

Solar PV in Brazil, Market Outlook to 2025 - Capacity, Generation, Levelized Cost of Energy (LCOE), Investment Trends, Regulations and Company Profiles

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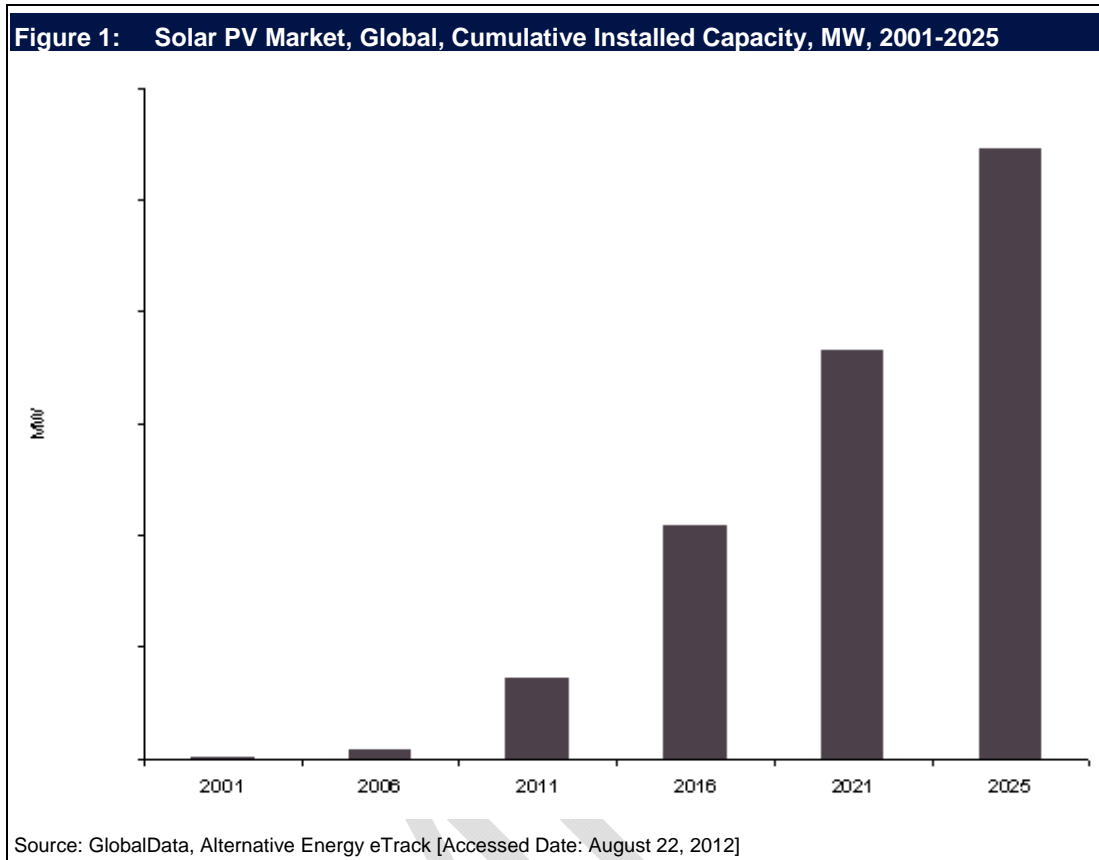
2 Executive Summary

2.1 *Global Carbon Emissions Continue to Increase in 2010-2011 after a Slight Dip in 2009*

2.2 *Global Power Market – Increasing Focus on Clean Technologies*

2.3 *Government Support will continue to Foster the Growth of Global Renewable Power Market*

2.4 *Global Solar Photovoltaic (PV) Market Will Sustain its Growth Momentum*

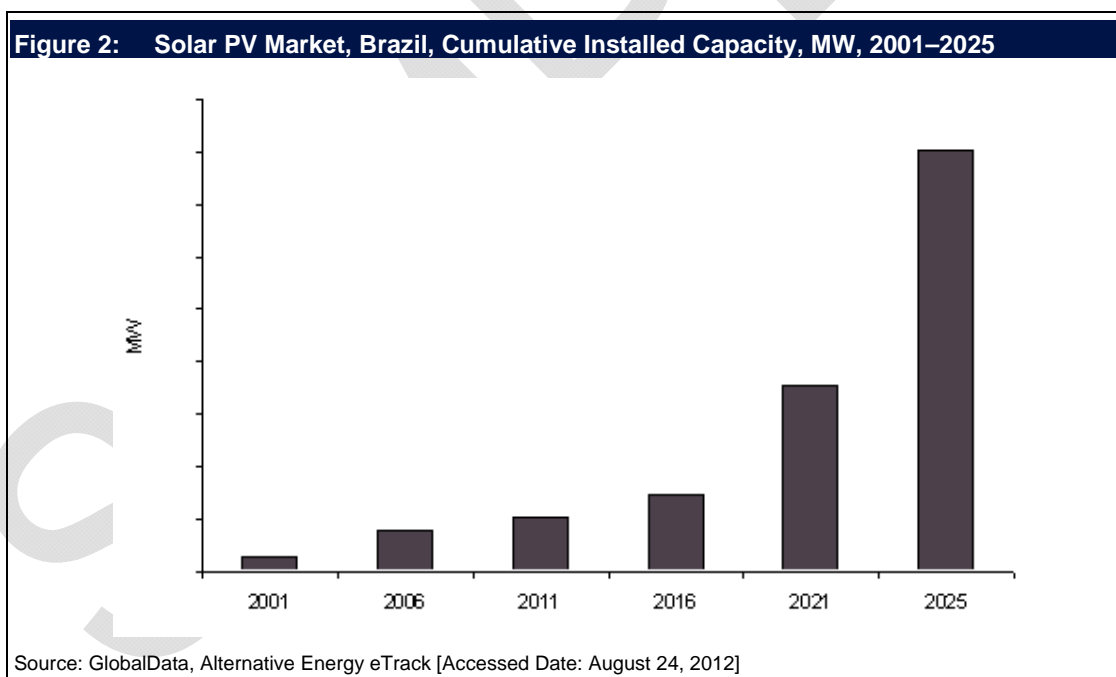


2.5 Hydropower is the Largest Power Generating Source in the Country

2.6 Electricity Prices in Brazil are among the Highest in the World

2.7 Brazil Aims to add another 10% of Electricity from Renewable Sources by 2020

2.8 Brazil Solar PV Market in its Nascent Stage of Development



3.3 Report Guidance

- The report begins with an executive summary which gives a snapshot of solar PV market in Brazil.
- The “Introduction” section provides an overview on carbon emissions and energy consumption pattern in the world.
- The “Renewable Power Market, Global” section provides an overview of renewable energy sources such as solar, wind, geothermal and biopower. The section provides historical (2001-2011) and forecast (2012-2025) cumulative installed capacity and generation data. The section also provides information on installed capacity split by source type, net capacity additions by source type and cross country comparison.
- The “Solar PV Market, Global” section gives a holistic overview of the global solar PV market along with historical (2001-2011) and forecast (2012-2025) installed capacity and generation data. The section covers cumulative installed capacity split by region and by key countries in 2011. The section also provides net installed capacity additions in major countries (2011-2025), cross country comparison, investment trends, cost break-up of a PV system, LCOE comparison among major countries, trade flow analysis of PV modules and major debt providers for solar PV projects in 2011.
- The “Power Market, Brazil” section provides an overview of the overall power market in Brazil. The section provides historical (2001-2011) and forecast (2012-2025) installed capacity and generation data for conventional thermal, nuclear, hydro and renewable sources. The section covers installed capacity by fuel type, net capacity additions by source type and comparison among various power generating sources.
- The “Renewable Power Market, Brazil” section gives an overview of the renewable power market in Brazil. The section provides historical (2001-2011) and forecast (2012-2025) installed capacity and generation data for wind, solar PV, solar thermal, biogas and biomass. The section covers installed capacity by source type, net capacity additions by source type, comparison of various renewable power sources on the basis of installed capacity and growth rate. The section also provides LCOE comparison among various renewable power sources such as wind, solar, biomass and small hydro in 2011.
- The “Solar PV Market, Brazil” chapter provides detail analysis on the solar PV market in the country. The section provides historical (2004-2011) and forecast (2012-2025) installed capacity and generation data. The chapter covers cumulative and annual installations by grid connectivity, investment trends, export and import of modules, carbon savings, homes powered and LCOE.
- The “Solar PV Market, Brazil, Deal Analysis” section provides trend analysis of the total investments in Brazil solar PV industry. The chapter provides data on deal value versus deal volume for 2004-2011. The section also provides split by deal type and asset finance deals information.
- The “Renewable Energy Regulatory Framework, Brazil” chapter gives an in depth understanding of the renewable energy policy framework in the country and government support provided for renewables in general and solar PV in particular.

- The “Solar PV Market, Brazil, Company Profiles” section provides value chain analysis of solar PV industry in Brazil. The chapter also provides company snapshots of major market participants in the country.

SAMPLE

8 Solar PV Market, Brazil, 2001-2025

8.1 Solar PV Market, Brazil, Overview

8.2 Solar PV Market, Brazil, Installed Capacity, MW, 2001-2025

Figure 34: Solar PV Market, Brazil, Installed Capacity, MW, 2001-2025

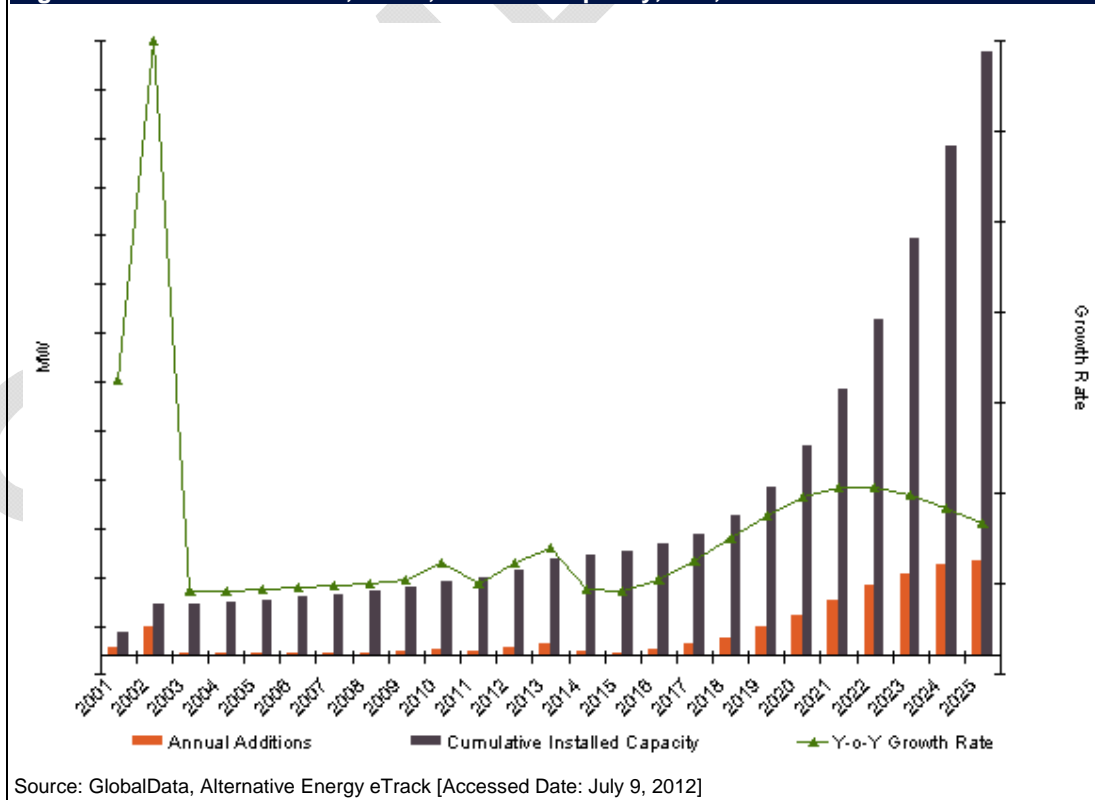


Table 27: Solar PV Market, India, Installed Capacity, MW, 2001–2025

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8.3 Solar PV Market, Brazil, Power Generation, GWh, 2001-2025

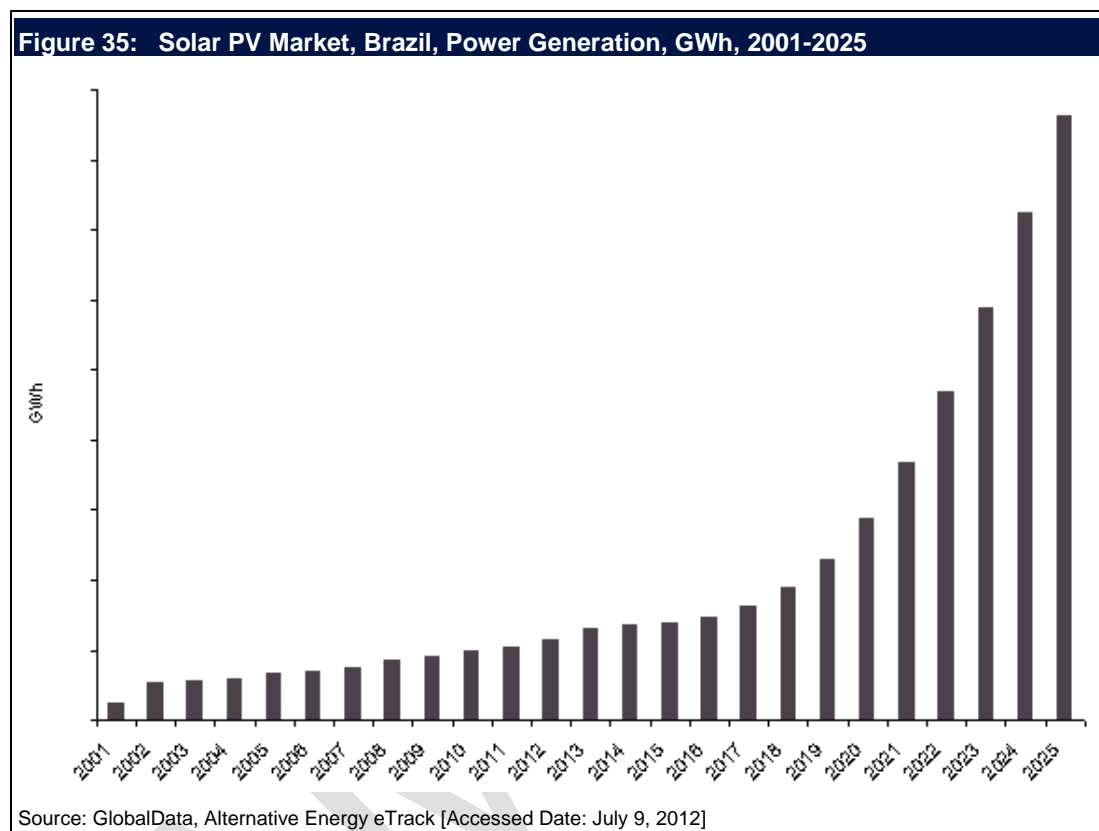


Table 28: Solar PV Market, Brazil, Power Generation, GWh, 2001-2025					
	2001	2002	2003	2004	2005
Solar PV	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	0.00
Hydro	79.00	80.00	81.00	82.00	83.00
Nuclear	0.00	0.00	0.00	0.00	0.00
Biomass	0.00	0.00	0.00	0.00	0.00
Coal	0.00	0.00	0.00	0.00	0.00
Oil	0.00	0.00	0.00	0.00	0.00
Gas	0.00	0.00	0.00	0.00	0.00
Wind	0.00	0.00	0.00	0.00	0.00
Solar Thermal	0.00	0.00	0.00	0.00	0.00
Geothermal	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00

[illegible]

Source: GlobalData, Alternative Energy eTrack [Accessed on July 17, 2012]

12 Appendix

12.1 Abbreviations

Table 58: Abbreviations	
Acronym	Expanded Form
\$	US Dollar
ANEEL	Agencia Nacional de Energia Eletrica
AWEA	American Wind Energy Association
bn	Billion
CAGR	Cumulative Annual Growth Rate
CHP	Combined Heat and Power
CSP	Concentrated Solar Power
CWET	Center for Wind Energy Technologies
FIT	Feed in Tariff
GW	Gigawatt
GWEC	Global Wind Energy Council
GWh	Gigawatt Hour
IEA	International Energy Agency
INR	Indian National Rupee
IPP	Independent Power Producer
ISP	Independent Service Providers
kT	Kilo Tons
ktoe	Kilo Tons of Oil Equivalent
kW	Kilowatt
kWh	Kilowatt Hour
LCOE	Levelized Cost of Energy
m	Million
mT	Million Tons
MW	Megawatt
O&M	Operation and Maintenance
OEM	Original Equipment Manufacturer
PTC	Production Tax Credit
PV	Photovoltaic
ROE	Return on Equity
TWh	Terawatt Hour
UK	United Kingdom
US	United States
WRD	Wobben Research & Development
Y-O-Y	Year on Year
Source: GlobalData	

12.2 Market Definitions

Historic Period: 2001-2011

Forecast Period: 2012-2025

Global Wind Power Market includes North America, Europe, Asia-Pacific, South and Central America, Middle East and Africa and Others.

North America Wind Power Market includes The US and Canada.

Europe Wind Power Market includes Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Spain, Sweden, Switzerland, Turkey, Ukraine and the UK.

Asia-Pacific Wind Power Market includes Australia, China, India, Indonesia, Japan, New Zealand, Pakistan, Philippines, Republic of Korea and Thailand.

South and Central America Wind Power Market includes Argentina, Brazil, Chile, Columbia and Mexico.

Middle East and Africa Wind Power Market includes Egypt, Iran (Islamic Republic of Iran), Israel, Morocco and South Africa.

Others include Rest of Europe, Rest of Asia-Pacific, Rest of South and Central America, Rest of Middle East and Africa.

Power Market includes Thermal Conventional (Coal, Gas and Oil), Nuclear, Large Hydro & Pump Storage and Renewables.

Renewable Power Market: Wind (Onshore and Offshore), Solar PV, CSP, Biomass, Biogas, Geothermal and Small Hydro.

Small Hydro: Classification of small hydro power is as follows –

- Project size of ≤ 30 MW is considered as small hydro in countries such as Brazil, Japan, Mexico, Venezuela, and the US.
- Project size of ≤ 50 MW is considered as small hydro in countries such as Canada and China.
- Project size of ≤ 25 MW is considered as small hydro in India.
- Project size of ≤ 10 MW is considered as small hydro in European countries.

Import and Export: The data for wind turbines is sourced from UN Comtrade through HS code 850231. The data for solar modules is sourced from UN Comtrade through HS code 854140.

12.3 Methodology

GlobalData's dedicated research and analysis teams consist of experienced professionals with a pedigree in marketing and market research, a background in consulting, and advanced statistical expertise in the energy industry.

GlobalData's research methodology for the hydro report mainly consists of primary and secondary research.

12.3.1 Secondary Research

The research process begins with exhaustive secondary research on internal and external sources being carried out to source qualitative and quantitative information relating to each market.

The secondary research sources that are typically referred to include, but are not limited to:

- Company websites, annual reports, financial reports, whitepapers, news and press releases.
- Industry trade journals, magazines and other literature.
- Industry associations, energy agencies and other government bodies.
- Internal proprietary databases such as our alternative energy eTrack and power eTrack.

12.3.2 Primary Research

GlobalData conducts extensive primary interviews with industry participants and commentators in order to validate its data and analysis. A typical research interview fulfills the following functions:

- To get the interviewee's perspective on installed capacities, capacity utilization rates, market share, market trends, growth trends, and future outlook
- Helps in validating and strengthening the secondary research findings
- Further develops the analysis team's expertise and market understanding

Primary research involves e-mail interactions, telephonic interviews as well as face-to-face interviews for each market, category, segment and sub-segment across geographies. Primary respondents include key representatives of companies across the industry value chain.

12.3.3 Modeling and Forecasting

To forecast installed capacity and generation, we use in-house models to forecast the data. Historic data and the analysis of trends within it form the basis of all forecasting methodology. Various qualitative and quantitative factors are usually taken into account for estimating future growth. The forecast data is validated through industry experts across the value chain.

12.3.4 Market Estimates and Assumptions

The following are the datapoints that are estimated or sourced through primary and secondary research.

12.3.4.1 LCOE Calculation

- **Capital Cost** – The capital costs of various technologies have been collected from secondary sources, such as energy agencies and asset finance deals from the internal databases (alternative energy eTrack; power eTrack). Capital costs have been forecasted based on the opinions obtained from industry experts and used to calculate base-case LCOE.
- **Capacity Factor** – Capacity factor for a technology has been estimated from installed capacity and generation of a technology in the country. Capacity forecasts have been done based on opinions obtained from industry experts. Thus obtained, the capacity factor is used to calculate base-case LCOE.
- **Discount Rate** – The discount rate is based on technological risk factors.

Table 59: LCOE Calculation, Discount Rates by Technology			
Technology	Discount Rate @ Low LCOE Case	Discount Rate @ Base LCOE Case	Discount Rate @ High LCOE Case
Wind	5%	6.5%	8%
Solar PV	5%	6.5%	8%
Biomass	5%	6%	7%
Small Hydro	5%	6%	7%
Source: GlobalData			

- **Fuel Cost** – Information on fuel cost for biomass power is sourced from industry associations and government agencies. Biopellets is considered as feedstock to calculate fuel cost for biomass power LCOE calculations. Data has been collected for the last 20 years and forecasted through to 2025 based on the trends observed in historic data.
- **O&M Cost** – O&M cost has been taken as percentage of capital cost. The percentage taken depends on the technology.
- **Life Period of Power Plants** – Generally accepted life span of a power plant in the industry has been considered for calculating LCOE for all technologies.

12.3.4.2 Investments

Investments are calculated on the basis of annual capacity additions in each year and capital cost.

12.3.4.3 Carbon Savings and Number of Homes Powered

Carbon savings (in million tons or in thousand tons) and number of homes powered is calculated for each renewable power source on the basis of project level information available for active and upcoming plants in the assets database of alternative energy eTrack or industry associations or trade publications.

12.3.5 Disclaimer

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