



# REPORT

## RENEWABLE ELECTRICITY IN

## PORTUGAL

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Monthly Edition

December 2018



# RENEWABLE ELECTRICITY IN MAINLAND PORTUGAL

## Portuguese Power Sector Highlights

- In 2018, the incorporation rate for renewable energy sources into the electricity production mix was about 53,1 %, thus representing a 26 % increase over the 2017 value.
- This year, high prices were recorded within MIBEL daily market, being the annual average price 57,5 €/MWh for the Portuguese market. The rise of the prices was boosted by technical and economical factors such as: the increase of electricity demand, the increase of commodity prices including carbon emission allowances and European nuclear power plants outage.
- RES incorporation into the electricity mix resulted in total savings of 1 459 billion € in fossil fuel imports and carbon emission allowances.
- RES avoided the total emission of 12 MtCO<sub>2</sub>eq, that resulted in savings of around 191 M€.



## Electricity Production Profile in mainland Portugal

2018 registered an incorporation rate for renewable energy sources (RES) into the electricity production mix of about 53,1 % (29,30 TWh), within an annual electricity production of 55,13 TWh. The remaining 46,9 % (25,83 TWh) were produced by fossil fuels.

This value reflects a 26 % increase in the RES representation, when comparing to the 2017 value, which is a clear result of the 2018 hydroelectric producibility index rise (increased from 0,47 to 1,05).

Hydroelectricity was the major energy source for electricity production, with a 24,2 % share, followed by wind, with 22,4 % (Figure 2).

However, and despite this hydroelectric predominance, large hydro power plants produced less renewable electricity than the wind farms, with a contribution of 22,2 %, while the remaining 2,0 % resulted from small hydro power plants.

Bioenergy and solar contributed with 5,0 % and 1,5 %, respectively.

The international trade reflected a net export balance of 2,6 TWh, which accounts for 4,7 % of the mainland's electricity production. Despite the annual export tendency, in some months (February, May and October), electricity imports were predominant.

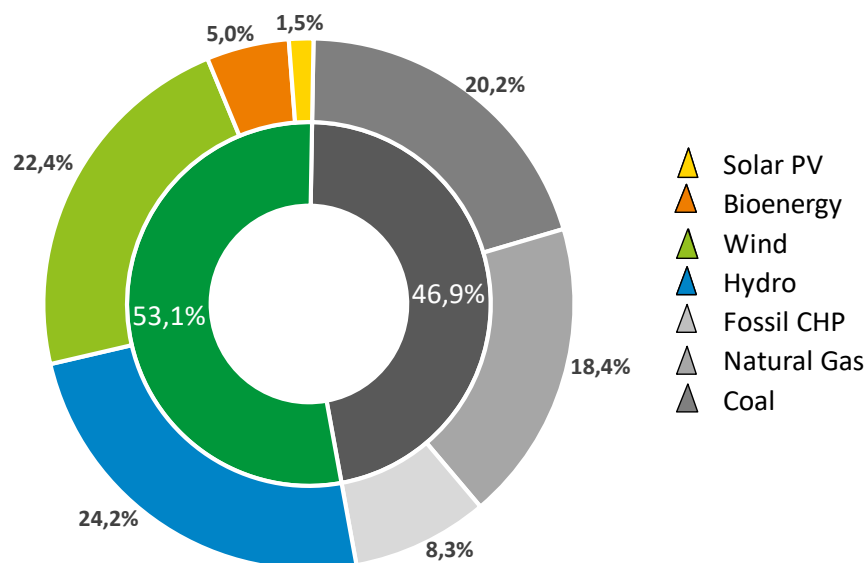


Figure 1: Electricity generation by energy source in mainland Portugal (January to December 2018).

Source: REN; APREN's analysis



## Electricity Market

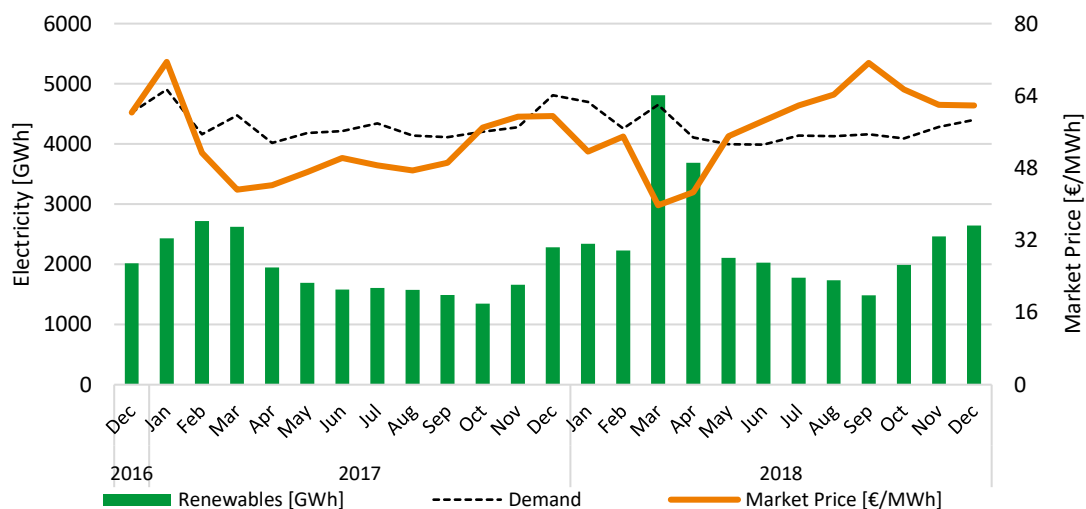
The annual average for MIBEL's daily market prices in Portugal was 57,5 €/MWh, which reflected a 9,6 % increase over last year's value. In fact, in 2018, some technical/economic factors were identified as clear enablers for high electricity prices, such as:

- the increase of electricity demand (2,5 % over 2017 value) in mainland Portugal (1,7 % when considering corrections on temperature and number of working days);
- the increase of CO<sub>2</sub> emission allowances price within the European market by 2,7 times compared to 2017, with a 2018's annual average of 15,9 €/tCO<sub>2</sub>;
- the increase of commodity prices over 2017 values: 34 % for natural gas and 15 % for coal;

- the outage of nuclear power plants in Spain and other European markets, leading to an increase in electricity prices throughout Europe.

Figure 2 shows the monthly electricity market prices for the last 2 years in Portugal; reflecting the positive impact of renewables for the same period. It is worth mentioning that March 2018 registered the second highest value for the monthly electricity demand and the minimum value for the monthly electricity market price (39,75 €/MWh). Also, in this month, RES production was enough to supply the demand.

The electricity demand has been reflecting an upwards tendency since 2016 with an average annual growth rate of 1,3 %. This may have resulted from an increase of electrification and from some improvements in the country's economic situation.



**Figure 2: Renewable Electricity Production and Iberian Wholesale Electricity Price (December 2016 to December 2018).**

Source: OMIE, REN; APREN's analysis



### Production profile for the last 2 years

The 2018's significant increase in RES electricity production in comparison to 2017 was partly due to the hydroelectric productivity, that was slightly above the average, with special predominance in March and April (Figure 3). As for the wind power production, it's larger values were recorded in March, followed by October, when severe weather systems hit the country's coastline, including the post-tropical storm Leslie.

2018 recorded 670 hours of 100% renewable electricity, meaning, periods when the RES pro-

duction met or surpassed the mainland's electricity demand. These periods were characterized by an average market price of 37,7 €/MWh, which is 34 % lower than the yearly average. The majority of such periods occurred in March and April, with March alone accounting for 66 %.

Focusing the analysis in December, there is an almost equitable renewables breakdown between hydro and wind technologies, although the monthly wind productivity was slightly below the average (0,83), when compared to the previous months and the last two years.

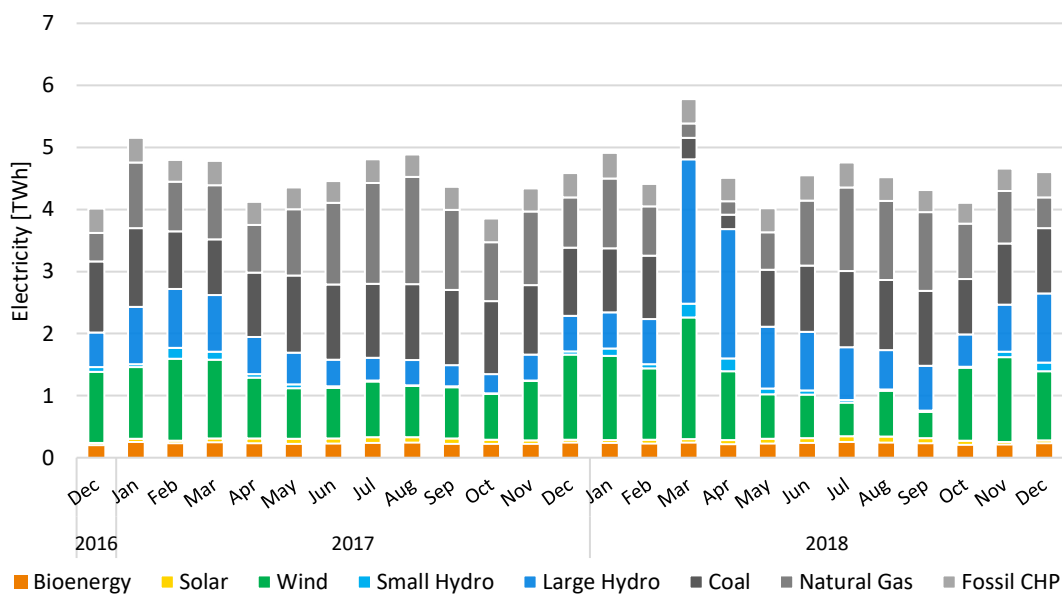


Figure 3: Electricity production distribution by energy source in mainland Portugal (December 2016 to December 2018).

Source: REN; APREN's analysis



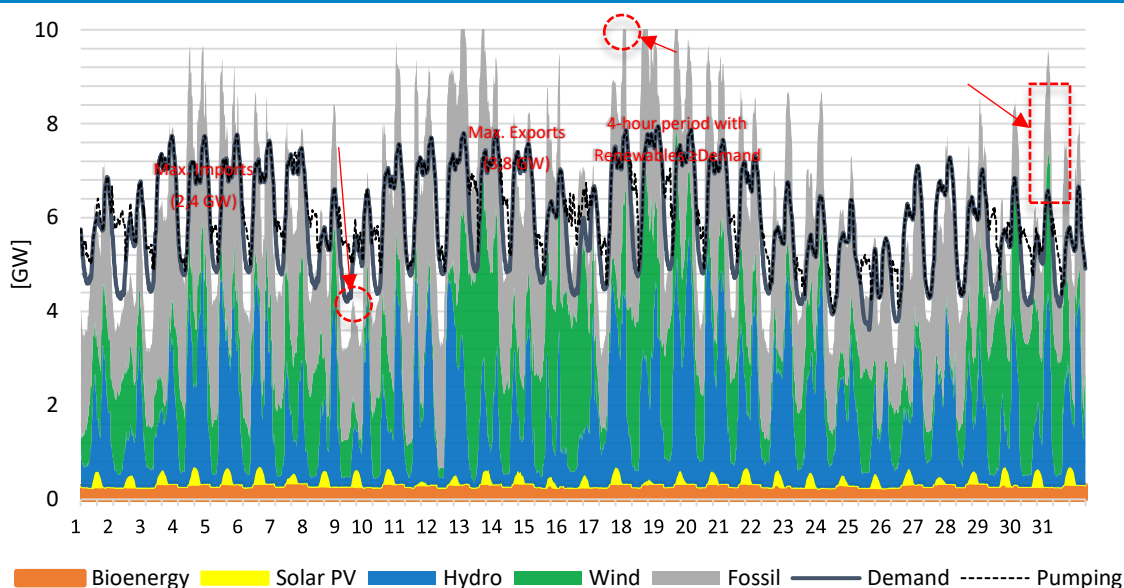
## December's Load Diagram

Figure 4 represents December 2018's load diagram by energy source. The majority (57,0 %) was provided by RES, with a total contribution of 4 610 GWh.

In some periods, RES production exceeded the electricity demand, such as the period depicted in the figure below, from 5 pm to 10 pm on the

30<sup>th</sup>. Hydro technology was the one with the highest share over the electricity demand, with 28,5 %, followed by wind power, with 25,2 %.

Considering December's electricity exchanges with Spain, a maximum import value was recorded on the 9<sup>th</sup> at 3 pm. (2,4 GW) and a maximum export value on the 18<sup>th</sup> at 7:15 pm (3,8 GW).



**Figure 4: Load Diagram for mainland Portugal (December 2018).**

**Source: REN; APREN's analysis**

Among the numerous economic benefits resulting from a greater RES incorporation into the electricity production mix, 2018 registered the following:

- a 1 268 million € saving in fossil fuel imports;
- a 191 million € saving in CO<sub>2</sub> emission allowances. Emphasis is also given to the environmental benefits derived from the avoided CO<sub>2</sub> emissions, which totalled 12 MtCO<sub>2</sub> in 2018 when the overall sectoral emissions accounted for 14 tCO<sub>2</sub>. In a fully "fossilized" scenario, the total sectorial emissions would al-

most double, thus placing renewable technologies as a vector of utmost importance to achieve the objectives set in the Paris Agreement, as well as the Country's goals set in the 2050 Portuguese Carbon Roadmap (RNC2050).

RES incorporation in the electricity mix is a clear vector within the roadmap to carbon neutrality, in parallel with other major energy policies, especially:



- 1) RES-E target of 80% by 2030 and 100% by 2050;
- 2) Energy efficiency measures, with a specific target for electricity demand reduction (in comparison to 2015 values) from 30-31% by 2030 and from 41-44% by 2050;
- 3) Higher RES integration in the transport sector (27-30% by 2030 and 100% by 2050);
- 4) Higher RES integration in the heating and cooling sector (34-37% by 2030 and 69-72% by 2050).

Following the RNC 2050 presentation, the National Energy and Climate Plan for 2030 is expected to be published in early 2019, which will serve as a complement to the stated roadmap and shall be in full compliance with EU policies and international climate ambitions, playing a major role in complying with the average world temperature rise well below 2°C in comparison to pre-industrial levels.

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