With the support of the **PV Market Alliance**

The PV Market Alliance

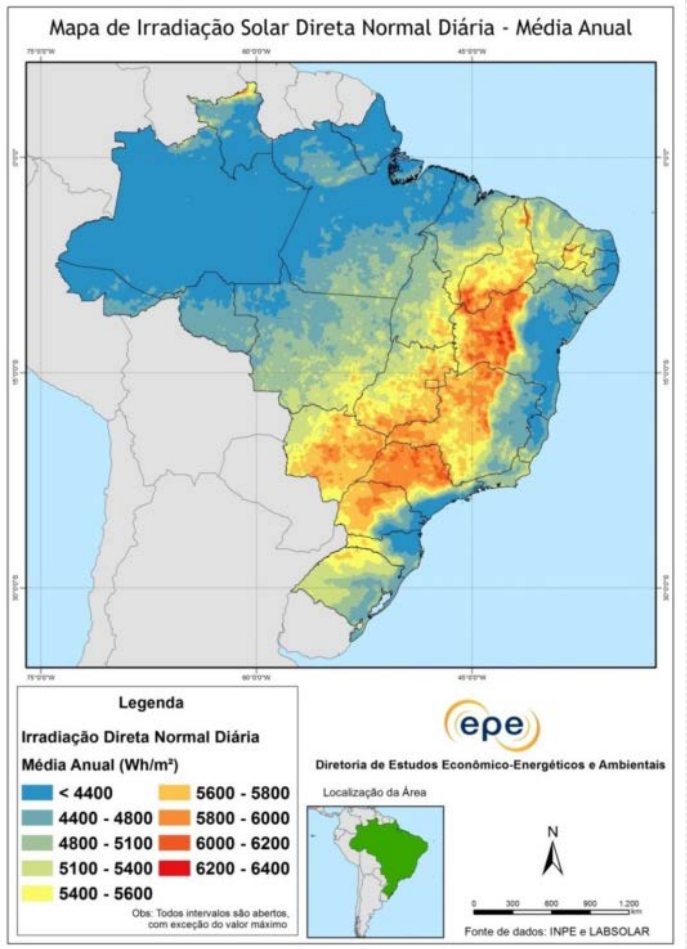
APVIA Q3 2017 Market Report

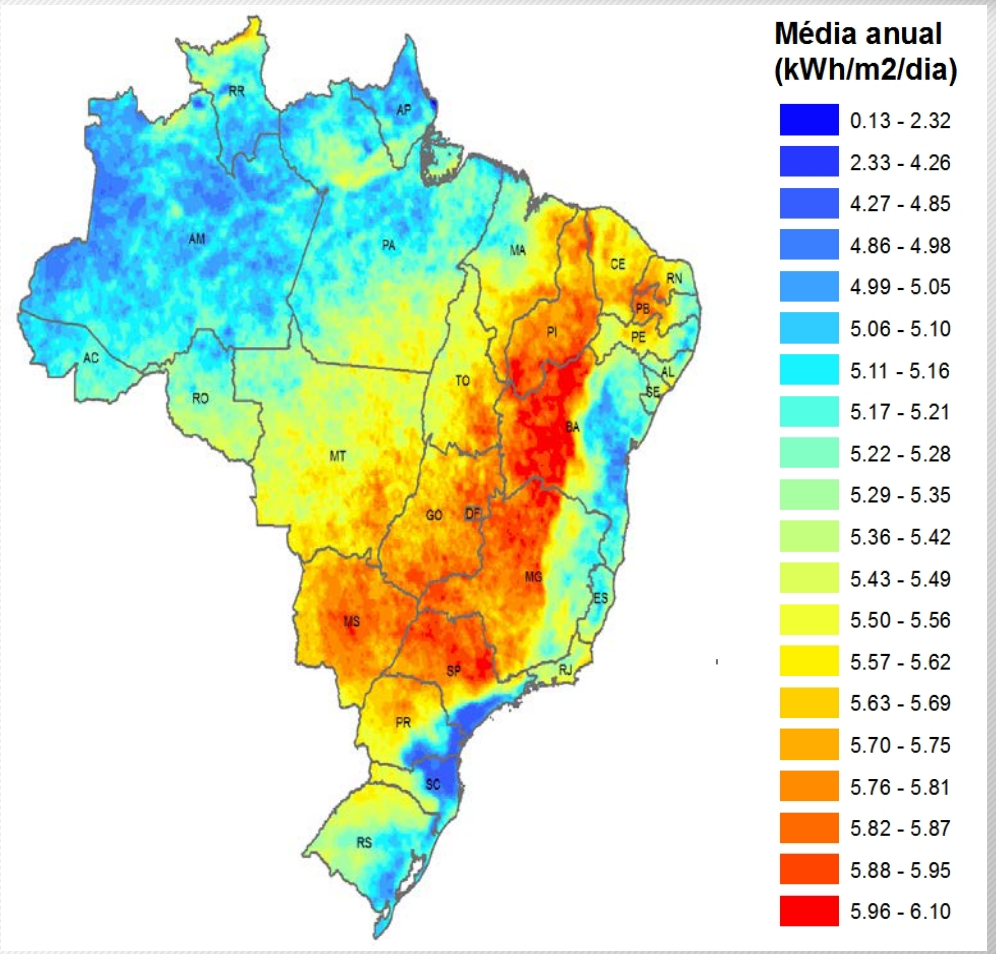
APVIA
ASIAN PHOTOVOLTAIC INDUSTRY ASSOCIATION

Introduction

- Launched in 2017, this 3rd edition of APVIA's quarterly PV market report focus on 'Brazil", anticipated to witness solid growth in terms of additionally added solar PV power generation capacity throughout 2017, 2018 and beyond.
- This report focuses on Brazil and the importance of renewable energy in its energy mix in general as well highlights and trends regarding solar PV in particular.
- This report has been prepared with information provided by the PV Market Alliance and especially Asia Europe Clean Energy (Solar) Advisory Co. Ltd. (AECEA)
- All information collected are valid at the time of publication. The data published do not engage the responsibility of APVIA or AECEA and should be considered with all due caution and are for informational purposes only.

Brazil's Solar Resource Maps





Brazil – 2700 km² required to power Brazil

Fossil Electricity Generation 2014:
123 TWh – Solar Required Area: 617 km²

Brazil Electricity Consumption 2014:
541 TWh – Solar Required Area: 2700km²

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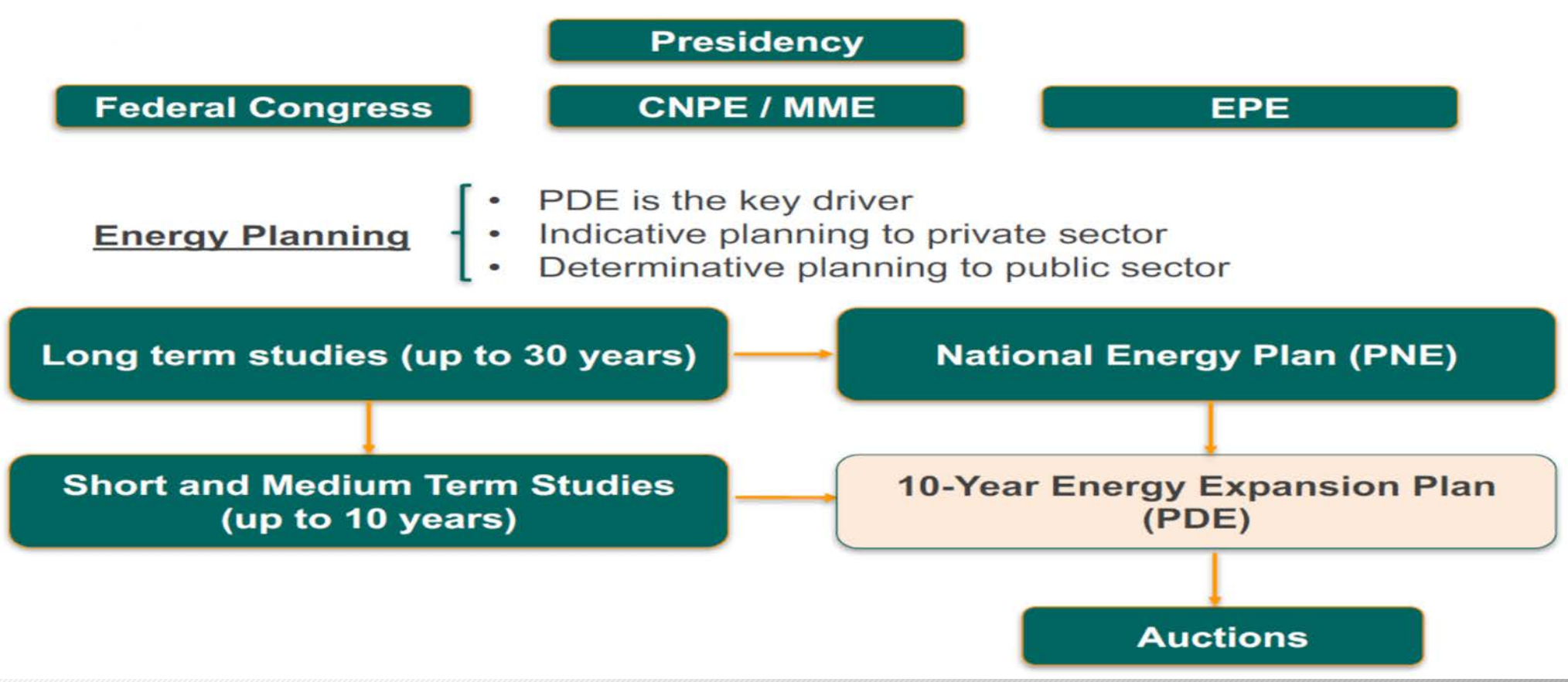
Brazil – Solar Policy and Planning



Brazil – Solar Policy and Planning

Distributed Generation	Micro/Mini Distributed Generation	Centralized Generation
• Connected to the distribution grid • Federal authorization for projects > 5MW	• Connected to the distribution grid; • Micro DG: ≤75kW; Mini DG: >75kW and ≦5MW • Registration with distribution company	• Connected to the distribution or transmission grid • Federal Authorization for projects > 5MW
• Sale to distributors in public bids organized by distributors	• Net metering regime • Offsetting between generation and consumption and surplus generation creates energy credits to be used in 60 months	• Sale to distributors or CCEE in federal regulated auctions or to other players in the free market

Brazil – Solar Policy and Planning

Pro Distributed Generation (MME Ordinance No. 538/15): develop DG renewable actions

- Incentivize sellers
- Establish specific reference value for distributed generation sale to distributors
- Studies for the sale in the free market
- Work group MME, ANEEL, EPE, CEPEL and CCEE
- Creation and expansion of credit lines to distributed generation
- Industrial incentive as focus for technological, productive and innovation development
- Incentive to human resources capacitation and formation
- Implementation of DG in federal schools, universities and hospitals

Brazil – Mini/Micro Distributed Generation

Key-Features

- **Shared Generation:** consumers organized in consortium or cooperative; same distribution concession area
- **Multiple Consumers Enterprise:** consumers located in the same or neighbour property with common use facilities; same distribution concession area
- **Remote Self Consumption:** consumers owned by the same individual or legal entity; same distribution concession area
- **Agreement with Distributor:** Operational Relationship (micro) and Operative Agreement (mini)
- **Generation Capacity:** limited to consumer capacity; increase allowed
- **Costs for Improvement, Reinforcement and Metering System:**
  - Paid by consumers if mini DG or shared micro | Paid by distributors if micro, except shared
- **Only to captive consumers**
  - Rental or purchase of real estate in Reais/electric power is forbidden | Distributor is responsible for O&M of metering system
- **Review of Regulations anticipated to take place by December 31, 2019**

Brazil – Mini/Micro Distributed Generation

Key-Features

- Net-Metering Scheme
- Law 13,169/2015: PIS/COFINS applied to net consumption
- ICMS Rule 16/2015 (Confaz): States may charge ICMS only to the net consumption; almost all states issued legislation to this effect
- Both provisions are not updated to new criteria of ANEEL RN 687
- Discussions on the suitability of the exemptions also to the portion of the tariff related to the use of the grid

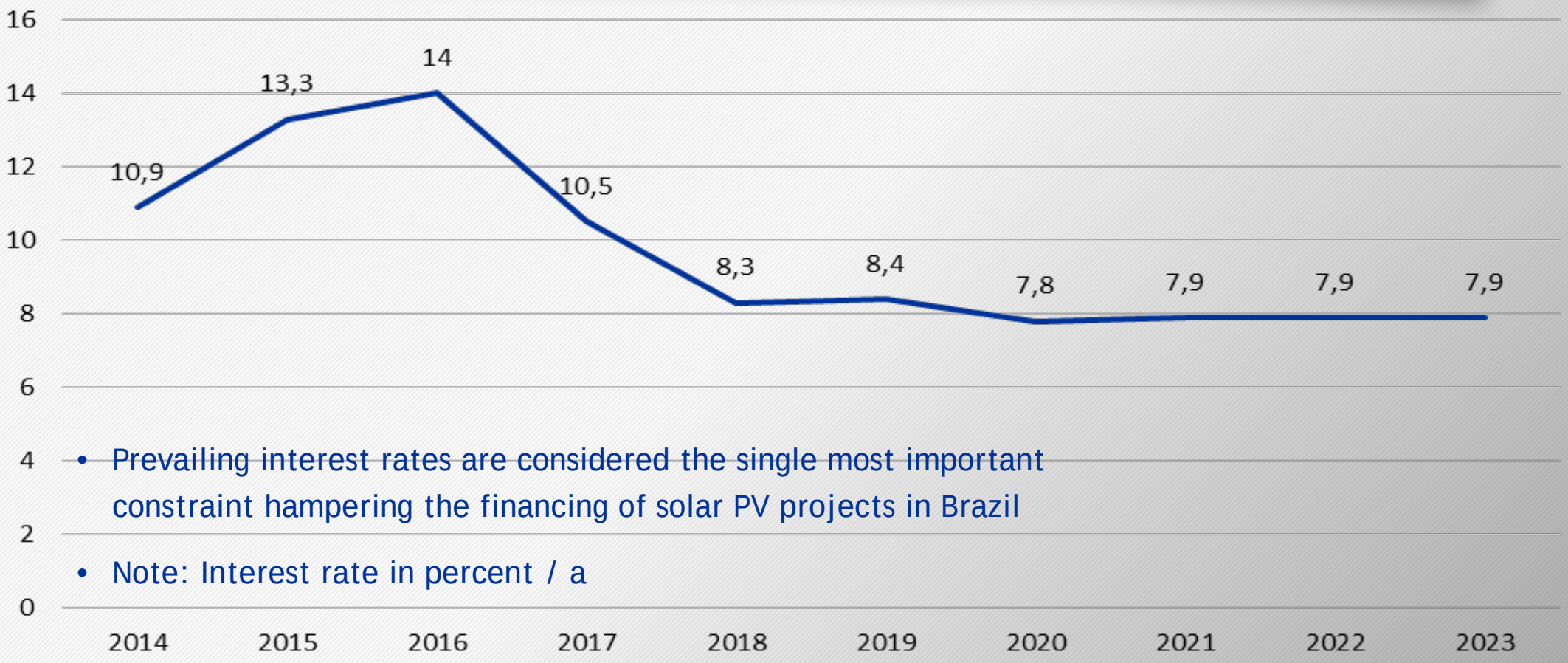
Brazil – BNDES Localization Policy

Methodology for Accreditation of products: Crystalline Silicon Technology (June'2017)							
	Components			Requirements	Up to Dec'2019	From Jan'2020 to Dec'2022	From 2023 on
Photovoltaic Generator System	C.1	PV Module	Glass	Manufactured in Brazil, with local content	5%	5%	5%
			Backsheet or Encapsulant (EVA)	Manufactured in Brazil, with local content	5%	5%	5%
			Junction Box	Manufactured in Brazil, with local content	5%	5%	5%
			Solar Cell	Manufactured in Brazil, with local content	30%	30%	30%
			PV Module with frame	Frame produced in Brazil, with local content	60%	50%	30%
				Cells connection			
				Material overlay			
				Lamination			
				Framing			
				Modules connection			
				Tests			
	C.2	Electrical Components (DC cables and combiner / string boxes)			10%	10%	10%
	C.3	Metal structures (fixed racks on floor or roof and trackers)			10%	10%	10%
	C.4	Inverters			20%	20%	20%
System "Factor C" with required items to allow accreditation					80%	90%	70%

Revised BNDES Localization Plan

- Simplified rules for localization
- Reduced scope of mandatory items
- Increased BNDES' participation in financing
- Extend the deadlines for changing levels
- Offer better conditions to Micro and Small companies
- Currently an increase of the import tax imposed on PV modules from presently 12% to 35% is being discussed among various industry stakeholders

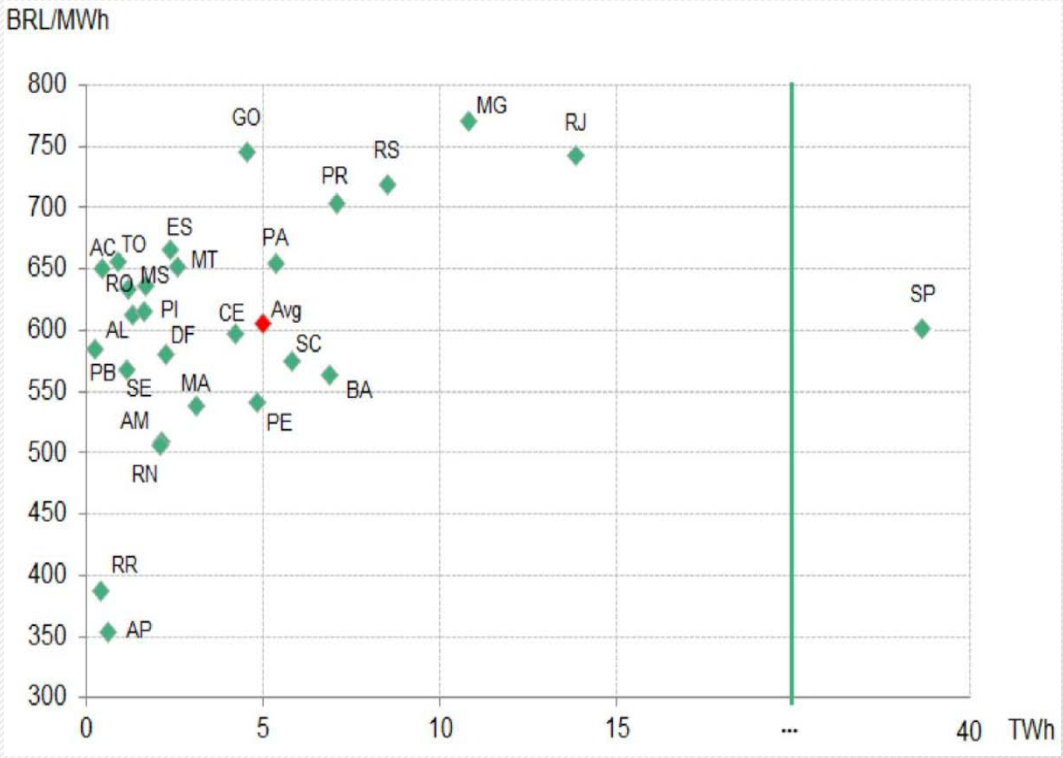
Brazil – Financing Constraints



- Prevailing interest rates are considered the single most important constraint hampering the financing of solar PV projects in Brazil
- Note: Interest rate in percent / a

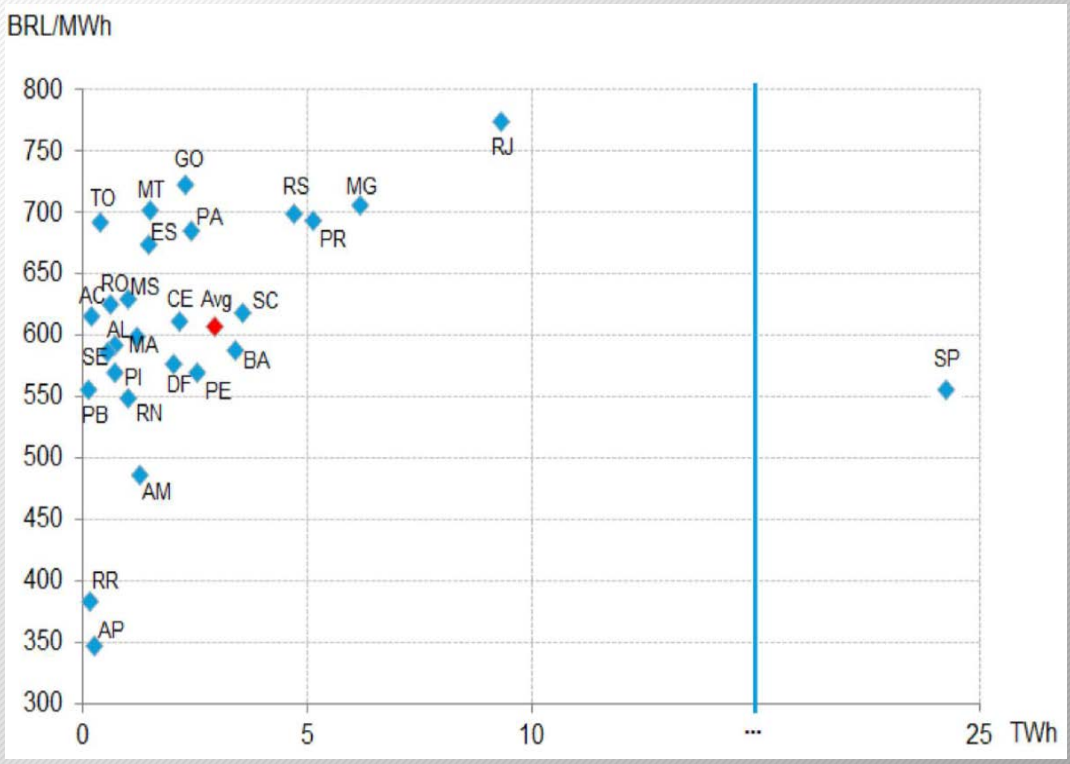
Brazil – Attractiveness of States

Residential Electricity Tariffs vs Electricity Consumption by State in 2016

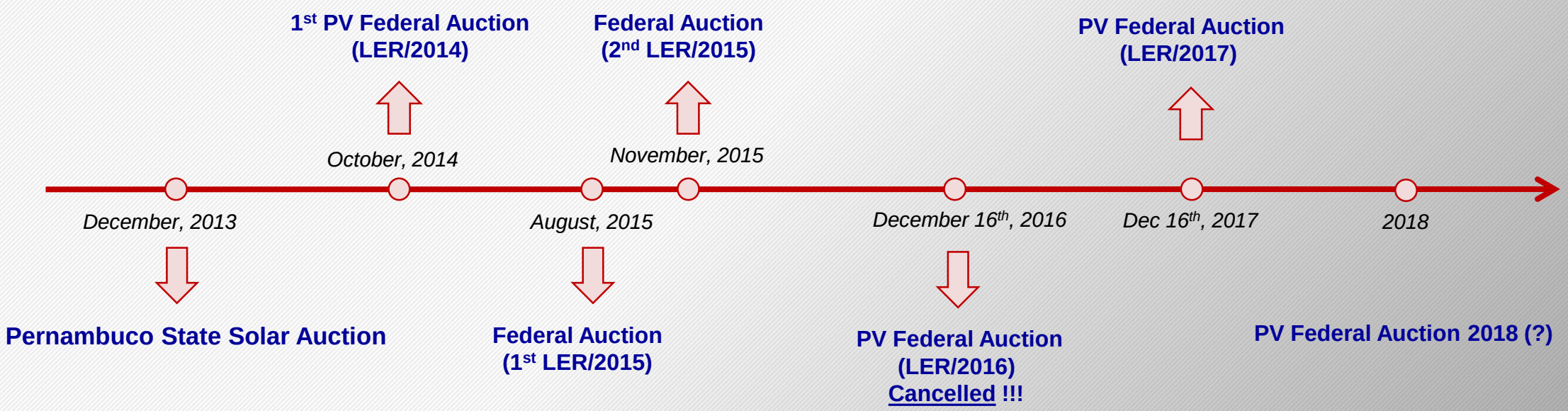


Source: ANEEL

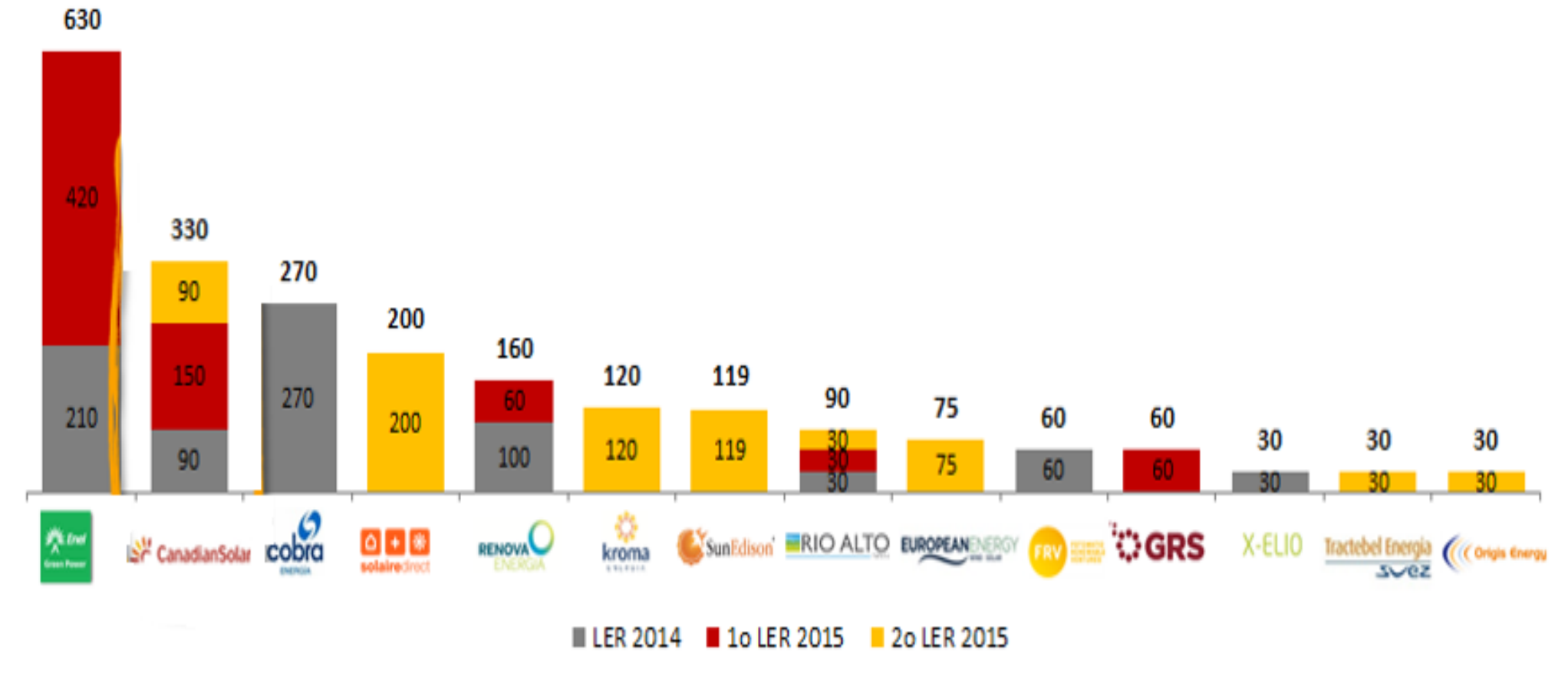
Commercial Electricity Tariffs vs Electricity Consumption by State in 2016



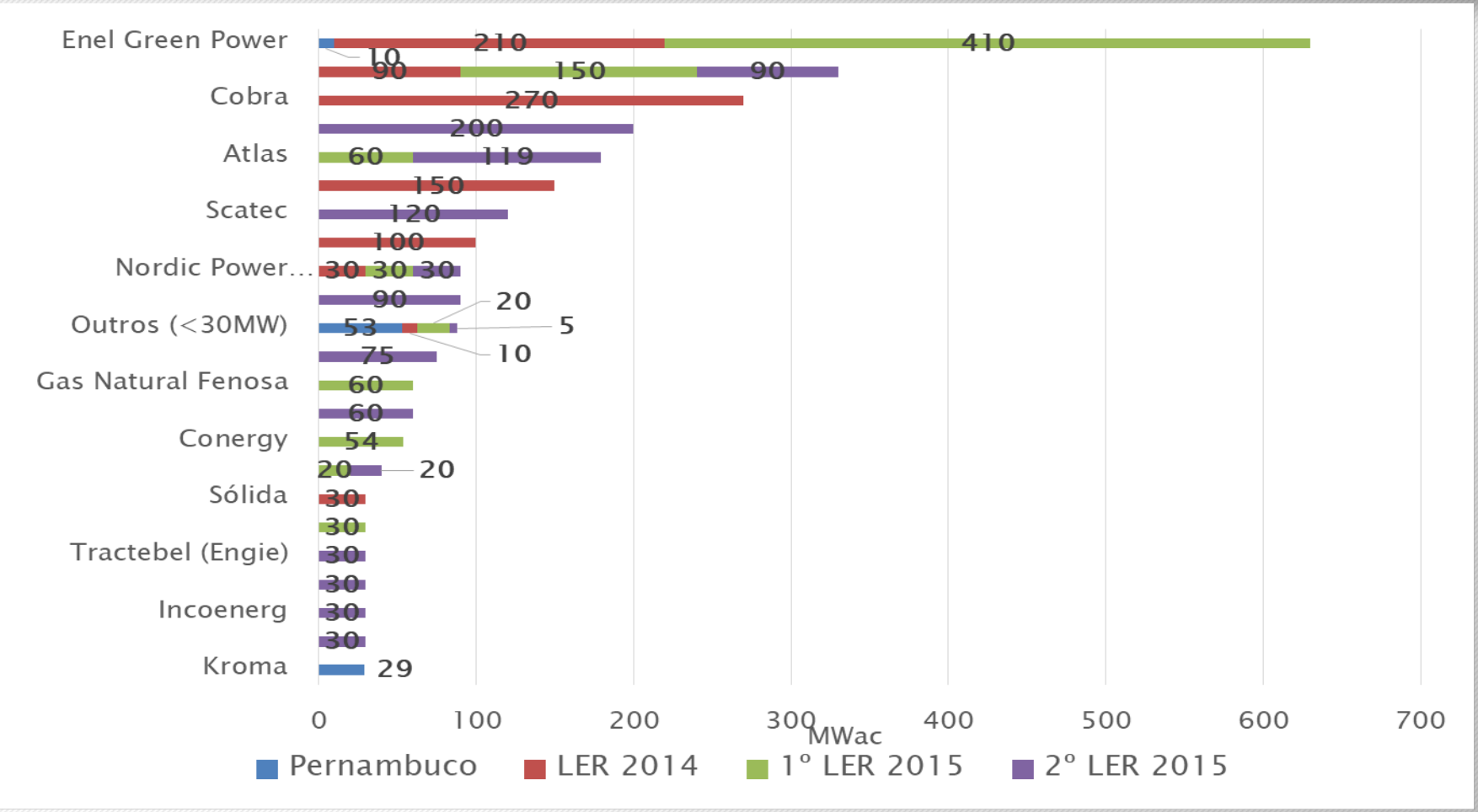
Brazil – Roadmap of Solar Auctions



Brazil – Auction Winner Landscape (2014-2015)

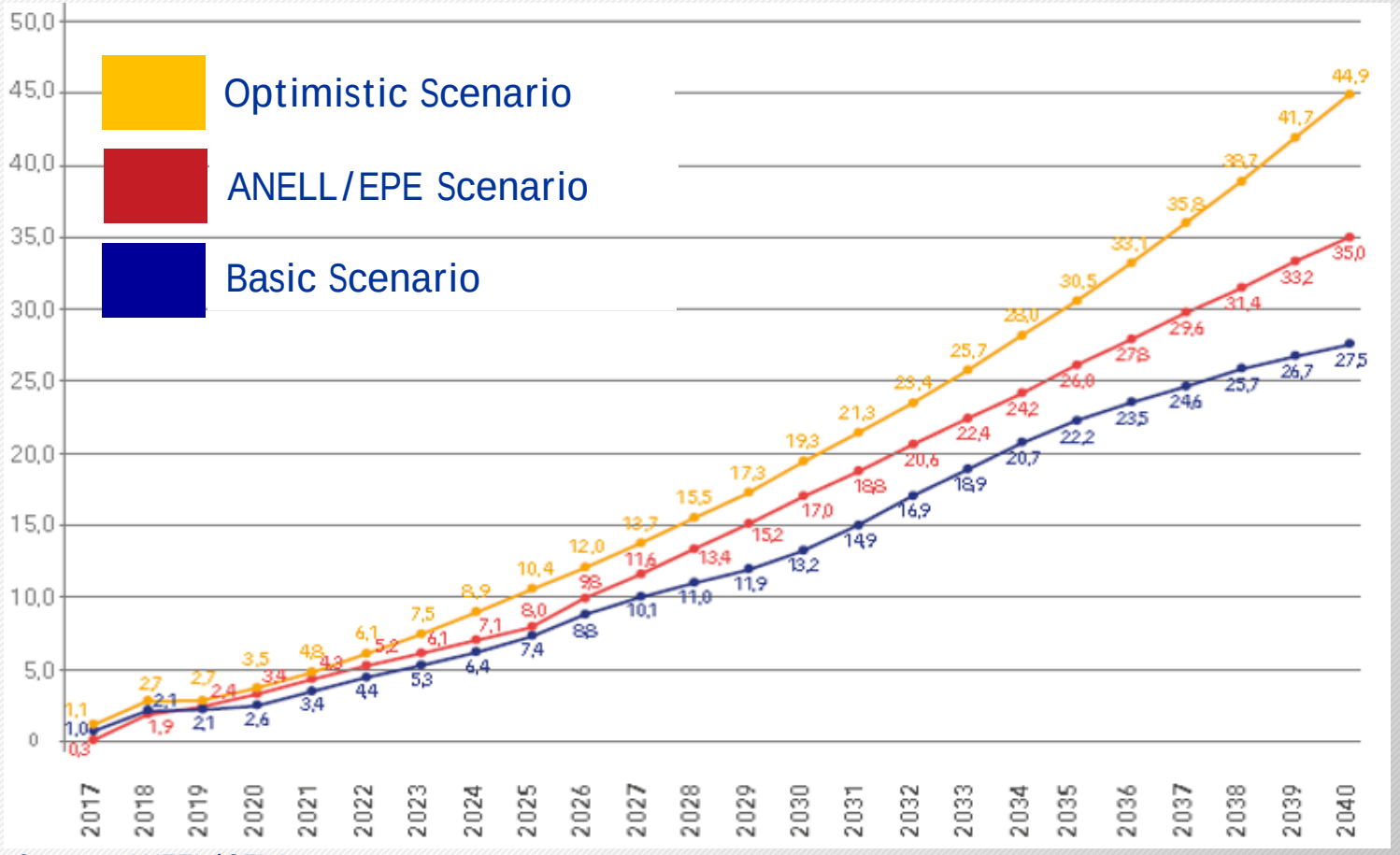


Brazil – Centralized Generation



- To date, up to 2.75 GW of large-scale utility solar PV projects were awarded through the conduction of three national auctions btw. 2014 and 2015
- During 2016 two planned auctions were cancelled at short notice
- Dec 18, 2017 the next auction which includes solar shall be conducted

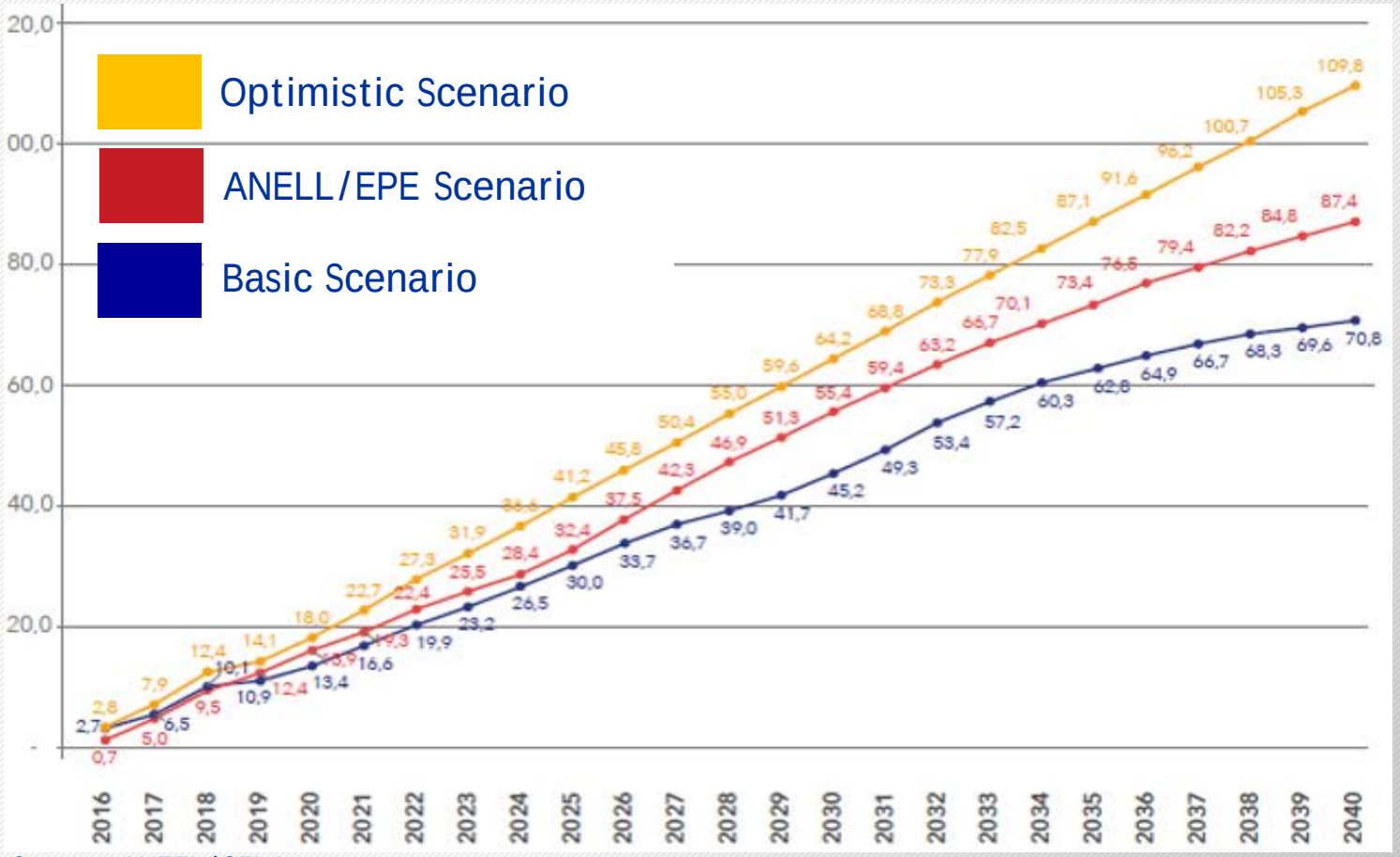
Brazil – Centralized Generation Prospects



Source: ANEEL/CELA

- To date, significantly below 1 GW of decentralized large-scale utility solar PV power generation capacities are deployed
- 2018 is anticipated to witness the construction of up to 2 GW
- According to the ANELL/EPE scenario approx. 4.3 GW will be installed by 2021
- Depending on the scenario the 10 GW mark might be crossed between 2025 and 2027

Brazil – Centralized Generation Prospects

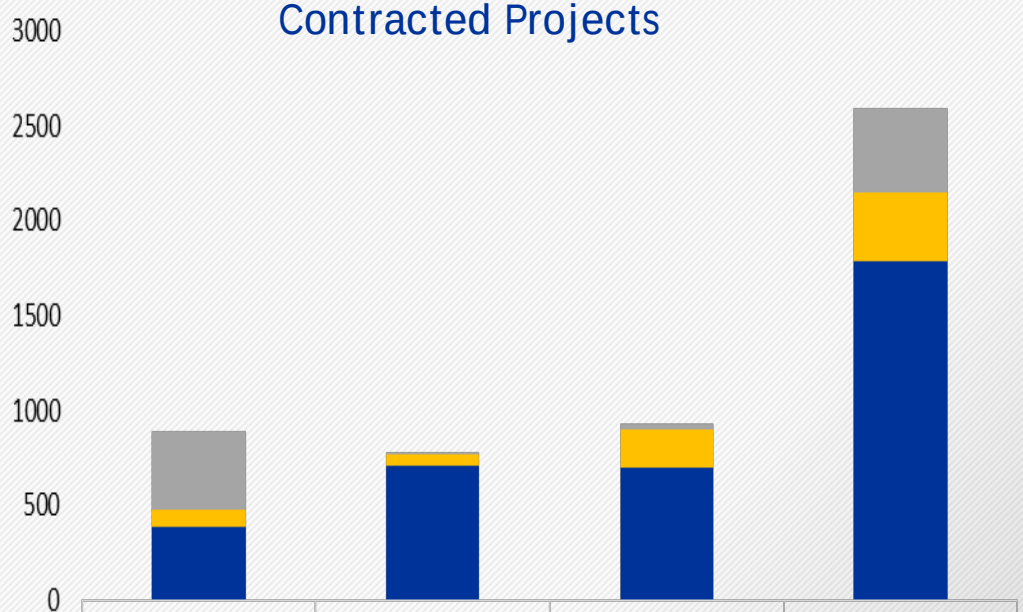


Source: ANEEL/CELA

- Till 2040 significant investments have been projected to be allocated towards solar PV
- Average annual investments are approx. R$ 4,4 billion, including approx. R$ 3.1 billion debt

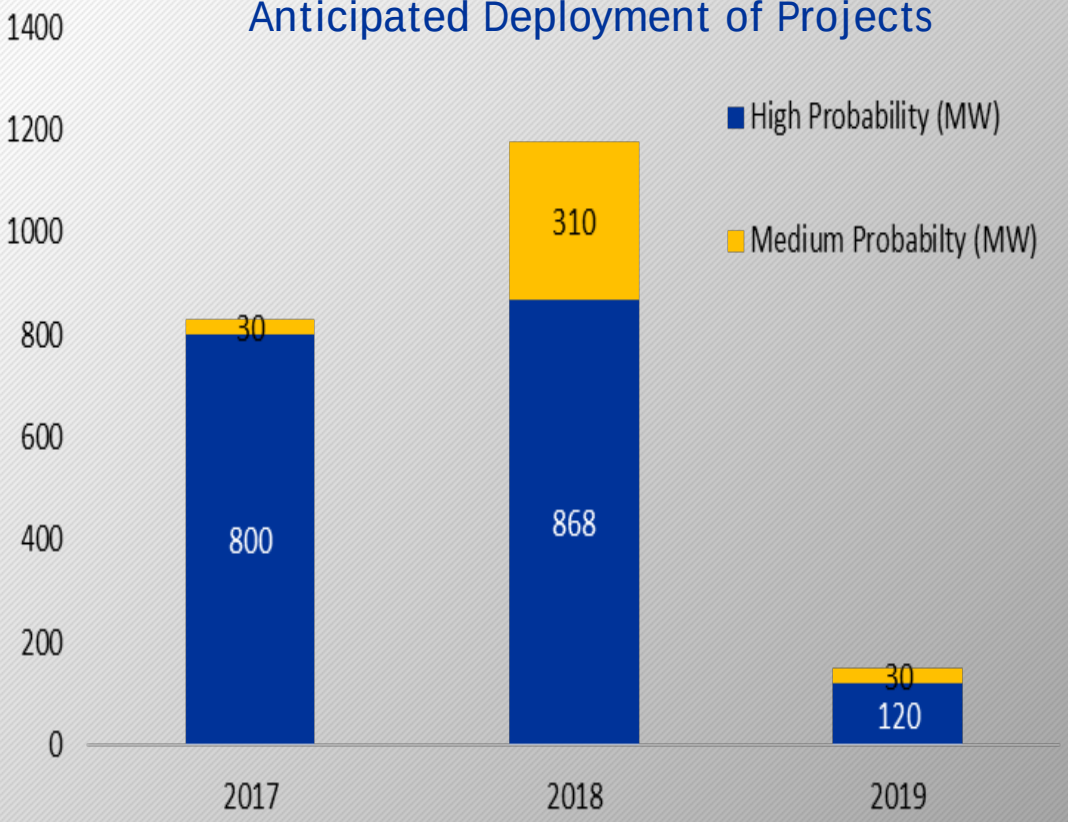
Brazil – Centralized Generation – Prospects

Contracted Projects



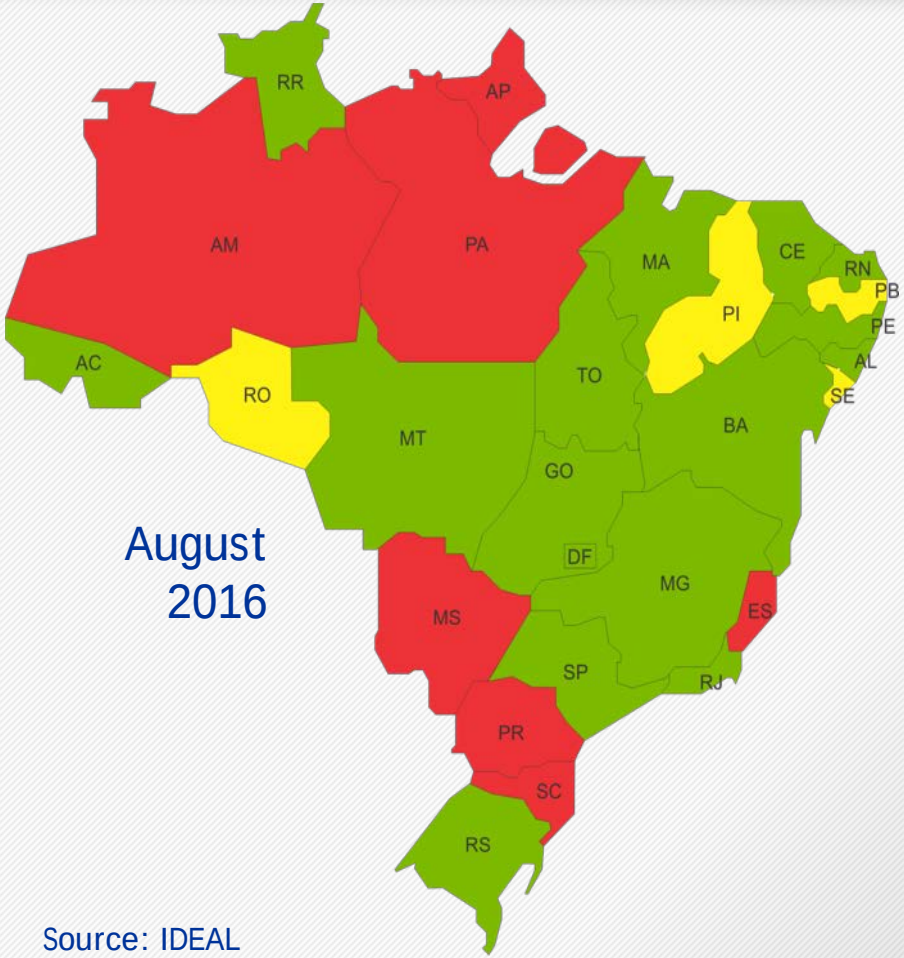
	6th Auction	7th Auction	8th Auction	Accumulated
Low Probability (MW)	409,7	5	30	444,7
Medium Probability (MW)	90	65,1	205	360,1
High Probability (MW)	390	703,7	694,3	1788

Anticipated Deployment of Projects

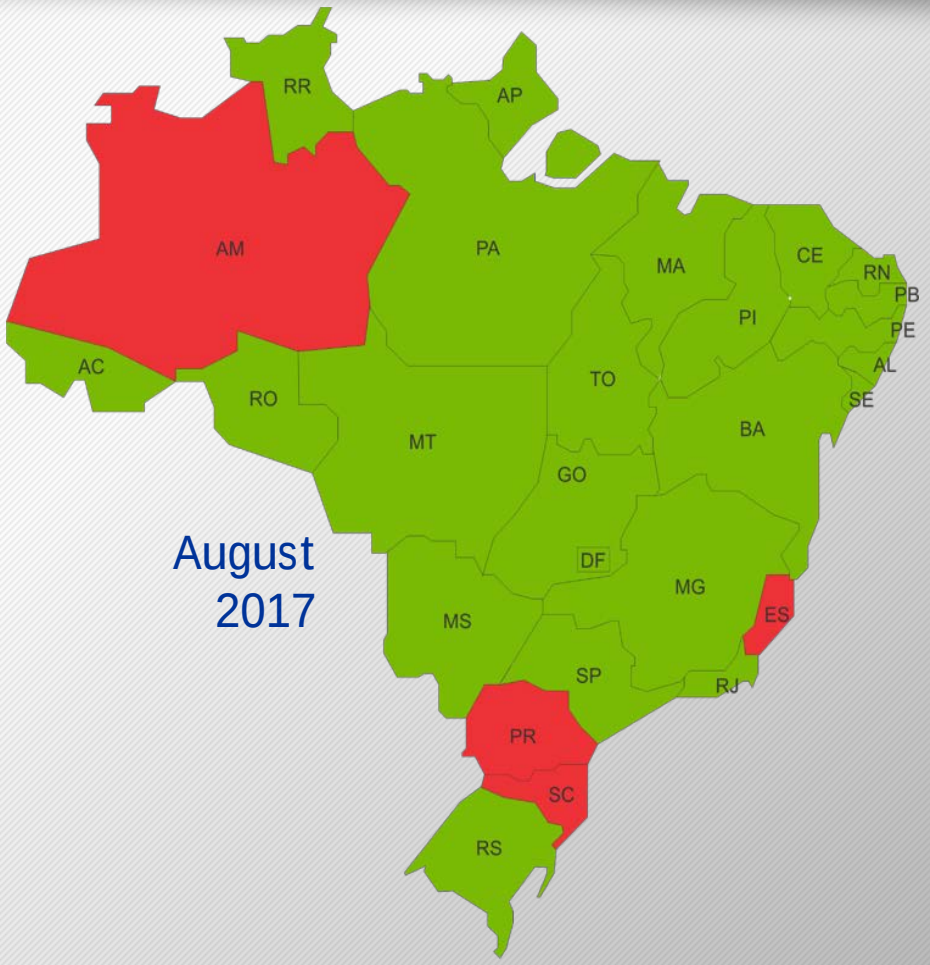


Source: ANEEL

Brazil – Distributed PV Policy Development



August 2016



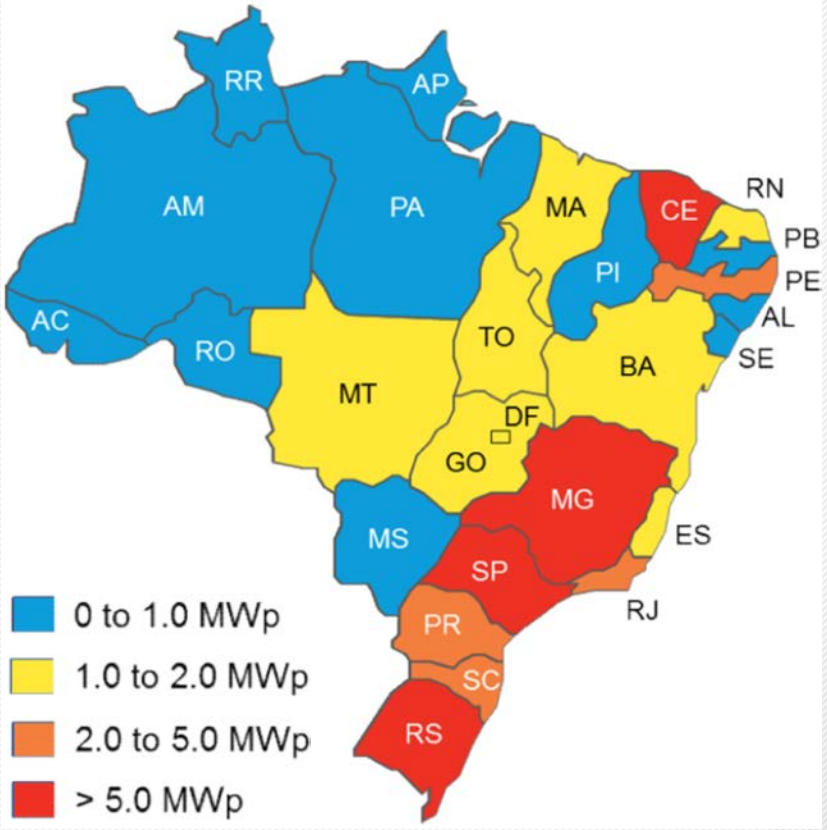
August 2017

- DG Policy (ICMS 16/2015) implemented
- DG Policy (ICMS 16/2015) implemented as of 01/09/2016
- DG Policy (ICMS 16/2015) implementation still pending

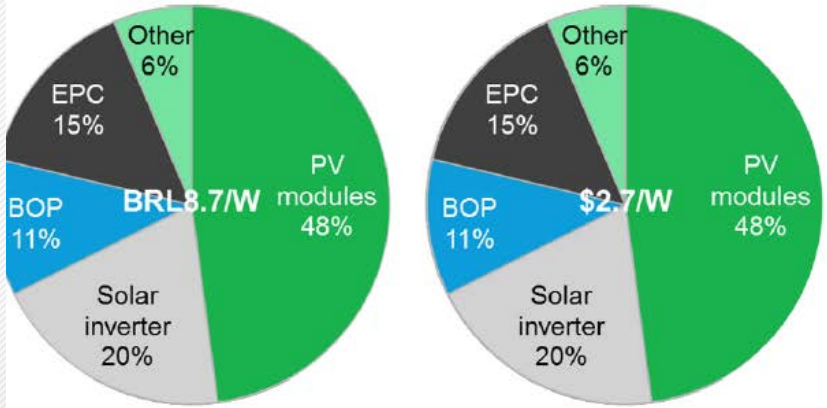
Source: IDEAL

Brazil – Distributed Generation Development

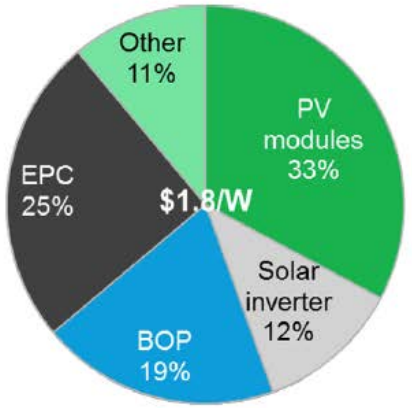
Small-Scale Solar Installation Volumes by State (2016)



System price breakdown in BRL and USD, Brazil as of 2016



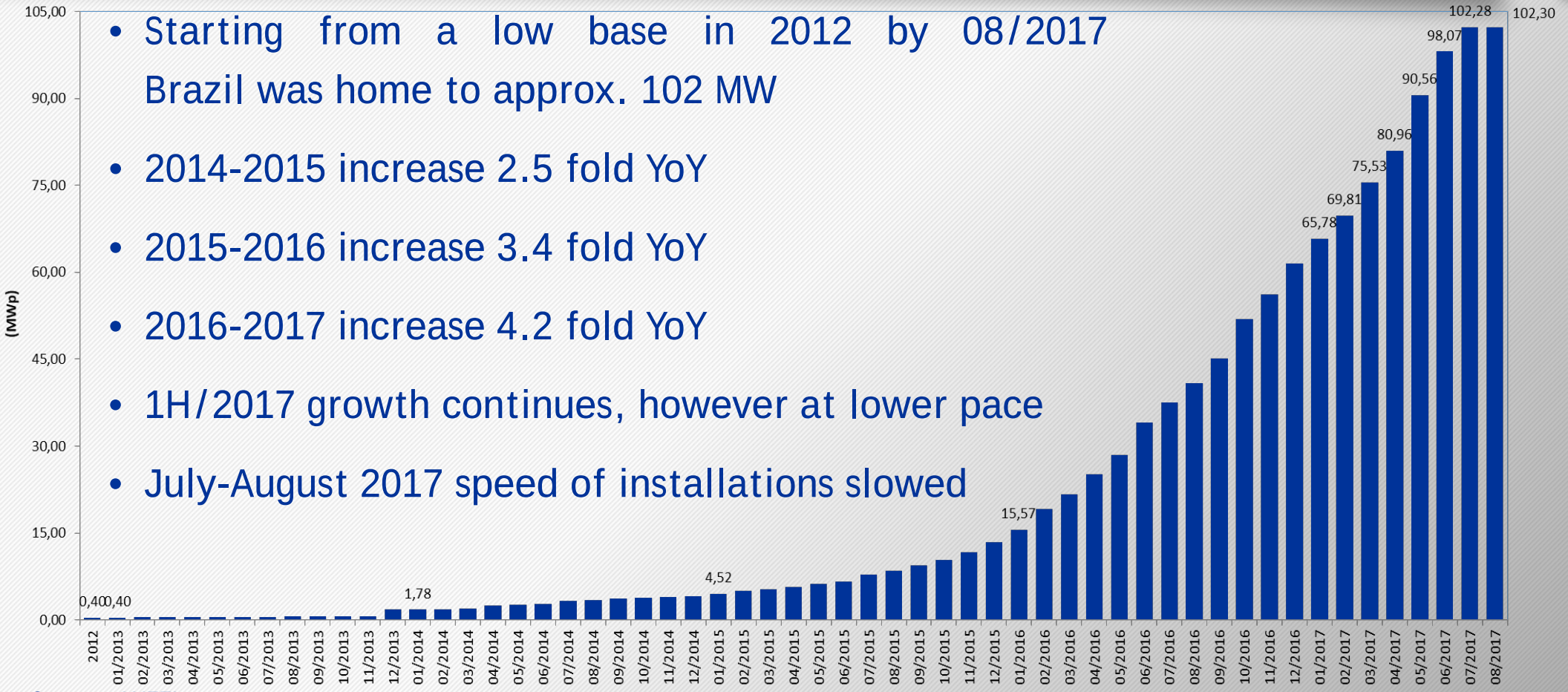
System price breakdown in USD, Global benchmark as of 2016



Source: BNEF 08/2017

Brazil – Distributed Generation Development (Installed Solar PV Capacity in MWp)

- Starting from a low base in 2012 by 08/2017 Brazil was home to approx. 102 MW
- 2014-2015 increase 2.5 fold YoY
- 2015-2016 increase 3.4 fold YoY
- 2016-2017 increase 4.2 fold YoY
- 1H/2017 growth continues, however at lower pace
- July-August 2017 speed of installations slowed



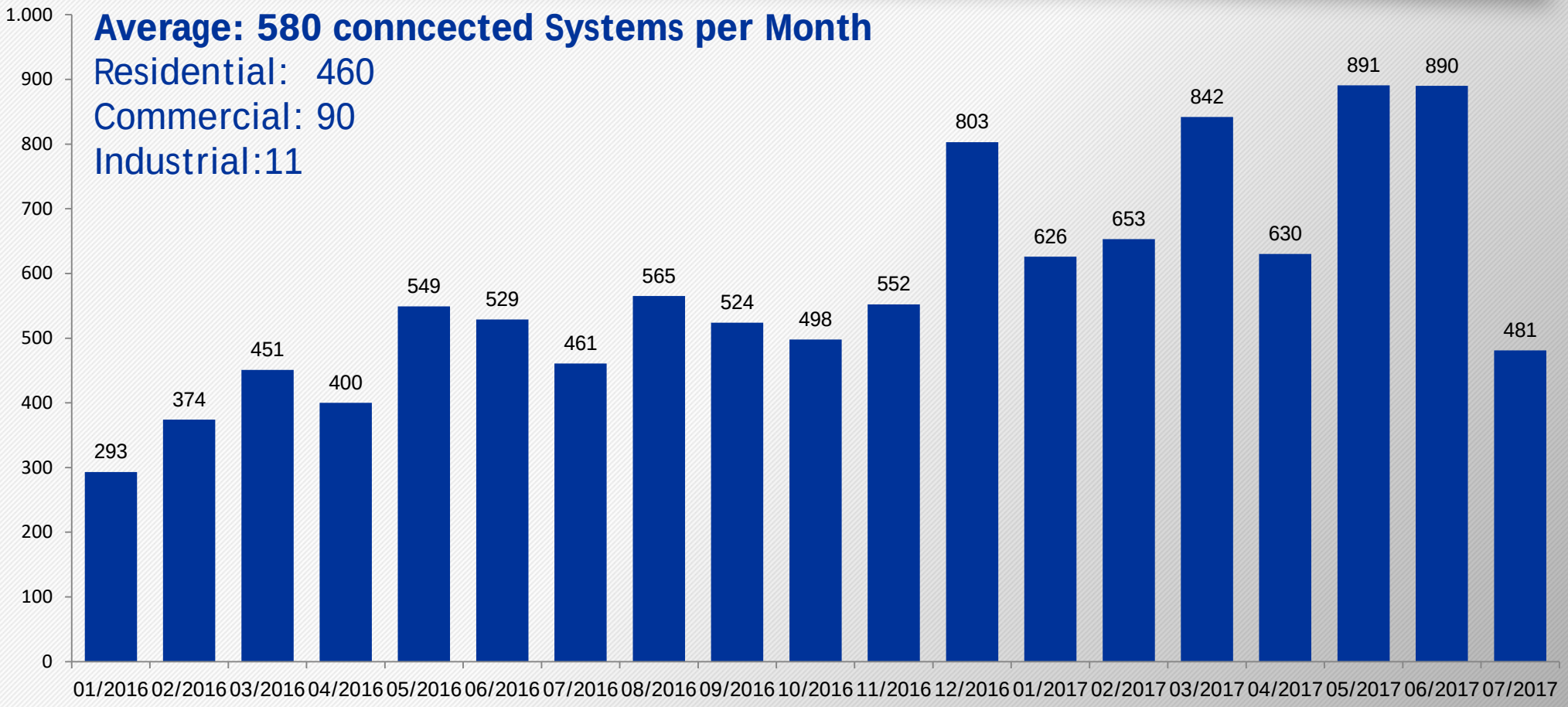
Source: ANEEL

Brazil – Distributed Generation Development (Number of Connected PV Systems)

- Starting from a low base in 2012 by 08/2017 close to 13,000 PV systems were installed
- 2014-2015 increase 6.3 fold YoY
- 2015-2016 increase 5.2 fold YoY
- 2016-2017 increase 4.1 fold YoY
- 1H/2017 growth continues, however at lower pace
- July-August 2017 speed of installations is zero

Source: ANEEL

Brazil – Distributed Generation (Number of Grid-Connected System by Type)



Source: ANEEL

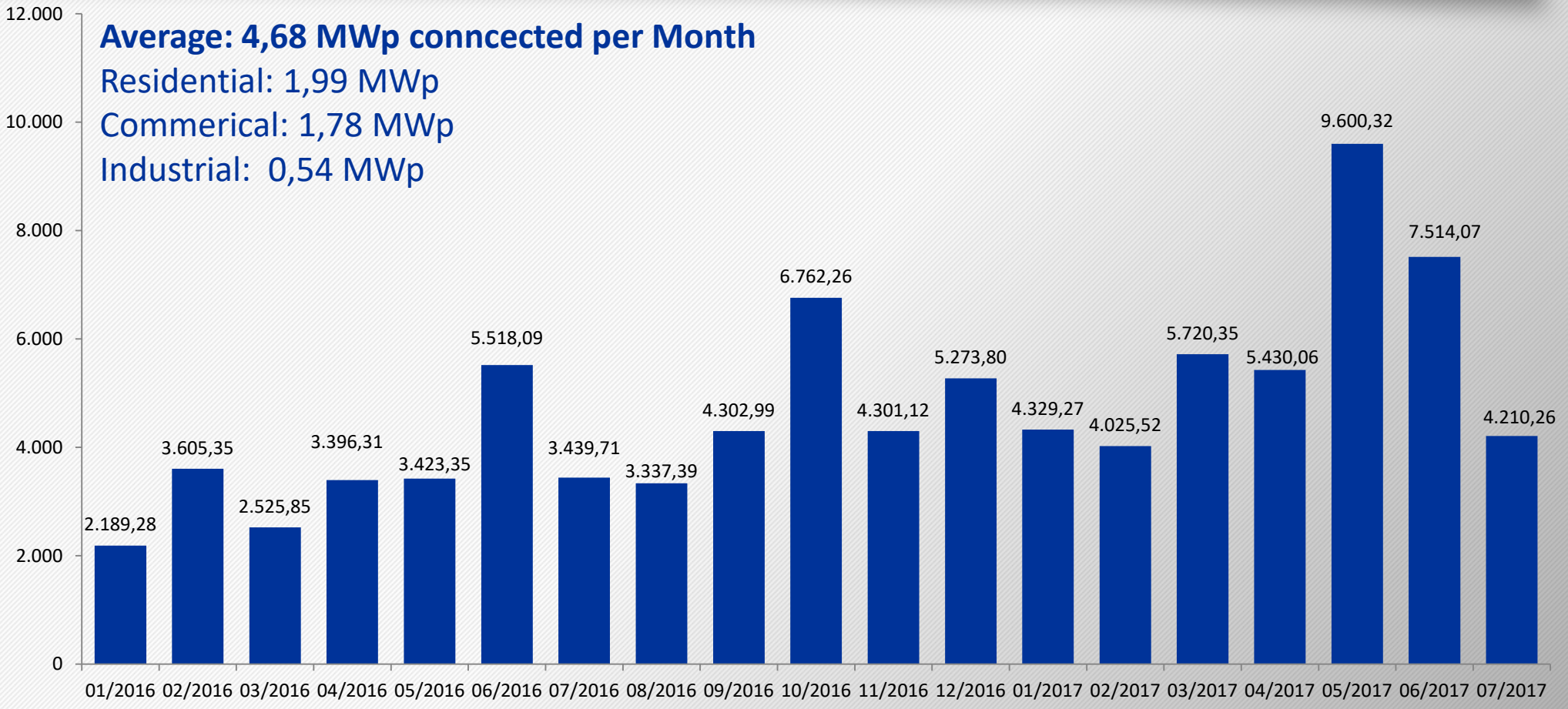
Brazil – Distributed Generation (Installed Capacity by System Type per Month)

Average: 4,68 MWp conncected per Month

Residential: 1,99 MWp

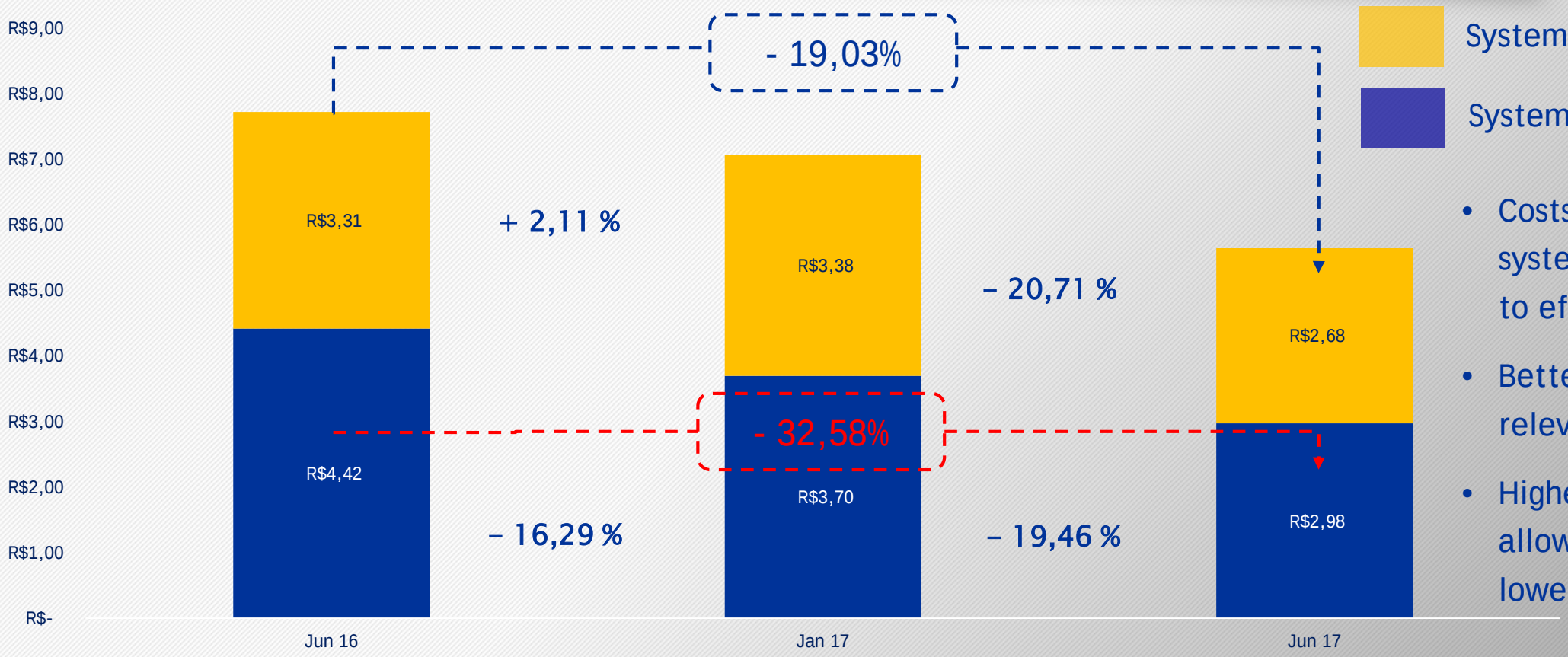
Commerical: 1,78 MWp

Industrial: 0,54 MWp



Source: ANEEL

Brazil – Price Development (Distributed)



- Costs to integrate PV systems dropped, due to efficiency gains
- Better access to relevant information
- Higher volumes allowed achieving a lower price

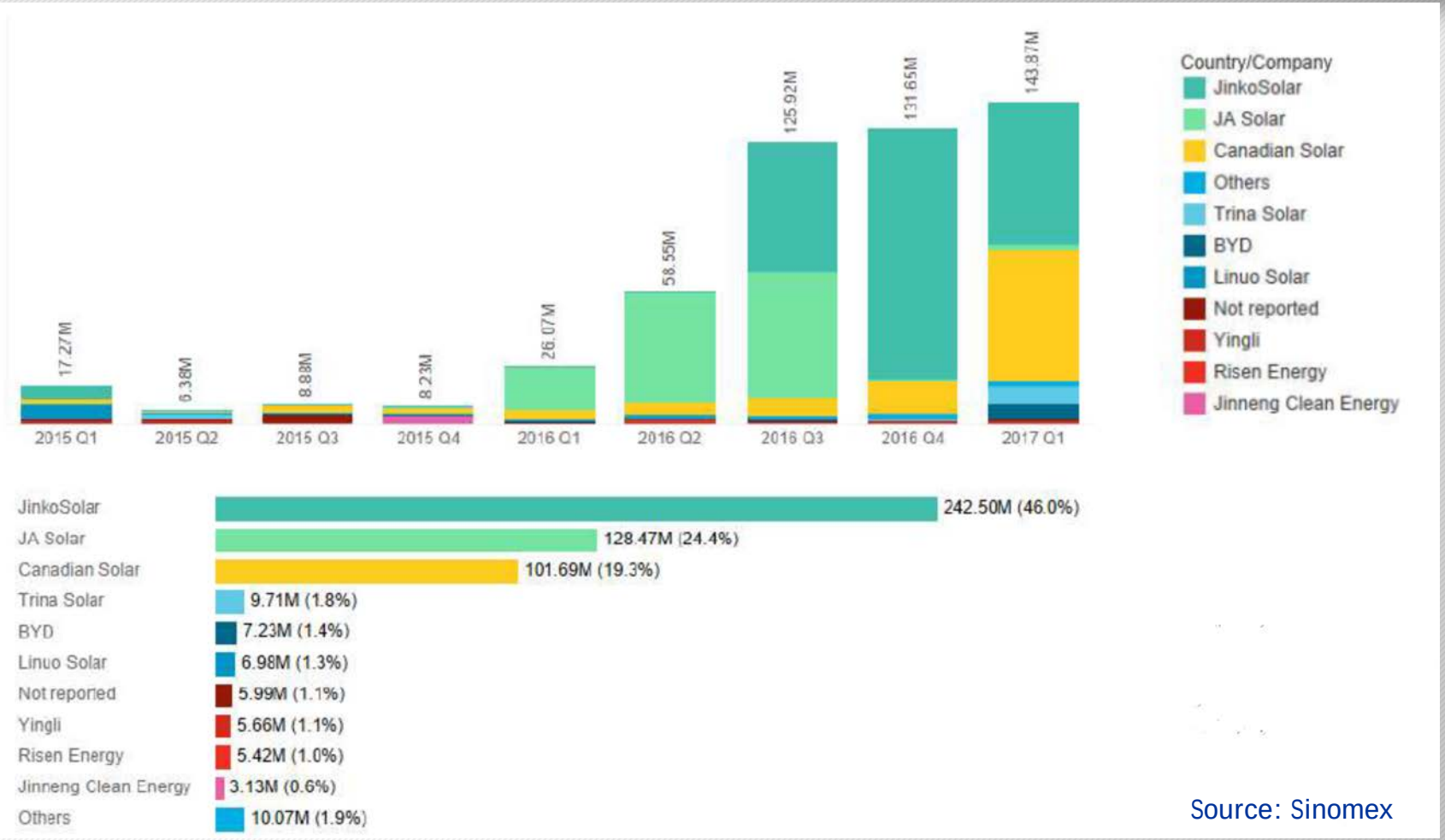
Source: Greener

Brazil – Price Developments (Distributed)

Average Price Variations up to 500kWp	June/2016 till Jan/2017	Jan/2017 till June/2017	June/2016 till June/2017
Cost of System Integration	+ 3,96%	- 19,07%	- 17,71%
PV System	- 22,58%	- 17,89%	- 36,53%
Final End-User / Customer Price	- 11,96%	- 19,29%	- 28,93%

Source: Greener

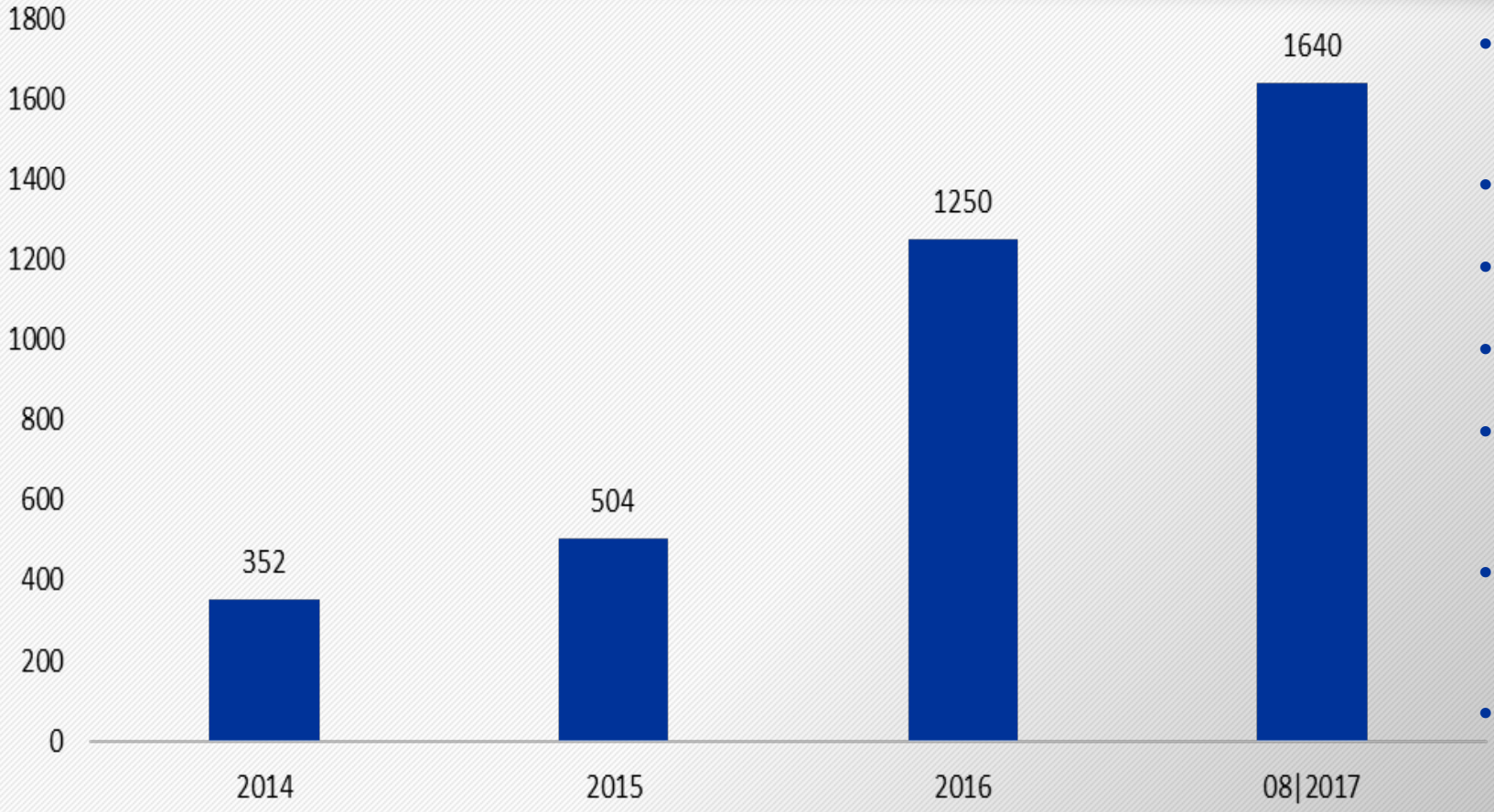
Brazil – Module Imports from China



Source: Sinomex

- Total imports from Q1/2015 to Q1/2017: USD 530 Mio
- JinkoSolar share almost 50%
- JinkoSolar, JA Solar and Canadian Solar enjoy a combined market share of almost 90%
- Share of Non-Chinese module suppliers considered negligible
- Import situation anticipated to remain unchanged in foreseeable future

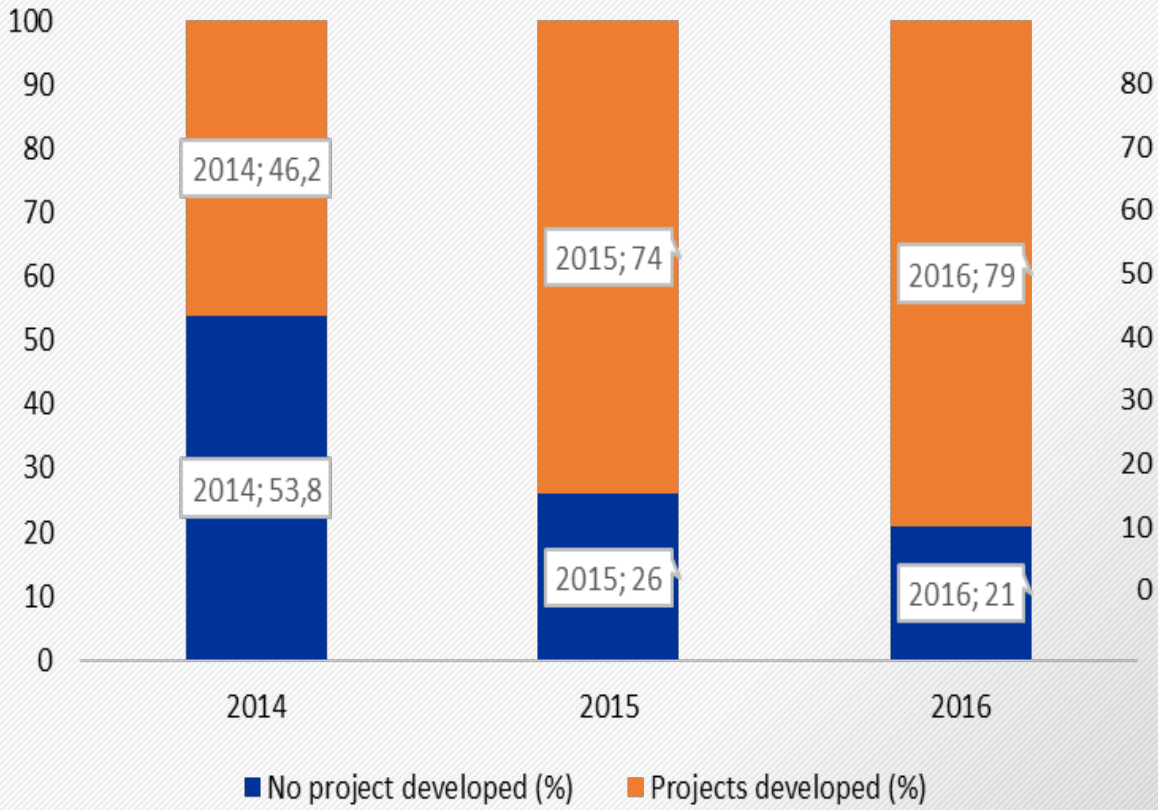
Brazil – Downstream Sector Development

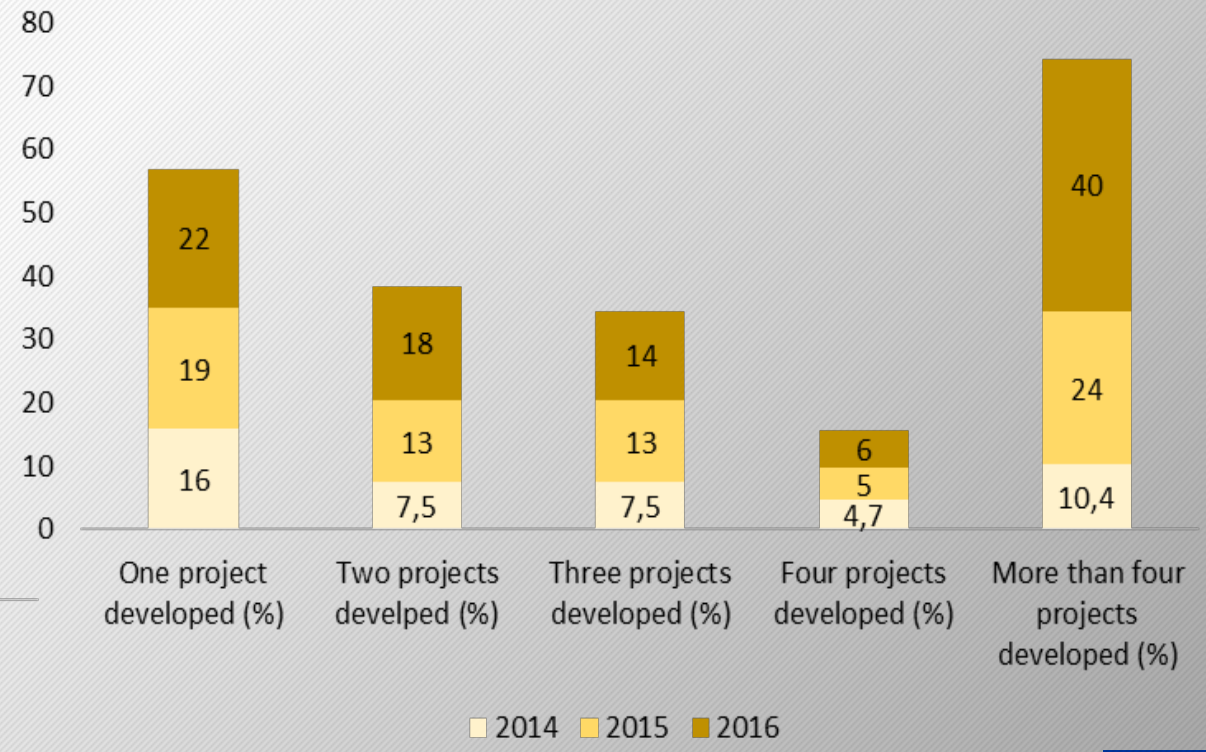


- Brazil's solar PV installer industry experiences exponential growth
- 10/2016: approx. 5.000 companies
- 04/2017: approx. 10.000 companies
- 08/2017: approx. 15.000 companies
- 40% of companies are less than 2 years old
- Proven track record varies among companies
- Installation time shortened from 6 months in 2013 to 2 months in 2016

Source: IDEAL company database

Brazil – Downstream Sector Development

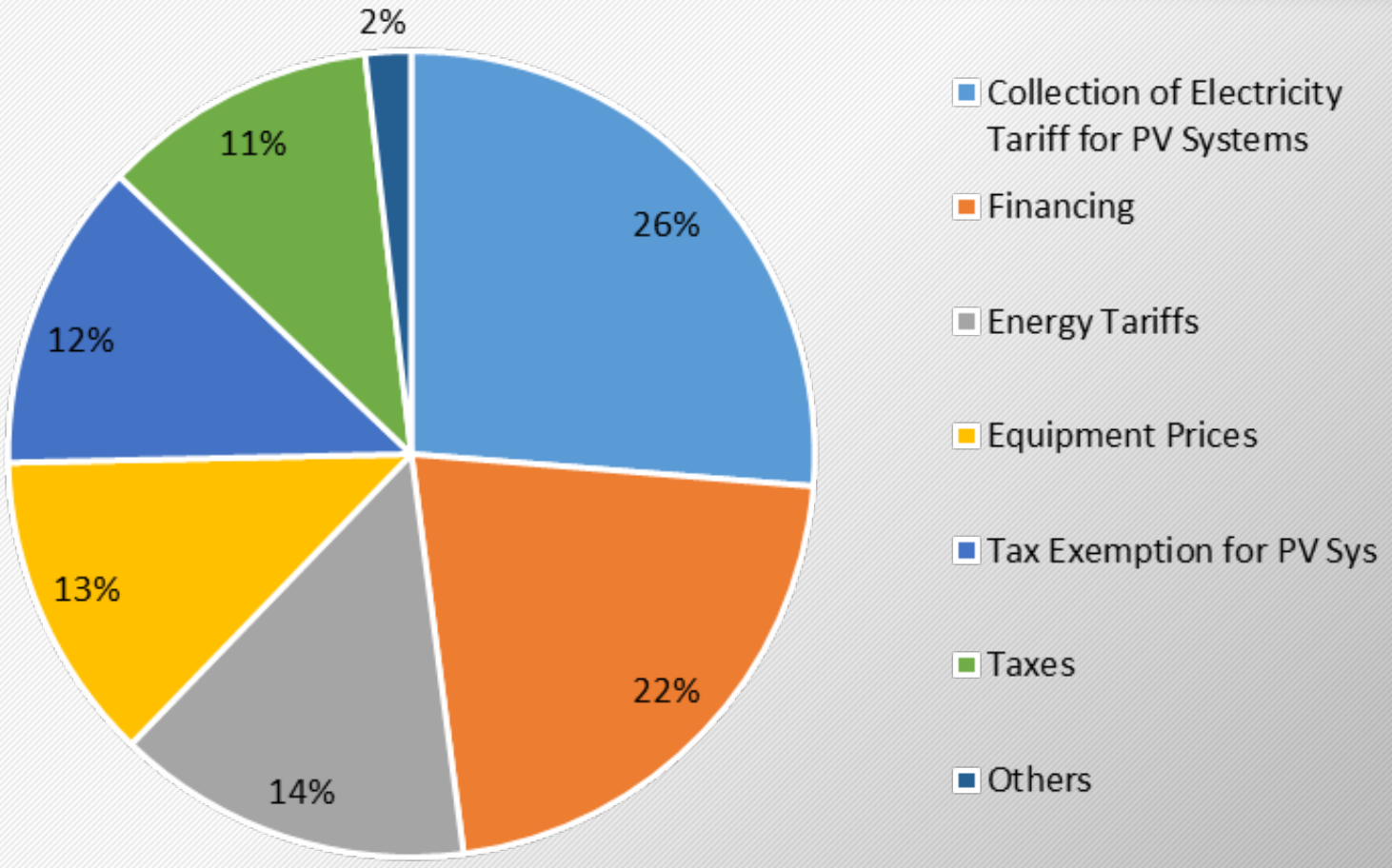




Source: IDEAL company database

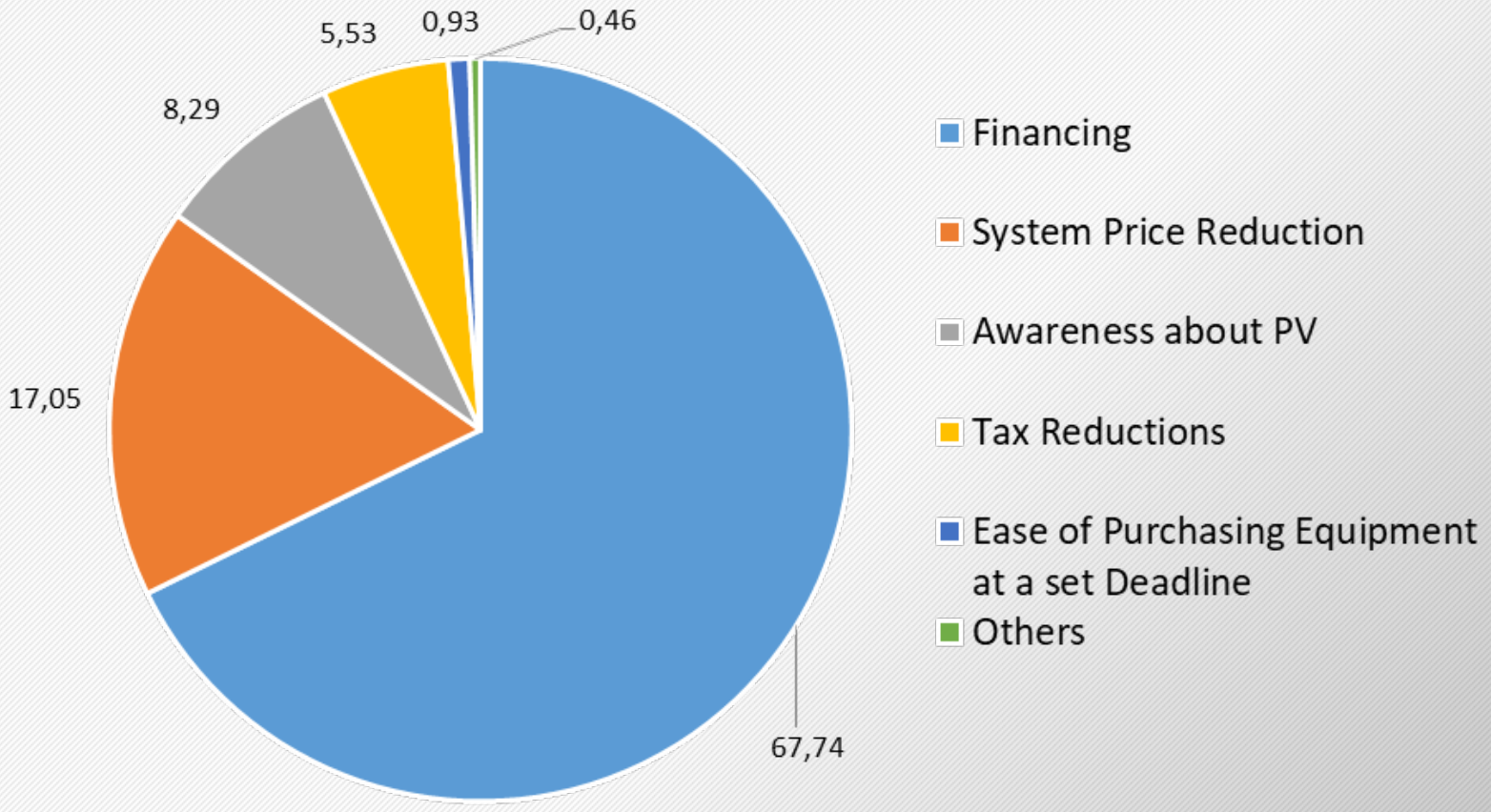
Brazil – Downstream Sector Issues

Brazil – Current Market Challenges



Source: Greener

Brazil – Market Bottlenecks



- Financing has been identified by 2/3 of participants of a recent survey among market stakeholders as the single most critical bottleneck
- Due to political and economical challenges, average system prices are considered relatively high, despite recent reductions
- Limited awareness among end-user has been identified by the local installer industry as the 3rd largest bottleneck

Source: Greener

Brazil – Market SWOT Analysis

Opportunities

- Positive attitude from the Ministry of Energy and other authorities
- Strong message to the industry by conducting multiple auctions in a relatively short period
- Chance of having states auctions
- Strong competitiveness in the market

Risks

- Negative / challenging macroeconomics
- Difficulty to obtain financing
- Local content issues: PADIS
- Foreign exchange rates
- Cancellation of auctions at short notice in 2016
- Change of govt may change the attitude towards solar

Strengths

- Consistent growth without incentives
- High insolation
- Relatively high electricity tariffs allowing distributed generation to thrive
- Strong environmental awareness

Weaknesses

- Tax structure
- Bureaucracy and permits
- Availability of qualified labours
- Limited practical experience among installer community

Brazil – Market Prospects

Short Term Prospects

Mini/Micro DG (net metering)

- Tax incentives not aligned with regulation
- Concept not set on legislation level; subject to change more easily
- Should apply to the tariff portion related to the use of the grid?

Centralized

- More certainty on the schedule of new auctions
- Solution for over contracting by distributors and economic recession
- Progressive reduction of incentives on TUSD/TUST
- Follow up on the new scheme for PPAs in the auctions

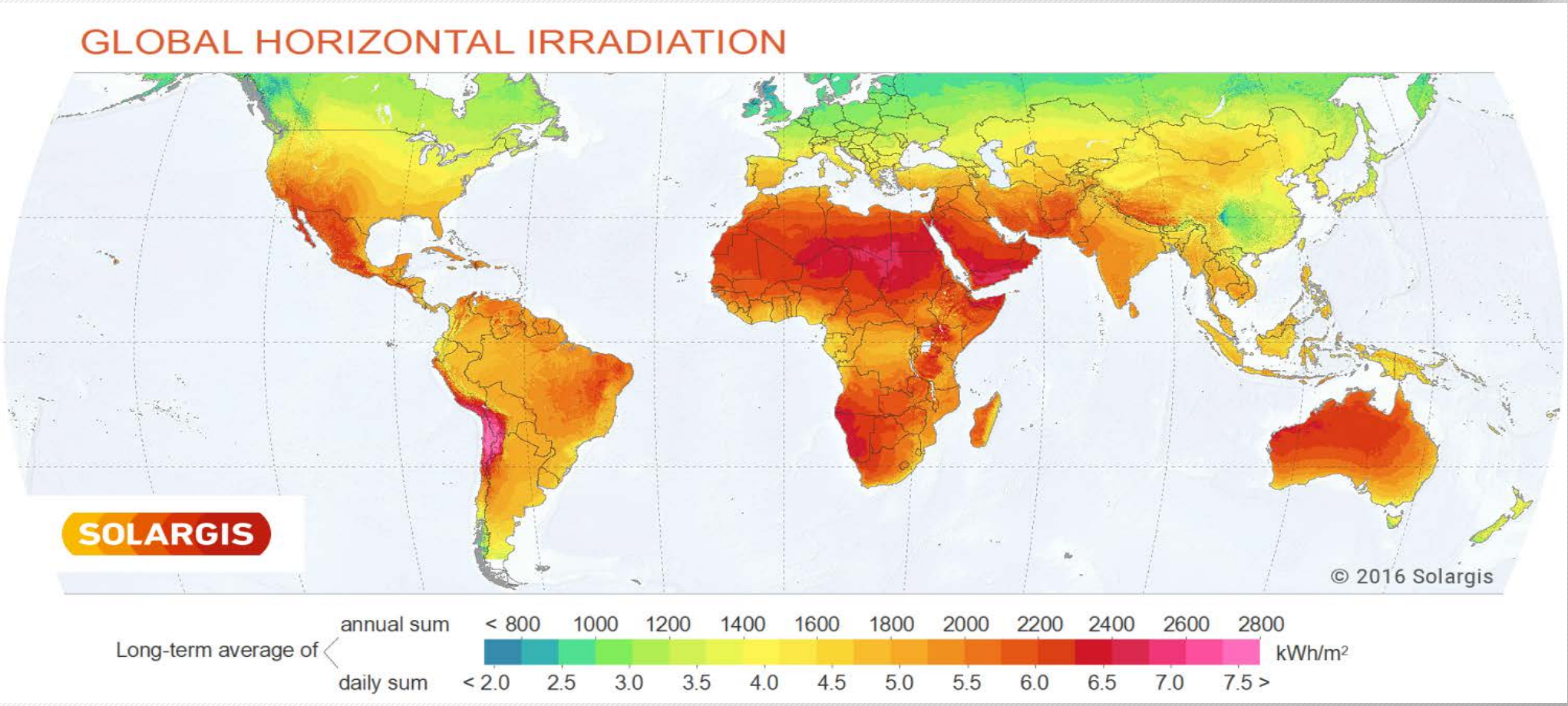
General

- Need for improvement of financing lines
- Institutional/political stability
- Implementation and approval of new model laws and regulation

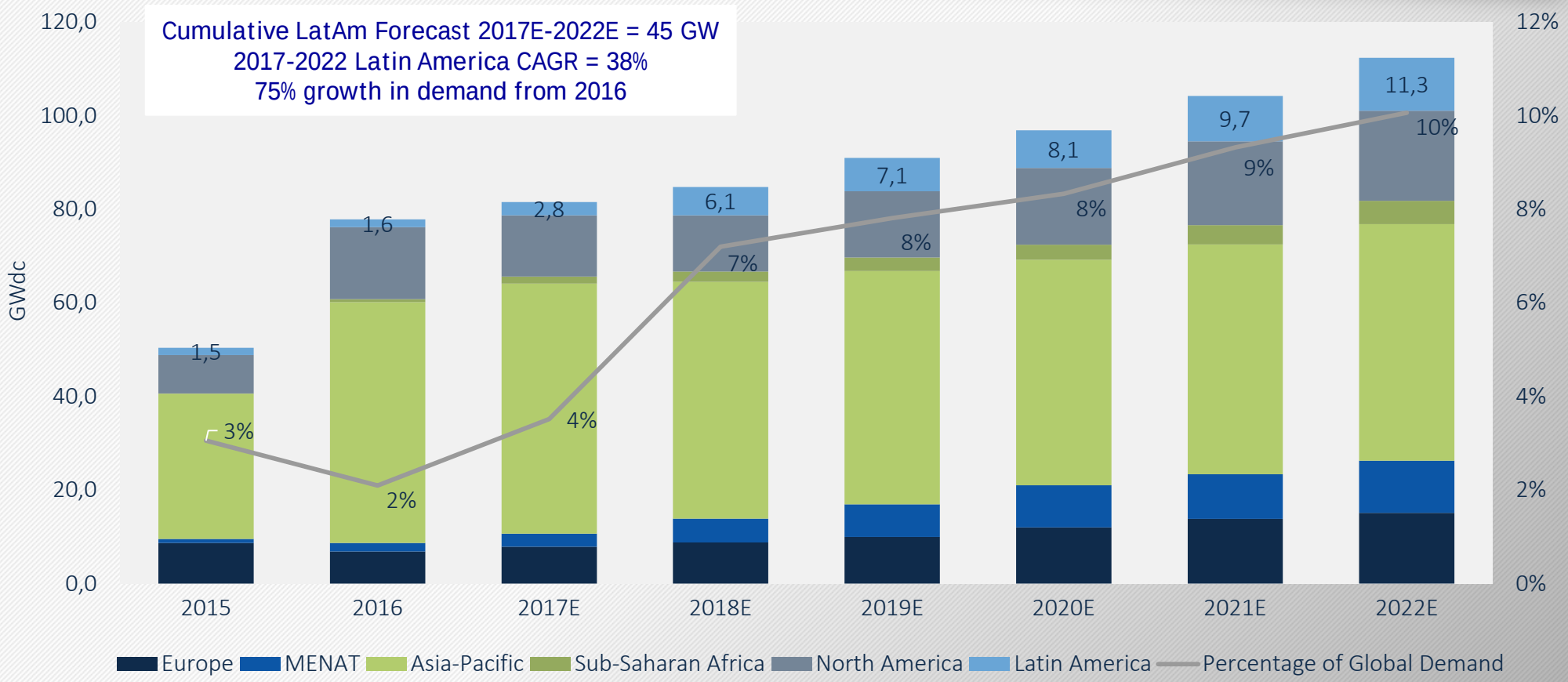
Medium / Long Term Prospects

- Medium and long term planning based on clear goals
- What type of subsidy should be in place and for which period?
- Better visibility on Mini/Micro DG regulation in the next years; possibility of sale of excess power; impacts on distribution utilities?
- Simplification of tax regimes and incentives
- Implementation and approval of new model laws and regulation

Regional View – LatAm Blessed with Sun



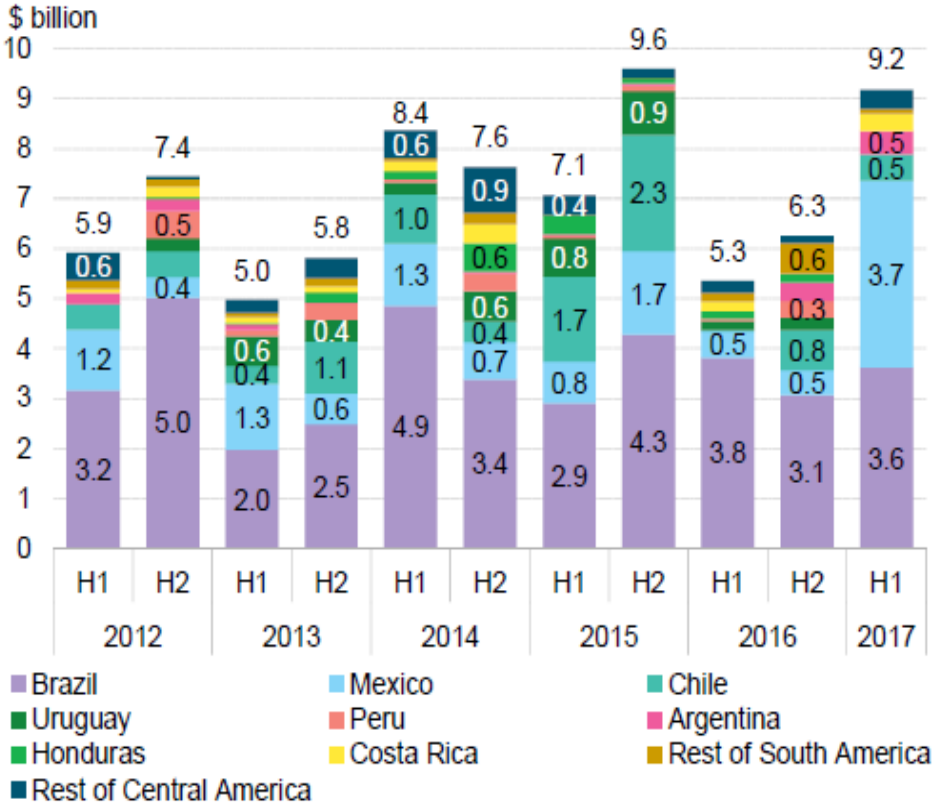
Regional View – LatAm PV Growth till 2022



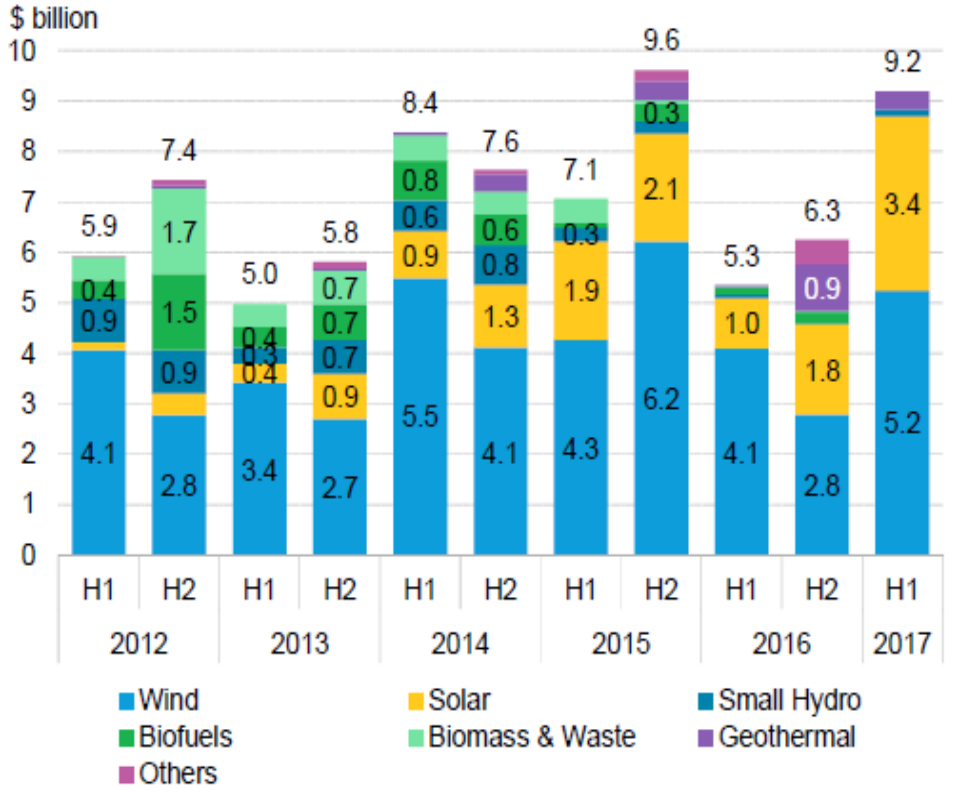
Source: GTM Research Global Solar Demand Monitor Q2/2017

Regional View – LatAm Clean Energy Investment Development

by country



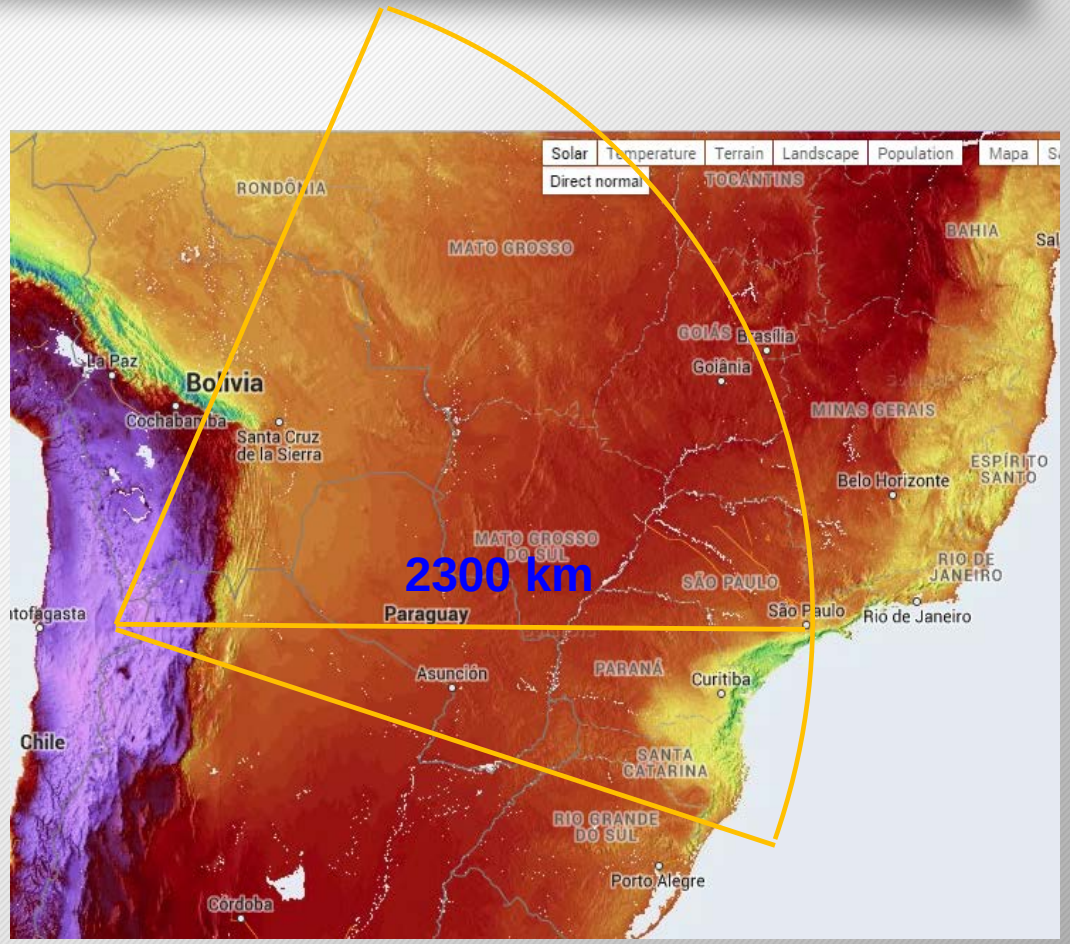
by technology



Source: BNEF 08/2017

Regional View – Chile the future solar hub

- A solar hub in northern Chile could supply energy to a large portion of central South America
- Range of 2300 km to Sao Paulo region (South of Brazil, Peru, Bolivia, North of Argentina, Uruguay, Paraguay)
- 2300 km of transmission lines required, global examples exist
- Larger hydro uncertainty due to climate change – solar + hydro could be the solution (Brazil: 94% Hydro)



Source: 08/2016 Fraunhofer Institute / Chile

Regional View – Rural Electrification

Country	% Electricity coverage
Haiti	30.0%
Honduras	79.9%
Guyana	80.5%
Nicaragua	85.3%
Bolivia	88.0%
Suriname	90.3%
Guatemala	92.0%
Belize	93.0%
Peru	93.3%
Panamá	93.9%
El Salvador	95.4%
Dominican Republic	96.9%
Colombia	97.0%
Ecuador	97.2%
Trinidad y Tobago	98.0%
Jamaica	98.0%
Mexico	98.5%
Argentina	98.8%
Venezuela	98.9%
Costa Rica	99.3%
Brazil	99.3%
Paraguay	99.3%
Chile	99.7%
Uruguay	99.7%
Barbados	99.8%

Country	% Coverage	Population with no access (thousands of people)
Haiti	30.0%	7,525.00
Peru	93.3%	2,087.16
Mexico	98.5%	1,827.52
Honduras	79.9%	1,684.00
Colombia	97.0%	1,446.10
Brazil	99.3%	1,438.22
Guatemala	92.0%	1,292.64
Bolivia	88.0%	1,289.58
Nicaragua	85.3%	921.98
Cuba	92.1%	891.21
Argentina	98.8%	517.58
Ecuador	97.2%	455.81
Venezeula	98.9%	343.94
Dominican Rep.	96.9%	326.69
El Salvador	95.4%	294.62
Panama	93.9%	243.36
Guyana	80.5%	149.57
Jamaica	98.0%	55.86
Chile	99.7%	54.02
Suriname	90.3%	52.67
Paraguay	99.3%	48.95
Costa Rica	99.3%	34.85
Trinidad & Tobago	98.0%	27.20
Belize	93.0%	25.13
Uruguay	99.7%	10.29
Barbados	99.8%	0.57
TOTAL	96.3%	23,044.52

- Across Latin-America approx. 23 Mio people have no access to electricity
- To achieve 100% electricity coverage by 2030 approx. USD 600 mio / annually are needed
- Sustainability of off-grid projects remains the most single key-challenge
- Opportunities for solar are immense in particular in combination with productive use

Source: OLADE-SIER 2016

Courtesy

- Market data have been collected and analysed by members of the PV Market Alliance.
- Special thanks to ABSOLAR / Brazil for providing content guidance!
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The PV Market Alliance