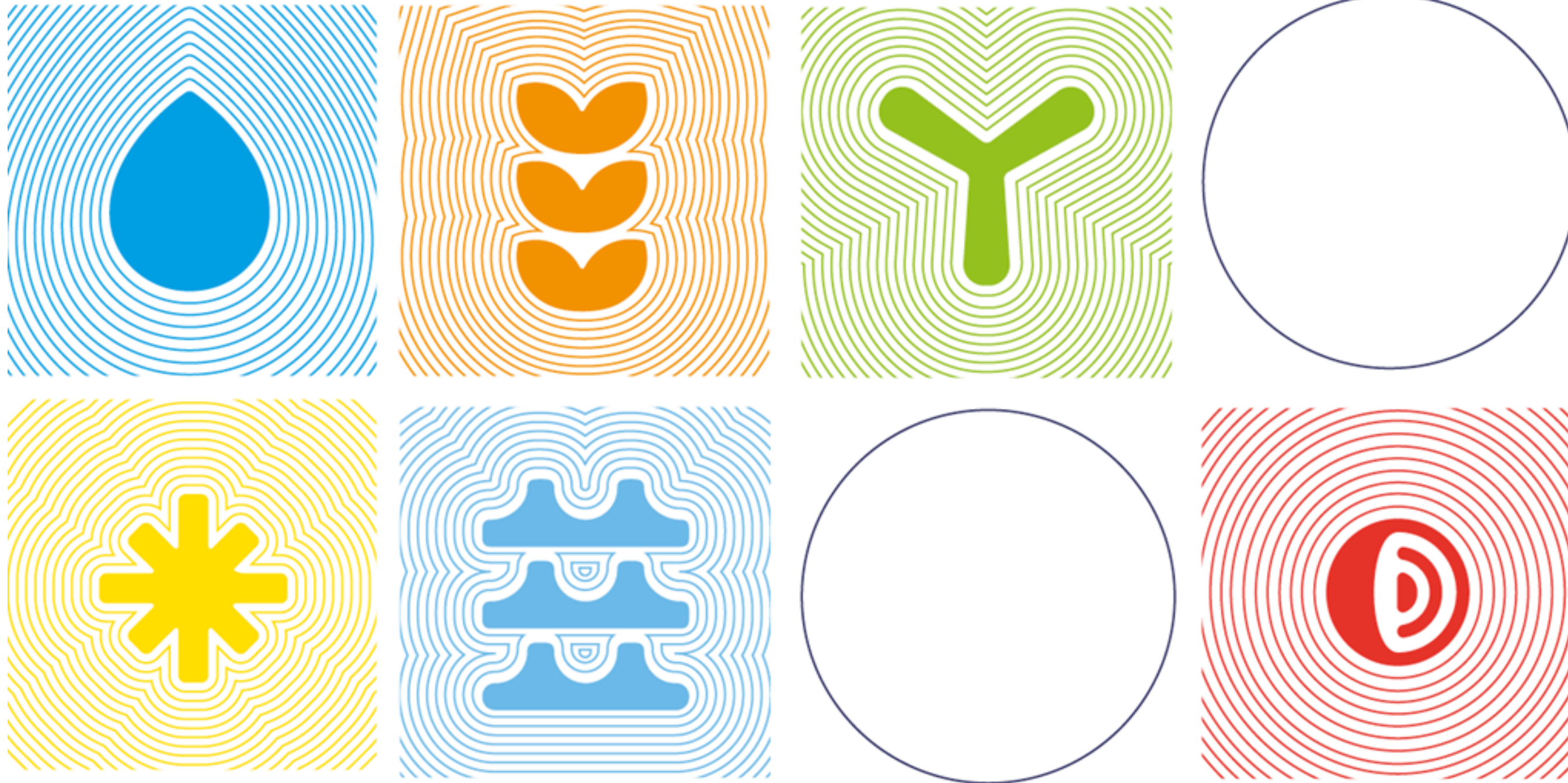


**Renewable Electricity Bulletin
June 2023**

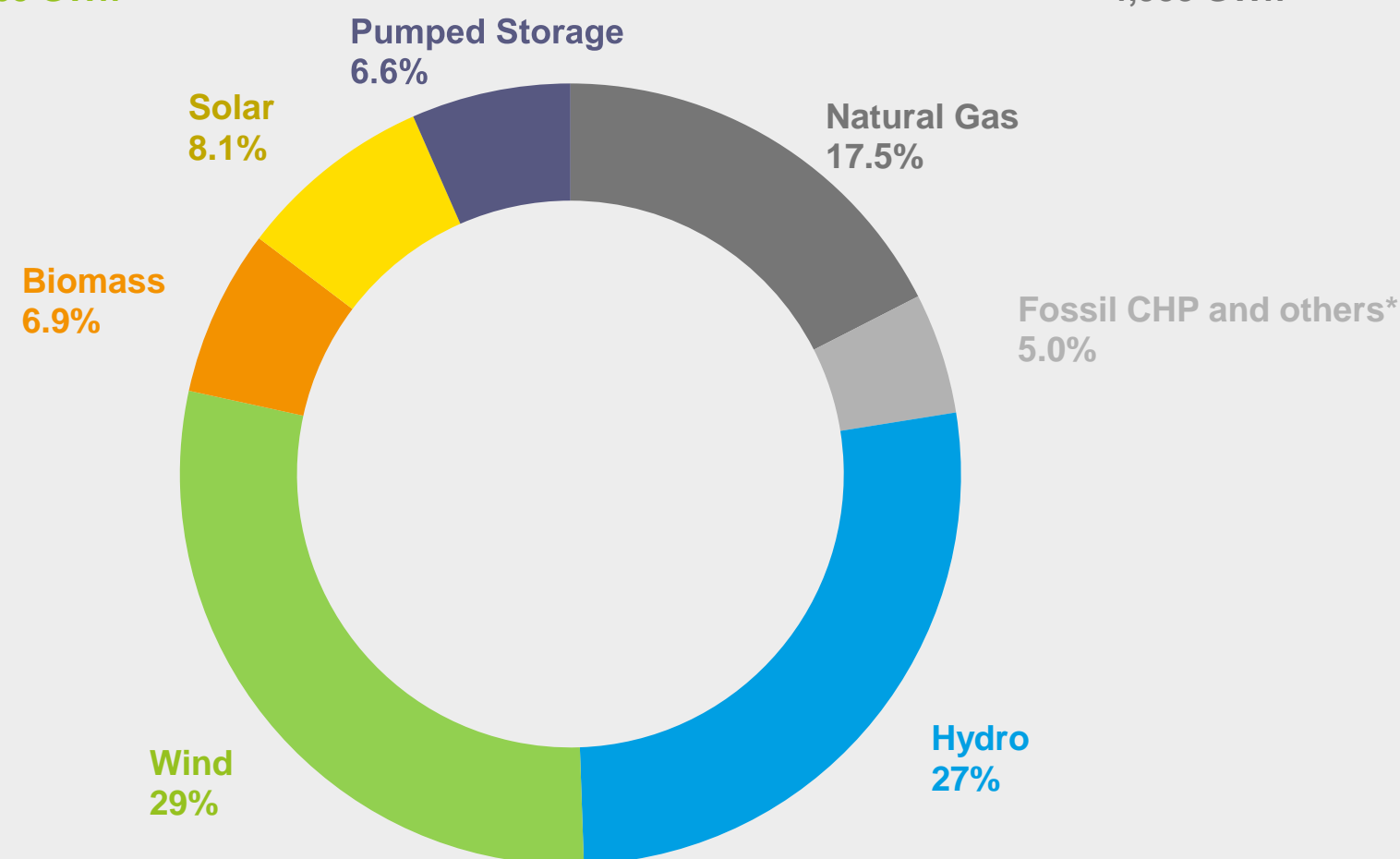


2023

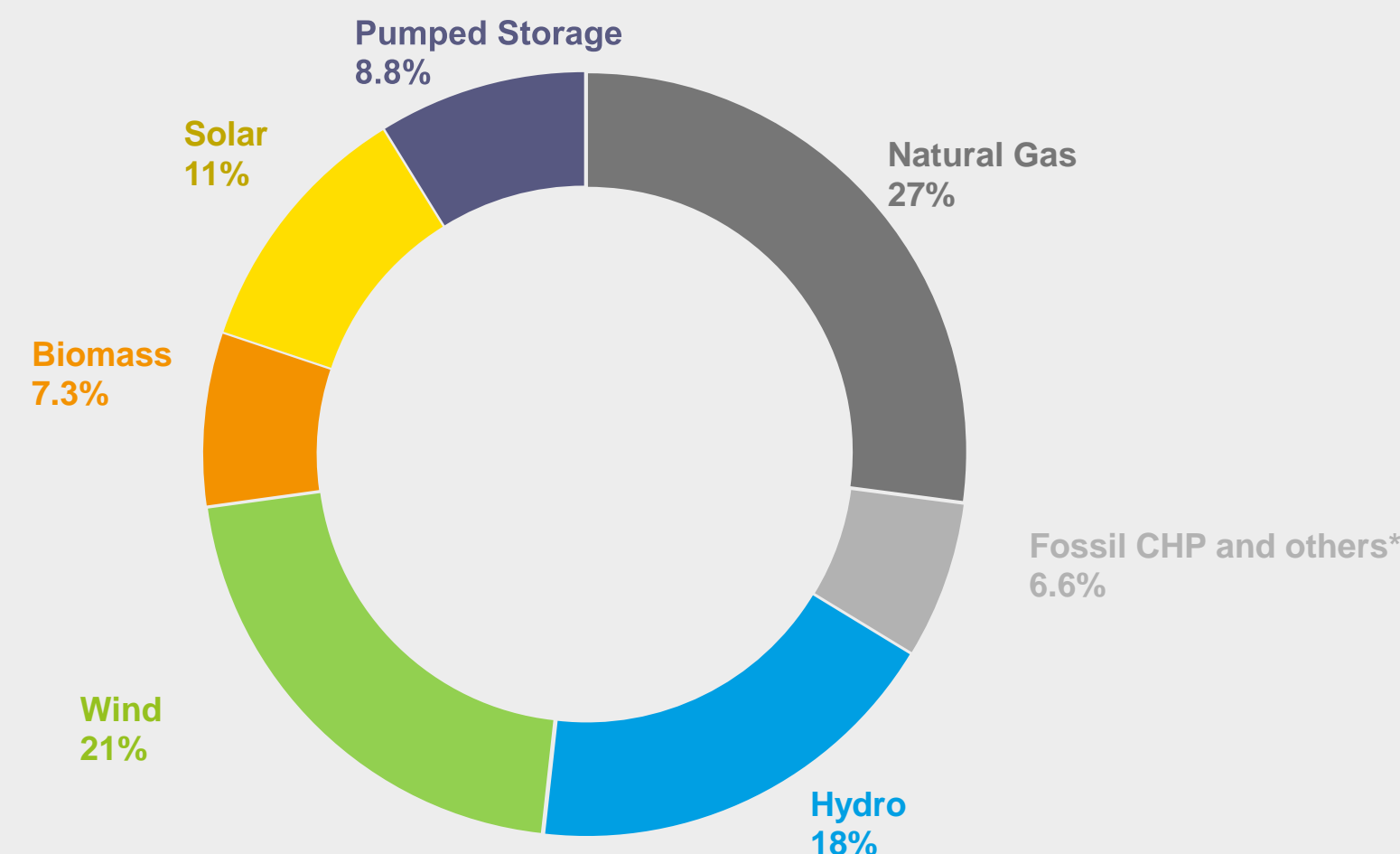
**PORTUGAL NEEDS
OUR ENERGY**

Executive Summary

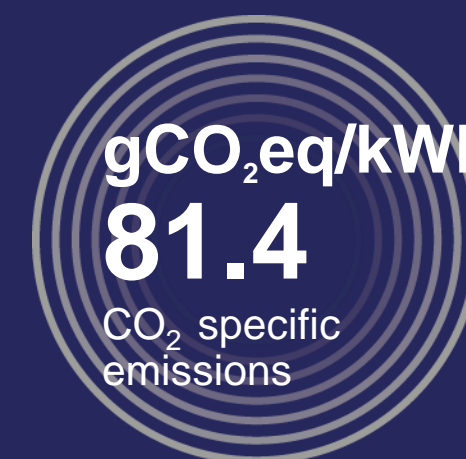
Accumulated Generation (Jan-Jun)



Monthly Generation (Jun)



Electricity sector indicators (Jan-Jun)

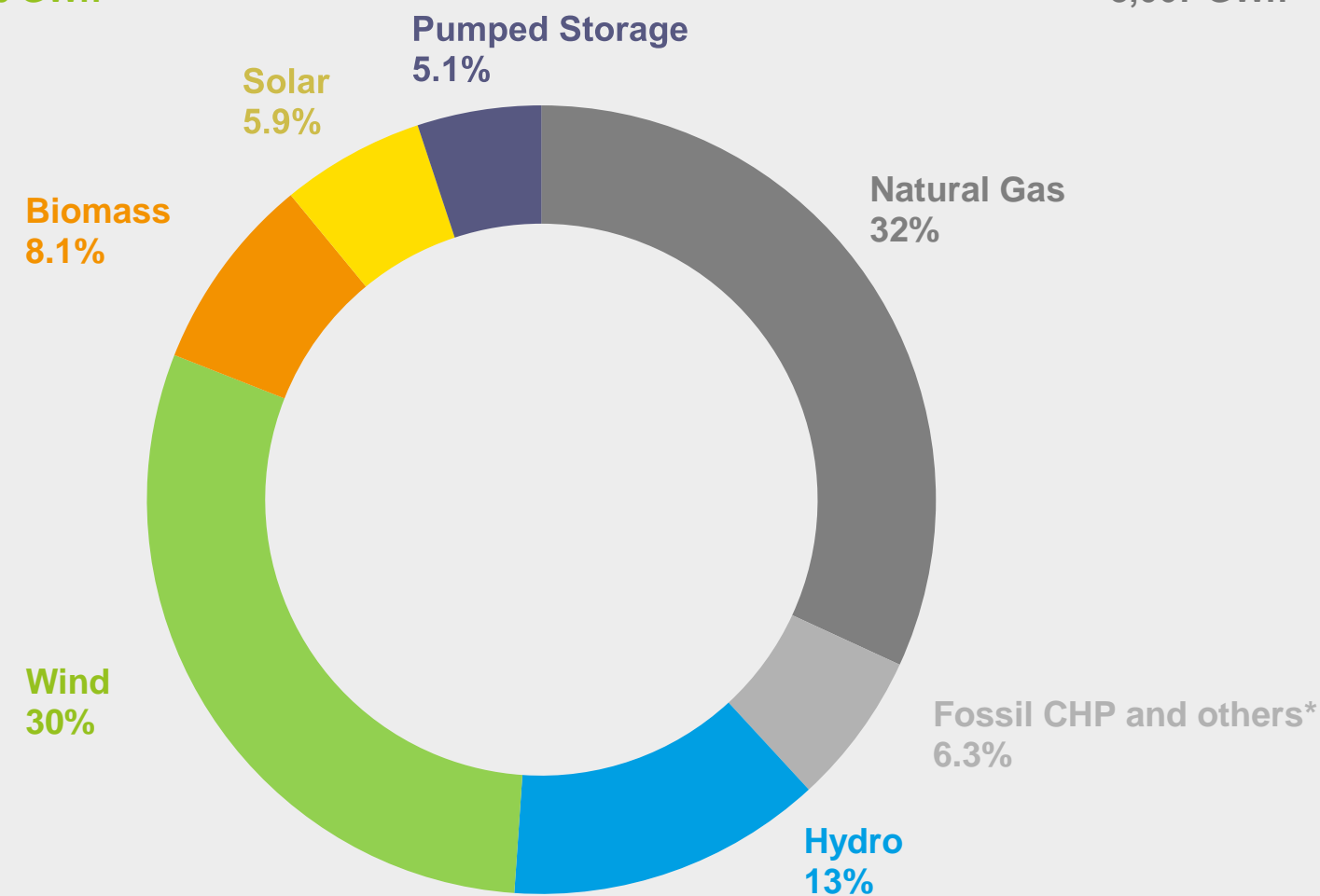
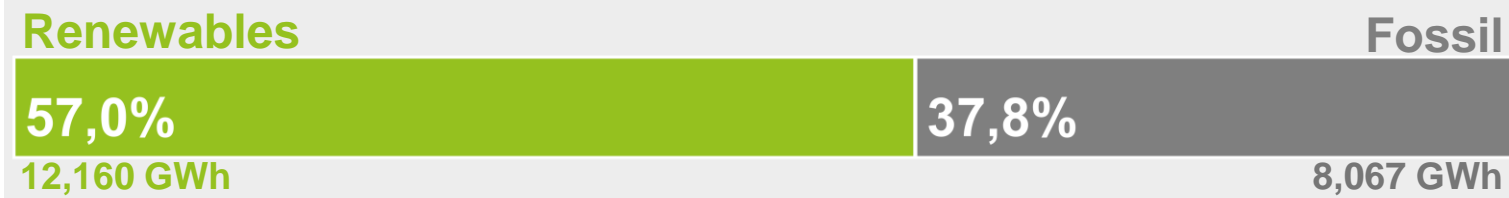


^aGeneration refers to the net power generation of the power plants, considering the production by pumping recently disclosed by REN. Pumping production is not accounted for in the percentage of production from renewable sources. Source: REN; Analysis APREN.

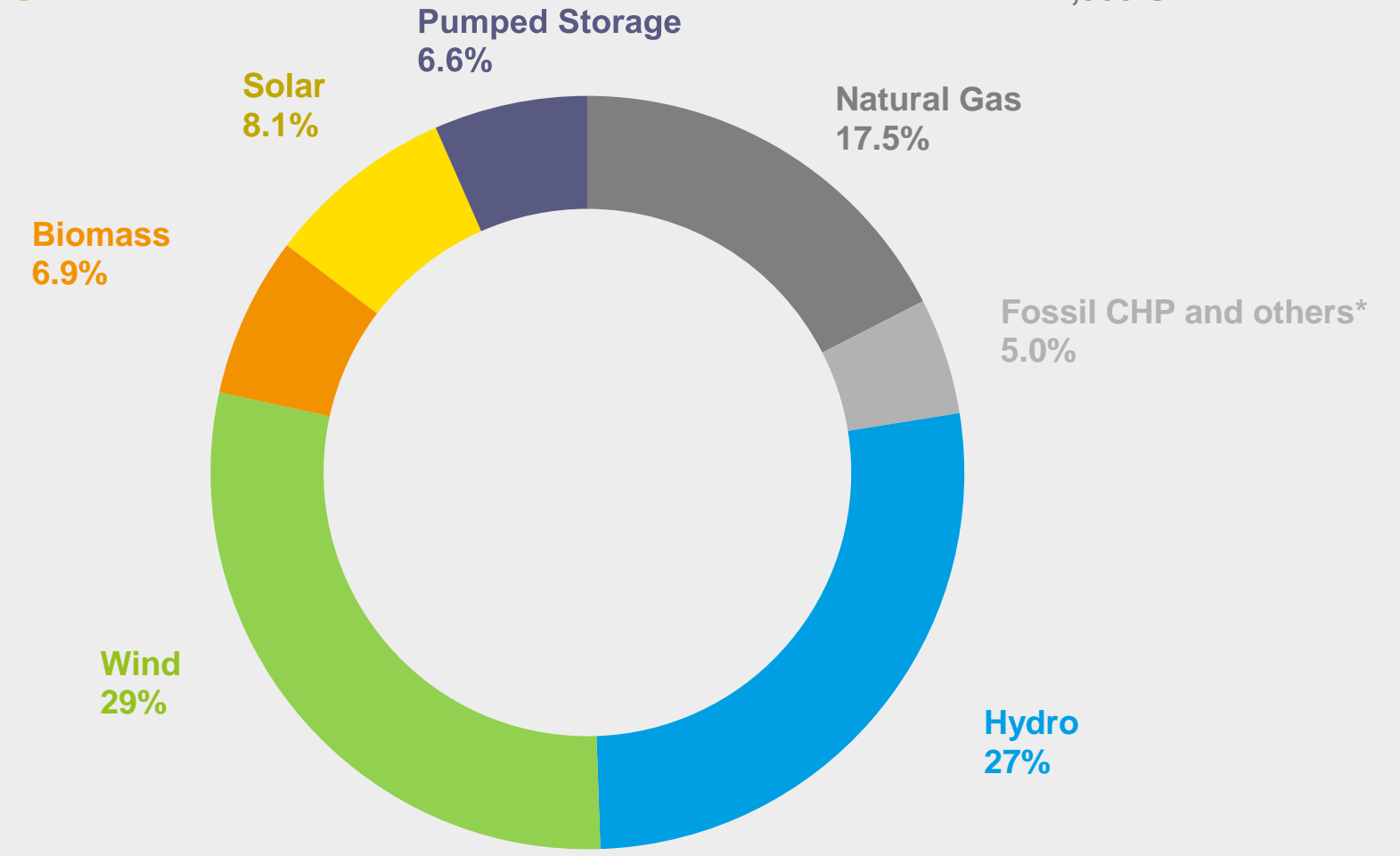
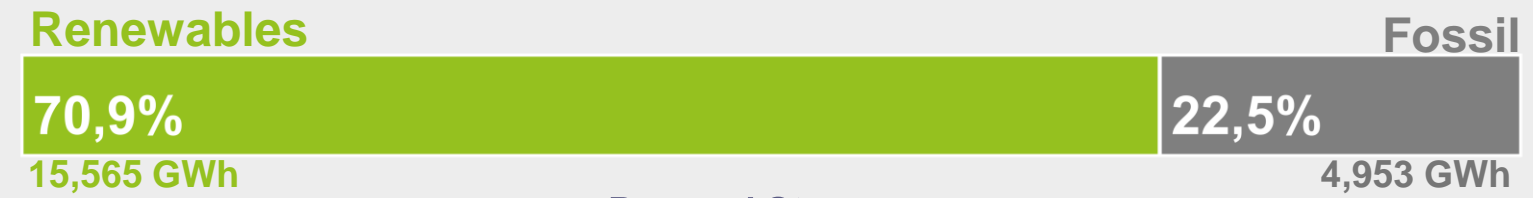
* Includes fuel oil, diesel, the non-biodegradable fraction of urban solid waste and other waste.

Executive Summary

Accumulated June 2022 (Jan-Jun)



Accumulated June 2023 (Jan-Jun)



Main indicators

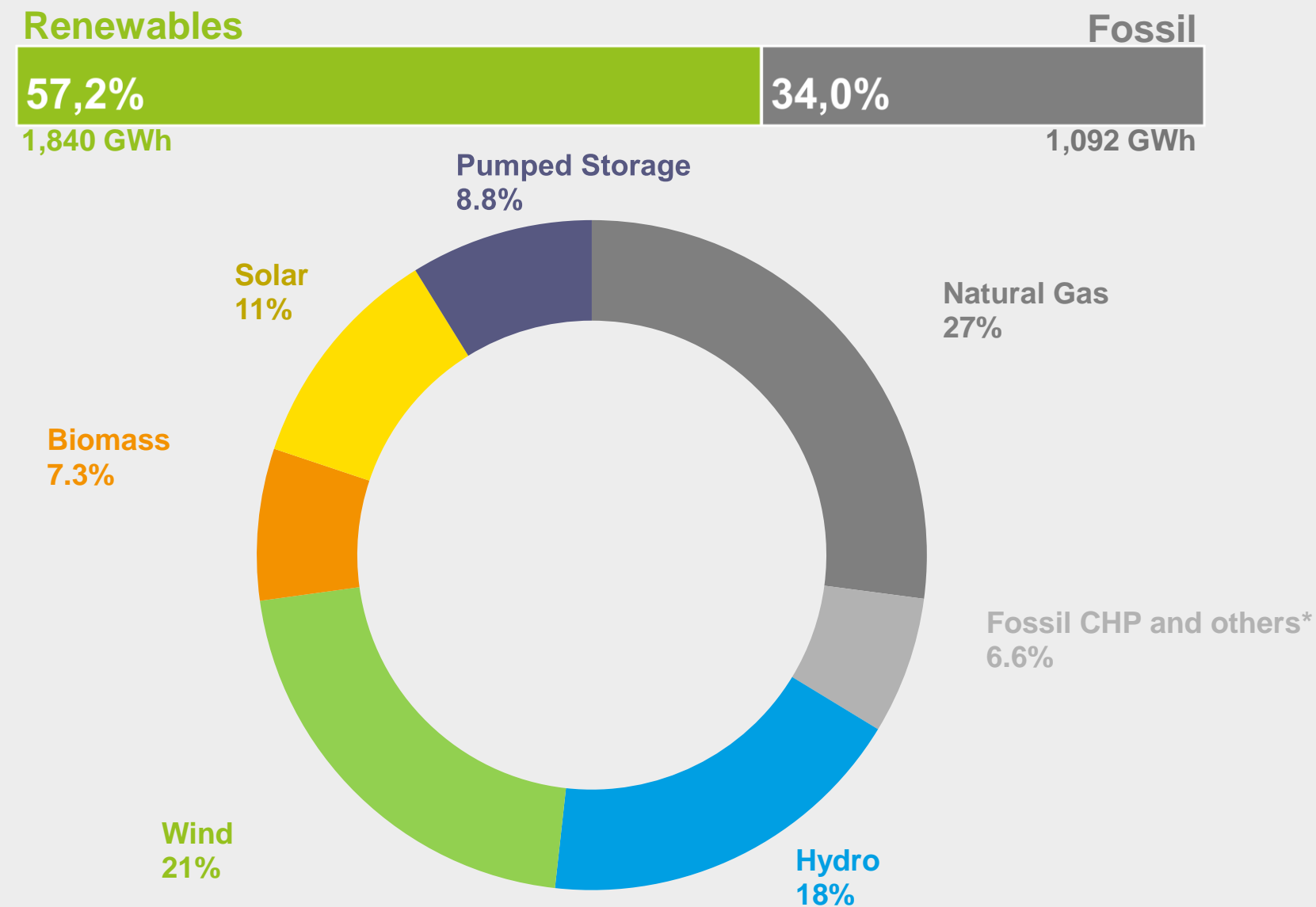
In comparison to June 2022

- 3.0%** ▲ GWh Generation^a **21,968**
- 13.8%** ▲ % Incorporation **70.9**
- 2.7%** ▲ GWh Consumption^b **25,330**
- 0.92** Wind index
- 0.79** Hydro index
- 1.07** Solar index

^a Generation refers to the net power generation of the power plants, considering the production by pumped storage recently disclosed by REN. Pumping production is not accounted for in the percentage of production from renewable sources. Source: REN, Analysis APREN

^b Consumption refers to the liquid generation of power of the plants, considering the import-export balance. * Includes fuel oil, diesel, the non-biodegradable fraction of urban solid waste and other waste. Source: REN, Analysis APREN

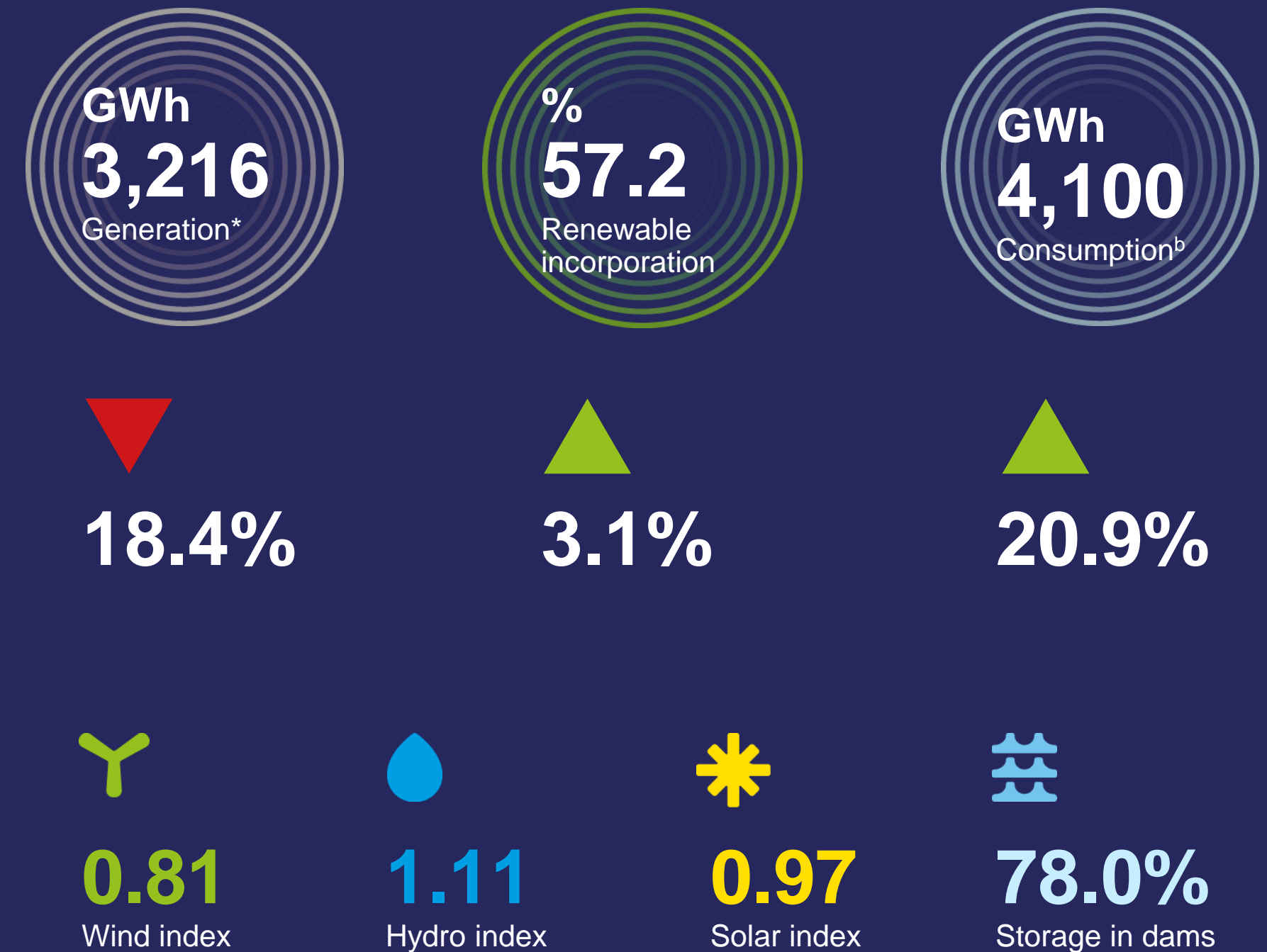
Monthly analysis in Portugal: June



Between June 1 and 30, 2023, renewable incorporation was 57.2%, with a total of 3,216 GWh produced. The increase of 3.1% compared to June 2022 is mainly due to the decrease in fossil incorporation in 11.6%, with a total production of 1,092 GWh in comparison with the 1,808 GWh in June 2022.

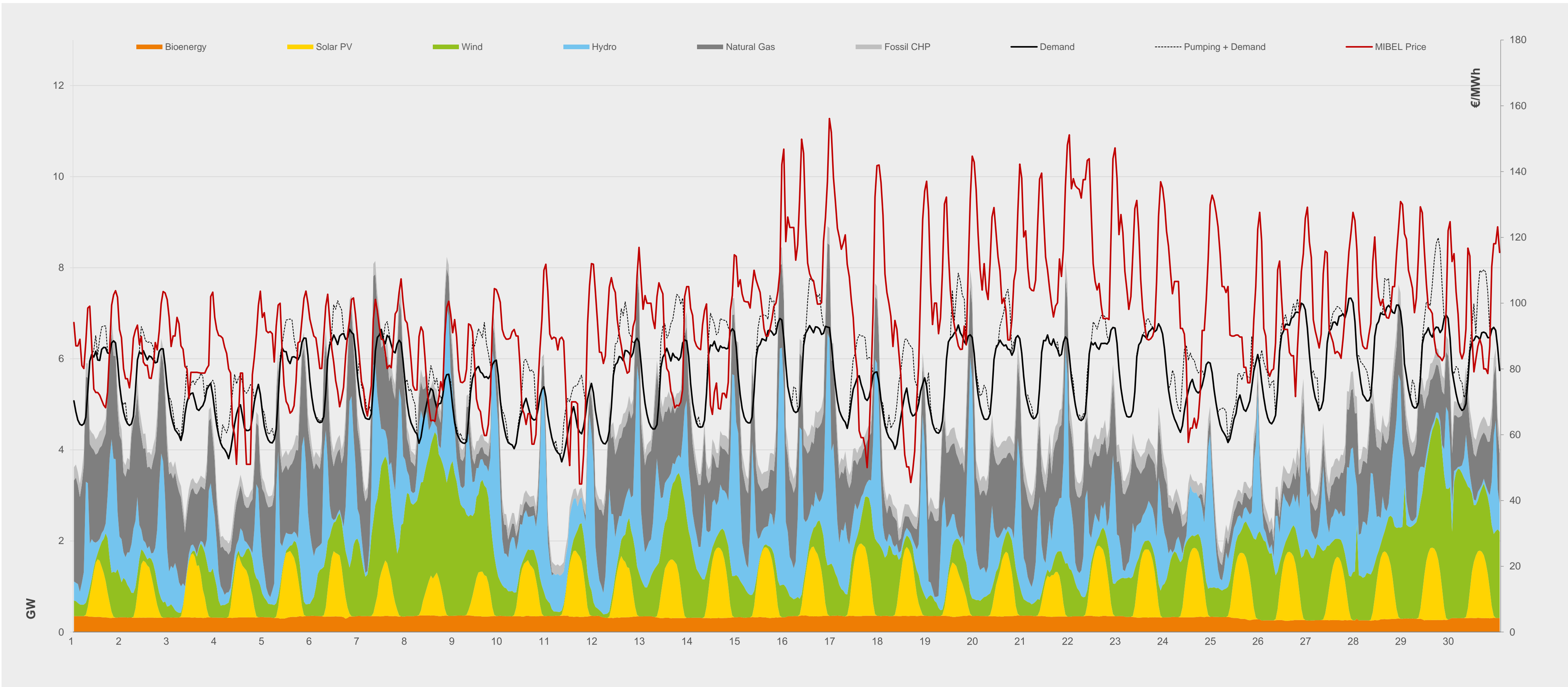
* Includes fuel oil, diesel, the non-biodegradable fraction of urban solid waste and other waste.

Indicators of the electricity sector (in comparison to June 2022)



^a Generation refers to the net power generation of the plants, considering the pumping production recently disclosed by REN. Pumping production is not accounted for in the percentage of production from renewable sources. Source: REN, APREN Analysis
^b Consumption refers to the liquid generation of power of the plants, considering the import-export balance. Source: REN, Analysis APREN

Monthly analysis in Portugal: Load diagram for the month of June 2023

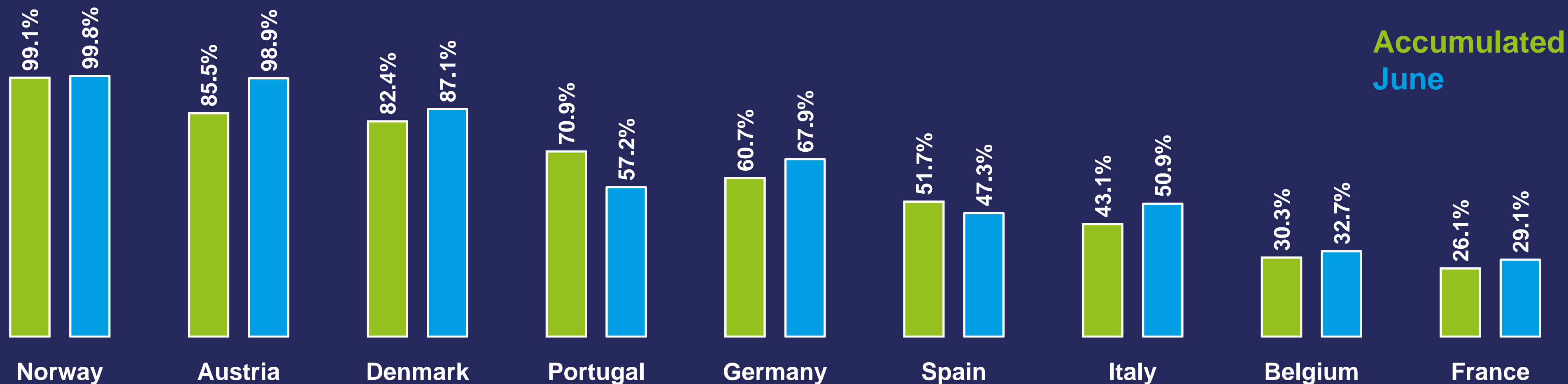


Source: REN, Analysis APREN

Renewable Electricity Europe

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

Between January 1 and June 30, 2023, Portugal was the fourth country with the highest renewable incorporation in electricity generation, behind Norway, Austria and Denmark, which obtained 99.1%, 85.5% and 82.4% from RES, respectively. From 1 to 30 June, Portugal was in fifth place in the countries considered, with the largest renewable incorporation in Europe.



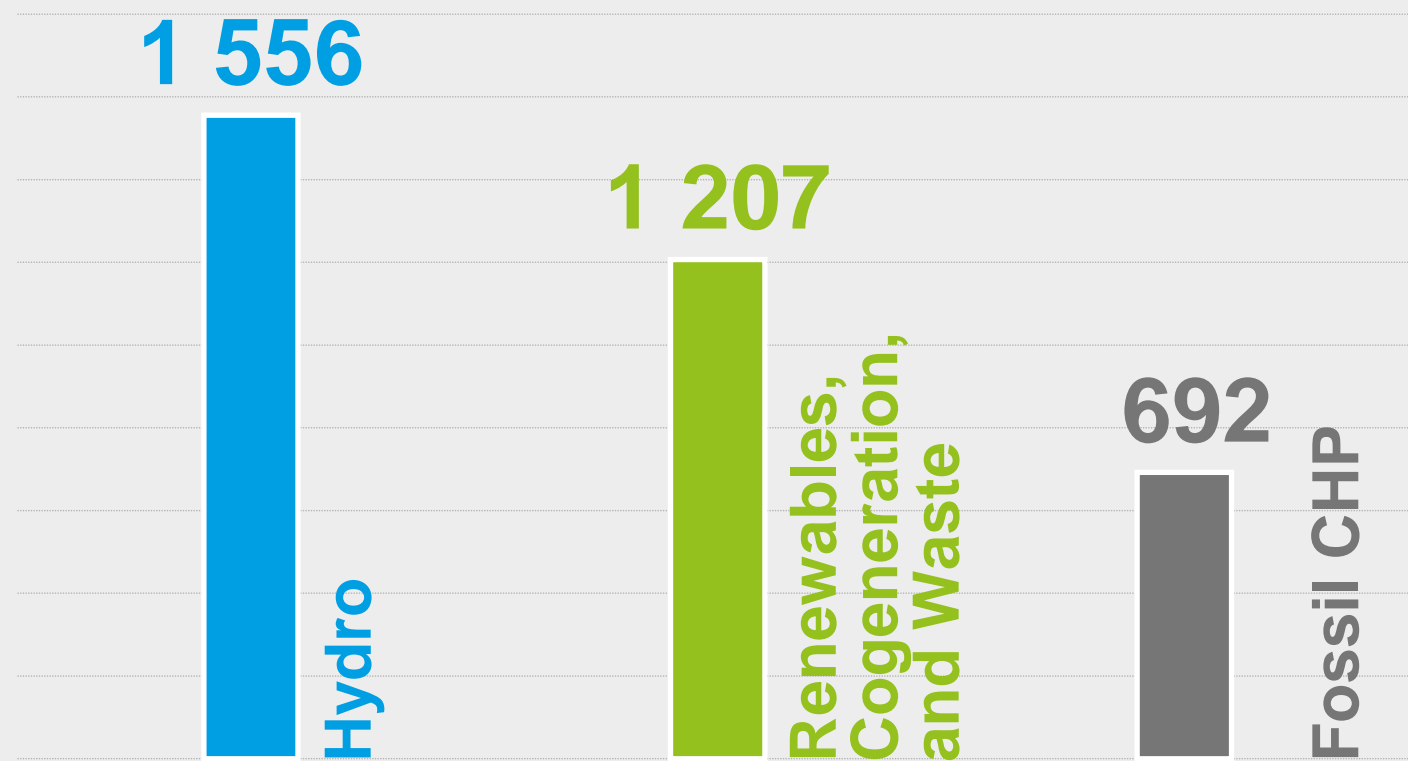
Renewable incorporation in the accumulated generation of electricity (Jan-May) and monthly (May).
Source: REN, Fraunhofer, REE, Terna, National Grid, ENTSO-E, Analysis APREN

Market price setting Portugal

Between January 1 and June 30, hydro was the market price setting technology that recorded the most hours, with 1,556 non-consecutive hours, followed by renewables, cogeneration and waste with 1,207 hours, and thermal generation with combined cycle with 692 hours.

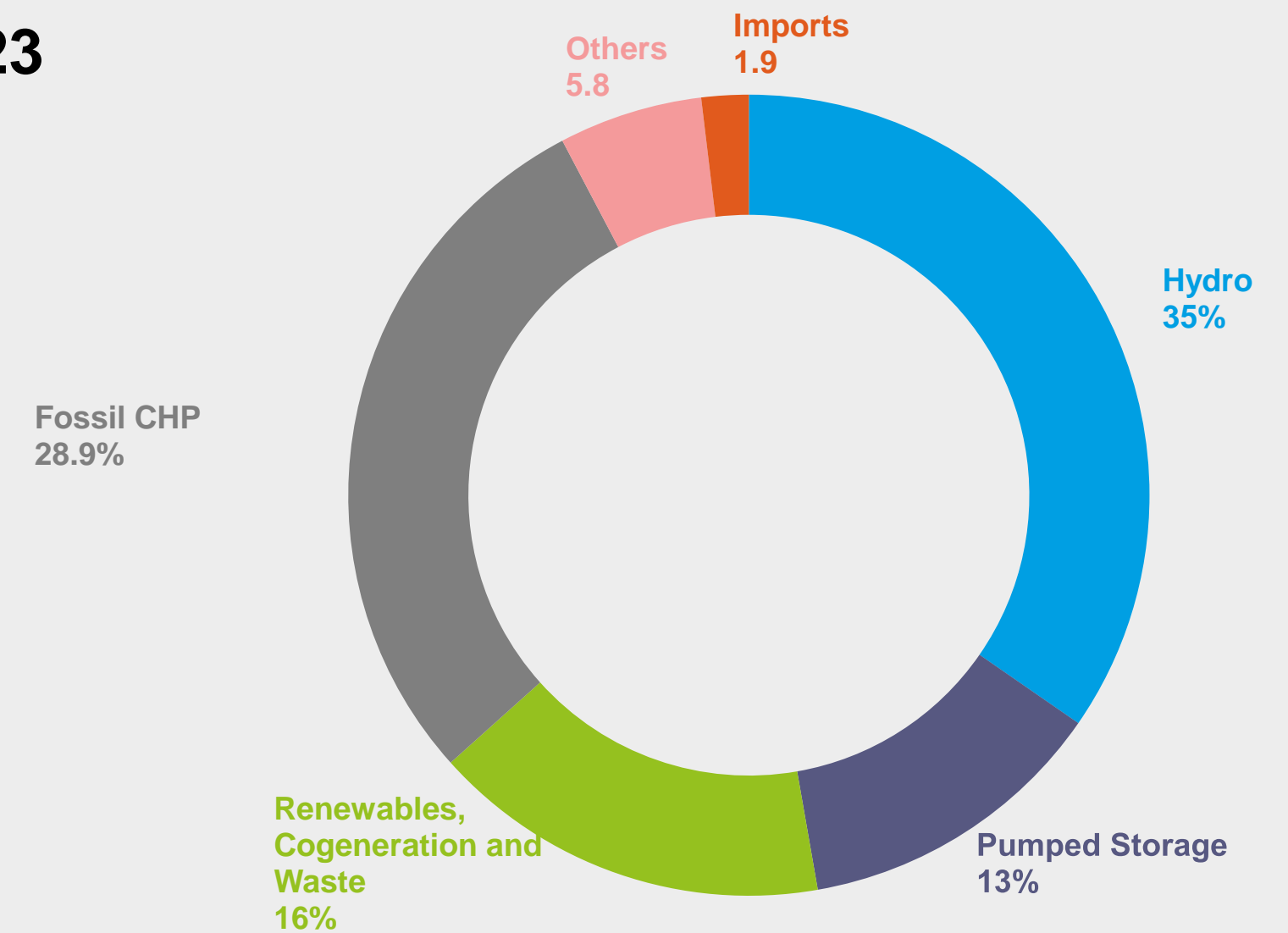


Accumulated January-June



Number of market price setting hours of the three main market setting technologies (Jan-2023 to June-2023).
Source: OMIE, Analysis APREN

June 2023



Percentage distribution of the number of market price setting hours of the various technologies, in a total of 720 hours (June).
Source: OMIE, Analysis APREN

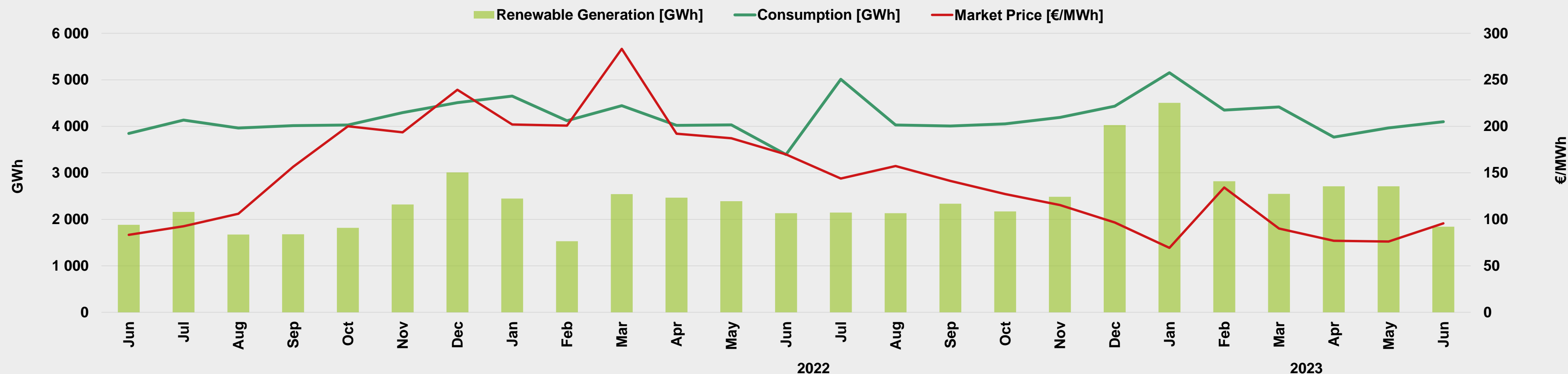
Electricity Market Portugal

Between January 1 and June 30, the average hourly price recorded in MIBEL in Portugal was €89.7/MWh^c, represents a decrease in approximately half compared to the same period last year.

In the same period, 427 non-consecutive hours were recorded in which renewable generation was sufficient to supply electricity consumption in mainland Portugal, with an average hourly price in the MIBEL of €61.2/MWh. From the June 1 to 30, renewable generation was sufficient to supply consumption for 14 non-consecutive hours.



Accumulated January-June



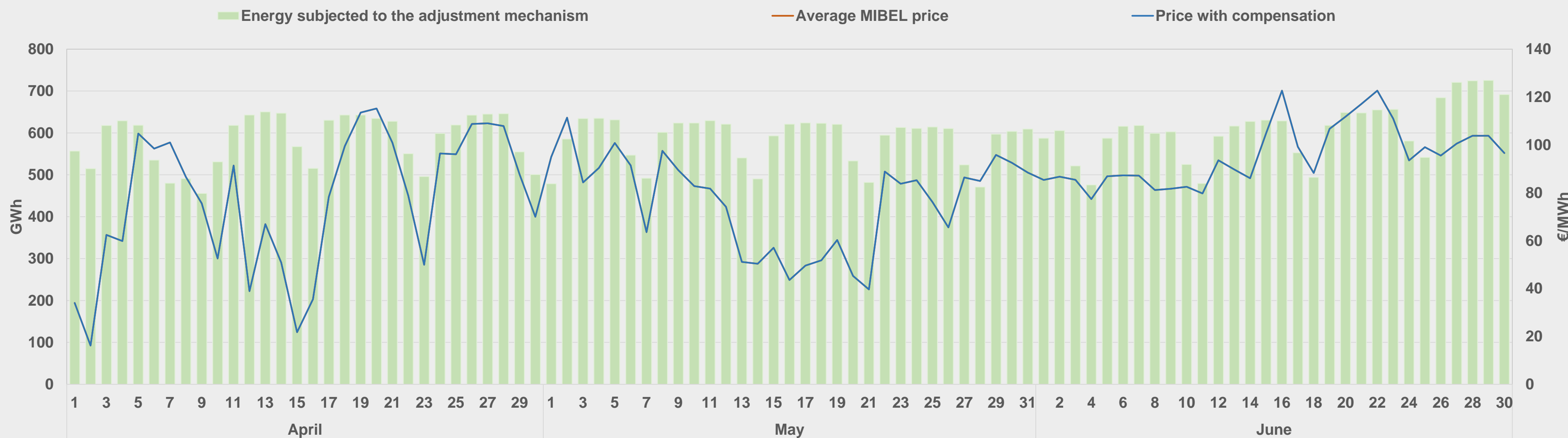
Number of market price setting hours of the three main market setting technologies (June-2021 to June-2023).
Source: OMIE, Analysis APREN

Electricity Market

Iberian gas price limit mechanism

Since June 15, 2022, when the Iberian natural gas price limit mechanism came into operation, until June 30, the mechanism generated savings of €26.49/MWh^c, which amounted to a reduction of 14.8% in the average hourly price at MIBEL.

The savings due to the price limit of natural gas, corresponding to the difference between the price without the mechanism and the price with the compensation to be paid to natural gas plants. During the months of March, April and May, the price limit on natural gas didn't introduce changes in the electricity prices. In total, 202.6 of the 282.8 TWh produced were subjected to the consumer adjustment mechanism in the Iberian Peninsula.



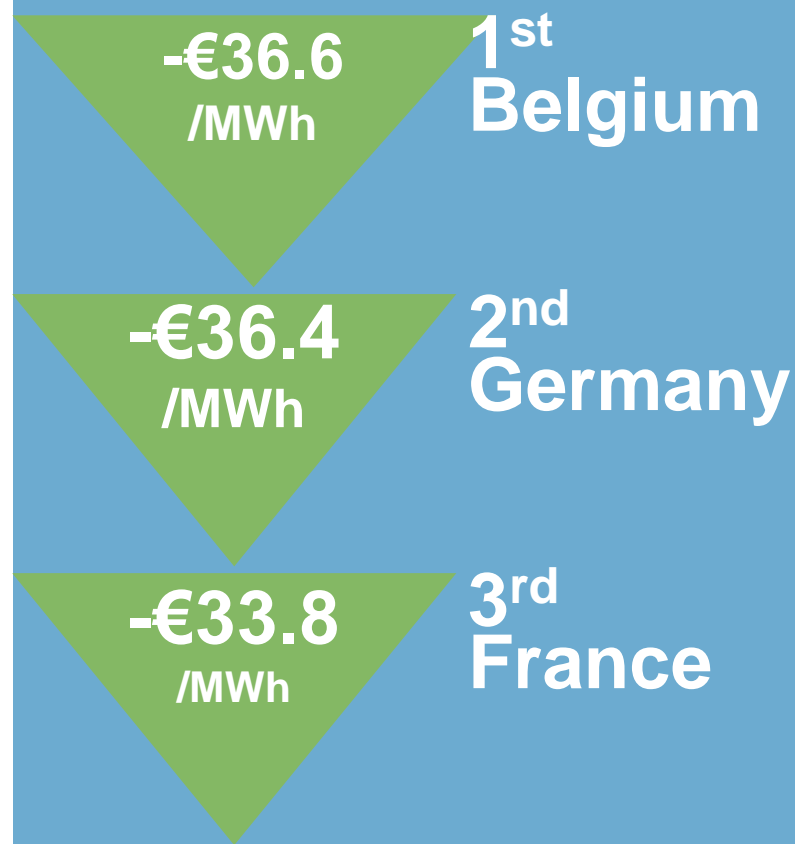
^c Arithmetic average hourly prices
Source: OMIE, Analysis APREN

Renewable Electricity Europe

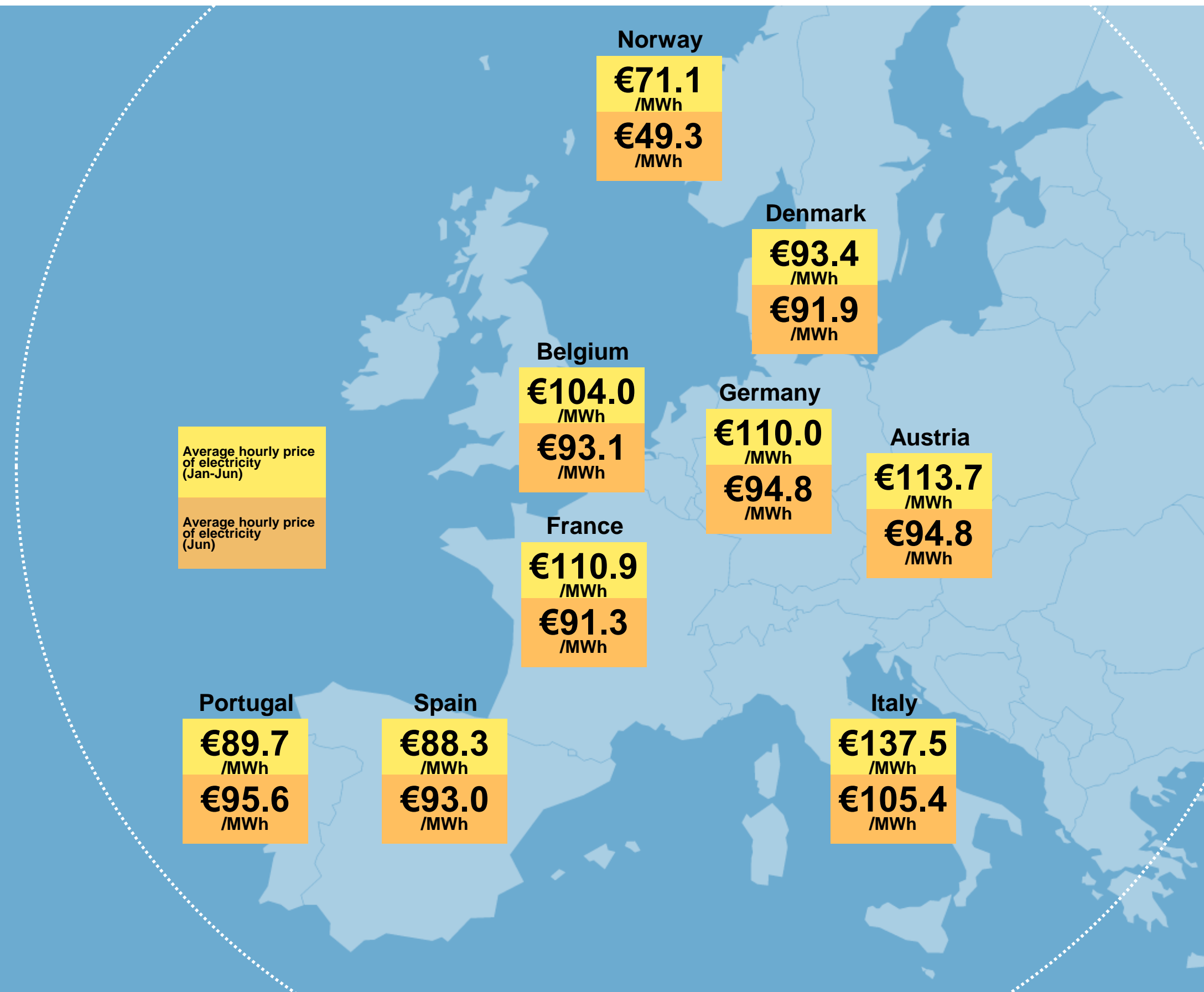
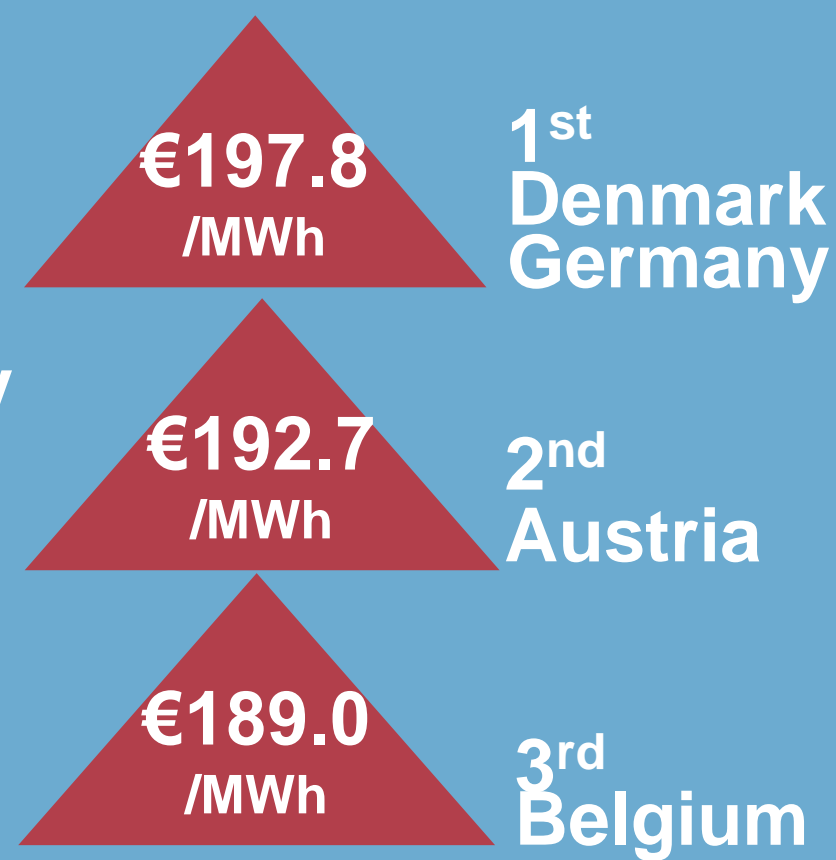
During the month of June 2023, there was a minimum hourly price at MIBEL in Portugal of €45.0/MWh for 2 consecutive hours, in which the market setting was due to a combination of technologies. The maximum hourly price reached €156.1/MWh, where the market set with thermal cogeneration.

Regarding prices in Europe, it should be noted that the average values were superior to those of the previous month. Maximum and minimum prices were also superior to those registered in the previous month.

Minimum Prices (June)



Maximum Prices (June)



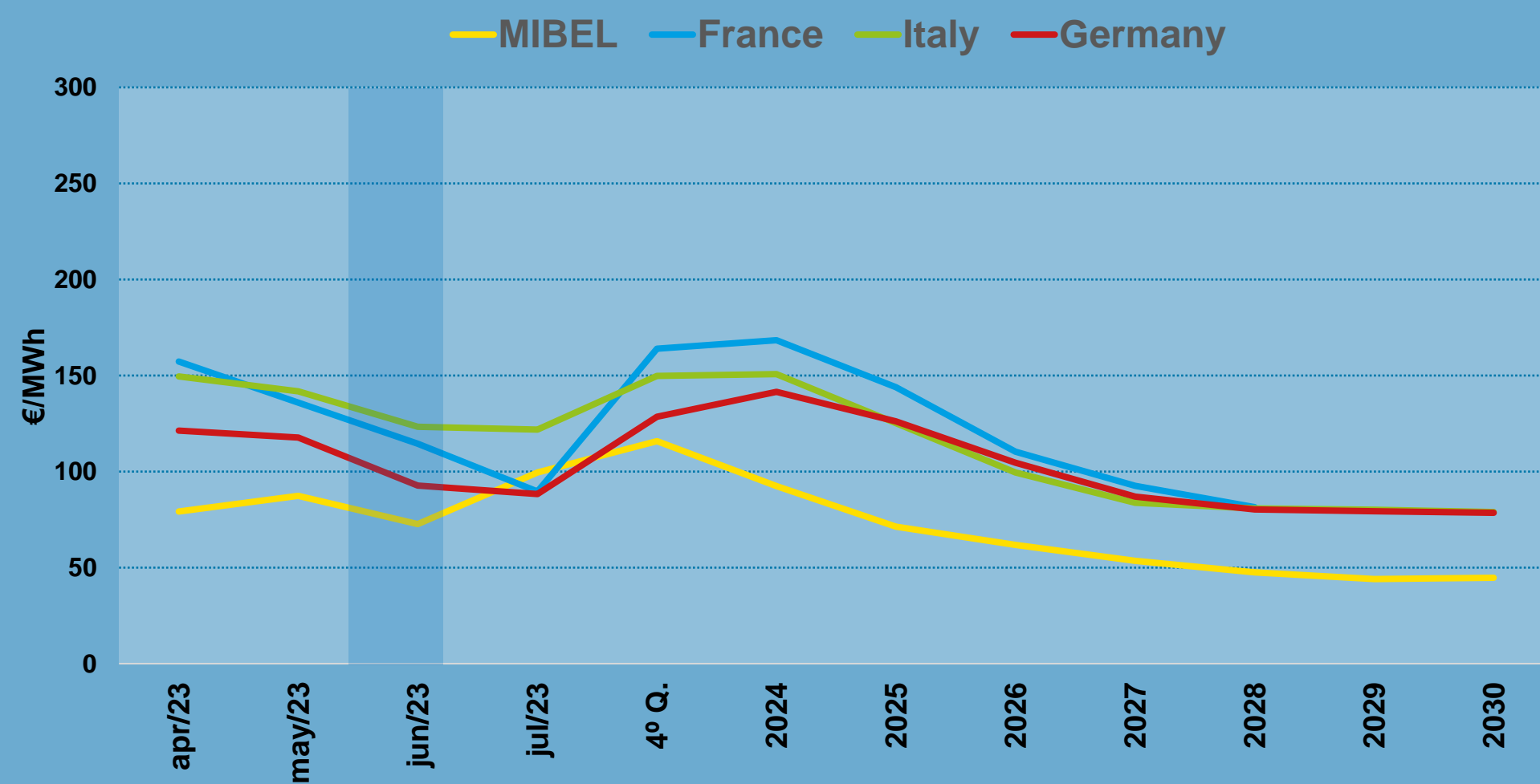
Source: ENTSO-E, OMIE, Analysis APREN

Future Electricity Market

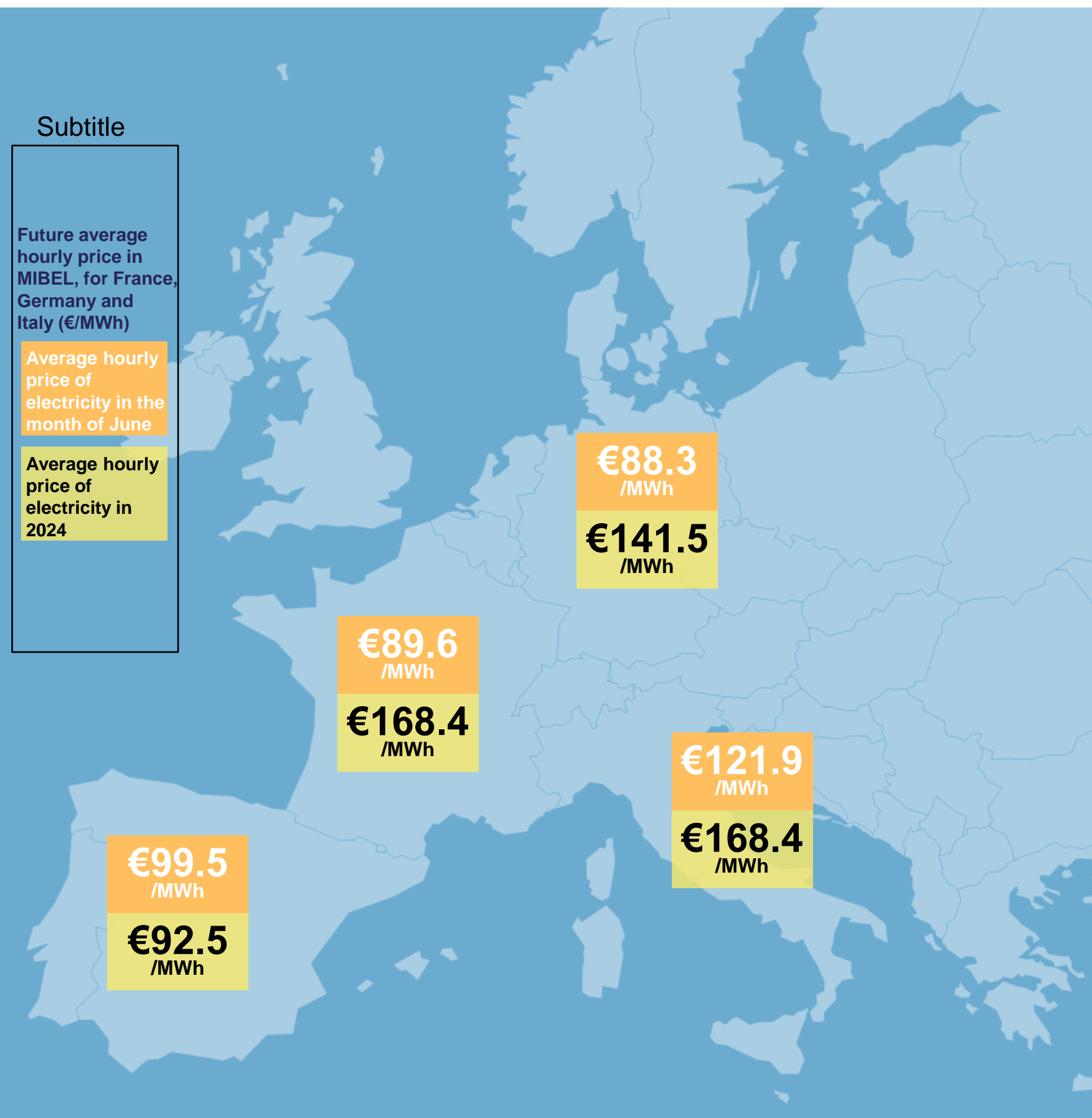
The evolution of the average future hourly price is calculated based on the contracts for the purchase and sale of electricity^d.

The map on the right displays the price values for the next month (July) and for the next year. In both cases, MIBEL has the lowest values, while the French and German markets have the highest.

MIBEL also has the lowest figures by 2030, coming from the Iberian gas price limit mechanism by June next year, and from investment in renewable production.



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



^d Values updated in the 1st of June.
Source: OMIP, EEX, Analysis APREN

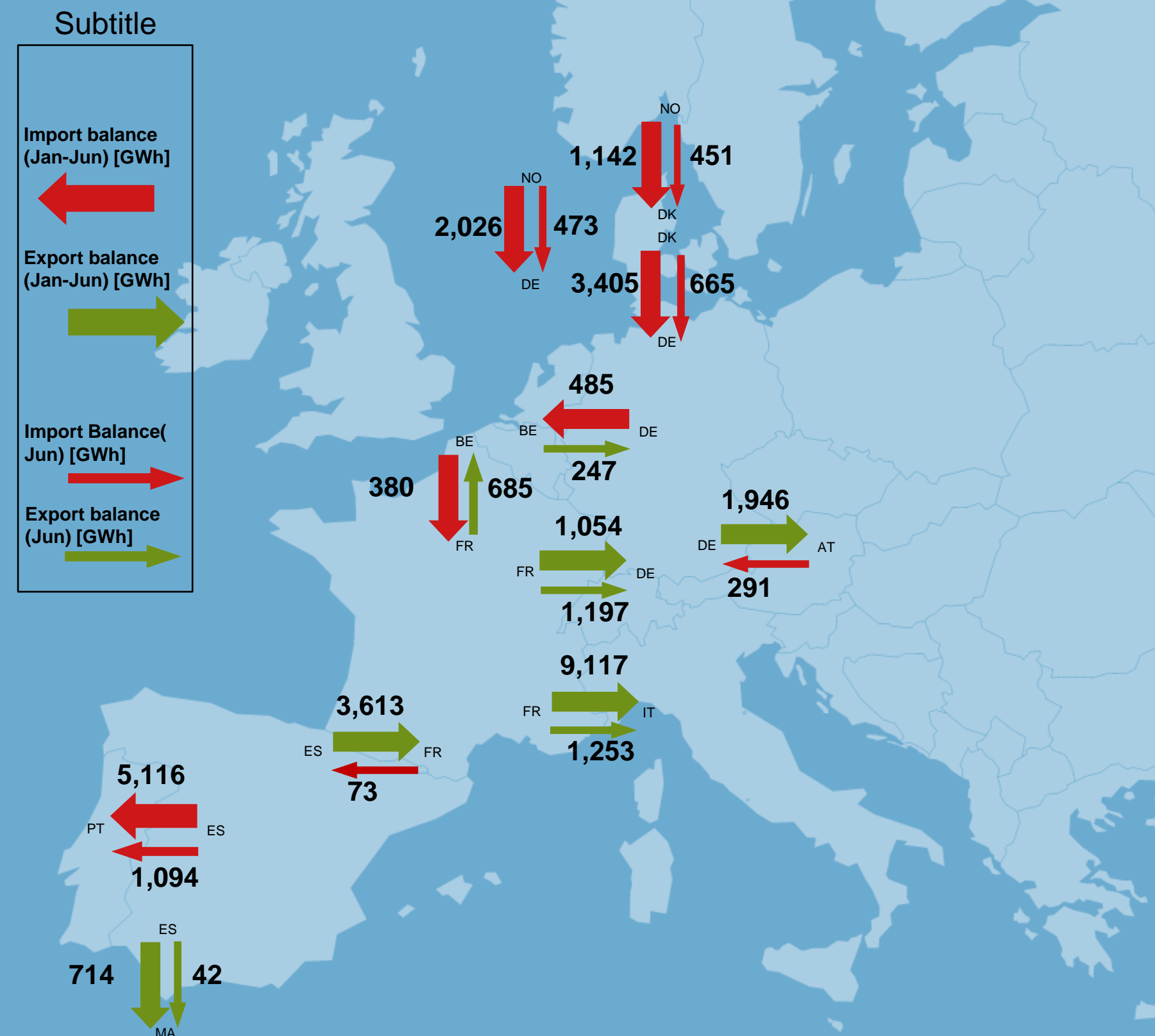
International trade

Europe

Between January 1 and Jun 30, 2023, the electricity system of Mainland Portugal recorded electricity imports equivalent to 6,764 GWh and exports of 1,648 GWh, with Portugal being an importer with a balance of 5,116 GWh.

Main Interconnection Indicators PT-ES

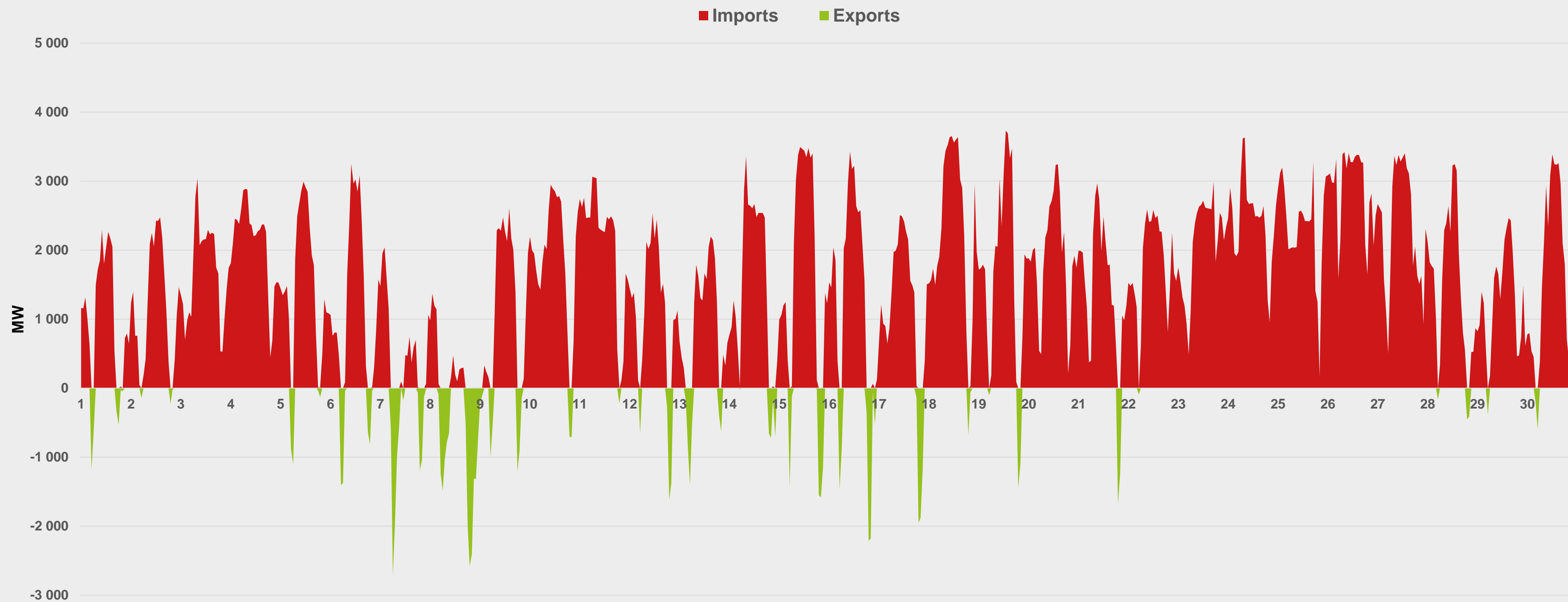
	PT-ES		ES-PT	
Usage	5.6% (Jan-Jun)	2.3% (Jun)	24.1% (Jan-Jun)	25.9% (Jun)
Congestion	0.0% (Jan-Jun)	0.0% (Jun)	0.1% (Jan-Jun)	0.0% (Jun)
Markets split	6.2% (Jan-Jun)	10.7% (Jun)	65.7% (Jan-Jun)	52.1% (Jun)
	PT-ES		MIBEL-FR	



Source: ENTSO-E, OMIE, Analysis APREN

International trade: June

Diagram of imports and exports in Portugal



Source: REN, Analysis APREN

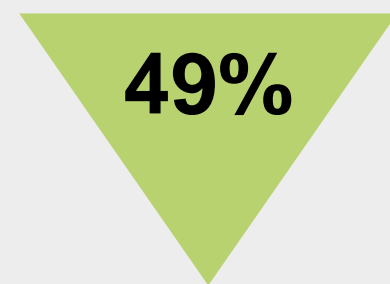
Power sector emissions

Between January 1 and June 30, 2023, specific emissions reached 81.4 gCO₂eq/kWh, with a total emissions from the power sector of 1.8 MtCO₂eq

The European Emissions Trading System (EU-ETS) recorded an average price of €87.2/tCO₂^c, being this figure a reduction in 4% compared to the same period in 2022.

Sector emissions

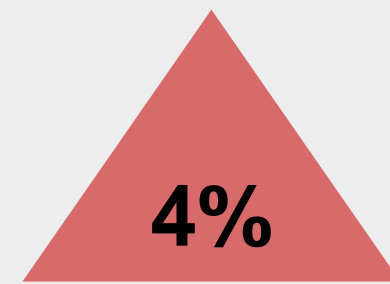
1.8
MtCO₂eq



In comparison to June 2022

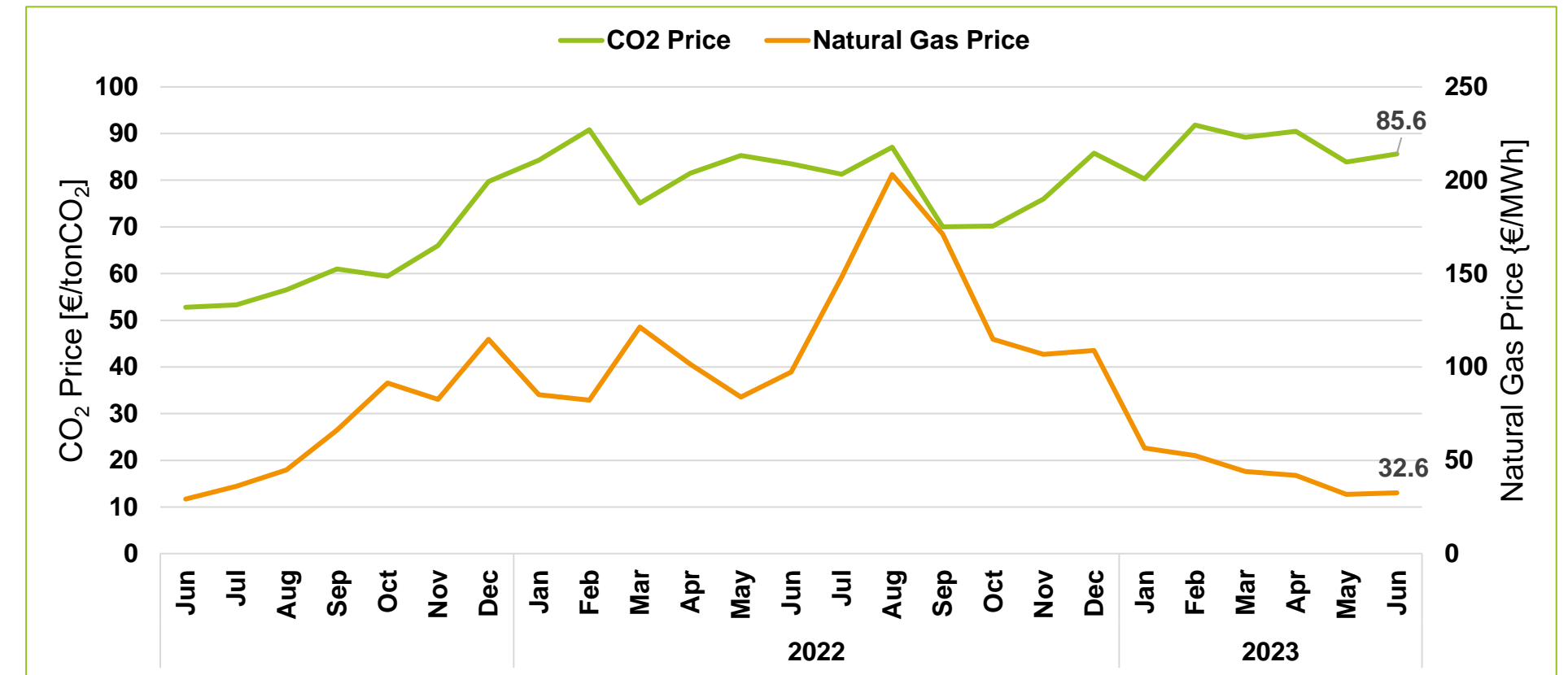
Allowances average price

€86.9
/tCO₂

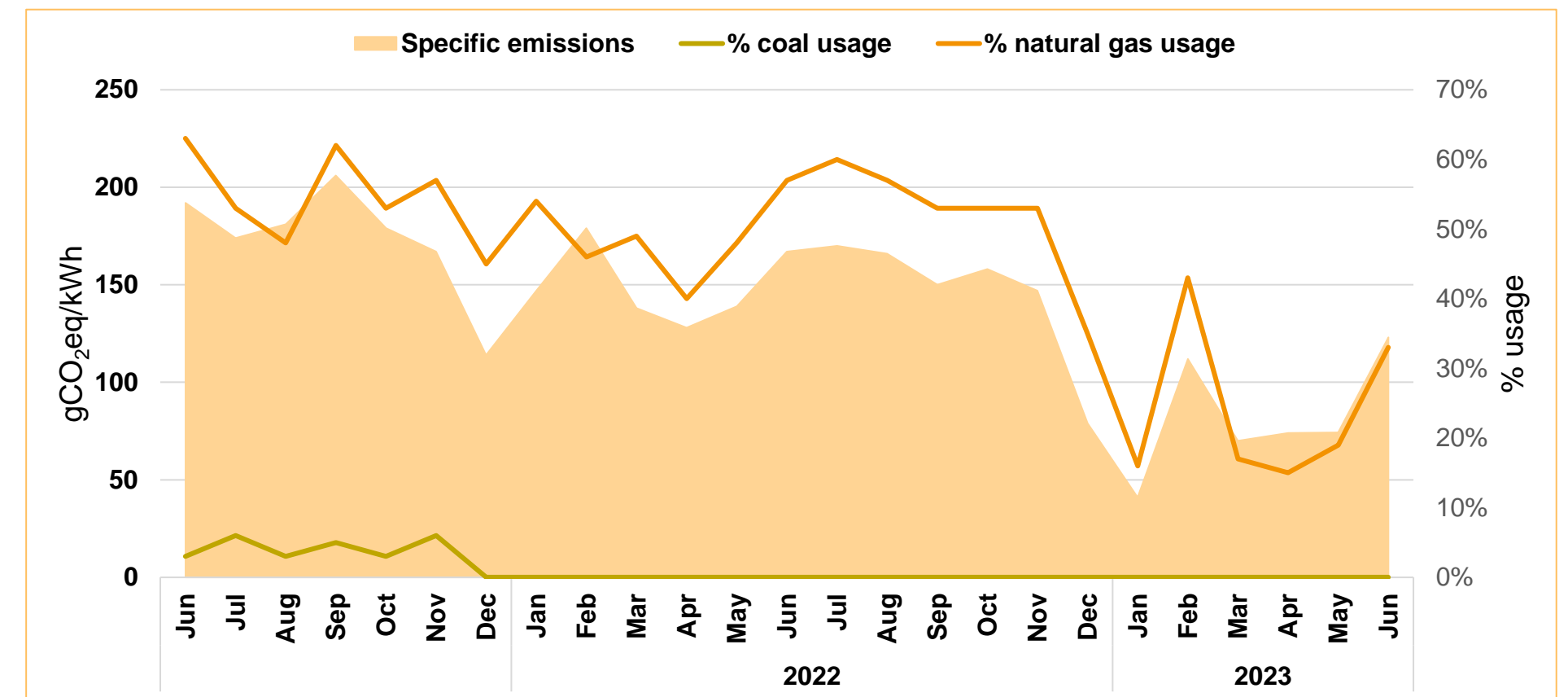


In comparison to June 2022

^c Arithmetic average hourly prices
Source: OMIE, WorldBank.



Price of CO₂ allowances in EU-ETS and natural gas price in Europe (June-2021 to June-2023).
Source: SendeCO₂, WorldBank.



Specific emissions from the power sector of Mainland Portugal, % use of coal-free power plants and natural gas (June-2021 to June-2023).
Source: REN, DGEG, ERSE, Analysis APREN

Simulation of price formation without SRP

Renewables have avoided:

The indicators below identify the savings achieved between January 1 and June 30, 2023, due to the contribution Special Regime Production (SRP).

This study is conducted for SRP and includes all installed power of fossil cogeneration. Given that the capacity equivalent to this technology within the SRP is quite residual and that the other technologies are renewable, the figures are very close to the real savings generated by renewables.



€140.9/MWh

Accumulated savings (Jan-Jun)

€132.2/MWh

Monthly savings (Jun)



€3,063.3 M

Accumulated savings (Jan-Jun)

€411,3 M

Monthly savings (Jun)

Source: OMIE, Analysis APREN.

Environmental Service

The figures below identify the savings achieved between January 1 and June 30, 2023, in natural gas, CO₂ emissions and CO₂ emission allowances resulting from the renewable incorporation in electricity generation.

This analysis assumes that, in the absence of renewables, production would be ensured primarily by natural gas, followed by imported electricity.

Renewables have avoided:



€1,004 M

Imported Natural Gas
(Jan-Jun)

€117 M

Imported Natural Gas
(Jun)



€378 M

Imported Electricity
(Jan-Jun)

€5 M

Imported Electricity
(Jun)



4.8 MtCo₂eq

CO₂ emissions (Jan-Jun)

0.7 MtCo₂eq

CO₂ emissions (Jun)



€372 M

CO₂ allowances (Jan-Jun)

€56.8 M

CO₂ allowances (Jun)

Source: REN, REE, SendeCO2, WorldBank, DGEG, ERSE, Analysis APREN.

Note 1: For the estimate of the savings in imported natural gas, the price of natural gas in Europe indicated in the WorldBank has been considered.

Note 2: For the estimation of savings in imported electricity, the average price on the MIBEL market has been considered.



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