



Destination India

Making India the solar capital of the World



Saibaba Vutukuri

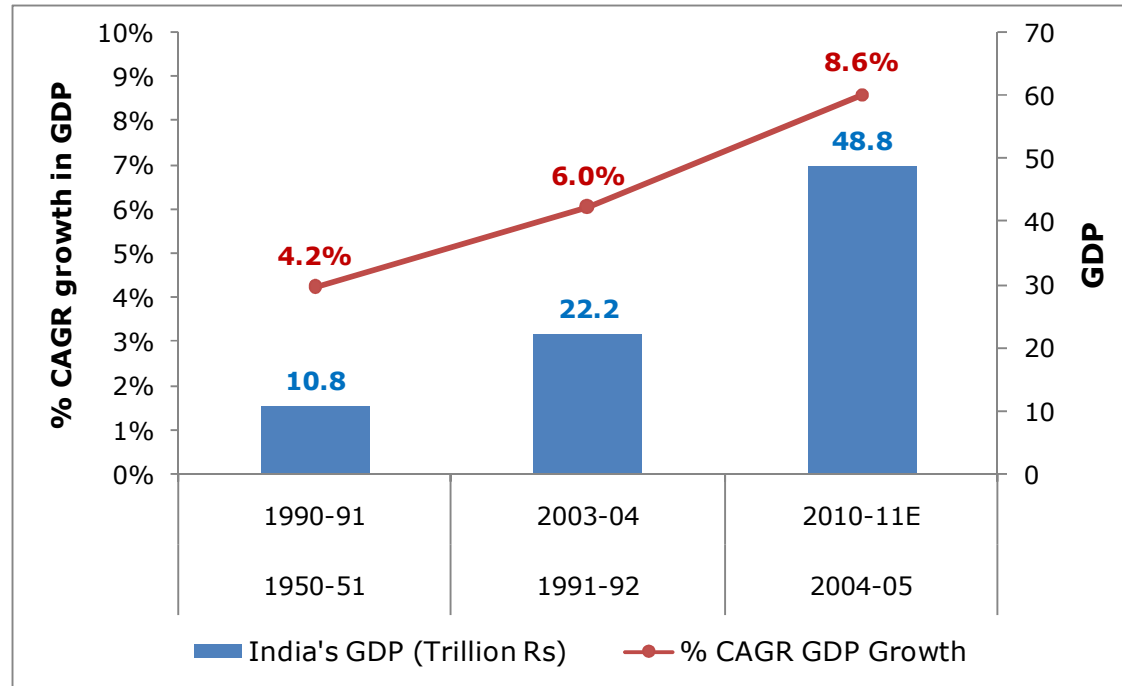
Co-Chairman- FICCI Solar Task Force
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- ❖ India – The Past and Future
- ❖ Indian Govt Infrastructure Focus
- ❖ Power Requirement of India
- ❖ Renewable Energy in India
- ❖ Solar Energy in India

India - The Past and Future

India's GDP (constant prices), Rs Trillion

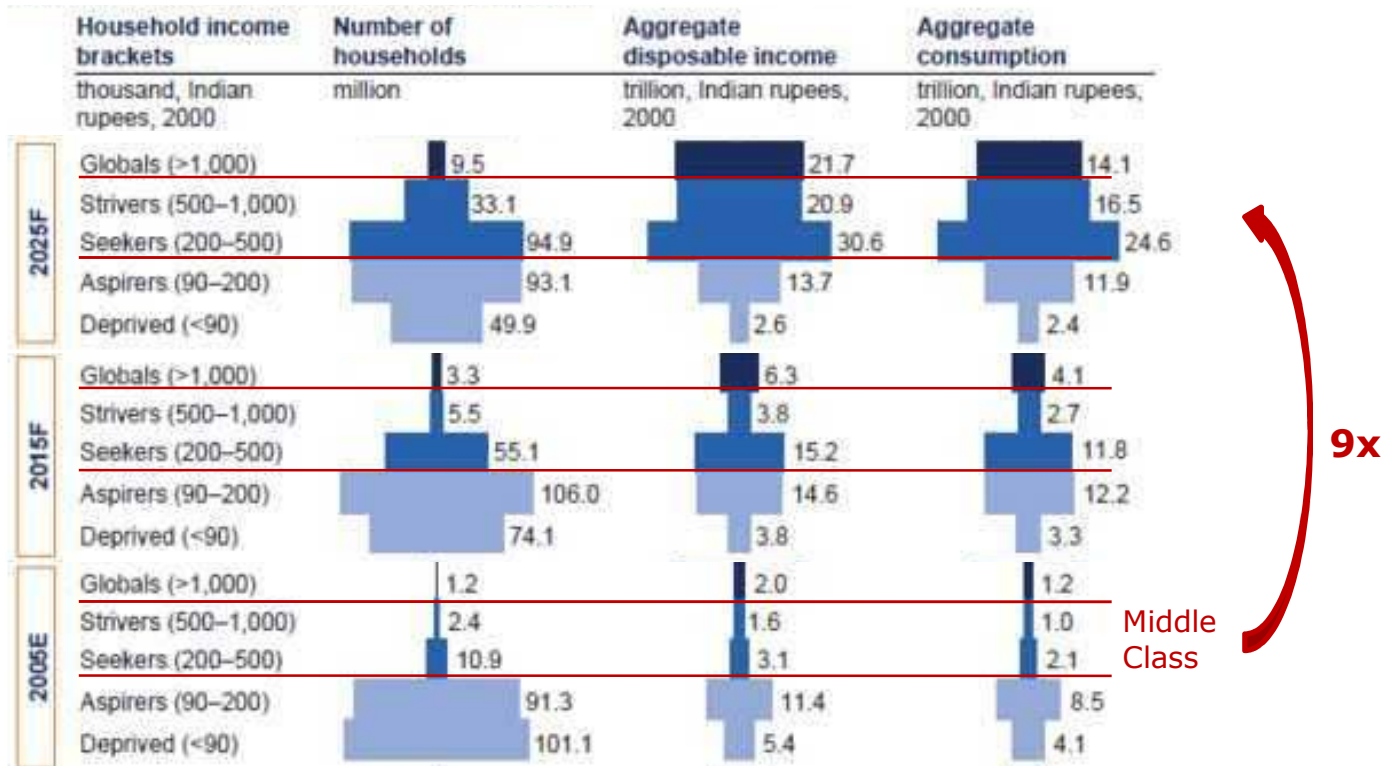


(Source: India's Economic Survey 10-11)

- ❑ From 1950-90, India's GDP has grown at slow pace with 4.2% CAGR
- ❑ With economic liberalization in 1991, Indian economy picked up & shown significant growth thereafter. In last 7 years, India's GDP has grown at 8.6% CAGR
- ❑ India GDP for 10-11 is estimated at Rs 48.8 trillion (~ 1.3 trillion US \$), 8.5% growth over 09-10
- ❑ India is the 4th largest economy in the world in terms of GDP (PPP) after US, China & Japan (source: IMF, World Economic Database, 2010)

IMF has forecasted, India's GDP will reach Rs 83 trillion (~ 2.78 trillion US \$) by 2016

Rising income of Indian Middle Class



(Source: Mckinsey Global Institute: The 'Bird of Gold': The rise of India's Consumer Market, May'2007)

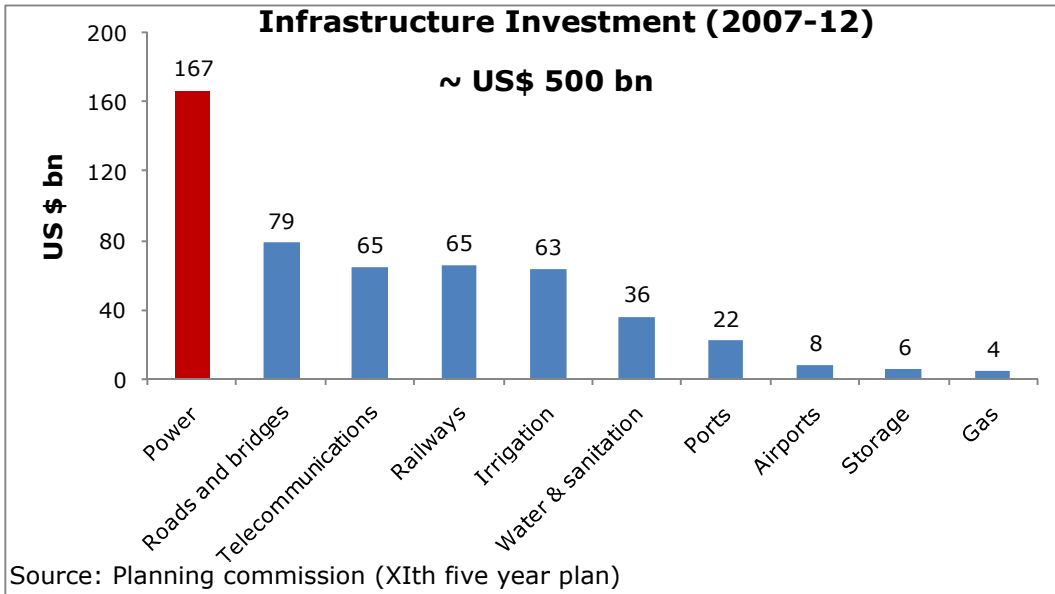
- ❑ Indian economy has evolved as domestic consumption economy.
- ❑ Spending power of middle class has risen & income levels will increase by 3 to 4 times.
- ❑ said by 2015-16, India will be a country of 53.3 million middle class households, translating into 267 million people falling in the category (As per NCAER)

India will be world's 5th largest consumer market by 2025

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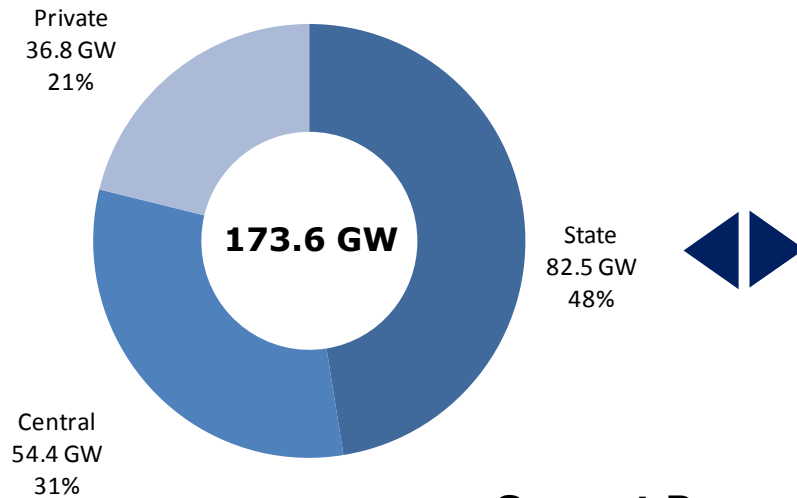
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Strong focus to drive infrastructure growth

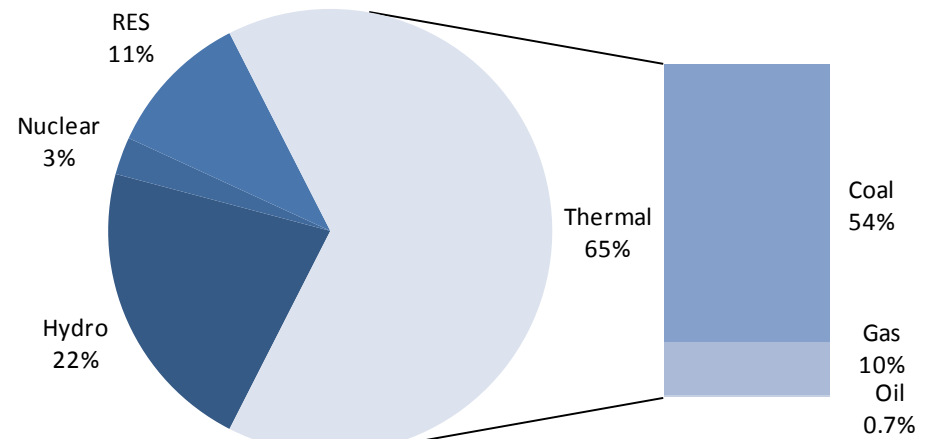


- ❑ Current government is putting lot of emphasis on infrastructure investment and growth
- ❑ Positive regulatory reforms remain a key driver of growth
- ❑ Power being the major thrust area
- ❑ **Infrastructure investment may be doubled (~1 trillion) in 12th five year plan (2012-17)**

Install Capacity (as on 31 Mar'11)



Generation mix (as on 31 Mar'11)



(Source: Central Electricity Authority ("CEA") & MNRE)

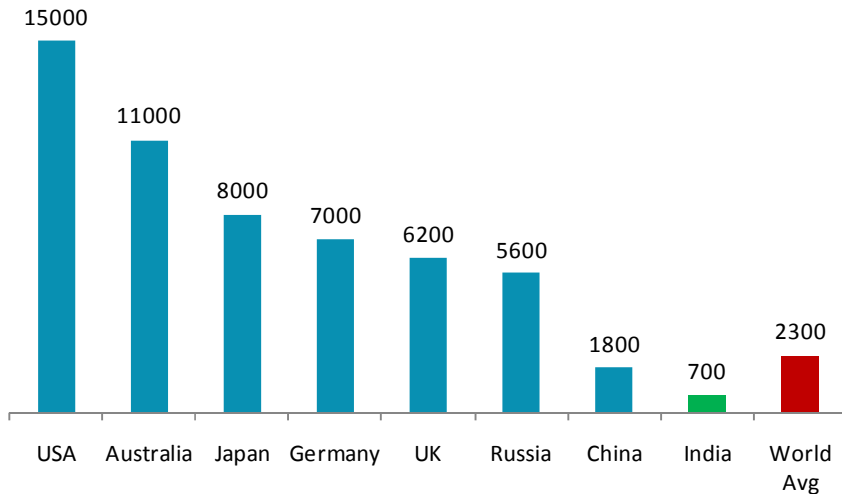
Current Power Scenario

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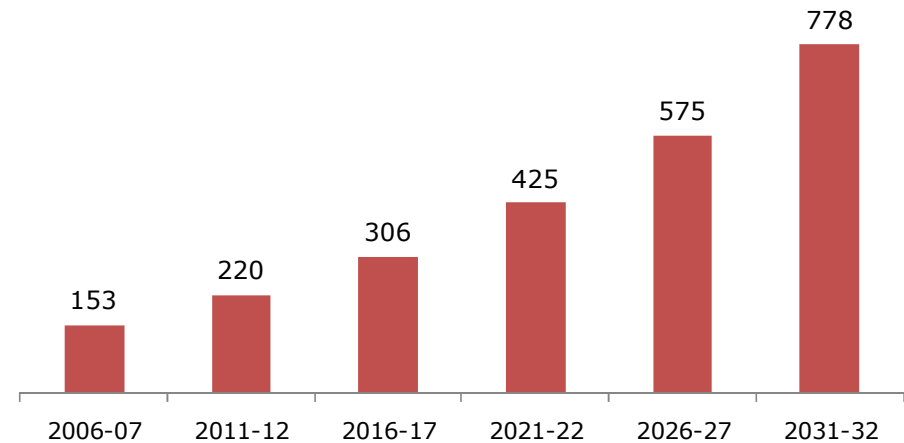
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India's power requirement would be fourfold

Current Per capita consumption of electricity (Approx kWh)



Power Requirement (GW)



(Source: Integrated Energy Policy - Planning Commission Report 2006)

- ❑ India uses less electricity as compared to the world's average
- ❑ Indian Govt. plans to increase per capita consumption to 1000kWh by 2012
- ❑ Currently, Demand for power is far more than supply. Average deficit stands at 10-12%. Peak deficit is around 15%.

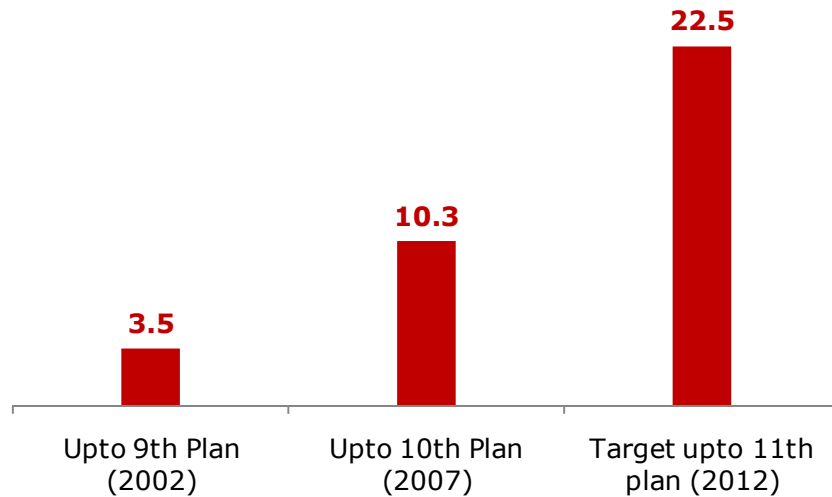
If India sustains 8% GDP growth year-on-year, it would require more than 750 GW of power by 2031-32.

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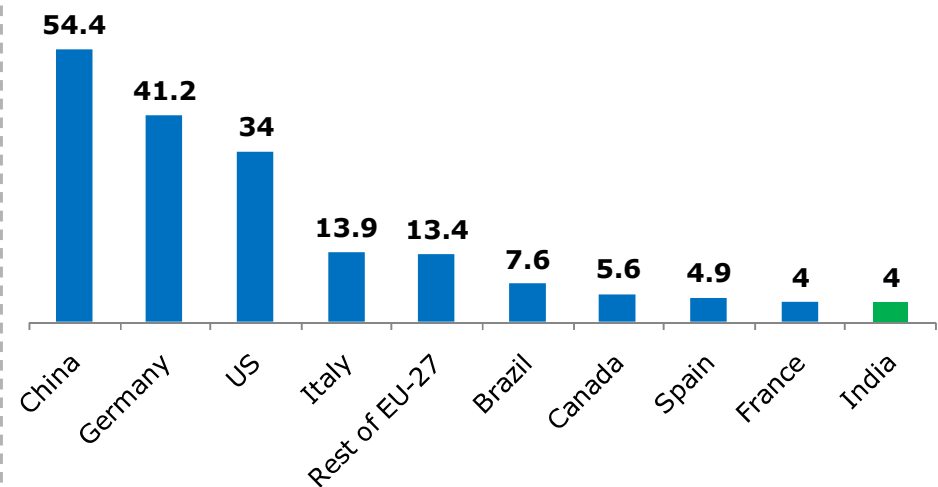
India ranked 10th in Clean Energy investment

RE Capacity Trend (GW)



(Source: MNRE, Annual report 2010-11)

Clean Energy Investment (\$ billion)

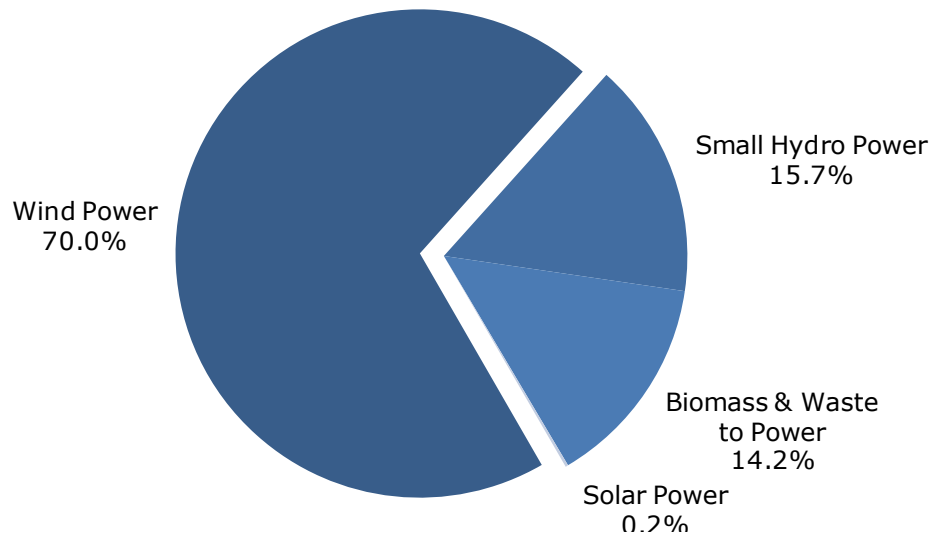


(Source: Pew Charitable Trusts research, 2010)

- ❑ Renewable Energy capacity in India has grown 6 times in last 10 years
- ❑ India attracted \$4 billion in private investments for clean energy, ranked 10th among the G-20 countries.
- ❑ Indian RE sector also ranked 10th for five-year growth rates for RE capacity
- ❑ Ranked 7th worldwide in the amount of installed RE capacity.

India has a large potential for RE

Installed capacity – 18.8 GW (as 31Mar'11)



(Source: MNRE, Annual report 2010-11)

RE Potential in India

Source	Estimated Potential (GW)	Installed (GW) as 31Mar'11
Wind Power	48.5	13.18
Biomass & Waste to Energy	23.7	2.67
Small Hydro	15.0	2.95
Solar Power	20-30 MW/sq.km	0.03

(Source: MNRE, Annual report 2010-11)

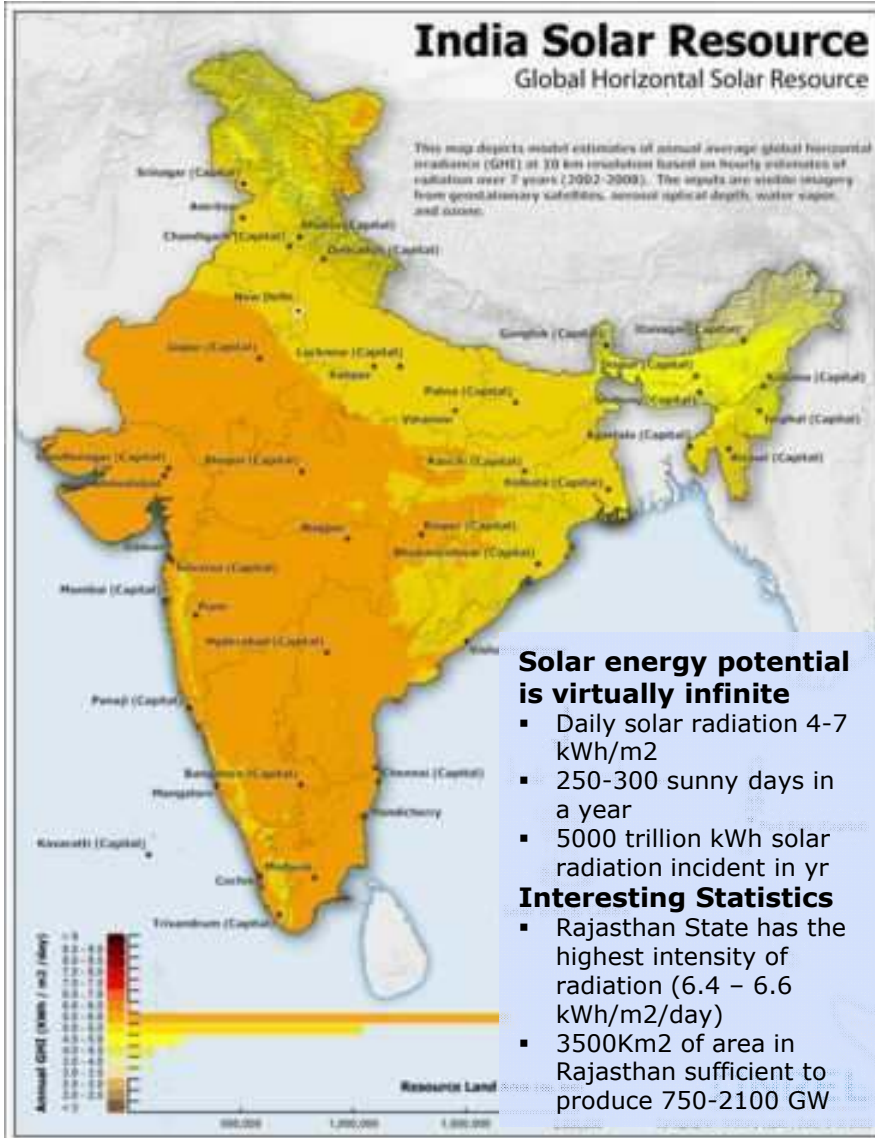
- ❑ Wind energy constitutes largest commercially exploited RE source in India.
- ❑ RE capacity is 10-11% of total grid installed capacity base
- ❑ Barely 20-22% of the total potential has been tapped **excluding solar energy**

Today, Solar power is merely 0.2% (32.4 MW) of Grid interactive RE power
 But potential of Solar power in India is far more than other RE sources

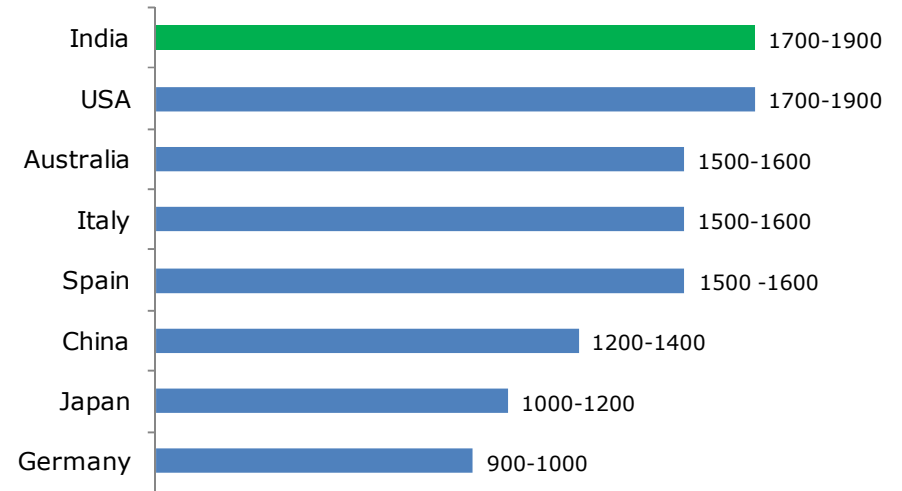
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India's Solar Advantage



Specific Avg Annual Solar Energy Yield (kWh/kWp)



Source: DLR; Fraunhofer Institute; DOE; NREL; Sargent & Lundy; McKinsey

Rank	Country	All Renewables	Solar Index	Solar PV	Solar CSP
1	China	72	62	67	48
2	USA	67	74	73	77
3	India	63	65	70	53
4	Germany	62	48	66	0
5	Italy	60	58	64	65

India emerged as the 3rd most attractive country on overall renewables index and 2nd on solar index

(Source: E & Y, All renewables country attractiveness index, May11)

Centre & State Govts policy support

Centre Govt even before & after JNNSM formed various conducive policies and regulatory ecosystem

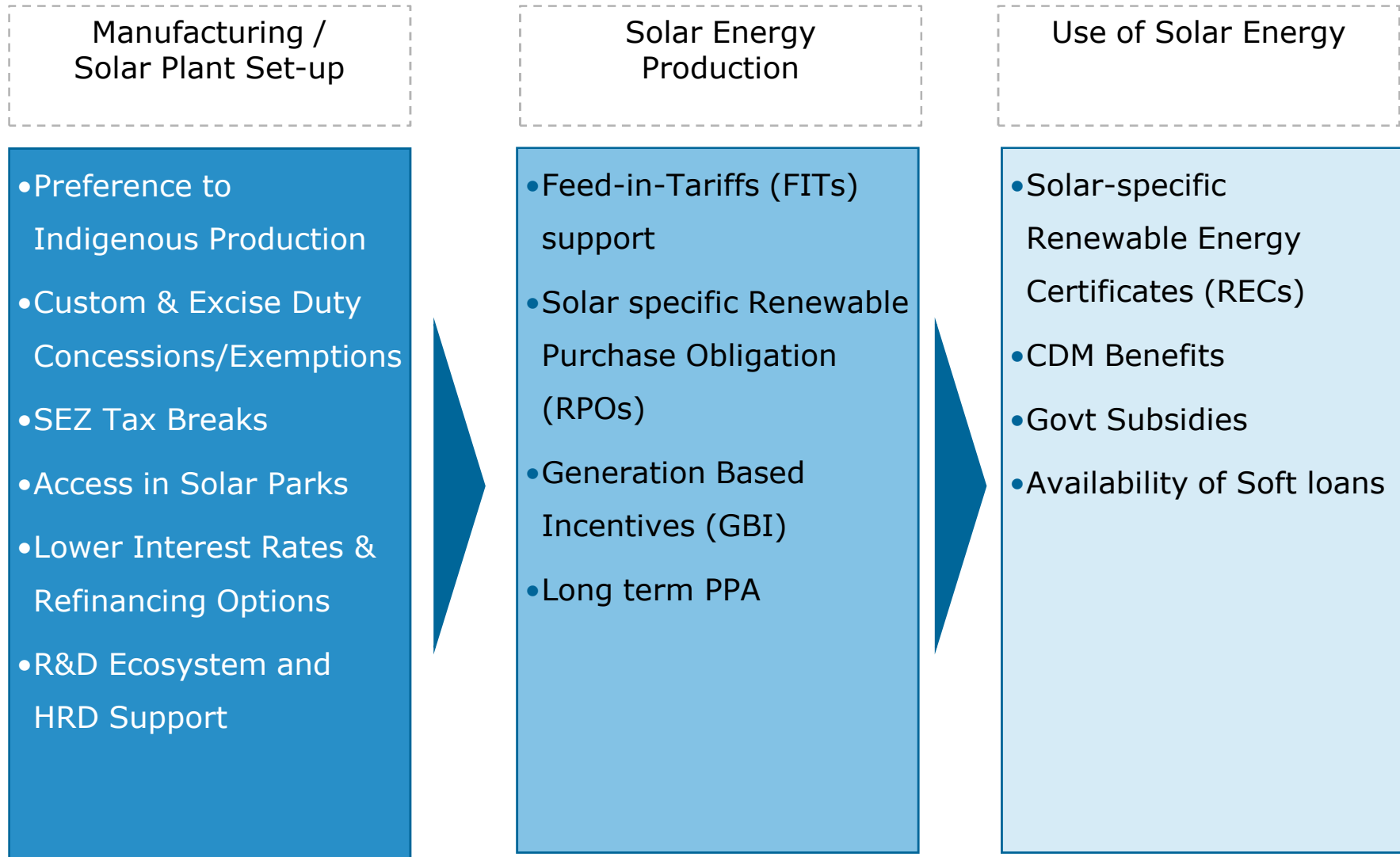
- ❑ The Electricity Act (2003)
- ❑ The National Tariff Policy (2006)
- ❑ The National Electricity Policy (2005)
- ❑ Integrated Energy Policy (2006)
- ❑ The Energy Conservation Act (2001)
- ❑ Special Incentive Package Scheme (2007)

State Govts are also supporting

- ❑ State Solar Policies
 - Gujarat
 - Rajasthan
 - Maharashtra, etc.
- ❑ Manufacturing Policies and SEZ Schemes
 - Karnataka Semiconductor Policy
 - Gujarat Solar SEZ Policy, etc

Assist Private Sector to invest in the solar power and equipment space in India

...& incentives across the value chain

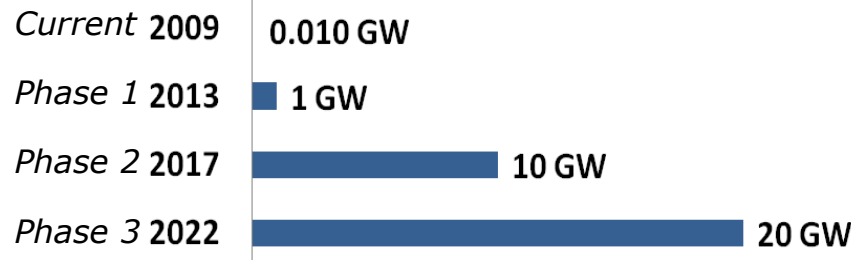


Initiative by GOI to promote Solar Power

Jawaharlal Nehru National Solar Mission

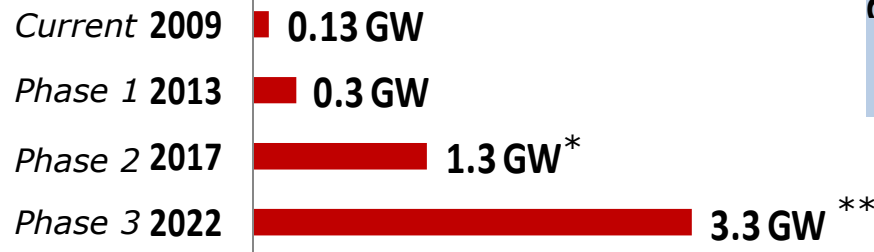
Grid Connected

**Solar PV
Farm large &
small and
rooftop**



Rural Electrification

**Other Off
Grid
Solutions**



**Market Size
Cumulative**

Currently....

- ❑ More than 1860 MW of capacity already allotted under various Centre & State Policy
- ❑ These capacity likely to come up by FY 11-12
- ❑ More than Rs. 27000 Cr (~6 billion US \$) of investments required

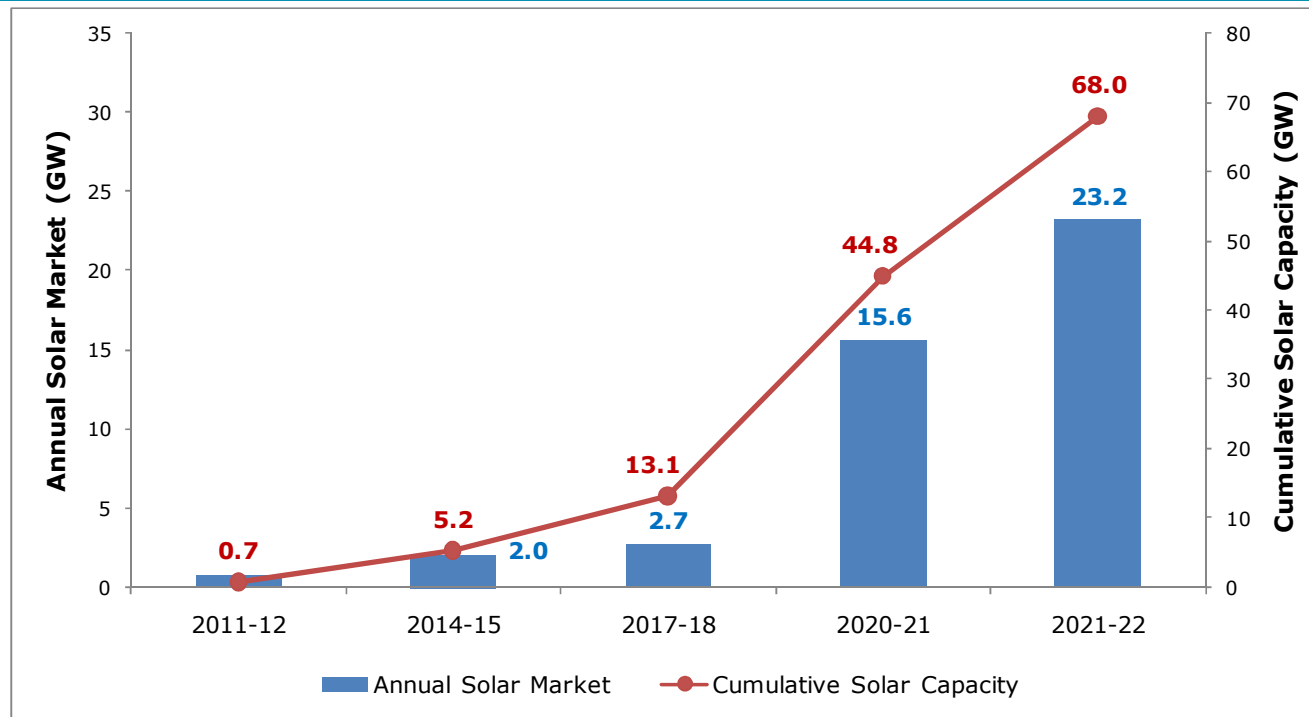
Next....

- ❑ More than 700 MW capacity to be allotted in current financial year
- ❑ Likely commissioning of projects by FY 12-13
- ❑ About Rs 12000 Cr (~2.6 billion US \$) of investments required

* : Remote village electrification program of about 10,000 villages

** : 20 Million solar lighting systems for rural areas

India will be the next solar capital of the World



(Source: KPMG's Solar Market Potential Model)

Till date growth was in Europe

- ❑ CAGR of ~ 60% for both CSP & Solar PV technology in the last 5 years in the world

Source: REN21

Next growth will be in India.

By 2021-22, cumulative Solar capacity will be 68 GW

Key Drivers

- ❑ Strong Government support
- ❑ Decreasing cost of Solar power
- ❑ Huge Off grid requirement of Agriculture/Rural segment

Tremendous growth projected in Off-Grid segment

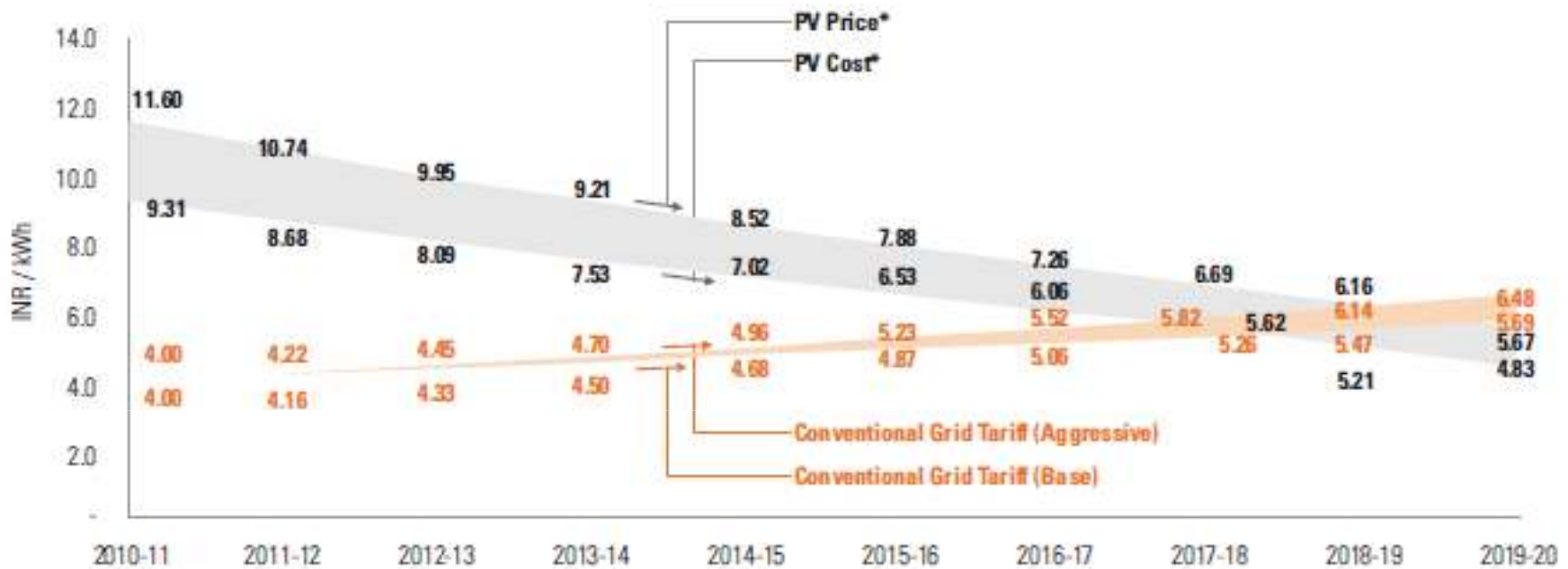
Annual Solar Market Off-take (MW)	17-18	18-19	19-20	20-21	21-22
Grid-connected Solar Potential					
Residential Rooftop	1024	1356	3600	5341	7677
Utility Scale Solar Power (CSP and PV)	1043	2229	3570	5084	8146
Off-grid Solar Application Potential					
Solar-powered Agriculture Pumpsets	268	563	3969	4639	6730
Solar-powered Telecom Towers	318	380	414	562	612
Total Annual Solar Market	2653	4528	11553	15626	23165

(Source: KPMG in India's The Rising Sun, May 2011)

- ❑ With decrease in cost of solar power, the residential rooftop and agriculture will be fastest growing segment
- ❑ Solar power, with its ability to provide day time power, can meet the agriculture power demand from the farmers without being connected to grid
- ❑ Solar power is already competitive with the effective price of diesel based power for Telecom towers. It has potential to replace ~30% of diesel consumption.

Grid parity in next 10 years

Levelized Cost Comparison of Utility-scale PV and Conventional Power at Grid



(Source: KPMG's Solar Grid Parity Model)

*Note that the CDM benefit of INR 0.60 / KWH has been factored in the Solar Costs)

In India grid parity to happen in 2019-20 when the levelized tariffs from solar power are comparable with the levelized tariffs of grid power

Significant investment opportunity exists

Solar Investments in India

	2012-17	2017-22
	USB Bn	USB Bn
Small Scale Solar Market (Rooftops, Agriculture Pumpsets, Telecom, Solar Lighting)	5	64
Utility-scale Solar Farms (CSP & PV)	15	28
Cumulative Investments in 5 year periods	20	92

Solar Specific Vendor Market

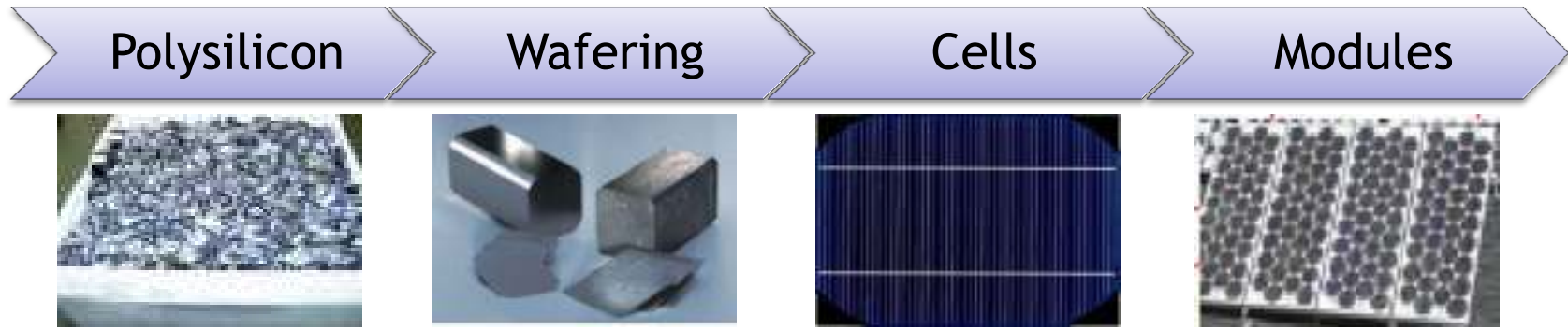
	2012-17	2017-22
	USB Bn	USB Bn
Solar PV Segment		
Inverter Market	1.8	12.3
Solar CSP Segment		
Parabolic Troughs	0.6	1.8
Mirrors	0.4	1.2
Subtotal	1	3
Total	2.8	15.3

Supporting Industries

	2012-17	2017-22
	USB Bn	USB Bn
Solar PV Segment		
EPC Services Market	1.5	7.5
Solar CSP Segment		
EPC Service Market	0.5	1.6
Civil Works	0.2	0.6
Subtotal	0.7	2.2
Total	2.2	9.7

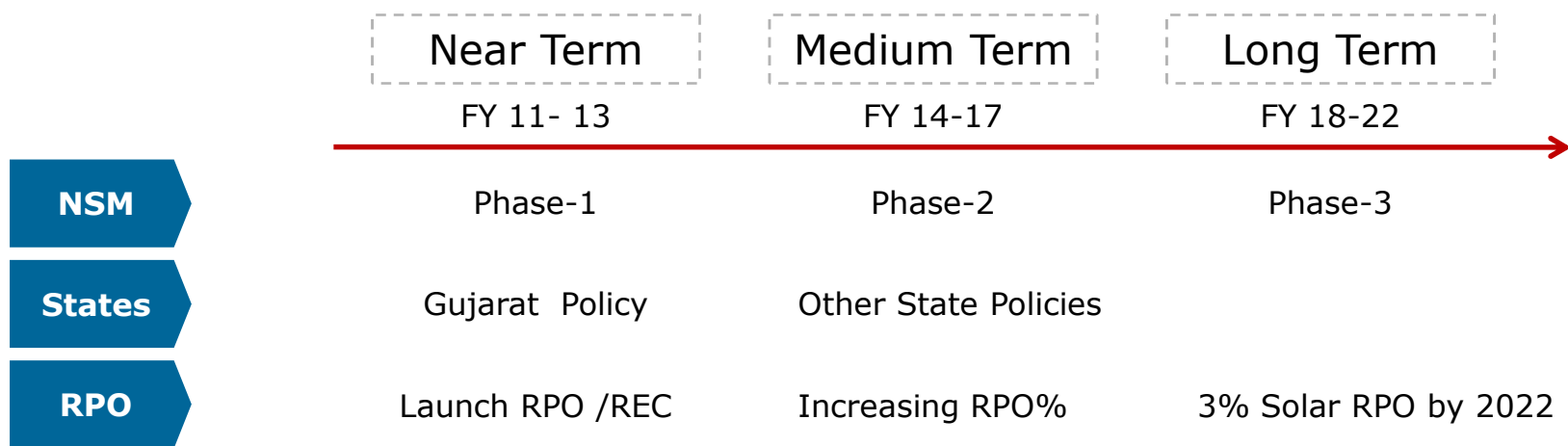
(Source: KPMG's Solar Market Size Model)

India will be next Manufacturing Hub



Capacity (MW)	None	Negligible	~ 500-600	~1000-1200
Current Manufacturers	Lanco is setting-up a plant	Maharishi Solar, Lanco are setting up plants	Moser Baer, Tata BP, Indo Solar, Solar Semiconductor, Jupiter, Webel, BHEL, BEL, CEL Thin Films: Moser Baer	More than 40 manufacturers
Investment Opportunity	Very High	Very High	High	Medium

Different financing opportunities as sector evolves



	Near Term FY 11- 13	Medium Term FY 14-17	Long Term FY 18-22
Commercial Banks	Medium	High	High
FI such as IREDA	Very high	Very high	High
International Development banks/agencies	Medium	High	Medium
Govt Lending/Subsidies	Very high	High	High
Private Equity/VC	Very low	Low	Low
Public Markets	Very low	Low	Medium

Above is a qualitative view on the level of different types of financing as the solar sector evolves in India



Source: EY Analysis, presented at Global Solar Investment Summit, Apr11, Mumbai

Concluding Remarks

- India's solar potential among highest in the World and barely a fraction of it has been exploited.
- Sufficient demand generated through Govt support - JNNSM & States policies.
- Tremendous growth opportunity exists in Off-Grid segment.
- Plethora of opportunities along the entire manufacturing value chain and ecosystem as current capacities are insufficient to meet the growing demand.
- Cost reduction through economies of scale in manufacturing/projects is possible

Solar Power is the solution to India's growing needs

Thank you