

# 2024

## RENEWABLE ELECTRICITY BULLETIN

DECEMBER  
2024

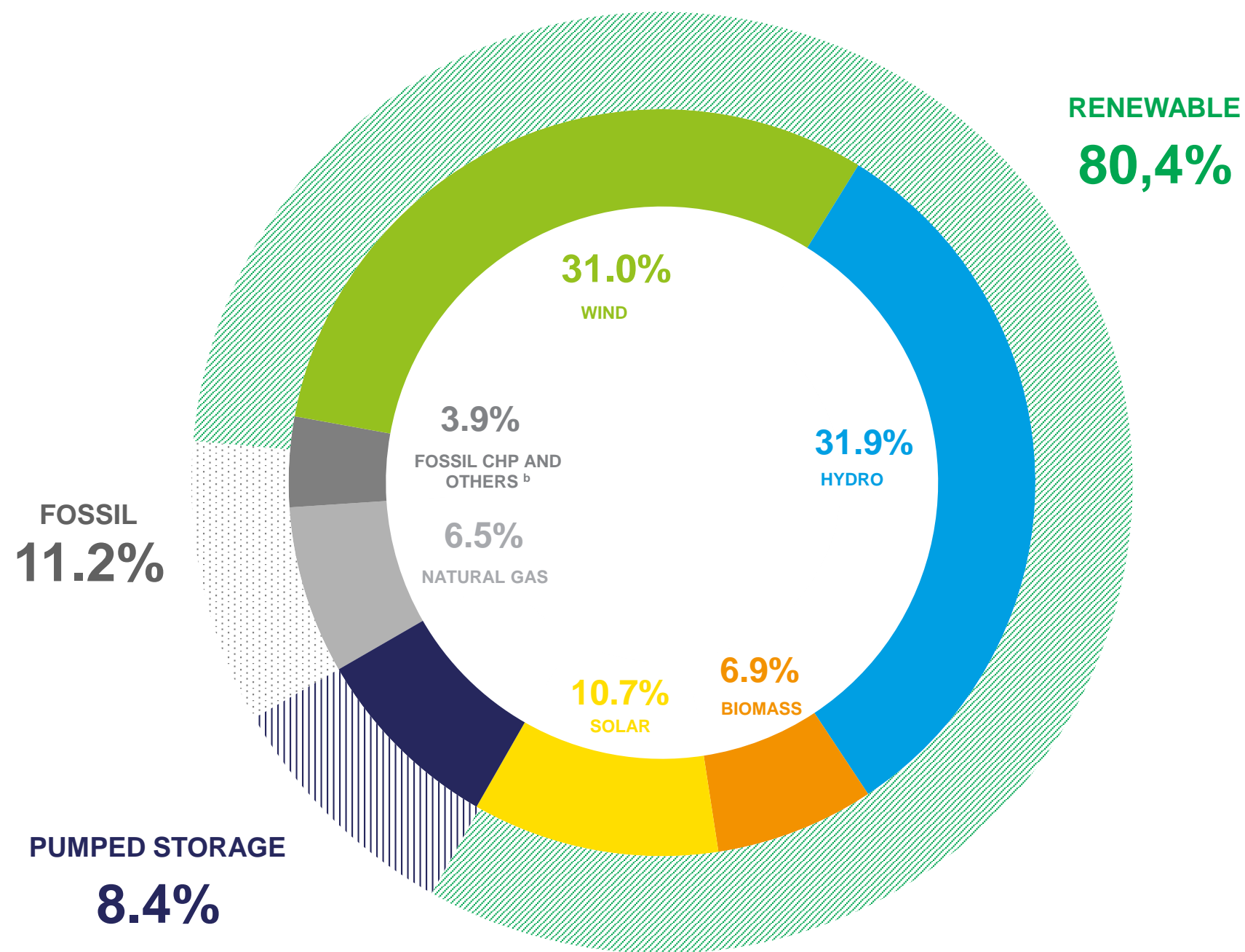
PORTUGAL NEEDS  
OUR ENERGY



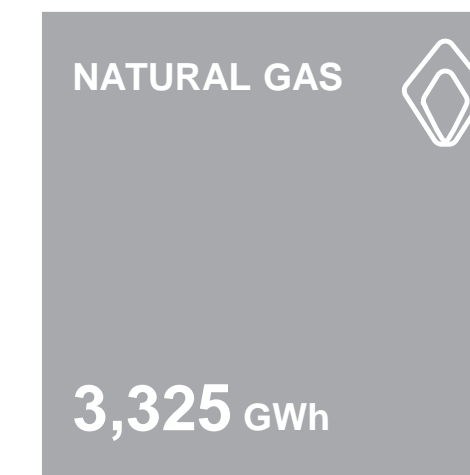
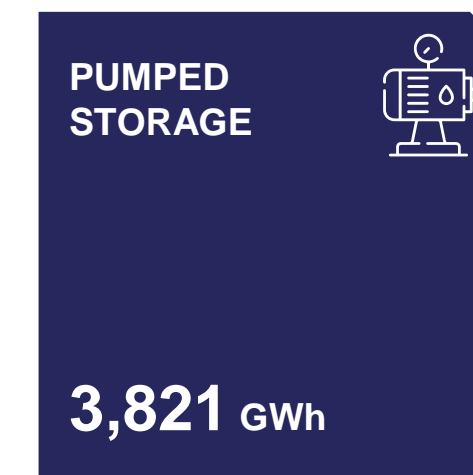
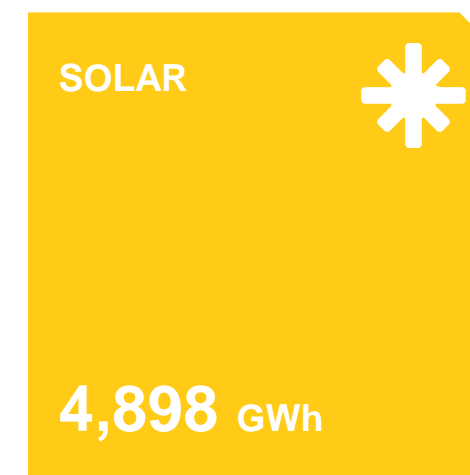
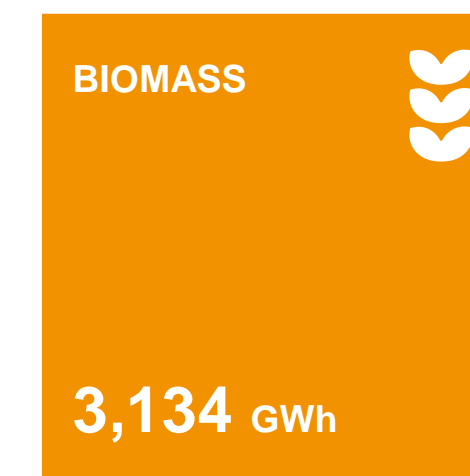
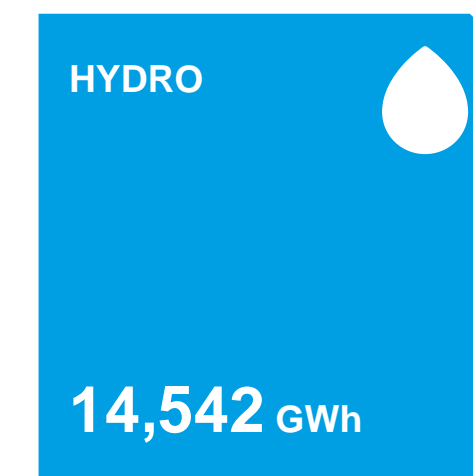
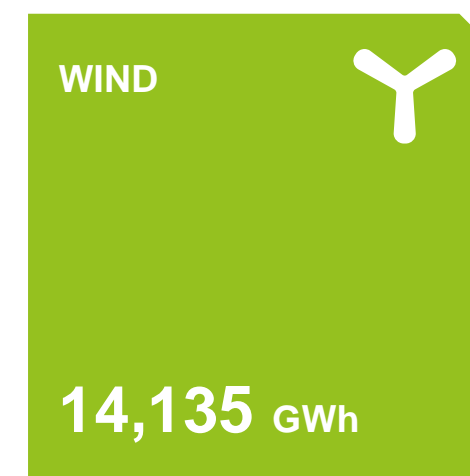
**APREN** Associação  
de Energias  
Renováveis

# EXECUTIVE SUMMARY

## GENERATION (JAN-DEC)



RENEWABLE  
**80,4%**



**MAIN INDICATORS (JAN-DEC)**

GWh  
**45,637**  
Generation<sup>a</sup>

€/ MWh  
**63,5**  
MIBEL PT Price

€/ tCO<sub>2</sub>  
**67.0**  
CO<sub>2</sub> Price

MtCO<sub>2</sub> - eq  
**11.4**  
CO<sub>2</sub> Emissions

GWh  
**10,442**  
Import Balance

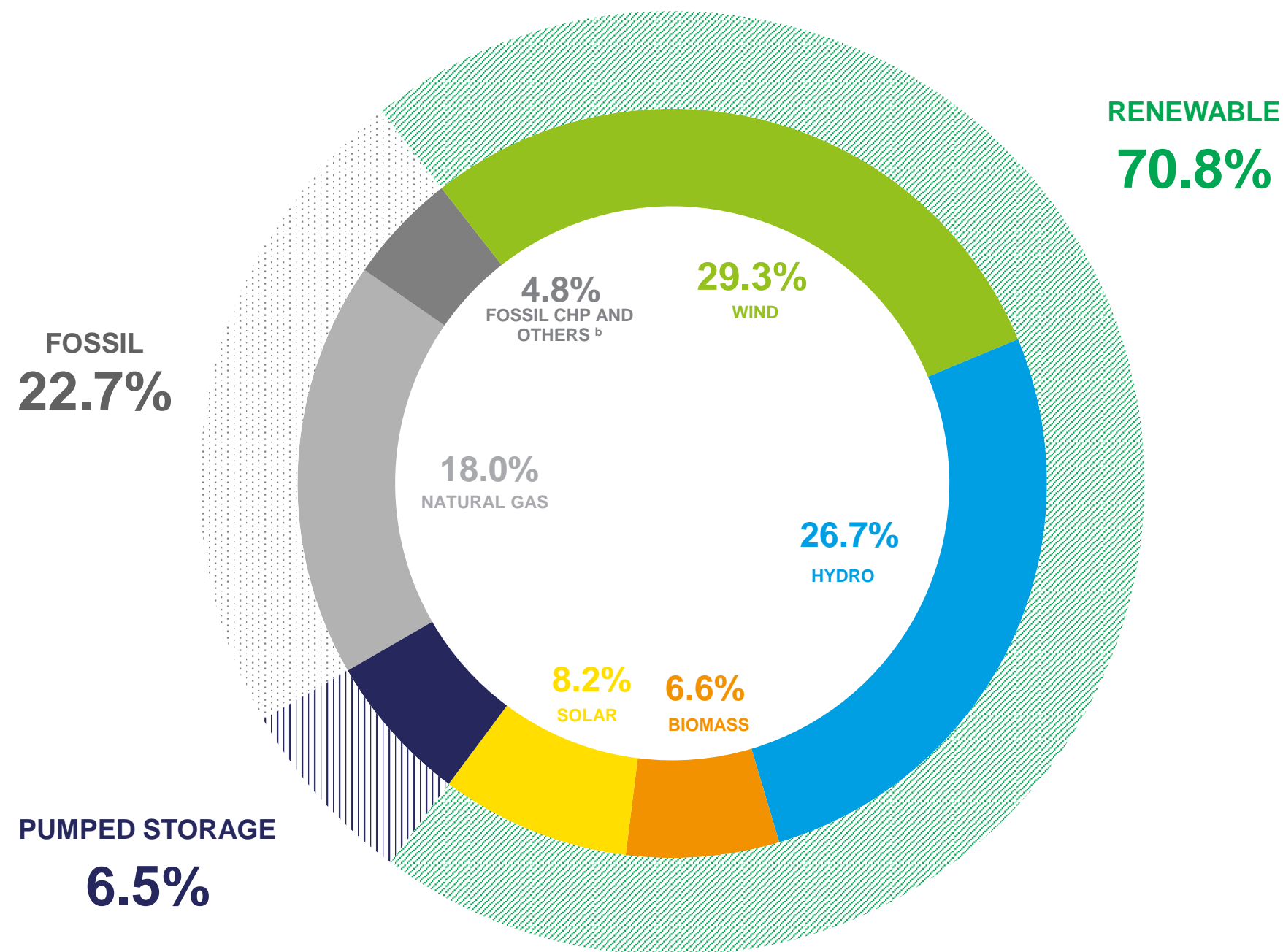
gCO<sub>2</sub> eq/kWh  
**39.8**  
CO<sub>2</sub> Specific Emissions

<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

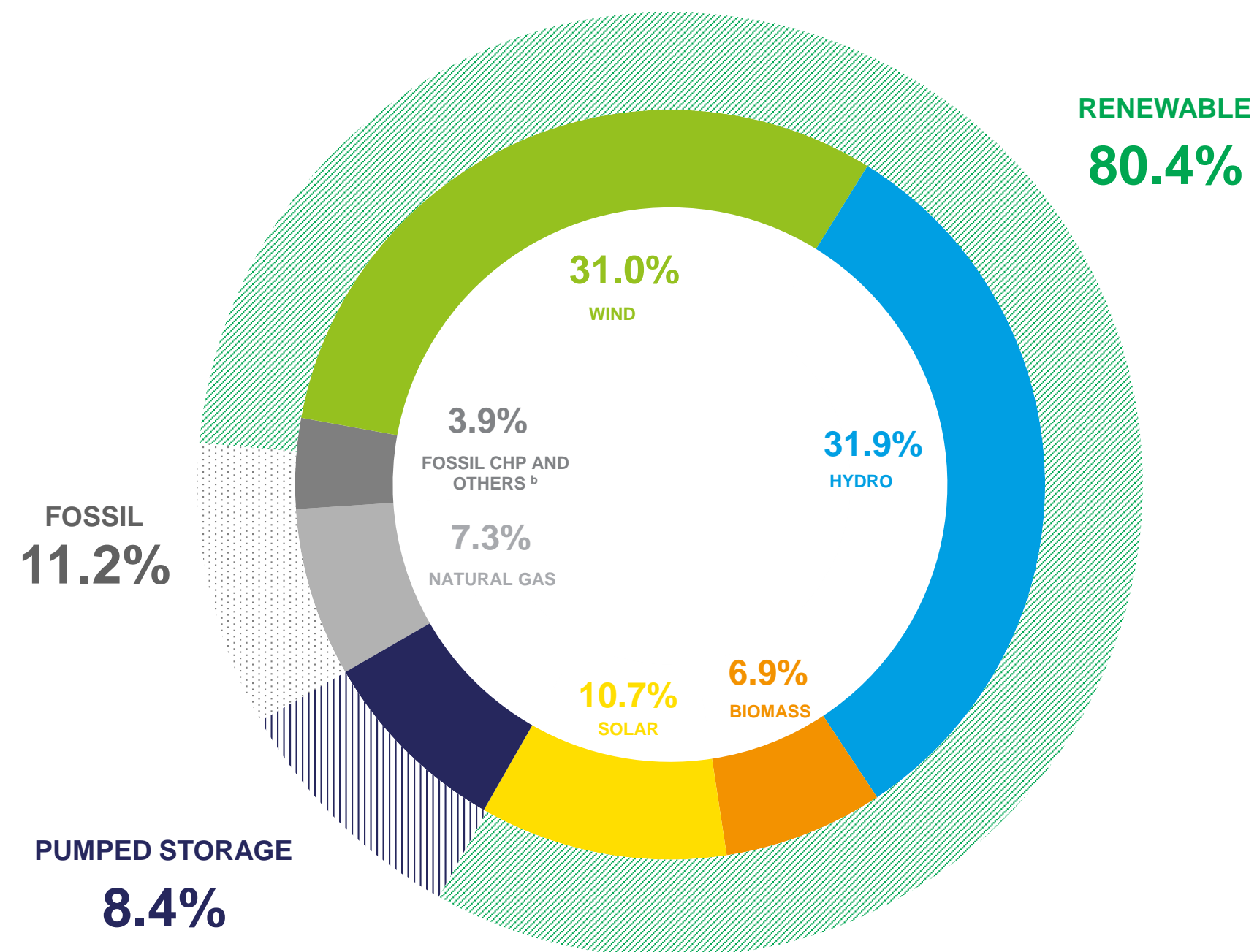
<sup>b</sup> Includes fuel oil, diesel, the non-biodegradable fraction of MSW and new waste

# EXECUTIVE SUMMARY

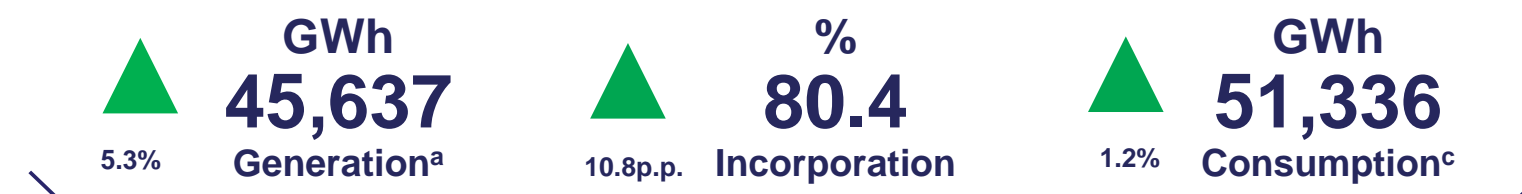
## DECEMBER ACCUMULATED GENERATION 2023



## DECEMBER ACCUMULATED GENERATION 2024



### MAIN INDICATORS COMPARED TO DECEMBER 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

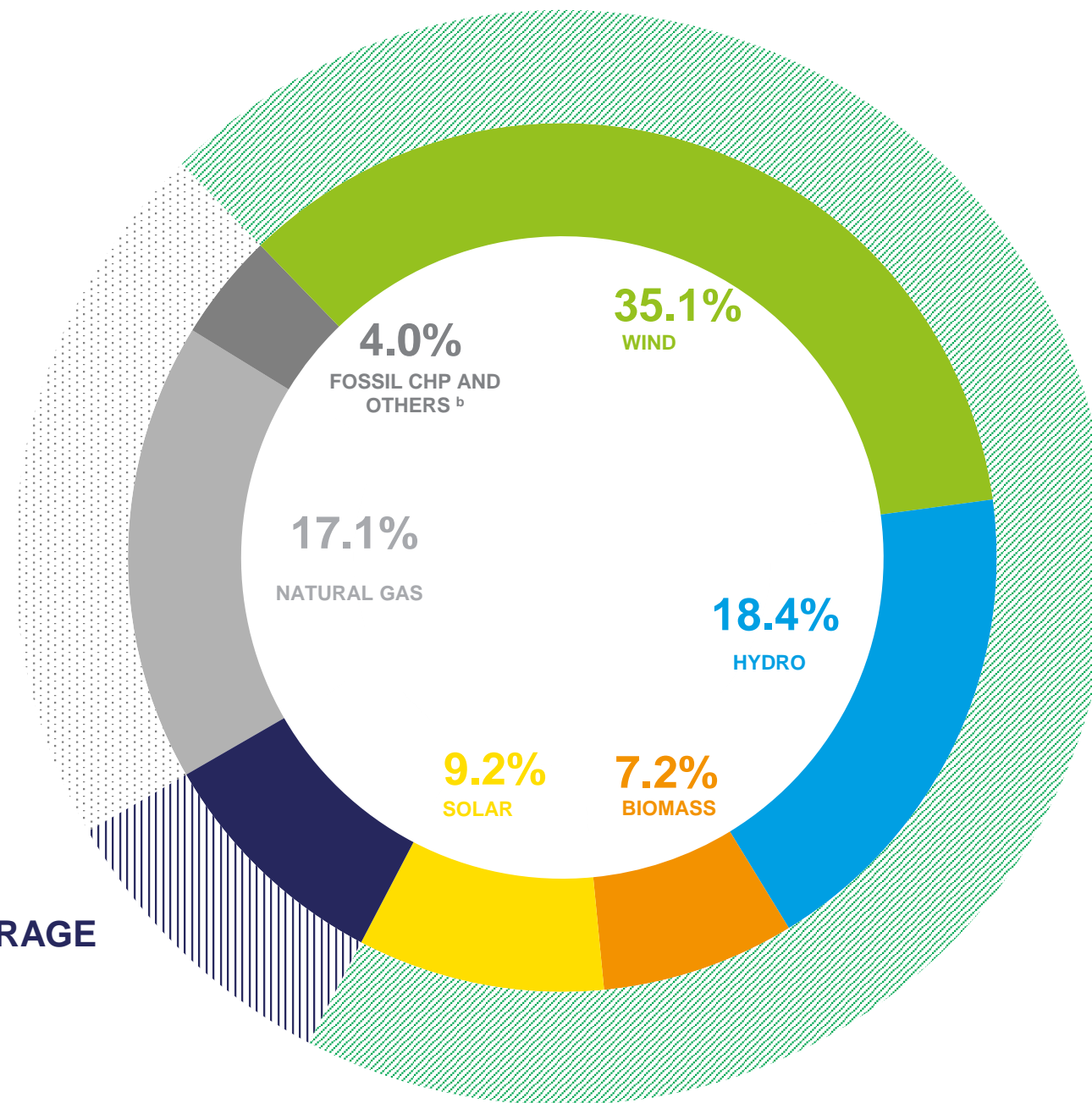
<sup>c</sup> Consumption refers to the net generation of energy by power stations, taking into account the import-export balance.  
Source: REN, APREN Analysis

# MONTHLY ANALYSIS IN PORTUGAL DECEMBER

Between 1 and 31 of December 2024, renewable incorporation was 69.9%, making up 2,498 GWh of the 3,572 GWh produced in the month under review.

The amount of energy generated compared to December 2023 is lower, mainly due to a reduction in hydro production of 24.6 percentage points, from 1,848 GWh to 657 GWh

In December 2024, imports totalled 32.1% of electricity consumption in mainland Portugal.



**RENEWABLE  
69.9%**

**FOSSIL  
21.1%**

**PUMPED STORAGE  
9.0%**

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

GWh  
**3,572**  
Generation<sup>a</sup>

▼ **16.9%**

GWh  
**4,664**  
Consumption<sup>c</sup>

▼ **1.2%**

%  
**69.9**  
Renewable incorporation

▼ **11.3 p.p.**

WIND INDEX

**0.86**

HYDRO INDEX

**0.36**

SOLAR INDEX

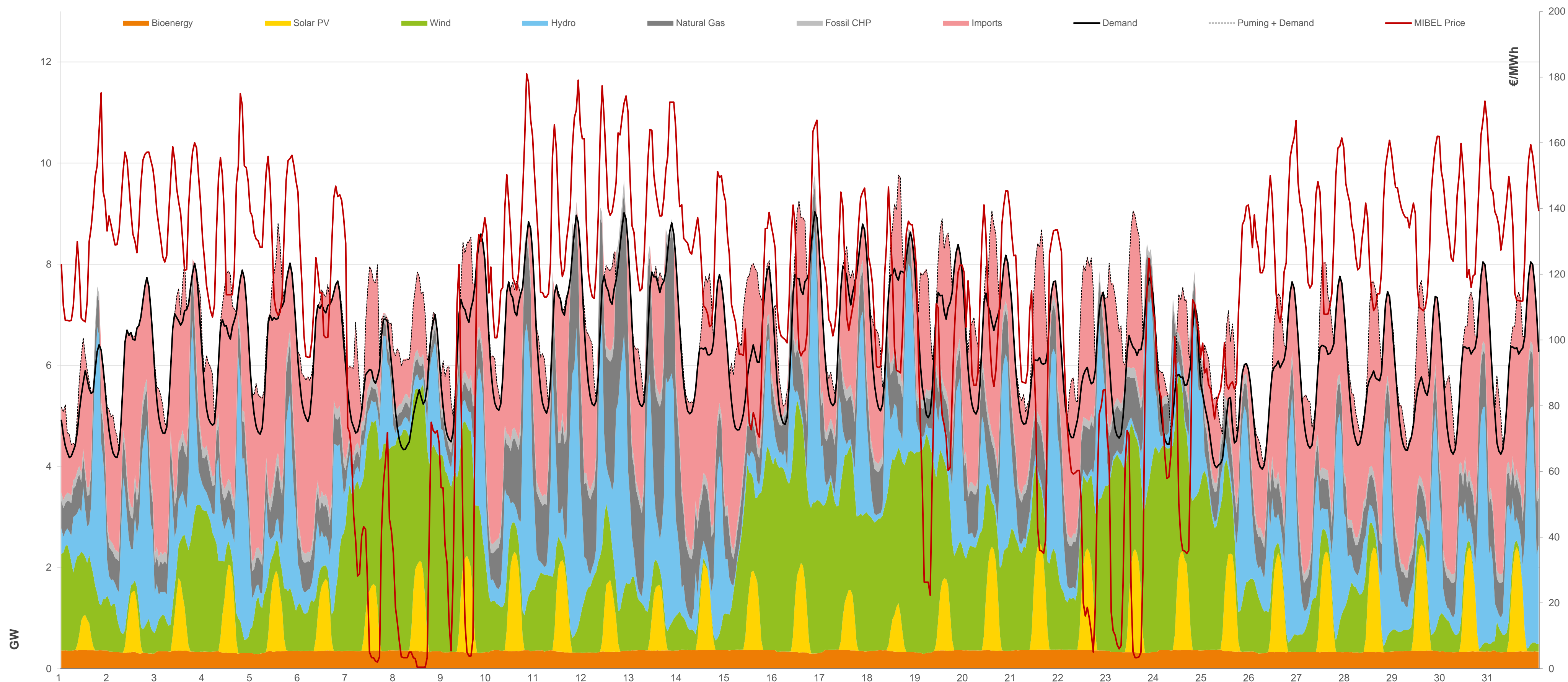
**1.08**

STORAGE IN DAMS

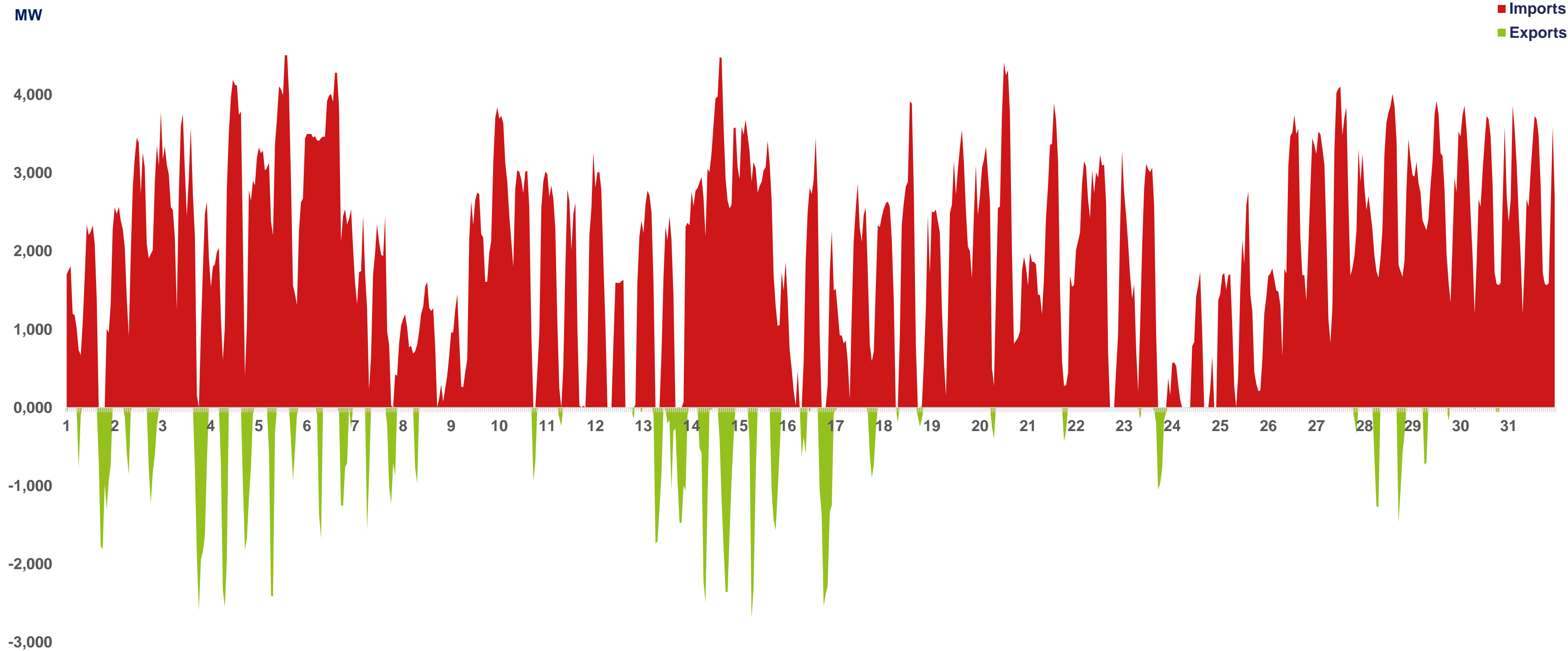
**57.7%**

<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: DECEMBER 2024 LOAD DIAGRAM



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



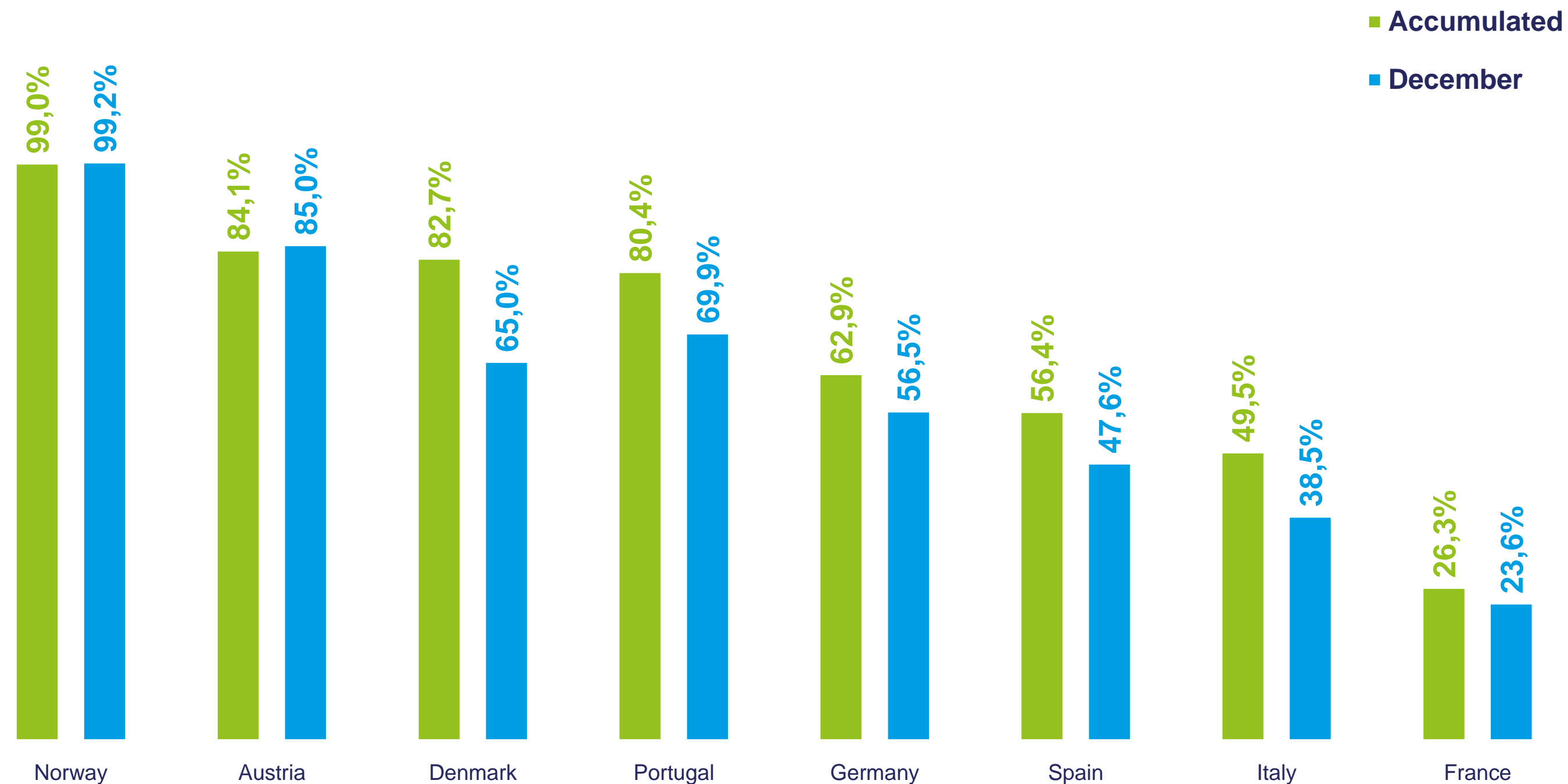
Source: REN, APREN Analysis

## RENEWABLE ELECTRICITY EUROPE

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

Between 1 January and 31 December 2024, Portugal was the fourth country with the highest share of renewable energy in electricity generation, with 80.4%, figuring behind Norway, Austria and Denmark, which respectively achieved 99.0%, 84.1% and 82.7%.

From 1 to 31 December, Portugal came third in the countries considered with the highest renewable incorporation in Europe, having reached 69.9%.

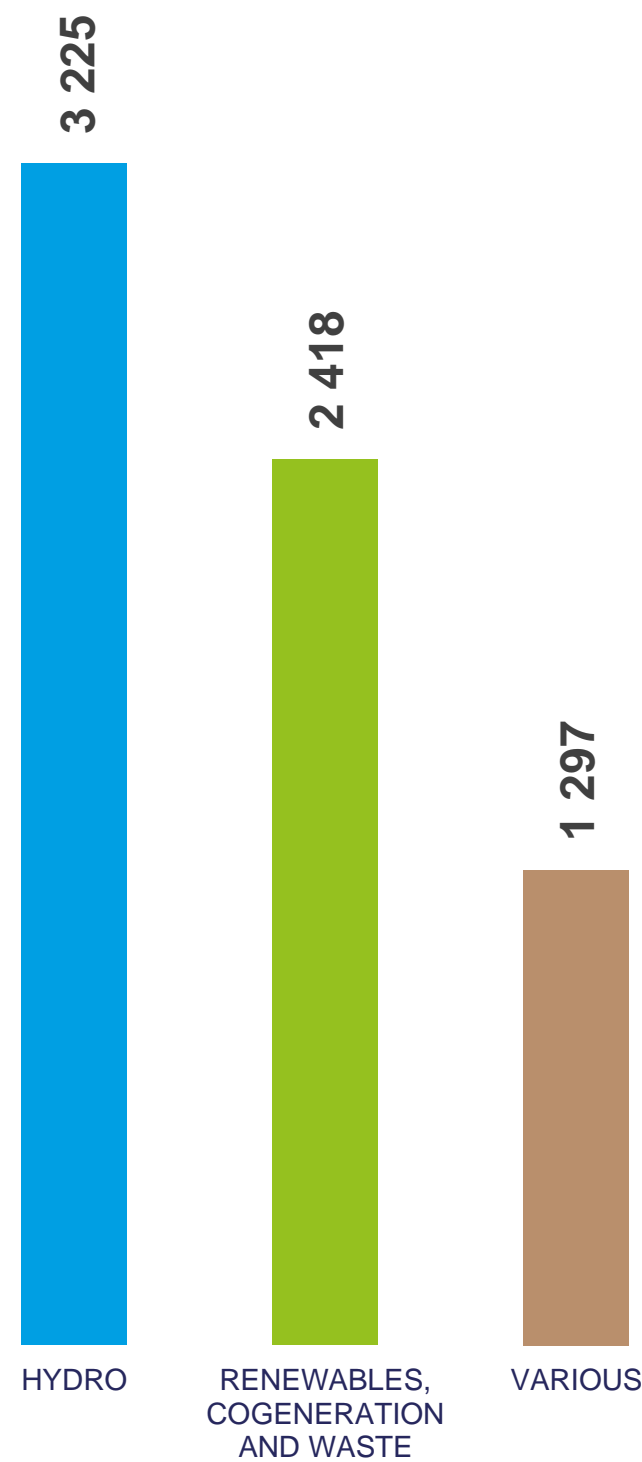


# MARKET PRICE SETTING PORTUGAL

Between 1 January and 31 December, the technology that cleared the market with the most hours was hydro, with 3,225 non-consecutive hours, followed by other renewables, cogeneration and waste with 2,418 hours, and various technologies with 1,297 hours.

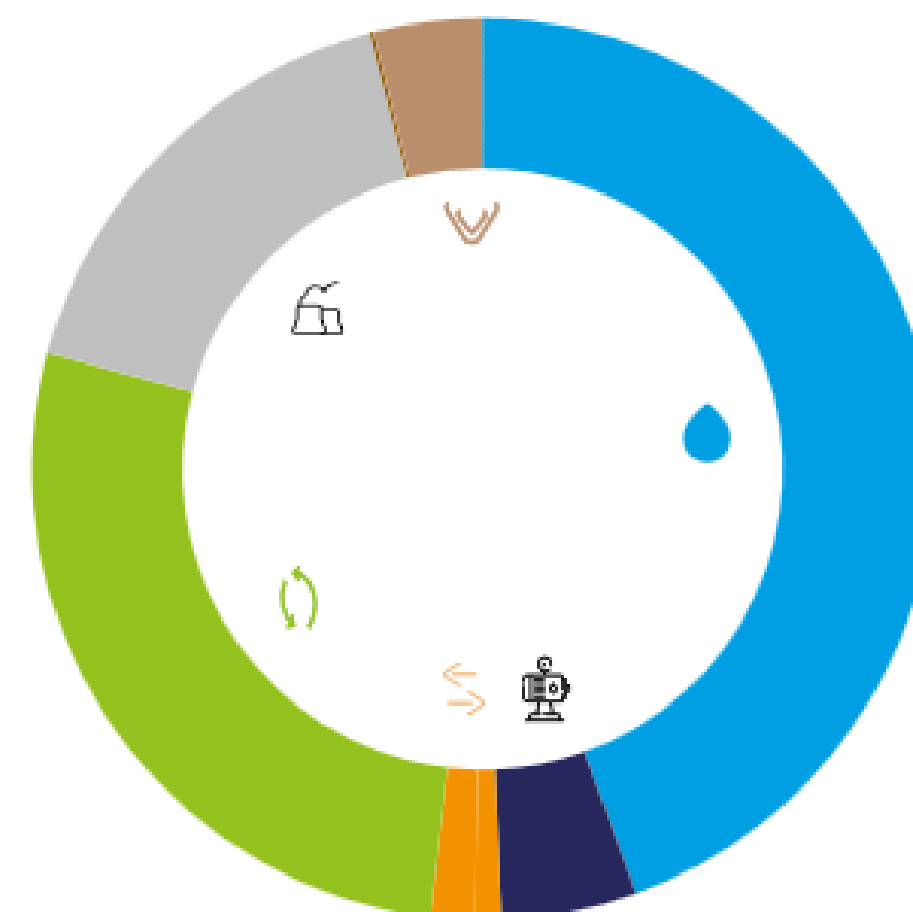


## ACCUMULATED DECEMBER 2024

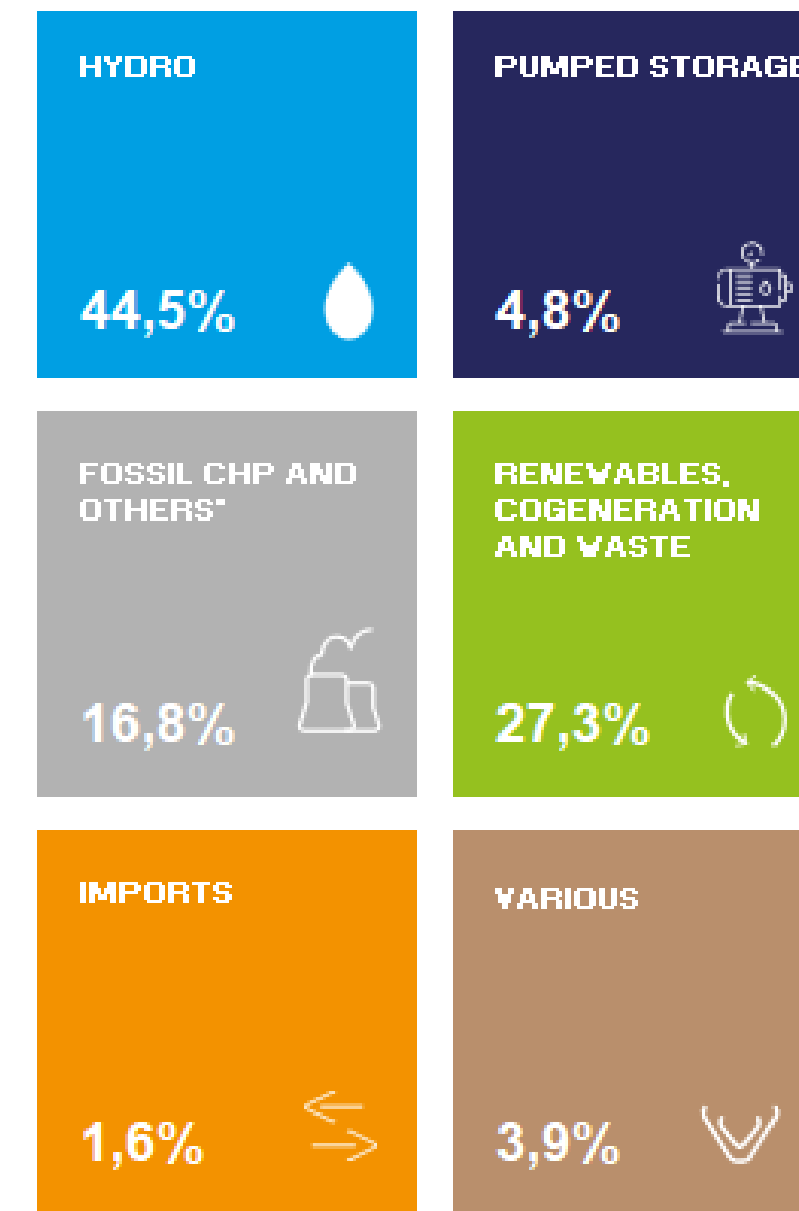


Number of market clearing hours (accumulated) for the three main closing technologies (Dec).  
**Source:** OMIE, APREN Analysis

## DECEMBER 2024



Percentage distribution of the number of hours of market clearing for the various technologies, totaling 744 hours (Dec).  
**Source:** OMIE, APREN Analysis

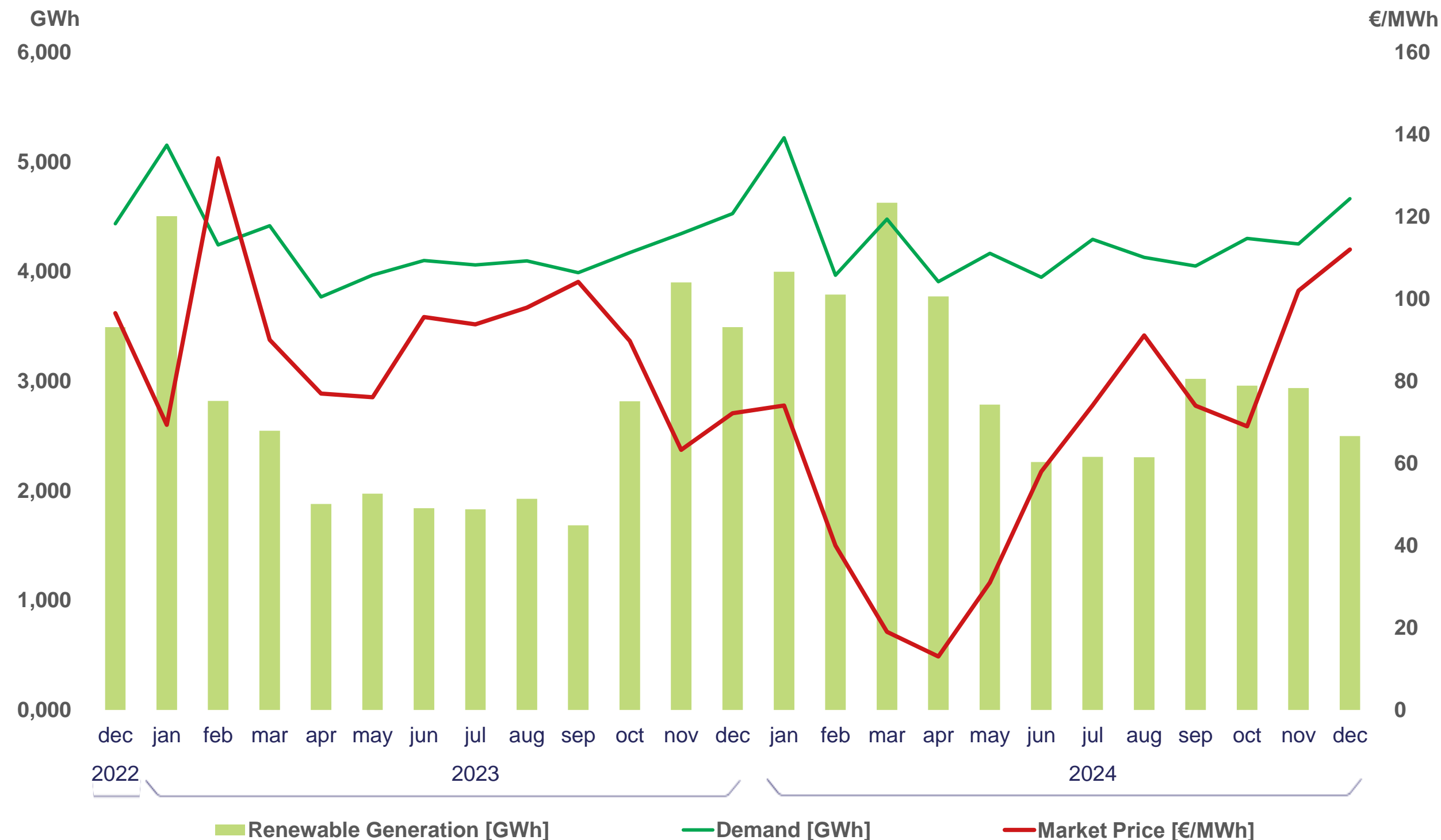




# ELECTRICITY MARKET PORTUGAL

Between 1 January and 31 December, the average hourly price recorded in MIBEL in Portugal (63.5 €/MWh<sup>d</sup>) represents a 32.9% reduction compared to the same period last year. In the same period, there were 1,867 non-consecutive hours in which renewable generation was sufficient to supply mainland Portugal's electricity consumption, with an average hourly price in MIBEL of 43.5 €/MWh.

<p style="font-size: 24px; font-weight: bold;">1,867</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;">43.5</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;">31</p> <p>Hours</p> <p style="font-size: 12px; font-weight: bold;">100% RENEWABLE HOURS [DECEMBER]</p>	<p style="font-size: 24px; font-weight: bold;">53.4</p> <p>€/MWh</p> <p style="font-size: 10px; font-weight: bold;">MIBEL'S AVERAGE PRICE (IN 100% RENEWABLE HOURS) [DECEMBER]</p>



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

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

# RENEWABLE ELECTRICITY EUROPE

During the month of December 2024, there was a minimum hourly price in MIBEL in Portugal of 0.44€/MWh, where the market was cleared mainly by Renewables, Cogeneration and Waste. The maximum hourly price was 181.00 €/MWh, where the market was cleared by Hydro.

## MINIMUM PRICES (DEC)

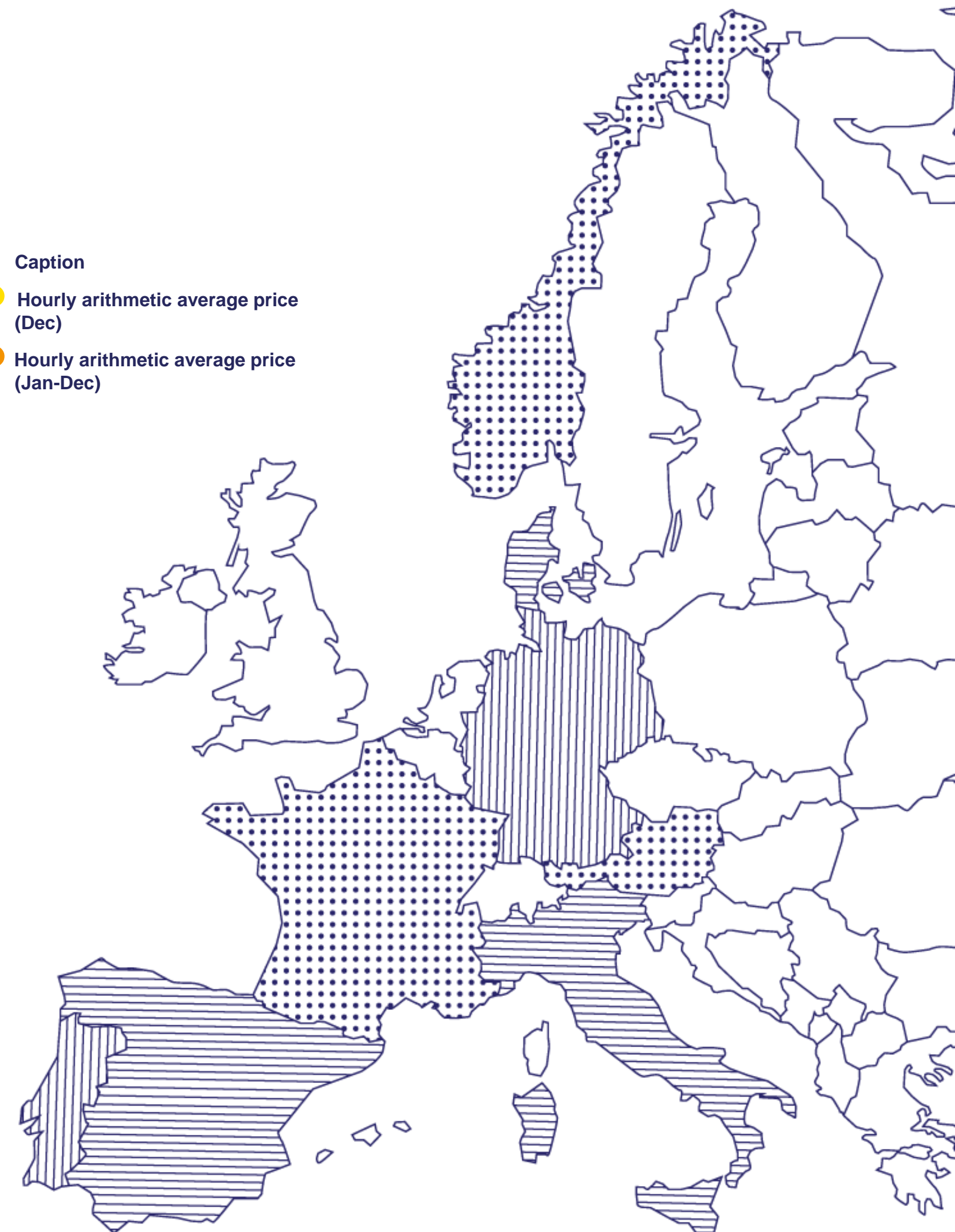
1 <sup>o</sup> Germany	€/MWh <b>-2.06</b>
2 <sup>o</sup> France	€/MWh <b>0.77</b>
3 <sup>o</sup> Norway (NO2)	€/MWh <b>0.0</b>

## MAXIMUM PRICES (DEC)

1 <sup>o</sup> Denmark (DK2)	€/MWh <b>936.31</b>
2 <sup>o</sup> Germany Denmark (DK1)	€/MWh <b>936.28</b>
3 <sup>o</sup> Austria	€/MWh <b>850.0</b>

Portugal €/MWh	111.5	63.5
Spain €/MWh	111.2	63.0
France €/MWh	98.2	58.0
Italy (IT-NORD) €/MWh	135.3	107.4
Germany €/MWh	108.3	78.5
Austria €/MWh	129.7	81.5
Denmark (DK1) €/MWh	91.8	70.6
Denmark (DK2) €/MWh	92.7	70.9
Norway (NO2) €/MWh	63.5	50.1

Caption  
 ● Hourly arithmetic average price (Dec)  
 ● Hourly arithmetic average price (Jan-Dec)



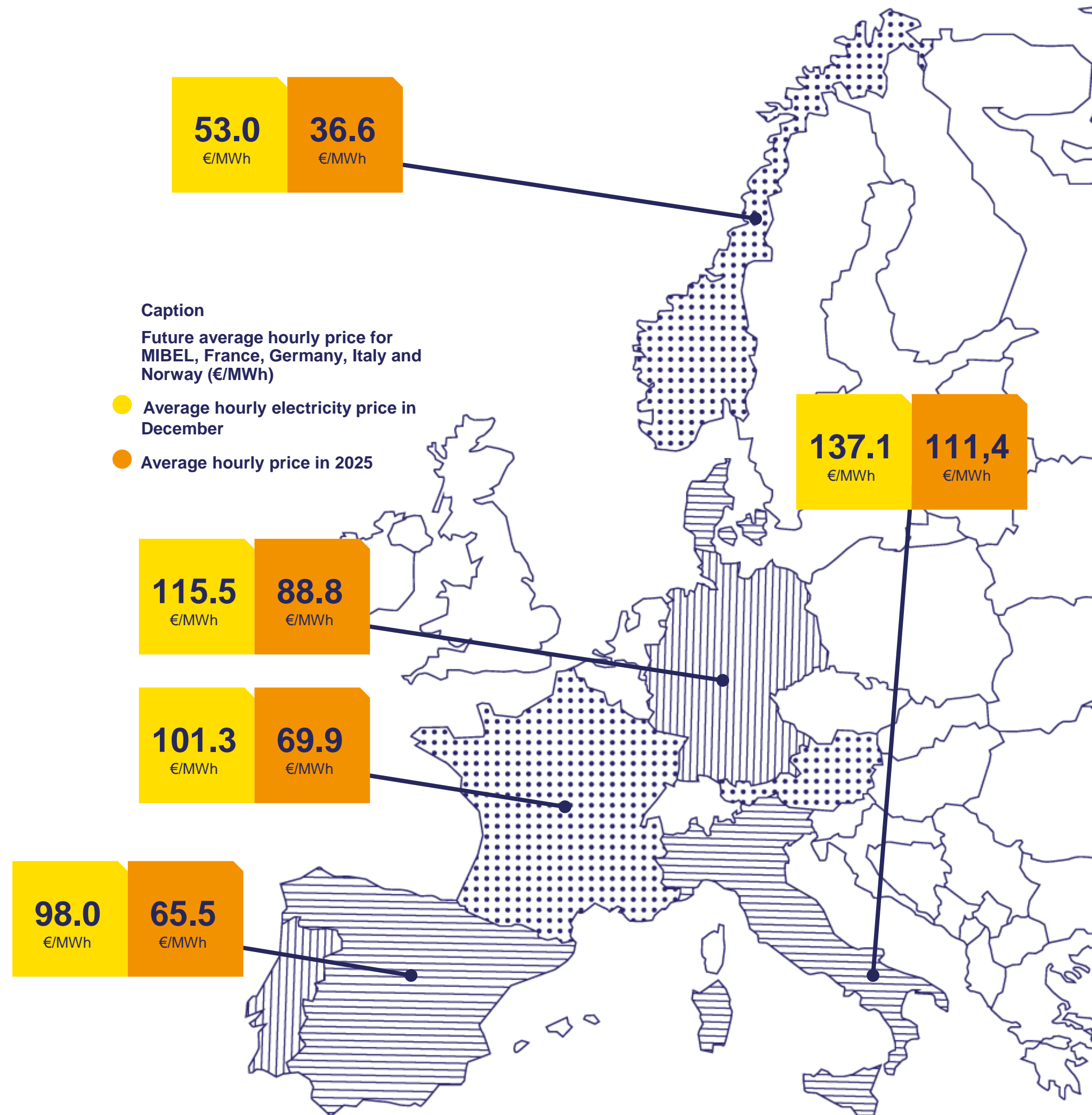
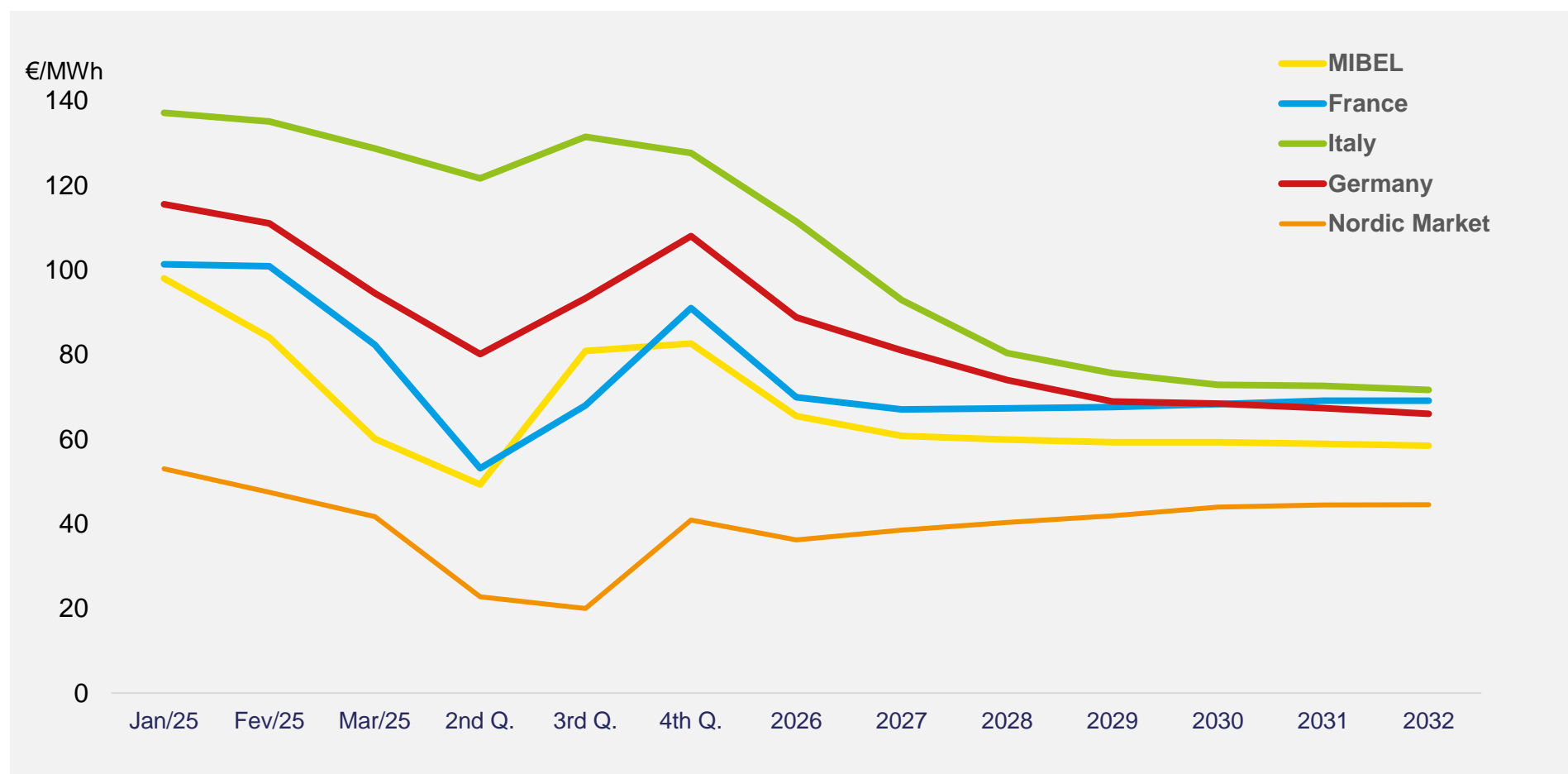
Source: ENTSO-E, OMIE, APREN Analysis

Disclaimer: due to changes in the ENTSO-e reporting format, the price values have been changed to those of the bidding zones, where applicable. In this edition, only bidding zones with interconnections with other countries have been considered.

# ELECTRICITY MARKET FUTURES

The evolution of the average hourly future price shown is calculated on the basis of electricity purchase and sale contracts. The map on the right shows the price values for next month (December) and next year. For next month, MIBEL is the second market with the lowest values, while for next year it is the Nordic Market that has the lowest values.

MIBEL has the second lowest values until 2034, due to investment in renewable production.



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

- Average hourly electricity price in December
- Average hourly price in 2025

<sup>e</sup>Values updated as of 6th of December.  
 Source: OMIP, EEX, APREN Analysis

# INTERNATIONAL EXCHANGES

## EUROPE

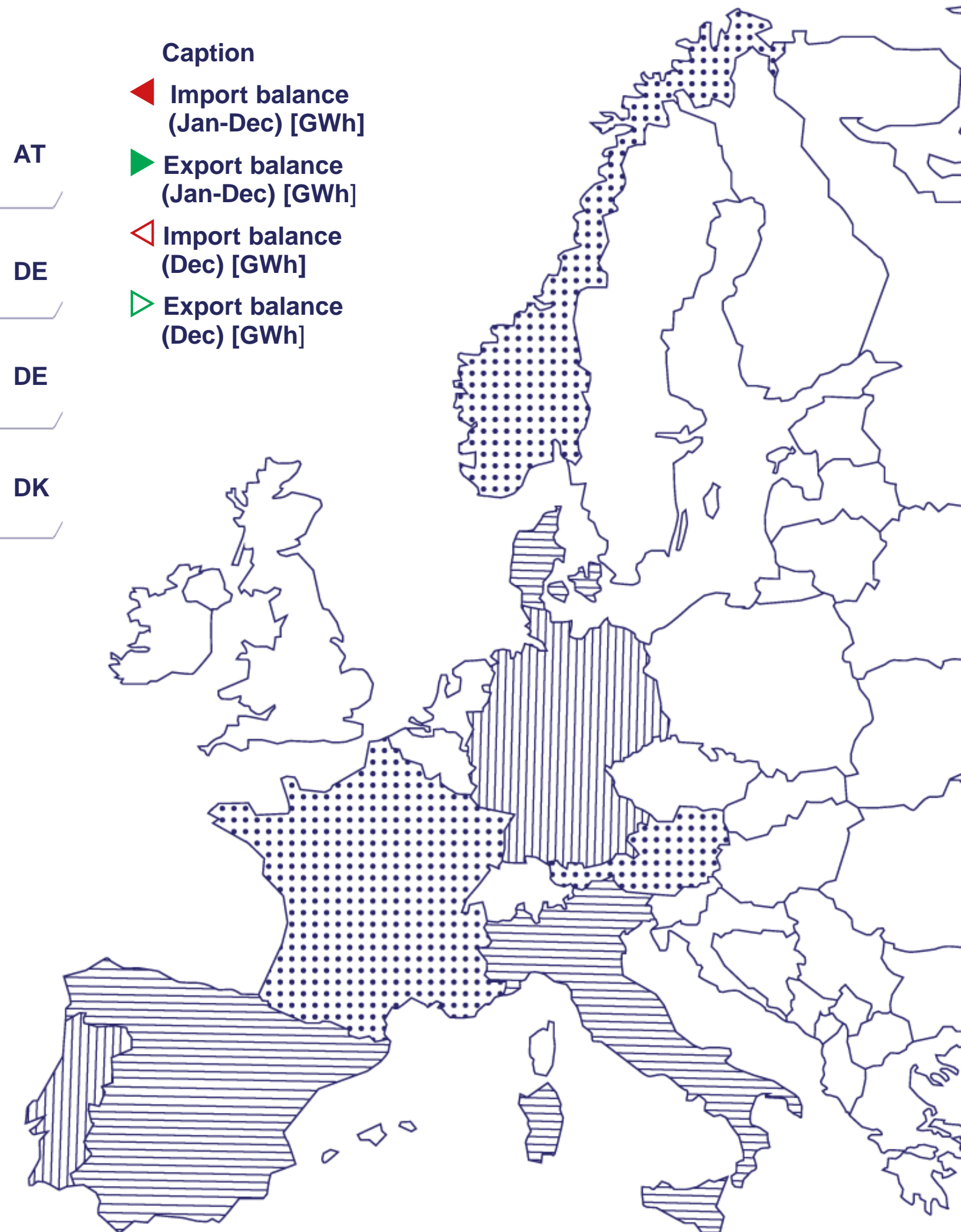
Between 1 January and 31 December 2024, mainland Portugal's electricity system registered electricity imports equivalent to 14,943 GWh and exports of 4,501 GWh, with Portugal being an importer with a balance of 10,442 GWh.

PT	10,442	1,499	ES	DE	2,392	689	AT
ES	2,534	253	MA	DK	7,431	684	DE
FR	1,894	900	ES	NO	5,778	616	DE
IT	19,843	1,766	FR	NO	6,466	690	DK
DE	19,774	1,517	FR				

**Caption**  
 ▲ Import balance (Jan-Dec) [GWh]  
 ▼ Export balance (Jan-Dec) [GWh]  
 ▲ Import balance (Dec) [GWh]  
 ▼ Export balance (Dec) [GWh]

### MAIN INDICATORS FOR PT-ES INTERCONNECTION

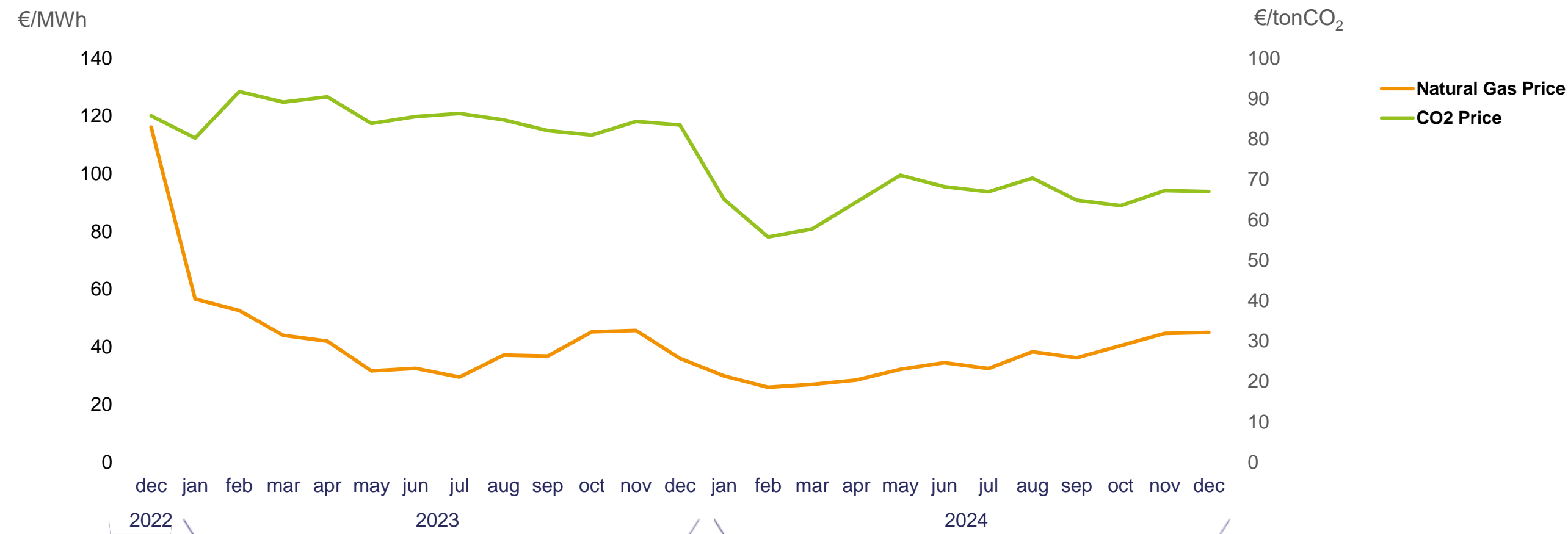
<b>usage</b>	23,3% (dec) PT-ES	36.3% (jan-dec)	53.9% (dec) ES-PT	49.5% (jan-dec)
<b>congestion</b>	0.0% (dec) PT-ES	5.6% (jan-dec)	3.1% (dec) ES-PT	7.8% (jan-dec)
<b>market separation</b>	3.1% (dec) PT-ES	6.8% (jan-dec)	72.7% (dec) MIBEL-FR	73.7% (jan-dec)



Source: ENTSO-E, OMIE, APREN Analysis  
 Disclaimer: due to changes in the ENTSO-e reporting format, the crossborder flow values have been changed to those of the bidding zones, where applicable. In this edition, only bidding zones with interconnections with other countries have been considered

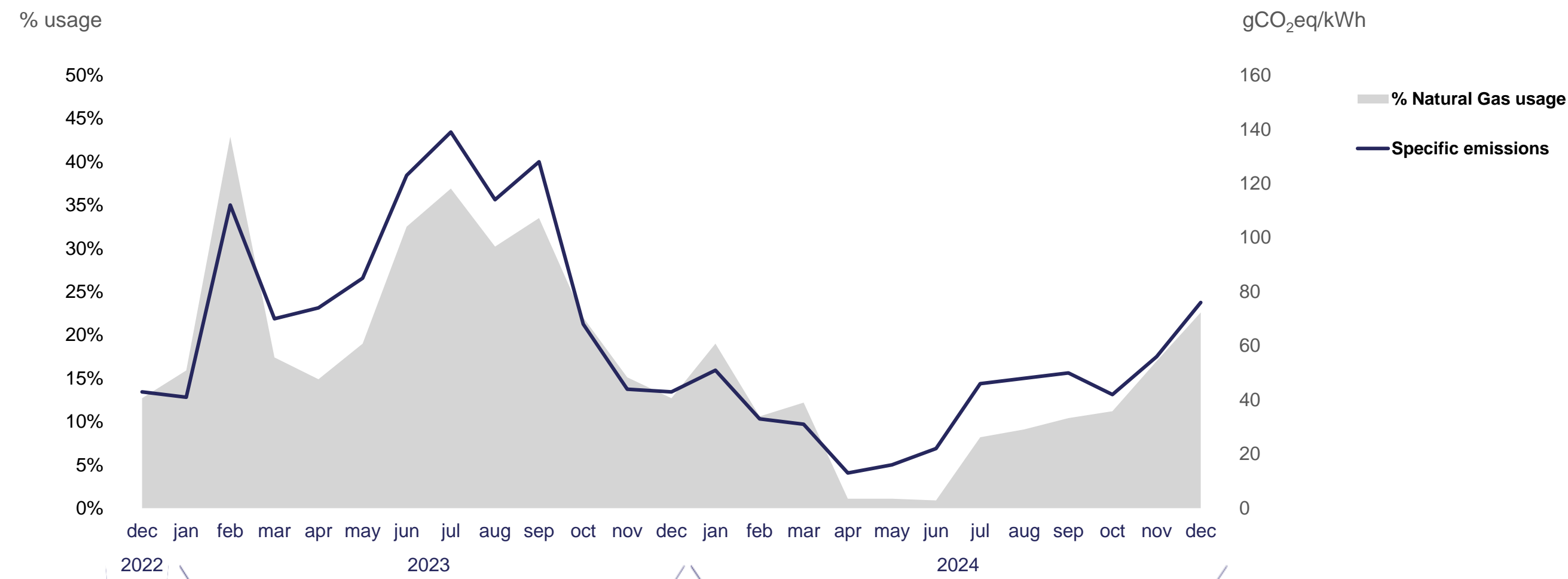
# POWER PRODUCTION EMISSIONS

Between 1 January and 31 December 2024, specific emissions reached 39.8 gCO<sub>2</sub>eq/kWh, giving total emissions from the electricity generation sector of 1.82 MtCO<sub>2</sub>eq. The European CO<sub>2</sub> Emissions Trading Scheme (ETS) recorded a price of 65.2 €/tCO<sub>2</sub><sup>d</sup>, a reduction of 50 per cent compared to the same period in 2023.



Price of CO<sub>2</sub> allowances in the EU ETS and price of natural gas in Europe (Dec-2022 to Dec-2024).  
Source: SendeCO2, WorldBank.

<p><b>1.82</b> MtCO<sub>2</sub>eq</p> <p>SECTOR'S EMISSIONS</p>	<p><b>65.2</b> €/tCO<sub>2</sub></p> <p>AVERAGE PRICE OF LICENCES</p>
<p><b>50</b> %</p> <p>COMPARED TO DECEMBER 2023 [ACCUMULATED]</p>	<p><b>23.5</b> %</p> <p>COMPARED TO DECEMBER 2023 [ACCUMULATED]</p>



Specific emissions from the electricity sector in mainland Portugal, % use of coal and natural gas power stations (Dec-2022 to Dec-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 identify the savings achieved by the merit order between 1 January and 31 December 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 residual and that the other technologies are renewable, the figures are close to the real savings generated by renewables.

185.3

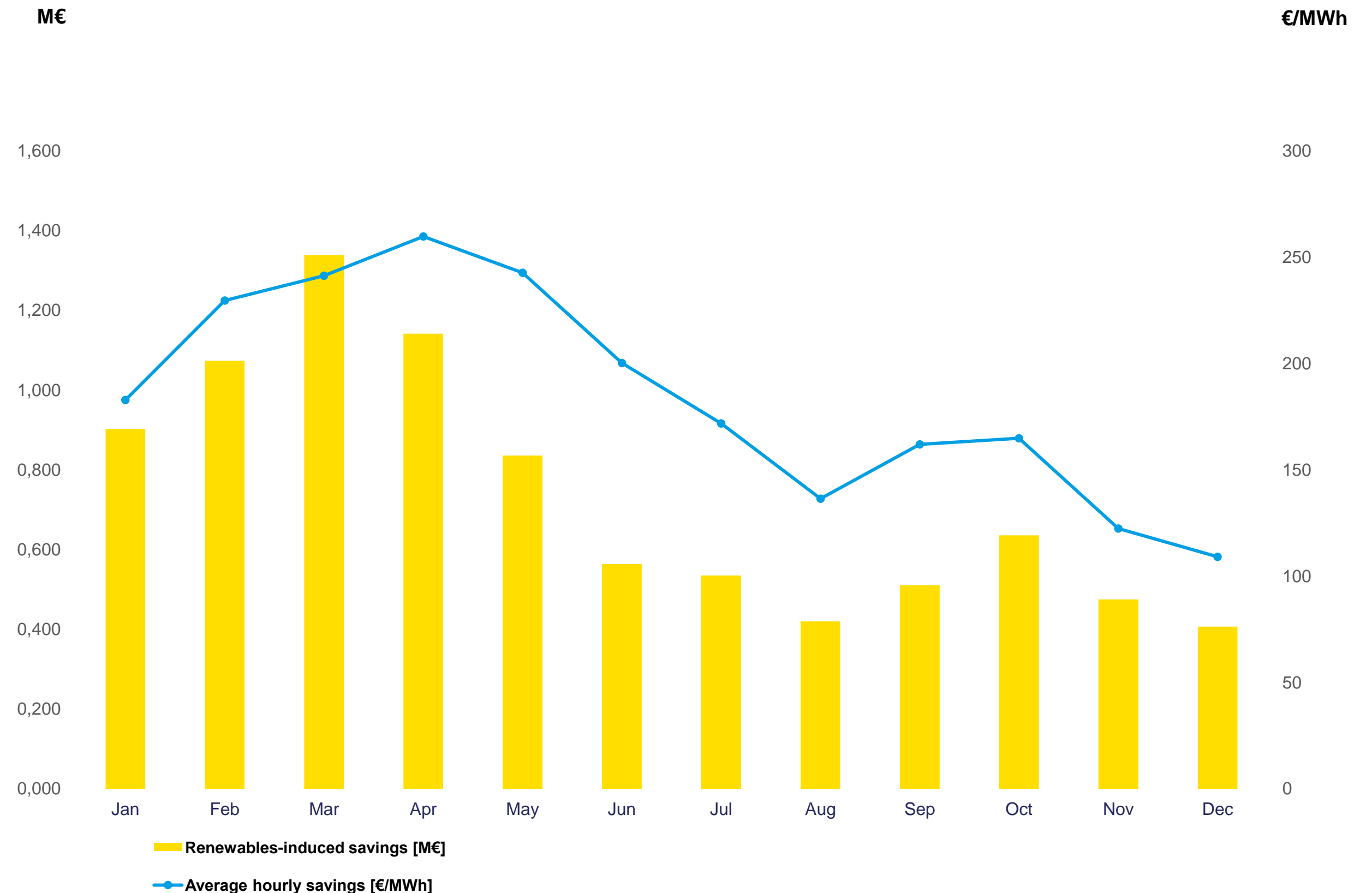
€/MWh

AVERAGE HOURLY SAVINGS (Jan-Oct\*)

8,844

M€

CUMULATIVE SAVINGS (Jan-Oct\*)

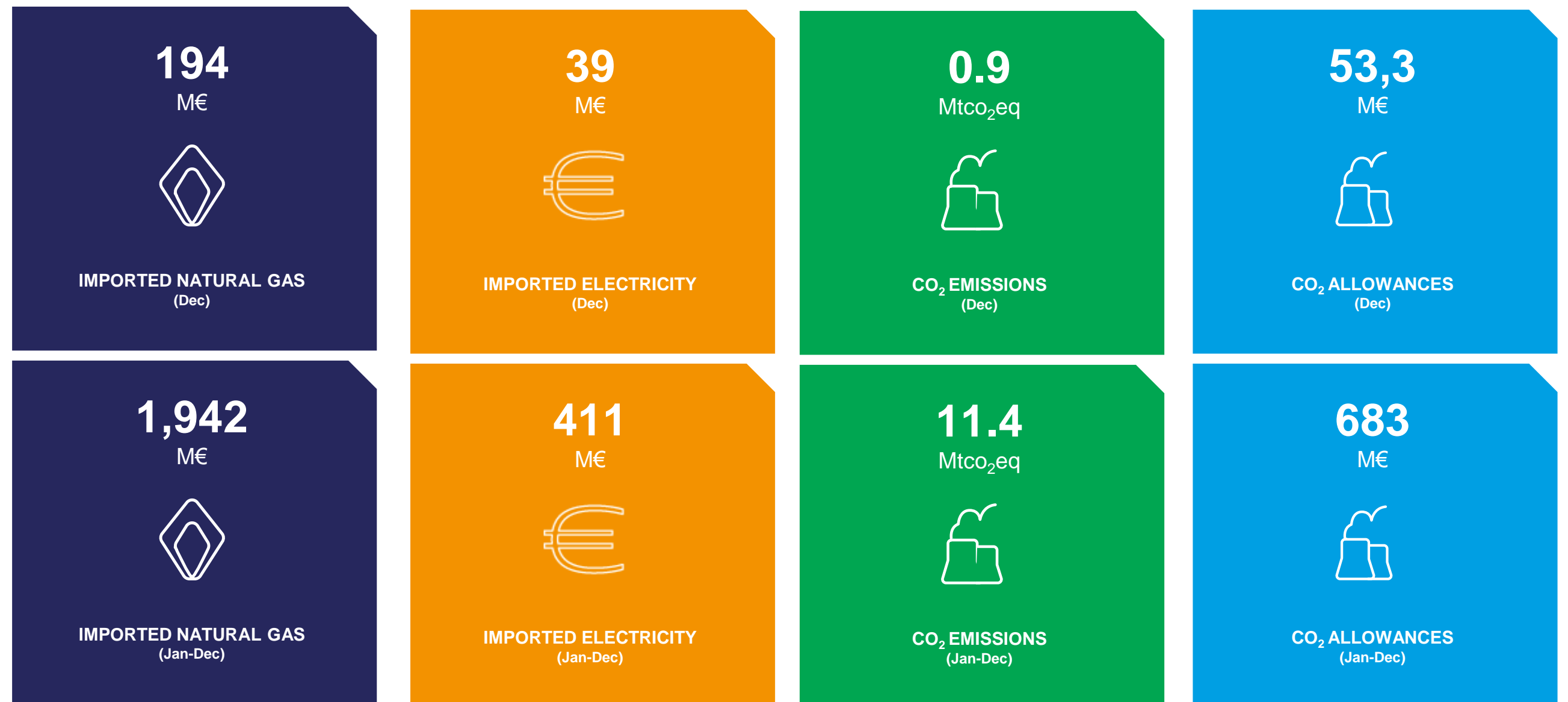


**Disclaimer:** This analysis is carried out using a program developed by APREN, based on the Deloitte calculation method.

# ENVIRONMENTAL SERVICE

## RENEWABLES AVOIDED:

The indicators below identify the savings achieved between 1 January and 31 December 2024 in natural gas, CO<sub>2</sub> emissions and CO<sub>2</sub> emission allowances, as a result of 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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