# POWER PLANTS

# Maximum capacity of electric power plants in Italy at 31 December 2017

## By energy source

Figure 5

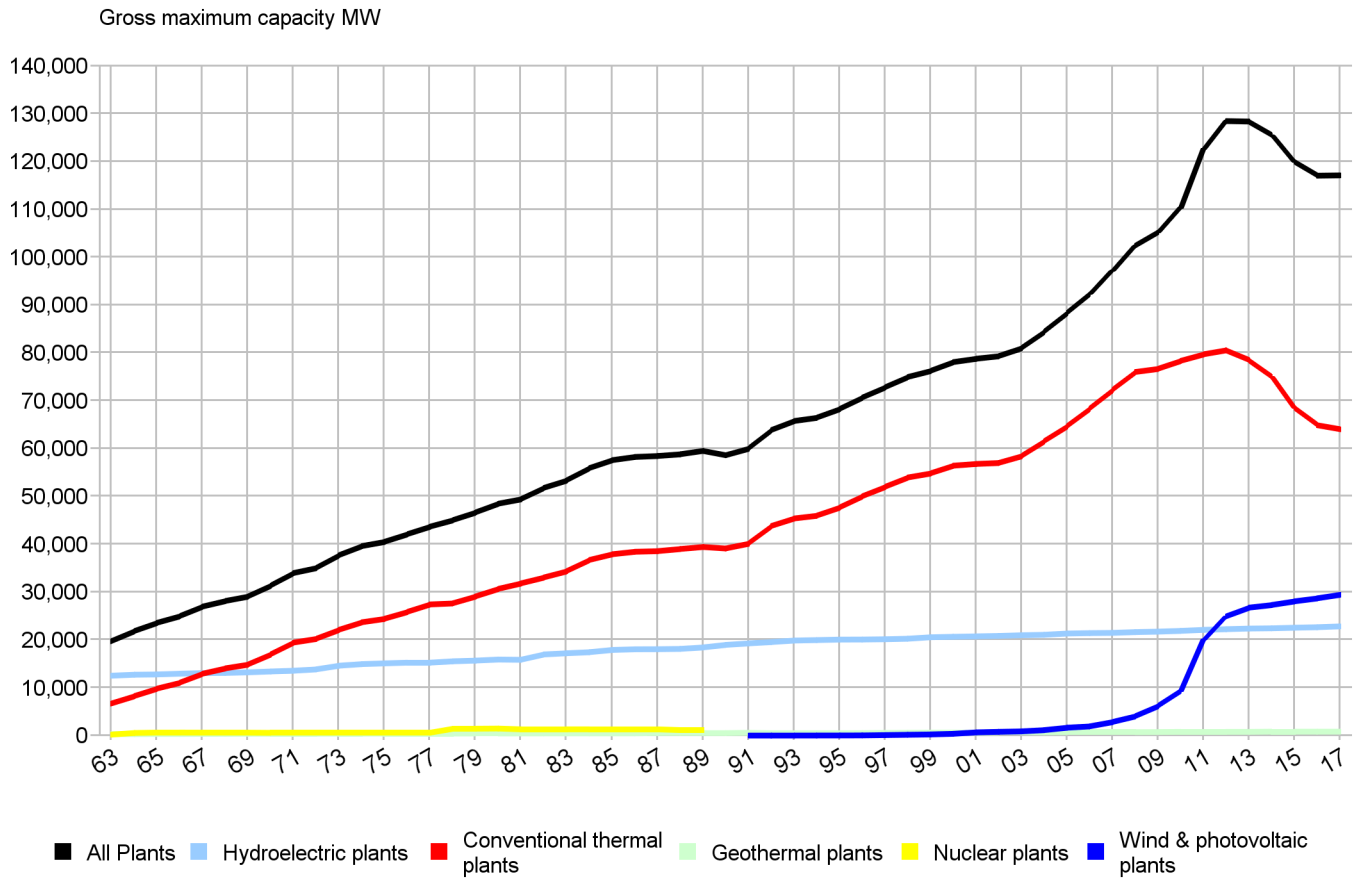


Table 5 (*)

| | Gross | | | Net | | |
|---|---|---|---|---|---|---|
| | Producers | Autoproducers | Total | Producers | Autoproducers | Total |
| **MW** | | | | | | **2017** |
| hydroelectric | 22,714.5 | 123.4 | 22,837.9 | 22,307.2 | 118.9 | 22,426.0 |
| thermal | 59,741.1 | 5,117.1 | 64,858.2 | 57,480.8 | 4,915.0 | 62,395.8 |
| *conventional* | *58,928.0* | *5,117.1* | *64,045.1* | *56,713.6* | *4,915.0* | *61,628.6* |
| *geothermal* | *813.1* | - | *813.1* | *767.2* | - | *767.2* |
| wind | 9,765.8 | .. | 9,765.9 | 9,736.6 | .. | 9,736.6 |
| photovoltaic | 19,682.3 | - | 19,682.3 | 19,682.3 | - | 19,682.3 |
| **total** | **111,903.7** | **5,240.6** | **117,144.3** | **109,206.8** | **5,033.9** | **114,240.6** |

The "maximum capacity" of a power plant is the maximum electrical capacity that could be produced continuously throughout a prolonged period of operation on the assumption that all parts of the plant are entirely efficient and in optimal condition (flow and heat in the case of hydroelectric plants, availability of fuel and of cooling-water in the case of thermoelectric plants).

Maximum capacity in "gross" if measured at the terminals of the plant's generators, or "net" if measured at the plant's busbars, that is, less the power absorbed by the plant auxiliary services and less the losses in the transformers that are considered integral parts of the plant.

(*) For the definition of "Autoproducer" or "Self-Producer" see Introduction of the volume, on page 3.

# Hydro plants

# Nominal and maximum capacity and average annual energy capability of hydro plants in Italy at 31 December

Table 6

| | Plants | | Nominal capacity | | | |
|---|---|---|---|---|---|---|
| | | | Prime movers | | Generators | |
| | no. | no. | MW | MW | MVA | MVA |
| | **2016** | **2017** | **2016** | **2017** | **2016** | **2017** |
| Producers | 3,842 | 4,188 | 24,455.1 | 24,472.0 | 27,998.2 | 28,058.1 |
| *variation 2017/2016* | | *9.0%* | | *0.1%* | | *0.2%* |
| Autoproducers | 85 | 86 | 136.2 | 138.0 | 171.3 | 173.5 |
| *variation 2017/2016* | | *1.2%* | | *1.4%* | | *1.3%* |
| **Total** | **3,927** | **4,274** | **24,591.3** | **24,610.0** | **28,169.5** | **28,231.6** |
| ***variation 2017/2016*** | | ***8.8%*** | | ***0.1%*** | | ***0.2%*** |

(*) Including energy capability from pumping inflows.

A "hydro plant" is a complex of hydraulic works, machinery, equipment, buildings and services for the conversion of hydraulic energy into electric energy. The "power station" is the plant comprising the building, the hydroelectric sets, the relative equipment and facilities such as the "station transformers". Two hydro plants with different heads, but having in common the power-station building, the discharge installations and part of the services, are considered as separate plants, each classified in its specific category (see definition on page 33).

In "pumped-storage plants", the pumps and the turbines are always connected to the same upper reservoir. The following two types of pumped-storage plants are distinguished according to the manner in which they are connected to the lower reservoir or reservoirs:

- "plants with contributory pumping", in which the pumps are connected to a lower reservoir separated from that into which the turbines are discharged. In this case it is not possible to provide for pumping cycles, and the function of the pumps, which may be installed in the powerhouse building or in a different building, is solely to raise the water collected by the reservoir which supplies the pumps to the upper reservoir. Pumping with these plants is defined as "contributory pumping";

- plants in which the pumps and turbines are connected to the same lower reservoir: in this case the pumping cycle is repeatable a larger number of times, if required. These plants are considered respectively as "pure pumped-storage plants" or "mixed pumped-storage plants" when the natural inflows which supply the upper reservoir are, on average, above or below 5% the average volume of water feeding the turbines in a year. The pumping of these plants is defined as "voluntary pumping".

The "nominal capacity" of a hydraulic prime mover (turbine) or of an electrical generator is the maximum capacity obtainable, in continuous operation according to the accepted standards; the nominal capacity is a gross capacity. In a hydroelectric plant (or in a group of plants), nominal capacity is the sum of the nominal capacities of the machines (main and auxiliary) installed in the power plant.

| Maximum capacity | | | | Average annual energy capability (*) | | | |
|---|---|---|---|---|---|---|---|
| Gross | | Net | | Gross | | Net | |
| MW | MW | MW | MW | GWh | GWh | GWh | GWh |
| **2016** | **2017** | **2016** | **2017** | **2016** | **2017** | **2016** | **2017** |
| 22,536.4 | 22,714.5 | 22,181.1 | 22,307.2 | 54,591.1 | 53,716.5 | 53,772.2 | 52,910.7 |
| | *0.8%* | | *0.6%* | | *-1.6%* | | *-1.6%* |
| 121.6 | 123.4 | 117.1 | 118.9 | 613.0 | 624.0 | 603.8 | 614.7 |
| | *1.5%* | | *1.5%* | | *1.8%* | | *1.8%* |
| **22,658.0** | **22,837.9** | **22,298.2** | **22,426.0** | **55,204.1** | **54,340.5** | **54,376.0** | **53,525.4** |
| | ***0.8%*** | | ***0.6%*** | | ***-1.6%*** | | ***-1.6%*** |

The "energy capability from natural inflows" of a hydroelectric plant in a given period is the maximum quantity of electric energy that it could possibly produce or store with said inflows in the period considered, on the assumption of complete utilisation of the inflows and that all parts of the plant are efficient. Energy capability may be gross or net and is calculated in a manner analogous to that defined for production (see page 25).

The "average energy capability from natural inflows" of a hydro plant in a given period is the arithmetic mean of the related energy capabilities during the largest possible number of consecutive years.

The "average energy capability from contributory-pumping inflows" of a hydro plant in a given period is defined in a manner analogous to energy capability from natural inflows, but with reference to a net head heigh equivalent to the difference between the level of the upper reservoir of the plant and that of the reservoir which supplies the pumps.

The "average energy capability from voluntary-pumping inflows" of a pure or mixed pumped-storage hydro plant in a given period is calculated conventionally on the basis of considerations that take into account the duty that this type of plant is called to perform in the generating system.

# Situation of hydro plants in Italy in 2017

Table 7

| | Plants | | Nominal capacity | |
|---|---|---|---|---|
| | | | Prime movers | Generators |
| | no. | Category | kW | kVA |
| **Situation at 31/12/2016** | **3,927** | | **24,591,251** | **28,169,491** |
| **Plants commissioned in 2017** | **356** | | **98,812** | **121,775** |
| Piemonte | 88 | Run of river | 20,610 | 25,908 |
| Valle d'Aosta | 19 | Run of river | 12,894 | 16,428 |
| Lombardia | 57 | Run of river | 24,900 | 30,824 |
| Trentino Alto Adige | 47 | Run of river | 8,872 | 10,741 |
| Veneto | 21 | Run of river | 5,957 | 7,213 |
| Friuli Venezia Giulia | 18 | Run of river | 2,638 | 3,099 |
| Liguria | 11 | Run of river | 1,934 | 2,186 |
| Emilia Romagna | 25 | Run of river | 5,614 | 6,865 |
| Toscana | 18 | Run of river | 5,455 | 6,496 |
| Umbria | 4 | Run of river | 364 | 437 |
| Marche | 14 | Run of river | 1,834 | 2,261 |
| Lazio | 16 | Run of river | 1,265 | 1,549 |
| Abruzzi | 5 | Run of river | 1,973 | 2,412 |
| Molise | 3 | Run of river | 168 | 266 |
| Campania | 3 | Run of river | 159 | 197 |
| Puglia | 1 | Run of river | 450 | 577 |
| Calabria | 2 | Run of river | 1,134 | 1,338 |
| Sicilia | 4 | Run of river | 2,591 | 2,978 |
| **Existing modified or decommissioned plants in 2017** | **-9** | | **-80,040** | **-59,682** |
| **Situation at 31/12/2017** | **4,274** | | **24,610,024** | **28,231,585** |

The **categories** in which hydro plants are classified are defined on page 33.
The electrical capacity of a set of reservoirs is the amount of electricity that their downstream hydro plants could generate through the complete emptying of the reservoirs' "water operating capacity", lacking natural flows and water losses.

| Gross maximum capacity | Average annual gross energy capability | | | |
|---|---|---|---|---|
| | from natural inflows | from pumping inflows | | Total |
| | | contributory | voluntary | |
| kW | GWh | GWh | GWh | GWh |
| **22,657,980** | **50,618.5** | **94.7** | **4,490.8** | **55,204.1** |
| **97,642** | **485.5** | **0.0** | **0.0** | **485.5** |
| 20,317 | 100.7 | - | - | 100.7 |
| 12,799 | 64.6 | - | - | 64.6 |
| 24,800 | 123.1 | - | - | 123.1 |
| 8,746 | 43.6 | - | - | 43.6 |
| 5,739 | 28.0 | - | - | 28.0 |
| 2,582 | 13.1 | - | - | 13.1 |
| 1,924 | 9.6 | - | - | 9.6 |
| 5,531 | 27.3 | - | - | 27.3 |
| 5,409 | 27.0 | - | - | 27.0 |
| 364 | 1.5 | - | - | 1.5 |
| 1,824 | 9.1 | - | - | 9.1 |
| 1,259 | 6.3 | - | - | 6.3 |
| 1,948 | 9.6 | - | - | 9.6 |
| 166 | 0.8 | - | - | 0.8 |
| 159 | 0.8 | - | - | 0.8 |
| 450 | 2.3 | - | - | 2.3 |
| 1,134 | 5.7 | - | - | 5.7 |
| 2,491 | 12.5 | - | - | 12.5 |
| **82,304** | **-265.6** | **-4.0** | **-1,079.5** | **-1,349.1** |
| **22,837,925** | **50,838.4** | **90.7** | **3,411.4** | **54,340.5** |

# Nominal and maximum capacity and average annual gross energy capability of hydro plants in Italy at 31 December 2017

By major geographical area and category of plant

Table 8

| | Plants | Nominal capacity | | Maximum capacity | | Average annual gross energy capability | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Prime movers | Generators | Gross | Net | from natural inflows | from pumpings | | Total |
| | | | | | | | contributory | voluntary | |
| | no. | MW | MVA | MW | MW | GWh | GWh | GWh | GWh |
| reservoir plants | 130 | 8,904.2 | 9,998.1 | 8,495.9 | 8,373.7 | 9,739.4 | 38.1 | 1,910.1 | 11,687.6 |
| *of which pure and mixed pumped-storage* | *16* | *5,103.4* | *5,798.3* | *4,871.8* | *4,816.7* | *2,037.2* | *0.5* | *1,910.1* | *3,947.8* |
| pondage plants | 133 | 3,819.1 | 4,282.3 | 3,558.4 | 3,495.0 | 11,075.8 | 22.7 | - | 11,098.5 |
| run-of-river plants | 3,189 | 5,069.0 | 6,052.6 | 4,670.6 | 4,548.2 | 20,594.4 | 10.8 | - | 20,605.2 |
| **Northern Italy** | **3,452** | **17,792.4** | **20,333.0** | **16,724.9** | **16,417.0** | **41,409.6** | **71.5** | **1,910.1** | **43,391.3** |
| reservoir plants | 9 | 305.6 | 372.7 | 274.1 | 263.9 | 460.9 | - | - | 460.9 |
| pondage plants | 43 | 919.1 | 1,102.2 | 764.3 | 747.5 | 2,004.9 | 5.2 | - | 2,010.1 |
| run-of-river plants | 485 | 571.7 | 702.4 | 524.9 | 510.5 | 1,987.5 | - | - | 1,987.5 |
| **Central Italy** | **537** | **1,796.4** | **2,177.3** | **1,563.3** | **1,521.8** | **4,453.3** | **5.2** | **-** | **4,458.5** |
| reservoir plants | 47 | 3,698.6 | 4,173.9 | 3,352.9 | 3,312.5 | 1,792.5 | 14.0 | 1,501.3 | 3,307.7 |
| *of which pure and mixed pumped-storage* | *7* | *2,777.1* | *3,134.3* | *2,522.0* | *2,500.3* | *427.9* | *1.0* | *1,501.3* | *1,930.2* |
| pondage plants | 28 | 860.1 | 975.9 | 767.0 | 754.7 | 1,531.5 | - | - | 1,531.5 |
| run-of-river plants | 210 | 462.6 | 571.4 | 429.8 | 420.0 | 1,651.5 | - | - | 1,651.5 |
| **Southern mainland & island** | **285** | **5,021.3** | **5,721.3** | **4,549.7** | **4,487.2** | **4,975.5** | **14.0** | **1,501.3** | **6,490.8** |
| **reservoir plants** | **186** | **12,908.5** | **14,544.8** | **12,122.9** | **11,950.1** | **11,992.7** | **52.1** | **3,411.4** | **15,456.2** |
| *of which pure and mixed pumped-storage* | *23* | *7,880.5* | *8,932.6* | *7,393.8* | *7,317.0* | *2,465.1* | *1.5* | *3,411.4* | *5,877.9* |
| **pondage plants** | **204** | **5,598.3** | **6,360.4** | **5,089.7** | **4,997.2** | **14,612.3** | **27.9** | **-** | **14,640.1** |
| **run-of-river plants** | **3,884** | **6,103.3** | **7,326.4** | **5,625.3** | **5,478.7** | **24,233.4** | **10.8** | **-** | **24,244.1** |
| **ITALY** | **4,274** | **24,610.0** | **28,231.6** | **22,837.9** | **22,426.0** | **50,838.4** | **90.7** | **3,411.4** | **54,340.5** |

# Nominal and gross maximum capacity and average annual gross energy capability of hydro plants in Italy at 31 December 2017

By gross maximum capacity class of plant

Table 9

| | Plants | Nominal capacity | | Gross maximum capacity | | Average annual gross energy capability |
|---|---|---|---|---|---|---|
| | | Prime movers | Generators | Of each Class | Cumulated | |
| | no. | MW | MVA | MW | MW | GWh |
| **gross maximum capacity class** | | | | | | |
| over 200 MW | 18 | 8,831.6 | 9,914.9 | 8,263.0 | 8,263.0 | 8,375.2 |
| from over 100 to 200 | 24 | 3,661.3 | 4,008.9 | 3,335.0 | 11,598.0 | 7,131.0 |
| " 50 " 100 | 30 | 2,210.2 | 2,541.5 | 2,050.4 | 13,648.4 | 6,167.1 |
| " 30 " 50 | 65 | 2,762.9 | 3,205.9 | 2,545.0 | 16,193.4 | 8,183.5 |
| " 20 " 30 | 55 | 1,530.1 | 1,801.8 | 1,400.4 | 17,593.8 | 4,856.1 |
| " 10 " 20 | 122 | 1,902.5 | 2,261.2 | 1,762.3 | 19,356.1 | 6,052.9 |
| " 5 " 10 | 146 | 1,125.9 | 1,346.6 | 1,049.8 | 20,405.9 | 3,767.9 |
| " 1 " 5 | 740 | 1,710.4 | 2,088.6 | 1,604.7 | 22,010.6 | 6,203.4 |
| up to 1 | 3,074 | 875.2 | 1,062.3 | 827.4 | 22,837.9 | 3,603.2 |
| **Total** | **4,274** | **24,610.0** | **28,231.6** | **22,837.9** | | **54,340.5** |

The "hydro plants" are classified, according to the filling period of the reservoir, in three categories: reservoir plants, pondage plants and run-of-river plants.

The "filling period" of a reservoir is the time necessary for providing the reservoir with a volume of water equivalent to its useful capacity (see definition on page 30), with the average annual flow of the water course(s) which runs into it, excluding possible pumping flows.

On the basis of the respective "filling periods", the reservoirs are classified as follows:
- seasonal "regulation reservoirs": those with a filling period of or exceeding 400 hours;
- weekly or daily "modulation pondage reservoirs": those with a filling period of less than 400 hours and more than 2 hours.

The three categories of plants are therefore defined as follows:
- reservoir plants: those with a reservoir classified as "seasonal regulation reservoir";
- pondage plants: those with a reservoir classified as "modulation pondage reservoir";
- run-of-river plants: those with no reservoir or a reservoir with a filling period of 2 hours or less.
When two or more plants, linked in series and situated at a short distance from one another and without appreciable intermediate inflows, are connected to the same reservoirs, they are classified in the category defined by the filling period of these reservoirs.

# Thermal plants

# Nominal and maximum capacity of thermal plants in Italy at 31 December (1)

Table 10

| | Plants | | Units | |
|---|---|---|---|---|
| | no. | no. | no. | no. |
| | **2016** | **2017** | **2016** | **2017** |
| producers | 4,335 | 4,712 | 5,442 | 5,829 |
| *of which: geothermal* | *34* | *34* | *36* | *36* |
| *variation 2017/2016* | | *8.7%* | | *7.1%* |
| autoproducers | 984 | 1,033 | 1,314 | 1,384 |
| *variation 2017/2016* | | *5.0%* | | *5.3%* |
| **ITALY** | **5,319** | **5,745** | **6,756** | **7,213** |
| ***variation 2017/2016*** | | ***8.0%*** | | ***6.8%*** |

(1) Capacity of thermal plants stoked with renewable sources (Bioenergy) is included. For the detail on plants from renewable sources, see Table 13.

A "thermal power unit" consists of: a steam generator, a thermal prime mover, an electrical generator, thermal-cycle equipment, main and auxiliary services. In the present publication, the term "unit" has, for reasons of simplicity, been adopted to indicate also thermal power sets, consisting only of: a thermal prime mover and an electrical generator (for example, internal-combustion engines, gas turbines, geothermal power sets).

The "nominal capacity" of the prime movers or of the electrical generators of a set, of a unit, of a power plant or of a group of power plants, is the sum of the maximum capacities in continuous-operating conditions, according to the accepted standards, of each of the machines considered of the same category. The nominal capacity is a gross value.

| Nominal capacity | | | | Maximum capacity | | | |
|---|---|---|---|---|---|---|---|
| Prime movers | | Generators | | Gross | | Net | |
| MW | MW | MVA | MVA | MW | MW | MW | MW |
| **2016** | **2017** | **2016** | **2017** | **2016** | **2017** | **2016** | **2017** |
| 61,855.7 | 60,762.0 | 76,400.8 | 75,143.1 | 60,831.3 | 59,741.1 | 58,479.5 | 57,480.8 |
| *916.8* | *915.3* | *1,073.1* | *1,073.1* | *814.6* | *813.1* | *767.2* | *767.2* |
| | *-1.8%* | | *-1.6%* | | *-1.8%* | | *-1.7%* |
| 5,018.0 | 5,232.8 | 6,077.5 | 6,426.6 | 4,898.5 | 5,117.1 | 4,716.6 | 4,915.0 |
| | *4.3%* | | *5.7%* | | *4.5%* | | *4.2%* |
| **66,873.7** | **65,994.8** | **82,478.3** | **81,569.7** | **65,729.7** | **64,858.2** | **63,196.1** | **62,395.8** |
| | ***-1.3%*** | | ***-1.1%*** | | ***-1.3%*** | | ***-1.3%*** |

The "maximum capacity" of a set, of a unit, of a power plant or of a group of thermal power plants is the maximum power which could be produced continuously throughout a prolonged period of operation, on the assumption that all the parts of the plant are entirely in efficient condition and that there is adequate availability of fuel and of cooling water. The value for maximum capacity is gross if measured at the terminals of the electrical generators of the plants; it is net if measured at the plant busbars.

# Situation of thermal plants in Italy in 2017

Table 11

| | Plants | Units | Type of unit |
|---|---|---|---|
| | no. | no. | |
| **Situation at 31/12/2016** | **5,319** | **6,756** | |
| **Plants commissioned in 2017** | **549** | **628** | |
| Piemonte | 54 | 47 | Power and heat generation |
| | | 37 | Power generation only |
| Valle d'Aosta | 1 | 1 | Power and heat generation |
| Lombardia | 115 | 96 | Power and heat generation |
| | | 25 | Power generation only |
| Trentino Alto Adige | 47 | 53 | Power and heat generation |
| | | 7 | Power generation only |
| Veneto | 62 | 55 | Power and heat generation |
| | | 12 | Power generation only |
| Friuli Venezia Giulia | 20 | 19 | Power and heat generation |
| | | 2 | Power generation only |
| Liguria | 2 | 2 | Power and heat generation |
| | | 1 | Power generation only |
| Emilia Romagna | 94 | 92 | Power and heat generation |
| | | 12 | Power generation only |
| Toscana | 25 | 23 | Power and heat generation |
| | | 4 | Power generation only |
| Umbria | 9 | 8 | Power and heat generation |
| | | 1 | Power generation only |
| Marche | 13 | 13 | Power and heat generation |
| Lazio | 24 | 23 | Power and heat generation |
| | | 5 | Power generation only |
| Abruzzi | 3 | 3 | Power and heat generation |
| Molise | 2 | 2 | Power and heat generation |
| Campania | 35 | 33 | Power and heat generation |
| | | 3 | Power generation only |
| Puglia | 10 | 8 | Power and heat generation |
| | | 6 | Power generation only |
| Basilicata | 4 | 4 | Power and heat generation |
| Calabria | 10 | 11 | Power and heat generation |
| Sicilia | 16 | 15 | Power and heat generation |
| | | 1 | Power generation only |
| Sardegna | 3 | 3 | Power and heat generation |
| | | 1 | Power generation only |
| **Existing modified or decommissioned plants in 2017** | **-123** | **-171** | |
| **Situation at 31/12/2017** | **5,745** | **7,213** | |

| Nominal capacity | | Maximum capacity | |
|---|---|---|---|
| Prime movers<br>kW | Generators<br>kVA | Gross<br>kW | Net<br>kW |
| **66,873,718** | **82,478,275** | **65,729,750** | **63,196,055** |
| **237,918** | **280,603** | **231,764** | **223,577** |
| 7,294 | 8,514 | 7,162 | 6,828 |
| 12,734 | 15,508 | 12,718 | 12,692 |
| 1,000 | 1,156 | 1,000 | 970 |
| 41,763 | 48,841 | 41,082 | 39,751 |
| 3,602 | 4,142 | 3,519 | 3,359 |
| 5,818 | 7,248 | 5,668 | 5,469 |
| 537 | 681 | 515 | 464 |
| 28,178 | 33,692 | 27,126 | 26,105 |
| 2,122 | 2,533 | 2,051 | 1,929 |
| 15,125 | 17,191 | 14,950 | 14,237 |
| 162 | 187 | 150 | 144 |
| 1,745 | 1,989 | 1,724 | 1,660 |
| 575 | 688 | 550 | 525 |
| 33,189 | 38,148 | 31,196 | 30,429 |
| 3,505 | 4,157 | 3,389 | 3,194 |
| 10,881 | 12,642 | 10,608 | 10,201 |
| 3,471 | 4,508 | 3,398 | 3,142 |
| 2,714 | 2,930 | 2,694 | 2,609 |
| 200 | 200 | 200 | 200 |
| 3,209 | 3,694 | 3,151 | 3,030 |
| 26,319 | 31,993 | 25,761 | 25,002 |
| 2,068 | 2,493 | 2,010 | 1,921 |
| 75 | 88 | 75 | 74 |
| 2,211 | 2,262 | 2,211 | 2,145 |
| 9,797 | 11,822 | 9,690 | 9,335 |
| 396 | 506 | 396 | 376 |
| 2,331 | 2,640 | 2,285 | 2,209 |
| 1,955 | 2,350 | 1,955 | 1,871 |
| 1,300 | 1,621 | 1,300 | 1,267 |
| 8,411 | 10,068 | 8,095 | 7,742 |
| 4,673 | 5,450 | 4,608 | 4,214 |
| 50 | 63 | 49 | 41 |
| 312 | 378 | 298 | 262 |
| 196 | 220 | 180 | 180 |
| **-1,116,845** | **-1,189,192** | **-1,103,312** | **-1,023,869** |
| **65,994,791** | **81,569,686** | **64,858,202** | **62,395,763** |

# Nominal and maximum capacity of thermal plants in Italy at 31 December 2017

By type of plant and gross maximum capacity class of units

Table 12

| | Producers | | | | |
|---|---|---|---|---|---|
| | Units | Nominal capacity | | Maximum capacity | |
| | | Prime movers | Generators | Gross | Net |
| | no. | MW | MVA | MW | MW |
| **A) Plants for power generation only** | | | | | |
| **internal combustion** | **1,615** | **1,071.4** | **1,325.7** | **1,041.6** | **999.1** |
| *-up to 25* | *1,615* | *1,071.4* | *1,325.7* | *1,041.6* | *999.1* |
| *-over 25 up to 50* | - | - | - | - | - |
| **gas turbine** | **57** | **2,725.1** | **3,259.8** | **2,716.8** | **2,663.6** |
| *-up to 25* | *36* | *163.4* | *189.4* | *155.3* | *153.1* |
| *-over 25 up to 50* | *2* | *76.4* | *100.0* | *76.3* | *74.3* |
| *-over 50 up to 100* | *7* | *607.2* | *730.4* | *607.2* | *576.0* |
| *-over 100 up to 200* | *8* | *938.0* | *1,120.0* | *938.0* | *930.2* |
| *-over 200 up to 500* | *4* | *940.0* | *1,120.0* | *940.0* | *930.0* |
| **steam condensing** | **99** | **11,802.1** | **13,615.5** | **11,719.6** | **10,720.8** |
| *-up to 25* | *62* | *499.1* | *600.0* | *472.1* | *421.5* |
| *-over 25 up to 50* | *3* | *100.0* | *155.8* | *100.0* | *85.8* |
| *-over 50 up to 100* | *4* | *271.0* | *320.8* | *271.0* | *245.0* |
| *-over 100 up to 200* | *8* | *1,272.0* | *1,409.0* | *1,259.5* | *1,187.7* |
| *-over 200 up to 500* | *14* | *4,440.0* | *5,140.0* | *4,397.0* | *3,941.0* |
| *-over 500* | *8* | *5,220.0* | *5,990.0* | *5,220.0* | *4,839.8* |
| **combined cylce** | **58** | **22,303.2** | **29,133.8** | **21,823.9** | **21,374.1** |
| *-up to 25* | *7* | *39.7* | *48.5* | *38.0* | *36.1* |
| *-over 25 up to 50* | *6* | *244.3* | *315.4* | *243.7* | *237.7* |
| *-over 50 up to 100* | *2* | *116.0* | *152.1* | *116.0* | *110.8* |
| *-over 100 up to 200* | *1* | *115.5* | *144.6* | *115.5* | *113.0* |
| *-over 200 up to 500* | *30* | *12,121.7* | *16,819.3* | *11,767.5* | *11,522.2* |
| *-over 500* | *12* | *9,666.0* | *11,653.8* | *9,543.1* | *9,354.2* |
| **turbo expander sets** | **60** | **119.4** | **148.4** | **118.5** | **114.7** |
| *-up to 25* | *60* | *119.4* | *148.4* | *118.5* | *114.7* |
| **plants not classified elsewhere** | **12** | **184.9** | **222.5** | **180.2** | **172.7** |
| *-up to 25* | *10* | *70.9* | *82.5* | *66.2* | *64.4* |
| *-over 25 up to 50* | *1* | *42.0* | *50.0* | *42.0* | *39.9* |
| *-over 50 up to 100* | *1* | *72.0* | *90.0* | *72.0* | *68.4* |
| **Total A** | **1,901** | **38,206.1** | **47,705.8** | **37,600.6** | **36,044.9** |

| Autoproducers | | | | | ITALY | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Units | Nominal capacity | | Maximum capacity | | Units | Nominal capacity | | Maximum capacity | |
| | Prime movers | Generators | Gross | Net | | Prime movers | Generators | Gross | Net |
| no. | MW | MVA | MW | MW | no. | MW | MVA | MW | MW |
| **120** | **203.3** | **247.0** | **198.6** | **192.4** | **1,735** | **1,274.7** | **1,572.7** | **1,240.2** | **1,191.5** |
| *119* | *168.3* | *204.3* | *164.5* | *158.6* | *1,734* | *1,239.7* | *1,530.0* | *1,206.1* | *1,157.7* |
| *1* | *35.0* | *42.7* | *34.2* | *33.8* | *1* | *35.0* | *42.7* | *34.2* | *33.8* |
| **3** | **1.9** | **2.3** | **1.9** | **1.8** | **60** | **2,727.0** | **3,262.2** | **2,718.7** | **2,665.4** |
| *3* | *1.9* | *2.3* | *1.9* | *1.8* | *39* | *165.4* | *191.8* | *157.1* | *154.8* |
| - | - | - | - | - | *2* | *76.4* | *100.0* | *76.3* | *74.3* |
| - | - | - | - | - | *7* | *607.2* | *730.4* | *607.2* | *576.0* |
| - | - | - | - | - | *8* | *938.0* | *1,120.0* | *938.0* | *930.2* |
| - | - | - | - | - | *4* | *940.0* | *1,120.0* | *940.0* | *930.0* |
| **6** | **28.1** | **34.8** | **28.0** | **25.2** | **105** | **11,830.2** | **13,650.3** | **11,747.6** | **10,746.0** |
| *6* | *28.1* | *34.8* | *28.0* | *25.2* | *68* | *527.2* | *634.8* | *500.1* | *446.6* |
| - | - | - | - | - | *3* | *100.0* | *155.8* | *100.0* | *85.8* |
| - | - | - | - | - | *4* | *271.0* | *320.8* | *271.0* | *245.0* |
| - | - | - | - | - | *8* | *1,272.0* | *1,409.0* | *1,259.5* | *1,187.7* |
| - | - | - | - | - | *14* | *4,440.0* | *5,140.0* | *4,397.0* | *3,941.0* |
| - | - | - | - | - | *8* | *5,220.0* | *5,990.0* | *5,220.0* | *4,839.8* |
| - | - | - | - | - | **58** | **22,303.2** | **29,133.8** | **21,823.9** | **21,374.1** |
| - | - | - | - | - | *7* | *39.7* | *48.5* | *38.0* | *36.1* |
| - | - | - | - | - | *6* | *244.3* | *315.4* | *243.7* | *237.7* |
| - | - | - | - | - | *2* | *116.0* | *152.1* | *116.0* | *110.8* |
| - | - | - | - | - | *1* | *115.5* | *144.6* | *115.5* | *113.0* |
| - | - | - | - | - | *30* | *12,121.7* | *16,819.3* | *11,767.5* | *11,522.2* |
| - | - | - | - | - | *12* | *9,666.0* | *11,653.8* | *9,543.1* | *9,354.2* |
| **16** | **61.5** | **86.2** | **52.5** | **51.3** | **76** | **180.9** | **234.6** | **171.0** | **166.0** |
| *16* | *61.5* | *86.2* | *52.5* | *51.3* | *76* | *180.9* | *234.6* | *171.0* | *166.0* |
| **1** | **1.3** | **1.4** | **1.0** | **1.0** | **13** | **186.2** | **223.9** | **181.2** | **173.7** |
| *1* | *1.3* | *1.4* | *1.0* | *1.0* | *11* | *72.2* | *83.9* | *67.2* | *65.4* |
| - | - | - | - | - | *1* | *42.0* | *50.0* | *42.0* | *39.9* |
| - | - | - | - | - | *1* | *72.0* | *90.0* | *72.0* | *68.4* |
| **146** | **296.1** | **371.8** | **282.0** | **271.6** | **2,047** | **38,502.2** | **48,077.6** | **37,882.6** | **36,316.5** |

# Nominal and maximum capacity of thermal plants in Italy at 31 December 2017

By type of plant and gross maximum capacity class of units

Cont. Table 12

| | Producers | | | | |
|---|---|---|---|---|---|
| | Units | Nominal capacity | | Maximum capacity | |
| | | Prime movers | Generators | Gross | Net |
| | n. | MW | MVA | MW | MW |
| **B) Power and heat generating plants** | | | | | |
| **internal combustion** | **3,585** | **2,203.9** | **2,697.8** | **2,143.2** | **2,056.5** |
| *-up to 25* | *3,583* | *2,133.1* | *2,611.6* | *2,073.5* | *1,989.8* |
| *-over 25 up to 50* | *2* | *70.8* | *86.1* | *69.8* | *66.8* |
| **gas turbine** | **82** | **398.3** | **482.3** | **378.4** | **369.2** |
| *-up to 25* | *78* | *152.6* | *185.6* | *146.5* | *141.9* |
| *-over 25 up to 50* | *3* | *118.7* | *144.3* | *104.9* | *102.3* |
| *-over 100 up to 200* | *1* | *127.0* | *152.5* | *127.0* | *125.0* |
| **combined cycle** | **113** | **17,587.3** | **21,410.8** | **17,389.5** | **16,938.8** |
| *-up to 25* | *45* | *250.5* | *302.8* | *242.7* | *232.8* |
| *-over 25 up to 50* | *12* | *534.7* | *670.7* | *507.1* | *490.7* |
| *-over 50 up to 100* | *11* | *789.1* | *1,010.9* | *758.3* | *732.4* |
| *-over 100 up to 200* | *14* | *2,230.7* | *2,682.5* | *2,210.8* | *2,150.0* |
| *-over 200 up to 500* | *25* | *9,113.6* | *11,148.2* | *9,085.3* | *8,860.1* |
| *-over 500* | *6* | *4,668.6* | *5,595.8* | *4,585.4* | *4,472.9* |
| **back-pressure steam** | **30** | **468.2** | **569.3** | **458.9** | **434.1** |
| *-up to 25* | *24* | *126.7* | *153.0* | *123.9* | *118.6* |
| *-over 25 up to 50* | *3* | *128.9* | *156.3* | *125.8* | *118.7* |
| *-over 50 up to 100* | *3* | *212.7* | *260.0* | *209.3* | *196.8* |
| **steam condensing with bleeding** | **82** | **982.9** | **1,204.0** | **957.3** | **870.0** |
| *-up to 25* | *73* | *588.9* | *732.4* | *567.6* | *516.6* |
| *-over 25 up to 50* | *5* | *144.5* | *179.6* | *140.2* | *125.3* |
| *-over 50 up to 100* | *4* | *249.5* | *292.0* | *249.5* | *228.1* |
| *-over 100 up to 200* | - | - | - | - | - |
| **Total B** | **3,892** | **21,640.6** | **26,364.3** | **21,327.4** | **20,668.7** |
| **Total plants ( A + B )** | **5,793** | **59,846.7** | **74,070.0** | **58,928.0** | **56,713.6** |
| **geothermal plants** | **36** | **915.3** | **1,073.1** | **813.1** | **767.2** |
| **Overall plants** | **5,829** | **60,762.0** | **75,143.1** | **59,741.1** | **57,480.8** |

| Autoproducers | | | | | ITALY | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Units | Nominal capacity | | Maximum capacity | | Units | Nominal capacity | | Maximum capacity | |
| | Prime movers | Generators | Gross | Net | | Prime movers | Generators | Gross | Net |
| n. | MW | MVA | MW | MW | n. | MW | MVA | MW | MW |
| **980** | **1,256.9** | **1,525.6** | **1,223.7** | **1,181.1** | **4,565** | **3,460.7** | **4,223.4** | **3,366.9** | **3,237.6** |
| *980* | *1,256.9* | *1,525.6* | *1,223.7* | *1,181.1* | *4,563* | *3,390.0* | *4,137.3* | *3,297.2* | *3,170.9* |
| - | - | - | - | - | *2* | *70.8* | *86.1* | *69.8* | *66.8* |
| **129** | **668.3** | **836.9** | **655.0** | **641.1** | **211** | **1,066.6** | **1,319.2** | **1,033.4** | **1,010.3** |
| *126* | *547.3* | *677.7* | *535.0* | *523.7* | *204* | *699.9* | *863.3* | *681.5* | *665.6* |
| *3* | *121.0* | *159.2* | *120.0* | *117.5* | *6* | *239.7* | *303.4* | *224.9* | *219.7* |
| - | - | - | - | - | *1* | *127.0* | *152.5* | *127.0* | *125.0* |
| **40** | **1,512.3** | **1,866.5** | **1,495.2** | **1,440.6** | **153** | **19,099.6** | **23,277.3** | **18,884.7** | **18,379.5** |
| *26* | *258.9* | *333.1* | *253.5* | *247.4* | *71* | *509.4* | *635.9* | *496.2* | *480.2* |
| *7* | *264.7* | *345.9* | *256.8* | *252.1* | *19* | *799.4* | *1,016.5* | *763.9* | *742.7* |
| *2* | *132.5* | *162.5* | *128.7* | *124.2* | *13* | *921.6* | *1,173.4* | *886.9* | *856.5* |
| *2* | *241.2* | *320.0* | *241.2* | *232.0* | *16* | *2,471.9* | *3,002.5* | *2,452.0* | *2,382.0* |
| *3* | *615.0* | *705.0* | *615.0* | *585.0* | *28* | *9,728.6* | *11,853.2* | *9,700.3* | *9,445.1* |
| - | - | - | - | - | *6* | *4,668.6* | *5,595.8* | *4,585.4* | *4,472.9* |
| **61** | **266.8** | **335.6** | **257.9** | **244.4** | **91** | **735.0** | **904.9** | **716.8** | **678.5** |
| *61* | *266.8* | *335.6* | *257.9* | *244.4* | *85* | *393.5* | *488.6* | *381.8* | *363.0* |
| - | - | - | - | - | *3* | *128.9* | *156.3* | *125.8* | *118.7* |
| - | - | - | - | - | *3* | *212.7* | *260.0* | *209.3* | *196.8* |
| **28** | **1,232.5** | **1,490.2** | **1,203.4** | **1,136.1** | **110** | **2,215.4** | **2,694.2** | **2,160.7** | **2,006.1** |
| *14* | *113.8* | *142.6* | *111.5* | *105.5* | *87* | *702.7* | *875.1* | *679.1* | *622.1* |
| *5* | *236.7* | *262.9* | *209.9* | *195.1* | *10* | *381.2* | *442.5* | *350.1* | *320.4* |
| *6* | *402.0* | *522.2* | *402.0* | *373.5* | *10* | *651.5* | *814.2* | *651.5* | *601.6* |
| *3* | *480.0* | *562.5* | *480.0* | *462.0* | *3* | *480.0* | *562.5* | *480.0* | *462.0* |
| **1,238** | **4,936.7** | **6,054.8** | **4,835.2** | **4,643.4** | **5,130** | **26,577.3** | **32,419.0** | **26,162.5** | **25,312.0** |
| **1,384** | **5,232.8** | **6,426.6** | **5,117.1** | **4,915.0** | **7,177** | **65,079.5** | **80,496.6** | **64,045.1** | **61,628.6** |
| **-** | **-** | **-** | **-** | **-** | **36** | **915.3** | **1,073.1** | **813.1** | **767.2** |
| **1,384** | **5,232.8** | **6,426.6** | **5,117.1** | **4,915.0** | **7,213** | **65,994.8** | **81,569.7** | **64,858.2** | **62,395.8** |

# Renewable energy sources

# Gross maximum capacity of plants from renewable sources in Italy at 31 December

## By source

Table 13

| | Plants | Gross maximum capacity | Plants | Gross maximum capacity | Gross maximum capacity |
|---|---|---|---|---|---|
| | n. | kW | n. | kW | % |
| | 2016 | | 2017 | | 2017/2016 |
| **Hydro** | **3,920** | **18,640,980** | **4,268** | **18,862,925** | **1.2%** |
| *0 - 1 MW* | *2,745* | *773,777* | *3,074* | *841,096* | *8.7%* |
| *1 - 10 MW* | *872* | *2,620,901* | *886* | *2,640,760* | *0.8%* |
| *> 10 MW* | *303* | *15,246,302* | *308* | *15,381,069* | *0.9%* |
| **Wind** | **3,598** | **9,409,934** | **5,579** | **9,765,856** | **3.8%** |
| **Photovoltaic** | **732,053** | **19,283,173** | **774,014** | **19,682,293** | **2.1%** |
| **Geothermal** | **34** | **814,590** | **34** | **813,090** | **-0.2%** |
| **Bioenergy (1)** | **2,735** | **4,124,080** | **2,913** | **4,135,034** | **0.3%** |
| Electricity production only | 1,067 | 2,021,306 | 1,087 | 2,007,484 | -0.7% |
| Solid | 138 | 825,713 | 136 | 811,605 | -1.7% |
| *- municipal solid waste* | *36* | *443,364* | *35* | *442,853* | *-0.1%* |
| *- solid biomass* | *105* | *382,349* | *103* | *368,752* | *-3.6%* |
| Biogas | 745 | 572,110 | 770 | 573,411 | 0.2% |
| *- from landfills* | *239* | *279,666* | *234* | *280,986* | *0.5%* |
| *- from sludge* | *21* | *7,101* | *20* | *6,741* | *-5.1%* |
| *- from manure* | *198* | *67,077* | *216* | *68,748* | *2.5%* |
| *- from crops and agricoltural waste* | *308* | *218,267* | *322* | *216,937* | *-0.6%* |
| Bioliquids | 190 | 623,482 | 187 | 622,467 | -0.2% |
| *- raw vegetable oils* | *160* | *526,194* | *155* | *524,156* | *-0.4%* |
| *- other bioliquids* | *33* | *97,288* | *35* | *98,311* | *1.1%* |
| Cogeneration | 1,680 | 2,102,774 | 1,837 | 2,127,550 | 1.2% |
| Solid | 263 | 844,981 | 327 | 855,735 | 1.3% |
| *- municipal solid waste* | *32* | *494,579* | *30* | *492,963* | *-0.3%* |
| *- solid biomass* | *234* | *350,402* | *300* | *362,772* | *3.5%* |
| Biogas | 1,121 | 851,432 | 1,222 | 870,520 | 2.2% |
| *- from landfills* | *150* | *121,644* | *176* | *130,218* | *7.0%* |
| *- from sludge* | *56* | *37,124* | *58* | *38,100* | *2.6%* |
| *- from manure* | *341* | *162,587* | *386* | *166,414* | *2.4%* |
| *- from crops and agricoltural waste* | *682* | *530,077* | *705* | *535,788* | *1.1%* |
| Bioliquids | 312 | 406,361 | 304 | 401,295 | -1.2% |
| *- raw vegetable oils* | *257* | *351,205* | *248* | *345,249* | *-1.7%* |
| *- other bioliquids* | *60* | *55,156* | *62* | *56,046* | *1.6%* |
| **Totale** | **742,340** | **52,272,756** | **786,808** | **53,259,198** | **1.9%** |

Further thermal plants mostly using conventional fuels, stoked with bioenergy too (see Table 19)

| | 2016 | | 2017 | | 2017/2016 |
|---|---|---|---|---|---|
| **Bioenergy (1)** | **4** | **1,749,500** | **4** | **1,749,500** | **0.0%** |

**(1)** Capacity of bioenergy plants is given for fuels which can be used.

# Gross maximum capacity of plants from renewable sources in Italy at 31 December 2017

By source

Figure 6