The Electric Power System

- BRAZIL -
Basic facts

- Area: 8,514,876,599 km²
- Population: 204,450,649
- Number of electricity consumers: 77,069,509
- Number of TSOs: 1
- Peak load: 60 MW
- Average interruption of electricity: 17.62 h (annual base)

Energy Integration in South America

ONS – Nacional System Operator
www.ons.org.br
Installed Capacity

Evolution of Brazilian Installed Capacity in Geographic Regions (GW)

Source: PDE 2023 (Ten-year Energy Expansion Plan 2023), EPE
Structure of electrical power system

ONS – Nacional System Operator
www.ons.org.br
Map of the high voltage grid

ONS – Nacional System Operator
www.ons.org.br
Information on TSO

- Name: Operador Nacional do Sistema - ONS
- Network length (km) 125,859
- Served area (km²)
- Annual transmitted energy (TWh) 540.902
- website: http://www.ons.org.br
Responsibilities of TSO ONS – National System Operator

The **ONS** is the institution responsible for operating, monitoring and controlling the generation of electricity in the National Integrated System - SIN and for managing the main grid of electricity transmission in Brazil.

The **ONS** has as main objectives the fulfillment of the load requirements, cost optimization and system reliability assurance. Another responsibility is to define the conditions of access the high voltage transmission grid in the country.
Installed capacity with reference to primary resources

 Installed Capacity with reference to primary resources

<table>
<thead>
<tr>
<th>Resource</th>
<th>Number of units</th>
<th>Installed Capacity (kW)</th>
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</thead>
<tbody>
<tr>
<td>Biomass</td>
<td></td>
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<tr>
<td>Sugar cane waste</td>
<td>390</td>
<td>10.436.420,00</td>
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<td>Biogas</td>
<td>2</td>
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<tr>
<td>Solar</td>
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<td></td>
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<tr>
<td>Solar Radiation</td>
<td>25</td>
<td>21.233,00</td>
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<tr>
<td>TOTAL</td>
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<td>110.187.763,00</td>
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Development of generation capacity since 1974


Brazilian Power System
Consuption per customer groups

- Residential: 31.03%
- Industry: 23.01%
- Commercial: 17.51%
- Other: 15.65%
- Rural: 8.30%
- Losses: 4.50%

Total Consumption: 463,335 GWh

Development of wind power

Balanço Energético Nacional 2015 – www.epe.gov.br
Development of photovoltaic power

EVOLUTION OF INSTALLED CAPACITY (KW)

(kW)

Start Operation Date

ANEEL – Banco de Informação da Geração [www.aneel.gov.br]
Brazilian Power System

RES installed capacity and production 2014

Matriz Elétrica Brasileira

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geração hidráulica\(^2\) em 2014: 407,2 TWh
geração total\(^2\) em 2014: 624,3 TWh
LOCATION OF RES

Go to http://sigel.aneel.gov.br/sigel.html

Brazilian Power System
Price development for industry consumers

TARIFA MÉDIA INDUSTRIAL ANUAL BRASIL (R$/MWH)

2003: 130,54
2004: 158,26
2005: 191,35
2006: 213,59
2007: 222,32
2008: 214,48
2009: 228,35
2010: 231,89
2011: 245,54
2012: 257,33
2013: 223,19
2014: 248,99

ANEEL – Regulatory Agent - www.aneel.gov.br

Brazilian Power System
Price development for households

TARIFA MÉDIA RESIDENCIAL ANUAL BRASIL (R$ /MWH)

ANEEL – Regulatory Agent

Brazilian Power System
Electricity market organisation

CCEE – Electrical Energy Comercialization Chamber [www.ccee.org.br]
Power balance in 2014

- Generation (TWh) 624.3 TWh
- Consumption (TWh) 531.1 TWh
- Losses (TWh) 93.2 TWh
Electric Energy Balance in 2014

Eletricity Market Environment

Sellers
Generation of public services, independente energy producers, traders and self producers

Regulated Contracting Environment
Distributors (Captive Consumers)

Free contracting Environment
Free Consumers, Traders(reselling)

SPOT MARKET

Brazilian Power System
Specific aspects of the electricity market

- Regulated Contracts Environment ≤ auctions
- Free Contracts Environment ≤ Contracts Freely Negotiated
- SPOT market ≤ regional prices