

The Spanish Electricity System

Renewable Energy - Summary Report



PRESENTATION



Renewable Energy - Summary Report

The year 2021, marked by the prolongation of the COVID-19 health crisis and by new conditioning factors at the end of the year such as the rise in raw materials and fuel prices, has made evident the need for new strategies and legislative proposals that make it possible to achieve climate neutrality and to reduce the dependence on fossil fuels.

In 2021, the 'Fit for 55' legislative package was published, which was already announced in the communication of the European Green Deal to increase the emission reduction effort in 2030 from 40% to 55% compared to 1990 levels. To achieve this goal, the target for the share of renewables in final energy generated is increased from 32% to 40%, which affects all sectors.

Within this context, the electricity sector in Spain carries a significant load and plays an important role in contributing to achieving goals regarding the decarbonisation of the economy and the energy transition nationwide. Red Eléctrica, as the main player in the Spanish electricity system, is one of the key agents in the change of the current energy model; a change which seeks to ensure the electrification of the economy, put in place all the necessary actions to guarantee the efficiency of the system and maximise the integration of renewables in the energy mix, while guaranteeing the security of supply at all times.

During 2021, approximately 4,500 MW of new renewable power capacity were incorporated into Spain's power generation fleet, which allows us to take another step forward in successfully achieving the energy transition. For several consecutive years now, there has been a high level of integration of renewables, and in order to enable the operation of an electricity system with such a high penetration of renewable energy under safe conditions, the control and supervision work carried out by Red Eléctrica's Control Centre of Renewable Energies (CECRE) is essential. In this regard, the CECRE, which in 2021 celebrated its 15th anniversary since it was commissioned, is a pioneering centre of reference at a worldwide level and is currently a key tool in the energy transition.

The importance of the measures taken in the fight against climate change, society's interest in learning more about the evolution of electricity generation using renewable technologies, together with our commitment to being a benchmark in the reporting of statistical information regarding electricity in Spain, have prompted us, for the sixth consecutive year, to present the 'Renewable Energy in the Spanish Electricity System' Report; a publication that provides a high-level overview of the role played by renewable energy in 2021, as well as how renewables have evolved over recent years.

This year we are renewing the report with a more digital focus and approach. The four chapters of this report, 'Energy from the Wind', 'Energy from Water', 'Energy from the Sun' and 'Energy from the Earth and the Sea', are published in the [REData](#) section of Red Eléctrica's corporate website: www.ree.es/en. You will be able to consult all the data for 2021 and how renewables have evolved throughout the year, as well as download the data and graphs you consider necessary. This eliminates the Excel files that in previous editions accompanied the report and allows improved access to information, as well as greater efficiency in the preparation of the reports.

The report begins with a summary chapter 'Renewable Energy in 2021', which provides consolidated data on all renewable energy technologies in order to give the reader a comprehensive overview of how renewables have fared throughout the year and their contribution to the generation mix nationwide; said chapter can be found at the beginning of the [REData](#) section.

As part of its continued effort to improve its service to society, Redeia aims to offer a quality service for all users. To this end, a contact form has been made available in the [REData](#) section of the corporate website, as a channel through which suggestions and observations may be submitted.

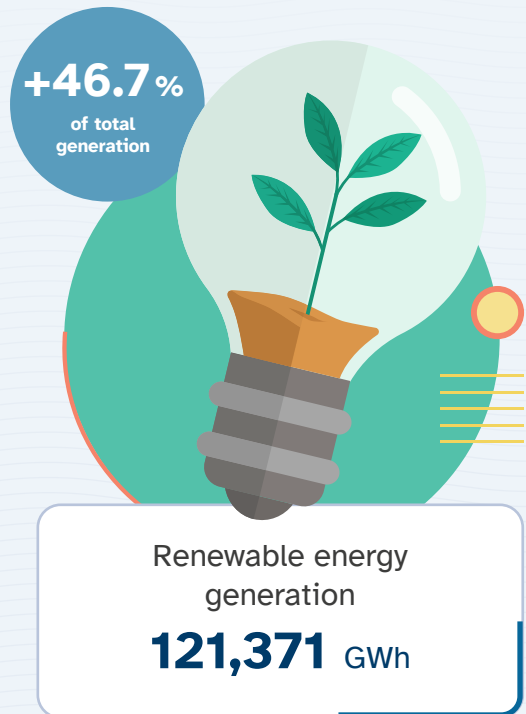
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Renewable energy in 2021

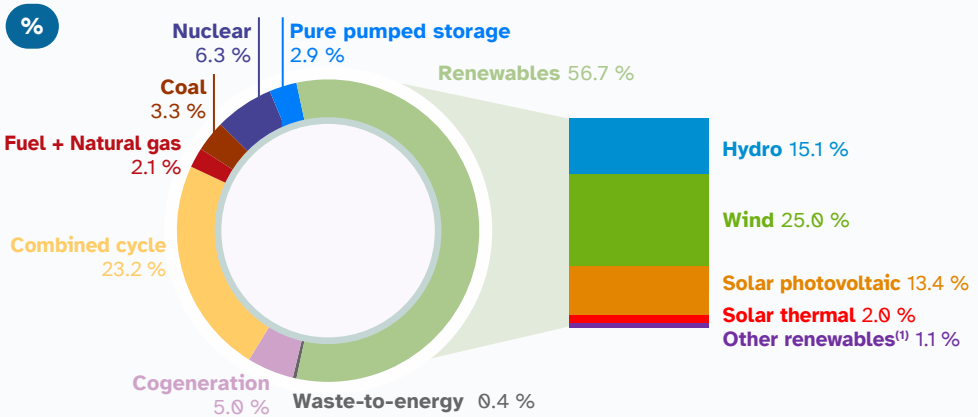
The power capacity of Spain's renewable generation fleet reached 64,182 MW at year-end and 46.7% of total generation in 2021 was produced with renewable technologies, both values represent all-time highs.

The increase in installed renewable power capacity was mainly due to the growth in solar photovoltaic facilities, which accounted for 80.4% of the new power capacity incorporated in 2021.



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Breakdown of installed power capacity as at 31.12.2021

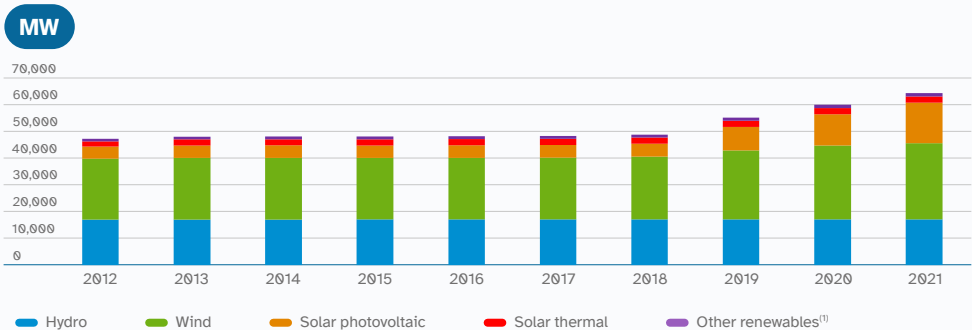


(1) Includes biogas, biomass, geothermal, marine-hydro, wind-hydro and renewable waste.

During 2021, the energy environment in Spain has continued to make progress in its recovery from the impact of the COVID-19 pandemic, registering a 7.2% increase in installed renewable power capacity compared to the previous year, which represented a growth of 4,338 MW. Renewable energy facilities account for 56.7% of the overall power generation fleet in Spain.

The increase in installed renewable power capacity was mainly due to the growth in solar photovoltaic facilities, which accounted for 80.4% of the new power capacity incorporated in 2021. Wind power contributed an additional 839 MW to the new renewable capacity and remains the leading technology in the national power generation fleet.

Evolution of installed renewable power capacity



(1) Includes biogas, biomass, geothermal, marine-hydro, wind-hydro and renewable waste.

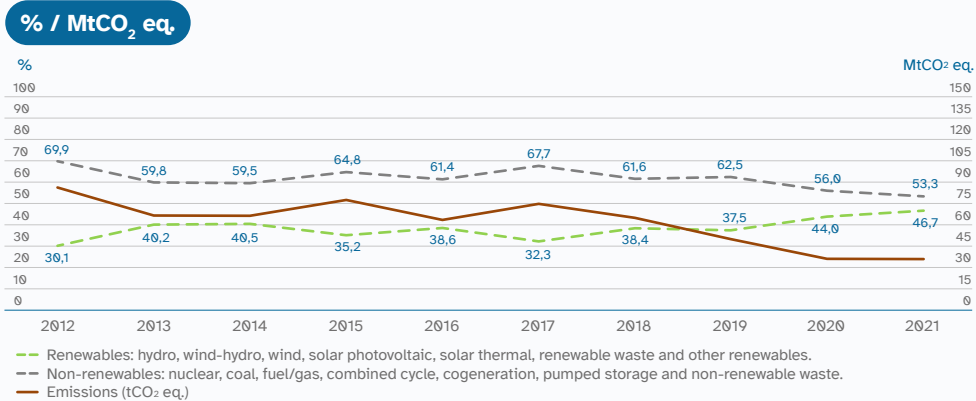
Source: Spanish National Markets and Competition Commission (CNMC) until 2014.



1 Renewable energy in 2021

The contribution of renewable energy to national electricity generation in 2021 has set a new all-time high, reaching a share of 46.7% in the electricity generation mix, 2.7 percentage points higher than the previous all-time high recorded in 2020, when renewables accounted for 44% of the electricity generation mix nationwide.

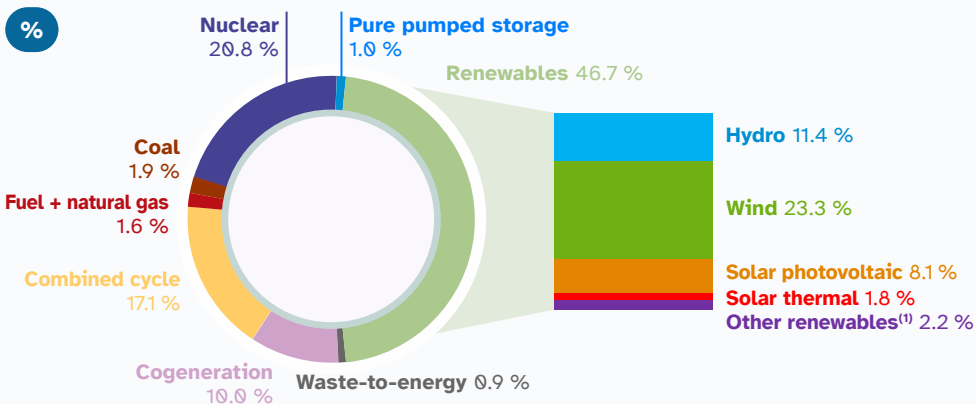
Evolution of renewable and non-renewable generation



This higher share of renewable energy generation in 2021 is mainly due to the increase in wind and solar photovoltaic power production, 10.2% and 36.9% respectively, compared with the previous year. These values were the result of favourable weather conditions and the increase in their installed renewable power capacity in the national electricity system.

In addition to the significant increase of 9.7% in renewable generation nationwide, the 0.7% decrease in coal-fired generation and the 3.4% drop in fuel/natural gas generation in 2021 have meant that CO₂ equivalent emissions associated with electricity generation reached an all-time low of 35.9 million tonnes of CO₂ equivalent, 0.6% lower than in 2020 and 67.7% below the emission levels registered in 2007.

Breakdown of the electricity generation mix in 2021



(1) Includes biogas, biomass, geothermal, marine-hydro, wind-hydro and renewable waste..

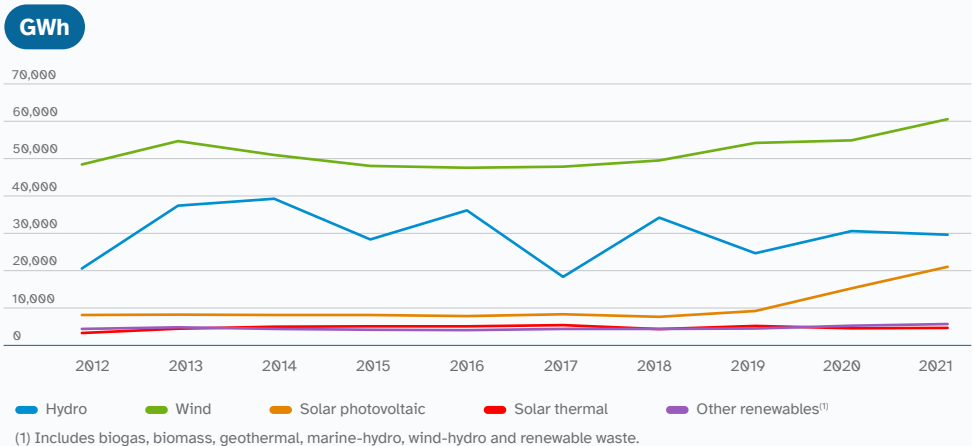
Wind power continues to be the most important renewable technology in the national generation mix, accounting for 23.3% of the total production, the highest annual share recorded to date. In addition, wind power has been the leading technology in the electricity generation mix for the first time since statistical records began, ahead of nuclear, whose share stood at 20.8% of the national total.

Production from wind power continued to grow for the fifth consecutive year, with a variation in 2021 of 10.2% compared to 2020. In total, 60,496 GWh were produced with this technology, which also reached a new all-time record for wind power generation.

In 2021, solar photovoltaic was the technology that grew the most in terms of installed power capacity nationwide, adding almost 3,500 MW to the national power generation fleet, representing an increase of 29.9% compared to the previous year. This boost has allowed solar photovoltaic electricity production in 2021 to experience an increase of 36.9%, reaching 20,954 GWh, which is not only a new all-time high for annual generation but also in its contribution to the national generation mix with an 8.1% share.

Wind power continues to be the most important renewable technology in the national generation mix, accounting for 23.3% of the total production, the highest annual share recorded to date.

Evolution of renewable energy generation





1 Renewable energy in 2021

From the point of view of the autonomous communities (regions in Spain), most of the installed renewable power capacity is located in four regions, Castilla y León, Andalusia, Galicia and Castilla-La Mancha, which together account for almost 56.7 of the total installed renewable power capacity nationwide.

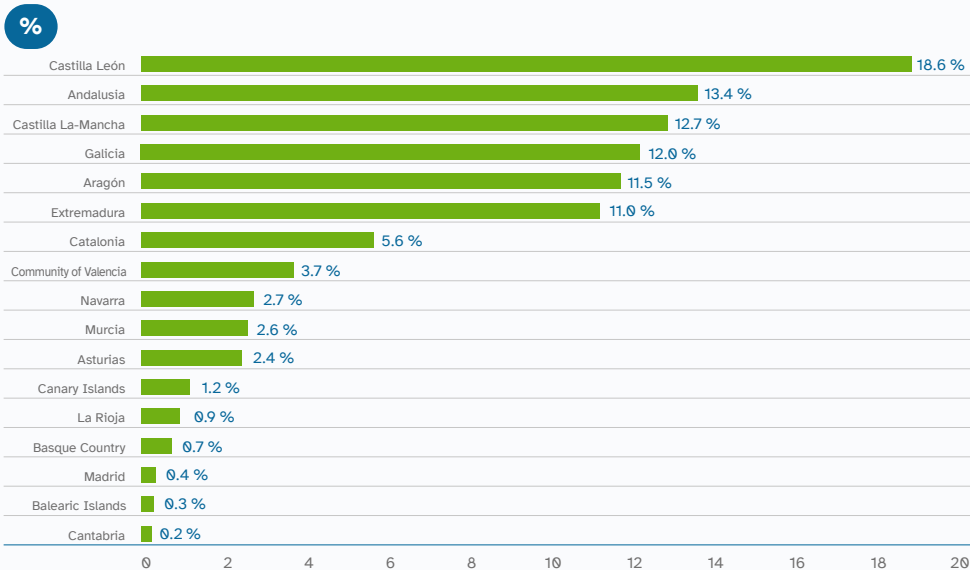
The largest increase in installed renewable capacity was recorded in the Balearic Islands, which closed 2021 with a growth of 31.1%. This growth is mainly due to the 44.2% increase in installed solar photovoltaic capacity compared to the previous year.

Castilla y León was once again the region with the highest installed renewable capacity in Spain, reaching a total of 11,908 MW of green power, which represents 95.4% of the region's power generation fleet. Wind power is the technology with the greatest presence in the region, accounting for 51.1% of the total, and photovoltaic is the technology which has grown the most in 2021, with a 20.5% increase in generation capacity compared to 2020.

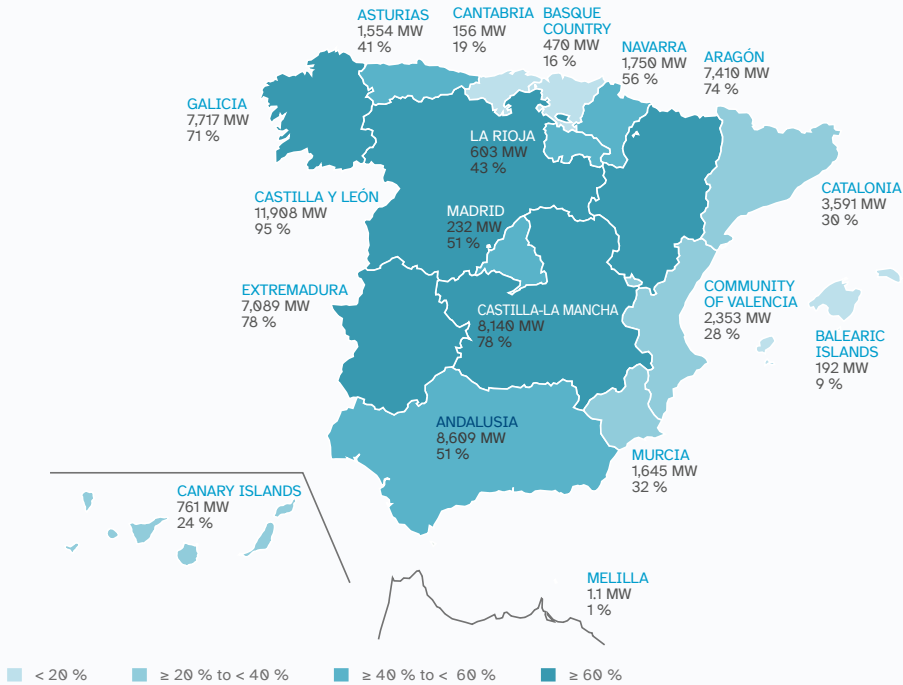
In 2021, Andalusia consolidated its position as the region with the second highest installed renewable power capacity with a total of 8,609 MW, meaning that at year-end more than half of Andalusia's power generation fleet was based on renewable energy technologies (51.3%).

Ranking third nationwide is Castilla-La Mancha, which in 2021 overtook Galicia by increasing its renewable installed capacity to 8,140 MW, an increase of 17.5% compared to 2020. Wind power is the technology with the largest production capacity in Castilla-La Mancha, with a share of 38.6% of the total. Photovoltaic solar energy is the technology that most increased its presence in the region's power generation fleet with an increase of 53.3 % in installed capacity compared to the previous year.

Share of the installed renewable power capacity per Autonomous Community in relation to national renewable power capacity as at 31.12.2021



Renewable power capacity/total power capacity ratio (%) and renewable power capacity (MW) as at 31.12.2021



Renewable energy generation in each autonomous region depends heavily on the amount and type of power capacity installed in each region and on the climatic conditions of each year.

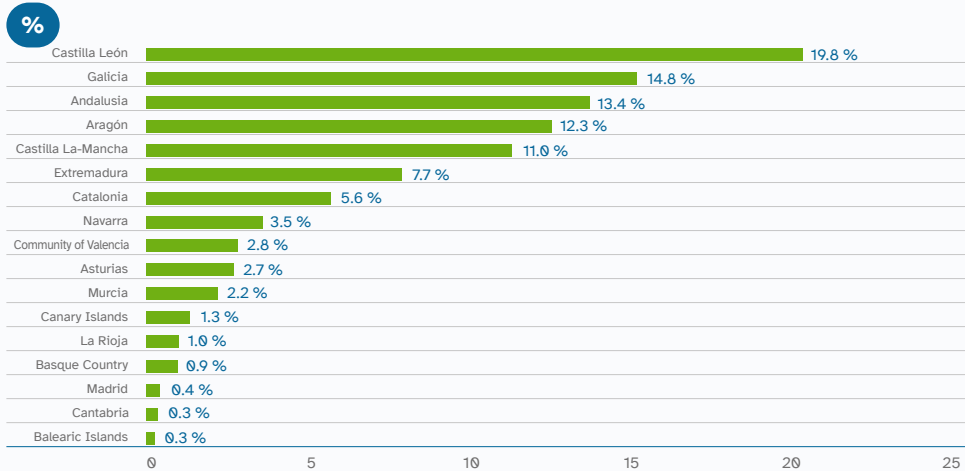
In 2021, Castilla y León continued to be the autonomous region with the highest renewable generation in the country: 24,068 GWh, accounting for 89.1% of its total production and setting a maximum share in the region's mix since records began. Both electricity generation and the share of renewables in the region's energy mix registered all-time highs in Spain in 2021, consolidating Castilla y León's leadership in renewable energy in the country.

In second place is Galicia, which in 2021 generated 74.3 % of its electricity using renewable sources, with wind power as the leading source of Galician generation with a share of 39.5 %. This was followed by hydro, which, with 7,692 GWh, was the second energy generation technology, accounting for 31.8% of the total. Hydroelectric generation in Galicia is very significant compared to the rest of Spain. In fact, one out of every four GWh of hydroelectric power produced in Spain comes from Galicia. Once again, last year wind and hydro together accounted for more than 70% of the region's electricity production.

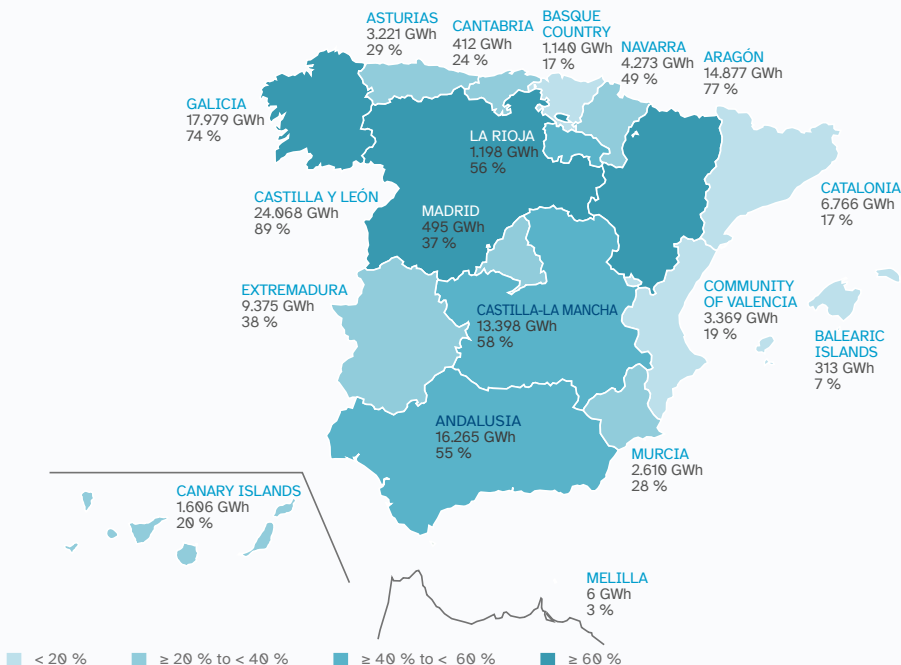
Andalusia is one of the regions leading the way in renewable energy in Spain. In 2021, generation from renewable energy technologies reached 55%, the highest annual share recorded to date. With a total of 16,265 GWh, 12.9% more than in 2020, it became the region with the third highest green GWh produced in 2021.



Share of the renewable power generation per Autonomous Community in relation to national renewable power generation in 2021



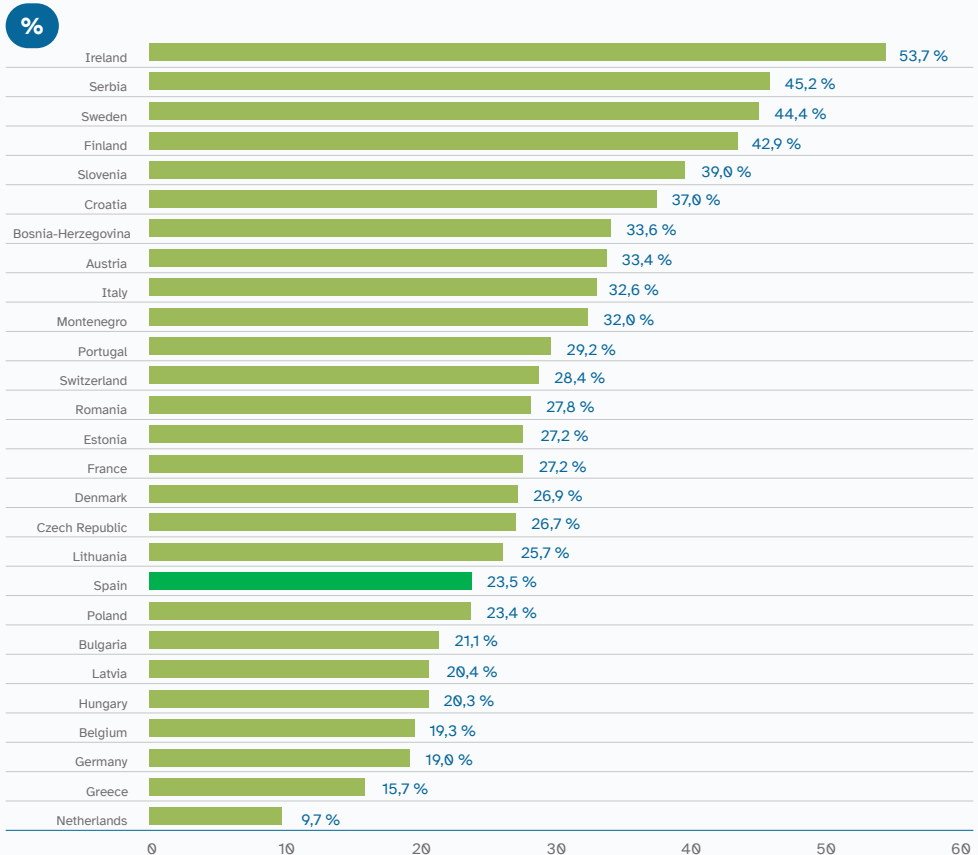
Renewable generation/total generation ratio (%) and renewable generation (GWh) in 2021



Compared with other European countries, Spain ranks second in terms of installed renewable power capacity in 2021. In terms of the utilisation rate of the available renewable energy generation capacity, calculated as the ratio between the generation output (at full power load) and the total installed renewable power, Ireland is clearly the leading country with a value of 53.7 %. Spain, with a utilisation rate of 23.5%, is below the average utilisation rate of ENTSO-E member countries, which on 31 December 2021 was 29.1%.

In terms of the contribution of renewables to total generation, Norway is in first place with a share of 94.8% of its total production coming from renewable energy sources, Spain is currently ranked in tenth place.

Utilisation of renewable power capacity in ENTSO-E member states as at 31.12.2021

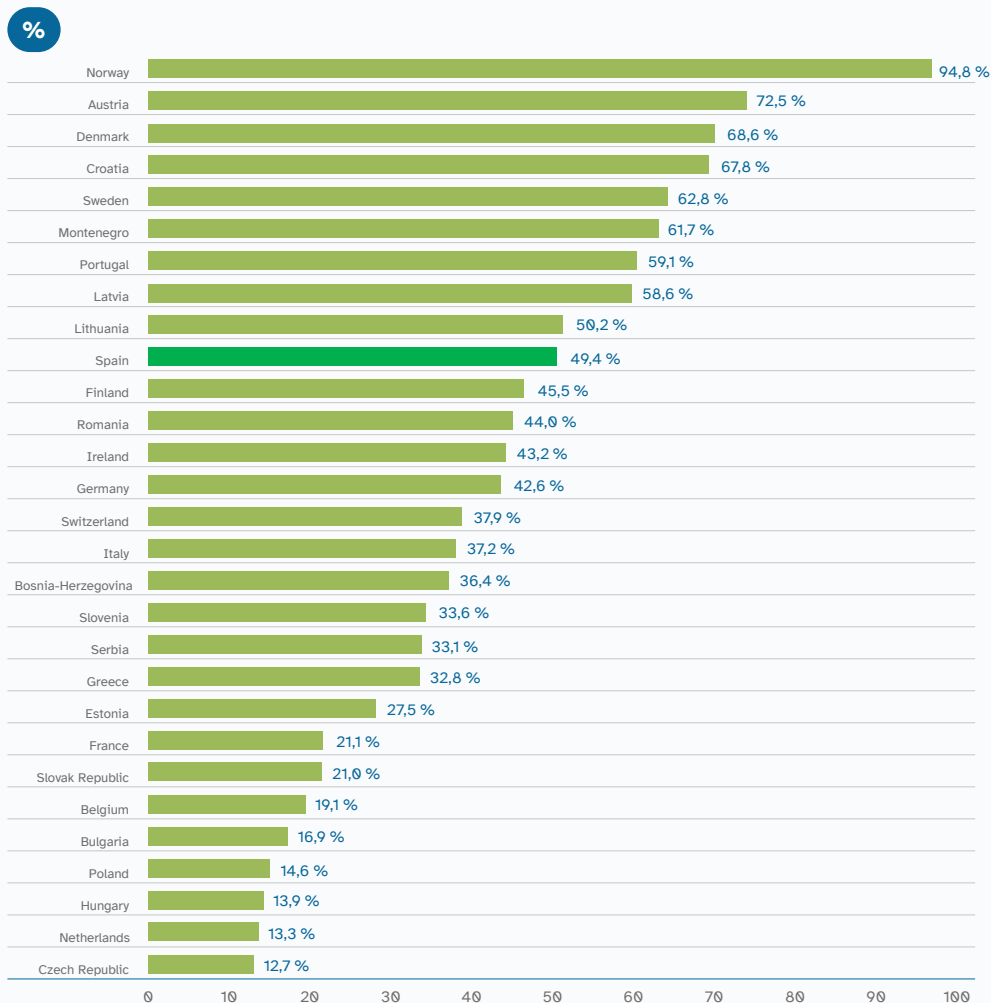


Source: data obtained from the ENTSO-E Transparency Platform as at 26/1/2022. The data is governed by Regulation (EU) No 543/2013, and is obtained from real-time systems and therefore differs from the consolidated data used for the specific case of Spain at a national level, which is obtained using a power measurement system.

The utilisation rate is calculated as the ratio between the generation output (at full power load) and the total installed renewable power capacity.



Renewable energy generation over total production in ENTSO-E member states in 2021



Source: data obtained from the ENTSO-E Transparency Platform as at 26/1/2022. The data is governed by Regulation (EU) No 543/2013, and is obtained from real-time systems and therefore differs from the consolidated data used for the specific case of Spain at a national level, which is obtained using a power measurement system.

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