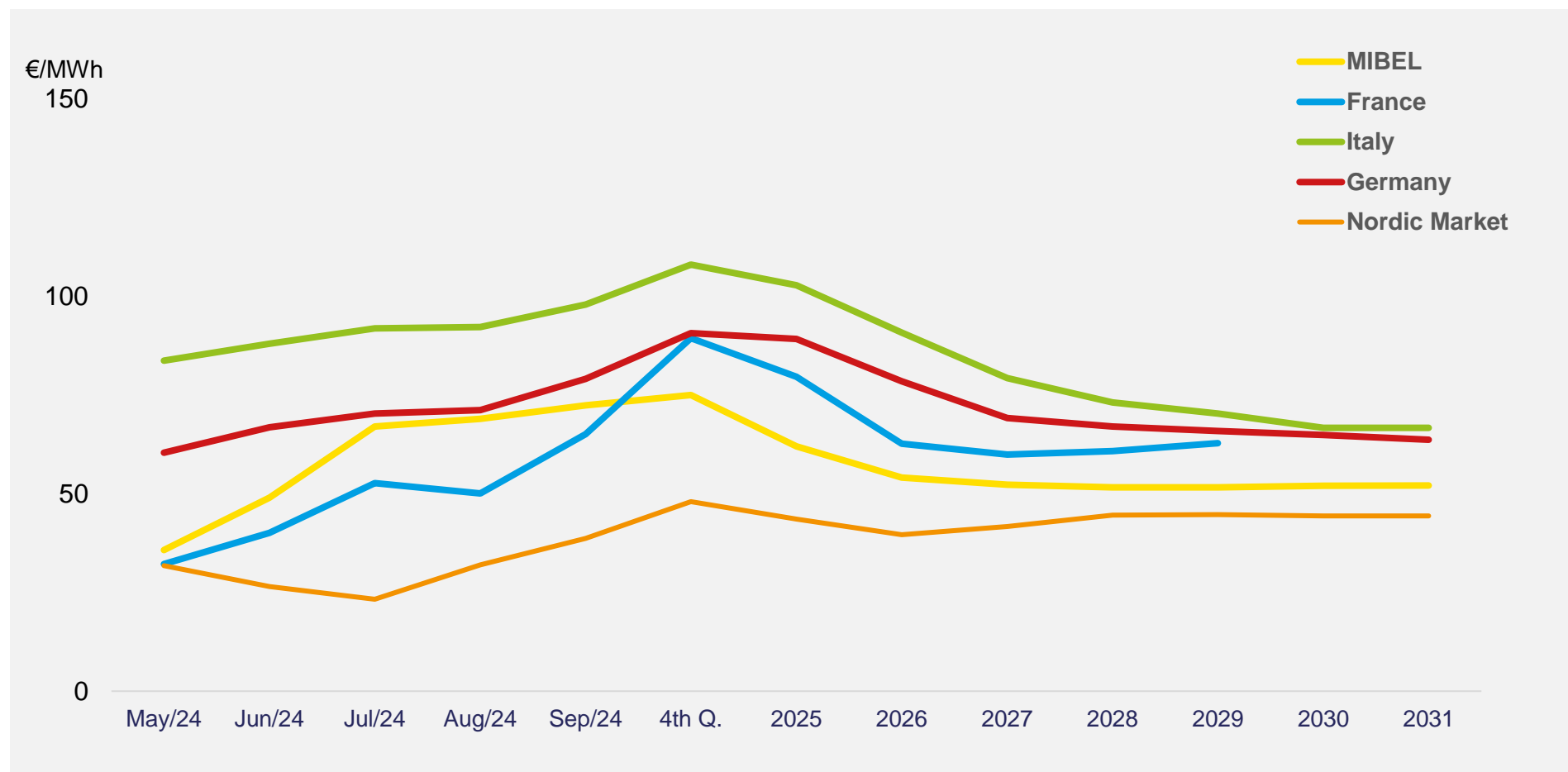
Caption
 ● Hourly arithmetic average price (may)
 ● Hourly arithmetic average price (jan-may)



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 (June) 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 June
- Average hourly price in 2025

^e Updated values at June 4th
 Source: OMIP, EEX, APREN Analysis

INTERNATIONAL EXCHANGES EUROPE

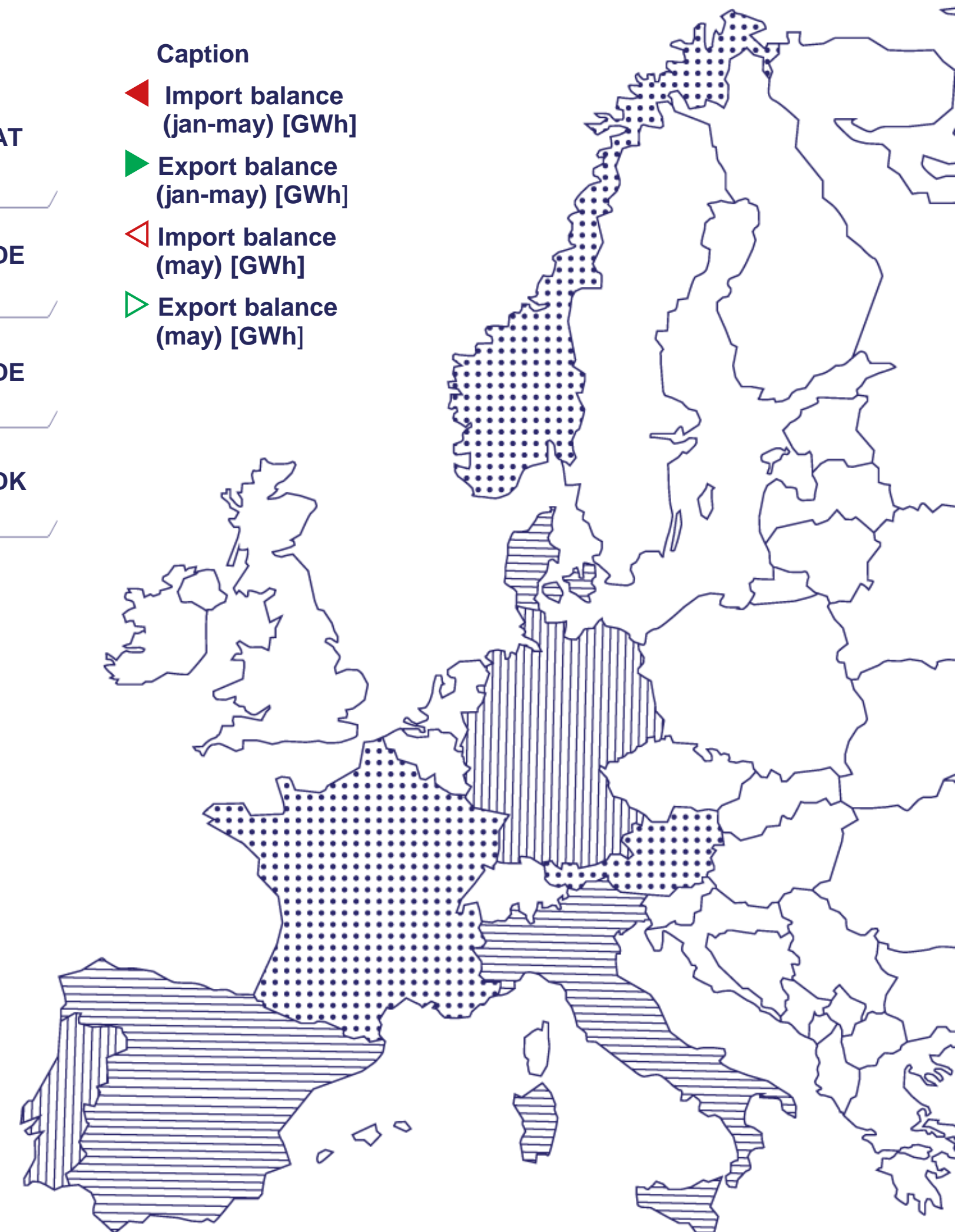
Between 1 January and 31 May 2024, mainland Portugal's electricity system registered electricity imports equivalent to 4,105 GWh and exports of 3,105 GWh, with Portugal being an importer with a balance of 1,000 GWh.

PT	1,000	1,134	ES	DE	795	25	AT
ES	943	304	MA	DK	795	323	DE
FR	2,575	884	ES	NO	1,879	593	DE
IT	7,730	1,884	FR	NO	1,264	619	DK
DE	6,774	1,435	FR				

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

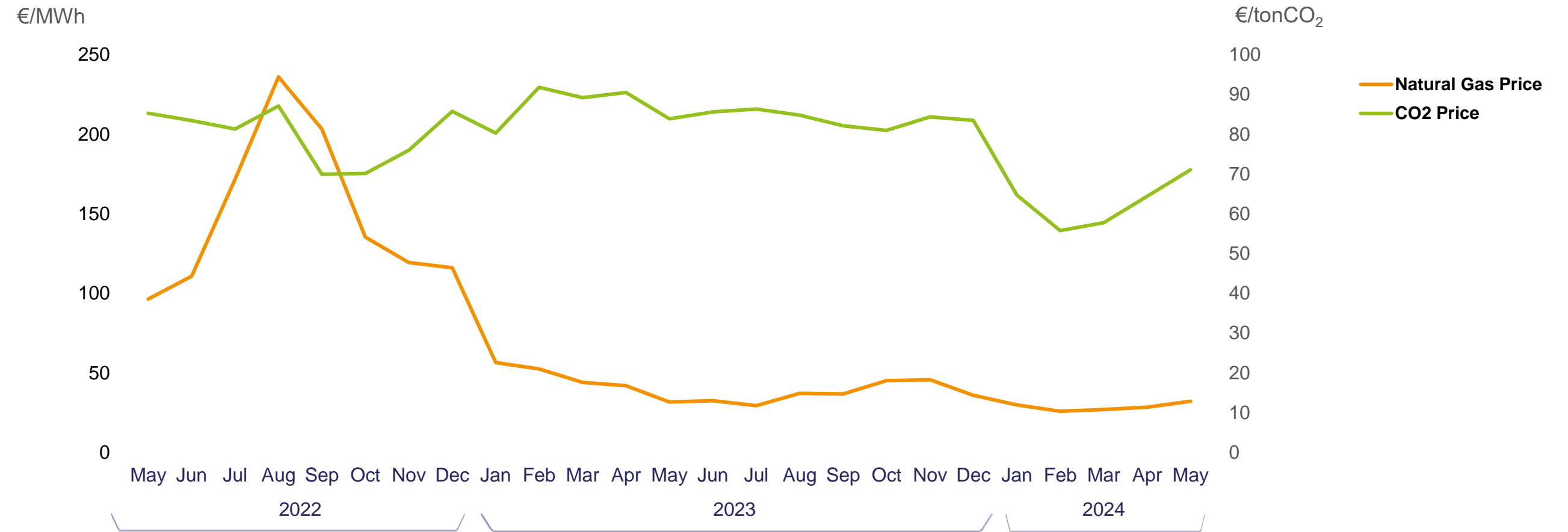
MAIN INDICATORS FOR PT-ES INTERCONNECTION

usage	3.8% (may) PT-ES	19.5% (jan-may)	45.2% (may) ES-PT	25.6% (jan-may)
congestion	0.0% (may) PT-ES	2.9% (jan-may)	9.4% (may) ES-PT	9.4% (jan-may)
market separation	8.2% (may) PT-ES	5.5% (jan-may)	49.7% (may) MIBEL-FR	69.2% (jan-may)



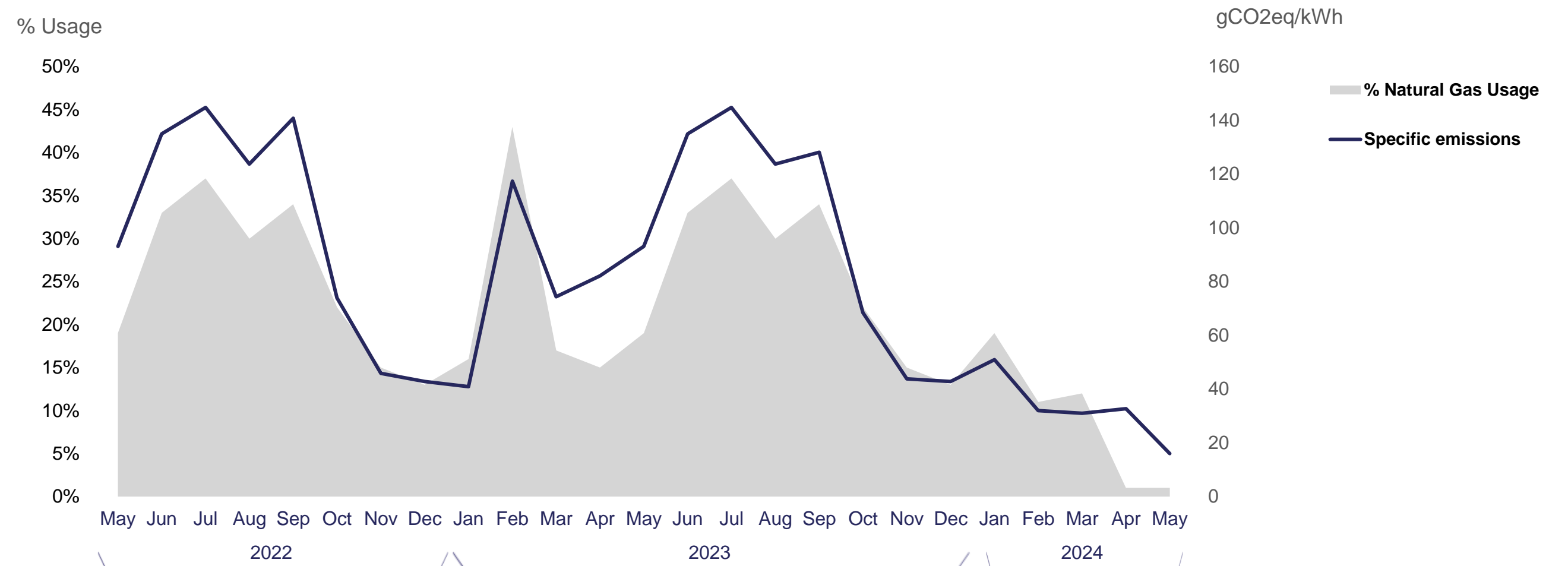
POWER PRODUCTION EMISSIONS

Between 1 January and 31 May 2024, specific emissions reached 30.1 gCO₂eq/kWh, giving total emissions from the electricity generation sector of 0.7 MtCO₂eq. The European CO₂ Emissions Trading Scheme (ETS) recorded a price of 60,8 €/tCO₂^d, a reduction of 31 per cent compared to the same period in 2023.



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

<p>0.7 MtCO₂eq</p> <p>SECTOR'S EMISSIONS</p>	<p>60.8 €/tCO₂</p> <p>AVERAGE PRICE OF LICENCES</p>
<p>50.9 %</p> <p>COMPARED TO MAY 2023</p>	<p>28 %</p> <p>COMPARED TO MAY 2023</p>



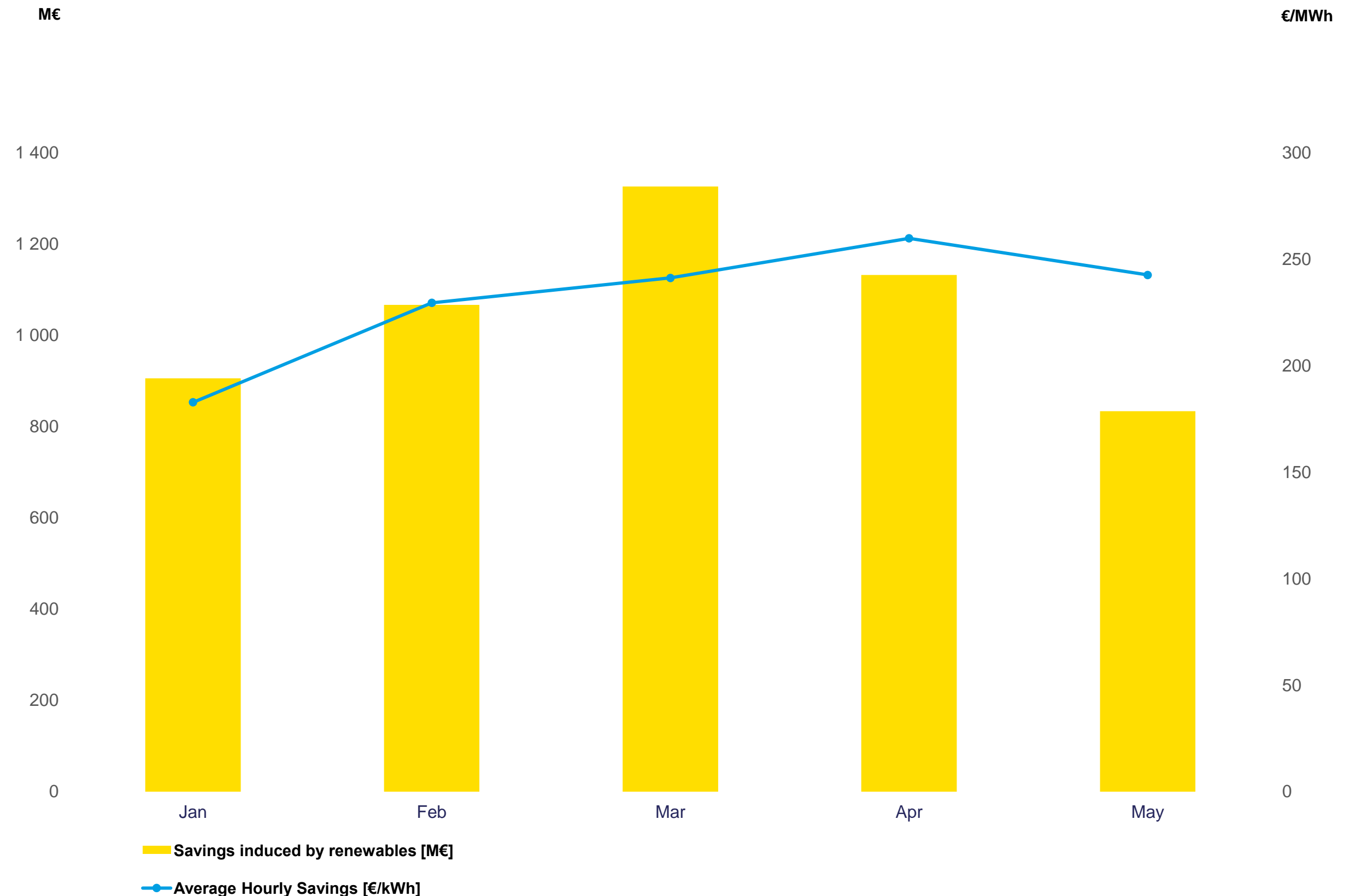
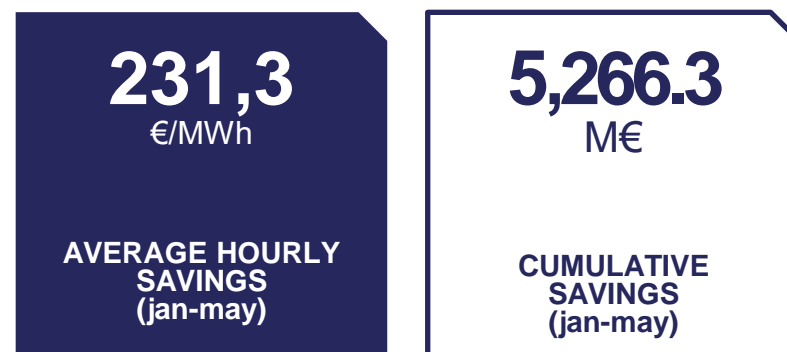
Specific emissions from the electricity sector in mainland Portugal, % use of coal and natural gas power stations (May-2022 to May-2024). Source: REN, DGEG, ERSE, APREN Analysis

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

SIMULATION OF PRICE FORMATION WITHOUT SRP

RENEWABLES AVOIDED:

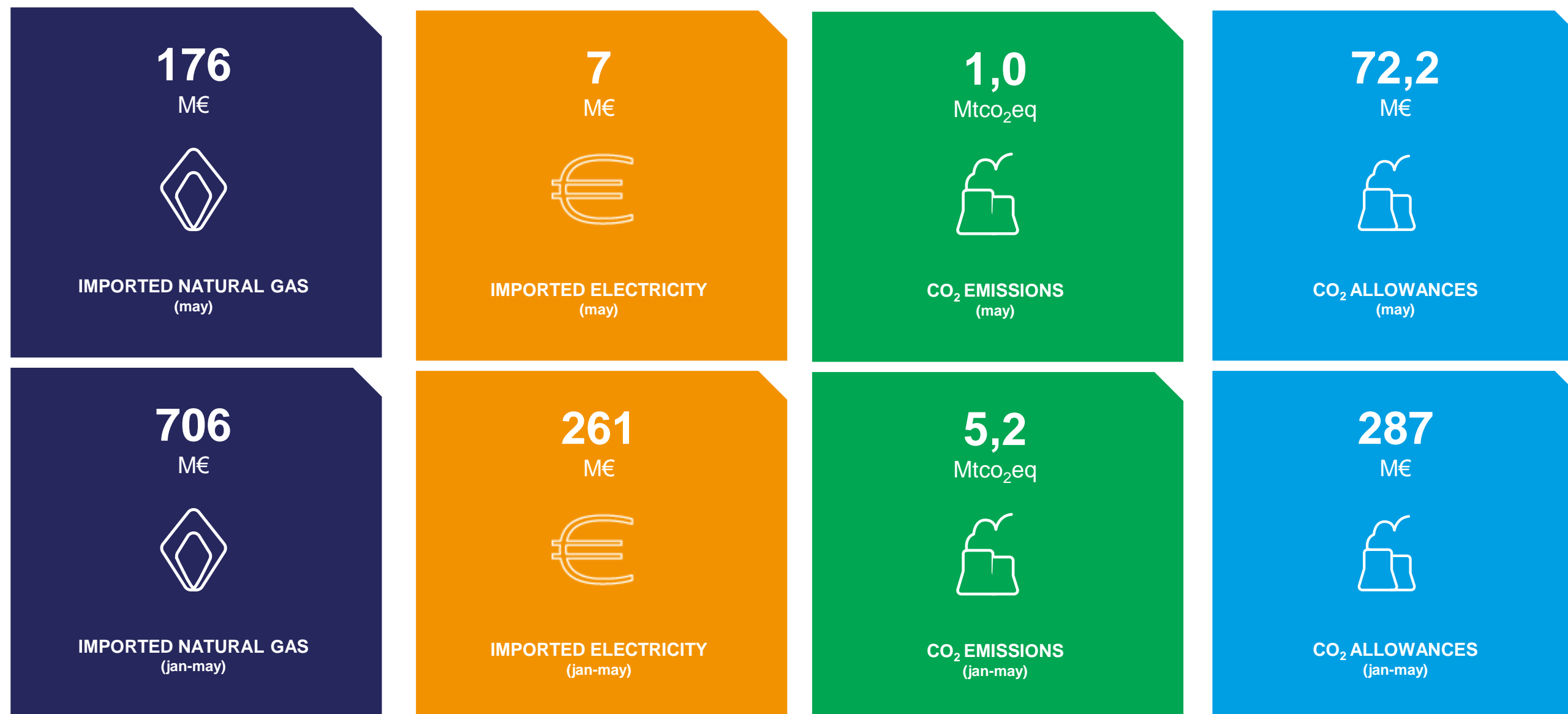
The indicators below show the savings achieved by the merit order between January 1 and May 31 2024 by the contribution of special regime production (PRE). This study is carried out for PRE, which includes all installed fossil cogeneration power. Bearing in mind that the capacity equivalent to this technology 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 May 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.

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APREN
DEPARTAMENTO TÉCNICO
E COMUNICAÇÃO

Av. da República 59 – 2º andar
1050-189 Lisboa
(+351) 213 151 621

apren@apren.pt
apren.pt

