

# 2024

**BOLETIM  
ELETRICIDADE  
RENOVÁVEL**  
APRIL  
2024

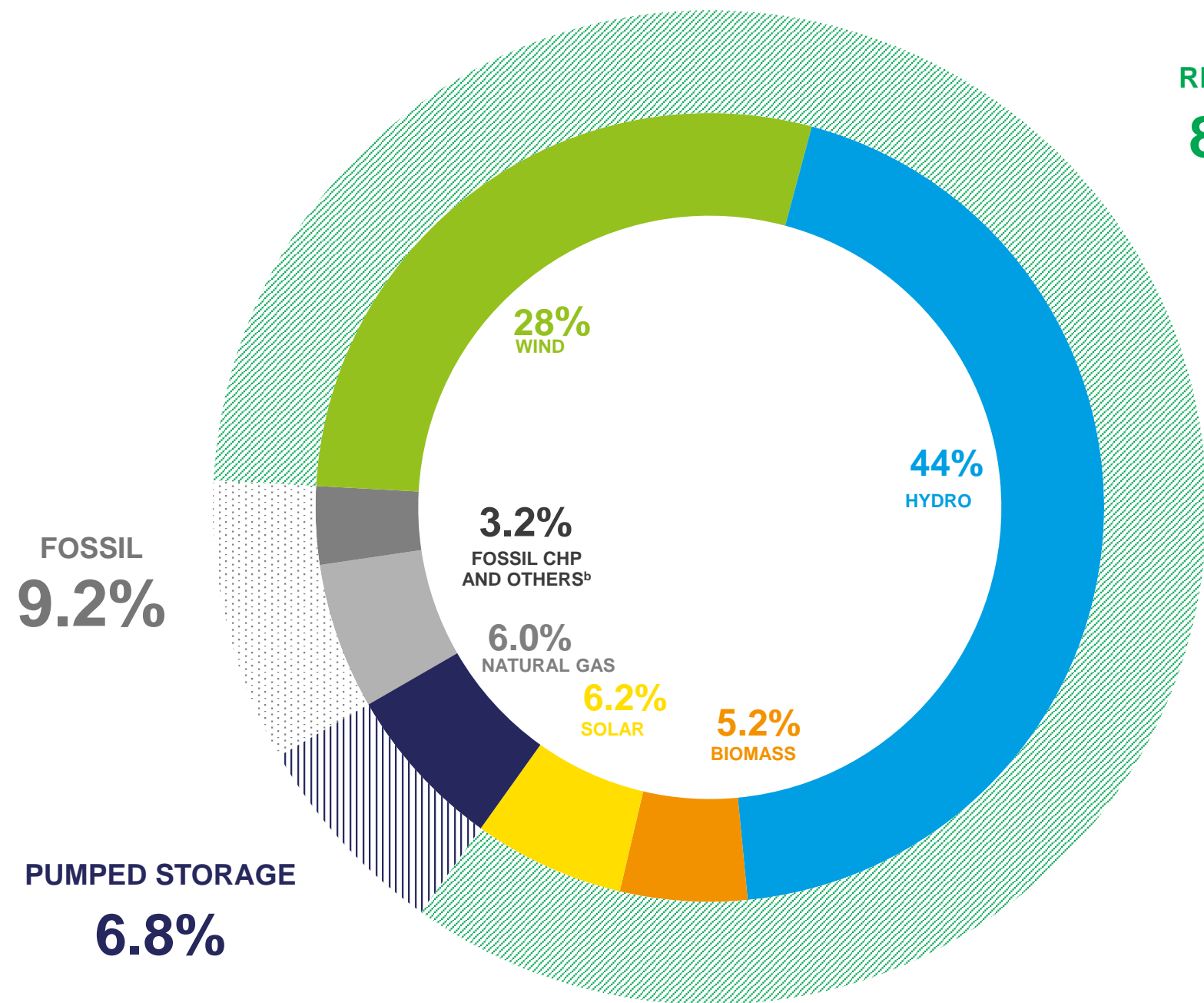
PORTUGAL PRECISA  
DA NOSSA ENERGIA.



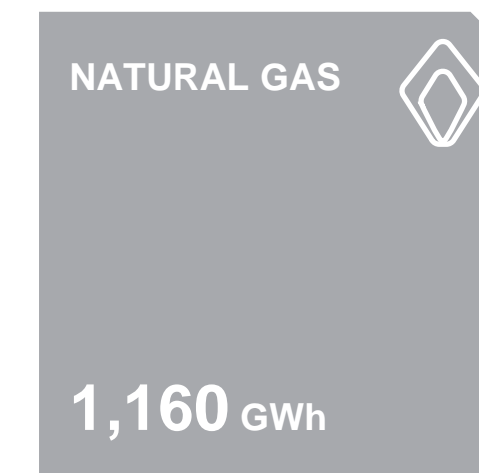
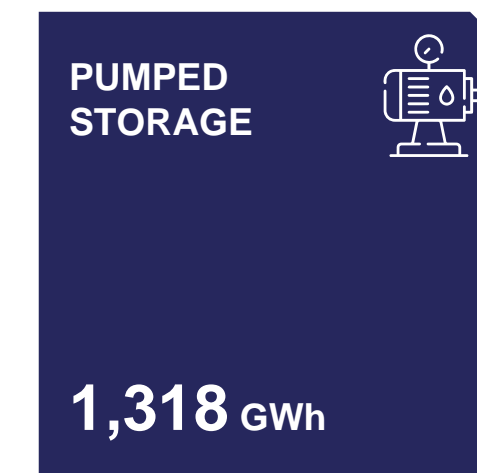
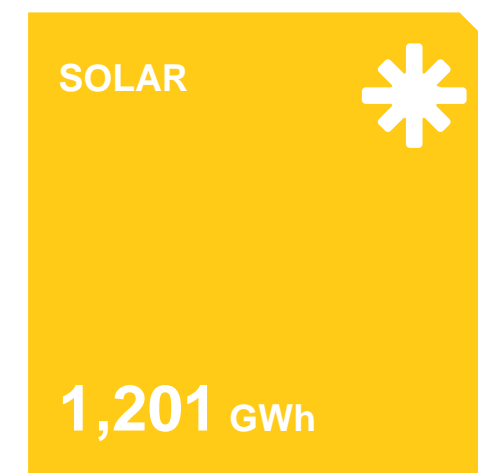
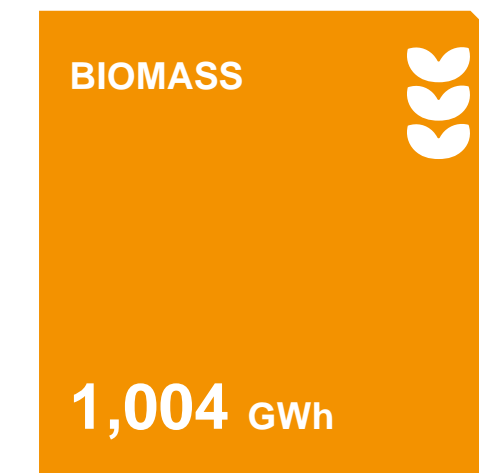
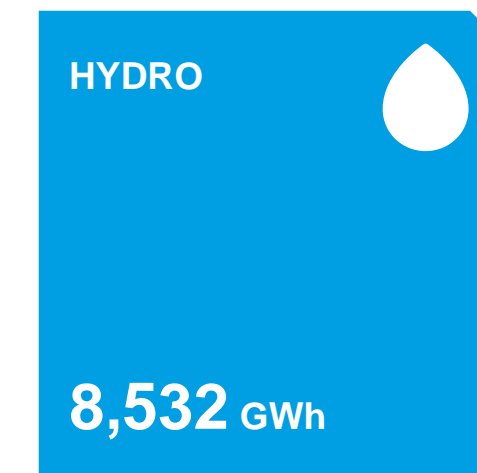
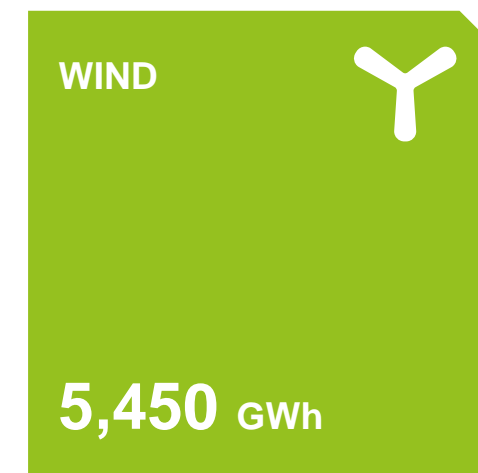
**APREN** Associação  
de Energias  
Renováveis

# EXECUTIVE SUMMARY

## GENERATION (JAN-APR)



RENEWABLE  
**84,0%**



**MAIN INDICATORS (JAN-APR)**

GWh  
**19,276**  
Generation<sup>a</sup>

€/ MWh  
**36.8**  
MIBEL PT Price

€/ tCO<sub>2</sub>  
**60.8**  
CO<sub>2</sub> Price

MtCO<sub>2</sub> - eq  
**0.6**  
CO<sub>2</sub> Emissions

GWh  
**-134**  
Import Balance

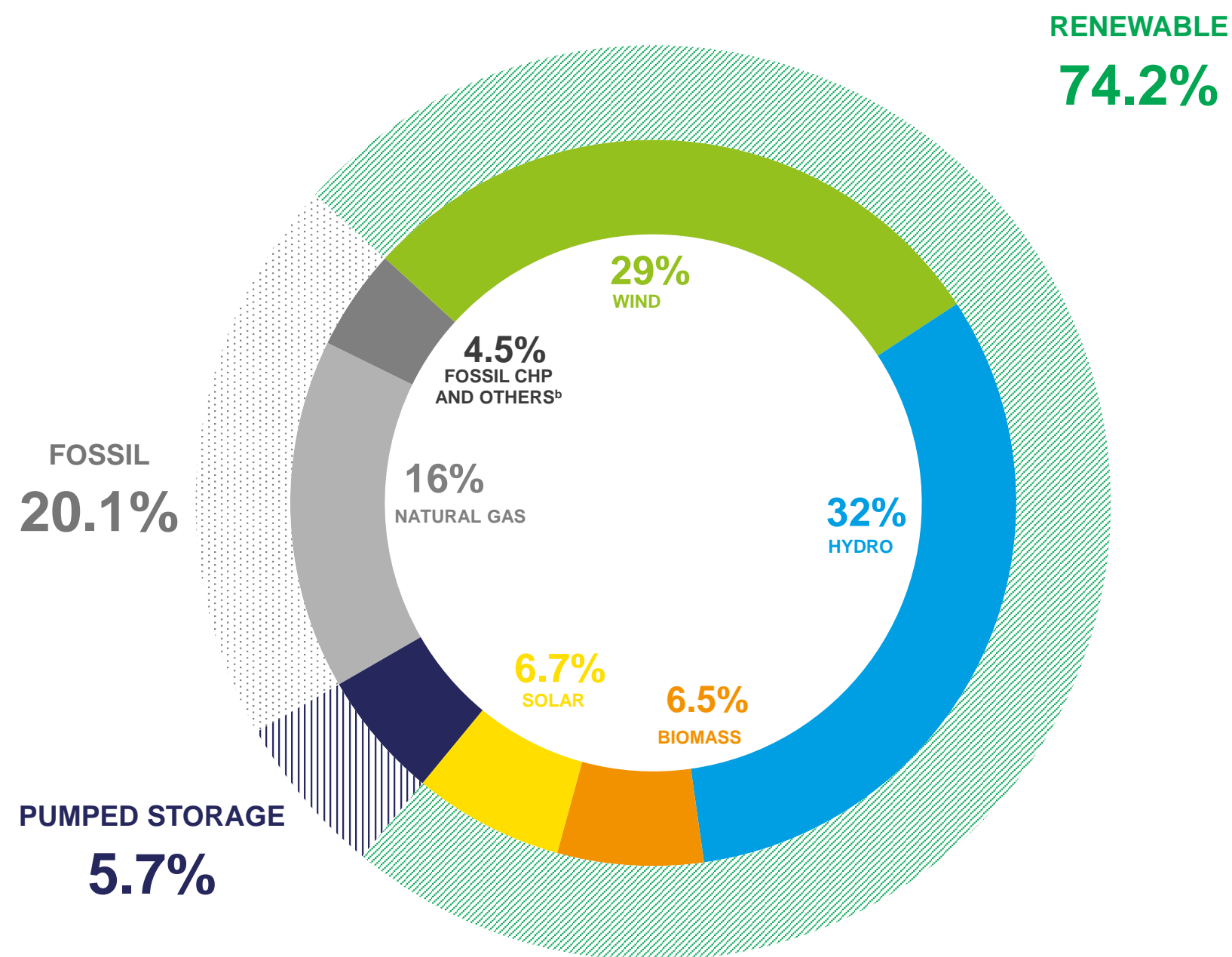
gCO<sub>2</sub> eq/kWh  
**32.7**  
CO<sub>2</sub> Specific Emissions

<sup>a</sup> 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

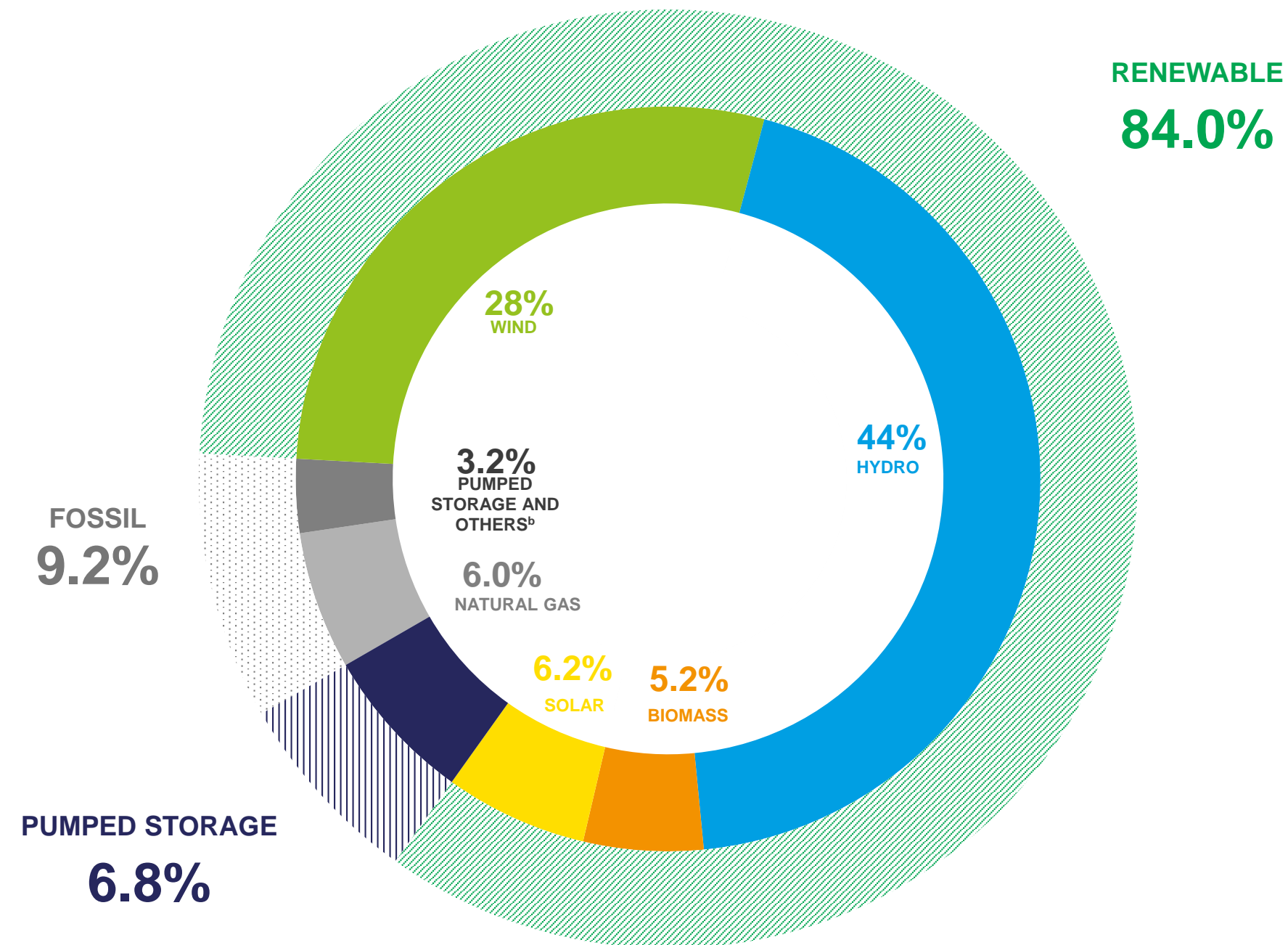
<sup>b</sup> Includes fuel oil, diesel, the non-biodegradable fraction of MSW and new waste

# EXECUTIVE SUMMARY

## APRIL ACUMULATED GENERATION 2023



## APRIL ACUMULATED GENERATION 2024



### MAIN INDICATORS COMPARED TO APRIL 2023



<sup>a</sup> 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

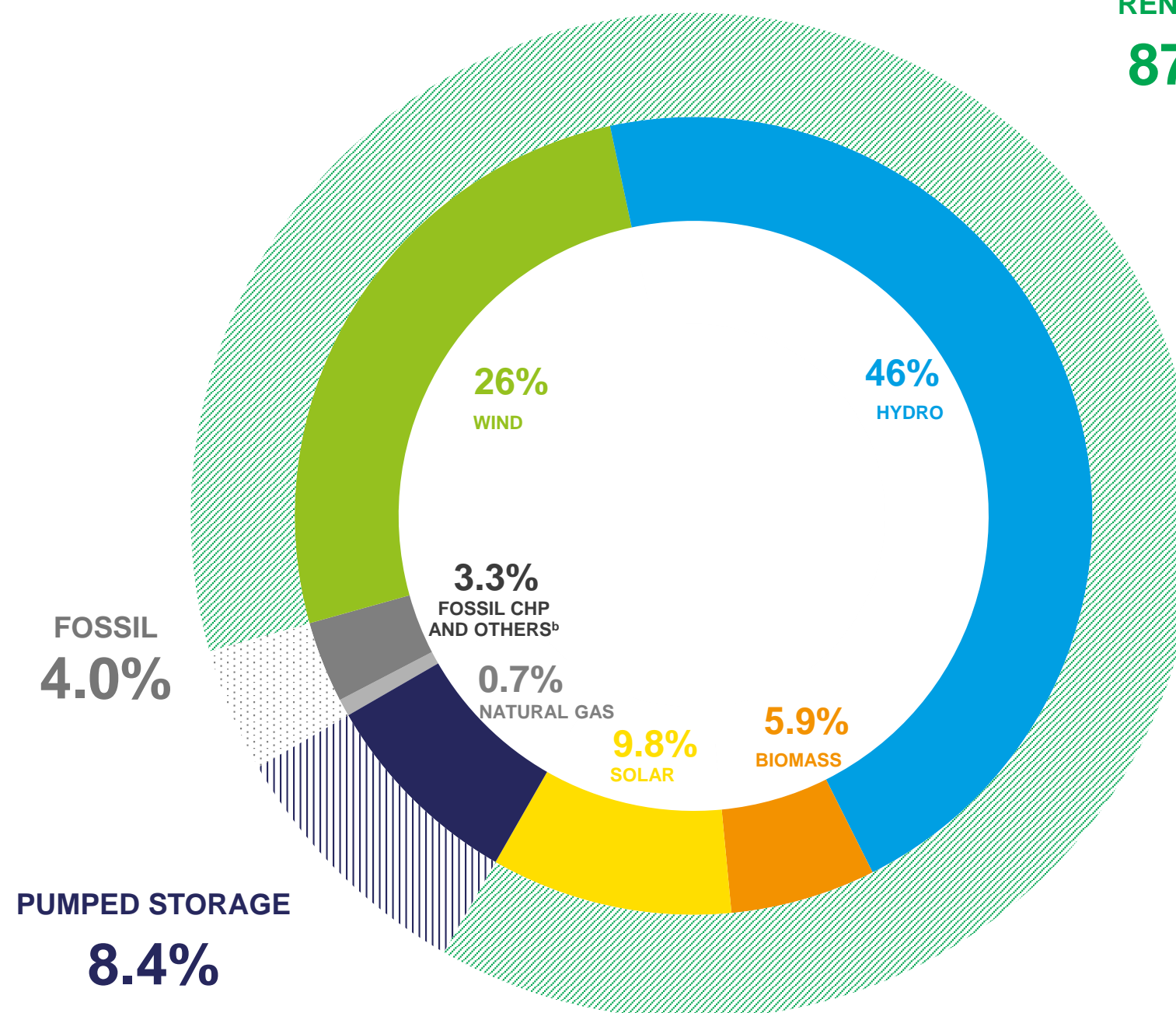
<sup>b</sup> Includes fuel oil, diesel, the non-biodegradable fraction of MSW and new waste

<sup>c</sup> 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 April 1 and 30 2024, renewable incorporation was 87.6%, with a total of 3,772 GWh produced. The 10.5% increase compared to April 2023 is mainly due to the 29 percentage points increase in hydro production, which corresponded to 1,965 GWh, compared to 407 GWh of hydro production in April 2023.

RENEWABLE  
**87.6%**



## ELECTRICITY SECTOR'S INDICATORS (IN COMPARISON WITH APRIL 2023)

GWh  
**4,304**  
Generation<sup>a</sup>

▲ **58.7%**

GWh  
**3,907**  
Consumption<sup>c</sup>

▲ **3.7%**

%  
**87.6**  
Renewable incorporation

▲ **10.5%**

WIND INDEX

1.08

HYDRO INDEX

1.49

SOLAR INDEX

1.01

STORAGE IN DAMS

88.1%

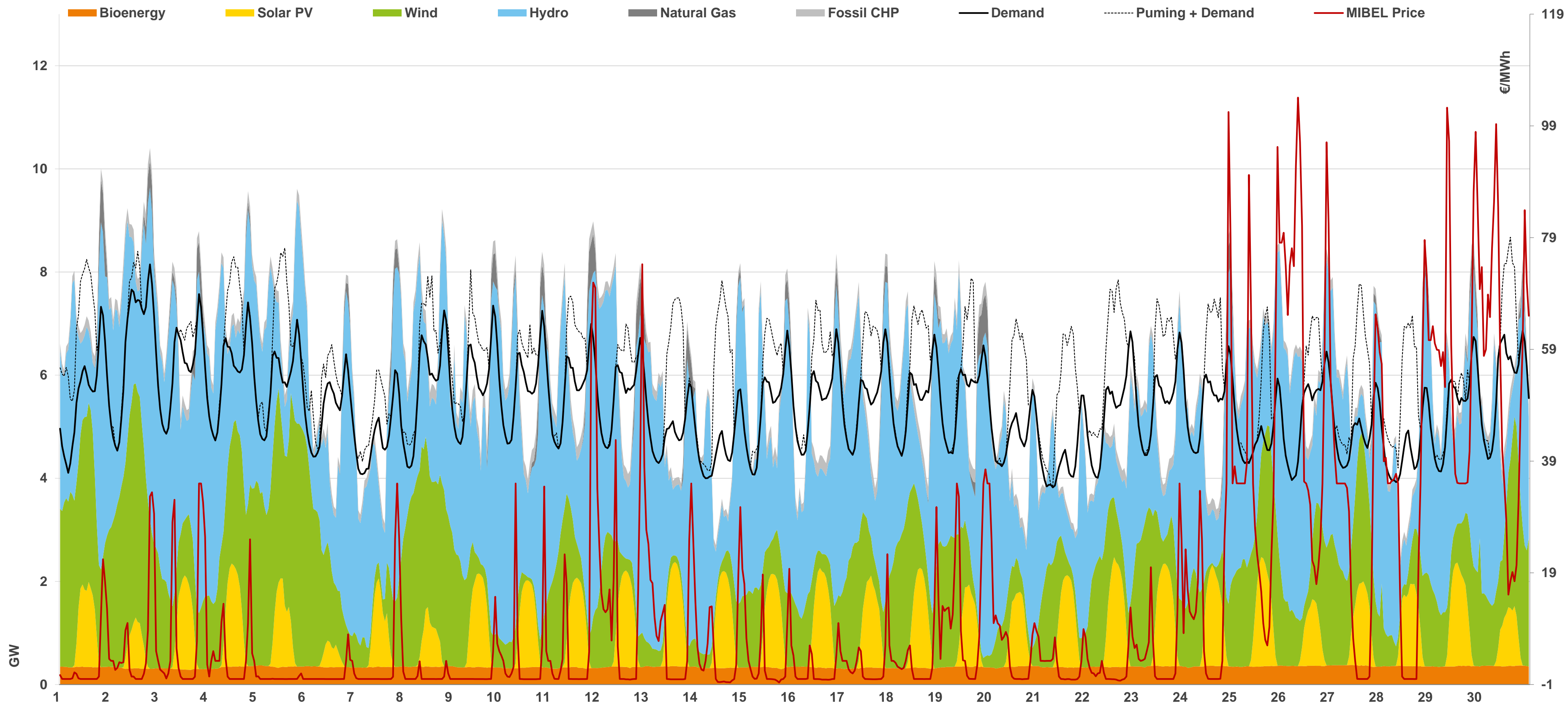
<sup>a</sup> Generation refers to the net energy generation of the power stations, taking into account the pumping production recently disclosed by REN. Production from pumping is not included in the percentage of production from renewable sources.

<sup>b</sup> Includes fuel oil, diesel, the non-biodegradable fraction of MSW and new waste

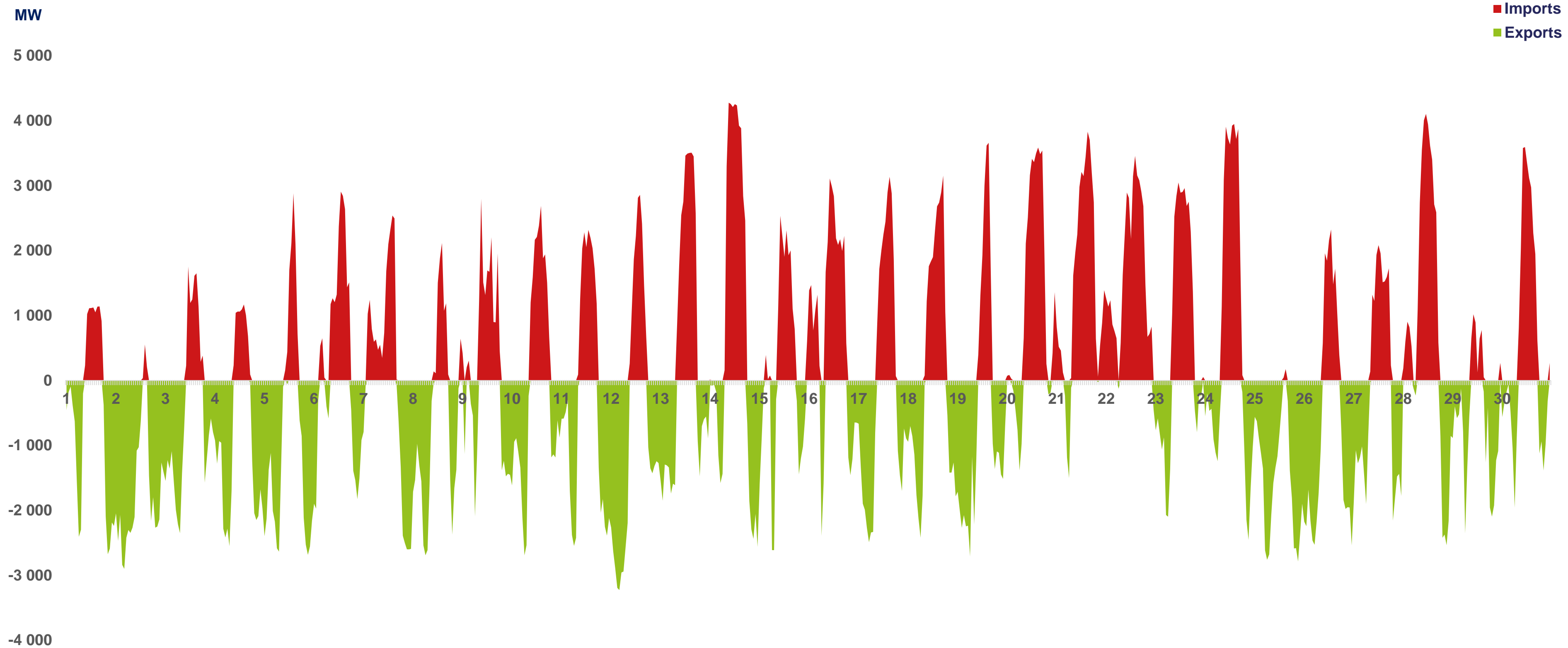
<sup>c</sup> Consumption refers to the net generation of energy by power stations, taking into account the import-export balance.

Source: REN, APREN Analysis

# MONTHLY ANALYSIS IN PORTUGAL: MARCH 2024 LOAD DIAGRAM



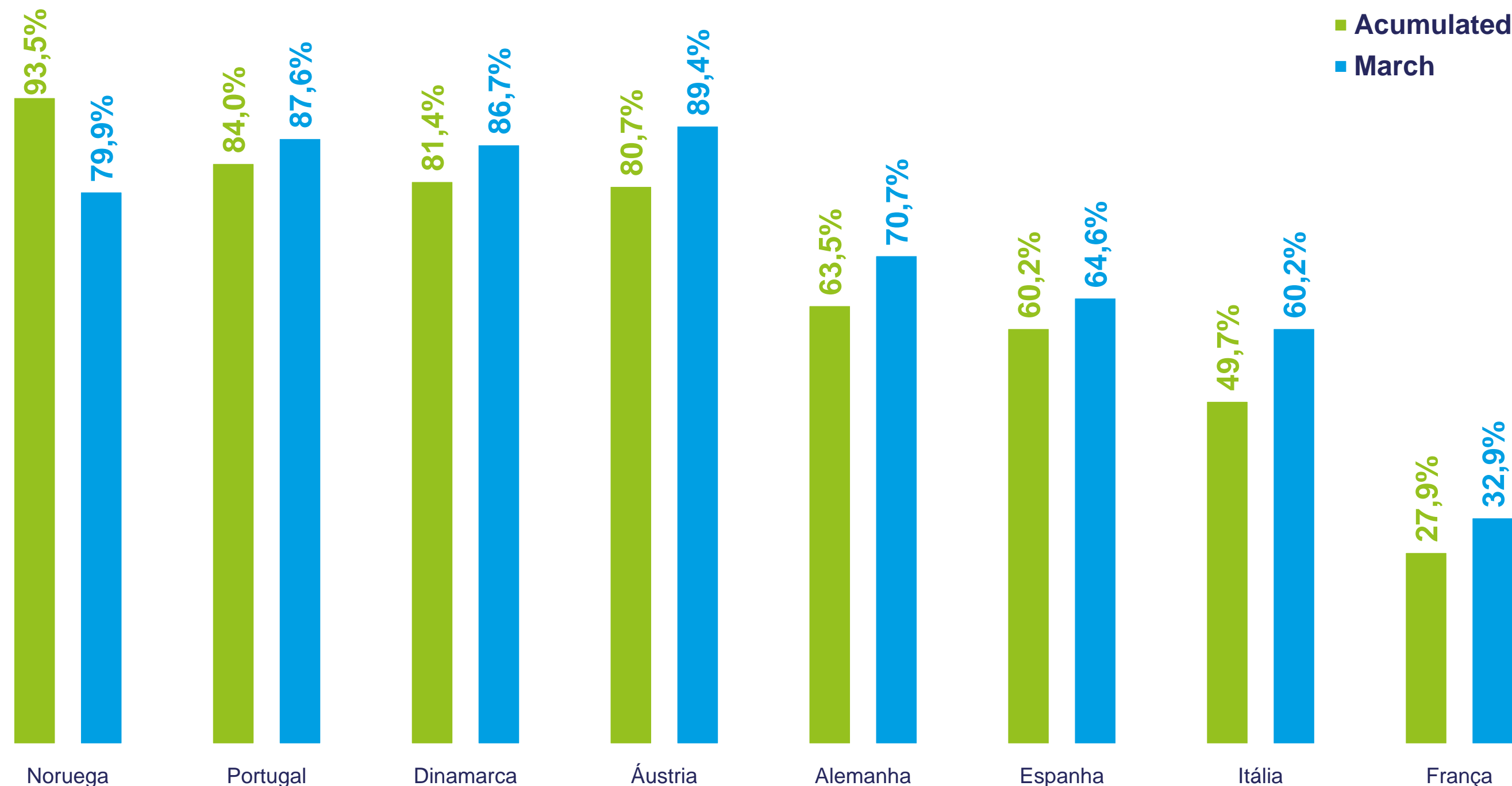
# MONTHLY ANALYSIS IN PORTUGAL: DIAGRAM OF IMPORTS AND EXPORTS IN PORTUGAL



# 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 April 30 2024, Portugal was the second country with the highest share of renewable energy in electricity generation, behind Norway, which achieved 93.5%, respectively. From April 1 to 30, Portugal came second in the countries considered with the highest renewable incorporation in Europe.



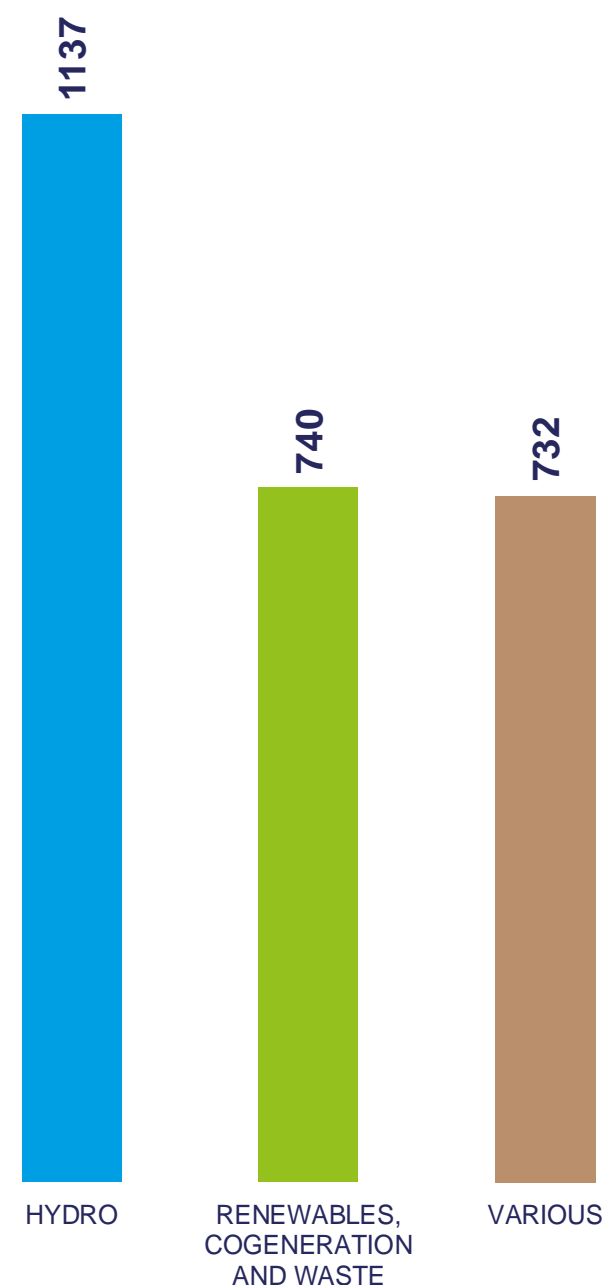
Renewable incorporation in cumulative (Jan-Apr) and monthly (Apr) electricity generation.  
 Source: REN, Fraunhofer, REE, Terna, National Grid, ENTSO-E, Análise APREN

# MARKET PRICE SETTING PORTUGAL

Between January 1 and April 30, the market closure technology that recorded the most hours was hydro, with 1,337 non-consecutive hours, followed by renewables, cogeneration and waste with 740 hours, and various technologies with 732 hours.



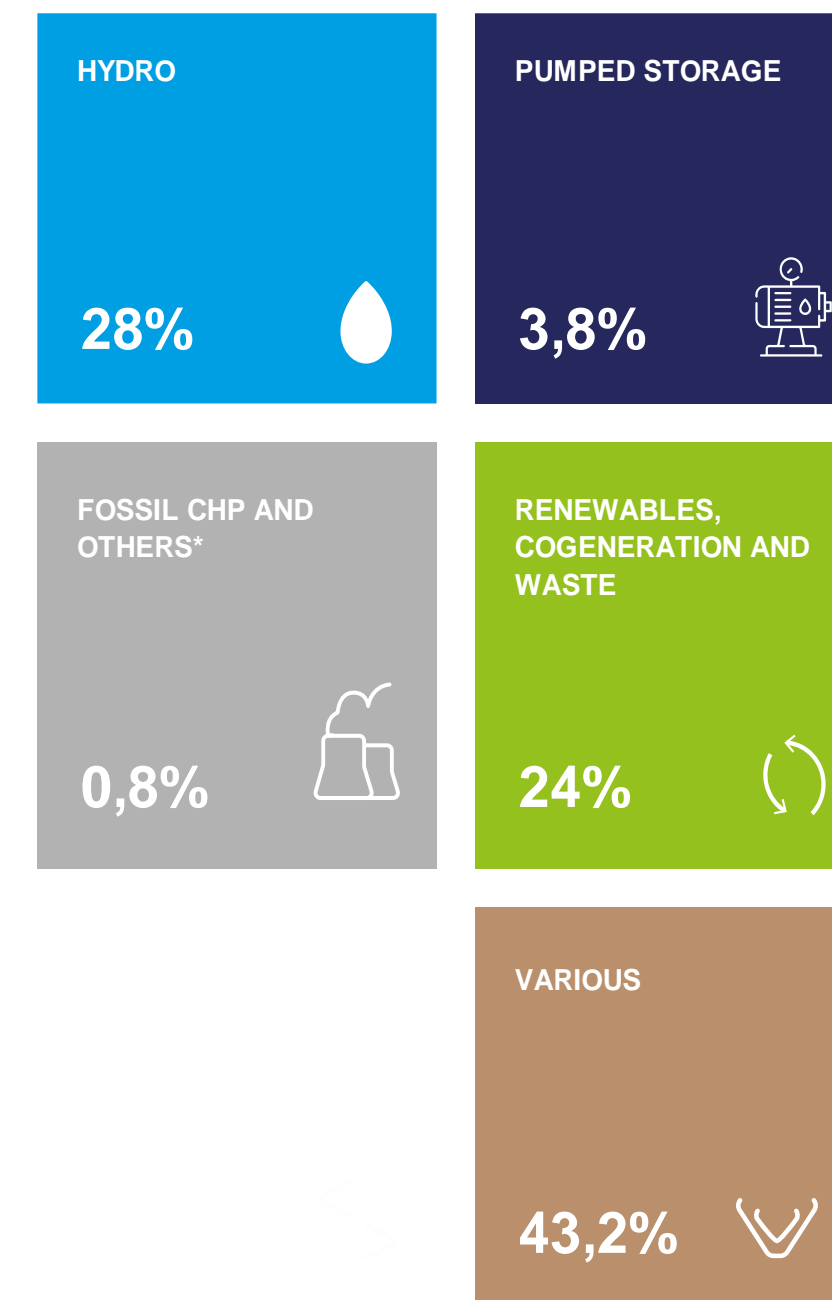
## ACUMULATED APRIL 2024



Number of market closing hours (accumulated) for the three main closing technologies (Apr).

Source: OMIE, APREN Analysis

## APRIL 2024



Percentage distribution of the number of hours of market closure for the various technologies, totalling 720 hours (Apr).

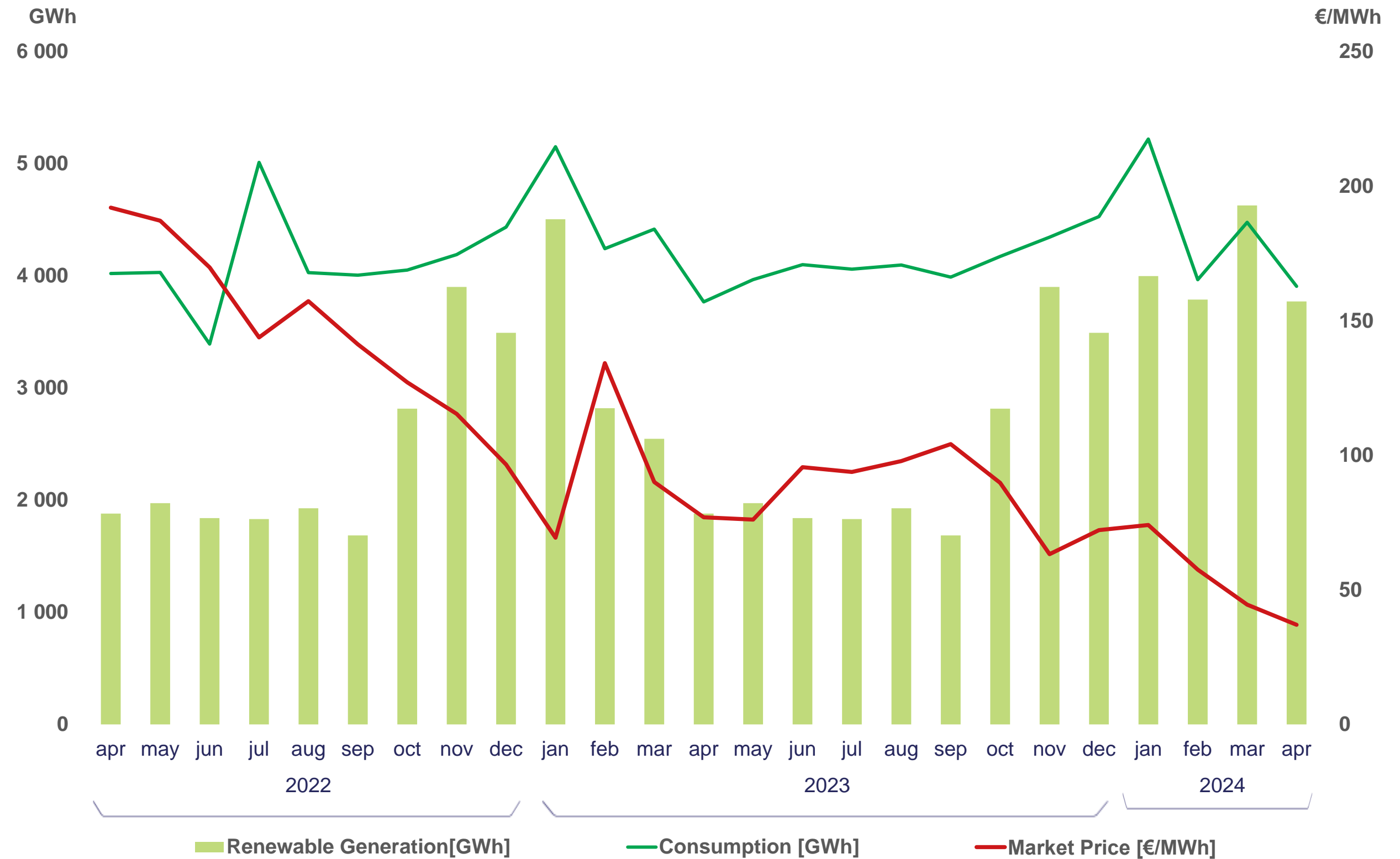
Source: OMIE, APREN Analysis



# ELECTRICITY MARKET PORTUGAL

Between January 1 and April 30, the average hourly price recorded in MIBEL in Portugal (36.8 €/MWh<sup>d</sup>) represents a 59.9% reduction compared to the same period last year. In the same period, there were 1,506 non-consecutive hours in which renewable generation was sufficient to supply mainland Portugal's electricity consumption, with an average hourly price in MIBEL of 35.0 €/MWh.

<p style="font-size: 24px; font-weight: bold;">1,506</p> <p>Hours</p> <p style="font-size: 12px; font-weight: bold;">100% RENEWABLE HOURS</p> <p>[Accumulated]</p>	<p style="font-size: 24px; font-weight: bold;">35.0</p> <p>€/MWh</p> <p style="font-size: 10px; font-weight: bold;">MIBEL'S AVERAGE PRICE (IN 100% RENEWABLE HOURS)</p> <p>[Accumulated]</p>
<p style="font-size: 24px; font-weight: bold;">433</p> <p>Hours</p> <p style="font-size: 12px; font-weight: bold;">100% RENEWABLE HOURS</p> <p>[April]</p>	<p style="font-size: 24px; font-weight: bold;">18.8</p> <p>€/MWh</p> <p style="font-size: 10px; font-weight: bold;">MIBEL'S AVERAGE PRICE (IN 100% RENEWABLE HOURS)</p> <p>[April]</p>



<sup>d</sup> arithmetic average of MIBEL prices.  
Source: OMIE

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

# RENEWABLE ELECTRICITY EUROPE

During the month of April 2024, there was a minimum hourly price in MIBEL in Portugal of -0.63 €/MWh, where the market was closed by renewables, cogeneration and waste. The maximum hourly price was 104.06 €/MWh, where the market was closed by hydro.

**MINIMUM PRICES (APR)**

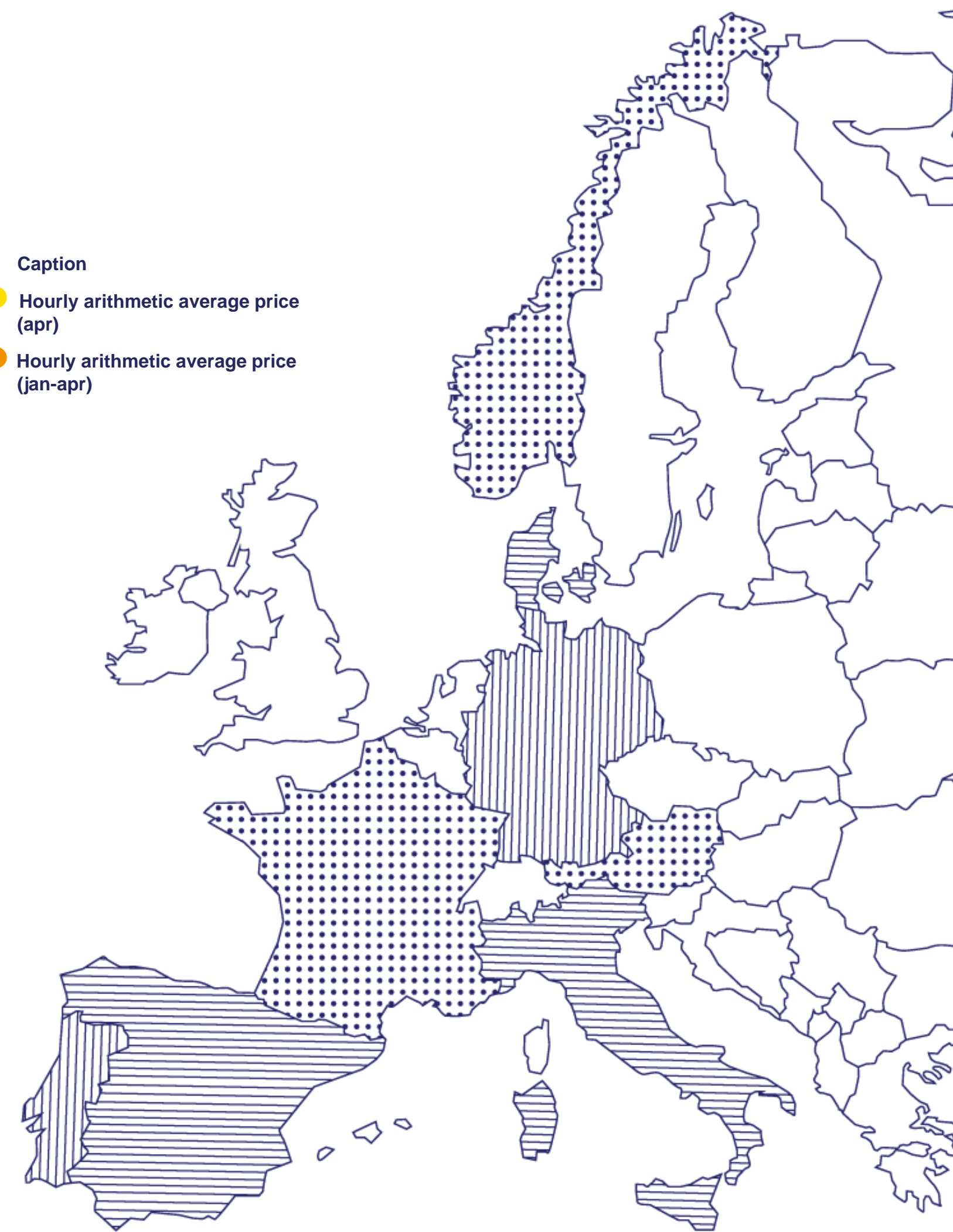
1 <sup>o</sup> Austria	€/MWh <b>-117.74</b>
2 <sup>o</sup> France Germany	€/MWh <b>-65.06</b>
3 <sup>o</sup> Denmark	€/MWh <b>-57.01</b>

**MAXIMUM PRICES (APR)**

1 <sup>o</sup> Denmark Germany	€/MWh <b>204.6</b>
2 <sup>o</sup> Austria	€/MWh <b>195.9</b>
3 <sup>o</sup> France	€/MWh <b>140.0</b>

Portugal €/MWh	13.3	36.8
Spain €/MWh	13.7	37.2
France €/MWh	28.2	54.3
Italy €/MWh	87.3	91.0
Germany €/MWh	62.4	66.4
Austria €/MWh	58.7	67.5
Denmark €/MWh	59.8	63.7
Norway €/MWh	49.8	56.0

**Caption**  
 ● Hourly arithmetic average price (apr)  
 ● Hourly arithmetic average price (jan-apr)

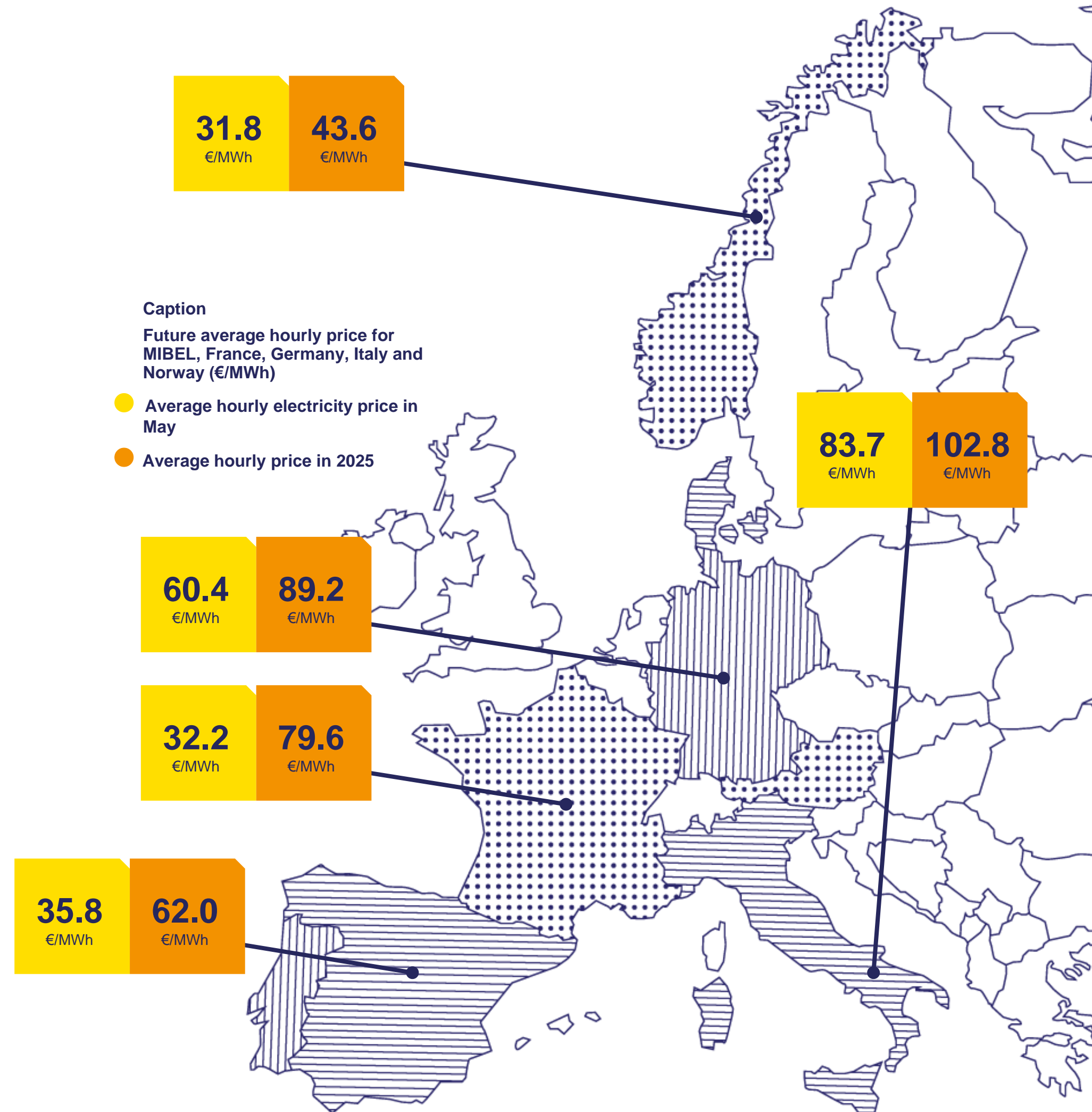
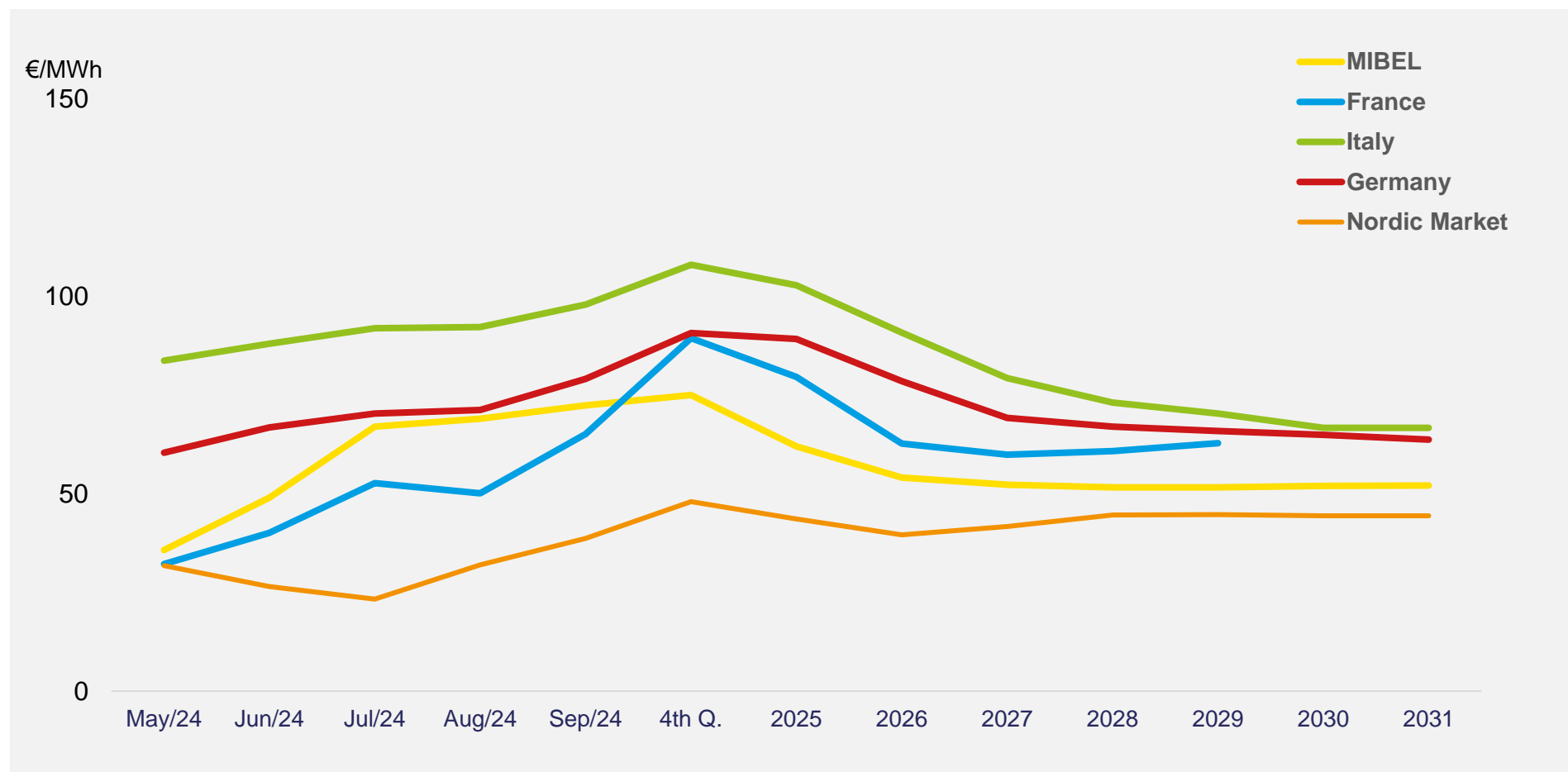


Fonte: ENTSO-E, OMIE, APREN Analysis

# ELECTRICITY MARKET FUTURES

The evolution of the average hourly future price shown is calculated on the basis of electricity<sup>e</sup> purchase and sale contracts. The map on the right shows the price values for next month (May) 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 May
- Average hourly price in 2025

<sup>e</sup> Updated values at May 7th  
 Source: OMIP, EEX, APREN Analysis

# INTERNATIONAL EXCHANGES EUROPE

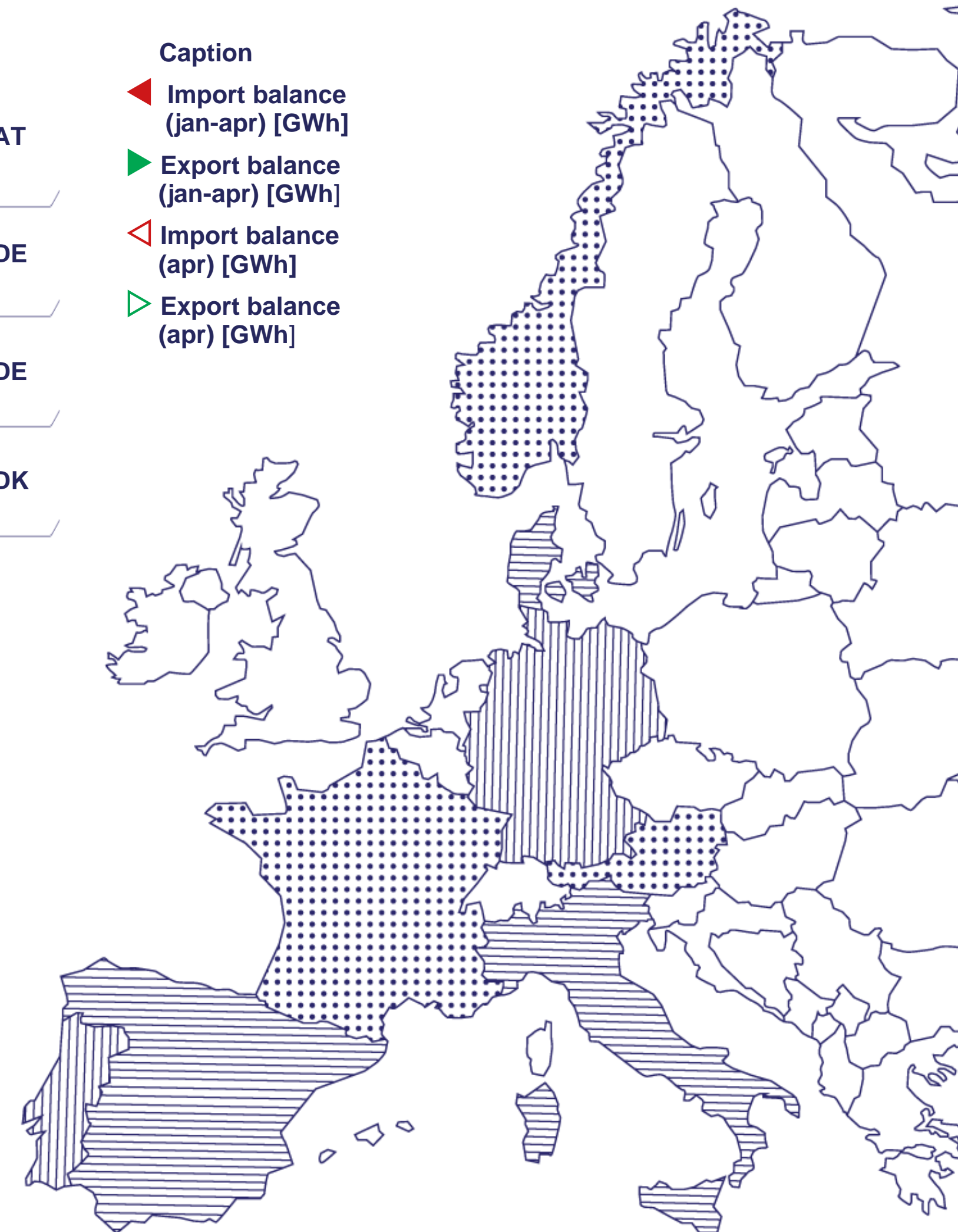
Between 1 January and 30 April 2024, mainland Portugal's electricity system registered electricity imports equivalent to 2,704 GWh and exports of 2,838 GWh, with Portugal being an exporter with a balance of 134 GWh.

PT	134	26	ES	DE	1,304	200	AT
ES	639	268	MA	DK	665	633	DE
FR	3,022	884	ES	NO	1282	430	DE
IT	5,843	1,137	FR	NO	945	430	DK
DE	5,336	1,084	FR				

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

## MAIN INDICATORS FOR PT-ES INTERCONNECTION

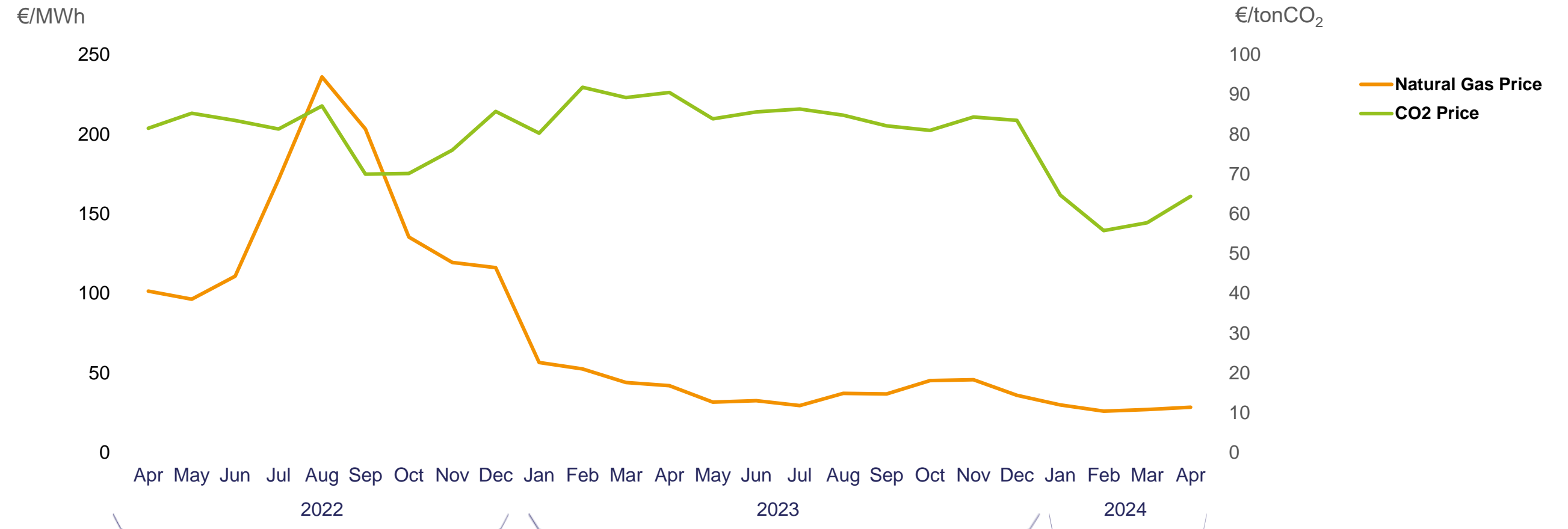
<b>usage</b>	40.6% (apr) PT-ES	45.8% (jan-apr)	40.3% (apr) ES-PT	49.6% (jan-apr)
<b>congestion</b>	7.4% (apr) PT-ES	8.6% (jan-apr)	5.7% (apr) ES-PT	17.5% (jan-apr)
<b>market separation</b>	5.5% (apr) PT-ES	9.3% (jan-apr)	69.9% (apr) MIBEL-FR	62.0% (jan-apr)



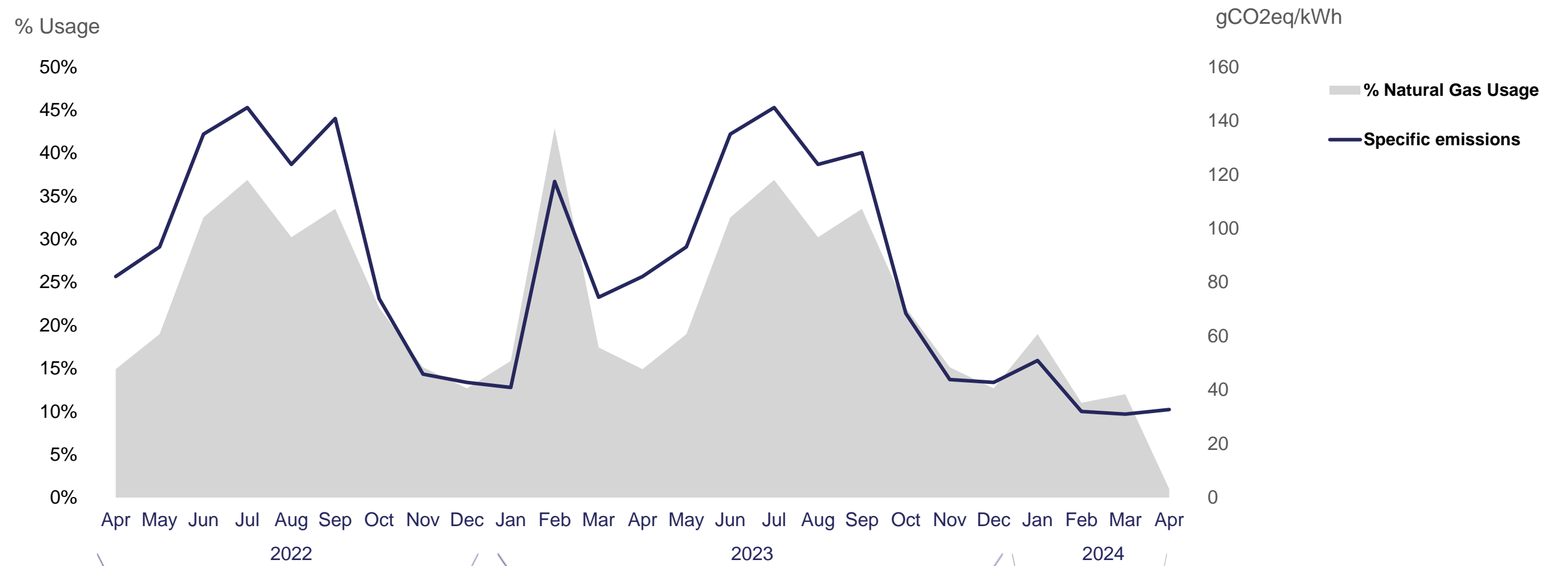
# POWER PRODUCTION EMISSIONS

Between 1 January and 30 April 2024, specific emissions reached 32.7 gCO<sub>2</sub>eq/kWh, giving total emissions from the electricity generation sector of 0.6 MtCO<sub>2</sub>eq. The European CO<sub>2</sub> Emissions Trading Scheme (ETS) recorded a price of 60,8 €/tCO<sub>2</sub><sup>d</sup>, a reduction of 31 per cent compared to the same period in 2023.

<p><b>0.6</b> MTONCO<sub>2</sub>eq  SECTOR'S EMISSIONS</p>	<p><b>60.8</b> €/tCO<sub>2</sub>  AVERAGE PRICE OF LICENCES</p>
<p><b>45.0</b> % ▼ COMPARED TO APR 2023</p>	<p><b>31</b> % ▼ FACE A APR 2023</p>



Price of CO<sub>2</sub> allowances in the EU ETS and price of natural gas in Europe (Apr-2022 to Apr-2024).  
Source: SendeCO<sub>2</sub>, WorldBank.



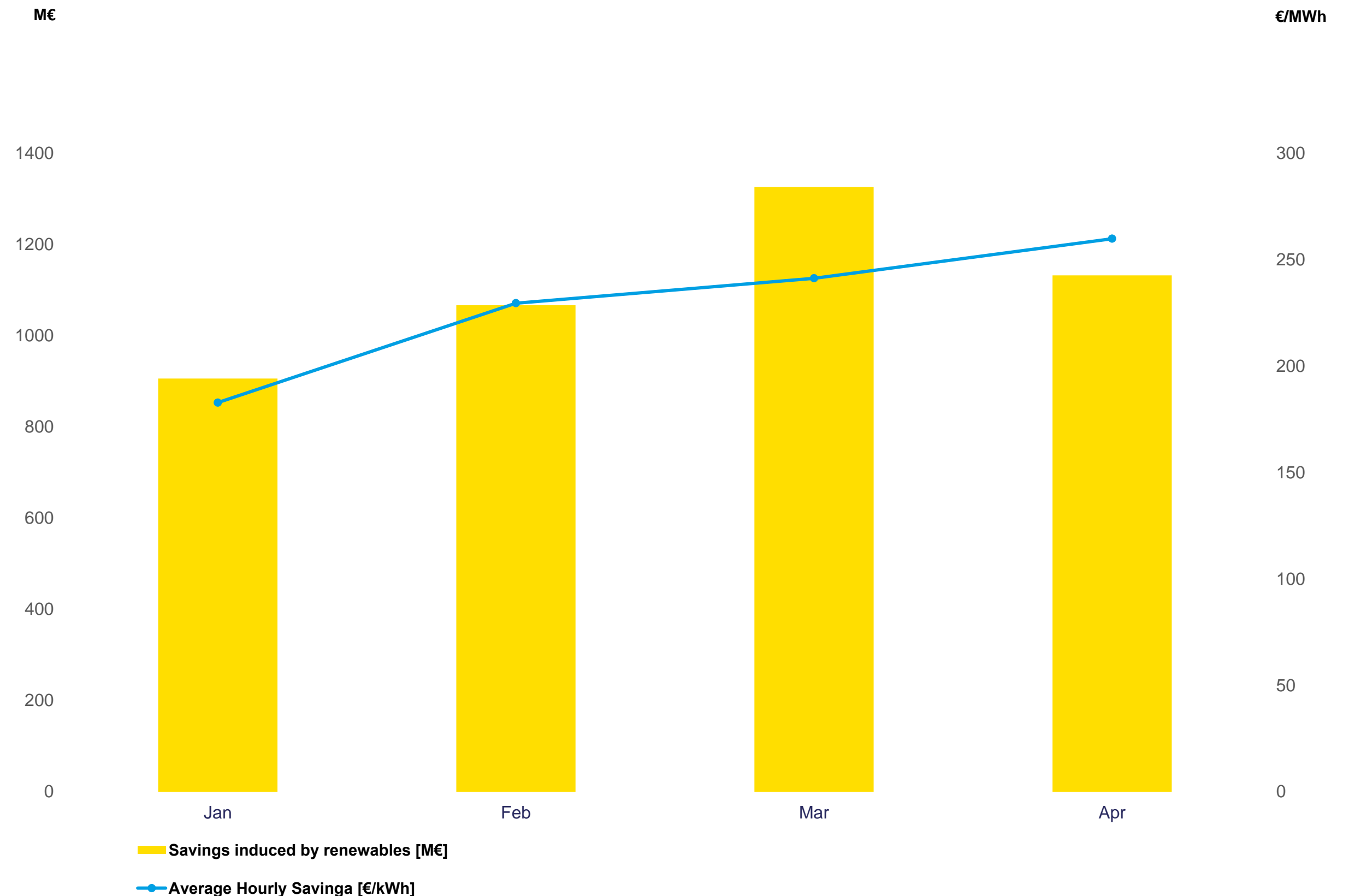
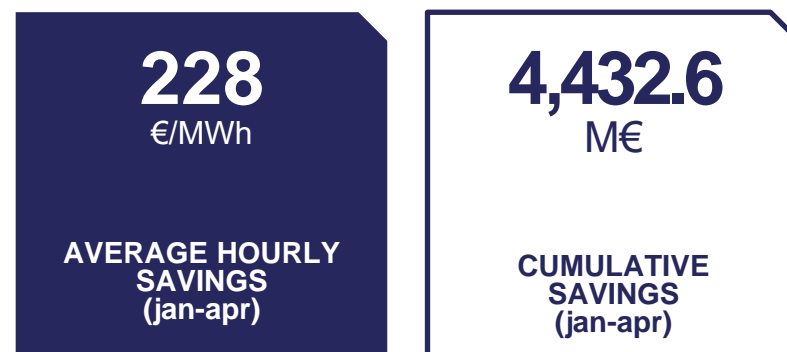
Specific emissions from the electricity sector in mainland Portugal, % use of coal and natural gas power stations (Apr-2022 to Apr-2024).  
Source: REN, DGEG, ERSE, APREN Analysis

<sup>d</sup> arithmetic average of hourly prices  
Source: OMIE, WorldBank.

# SIMULATION OF PRICE FORMATION WITHOUT SRP

## RENEWABLES AVOIDED:

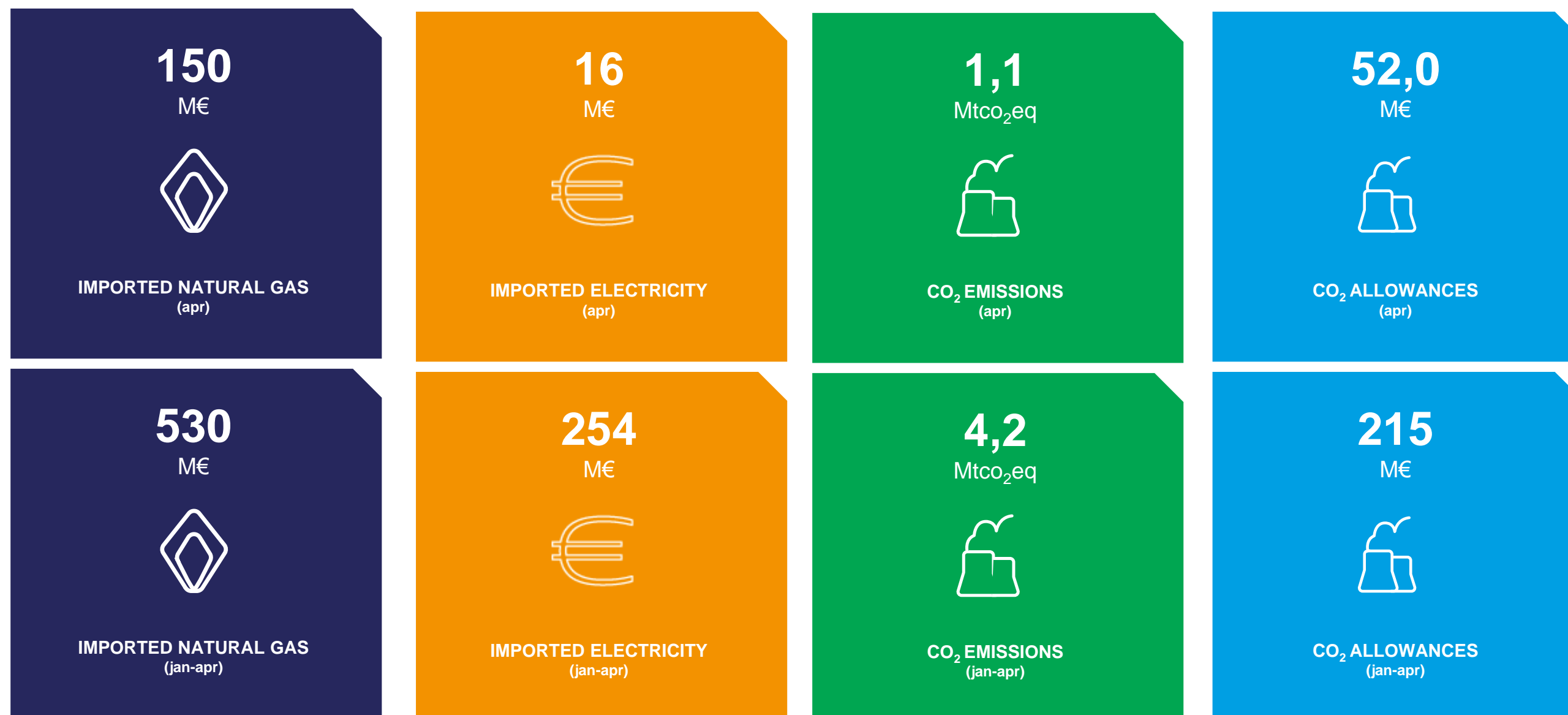
The indicators below show the savings achieved by the merit order between January 1 and April 30 2024 by the contribution of special regime production (PRE). This study is carried out for PRE, which includes all installed fossil cogeneration power. Bearing in mind that the capacity equivalent to this 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 April 30 2024 in natural gas, CO<sup>2</sup> emissions and CO<sup>2</sup> 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](mailto:apren@apren.pt)  
[apren.pt](http://apren.pt)

