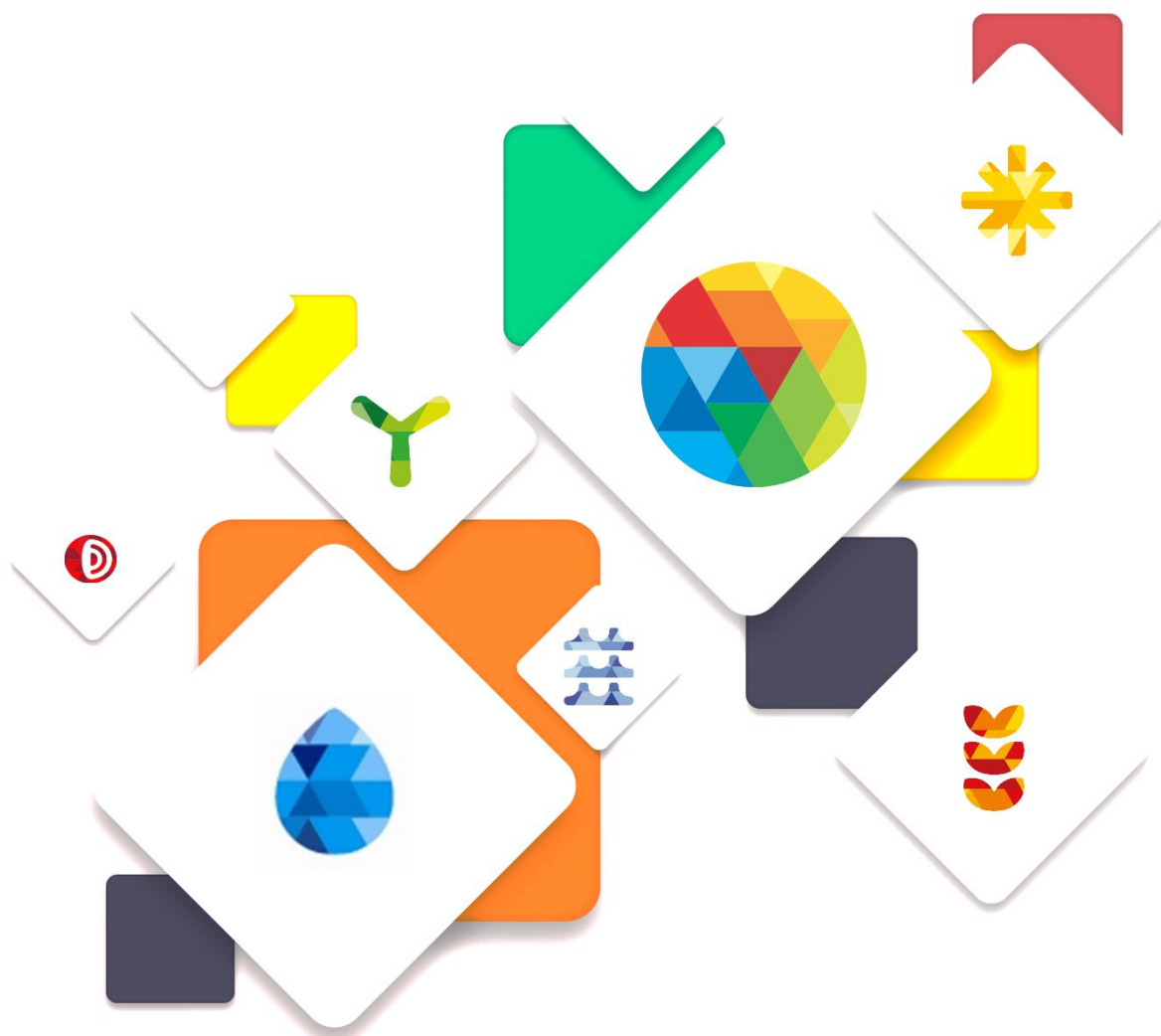




APREN Associação
de Energias
Renováveis



REPORT RENEWABLE ELECTRICITY IN PORTUGAL

Monthly Edition
December 2017

RENEWABLE ELECTRICITY IN MAINLAND PORTUGAL



Highlights of 2017

- One of the four hottest years since 1931.
- 25 % increase of carbon dioxide emissions from non-renewable power plants, compared to 2016 (overall emissions of 19.4 million tons).
- The increase of the non-renewable electricity generation in 2017 led to a rise of 33% in the average annual electricity wholesale market price, compared to 2016, which resulted in 52,45 €/MWh.
- One of the lowest renewable electricity shares in Portugal.
- Second highest value of electricity net exports, almost half of the 2016's value.
- Benefit of 727 M€ to the Portuguese economy due to the positive influence of the renewable electricity in the wholesale market price.

2017 was characterized by being extremely dry and hot. In fact, according to the Portuguese Institute of the Sea and Atmosphere, 2017 was among the four hottest years since 1931.

These conditions negatively influenced the renewable production of electricity and during the year, renewable energy sources only accounted for 44.3% (22,956 GWh) of the total consumption ¹ of Mainland Portugal (51,839 GWh).

In 2017 the hydro coefficient was 0.47, which translates into a reduction of the hydroelectricity generation (hydropower plants produced slightly more than 1/3 of 2016).

This low value was one of the weakest ever, only surpassed by the values of 1992 and 2005.

By its turn, 2017's wind index (index = 0.97) was slightly lower than 2016 (index = 1.0). Nonetheless, wind power was the most prominent renewable source of 2017, accounting for 23.1% of the electricity consumption in the Mainland, followed by hydroelectricity that had a share of 14.2%.

The 2017's accumulated value of the electricity production (production = consumption + exports) by energy sources in Mainland Portugal is shown in figure 1.

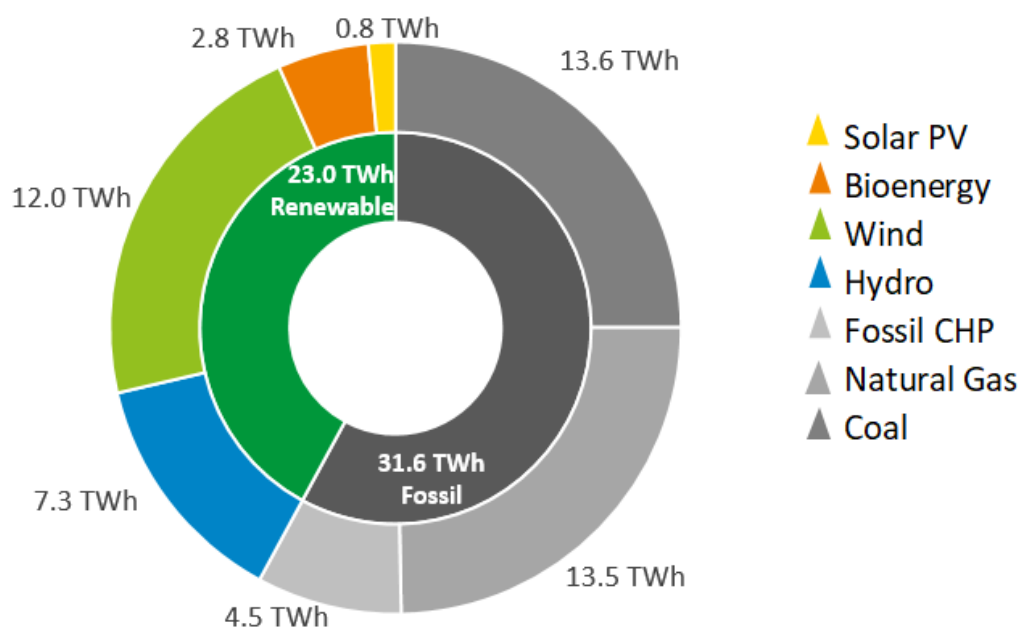


Figure 1: Electricity generation by energy sources in Mainland Portugal. (January until December 2017)
Source: REN; APREN's analyses

¹ This consumption value refers to the power plant's electricity generation for final consumption (grid losses and pumped hydroelectric energy storage consumptions are added up to this value.)



Biomass and solar increased slightly their production, representing respectively 5.4% and 1.6% of the consumption.

It should also be noted that, although in recent years, there has been a reduction of costs in the photovoltaic systems, despite the high levels of solar irradiation in Portugal and the suitability of solar to the Portuguese load diagram, the power installed in large scale solar plants had only a 3% growth.

On the other hand, the fossil power plants generated 31,567 GWh, which were responsible for approximately 19.4 million tons of carbon dioxide. This value represents

an increase of around 4 million tons (+ 25%), when compared to 2016.

Regarding the annual breakdown of fossil production, the conventional thermal power plants generated 27,086 GWh (13,608 GWh in coal power plants and 13,478 GWh in natural gas power plants), while fossil fuel cogeneration produced 4,481 GWh.

The electricity exports (net value of 2,684 GWh) was also a milestone in the power generation sector during 2017. This export value is the second largest ever of Mainland Portugal, being only surpassed by the value of 2016 (5,082 GWh).

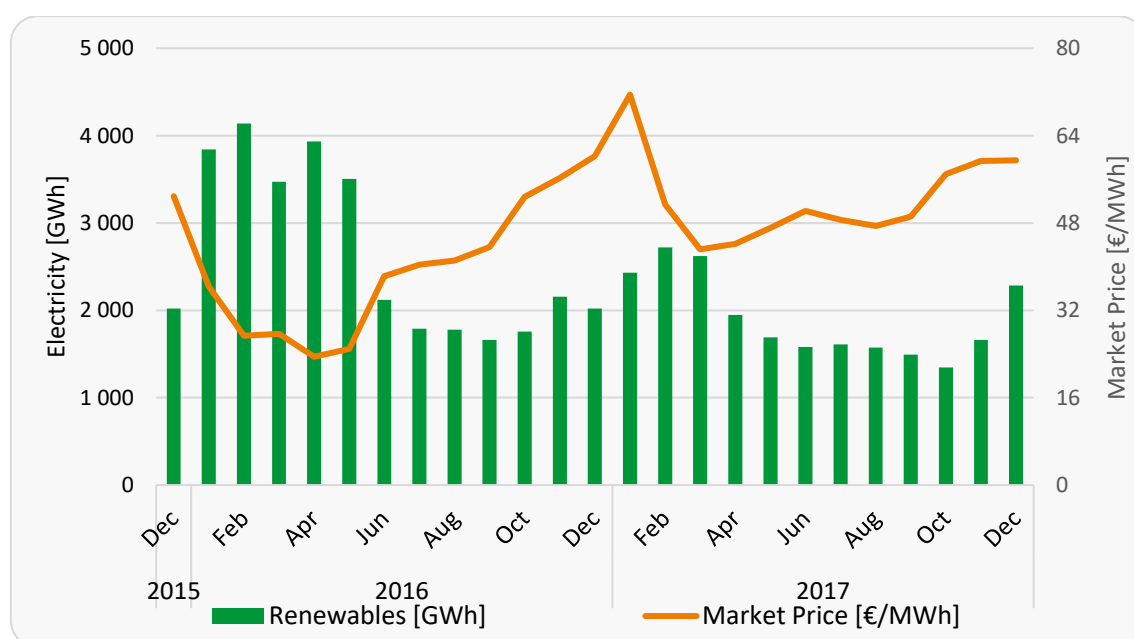


Figure 2: Evolution of the Renewable Electricity Production and of the Iberian Wholesale Electricity Price. (December of 2015 until December of 2017)

Source: OMIE, REN; APREN's Analysis



During 2017, the rise of the electricity generated in fossil power plants, due to the lower share of renewable sources, led to an increase in the electricity's price in the wholesale market. The yearly average of 2017 stood at 52.45 €/MWh, a value far higher than the 2016's value (39.4 €/MWh), when the renewables accounted for 64 % of the Mainland consumption.

Even so, it is estimated that in 2017 the renewable production had a beneficial effect of 727 M€² on the Portuguese economy by having reduced the wholesale price of electricity at around 18.3 €/MWh.

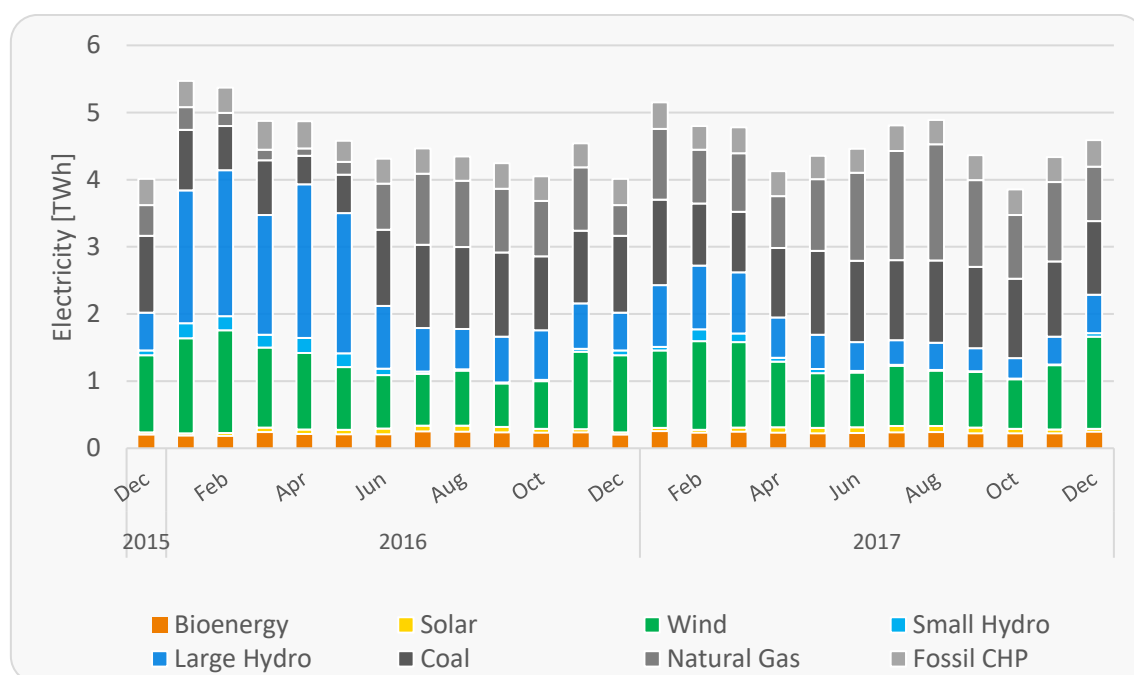


Figure 3: Distribution of the electricity generation by source in Mainland Portugal. (December of 2015 until December of 2017)

Source: REN; APREN's Analysis

Figure 3 illustrates the production of electricity by source in the last 2 years. In 2017, it is highlighted the significant drop in the hydroelectricity generation, when compared to 2016.

However, in the more critical months of drought, the contribution of other renewable technologies maintained an important share in the electricity mix (close to 30% of production).

² Estimated value, based on the most recent data (September 2017), of the production offers made available by the operator of the Iberian electricity market.



In 2017, it was still possible to obtain a set of 122 hours, non-consecutive, in which renewable energy alone were enough to supply the electricity consumption of Mainland Portugal.

Focusing the analysis on the production mix of December (Figure 4), two peculiar aspects are emphasized.

The first refers to the peak of the renewable electricity monthly production, 7,485 MW,

which occurred at 5:45 p.m. on the 26th. During this period, renewables accounted for 105% of the Portuguese electricity consumption.

The second event occurs on the 12th of December, when the peak of the fossil electricity monthly production reached 5,598 MW at 7:00 p.m.

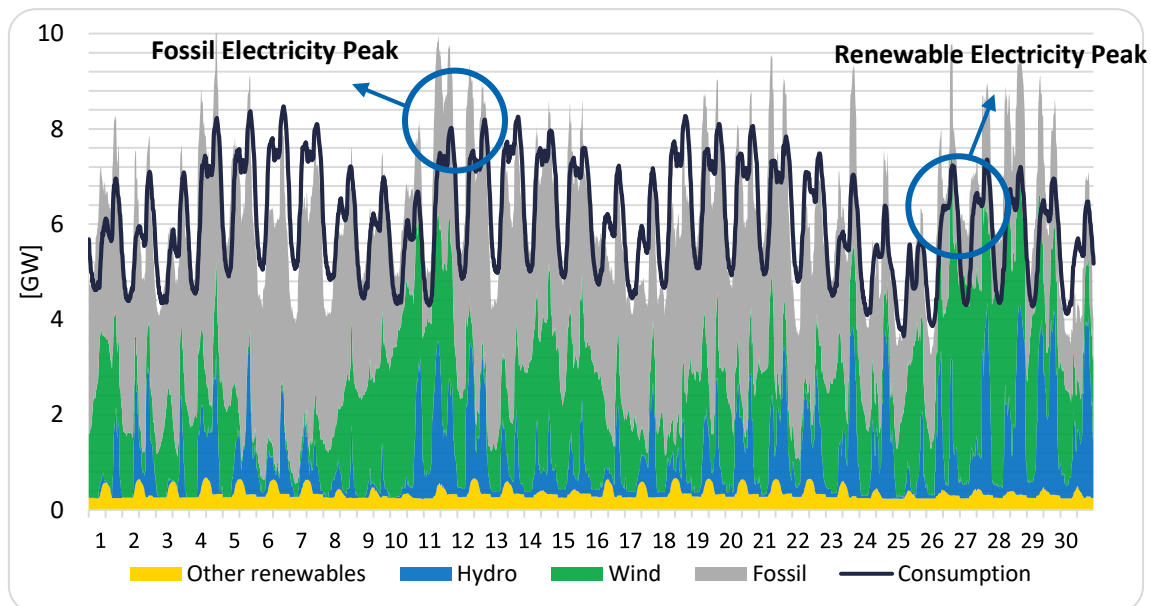


Figure 4: Load Diagram of Mainland Portugal. (December of 2017)

Source: REN; APREN's analyses

In normalized terms (annual means of resource availability and wind power), it is estimated that in 2017 the share of renewable electricity was 56%³. This is a much lower value than the expectations to achieve the goal the Portuguese Government agreed with the European Union, that by 2020 60% of

electricity consumed in Portugal had its origin in renewable energy sources, which demonstrates the need for a more ambitious policy in the renewable sector.

It is expected that during 2018, following Portugal's admission to "Powering Past Coal Alliance ", an alliance created at COP23, in

³ APREN's forecast, using the methodology of the Directive 2009/28/EC.

which its subscribers commit themselves to decommission their coal-fired power stations by 2030, and following the announcement of the Portuguese Prime Minister and the Minister of Environment that Portugal aims to achieve carbon neutrality, in the overall energy sector, by 2050, the new year will be marked by new actions and policies to fight climate change.

Such measures should be in line with the Clean Energy package, in discussion in the EU, for 2030, which aims to put Europe as a worldwide leader of the renewable sector and in which, Portugal along with Denmark aim for ambitious targets.

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