

CURRENT STATUS AND FUTURE DIRECTIONS OF RENEWABLE ENERGY SOURCES IN SPAIN

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Abstract: This paper reviews the existing status of renewable energy source (RES) along with assessing their potential for the contribution of energy demand in Spain, and to make the best possible use of these resources, it examines the prospects. Spain most viable renewable energy sources are solar and wind. Nowadays, Spain is on importing electricity from the neighbour countries, such as Portugal or France, which is not an optimum solution for the long-term. The most hopeful and promising source for everlasting electricity generation in Spain is renewable energy (RE), which offers a wide array of opportunities. Spain can produce around 65 GW of power through utilizing renewable energy resources available in the country, most of it comes from the wind. The rapid and high deployment of renewable energy empowers a sustainable future in Spain.

Keywords: Renewable energy, Electricity generation, Power sector, Installed Capacity.

INTRODUCTION

Country Profile and Power Sector Outlook. Spain is a transcontinental country located in the southwestern Europe and in the North of Africa. Without a doubt, Spain has an excellent geographical location that allows it to exploit natural resources that came mainly from the sun and the wind – we are currently the fourth largest supplier of wind energy in the world. There are more than 3167 km of coast and loss of mountain systems, the relief of the Iberian Peninsula is articulated around a great central unit, the “Meseta Central” with a high average altitude. Regarding the climate, due to our peninsular situation, we are exposed to hot and cold air masses, in the north there is a colder and more humid climate and, in the Mediterranean, a dry and warm climate.

Spain is on the verge of stability and growth and needs reliable supply of energy sources to fuel this growth. Last year, Spain had an Electrical Power Installed that exceed 113.455 MW, of this amount 49.4% come from renewable energy and the other 51.6% are from non-renewable energy, most of it combined cycle and nuclear.

Spain’s total power production capacity is 113 MW, 26% of this power is self-generated meanwhile the other 74% is imported energy. The country produce more than 26.250 MW combined cycle energy and 28.559 MW wind energy, these two are the most important sources of energy in Spain.

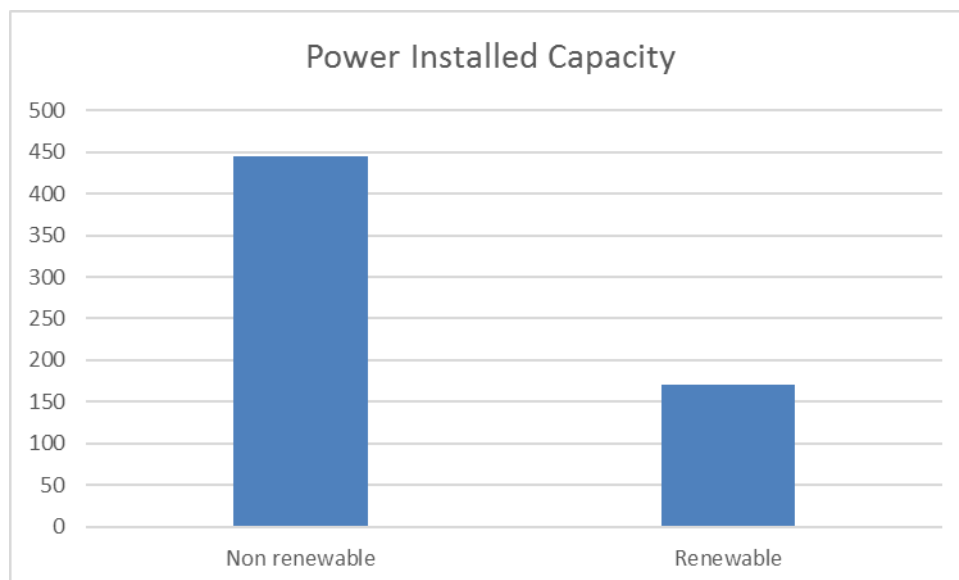


Fig. 1. Power Installed Capacity of Spain (MW), 2021

EXPOSITION

Renewable Energy Outlook in Spain

As seen before, Spain has lots of potential with the Renewable Energy Sources, we have only begun to exploit them. If we were able to exploit these energy sources, it would be the beginning of a new era for the environment and for the population, which would save a lot of money on energy. It also helps the country not to be dependent on other countries to survive energetically.

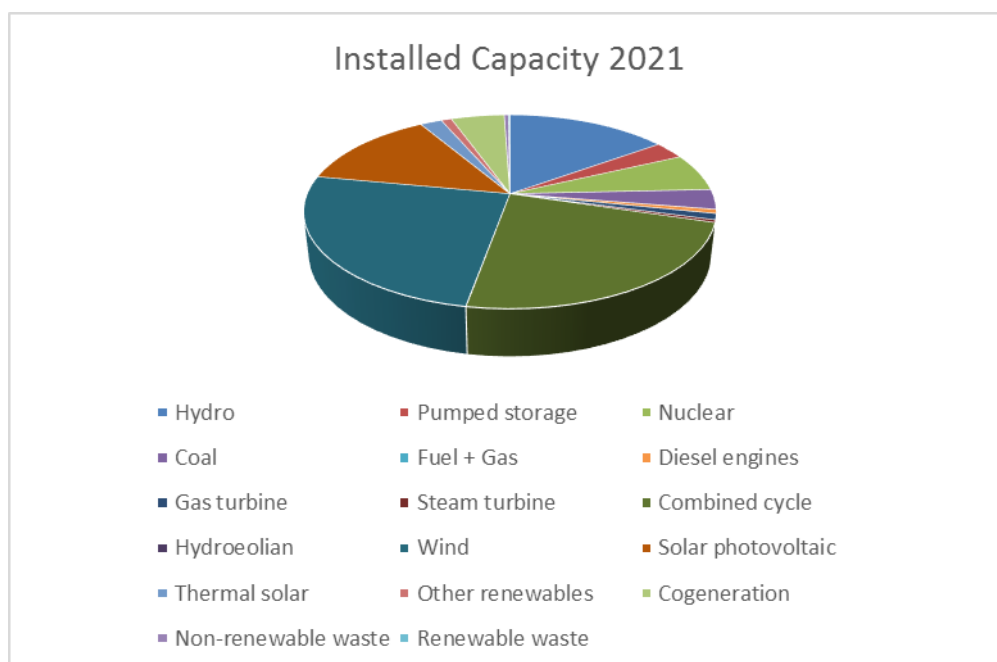


Fig. 2. Installed Capacity of Spain (%), 2021

The two renewable energies that have the most potential in Spain are the wind energy and the solar energy. In total, the national electricity system added more than 4000 renewable MW in 2021 compared to 2020, obtaining approximately 63000 MW of green capacity. Photovoltaic solar energy was the technology that contributed the most to this impulse. Its installed power has

increased by almost 28.8%, allowing the generation of electricity with this technology to increase to 36.75%.

The “Avance del Informe del Sistema Eléctrico Español 2021” reveals that one in every for MW installed in Spain is from wind generation, a technology that has increased its presence by 2.5% compared to 2020. After wind power, which is the technology with the highest installed power in the country, come the combined cycle (23.3%); hydraulics (15.1%) and solar photovoltaic (13.3%). According to the report, coal reduces by almost 2000 MW and is the star of the biggest decrease of the year.

These renewable technologies reached a historical production record, in 2020 it was 37% and in 2021 was 47%. Spain has a great potential to continue increasing its production of renewable energies in the future (Smartgridsinfo,2022).

Wind Energy

The wind energy is one of the most used in our country. Spain is also the fifth country in the world for installed wind power, after China, USA, Germany, and India, and the second in Europe behind Germany. It produces more than 28000 MW thanks to the more than 1290 wind farms that are all around Spain. All this energy is produced mainly because of the fantastic geographical location of these farms, since the average wind speed in Spain is about 3.7 m/s.

These data are very relevant figures, but they are well below the 2.2 GW per year that it would be necessary to install until 2030 to achieve the objectives set in the National Integrated Energy and Climate Plan (PNIEC), which seeks a reduction of 23% of greenhouse gas (GHG) emissions compared to 1990, which implies an increase in renewables and, in particular, doubling wind power (Spanish Wind Energy Association, AEE).

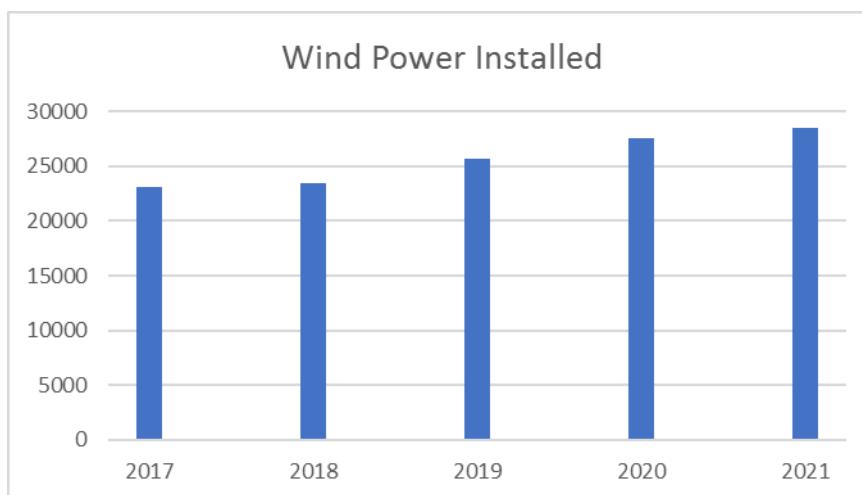


Fig. 3. Wind Power Installed in Spain (2017-2021) (MW)

Solar Energy

In Spain we produced 15.190 MW of solar energy installed last year with more than 62.406 photovoltaic installations around the country. Is placed as ninth country with more solar energy installed worldwide, more than 2500 hours per year. From solar energy are obtained both solar thermal and photovoltaic energy, but the most profitable is the second one.

The increase in the energy price is not only making a dent in household consumption, but also in the entire energy mix. The rise in the price of gas has also increased the price of electricity, which has ended up promoting the use of solar energy throughout the country.

According to official data from “Red Eléctrica Española (REE),” photovoltaic solar power has tripled in the last 3 years, going from 4.767 MW in 2019 to more than 15.000 MW in 2021. Part of this increase is based on self-consumption.

One of the Keys to this increase has been the repeal of the so-called “Sun tax” in 2018. The tax recorded the connection to the electricity grid, which resulted in economic losses for investors and private consumers who had opted for this clean energy. Another of the factors that has promoted the self-consumption has been the increase in the government aid and subsidies.



Fig.4. Annual hours of sunshine map of Spain

Advances in the energy transition in Spain

The report of “Red Eléctrica de España (REE)” reveals the addition of 206 new km put into service and 850 new MVA of transformation capacity that reinforce the reliability and security of an increasingly meshed, intelligent, and sustainable transport network.

Last year extensions of the transmission network were undertaken to allow the connection of renewable power. Specifically, 16 positions have been completed and put into service that will facilitate the connection of renewable installations for a total of almost 4.700 MW.

These data, together with the fact that renewable energies reached the largest share since records began, touching 47% of the generation mix; that wind power is consolidated as the main source of generation with a 23% share in the mix; and the photovoltaic energy is the technology that grows the most in 2021 - not only in its generation, where it increases by 37%, but also in terms of its installed power, where it is close to an increase of 30%-, show that Spain continues to take steps in its energy transition process.

Risks and Barriers

Despite being developing very quickly and having government and European Union support, there are certain adversities to consider regarding renewable energies.

One of these most important adversities is the economic factor, despite having subsidies, the cost of infrastructures for wind farms and photovoltaic cells, for example, is still extremely high and it takes too long to amortize that money.

Another problem that must be considered is the environmental issue, building these structures occupy many kilometres of land, which invades the habitat of many animals and forces them to go to another places. The noise and movement of these machines also disturb the flora and fauna of the area, for example, a bird that is in time of migration would be unable to dodge the propellers of a wind turbine that had 260 meters high. This disturbance must be solved as soon as possible so as not to alter the ecosystem.

CONCLUSION

Spain has always been characterized by its extremely high energy dependence on fossil fuels, which reached its historical maximum in 2008, when it reached 81.3%. Thanks to generation with renewable energies, dependency decreased year after year until 2013, when dependency was reduced to 70.2%. Due to the renewable moratorium, this decrease was interrupted, remaining at around 73% in the following years.

Finally with the boom of renewable energy in recent years we have been increasing our percentage of clean energy increasingly, reaching 48.4% which continues to rise. Renewable energies, being clean, autochthonous, and inexhaustible sources of energy, are a fundamental and necessary tool to solve all the dependence energy problems.

So, as seen, Spain has privileged conditions, thousands of kilometres of coastline, 2500 hours of sunshine per year and, in general, perfect weather conditions. As a result, this is the time to look forward and deal with all the adversities and focus on the renewable energies instead of relying on other countries for energy. With a little more effort, Spain has the potential to develop as a world power in the renewable energy sector in a brief period.

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