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 – 2015” statistical report (published in March 2017 and downloadable from the GSE http://www.gse.it/it/Statistiche/RapportiStatistici/Pagine/default.aspx 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). In 2015, the total number of installations powered by renewable sources in Italy reached 697,506 with an overall installed capacity of 51,475 MW. Compared to 2014, the installed capacity has increased by 880 MW (+1.8%), while the number of plants increased by 6.3% against the previous year.

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

**Source:** GSE - “Rapporto Statistico – Energia da fonti rinnovabili in Italia, Anno 2015”

From 2002 to 2015, the gross efficient generation capacity installed in Italy rose from 19,221 MW to 51,475 MW, with an increase of 32,254 MW and an average annual growth rate in overall capacity of 7.9%; 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, these plants now cover only 36% of the total, 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 8,048.5 MW (equal to 15.6% of the total national installed capacity), followed by Puglia with 5,267.8 MW (equal to 10.2%) and Piedmont with 4,587.8 MW (equal to 8.9%).

Production of electricity from renewable sources

Production from renewable sources, which from 2008 al 2014 had reached a new record level each year, in 2015 totalled...
108,904 GWh, a drop of around 12,000 GWh against the previous year (9.8%).

In 2015 too, hydropower was the source that made the largest contribution to electricity generation, even though at levels that had decreased considerably against 2014 (-22.2%): with 45,537 GWh it covered 42% 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 2015 they accounted for 58% of national electricity production from renewable sources. In particular, in 2015 the contribution by renewable sources to total gross national production of electricity was 38.5%. In Italy, in fact, hydrocarbons and, in particular, natural gas, still remain the major sources used to generate electricity.

Source: GSE - "Rapporto Statistico – Energia da fonti rinnovabili in Italia, Anno 2015"

To better appreciate the development of wind, solar, geothermal and biomass sources in the decade from 2006 to 2015, hydroelectric power has been excluded from the chart on production from renewable sources in Italy.

Source: GSE - "Rapporto Statistico – Energia da fonti rinnovabili in Italia, Anno 2015"
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 account for 53.7% 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 15.3% and 10.7% of national production, are worth noting. Of the regions in Central Italy, which contribute 14.8% of the national production, Tuscany stands out because, due to its geothermal plants, it contributes 7.8% of national production. In Southern Italy (including the islands), which supplies the remaining 31.5%, Puglia, followed by Sicily and Calabria, is the region that makes the highest contribution to national production.

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Renewable sources in detail

**Solar photovoltaic power in Italy**
At 31 December 2015, there were 688,398 photovoltaic installations in Italy (98.7% of all installations using renewable sources of energy) with an installed capacity of 18,892 MW (or 37% of the capacity of the whole renewable source installation park). Compared to the previous year, in 2015 there was a 1.6% increase in installed capacity and a 6.2% 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.

At regional level, 44% of installed capacity is in the North, 37% in the South and 19% in Central Italy. With 2,600 MW, Puglia 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 2,109 MW (11.2%).

With regard to the number of installations, at regional level, 54% of the installations are located in the North, 29% in the South and, lastly, 17% in Central Italian regions. The region with the highest number of installations is Lombardy with 101,403 installations (equal to 14.7% of the national total), followed by Veneto with 93,168 (13.5%).

Lastly, regarding production of electricity from solar photovoltaic installations, 22,942 GWh were produced in 2015, 2.9% more than the previous year: the increase versus 2014, while significant, was lower than those achieved in the previous years. Since 2009, production has increased approximately 34-fold and photovoltaic power is no longer the straggler amongst the renewable sources used in Italy to produce electricity. In 2015, the contribution of production from the solar source to total production of electricity was 7.1%.

**Wind power**
There were 2,734 installations in Italy at the end of 2015, with an installed capacity of 9,162 MW. In Italy, the majority of wind power installations, 85.8%, are small sized (capacity lower than 1 MW), while 90.3% of the installed capacity (8,275 MW) is concentrated in 274 wind farms with a capacity higher than 10 MW. From 2000 to 2015, 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 2015, with installed capacity of 9,162 MW, 18% of the total power produced by all renewable source installations was generated by wind farms.

Due to the environmental characteristics of our country, 96.7% of Italian installed capacity and 87.2% of the installations are located in the regions in Southern Italy and the islands, where the windiness, the mountainous terrain and the accessibility of the sites are favourable to installation of wind farms. The region with the highest installed capacity is
Puglia (2,360 MW, equal to 25.8% of the national total), followed by Sicily and Campania, respectively with installed capacities of 1,758 MW (19.2%) and 1,318 MW (14.4%).

Electricity production from wind power increased over tenfold from 2002 to 2015, going from 1,404 GWh to 14,844 GWh; the growth trend has slowed down considerably from 2014, and in 2015 there was a decrease of 334 GWh. In 2015, the contribution of production from wind power to total production of electricity was 4.6%.

**Hydroelectric power**

There were 3,693 hydroelectric installations in Italy at the end of 2015, with an installed capacity of 18,543 MW. Between 2014 and 2015, the number of installations increased by 7.6%, while the overall increase in terms of installed capacity was only 0.7%. The significance of installed hydroelectric capacity as compared to the overall capacity of renewable source installations in Italy has remained more or less unchanged from that of 2014, decreasing slightly from 36.4% in 2014 to 36% in 2015. From 2002 to 2015, the capacity of the 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 2015 the installed hydroelectric capacity accounted for 36% of the capacity of the whole renewable source installation park.

At regional level, 80.6% of hydroelectric installations are located in Northern Italy. In particular, 55.4% of all the installations in Italy are located in Piedmont (760 installations), Trentino Alto Adige (744) and Lombardy (542). In terms of capacity too, 75.9% is installed in Northern Italian regions: Lombardy in first place with 5,082 MW installed, followed by Trentino Alto Adige with 3,288 MW and Piedmont with 2,687 MW. The only region in the central and southern Italy that makes significant use of hydroelectric power is Abruzzo with an installed capacity of 1,011 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 2002 to 2015, the production underwent considerable variations in this period. In 2015, hydroelectric energy production was 45,537 GWh, 14% of total Italian electricity production, a considerable decrease against 2014, due precisely to adverse weather conditions.

**Bioenergy**

This term indicates the energy produced from biomass (including solid urban waste), biogas and bioliquids. There were 2,647 installations fuelled by bioenergy in Italy up to the end of 2015, with an installed capacity of 4,056 MW (or 7.9% of the capacity of the whole renewable source installation park). In 2015, the number of installations increased by 6.6%, while the installed capacity grew by only 0.3% against the previous year. If we consider the installed capacity, 39.7% originates in installations burning solid biomass, 34.7% from biogas installations and 25.6% from bioliquid installations.

The majority of these installations (74.1%) are in Northern Italy and, in particular, Lombardy is the region with the highest number of installations (26%), followed by Veneto (13.4%). The share contributed by Central Italy is 15.9%, while that of Southern Italy is 10%.

Electricity produced from bioenergy in 2015 increased by 3.5%, from 18,732 GWh in 2014 to 19,396 GWh. In 2014, the contribution of production from bioenergy to total production of electricity was 5.7%.

**Geothermal power**

There were 34 geothermal installations in Italy at the end of 2015, with an installed capacity of 821 MW. From 2014 to 2015, 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 6,185 GWh in 2015.

In 2015, geothermal power provided 5.6% 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 9% in 2000 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%.

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