

Design and implementation of Reverse Auction – Case study of Brazil

SAARC Knowledge Sharing Workshop on “Modern Techniques including Renewable Energy Auctions for Economizing Renewable Energy Tariff”

SAARC, Colombo, Sri-Lanka, May 10th, 2018

Outline

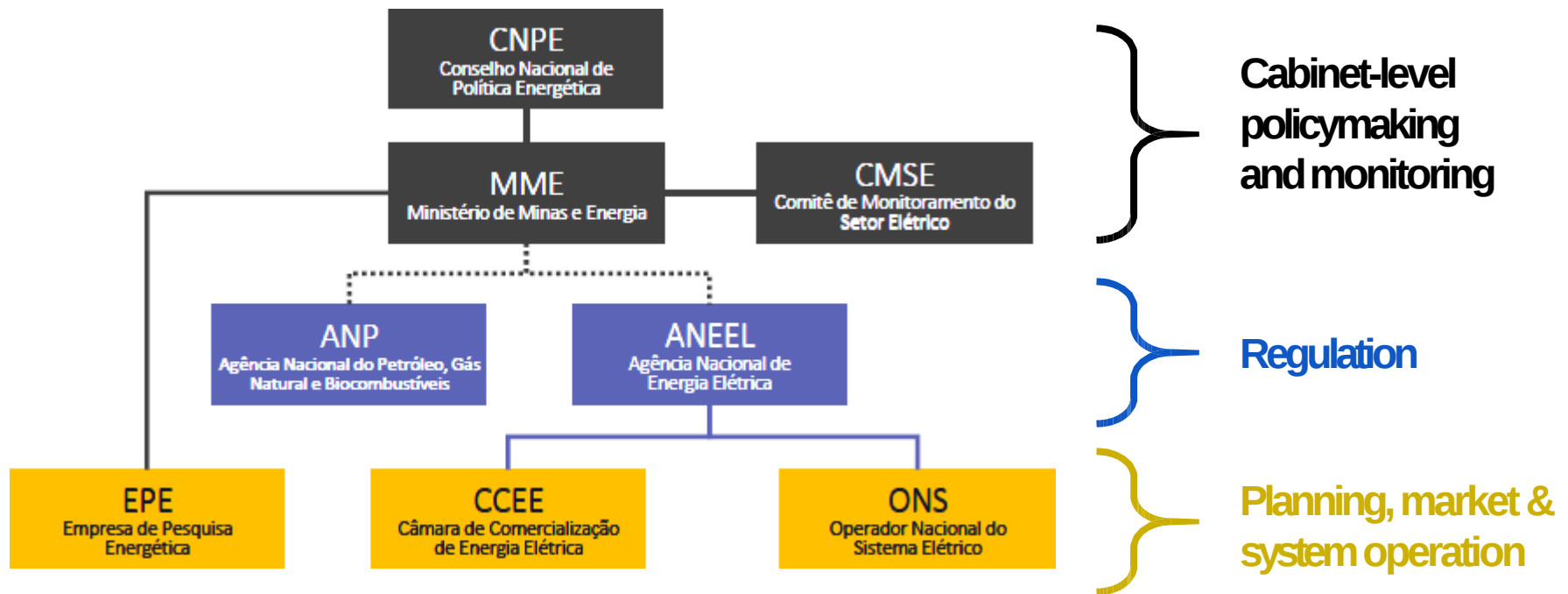


- EPE – WHO ARE WE?
- ELECTRIC POWER IN BRAZIL
- EXPANSION PLANNING
- THE EVOLUTION OF THE RENEWABLES IN BRAZIL
- BRAZILIAN AUCTIONS SUMMARY
- RENEWABLE AUCTION LESSONS

ENERGY RESEARCH OFFICE (EPE) – WHO ARE WE?

EPE - WHO ARE WE?

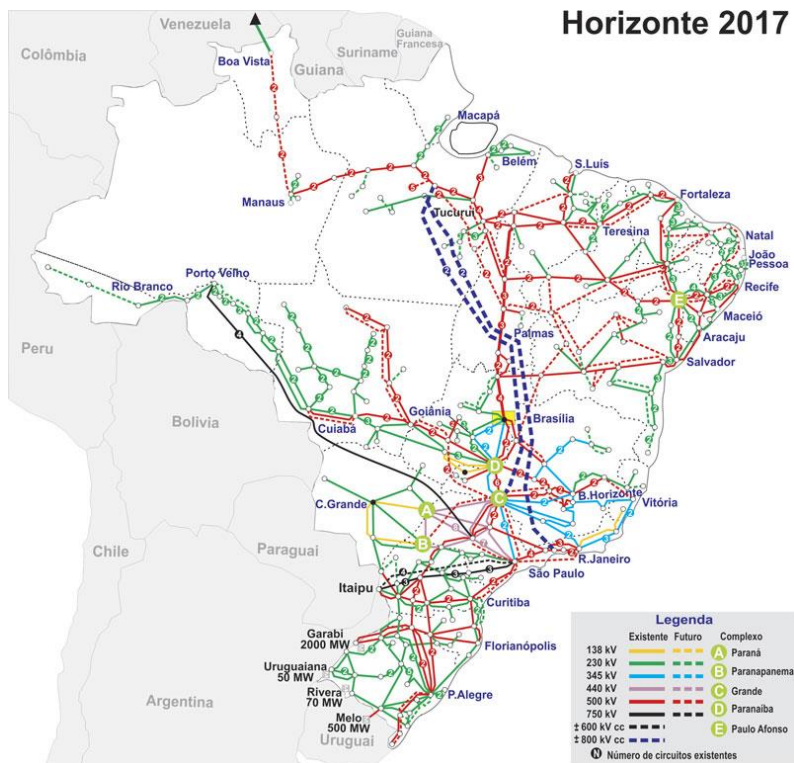
- EPE is a governmental agency supporting the Ministry of Mines and Energy in its policy decisions, via planning studies for the energy sector. Created by law in 2004.
 - Those studies includes electric energy, oil and gas, renewables, coal, nuclear, energy efficiency, distributed generation and others
 - Technical staff of ~350 people, 65% with MSc or PhD degrees



ELECTRIC POWER IN BRAZIL

BIG NUMBERS

Interconnected System – Map 2017



3,000 - 5,000 MW of new additions
needed per year in business as usual
years

Brazil

- Area 8,515,759 Km²
- Population 208.6 million

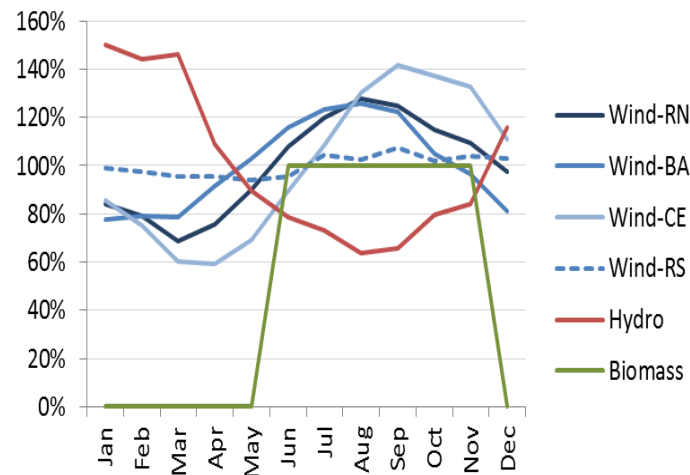
Electricity Sector

- Transmission lines 141,576 Km
- Generation Capacity 157.9 GW
 - Hydro 63.7%
 - Thermal 26.5% (9%Biomass)
 - Wind 7.8%
 - Nuclear 1.3%
 - Solar PV 0.7%
- Consumption 557 TWh
 - Regulated Market 70.2%
 - Free Market 29.8%
- Considerable private participation in G, T & D

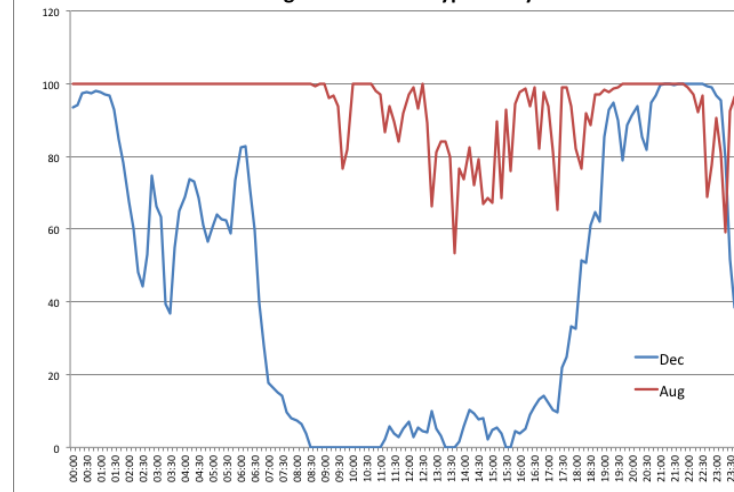
BRAZILIAN POWER SYSTEM IS CHANGING...

- Renewables are growing. Economic competitiveness. Complementarity with hydro.
- Balance between supply and demand must be supplied by dispatchable sources.
- Less Hydro reservoirs projects...
- ... means that thermal energy is as an option for the latent need for firm energy supply.

Seasonal generation patterns

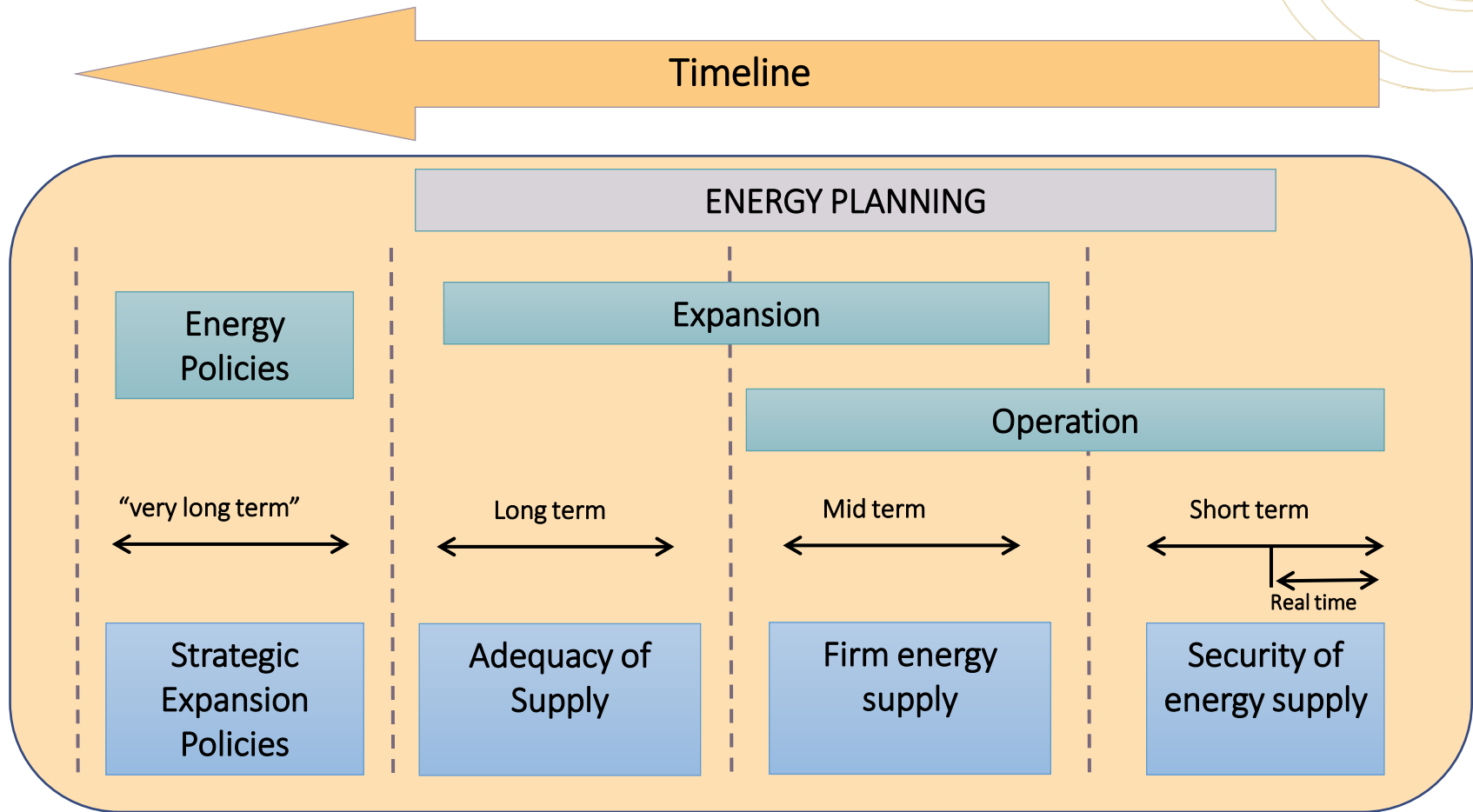


Wind generation in a typical day



EXPANSION PLANNING

ENERGY PLANNING IN BRAZIL



PLANNING THE POWER EXPANSION

PDE

Ten-Year Energy Expansion Plan



- Medium-term View (10-years period)
- Tactical and operational approach
- Auction Programs: Power Lines and Generation

PNE

Long-term National Energy Plan



- Long-term View (30-years period)
- Strategic Approach
- Forecasts: Demand, Supply, Technology, Energy Efficiency, Energy Source Replacement

TEN-YEAR ENERGY EXPANSION PLAN - PDE 2026

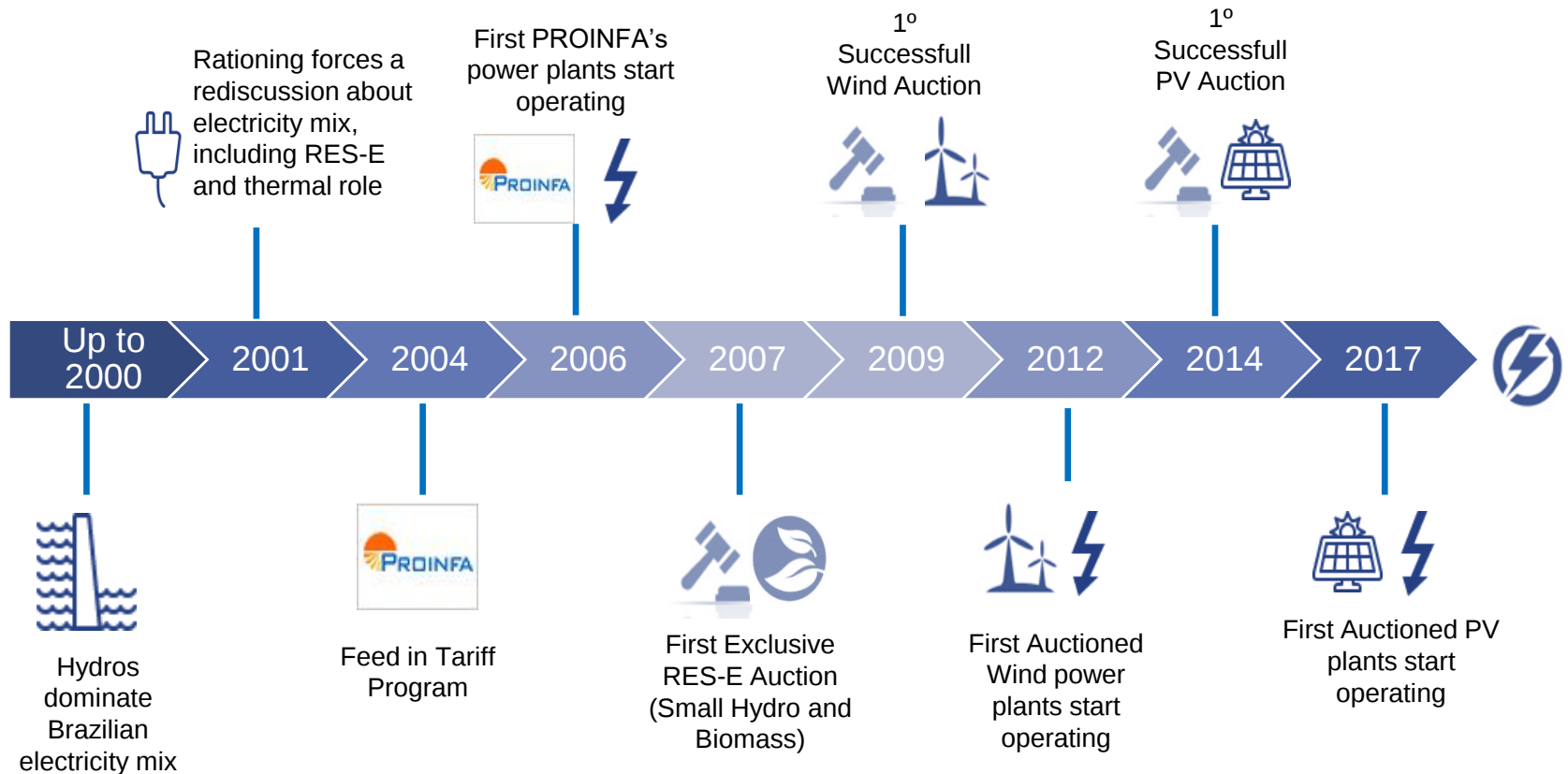


- The power generation plan is **indicative**
- The transmission plan is **determinative**
- Should provide adequate economic signaling to the market
- Balance between supply and demand
- Respecting contracts and conditions of energy policies
- Power Generation Expansion: **More than 60 GW until 2026** (already contracted and indicative).

THE EVOLUTION OF THE RENEWABLES IN BRAZIL

The evolution of the renewables in Brazil

Small Hydro, Wind, Solar PV and Biomass



New Capacity Auctions: main results

New Capacity
Contracted since 2005
1.167 projects
90.190 MW

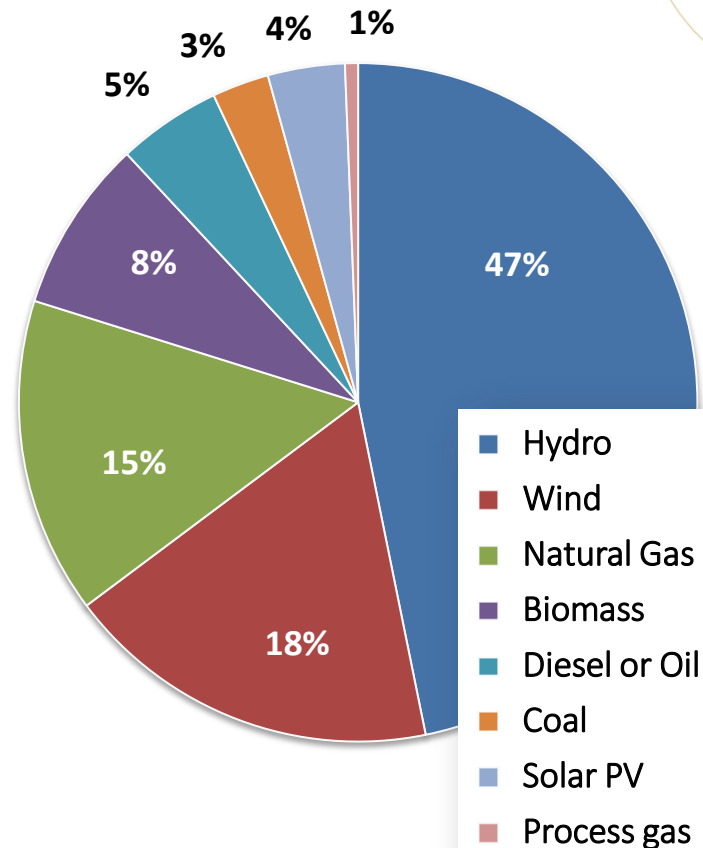
39 Auctions

24 New Energy Auctions

9 Reserve Auctions

3 Alternative Sources Auctions

3 Special Auctions



Not accounted: Projects with cancelled grants, cancelled contracts.

Source: CCEE (May/2018)

BRAZILIAN AUCTIONS SUMMARY

Auctions Summary – Companies/Entities

Ministério de

Minas e Energia

Ministry of Mines and Energy

- Ordinances - Auction Guidelines
- Declaration of needs (Utility companies)
- Grants



Agência Nacional de Energia Elétrica

National Electricity Agency

- Authorizing Acts
- Public Hearing
- Tender Announcement - draft of Power Purchase Agreements
- Guarantees and Penalties for participants



Energy Research Office

- Registration and Technical Qualification of projects
- Cap Price
- Firm energy certificate of each project
- Auction demand (reserve auctions)
- Projects Datasheet for Auction system



Electric Energy Commercialization Chamber

- Preparation of Auction System
- Realization of the Auction
- Signature and Registration of Power Purchase Agreements



National Grid Operator

- calculates the Flow Capacity of grid

Auctions Summary – Auctions types

Auctions to attend Utility Companies demands

Alternatives
Sources

Special
Auctions

New Energy

Existing
Energy

Reserve Auction

Supply Adequacy

EPE calculates the
auction's demand

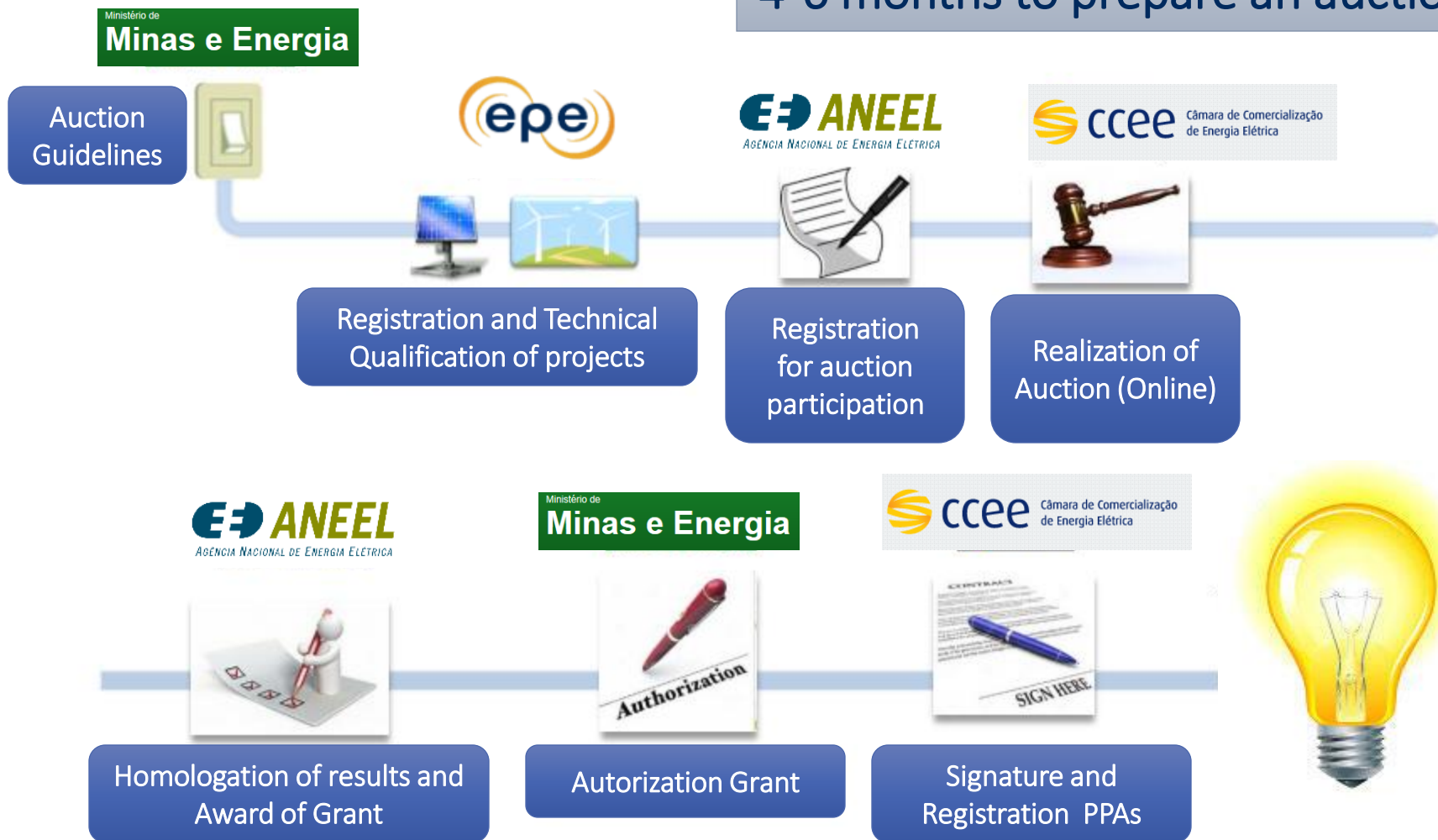
All consumers pay
for it

Auctions Summary

Item	Description
Why auctions?	Auctions are competitive mechanisms that allow price discovery and can foster new technologies, especially if there is a legal, technical and regulatory framework.
The Buyers	Regulated Auctions: Utility companies that need to cover their loads Reserve Energy: Market operator (CCEE) with the goal of improving supply adequacy.
Sellers	Independent Producers technically certified by Energy Research Office (EPE is the equivalent Brazilian acronym) and with bid bonds deposited on CCEE.
Forward Period	New Energy Auctions: 3 to 7 years Existing Energy: 1 to 5 years Renewables tend to participate in 3 year forward auctions
Delivery Period	Hydro: 30 years Wind, Solar PV and Biomass: 20 years

Auctions Summary - Scheme

4-6 months to prepare an auction

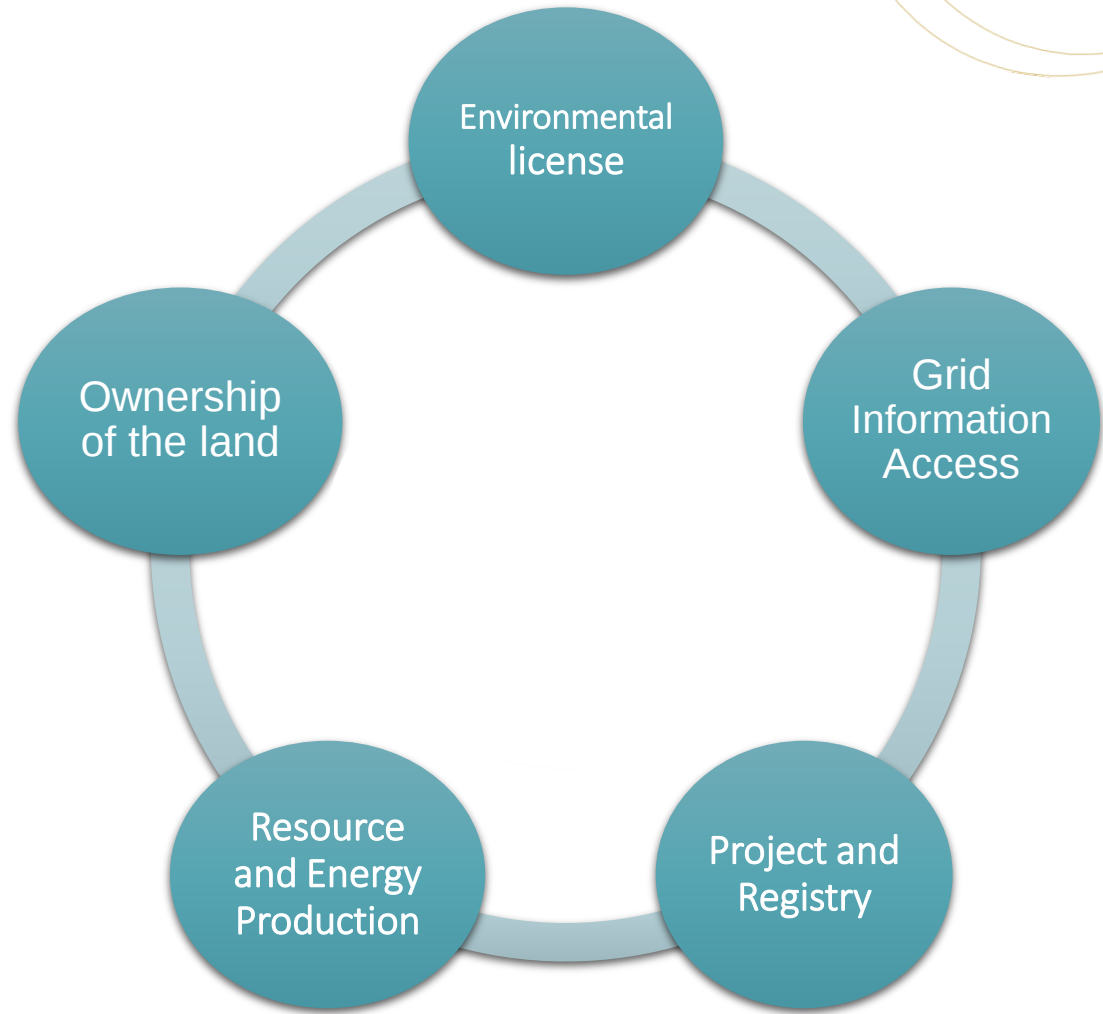


Technical Qualification

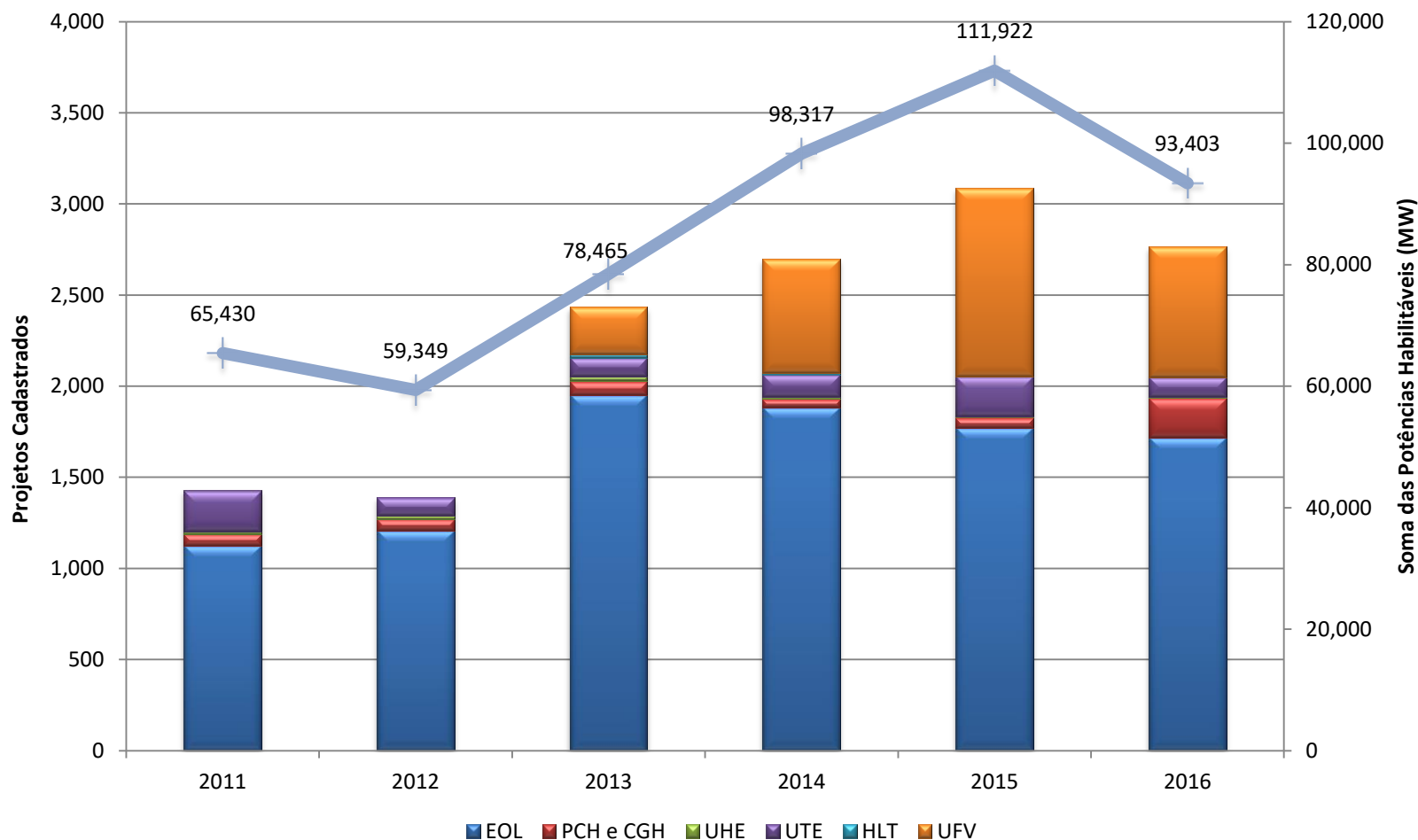
Technical Analysis

Documentary analysis

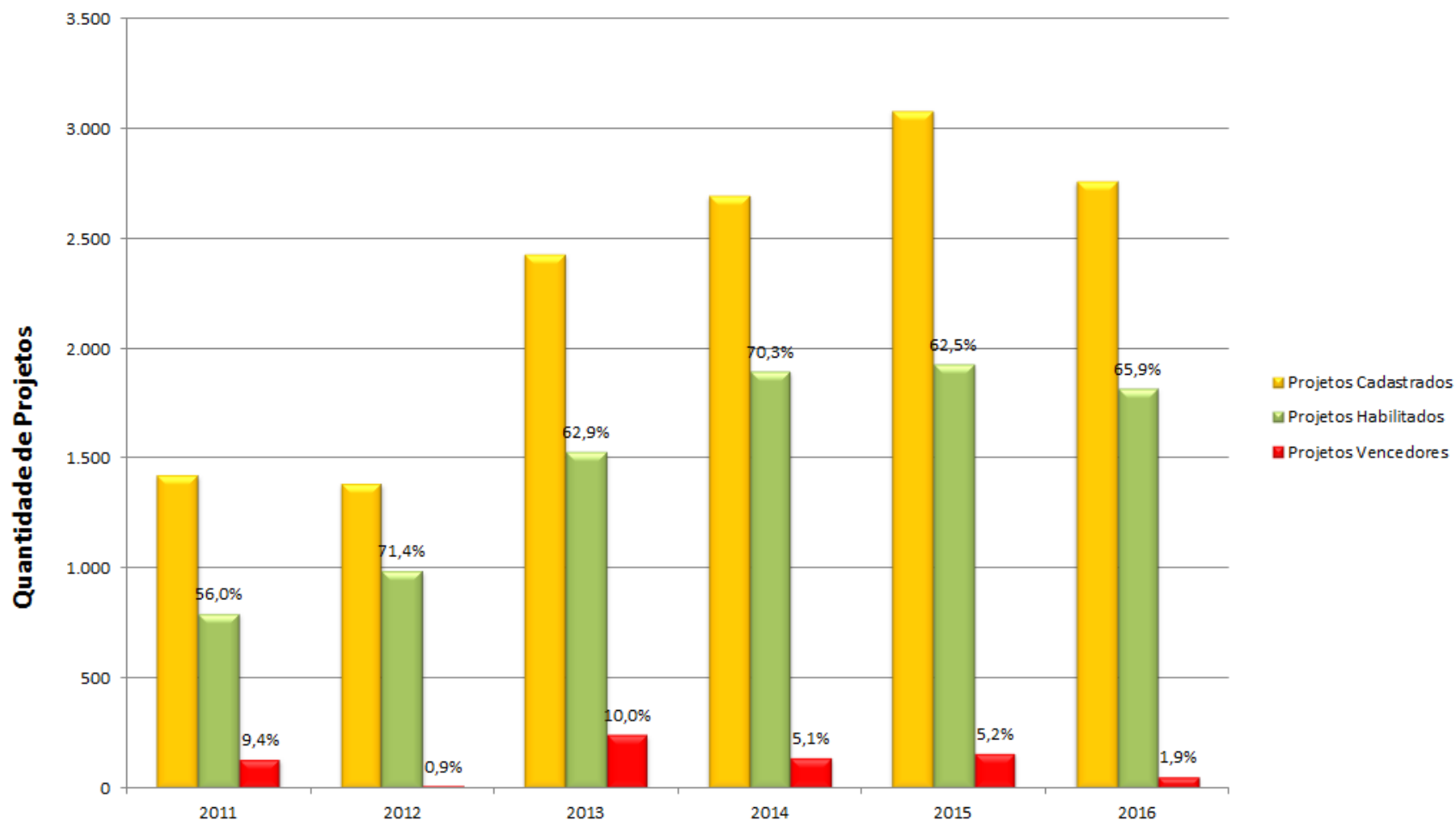
Project's Datasheet



Registered Projects



Results



RENEWABLE AUCTION LESSONS

Lessons learned: technical qualification



- Technical requirements should be clear, objective and as simple as possible
- Diligences demand effort and time, but they can be important for the competition
- Tradeoff: strict qualification rules tends to lead to higher success levels in the implementation of the projects, but reduces competition
- Tradeoff: Track record requirements x Project quality requirements

Lessons learned: post-auction project changes

- After the auctions, it's normal that winners make some changes in the technical features of their projects:
 - Technical and economical optimization, deals with equipment suppliers, new technologies available, international financing, etc.
- These changes doesn't mean the technical qualification was useless... Making changes is much less risky when a project has been consistently developed

Lessons learned: confidence in the process

- Submitting a project demands time and investment for the participants: rules should not be changing all the time
- Make sure you have demand before calling an auction to avoid frustration
- Technical qualification is just one part. The financial arrangement after the auctions is also a significant challenge

Lessons learned: mixing different sources

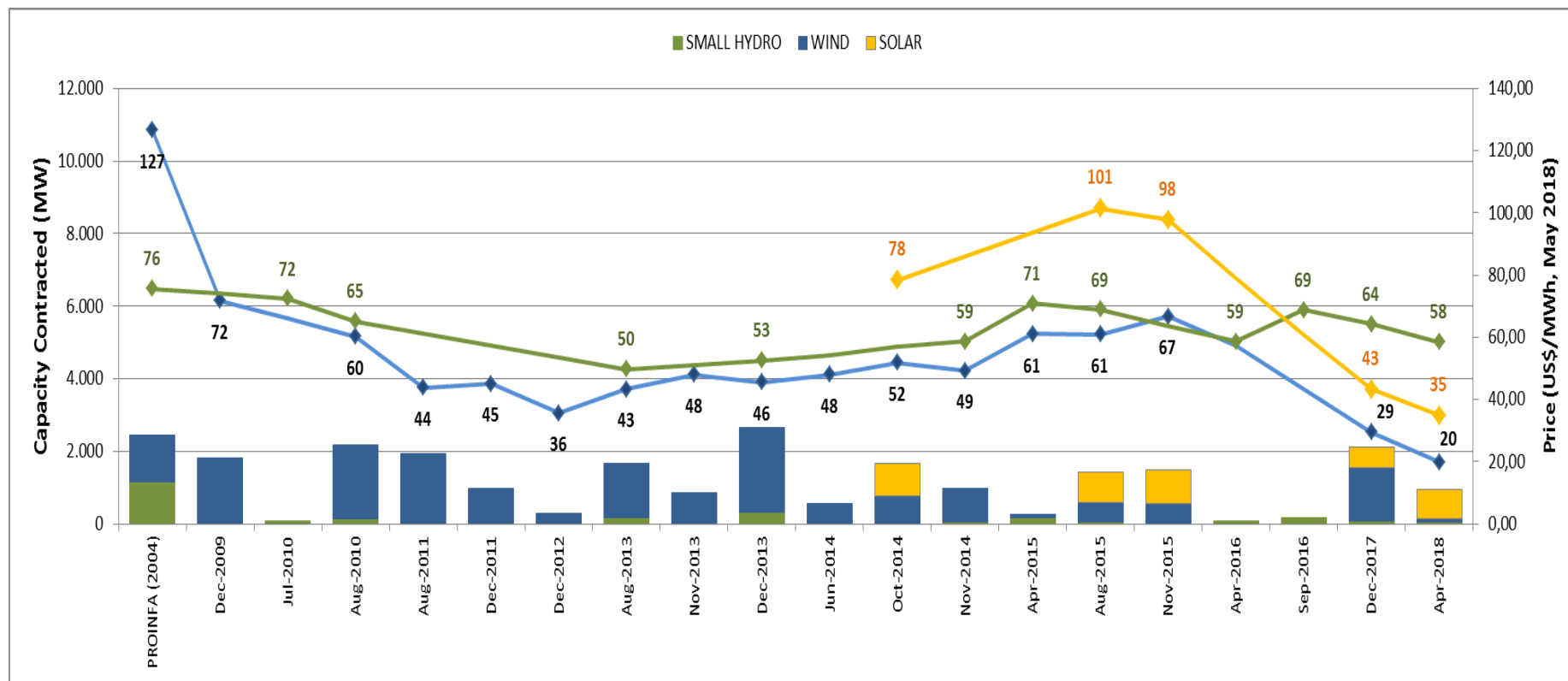
- Brazil has many energy resources and we have aimed to have a mixed matrix – it means you don't always buy the cheapest sources and you should adapt the auctions to have some demand met by different sources
- Consistent metrics to compare different energy sources is important if they are competing with each other
 - Adding attributes to the metrics of competition can be tricky and end up easy to manipulate according to subjective opinions

Lessons learned: cap price

- The cap price can be revealed before the auction or not. In Brazil, it's revealed before and it can attract or discourage participants in the auctions.
- The cap price is just a piece of the attractiveness of the auction:
 - Risk evaluation is a key issue: currency, grid connection, environmental permitting, regulatory environment, financing, resource availability, etc.
 - Risk allocation is everything: setting the risk-adjusted return level, product design, FX risk, etc.

Lessons learned

Regulated auctions prices: historical figures



R\$/US\$ 3,39

Lessons learned: grid access

- Grid connection has proven to be a big issue, especially in the Northeastern region where the best wind and solar resources are located
- At first, we used to plan and contract new transmission lines after the new capacity auctions, but delays have been common
- More recently, a new approach: transmission planned and contracted before the new capacity auctions and projects are qualified only if there's grid capacity
- This demands a transmission grid capacity evaluation, which can be a complex problem
- A new phase in the auction for competing for the available grid capacity

Lessons learned: Pitfalls



Cancelling auctions near to auction date:

- In 2016, Brazil decided to organize auction
- Canceled the procurement at the last-minute



Construction and non-completion rates:

- Delay rate = approx. 27%
- Non-completion rate = 10%



Generation and transmission mis-match:

Power plants completed before transmission lines **cost consumers approx. \$1 billion USD.**

More information about auctions

EPE Youtube Channel : The importance of qualification requirements for energy auctions



<https://www.youtube.com/watch?v=LUXK5c2Z3d0>

More information about auctions

- Report of Brazilian Electricity Auctions in 2017



Brazilian Electricity Auctions in 2017

Presenting the results and how they influence energy planning studies

In December 2017 the contracting of energy from new power generation plants in Brazil was resumed, with two auctions that took place under the guidelines of the Ministry of Mines and Energy (MME). On the 18th, the "A-4" auction was conducted, for supply to begin in January 2021, while on the 20th it was time for the "A-6" auction, for energy supply to begin in January 2023¹.

Such auctions are part of the electricity supply adequacy mechanisms in Brazil. They have the objective of supplying the regulated market, providing long term energy contracts for power generators, that must be backed by firm energy.

These two auctions were relevant because they have consolidated a couple of features that had been tested in previous years, such as a preliminary phase of competition for the available capacity in the transmission grid. At the same time, they were

MAIN GUIDELINES

Both auctions were scheduled by the MME on the 4th of August 2017, according to Ordinance 293/2017. Afterwards, Ordinance 390/2017 set the guidelines for the auction systematic. The objective of these auctions is to contract energy for meeting the demand declared by distribution utilities, responsible for supplying its captive consumers.

According to the set of guidelines by the MME, both auctions were held with technology-specific products and contracts.

In the "A-4", there were 4 distinct products, which are long-term contracts catered per technology : (i) windpower; (ii) solar PV; (iii) biomass-fired thermal; and (iv) small hydro (1 to 50 MW). Each technology competed exclusively within its own product, according to the previously allocated share of the total demand. In the "A-6", there were also 4

<http://epe.gov.br/sites-en/sala-de-imprensa/noticias/Documents/Report%20-%20Electricity%20Auctions%202017.pdf>

Thank you!

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