



Market Update: Solar Energy in Brazil

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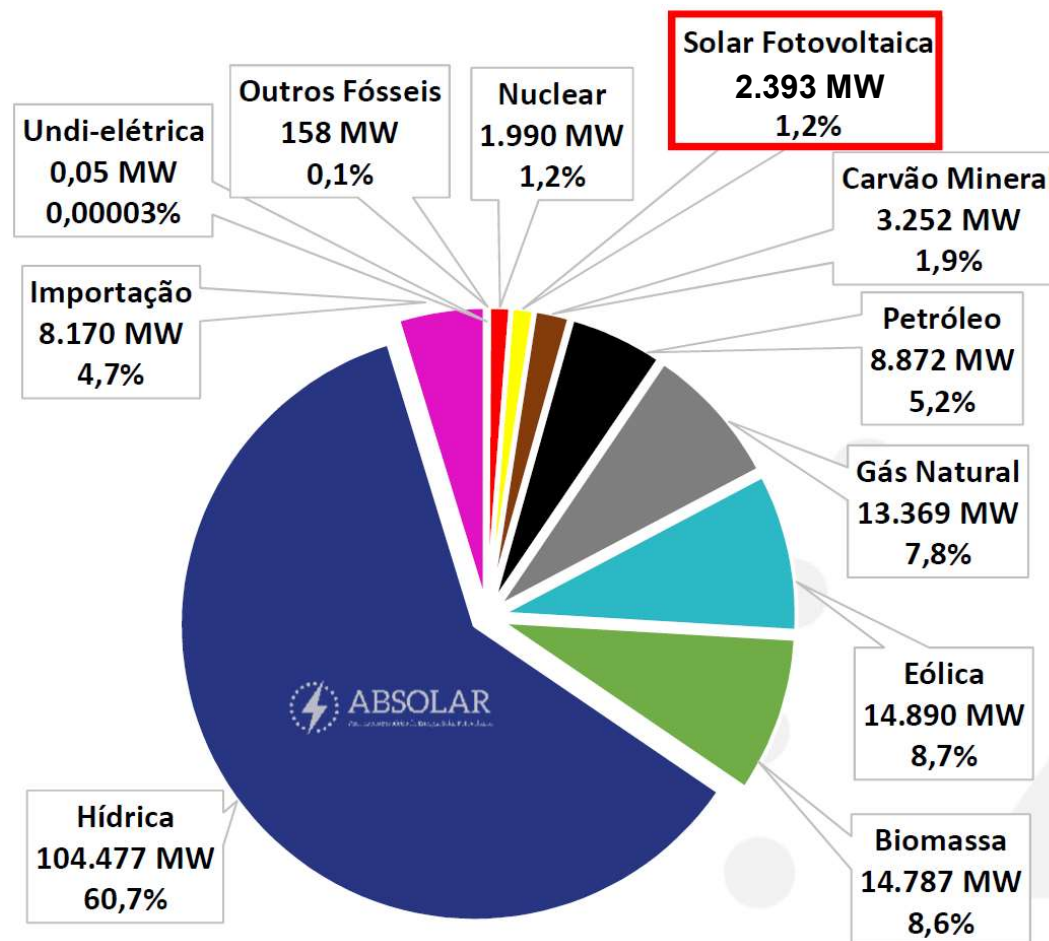


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1. **Brazilian Electricity Market Overview**
2. **Prospects of the New Energy Auction A-4, June 28th, 2019**
3. **Brazilian Private PPA's - Free Energy Market (ACL)**
4. **Distributed Generation in Brazil**
5. **SOLTEC is your reliable partner in Brazil**

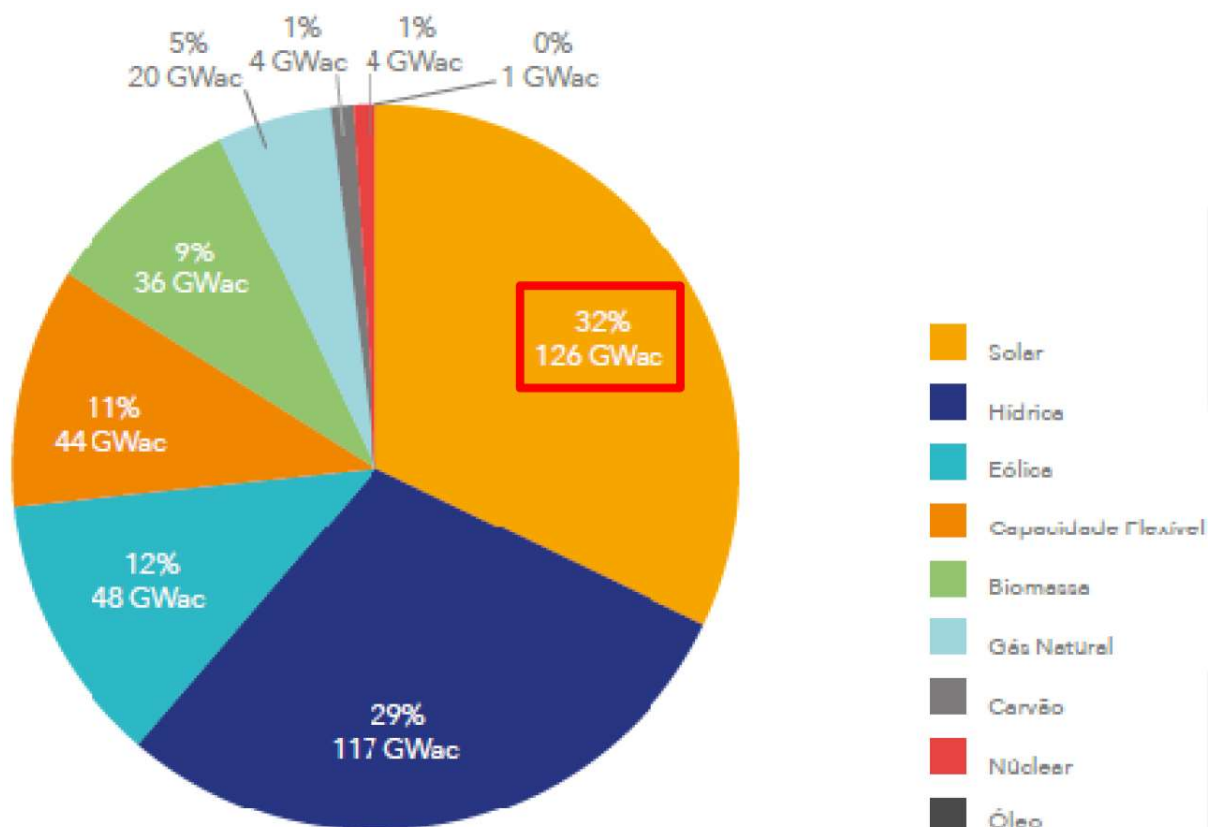
1. Brazilian Electricity Market Overview

Brazilian Electricity Matrix.
Electricity Power in Operation (MW)



1. Brazilian Electricity Market Overview

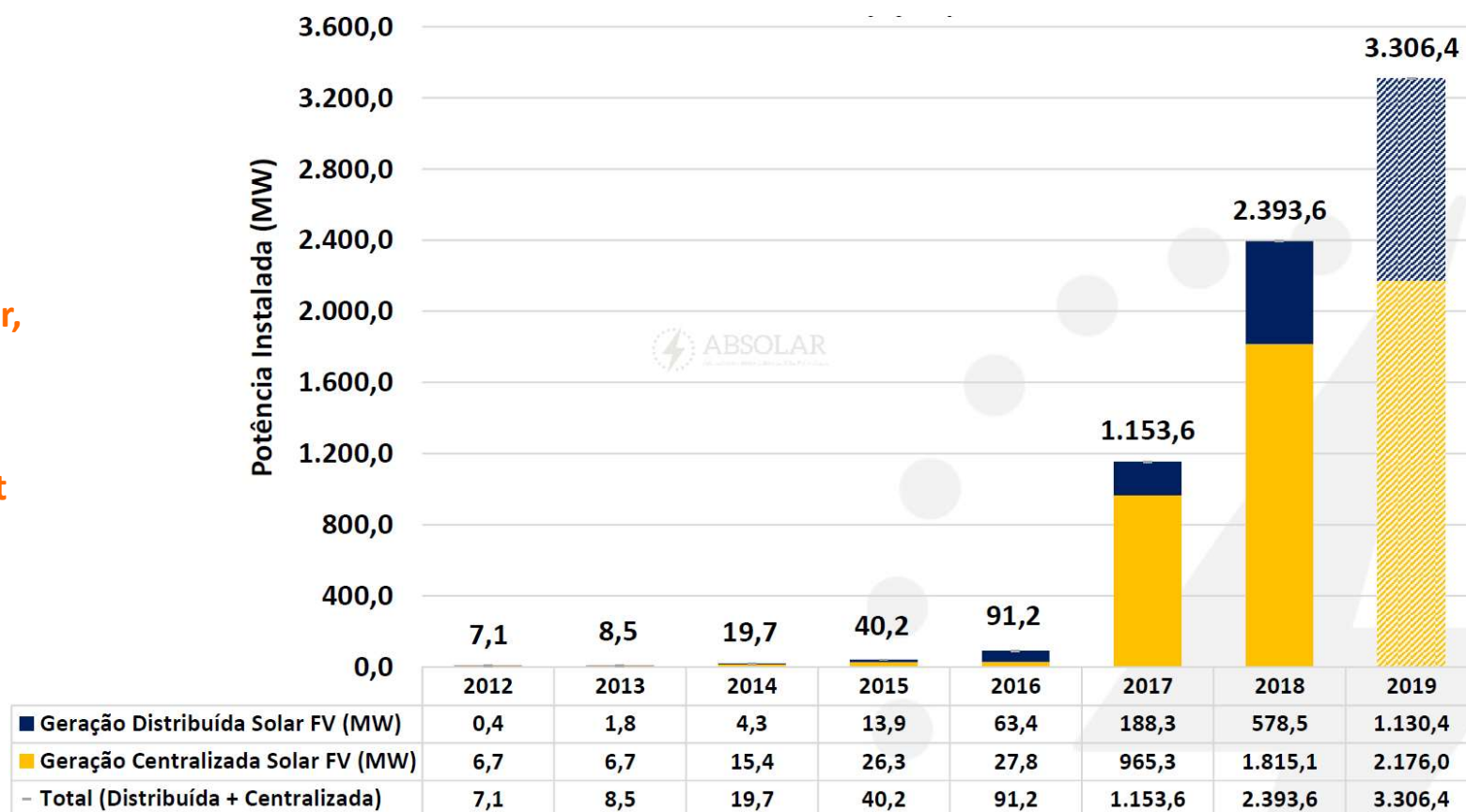
**BNEF's 2040 Forecast
for the Brazilian
electricity Matrix
(400GW)**



Source: BNEF 2016, adapted by CELA – Clean Energy Latin America

1. Brazilian Electricity Market Overview

**Photovoltaic
Installed Power,
Accumulated
(MW) in Brazil
+2019 Forecast**



Source: ANEEL/ABSOLAR 2019

2. Prospects of the New Energy Auction A-4, June 28th, 2019

DATE: 28/06/2019

COD: 01/01/2023

TOTAL POWER REGISTERED: 48 GW

**75% OF THE REGISTERED SOLAR POWER
HAS BEEN ENABLED: 19 GW**

**Bifacial modules are
responsible for 17% of
total registered solar
projects (+4 GW)**



Source:	Contract	Power(MW)	SHARE(%)
 Solar	20 YEARS	25.067	52%
 Wind	20 YEARS	22.125	46%
 Biomass Thermoelectric	20 YEARS	569	1,2%
 Hydroelectric	30 YEARS	288	0,6%

**Which is the expected
power to be awarded?**

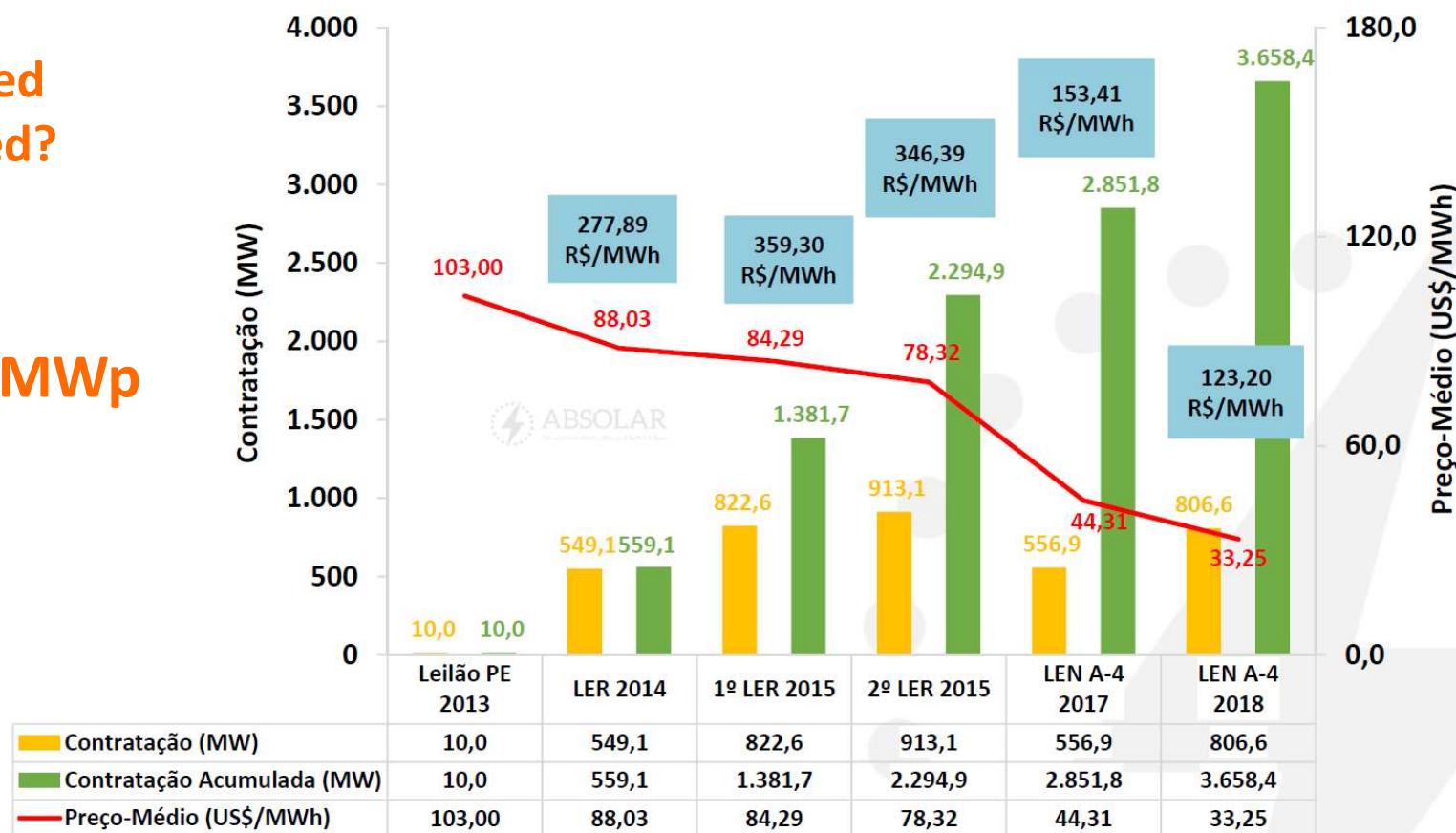
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2. Prospects of the New Energy Auction A-4, June 28th, 2019

Which is the expected power to be awarded?

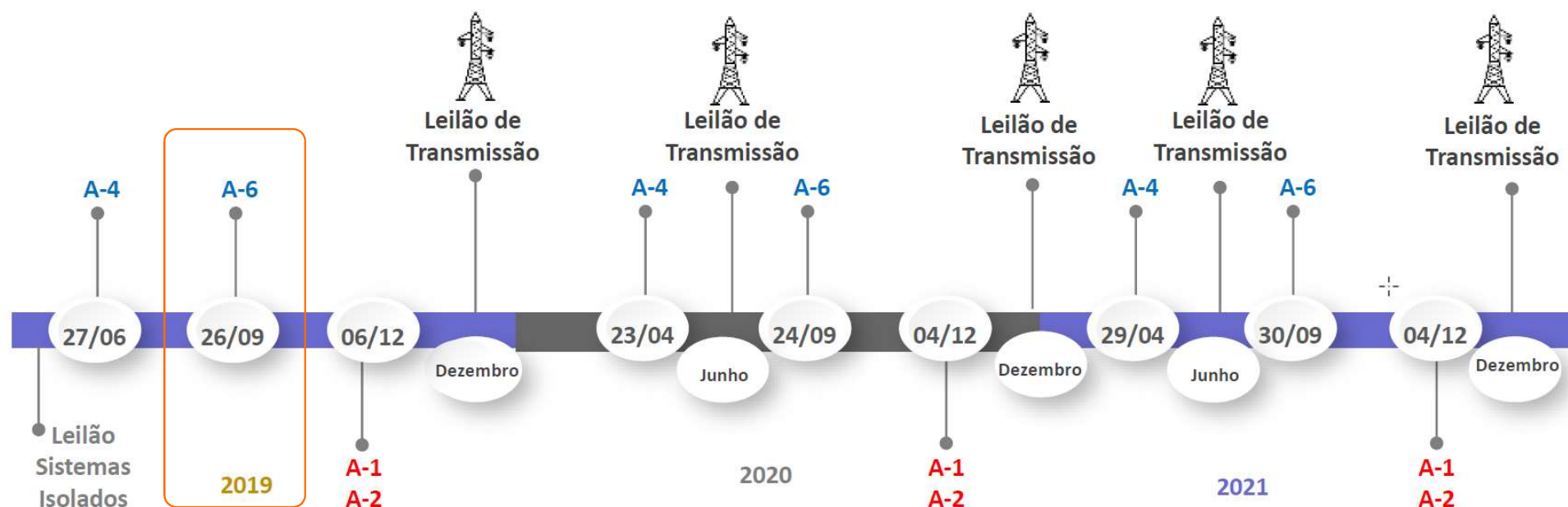
AWARDED < 500 MWp



Source: ANEEL/ABSOLAR 2019. USD price calculated according to the exchange rate on the day the auctions took place.
R\$/MWh values are corrected by the Brazilian CPI (IPCA).

2. Prospects of the New Energy Auction A-4, June 28th, 2019

Predictability: Generation and Transmission Public Auction Schedule



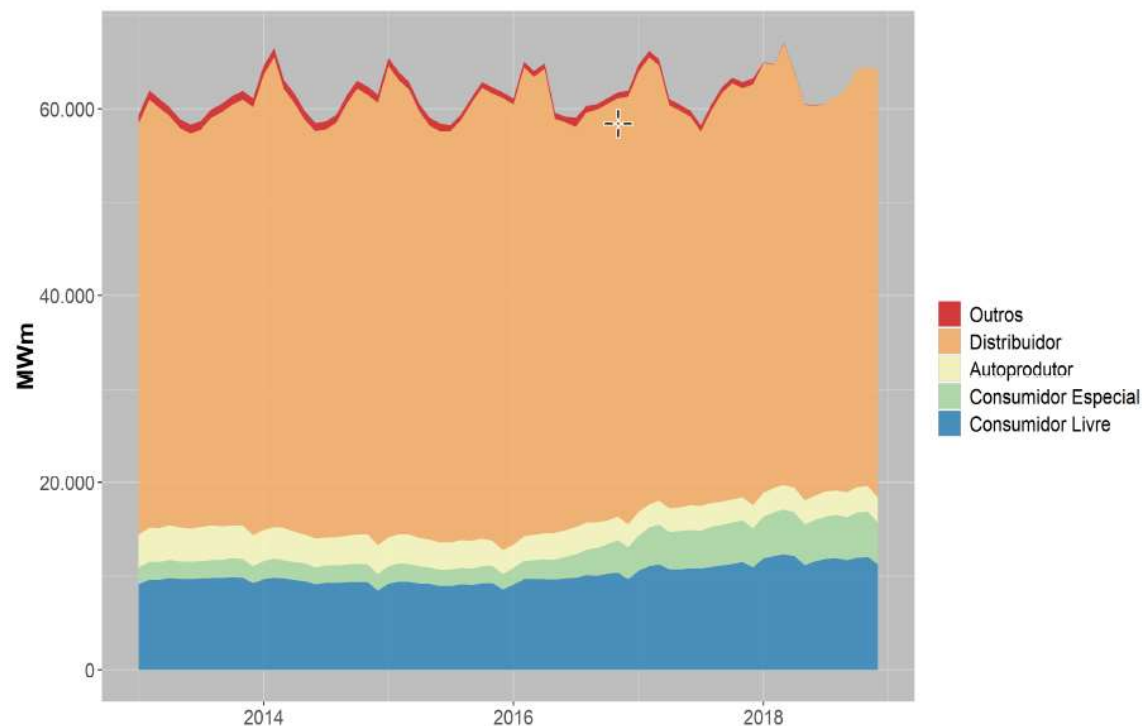
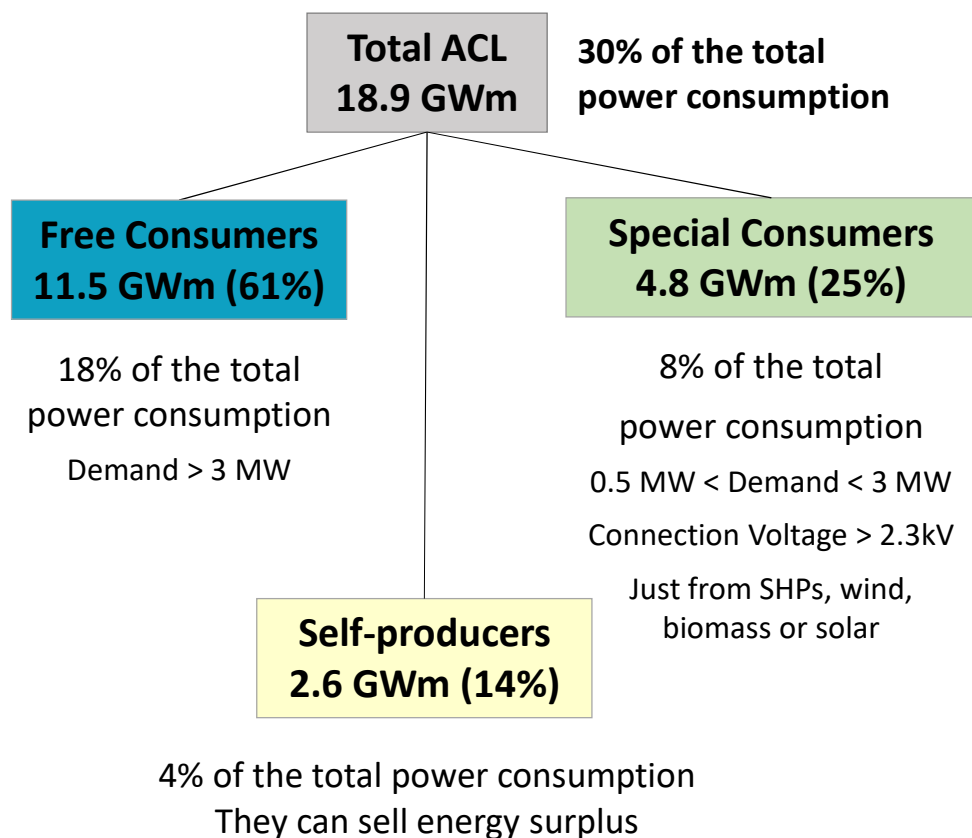
Solar will also take part in the A-6 New Energy Auction, on September 26th, 2019.

A-4/A-6 → New energy Auction

A-1/A-2 → Existing energy Auction

3. Brazilian Private PPA's – Free Energy Market (ACL)

Total Electrical Energy Consumption in Brazil 2018: 63 GWm



ACL ↑ 33% SINCE 2016

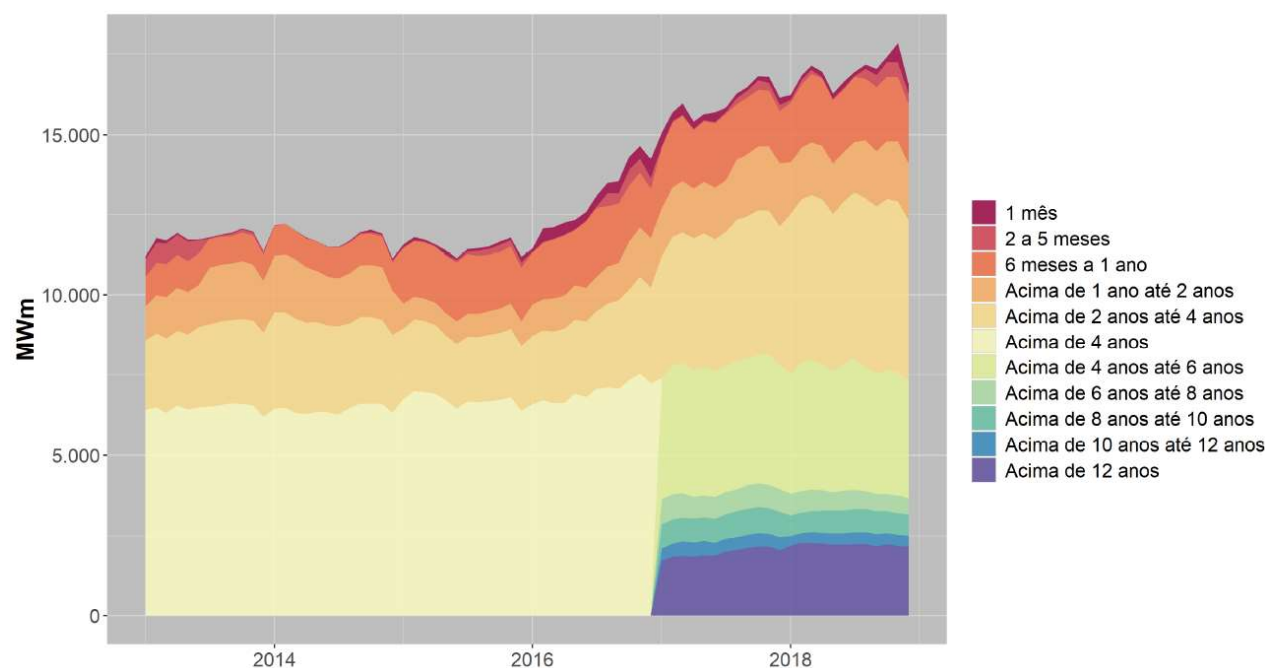
3. Brazilian Private PPA's – Free Energy Market (ACL)

Why PPA's already make sense in Brazil?

- More flexibility and better energy prices than Public Auctions.
- Reasonable Contract duration.



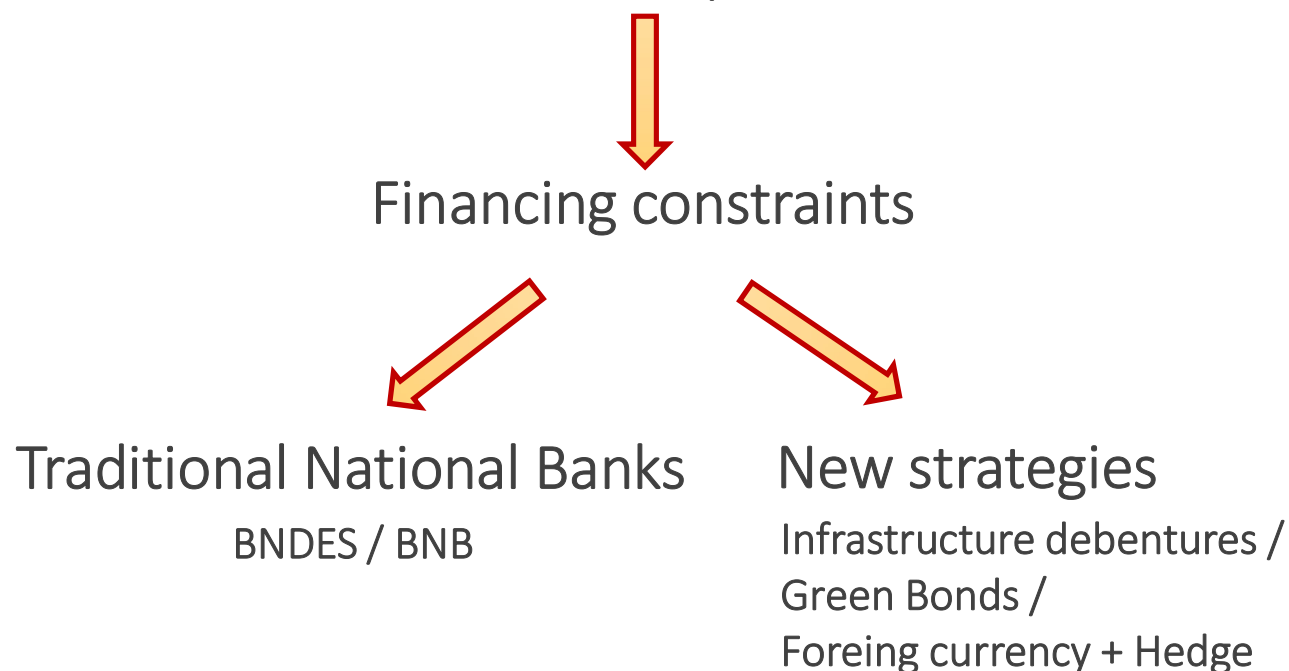
Currently, 20% of the Private PPA's have 8 years duration or more.



3. Brazilian Private PPA's – Free Energy Market (ACL)

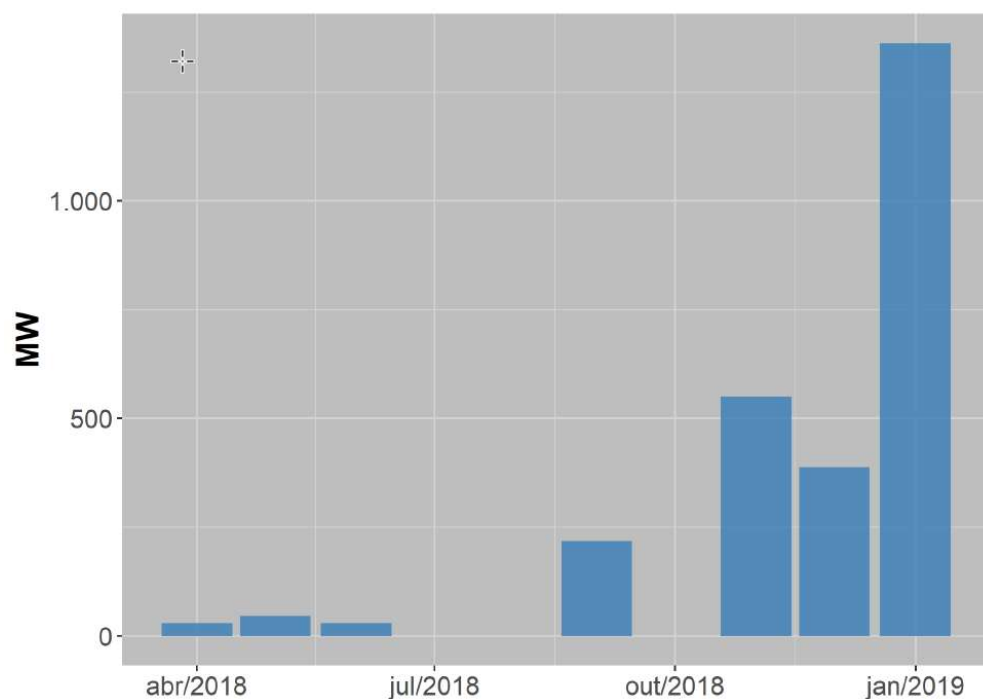
CONS

- More difficulties to get connection permits to the grid, compared to public auction projects.
- Private PPA's clients have more corporate risk.



3. Brazilian Private PPA's – Free Energy Market (ACL)

PV plants connection request for the ACL:



Currently, there are **more than 2.5 GW** of projects in the process to get ANEEL's (Brazilian Electricity Regulatory Agency) approval for the ACL.

3. Brazilian Private PPA's – Free Energy Market (ACL)

Brazilian private PPA's are already a reality:



The Brazilian Private Energy Group contracted 538.5 MW of solar and wind projects in 2 auctions celebrated in 2018.

Projects must be operating by January 2022.





With 20 years PPA duration and a higher price than last government public auction.



4. Distributed Generation in Brazil

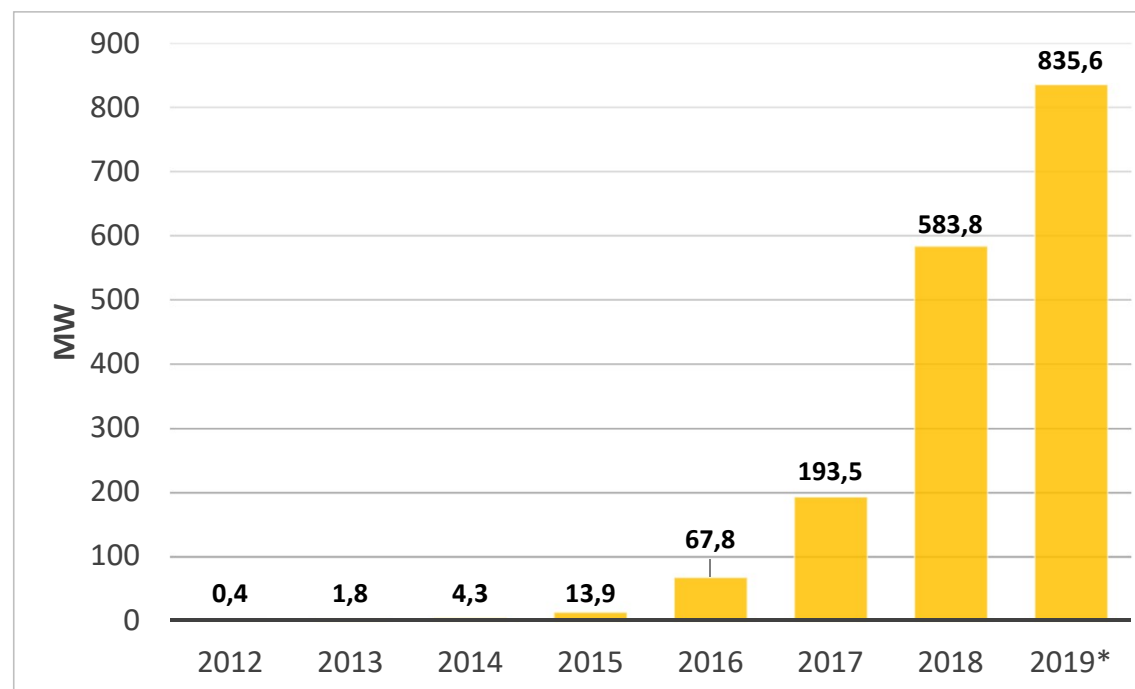
Overview

Micro (up to 75 kW) and mini generation systems (above 75 kW up to 5 MW) are deployed in residence, commerce, industries, rural properties and public buildings.

 835.6 MW Total installed photovoltaic power in distributed generation until June 4 th , 2019.	 99.6% Of all the micro and mini generation connections are for the solar photovoltaic source.
 71,701 systems Solar photovoltaic systems connected to grid	 26% Is the contribution of the PV distributed generation to the total solar power installed in Brazil, until May/19

4. Distributed Generation in Brazil

Market Evolution – DG PV Solar Power already connected to the mains



Solar PV represents 85% of the total Brazilian DG Market

Source: ANEEL, until June 4th, 2019

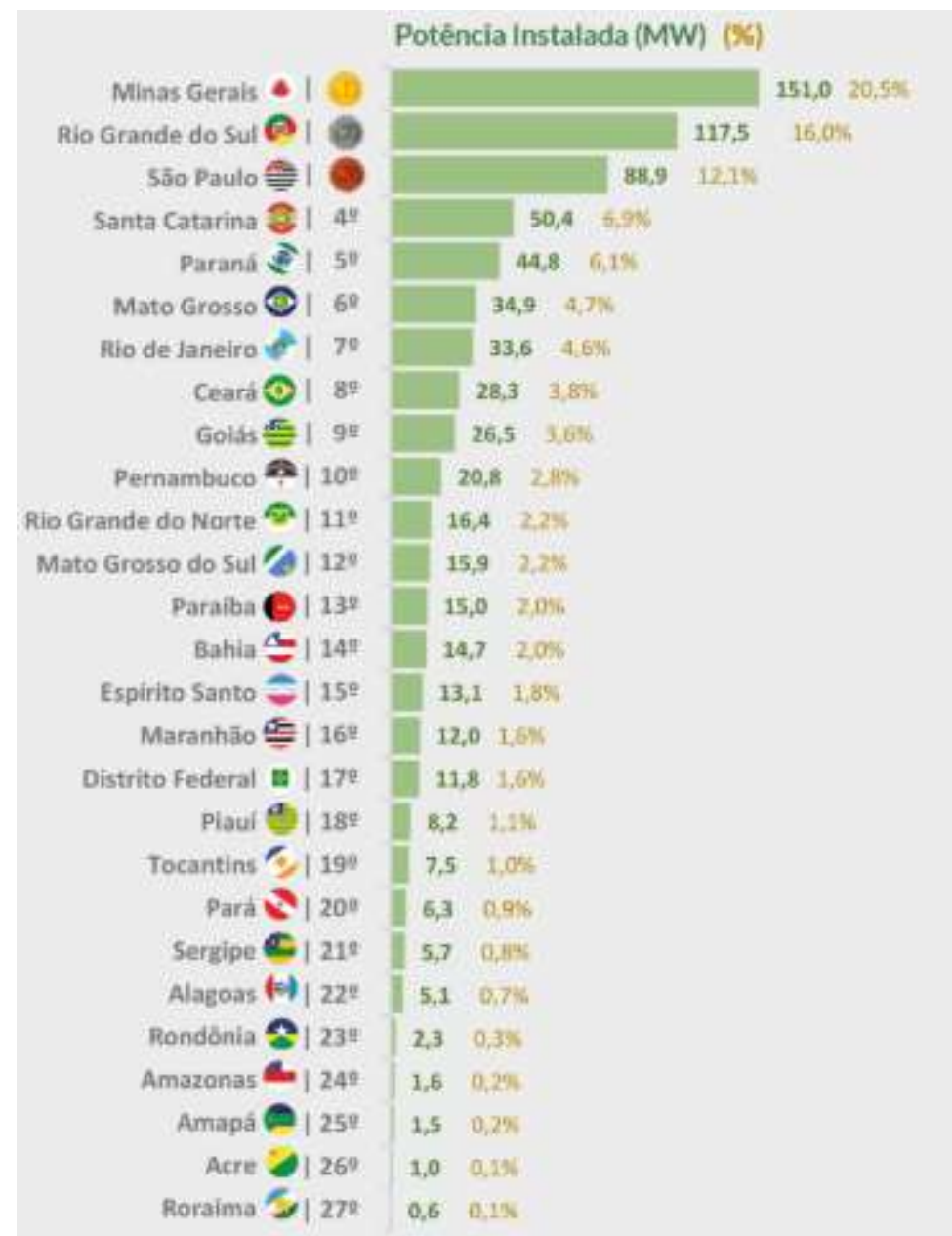
4. Distributed Generation in Brazil

What makes a state to be competitive in DG?

- Having an excellent solar resource
- High electricity price
- Favorable state legislation
- Access to affordable financing
- Energy compensation in all the state territory

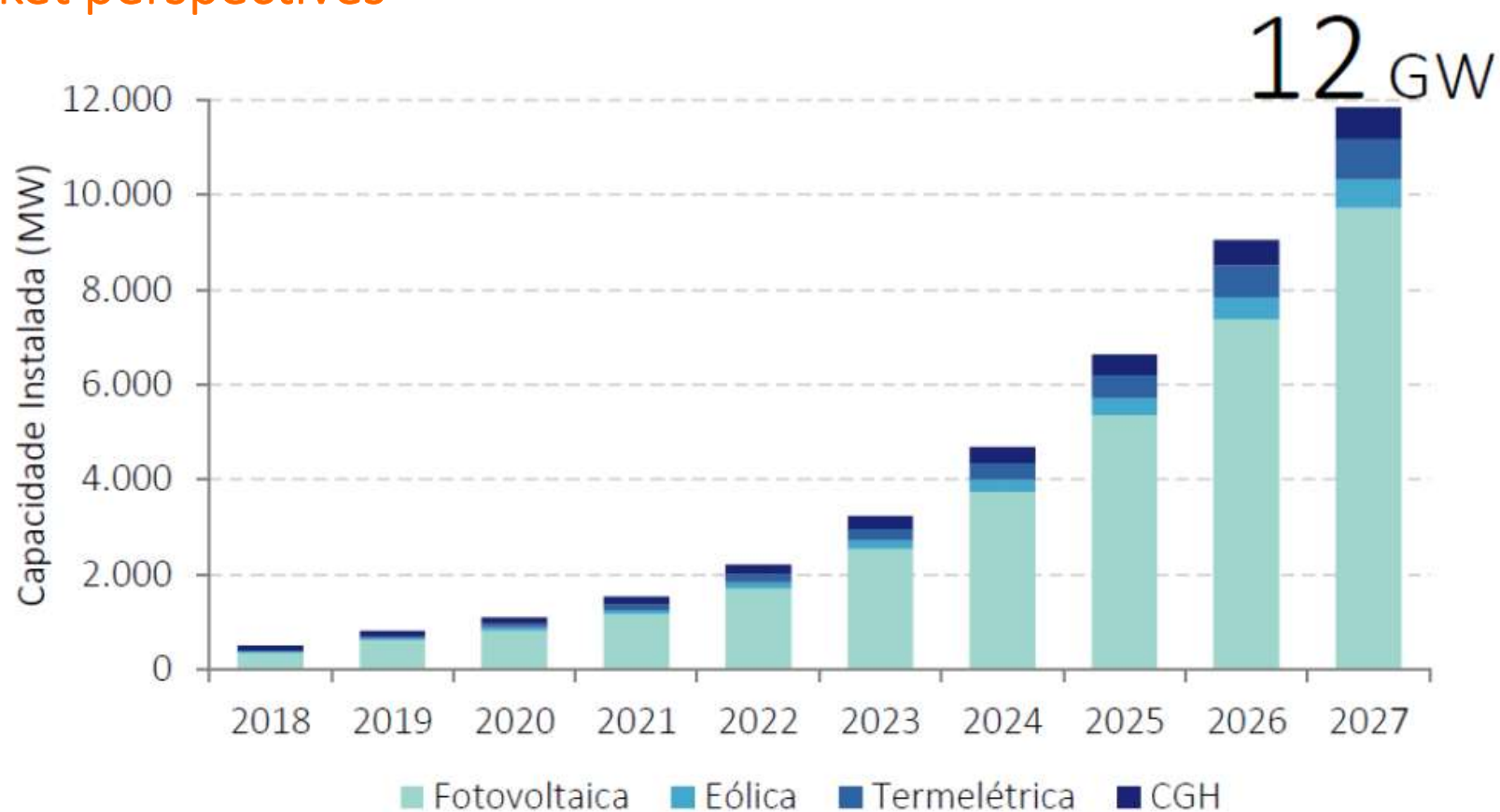
What are the uncertainties DG is facing?

- Open discussion on the RN 482 legislation
- Tarifa Binômia



4. Distributed Generation in Brazil

Market perspectives



Source: PDE 2027. Ministry of Mines and Energy

5. Soltec your reliable partner in Brazil

In Brazil since 2014

1.5 GW

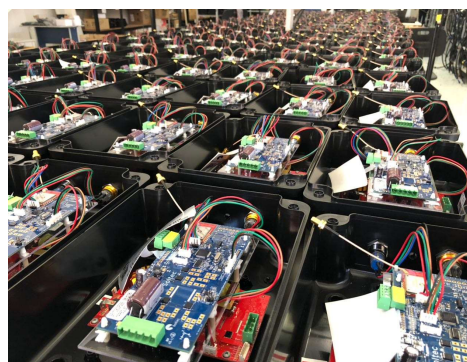
**Manufacturing
Capacity /Year**

+ than 250 people

- Project Management
- Tracker Assembly
- International and national logistics
- Engineering
- International and national supply chain
- O&M etc

Our Factory is located in a strategic place:

Lauro de Freitas,
10 km from the Salvador Airport.



5. Soltec your reliable partner in Brazil

**SOLTEC - Tracker
Manufacturer leader in Brazil**

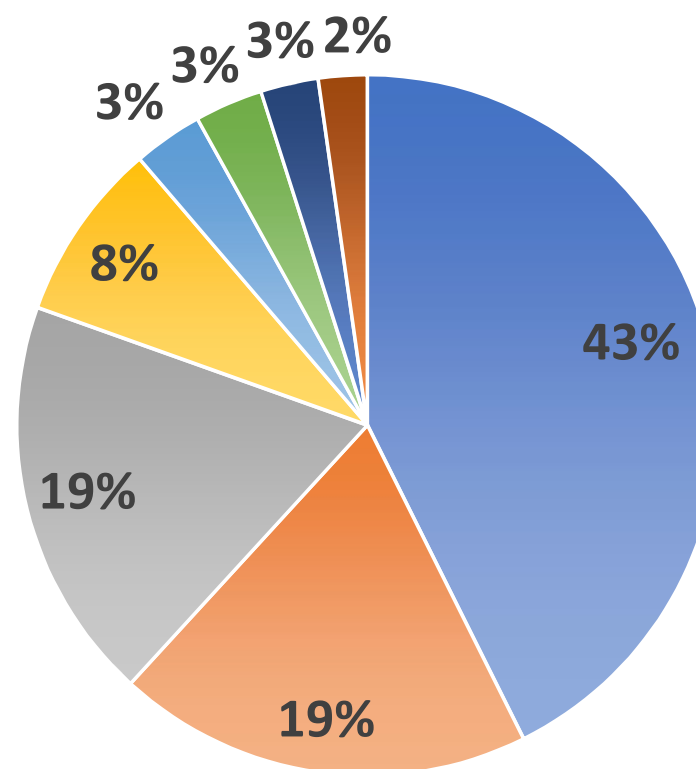
#1 place

1.592 GWp

43% Market Share

Accumulated volumes up to 2018

Source: Greener Strategy Study Utility Scale -
Brazilian PV Market 2019



5. Soltec your reliable partner in Brazil



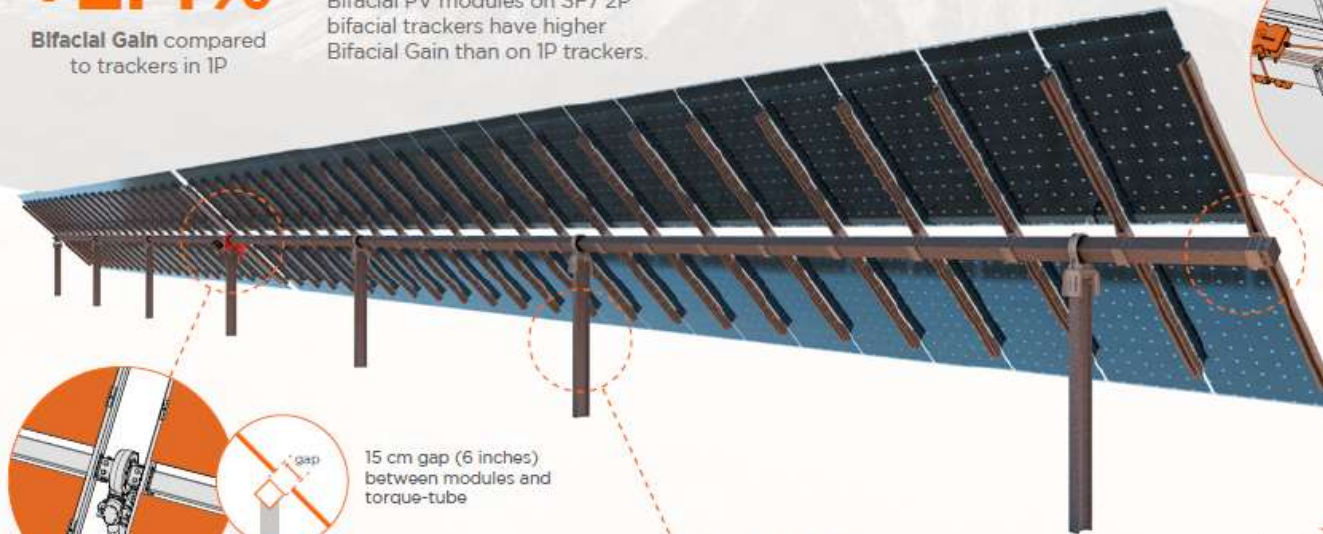
The SF7 standard configuration enables cost-effective installation, operation, and innovation such as the bifacial tracking solution. The BiTEC data indicates that individual bifacial modules on SF7 Bifacial Solar Tracker achieve **+19.2%** Bifacial Gain under high albedos.

+2.4%

Bifacial Gain compared to trackers in 1P

Higher output

Bifacial PV modules on SF7 2P bifacial trackers have higher Bifacial Gain than on 1P trackers.



15 cm gap (6 inches) between modules and torque-tube

No Shading

2P module mounting: no backside shading from torque tube.



Only 7 piles every 90 modules

46% fewer piles per MW than 1P trackers, and no dampers, the SF7 minimizes the number of objects shading the rear side of the panels.

+19%

Bifacial Gain under high albedo compared to monofacial trackers

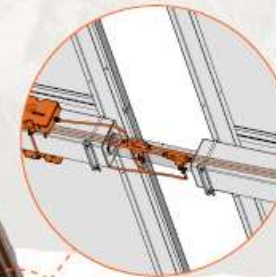
+12%

Bifacial Gain under medium albedo compared to monofacial trackers



3rd party independent engineering B&V data-validation letter available upon request.

Bifacial Tracker Evaluation Center (BiTEC) real data



No hanging wires

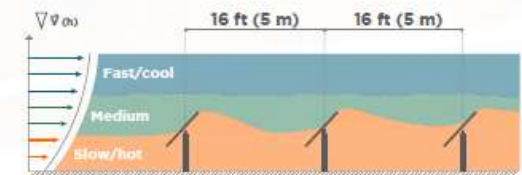
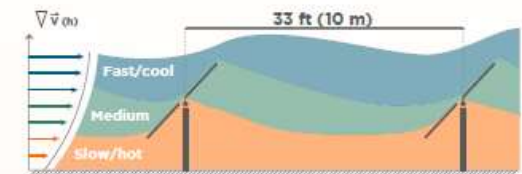
Manages DC cable through torque-tube with no shading interference over the back-side of the panels.

- ✓ **83%** Total wire reduction
- ✓ **75%** Installation labor reduction

Cooler Modules

Tracker design improves airflow. Modules operate at lower temperatures than regular 1P trackers, resulting in higher module energy output.

2P Vs 1P tracker Cooling



Taller Tracker

Higher modules position increase diffuse and reflected irradiance. Panels operate at lower temperatures, leading to higher module power output.



THANKS FOR YOUR ATTENTION!

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