

Study

MARKET INFO BRAZIL – PHOTOVOLTAICS

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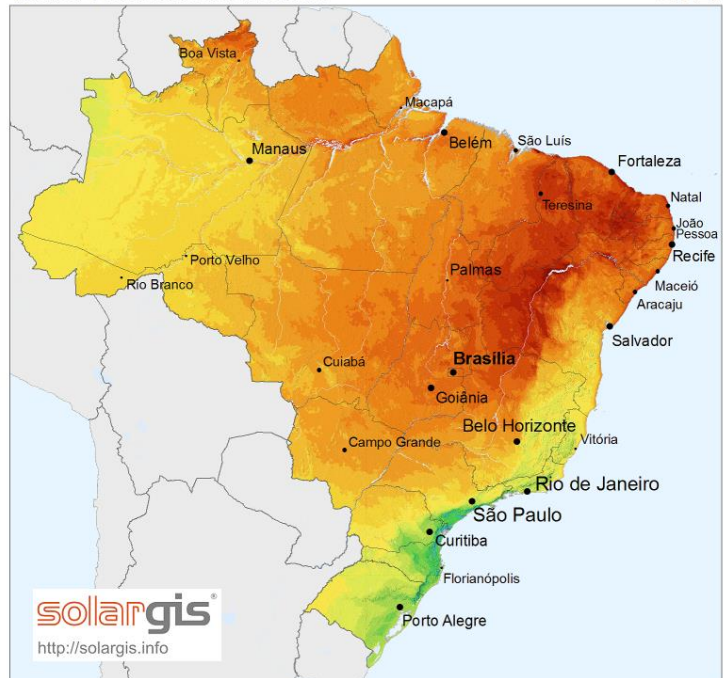
Federal Ministry
for Economic Affairs
and Energy

on the basis of a decision
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SOLAR IRRADIATION & POPULATION DENSITY

Annual global solar irradiation

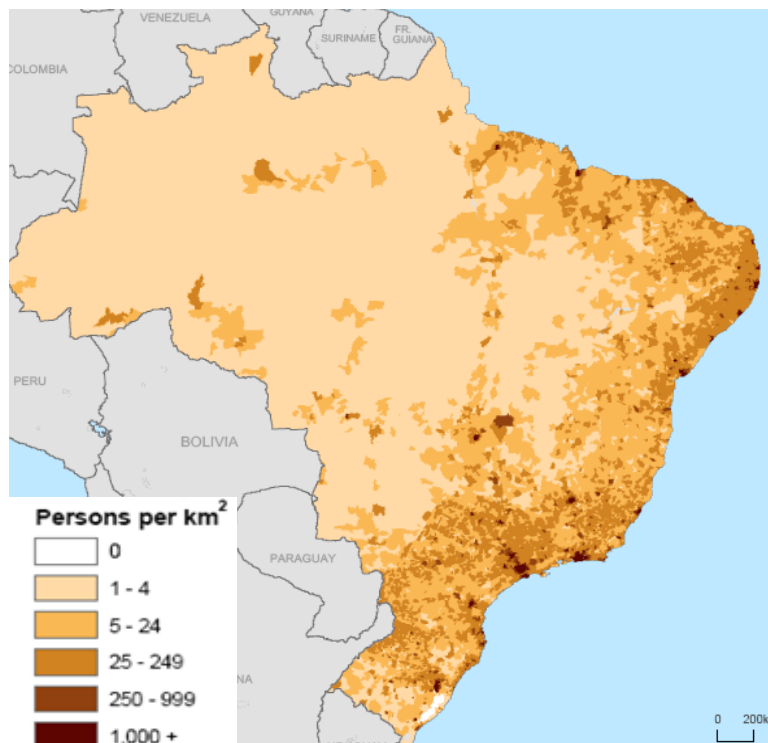
Global Horizontal Irradiation Brazil



Yearly sum of global horizontal irradiation, average 1999-2011
 < 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400 kWh/m² SolarGIS © 2013 GeoModel Solar

Source: SolarGIS (2013)

Population density



Source: SEDAC (2012)

BASIC DATA

General basic data (2014)			
Area	8,514,877 km ²	GDP (est.)	5,231.2 bn R\$ (~ 1,686.9 bn € ^{**})
Population (est.)	200 m	GDP per capita (est.)	26,156 R\$ (~ 8,435 € ^{**})
Language	Portuguese	GDP growth (est.)	1.8 %
Government type	Federal republic	Inflation (est.)	5.9 %
Administrative division	26 states, 1 federal district	Unemployment rate (2013)	5.8 %
Basic energy market data (2012)			
Electricity consumption (total)	545 TWh		
Total electricity import (2011)	40 TWh		
Electricity price (residential) net	0.33 R\$ / kWh (~ 0.13 €ct / kWh*)		
Electricity price (industry) net	0.26 R\$ / kWh (~ 0.10 €ct / kWh*)		
Share of renewable energy (electricity consumption 2011)	88.8 %		
Estimated increase in electricity consumption (2011 - 2021)	+ 4.5 % p. a.		
Annual average global solar irradiation	1,857 kWh / m ² a		

*Annual average exchange rate 2012 of the European Central Bank (ECB): 1 Euro = 2.51 R\$, ** exchange rate April 2014: 1 Euro = 3.101 R\$

PHOTOVOLTAIC MARKET INDICATORS

Indicators					
Market size (annual installed on-grid capacity)	2012: 2.6 MW	2013: 0.7 MW	2014e: 25 MW	2015e: 100 MW	2016e: 250 MW
National PV target	<ul style="list-style-type: none"> 3.5 GW by 2023 				
Installed PV capacity (2012)	<ul style="list-style-type: none"> 22.5 MW off-grid, 7.6 MW on-grid (9.9 MW on-grid in June 2014) 				
Main market drivers 2014	<ul style="list-style-type: none"> In comparison to international benchmarks there are high electricity prices in Brazil. Brazil has a net metering regulation (for details see slide 7). Grid parity has been reached in many regions and market segments. A boom of new PV power plants is expected with regard to current and upcoming large-scale sport events like the World Soccer Cup 2014 and the Olympic Games 2016. Capacity auctions and further PV support in several Brazilian states (see slide 6 and 8). 				
Net metering	<ul style="list-style-type: none"> There is no FIT for PV projects. However, for excess electricity produced by PV power plants of less than 1 MWp capacity, the power plant operator can receive a credit for the electricity fed into the grid. These electricity credits can be used to offset power consumed from the grid in the following 36 months. 				
Recent changes to the PV support regulation	<ul style="list-style-type: none"> Net metering: distribution grid operators had to prepare to be able to handle connection requests for mini- and micro-generation units from 15th December 2012 onwards. (ANEEL's Normative Resolution No. 482 of 17th April 2012 as amended by Normative Resolution No. 517 of 11th December 2012) A first national tender is open until 10th July 2014 for reserve power plant capacity, with a specific category (exclusively) for PV plants for the first time. Awarding contracts is scheduled for October 2014 (see slide 6). On 12th August 2014, the Brazilian Development Bank BNDES announced local content rules for PV in case of awarding loans to developers of PV power plant projects. 				

MAIN PV SUPPORT SCHEME: CAPACITY AUCTIONS

Category	Details
Empresa de Pesquisa Energetica (EPE) Tendering	<ul style="list-style-type: none"> On 18th November 2013, the national energy agency (EPE) held the so-called A3-auction, where contracts for electricity producing power plants have been allocated. The Ministry of Mines and Energy announced in September 2013 that contracts for PV systems will be allocated by the EPE in the same manner as the A5-auction, which took place on 13th December 2013. For the first time, PV systems were admitted to the auction. Another auction for reserve power plant capacity with a specific category (exclusively) for PV plants was officially announced on 2nd June 2014 . Until 10th July 2014, wind-, PV-, und biomass projects could be submitted. To facilitate participation the same documents, which have been submitted during the A3- and A5 auction in 2013, could be used for the current PV auction. The auctions for reserve power capacity were held specifically for each renewable technology in 2014 for the first time. The first solar PPAs with the Brazilian Chamber of Commercialization of Electric Energy (CCEE – Camara de Comercializaçao da Energia Eletrica) are awarded through EPE. PV projects have to come into operation no later than 1st October 2017.
	Scope <ul style="list-style-type: none"> PV power plants which produce electricity latest 1st October 2017.
	Remuneration <ul style="list-style-type: none"> Allocation of guaranteed contracts for 20 years.
	Process <ul style="list-style-type: none"> The Brazilian National Electric Energy Agency (ANEEL) had placed a ceiling price of 262 Reais /MWh (~84,48 €/MWh) for the PV auction. Afterwards bidders haggled the price down in a reverse auction, until the offers with the lowest prices were awarded with the respecting electricity supply agreement.
	Results <ul style="list-style-type: none"> A3-auction 2013: 31 participating PV projects with a capacity of 813 MW in total - no PV projects were awarded. A5-auction 2013: 88 participating PV projects with a capacity of 2.02 GW in total - no PV project were awarded. At the reserve energy auction on 31st October 2014, 31 PV projects totaling 889.7 MW out of 400 PV projects (10,79 GW in total) were granted approval.



Further information on auction s can be found on the EPEs site: www.epe.gov.br

MAIN PV SUPPORT SCHEME: BRAZILIAN NET METERING

Category	Details	
Net metering regulation*	The Brazilian electricity regulator (ANEEL) passed a net metering regulation on 19 th April 2012. The conditions are as follows:	
	Power plant scope	<ul style="list-style-type: none"> Small- and medium-scale PV power plants (<100 kW) and large-scale PV power plants (>100 kW – 1 MW).
	Payment	<ul style="list-style-type: none"> The electricity produced by PV power plants has to be used primarily for self-consumption. Public facilities and private enterprises can pass the electricity produced by their own PV power plants on to their sub-facilities. Excessive electricity may be fed into the electricity grid. PV power plant operators may receive a credit on their bill for the excess electricity fed into the grid. This electricity credit can be used to offset power consumed from the grid by the power plant operator within the following 36 months.
	Guaranteed power grid access	<ul style="list-style-type: none"> Brazilian distribution grid operators are obliged within 240 days after the publication of the amendment to the standardisation regulation from 19th April 2012 to develop and publish new technical standards. These technical standards should enable PV power plant operators to use net metering for operating small PV power plants.
	Costs	<ul style="list-style-type: none"> In Brazil the electricity end-consumer has to pay for the net metering equipment. The grid operator, however, has to bear the maintenance costs.

* Net metering regulation in accordance with the standardisation regulation no. 482 of the Brazilian electricity regulator ANEEL of 17th April 2012 in its amended version of 11th December 2012.



More detailed information on the Brazilian net metering regulation can be found on the website of ANEEL: www.aneel.gov.br or in the [dena-Market Report Brazil – Photovoltaics](#).

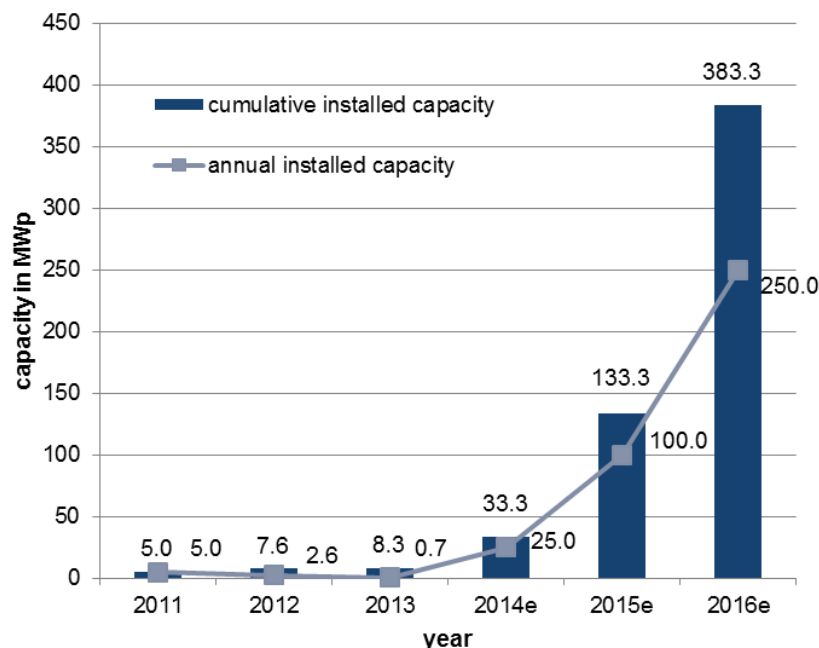
OTHER PV SUPPORT SCHEMES

Category	Details
Tax rebates	<ul style="list-style-type: none"> PV modules benefit from an exemption from the Brazilian sales tax (ICMS) until the end of 2015 . (Certain PV modules and cells also benefitted from an import tax reduction of 2 % instead of 12 % until 31 December 2012.)
Reduced power grid charges	<ul style="list-style-type: none"> The Brazilian electricity regulator ANEEL offers reduced power grid charges to PV power plant operators for using its distribution grid (TUSD) and its transmission grid (TUST). While, in general, power plant operators (including PV operators) are charged for using the Brazilian distribution and transmission grids, PV plant operators (PV plant capacity ≤ 30 MW) can benefit from an 80 % reduction on the power grid charges for the first ten years. These PV plants have to be connected to the grid by 31st December 2017. After the initial ten years the reduction on the power grid charges is reduced from 80 % to 50 %. PV plants, which are connected to the grid after 31st December 2017 will receive a reduction on the power grid charges of 50 %.
Regional support schemes	<ul style="list-style-type: none"> The Brazilian Federal State of Ceará has implemented an investment fund of 10 Mio. R\$ (4.4 Mio. €*) to promote the implementation of PV projects. The Federal State of Minas Gerais has decided to introduce the program “Energia de Minas”, which includes tax breaks for PV systems and inverters. However, financial details have not been disclosed yet. In December 2013, a first PV auction in the state of Pernambuco was held. 20-year PPAs were awarded for PV capacities of 123 MW. Further tenders are expected. In the state of Piauí a similar tender is planned. In the state of Paraíba a net metering regulation is planned for applications within the state’s domestic building programme. In certain cases the state of São Paulo is granting value-added tax exemptions for PV equipment. In the state of Tocantins a value-added tax exemption for PV-generated electricity and PV equipment is planned.
Off-grid program „Luz para todos“	<ul style="list-style-type: none"> The program has existed since 2003. The second phase of the program is running from 2011 to 2014. The program is coordinated by the Brazilian Ministry for Mining and Energy, but is carried out by Brazilian electricity utilities and cooperatives for rural development. As part of the extended “Luz para todos” program until 2014, ANEEL will tender off-grid PV systems.

*Annual average exchange rate 2012 of the European Central Bank (ECB): 1 € = 2.51 R\$

MARKET DEVELOPMENT AND BARRIERS

PV market development (on-grid)



Sources: ANEEL (2014), GTAI (2013), projection 2016: dena (2014)



Main barriers in the Brazilian PV market

Technology competition

- Large-scale hydro power currently dominates the power sector in Brazil.
- The primary renewable energy technologies so far have been wind power and biomass (especially bioethanol), which have had a strong support by the government.

Costs for power grid access

- Developers of PV power plants wanting to connect to the grid struggle with the poorly developed grid infrastructure in the North, North-East and Central Brazil.
- The relatively high costs for power grid access have to be borne by the PV power plant operator. Moreover, the approval process for grid access can be time consuming and bureaucratic.

Financing barriers and local content

- The interest rates for borrowing money in Brazil are high in comparison to international benchmarks.
- The Banco Nacional de Desenvolvimento Econômico e Social (BNDES) offers soft loans for PV and other renewable energy projects. However, there is a local content requirement of 60 % on the equipment.

MARKET NEWS (1/5)

Date	Topic	Source
01/11/2014	<p>Brazil's first PV power auction sets very low US\$86.78/MWh mark</p> <p>The 6th Reserve Energy Auction, conducted by the Brazilian National Electric Energy Agency (ANEEL) and operated by the Electricity Trading Chamber (CCEE) was said to have generated intense bidding from a massive oversubscription. After the longest auction Brazil has undertaken, 31 out of 400 PV project opportunities totalling 889.7 MW were granted approval at providing electricity at the fixed price of US\$86.78/MWh for 20 years, beginning on 1st October 2017.</p> <p>CCEE had originally placed an aggressively low ceiling price for PV of US\$105.69/MWh, but interest in the Energy Auction Reserve was significant with only one obvious outcome, a significant 17.9% discount to the ceiling price. CCEE noted that the state of Bahia had the most projects, without providing further details. The remaining projects approved were spread over the states of São Paulo, Rio Grande do Norte, Ceará, Minas Gerais, Pernambuco, Piauí and Goiás.</p>	PV-Tech
17/09/2014	<p>Brazil State to Have Solar Auction as It Seeks Local Panel Plant</p> <p>Brazil will hold its second regional solar energy auction amid an effort to spur local panel manufacturing. Minas Gerais, in southeastern Brazil, is finalizing the rules for the November auction, Guilherme Augusto Duarte de Faria, superintendent of the state's Economic Development Secretary, said in a phone interview yesterday. The state will set a ceiling of about 260 reais (\$111) a megawatt-hour for the auction, which will involve 15-year contracts for power.</p> <p>"We want to take advantage of the improving environment for solar energy development in Brazil," said Faria. "The idea is to have solar panel manufacturing plants in the state."</p> <p>Brazil gets less than 1 percent of its electricity from solar power and the government wants to diversify its energy mix. Pernambuco state held the nation's first solar energy auction last year. On 31st October, Brazil will hold the first national energy auction with a specific category for photovoltaic projects, for which developers applied to sell more than 10 gigawatts of capacity.</p> <p>Developers must buy photovoltaic modules made in Minas Gerais for the November auction. According to Faria, five developers have expressed interest in participating and three panel manufacturers are in advanced talks to build a plant in the state. Brazilian utility Cia. Energetica de Minas Gerais will buy the solar energy.</p>	Bloomberg

MARKET NEWS (2/5)

Date	Topic	Source
13/08/2014	<p>Brazilian local content rules could spur domestic industry</p> <p>A key hurdle for projects participating successfully in Brazil's first solar-only national energy auction may be one step closer to being met. On 12th August, the National Bank for Economic and Social Development (BNDES) published an accreditation methodology and local content rules for financing solar projects. Eligible projects will include those in the nation's reserve auction, which will be held on 31st October 2014. The solar-only portion of the auction has attracted over 400 projects, with a total capacity of more than 1 GW. Until 2017, the rules stipulate that projects receiving funding must use PV modules assembled in the nation using locally produced frames, with additional requirements and methodology to be introduced in 2017.</p>	PV-Magazine
01/08/2014	<p>Brazilian bank aims to boost domestic solar manufacturing</p> <p>Brazilian development bank, the Banco Nacional de Desenvolvimento Economico e Social (BNDES), is set to announce details of low-cost financing to boost solar development in the nation. According to a Bloomberg report yesterday, the bank will boost a BRL560 million (\$247.4 million) cash injection from the government's Fundo Clima anti climate change fund with its own reserves, to give the solar industry a much-needed leg-up.</p> <p>According to the Bloomberg report, any solar projects developed with BNDES money up to 2017 will have to combine panels with Brazilian-made frames as well as some, unspecified, locally sourced electronic components. For the following two years, bank-funded schemes will have to include further system products manufactured in Brazil and the domestic content requirement of the loan scheme will demand the use of Brazilian cells from 2020 onwards, with the bank offering additional help – unspecified in the Bloomberg report – to developers who use additional locally-made components. Brazil is preparing for its first national solar auction in October amid hopes of developing 3.5 GW of projects within four years.</p>	PV-Magazine

MARKET NEWS (3/5)

Date	Topic	Source
04/06/2014	<p>Brazil's first PV auction set for October</p> <p>For the first time ever, PV projects will be included in a specific category in a national auction in Brazil. Successful projects are to start operation on 1st October 2017. The Brazilian Ministry of Energy and Mines has set the date of the first auction that will have a specific category for PV projects for 10th October. This reserve energy auction, in which there is also a category for wind and a category for biomass, is open to projects with more than 5 MW in the PV category. According to a resolution from the ministry published on Monday, successful projects are supposed to start operations on 1st October 2017. The contracts that are closed for PV projects as part of the auction will last for 20 years. The government has set 10th July as the application deadline. The providers that would like participate in the auction need to apply for the authorization at the Brazilian federal energy planning company Empresa de Pesquisa Energética (EPE). Projects that are already registered to obtain technical authorizations for the A-3 and A-5 auctions this year – the A-5 auction that takes place in September is open to solar projects – can obtain an easier registration at the EPE. The Brazilian government has not yet set the maximum price for PV in the auction.</p>	PV-Magazine
19/02/2014	<p>Tax break paves way for 6.5 MW PV plant in Brazil</p> <p>A 6.5 MW PV power plant is to be built in Brazil with the help of a sales tax break that was announced last year. The project will be built in Votuporanga in the north west of São Paulo state, with shopping centre developer SG Par agreeing to purchase power from the site. At the end of 2013, São Paulo's state government announced a moratorium on sales tax for solar energy equipment. The sales tax can climb as high as 25 % for some products.</p>	PV-Tech

MARKET NEWS (4/5)

Date	Topic	Source
02/01/2014	<p>Brazilian state approves 123MW of solar developments in energy auction</p> <p>The Brazilian state of Pernambuco has approved 122.82 MW of solar projects after hosting the country’s first solar-only tender auction. Competing in the auction were 34 project bidders – six from Brazil along with others based in China, Germany, Italy and Spain. The largest of this six successful tenders was won by Sowitec for a 30 MW solar plant, closely followed by Sun Premier Holding Participações, which won a 29.75 MW bid, and Kroma Comercializadora de Energia, which won 29.25 MW. Concierge Cone S/A has been commissioned to build 22.82 MW and Enel Green Power two 5 MW projects.</p>	PV-Tech
19/12/2013	<p>No successful solar bids in Brazil’s latest energy auction</p> <p>No solar PV projects were selected in the long awaited A-3 energy tender auction in Brazil on Monday. The first government energy tender auction to allow the participation of solar energy projects was unanimously dominated by wind, with 39 wind farms totaling 867.6 MW commissioned at the auction. The auction took place yesterday, 18 November at the headquarters of the Chamber for Commercialisation of Electric Energy (CCEE) in Sao Paulo. There were 31 unsuccessful PV projects with a generation capacity of 813 MW participating in the A-3 energy auction, of which 12 projects were planned in the Bahia region amounting to 309MW, four projects in Minas Gerias totaling 115 MW, nine in Paraiba totaling 253 MW, four projects in Piauí accounting for 91 MW and two projects in Rio Grande do Norte with a capacity of 45 MW. In September, a much higher 2.7 GW of PV projects were being considered in the preliminary round for the A-3 auction. In total, 429 renewable energy projects, from biomass and hydro, participated in the A-3 auction with a total of 10.46 GW in proposed energy projects all competing for tenders. A ceiling price of BRL126 per MWh (US\$54) was set for all power sources, which industry observers previously said could prove be too low for solar projects in Brazil to be financially viable, and would prevent solar projects being selected in the A-3 auction. By the end of the auction the average price for the wind energy bids was BRL124.43 MWh (US\$54.92). Just before the auction a consortium of Brazilian energy companies called for solar-only auctions, claiming a reasonable price to offer PV projects would be between BRL190 (US\$83) to BRL200 (US\$87) per megawatt hour, far higher than the A-3 ceiling price.</p>	PV-Tech

MARKET NEWS (5/5)

Date	Topic	Source
17/12/2013	No solar PV, CSP awarded in Brazil's A-5 auction Brazilian national utility EPE did not select a single solar project among the 119 projects totaling 3.5 GW of capacity awarded in its A-5/2013 energy auction. Wind represented the majority of successful projects, with 97 projects representing 2.34 GW of capacity approved.	SolarServer
09/12/2013	Hanergy to build thin-film plant in Rio Grande, Brazil The local government of Rio Grande do Sul has announced that Chinese firm Hanergy plans to build a thin-film solar PV module factory in the Brazilian state. A preliminary agreement was signed in Beijing on 4 December between Hanergy directors, regional Science, Innovation and Technological Development (SCIT) secretary Cleber Prodanov and Susana Kakuta, director of Tecnosinos Technological Park, Sao Leopoldo, where the production line will be built. Financial terms of the deal have not been disclosed. The capacity of the production line at the planned thin-film facility has also not been revealed.	PV-Tech
14/10/2013	Developers file for 729 MW of solar PV projects in Brazil The Brazilian electricity board (ANEEL) is permitting 30 PV projects with a total capacity of 729 MW to the A3-auction from the EPE. In total 109 PV-projects applied with a total capacity of 2,729 MW. The projects that failed to be permitted are offered the opportunity to apply for the A5-auction in December 2013.	Solarserver
14/10/2013	40MW array for dairy farm in Brazil Energy Team Brazil, a branch of the European renewable energy developer Energy Team is planning to install a PV system with a capacity of 40 MW on the rooftop of a dairy farm in the state of Rio Grande do Sul.	PV-Tech
07/08/2013	Brazil Rooftop Solar Power Seen Reaching 1,400 MWs by 2022 This goal will most probably be included in the Ministry of Mining and Energy 's energy plan for 2014. Currently, the rooftop systems have a total capacity of eleven MW. The expected increase is due to lower material cost. Further projects, exceeding the volume of 1,400 MW by 2020, are to be expected.	Bloomberg

CONTACT INFORMATION

Category	Name	Website
Ministry of Energy and Mining Ministry of Environment	Ministério de Minas e Energia (MME) Ministério do Meio Ambiente (MMA)	www.mme.gov.br www.mma.gov.br
Ministry of Economics, Industry and Trade	Ministério do Desenvolvimento, Indústria e Comércio Exterior (MDIC)	www.desenvolvimento.gov.br
German-Brazilian Chamber of Commerce	Câmara de Comércio e Indústria Brasil-Alemanha Brasília (AHK)	www.ahkbrasil.com
Solar Industry Association	Associação Brasileira de Refrigeração, Ar Condicionado, Ventilação e Aquecimento (ABRAVA)	www.abrava.com.br
Association of Independent Power Producer	Associação Brasileira dos Produtores Independentes de Energia Elétrica (APINE)	www.apine.com.br
Electrical and Electronics Industry Association	Associação Brasileira da Indústria Elétrica e Eletrônica (ABINEE)	www.abinee.org.br
National Electricity Regulator	National Agency of Electrical Energy (ANEEL)	www.aneel.gov.br
Major Brazilian Electricity Utility	Eletrobrás	www.eletrobras.com
National Transmission Grid Operator	Operador Nacional do Sistema Elétrico (ONS)	www.ons.org.br
National Renewable Energy Research Association	Empresa de Pesquisa Energética (EPE)	www.epe.gov.br
National Development Bank for Financing Renewable and Solar Energy Projects	Banco Nacional de Desenvolvimento Econômico e Social (BNDES)	www.bndes.gov.br

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