The Electric Power System

- Italy -
Basic facts

- Area: 302,073 km² (source ISTAT)
- Population: 60,783 mln (source ISTAT)
- Number of electricity consumers: 37 mln (2014) (source AEEGSI)
- Number of TSOs: 1
- Number of DSOs: 139 (source TERNA)
- Peak load: approx 54 GW provisional 2015 (source TERNA)
- Average interruption of electricity: 0.5 min/year (AIT 2014) (source TERNA)
Global map of the grid and of its interconnections

- Interconnectors with:
  - France
  - Austria
  - Switzerland
  - Slovenia
  - Greece
  - Malta
The electricity grid in Italy is divided into transmission grids (380-220-150-132kV voltage) and distribution grids (lower voltage)

<table>
<thead>
<tr>
<th>Voltage Level</th>
<th>Total length (approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission Grid EHV</td>
<td>380 kV</td>
</tr>
<tr>
<td>Transmission Grid EHV</td>
<td>220 kV</td>
</tr>
<tr>
<td>Transmission Grid HV</td>
<td>150-132 kV</td>
</tr>
<tr>
<td>Distribution Grid MV</td>
<td>20 KV 15kV</td>
</tr>
<tr>
<td>Distribution Grid LV</td>
<td>400 V</td>
</tr>
</tbody>
</table>

*Source Terna

*Only Enel distribution grid; source Enel D.
Structure of electrical power supply

TSO

Conventional Generation

Bulk-Industry

380 kV

220 kV

132 kV/150 kV

TSO-Grid

Utilities

20/10 kV

Dispersed Generation

Households

380 V

Industry

DSO

Source: Amprion GmbH
Map of the high voltage grid (380 kV)
Map of the high voltage grid (220 kV)
Information on TSO(s)

- Name: Terna
- Network length (km) approx 63,900
- Served area (km²) 302,073
- Annual transmitted energy (TWh) 310 (2014)
- Website: http://www.terna.it

Source Terna
Cooperation of TSO and DSOs
Power structure of the country 2014 [MW]

- **Thermo**: 110 MW
- **Hydro**: 16.396 MW
- **Wind**: 18.409 MW
- **PV**: 26.845 MW

Source: Terna
Installed capacity with reference to primary resources

Installed capacities (GW), year 2014

Source: Terna
Energy production with reference to primary resources

Electricity generated (TWh), year 2014

- Wind
- Photovoltaic
- Hydro
- Thermo Others (gas)
- Thermo Others (solid)
- Thermo Oil
- Thermo Gas
- Thermo Solid

Source: Terna
Development of generation capacity since 1991

Source: Terna
Comsuption per customer groups

Power consumption by consumer groups, 2014

- Agriculture: 2%
- Industry: 42%
- Terziary: 34%
- Households: 22%

Source: Terna
Location of RES (PV & W 2014)

Wind
8.703 MW

Photovoltaic
18.609 MW

Source Terna
Development of wind and photovoltaic power

Source Terna
RES installed capacity and production since 2005

Source: Terna
Price development for households

Average price for electricity for households [cent/kWh]
Yearly consumption about 2,700 kWh

Source: AEEGSI

Costi di rete e di misura | Oneri generali di sistema | Imposte | PED (prezzo energia + dispacciamento) + PPE (perequazione) | Commercializzazione
---|---|---|---|---
2011 I | 15.6 | 0.6 | 8.7 | 2.2 | 1.5
2011 II | 16.2 | 0.6 | 8.9 | 2.3 | 1.9
2011 III | 16.5 | 0.6 | 8.8 | 2.3 | 2.2
2011 IV | 16.5 | 0.6 | 8.9 | 2.3 | 2.2
2012 I | 17.3 | 0.8 | 10.1 | 2.5 | 2.4
2012 II | 18.7 | 0.8 | 10.1 | 2.5 | 2.4
2012 III | 19.1 | 0.8 | 9.6 | 2.5 | 2.4
2012 IV | 19.4 | 0.8 | 9.2 | 2.5 | 2.4
2013 I | 19.1 | 0.8 | 9.2 | 2.6 | 3.4
2013 II | 18.9 | 0.8 | 9.5 | 2.6 | 3.4
2013 III | 19.2 | 0.8 | 9.3 | 2.6 | 3.7
2013 IV | 19.0 | 0.8 | 9.0 | 2.6 | 3.7
2014 I | 19.2 | 0.8 | 8.6 | 2.5 | 4.0
2014 II | 19.0 | 0.8 | 8.5 | 2.5 | 4.0
2014 III | 19.0 | 0.8 | 8.6 | 2.5 | 4.0
2014 IV | 19.3 | 0.8 | 7.7 | 2.5 | 4.4
2015 I | 18.7 | 0.9 | 7.7 | 2.5 | 4.4
2015 II | 18.5 | 0.9 | 7.4 | 2.5 | 4.4
2015 III | 18.4 | 0.9 | 7.2 | 2.5 | 4.6
Price development for households

**Average price for electricity for LV commercial customers [€/MWh]**
Yearly consumption about 35 MWh/year

![Diagram showing average price for electricity for LV commercial customers from 2013 to 2014. The categories include energy, system cost (including renewables support), transmission, distribution, and dispatching cost, and taxes.](image)

*Fonte: elaborazioni REF Ricerche su dati CCIAA Milano*
Price development for households

Average price for electricity for MV industrial customers [€/MWh]
Yearly consumption about 600 MWh/year

Energy
- System cost (including renewables support)

Transmission, distribution and dispatching cost

Taxes

Fonte: elaborazioni REF Ricerche su dati CCIAA Milano
## Electricity market organisation

<table>
<thead>
<tr>
<th>Electricity Trading Markets</th>
<th>Counterpart</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Day-Ahead Energy Market (MGP)** | GME | - The Italian electricity market organization adopted a **zonal market**;  
- Clearing market price is defined by the **system marginal price** given by the intersection of demand and supply curves. The result is a zonal clearing price and the algorithm applies also a **national single purchasing price** (PUN), which is equal to the average of zonal prices weighted by zonal consumption;  
- hourly energy blocks are traded for the next day;  
- Market Participants submit offers/bids where they specify the quantity and the min/max price at which they are willing to sell/purchase;  
- After the close of the market sitting, supply offers/demand bids are accepted respecting the economic merit order and in such a way as to satisfy transmission limits between zones. |
| **Intraday Market (IM)** | GME | - Market participants are allowed to modify the schedules resulting from the Day-Ahead Market by submitting additional demand bids or supply offers;  
- Supply offers and demand bids are selected under the same criterion as for the Day-Ahead Market. |
| **Dispatching Services Energy Market (MSD)** | TERNA | In MSD TERNA procures resources required for managing, operating and controlling the system, in order to:  
– solve intra-zonal congestions;  
– create a reserve margin;  
– balance injections and withdrawals in real time.  
MSD is divided into two sittings, MSD ex – ante (which takes place the day preceding the day the offers refer) and MB (which takes place in real time). In the MSD accepted offers/bids are valued at the offered price (pay as bid). |
## Power balance in 2014

<table>
<thead>
<tr>
<th>Category</th>
<th>Value (TWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generation</td>
<td>267</td>
</tr>
<tr>
<td>Consumption</td>
<td>291</td>
</tr>
<tr>
<td>Imports</td>
<td>47</td>
</tr>
<tr>
<td>Exports</td>
<td>3</td>
</tr>
<tr>
<td>Losses</td>
<td>19</td>
</tr>
</tbody>
</table>

Source: Terna
Energy exchanges in 2014

Physical flows (TWh)

- France
  - Import: 15.5 TWh, Export: 0.7 TWh

- Switzerland
  - Import: 24.4 TWh, Export: 0.8 TWh

- Austria
  - Import: 1.5 TWh, Export: 0.03 TWh

- Slovenia
  - Import: 5.2 TWh, Export: 0.2 TWh

- Greece
  - Import: 0.1 TWh, Export: 1.3 TWh

Source: Terna
Energy exchanges in 2014

Commercial flows (TWh)

- France: 19.7 TWh (0.5 TWh)
- Switzerland: 21.9 TWh (0.9 TWh)
- Austria: 1.9 TWh (0.02 TWh)
- Slovenia: 3.9 TWh (0.5 TWh)
- Greece: 0.2 TWh (1.5 TWh)

Source: Terna
Specific aspects of Italian electricity market

Market zone
Italian market consider 6 internal geographical zone and 4 pole with limited production

Market coupling

Pursuant to the AEEGSI resolution no. 45/2015/R/EEL, on the Italian-Slovenian, Italian-French and Italian-Austrian border, interconnection capacities are allocated daily through the mechanism of "market coupling". This mechanism simultaneously performs an implicit allocation of the daily physical rights transmission and the "clearing" of the bids/offers to buy and sell energy.