

2024

RENEWABLE ELECTRICITY BULLETIN

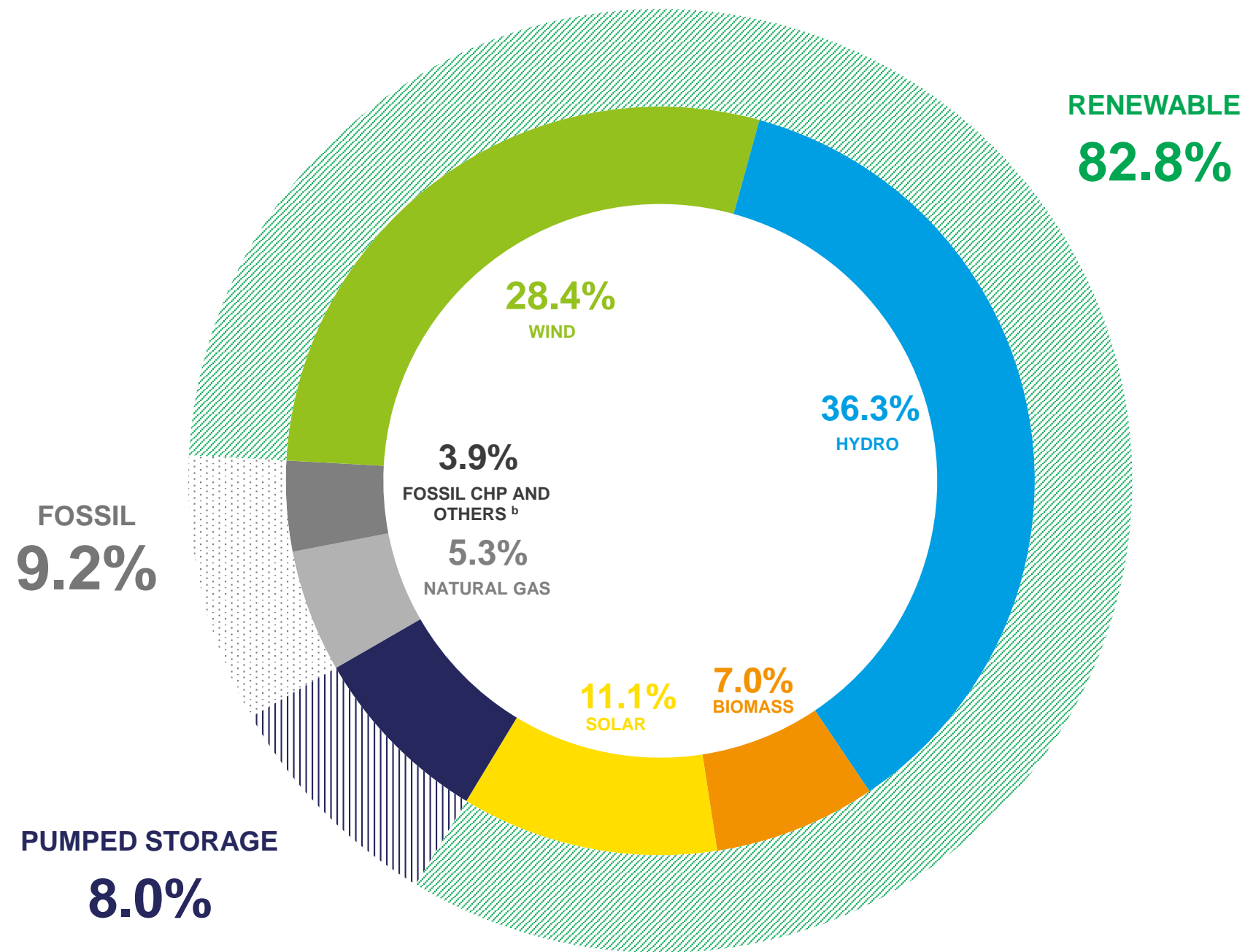
AUGUST
2024

PORTUGAL NEEDS
OUR ENERGY

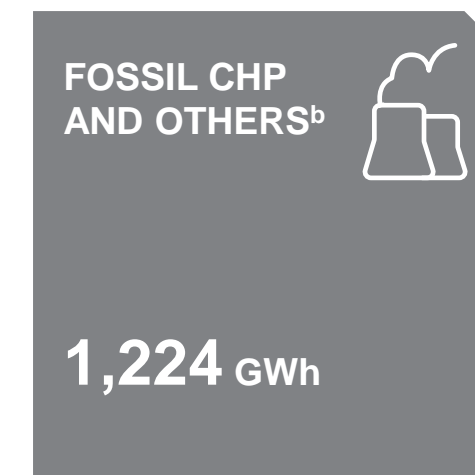
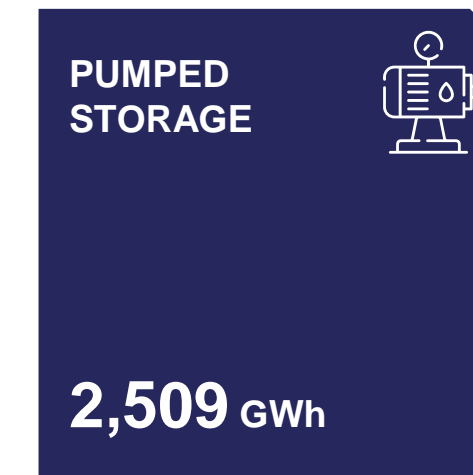
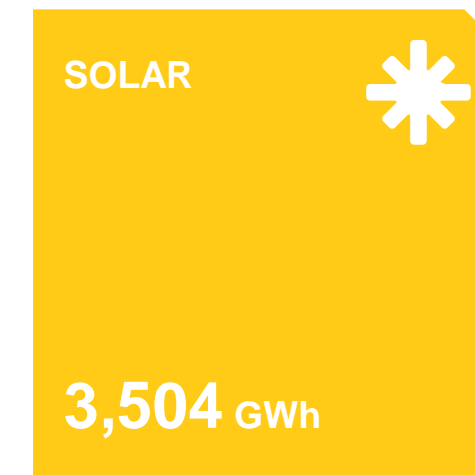
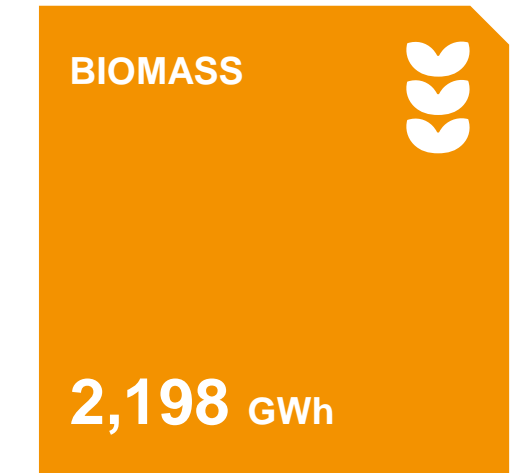
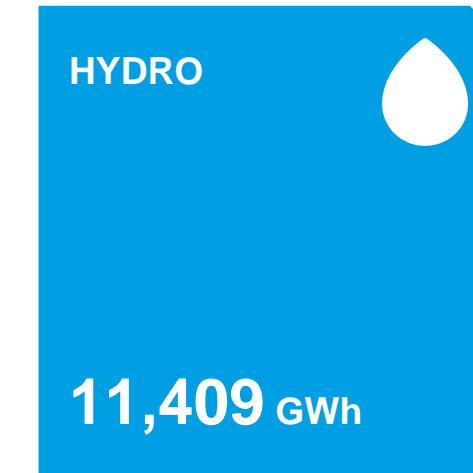


APREN Associação
de Energias
Renováveis

EXECUTIVE SUMMARY GENERATION (JAN-AUG)



RENEWABLE
82.8%



**MAIN INDICATORS
(JAN-AUG)**

GWh
31,443
Generation^a

€/ MWh
50.3
MIBEL PT Price

€/ tCO₂
65.0
CO₂ Price

MtCO₂ - eq
1.02
CO₂ Emissions

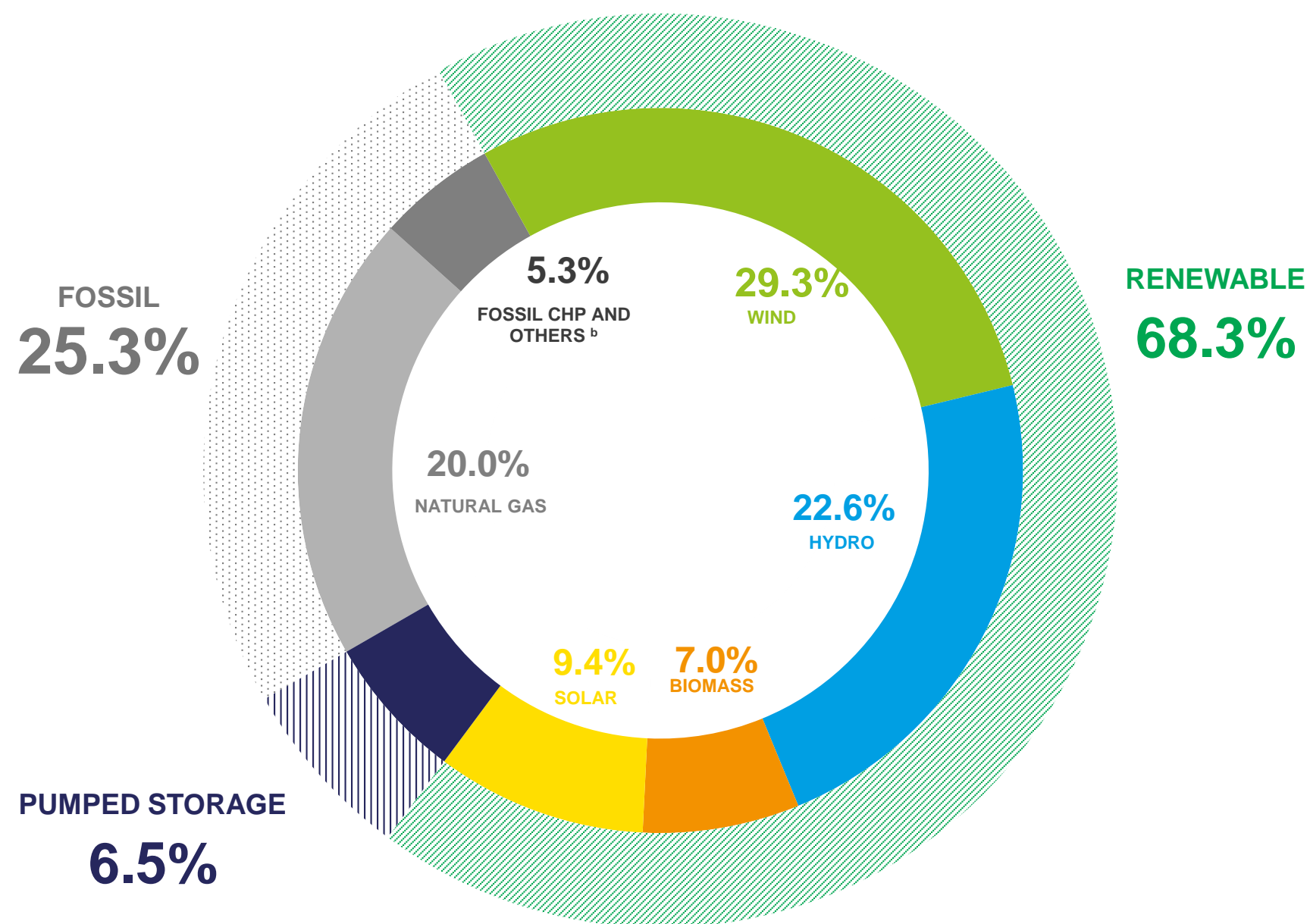
GWh
5,726
Import Balance

gCO₂ eq/kWh
32.4
CO₂ Specific Emissions

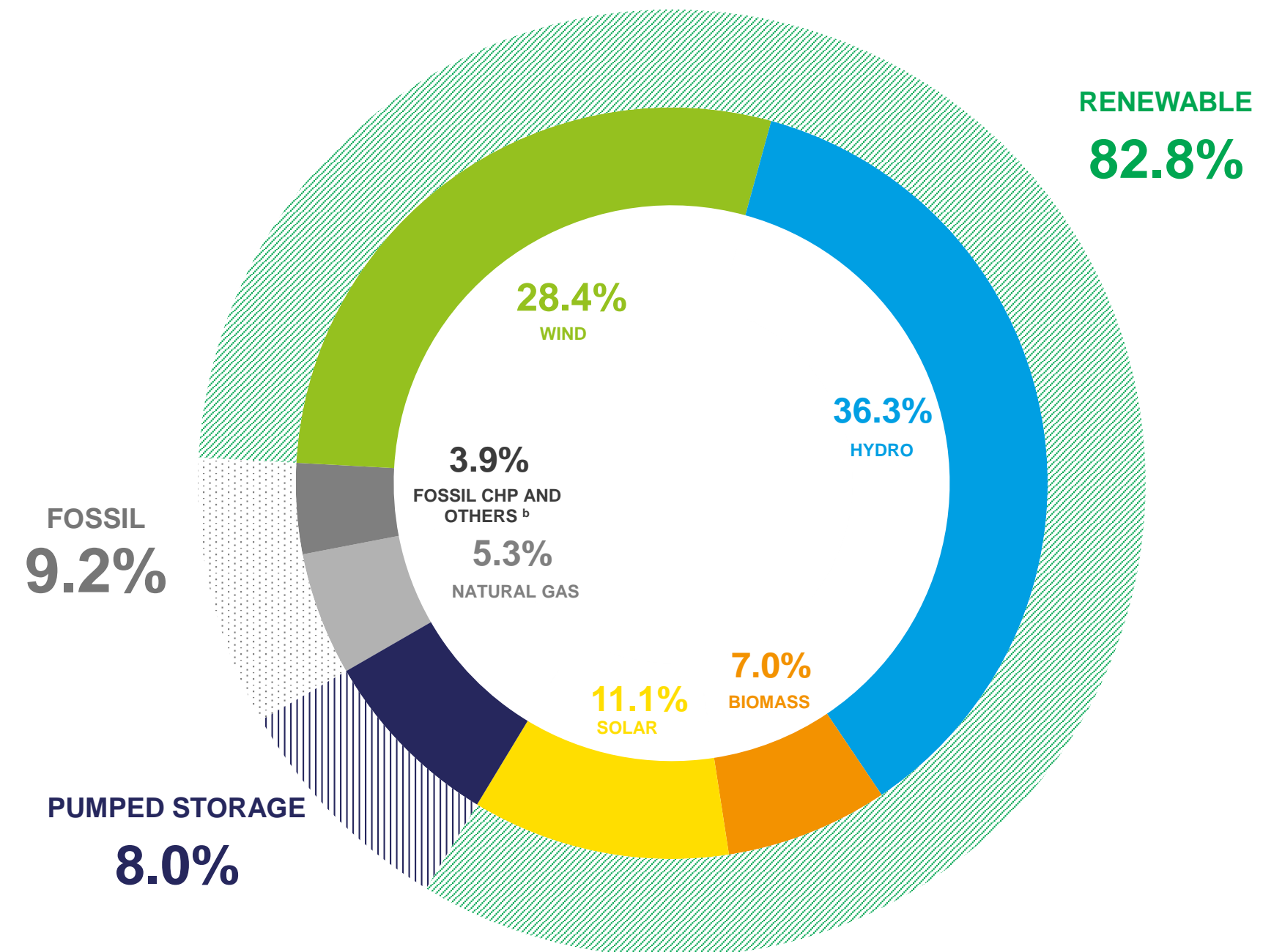
^a Generation refers to the net energy generation of the power stations, taking into account the pumping production recently disclosed by REN. Production from pumping is not included in the percentage of production from renewable sources
^b Includes fuel oil, diesel, the non-biodegradable fraction of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

EXECUTIVE SUMMARY

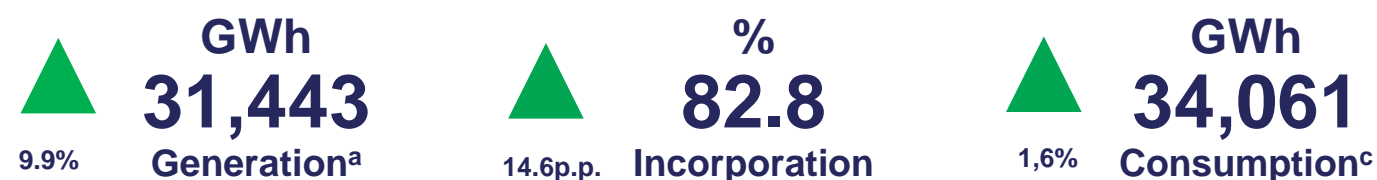
AUGUST ACCUMULATED GENERATION 2023



AUGUST ACCUMULATED GENERATION 2024



MAIN INDICATORS COMPARED TO AUGUST 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

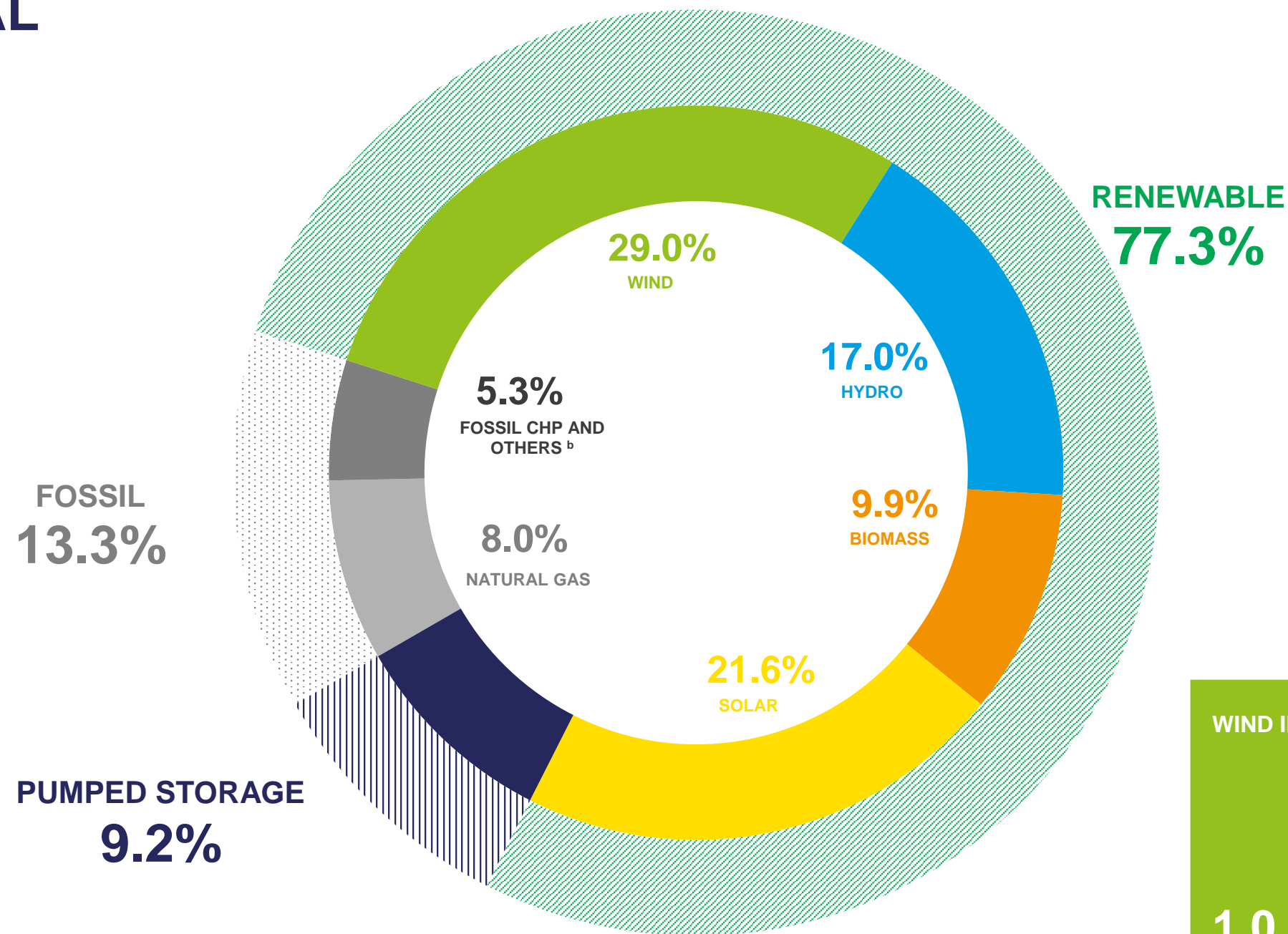
^b Includes fuel oil, diesel, the non-biodegradable fraction of MSW and new waste

^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 AUGUST

Between 1 and 31 August 2024, renewable incorporation was 77.3%, making up 2.307 GWh of the 2.985 GWh produced in the month under review.

The 6.0 % drop in generation compared to August 2023 is mainly due to an 18.0 p.p. reduction in fossil production using natural gas, with 817 GWh produced by this technology in August 2023 and 245 GWh in August 2024. In the renewable panorama, the contribution of hydroelectric and solar photovoltaic increased by 9.0 and 8.6 p.p. respectively, with production totaling 253 and 425 GWh in August 2023, compared to 496 and 644 GWh in August this year, respectively. In addition, imports remained high, totaling 36.0% of electricity consumption in August.



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

GWh
2,985
Generation^a

▼ **6.0%**

GWh
4,128
Consumption^c

▲ **0.6%**

%
77.3
Renewable incorporation

▲ **16.6 p.p.**

WIND INDEX

1.0

HYDRO INDEX

1.68

SOLAR INDEX

1.02

STORAGE IN DAMS

64.4%

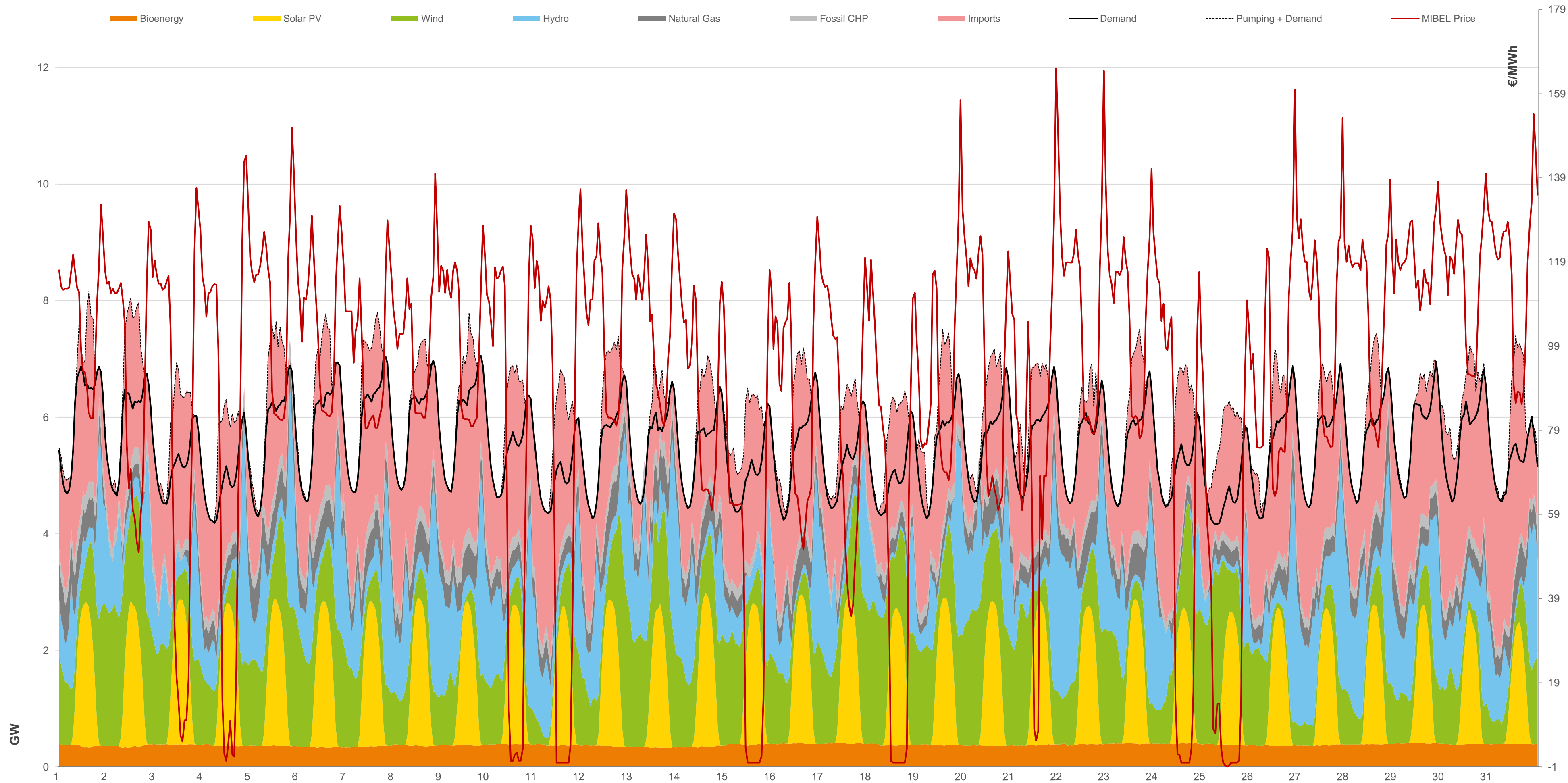
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^b Includes fuel oil, diesel, the non-biodegradable fraction of MSW and new waste

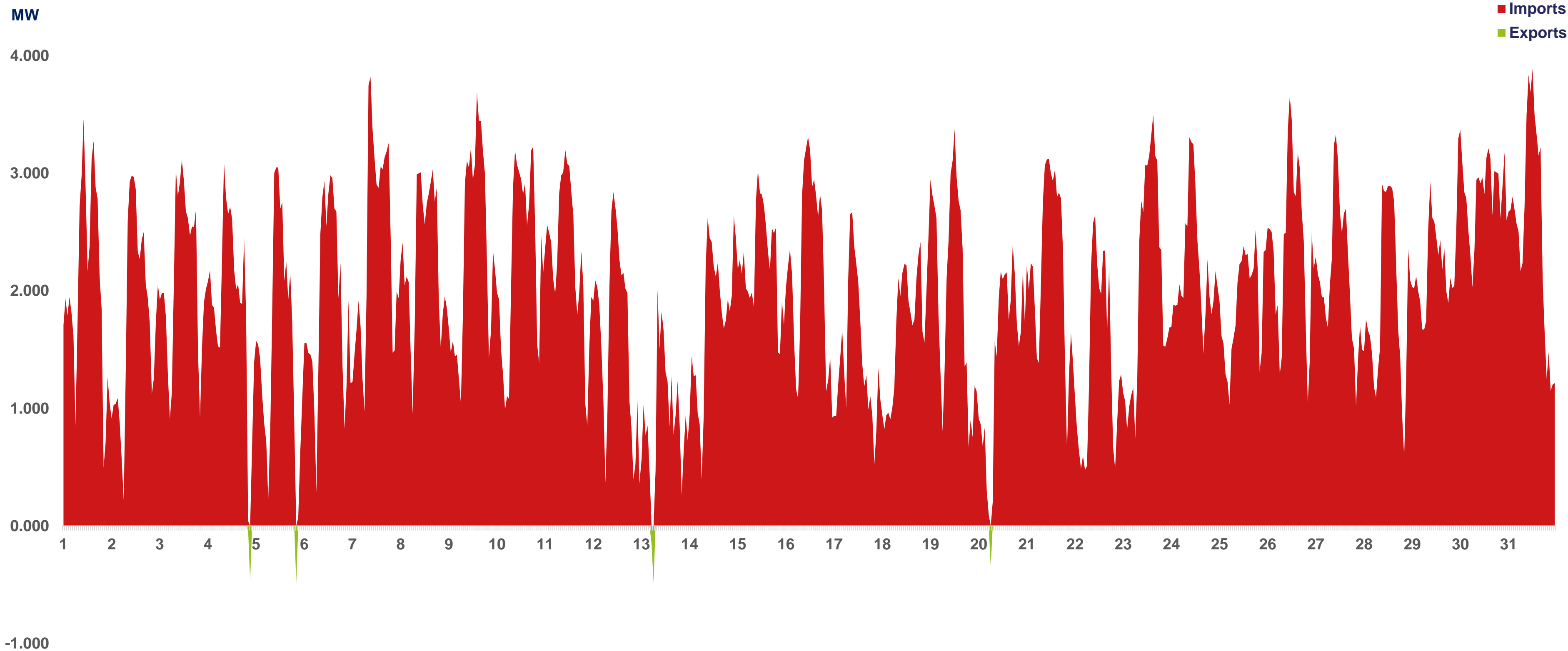
^c Consumption refers to the net generation of energy by power stations, taking into account the import-export balance.

Source: REN, APREN Analysis

MONTHLY ANALYSIS IN PORTUGAL: AUGUST 2024 LOAD DIAGRAM



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



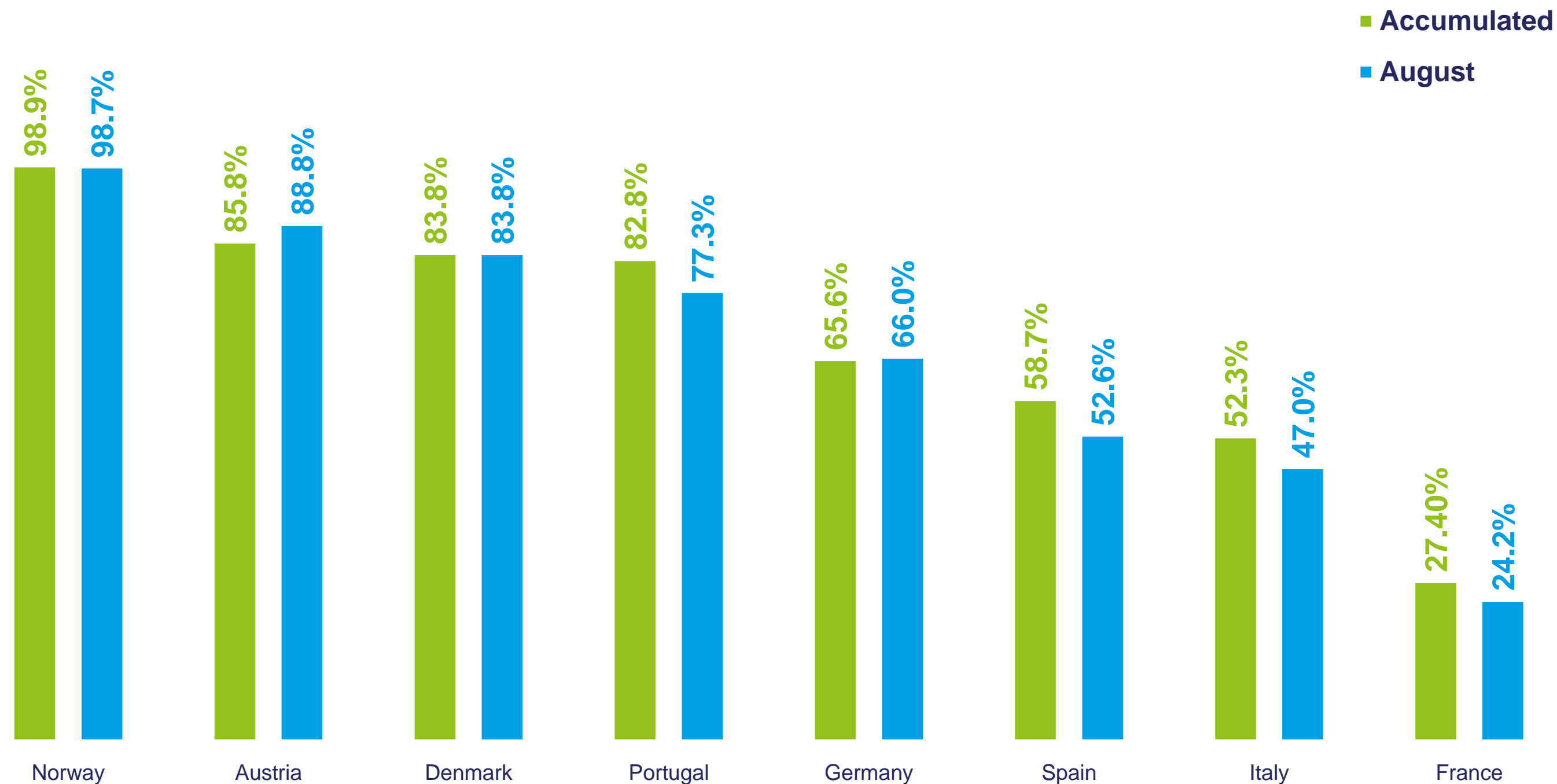
Source: REN, APREN Analysis

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 August 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 98.9%, 85.8% and 83.8%.

From 1 to 31 August, Portugal came forth in the countries considered with the highest renewable incorporation in Europe, having reached 77.3%.

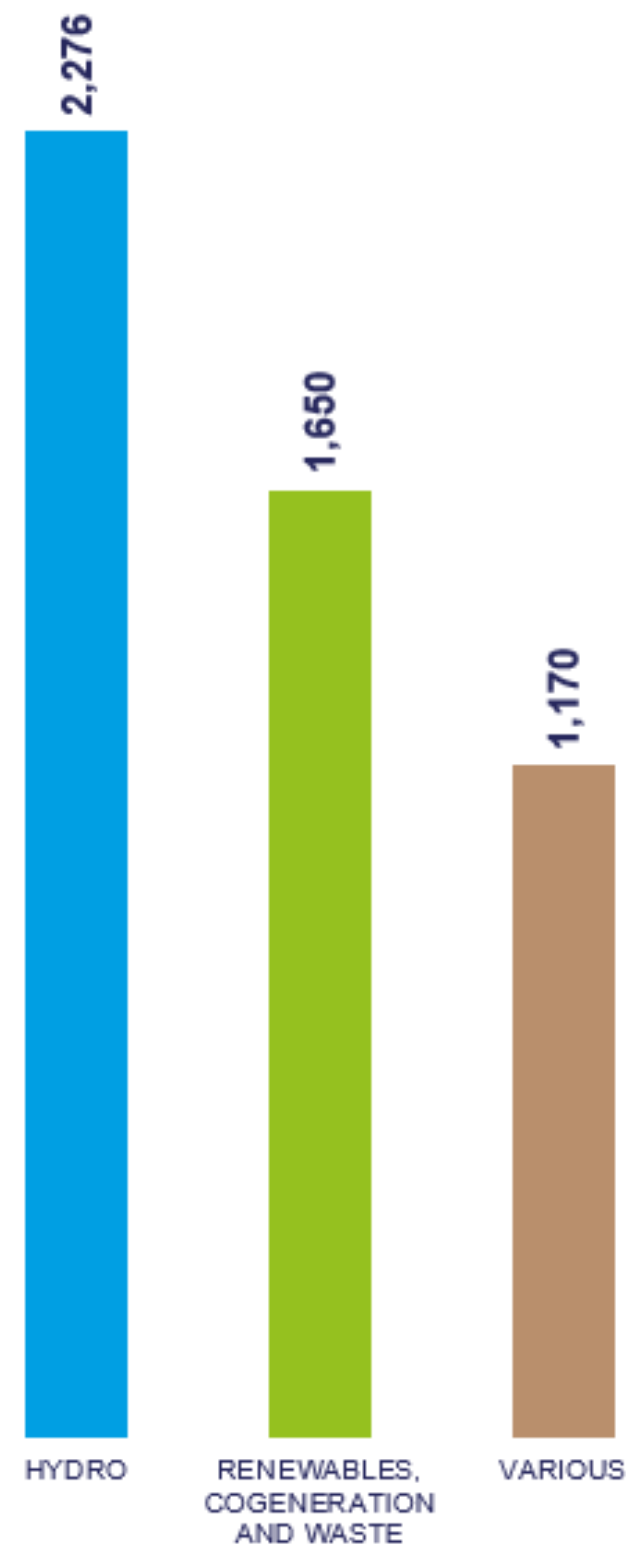


MARKET PRICE SETTING PORTUGAL

Between 1 January and 31 August, the closing technology that recorded the most hours was hydro, with 2,276 non-consecutive hours, followed by renewables, cogeneration and waste with 1,650 hours, and various technologies with 1,170 hours.

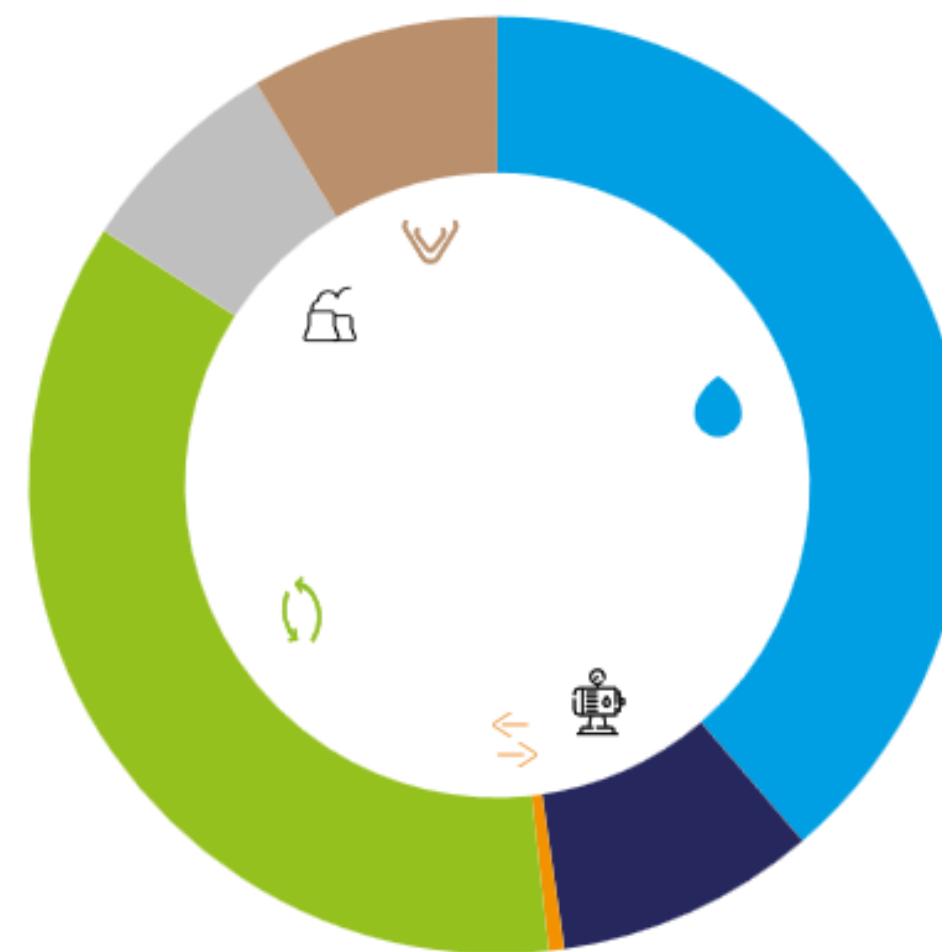


ACCUMULATED AUGUST 2024

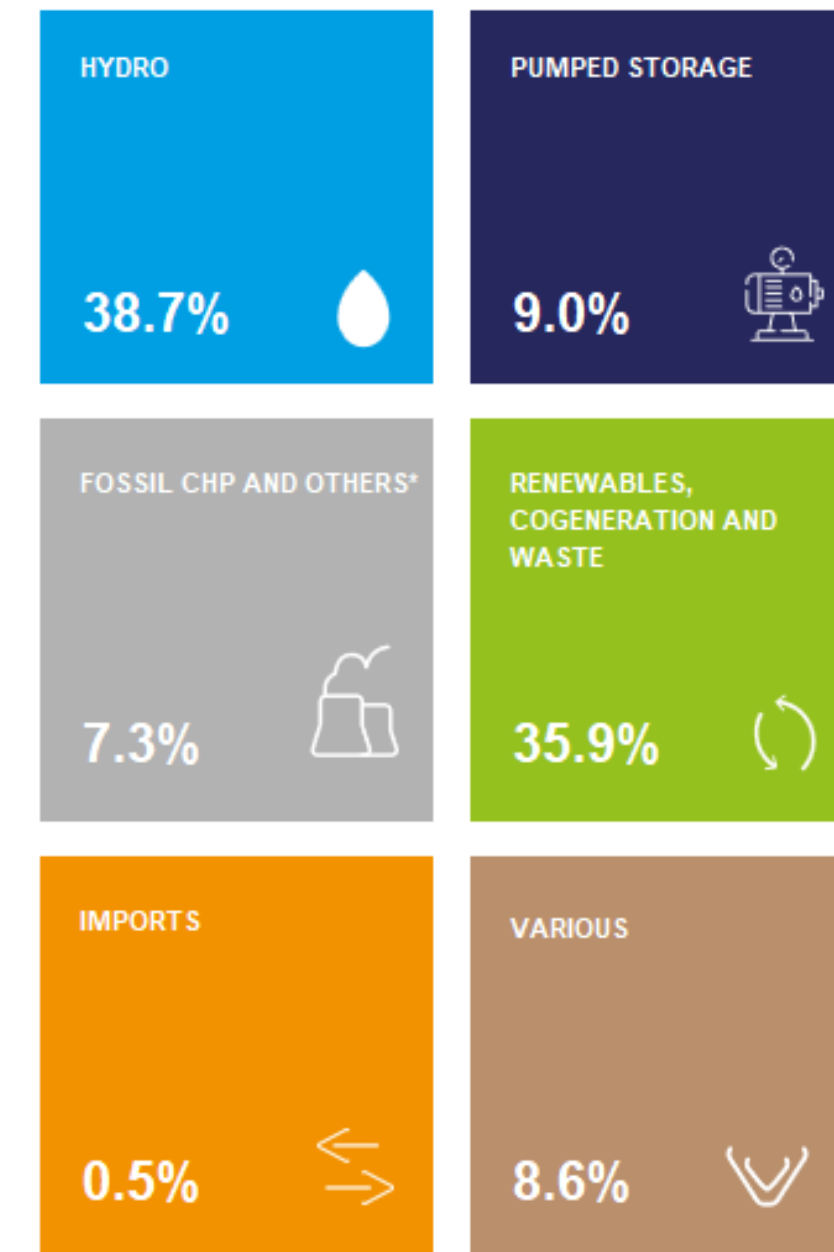


Number of market closing hours (accumulated) for the three main closing technologies (Aug).
Source: OMIE, APREN Analysis

AUGUST 2024



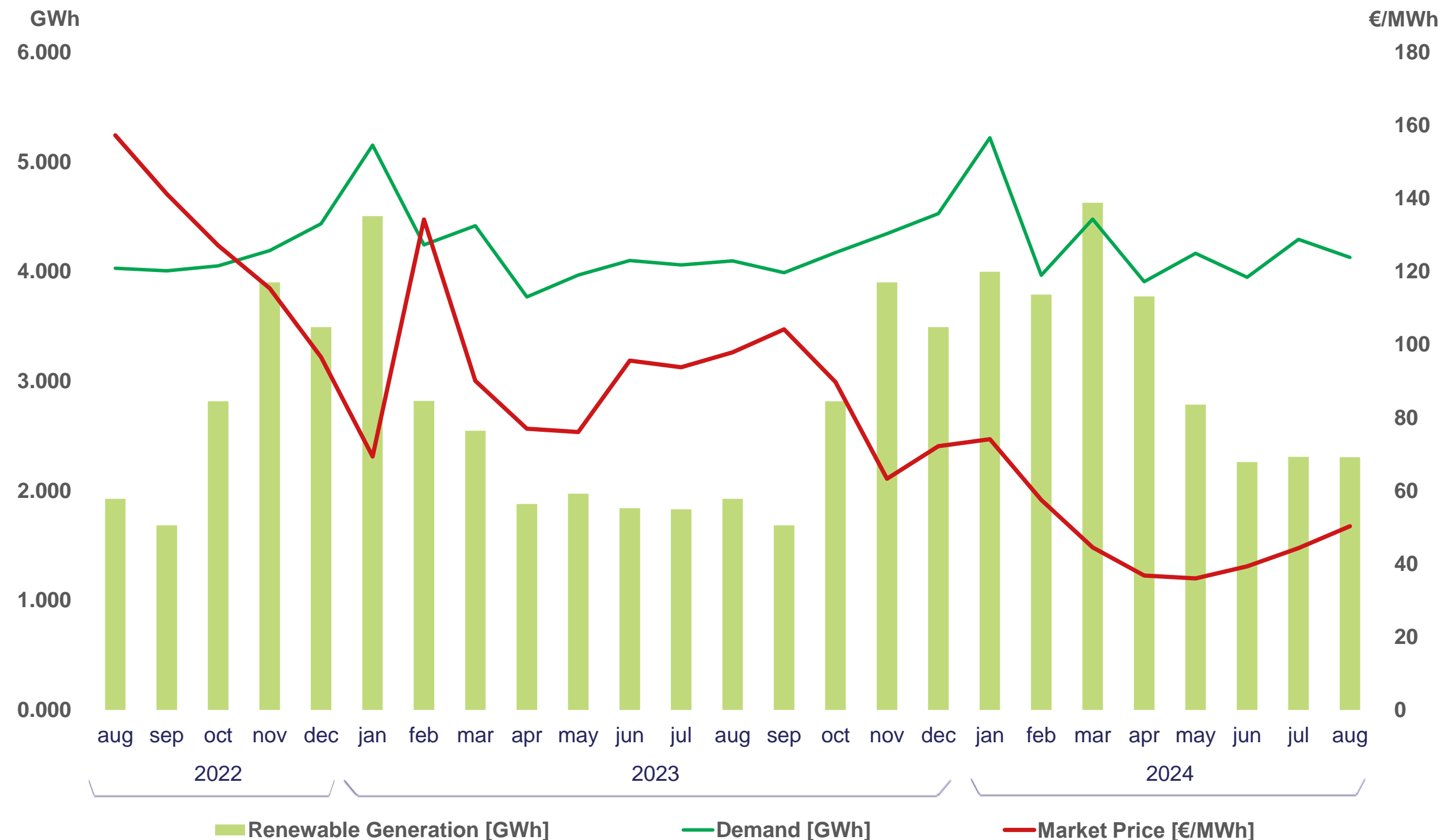
Percentage distribution of the number of hours of market closure for the various technologies, totaling 744 hours (Aug).
Source: OMIE, APREN Analysis



ELECTRICITY MARKET PORTUGAL

Between January 1 and August 31, the average hourly price recorded in MIBEL in Portugal (50.3 €/MWh^d) represents a 45% reduction compared to the same period last year. In the same period, there were 1,627 non-consecutive hours in which renewable generation was sufficient to supply mainland Portugal's electricity consumption, with an average hourly price in MIBEL of 30.7 €/MWh.

<p style="font-size: 24px; font-weight: bold;">1,627</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;">30.7</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;">0</p> <p>Hours</p> <p style="font-size: 12px; font-weight: bold;">100% RENEWABLE HOURS [AUGUST]</p>	<p style="font-size: 24px; font-weight: bold;">N/A</p> <p>€/MWh</p> <p style="font-size: 10px; font-weight: bold;">MIBEL'S AVERAGE PRICE (IN 100% RENEWABLE HOURS) [AUGUST]</p>



^d arithmetic average of MIBEL prices.
Source: OMIE

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

RENEWABLE ELECTRICITY EUROPE

During the month of August 2024, there was a minimum hourly price in MIBEL in Portugal of -0.95 €/MWh, where the market was cleared by renewables, cogeneration and waste. The maximum hourly price was 165.01 €/MWh, where the market was closed by hydro.

MINIMUM PRICES (AUG)

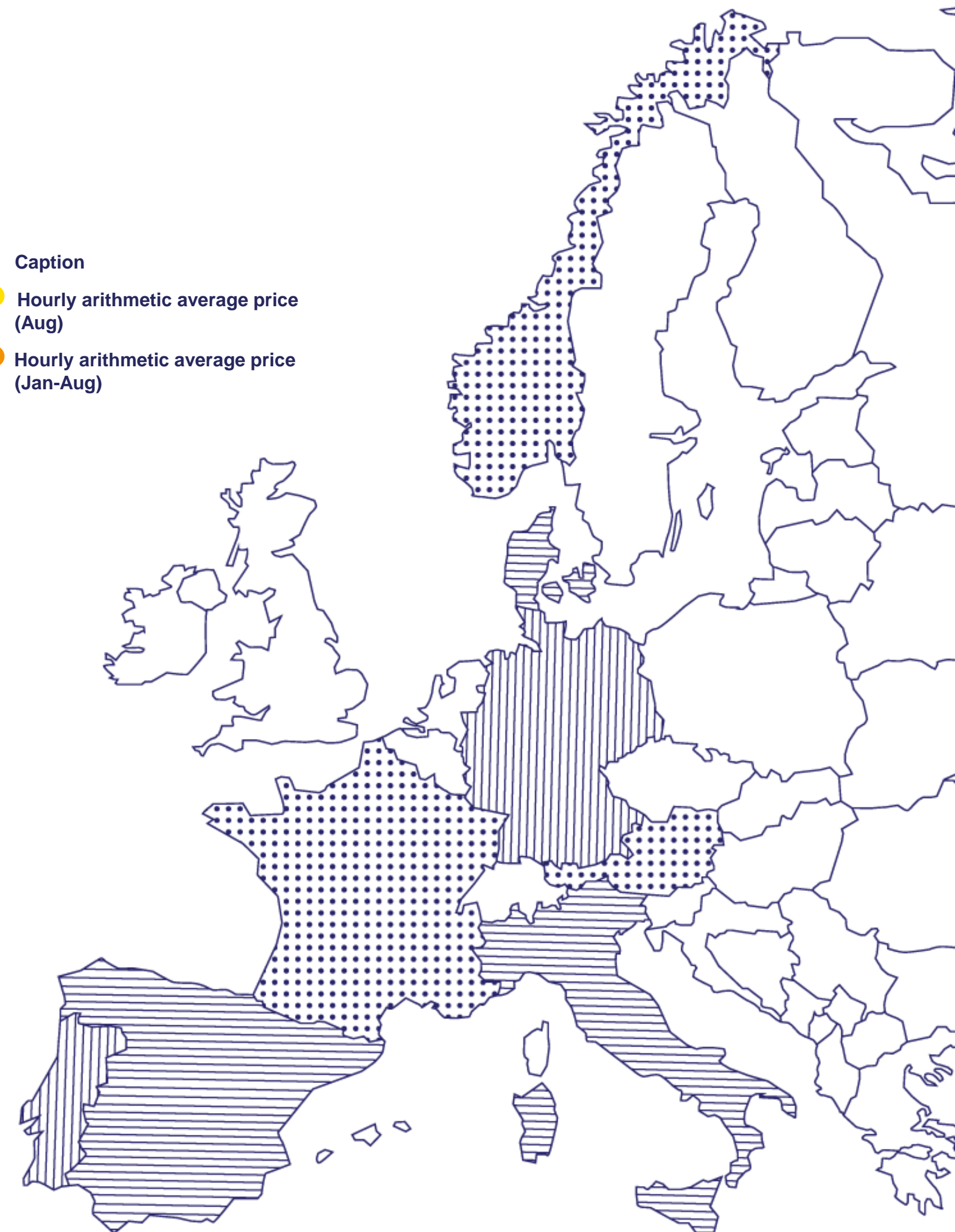
1 ^o Denmark Germany	€/MWh -59.96
2 ^o France	€/MWh -59.67
3 ^o Austria	€/MWh -57.88

MAXIMUM PRICES (AUG)

1 ^o Germany	€/MWh 289.27
2 ^o Austria	€/MWh 283.88
3 ^o Italy	€/MWh 249.86

Portugal €/MWh	91.1	50.3
Spain €/MWh	91.1	49.9
France €/MWh	54.6	47.9
Italy €/MWh	124.5	99.1
Germany €/MWh	82.0	68.8
Austria €/MWh	85.1	68.8
Denmark €/MWh	72.8	64.2
Norway €/MWh	16.8	40.7

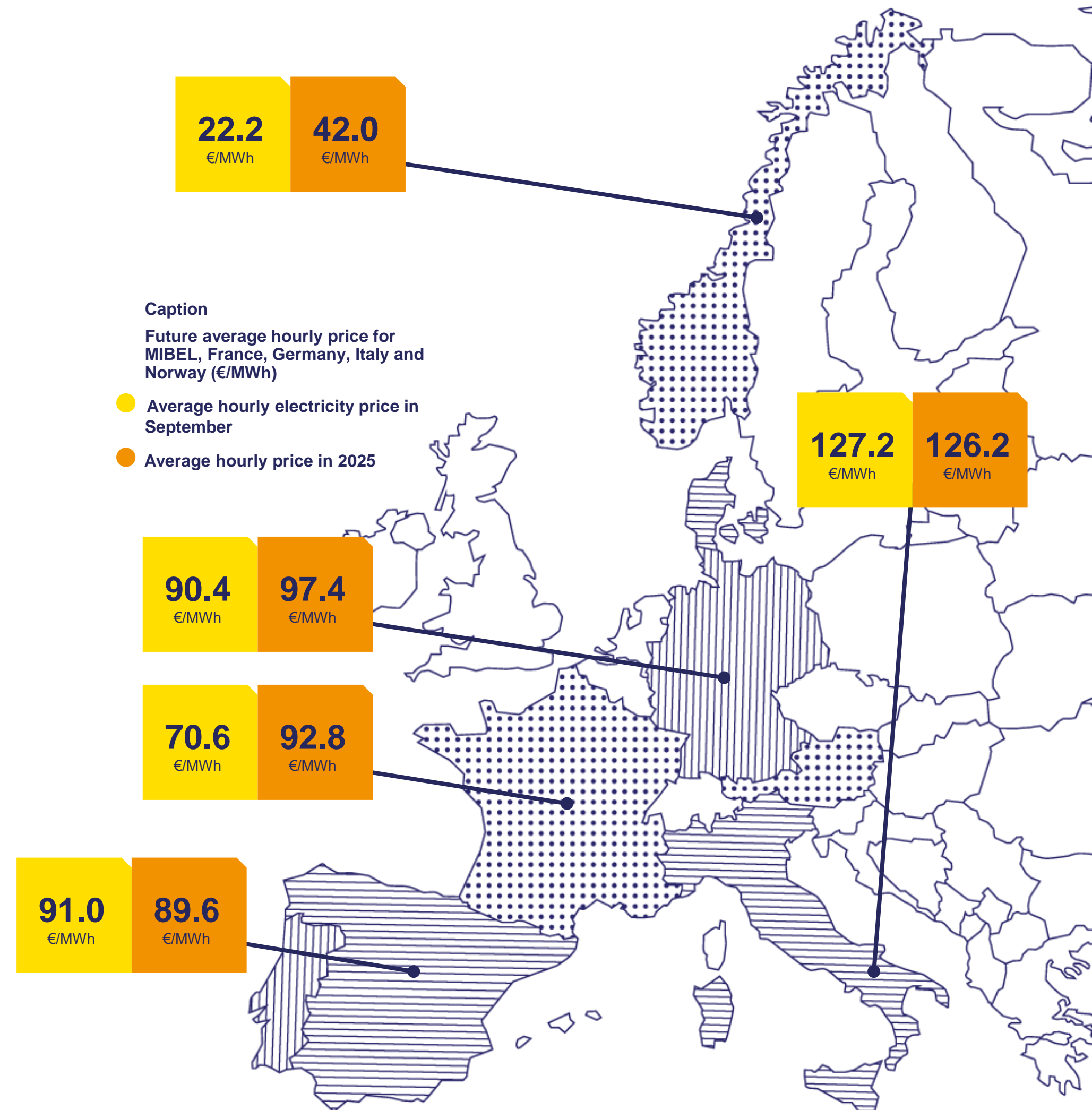
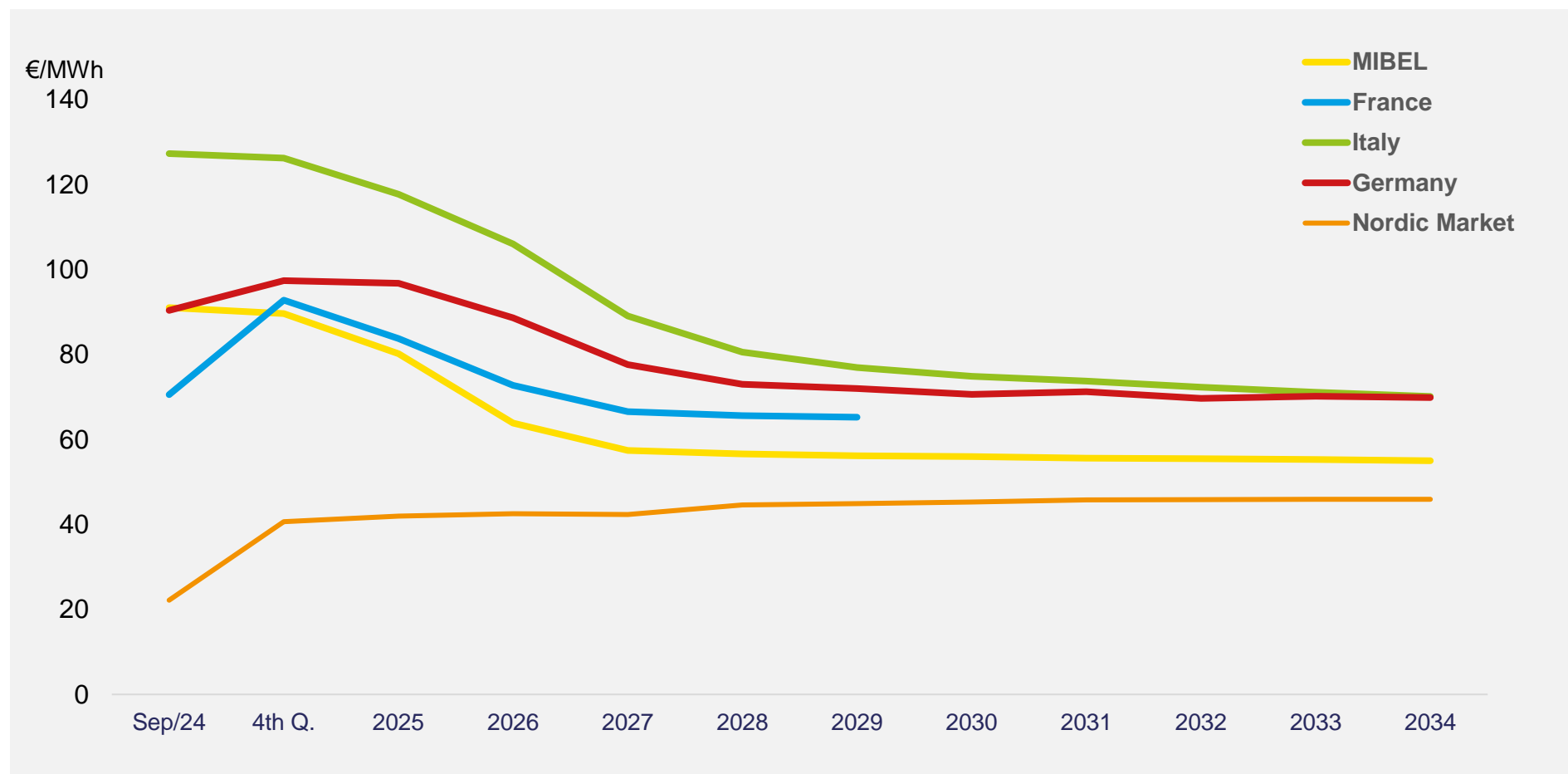
Caption
 ● Hourly arithmetic average price (Aug)
 ● Hourly arithmetic average price (Jan-Aug)



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 (September) and next year. In both cases, MIBEL and the Nordic Market present the lowest figures, whereas the Italian market presents the highest figures amongst the markets analyzed.

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



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

- Average hourly electricity price in September
- Average hourly price in 2025

^eValues updated as of 4th September.
 Source: OMIP, EEX, APREN Analysis

INTERNATIONAL EXCHANGES EUROPE

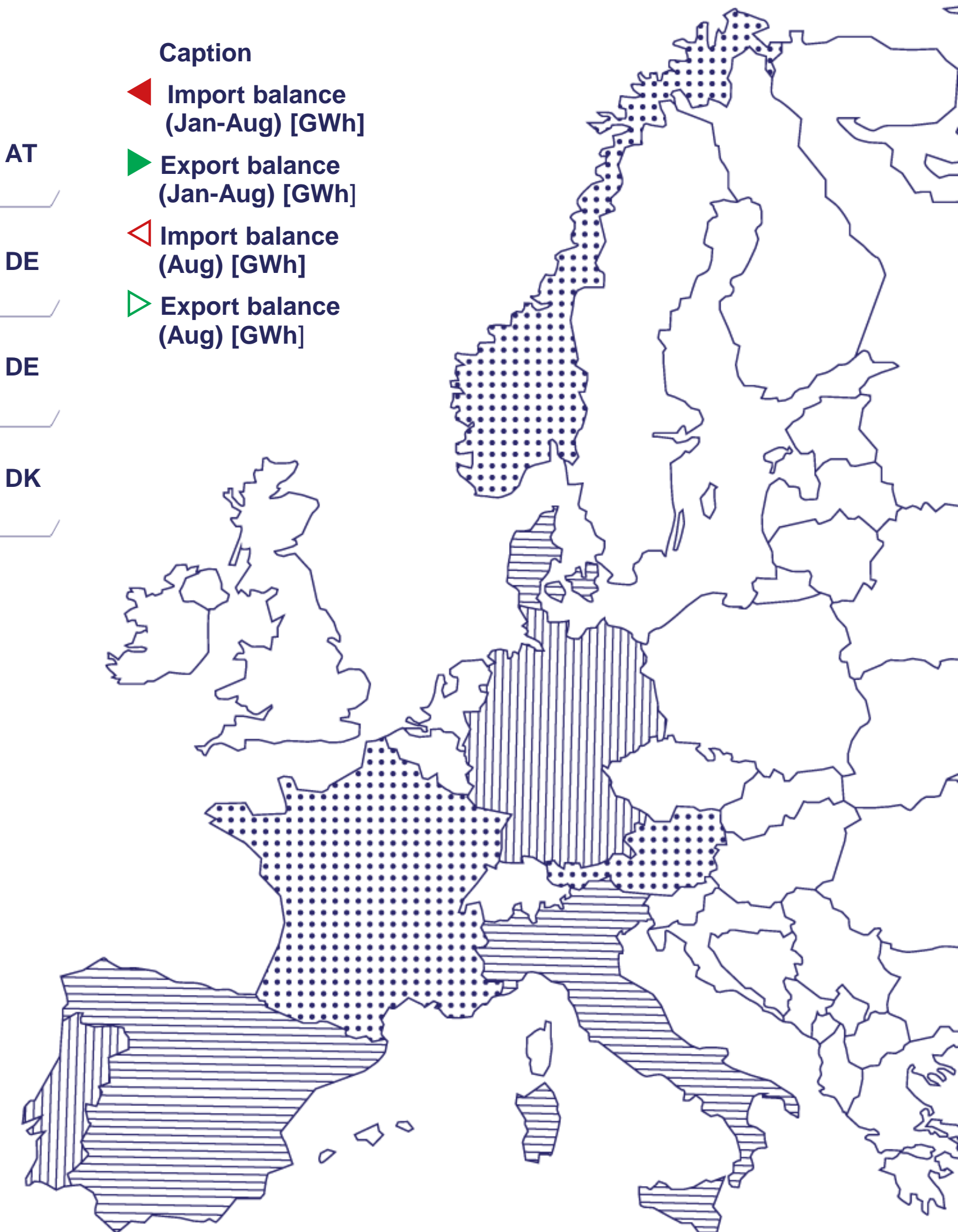
Between 1 January and 31 August 2024, mainland Portugal's electricity system registered electricity imports equivalent to 9,325 GWh and exports of 3,599 GWh, with Portugal being an importer with a balance of 5,726 GWh.

PT	5,756	1,490	ES	DE	748	301	AT
ES	1,729	279	MA	DK	4,285	1,014	DE
FR	2,429	16	ES	NO	3,551	613	DE
IT	13,222	1,804	FR	NO	3,517	790	DK
DE	12,252	1,969	FR				

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

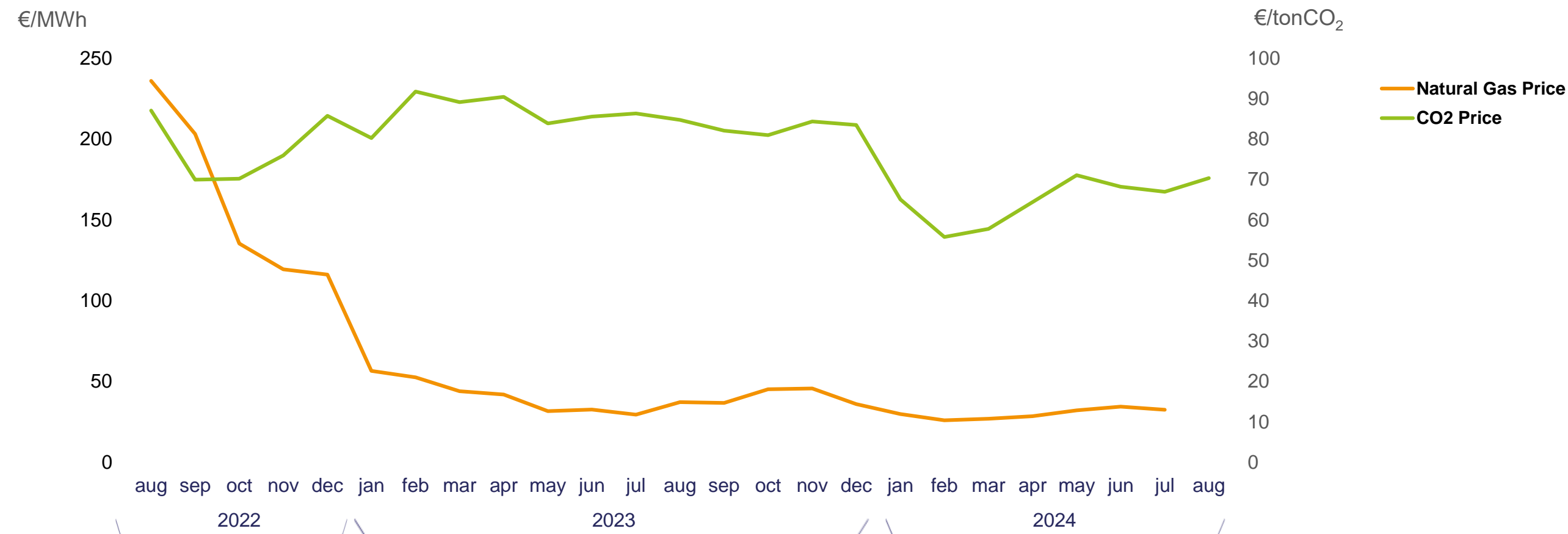
MAIN INDICATORS FOR PT-ES INTERCONNECTION

usage	0.1% (Aug) PT-ES	12.2% (Jan-Aug)	53.3% (Aug) ES-PT	37.7% (Jan-Aug)
congestion	0.0% (Aug) PT-ES	1.8% (Jan-Aug)	1.3% (Aug) ES-PT	5.7% (Jan-Aug)
market separation	9.4% (Aug) PT-ES	7.8% (Jan-Aug)	75.1% (Aug) MIBEL-FR	67.5% (Jan-Aug)



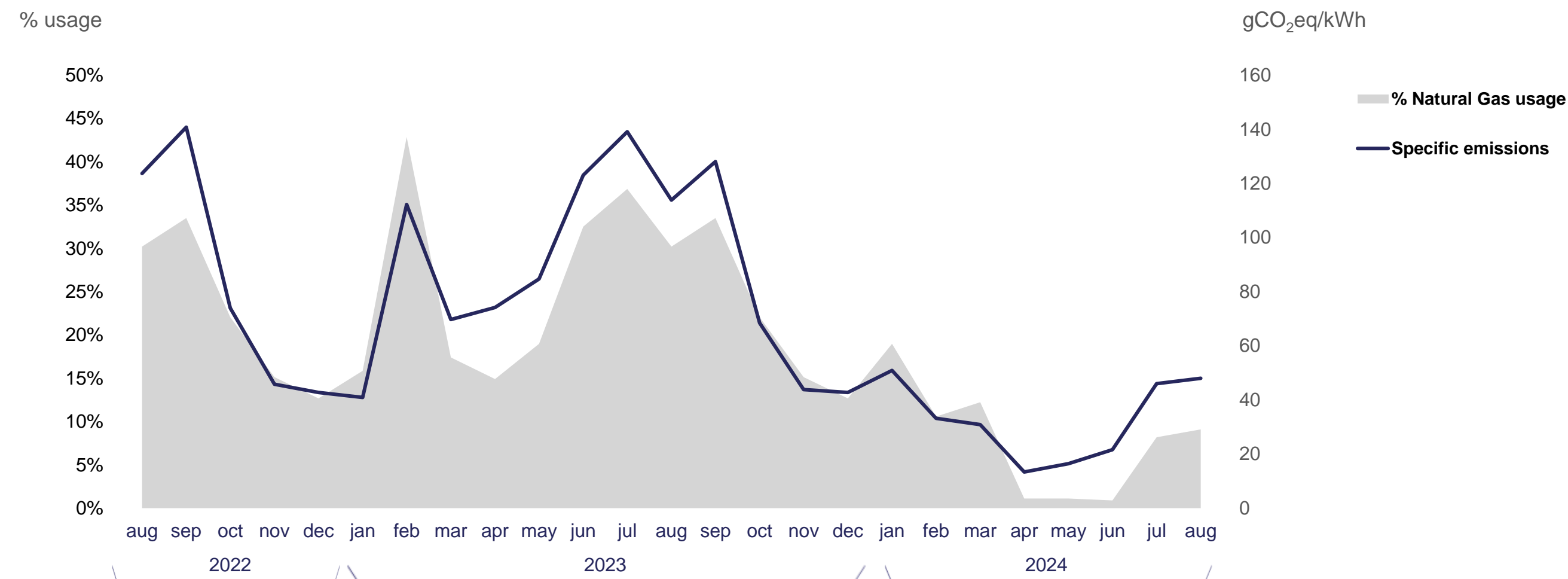
POWER PRODUCTION EMISSIONS

Between 1 January and 31 August 2024, the specific emissions reached the value of 32.4 gCO₂eq/kWh, corresponding to a total of 1.02 MtCO₂eq of emissions from the electricity generation sector. The European CO₂ Emissions Trading Scheme (ETS) recorded a price of 65.0 €/tCO₂^d, a reduction of 25% compared to the same period in 2023.



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

<p>1.02 MtCO₂eq</p> <p>SECTOR'S EMISSIONS</p>	<p>65.0 €/tCO₂</p> <p>AVERAGE PRICE OF LICENCES</p>
<p>60.7 %</p> <p>COMPARED TO AUGUST 2023 [ACCUMULATED]</p>	<p>25.0 %</p> <p>COMPARED TO AUGUST 2023 [ACCUMULATED]</p>



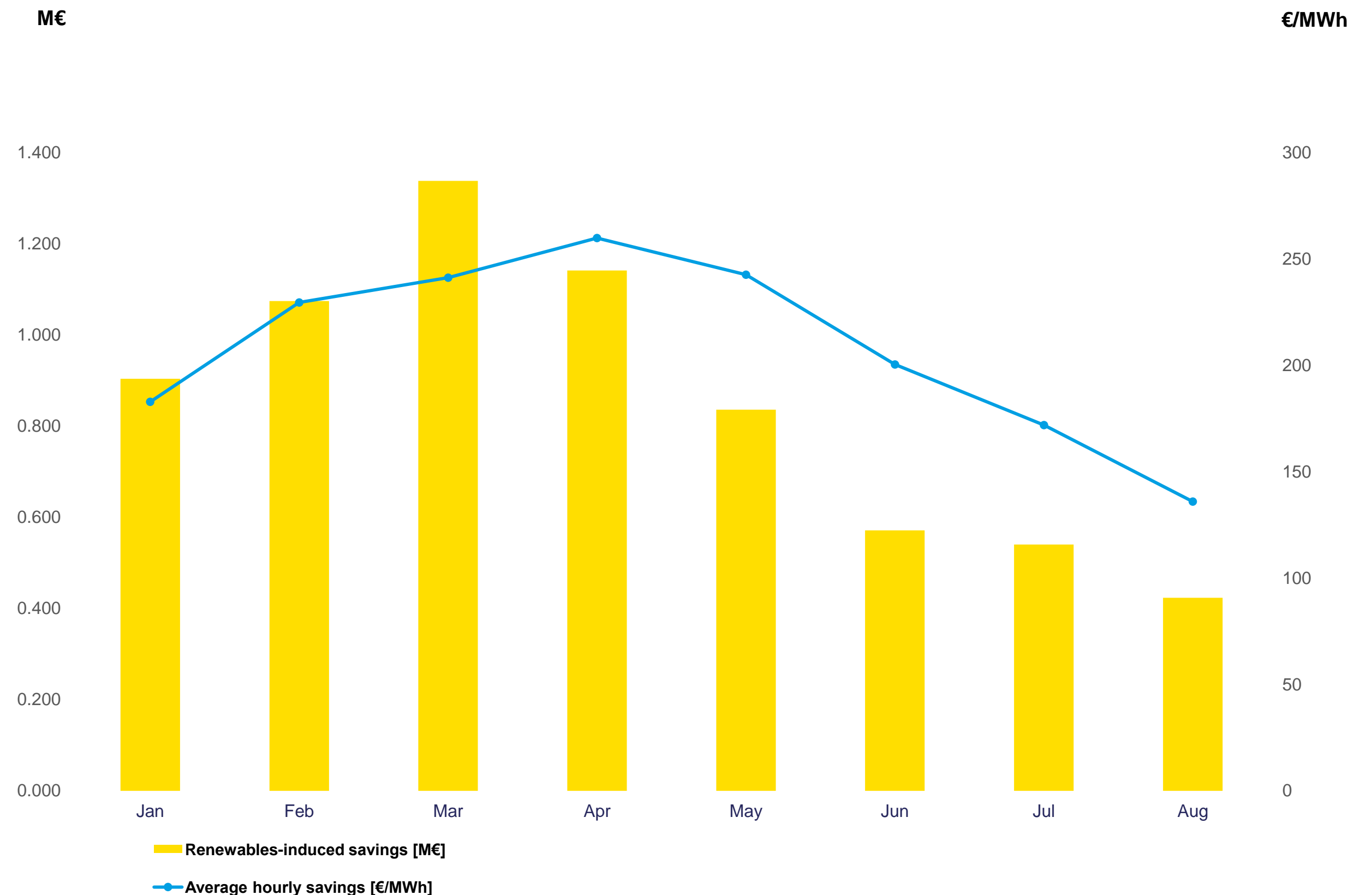
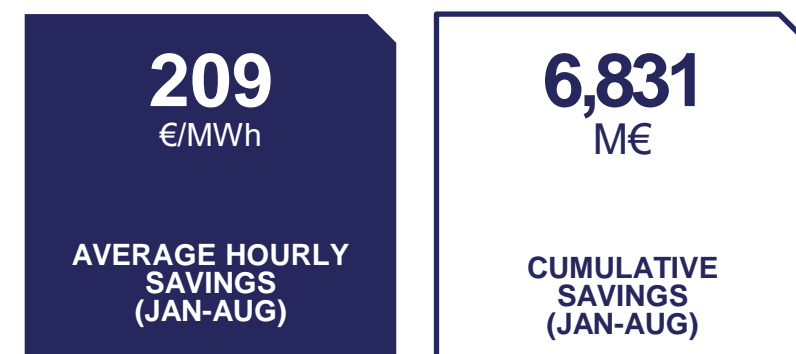
Specific emissions from the electricity sector in mainland Portugal, % use of coal and natural gas power stations (Aug-2022 to Aug-2024).
Source: REN, DGEG, ERSE, APREN Analysis

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

SIMULATION OF PRICE FORMATION WITHOUT SRP

RENEWABLES AVOIDED:

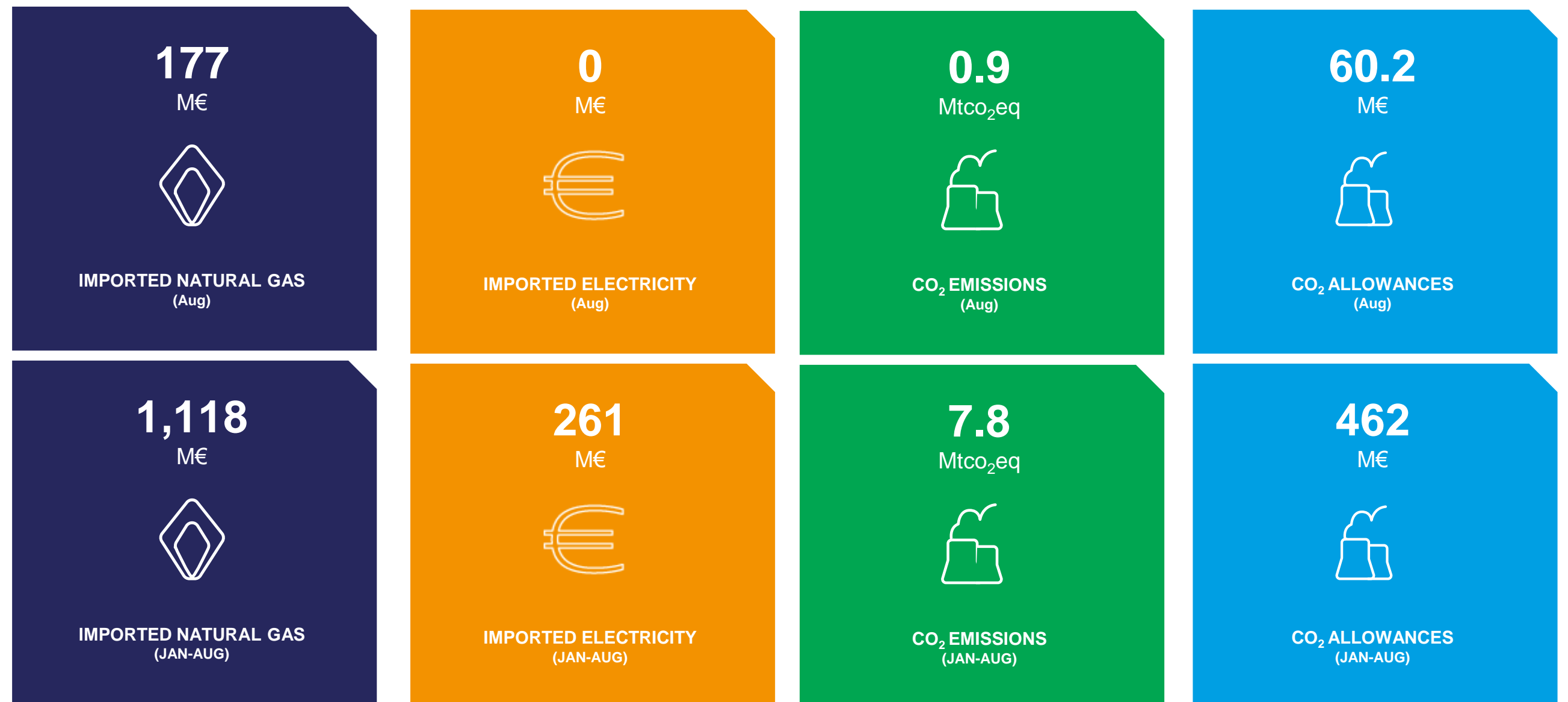
The indicators below show the savings achieved by the merit order between January 1 and August 31 of 2024 by the contribution of special regime production (PRE). This study is carried out for PRE, which includes all installed fossil cogeneration power. Bearing in mind that the capacity equivalent to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



ENVIRONMENTAL SERVICE

RENEWABLES AVOIDED:

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



Source: OMIE, APREN Analysis.

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