The Electric Power System

- Romania-
Basic facts

- Area: 238 391 km²
- Population: 19 960 000
- Number of electricity consumers: 9150000
- Number of TSOs: 1
- Number of DSOs: 8
- Peak load: 9 334 MW
- Average interruption of electricity (2014): 0.82 min
Global map of the grid and of its interconnections

- Interconnectors with:
  - Ukraine
  - Hungary
  - Serbia
  - Bulgaria

Source: ENTSO-E
The electricity grid in Romania is sub-divided into transmission grids (maximum voltage) and distribution grids (high, medium and low voltage).

<table>
<thead>
<tr>
<th>Responsibility</th>
<th>Voltage Level</th>
<th>Total length(approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSO</td>
<td>750 kV</td>
<td>3.1 km</td>
</tr>
<tr>
<td>TSO</td>
<td>400 kV</td>
<td>4915.2 km</td>
</tr>
<tr>
<td>TSO</td>
<td>220 kV</td>
<td>3875.6 km</td>
</tr>
<tr>
<td>TSO</td>
<td>110 kV</td>
<td>40.4 km</td>
</tr>
<tr>
<td>DSO</td>
<td>110 kV &amp;&lt;110 kV</td>
<td>337500 km</td>
</tr>
</tbody>
</table>
Structure of electrical power system

TSO-Grid

400 kV

220 kV

110 kV

20/10 kV

400 V

Conventional Generation

Bulk-Industry

Households

Utilities

Dispersed Generation

DSO-Grid

DSO

Source: Amprion GmbH

Romanian Power System
Map of the high voltage grid
Information on TSO

- Name: CNTEE TRANSELECTRICA SA
- Network length: 8 834 km
- Served area: 238 391 km²
- Annual transmitted energy: 42.85133 (TWh)
- Website: http://www.translectrica.ro
Cooperation of TSO and DSOs

- TRANSELECTRICA coordinates the generation & technological system services

- Operational control of the transmission network and distribution networks at 110 kV level

→ hierarchical structure of the operational control management within TRANSELECTRICA:

National Dispatching Centre & 5 Regional Dispatching Centers.
Responsibilities of TSO & DSOs

- **Operational planning** activity covers the following components:
  - Planning the normal operational diagram;
  - Planning the withdrawing from operation of generation, transmission and distribution installations within the RPS;
  - Planning the protection and automation systems;
  - Voltage levels planning;

- **Operational management**
  - **Operational scheduling** and
  - **Operational control**

- **Balancing market (only for TSO)**
Power structure of the country

Installed capacities 24 513 MW in 2015

- Coal: 6435.2; 26.2%
- Natural gas: 5562.9; 22.7%
- Nuclear: 1413.00; 5.7%
- Hydro: 6732.9; 27.5%
- Wind: 2976.89; 12.14%
- Biomass: 104.860; 0.43%
- PV: 1287.58; 5.25%

Romanian Power System
Installed capacity with reference to primary resources

- Installed capacities 24.513 GW, in 2015
  - Coal 6435.200 MW
  - Gas 5562.916 MW
  - Nuclear 1413.000 MW
  - Hydro power 6732.854 MW
  - Solar power 1287.576 MW
  - Wind power 2976.894 MW
  - Biomass 104.860 MW
  - Others 0.05 MW
Energy production with reference to primary resources

- Electricity generated 64863 GWh, in 2014
  - Coal 18132 GWh
  - Gas 7756 GWh
  - Nuclear 11676 GWh
  - Hydro power 18950 GWh
  - Solar power 1634 GWh
  - Wind power 6201 GWh
  - Biomass 514 GWh
Development of generation capacity since 2009

![Graph showing the development of generation capacity in Romania since 2009, with categories for Coal, Gas, Nuclear, Hydro, and Renewables.](image-url)
Consumption per customer groups

Electricity final consumption by sectors, 2013

Industry (including Mining) % 55%
Construction % 1%
Others (Services & Transports) % 18%
Households % 24%
Agriculture % 2%
Location of renewable energy sources

Installed PV panels

Installed Wind turbines
Development of wind power

![Graph showing the development of wind power in Romania from 2009 to 2015. The graph plots the accumulated capacity (End of Year) and the development of capacity over the years. The installed capacity is measured in MW.]

Romanian Power System
Development of photovoltaic power

![Graph showing the development of photovoltaic power in Romania from 2009 to 2015. The graph indicates a significant increase in capacity, especially in 2013 and 2014, with a peak in 2015. The x-axis represents the year, and the y-axis represents installed capacity in MW.](image-url)
RES installed capacity and production since 2009
## Price development for industry consumers

<table>
<thead>
<tr>
<th>Year</th>
<th>Non-household customers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tariff before taxes</td>
</tr>
<tr>
<td></td>
<td>lei/MWh</td>
</tr>
<tr>
<td>2012</td>
<td>361.37</td>
</tr>
<tr>
<td>2013</td>
<td>364.45</td>
</tr>
<tr>
<td>2014</td>
<td>318.97</td>
</tr>
</tbody>
</table>

The fees include VAT, excise duty, contribution for cogeneration and value of green certificates and the tariff for services is the average price for transport, distribution, ancillary services and electricity market management.
Price development for households

<table>
<thead>
<tr>
<th>Year</th>
<th>Household customers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tarrif before taxes</td>
</tr>
<tr>
<td></td>
<td>lei/MWh</td>
</tr>
<tr>
<td>2012</td>
<td>365.24</td>
</tr>
<tr>
<td>2013</td>
<td>400.11</td>
</tr>
<tr>
<td>2015</td>
<td>412.06</td>
</tr>
</tbody>
</table>

The fees include VAT, excise duty, contribution for cogeneration and value of green certificates and the tariff for services is the average price for transport, distribution, ancillary services and electricity market management.
Electricity market organisation

State ownership interests in the sector
• Bulk of generation (Ministry for Energy)
• Transmission (Ministry of Economy)

Large state-owned businesses recently listed to the stock exchange
• Generation: small stakes of Nuclearelectrica, Romgaz
• Distribution & Sale: majority share of Electrica

Unbundling √
• Network business fully separated from market side (generation and sale)

Corporate governance Ordinance (no. 109/2011) being gradually implemented at state-owned companies

Full Market Liberalization (incl. Retail) by the end of 2017
Power balance in 2014

<table>
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<tr>
<th>Operational Highlights 2014 / 2013</th>
</tr>
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<tbody>
<tr>
<td><strong>Electricity Generation</strong></td>
</tr>
<tr>
<td>60.7 TWh ▲11.3%</td>
</tr>
<tr>
<td><strong>Electricity Domestic Demand</strong></td>
</tr>
<tr>
<td>53.5 TWh ▲2.0%</td>
</tr>
<tr>
<td><strong>Net Cross-Border Physical Flow</strong></td>
</tr>
<tr>
<td>7.1 TWh EXPORT (8.5 TWh EXPORT – 1.4 TWh IMPORT)</td>
</tr>
<tr>
<td><strong>Hourly Demand (Average / Peak)</strong></td>
</tr>
<tr>
<td>6,083 / 8,464 ▲2.0% / ▲1.8%</td>
</tr>
<tr>
<td><strong>Total Generation Fleet Connected to RPS (01-01-2015)</strong></td>
</tr>
<tr>
<td>21,135 MW</td>
</tr>
<tr>
<td><em><em>Renewables</em> Connected to RPS (01-01-2015)</em>*</td>
</tr>
<tr>
<td>4,138 MW</td>
</tr>
<tr>
<td><strong>Electricity Injected into Transmission Grid</strong></td>
</tr>
<tr>
<td>42.85 TWh (40.90 TWh in 2013) ▲4.8%</td>
</tr>
<tr>
<td><strong>Transmission Losses</strong></td>
</tr>
<tr>
<td>2.40% ▼0.12 pp</td>
</tr>
</tbody>
</table>

*Renewables: Wind, Photovoltaic, Biomass, Geothermal

RPS: Romanian Power System

**2014**

**Generation mix**

- 13.6% Renewables
- 30.7% Hydro
- 17.7% Nuclear
- 26.1% Coal
- 11.9% Gas

**Generation fleet capacities as of 1st Jan 2015**

- 19.6% Renewables
- 30.0% Hydro
- 6.1% Nuclear
- 24.7% Coal
- 19.6% Gas

**Electricity sources vs. uses**

- 60.7 TWh
- 53.5 TWh
- 8.5 TWh

1.4

**Transmission losses**

- 41.8 TWh
- 1.03 TWh

- Energy injected into the transmission grid
- Energy taken off the transmission grid
- Transmission losses

Romanian Power System
Energy exchanges in 2014

- Exports
  - Commercial flows: -9937 GWh
  - Technical flows: 1453 GWh
- Imports
  - Commercial flows: 2811 GWh
  - Technical flows: -1450 GWh
- Balance
  - Physical flows: 7125 GWh
  - Technical flows: 2 GWh
Specific aspects of the electricity market

Romanian Market Structure 2005 - present

- Market for bilateral contracts – 100 % centralized market since 2012
- Day Ahead Market – voluntary and centralized market (2005); 4M MC (CZ-SK-HU-RO Day Ahead Market Coupling) since November 2014
- Intraday Market – voluntary and centralized market (2011)
- Balancing Market – mandatory and centralized market (2005)
- Ancillary Services Market – mandatory / voluntary centralized market
- Green Certificates Market – centralized market
Specific aspects of the electricity market

Romanian Market Structure

ADVANTAGES

- system balancing – using market based mechanisms
  - balancing energy suppliers receive at least the offered price;
  - the imbalances are penalized (imbalance price);
  - contractual obligations are guaranteed (bilateral, day-ahead and intraday contracts);
  - congestion management – costs supported by TSO.

- self - scheduling
Specific aspects of the electricity market

Romanian Market Structure

Energy
- Market for bilateral contracts
- Day Ahead Market
- Intraday Market
- Balancing Market

Capacity
- Cross Border Capacity Allocation Market
- Ancillary Services Market

Promote
- Green Certificates Market

Romanian TSO - administrates
- Cross Border Capacity Allocation Market
- Ancillary Services Market
- Balancing Market

integrated under one market platform (DAMAS)

The monitoring activity is done according with the Regulator Authority Methodology and the internal procedures, in compliance with the international practice.
Specific aspects of the electricity market

Market coupling - Next steps
NWE – CEE Price Coupling

- Romania applied for full membership in the NWE-CEE Flow-Based MC project
- The partnership is considered a strategic project for Romania and also for SEE, aiming to inter-regional integration and IEM implementation
- Romania holds an observer status to working structures’ meetings