



20
22

BULLETIN
RENEWABLE ELECTRICITY

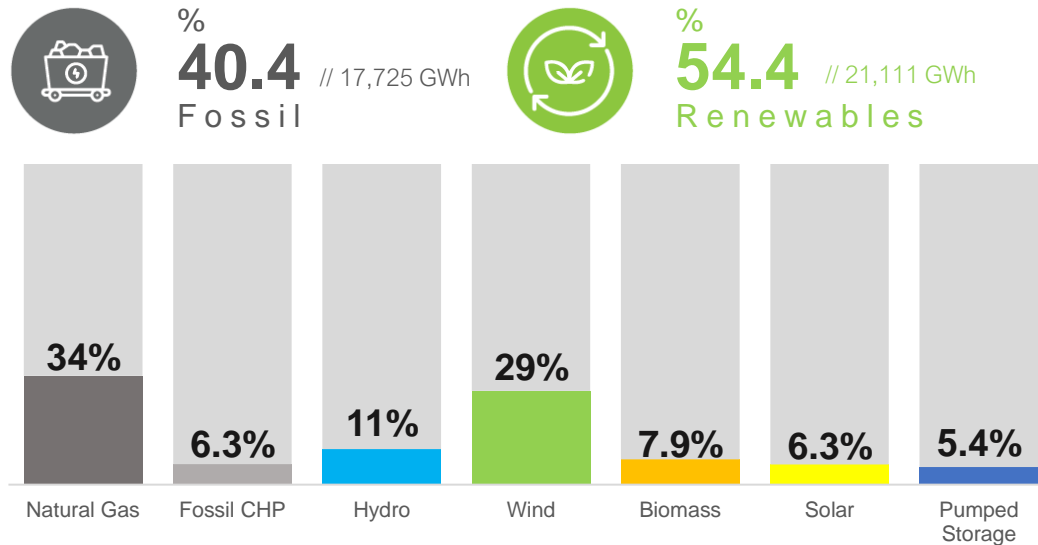
**Portugal precisa
da nossa energia!**

Portugal needs our energy!

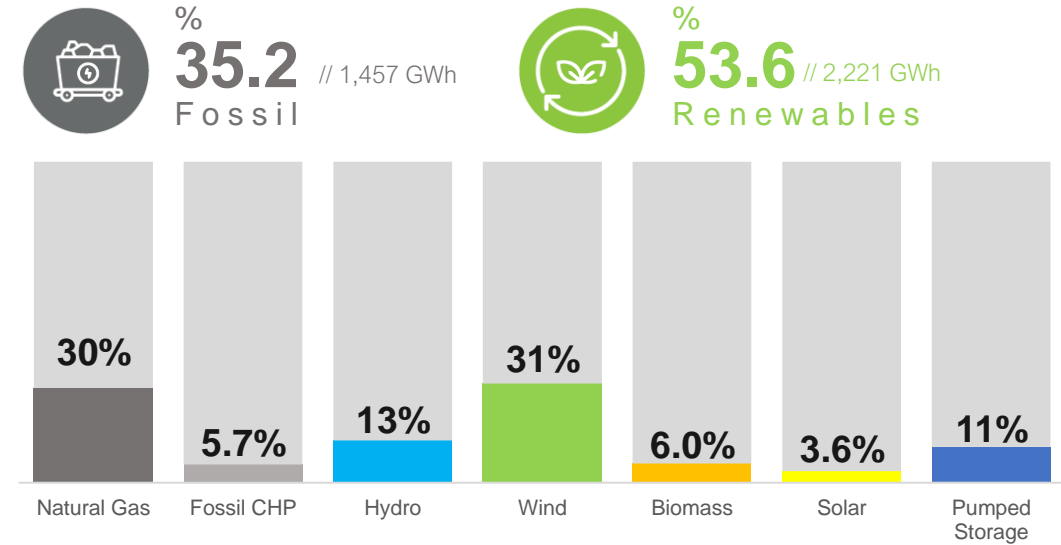


Executive Summary

ACCUMULATED GENERATION (Jan-Nov)



MONTHLY GENERATION (Nov)



ELECTRICITY SECTOR INDICATORS (Jan-Nov)



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

Electricity Generation: Mainland Portugal

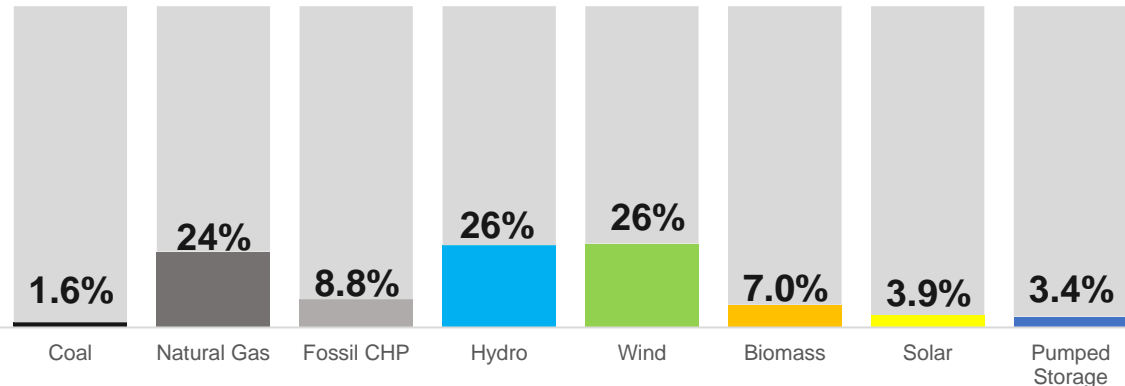
ACCUMULATED NOVEMBER 2021 (Jan-Nov)



%
34.0 // 15,858 GWh
Fossil



%
62.6 // 26,532 GWh
Renewables



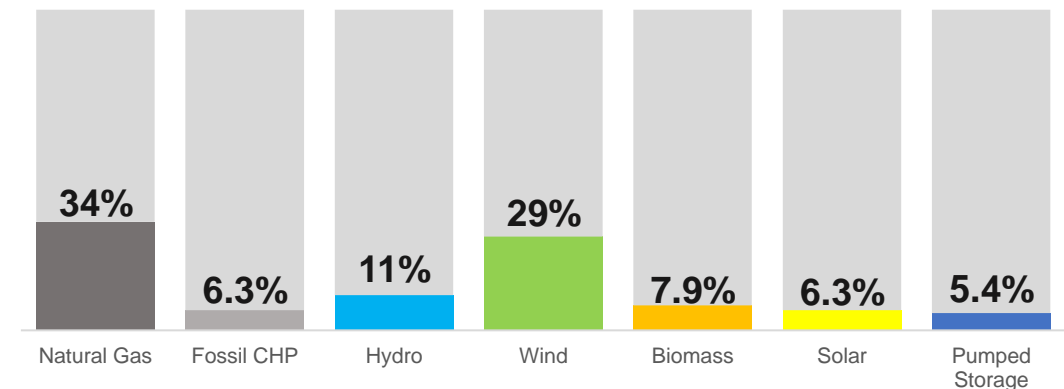
ACCUMULATED NOVEMBER 2022 (Jan-Nov)



%
40.4 // 17,725 GWh
Fossil



%
54.4 // 21,111 GWh
Renewables



MAIN INDICATORS



GWh
38,836
Generation^a



%
54.4
Renewable
incorporation



GWh
45,947
Consumption^b



0.97
Wind index



0.46
Hydro index



1.08
Solar index

▼ **8.2%**

in comparison nov 2021

▼ **19.2%**

in comparison nov 2021

▲ **21%**

in comparison nov 2021

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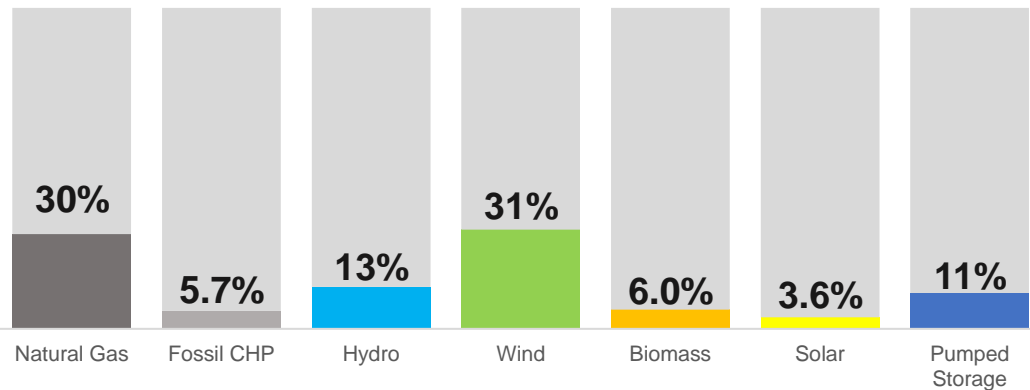
^b Consumption refers to the liquid generation of power of the plants, considering the import-export balance. Source: REN, Analysis APREN.

Monthly analysis in Portugal: November

Between November 1 and 30, 2022, renewable incorporation was 53.6%, totaling 4,141 GWh generated. The increase of 2.8 % in comparison to November 2021 is mainly due to the increase in wind production and pumping, contributing with 463 GWh to production in November compared to 149 GWh in the same period last year.

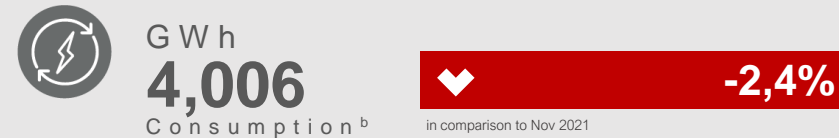
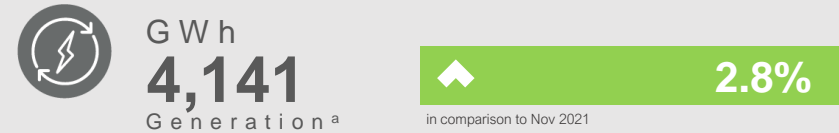
It should also be noted that hydro generation recovered in comparison to last months values. The hydro index was 0.88, (the highest value of the year), and close to the average of the last 10 years in November.

Source: REN, Analysis APREN



Source: REN, Analysis APREN

INDICATORS OF THE ELECTRICITY SECTOR

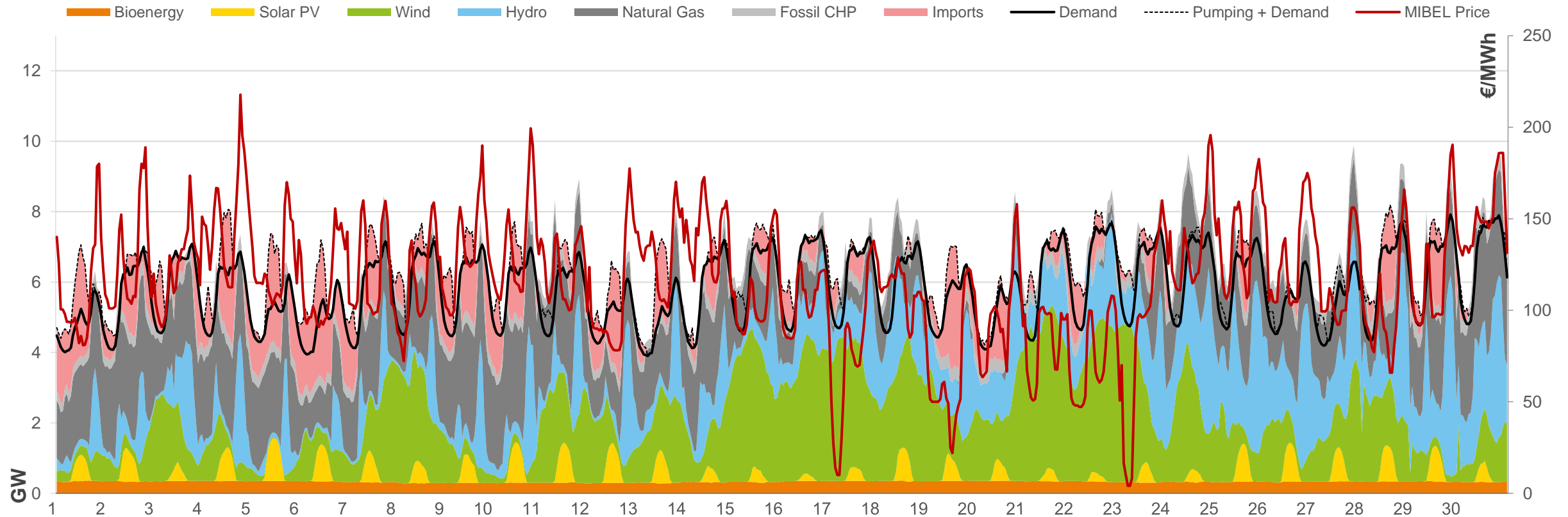


^a 'Generation' refers to the net power generation of the power plants, considering the pumped storage generation recently disclosed by REN.
Generation through pumped storage is not accounted for in the percentage of generation from renewable sources.

^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: November

Load diagram for the month of November 2022

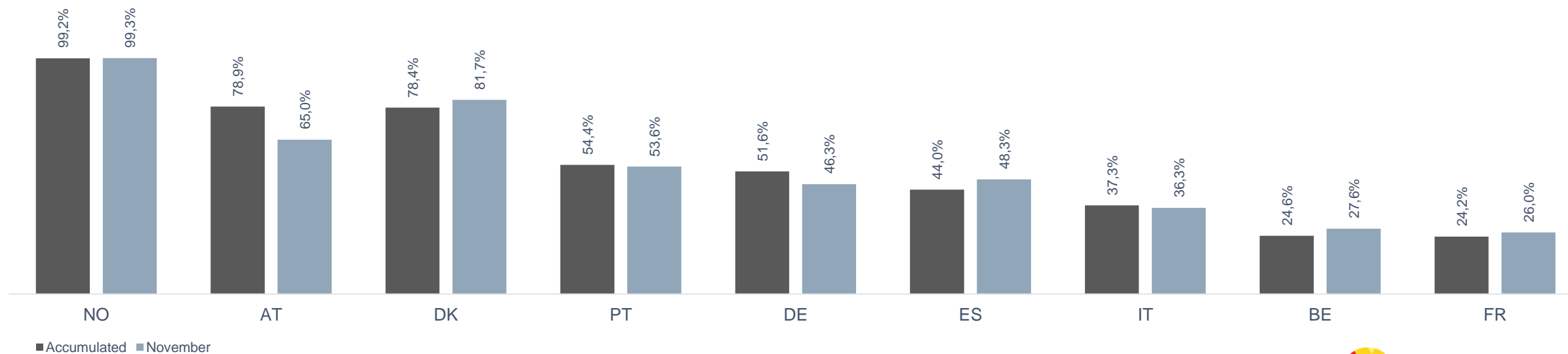


Source: REN, Analysis APREN

Renewable Electricity Europe

The present analysis considers only the main countries from the different European markets, in order to have a representative framework of comparison. Between January 1 and November 30, Portugal was the fourth country with the highest renewable incorporation in electricity generation, behind Norway, Austria and Denmark, which obtained 99.3%, 81.7% and 65.0%, respectively, from RES. From November 1 and November 30, Portugal was fourth in the analysed countries with the largest renewable incorporation in Europe.

Source: OMIE, Analysis APREN



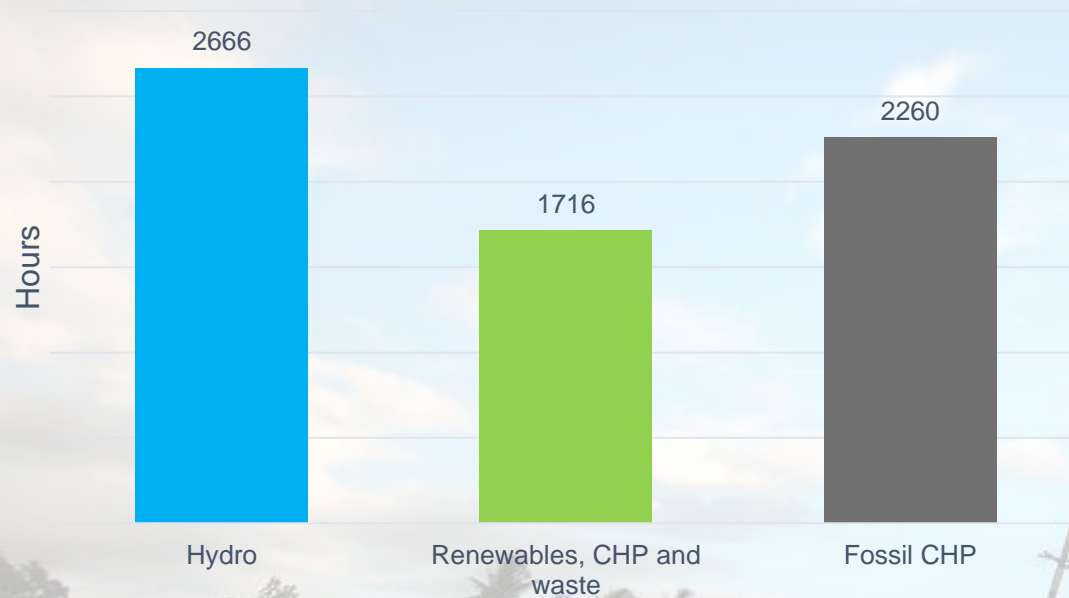
Renewable incorporation in accumulated electricity generation (Jan-Nov) and monthly electricity (Nov).
Source: REN, Fraunhofer, REE, Terna, National Grid, ENTSO-E, Analysis APREN

Market Price Setting: Portugal

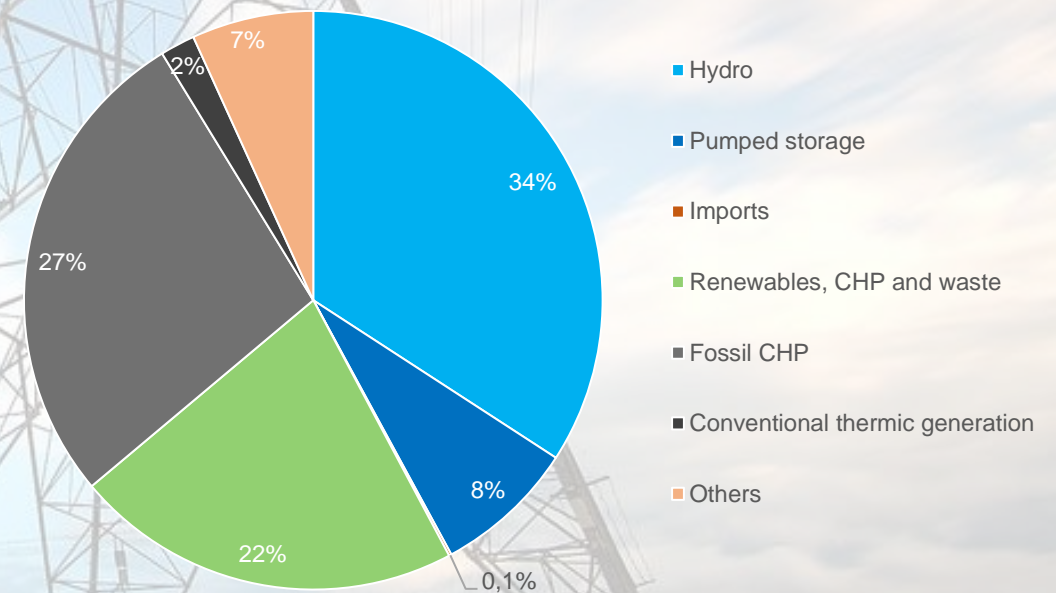
Between January 1 and November 30, hydro was the market price setting technology that recorded the most hours, with 2,666 non-consecutive hours, followed by thermal generation combined cycle with 2,260 hours and by renewables, cogeneration and waste with 1,716 hours.

ACCUMULATED JAN-NOV

NOVEMBER 2022



Number of market price setting hours of the three main technologies (Jan-2022 to Nov-2022).
Source: OMIE, Analysis APREN



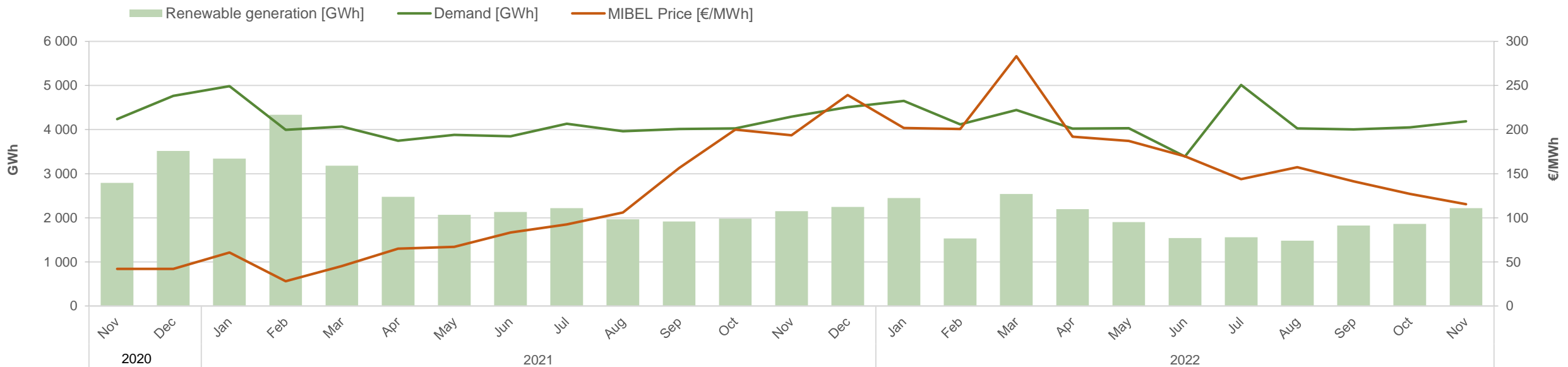
Percentage distribution of the number of market price setting hours of the various technologies, totaling 720 hours (Nov).
Source: OMIE, Analysis APREN

Electricity Market Portugal

Between January 1 and November 30, the average hourly price recorded in MIBEL in Portugal (€174.5/MWh^o), represents an increase to double compared to the same period last year.

In the same period, 126 non-consecutive hours were recorded, in which renewable generation was sufficient to supply the electricity consumption in mainland Portugal, with an average hourly price in MIBEL of €114.6/MWh. From November 1 to 30, renewable generation supplied consumption for 49 non-consecutive hours.

^oArithmetic average hourly prices
Source: OMIE, Analysis APREN



Market price, electricity consumption and renewable generation (Nov 2020 to Nov 2022).
Source: OMIE, REN, Analysis APREN

Electricity Market

Iberian gas price limit mechanism

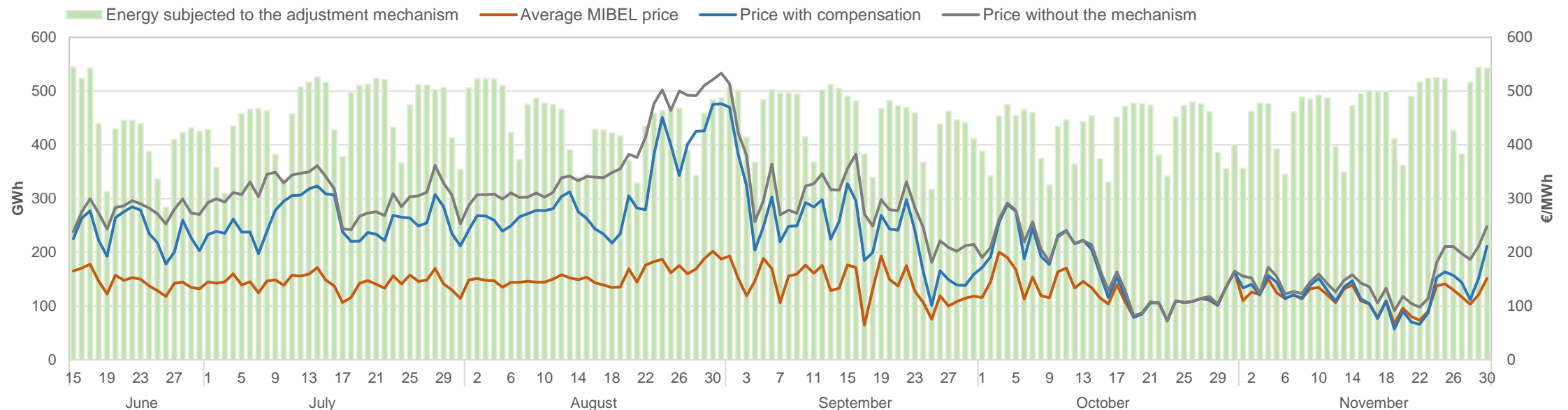
Since June 15, when the Iberian natural gas price limit mechanism came into force, until November 30, the mechanism generated savings of €40.4/MWh^c, which amounted to a 12.5% reduction in the average hourly price in MIBEL.

The savings due to the limit on the price of natural gas, corresponding to the difference between the price without the mechanism and the price with the compensation payable to natural gas plants, reached a maximum value of €157.2/MWh^c, and a minimum of €1.30/MWh^c.

In total, 75,1 of the 140.5 TWh produced, were subject to the consumer adjustment mechanism in the Iberian Peninsula.



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



Market price, with and without natural gas price limit mechanism.
Source: OMIE, Analysis APREN

Electricity Market: Europe

During the month of November 2022, there was a minimum hourly price at MIBEL in Portugal of €4.11/MWh^c, for an hour in which the market price setting was due to hydro and thermal generation combined cycle. The maximum hourly price reached €217.7/MWh^c, where the market price setting was hydro, due to the reversal of the import-for-export flow in this time period.

Concerning the prices in Europe, it should be noted that the average values decreased in comparison to the previous month, as well as the maximum prices.

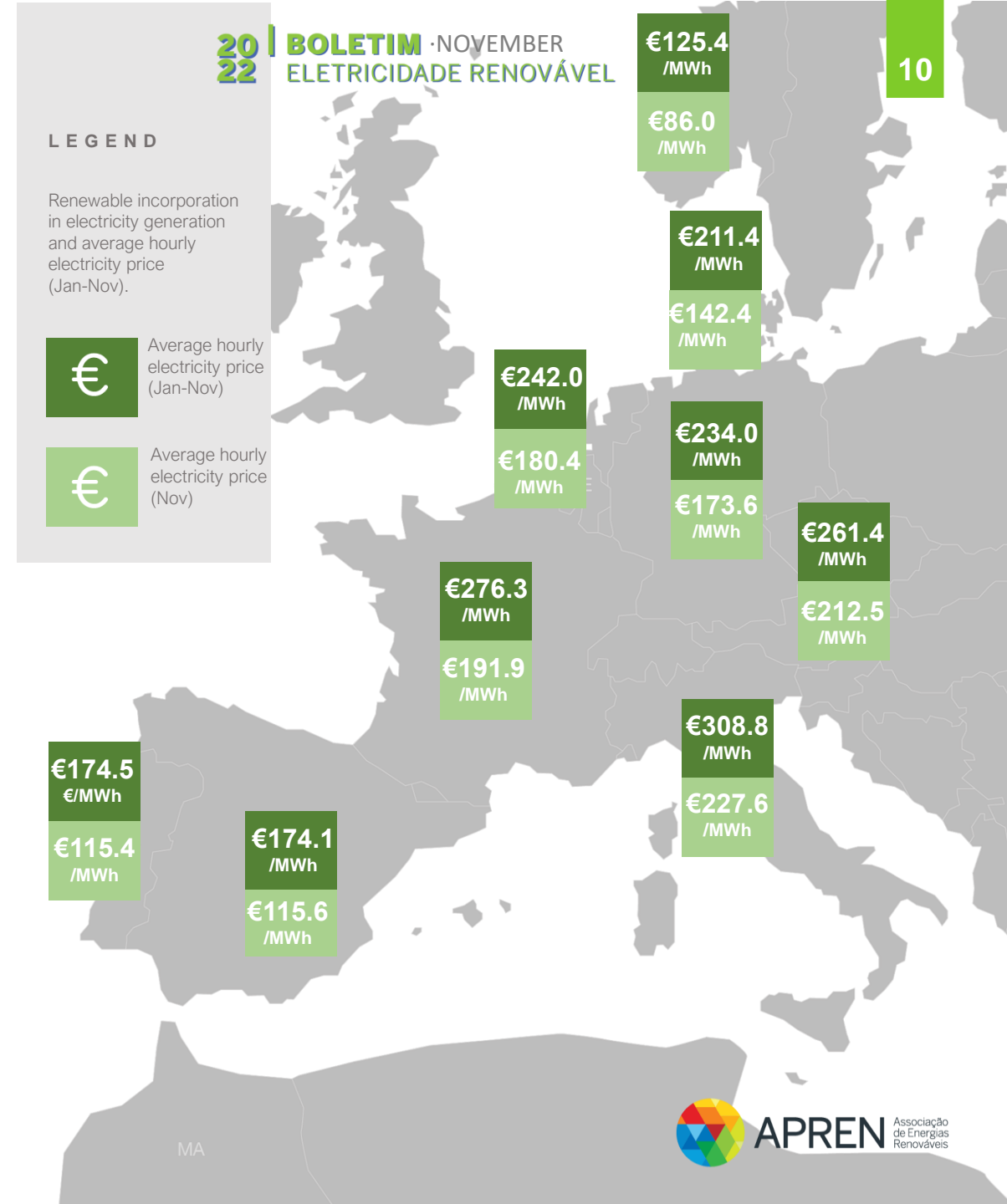
PRICES MINIMUM (Nov)

1st	-€4.10 /MWh	BELGIUM
2nd	-€0.38 /MWh	NORWAY
3rd	€0.04 /MWh	DENMARK

PRICES MAXIMUM (Nov)

1st	€503.6 /MWh	AUSTRIA BELGIUM DENMARK FRANCE GERMANY ITALY
2nd	€493.5 /MWh	NORWAY
3rd	€237.0 /MWh	SPAIN

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



Future Electricity Market

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

The map on the right shows the price values for the next month (December) and for next year. In both cases, MIBEL has the lowest values, while the French market has the highest ones.

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

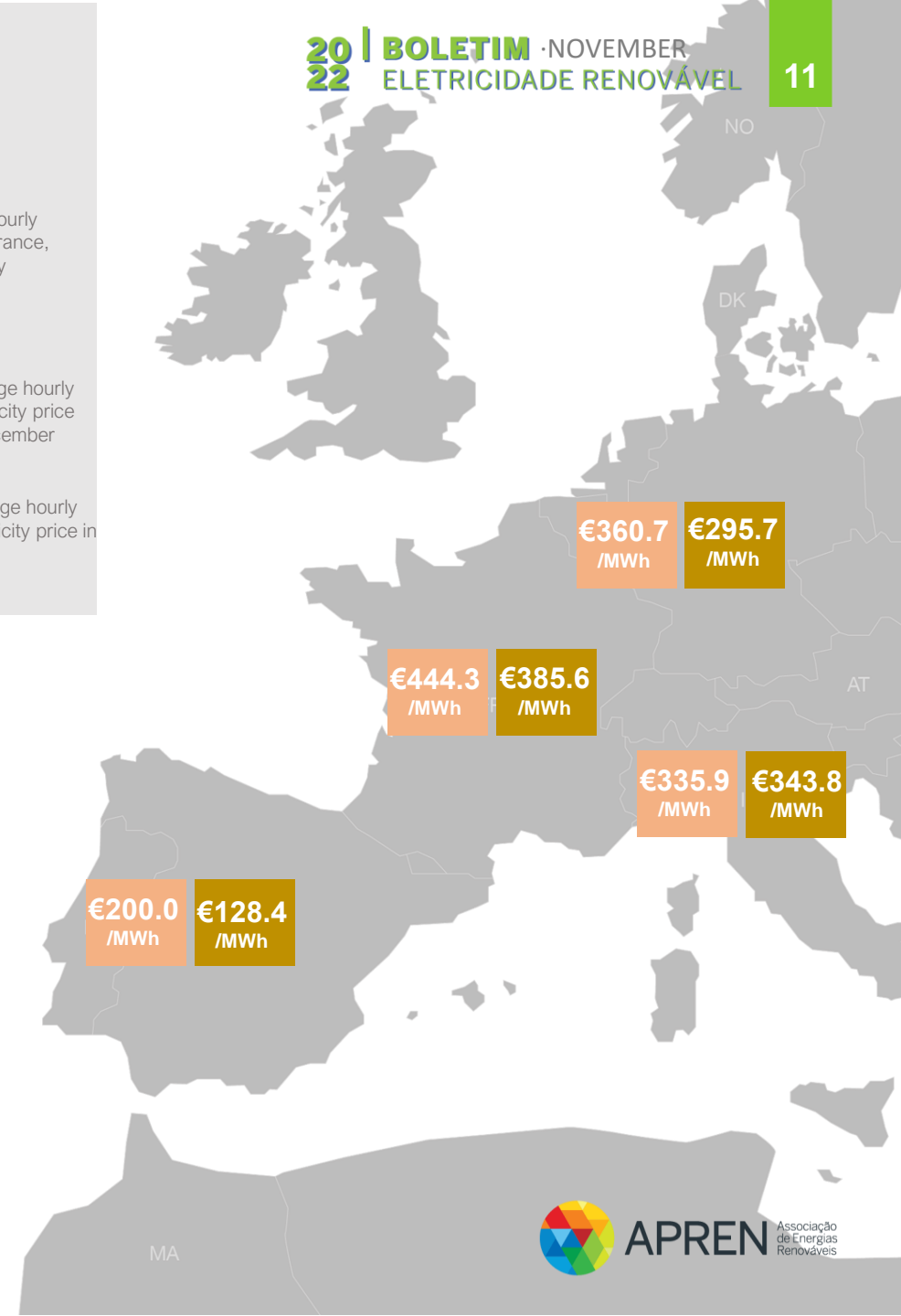
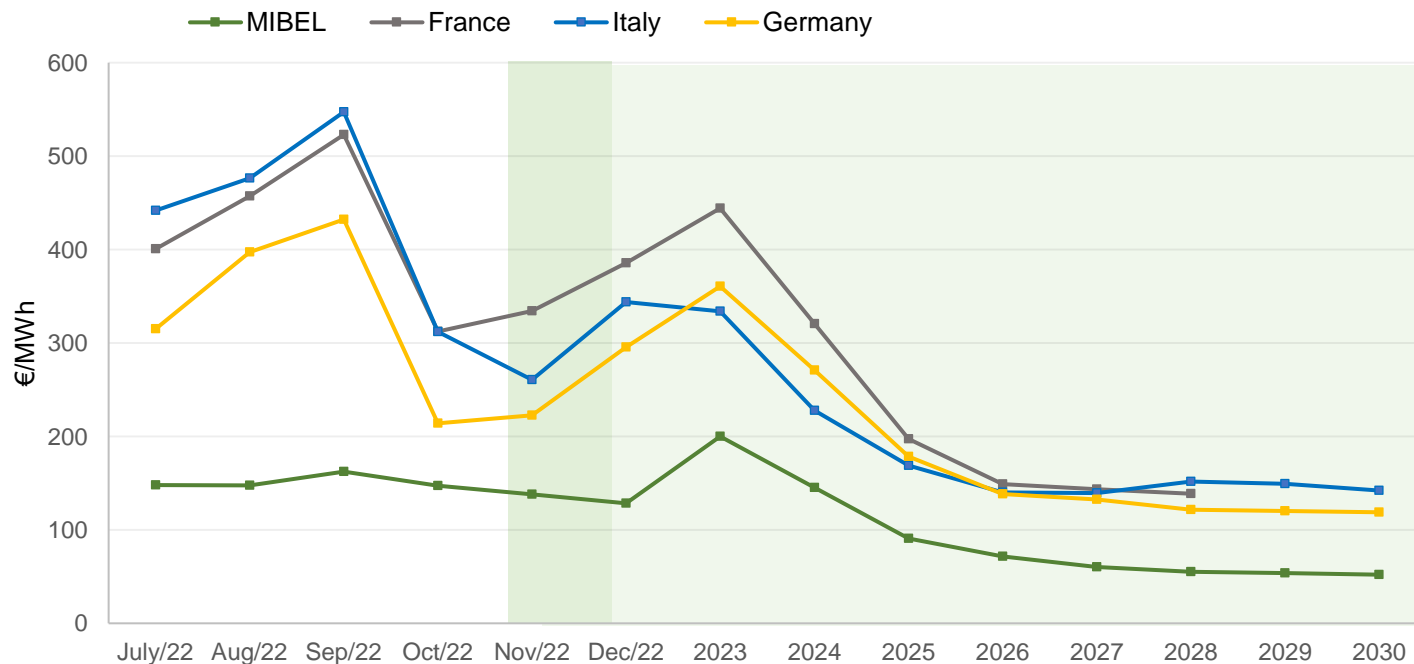
^d Values updated on December 5.
Source: OMIP, EEX, Analysis APREN

LEGEND

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

€ Average hourly electricity price in December

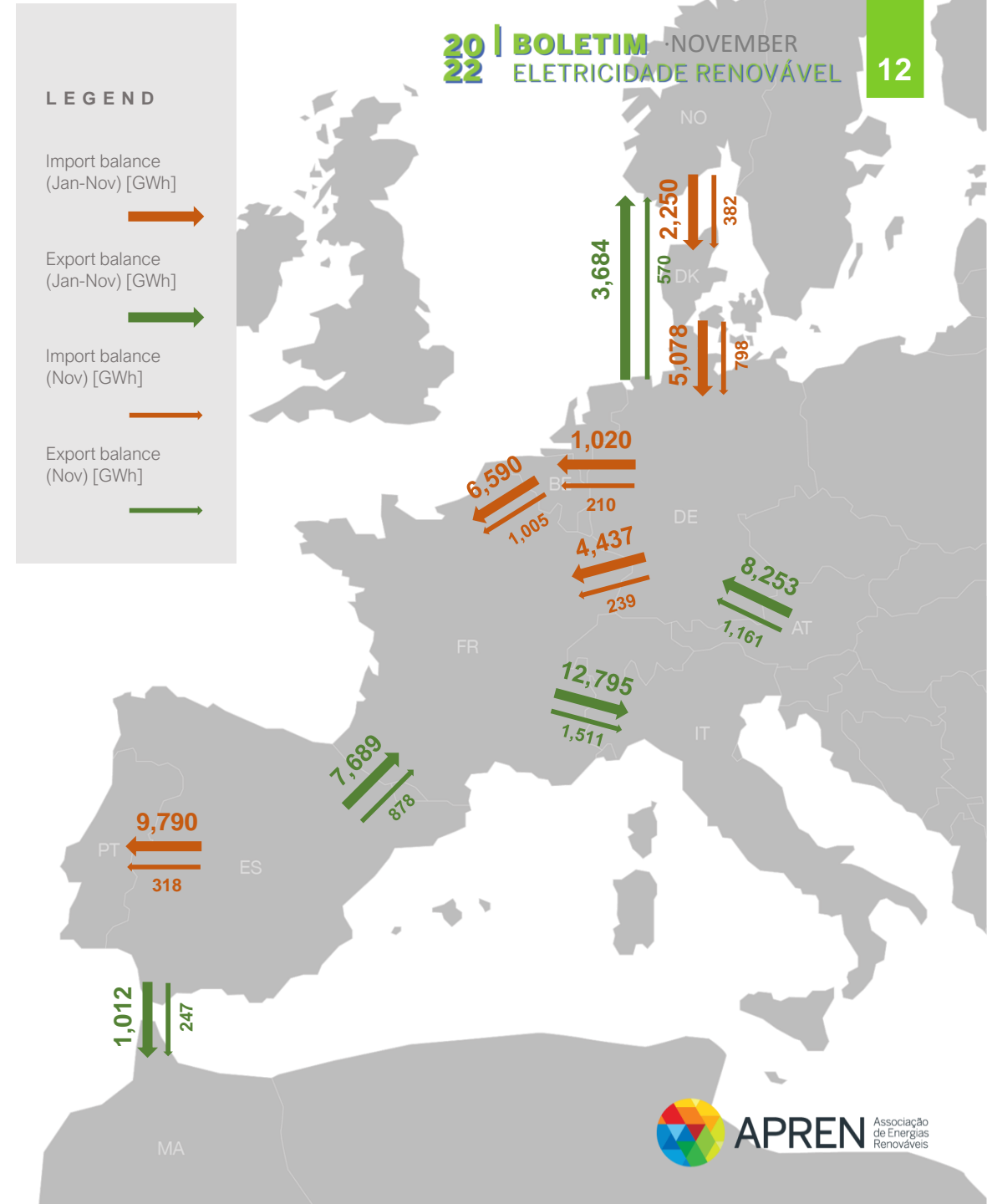
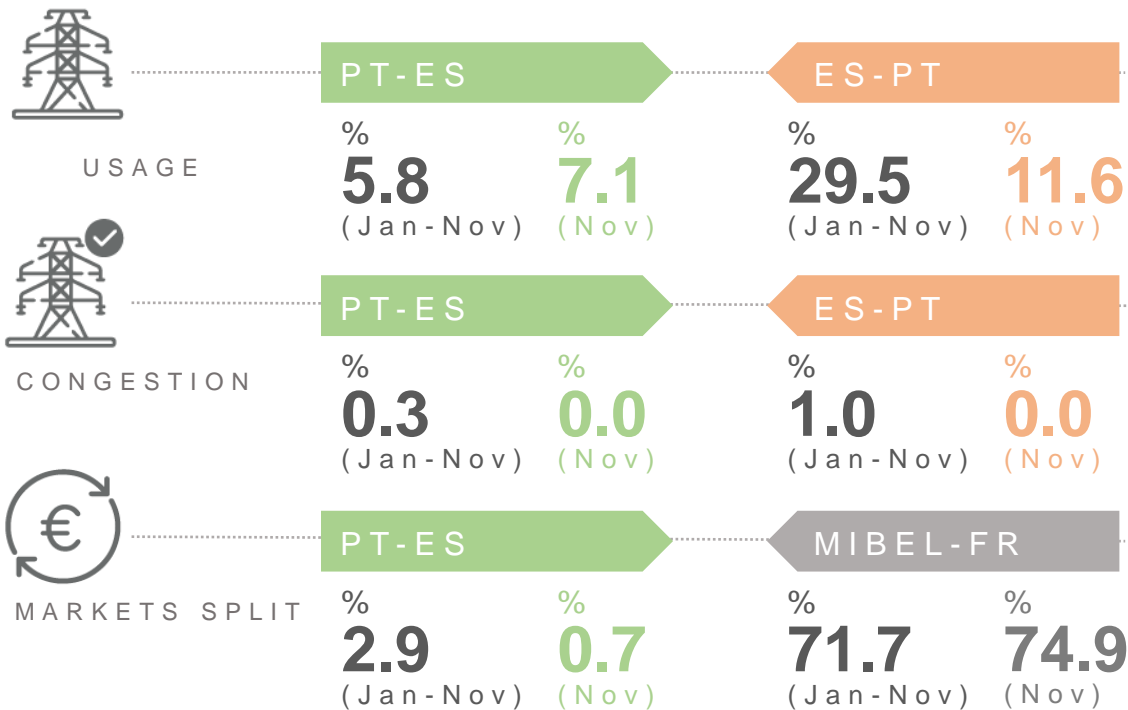
€ Average hourly electricity price in 2023



International Trade

Between January 1 and November 30, 2022, the electricity system of Mainland Portugal recorded electricity imports equivalent to 11,912 GWh and exports of 2,122 GWh, with Portugal being an importer with a balance of 9,790 GWh.

MAIN INTERCONNECTION INDICATORS PT-ES



Source: REN, Analysis APREN.

Simulation of price formation without SRP

SRP ESTIMATED SAVINGS

The indicators on the right identify the savings achieved between January 1 and November 30, by the contribution of production under special regime (SRP).

This is a study for SRP, which includes all installed capacity 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 that renewables have generated.



€202.3/MWh
Accumulated savings (Jan-Nov)

€164.9/MWh
Monthly savings (Nov)



€7.852 M
Accumulated savings (Jan-Nov)

€683 M
Monthly savings (Nov)

Note: This analysis is prepared using a program developed by APREN, based on Deloitte's calculation method.

Power sector emissions

Between January 1 and November 30, 2022, specific emissions reached 147 gCO₂eq/kWh, while the total emissions from the electro-producing sector reached 5,7 MtCO₂eq. The European Emissions Trading System (EU-ETS) recorded an average price of €80.5 /tCO₂^c, a sharp increase compared to the same period in 2021.

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

SECTOR EMISSIONS

5.7

MtCO₂eq

▼ **17.1%**

in comparison to Nov 2021

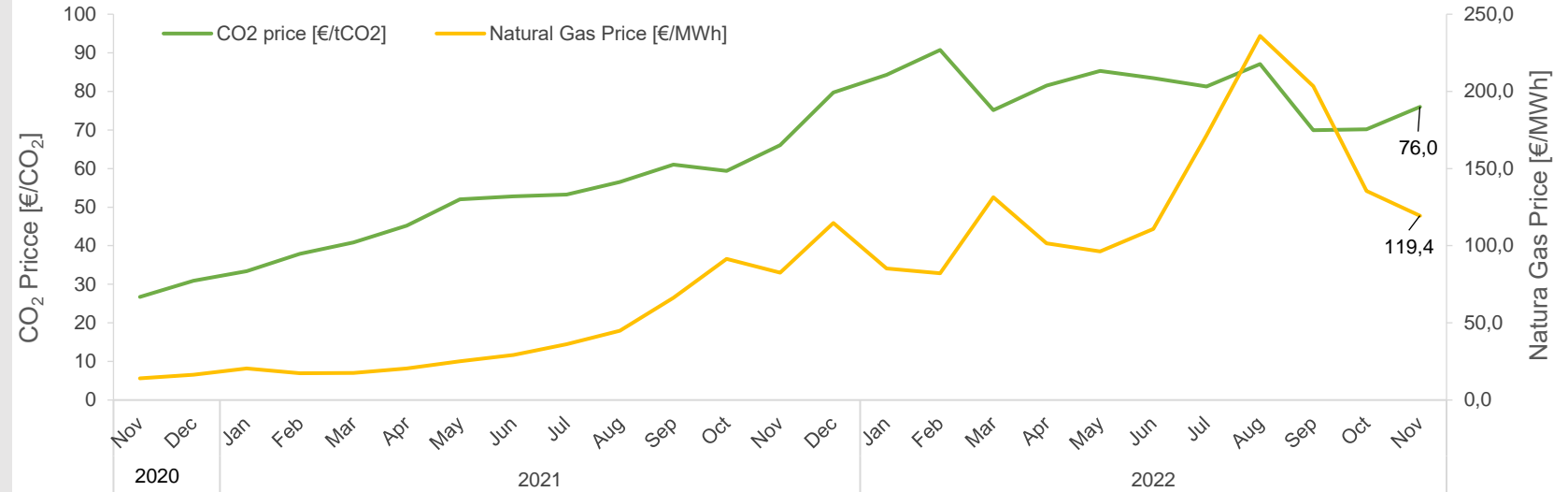
ALLOWANCES AVERAGE PRICE

€80.5

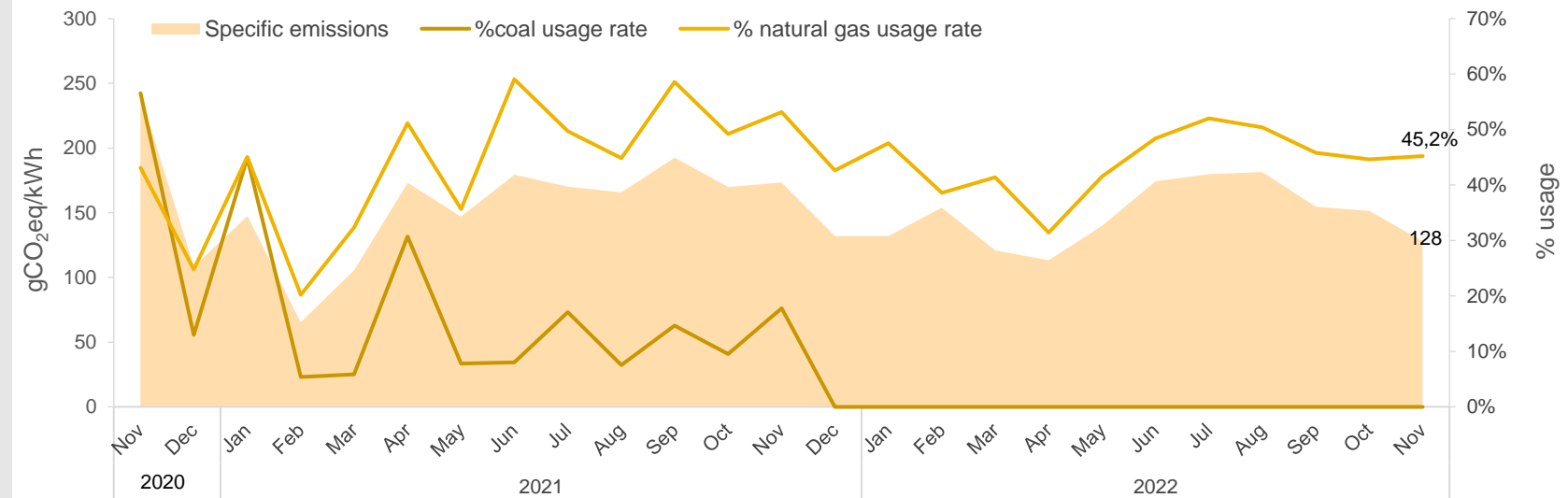
/tCO₂

▲ **58.0%**

in comparison to Nov 2021



Price of CO₂ allowances in EU-ETS and natural gas price in Europe (Nov-2020 to Nov-2022).
Source: SendeCO₂, WorldBank.



Market price, electricity consumption and renewable generation (Nov-2020 to Nov-2022).
Source: OMIE, REN, Analysis APREN

Environmental Service

The indicators on the right identify the savings reached between January 1 and November 30, 2022, in natural gas, CO₂ emissions and CO₂ emission allowances, resulting from renewable incorporation into electricity generation.

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

Renewables avoided:



€4,582 M

Imported natural gas (Jan-Nov)

€345 M

Imported natural gas (Nov)



6.9 MtCO₂eq

CO₂ emissions (Jan-Nov)

0.7 MtCO₂eq

CO₂ emissions (Nov)



€853 M

Imported electricity (Jan-Nov)

€90 M

Imported electricity (Nov)



€493 M

CO₂ allowances (Jan-Nov)

€41 M

CO₂ allowances (Nov)

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.

European Barometer

EU Innovation Fund

On 3 November the European Commission launched the [third call](#) for large-scale projects, concerning the decarbonisation, electrification of industry, hydrogen sector, and clean technologies.

Acceleration of the permitting process

On November 9, the European Commission has proposed a [temporary emergency regulation](#) to accelerate the permitting of renewable energy projects in order to meet the objectives of REPowerEU.

Limit to excessive natural gas price spikes

On November 22, the European Commission proposed a new UE [instrument](#) to limit excessive increases in natural gas prices to protect European businesses and households.

European funding

On November 23, more than €380 million in support for 168 new projects across Europe were [approved](#), under the [LIFE Programme](#), for the environment and climate action, and energy transition.

Natural gas supply

On November 24, the European Commission [set](#) intermediate objectives for Member States to achieve the target of having natural gas reserves at 90% by 1 November 2023.

National Barometer

Production and exploration permitting

On November 3, [Ordinance No. 267/2022](#) was published, establishing the structural elements of applications for production and operating permits for biomass plants. It repeals Ordinance No. 76/2022 of April 1.

Financial incentives in the Autonomous Region of the Azores

On November 4, the [Rectification Declaration No 6/2022/A](#) was published, amending the Regional Regulatory Decree No. 17/2022/A of September 8, which regulates the allocation of financial incentives for the acquisition and installation of photovoltaic solar systems to be installed in the Autonomous Region of the Azores.

Security of energy supply

On November 15, the [Rectification Declaration No. 29/2022](#) was published, amending the Resolution of the Council of Ministers No. 82/2022, defining preventive measures concerning the current situation and future disruptions, in order to ensure the security of energy supply.

Technological Free Zone in Viana do Castelo

On November 18, the [Notice No. 2023/2022](#) was published, which submits to the public consultation the draft ordinance that proceeds to the delimitation of the Free Technological Zone of renewable energies of origin or oceanic location in Viana do Castelo.

Metering, measurement and control equipment

On November 25, [Dispatch No. 26/DGEG/2022](#) was published, concerning the installation of metering, measurement and control equipment in each wind subpark, as defined in Decree-Law No. 35/2013.



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