

Bosch Solar Energy – a corporate division introduces itself

Bosch Approach to PV and PV in India

Bosch Solar Energy



Outline

Agenda



Appeal and challenges of photovoltaics



Vision for Bosch Solar Energy



Facts and figures



Technologies and products

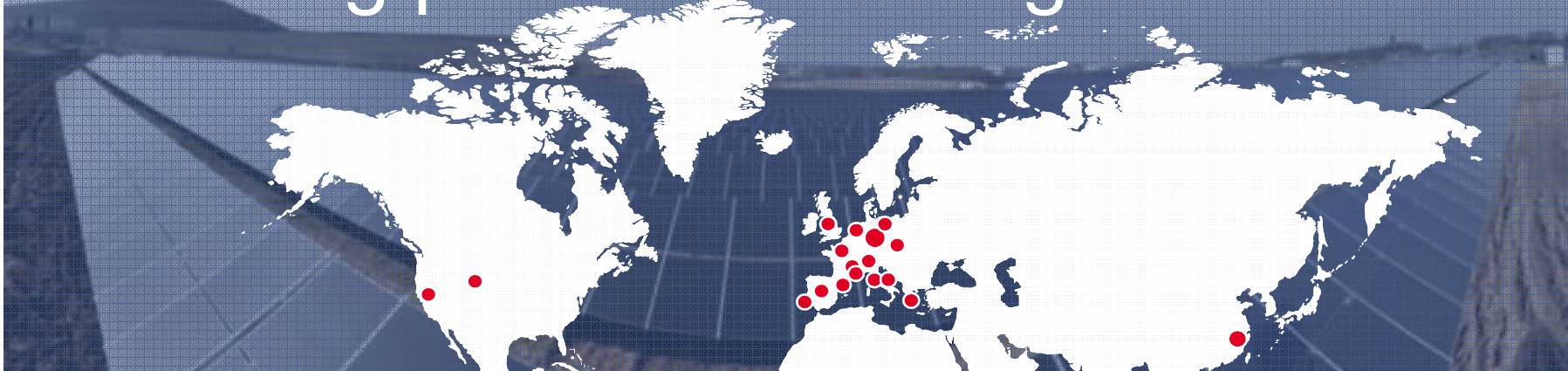


Current projects



Appeal and challenges of photovoltaics

Starting point: Global mega-trends

- 
- According to the UN, the global population will increase from 6,7 to 9,2 billions in 2050. The WEF has stipulated that the entire world population consumes 25% more of the natural resources the Earth can produce.
 - The energy need is continuously increasing, traditional energy sources such as coal or oil are reaching their economic and ecologic limits.

Appeal and challenges of photovoltaics

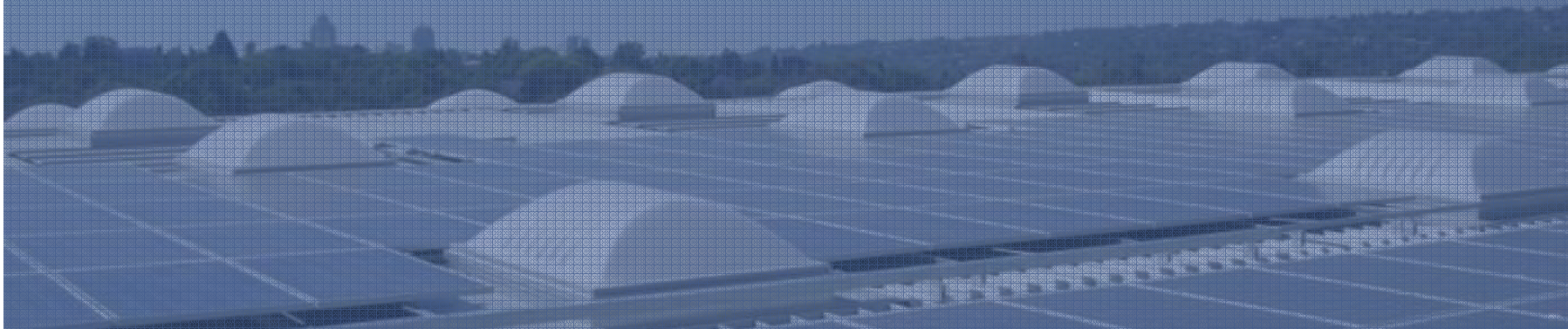
Appeal of photovoltaics

- In one hour, the sun sends to the Earth as much energy as the entire world population consumes in a whole year.
- Photovoltaics harnesses this energy using photoelectric effects to generate electricity that is friendly to the environment and our climate.
- Photovoltaics are today viewed as a crucial pillar of a modern, forward-looking energy supply.



Appeal and challenges of photovoltaics

Challenges of photovoltaics



- **Major markets are losing momentum, new growth regions are emerging, competition is getting tighter. The price of solar power systems is falling.**
- **For photovoltaic companies, this means they must grow, while cutting manufacturing costs and adapting their business models quickly without jeopardizing highest quality levels.**
- **At the same time, though: solar energy "from off the roof" is getting more and more competitive. In some markets it's already cheaper than electricity "from the wall".**



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Current projects



Vision for Bosch Solar Energy

- 
- **Our vision: We are doing our part to provide a safe, clean, independent and affordable supply of energy – worldwide.**
 - **Our goal: To help photovoltaics become a key component in the energy mix of the future. In doing so, we're helping to prevent carbon dioxide from being created during the production of electricity.**
 - **Our path: We are working continuously on the reduction of manufacturing costs and developing the PV solar cells, module, and system concepts of the future → day in and day out and with uncompromised highest levels of quality.**



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Facts and figures



Technologies and products



Current projects



Facts and figures

Milestones (I)

Mar 1997



Founding of Ersol Solarstrom GmbH & Co. KG

Sep 2005



IPO
Converted to a stock corporation in 2001, the renamed ersol Solar Energy AG, issued an IPO in 2005.

Jun 2008



Bosch buys controlling shares
Robert Bosch GmbH acquires ersol Solar Energy AG.

Mar 2009



Cornerstone laid for new production facility in Arnstadt
Bosch invests € 530mn in Arnstadt facility. New factories for solar cells and modules, an R&D center and new headquarters are created.

1) formerly: Johanna Solar Technology GmbH

Facts and figures

Milestones (II)

Sep 2009



**Renamed
Bosch Solar
Energy AG**

On September 1, 2009 ersol Solar renamed Bosch Solar Energy AG.

Nov 2009



**Business
acquisition**

Robert Bosch GmbH acquires the majority shares in aleo Solar AG and Bosch Solar CISTech GmbH¹⁾.

Aug 2010



**Dedication of
Cell Fab 3 in
Arnstadt**

In August 2010 the first part of the overall complex was dedicated in Arnstadt.

May 2011



**International
production**

Bosch Solar Energy presents industrial concept for crystalline module production in Vénissieux, France.

Facts and figures

Markets and facts 2010

Bosch Solar Energy

- EUR 918mn revenue
- 2,911 employees
- 7 production sites



Germany

- 63.6% share of revenues
- 4 production sites



Europe (without GER)

- 31.4% share of revenues
- 2 production sites



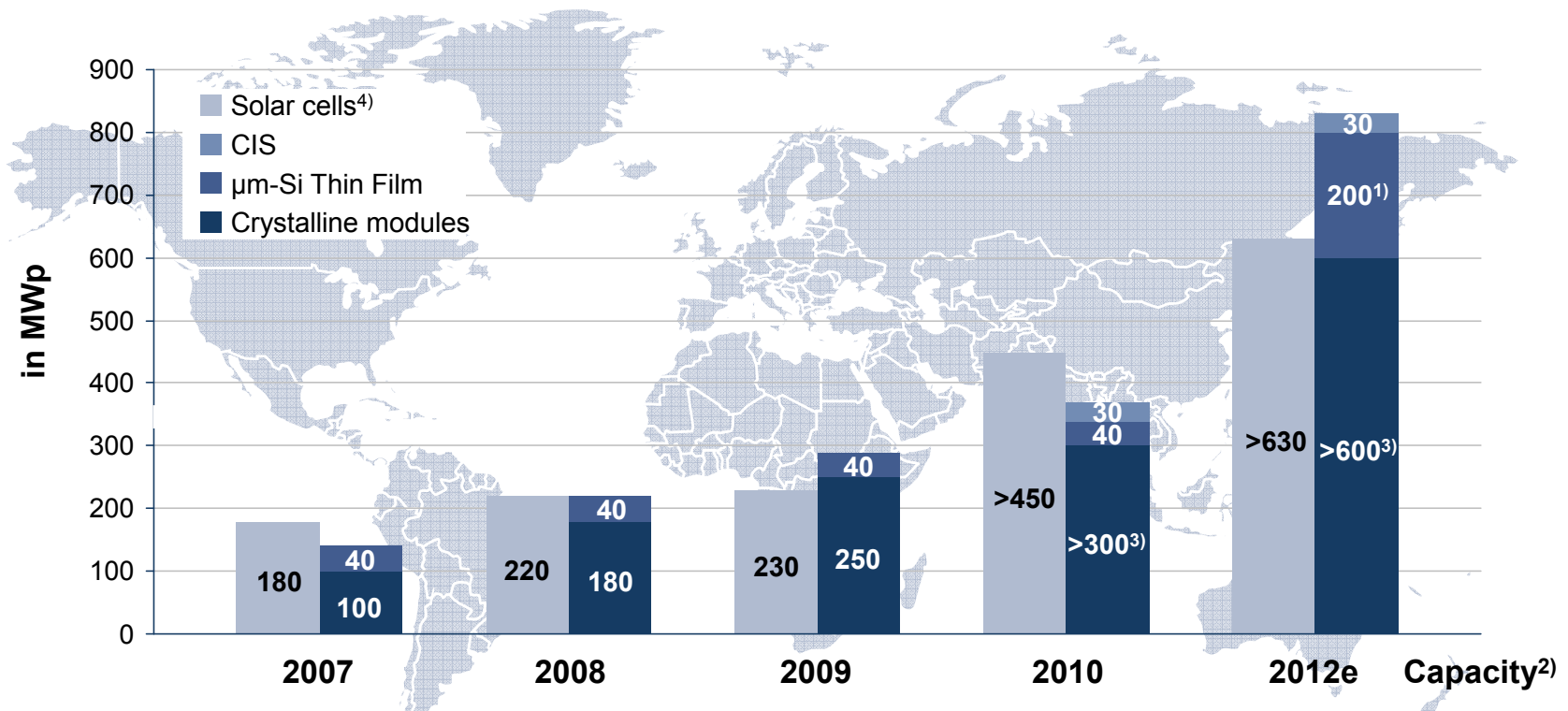
Asia and rest of world

- 5% share of revenues
- 1 production site



Facts and figures

Expected production capacities Bosch Solar Energy incl. aleo

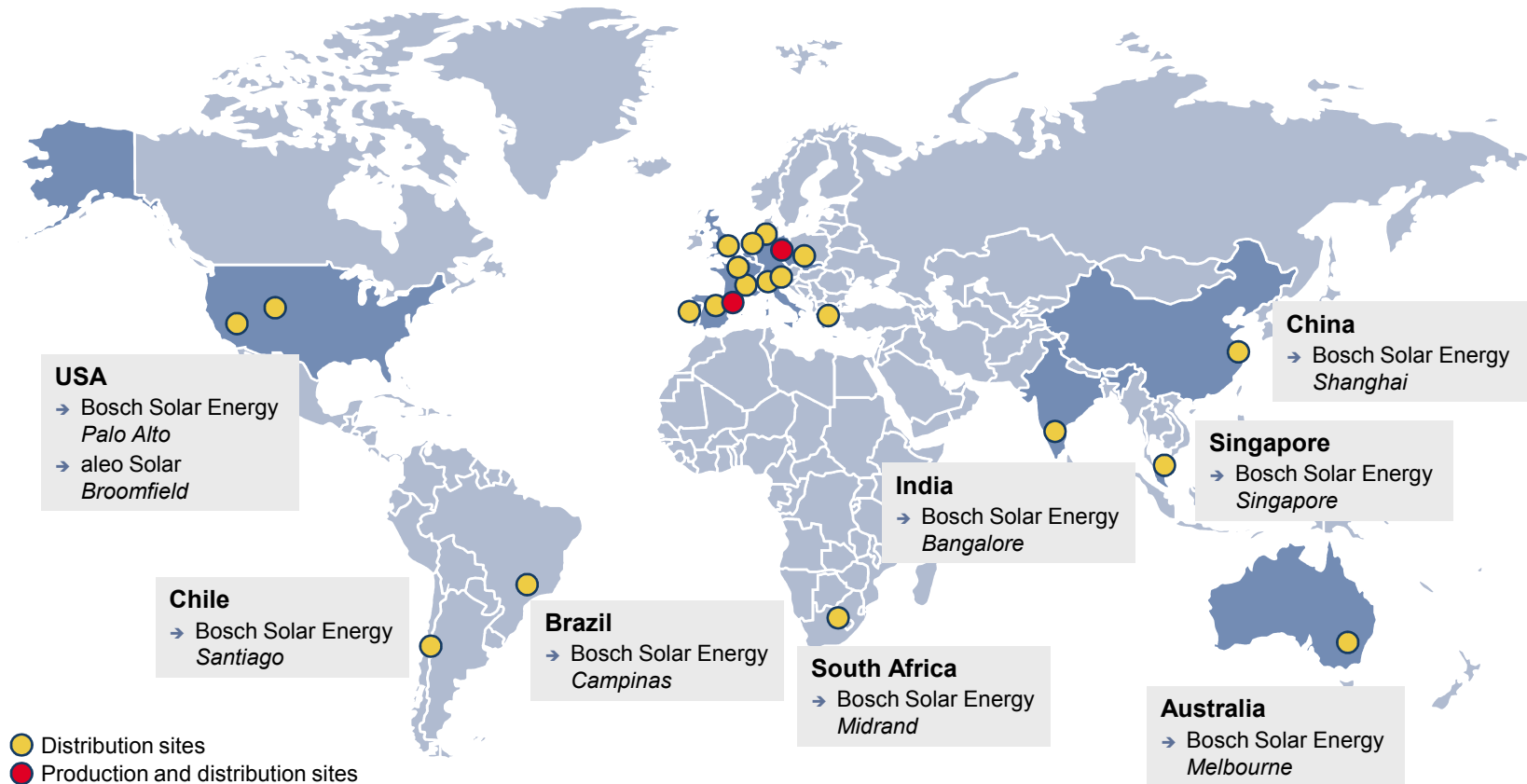


1) Depending on milestones
2) Nominal capacity at year's end

3) Additional capacity through joint venture
4) Internal and external suppliers

Facts and figures

Global distribution network



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Appeal and challenges of photovoltaics



Vision for Bosch Solar Energy



Facts and figures



Technologies and products



Current projects



Technologies and products

Product portfolio - Overview

Solar cells

- Monocrystalline silicon solar cells
- Efficiency of over 18 percent
- 156 x 156 mm
- 3 busbar technology



Crystalline solar modules

- Based on mono- and multicrystalline silicon solar cells
- Very high efficiency per module (approx. 15 percent)
- With 48 or 60 solar cells



Thin film solar modules

- Thin film solar modules on silicon basis (micromorph)
- CIS thin film solar modules



Solar projects

- Global use of crystalline and thin-film modules
- With a nominal output from around and above 1 MWp



Company presentation 2011



Appeal and challenges of photovoltaics



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Facts and figures



Technologies and products



Current projects & Approach to India



Current projects

Bosch solar energy plant in Great Britain

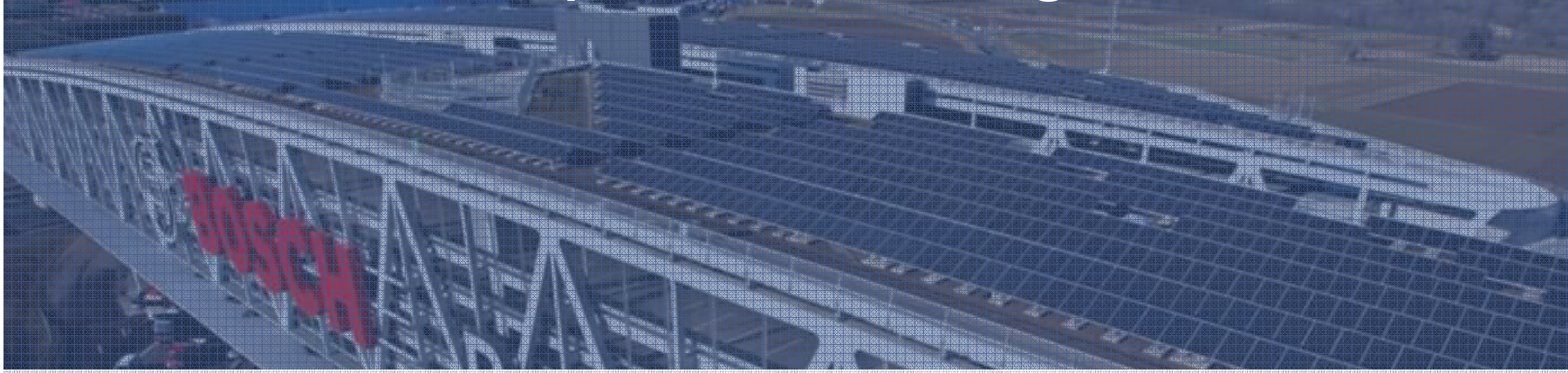


- **Bosch Solar Energy AG is building in Treffulock one of the biggest solar plants in the UK. About 21,000 Bosch c-Si M 60 monocrystalline modules, with 5 Megawatt total output will be installed.**
- **Bosch offers turn-key PV-plants – from planning and implementation to monitoring of the solar plant once finished, using high quality Bosch components.**



Current projects

Bosch solar plant in Stuttgart



- **Bosch Solar Energy together with Stuttgart airport put into operation in December 2009 a 955 kWp photovoltaic plant over the roof of Bosch car park in Stuttgart.**
- **4,247 monocrystalline solar modules over a surface of 7,000 sqm. produce 870.000 kWh “green“ energy every year.**
- **This would cover the yearly energy need of 250 four-people households.**

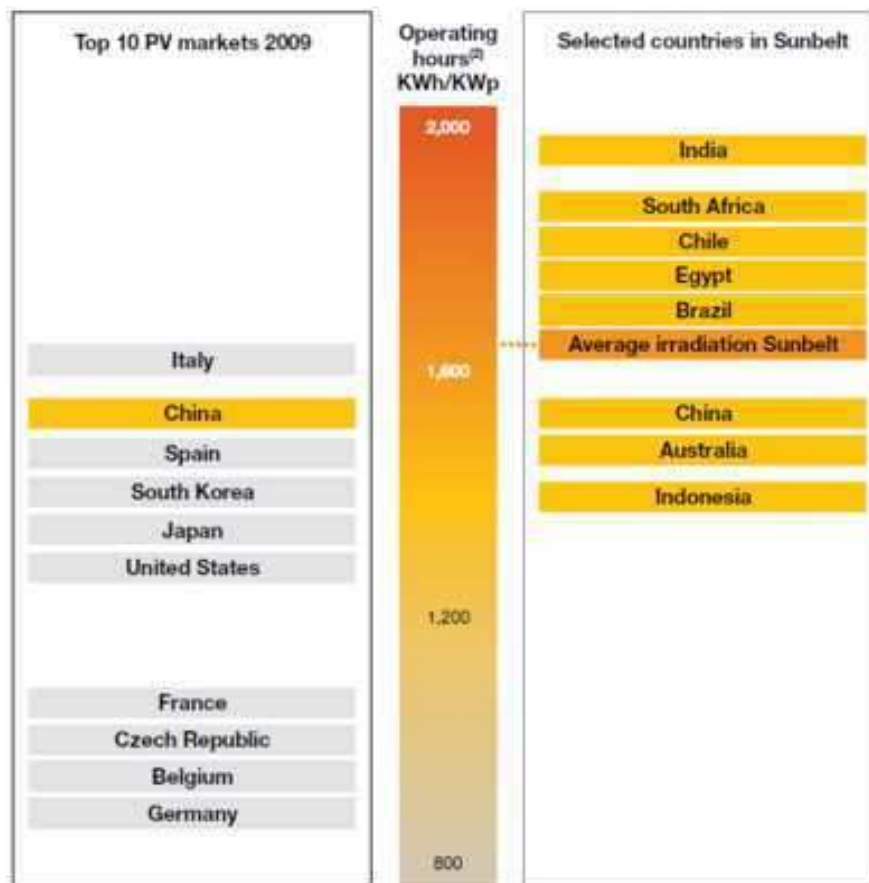


Current projects

eBike presented at Solar Power International 2010

- **Bosch Solar Energy presented a solar-powered eBike at the Solar Power International 2010 event.**
- **Bosch thin film modules deliver reliable, environmentally friendly energy for the motor.**
- **The SE modules can charge the eight ampere-hour lithium ion batteries on the eBike in just two and a half hours.**

India: A Natural PV market



- **High Irradiation Levels**
 - Makes PV suitable for Indian conditions
- **India’s Electricity Demand**
 - > 10% Demand Supply Gap¹
 - 460 GW of requirement by 2030¹
 - Sustained Economic Growth at 9% YoY
- **Absence of Grid-Connectivity, Need for Rural Electrification**
 - PV is scalable, standalone and is generated close to consumption
- **High Growth Rate, Over-dependence on Fossil Fuels together with high pollution**
 - PV can generate clean & “independent” energy

Graphic Source: EPIA Article Oct 2010, Unlocking the Sunbelt

¹ SEMI – PV Group white paper on Solar PV Landscape in India 2008

Solar Energy



Current projects

Reference Projects at Bosch India



- 3 Reference Projects for Captive Power Consumption on Bosch Plants
- Demonstrate and Evaluate Performance of Bosch PV Modules under different conditions
- Based on performance results customize products for Indian Conditions

Plant Details:

Plant Capacity: 40 kWp (each location)

Technologies: mono crystalline silicon
poly - crystalline silicon
micro-morph Thin film
CIGS Thin Film
(each 10 kWp)

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Current projects

Pictures from the Reference Projects



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Solar Project Inauguration at BanP former president of India Mr.A.P.J. Abdul Kalam at Bangalore on 01.06.11



Thanks for your attention!

www.bosch-solarenergy.de



info.se@de.bosch.com



For more information.

Dr. George Hanna
Head of Sales India and Off-Grid Products Worldwide

Tel.: +49 (0)361 2195-1194
email: George.Hanna@de.bosch.com

