Renewable Energy in India: Growth and Targets

Ministry of New and Renewable Energy (MNRE)

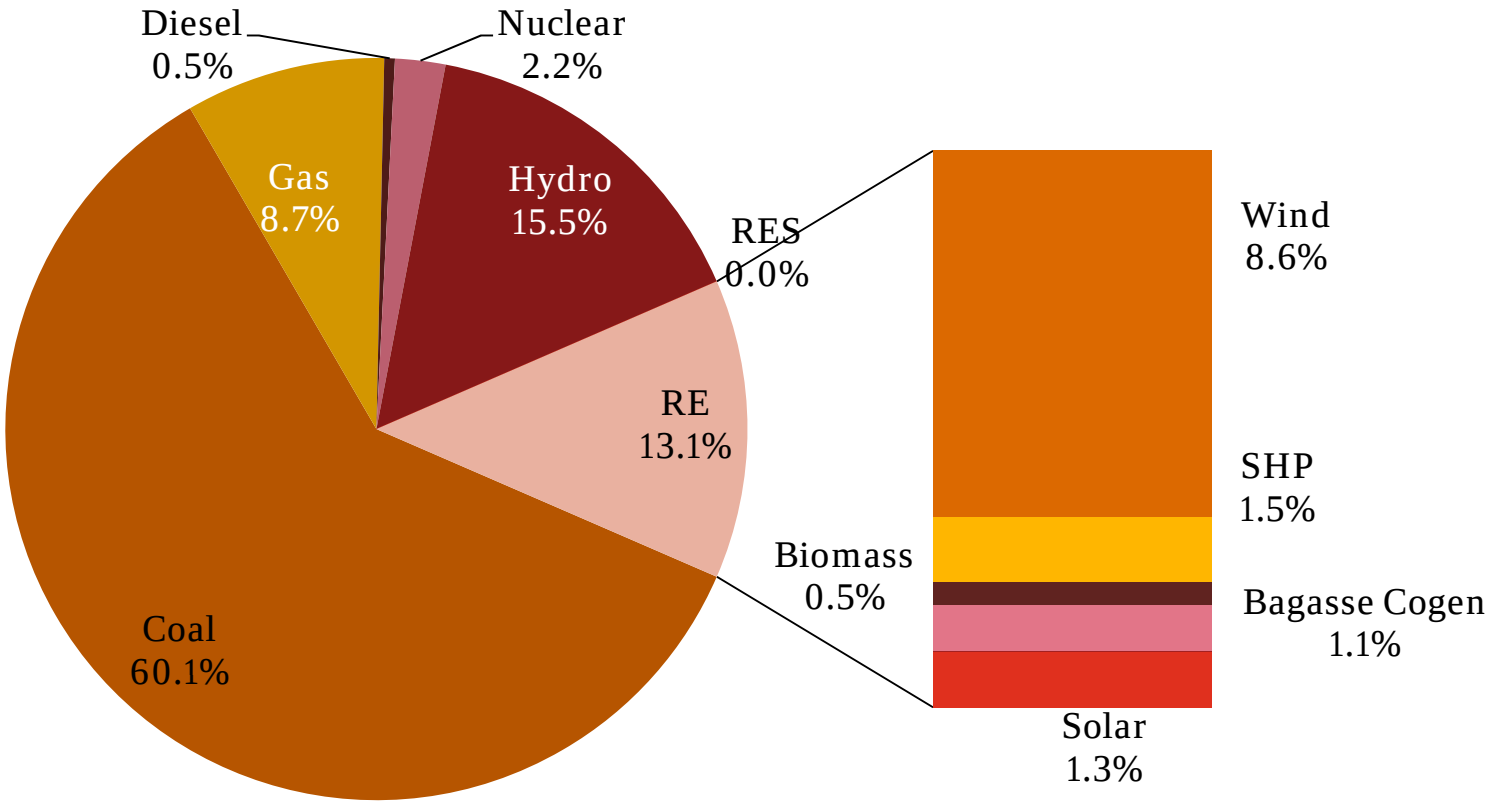
13 May 2015

Strictly Private and Confidential

12 May 2015

Present Power Scenario of India

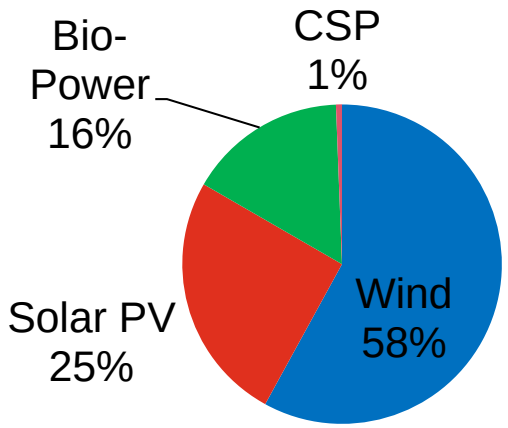
Total installed capacity of **263.66 GW** and RE capacity of **34.35 GW** (**13%** of Installed capacity and approximately **7%** of electricity produced) *(as on March 2015)*



*Source: MNRE, GoI ; CEA Statistics

Renewable Energy: Globally and India's position

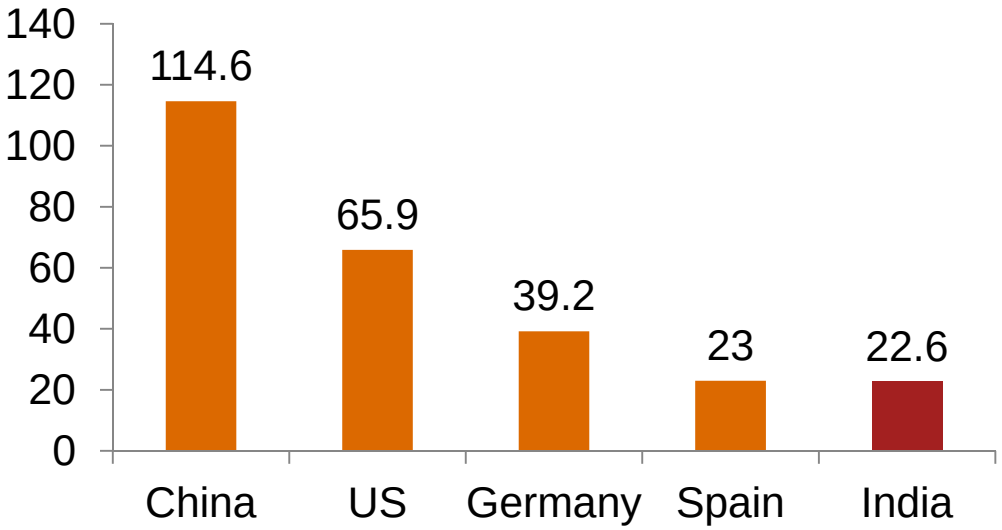
Global Installed RE Capacity



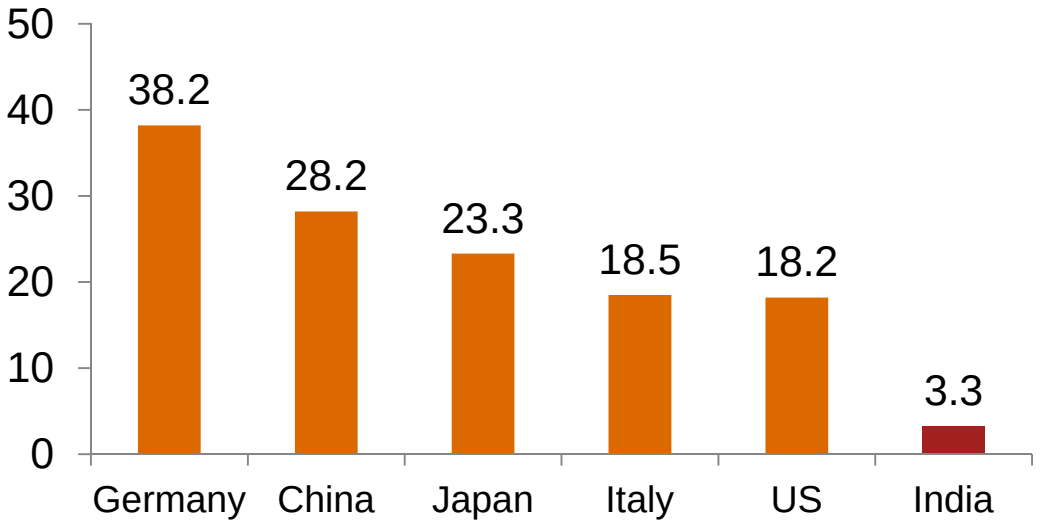
- Global RE installed capacity of 673 GW*
- Global Wind: 370 GW* and India **5th** with 22.6 GW
- Global Solar: 177 GW** and India **11th** with 3.3 GW

**As on Dec 2014: Global Wind Energy Council*
***As on Jan 2014, IEA PVPS)*

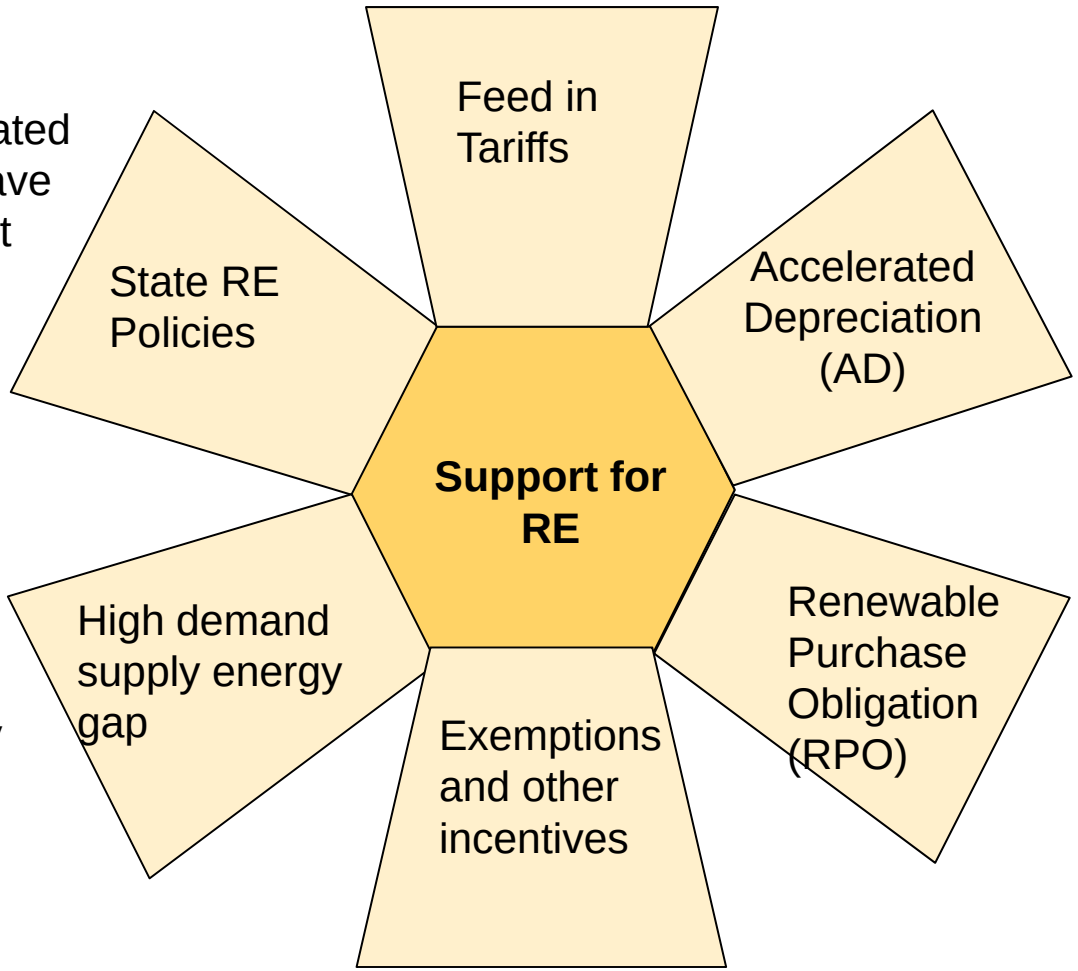
Country wise Wind (GW)



Country wise Solar (GW)



Support Mechanism for Renewable Power In India



Introduced by almost all states for RE technologies

States have formulated RE policies and have added significant capacities

- Key instrument for success of wind
- Also exists for of solar, biomass projects

- RPOs mandated by the EA 2003 and National Tariff Policy
- REC mechanism launched to fulfill RPOs

Power shortage prevails and Energy gap is expected to increase

- Excise & Custom duty exemptions for most of the Equipment, Machinery etc.
- 10 year tax holiday

Policy and Regulatory Framework for RE development (1)

Electricity Act (EA), 2003 ***National Electricity Policy (NEP), 2005***

EA, 2003

1. Section 86 - promotes RE by ensuring grid connectivity & sale of RE.
2. Section 3 - Central Government to develop a national policy for optimal utilization of resources including RE .
3. SERC's to:
   - Section 86 - fix minimum % energy purchase from RE sources (RPO).
   - Section 61 – determine tariffs for the promotion of RE

NEP, 2005

1. Section 5.2.20 of NEP promotes private participation in RE.
2. Section 5.12.1 of NEP targets capital cost reduction in RE through competition.
3. Section 5.12.2 of NEP states that SERCs should specify appropriate tariffs to promote RE and specify targets for RE.

Policy and Regulatory Framework for RE development (2)

National Tariff Policy (NTP) 2006

National Action Plan for Climate Change, 2008

REC Mechanism, 2010

NTP, 2006

1. A minimum percentage procurement should be made applicable latest by April 1, 2006
2. A preferential tariff to be determined by SERC to enable RET's to compete
3. Procurement of RE by distribution licensee through competitive bidding.

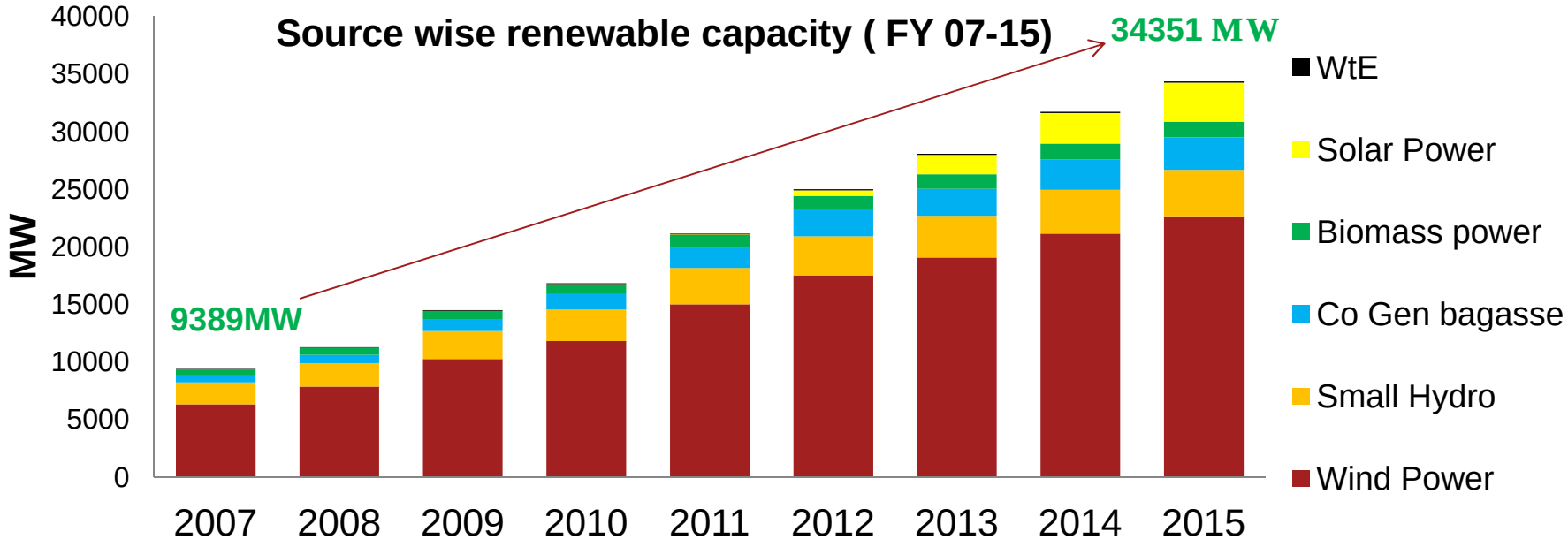
National Action Plan for Climate Change, 2008

1. A dynamic minimum renewable purchase standard (DMRPS) may be set, with escalation each year till a pre-defined level is reached.
2. NAPCC has set the target of 5% RE purchase for FY 2009-10, with increase of 1% in target each year for the next 10 years

REC Mechanism, 2010

1. A mechanism which will enable and recognize the inter-State RE transactions
2. Seeks to address the mismatch between availability of RE sources and the requirement of the obligated entities to meet their RPO across States

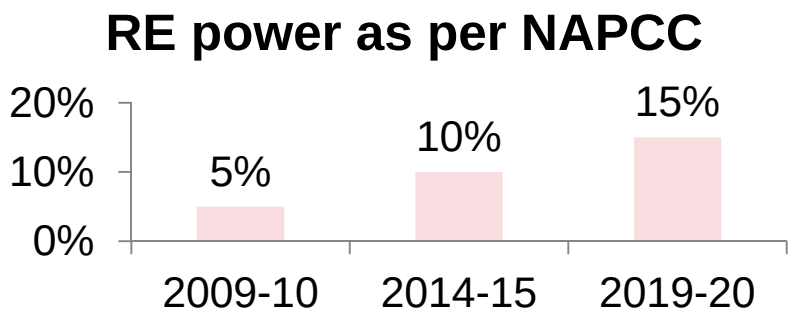
RE in India: Status and Revised targets

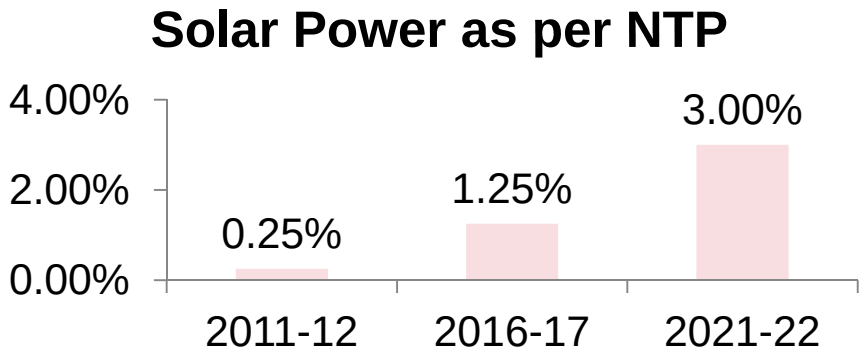


Capacities in MW				
Source	Installed capacity by end of 11th Plan (March 2012)	Current installed Capacity (March 2015)	Target as per 12th Plan (March 2017)	**Revised Targets till 2022**
Solar Power	941	3,383	10,941	**1,00,000**
Wind power	17,352	22,645	32,352	**60,000**
Biomass Power	3,225	4,183	6,125	**10,000**
Small Hydro	3,395	4,025	5,495	**5,000**
TOTAL	**24,914**	**34351**	**54,914**	**1,75,000**

RPO revision with scale up plans

Targets Previously:



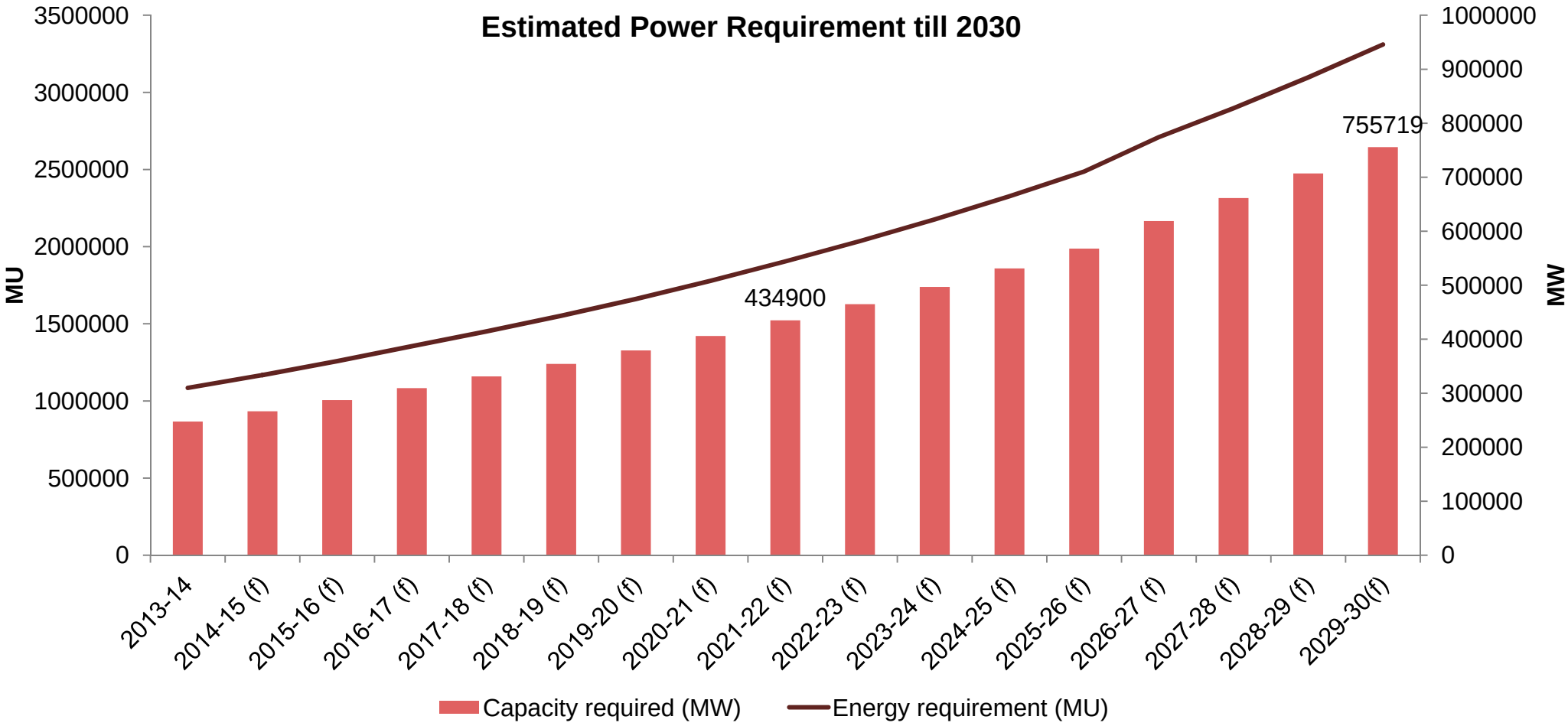


New Vision:

	Current Situation	NAPCC	Scale up targets
Capacity	Installed capacity stands at **34.5 GW**	RE installed capacity of **142.3GW** by 2020	**175 GW** by 2022 • Solar 100 GW • Wind 60 GW
RPO	~ 7% power from RE with each state having specific RPOs	**15%** RE power by 2020	RPO of **10.5%** required for 100 GW solar by 2022

Projected power requirement

Energy requirement is expected to increase by 200% from FY 15 to FY 30

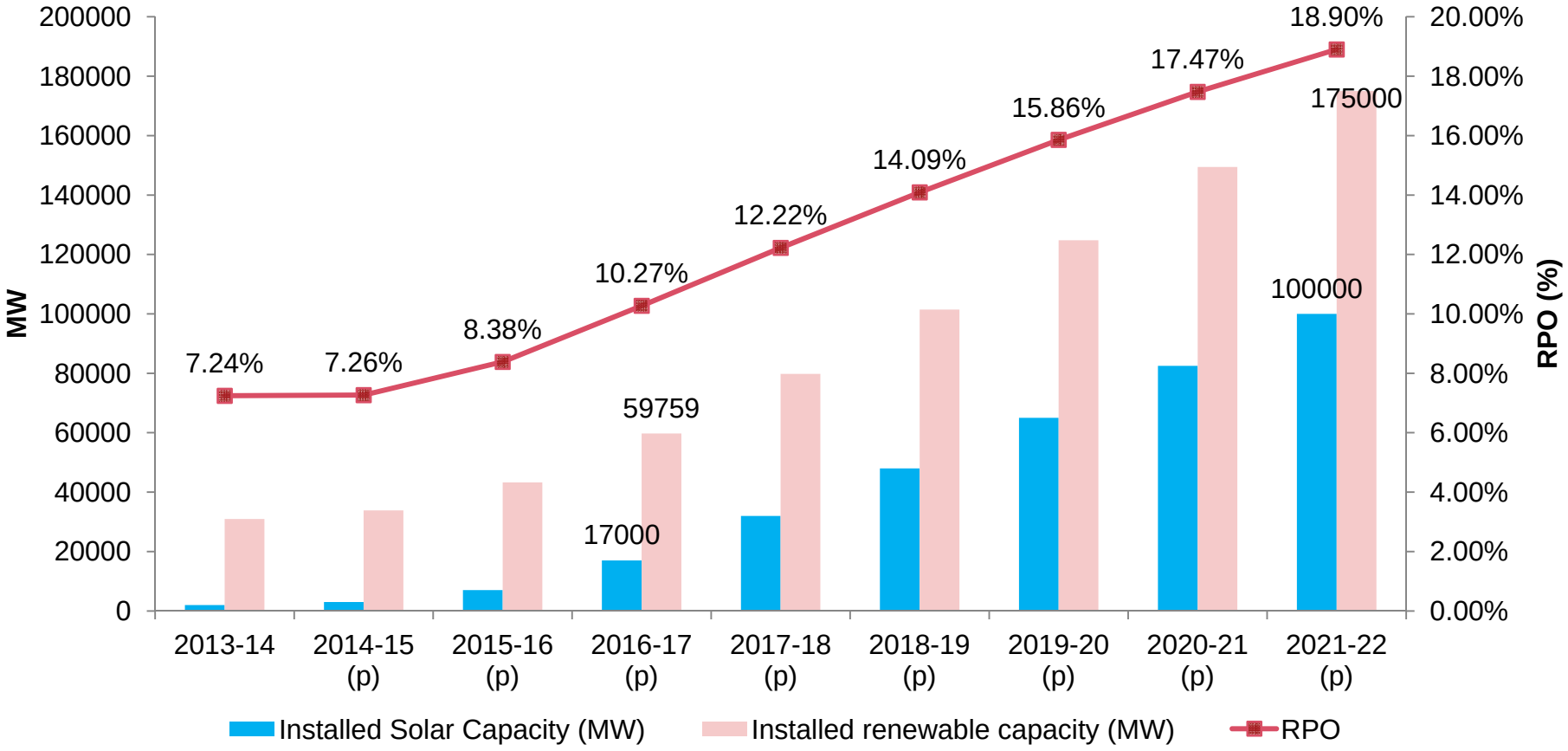


Source: 18th EPS, CEA

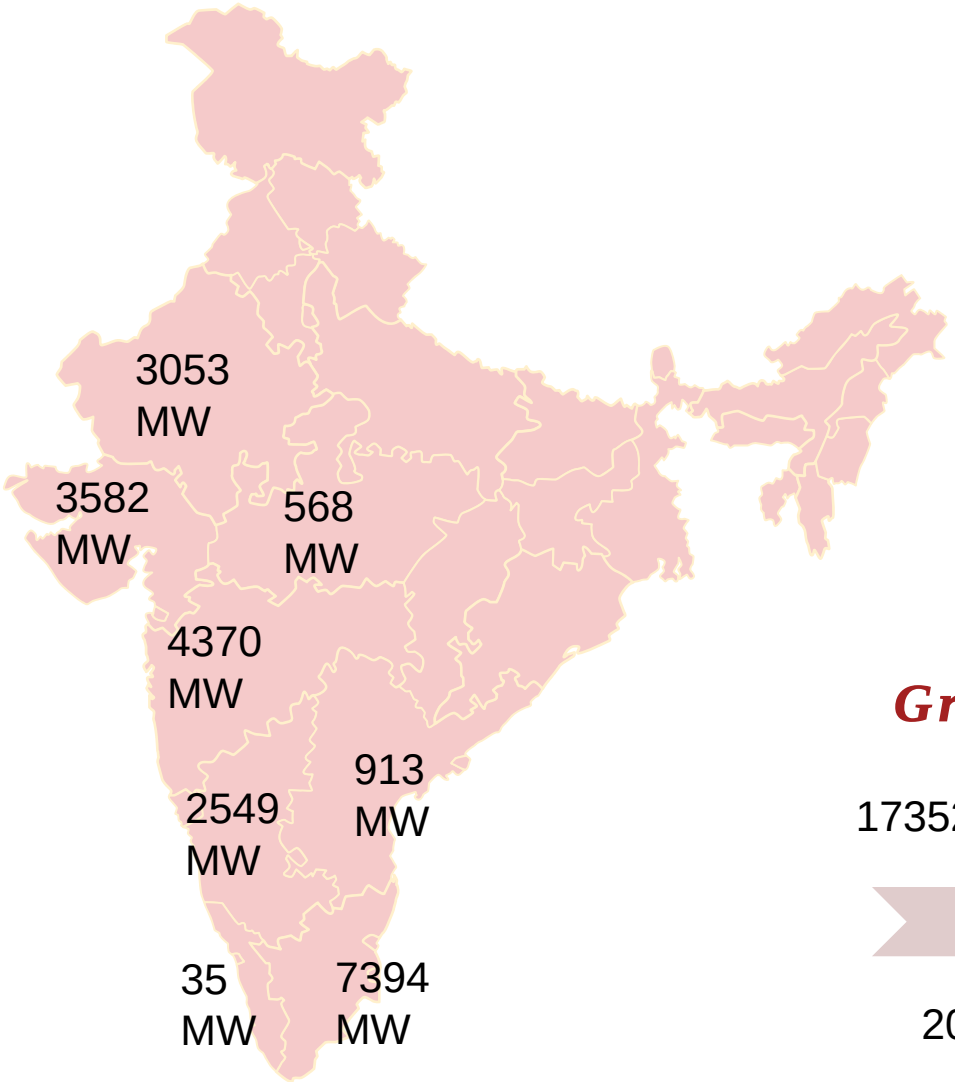
Assumption- Based on average PLF @ 50% prevailing at FY 11, FY 12, FY 13

Share of RE in future energy mix

175 GW RE will contribute to **18.9%** of the entire power consumption in India in 2022

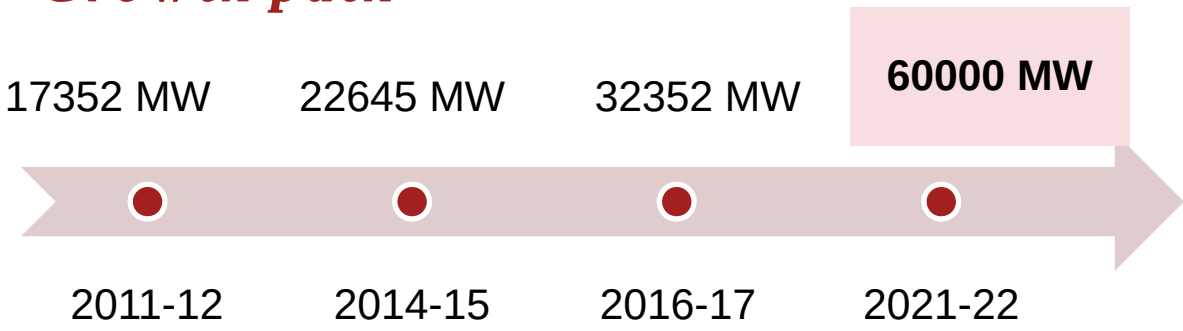


Wind energy across states



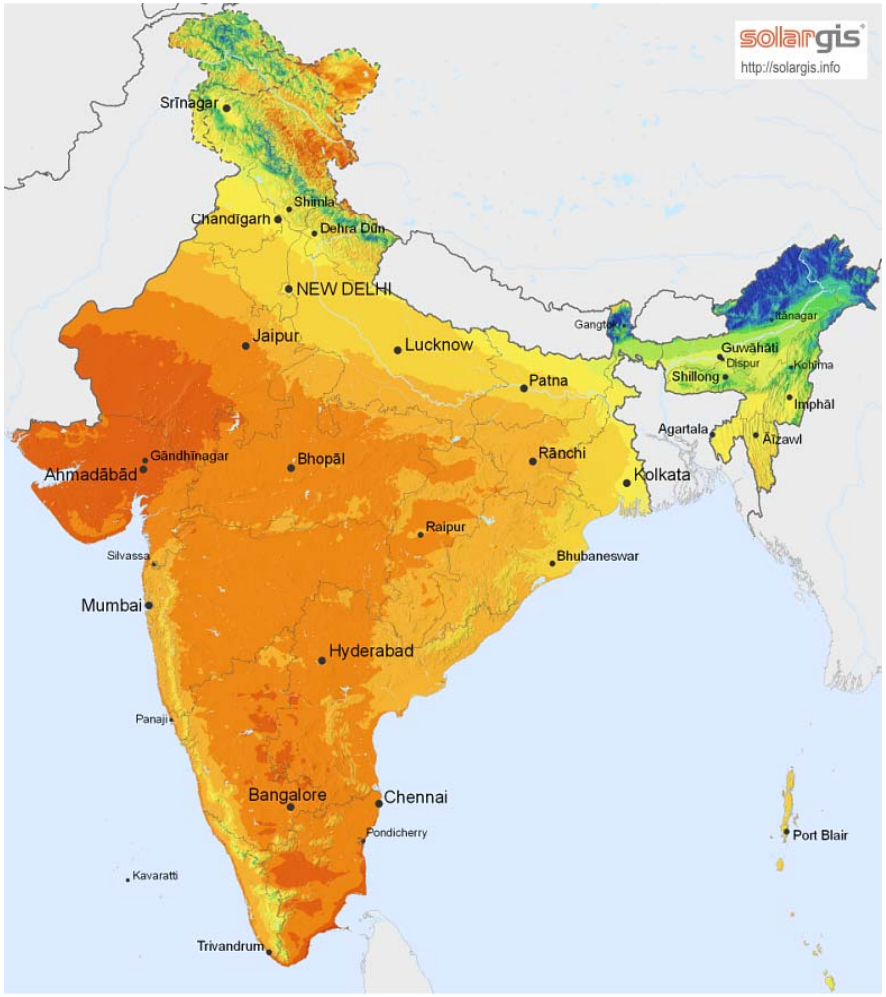
- Current Installed capacity of **22645** MW
- According to CWET, the wind power potential in India at 50 m hub-height is estimated to be **49,130 MW** and at 80 m hub-height is estimated to be **1,02,788 MW**

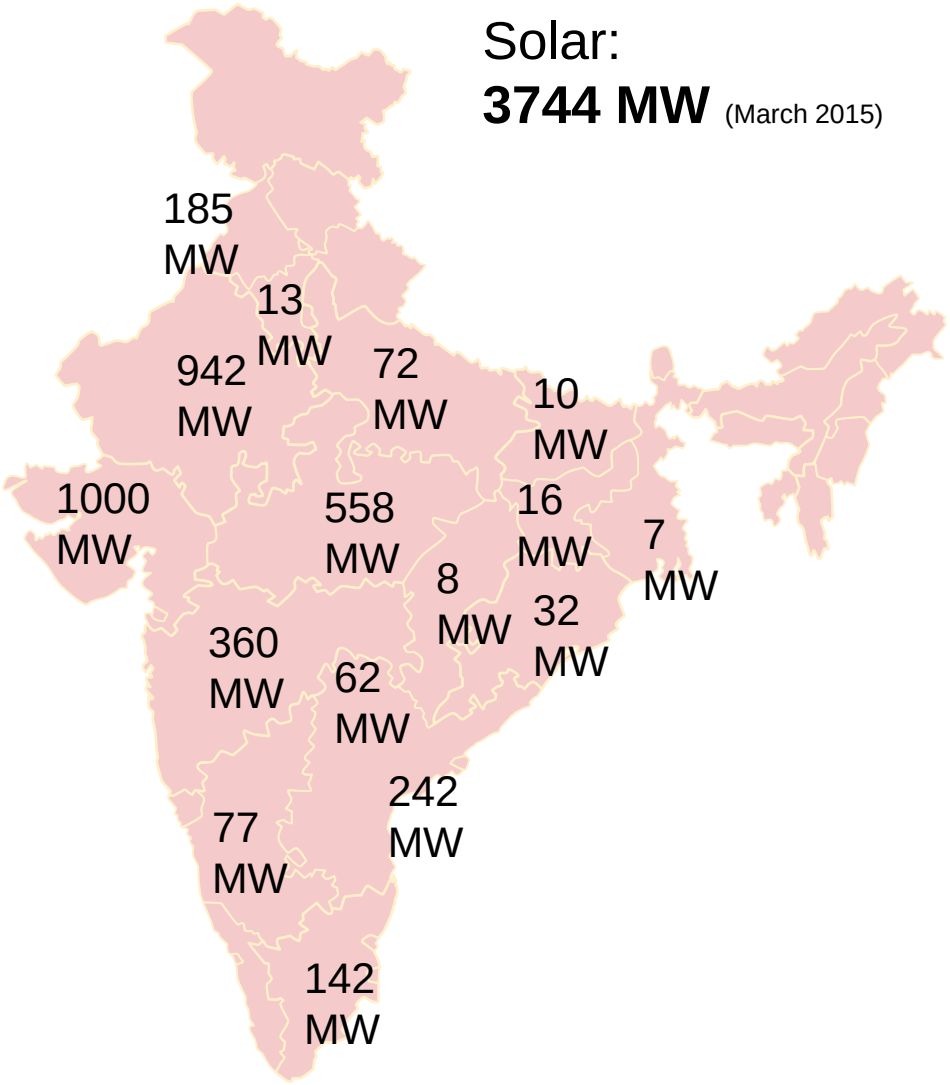
Growth path



Solar Energy across states

Solar Resource

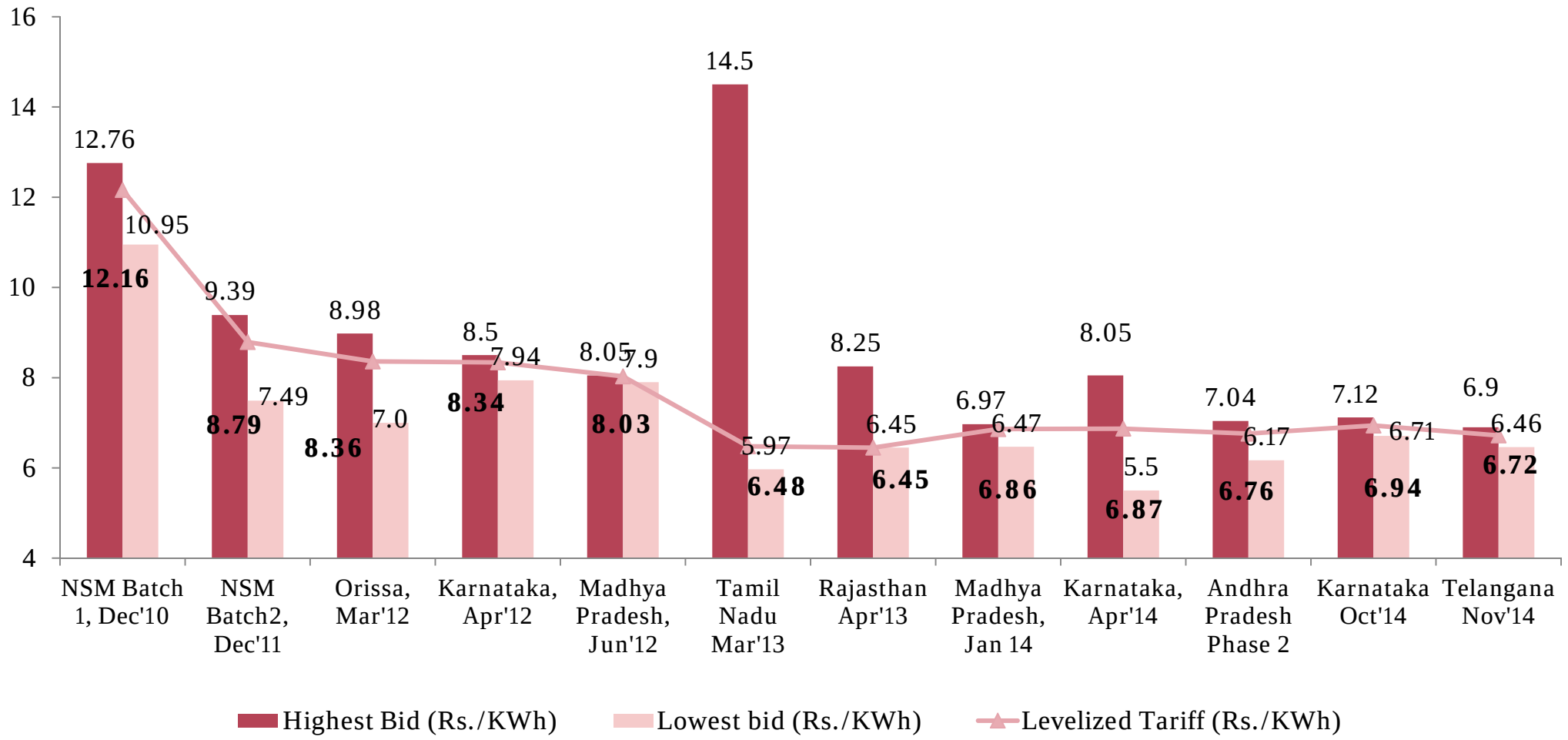




- Current Installed capacity of **3744 MW**
- Solar potential stands at **748 GW**

Solar Power edging towards grid parity

Price of solar power has come down from Rs 17.91/kWh in 2010 to under Rs 7/kWh now.



- Analysis of tariffs suggest grid parity 3 years from now, as against anticipated in 2022 (JNNSM)
- CERC solar PV tariffs are Rs 6.91/kWh and Rs.7.72/kWh with and without accelerated depreciation benefit respectively for the FY 2014-15

Solar Scale-up Plans- 100 GW Vision

Category 1. Rooftop Projects

40,000 MW

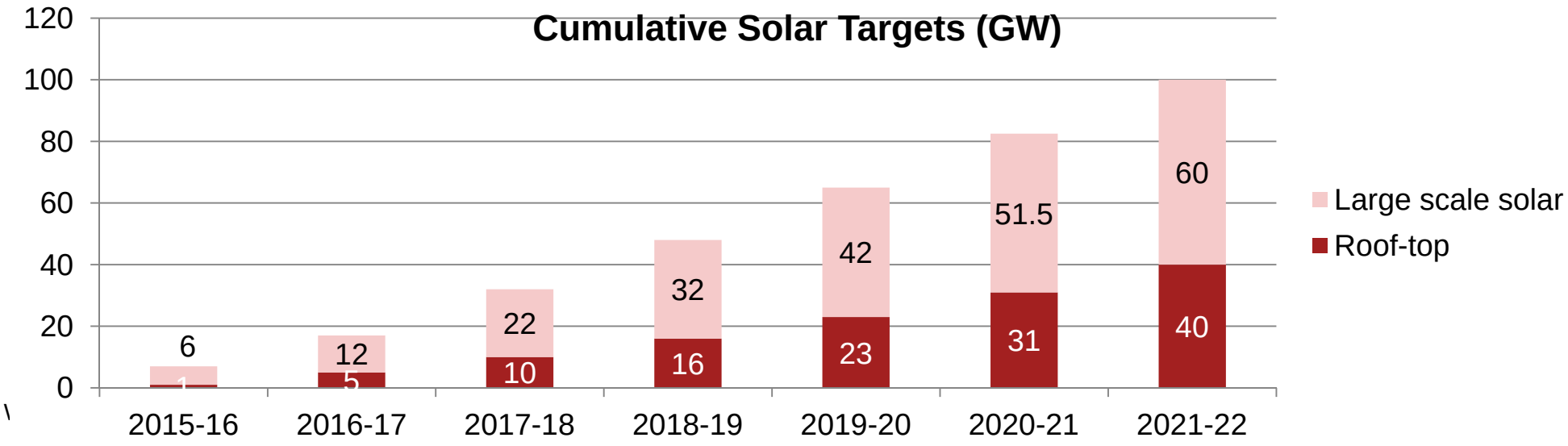
Category 2. Large scale Projects

Inside Solar park

20,000 MW

Outside Solar Park

40,000 MW



40 GW through grid connected rooftop

Status	358 MW Projects sanctioned and 41 MW installed [Potential for 124 GW exists]
Target	**40,000** MW by 2022 of which **10 GW** during 2015-16 to 2017-18.
Current support	Financial assistance of 15% of the benchmark [Reduced from 30% earlier]

Updates:

- 14 States have rooftop provisions in their Solar Policy and 20 States/UTs have notified regulations
- Rooftop included under IPDS and guidelines issued
- Guidelines issued to include rooftop under housing loan and **9 banks** have issued instructions
- Central Electricity Authority (CEA) has notified technical standards for connectivity and metering

Advantages of solar rooftops

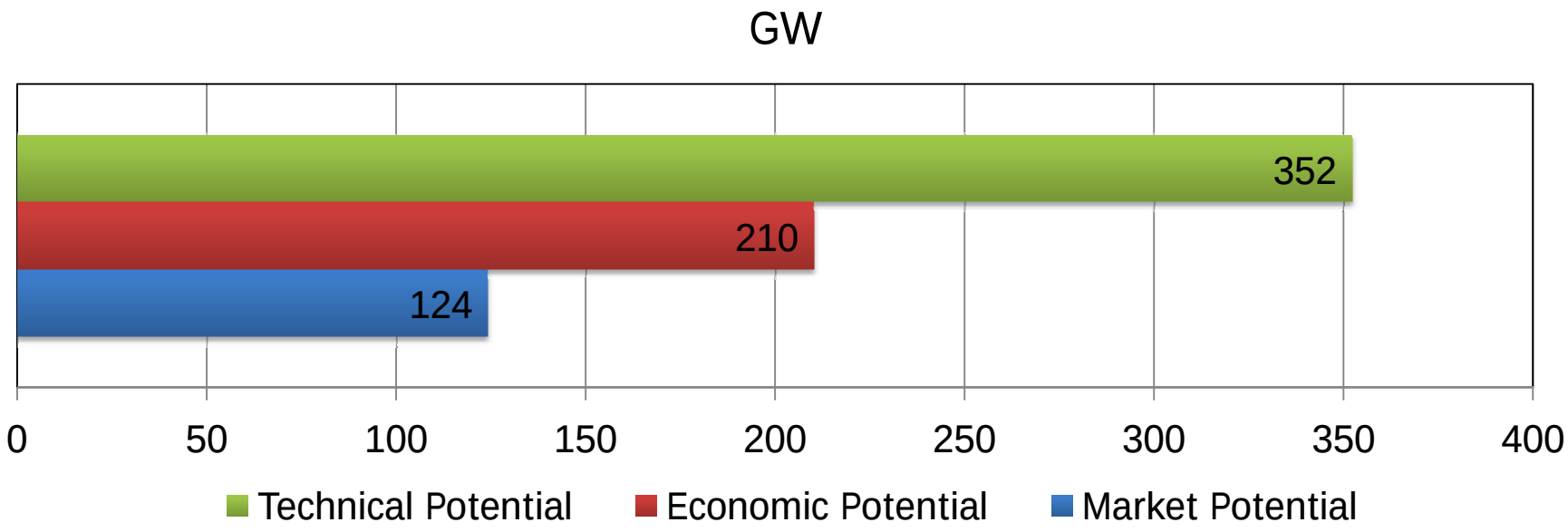
MNRE

- Savings in transmission and distribution losses
- Low gestation time
- No requirement of additional land
- Improvement of tail-end grid voltages and reduction in system congestion with higher self-consumption of solar electricity
- Local employment generation
- Reduction of power bill by supplying surplus electricity to local electricity supplier
- Battery elimination makes easy installation and reduced cost of system

All-India Rooftop SPV Potential

MNRE

In India market potential for rooftop SPV is 124 GW.



Present Status in India

- 360 MW of Solar Rooftop Projects sanctioned by MNRE and 49.677 MW commissioned

Sector	Installed by SECI (MW)	Installed by States (MW)	Total installed (MW)
Commercial	11.36	12.71	24.07
Government	2.36	4.893	7.253
Hospital	1.6	0.47	2.07
Institutional (Schools, Collages)	3.215	5.131	8.346
Religious institution	0.12	7.52	7.64
Residential	0	0.298	0.298
Total	**18.655**	**31.022**	**49.677**

Present Status: Policies and Regulations

MNRE

- 13 States have come out with Solar Policy supporting grid connected rooftop systems :

- Andhra Pradesh Chhattisgarh, Gujarat, Haryana, Karnataka, Kerala, Manipur, Punjab, Rajasthan, Uttar Pradesh, Tamil Nadu, Uttarakhand and West Bengal.

- SERCs of 20 States/UTs have notified regulations for net metering/feed-in-tariff mechanism.
- Andhra Pradesh, Chhattisgarh, Delhi, Gujarat, Haryana, Karnataka, Kerala, Tamil Nadu, Uttarakhand , West Bengal, Andaman & Nicobar, Chandigarh, Dadra & Nagar Haveli, Daman & Diu, Lakshadweep, Pondicherry , Goa, UP, Rajasthan and Odisha.

- Remaining States being pursued to come out with their policies/regulations.

Cost Economics of 100 kWp Grid Connected Rooftop Solar Project

Sl. No.	Parameter	Value
1.	Capacity (in kWp)	100
2.	Cost (in Rs)	70 lakh
3.	Equity by developer (20%) Borrowing from other sources (30%)	14 lakh + 21 lakh loan from other sources. It could be SBI's normal lending
4.	World Bank loan to developer (50%)	35 lakh
5.	Electricity generation per year	1.50 lakh unit
6.	Revenue generation per year @Rs.7.04 per unit * (CERC rate for 2015-16)	Rs.10.56 lakh

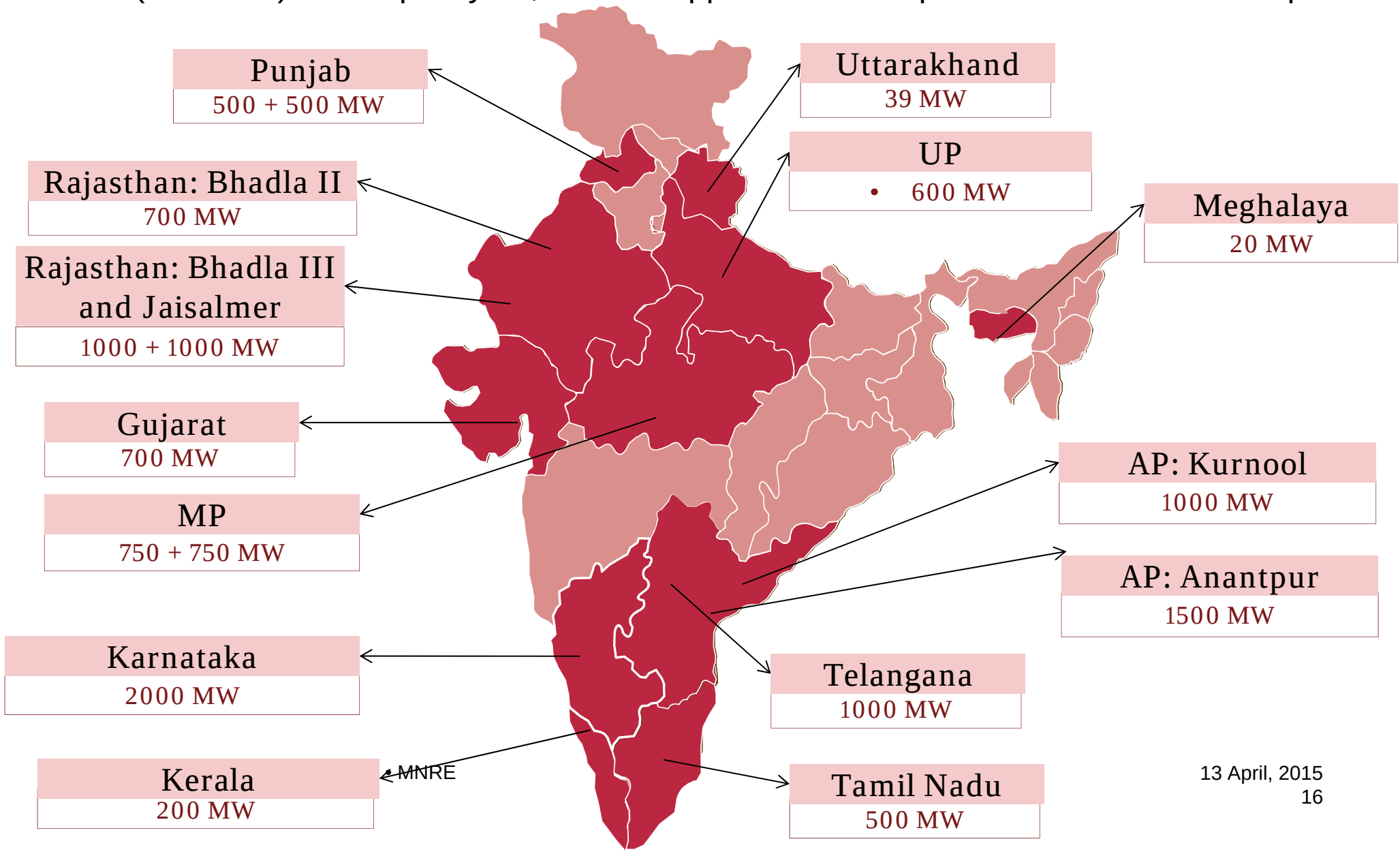
Cost Economics of 100 kWp Grid Connected Rooftop Solar Project

Sl. No.	Parameter	Value
7.	Revenue generation per month	Rs. 88, 000/-
8.	Simple payback period (2÷6)	6.62 year
9.	EMI for world Bank/ADB (8%, 15 yr, Rs. 35 lakh)	Rs. 33,447/-
10	EMI for balance 50% equity/borrowing (12%, 15 yr, Rs. 35 lakh)	Rs. 42,000/-
11.	Total EMI payment by developer	Rs. 75,447/-
12.	Net saving per month to developer (7-11)	Rs. 12,553/-

***Higher tariff could also be available for developer**

20 GW through Solar park and UMPPs

17 Parks (12 states) with capacity 12,759 MW approved and request received for 5 more parks



20 GW from Unemployed youth, MSME, Gram panchayats

Size
- 0.5 MW to 5.0 MW in multiples of 100 kW
- Target: 20 GW in 5 years

MNRE Support
- Facilitate Loans: Equity support
- State Govt. may provide additional grants

Scheme

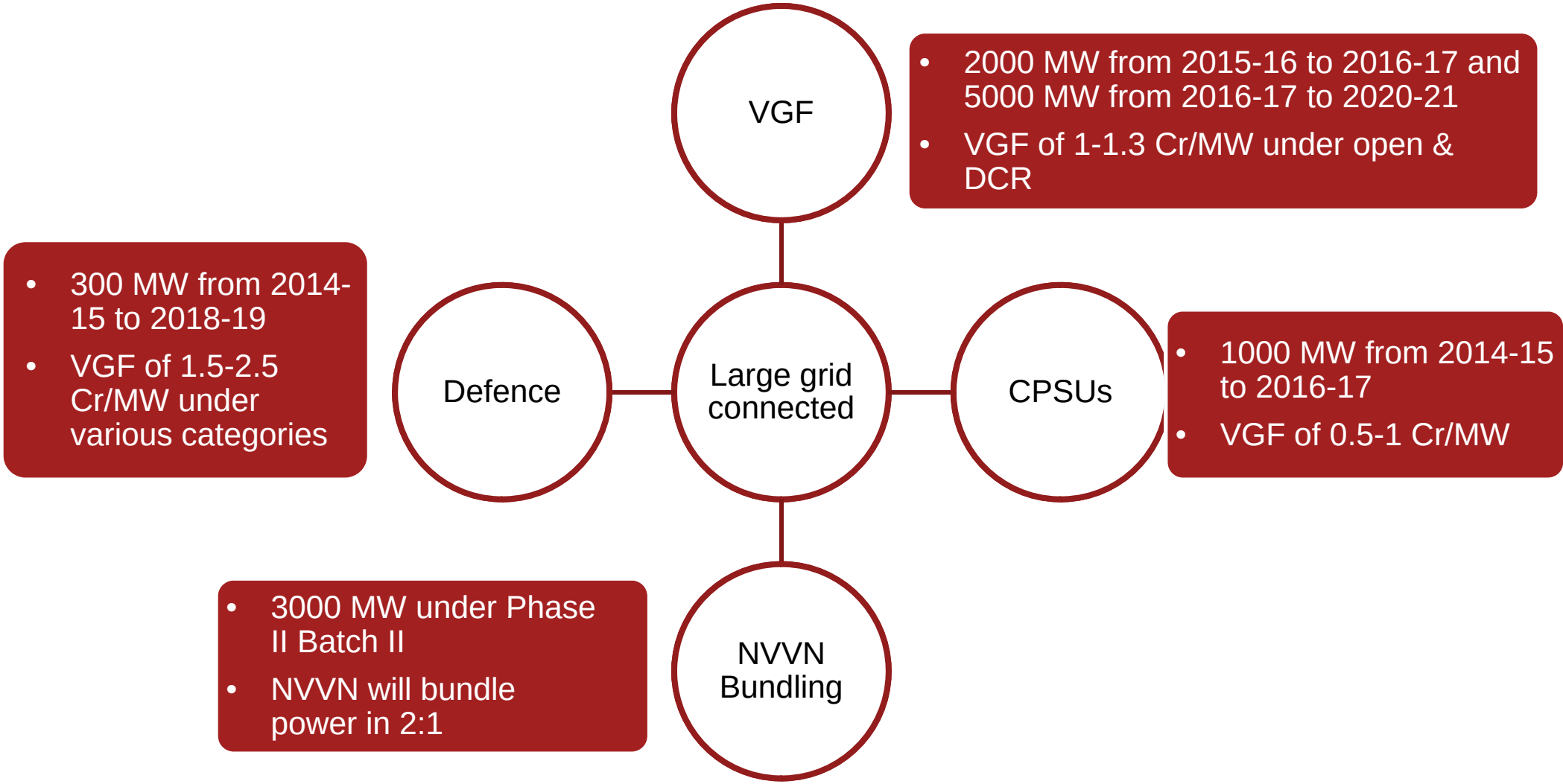
Beneficiaries
- Unemployed Graduates either alone or in partnership
- Gram Panchayats, Existing MSMEs

Implementing agency
- SECI on behalf of MNRE
- State governments to implement scheme

Key Benefits

- Utilization of sub-stations with spare capacities & additional power for states
- Employment to almost 20,000 unemployed youth
- Additional grant from states will bring down the cost of power

11.3 GW through Grid connected (VGF+NVVN)



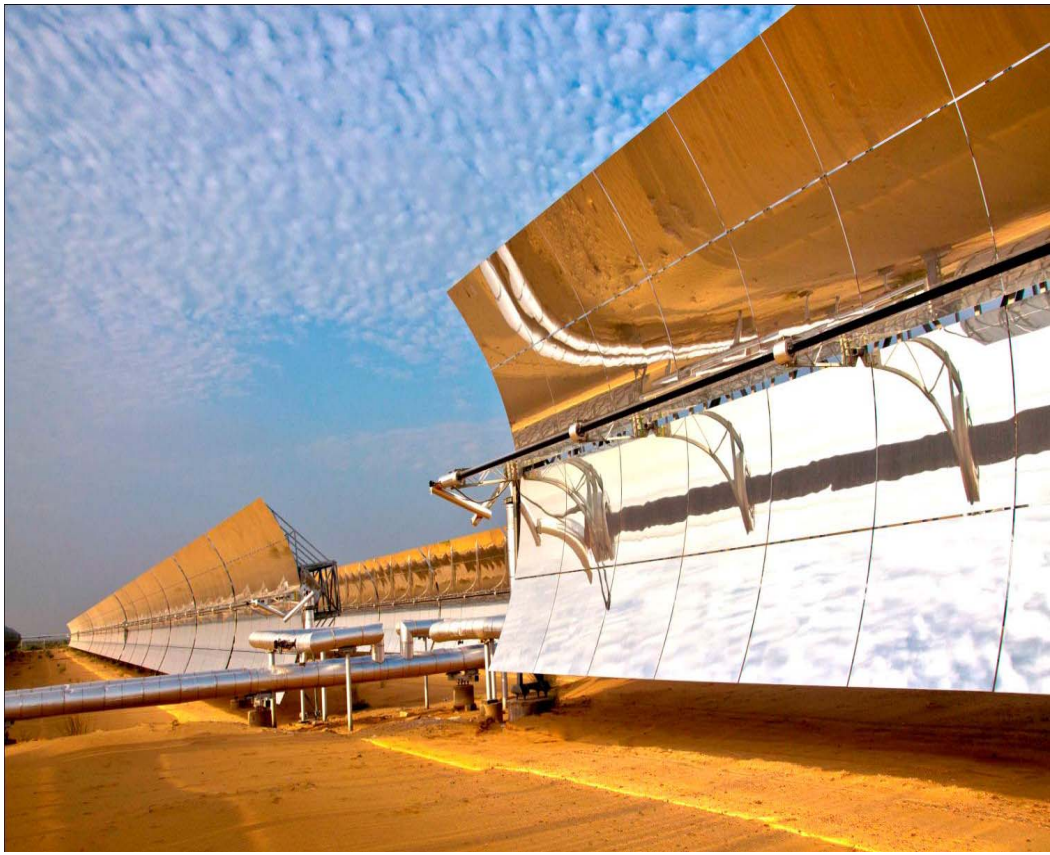
Punjab Engineering College, Sector – 1, Chandigarh

Government Hospital, Sector – 16, Chandigarh

Govt. College for Girls, Sector – 11, Chandigarh

Reliance 100 MW Solar CLFR Plant in Rajasthan

Godawari 50 MW in Pokharan, Rajasthan



Solar Water Heaters

Park Sheraton, Chennai(40,000 liter/day)

Sheraton Chola, Chennai (10,000 liter/day)

The Taj Ambassador, Delhi (7000 LPD)

Gujarat Solar Park- Charanka

150 MW in Neemuch, MP

Experience in Implementation of GEF Projects and Suggestions for New Funding

Experience of the Ministry

Implemented Projects : 2 [Small Hydro & Waste to Energy (Biomethanation)]

Ongoing Projects : 4 [Grid Connected Biomass Power, Market Development of Solar Concentrator, Scaling up Solar Thermal Technology(UNIDO) and Access to Energy for Productive Uses

Suggestions

- Part of the GEF Contribution should be for setting up of actual Projects in the Field
- Demonstration of New Technology (s) / Hybrid System should also be encouraged
- In NIM Modality of Implementation, Time required for Operationalization of the Project should be Factor in into the Project Cycle
- Co- financing from Private Sector / Other Sources should be based on firm Commitment to avoid delays in completion of Projects

Thank You

Tarun Kapoor,
Joint Secretary, MNRE