Renewable Policy Framework and Wind Energy Programme in India

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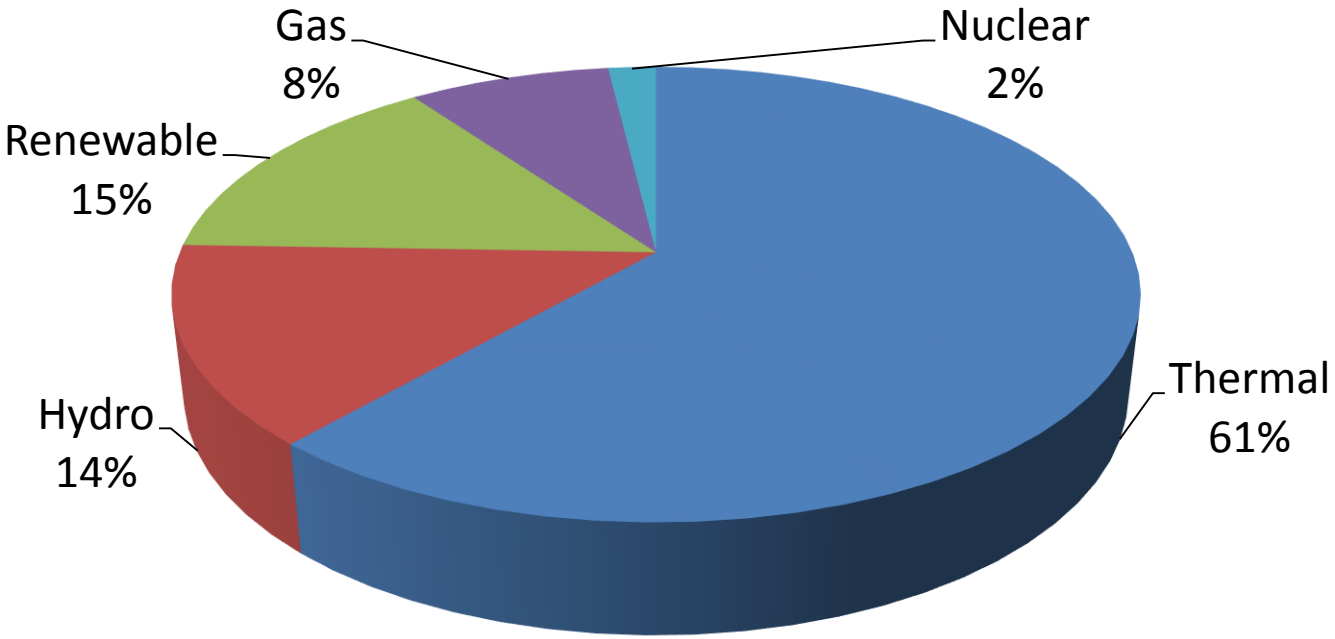
In this Presentation

- Energy Scenario in India
- Renewable Energy Resources and Potential
- Policy & Regulatory Framework for Renewable Energy Development
- Wind Energy Programmes

Energy Scenario in India

Indian Power Sector

- Total Installed Capacity- 304.5 GW

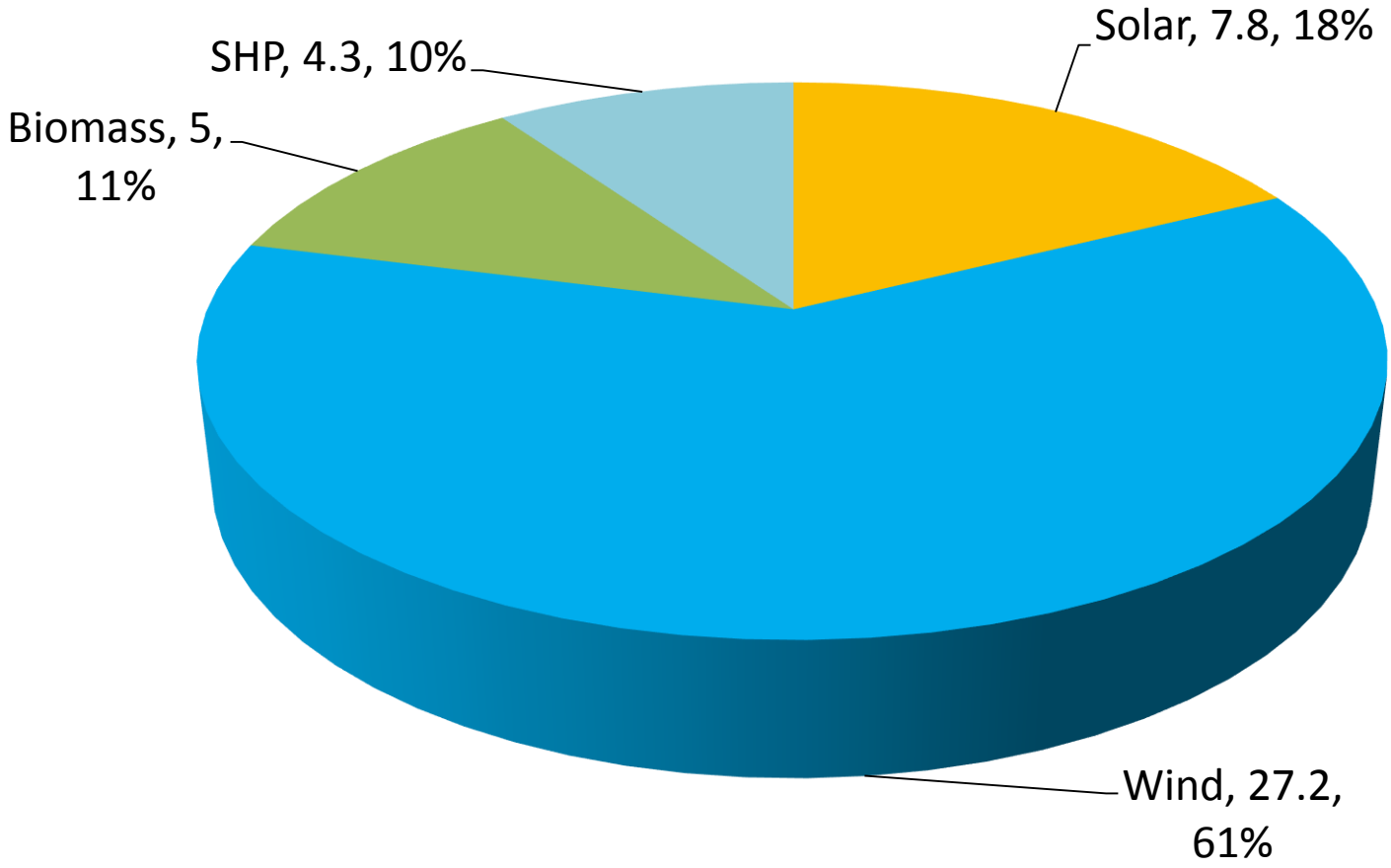


Thermal	Hydro	Renewable	Gas	Nuclear
187.2	42.8	44.2	24.5	5.8

Source: Central Electricity Authority (CEA) as on 30.06.2016

Indian Renewable Sector

- Total Installed Capacity- 44.2 GW



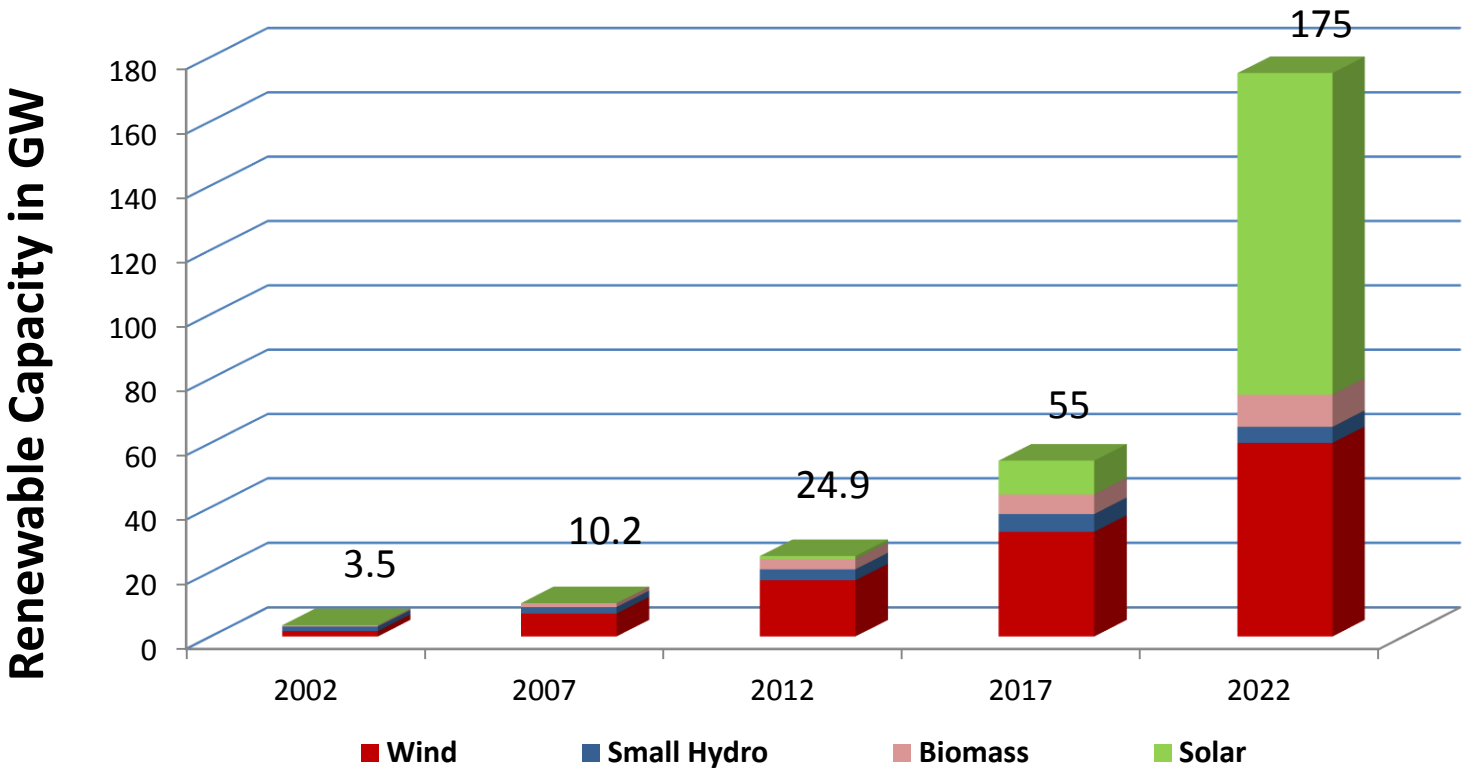
Source: MNRE 30.06.2016

India's Global Position-Overall Ranking

(Year 2015 – Capacity in GW)

Technology	India		First Position	
	Global Position	Capacity	Country	Capacity
RE Capacity World total = 785 GW	5th	36	China	199
Solar Energy (PV) World Total = 227 GW	9th	5.2	China	44
Solar Energy (CSP) World total = 4.8 GW	3th	0.23	Spain	2.3
Wind Energy World total = 433 GW	4th	25	China	145
Bio power generation World total = 106 GW	4th	5.6	USA	16.7
Hydro Power (incl large HP) World total = 1064 GW	6th	47	China	296
Source- Renewable 2016 - Global Status Report, Renewable Energy Policy Network (called REN, 21)				

Exponential Growth of Renewable Power



Budget Speech 2015 ***"The Ministry of New Renewable Energy has revised its target of renewable energy capacity to 1,75,000 MW till 2022, comprising 100,000 MW Solar, 60,000 MW Wind, 10,000 MW Biomass and 5000 MW Small Hydro."***

Renewable Energy Resources and Potential

Renewable Energy Potential - Present Assessment

Wind	**302 GW (at 100 meter hub height)** - **Online wind atlas is available at www.niwe.res.in** - **National *Off shore Wind Energy Policy released, preliminary assessment at 2 locations - 2000 MW, full potential being studied***
Solar Power	**750 GW** ***assuming 3% wasteland is made available*** ***60 Km x 60 km waste land could generate electricity as consumed in India in 2012***
Biomass Power	**25 GW** **From surplus agro biomass**
Small Hydro	**20 GW** **for ≤ 25 MW and being revised upward**

Policy & Regulatory Framework for Renewable Energy Development

History of creation of MNRE

- **1981- Commission on Additional Sources of Energy (CASE) established in the Department of Science & Technology**

- **1982 - Department of Non-conventional Energy Sources (DNES), was created in the then Ministry of Energy.**

- **1992 - DNES became the Ministry of Non-conventional Energy Sources (MNES).**

- **2006 - MNES was re-christened as Ministry of New and Renewable Energy (MNRE).**

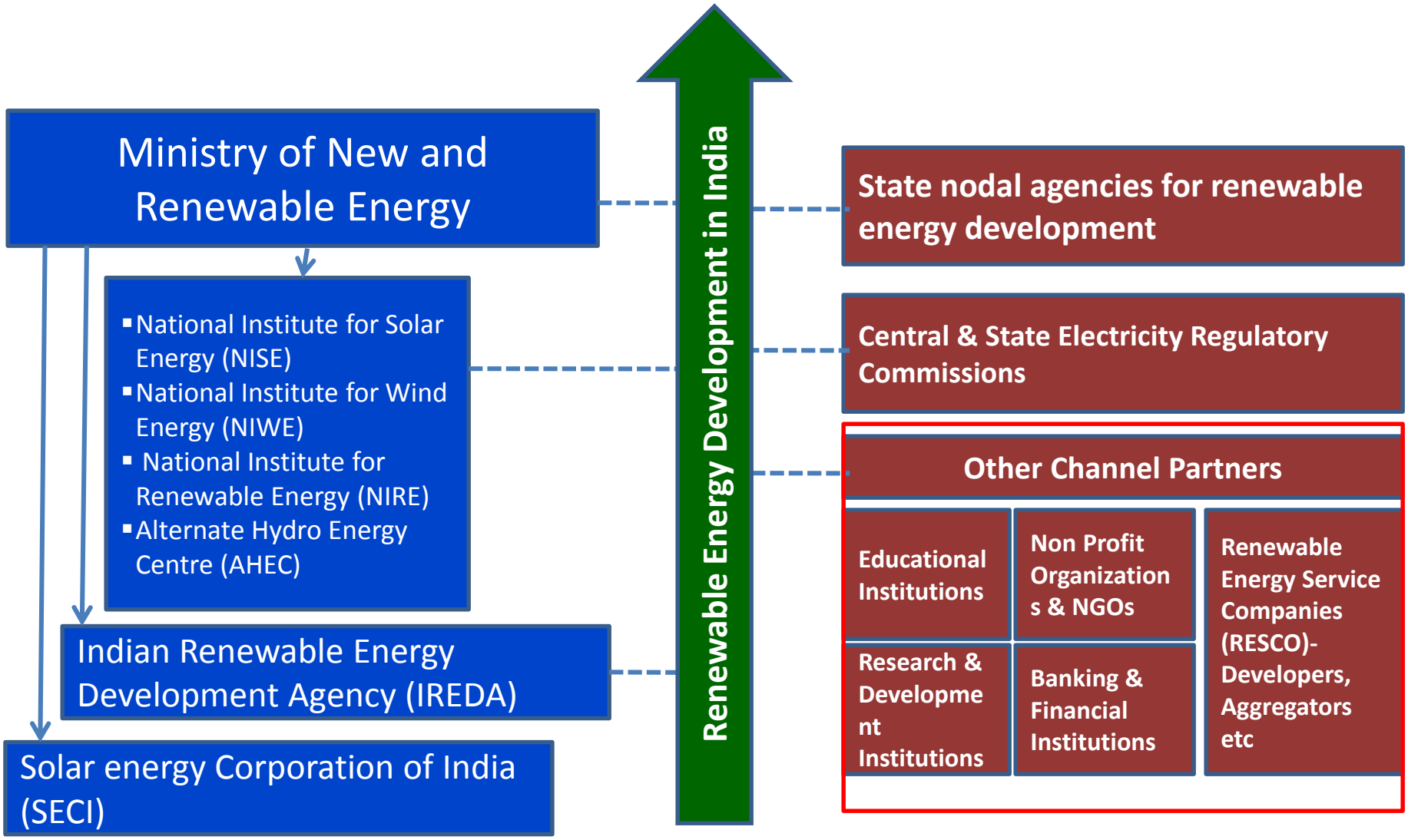
Mandate of MNRE

- **Nodal Ministry for all matters relating to New and Renewable Energy covering:**
  - ✓ **Wind energy**
  - ✓ **Solar Energy**
  - ✓ **Small Hydro Power (up to 25 MW)**
  - ✓ **Bio-energy - Biomass/ Bio-wastes including agricultural/urban & industrial**
  - ✓ **New Energy Sources such as hydrogen geothermal, tidal, etc.**
- **Coordinating Ministry for Bio-fuels policy and applications**

Institutions/PSUs under MNRE

S. No	Institution	Nature	Location	Objective/Focus Areas
1	National Institute of Solar Energy (NISE)	Society	Gurgaon	Solar Energy Development
2	Sardar Swaran Singh National Institute of Bio Energy (SSS-NIBE)	Society	Kapurthala Punjab.	Bio-energy Development.
3	National Institute of Wind Energy (NIWE)	Society	Chennai	Wind Energy
4	Solar Energy Corporation of India (SECI)	Company	New Delhi	Implementation of JNNSM
5	Indian Renewable Energy Development Agency (IREDA)	Non-Banking Financial Institution	New Delhi	Term-loans for RE and EE Projects

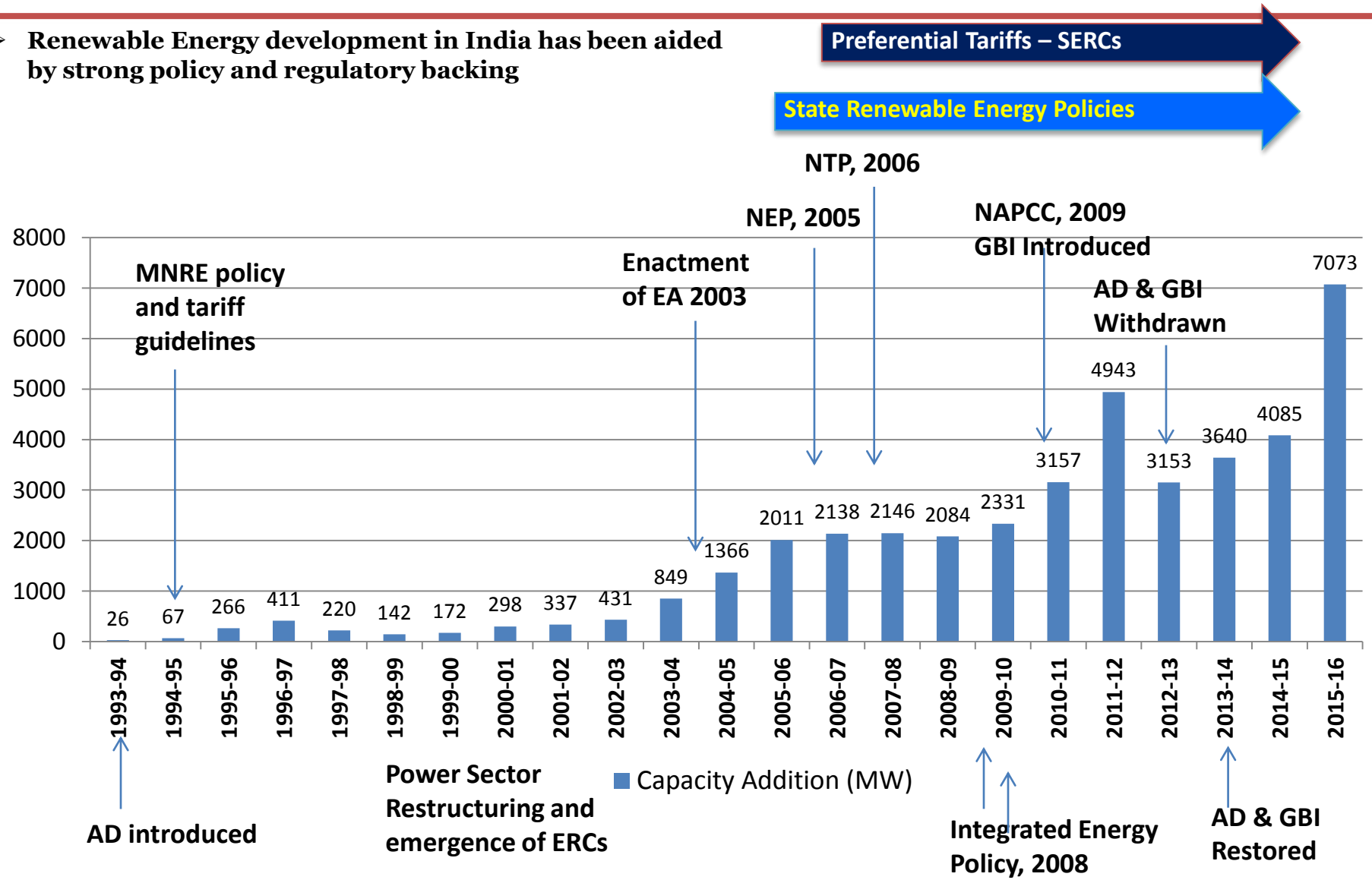
Institutional Structure



Renewable Energy Regulatory Framework

Growth of Renewable & Regulation

- **Renewable Energy development in India has been aided by strong policy and regulatory backing**



Policy and regulatory framework for Renewable Energy(RE)

Electricity Act (EA), 2003

- Central Government to develop a national policy for optimal utilization of resources including RE.
- Promotes RE by ensuring grid connectivity & sale of RE.
- SERC's to fix a minimum percentage energy purchase from RE sources (RPO) and to determine tariffs for the promotion of RE.

National Electricity Policy (NEP), 2005

- Capital cost reduction in RE through competition.
- SERCs should specify appropriate tariffs to promote RE and specify targets for RE.
- Promotes private participation in RE.

Policy and Regulatory framework for Renewable Energy(RE)

Contd.

National Tariff Policy (NTP), 2006

- A minimum percentage procurement should be made applicable latest by April 1, 2006.
- A preferential tariff to be determined by SERC to enable RET's to compete.
- Procurement of RE by distribution licensee through competitive bidding
- Solar specific RPO starting from a minimum of 0.25% 2012-13 to 3% by 2022 (Amendment in 2011)
- Solar RPO to be 8% by 2022 (Amendment in 2016)
- No interstate transmission charges and losses for Solar & Wind
- RGO introduced

National Action Plan on Climate Change

- The plan identifies eight core "National Missions" running through 2017.

- Regarding Renewable Energy, Starting 2009-10, Renewable Purchase Obligations be set at 5% of total grids purchase, to increase by 1% each year for next 10 years.

Policy and regulatory framework for Renewable Energy(RE)

Contd.

- **Fiscal Incentives:**
  - Accelerated depreciation
  - Generation based incentives
  - Viability gap funding
  - Concessional excise and customs duties
  - Capital subsidies for off-grid systems
  - budgetary support for research, development and demonstration of technologies
  - Income tax holiday

Policy and Regulatory framework for Renewable Energy

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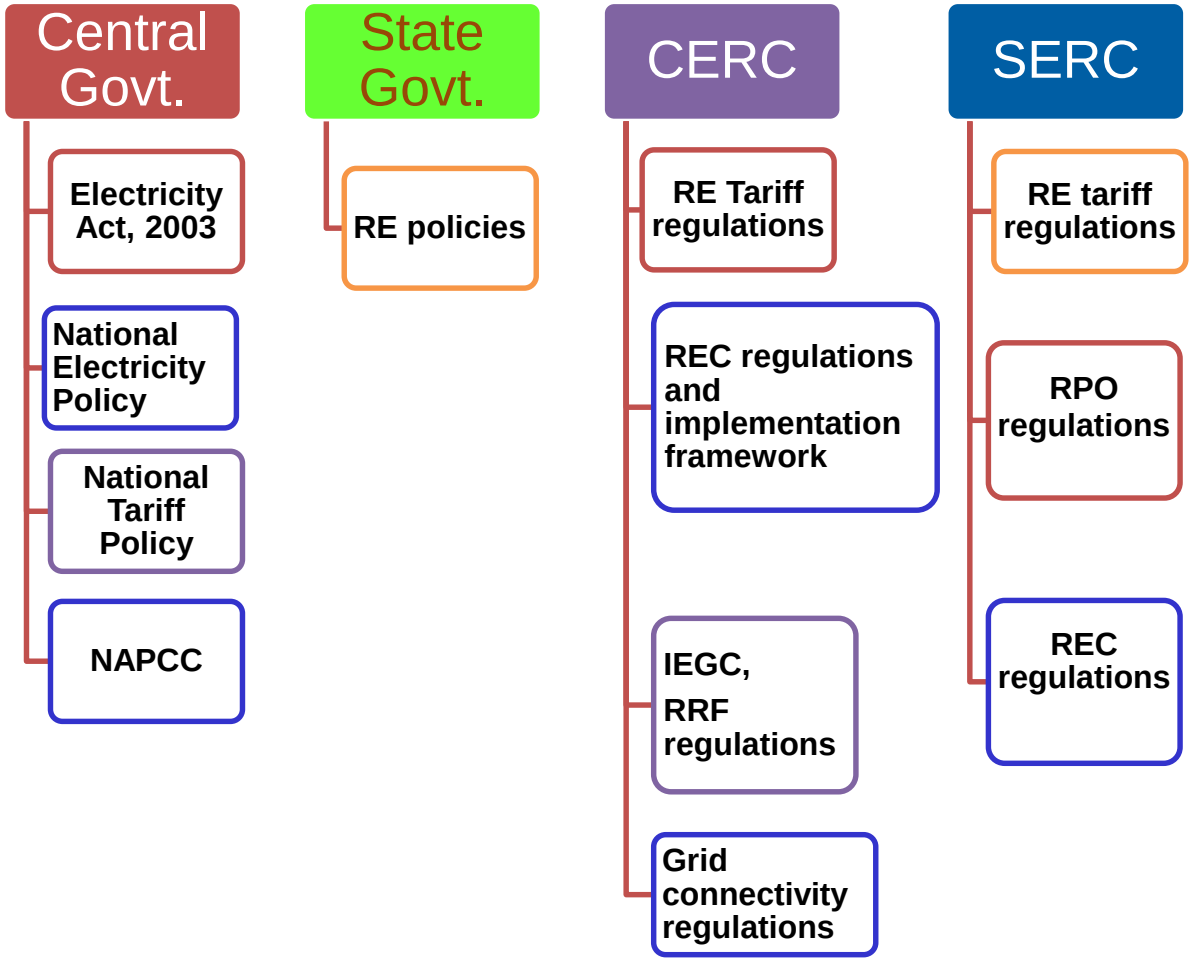


- Electricity is a Electricity is a concurrent subject (Entry 38 in concurrent list)
- Almost all the states have issued technology wise RE tariff regulations
- All states have specified RPO obligations, including separate obligation for solar and also issued REC regulations.

Contd.

Policy and regulatory framework for Renewable Energy(RE)

Renewable Energy Certificate

- Renewable Energy (RE) sources are not evenly spread across different parts of the country.
- Upto RPO level states purchase renewable electricity at Feed-in-Tariff- which is higher than the average pooled price of electricity in the state
- In states with high Renewable Energy potential, high cost of generation discourages the local distribution licensees from purchasing renewable power beyond the RPO level mandated by the State Commission.
- REC seeks to address this mismatch between availability of resources and the requirement of the obligated entities to meet their RPO
- It is also expected to encourage the RE capacity addition in the States where there is potential for RE generation as the REC framework seeks to create a national level market for such generators to recover their cost.
- Central Electricity Regulatory Commission (CERC) has notified Regulation on Renewable Energy Certificate (REC) in fulfillment of its mandate to promote renewable sources of energy and development of market in electricity.

REC Mechanism

- REC mechanism is a market based instrument to promote renewable energy and facilitate renewable purchase obligations (RPO)

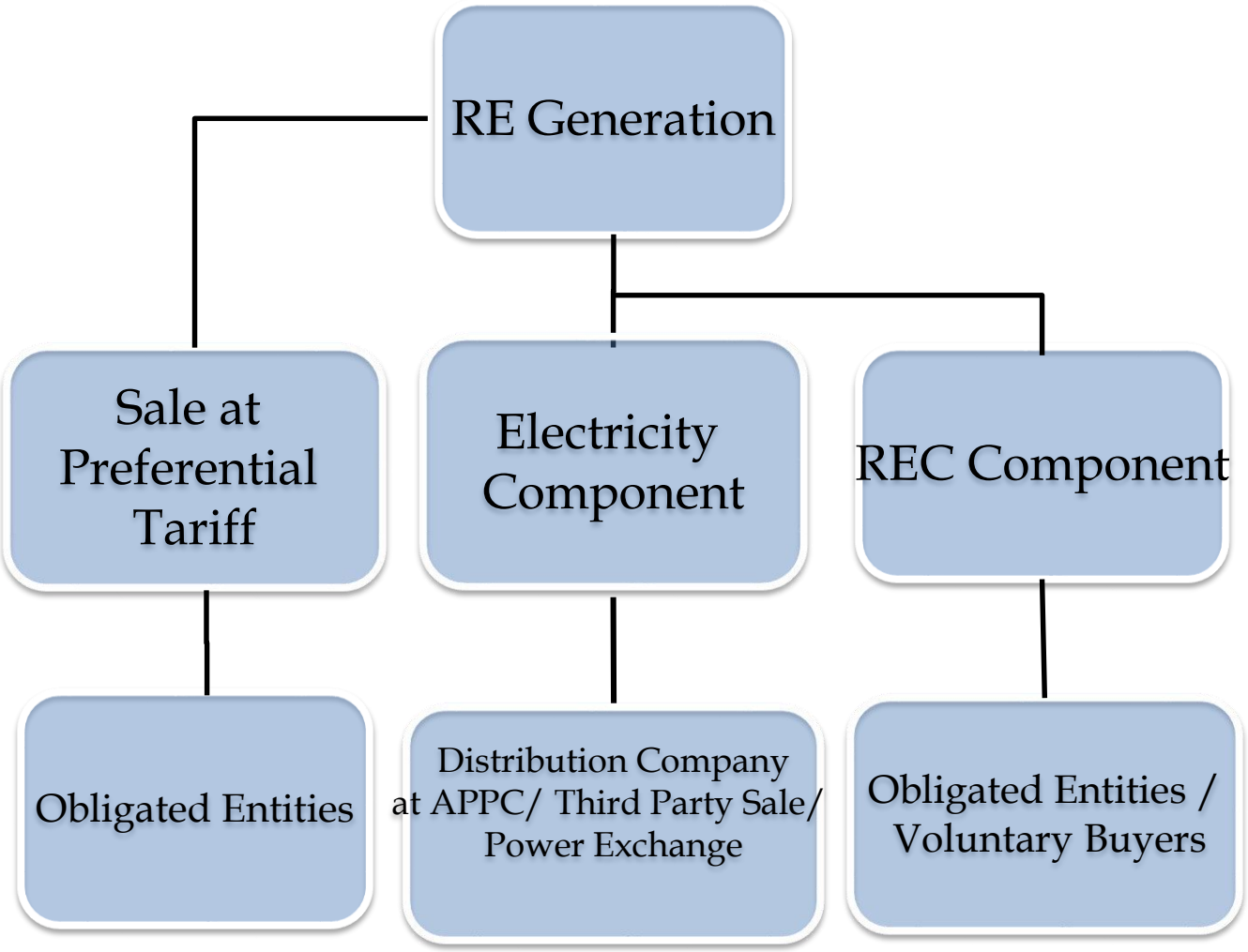
- Cost of electricity generation from renewable energy sources is classified as cost of electricity generation equivalent to conventional energy sources and the cost for environmental attributes.

- RE generators have two options:
  i) either to sell the renewable energy at preferential tariff or
  ii) to sell electricity generation and environmental attributes associated with RE generations separately.

- There are two categories of certificates, viz., solar certificates issued to eligible entities for generation of electricity based on solar as renewable energy source, and non-solar certificates issued to eligible entities for generation of electricity based on renewable energy sources other than solar.

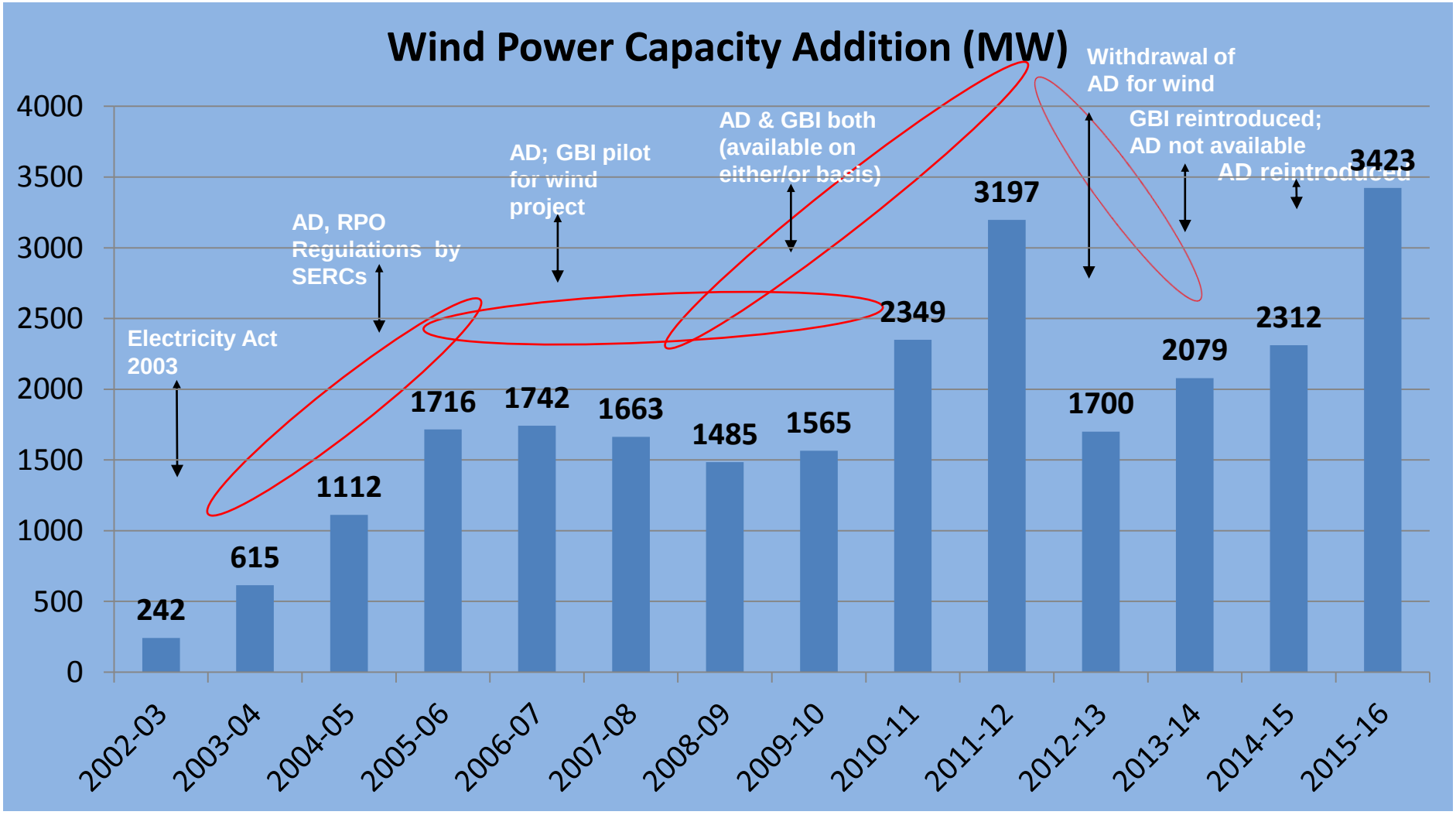
- REC will be issued to the RE generators for 1 MWh (1000 units) of electricity injected into the grid from renewable energy sources.

Renewable Energy Certificates Concept



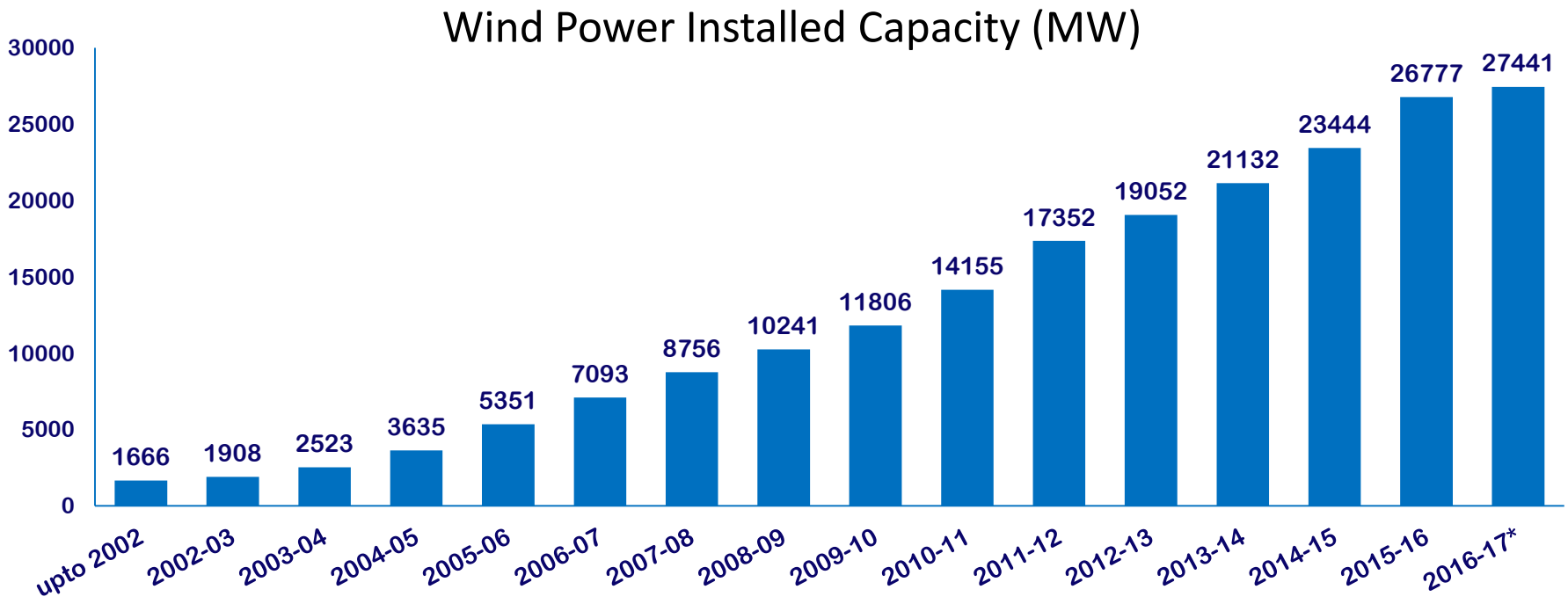
Wind Energy Programme in India

Growth of Wind Sector



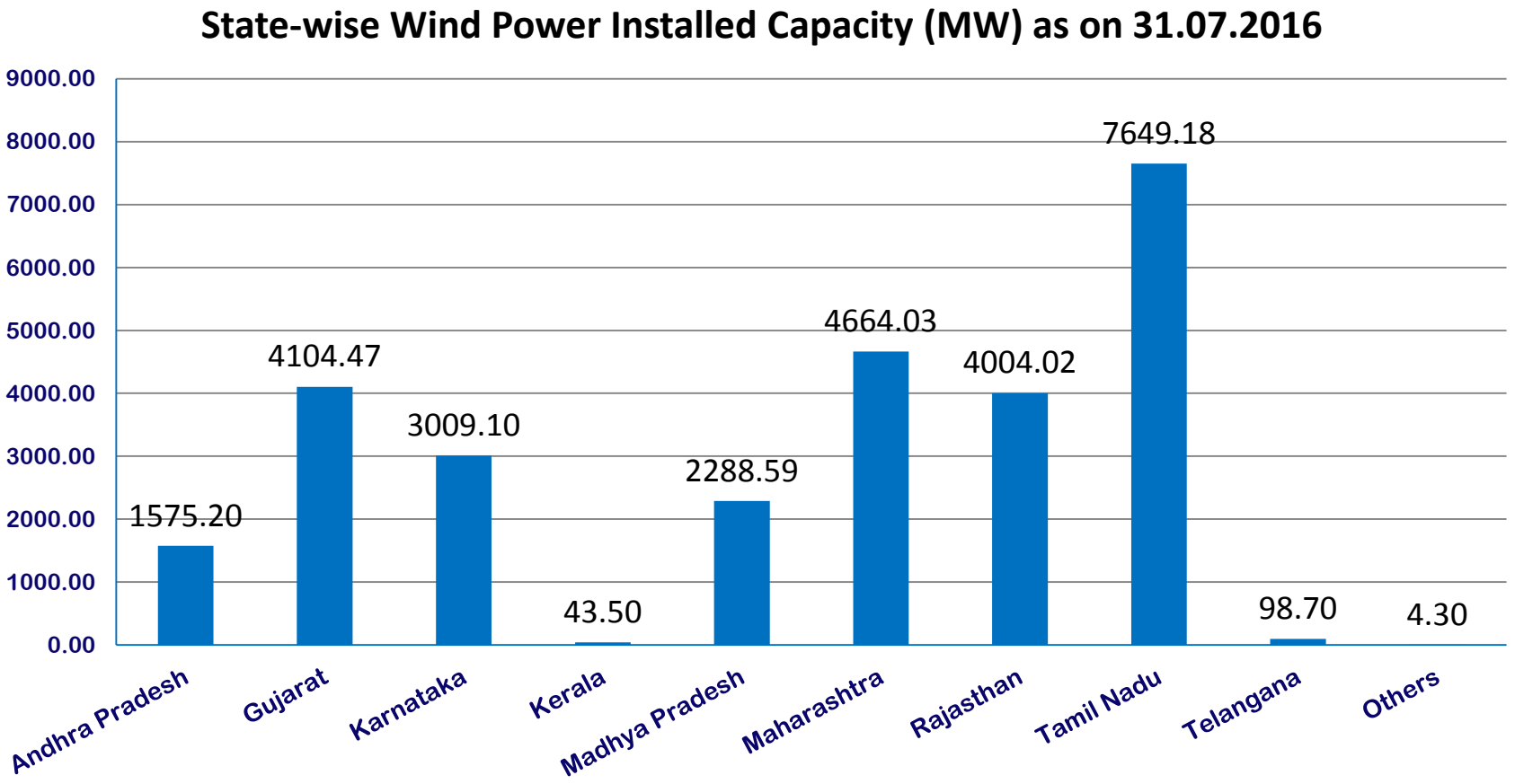
Growth in Wind Power

Globally India is the fourth largest in wind power installed capacity after China, USA & Germany



* Installed Capacity as on 31.07.2016

Major Windy States



Growth Factors for Wind

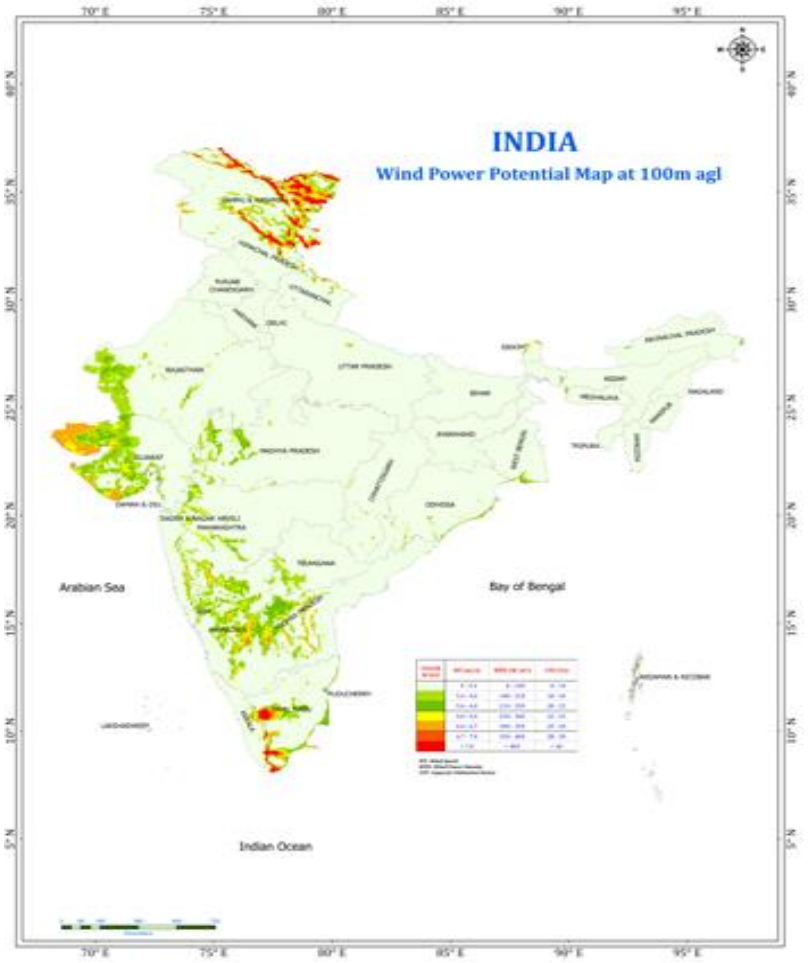
- Extensive wind resource assessment data
- Technology development and a strong domestic manufacturing base
- Quality assurance
- Conducive policy framework for investment

Wind Resource Assessment & Data Availability

- 800 monitoring stations installed since inception
- Data collected from 693 monitoring stations
- Data being collected from 107 monitoring stations
- 8 handbooks on Wind Energy Resource Data
- Indian Wind Atlas published by National Institute of Wind Energy (formerly C-WET) in 2010
- Detailed datasets available on payment to industry
- Online Wind Resource Atlas at 100 m height launched by Hon'ble Minister on 02.09.2015

Onshore Wind Potential

Potential @100 M: 302 GW



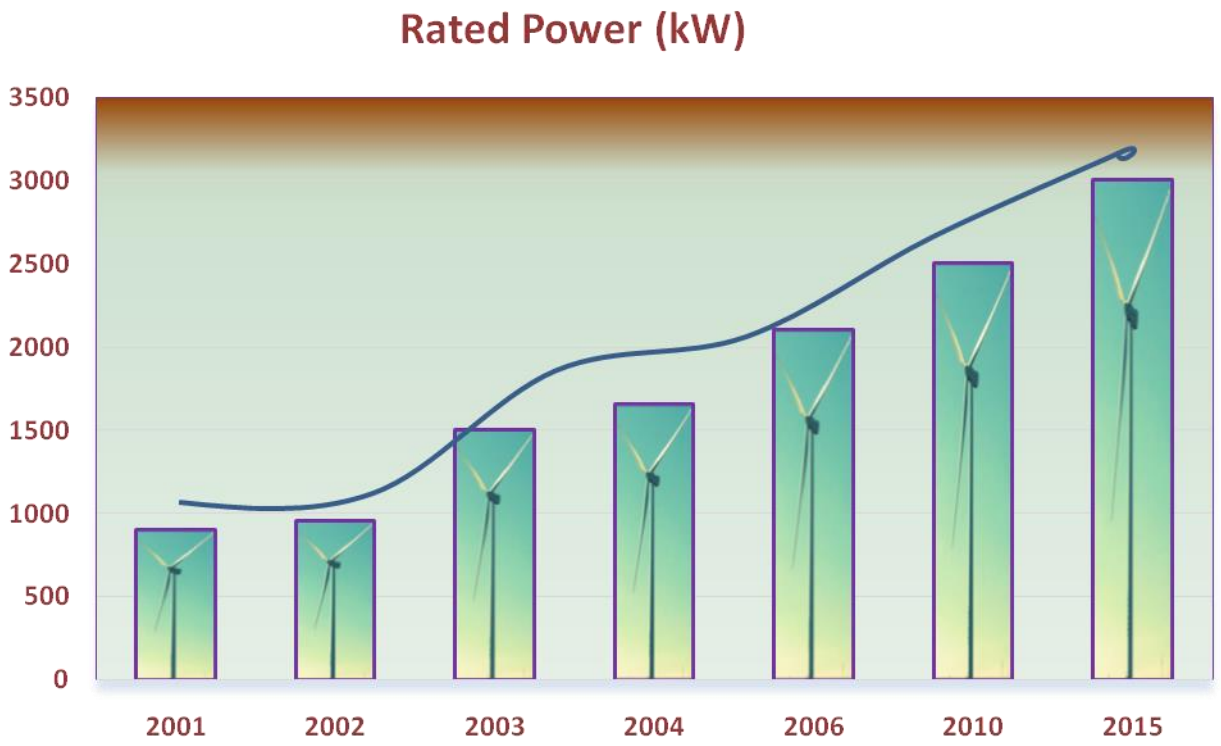
The revised potential assessment at 100m has been carried out at a very high spatial resolution of 500m, using the advanced meso-micro coupled numerical wind flow model, and with the corroboration of 1300 actual measurements spread all over India, which can be stated as first of its kind. The revised wind atlas is available online at NIWE's website.

State-of-Art Technology & Manufacturing

- Cost of Indian wind turbines among lowest in the world
- Capacity: 250 KW – 3 MW; Gear & Gearless
- Hub heights: Up to 141 m
- Rotor Diameter: Up to 125 m
- 21 manufacturers with 58 models
- Export to USA, Europe, South America, Asia
- Indigenization about 70%
- Rotor blades, gear boxes, yaw components, nacelle cover, raw material for blades being manufactured

Evolution of Wind Turbine Technology

Year	Rated Power
2001	900 kW
2002	950 kW
2003	1500 kW
2004	1650 kW
2006	2100 kW
2010	2500 kW
2015	3000 kW



Quality Assurance-NIWE

- National Institute of Wind Energy, Chennai
  - Wind Resource Assessment
  - International Level Testing Facilities
  - Standardization & Certification
  - Type Approval of Turbines
  - R&D
  - Information, Training, Commercial Service

- RLMM COMMITTEE- Revised List of Manufacturers & Models Committee; approves models for wind projects

Policy Incentives-I

- Income Tax Holiday U/S 80 1A for 10 years
- Full Excise Duty exemption
- Concessional Customs Import Duty on specified parts and components
- Exemption on Special Additional Duty (SAD) on parts & components of wind turbines

Policy Incentives-II

- Feed-In-Tariff (FiT) by State Regulators
- Generation Based Incentive @ Rs. 0.50/unit,
  - over and above the FIT;
  - ceiling Rs. 10 million/ MW,
  - >4 years & <10 years;
  - GBI allowed to captive producers but not to merchant power

OR

- Accelerated Depreciation at 80%

Wind Policy in States

- Wind potential states are providing promotional tariff for wind power projects

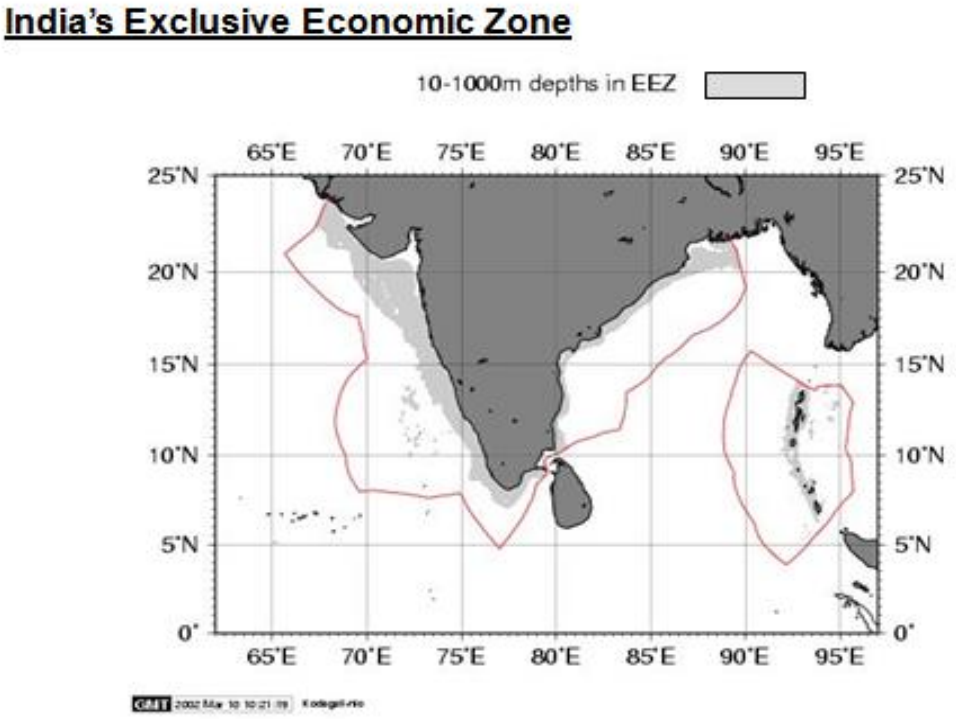
State	Tariff per kWh
Andhra Pradesh & Telangana	4.84
Gujarat	4.15
Karnataka	4.50
Kerala	4.77
Madhya Pradesh	4.78
Maharashtra	3.82-5.56
Rajasthan	5.76 & 6.04
Tamil Nadu	4.16

- States are also providing concessional wheeling, banking, Electricity Duty and Cross Subsidy Surcharges

Off-Shore Wind Policy

Offshore Wind- The Next Frontier

- Entire Exclusive Economic Zone (EEZ) available for offshore wind
- Very good potential in Tamil Nadu & Gujarat coast
- Offshore policy notified on 06.10.2015



Offshore Wind - Parameters for Consideration

- Within 20 km from sea coast/port
- Average water depth < 25 m
- Average wind speed > 6.5 m/sec at 50 m height
- Outside oil and gas activity zone, marine protected areas, submarine power and communication channels, air traffic, free from security considerations, cyclone zone and in low risk earthquake zone.
- Within 20 km from onshore substation

Small Wind Energy Programme

Aero-generators/Small Wind Energy Hybrid Systems (SWES) programme

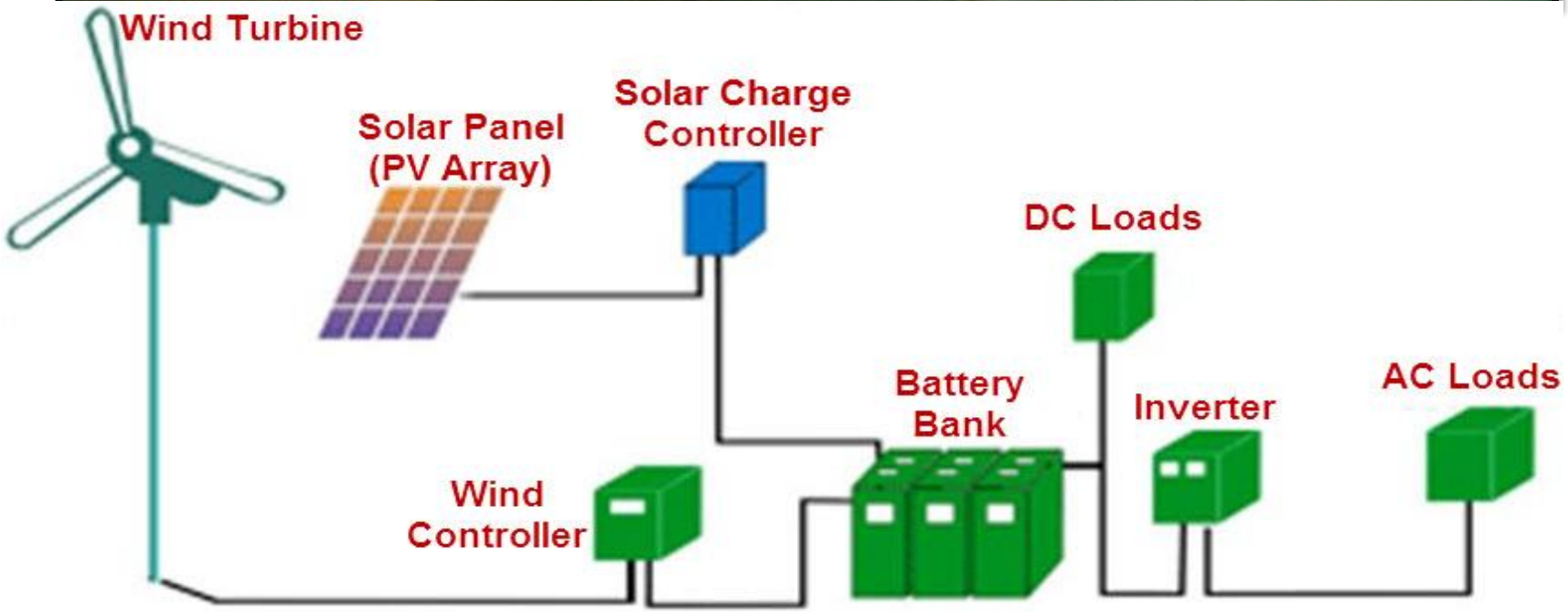
Providing Electricity Access through

- Water pumping windmills
- Aero-generators
- Wind-solar hybrid systems

Target category

- Government buildings,
- Schools, colleges, Goshala's, community halls/ centres,
- Gram panchayats etc along coastal/ hilly and remote regions
- Telecom towers etc.

ROOF-TOP WIND-SOLAR HYBRID SYSTEM



Programme Details

- Financial Support of Rs. 1.00 Lakh/kW is being provided on reimbursement mode to community users only through State Nodal Agencies or Banks/Financial Institutions.
- Current programme supports off-grid SWES systems only.
- Cumulative capacity addition is 2.690 MW.
- Over 60% capacity installed in State of Maharashtra, followed by Goa, Karnataka, West Bengal, Manipur, and Tamil Nadu.

Future Plans

- Both Grid-tied and off-grid/battery charging small wind turbines are available globally.
- The Solar Off-grid scheme & Solar Rooftop (grid-tied) scheme of the Ministry has a provision to support installation of wind-solar hybrid systems.
- A detailed guideline for installation of wind-solar hybrid systems under off-grid solar is under progress.
- Grid-interactive small wind turbine/hybrid systems under net metering policy will boost the sector in line with solar rooftop PV.
- NABL accreditation of NIWE' s Small wind turbine testing facility at Kayathar.

Major Challanges

Major Challenges in the Wind Sector

- Variability of wind needs proper forecasting, scheduling and balancing by the Load Despatch Centres;
  - CERC issued forecasting & scheduling regulations for inter-state transmission of wind and solar power in Aug 2015. States in the process for introducing F&S mechanism.
  - NIWE has successfully carried out pooling station level F&S for the state of Tamil Nadu with 5-10% accuracy
  - Renewable Energy Management Centres being established.
- Wind potential is concentrated in 7-8 States
  - Inter state and intra state transmission strengthening being taken up under Green Energy Corridor
  - Tariff Policy amended to exempt inter-state transmission loss and charges for solar and wind.

Thank You

www.mnre.gov.in