

NTPC & Wind Energy in India

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Asia Pacific Partnership on Wind Energy

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NTPC Limited
(A Government of India Enterprise)

Content

- India- Electricity
- NTPC
- Wind Energy Growth & Regulatory Framework
- Tariff Policy, Technical Support & Fiscal Incentive by Govt.
- NTPC Initiatives for Renewable Energy

Content

- **India- Electricity**
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INDIA

- A Nation with Huge Pool of Productive Human Resource
- GDP of Indian Rupees(Rs) 61641780 Million
(2009-10, At current market prices)
- GDP Growth Rate(2009-10) At Current Price Is 10.6% (7.2 % At 2004-05 Price Level)
- GDP Is Poised To Grow At Around 8% (At 2004-05 Price Level)

Contd..

- Though the share of Industry has grown marginally in 2009-10 due impact of global slowdown, it is poised to grow fast now
- The share of Agriculture in GDP is in decline from 18.9% in 2004-05 to 14.6% in 2009-10
- The share of Service Sector grown from 53.2% in 2004-05 to 57.2% in 2009-10

Electricity in India

- Electricity- Predominantly a State Subject
- SEB were created as per Electricity Act-1948 entrusted with following Jobs
 - Generation
 - Transmission
 - Distribution
- Downstream Tariff fixation was done by State Governments.

Main amendments to the existing Acts(1948)

- Amendment in 1975 enabled generation in Central sector
- Amendment to bring in commercial viability in the functioning of SEBs –
 - Section 59 amended to make the earning of a minimum return of 3% on fixed assets a statutory requirement (w.e.f 1.4.1985)
- Amendment in 1991 to open generation to private sector and establishment of RLDCs
- Amendment in 1998 to provide for private sector participation in transmission, and also provision relating to Transmission Utilities.

India: Installed Capacity

- Present Installed Capacity (MW)

Data As On 31st July'10 (Source: Central Electricity Authority, Min Of Power ,GOI)

S No	Coal	Gas	DSL	Total Thermal	Nuclear	Hydro	RES	Total
1.	87093	17354	1200	105647	4560	37033	16430	163670

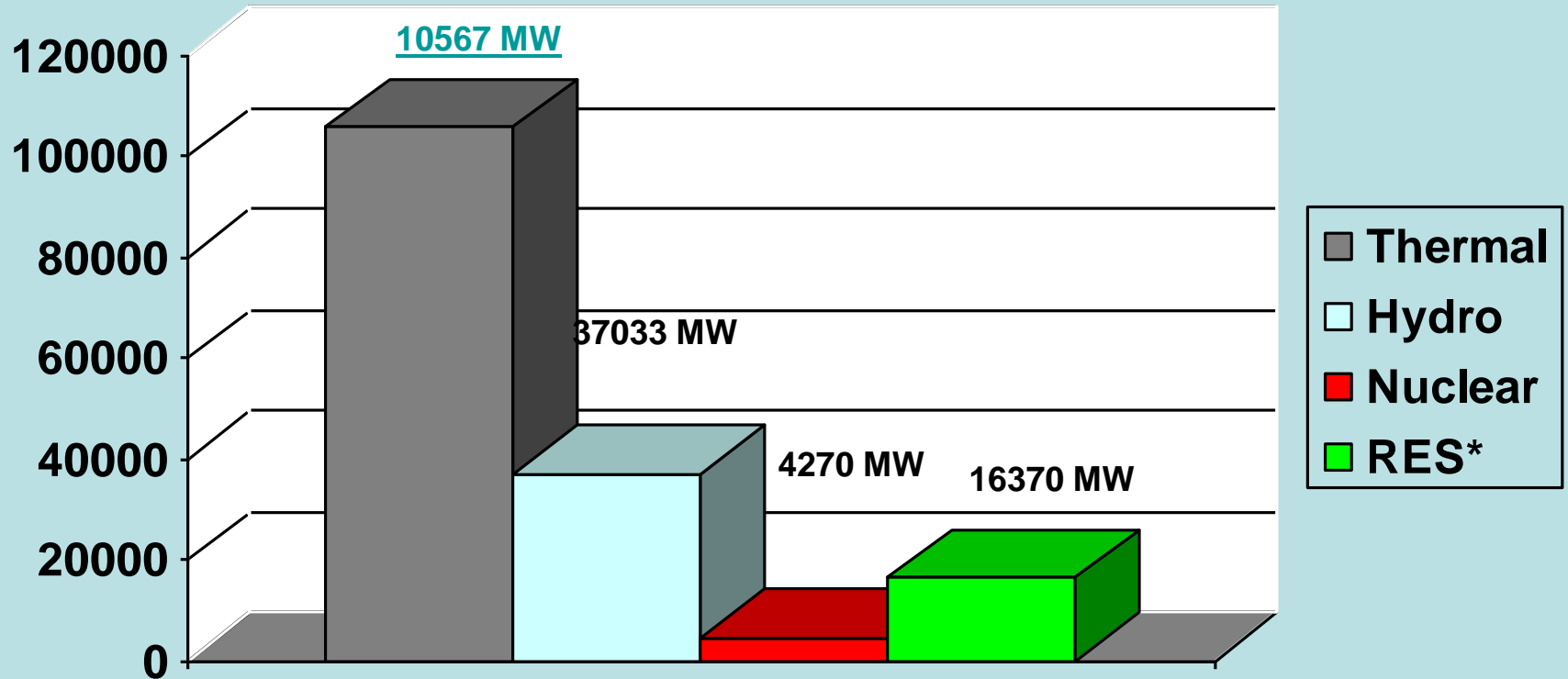
Captive Generating capacity connected to the Grid (MW) = 19509

(*)RES - Renewable Energy Sources includes Wind-Energy, Small Hydro Project (SHP), Biomass Gas (BG), Biomass Power (BP) and Urban & Industrial waste Power (U&I).



India: Installed Power Capacity

(As on 31st July 2010)



* Renewable Energy Source

Source: Central Electricity Authority, Min Of Power ,GOI

INDIA-Power Requirement

- To Match The Growth Projection in Indian Economy, Power Sector Needs a Steep Growth As Per Government's Integrated Energy Policy
- During 12th Plan Period(April12-March17) 82000MW Capacity Addition Has Been Planned
- Out of 82000MW Capacity Addition, Less Than Half (48%) From Fossil Fuel As compared to Present 65% of Installed Capacity From Fossil Fuel

(Source: Central Electricity Authority, Min of Power ,GOI)

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NTPC

- A “*Maharatna*” Public Sector Undertaking under Ministry of Power formed in 1975 under with following Function
 - Generation of Electricity
 - Consultancy Services
 - Management of Power Stations
- Ranked as Asia’s No. 1 Independent Power Producer in Platt’s Top 250 Global Energy Company with Installed Capacity of 32,194 MW
- Contributed 29% of India’s Electricity during FY-2009-10
- Annual Turnover Rs 492.47 Billion in FY-2009-10
- 17,340 MW Capacity under Construction
- Diversification into Hydro, Nuclear, Coal Mining and Renewables

Marching Towards Integrated Power Major

- Hydro
- Nuclear
- Renewables

Lateral
Integration

- Power Trading(NVVN)
- Power Distribution
(NESCL)

Forward
Integration

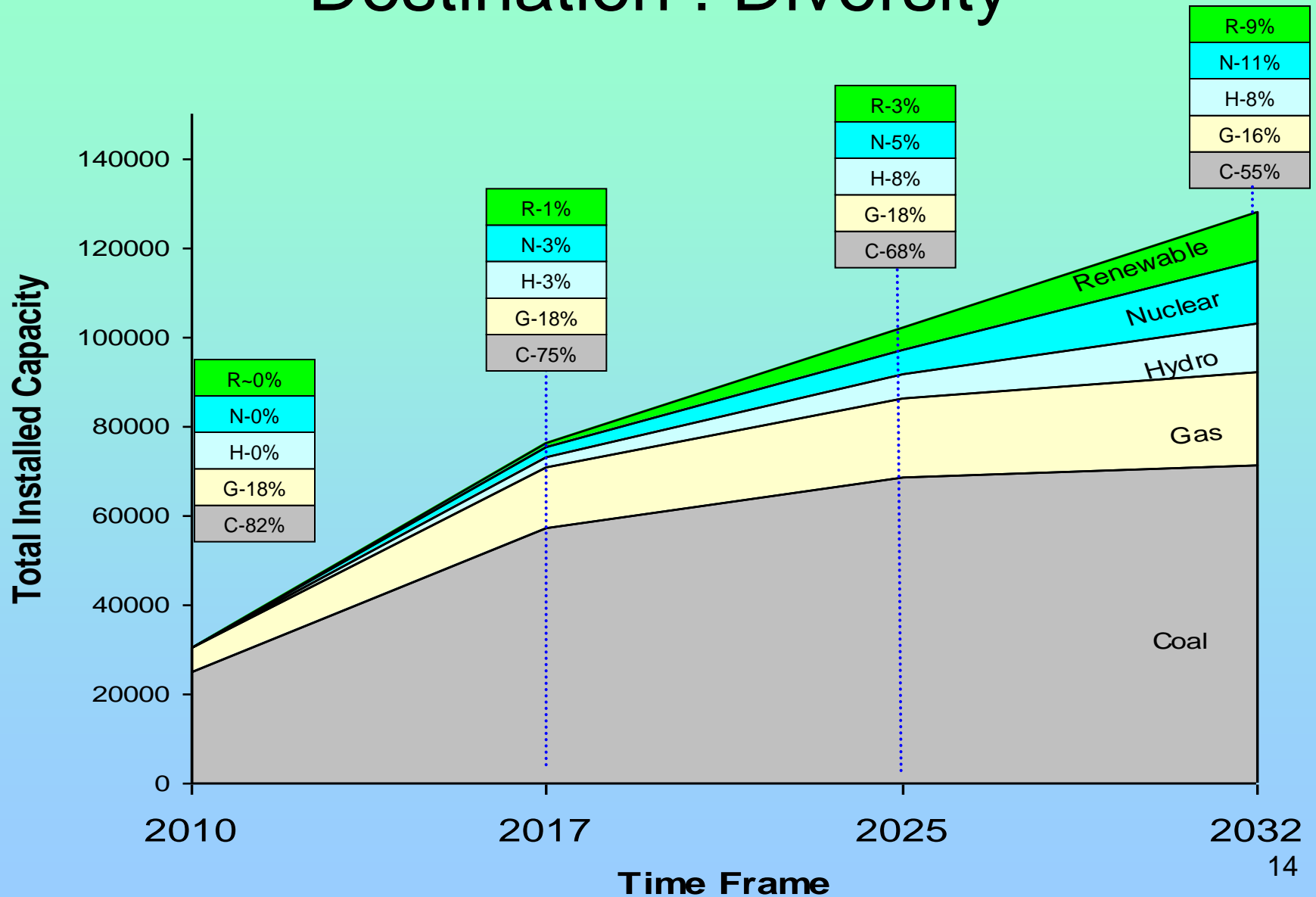
Backward
Integration

Related
Diversification

- Coal Mining
- Oil/Gas Exploration
- LNG Value Chain

- Equipment Mfg.(BHEL, TELK, BFL)-JV/ Equity
- R&M (Alstom) - JV
- JV for captive power (RINL)

Destination : Diversity



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Wind Power in India

- Wind farms started coming from early 90's
- Primarily Dominated by Private Sector Investment through Non-tendering Process
- Driving Force
 - Accelerated Depreciation
 - Tax Holiday
 - Rebate in Excise and Custom duty.
 - Wheeling & Banking of Power
- Early wind farm came on High Potential Area.
- Growth of wind power slowed in Late 90s

Electricity Regulation Act-1998

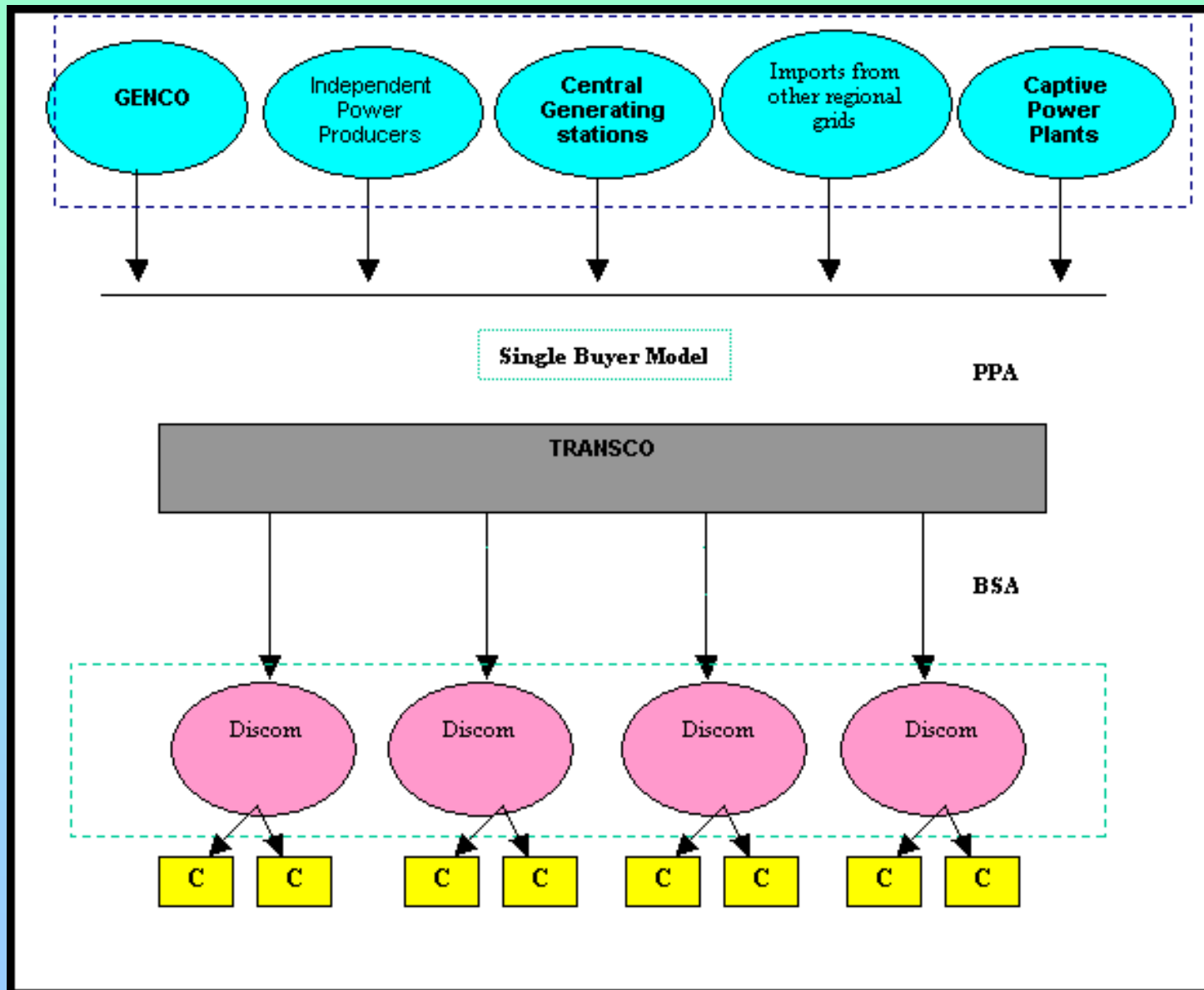
- Majority of SEBs had become financially ill due to populist Political decisions
- Electricity Act- 1998, Mandated for formation Regulatory commission
 - CERC-For Central Sector
 - SERC-For State Sector
- Downstream and upstream tariff fixation had gone to commission.

Electricity Act 2003

- Mandated for Re-organization of Electricity Board.
- **Section 86(i)e:** The State Commission shall discharge the following functions, namely
 - Promote Generation of Electricity from renewable by providing suitable measure for connectivity with the grid
 - Fix a minimum percentage for purchase of energy from such sources taking into account availability of such resources in the region
 - Such procurement by Distribution Licensees for future requirements shall be done, as far as possible, through competitive bidding process under Section 63 of the Act within suppliers offering energy from same type of non-conventional sources.
- **Subsequently, as per the National Tariff Policy-2006, state regulators to provide preferential tariff for renewable power.**

Electricity Act 2003 provided required stimulus for wind industry

Present Model



CUMMULATIVE WIND POWER ADDITION

	PERIOD	TARGET (MW)	ACHIEVEMENT (MW)
9 th Plan	1998-2002	800	728
10 th Plan	2002-07	2200	5456
11 th Plan	2007-12	10500	5035.3 (Up to July 2010)

State wise Installed Capacity

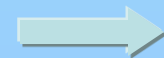
Tamil Nadu	5072.8 MW
Maharashtra	2107.8 MW
Karnataka	1517.8 MW
Gujarat	1934.1 MW
Rajasthan	1095.9 MW
Others	401.8 MW
All India	12129.2 MW

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Wind Power Potential in India

Region	Wind Power W/m ²	Wind Power Potential
Class-2A	200-250	32,647
Class-2B	250-300	10,819
Class-3	300-400	4,683
>Class-3	>400	412
Total		48159 MW



* Assuming 1% of the available land is available for wind farming

Capacity Utilisation Factor (CUF)

Wind Power	
Annual Mean Wind Power Density (W/m ²)	CUF
200-250	20%
250-300	23%
300-400	27%
> 400	30%

- **Depreciation:**

- 1st 10 years : 7%
- 11th year onwards : Spread over remaining useful life.

- **ROE:**

- 1st 10 years : Pre-tax 19%
- 11th year onwards : Pre-tax 24%

- **Interest on WC:**

- Wind Energy/Small Hydro/Solar PV/Solar Thermal.
 - O&M Expenses : 1 month
 - Receivables : 2 months energy charges at normative CUF
 - Maintenance Spares: 15% of O&M Expenses
- IWC shall be average of SBI ST PLR during previous year plus 100 basis point.

CERC Tariff Regulation for RE Power

- Single Part Tariff
 - Fixed Cost Components:
 - Return on Equity
 - Interest on Loan
 - Depreciation
 - Interest on Working Capital
 - O&M Expenses
- RE Technologies having fuel component like Biomass, non-fossil fuel cogeneration shall have two components:
 - Fixed Cost and
 - Fuel Cost.

Wind Power - Levellised Tariff (Rs/KWh)

S.No.	CUF (%)	2009-10	2010-11
1	30	3.75	3.38
2	27	4.17	3.75
3	23	4.90	4.41
4	20	5.63	<u>5.07</u>

RPO Across States

State	RE Source/ Eligible Entity	RPO Levels		
		FY09	FY10	FY11
Assam			5%	
Andhra Pradesh		5%	5%	5%
Chhattisgarh	Biomass	5%	5%	5%
	SHP	3%	3%	3%
	Others	2%	2%	2%
Delhi	NDPL	1%	1%	1%
	BYPL	1%	1%	1%
	BRPL	1%	1%	1%
	NDMC	1%	1%	1%
Gujarat		2%	2%	5%
Haryana		5%	10%	10%
Karnataka	BESCOM, MESCOM, CESC	10%		
	GESCOM, HESCOM, Hukeri	7%		
Kerala	SHP	2%		
	Wind	2%		
	Others	1%		
Madhya Pradesh	Wind	5%	6%	6%
	Biomass	2%	2%	2%
	Cogen & Others	3%	2%	2%
Maharashtra	Non Solar			5.75%
	Solar	5%	6%	0.25%
Punjab		1%	2%	3%
Rajasthan	Wind	5%	6%	6.75%
	Biomass	1.25%	1.45%	1.75%
Tamil Nadu		10%	13%	14%
UP		7.5%	7.5%	7.5%
Uttarakhand		5%	8%	9%
West Bengal	WBSEB	4.8%	6.8%	8.3%
	CESC	4.0%	6.0%	8.0%
	DPL	2.5%	4.0%	7.0%
	DPSC	2.0%	4.0%	7.0%

Technical Support Extended by Gol

Centre for Wind Energy Technology, established as an autonomous institution under Ministry of New & Renewable Energy, Government of India in 1998.

Objectives:

- 1. Technical focal point for wind power development**
- 2. Wind Resource Assessment. It has installed more than 1244 wind monitoring masts across India out of which 233 Sites Found farmable**
- 3. Standardization and certification**
- 4. Testing facilities as per international standards**
- 5. Type approval for wind turbines**
- 6. Information, Training & Commercial Services**
- 7. Research and Development**

Renewable Energy Certificate

- Full exploitation of available RE potential inhibited due to:
 - Uneven geographical distribution of RE sources
 - High cost of generation discourages harnessing RE potential beyond the RPO level
- CERC Regulations seek to:
 - Address mismatch between availability of RE sources & requirement of obligated entities to meet their RPO
 - Encourage RE capacity addition in States where potential exists
- Concept of national REC framework & Model Regulation for SERCs was evolved by Forum of Regulators
- SERCs expected to notify their Regulations for enabling fulfillment of obligations by purchasing of RECs

RE Framework

- RE generators shall have two options –
 - Either sell RE at preferential tariff fixed by concerned Regulatory Commission, OR,
 - Sell electricity generation and environmental attributes associated with RE generation separately.
- On choosing the second option, the environmental attributes can be exchanged in the form of REC.
- Price of electricity component would be equivalent to weighted average power purchase cost of the distribution company including short-term power purchase but excluding renewable power purchase cost.
- Distribution companies, Open Access consumer, Captive Power Plants (CPPs) will have option of purchasing the REC to meet their Renewable Purchase Obligations (RPO).

IMPLEMENTING AGENCY

- Shall be designated by CERC
- Functions:
 - Registration of participating RE generators (eligible entities)
 - Issuance of certificates
 - Maintaining & settling accounts w.r.t REC
 - Repository of transactions of REC

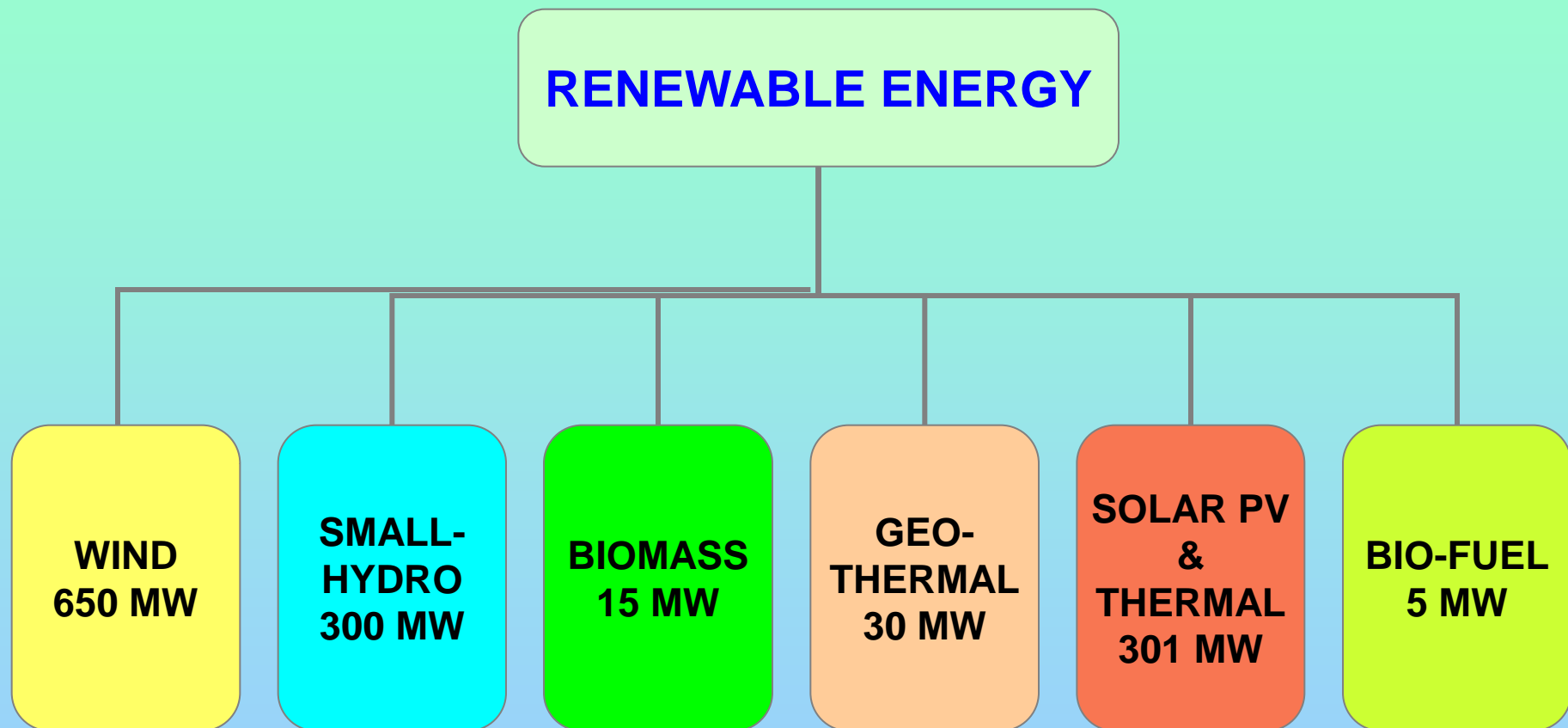
Generation based Incentive

- Ministry of New & Renewable Energy has declared a Generation based Incentive in Feb, 2010
- Only applicable for sale of Electricity thru SERC notified tariff
- Indian Renewable Development Agency (IREDA) has been nodal Agency.
- Applicable for Grid connected Wind Energy project set up for sale of electricity to Grid at SERC tariff.
- GBI shall be Rs 0.50/kWhr.

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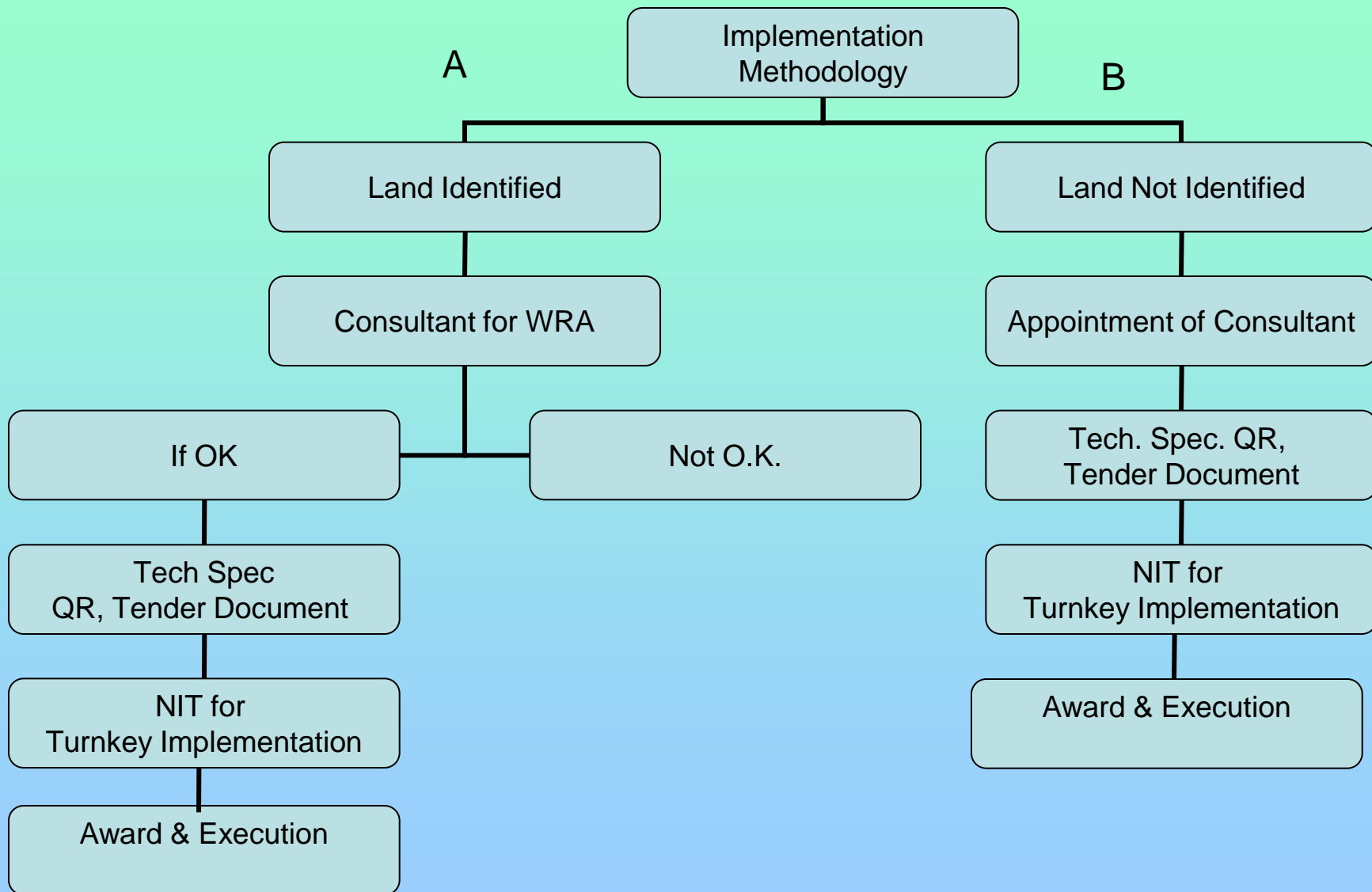
Portfolio Projection of Renewable Energy



Renewable Energy Project of NTPC

- “Installation of 100 MW Wind farm” in advance stage of awarding Contract.
- NIT for 8 MW Small Hydro at Singrauli Station, 5 MWp Solar Power Project at Dadri Station has been issued.
- Management Approval accorded
 - 100 MW Wind Project in state of Karnataka
 - 5 +1 MWp Solar PV Project at Andaman Island
 - 15 MW Solar Thermal Project at NTPC Anta Station

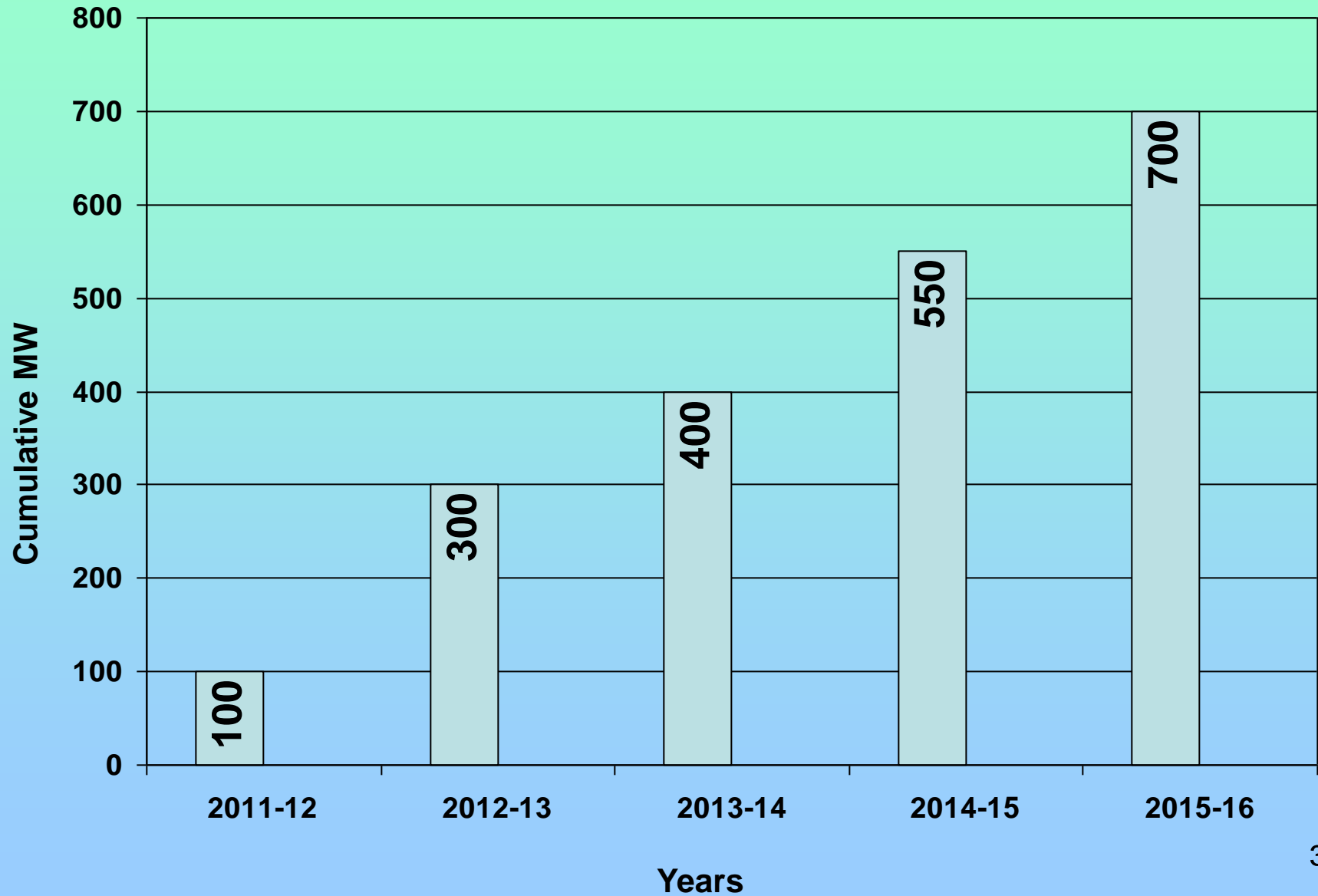
Implementation Methodology of Wind Power



Other Initiatives for Wind Energy

- 300 MW Wind energy Projects in Gujarat
- 400 MW additional Wind Energy Project in Karnataka

Capacity addition plans



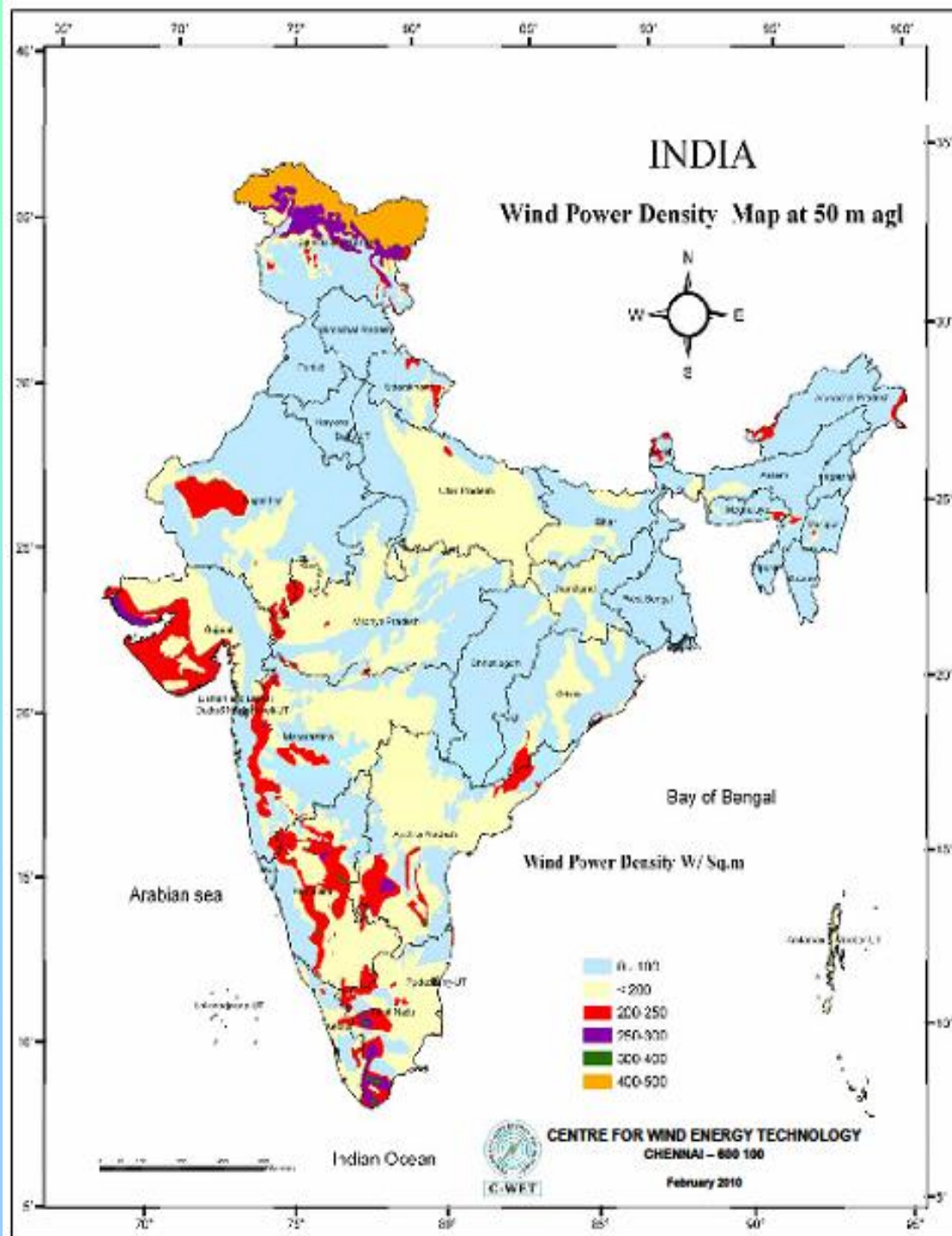
Challenges for NTPC

- Most of the potential land for developing wind power project has been acquired by developers.
- For Virgin land, additional one year is required for Wind Resource Assessment.
- Forest Land requires diversion and requires delineation prior to approval
- Forest diversion process is time consuming.
- Unlike cost plus approach in Conventional project, Generic Tariff has been declared.

Other Initiatives for Solar RE Projects

SI	Project details	Cap.	Technology	DPR
1	NTPC Singrauli	25 MW	Thermal	Dec 2009
2	Banaskantha I (Gujarat)	50 MW	Thermal	Mar 2011
3	Banaskantha II (Gujarat)	50 MW	Thermal	Mar 2012
4	Jodhpur I (Rajasthan)	50 MW	Thermal	Sept 2011
5	Jodhpur II (Rajasthan)	50 MW	Thermal	Sept 2012
6	NTPC sites like Korba, Unchahar, Koldam, Faridabad, Ramagundam	50 MWp	Solar PV	July 2010

thank you



Role MNRE

- To assess wind power potential in the country and to identify suitable sites for wind power projects.
- To set up demonstration wind farm projects with a view to create awareness about new technologies, opening of new sites, creation of infrastructure facilities, leading to development of large-scale wind power projects in the commercial sector.
- Promotional policies for creating conducive environment for private sector investment for development of Wind Power on large scale for grid quality power..
- Research & Development

Vendor Development

- **More than 13 players in the sector**
- **Indigenisation – about 80 to 50%**
- **Export of wind turbines and blades to USA, Europe, South America and Asian countries**
- **Vendor development – parts and components including rotor**
- **blades, gear boxes, yaw components, nacelle cover, raw material for blades being manufactured**

Generation

- Generation free from licensing. (*Section 7*)
- Requirement of TEC for non-hydro generation done away with. (*Section 7*)
- Captive Generation is free from controls. Open access to Captive generating plants subject to availability of transmission facility. (*Section 9*)
- Clearance of CEA for hydro projects required. Necessary due to concern of dam safety and inter-State issues. (*Section 8*)
- Generation from Non-Conventional Sources / Co-generation to be promoted. Minimum percentage of purchase of power from renewables may be prescribed by Regulatory Commissions. (*Sections 61 (h), 86 (1) (e)*)

Country wise Installed Capacity

USA	35159 MW
China	26010 MW
Germany	25777 MW
Spain	19149 MW
India	10925 MW
World	159213 MW

Average Growth Rate 31.7%

Slowdown in growth of wind energy

- Lowering of tax benefits
- Withdrawal of third party sales in some states
- Inadequate power evacuation facilities
- Delay in processing of land allotment
- Various technical problems
- Unstable policy drivers and poor payment of some State Electricity Board

Form 1.2 Form Template for (Wind Power Projects) : Determination of Tariff Component

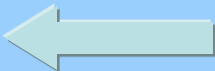
Units Generation	Unit	Year--->	1	2	3	4	5	6	7	8	9	10	11	12	13
Installed Capacity	MW		1	1	1	1	1	1	1	1	1	1	1	1	1
Gross/Net Generation	MU		1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75

Fixed Cost	Unit	Year--->	1	2	3	4	5	6	7	8	9	10	11	12	13
O&M Expenses	Rs Lakh		6.87	7.26	7.68	8.12	8.58	9.08	9.59	10.14	10.72	11.34	11.99	12.67	13.40
Depreciation	Rs Lakh		32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70	6.23	6.23	6.23
Interest on term loan	Rs Lakh		41.59	37.21	32.84	28.46	24.08	19.70	15.32	10.95	6.57	2.19	0.00	0.00	0.00
Interest on working Capital	Rs Lakh		2.58	2.50	2.43	2.35	2.28	2.21	2.14	2.08	2.01	1.95	1.51	1.54	1.58
Return on Equity	Rs Lakh		26.63	26.63	26.63	26.63	26.63	26.63	26.63	26.63	26.63	26.63	33.63	33.63	33.63
Total Fixed Cost	Rs Lakh		110.37	106.31	102.27	98.26	94.27	90.32	86.39	82.49	78.63	74.80	53.35	54.08	54.84

Levallised tariff corresponding to Useful life

Per Unit Cost of Generation	Unit		1	2	3	4	5	6	7	8	9	10	11	12	13
O&M expn	Rs/kWh		0.39	0.41	0.44	0.46	0.49	0.52	0.55	0.58	0.61	0.65	0.68	0.72	0.76
Depreciation	Rs/kWh		1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	0.36	0.36	0.36
Int. on term loan	Rs/kWh		2.37	2.12	1.87	1.62	1.37	1.12	0.87	0.62	0.37	0.12	0.00	0.00	0.00
Int. on working capital	Rs/kWh		0.15	0.14	0.14	0.13	0.13	0.13	0.12	0.12	0.11	0.11	0.09	0.09	0.09
RoE	Rs/kWh		1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.92	1.92	1.92
Total COG	Rs/kWh		6.30	6.07	5.84	5.61	5.38	5.15	4.93	4.71	4.49	4.27	3.05	3.09	3.13

Discount Factor			1	0.862	0.744	0.641	0.553	0.477	0.411	0.354	0.306	0.264	0.227	0.196	0.1
Levallised Tariff	5.07	Rs/Unit													



Indian Electricity Grid Code

- Enacted by CERC on 28th April 2010
- Keeping in view of large scale integration, Wind/Solar Energy Projects have come in preview of scheduling.
- System operator may instruct the solar /wind generator to back down generation on consideration of grid security or safety of any equipment or personnel is endangered
- Strict control of VAR consumption
- The SLDC shall take into account the Wind Energy forecasting to meet the active and reactive power requirement
- Wind Energy Project to provide daily performance report to SLDC
- Scheduling affective from 1.1.2011 wind power generation plants where the sum of generation capacity of 10 MW and connected at the transmission or distribution system 33 KV and and where PPA has not yet been signed

