

# Brazilian Electricity Auctions (G+T) and Ten-Year Energy Expansion Plan

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# Summary

- **About EPE**
- **Brazil in big numbers**
  - **Insights for strategic positioning**
  - **Current Structure**
- **Electricity auctions in Brazil**
- **The Ten-Year Energy Expansion Plan**
- **Conclusions**

# About EPE – Energy Research Office



[www.epe.gov.br](http://www.epe.gov.br)



**Federal Office linked to the Ministry of Mines and Energy**



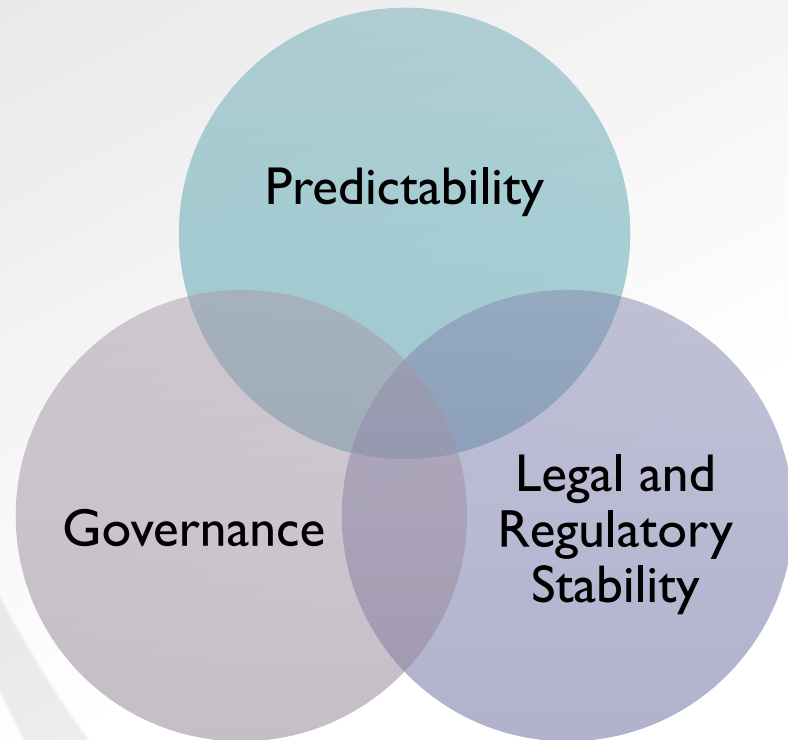
**We develop energy studies and statistics to support formulation, implementation and evaluation of energy policies**

**Member of the National Council for Energy Policy (CNPE)**

# About EPE – Energy Research Office

## Role of EPE

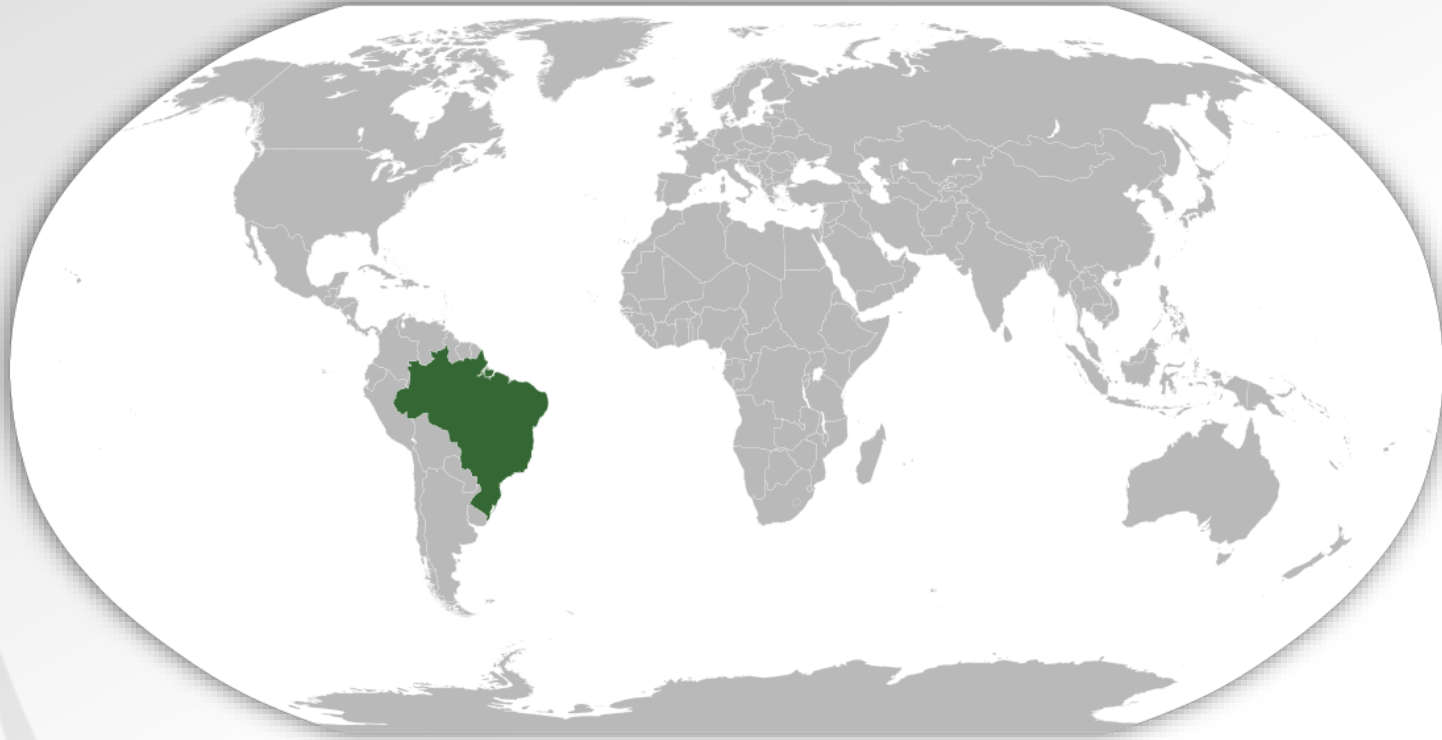
**Guidelines stated by the  
Ministry of Mines and Energy**



- **Technical branch of MME, providing timely studies and reports**
- **Provides unbiased technical, economical and environmental evidence to support decision making and public engagement**
- **Contributes to the consistency, transparency and credibility of actions by MME**
- **Reduces asymmetry of information in the Market**

# Brazil in big numbers: Insights for strategic positioning

# Brazil's economy and markets has scale



Brazil is the **largest economy** in **Latin America**



**210**

million people

**5th** largest population  
in the world



GDP of almost

**\$2 trillion**

**8th** largest economy  
in the world

# Brazil is rich in energy resources



Pre-salt has boosted oil and gas reserves and Brazil is on track to become one of top producers



4th largest agricultural production in the world represents immense bioenergy potential

Huge and high quality onshore windpower potential and yet untapped offshore wind



Excellent irradiation covers the territory and best PV sites alone would exceed electricity demand



Uranium reserves enough to supply at least 10 additional 1 GW Nuclear Power Plants



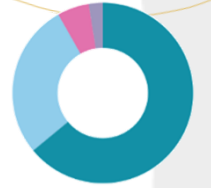
World's 2nd largest hydropower producer. Pumped storage potential is huge as well

# Emerging economy demanding infrastructure investments



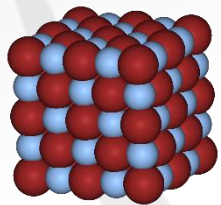
**Growing energy investments (Electricity, Oil and Gas)**

**Increasing private participation**



**Developing more diverse financing solutions**

**Cheap renewables driving need for transmission, natural gas and storage**



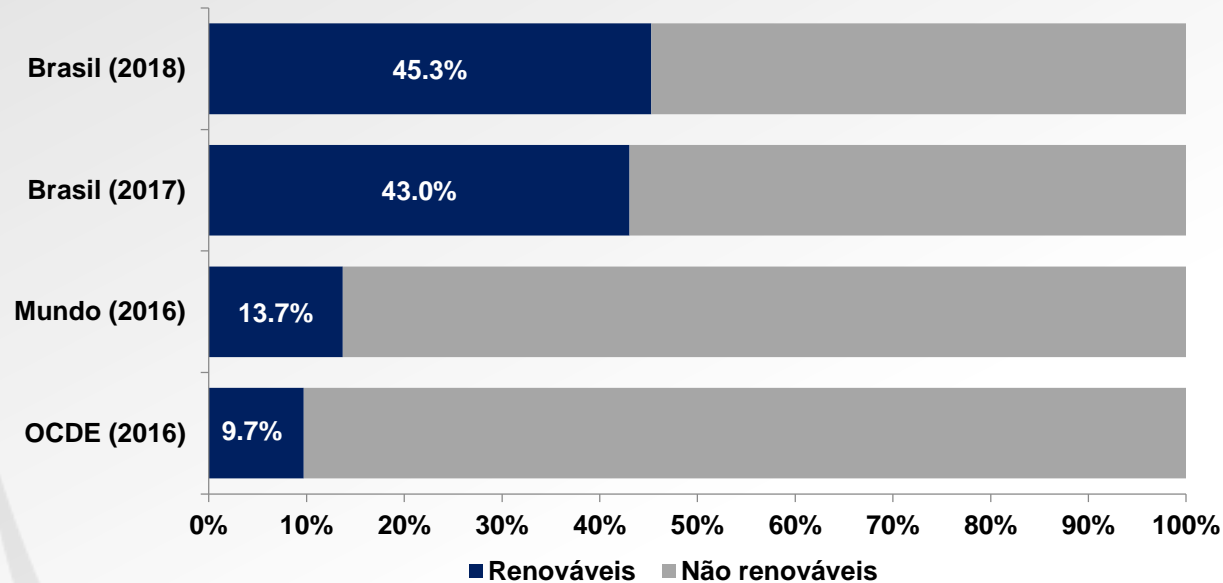
**Robust energy sector/market and Institutions (MME, ANEEL, ANP, EPE, CCEE, ONS, etc.)**



# Brazil in big numbers: Current structure

# Brazil is a leading country when it comes to renewables

**RENEWABLES ▶ 45,3%**



Source: EPE (Brazilian Energy Balance 2019)



**Sugarcane Biomass**  
17,4%



**Hydraulic<sup>1</sup>**  
12,6%



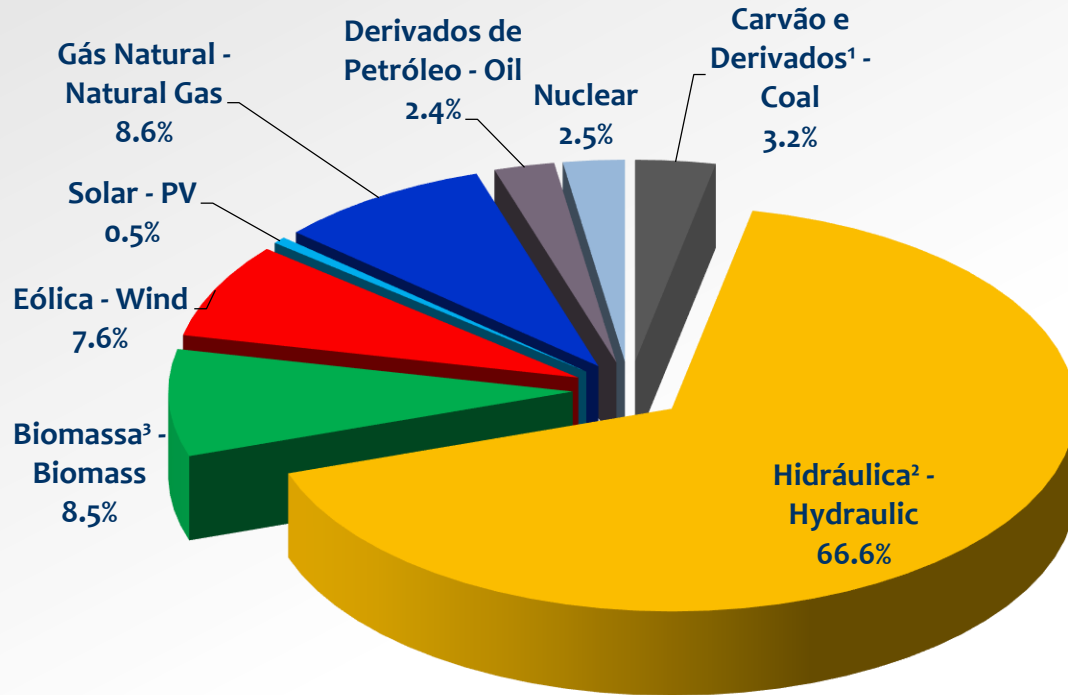
**Firewood and Charcoal**  
8,4%



**Black Liquor and other renewables**  
6,9%

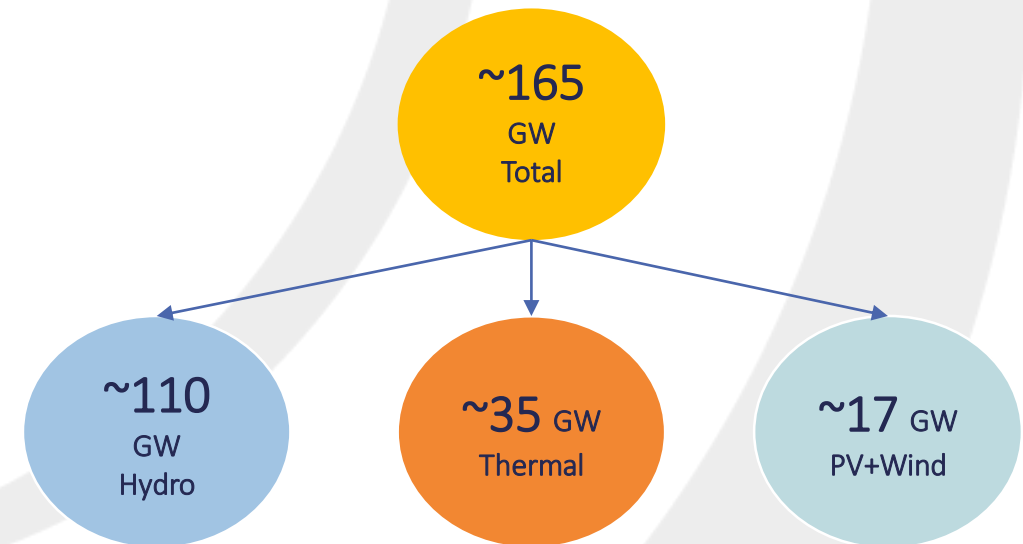
# In the power sector, hydro is combined with other resources

## Electricity supply in 2018



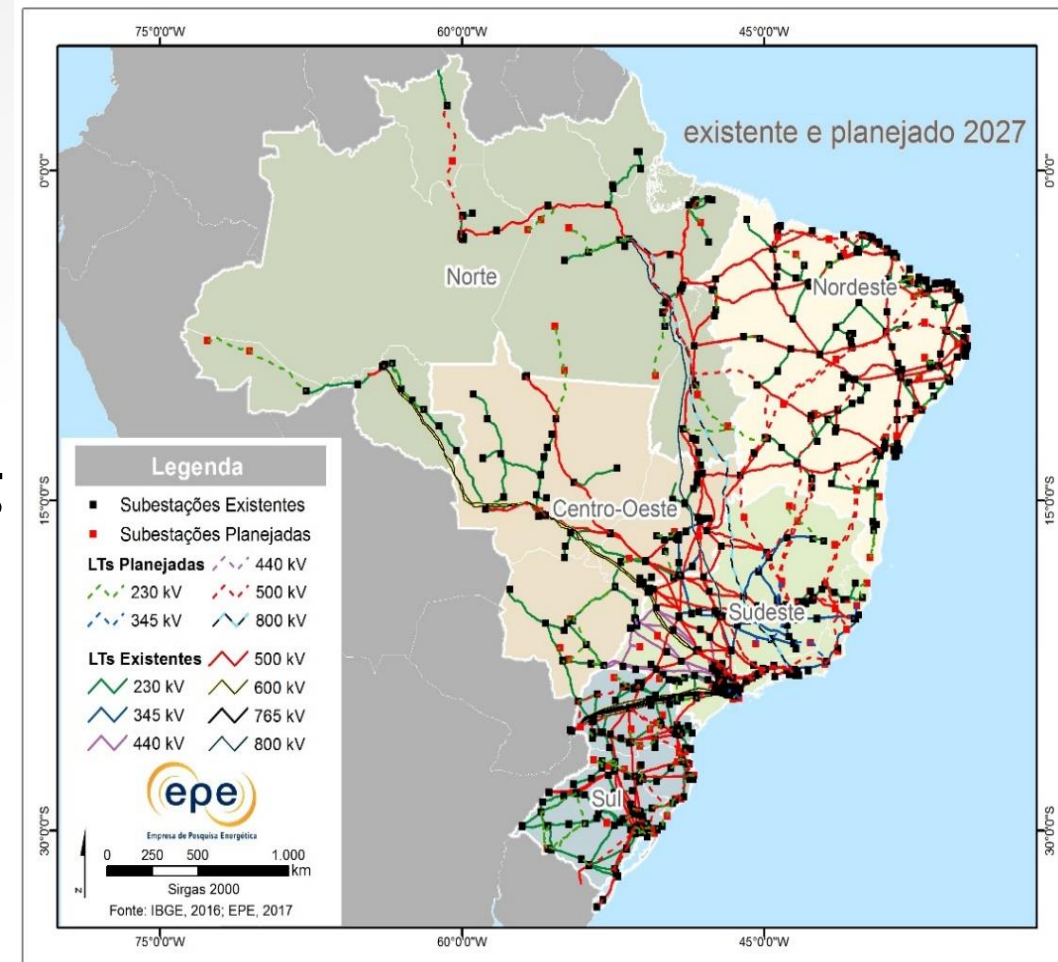
Source: EPE (Brazilian Energy Balance 2019)

## Installed generation capacity - 2019



# Power Sector in Brazil: Big Numbers

- Installed generation capacity: **165 GW, 66% hydro**
- HV transmission system length: **~150,000 km**
- Average annual load growth rates:
  - 2004 – 2010: +4.3%; 2010 – 2016: +1.9%
- **Private participation** in **G, T, D** and trading
- Investment market:
  - **Generation:** wholesale energy market in place + auctions of long-term (20+ years) energy contracts for new capacity
  - **Transmission:** central planning + auctions for 30-year concessions of new transmission facilities
  - Institutions in place & regulatory framework: independent (and federal-level) regulator & ISO & market operator; current framework established in 2004

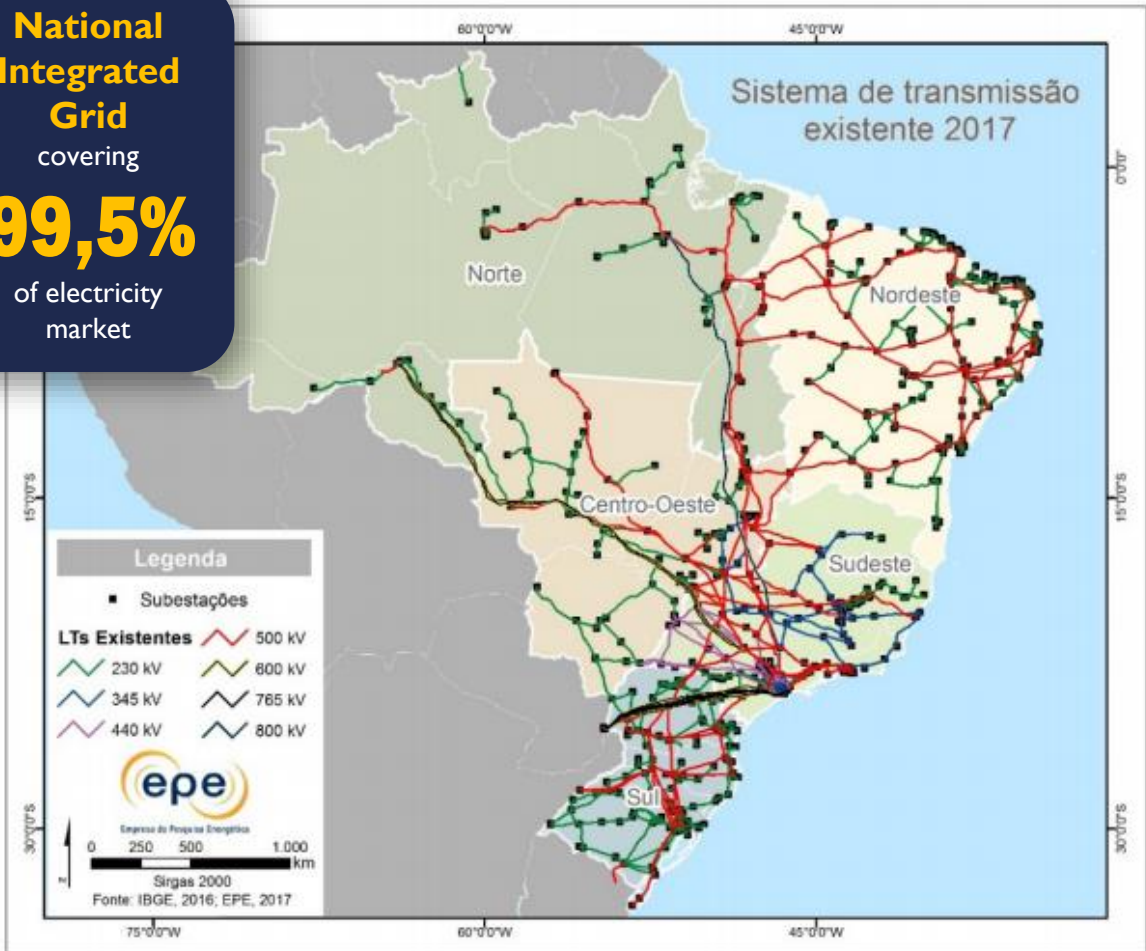




# National Grid of continental size

Optimization of resources and untapping flexibility

**National Integrated Grid** covering **99,5%** of electricity market



Fonte: EPE



Source: EPE

# Electricity auctions in Brazil

# Power Generation Expansion by Auctions – Since 2005



Power Generation



95.468 MW  
1.331 power plants



57% of the electrical matrix<sup>(1)</sup>

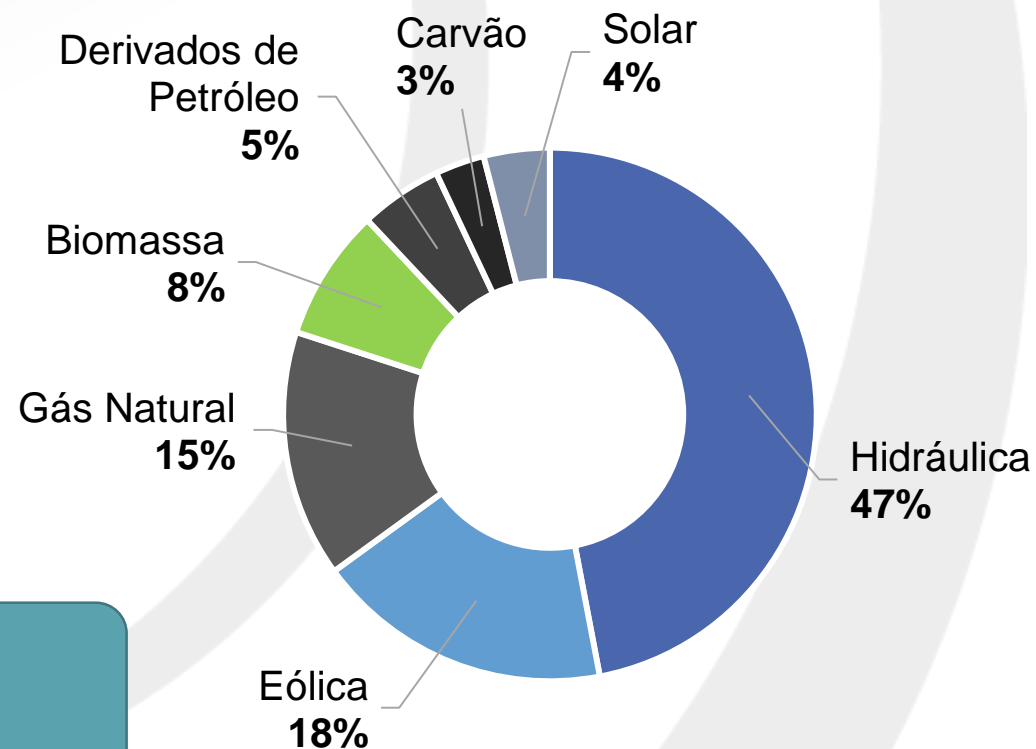


42 auctions



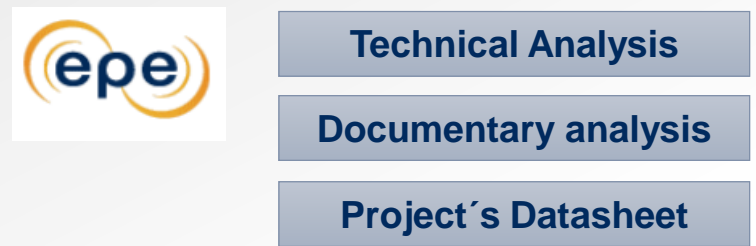
- 27 New Energy Auctions
- 9 Reserve Auctions
- 3 Alternatives Sources Auctions
- 3 Structuring/Special Auctions

More than **US\$ 80 billions** in investments

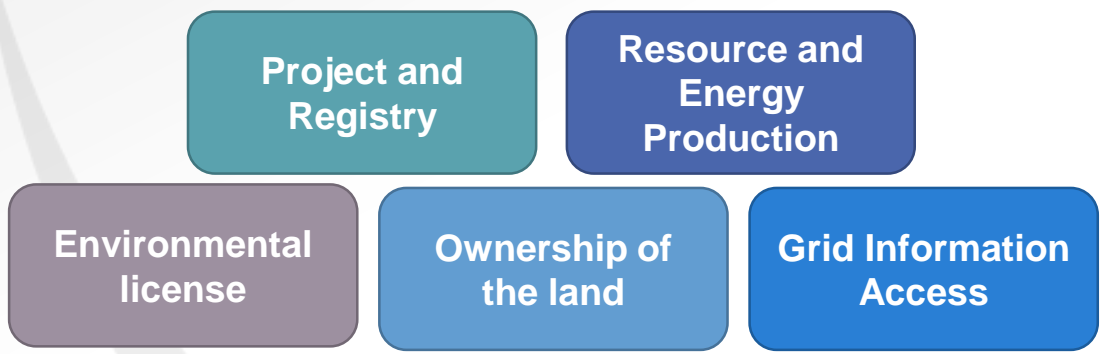


<sup>(1)</sup> Canceled projects not counted.  
Source: CCEE (outubro/2019)

# New Energy Auctions Scheme



## Technical Qualification





# New Energy Auctions Scheme

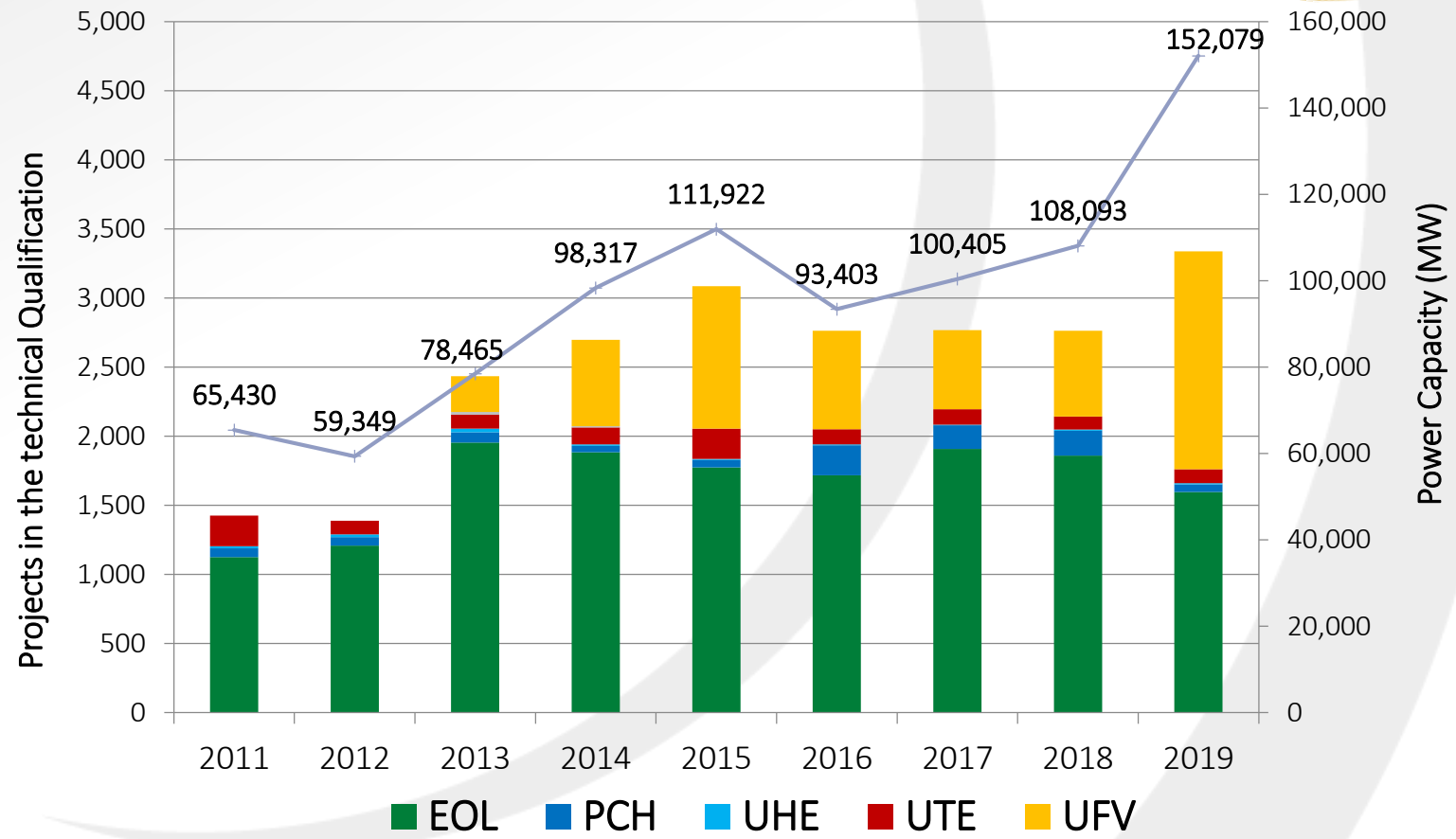
**Auction A-6/2019 - New Record!**  
 More than 100 GW and 1.800 projects in the Technical Qualification



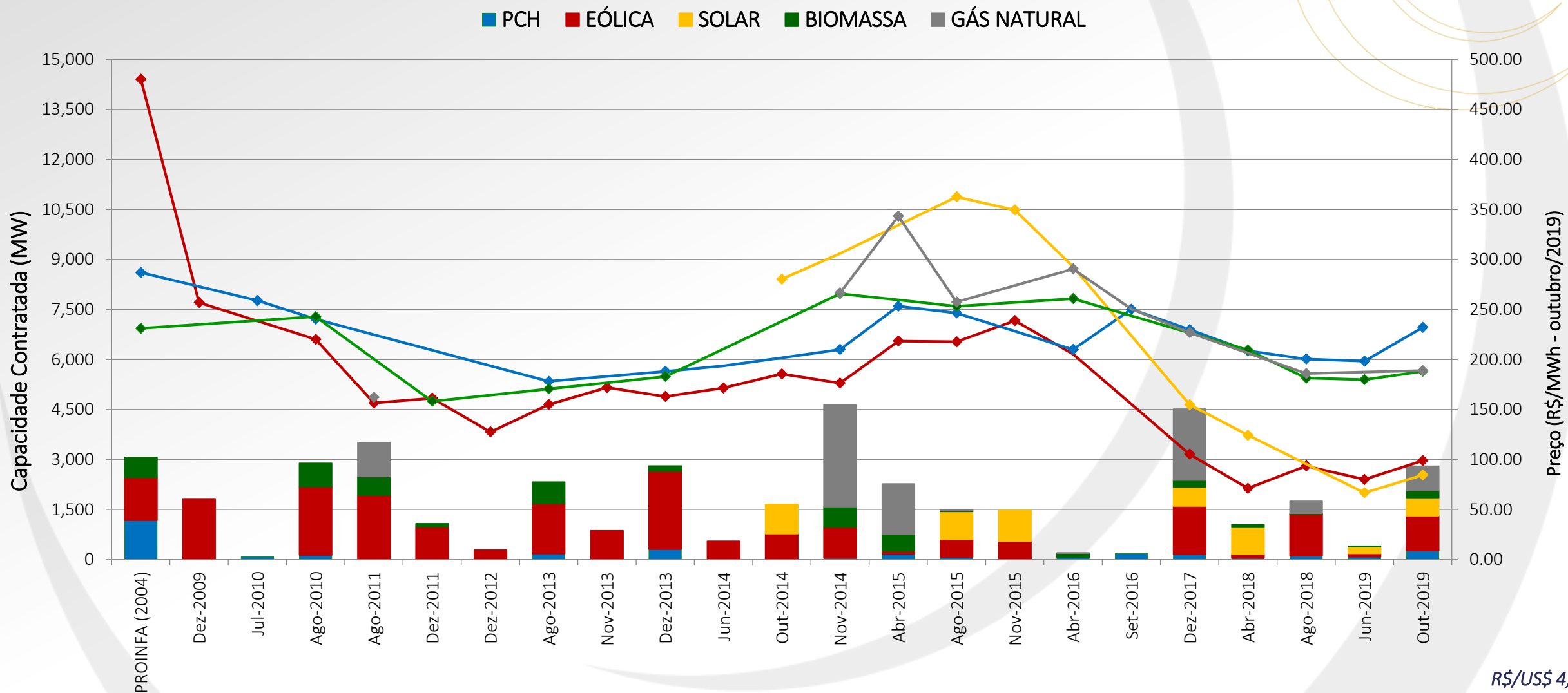
- Lower standards of requirement:
- Greater competition
  - Lower success rate
  - Lower credibility



- Higher standards of requirement:
- Prize in the price
  - Higher success rate
  - Higher credibility



# Renewables are getting cheaper...



R\$/US\$ 4,10

# Reducing asymmetry of information in the Market

**15 anos**  
Empresa de Pesquisa Energética

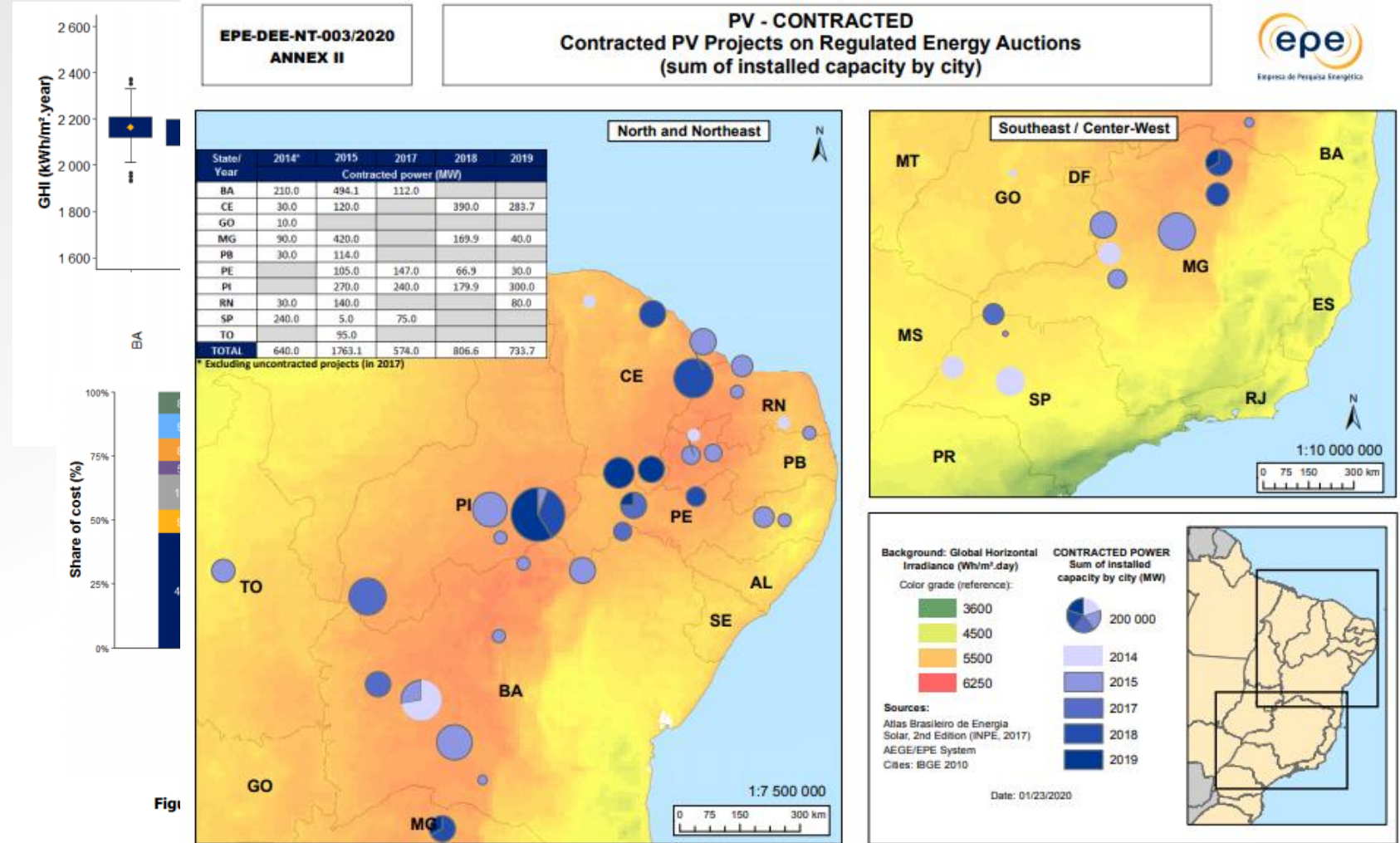
**GENERATION EXPANSION**

**PHOTOVOLTAIC PROJECTS ON BRAZILIAN ENERGY AUCTIONS**

*A-4/2019 and A-6/2019 auctions analysis*

January, 2020

MINISTÉRIO DE MINAS E ENERGIA  
PÁTRIA AMADA BRASIL

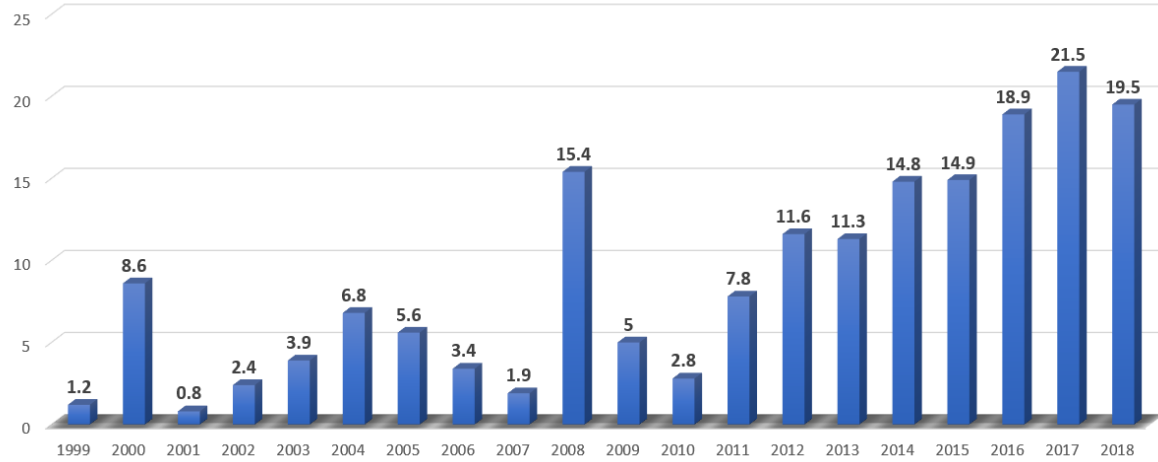


Report published this week!

<http://www.epe.gov.br/sites-en/publicacoes-dados-abertos/publicacoes/Paginas/Technical-Note-PV-projects-on-Brazilian-Energy-auctions.aspx>

# Transmission Auctions

Investments in Billions (R\$)  
1999 - 2018



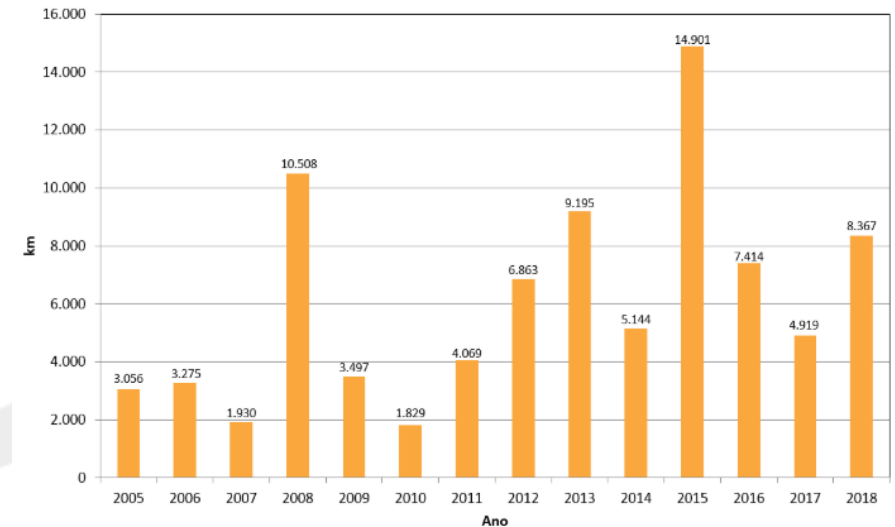
Source: ANEEL

Almost **US\$ 40**  
billions of  
investments, since 2005

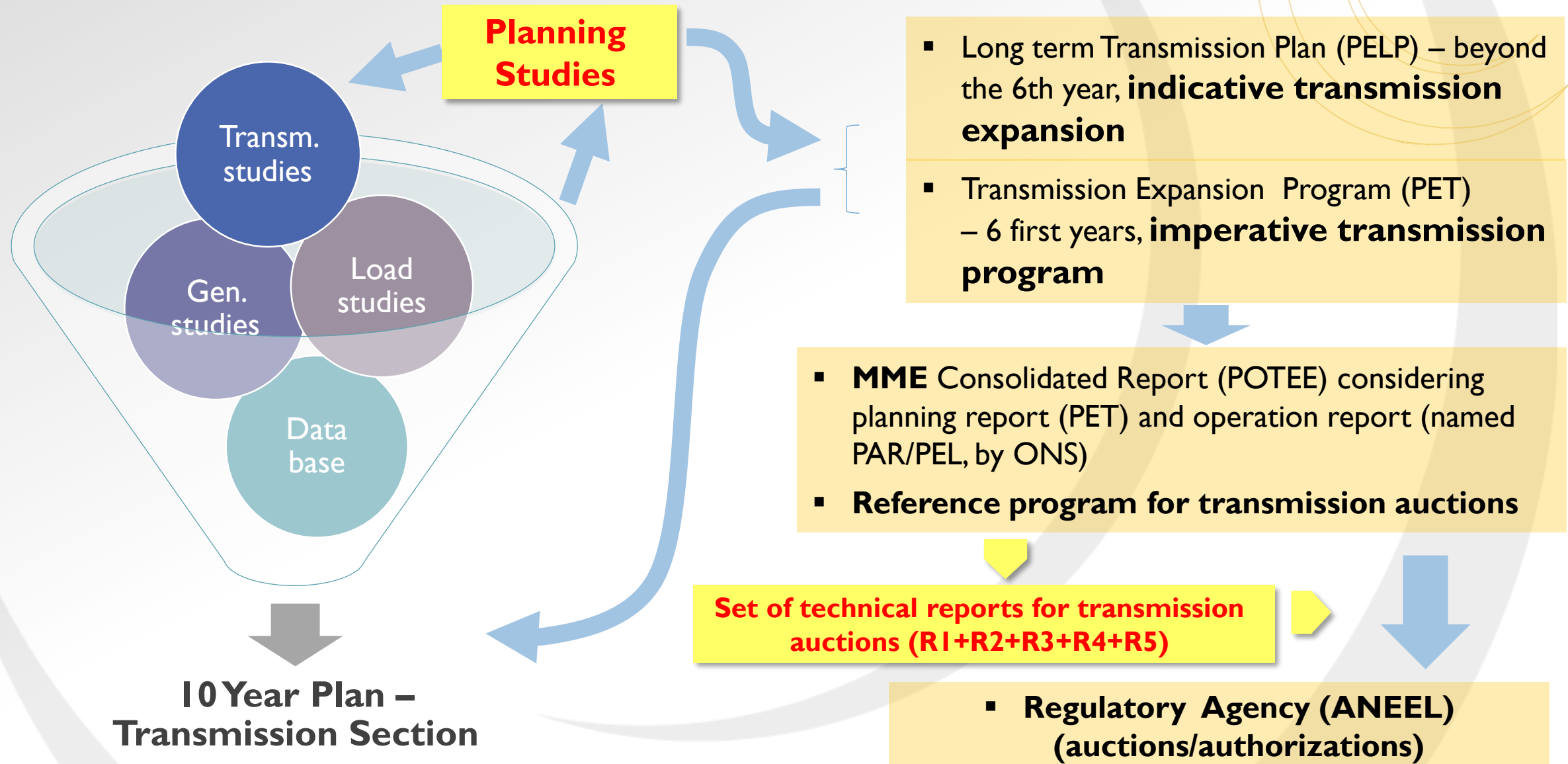
**90,000 km** of  
transmission lines, since  
2005

Source: ANEEL

Linhas de Transmissão Licitadas



# Transmission Planning Process - Continuous Cycling study process



# Transmission studies - Motivations

## Main study purposes:

- Meeting **DISCOS power demand projections**
- **Connection of future generation** sources as per 10-year Plan
- Interconnection of **isolated areas** and regional integration
- Solving **transmission congestions**
- **Alternative solutions** for delays or difficulties in transmission line implementation
- **International interconnections**

## Some remarks:

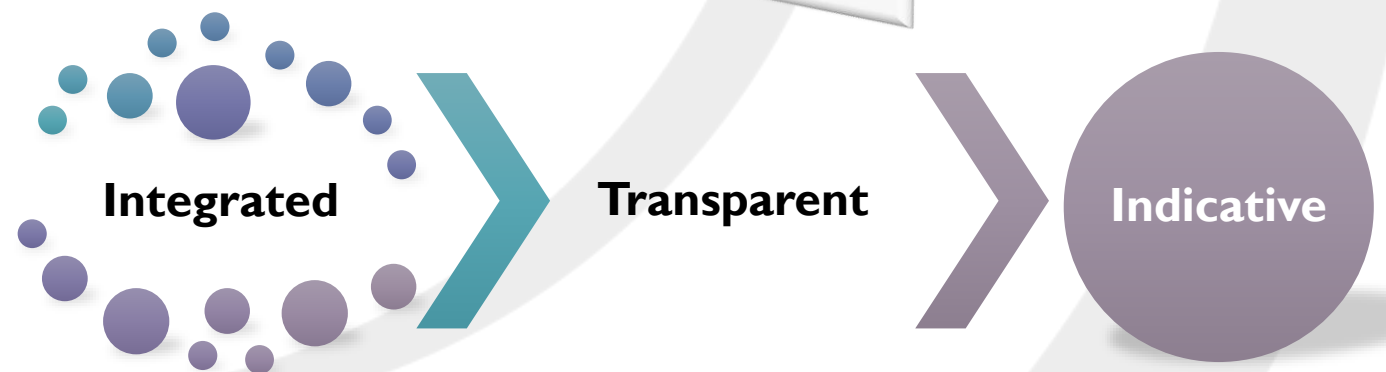
- **Proactive Transmission Planning** and coordination of power generation and transmission expansion
- **Social and environmental challenges** in transmission planning (mainly in metropolitan areas)
- **Flexibility and controlability of Power Systems**, regarding more renewables and no more hydro reservoirs



# The Ten-Year Energy Expansion Plan – PDE 2029

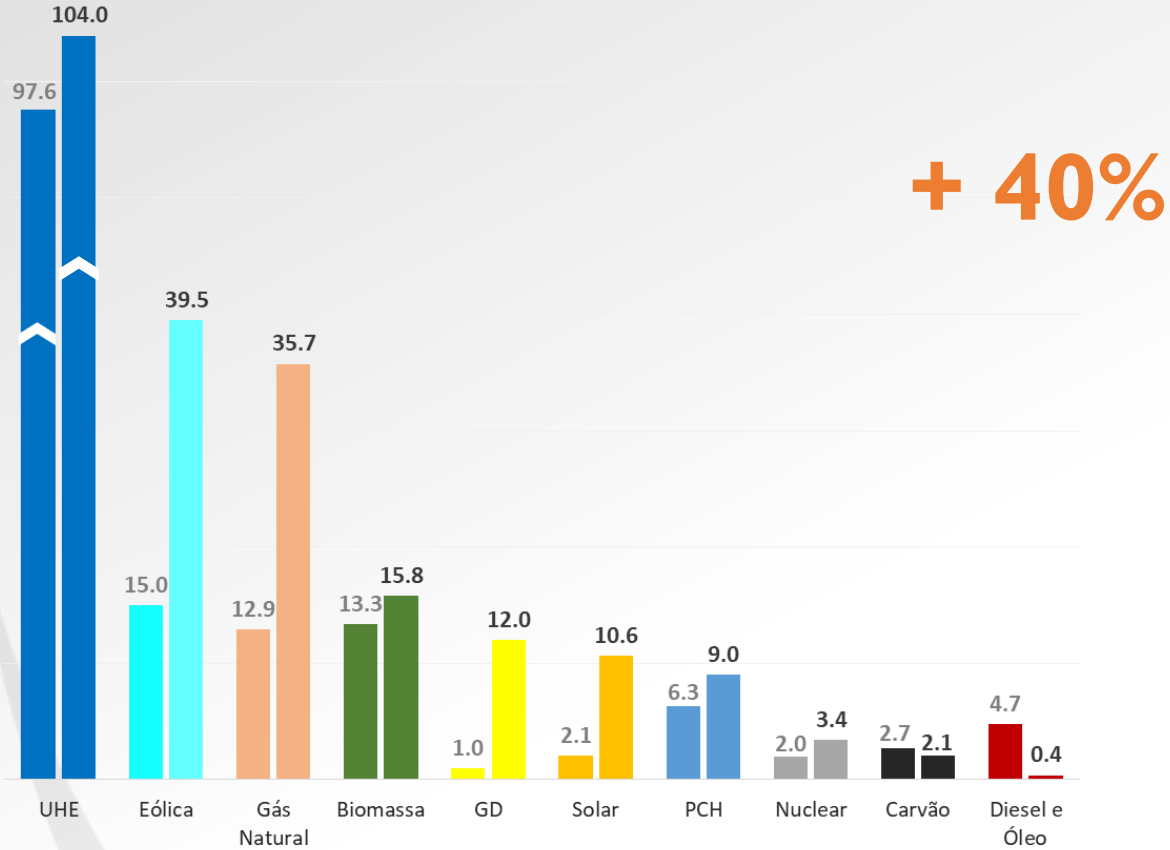
# Ten-year Plan for Energy Expansion

- General assumptions
- Energy demand
- Utility-scale power generation
- Transmission
- Oil & Gas Production
- Oil Products Supply
- Gas Supply
- Biofuels Supply
- Energy Efficiency and DG
- Socio-environmental Analysis
- Consolidation





# Reference Expansion

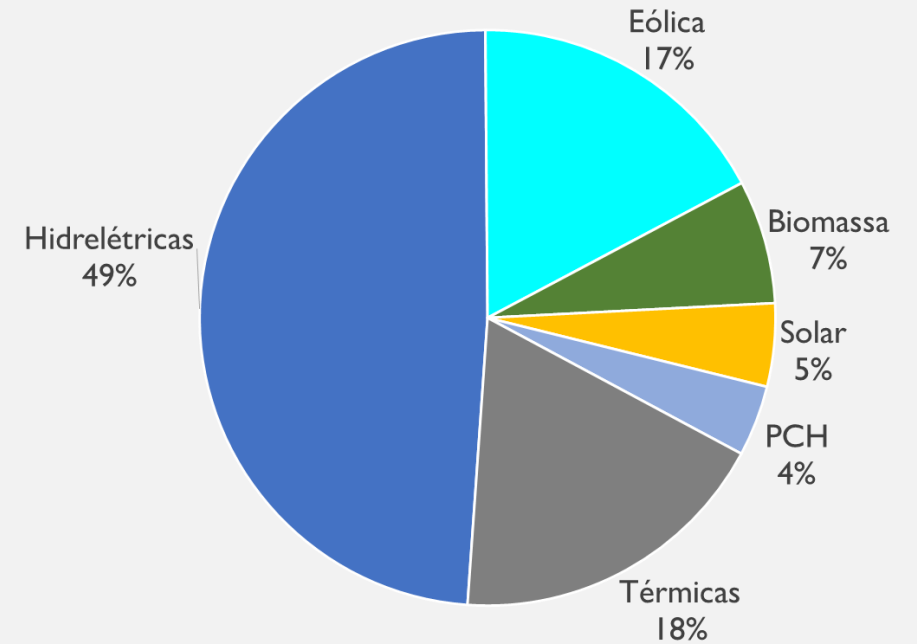


**+ 40%**

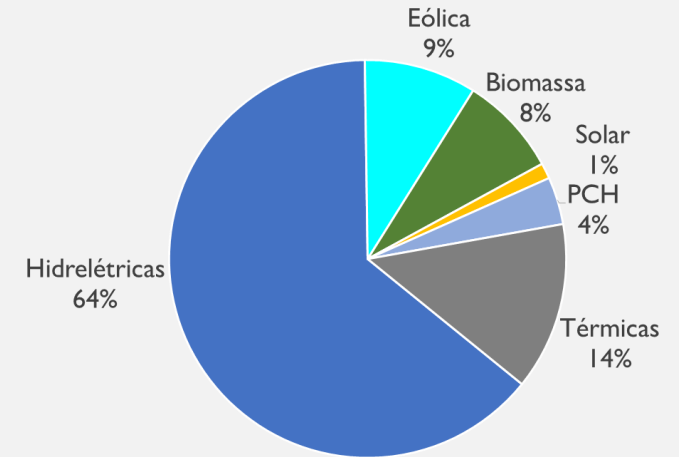
**Installed Capacity  
2019 and 2029 (GW)**

(1) Dados de maio de 2019  
 (2) Gás natural inclui gás de processo  
 (3) UHE não inclui a parte paraguaia da usina de Itaipu

**Installed Capacity  
2029  
228  
GW**

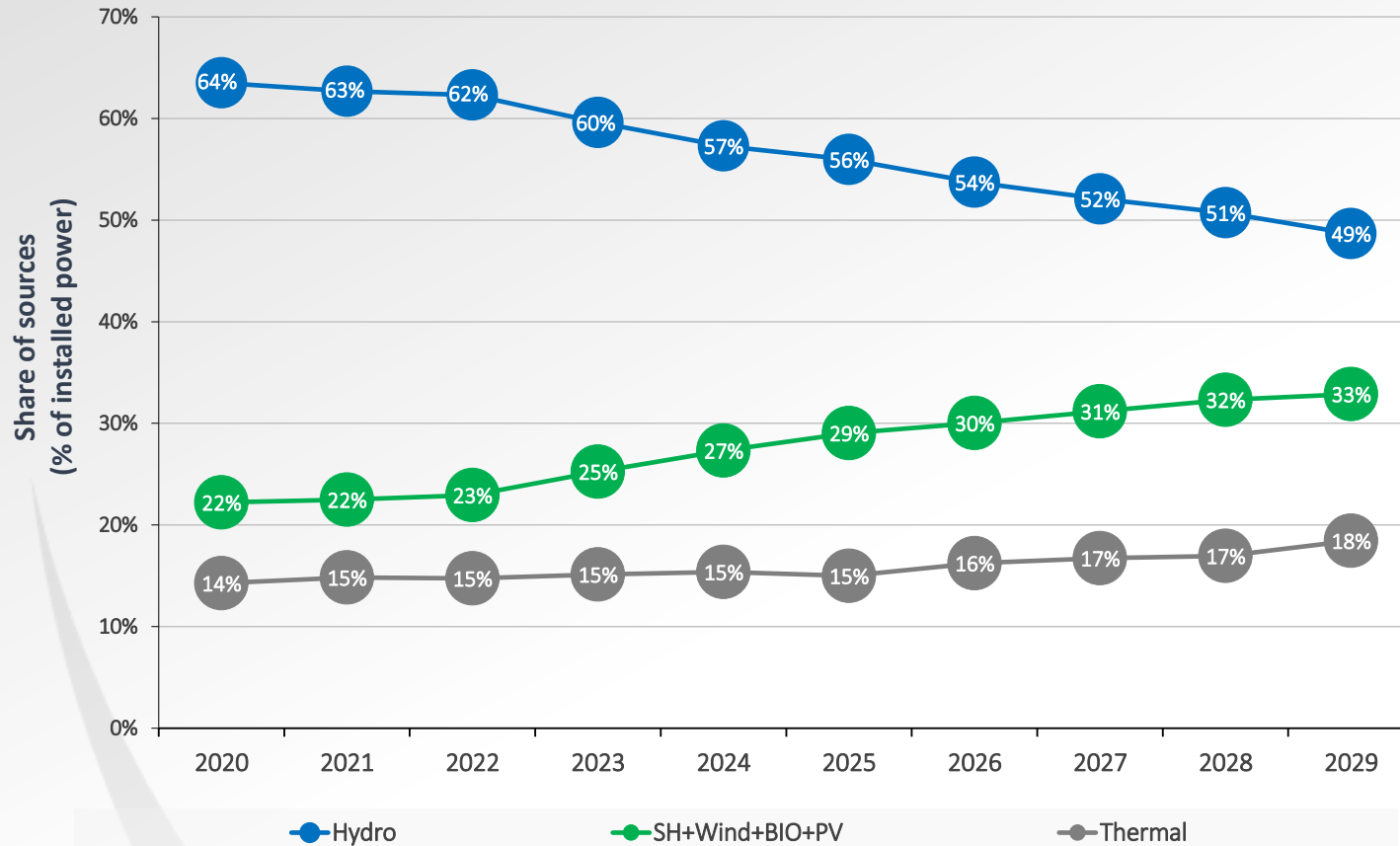


**Installed Capacity  
2019  
164 GW**



(1) Considera apenas a geração centralizada  
 (2) Inclui a parte paraguaia da usina de Itaipu

# Brazil tends to continue over the ten-year period with a predominantly renewable electricity generation supply



Predominance of renewable sources with more than 80% of total installed capacity of SIN

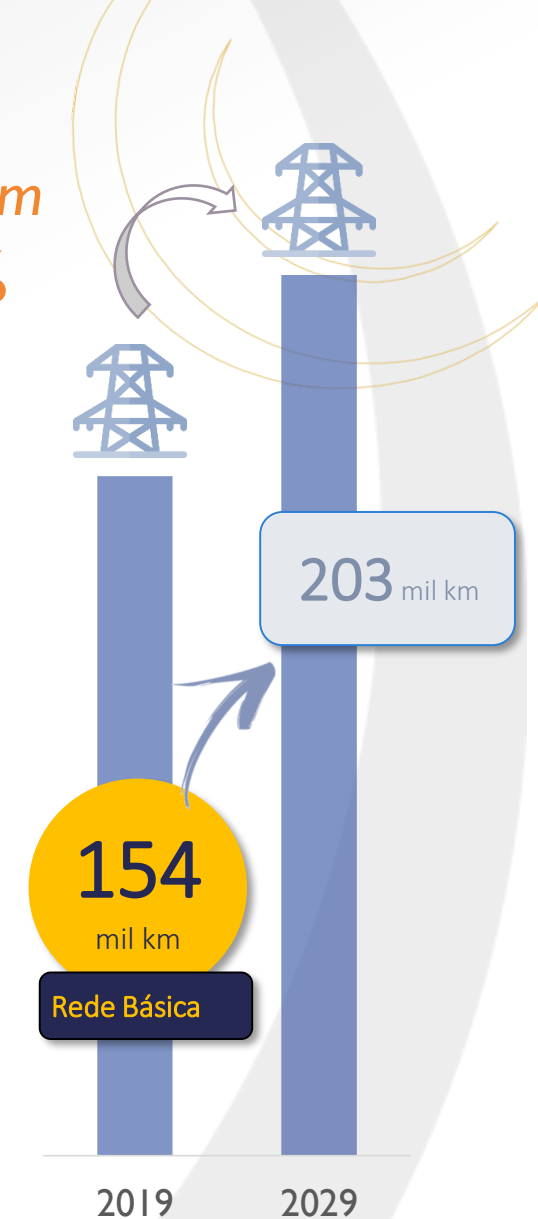


Emissions below the estimated contribution to the electricity sector to meet the Paris Agreement commitments

# Reference Expansion – Transmission Lines

49 mil km  
+30%

Voltage	±800 kV	750 kV	±600 kV	500 kV	440 kV	345 kV	230 kV	TOTAL
	km							
Estimative dez/2019	9.046	2.683	12.816	52.827	6.800	10.327	59.920	154.419
Evolution 2020-2029	2.920	0	0	28.146	228	1.526	16.179	48.998
2020-2024	0	0	0	20.735	122	1.294	9.644	31.795
2025-2029	2.920	0	0	7.411	106	232	6.534	17.203
Estimative 2029	11.966	2.683	12.816	80.973	7.028	11.853	76.098	203.417



**Substations Capacity: from 385,000 MVA (2019)  
to 557,000 MVA (2029)**

# The country needs huge investments...



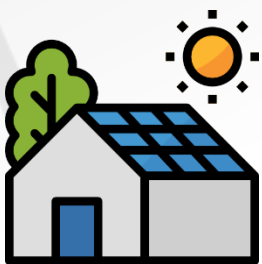
**US\$ 78**  
billion

*Utility-scale power generation*



**US\$ 27**  
billion

*Transmission*



**US\$ 13**  
billion

*Distributed Energy Resources*

Modernization of the legal, regulatory and commercial framework to tackle this transformation of the system

“Correct” economic signals → investment decisions and efficient use of resources

Adequate allocation of risks, with the instruments to manage them

Source: EPE

# Conclusions

# Conclusions

- Brazil's economy and markets has scale, with robust energy market and Institutions
- Almost 60% of the power generation and transmission expansion were made feasible through auctions schemes (since 2005)
- Brazil is leader in renewables (energy and electricity perspectives)
- Over the next ten years, Brazil tends to continue with a hegemonic renewable electricity generation offer, with around 80% of the generation park consisting of hydroelectric, wind, solar and biomass plants
- Brazil needs huge investments in electricity sector: more than US\$ 100 billion over the next ten years

# Conclusions

- The Brazilian electricity system has been undergoing several changes and PDE 2029 has brought new discussions to contribute to this modernization process and to help prepare Brazil for the next ten years.
- The significant expansion of the transmission system will increase the overall reliability and it will provide the flexibility required to operate a system in which RES such as wind and PV solar play a very important role.
- Market conditions are dynamics: regulatory and legal aspects must be up to date (examples of Electricity Modernization Working Group and New Gas Market).

**Thank You!**  
*¡Muchas Gracias!*

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