REFERENCE CODE **GDAE1093MAR** | PUBLICATION DATE **DECEMBER 2014**

GlobalData

SOLAR PV BALANCE OF SYSTEM – GLOBAL MARKET SIZE, TECHNOLOGY REVIEW, COST ANALYSIS, AND KEY COUNTRY ANALYSIS TO 2020

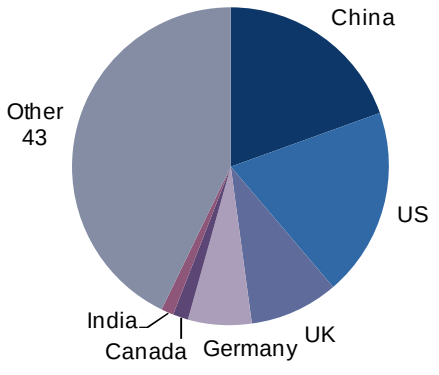
Executive Summary

China Continues to be Largest Market for Solar Balance of System

In 2013, with a sharp increase in capacity addition, China overtook the US to become the largest market for solar Balance of System (BOS). Having added XX Gigawatts (GW) in capacity, it is estimated that China will again have the largest market for BOS in 2014. At $XX billion, China's BOS market accounts for XX% of the global BOS market. The US BOS market accounts for 19% of the global BOS market.

The following chart shows the share of the global BOS market size held by each of the key countries covered in this report.

Balance of System Market, Global, Market Size by Country (%), 2014



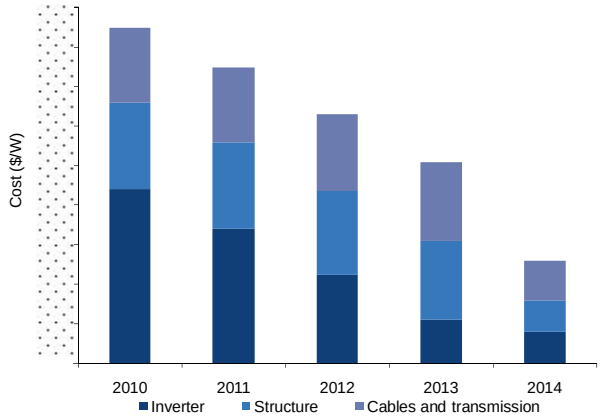
Source: GlobalData, Power Database [Accessed on October 14, 2014]

Decline in Hardware-Component Costs in India

India has a domestic content requirement for solar Photovoltaic (PV) but is restricted to cells and modules. The components of BOS can be sourced from outside the country without affecting the government incentive. Most of the inverters that are used in India are imported from European countries, but structures are supplied by several Indian companies at competitive rates. However, a number of developers import structures or purchase their installation as a service from companies outside of India, for reasons varying from lower cost to better and faster installation. Cables and transmission components are also of mixed sourcing. While some components are mostly purchased from domestic manufacturers, others are almost entirely imported.

The following chart shows how the costs of all hardware components have displayed a declining trend in India between 2010 and 2014. This has hugely influenced the fall in overall BOS cost in the country, in spite of rising labor rates.

Balance of System Market, India, Cost of Hardware Components ($/W), 2010–2014



Source: GlobalData, Power Database [Accessed on October 14, 2014]
W: Watt

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2 Introduction

2.1 Solar Photovoltaic Energy

Solar Photovoltaics (PV) is the conversion of sunlight into electrical energy, which is subsequently supplied either to the electric grid or to the consumer of electricity directly. This conversion is done by photosensitive semiconducting material assembled in the form of modules, usually referred to as solar PV modules or just solar modules. Since a single module produces only a few hundred Watts (W), multiple PV modules are usually connected to form a PV array that can produce greater output. Direct Current (DC) produced from PV arrays can be used to power equipment and recharge batteries. In order to be grid-connected, DC needs to be converted into Alternating Current (AC) using specifically designed inverters. A PV array can be installed on the roof of a building, on the ground, as a building façade, or integrated into the building itself.

2.2 Solar PV Modules

The modules convert the energy and are thus the most important component of a solar PV system. They are also one of the most expensive. There has been great focus worldwide on bringing down the costs of these modules, to make solar energy more affordable and bring it closer to grid parity. This led to a huge fall in the price of PV modules over the past decade, changing the dynamics of the solar PV market. Mass production in China contributed greatly to this price fall.

2.3 Solar PV Balance of System

The components of a solar PV system, excluding the modules, are collectively called the Balance of System (BOS). They represent all of the system, except for the key component: the modules. In different contexts and studies the term may include or exclude certain components. Hardware components of BOS include inverters and structures, as well as cabling and transmission. The components that are used in a system optionally, such as tracking devices, monitoring systems, and module-cleaning equipment, are also hardware components of BOS. The cost of land acquisition, civil work, and labor is included in the cost of BOS when discussing solar PV costs. Permitting, liaising and financing costs are also part of the BOS cost.

Thus, all non-module costs are taken into account when calculating the BOS cost of a solar PV plant. Of these costs, inverter, structure, cable and transmission costs are defined as hardware BOS, while the remaining costs are considered non-hardware BOS.

Introduction

2.5 GlobalData Report Guidance

- The report begins with an executive summary that gives a snapshot of the key indicators in the solar PV BOS market.
- The introduction provides an overview of the market, solar PV modules, and the different hardware and non-hardware components of BOS.
- The global BOS market chapter gives an insight into the global market for solar PV BOS. The chapter discusses the cumulative annual solar PV capacity. It also discusses the global average overall BOS cost on a per W basis, the global market size for the 2010–2014 period, and the estimated values for the 2015–2020 period.
- The following six sections cover the BOS market of each of the six key countries selected for this report. Each section explains the solar PV capacity scenario of the corresponding country for the 2010–2020 period and provides a cost analysis of the BOS markets and hardware components. Also discussed are the market sizes of BOS in the 2010–2020 period and individual hardware components in the 2010–2014 period.

Solar PV Balance of System Market, US

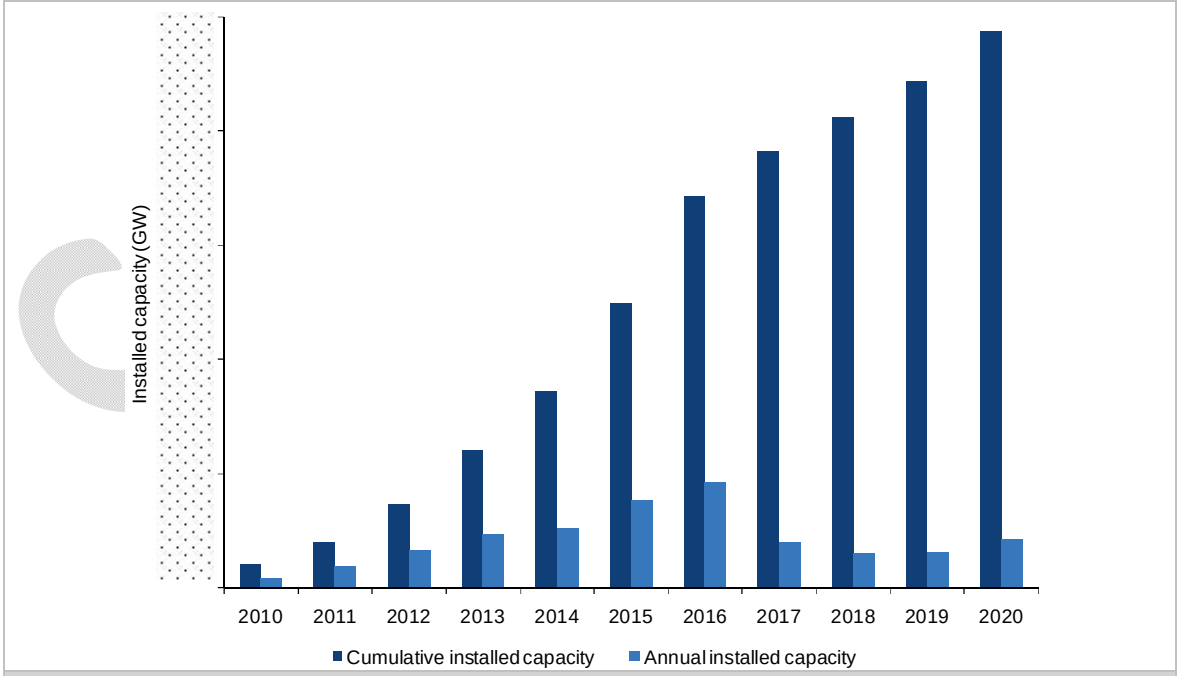
4.2 Balance of System Market, US, Installed Capacity, 2006–2025

The cumulative installed capacity of solar PV in the US increased from XX GW in 2010 to XX GW in 2014, with increasing annual additions during this period and a significant addition of XX GW in 2013 alone. Annual additions are expected to continue increasing and reach XX GW in 2016, followed by a steep fall in 2017, with a capacity addition of only XX GW, owing to the expiry of ITC. Annual additions are expected to be lower during the 2017–2020 period, unless the ITC is renewed.

The estimated annual capacity addition ensures an upward market for both hardware and non-hardware BOS components until 2016, but beyond then the state of the market is less certain. The market for cleaning and maintenance equipment and services is less speculative beyond 2016, as even in the case of a fall in annual additions, the already existing capacity has the potential to generate demand for such products and services.

The following figure and table illustrate the annual and cumulative installed solar PV capacity in the US between 2010 and 2020.

Figure 4: Balance of System Market, US, Installed Capacity (GW), 2010–2020



Source: GlobalData, Power Database [Accessed on October 14, 2014]

Solar PV Balance of System Market, US

Table 4: Balance of System Market, US, Installed Capacity (GW), 2010–2020		
Year	Cumulative installed capacity	Annual installed capacity
2010		
2011		
2012		
2013		
2014		
2015		
2016		
2017		
2018		
2019		
2020		
Source: GlobalData, Power Database [Accessed on October 14, 2014]		

4.3 Balance of System Market, US, Cost Analysis

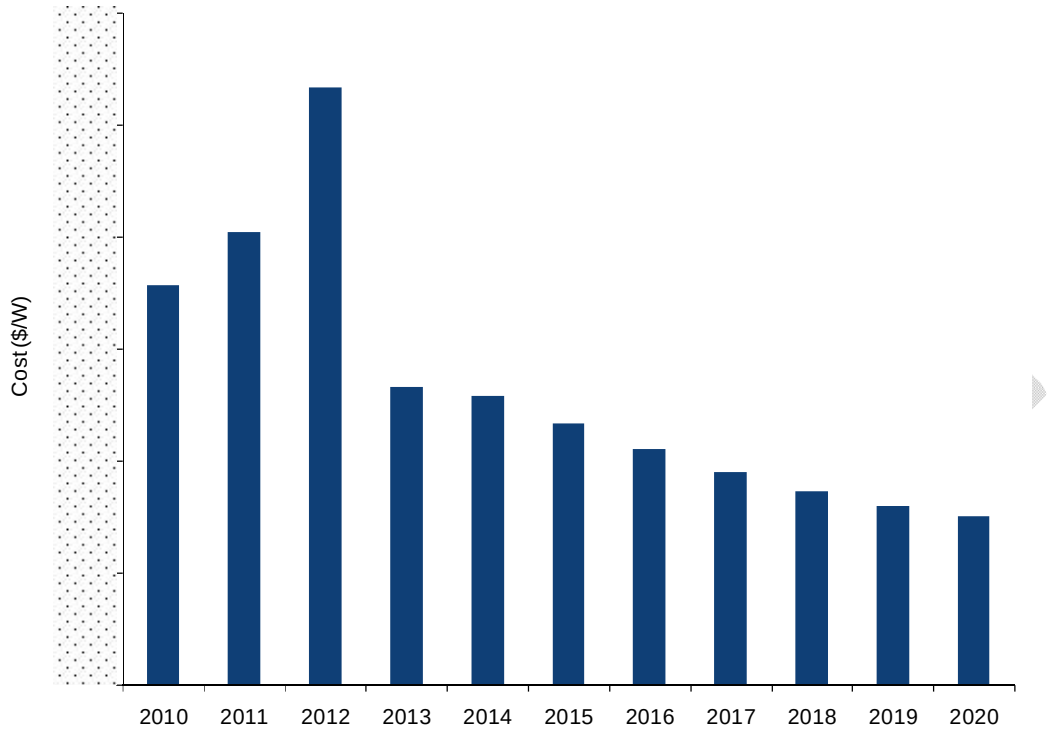
4.3.1 Balance of System Market, US, Non-Module Plant Cost, 2010–2020

The cost of BOS in the US, which includes all hardware equipment outside of modules, all service costs including labor, and all soft costs including permits and inspections, is estimated to have been $XX/W in 2010. This increased to $XX/W in 2012, with increasing soft costs and service costs. However, the overall plant costs fell slightly during this period from $XX/W in 2010 to $XX/W in 2012, as the increase in BOS costs was more than compensated by the fall in module prices from $XX/W in 2010 to $XX/W in 2012.

BOS costs fell sharply in 2013, owing to the formation of a more optimized and standardized BOS market. These costs are expected to decrease gradually and reach $XX/W in 2020. The following chart shows the overall BOS cost in the US between 2010 and 2014 and the estimated costs between 2015 and 2020.

Solar PV Balance of System Market, US

Figure 5: Balance of System Market, US, Non-Module Plant Cost ($/W), 2010–2020



Source: GlobalData

Table 5: Balance of System Market, US, Non-Module Plant Cost ($/W), 2010–2020

Year	Cost
2010	
2011	
2012	
2013	
2014	
2015	
2016	
2017	
2018	
2019	
2020	

Source: GlobalData

10 Appendix

10.1 Abbreviations

Table 34: Abbreviations	
Abbreviation	**Definition**
AC	Alternating Current
BOS	Balance of System
DC	Direct Current
DoE	Department of Energy
EEG	Renewable Energy Sources Act (Erneuerbare Energien Gesetz)
FIT	Feed-in Tariff
GBI	Generation Based Incentive
GHG	Greenhouse Gas
GW	Gigawatt
GWh	Gigawatt hour
ITC	Investment Tax Credit
KfW	Reconstruction Loan Corporation (Kreditanstalt für Wiederaufbau)
kW	Kilowatt
kWh	Kilowatt hour
MNRE	Ministry of New and Renewable Energy
MW	Megawatt
MWh	Megawatt hour
NSM	National Solar Mission
PTC	Production Tax Credit
PV	Photovoltaic
REC	Renewable Energy Certificate
RES	Renewable Electricity Standards
RPO	Renewable Purchase Obligation
RPS	Renewable Portfolio Standards
SEIAC	Solar Energy Industry Advisory Council
T&D	Transmission and Distribution
UL	Underwriters Laboratories
W	Watt
Source: GlobalData	

Appendix

10.2 Sources

- EIA (2013). Annual Energy Outlook 2013. *United States Energy Information Administration*. Available from: http://www.eia.gov/forecasts/aeo/pdf/0383(2013).pdf
- PC (2012). Twelfth Five Year Plan. *Planning Commission – Government of India*. Available from: http://planningcommission.gov.in/plans/planrel/12thplan/pdf/vol_1.pdf
- Platzer (2012). U.S. Solar Photovoltaic Manufacturing: Industry Trends, Global Competition, Federal Support. *Congressional Research Service*. Available from: http://fas.org/sgp/crs/misc/R42509.pdf

10.3 Research Methodology

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

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

10.3.1 Secondary Research

The research process begins with exhaustive secondary research on internal and external sources 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: whitepapers, press releases, news and annual reports
- Industry trade journals, magazines and other literature: news articles and research studies
- Industry associations, energy agencies and other government bodies
- Internal proprietary databases such as our alternative energy eTrack and power eTrack

Information related to the overall BoS cost and the cost of hardware components has been obtained through extensive secondary research.

Appendix

10.3.2 Primary Research

GlobalData conducts extensive primary interviews with industry participants and commentators in order to validate its data and analysis.

A typical research interview is conducted to fulfill the following functions:

- To get the interviewee's perspective on the market size, market trends, growth trends, competitive landscape, and future outlook
- To validate secondary research findings
- To further develop the analysis team's expertise and market understanding

10.3.3 Market Estimates and Assumptions

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

Overall Balance of System Cost

The overall BOS cost is calculated as the difference between the total capital expenditure per watt and the cost of solar modules per watt. Module costs are covered by GlobalData's Power Database, and capital expenditure in different countries in each year are obtained through primary and secondary research.

Hardware-Component Costs

Hardware components are classified into three groups in the report – Inverters, Structures, and Cables and transmission equipment. These costs are obtained mostly through secondary research and a few primary research interviews.

10.4 Disclaimer