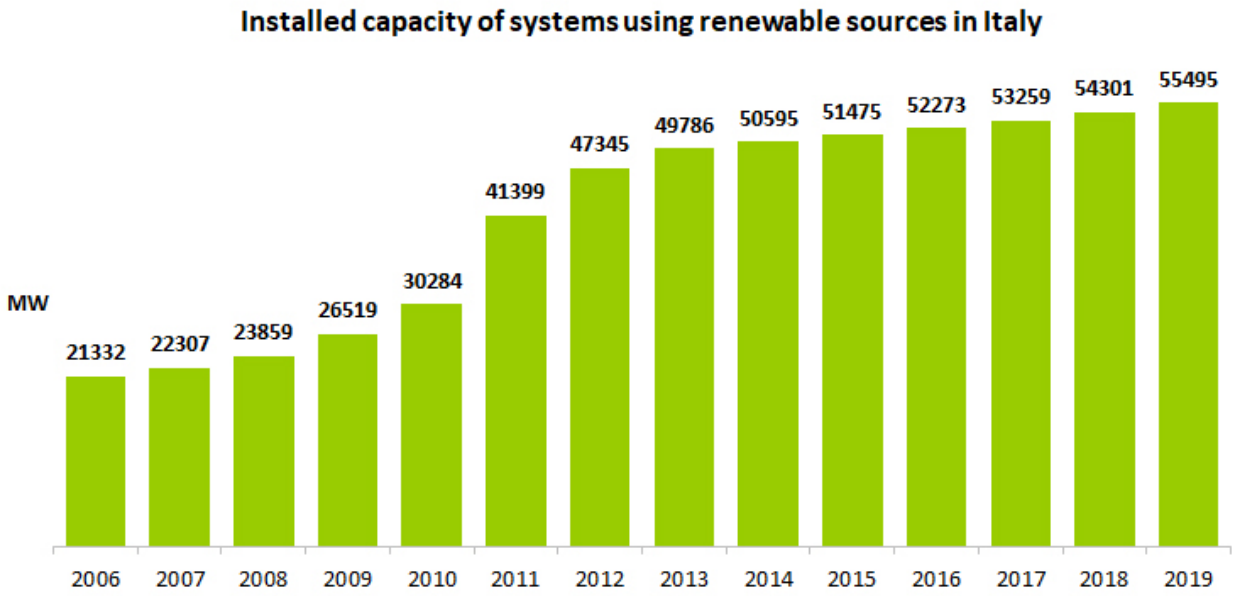
Italy's renewable sources

Renewable energy sources in Italy

The Energy Services Operator (GSE) periodically publishes data and statistics on the renewable energy sources used in Italy. The release of the "Energy from Renewable Sources in Italy - 2019" Statistical Report (published in 2021 and downloadable from the GSE website) allows us to get a picture of the current situation on renewable sources in Italy, a sector that is constantly developing and changing.

According to the data in the Statistical Report, renewable energy sources play a key role on the Italian energy scene, and are widely used both for production of electricity (Electricity sector) – which we will discuss in detail later – and for production of heat (Thermal sector), as well as biofuels for transport (Transport sector).



Source: GSE - "Energy from Renewable Sources in Italy - 2019 Statistical Report"

In 2019, the total number of plants powered by renewable sources in Italy reached 893,109 with an overall installed capacity of 55,495 MW. Compared to 2018, the installed capacity increased by just over 1,000 MW (+2.2%), while the number of plants grew by 6.9% overall against the previous year.

Between 2006 and 2019, the gross efficient power generation capacity installed in Italy increased from 21,332 MW to 55,495 MW, with an increase of 34,163 MW and an average annual growth rate in overall capacity of 7.2%; the years with the highest increases in capacity were 2011 and 2012.

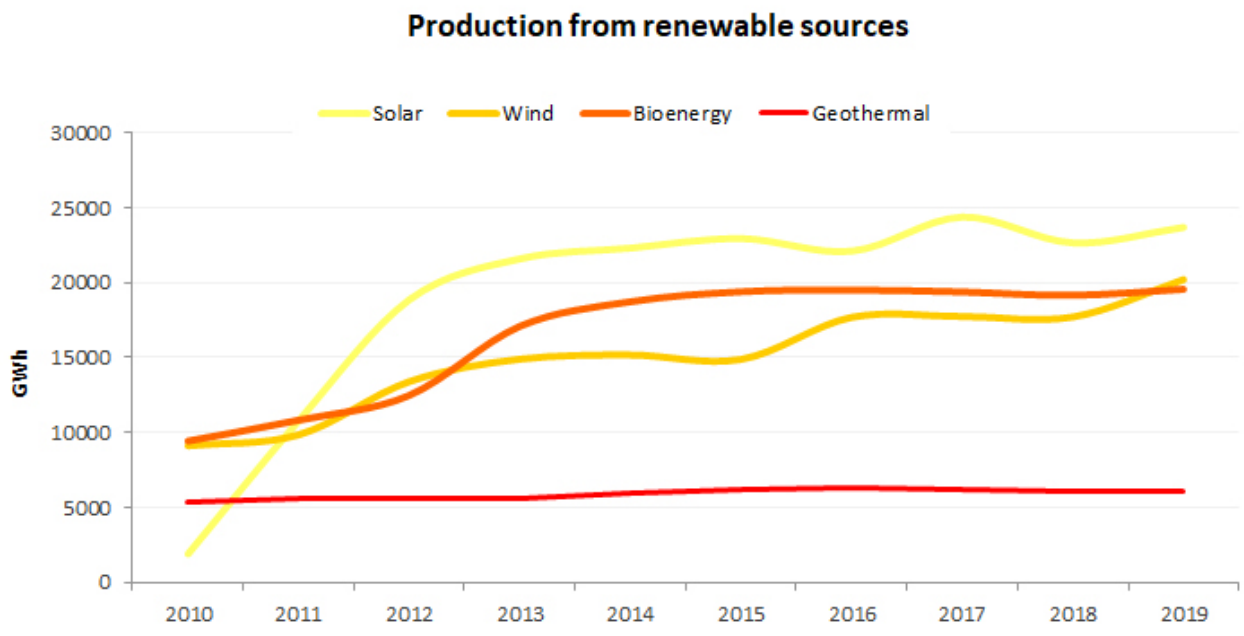
From the early 1900s, electricity generation in Italy from renewable sources has involved above all hydroelectric plants. In more recent years, the installed capacity of these plants has remained more or less constant (+0.8% on average per year) while other renewable sources have grown considerably thanks to the various incentive schemes that have supported their development. While in 2000 the capacity of hydroelectric plants accounted for about 91% of the installed

capacity from renewable sources, this percentage has now dropped to 34.2%, due to the exponential growth of bioenergy and wind and solar power.

At regional level, Lombardy is confirmed as the Italian region with the highest installed capacity with 8,490 MW (equal to 15.3% of the national installed capacity), followed by Apulia with 5,750 MW (equal to 10.4%) and Piedmont with 4,786 MW (equal to 8.6%).

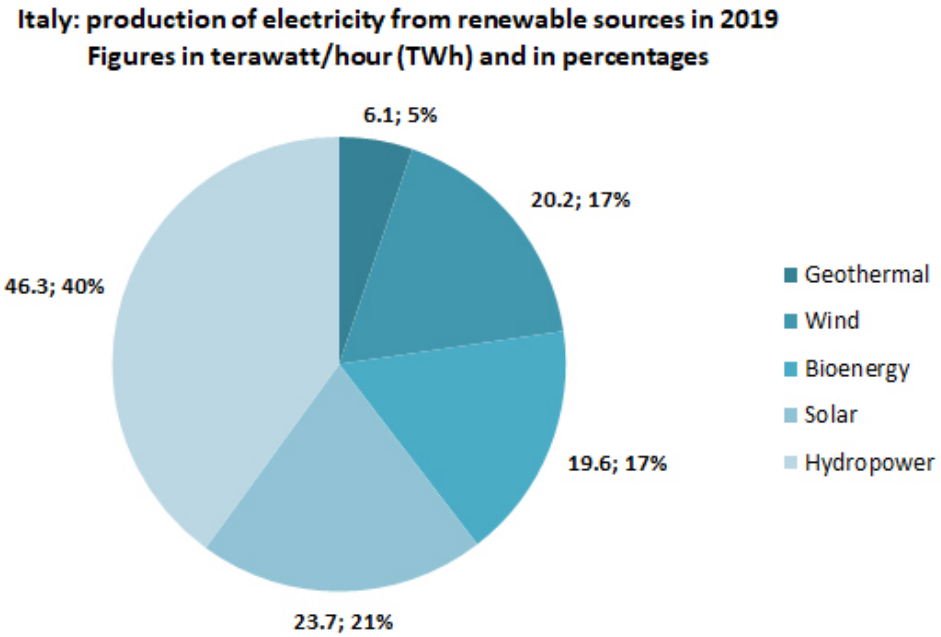
Electricity production from renewable sources

Production from renewable sources, which after a steady growth from 2008 to 2014, had shown decreasing values from 2015 to 2017, in 2019 totalled 115,847 GWh, a slight increase compared to the previous year (+1.3%). Once again in 2019, hydroelectricity was the source that made the greatest contribution to electricity generation with 46,319 GWh, accounting for 40% of total production from renewable sources. While up to 2008, the trend for electricity generated from renewable sources was mainly dominated by hydropower, the importance of 'new renewable sources' (solar, wind and bioenergy) has increased in recent years, and in 2019 they accounted for 54.8% of national electricity production from renewable sources. Lastly, geothermal power accounted for 5.2% of electricity production.



Source: GSE - "Energy from Renewable Sources in Italy - 2019 Statistical Report"

In order to better appreciate the development of wind, solar, geothermal and biomass sources in the decade from 2010 to 2019, the graph showing production from renewable sources in Italy does not include hydropower.



Source: GSE - "Energy from Renewable Sources in Italy - 2019 Statistical Report"

In 2019, solar power contributed 23,689 GWh to total electricity production, up from 2018 (+4.6%); this increase can be attributed mainly to higher solar radiation on national territory than the previous year. In 2019, the performance of wind power plants was very positive, generating 20,202 GWh of energy (+14.% compared to 2018), while production from bioenergy totalled 19,563 GWh.

Over the past decade, wind, solar and bioenergy sources, representing the most promising sources from the point of view of technological development and investment in Italy, have made an increasingly higher contribution to generation of electricity from renewable sources. With regard to hydroelectric power, in Italy the highest level possible of exploitation has been virtually reached, since the most favourable and convenient sites from a technical and economic point of view are already used. Consequently, the future of hydroelectric power in Italy, the annual growth rate of which is around 0.7% seems to lie in construction of small scale plants (mini hydroelectric power plants).

Regarding the regional distribution of electricity production from renewable sources, the regions of Northern Italy account for 52.6% of national production, since almost all the hydroelectric power plants in Italy are located there. The shares produced in particular by the Lombardy and Piedmont regions, respectively contributing 14.9% and 9.6% of national production, are worth noting. Of the regions in Central Italy, which contribute 14% of the national production, Tuscany stands out because, due to its geothermal plants, it provides 7.4% of national production. In Southern Italy (including the islands), which covers the remaining 33.4%, the region that contributes most to national production, namely 8.9%, is Apulia, followed by Sicily and Calabria. In 2019, the contribution of renewable generation to total electricity production was 35.3%. In Italy, hydrocarbons, and natural gas in particular, are still the main sources used to generate electricity.

Renewable sources in detail

Solar photovoltaic power in Italy

As of 31 December 2019, there were 880,090 photovoltaic installations in Italy (38% of the total renewable source

installations) with an installed capacity of 20,865 MW (equal to 21% of the entire park of installations using renewable sources). Compared to the previous year, in 2019 there was a 3.8% increase in installed capacity and a 7% increase in the number of photovoltaic installations. Of the approximately 58,000 plants installed during 2019, 31% have a capacity less than or equal to 3 kW, 65% between 3 kW and 20 kW, and the remaining 4% greater than 20 kW. Small-scale plants (power less than or equal to 20 kW) account for more than 90% of the total plants installed in Italy and 21% of total national capacity.

At regional level, 44.4% of installed capacity is in the North, 37.4% in the South and 18.2% in Central Italy. With 2,826 MW, Apulia is confirmed as the Italian region with the highest installed capacity, equal to 13.5% of the national total, followed at a distance by Lombardy with 2,399 MW (11.5%).

Regarding the number of installations, at regional level 55% of them are located in the North, 28% in the South and, lastly, 17% in the Central Italian regions. The region with the highest number of installations is Lombardy with 135,479 (equal to 15.4% of the national total), followed by Veneto with 124,085 (14.1%).

Lastly, regarding production of electricity by solar photovoltaic installations, 23,689 GWh were produced in 2019, an increase against the previous year (+4.6%). The contribution of the solar source to national electricity production in 2019 was 7.3%, while it accounted for 20.5% of the 116 TWh produced from renewable sources in Italy.

Wind power

From 2005 to 2019, there has been huge increase in wind farms in Italy, accentuated in particular in recent years. At the end of 2005, there were 148 farms installed with a capacity of 1,639 MW, while at the end of 2019, the national park consists of almost 5,644 farms, with a capacity of 10,715 MW. In 2019, installed wind power accounted for 19.3% of total renewable installations.

Due to the environmental and territorial characteristics of our country, 96.5% of Italy's installed capacity and 92.4% of the wind farms are located in Southern Italian regions and islands, where the windiness, the mountainous terrain and accessibility of the sites are favourable to their installation. The region with the highest installed capacity is Apulia (2,571 MW, equal to 24% of the national total), followed by Sicily and Campania, respectively with installed capacities of 1,894 MW (17.7%) and 1,735 MW (16.2%).

Electricity generation by wind farms, between 2005 and 2019 increased almost tenfold, from 2,343 GWh to 20,202 GWh; in 2019, in particular, production increased considerably (+14% compared to 2018), mainly due to very favourable wind conditions. Wind power accounted for 6.3% of national electricity production in 2019 .

Hydroelectric power

Hydroelectric installations in Italy at the end of 2019 totalled 4,395 with an installed capacity of 18,982 MW; over 81% of the installed capacity is concentrated in installations with capacities higher than 10 MW, while 72% of the installations are small, i.e. with a total capacity of less than 1 MW. Between 2005 and 2019, the installed capacity of the installations increased at an average annual rate of 0.7%.

Thus, hydroelectric power capacity has not changed significantly in recent years, in that, in this period, many small-sized installations have gone into operation. In the future, it is expected that, in the main, small and mini hydroelectric installations will be constructed, in line with the trend in recent years. While there has not been a very substantial growth

in hydroelectric power, in 2019 the installed hydroelectric capacity accounted for 34.2% of the capacity of the whole renewable source installation park.

At the regional level, 76.2% of hydroelectric installations are located in northern Italy. More specifically, over 55% of all installations in the country are in Piedmont, Lombardy and the Autonomous Provinces of Trento and Bolzano.

In terms of capacity too, 76.2% is installed in the regions of Northern Italy: Lombardy alone accounts for 27.2% of the installed capacity on the national territory (5,158 MW), followed by Piedmont with 14.6% (2,772 MW) and the Autonomous Provinces of Bolzano and Trento, respectively with 9.1% (1,732 MW) and 8.6% (1,634 MW). The only region in central and southern Italy that makes significant use of hydroelectric power is Abruzzo with 1,013 MW of installed capacity.

For the hydroelectric source, weather factors are the main reason for the variability of electricity production. While the capacity of hydroelectric installations has grown slightly and gradually, but in the period from 2005 to 2019, on the contrary, production underwent very significant changes: in 2019, hydroelectric production amounted to 46,319 GWh, down compared to 2018 (-5.1%) and accounted for 14.3% of national electricity production.

Bioenergy

The term bioenergy refers to energy produced from biomass (including solid urban waste), biogas and bioliquids. At the end of 2019 there were 2,946 bioenergy plants in Italy with an installed capacity of 4,120 MW. In 2018, the number of plants increased by 0.8%, while installed capacity decreased by 1.5% compared to the previous year. If we consider the installed capacity, 40.8% comes from plants burning solid biomass, 35.4% from biogas plants and 23.8% from bioliquids plants.

The majority of the installations (72.8%) are in Northern Italy, which therefore makes the highest contribution to installed capacity (62.1%). In particular, Lombardy is the region with the highest number of plants (25.4%), followed by Veneto (13.4%). Central Italy contributes 14.2%, while Southern Italy and the Islands account for 13%.

Electricity produced from bioenergy in 2019 increased by 2.1%, from 19,153 GWh in 2018 to 19,563 GWh. The contribution of bioenergy to national electricity production in 2019 was 5.6%.

Geothermal power

There were 34 geothermal installations in Italy at the end of 2019 with an installed capacity of 813 MW. Both the capacity of geothermal plants and their number have remained unchanged over the past three years. The 34 plants in Italy are concentrated in a single region, Tuscany. In terms of electricity production, 6,075 GWh was produced in 2019. In 2018, geothermal energy accounted for 5.3% of the electricity production of the entire renewable plant park in Italy and 1.8% of national electricity production.

The contribution by the geothermal source to total renewable production has shown a certain variability over the years, rising from 10% in 2004 to a maximum of 12% in 2007, before dropping to a minimum of 5% in 2013-2014, due to the progressively increasing production from all other renewable sources.

by Benedetta Palazzo