



Opportunities and Challenges for development of Grid Connect PV projects in India

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Private and Confidential

About Kiran Energy



Kiran Energy is a leading solar power utility with a project portfolio of 85 MW

Operational Projects

- **5MW** Solar Project in Rajasthan with Mahindra Group
- **20MW** Project in Gujarat Solar Park

Projects in 2012-13

50MW projects won under NVVN Phase I Batch II scheme

Land Bank

- Govt Land Bank to develop more than ~130MW size projects in Gujarat and Rajasthan
- Private land acquisition in process in Gujarat, Rajasthan and other high DNI states



Private Equity Investment - \$55MN



Management

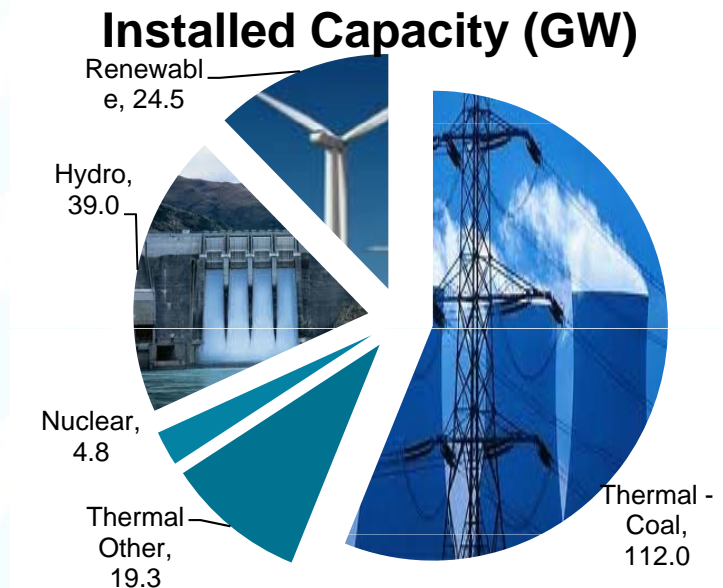
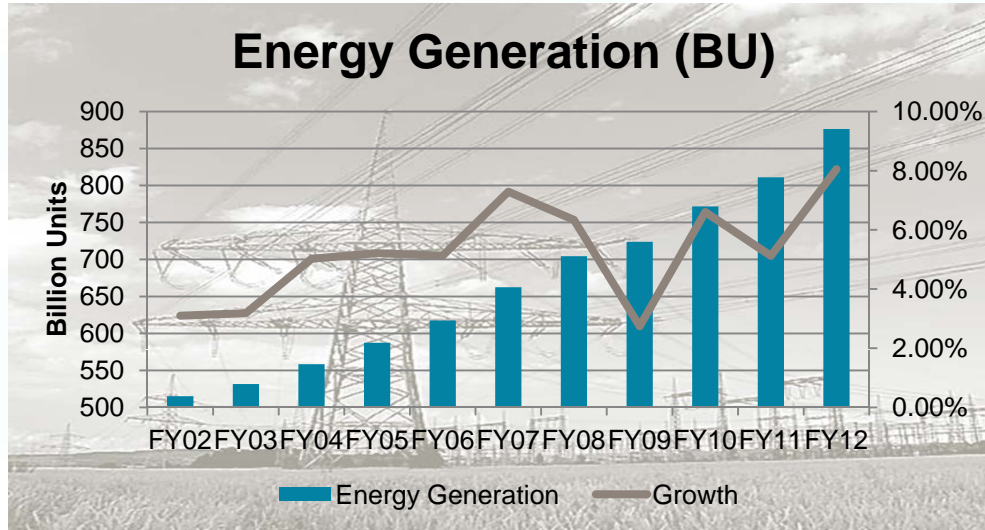
Ardeshir Contractor: Former Managing Director at KPMG India, Ardeshir serves on several international company Boards and Government Committees. Ardeshir is a BTech from IIT Mumbai and an MS from Ohio State University

Alan Rosling: Former Executive Director of Tata Sons and Chairman of the Jardine Matheson Group in India, Alan has also been a Special Advisor to the British Prime Minister, John Major. Alan was educated at Cambridge University and Harvard Business School.

Technology Partnerships



Energy Need/Deficit



⑩ Energy security in India is weak

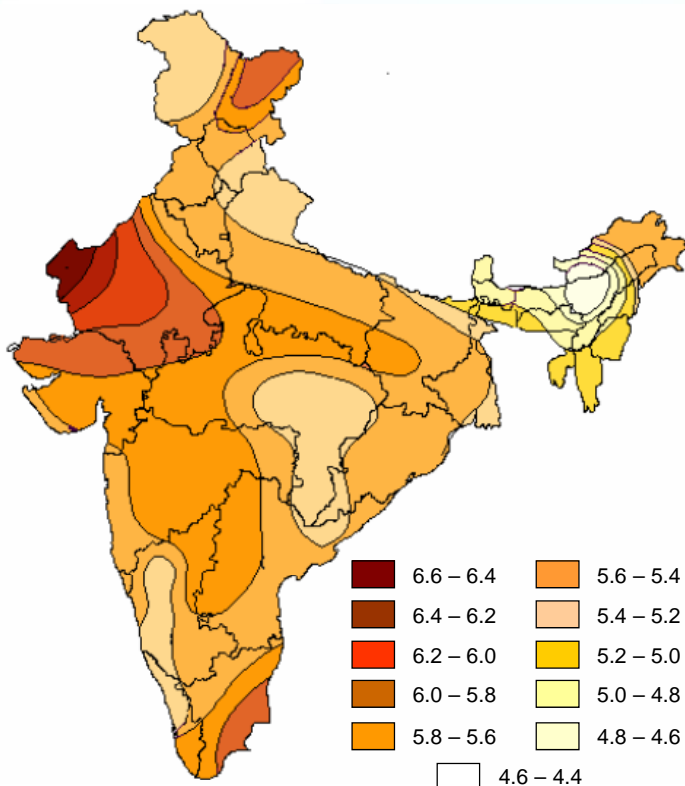
- 65% of energy produced is thermal and mainly using coal
- 75% of oil required imported
- 30% of coal required imported

⑩ 9% GDP growth shall demand growth in Energy generation by 10%

	Peak Demand	Peak demand met	Peak Demand Deficit %
Maharashtra	20200	14678	-27.3
UP	11800	8680	-26.4
Andhra P.	13916	11336	-18.5
Gujarat	11832	9569	-19.1
Tamil Nadu	12755	10616	-16.8
All India	136193	118676	-12.9

India Solar Opportunities

India – Radiation Map (kWh/m²/Day)



Supportive regulatory regime

India aims to establish itself as a global leader in solar energy by creating policy conditions for its diffusion across the country

Resources

Availability of sunshine for longer hours with greater intensity and abundance of large tracts of barren land suitable for solar

Tariff

Government supported Feed-In-Tariff programs and high peak prices in the merchant market make solar an attractive proposition

Solar Renewable Purchase Obligation

Mandates utilities to source up to 3% of their total power demand from solar power resources by 2022

Cost leadership

Upcoming state-of-the-art manufacturing capacities at competitive costs will position India as a hub for Solar Energy

Proactive Government Support to Solar Market



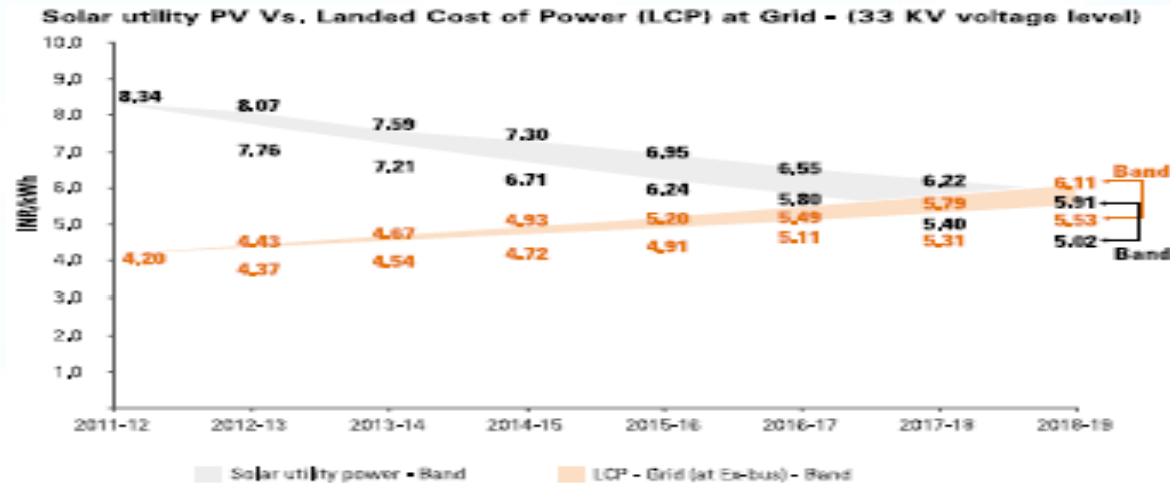
Power Purchase Agreement (PPA) – Policy Driven

Regulatory Driven

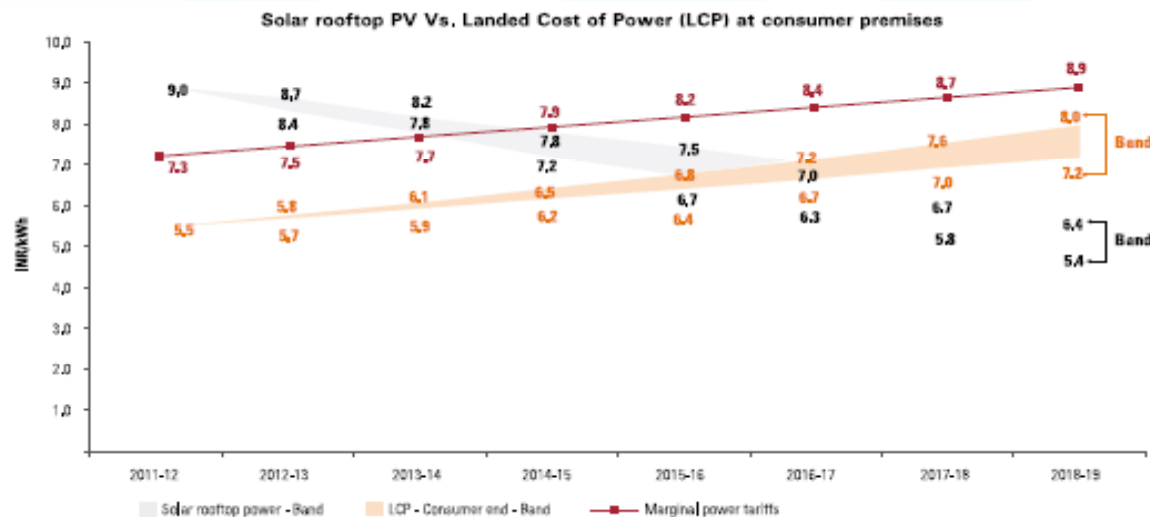
I Jawaharlal Nehru National Solar Mission (JNNSM)	II State level solar programs	III Renewable Energy Certificate (REC) Market	IV Renewable Purchase Obligation (RPO) Market
<ul style="list-style-type: none"> • <u>Grid Connected:</u> <u>Phase – 1:</u> <ul style="list-style-type: none"> • 1000 MW by 2013 (500 MW of Solar thermal) • 20,000 MW by 2022 • <u>Rooftop & Small Scale Solar Power Generation</u> 100 MW already allotted • <u>Off-grid & Decentralized Solar Applications</u> Market size of 200 MW by 2013 	<ul style="list-style-type: none"> • Several states have introduced solar power policies to encourage deployment of solar power. • Gujarat: Signed PPA's for about 965 MW of solar power. • Rajasthan: Phase1 (up to 2013) Max Capacity 200 MW & Phase2 (2014 - 2017) Max Capacity 400 MW • Karnataka: Invited bids for 50 MW Solar PV projects and 30 MW solar thermal projects. Target of 200 MW by 2016 • Orissa: Total capacity: 25 MW Solar PV, Bidding in November 2012 	<ul style="list-style-type: none"> • Developers can trade REC with utilities that are short of the mandated quota of renewable energy for each state in the power exchange • REC market started trading in India 	<ul style="list-style-type: none"> • In line with National Action Plan of Climate Change, Solar specific RPO has been mandated on Distribution utilities, Captive consumers and Open access consumers • All states are implementing RPO as a % of total power consumption

Grid Parity Economics

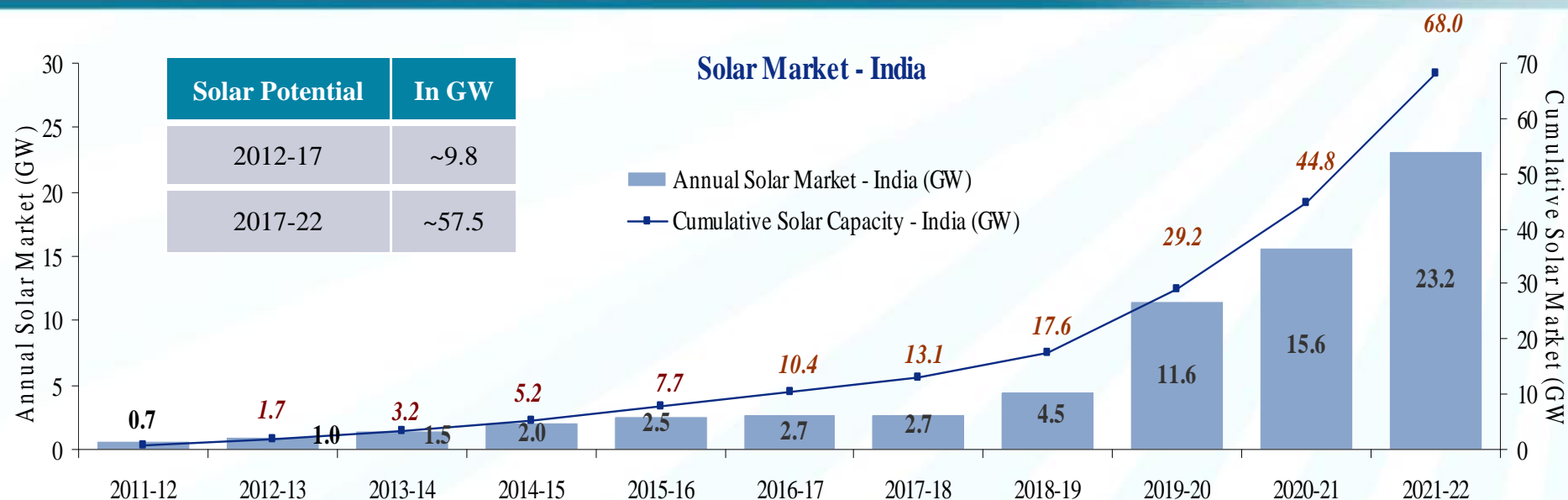
Grid Parity for Solar Power - Utility level



Grid Parity for Solar Power - Consumer level



Solar Energy potential in India: Market size



Source: KPMG India

- Solar Market can reach up to 68 GW by 2022 unlike JNNSM target of 20 GW
- 36% of the 57 GW market (from 2017-18) to come from utility-scale solar potential
- Solar rooftops and solar-powered agriculture pumpsets may require government interventions to encourage solar adoption
- However, utility-scale solar installations would be driven by cost economics of solar power

Challenges

- Price versus conventional power
- RPO enforcement
- Financial position of key utility customers
- Financing
- Grid issues and charges
 - Grid availability
 - Open access and wheeling charges
- Project implementation challenges
 - Land
 - Permitting



Way Forward



- NSM Phase II
- State Policies
- RPO enforcement
- Open access facilitation
- Drive cost down
 - Scale
 - Reliable pipeline of projects
 - Open markets/ competition



The local content debate

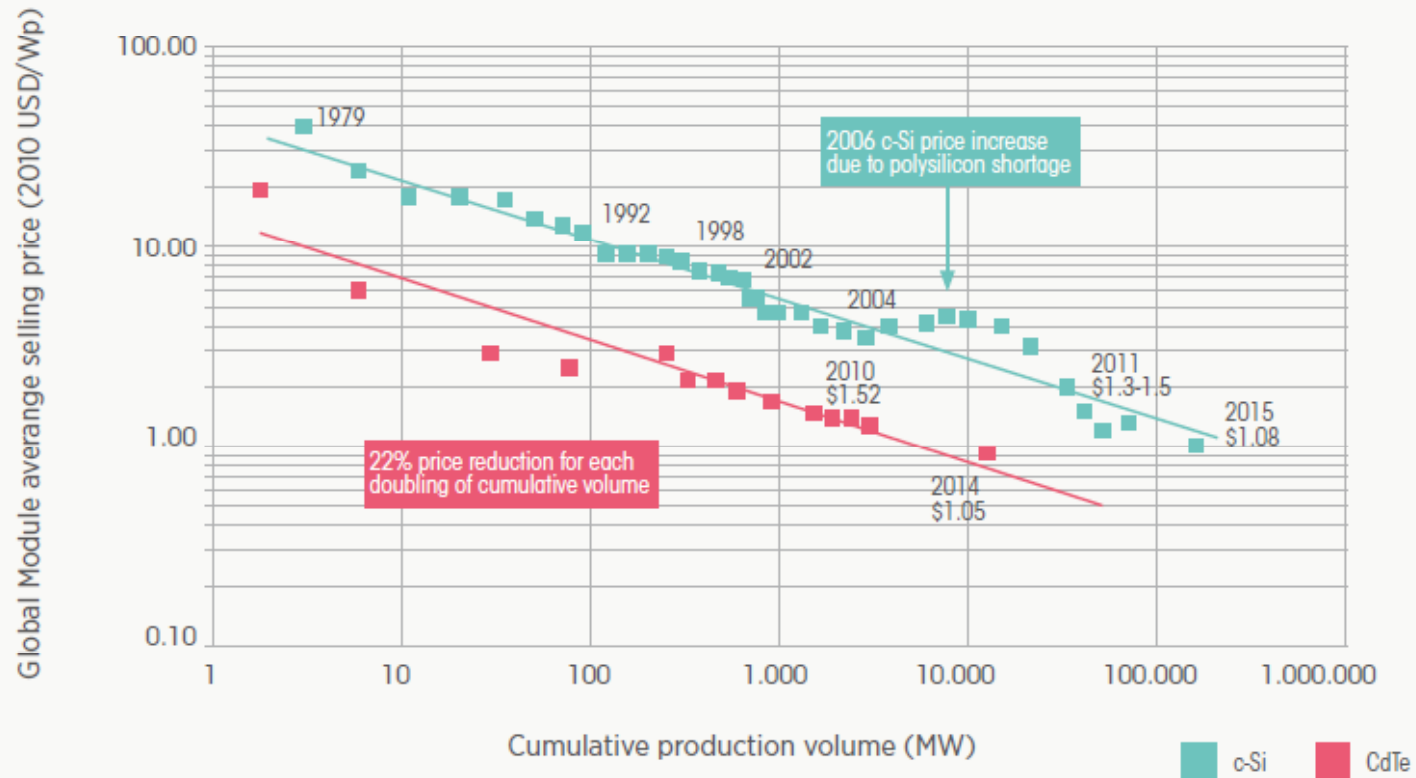
Maintain open market

- Key aim is to grow the solar market and achieve grid parity
- Economic impact from power availability rather than manufacturing
- Manufacturing will follow the market, so focus on project pipeline/ certainty
- Module price driven by world market
- Scale
- Innovation
- Supply/ demand
- Indian manufacturing smaller, not integrated and historic investments
- No Thin Film capacity
- Bankability critical

Local content

- Developing local industry a secondary objective of National Solar Mission
- Objective
- Local value add/ employment
- Energy security/ forex
- Local content provision in NSM Rounds 1A and B
- Indian module and cell manufacturers not competitive with imports
- Accusations of dumping/ anticompetitive support against a number of countries

The Global PV Module Price Learning Curve for C-Si water based and CdTe Modules, 1979 - 2015



Sources: based on data from EPIA and Photovoltaic Technology Platform, 2010 and Liebreich, 2011.