Italy’s status on renewable sources

Renewable sources in Italy

The Energy Services Operator (GSE) periodically publishes data and statistics on the renewable sources used in Italy. The issue of the “Energy from Renewable Sources in Italy – 2017” statistical report (published in February 2019 and downloadable from the GSE website) allows us to provide a picture of the current situation on renewable sources in Italy, a sector that is constantly developing and changing.

According to this statistical report, renewable energy sources play a key role on the Italian energy scene, and are widely used both for production of electricity (Electric sector) - about which we will speak in detail later - and for heat production (Thermal sector), as well as in the area of biofuels for motor propulsion (Transport sector).

![Installed capacity of systems using renewable sources in Italy](image)


In 2017, the total number of installations powered by renewable sources in Italy reached 786,808 with an overall installed capacity of 53,259 MW. Compared to 2016, the installed capacity has increased by 1,001 MW (+1.9%), while the number of plants increased by 6.3% against the previous year.

From 2003 to 2016, the gross efficient generation capacity installed in Italy rose from 19,663 MW to 53,259 MW, with an increase of 33,596 MW and an average annual growth rate in overall capacity of 7%; the years with the highest increases in capacity were in 2011 and 2012.

From the early 1900s, electricity generation in Italy from renewable sources has involved above all hydroelectric plants. Over more recent years, the installed capacity of these plants has remained more or less constant (an average increase of +0.8% per year) while the other renewable sources have grown considerably thanks to the various incentive schemes in support of their development. While in 2000, the capacity of hydroelectric plants accounted for around 91% of total installed capacity from renewable sources, this percentage is now only 35.4%, 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 8,306.4 MW (equal to 15.6% of the total national installed capacity), followed by Puglia with 5,453 MW (equal to 10.2%) and Piedmont with 4,687.2 MW (equal to 8.8%).

Production of electricity from renewable sources

Production from renewable sources, which from 2008 to 2014 had reached a new record level each year, in 2017 totalled
103,898 GWh, a drop of around 4,124 GWh against the previous year (-3.8%).

In 2017 too, hydropower was the source that made the largest contribution to electricity generation, even though at levels that decreased considerably against 2016 (-14.7%): with 36,198.7 GWh it covered 35% of the total production from renewable sources. While up to 2008, the trend for electricity generated from renewable sources was dominated mainly by hydropower, over recent years the importance of “new renewable sources” (solar, wind and bioenergy) increased, and in 2017 they accounted for 59% of national electricity production from renewable sources. Lastly, geothermal power accounted for 6% of electricity production.

To better appreciate the development of wind, solar, geothermal and biomass sources in the decade from 2007 to 2017, hydroelectric power has been excluded from the chart on production from renewable sources in Italy.

In 2017, solar power contributed 24,377.7 GWh to total electricity production, an absolute all-time record (+10.3% more than 2016); this increase can be attributed mainly to higher solar radiation on national territory than in the previous year. Wind power production was almost unchanged at 17,742 GWh. Electricity produced from bioenergy in 2017 stabilised at 19,378 GWh, slightly less than in 2016 (-0.7%). Lastly, geothermal production dropped slightly, to 6,201.2 GWh (-1.4% than in 2016).

Over the past decade, wind, solar and bioenergy sources, representing the most promising sources from the technological development and investment point of view in Italy, have made and increasingly greater contribution to electricity production from renewable sources. With regard to hydroelectric power, in Italy the highest level possible of exploitation has almost been 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 1%, seems to lie in construction of small sized plants (mini hydroelectric power plants).

Regarding regional distribution of electricity production from renewable sources, the regions in the North of Italy accounts for 49.9% 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 14.8% and 9.4% of national production, are worth noting. Of the regions in Central Italy, which contribute 15.1% of the national production, Tuscany stands out because, due to its geothermal plants, it provides 8.1% of national production. In Southern Italy (including the islands), which supplies the remaining 35%, Puglia is the region that makes the highest contribution to national production, followed by Sicily and Calabria.

In 2017, the contribution of production from renewable sources to total production of electricity was 31.5%. In fact, hydrocarbons and, in particular, natural gas, still remain the major sources used to generate electricity in Italy.

**Renewable sources in detail**

**Solar photovoltaic power in Italy**

At 31 December 2017, there were 774,014 photovoltaic installations in Italy (98.4% of all installations using renewable sources of energy) with an installed capacity of 19,682 MW (or 37% of the capacity of the whole renewable source installation park). Compared to the previous year, in 2017 there was a 6% increase in installed capacity and a 2% increase in the number of photovoltaic installations. From 2008 to 2011, the number of photovoltaic installations has more than doubled from one year to the next. At the end of 2012, there were over 480,000 installations in Italy, and these had increased to almost 648,196 at the end of 2014. From 2013, when the Feed-in Tariff ceased, growth rates are significantly less steady.

At regional level, 44% of installed capacity is in the North, 37% in the South and 19% in Central Italy. With 2,632 MW, Puglia is confirmed as the Italian region with the highest installed capacity, equal to 13.4% of the national total, followed at a distance by Lombardy with 2,227 MW (11.3%).

With regard to the number of installations, at regional level, 55% of the installations are located in the North, 28% in the South and, lastly, 17% in Central Italian regions. The region with the highest number of installations is Lombardy with 116,644 installations (equal to 15.1% of the national total), followed by Veneto with 106,211 (13.7%).

Lastly, regarding production of electricity from solar photovoltaic installations, 24,378 GWh were produced in 2017, a marked increase in production compared to the previous year (+10.3%). In 2017, the contribution of production from the solar source to total production of electricity was 6.9%.

**Wind power**

There were 5,579 installations in Italy at the end of 2017, with an installed capacity of 9,766 MW. In Italy, 93% of wind power installations are small sized (capacity lower than 1 MW), while 89% of the installed capacity (8,655 MW) is concentrated in 287 wind farms with a capacity higher than 10 MW. From 2000 to 2017, there was a huge growth in wind farms in Italy, accentuated in particular during the past few years. At the end of 2000, the installations numbered 55 with a power of 363 MW and wind power provided only 2% of power from renewable sources in Italy. In 2017, with installed capacity of 9,766 MW, 18.3% of the total power produced by all renewable source installations was generated by wind
farms.
Due to the environmental characteristics of our country, 96.8% of Italian installed capacity and 92.2% of the installations are located in the regions in Southern Italy and the islands, where windiness, the mountainous terrain and accessibility of the sites are favourable to installation of wind farms. The region with the highest installed capacity is Puglia (2,473.2 MW, equal to 25.3% of the national total), followed by Sicily and Campania, respectively with installed capacities of 1,810.9 MW (18.5%) and 1,390.4 MW (14.2%).
Electricity production from wind power increased over tenfold from 2003 to 2016, going from 1,458 GWh to 17,742 GWh; in 2017 in particular, the level of production remained more or less stable (17,742 GWh, +0.3% compared to 2015). In 2017, the contribution of production from wind power to total production of electricity was 5.5%.

**Hydroelectric power**
There were 4,268 hydroelectric installations in Italy at the end of 2017, with an installed capacity of 18,863 MW. Between 2016 and 2017, the number of installations increased by 15.6%, while the overall increase in terms of installed capacity was only 1.7%. From 2003 to 2017, the capacity of installations has increased at an average annual rate of 0.8%.
Over recent years, therefore, hydroelectric capacity has not changed significantly in that, in this period, many small-sized installations have gone into operation. In the future, it is predicted 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 2017 the installed hydroelectric capacity accounted for 35.4% of the capacity of the whole renewable source installation park.
At regional level, 81% 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% is installed in Northern Italian Regions: Lombardy alone accounts for 27.3% of the installed capacity in Italy (5,141.4 MW), followed by Piedmont with 14.5% (2,738.6 MW) and the Autonomous Provinces of Bolzano and Trento respectively with 9.1% (1,632.3 MW) and 8.6% (1,716.1 MW).
The only region in the central and southern Italy that makes significant use of hydroelectric power is Abruzzo with an installed capacity of 1,013 MW.
Weather factors are the main reason for the variability of hydroelectric power production. While the capacity of hydroelectric installations has been gradually increasing slightly, from 2003 to 2017, the production underwent considerable variations: in 2017 hydroelectric energy production was 36,199 GWh, a marked decrease against 2016 (-14.7%) and was equal to 11.2% of total national electricity production.

**Bioenergy**
This term indicates the energy produced from biomass (including solid urban waste), biogas and bioliquids. There were 2,913 installations fuelled by bioenergy in Italy up to the end of 2017, with an installed capacity of 4,135 MW (or 7.8% of the capacity of the whole renewable source installation park). In 2017, the number of installations increased by 6.5%, while the installed capacity grew by only 0.3% against the previous year. If we consider the installed capacity, 40.3% originates in installations burning solid biomass, 34.9% from biogas installations and 24.8% from bioliquid installations.
The majority of the installations (72.6%) are in Northern Italy, which therefore makes the highest contribution to installed capacity (61.7%). In particular, Lombardy is the region with the highest number of installations (25%), followed by Veneto (13.3%). The share contributed by Central Italy is 14.5%, while that of Southern Italy is 12.9%.
Electricity produced from bioenergy in 2017 decreased by 0.7%, dropping from 19,508.6 GWh in 2016 to 19,378.2 GWh. In 2017, the contribution of production from bioenergy to total production of electricity was 5.6%.

**Geothermal power**
There were 34 geothermal installations in Italy at the end of 2017, with an installed capacity of 813 MW. From 2016 to 2017, both the capacity and number of geothermal installations remained unchanged. The 34 installations located in Italy are concentrated in a single region, Tuscany. The production of electricity at these installations was 6,202 GWh in 2017.
In 2017, geothermal power provided 6% of the production of electricity of the whole renewable source installation park.
and 1.8% of the national production of electricity. The contribution of geothermal power to the total production from renewable sources has been somewhat variable over the years, increasing from 10% in 2004 to the highest share of 12% in 2007, then decreasing to a minimum share of 5% in 2013 and 2014, due to the progressively increasing production from all the other renewable sources. The contribution of geothermal production to the total production of electricity in Italy has remained constant during the time span analysed at a rate of 1.6-2.2%.

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