STRATEGIC STUDY

UTILITY SCALE PV MARKET 2020 BRAZIL

FREE MARKET AND PUBLIC AUCTIONS

Executive Summary

Greener

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Enabling investments in the Brazilian Solar PV sector.

Transaction of assets

Advisory services for investments in **PV Assets**, and risk mitigation through our **Due Diligence** services.

PV plant development

Advisory and consulting for **all stages of PV plant development** for both Distributed Generation and Centralized Generation, in order to improve efficiency of the whole process and to mitigate possible financial and operational risks.

Market Intelligence

Personalized market research, meeting the needs of manufacturers, distributors, and **Business Intelligence platforms** to monitor the market continuously and advise about (regulatory) changes ahead.

Highlights

- **ANEEL AUCTIONS (ACR)** : Out of 4.4GW of Solar PV projects contracted up to 2019, 2.5GW are already in operation. 416MW are under construction and 1.4GW have not started construction yet.
- **Investments (ACR)** : R$10.6 Billion of investment required for PV projects up to 2019. A further **R$9.5Billion** should be invested until 2025, not including future investments through auctions.
- **Technology** : Bifacial modules are rapidly increasing market share in Brazil. 70% of the modules selected in the winning bids for the A-4/2017 auction are bifacials.
- **Free Market (ACL)** : 7.3GW of solar projects are in advanced stages of development, 53% of this volume is located in the Southeast and Center-West regions.
- **Financing (ACR)** : More than 50% of solar ventures in operation or under construction had access to special financing instruments offered by Brazilian development banks, especially BNB.
- **Bankability (ACL):** Less than 20% of the amount of energy contracted through the Free Market from various sources has a duration above 6 years, creating a bankability challenge for such projects.

ACR: Regulated Contracting Enviroment ; ACL: Free Contracting Enviroment

Contents

Introduction

This Report aims to show an overview of the Brazilian PV market for large scale solar projects, both in the Free Market (ACL) and the Regulated Market (ACR – meaning those projects that won government auctions).

This paper also creates references for current and future PV projects related to Brazilian market dynamics and the principal variables that affect their financial attractiveness.

In this Report we cover:

Status of PV projects

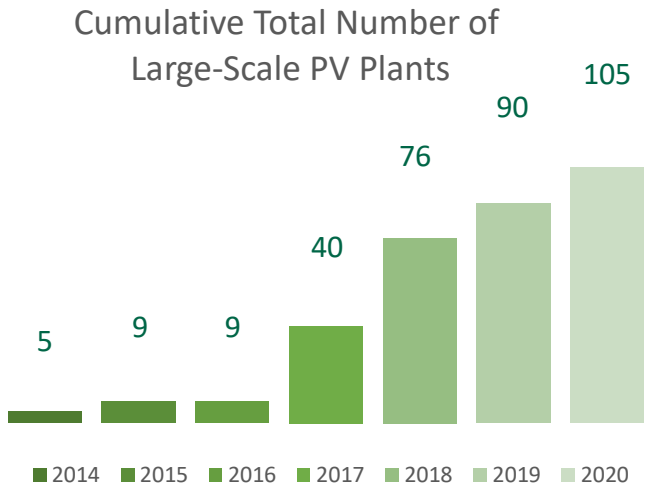
Profile of the projects

Rankings of suppliers: Modules, Inverters, Tracking, financing and EPC

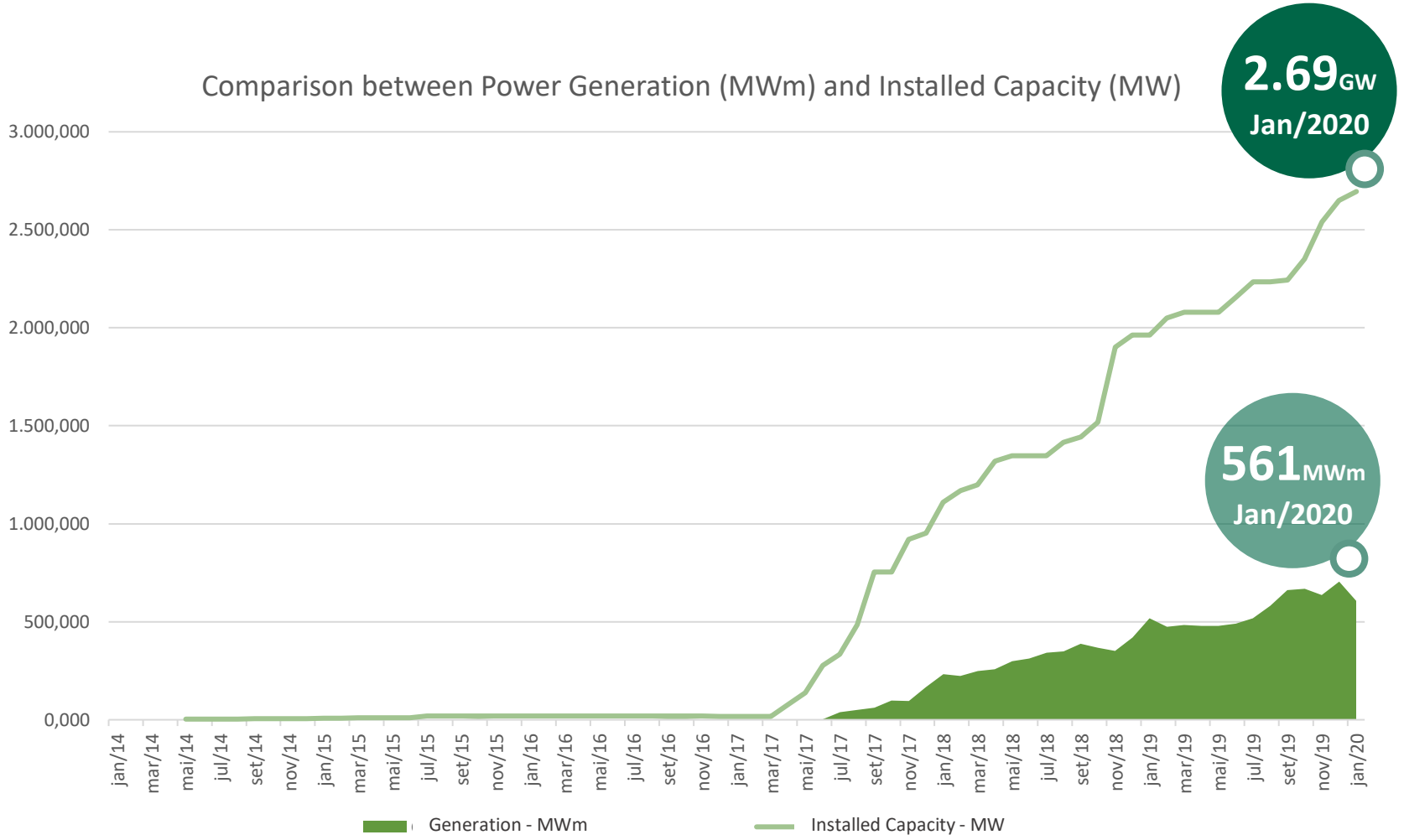
Risk Modeling

Overview: Large-Scale PV Plants in Operation

History of PV Power Generation



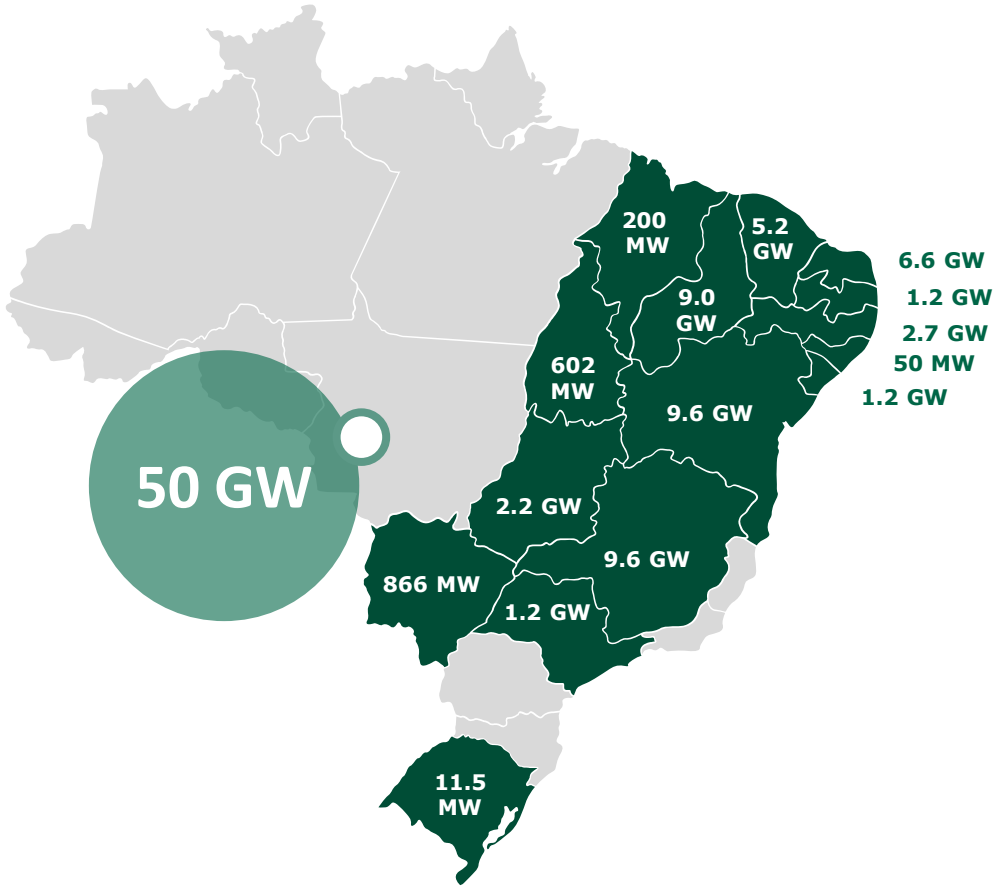
Last year, the solar PV production level reached 561 MWm in the center of gravity. 92% of this amount was commissioned under the ACR regime (auctions).



Dados: CCEE Jan/2020

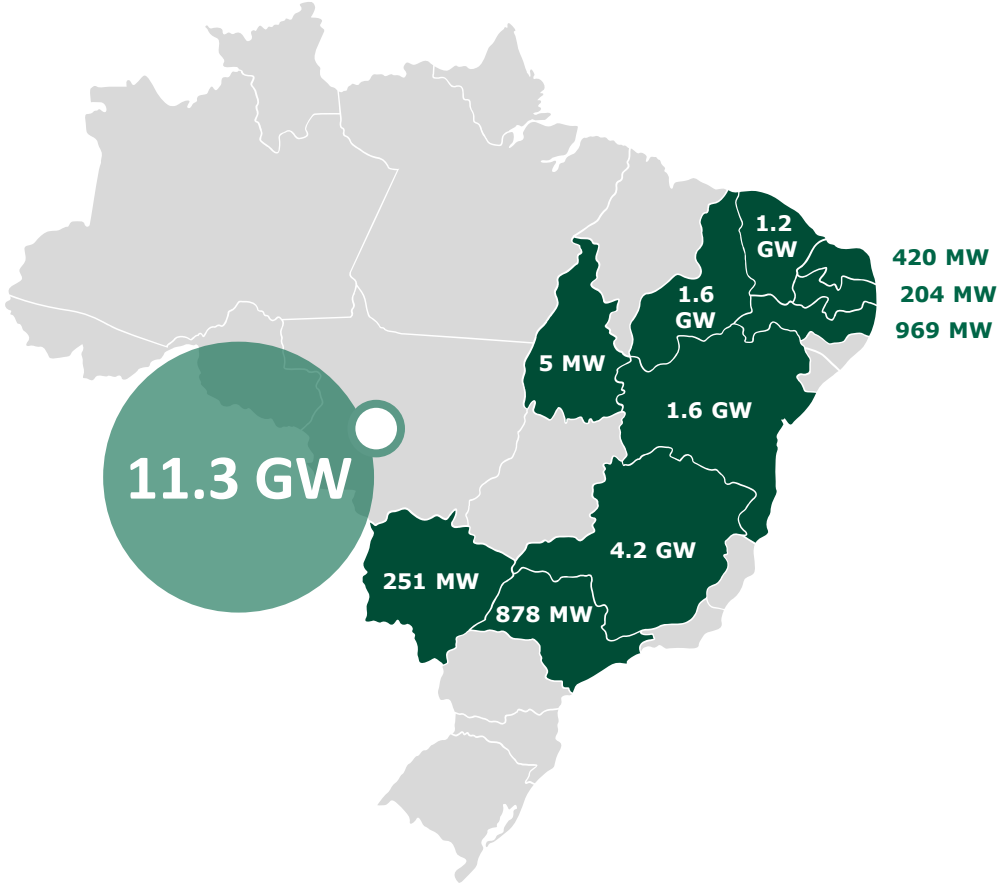
Overview: Status of Solar PV Projects

Projects with grant applications (DRO) in progress or already granted.



Capacity of PV Projects with DRO (authorization approval) pending

Considers PV Projects in Brazil with DRO ("Despacho de Requerimento de Outorga") pending.



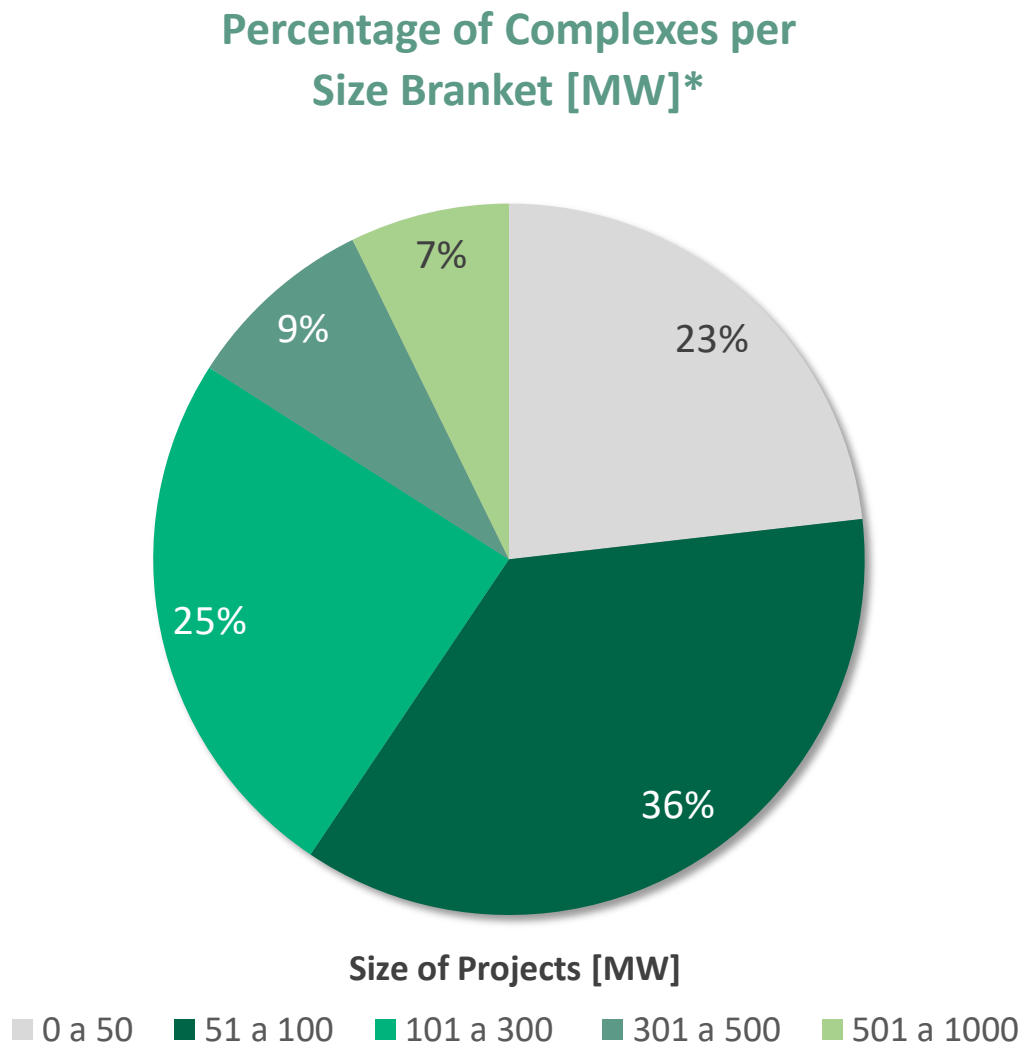
Capacity of PV Projects with DRO granted

Considers PV Projects in Brazil that have already been approved and are in operation or expected to become operational in the next 3 years.

Source: ANEEL, Greener. Updated: 03/2020.

Overview: Size of Large-Scale PV Complexes

Free Market and Regulated Market



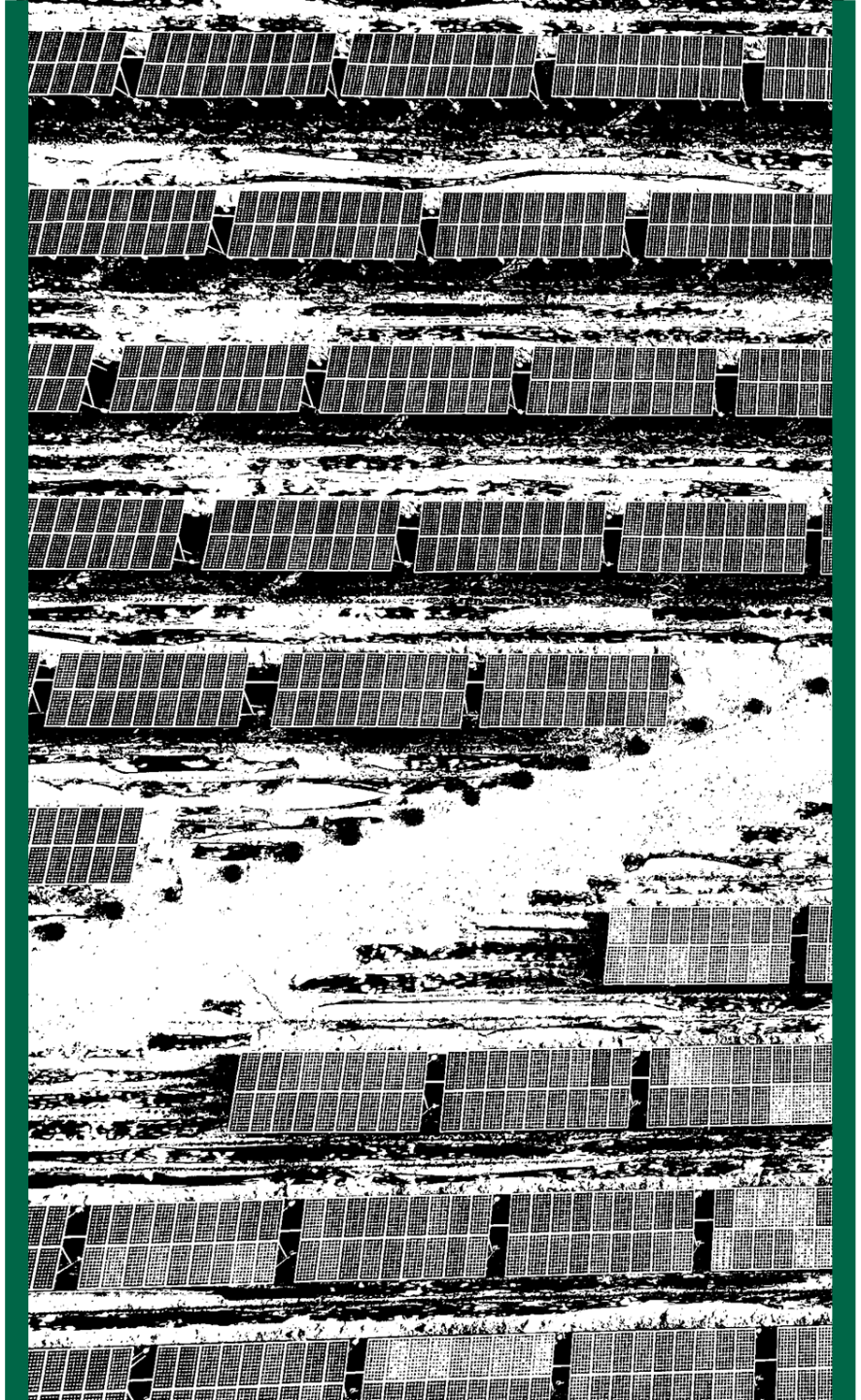
A Solar PV Complex takes into consideration a cluster of PV plants that use the same grid connection point and connection infrastructure, taking into consideration all the different SPV's.

Over 50% of authorized solar PV complexes in the Free or Regulated markets are between 50 and 300 MW in size.
The development of such larger complexes may add complexity to the project, however also creates scale/efficiency benefits related to the development costs, both in construction and ongoing operations.

Source: ANEEL, CCEE, Greener. Updated: 03/2020.

*All projects with authorized project proposals were taken into account, both operational and under construction, in the Free and Regulated Markets.

ANEEL Auctions



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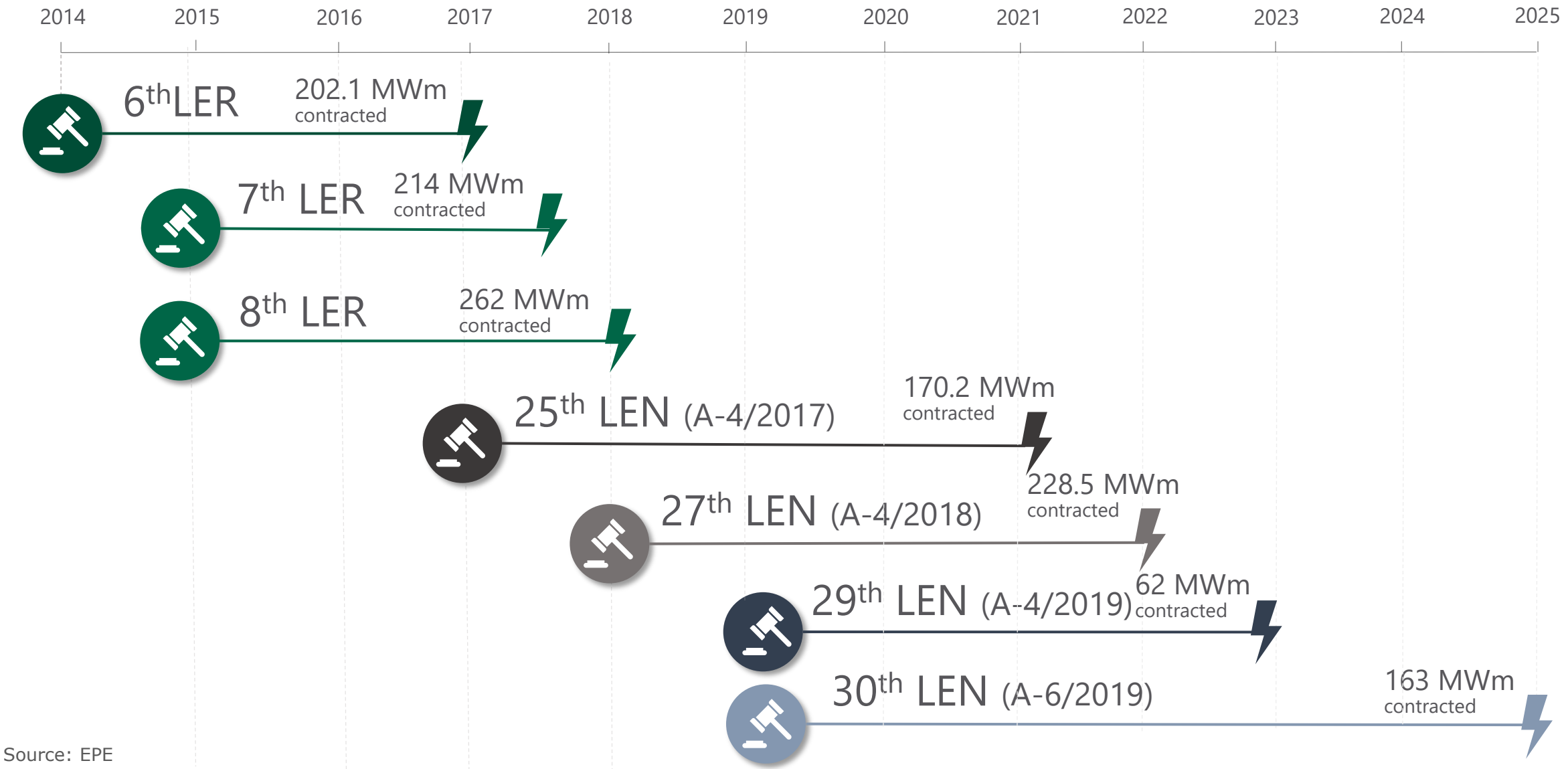
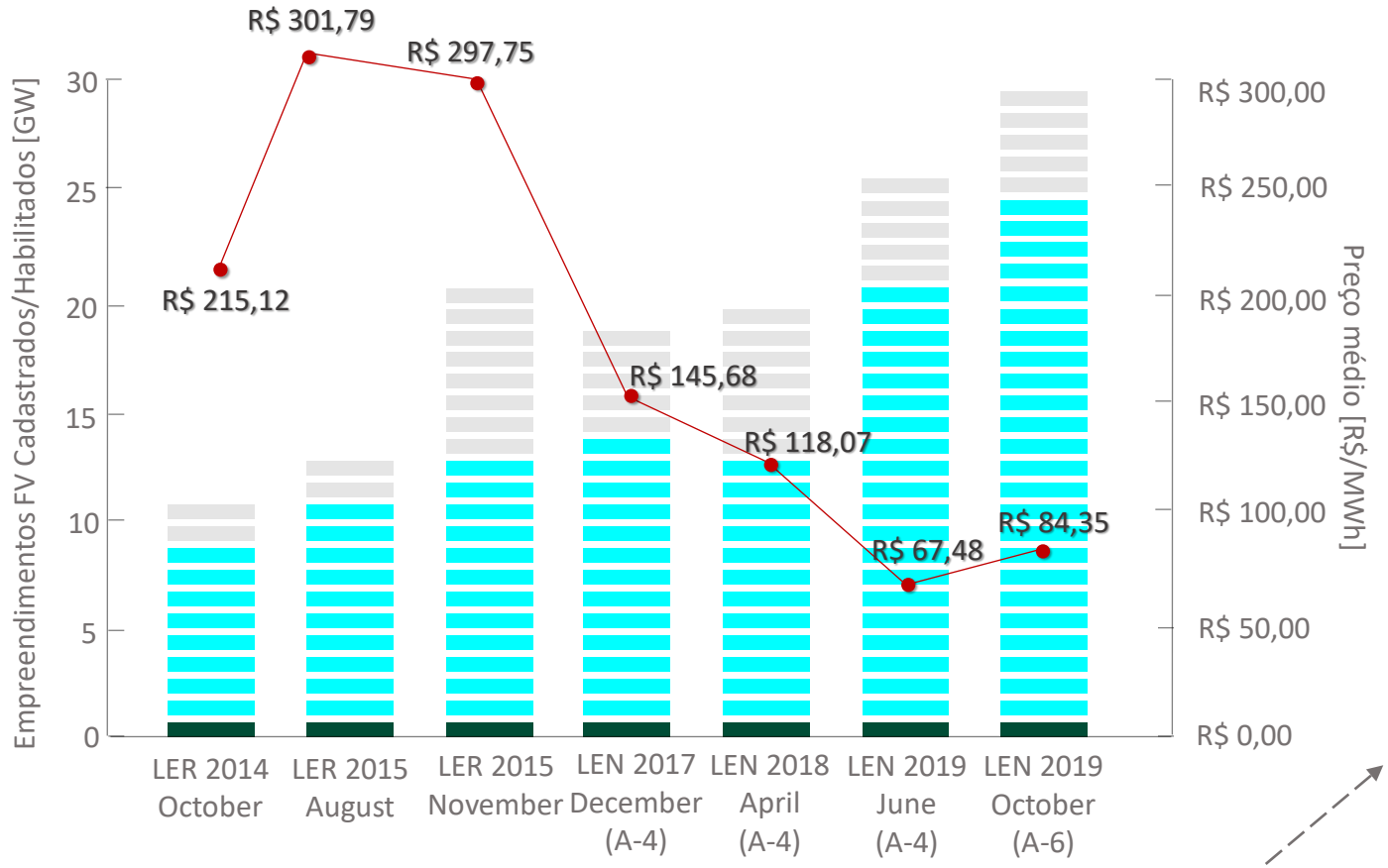
Solar Energy in Brazil's Energy Auctions



Source: EPE

Summary of Auction Results

Competition at auctions



Volume of projects that were **registered but not eligible**

Volume of **eligible projects that were not selected**

Volume of projects that were **de facto contracted**

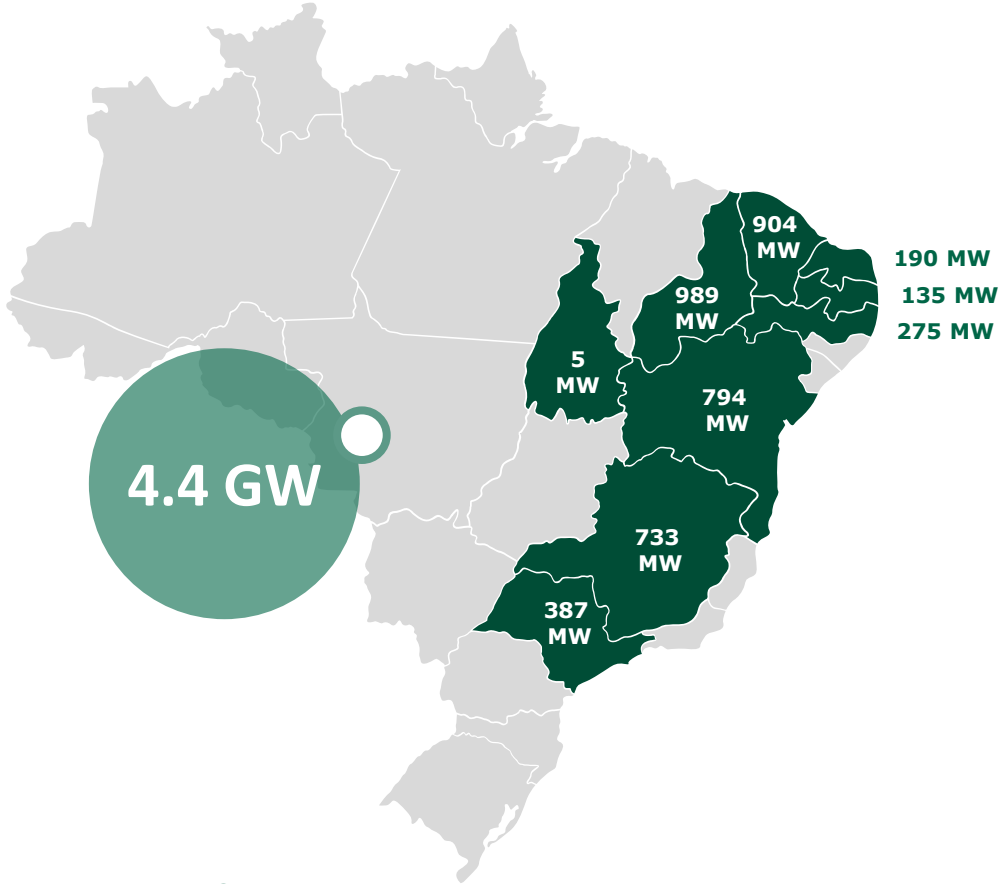
Source: EPE

The government autions achieved record (low) prices in 2019, due to a low volume to be contracted and high level of competition: there was also a record in total registered and eligible project volumes (29.8 GW and 24.6 GW in the A-6 auction).

Auction	Capacity of the contracted projects (MW)
A-3 2014	744.9
A-2 2015	833.8
A-3 2015	929.3
A-4 2017	574.0
A-4 2018	806.4
A-4 2019	203.7
A-6 2019	530.0

Projects Contracted via Auctions

Winning Projects through auctions.



Capacity of Projects in Regulated Market per State

Considers authorized PV Power Plants, either in operation, under construction or possessing required permits before construction

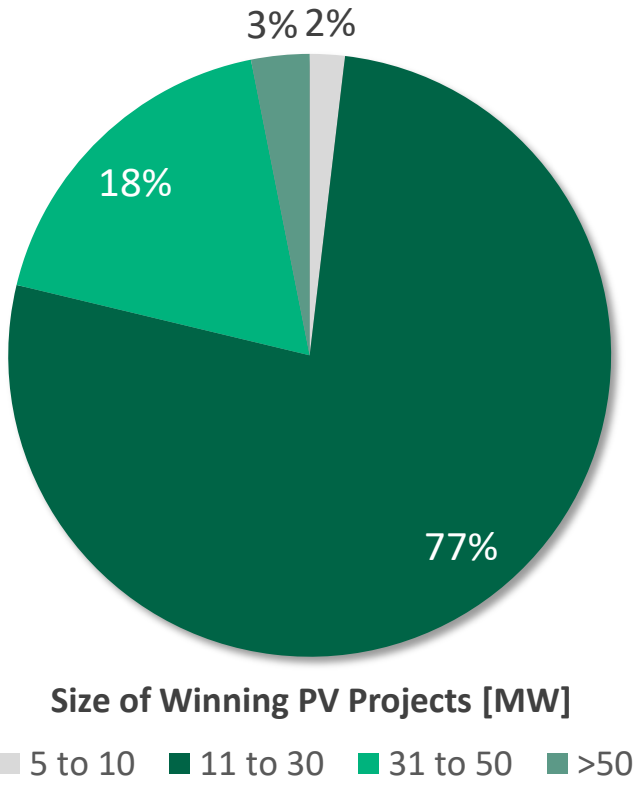
62%

Of these projects are already operational.

75%

Located in the Northeast region of Brazil, with Piauí being the State with highest contracted PV capacity (989 MW).

Percentage of Projects per Size Category [MW]*

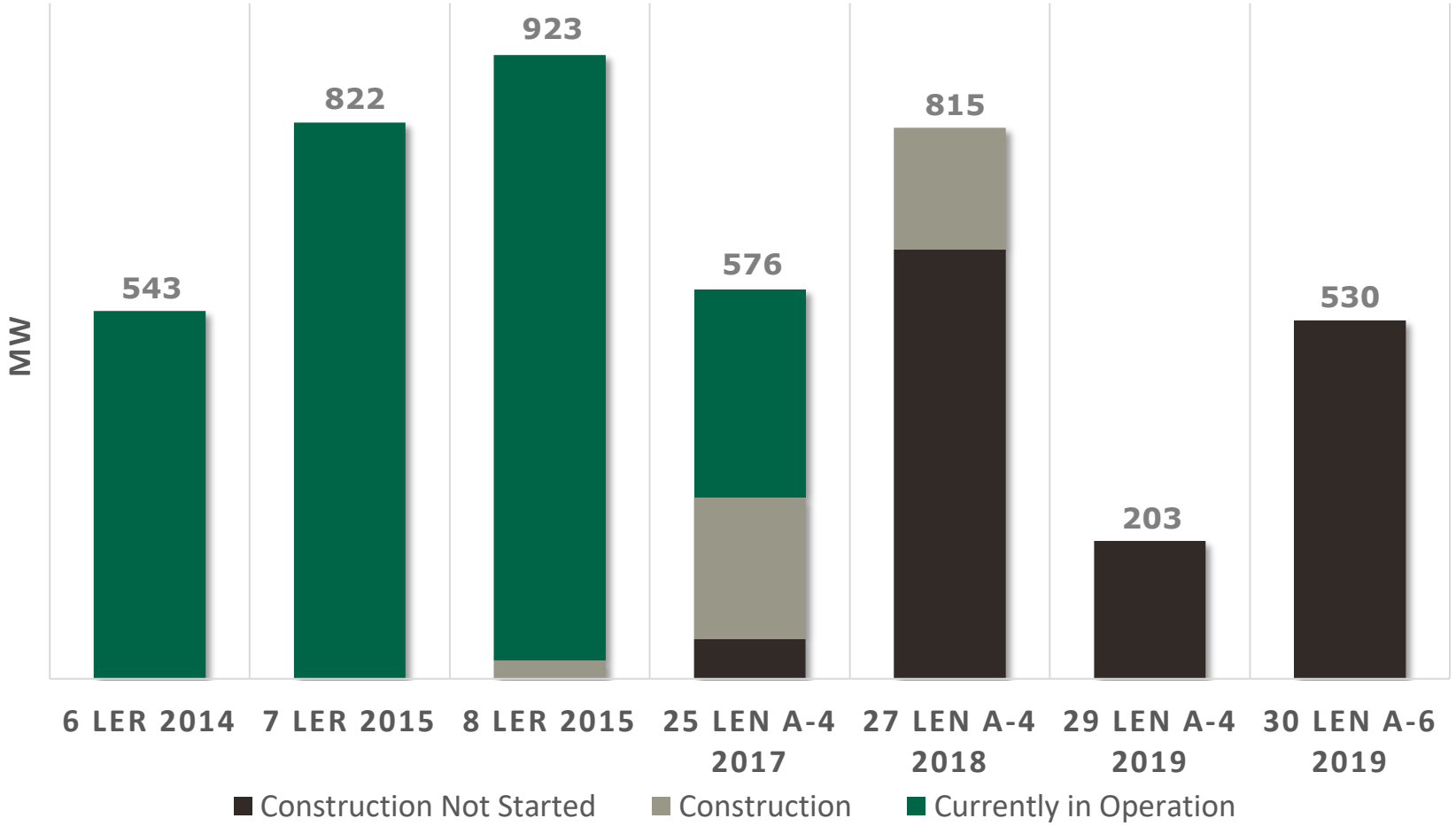


Source: ANEEL, CCEE, Greener. Updated: 03/2020.

*Considers the power of each SPE and not the total power of the PV project.

Status of Winning Projects

Auction-winning Projects.



2.57GW
Currently In Operation

416MW
Construction Phase

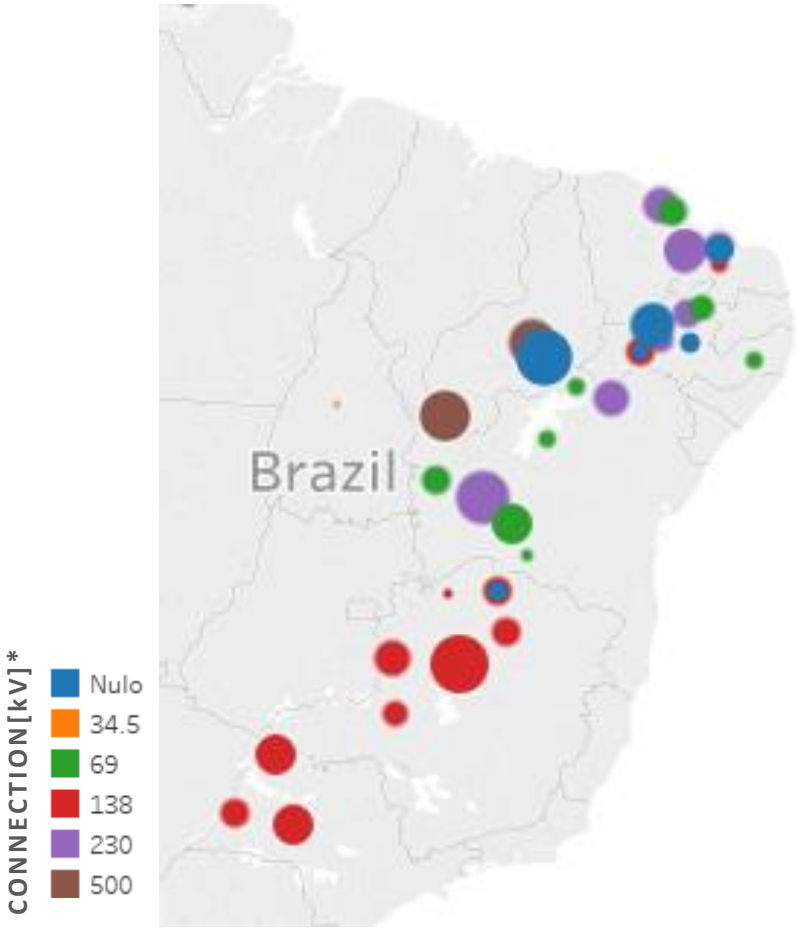
1.4GW
Construction Not Started

The overview of PV Power Plants does not consider those projects which had their permits revoked or which were subsequently deselected..

Source: ANEEL, CCEE, Greener. Updated: 03/2020.

Connection to the Grid

Solar PV Projects that won ANEEL Auctions.

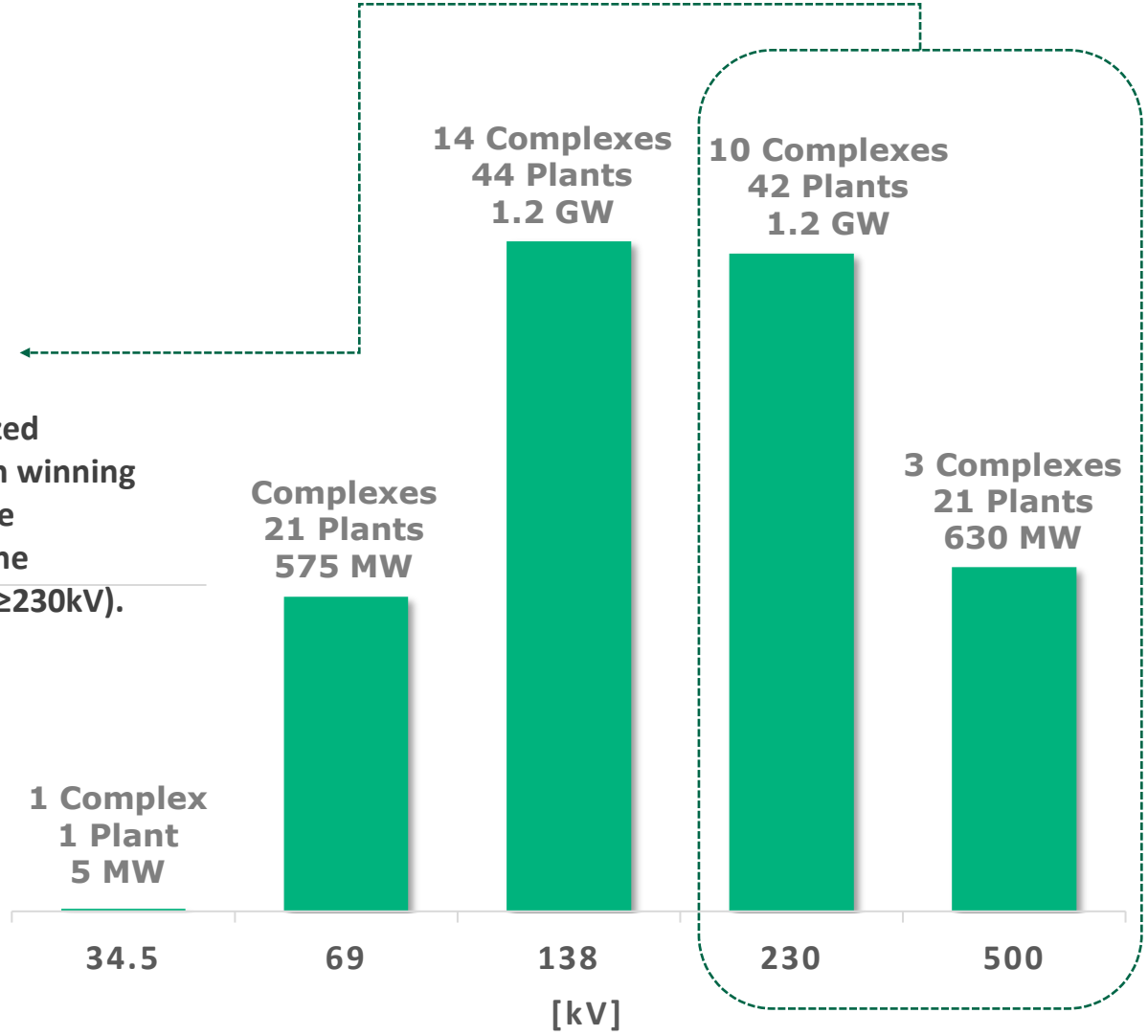


Projects in Regulated Market per State

Considers authorized PV Power Plants, either in operation, under construction or possessing required permits before construction

26.5%

Of the authorized complexes with winning auction bids are connected to the standard grid (≥230kV).



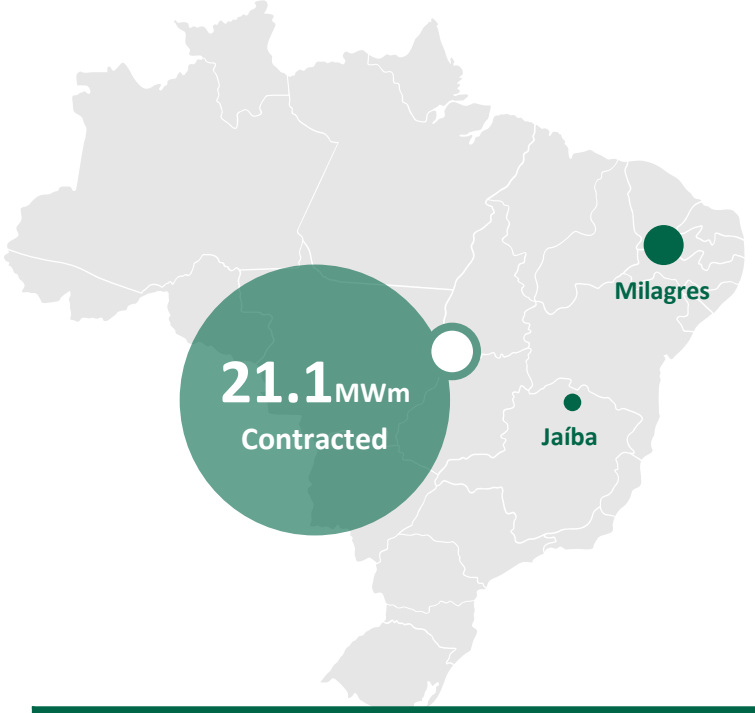
Connection Voltage of Authorized Power Plants

Source: ANEEL, ONS, CCEE, Greener. Updated: 10/2019.

*Those projects with connection classified as 'Null' are projects that won auctions in 2019 but which still haven't received full grid permission to operate.

X-Ray of Auction winners in 2019 (A4)

Auction A-4 2019

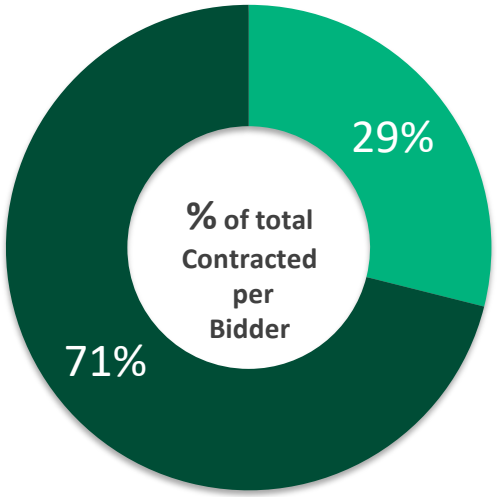


WEIGHTED AVERAGE PRICE OF AUCTION WINNERS (R$/MWh)

67.48

WEIGHTED AVERAGE 'MIX' OF PV PLANTS

35%



Enabled Capacity (MW)

203.7

- Enerlife and Lightsource
- CEI Solar and Canadian Solar

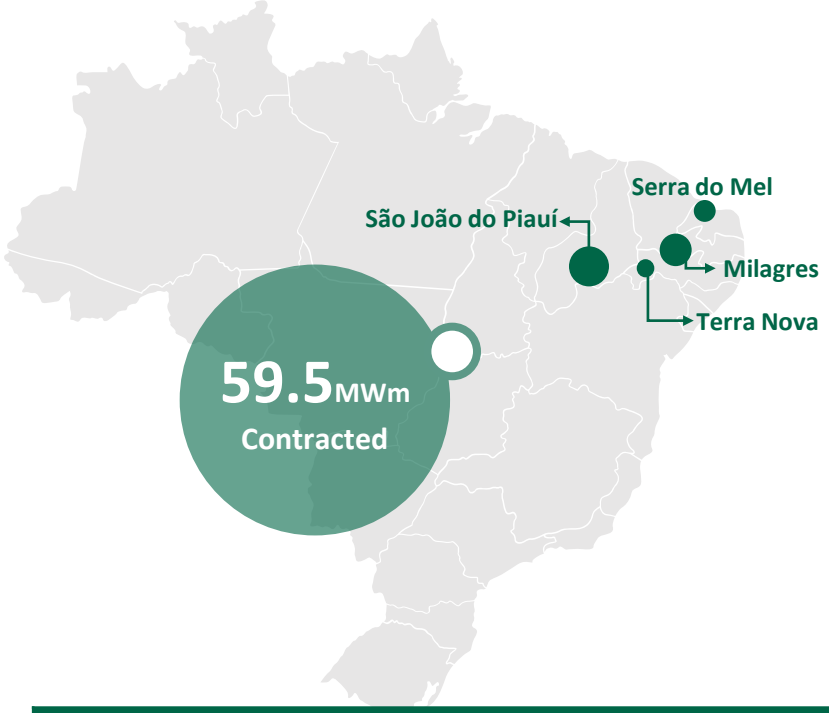
PV Project Name	Bidding Consortium	Size (MW)	Contracted (MWm)	MIX*	Location	TUST (R$/kW)	Overload (CC/CA)	Estimated Capacity Factor	Energy Price (R$/MWh)
JAÍBA SE1	CEI Solar and Canadian	40	6.1	50%	Jaíba-MG	3.20	1.28	30.75%	73.60
MILAGRES I	Enerlife and Lightsource	32.74	3.0	30%	Abaiara-CE	6.47	1.24	30.24%	64.99
MILAGRES II	Enerlife and Lightsource	32.74	3.0	30%	Abaiara-CE	6.47	1.24	30.54%	64.99
MILAGRES III	Enerlife and Lightsource	32.74	3.0	30%	Abaiara-CE	6.47	1.24	30.24%	64.99
MILAGRES IV	Enerlife and Lightsource	32.74	3.0	30%	Abaiara-CE	6.47	1.24	30.54%	64.99
MILAGRES V	Enerlife and Lightsource	32.74	3.0	30%	Abaiara-CE	6.47	1.24	30.54%	64.99

Source: ANEEL, MME, ONS, CCEE, Greener. Updated: 10/2019.

*The 'mix' represents the portion of each venture which was contracted for the regulated market. The trend is that the remainder will go to the Free Market.

X-Ray of Auction winners in 2019 (A6-1)

Auction A-6 2019

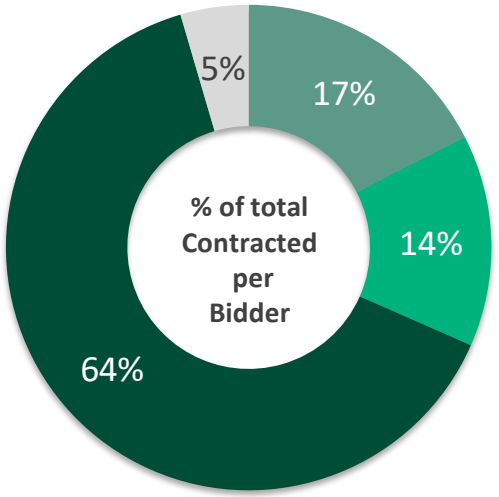


WEIGHTED AVERAGE PRICE OF AUCTION WINNERS (R$/MWh)

84.39

WEIGHTED AVERAGE 'MIX' OF PV PLANTS

39%



ENABLED CAPACITY (MW)

530

- Engady and Powertis
- Gameleira and Canadian Solar
- Voltália
- Enercom and Canadian Solar

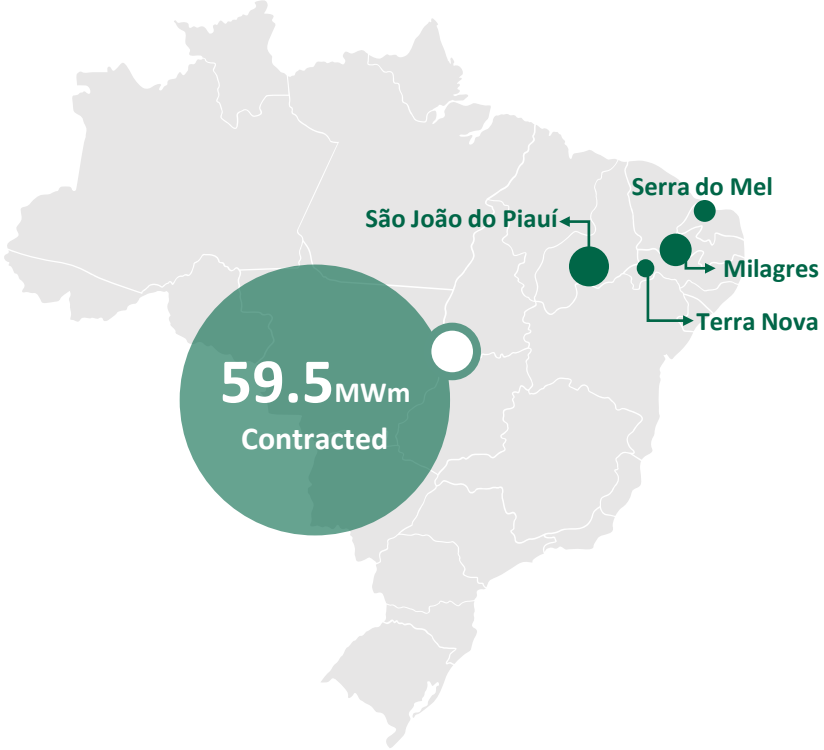
PV Project Name	Bidding Consortium	Size (MW)	Contracted (MWm)	MIX*	Location	TUST (R$/kW)	Overload (CC/CA)	Estimated Capacity Factor	Energy Price (R$/MWh)
GAMELEIRA 1	Gameleira and Canadian	30	2.6	30%	Milagres-CE	6.55	1.23	28.67%	84.39
GAMELEIRA 2	Gameleira and Canadian	30	2.6	30%	Milagres-CE	6.55	1.23	28.67%	84.38
GAMELEIRA 3	Gameleira and Canadian	30	2.6	30%	Milagres-CE	6.55	1.23	28.67%	84.37
GAMELEIRA 4	Gameleira and Canadian	30	2.6	30%	Milagres-CE	6.55	1.23	28.67%	84.36
SERRA DO MEL I	Voltalia	60	6.3	30%	Serra do Mel-RN	6.95	1.37	34.83%	84.90
SERRA DO MEL II	Voltalia	20	2.1	30%	Serra do Mel-RN	6.95	1.37	35.00%	84.00

Source: ANEEL, MME, ONS, CCEE, Greener. Updated: 10/2019.

*The 'mix' represents the portion of each venture which was contracted for the regulated market. The trend is that the remainder will go to the Free Market.

X-Ray of Auction winners in 2019 (A6-2)

Auction A-6 2019

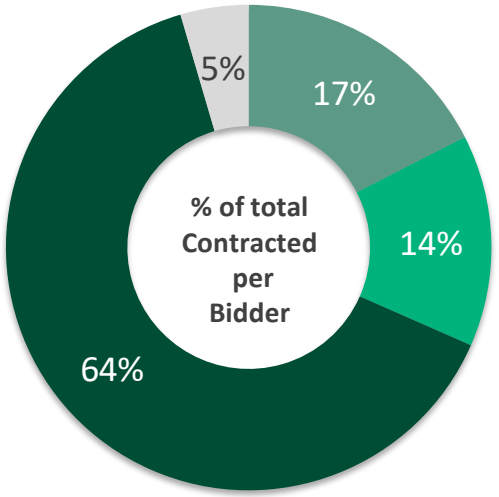


WEIGHTED AVERAGE PRICE OF AUCTION WINNERS (R$/MWh)

84.39

WEIGHTED AVERAGE 'MIX' OF PV PLANTS

39%



ENABLED CAPACITY (MW)

530

- Engady and Powertis
- Gameleira and Canadian Solar
- Voltália
- Enercom and Canadian Solar

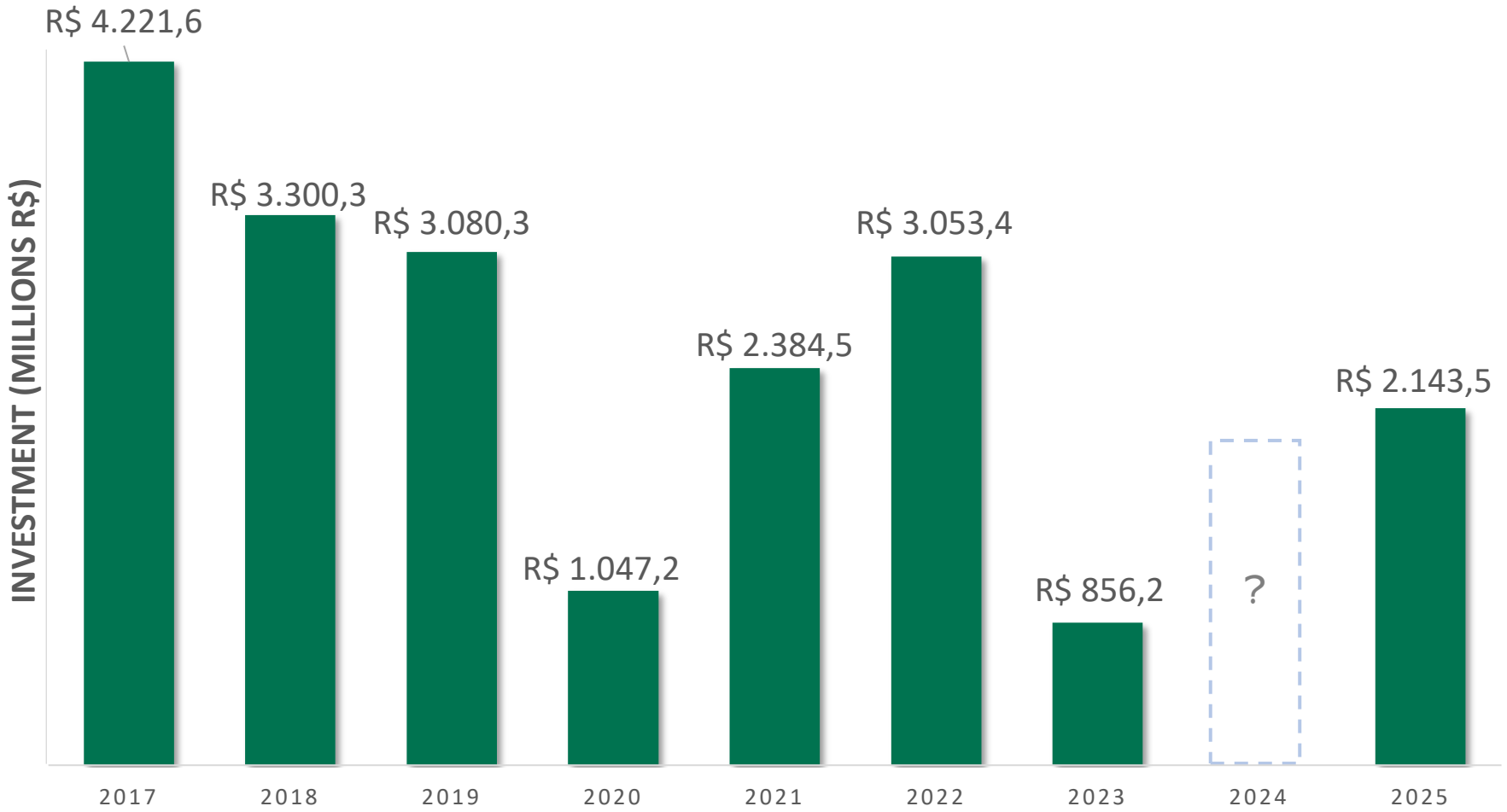
PV Project Name	Bidding Consortium	Size (MW)	Contracted (MWm)	MIX*	Location	TUST (R$/kW)	Overload (CC/CA)	Estimated Capacity Factor	Energy Price (R$/MWh)
GRAVIOLA 1	Engady and Powertis	75	11.8	52%	São João do Piauí-PI	7.73	1.33	30.53%	84.50
GRAVIOLA 2	Engady and Powertis	75	11.8	52%	São João do Piauí-PI	7.73	1.33	30.53%	84.55
GRAVIOLA 3	Engady and Powertis	75	7.2	31%	São João do Piauí-PI	7.73	1.33	30.67%	84.00
GRAVIOLA 4	Engady and Powertis	75	7.2	31%	São João do Piauí-PI	7.73	1.33	30.53%	84.00
LUIZ GONZAGA II	Enercom and Canadian	30	2.7	30%	Terra Nova-PE	3.70	1.29	30.00%	84.40

Source: ANEEL, MME, ONS, CCEE, Greener. Updated: 10/2019.

*The 'mix' represents the portion of each venture which was contracted for the regulated market. The trend is that the remainder will go to the Free Market.

Investments

Considering all projects contracted via Auctions in 2014, 2015, 2017, 2018 and 2019.

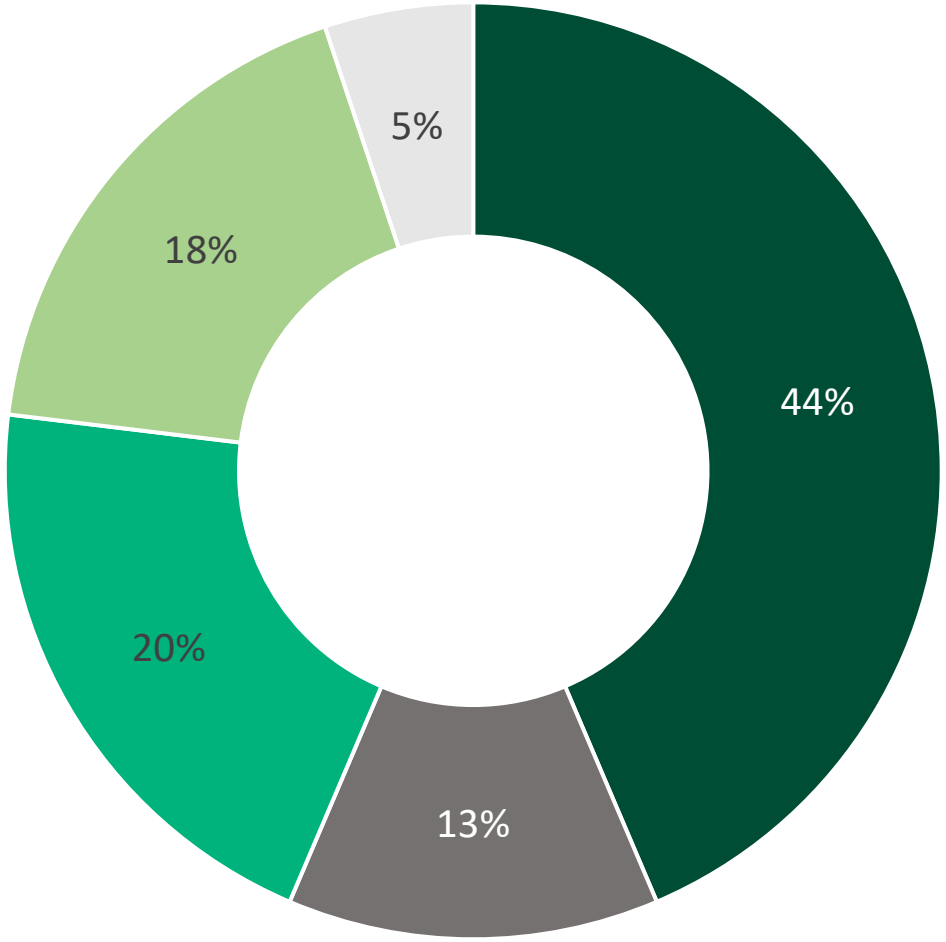


It's expected that over R$9Billion will be invested in Brazilian Large-Scale Solar PV Projects between 2020 and 2025 for the Regulated Market / Public Auctions.

This sum could increase in case further Solar Power Plants are contracted in the auctions that are expected to take place in 2020 and 2021.

Financing Sources

Considering all PV Plants in operation or under construction.



The numbers refer to the number of PV solar complexes in operation or with construction underway (3.3 GW), which at this moment means a total of 39 solar PV complexes.

Get the full version!

Getting the full version of this Study, you will have access to:

- Capacity Factor of the projects: expected x real
- Modules: ranking of suppliers
- Inverters: ranking of suppliers
- Structures: ranking of suppliers
- EPC: ranking of suppliers lean x full
- Free Market: grid connection
- Free Market: contract duration
- Sensitivity analysis for each scenario
- Statistical risk analysis for each scenario
- Appendix: steps in PV plant development

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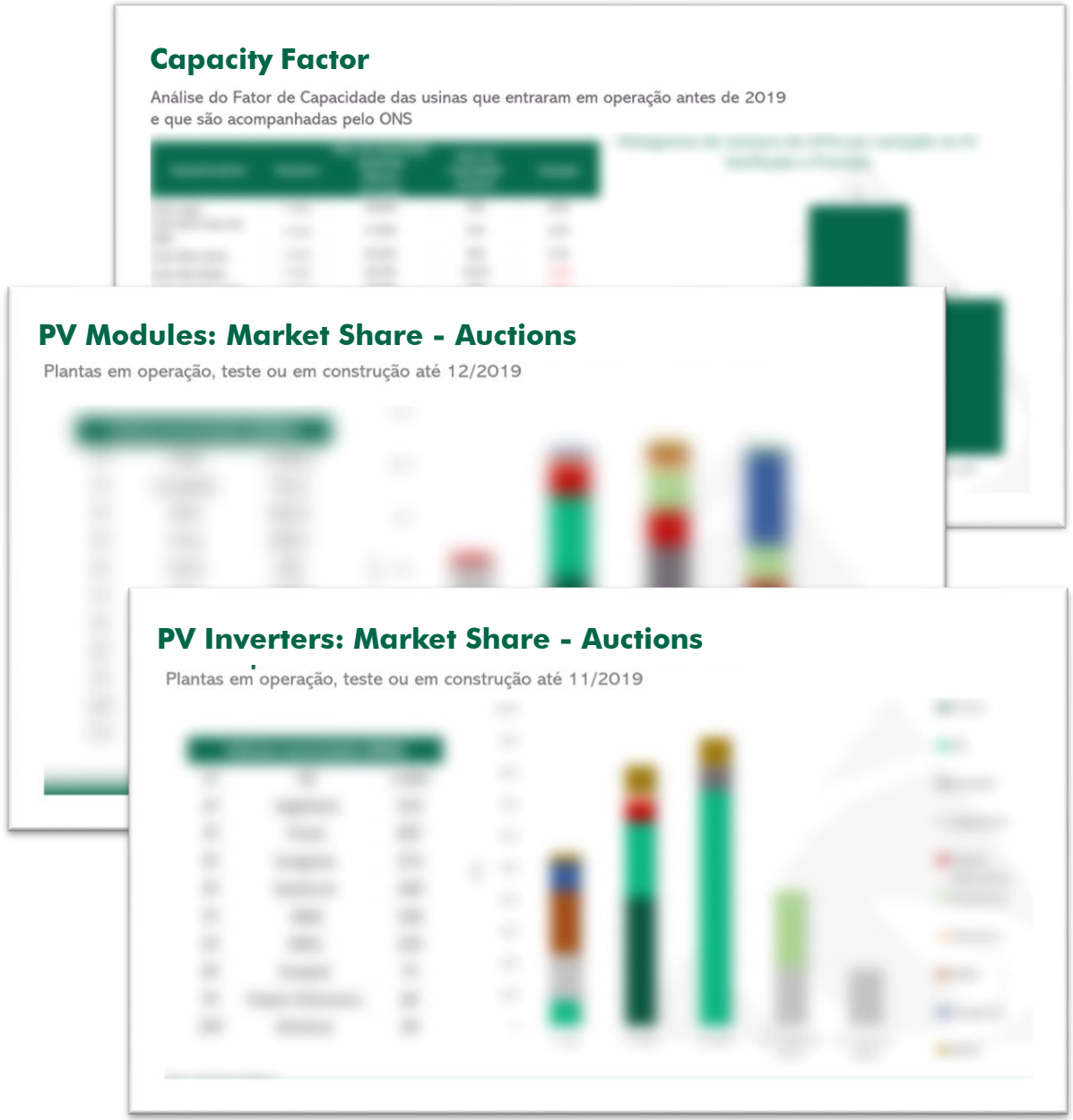
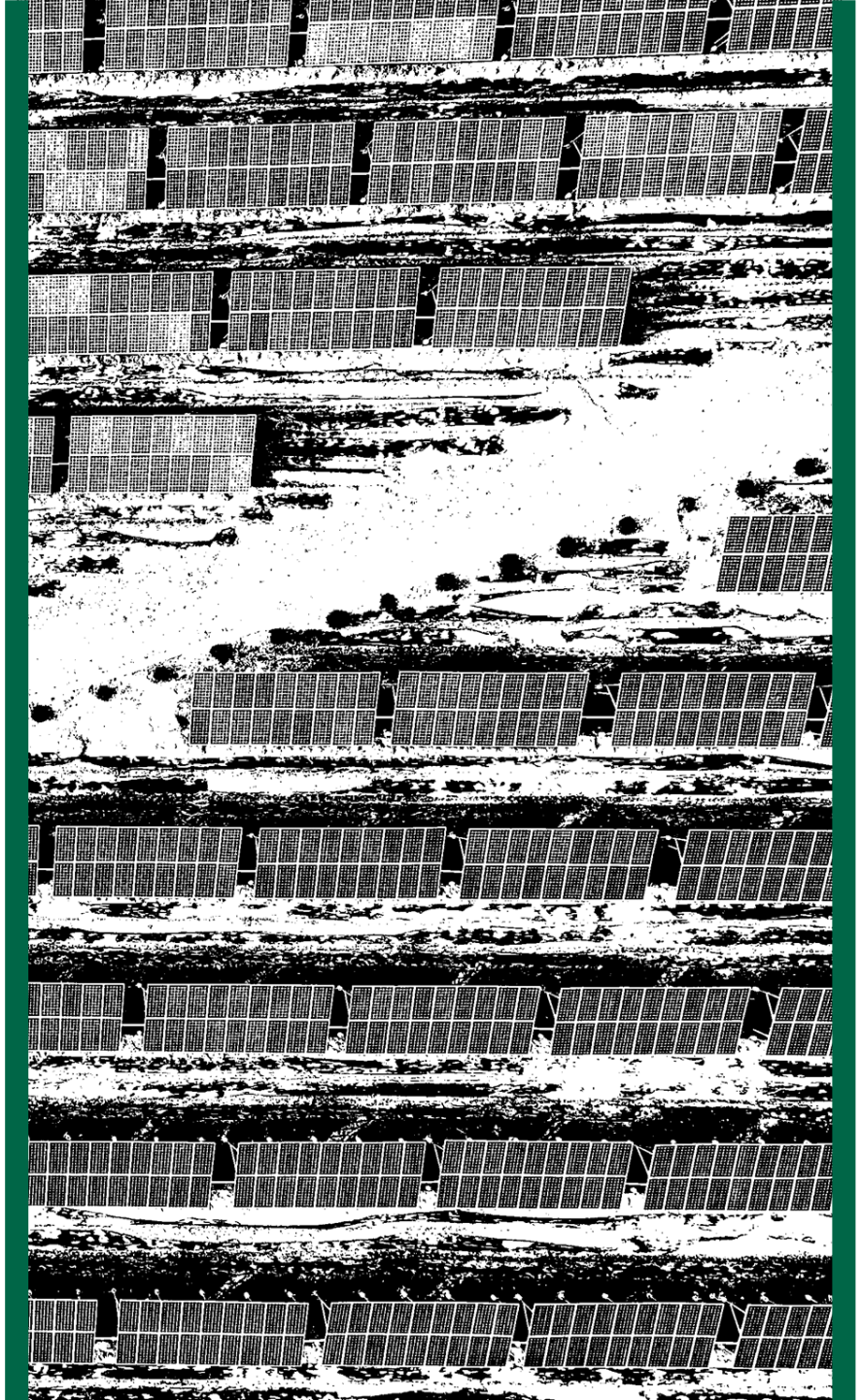


Solar Projects in the Brazilian Free Market



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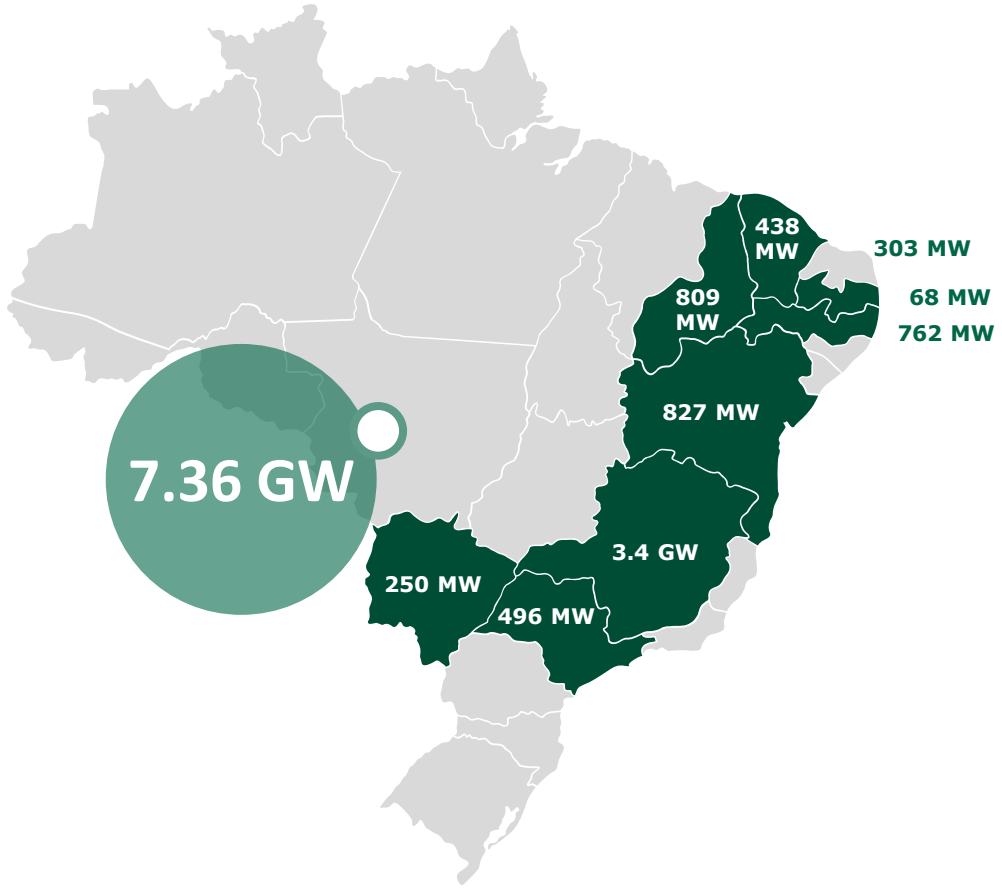
Status of Projects

Authorized PV Projects with high probability of supplying the Free Market.



Power Capacity of Projects in the Free Market*

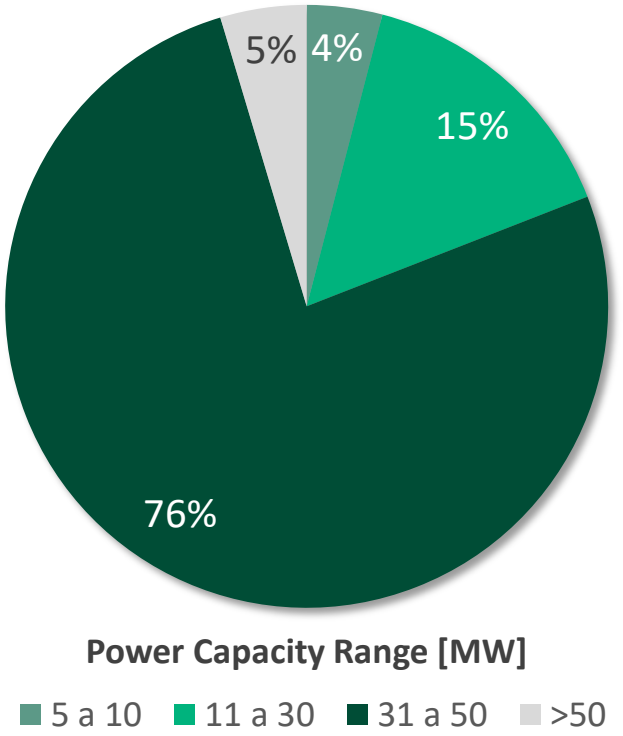
Considers PV Power Plants in operation or fully permitted which did not supply power to the Regulated Market.

98.2%
of the plants are not yet in operation.

53%
are located in the SouthEast/CenterWest regions.

56%
didn't participate in the auctions in 2019.

Percentage of Projects per Size Range [MW]** in the Free Market



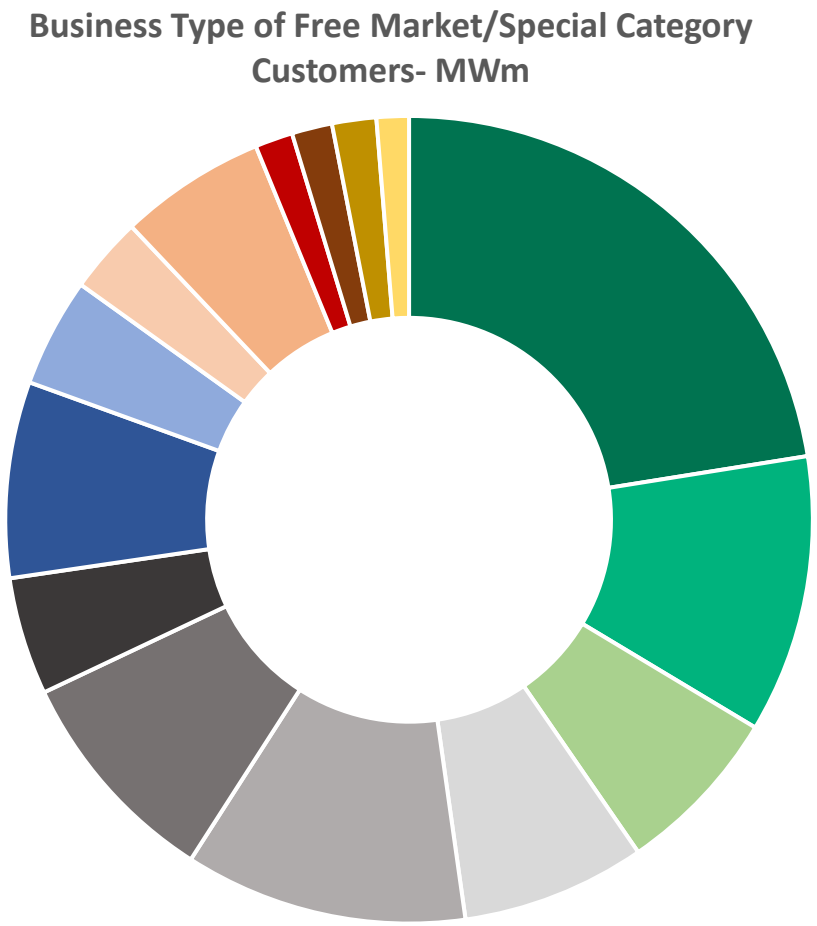
Source: ANEEL, CCEE, ONS. Greener. Updated: 03/2020.

**Considers the Power Capacity of each SPV and not the total power of each complex.

* Solar Power Plants with full permits/authorization that do not have Regulated Market contracts were determined to have a high probability of supplying the Free Market.

Profile of Free Market Energy Consumers

Type of Business Activity



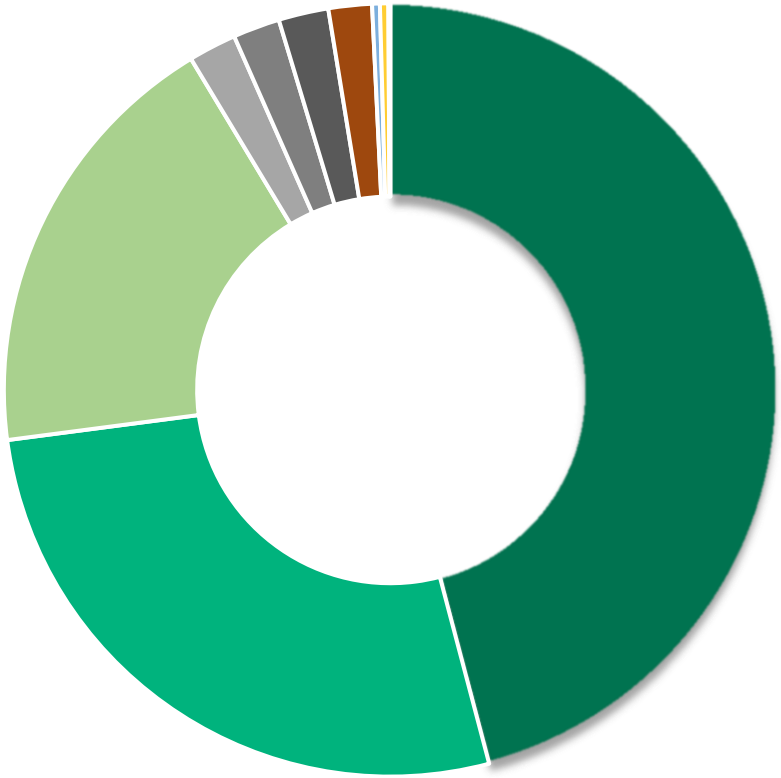
Type of Business Activity	Consumption (MWm)*	%
METALLURGY AND METAL PRODUCTS	4,005.115	22,48%
CHEMICALS	1,982.678	11,13%
WOOD, PAPER AND CELLULOSE	1,209.721	6,79%
NON-METALLURGIC MINERALS	1,313.632	7,37%
FOOD	2,018.100	11,33%
DIVERSE MANUFACTURED GOODS	1,582.450	8,88%
METALLIC MINERAL EXTRACTION	839.664	4,71%
SERVICES	1,398.400	7,85%
VEHICLES	777.838	4,37%
TEXTILES	541.705	3,04%
TRADE	1,045.938	5,87%
TRANSPORT	269.641	1,51%
DRINKS	288.346	1,62%
WASTE MANAGEMENT	315.265	1,77%
TELECOMMUNICATIONS	230.54	1,29%
Total Geral	**17,819.037**	**100%**

*Results based on Energy Consumption in January 2020

Source: CCEE

Profile of Self-Generators

Type of Business Activity



Type of Business Activity	Consumption (MWm)*	%
METALLURGY AND METAL PRODUCTS	947.637	45,89%
NON-METALLIC MINERALS	558.349	27,04%
EXTRACTION OF METALLURGIC MINERALS	380.823	18,44%
CHEMICALS	41.445	2,01%
SERVICES	40.460	1,96%
TEXTILES	43.134	2,09%
TRADE	37.475	1,81%
WOOD, PAPER AND CELLULOSE	6.676	0,32%
DIVERSE MANUFACTURED GOODS	7.271	0,35%
FOOD	1.757	0,09%
Total Geral	**2.065,026**	**100,00%**

*Results based on Energy Consumption in January 2020

Source: CCEE

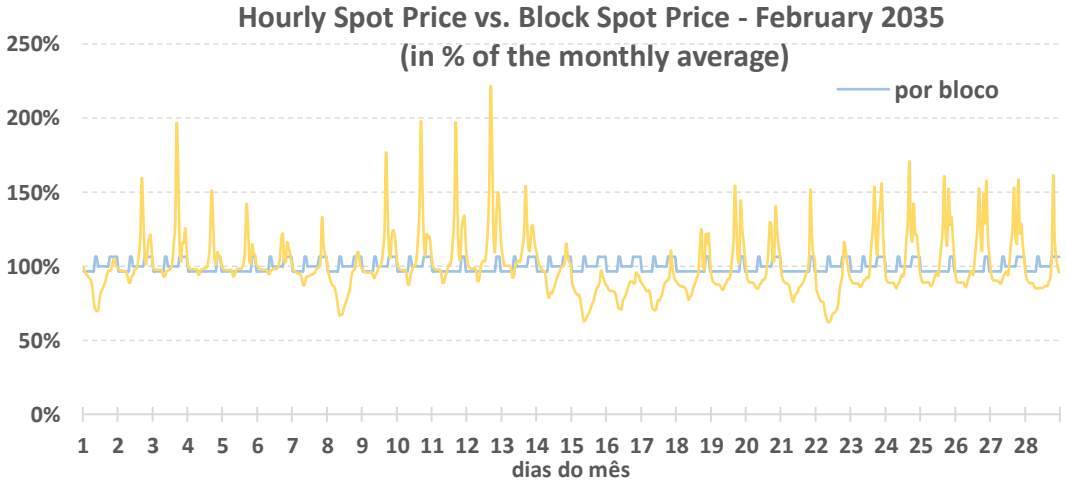
Impact of hourly pricing on Power Generation (1)

Edmundo Grune
Project Manager
PSR

In 2019 the Ministry of Mining and Energy approved the proposals for finetuning of the computational models used in the operation of the Brazilian electrical system, and the introduction of a new model for hourly pricing of electricity for the short-term market. The hourly price will be implemented in two phases: from Jan/20, 1st phase, the Grid Operator ONS will adopt DESSEM (model for short-term hydrothermic dispatch) in its operational program and, from Jan/21, 2nd phase, the CCEE also will start using it for the purpose of calculating the Price for Liquidation of Differences (PLD) on an hourly basis.

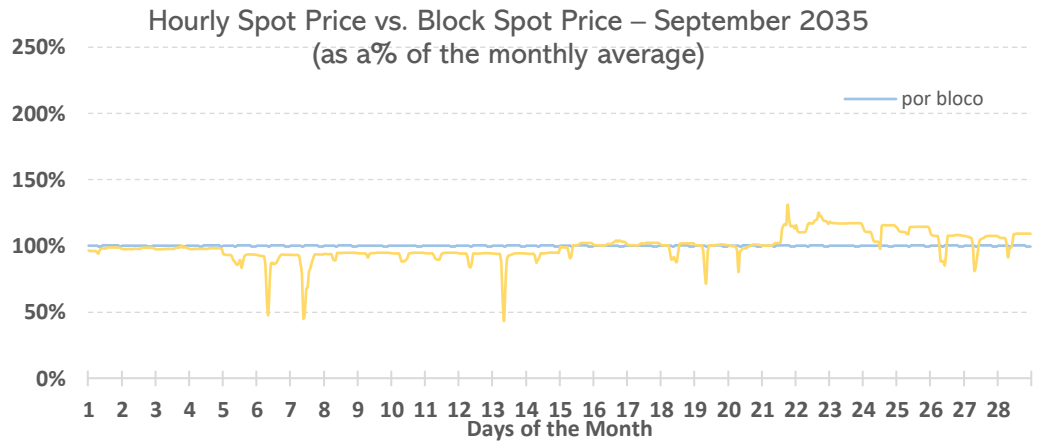
The absence of an 'official' platform for simulations has created strong speculation about the impacts of these changes.

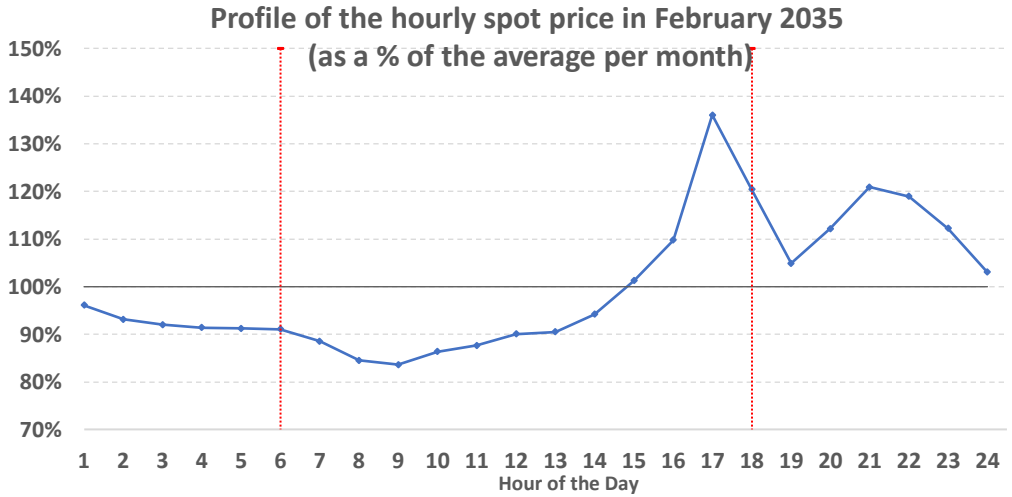
The PSR has run simulations of the hourly pricing model for the Brazilian system. Our simulations indicate that, on average, the volatility of spot prices will only increase significantly – compared to prices per block – once a certain level of penetration of renewable generation has been reached, and even then will only be relevant in the months of highest demand (January till March). Clearly there will be higher volatility at lower reservoir availability. Graphs 1 and 2 show the results of the most recent simulations for February and September 2035.



The reason for this effect lies with the history of the Brazilian system: until: the early 2030s the hydroelectric reservoirs will be sufficient to modulate the intermittence of renewables and to maintain the volatility of hourly prices close to current levels (in years with close to average rainfall). In the following years, during the dry season the high penetration of wind power combined with lower utilization of hydroelectric power to meet energy demand should free up the reservoirs to be used for load modulation. In the rainy season, however, the hydropower stations have a reduced modulation capacity since they are used more intensely to meet energy demand, which results in higher usage of thermoelectric power plants for modulation and, consequently, an increase in the volatility of the PLD.

Impact of hourly pricing on Power Generation (2)





Another interesting result of the simulations is the realization that the correlation between generation and price is more important than the actual volatility in itself. In other words, the impact of the hourly price volatilty (compared to prices per block) on the financial results of the sale of the generated energy is less than the impact of the relationship between low generation volume and high prices.

To illustrate the results, we show the average daily profile of the hourly prices simulated for February 2035 (see Graph 3). The interval between the vertical red lines is when solar generation typically takes place.

From the graph we can see that, specifically for this exercise, there are price peaks at the end of the afternoon and early evening. These hours are the most critical period for a solar power generator which has signed a sales contract with *flat* modulation, or which follows the profile of the total demand, because this generator will have to turn to the spot market to meet this demand. It will therefore be necessary for solar energy generators to adopt good practices of risk management, mitigating any exposure with a price hedge or by using portfolios of different energy generation sources.

The simulations presented here were created on the basis of a scenario of continued long-term expansion of the PSR and using assumptions that are typical for a solar power project located in the NorthEast. The results can vary due to changes in the used assumptions, like the system configuration and specific data for each solar project.

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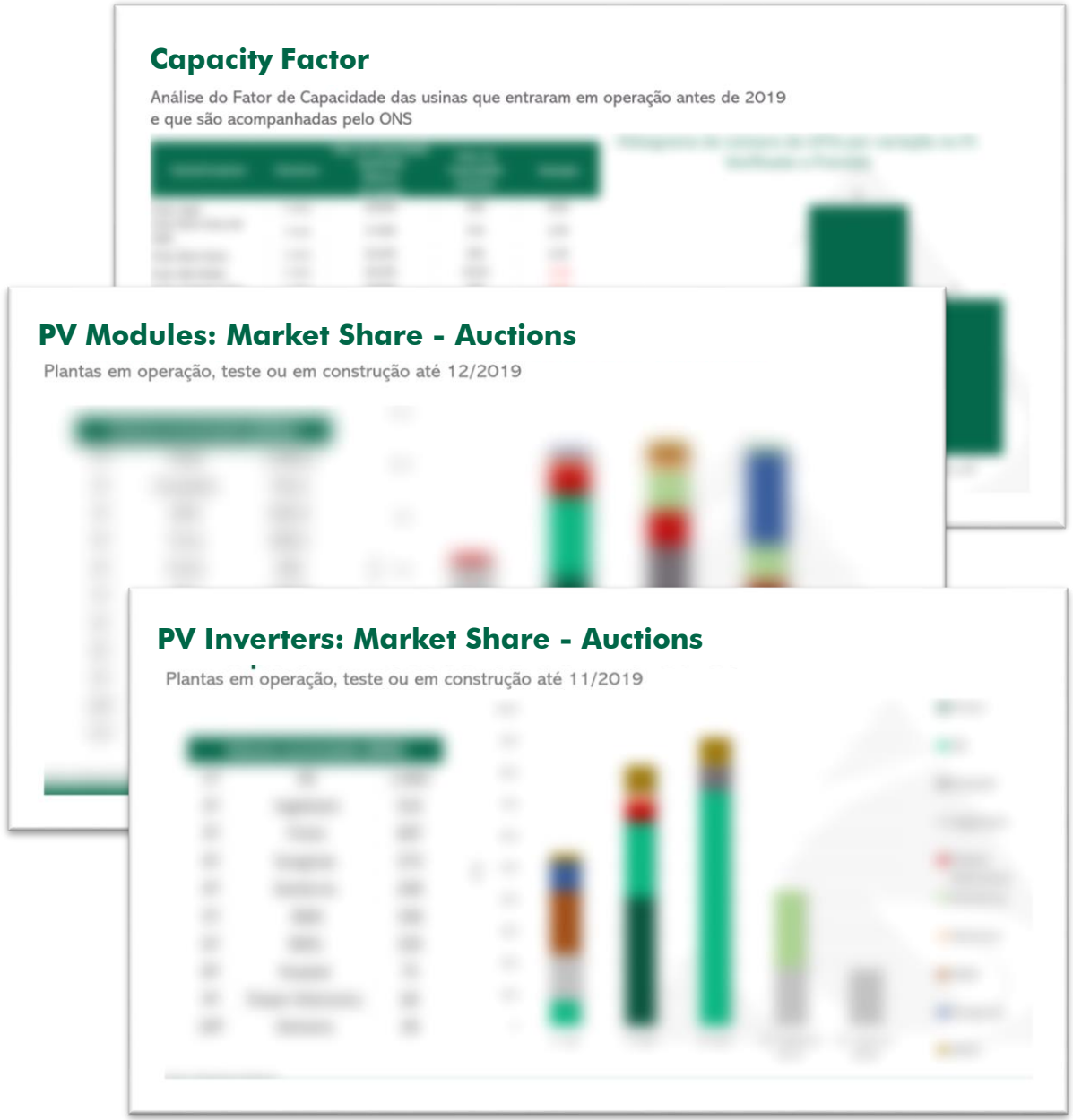
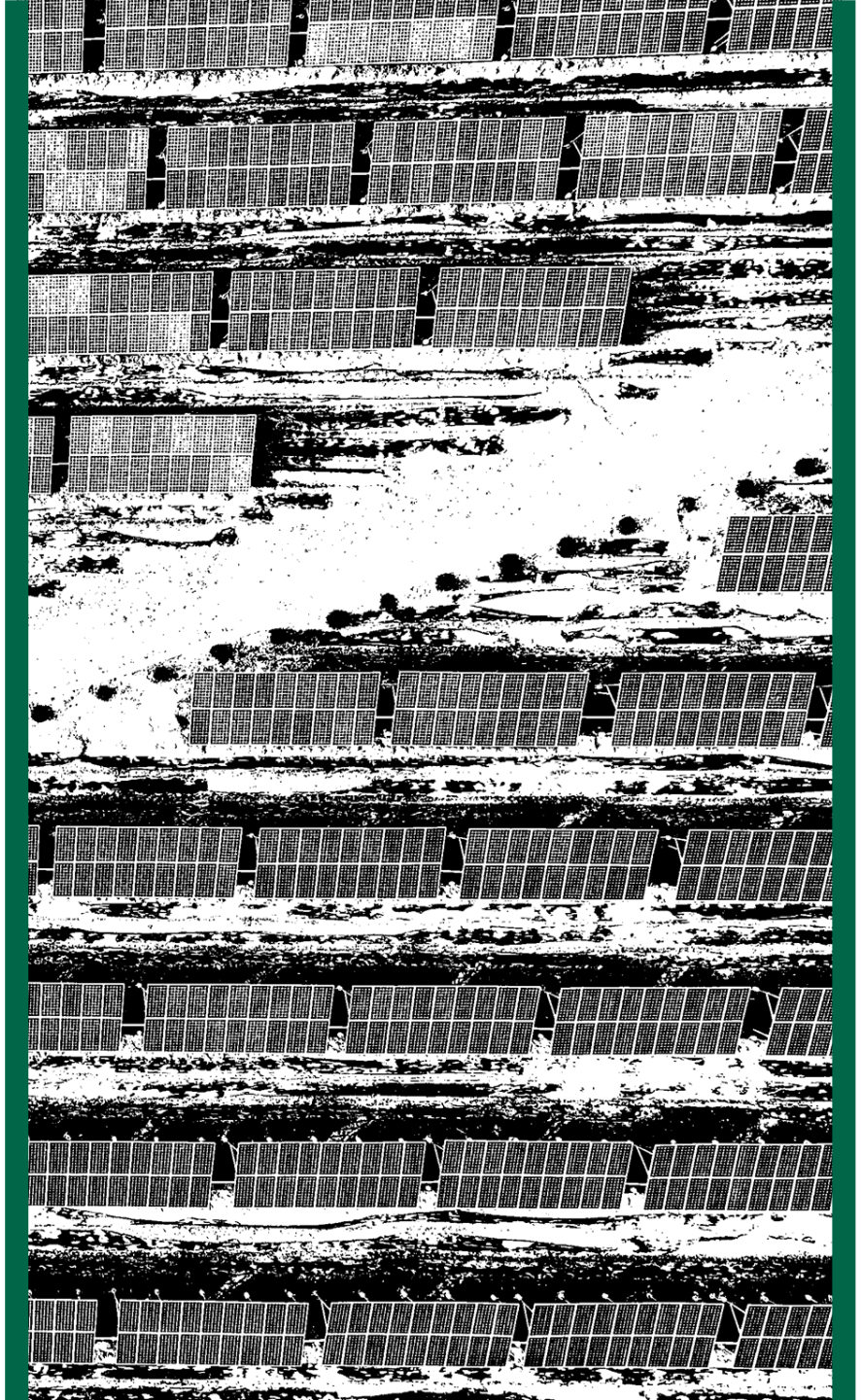


HYPOTHETICAL CASE STUDY



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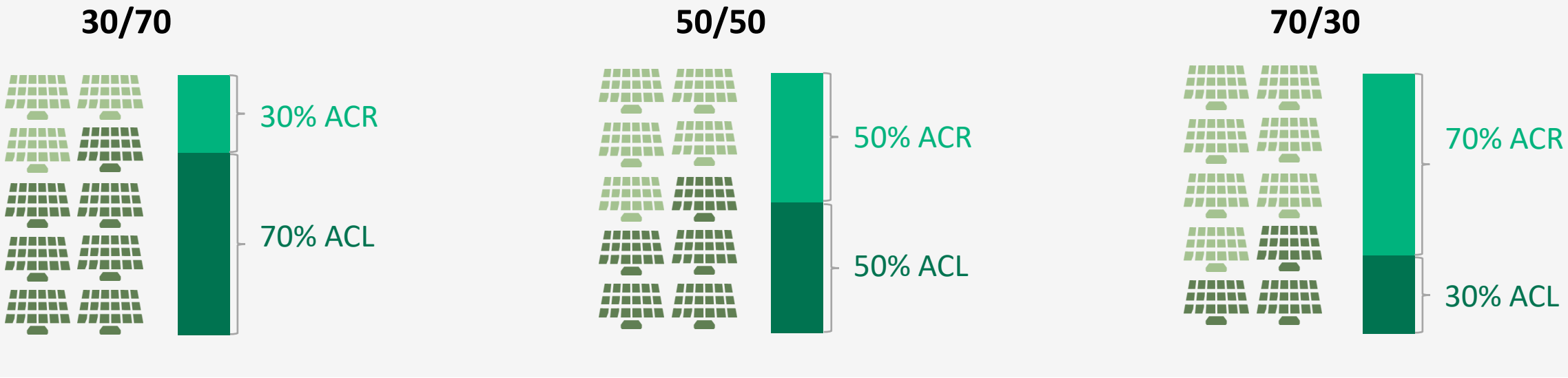
Introduction

This chapter aims to show the impact of the key drivers on the viability and return on investment of a solar power plant, Efficiently used CAPEX, an optimized capital structure and a realistic vision of the macroeconomic conditions have a direct impact on the profitability of the project.

An appropriate evaluation of the different scenarios and market trends can make a critical difference in competitiveness during the auctions..

The prices used here are hypothetical and can vary significantly depending on the specifics of each project.

Simulated Scenarios



Relevant Variables (1)

In order to contextualize the assumptions made for the simulation of this hypothetical case study, the next 3 slides contain a brief reference to the main drivers that impact on the return on investment of a solar power plant.

SELIC

The SELIC rate (basic interbank interest rate in Brazil) is an important reference for the definition of the cost of capital of a project. Lower rates tend to be favourable for the return on investment on infrastructure projects.

Inflation (IPCA)

The inflation rate is directly related to the balance between consumption and productivity of a certain place. When inflation rises and interest rates are maintained stable, the return on capital is reduced.

Exchange Rate (R$/USD)

A significant part of the CAPEX is directly impacted by the exchange rate (USD). For this reason, the variation in the exchange rate is generally considered one of the principal risks in modelling a project.

Relevant Variables (2)

Private Funding

A capital structure that uses private sector funds (banks, funds, etc.) is an alternative for investors who don't want to invest 100% of their own capital in the project. Such financing generally increases the Cost of Capital (WACC) of the project and doesn't offer much flexibility in the payment terms compared to the development banks. However, this kind of financing reduces the amount the investors need to contribute from own funds.

Development Bank

A capital structure that uses development banks is generally aimed at reducing the WACC, levelling off financing costs through cheaper capital with a longer amortization period. Development banks typically have stringent documentation requirements regarding the project, and the amount that can be financed is directly related to using a certain minimum percentage of domestically produced equipment in the project.

Relevant Variables (3)

Power Plant Location

The choice of the power plant location should be dependent on a number of fundamental factors for the success of the project. Among the principal considerations are finding a region with good historical solar radiation and favourable conditions to connect to the existing/planned Power Grid (preferably a short distance from a substation with the lowest possible voltage), as well as a plot where one should get an easy environmental license.

Technologies

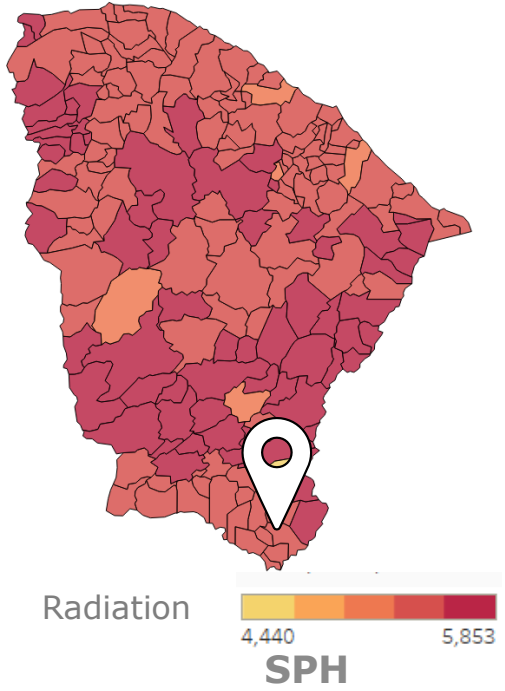
The technology chosen to equip the power plant will affect the competitiveness of the project. An appropriate choice for module technology (bifacial, monocrystalline, polycrystalline, PERC), inverters (central, *string*) and mounting structure (fixed, *tracker*) will influence the CAPEX required, but also the efficiency and productivity of the plant, the size of the necessary terrain and the operation and maintenance costs.

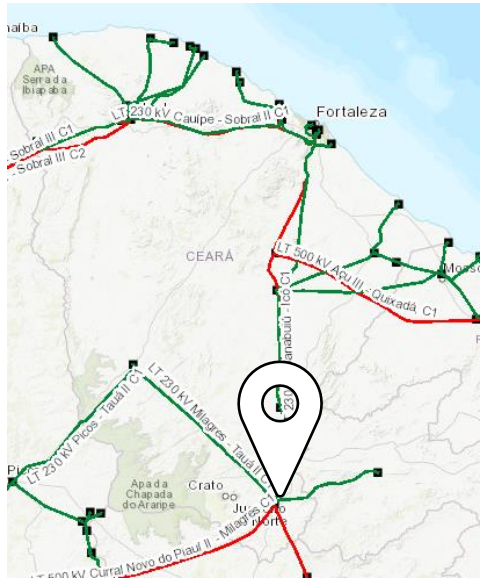
Operation and Maintenance

Despite of the impact of different technologies on the O&M costs, other factors are also crucial for guaranteeing an efficient running of the plant . The frequency of cleaning the modules should be considered, as well as the availability of water resources for doing so. Increased scale of the power plant can help to dilute the fixed costs, but there are also implications for security and insurance, which are important cost items themselves.

PV Project: 150 MW/195 MWp

Location: Brejo Santo, Ceará (NorthEast)





Transmission Lines

Technical Data	
Modules	MonoPerc Bifacial 425 Wp
Inverters	Central 2.5 MW
Mounting Structure	Tracker with -55°/+55° inclination
Connection	230 kV
Transmission Line	8 km at 230 kV
Arrangement	5 plants of 30 MW

Generating Data	
Productivity	2,360 kWh/kW/year
Capacity Factor	26.9%
Generation	460 TWh/year
Electrical Losses	3.0%
Degradation of Modules in 1st year	2.5%
Degradation of Modules subsequent years	0.5%/year

Other Data	
O&M	1% of CAPEX/year
Other Costs	0.19% of CAPEX/year
Insurance	0.1% of CAPEX/year
Fiscal Treatment	Expected Profit
Contract Duration	20 years (+Free Market in 2 cases)

Economic conditions and Investment Details

Macroeconomics	
SELIC	4.5% (focus bulletin Nov/19)
Inflation	4.6% (focus bulletin Nov/19)
Exchange Rate	R$4.00 (focus bulletin Nov/19)
Year of Construction	Start and finish in 2021

Financing	
Opportunity Cost (%/year)	8%
Own Capital	40%
Debt Financing	60%
Interest Rate	7,6% per year
Amortization Period	12 years
Grace Period	None

CAPEX Composition – R$/Wp		
Modules	1.13	36.2%
Inverters (R$/W)	0.245	7.9%
Trackers	0.565	18.1%
Substation	0.324	10.4%
Transmission Line	0.052	1.7%
Support Infrastructure, Mounting System and Engineering	0.663	21.3%
Management	0.045	1.4%
Others	0.095	3%

R$ 597.2 million

Sensitivity Analysis

Values used in the sensitivity analysis

PPA Price of the Auction [R$/MWh]

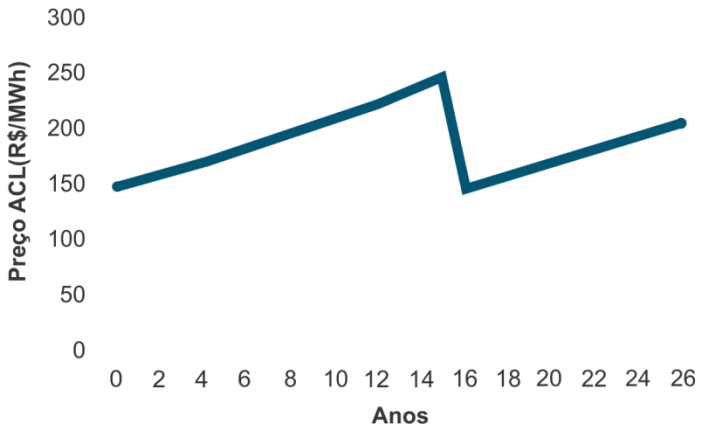
60 65 70 75 80 85 90 95 100 105 110 115

CAPEX Variation [R$/Wp]

2.10 2.20 2.30 2.40 2.50 2.60 2.70 2.80 2.90 3.00 3.10 3.20

1st year: 100% Free Market / ACL
2nd to 22nd year: Mix ACL/ACR
23rd year and after: 100% ACL

Contract Price ACL: R$ 147.50 / MWh
Inflation adjusted until the 15th year.
Returns to R$147.50/ MWh from the 16th year then inflation adjusted (IPCA).



Scenario 3 – 70% ACR + 30% ACL

Impact analysis of CAPEX and PPA Price on Internal Rate Return (IRR)

CAPEX (R$/Wp)

WACC 7.76%	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3	3.1	3.2
60	6.49%	6.17%	5.87%	5.58%	5.30%	5.02%	4.76%	4.50%	4.25%	4.01%	3.77%	3.53%
65	6.97%	6.64%	6.33%	6.03%	5.73%	5.45%	5.18%	4.92%	4.66%	4.41%	4.16%	3.92%
70	7.45%	7.11%	6.79%	6.48%	6.18%	5.89%	5.61%	5.33%	5.07%	4.81%	4.56%	4.32%
75	7.94%	7.59%	7.26%	6.94%	6.63%	6.33%	6.04%	5.76%	5.49%	5.22%	4.96%	4.71%
80	8.44%	8.08%	7.73%	7.40%	7.08%	6.77%	6.47%	6.18%	5.90%	5.63%	5.37%	5.11%
85	8.94%	8.57%	8.21%	7.86%	7.53%	7.21%	6.91%	6.61%	6.33%	6.05%	5.78%	5.52%
90	9.45%	9.06%	8.68%	8.33%	7.99%	7.66%	7.35%	7.04%	6.75%	6.46%	6.19%	5.92%
95	9.95%	9.55%	9.17%	8.80%	8.45%	8.11%	7.79%	7.48%	7.17%	6.88%	6.60%	6.32%
100	10.46%	10.05%	9.65%	9.27%	8.91%	8.56%	8.23%	7.91%	7.60%	7.30%	7.01%	6.73%
105	10.97%	10.54%	10.13%	9.74%	9.37%	9.02%	8.67%	8.34%	8.03%	7.72%	7.42%	7.14%
110	11.48%	11.04%	10.62%	10.22%	9.84%	9.47%	9.12%	8.78%	8.45%	8.14%	7.84%	7.54%
115	12.00%	11.54%	11.10%	10.69%	10.30%	9.92%	9.56%	9.22%	8.88%	8.56%	8.25%	7.95%

PPA Price Auction (R$/MWh)

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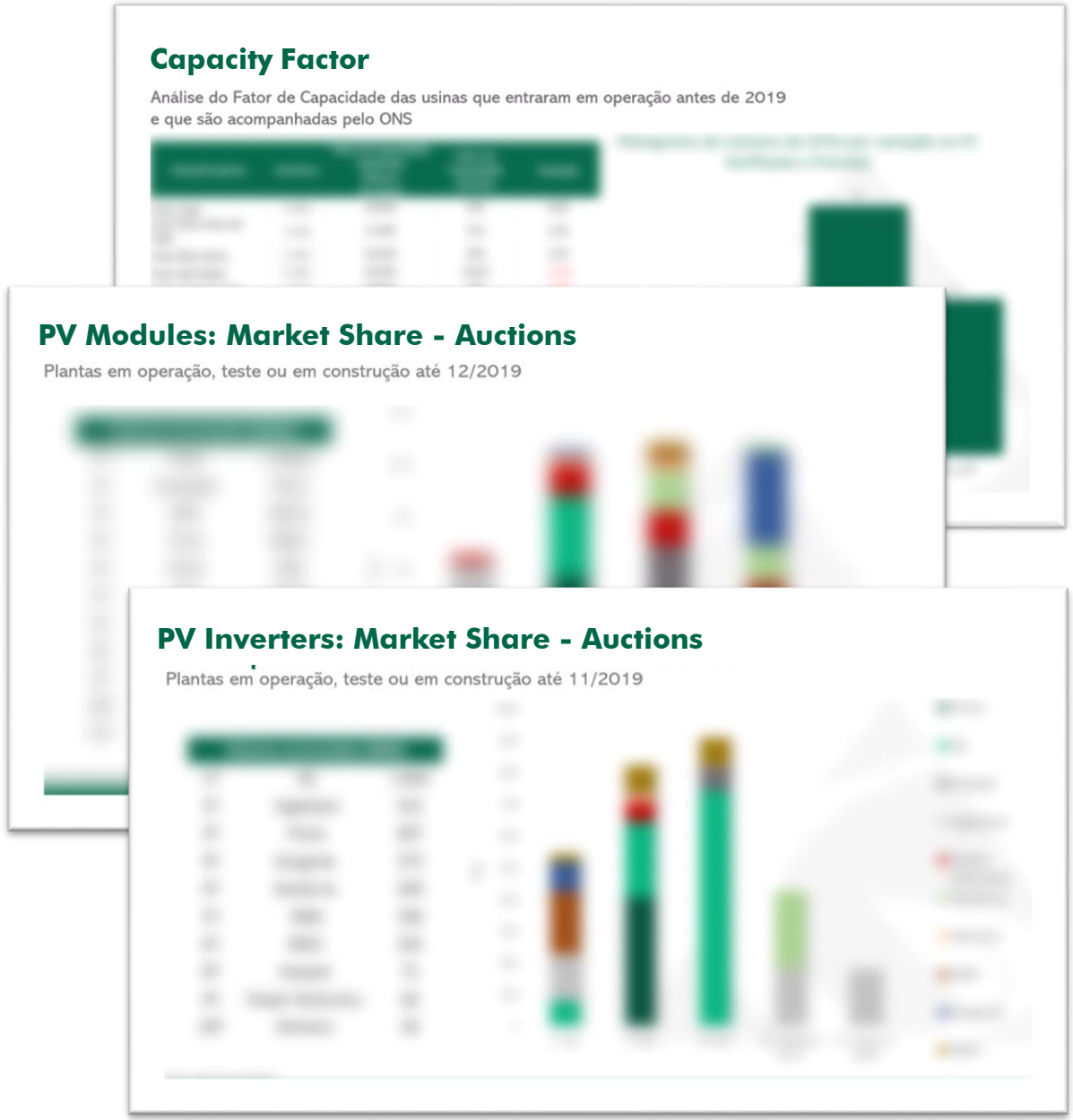
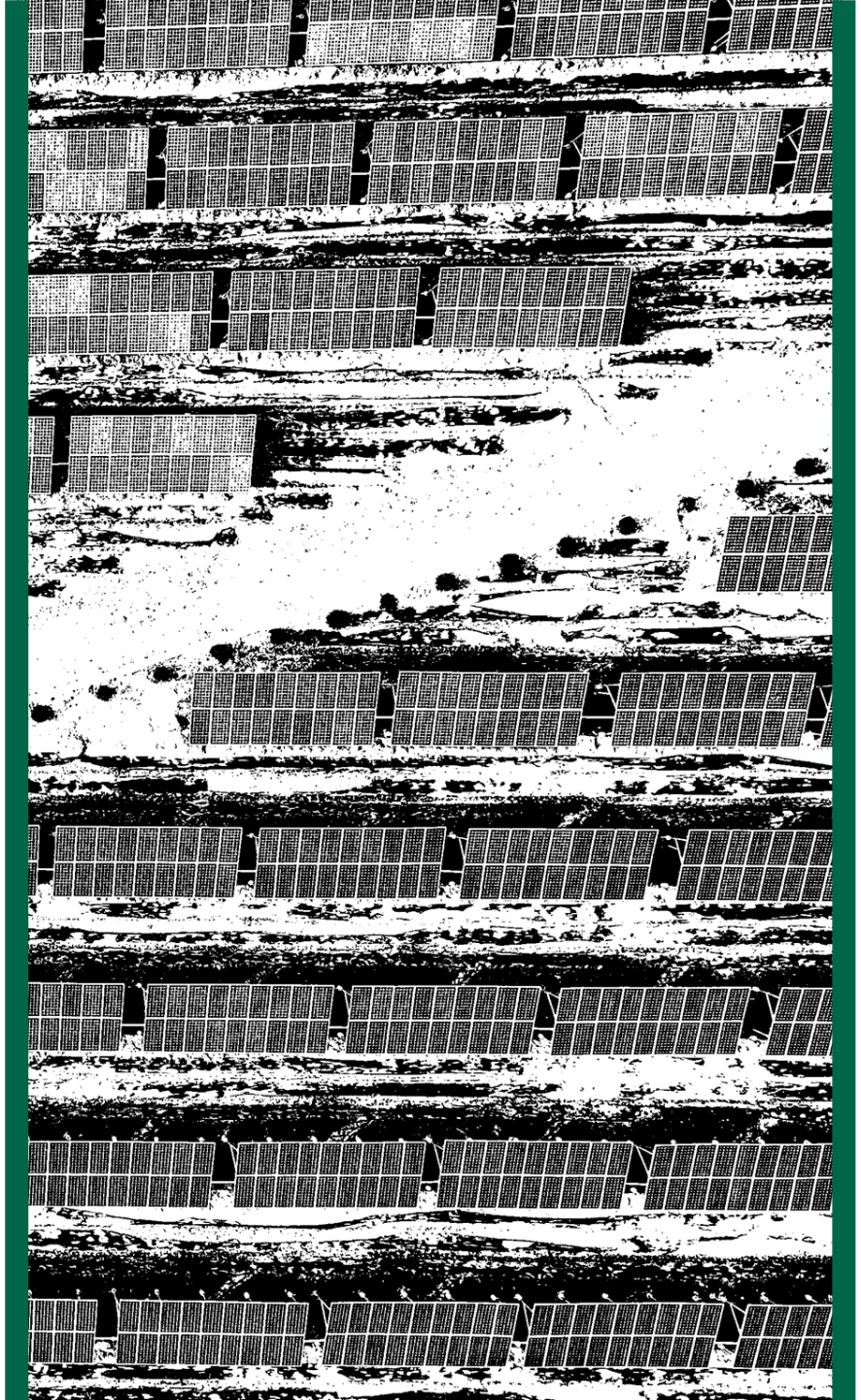


GREENER INSIGHTS



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Greener Insights

- In a scenario of 2% average growth during the next 5 years, just the 10 biggest Free Market energy consumers may demand up to 1.6GWm extra generating capacity. Despite strong growth in supply, there is still room in the market for new solar energy ventures.

- An important amount (67%) of solar power plants in operation are showing a capacity factor below what was expected. This could be due to adverse solar radiation conditions during the period under analysis, however, it indicates an important point of attention for the PV Projects in planning and construction stages, demanding extra caution regarding the used assumptions and O&M requirements.

- A significant part (+50%) of the projects being built for the Regulated Market were financed by Development Banks, especially by the BNB (Banco do Nordeste). However, new financing instruments are becoming viable and are appearing on solar entrepreneurs' radar screens.

Greener Insights

- Short term contracts on the ACL/Free Market have shown the sharpest growth recently, as opposed to long term contracts. Such short term contracts carry greater restrictions in terms of bankability. Alternatives: search for offtakers with a profile for self-generation, or use energy traders to guarantee a greater liquidity for the generated energy.

- There is a high number of projects under development in the SouthEast region for the Free Market, in line with the location of the principal industrial and commercial consumer bases, and showing solar investors' preference to prioritize generation in the same region where likely consumers are located, reducing the risk of supply difficulties in several subregions.

Greener Insights

- The change to a hourly PLD (Spot Prices) expected to 2021 brings additional uncertainties to solar energy projects, and is an important point of focus in the economic modeling and drafting of long-term contracts, and should be part of any risk mitigation strategy for Project ownwers in this sector.

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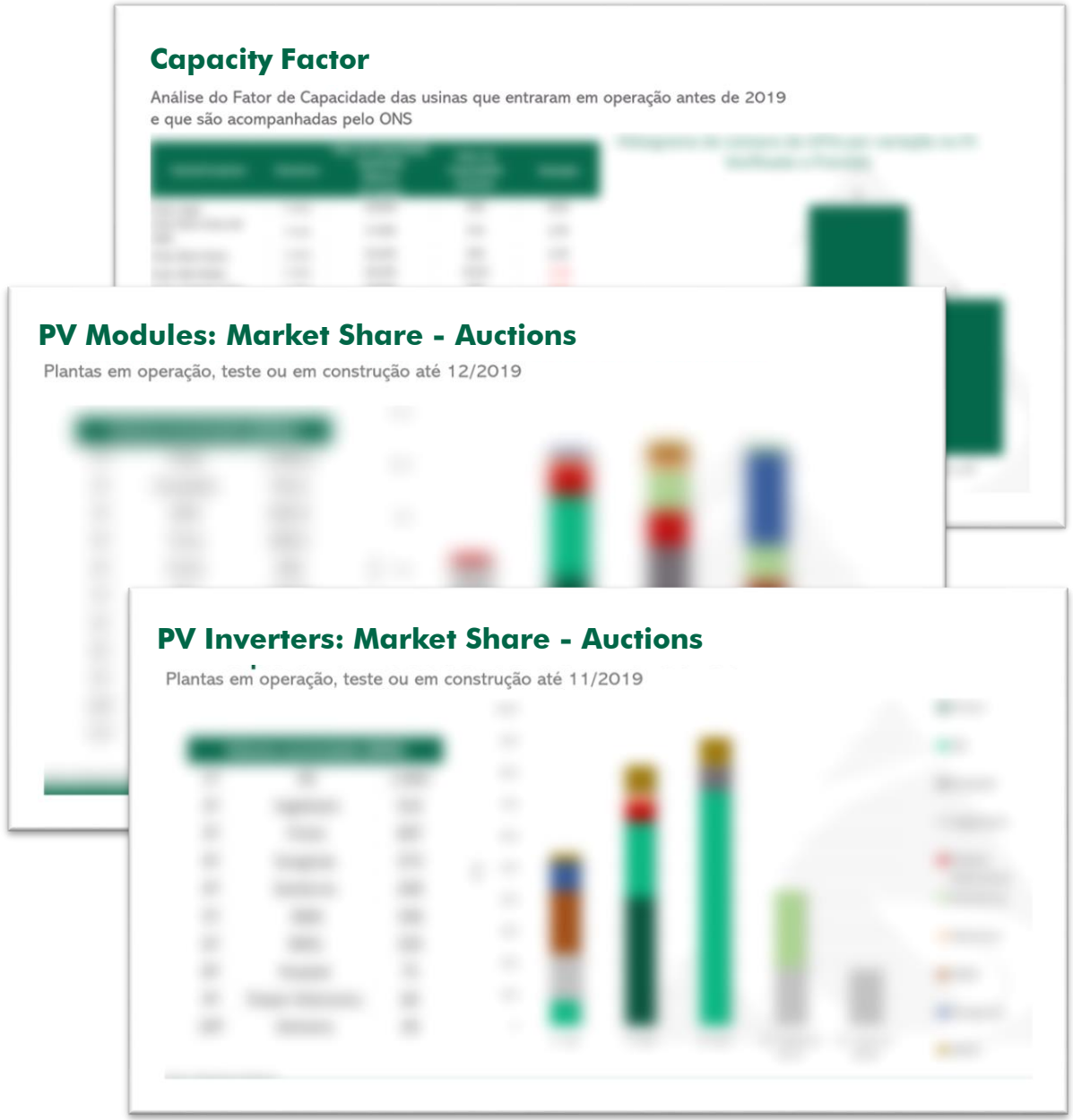
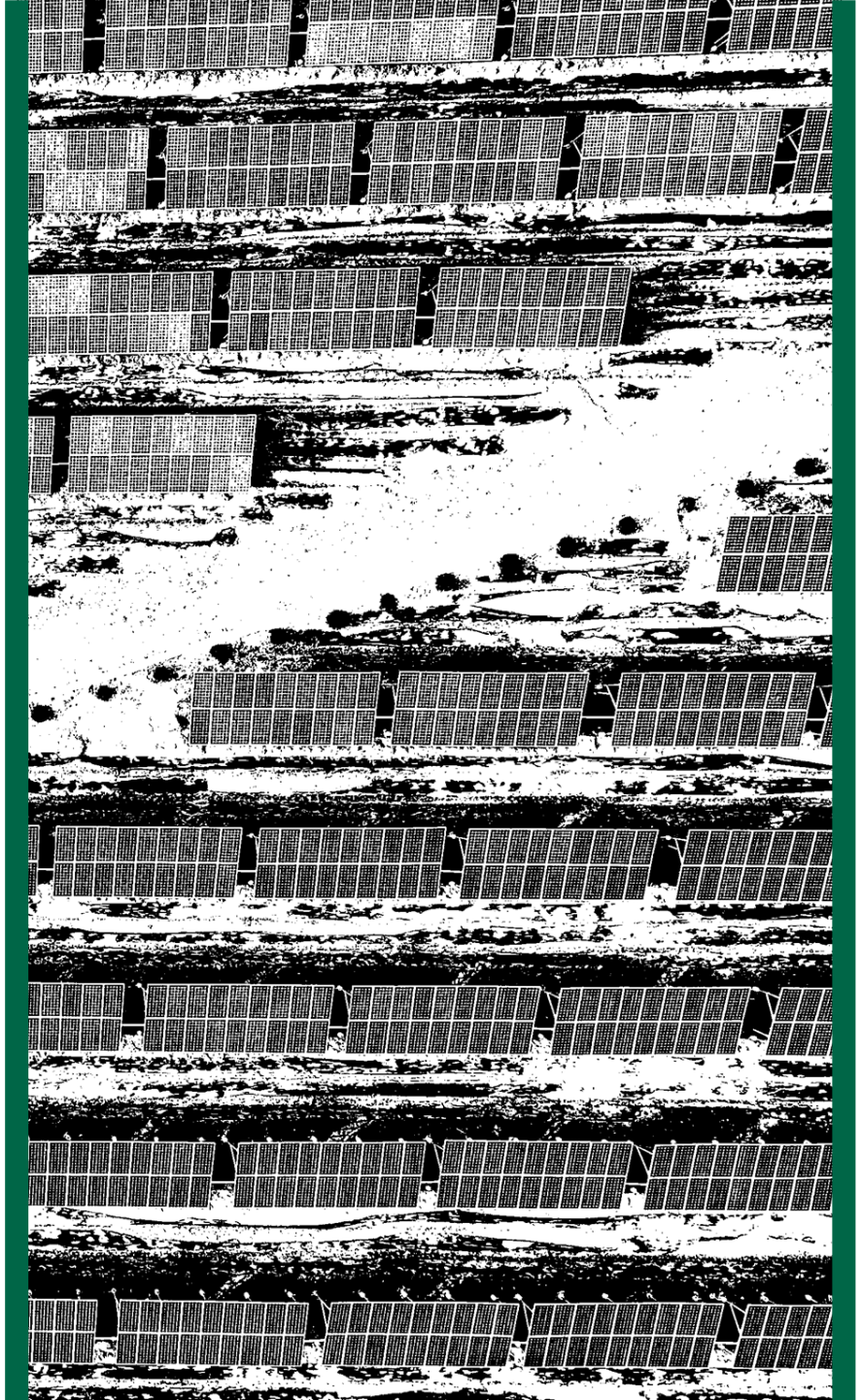


APPENDIX: DEVELOPING STEPS LARGE-SCALE PV POWER PLANTS



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