

Expansion

Energy Generation and Transmission

Investment Opportunities



Minister Eduardo Braga

October 2015



Summary

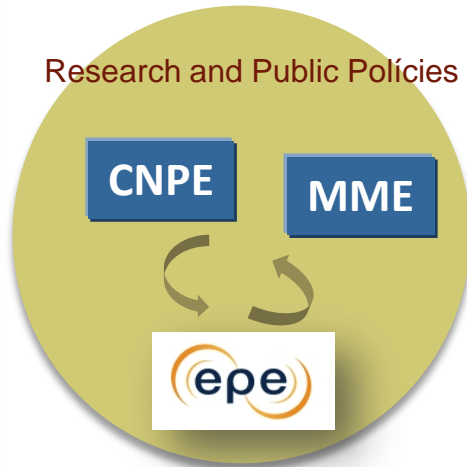
1. **Institutional Environment**
2. **Electricity Sector in Brazil**
3. **Generation and Transmission Expansion**
4. **Investment Opportunities**

Institutional Environment

Regulation and Enforcement



Research and Public Policies



Operation



Trade



CMSE

Monitoring



Institutional Environment

Market

Competition



Generation



Trade

Natural Monopoly



Transmission



Distribution

**Regulated
Market**

**Separation
of Market
Sections**

Free Market

Institutional Environment



Auctions

of Electricity Generation

Free Contractual Environment

Prices Freely Negotiated

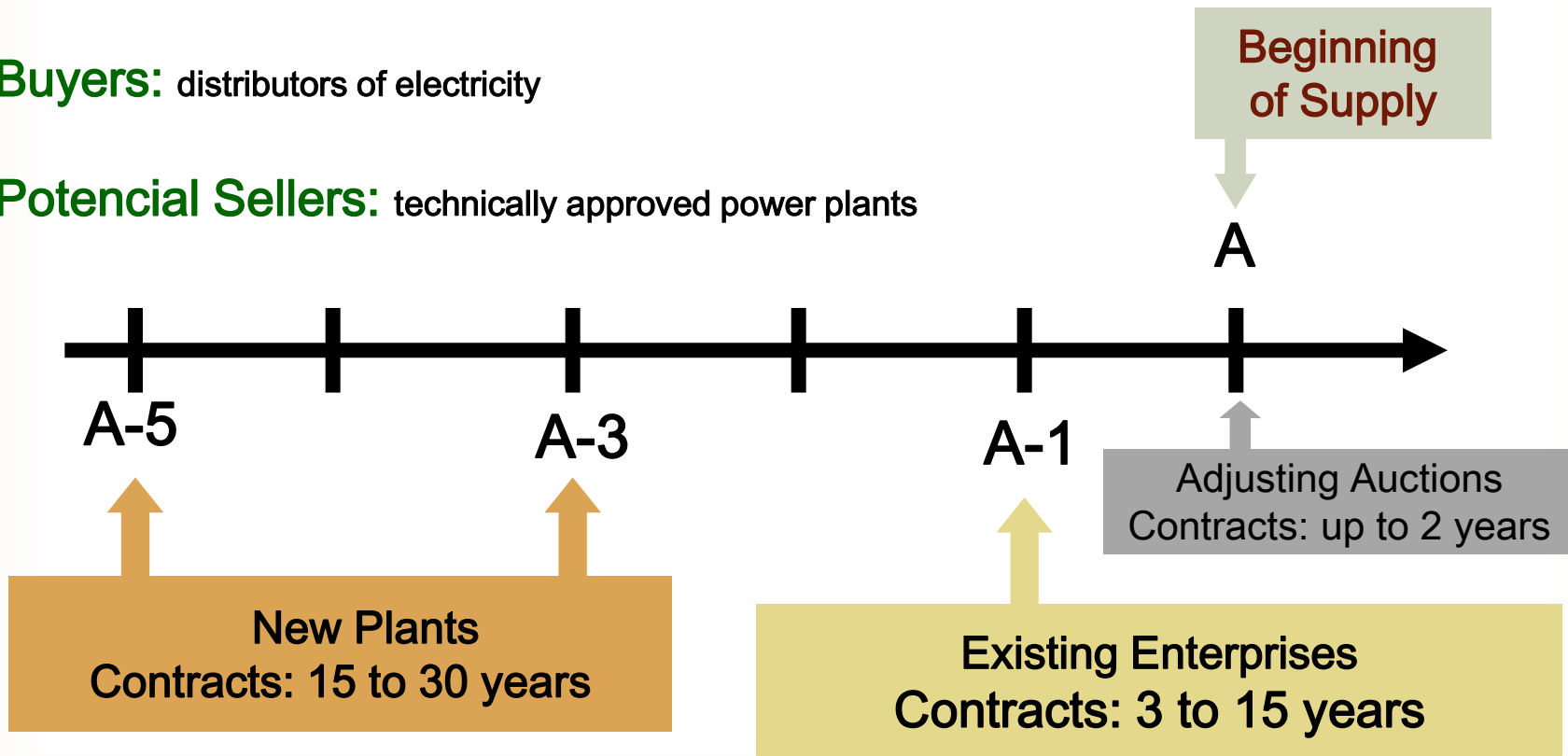
Regulated Contractual Environment

Prices are Results of Auctions
Lower Tariff

Auctions of Electricity Generation

Buyers: distributors of electricity

Potential Sellers: technically approved power plants

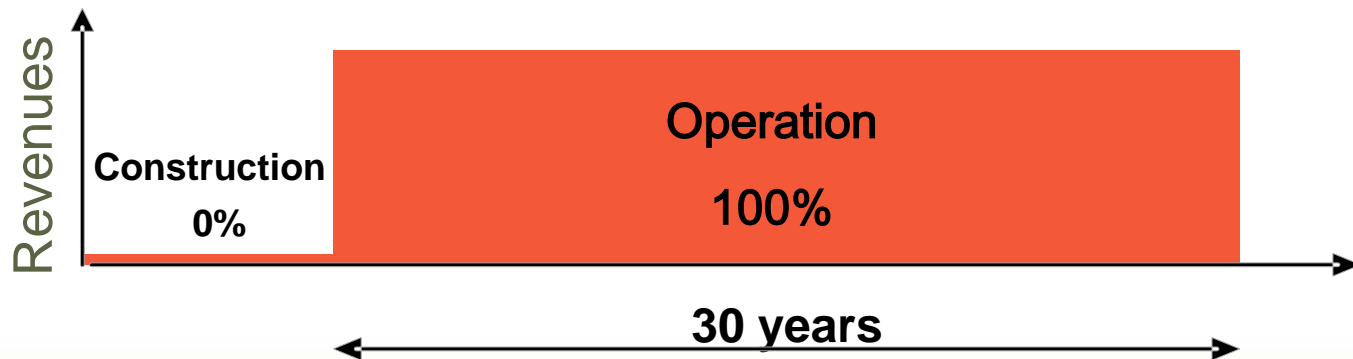


Auctions of Electricity Transmission

Object: Operation of public service of transmission of electric energy by building, operating, and maintaining transmission utilities.

Duration: 30 years

Source of Revenues: consumers of the system, regardless the actual energy provided.



Energy Sector In Brazil



Key Features



INSTALLED CAPACITY
138 GW



TRANSMISSION LINES
126 thousand km

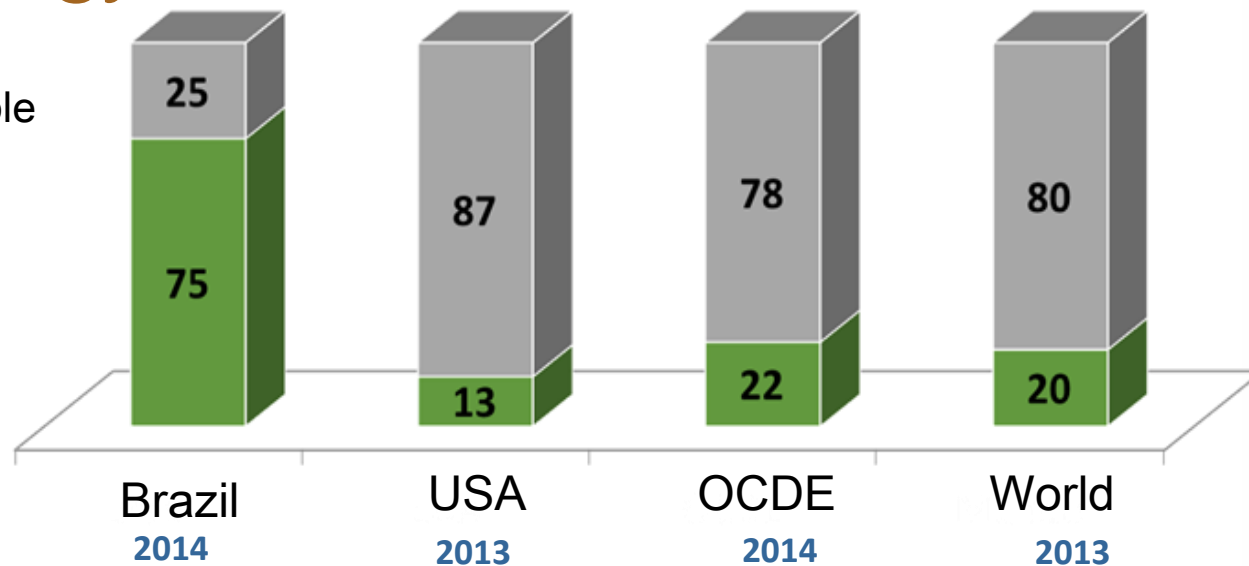
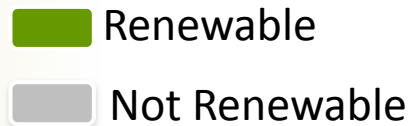
ELECTRIC ENERGY PRODUCTION
550 thousand GWh (projected for 2015)
(58% of South America)

Electric Energy Sector in Brazil

Supply of Electric Energy

Percentage of Renewable Sources

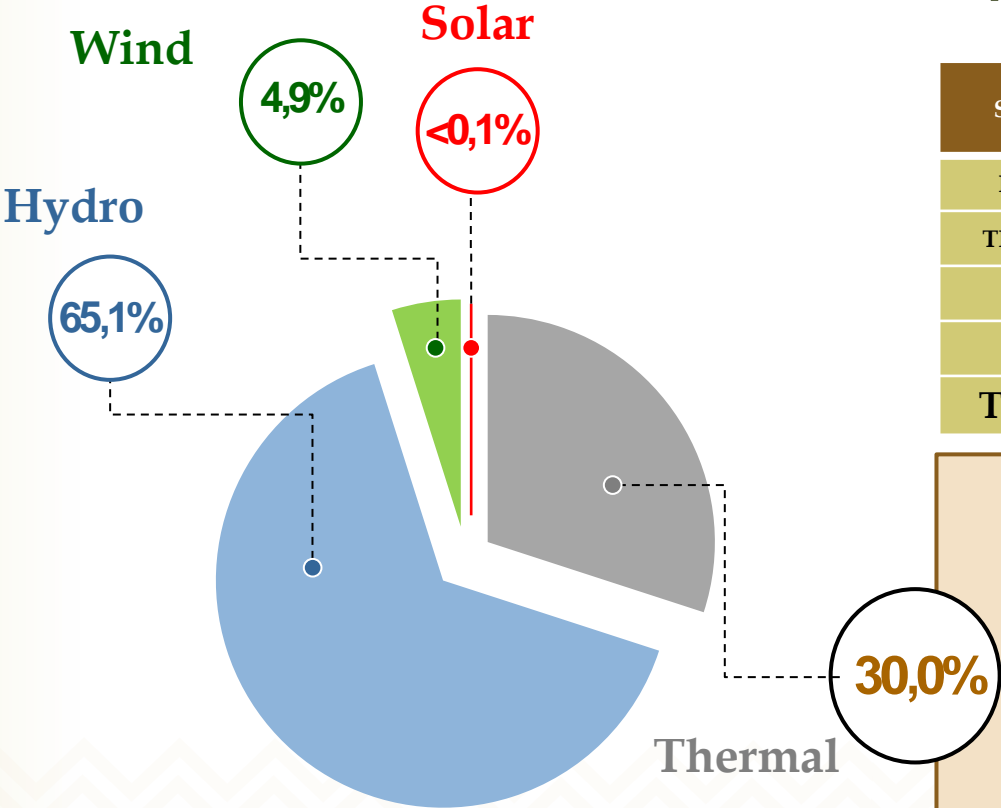
Percentage of Renewable Sources (%)



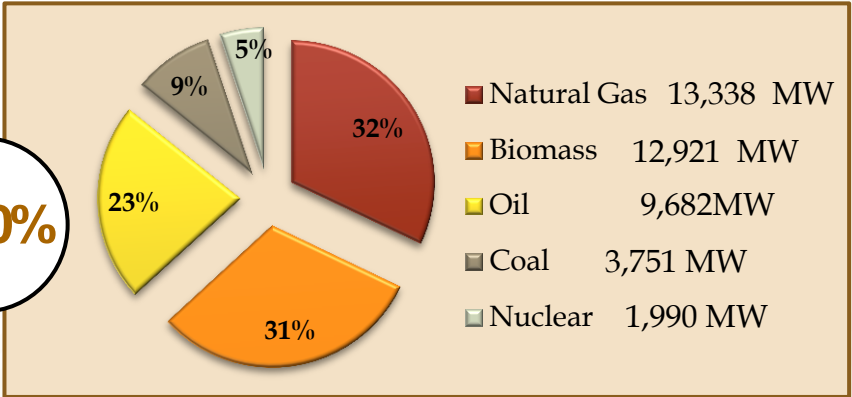
Source: IEA and MME

Electric Energy Sector in Brazil

Installed Capacity Generation



| SOURCE | INSTALLED CAPACITY(MW) | N°OF PLANTS |
|--------------|------------------------|--------------|
| HYDRO | 90,388 | 1,189 |
| THERMAL | 41,682 | 2,808 |
| WIND | 6,629 | 273 |
| SOLAR | 25 | 25 |
| TOTAL | 138,724 | 4,209 |

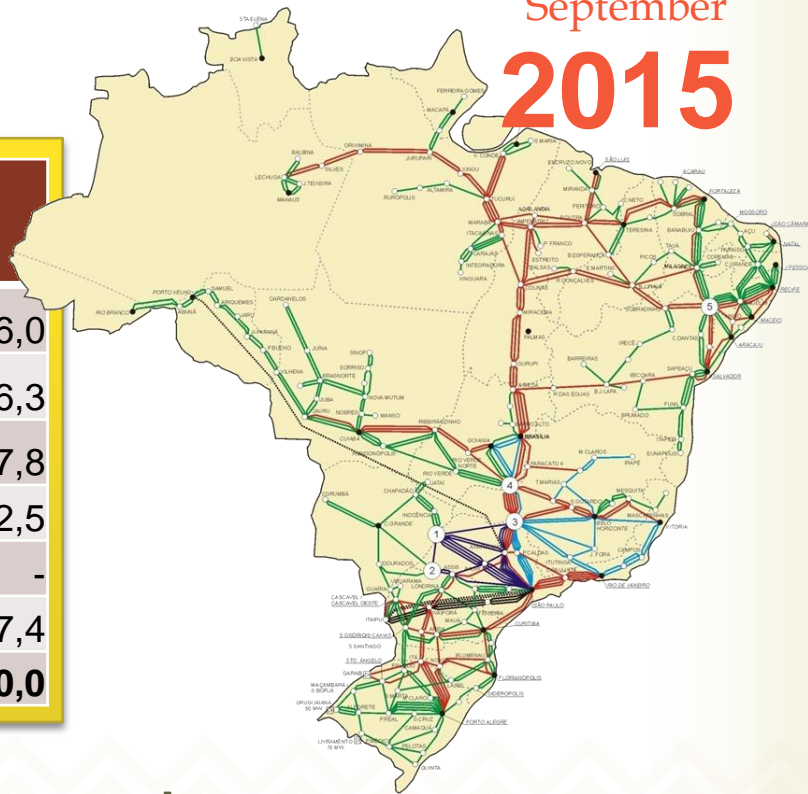


Transmission System

126 thousand km

September 2015

| Tension (kV) | Extension (km) | % | Capacity MVA | % |
|--------------|----------------|--------------|----------------|--------------|
| 230 | 53.024 | 41,8 | 79.390 | 26,0 |
| 345 | 10.303 | 8,1 | 49.795 | 16,3 |
| 440 | 6.741 | 5,3 | 23.916 | 7,8 |
| 500 | 41.197 | 32,5 | 129.842 | 42,5 |
| 600 (CC) | 12.816 | 10,1 | - | - |
| 750 | 2.683 | 2,1 | 22.500 | 7,4 |
| TOTAL | 126.764 | 100,0 | 305.443 | 100,0 |



102 Transmission companies

Electric Energy Sector in Brazil

Transmission System



BRAZIL

Continental Dimension



4,000 km



EUROPE

System Operation

Centralized Operation

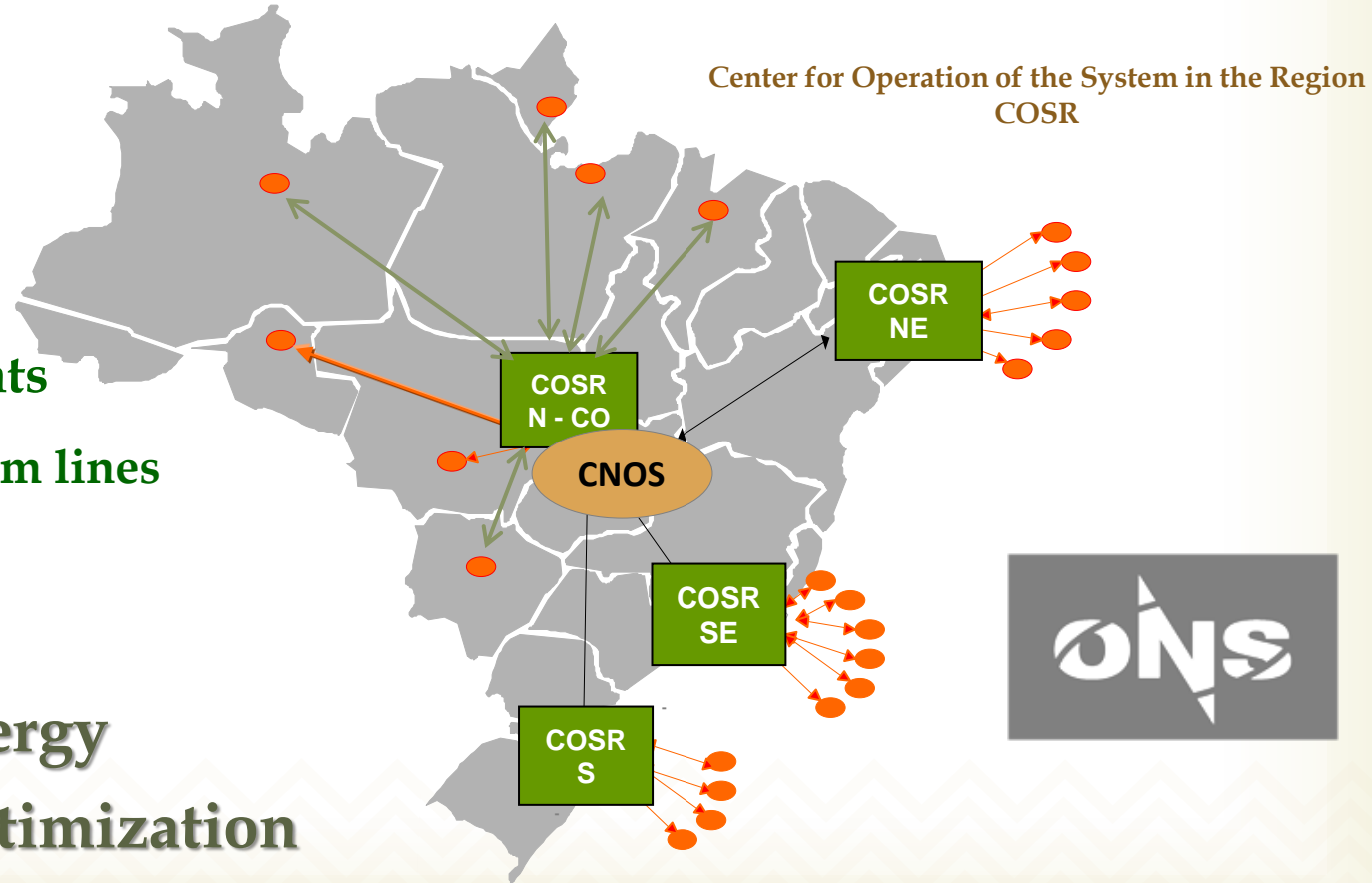
290 power plants

126 thousand km lines

560 substations



Energy Optimization



**Expansion
of**

**Generation and
Transmission of Electricity**

Expansion of Electricity Generation and Transmission

GENERATION

Potential and Diversity

HYDRO



NATURAL GAS



BIOMASS



NUCLEAR



WIND



COAL



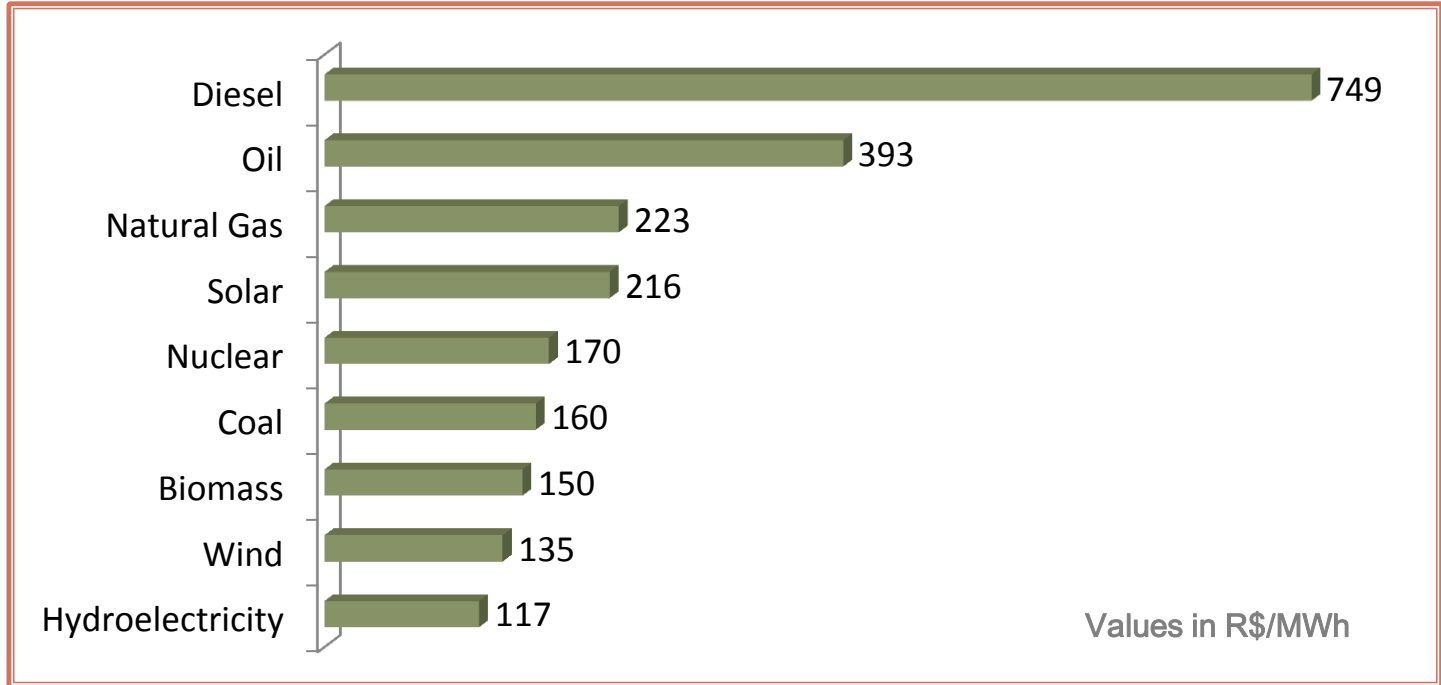
SOLAR



Generation and Transmission Expansion

GENERATION

Competitiveness between the Main Sources



Source: SPE/MME - Average values

Generation

Ten-Year Plan - Electric Energy (PDE) 2024

Source: MME / SPE - PDE 2024

| Source | September 2015 | | December 2024 | | |
|--------------|----------------------|-------------------|----------------------|---------------|-------------------|
| | Installed Power (GW) | Participation (%) | Installed Power (GW) | Increase (GW) | Participation (%) |
| Hydro | 90,3 | 65,1 | 125,0 | 34,7 | 60,4 |
| Thermal | 41,7 | 30,0 | 51,0 | 9,3 | 24,6 |
| Wind | 6,6 | 4,9 | 24,0 | 17,4 | 11,6 |
| Solar | < 0,03 | < 0,1 | 7,0 | 7,0 | 3,4 |
| TOTAL | 138,6 | 100,0 | 207,0 | 68,4 | 100,0 |

Contracted Projects

Period: 2015 - 2018

504 power plants

39 thousand **MW**
of installed capacity

Source: CMSE/MME - september 2015

GENERATION

US\$ **49** billion in investments

Transmission Lines Expansion Policies

- National integration
- Regional connections
- Strengthening of main grid
- Energy optimization



Ten-Year Plan - Electric Energy (PDE) 2024

Source: PDE 2024 - MME

| Tension (kV) | September 2015 | | December 2024 | |
|--------------|----------------|----------------|----------------|----------------|
| | Extension (km) | Capacity (MVA) | Extension (km) | Capacity (MVA) |
| 230 | 53.024 | 79.390 | 73.517 | 126.471 |
| 345 | 10.303 | 49.795 | 11.969 | 70.942 |
| 440 | 6.741 | 23.916 | 7.081 | 34.947 |
| 500 | 41.197 | 129.842 | 83.439 | 234.520 |
| 600 (CC) | 12.816 | - | 12.816 | - |
| 750 | 2.683 | 22.500 | 2.683 | 26.897 |
| 800 (CC) | - | - | 10.055 | - |
| TOTAL | 126.764 | 305.443 | 201.560 | 493.777 |

Extension (km): increase of **59%**

Capacity (MVA): increase of **62%**

TRANSMISSION

Registered Projects

Period: 2015 - 2018

232 transmission lines

32,5 thousand km

192 substations

42,5 thousand MVA

Source: CMSE/MME – september 2015

US\$ **15** billion in investments





Investment Opportunities

New Auctions Electricity Generation

Auctions of partially financed hydro plants



Date: November 6th, 2015

Source: Hydro

Projects: 29 plants (1,5 ~ 3.444 MW)

Registered Power: 6.062 MW

New Auctions Electricity Generation

Partially Financed UHEs Auctions

Some projects



UHE Três Marias
396 MW



UHE Jupia
1.551 MW



UHE Ilha Solteira
3.444 MW

New Auctions Electricity Generation

2nd Auction of Energy Reserve



Date: 13 de novembro de 2015

Sources: Solar Fotovoltaica e Eólica

Registered Projects: 1.379

Registered Power: 39.917 MW

Contracts: 20 years

Ceiling -Prices: Solar – R\$ 381,00 / MWh

Eolic – R\$ 213,00 / MWh

New Auctions Electricity Generation

Auction A-5 /2016



Date: February 5th, 2016

Sources: Hydro, Coal, Biomass, Natural Gas and Wind

Contracts: 20 - 30 years

Registration Deadline: to be confirmed

New Auctions



Source: Aneel – september 2015

Transmission

Auction nº 5/2015

Date: November 6th, 2015

4.267 km of transmission lines

9.767 MVA of processing capacity

Beggining of operations : july/ 2019 – january/ 2021

Investments: R\$ **7,1** billion

New Auctions



Source: Aneel – september 2015

Transmission Auction n° 13/2015

Date: January 29th, 2016

7.806 km of transmission lines

3.300 MVA of processing capacity

Beggining of operations: april/2019 – april/2021

Investments: **R\$ 12,6** billion

Transmission Lines Expansion - 2016

over 3 Auctions

Investments of US\$ 4,4 billion

Interconnection
Expansion
North - Southeast and
Northeast - Southeast



South Reinforcements



Midwest Region
Reinforcements



Thank you!

