1. The Brazilian Electricity Sector | Sectorial Context
2. Distribution | Sectorial Context
3. Regulatory vs. Real | Current situation
4. Enel Rio | New Concession Agreement
5. Power Purchase | Overcontracting of energy
6. Generation | Sectorial Context
7. Enel Cachoeira
8. Enel Generation Fortaleza
The Brazilian Electricity Sector
The Brazilian Electricity Sector | Sectorial Context

Key data of 2016

**Generation**

- **Installed capacity by technology %**
  - HPP: 64.5%
  - TPP: 19.3%
  - NCRE: 16.2%

- **Installed capacity GW**
  - 2007: 100
  - 2016: 150
  - +50%

**Transmission**

- **Transmission Millions km**
  - 2007: 82
  - 2016: 135
  - +65%

**Distribution**

- **Customers Millions**
  - 2007: 60
  - 2016: 81
  - +35%

Source: Aneel – data of 2016

- Distributors: 64
- +38 Cooperatives / Special authorizations

01/06/2017
Governance

- **CMSE**
  - Electric Sector Monitoring Committee
  - Monitors the Safety and Efficiency of Energy Supply

- **MME**
  - Ministry of Mines and Energy
  - Advises the Presidency and develops policies for the sector.
  - Promotes investment, finances research and implements government policies

- **ANEEL**
  - Brazilian Electricity Regulatory Agency
  - Independent Regulator
  - Responsible for developing integrated and long-term planning of the electricity sector

- **EPE**
  - Energy research company
  - Coordinates and controls the generation and transmission of electricity

- **ONS**
  - National Grid Operator

- **CCEE**
  - Electric Energy Trading Chamber
  - Coordinates the electricity markets

- **Others Agencies**
  - IBAMA
  - IPHAN
  - ANA
  - ADEN
  - CADE
Distribution
**Sectorial Context | Dx Market**

Dx competition in 2016

**Main Players**

<table>
<thead>
<tr>
<th>Distribution: Market share (Revenue)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATE GRID</td>
</tr>
<tr>
<td>ENEL</td>
</tr>
<tr>
<td>AES</td>
</tr>
<tr>
<td>CEMIG</td>
</tr>
<tr>
<td>NEOENERGIA</td>
</tr>
<tr>
<td>LIGHT</td>
</tr>
<tr>
<td>ENERGISA</td>
</tr>
<tr>
<td>COPEL</td>
</tr>
<tr>
<td>ELETROBRAS</td>
</tr>
<tr>
<td>EDP</td>
</tr>
<tr>
<td>EQUATORIAL</td>
</tr>
<tr>
<td>IBERDROLA</td>
</tr>
<tr>
<td>OUTROS</td>
</tr>
</tbody>
</table>

**Distribution: Market share (Customers)***

| NEOENERGIA | 13.4% |
| STATE GRID | 11.3% |
| ENEL | 11.0% |
| AES | 10.2% |
| CEMIG | 8.6% |
| ELETROBRAS | 8.1% |
| LIGHT | 6.0% |
| COPEL | 5.6% |
| ENERGISA | 5.6% |
| EQUATORIAL | 4.8% |
| IBERDROLA | 4.1% |
| OUTROS | 3.2% |
| OTHERS | 8.2% |

**Distribution: Market share (Revenue)**

- **Private**: 73%
- **State Owners**: 27%

**Distribution: Market share (Customers)**

- **Private**: 73%
- **State Owners**: 27%

*Exchange rate: 3.46 BRL/€

1/ State Grid
2/ Three Gorges
The tariff is divided into two parts, Components A and B.

- **Component A (Unmanageable):**
  - Power Purchase: ~42% of tariff
    - Public auctions: lowest price (bilateral negotiations between Dx and GX are not allowed)
    - Different treatment between existing and new sources
    - Obligation of 100% long term contractual coverage
  - Transmission: ~9% of tariff
    - The costs of the whole national grid are shared between Dx and Gx
    - Transmission contracting: public auctions based on lower required revenue (Annual Allowable Income – RAP), 30 years concession
  - Sectorial Charges: ~19% of tariff
    - Cover the tariff subsidies: low income customer especial tariff, NCRE generation, thermal power plant fuel costs (North Region), etc.

- **Component B (Manageable):**
  - Distribution: ~30% of tariff
    - Operational and Maintenance Costs
    - Remuneration of investments
    - Depreciation of investments
    - Regulatory losses and default rate
Sectorial Context | The Tariff review process
The Revision and Tariff readjustments

Concession Agreement for the distribution of electricity.
- Terms of Service
- Term of Concession: 30 years
- The Grid Expansion commitments
- Applicable Service Fees
  - Tariffs: Maximum Price
  - Tariff update Rules
- Penalties

Tariff Revision
- Ensure the economic and financial balance of the concession.
- Performed every 4/5 years.

Tariff Adjustment
- Seeks to preserve the economic and financial balance of the concession established in the tariff revision.
- Performed annually

Extraordinary Tariff Revision
- Applied when something extraordinary unbalances the concession contract.
- Does not have a defined frequency
The Tariff review process

**COMPONENT A**
- **Pass-through to Tariff** (In Readjustments and Revisions)
- **Imbalances between costs** are transferred to the Tariffs in the next Readjustment / Revision

**COMPONENT B**
- **Tariff Adjustment**: Updated by the market variation and inflation discounted of the Productivity Factor (factor X)
- **Tariff Revision**: The parcel B is recalculated

**CVA**
- **Variations costs in COMPONENT A**
  - 12 quotas indexed to SELIC interest rate

**New Component B**
- **Operational Costs**
- **Investment remuneration**
- **Depreciation**
- **Losses and default rate**

- Benchmarking Analysis
- Net Remuneration Base x WACC
- Remuneration Basis x % of depreciation
- Technical Losses based on actual Non Technical Losses and default rate based on socioeconomic model and benchmarking
# Sectorial Context | The 4° Cycle of Tariff Revision

Main changes in the methodology of Review for Dx

<table>
<thead>
<tr>
<th>Cycle</th>
<th>WACC Real Before Taxes</th>
<th>WACC Real After Taxes</th>
<th>Reference Company (Standard costs in processes and activities)</th>
<th>OPEX</th>
<th>Remuneration Basis</th>
<th>Non Technical Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1° Cycle</td>
<td>17,06%</td>
<td>11,26%</td>
<td>Reference Company (Standard costs in processes and activities)</td>
<td>OPEX</td>
<td>Construction of the first remuneration base</td>
<td>Dx historical average level of losses</td>
</tr>
<tr>
<td>2° Cycle</td>
<td>15,05%</td>
<td>9,95%</td>
<td>Reference Company (Standard costs in processes and activities)</td>
<td>OPEX</td>
<td>Revaluation of investments recorded in books</td>
<td>Benchmarking + Qualitative analysis (Comparison between Dx base on social and economic Complexity of the concession area - % Families low income, % precarious housing, % homicide)</td>
</tr>
<tr>
<td>3° Cycle</td>
<td>11,36%</td>
<td>7,50%</td>
<td>Benchmarking (Comparison between Dx base on Network extension, consumers, market, wage differences between regions)</td>
<td>OPEX</td>
<td>The same, with greater control and rigor in the accounting records.</td>
<td>Benchmarking (The same as in the second cycle With small changes in the variables used and w/o Qualitative analysis)</td>
</tr>
<tr>
<td>4° Cycle</td>
<td>12,26%</td>
<td>8,09%</td>
<td>Benchmarking (The same as in the third cycle including in the benchmarking the non technical losses and Quality indicator)</td>
<td>OPEX</td>
<td>The same, with Recognition of Special Obligations</td>
<td>Benchmarking (The same as in the third cycle With small changes in the variables used)</td>
</tr>
</tbody>
</table>

01/06/2017
## Sectorial Context | The 4° Cycle of Tariff Revision

Main changes in the methodology of Review for Dx

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1° Cycle</td>
<td>Defining one level of bad debt for all Dx</td>
</tr>
<tr>
<td>2° Cycle</td>
<td>Benchmarking based on social and economic Complexity</td>
</tr>
<tr>
<td></td>
<td>(Classification of Dx in 3 cluster according with the social complexity. Bad Debt considered - unpaid invoices between 18-24 months)</td>
</tr>
<tr>
<td>3° Cycle</td>
<td>Benchmarking based on social and economic Complexity</td>
</tr>
<tr>
<td></td>
<td>(The same as in the second cycle but with the definition of individual limits for each class of consumption)</td>
</tr>
<tr>
<td>4° Cycle</td>
<td>Benchmarking based on social and economic Complexity</td>
</tr>
<tr>
<td></td>
<td>(The same as in the third cycle but without the separation of Dx in clusters. Bad Debt considered - unpaid invoices between 49-60 months)</td>
</tr>
</tbody>
</table>

### Bad Debt
- 1° Cycle: Defining one level of bad debt for all Dx
- 2° Cycle: Benchmarking based on social and economic Complexity (Classification of Dx in 3 cluster according with the social complexity. Bad Debt considered - unpaid invoices between 18-24 months)
- 3° Cycle: Benchmarking based on social and economic Complexity (The same as in the second cycle but with the definition of individual limits for each class of consumption)
- 4° Cycle: Benchmarking based on social and economic Complexity (The same as in the third cycle but without the separation of Dx in clusters. Bad Debt considered - unpaid invoices between 49-60 months)

### Q Factor (quality)
- 1° Cycle: There was not
- 2° Cycle: There was not
- 3° Cycle: DEC / FEC variations above +/- 5% will impact in increases or reductions in Tariff in the annual readjustments.
- 4° Cycle: The same as in the third cycle including indicators of commercial quality

### X Factor (productivity)
- 1° Cycle: Discounted cash flow and consideration of customer satisfaction
- 2° Cycle: Discounted Cash Flow with Investment Projection
- 3° Cycle: Productivity average in the sector. Does not consider the individual investment plan of the Dx
- 4° Cycle: Productivity average in the sector. Does not consider the individual investment plan of the Dx

### Remuneration Basis
- 1° Cycle: Construction of the first remuneration base
- 2° Cycle: Revaluation of investments recorded in books
- 3° Cycle: The same, with greater control and rigor in the accounting records.
- 4° Cycle: The same, with Recognition of Special Obligations
Regulatory vs. Real
Current situation
### Regulatory vs. Real

**Current situation - 2016**

#### Key issues

- **Enel Rio**: The great challenges remain the non-technical losses and the adequacy of the quality indicators the company's service to the regulatory standards.

- **Enel Ceará**: The Company is in a better position than the defined regulatory parameters. Losses remain a regulatory challenge.

- **CELG**: The main challenge is to adapt the quality of service indicators to the regulatory standards.

#### Key metrics

<table>
<thead>
<tr>
<th>Company</th>
<th>OPEX R$ per consumers</th>
<th>Bad Debt % revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regulatory</td>
<td>Current</td>
</tr>
<tr>
<td>Enel Rio</td>
<td>224</td>
<td>289</td>
</tr>
<tr>
<td>Enel Ceará</td>
<td>200</td>
<td>157</td>
</tr>
<tr>
<td>CELG</td>
<td>291</td>
<td>354</td>
</tr>
</tbody>
</table>

01/06/2017
## Regulatory vs. Real
### Current situation

<table>
<thead>
<tr>
<th>Non Technical Losses</th>
<th>DEC Hours</th>
<th>FEC Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>% over the low voltage market</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Enel Rio</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.0%</td>
<td>11.2</td>
<td>9.2</td>
</tr>
<tr>
<td>24.4%</td>
<td>22.3</td>
<td>12.5</td>
</tr>
<tr>
<td><strong>Enel Ceará</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1%</td>
<td>12.1</td>
<td>8.8</td>
</tr>
<tr>
<td>8.6%</td>
<td>8.2</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>CELG</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.9%</td>
<td>14.9</td>
<td>12.8</td>
</tr>
<tr>
<td>6.9%</td>
<td>29.6</td>
<td>18.9</td>
</tr>
</tbody>
</table>

*01/06/2017*
Enel Distribuição Rio
New contract
Enel Distribuição Rio | New contract

Key changes

- **Enel Río Tariff Review anticipation for 2018**
  (Previous was 2019)

- **Regulatory non-technical losses review:**
  new limits for 2017 and 2018, with partial
  recognition of losses in areas with high
  criminal levels as an exception of socio-
  economic model

- **Regulatory Bad Debt:** annual adjustment
  based on the regulatory revenue requirement
  established in the tariff readjustment process

- **Components A costs neutrality:**
  Calculated for energy, transmission, bad debt and other
  financial costs.

### New limits of non-technical losses

% over low tension market

<table>
<thead>
<tr>
<th>Year</th>
<th>New Limits</th>
<th>Original Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>24.40%</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>19.4%</td>
<td>18.5%</td>
</tr>
<tr>
<td>2019</td>
<td>15.7%</td>
<td>14.7%</td>
</tr>
<tr>
<td>2020</td>
<td>13.6%</td>
<td>12.6%</td>
</tr>
<tr>
<td>2021</td>
<td>11.5%</td>
<td></td>
</tr>
</tbody>
</table>

The values of 2019 - 2023 will be defined based on the Aneel methodology revision in 2018/19.
Adequacy of quality indicators:
Definition of a path to adapt the DECi / FECi indicators to regulatory limits from 2018 to 2022

Efficiency in economic and financial management: The establishment of new objectives for economic and financial management

The non-compliance for 2 consecutive years or in 2022 of the new quality and economic and financial management objectives, will trigger a process for the termination of the concession

### New objectives for economic and financial management

<table>
<thead>
<tr>
<th>Year</th>
<th>EBITDA Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>$\text{EBITDA} \geq 0$</td>
</tr>
<tr>
<td>2020</td>
<td>$\text{EBITDA} - \text{Regulatory Depreciation (QRR)} \geq 0$</td>
</tr>
<tr>
<td>2021</td>
<td>$\text{EBITDA} - \text{QRR} - (0.8 \times \text{Selic \times Net Debt}) \geq 0$</td>
</tr>
<tr>
<td>2022</td>
<td>$\text{EBITDA} - \text{QRR} - (1.1 \times \text{Selic \times Net Debt}) \geq 0$</td>
</tr>
</tbody>
</table>
Power Purchase
Overcontracting of energy
Brazil Distribution Overview

Contracted capacity

Current situation

- **Brazilian Dx are over contracted** due to the Brazilian economic crisis and the market reduction in the years 2015-16

- Part of the problem is that Dx have to contract its energy demand five years in advance

The key issue

- The energy costs transfer to the Tariff of is limited to 105% of the amounts of energy required, i.e. discos are exposed to price risk for energy above 105% of their demand

Total Dx energy contracting situation in Brazil

% surplus over energy required

<table>
<thead>
<tr>
<th>Year</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surplus</td>
<td>8.0%</td>
<td>7.2%</td>
<td>6.2%</td>
<td>3.4%</td>
<td>2.6%</td>
</tr>
</tbody>
</table>

Regulatory limit: 5%
Enel Distribution Overview

Contracted capacity

Action Plan

- Reduction of contracts with the Enel plants
  - Initial: 10.5%  |  Current: 3.6%  |  Limit: 1.3%
  - 2018: 10.5%  |  2019: 8.0%  |  2020: 8.4%  |  2021: 8.2%

- Participation in the mechanisms of contract exchanges (from 2018)
  - Initial: 13.9%  |  Current: 7.5%  |  Limit: 1.6%
  - 2018: 13.9%  |  2019: 12.3%  |  2020: 10.7%  |  2021: 8.0%

- Reduction of existing energy contracts
  - Initial: 9.9%  |  Current: 7.3%  |  Limit: 8.2%
  - 2018: 9.9%  |  2019: 13.3%  |  2020: 10.8%  |  2021: 10.8%

Actions in progress

- Bilateral agreements with generators

- Participation in surplus auctions (sale to free consumers)
Regulatory Generation
Due to its large size (150 GW), energy generation market in Brazil is not concentrated, presenting only one major player, Eletrobras, a state owned company, with a market share above 10%.

Hydro power is the most important generation technology in the Brazilian market, being responsible for nearly 65% of the country installed capacity and more than 75% of its energy generation.
Decree 5.163/2004 defines Regulated market and Free market. Large consumers (> = 3 MW) or consortium of consumers (> = 0.5 MW) have the option to buy energy in any environment, but must notify the distributor 5 years before the return to the ACR, special consumers (0.5-3 MW can buy renewable energy only in the free market).
Promoted by MME to guarantee energy supply

**Existing energy**
- Delivery started in the same year (A) or up to the 5th year (A-5)
- Supply between 1-15 years (contracting CCEAR)

**New Energy**
- Delivery started in 3rd year (A-3) or up to 7th year (A-7)
- Supply between 15-35 years (contracting CCEAR)

**Adjustment Auction**
- Up to 5% of the Dx load with supply up to 2 years (contracting CCEAR).

**Reserve Auction**
- Need for contracting depends on the MME – objective of guaranteeing energy security
- Recruitment costs are prorated among all free and regulated consumers via charges

**Types of contracts (PPA)**

**By availability**
- Fixed: for remuneration of assets and payment of fixed costs
- Variable: declared cost in auction x MWh generation
- Typically for thermal plants

**By quantity**
- Amounts and prices (auction) – independent of effective generation
- Typical for renewable sources, including large hydro
Operation and formation of the “Spot Price”
Centralized Dispatch (ONS): “Should I use water now or in the future?”

The ONS dilemma

“Should I dispatch Hydro today?”

- Yes
- No

Future hydrology

Favorable: Moist

- Yes: Ok!
- No: Moist

Unfavorable: Dry

- Yes: Deficit
- No: Dry

Optimization process (variables in account)

- Hydrology (flows).
- Storage of reservoirs.
- Transmission capacity.
- Thermal (indices of availability and variable costs etc).
- Central Hydro (availability)
- Wind and solar (not simulated).
- Demand for landing.
- Entry of new plants.

Dispatch by economic optimization

PLD
On a weekly basis, the ONS optimizes the use of resources.

Hourly dispatch centralized in Southeast (responsible for 60% of national supply)

Dispatch by order of merit, when $CVU < CMO$

- The plants that operate at the Base do not participate in the optimization process: wind, solar, nuclear and the inflexible part of the thermal power plants.
- The Brazilian water characteristic is responsible for marking the marginal cost of the system.
- The central problem is in the assessment of the future cost of water, which for this example, there are hydros with water cost higher than the variable of some thermals.

The plants are ordered to reach the required consumption.

Marginal Cost of Operation

915 R$/MWh
What has motivated the creation of the MRE?

- **Centralized dispatch**
- **Mitigation of individual risk**
- **Several plants in cascade**

**Case Energy SURPLUS (GSF>1):**
Generation Hydro > Physical guarantee Hydro:

- In this example there was a SURPLUS of generation of the Hydros, characterizing secondary energy existence in the MRE.

**Case Energy DEFICIT (GSF<1):**
Generation Hydro < Physical guarantee Hydro

- In this example there was DEFICIT of generation of the Hydros, characterizing insufficiency of physical guarantee coverage in the MRE.

- The individual generation of each hydro is not so relevant. The important thing is the total generation of hydros!
Until 2012, GSF > 1 - so that in addition to recomposing the individual generation of Cachoeira up to its Physical Guarantee, there were leftovers (secondary energy).

However, from 2013, the GSF < 1 - So, MRE has allowed Cachoeira mitigate their individual risk of generation deficit.

From 2018, the physical guarantee of Cachoeira will be reduced for the first time by 5% (According to the current regulations, a total reduction of up to 10% is allowed for the entire contract).

Cachoeira Dourada was privatized in 90’s and its concession contract ends in 2027.
Contracts via Thermoelectric Priority Program

Energy contract with Enel Distribuição Ceará (Coelce)

Thermoelectric Priority Program (PPT)
Program created in 2000 (Decree 3371/00) for the implementation of thermal power plants, under funding incentives and gas supply guarantee for 20 years, in order to avoid a short-term energy crisis (there were no restrictions on self-dealing at that time). Enel Geração Fortaleza contract expires in 2023, and has no renewal clause.

- Costs: Gas contract with Petrobras, take-or-pay 70% annual and ship-or-pay 95% annual.
- PPA Price: 382 R$/MWh. Index for Brazilian inflation, Exchange Rate and Fuel (annual indexation).
- Variable Cost (used by the ONS for the purposes of the optimization process): 139.88 R$/MWh (revised annually)

Operation example

Indexation Price PPA

Gas price in Brazilian market

USD/MMBtu

| Source: Reportgas MME Jan17 |
| * Note: lack of transportation and distribution |

4.2 6.47 11.5

PPT Petrobras to Gas Dx* Final Price (industrial)
End