**Total Installed Power Capacity:** 170,2 GW

Renewable: 142,8 GW (83,9%)  
Fossil and Nuclear: 26,9 GW (15,8%)

- **Hydro**  
  109 GW  
  61,1%

- **Biomass**  
  15 GW  
  8,4%

- **Solar PV**  
  2,5 GW  
  1,4%

- **Fossil**  
  25 GW  
  14,7%

- **Wind**  
  15,4 GW  
  8,7%

- **Nuclear**  
  1,9 MW  
  1,1%

- **Distributed Generation**  
  0,9 GW  
  1%

Source: BIG/ANEEL  
Updated in February 2020
How do we classify our hydro powerplants?

- **CGH – Mini/Micro**
  - Power capacity $\leq$ 5,0 MW
  - Simplified registration procedure

- **SHP – Small Hydro – REN 673/2015**
  - 5,0 MW $<$ Power capacity $\leq$ 30 MW
  - Reservoir up to 13km²
  - Weekly flow regulation
  - Multiple reservoir uses

- **HPP – Hydro Power Plants – Authorization Permit – REN 765/2017**
  - Power capacity $\leq$ 50 MW, not framed as SHP

  - Power capacity $>$ 50 MW
  - Mandatory auction
Hydropower expansion planning in the Brazilian electricity sector

Planning studies

- **PNE** (Long term)
- **PDE** (Medium term)

Hydropower Inventory Studies

- 2 years
- 3 years
  - Feasibility Studies: EVTE; EIA; ECI e ECQ

Energy auctions

- 0.5 year
  - MME
  - Aneel
  - CCEE
  - EPE

Construction

- 5 years
  - Private Sector

Operation

- >30 years
  - Private Sector

Source: EPE, 2017
Expansion planning in the electricity sector

- Latest PDE (10 year) - 2029
  http://www.mme.gov.br/web/guest/secretarias/planejamento-e-desenvolvimento-energetico/publicacoes/plano-decenal-de-expansao-de-energia

- Latest PNE (30 year) – 2050
Legislation

Law nº 9.074, July 7th, 1995, art. 5º:

§ 2º Nenhum aproveitamento hidrelétrico poderá ser licitado sem a definição do "aproveitamento ótimo" pelo poder concedente, podendo ser atribuída ao licitante vencedor a responsabilidade pelo desenvolvimento dos projetos básico e executivo.

§ 3º Considera-se "aproveitamento ótimo", todo potencial definido em sua concepção global pelo melhor eixo do barramento, arranjo físico geral, níveis d’água operativos, reservatório e potência, integrante da alternativa escolhida para divisão de quedas de uma bacia hidrográfica.
Legislation

Decree nº 2.335, October 6th, 1997:

Art. 4º À ANEEL compete:
“...
XXVI - determinar o aproveitamento ótimo do potencial de energia hidráulica, em conformidade com os §§ 2º e 3º do art. 5º da Lei nº 9.074, de 7 de julho de 1995;
...
”
Legislation

Decree nº 5.163, July 30, 2004:

Art. 75-A Ficam delegadas à ANEEL:
“...
II – a definição do “aproveitamento ótimo” de que tratam os §§ 2º e 3º do art. 5º da Lei nº 9.074, de 7 de julho de 1995.
…”
How is a hydro powerplant “born”?
ANEEL Resolution 672/2015

- Defines procedures for developing inventory studies for river basins
- [http://www2.aneel.gov.br/cedoc/ren2015672.pdf](http://www2.aneel.gov.br/cedoc/ren2015672.pdf)


- Used as reference for developing hydropower inventory studies in Brazil
The role of hydropower inventory studies - optimal dam siting
Hydropower Inventory Studies

48 studies being developed (January 2020)
Main challenges to HPP and SHP development

Source: RAPEEL/SFG/ANEEL
Participatory Hydropower Inventory Study
Participatory Hydropower Inventory Study Initiative

Previous discussion about environmental feasibility – performed during the elaboration of the hydropower inventory study.

The goal is to make it easier to license HPP and SHP which have environmental feasibility while discarding, during the planning stage, those which are not feasible.

Pilot Project concluded - Pardo River and its tributaries - IMASUL (MS).

Pardo River region, in the state of Mato Grosso do Sul
11 sites
3 streams – Pardo, Botas and Anhanduí
Total installed power capacity – 197 MW
**IMASUL assessment (May 2018)**

Dam siting reassessment considering

(i) Power capacity x reservoir area
(ii) Local vegetation
(iii) Wetlands
(iv) Tributary interference
(v) Maximum reservoir elevation
(vi) Pardo UGP multiple uses

Several recommendations and the necessity to develop the Integrated Environmental Assessment (IEA) for the Pardo River Watershed prior to the environmental licensing process.

6 sites were initially considered viable for SHP installation.
Technical meeting IMASUL/ANEEL (August 2018)

Discussion about the results reached by both agencies.

Several adjustment needs were identified and submitted to the developer of the inventory studies – new deadline to present the revised version of the studies.
Technical meeting IMASUL/ ANEEL (March 2019)

Analysis of the most recent version of the studies.

It was decided that the Term of Reference for the IEA would be made available along with the inventory study approval.

Definition of the optimal dam siting for the Pardo River Watershed.

<table>
<thead>
<tr>
<th>Stream</th>
<th>Site name</th>
<th>Installed Power Capacity [MW]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pardo</td>
<td>Barreiro</td>
<td>24,10</td>
</tr>
<tr>
<td>Pardo</td>
<td>São Sebastião</td>
<td>23,90</td>
</tr>
<tr>
<td>Pardo</td>
<td>Cachoeira Branca</td>
<td>21,00</td>
</tr>
<tr>
<td>Pardo</td>
<td>Botas</td>
<td>18,20</td>
</tr>
<tr>
<td>Pardo</td>
<td>Recreio Jusante</td>
<td>13,00</td>
</tr>
<tr>
<td>Ribeirão das Botas</td>
<td>Ribas</td>
<td>13,60</td>
</tr>
<tr>
<td>Ribeirão das Botas</td>
<td>do Cervo</td>
<td>16,10</td>
</tr>
</tbody>
</table>
7 sites
2 streams – Pardo and Botas
Total installed power capacity - 130 MW
**Insights about the whole process**

- Environmental licensing becomes more realistic by reducing miscommunication and asymmetry of information between agencies and between the environmental agency and the developer of the study.

- The watershed multiple uses are optimized, considering the negative impacts, the positive impacts and the benefits from a holistic perspective, not only from the energy sector.

- Optimal dam siting was defined for the Pardo River Watershed considering the environmental agency perspective.

- IMASUL defined the Term of Reference for the Pardo UGP before the beginning of the licensing process.
Next steps

- Run pilots with other state agencies and with IBAMA.

- Develop a framework for the participation of environmental agencies in the inventory study approval process.

- Study ways of involving social movements during this process.

- Identify regulatory and legal gaps that might be filled in order to make participatory hydropower inventory studies a standard procedure.
Planned actions to increase renewable hydro participation

Previous discussion about the environmental feasibility of a HPP or SHP during the Inventory Study stage.

I incentives to build reservoirs with flow regulation capacity.

Urge need to improve relationship with environmental agencies and social movements.
Thank you!

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