Wind Power Development in India

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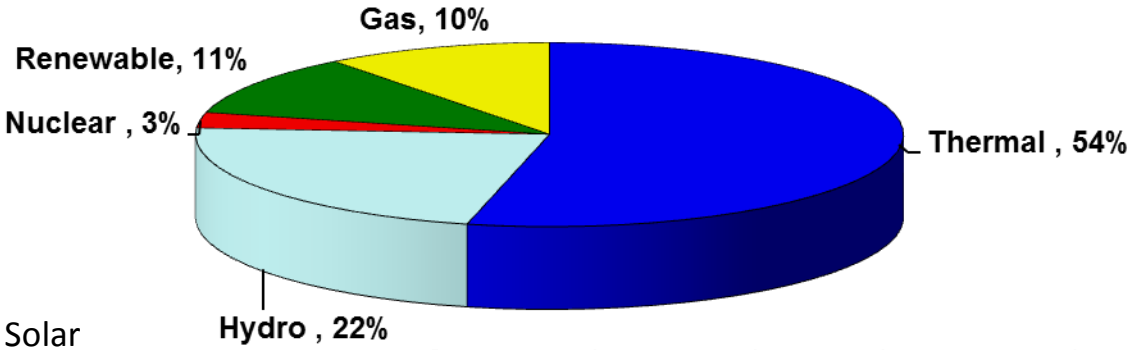
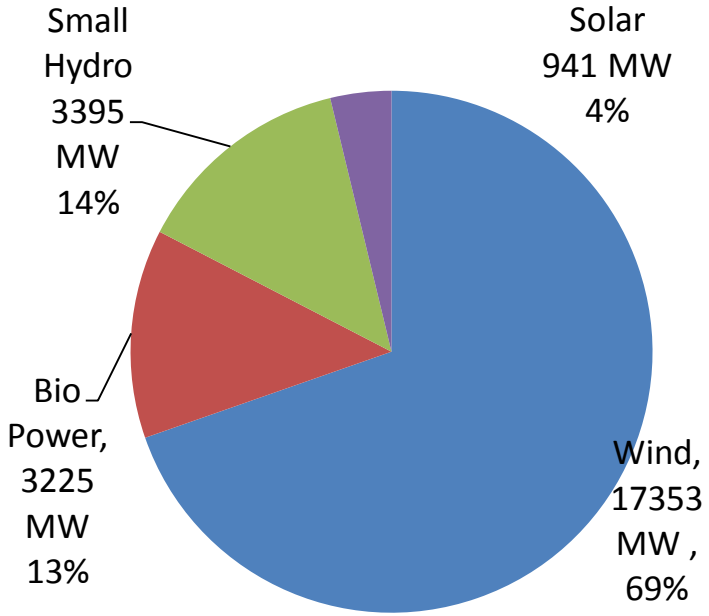
Indian Power Sector at a Glance



Thermal	Hydro	Gas	Renewable	Nuclear
1,06,637	38,848	18,093	24,914	4780

Renewable Energy



- **Total installed capacity : 1,90,592 MW**
- **Renewable contributes 24,914 MW – 13 %**

Renewable Power Potential

S. No.	Resource	Estimated Potential (In $MW_{eq.}$)
1.	Wind Power	1,00,000
2.	Small Hydro Power (up to 25 MW)	15,000
3.	Bio-Power:	
	Agro-Residues	17,000
	Cogeneration - Bagasse	5,000
	Waste to Energy: - Municipal Solid Waste to Energy - Industrial Waste to Energy	 2,600 1,280
	Sub-Total	1,40,880
4	Solar Energy	>100,000 30-50 MW/ sq. km.
	Total	>2,40,880

Power Growth Perspective in India

- Electricity demand growing @ 8% annually
- Capacity addition of about 120,000 MW required in the next 10 years
- Challenge is to meet the energy needs in a sustainable manner

Historical Development in Wind Sector

- Wind Resource Assessment in late 80s
- Infrastructural development-Road, Grid etc.
- DANIDA assisted projects
- Demonstration Projects
- Manpower development
- Establishment of C-WET
- Conducive policy introduction
  - Buy-back
  - Wheeling for captive use
  - Banking
  - Third party sale
  - Accelerated Depreciation
- Manufacturing base
- Public sector investment leveraged private sector participation
- Commercialization

Policy Initiatives

- Income Tax Holiday for 10 years
- Sales tax, excise duty reliefs
- Concessional import duty on specified parts and components
- IREDA and Nationalized Banks provide loan for commercial wind power projects
- Preferential tariff by State Utilities
- Generation Based Incentive
- Accelerated Depreciation – reduced recently

Generation Based Incentive

- To broaden investor base – IPPs and FDIs
- Encourage higher generation/improve CUF
- Framework for transition from investment based incentive to outcome based incentive
- GBI- US 1 cent /kWh subject to max USD 0.13 million /MW
- Duration : > 4 years, and < 10 years
- Total of 1500 MW projects installed under GBI scheme
- Incentive to be continued in 2012 onwards subject to approval of Cabinet

Policy on Tariff Determination

Central Electricity Regulatory Commission (CERC) brought out Tariff Regulations in September, 2009

- Will have a bearing on tariff framework at state levels in the coming period
- Based on assumptions (viz. Capex & PLF) under the regulations, the following is specific investment costs considered for tariff computation

WPD (Watts/ m^2)	**PLF/CUF**	**E.gen (lacs per MW/yr)**	**Specific Investment cost at Rs 5.15 crores per MW (Rs/kWh)**	**Levelised tariff as per CERC regulations & format prescribed (Rs/kWh)**
200-250	20%	17.52	**29.39**	5.60-5.70 (US 12 cents/kWh)
250-300	23%	20.14	25.56	4.90-5.00 (US 11 cents/kWh)
300-400	27%	23.65	21.77	4.15-4.25 (US 9.5 cents/kWh)
>400	30%	26.28	19.59	3.60-3.65 (US 8 cents/kWh)

Wind Development - Progress

- Potential : 49,130 MW
- Achievement so far : 17,350 MW
- 11th Plan Target (2007-11) : 9,000 MW
- Achievement during 11th Plan : 10,250 MW
- Target for 2012-13 (2012-2017) : 2,500 MW
- Target for 12th Plan : 15,000 MW

Technology Status

- Capacity: 250 – 2500kW
- Hub heights: 41– 100 mt.
- Rotor Diameter: 28 – 110 mt.
- Gear and gearless type turbines
- State-of-the-art technology available in India
- 18 major companies with 44 models
- Indigenization – about 80 to 50%

Wind Resource in India

- Winds in India influenced by
  - ➢Strong South-West Summer Monsoon (April-September)
  - ➢Weaker North-East Winter Monsoon
- 1100 wind monitoring stations in 33 States/UTs established.
- Seven handbooks on Wind Energy Resource
- States with high potential
  - • Andhra Pradesh • Gujarat • Karnataka • Kerala
  - • M.P. • Maharashtra • Rajasthan • Tamil Nadu
- 233 sites with annual average wind power density > 200 Watts/m^2
- A Wind Atlas for India using models like WAsP and KAMM has been prepared.

Centre for Wind Energy Technology (C-WET)

Established at Chennai as an autonomous institution of MNRE, Government of India

Objectives

- Technical focal point for wind power development
- Wind Resource Assessment
- Standardization and certification
- Testing facilities as per international standards
- Type approval for wind turbines
- Information, Training & Commercial Services
- Research and Development

Regulatory Framework

- As per National Electricity Act-2003, state regulators to specify a minimum percentage of power to be purchased from renewable sources.
- RPOs have been announced by major states
- As per National Tariff Policy-2005, state regulators to provide preferential tariff for renewable power. Tariff rates offered in the range from Rs. 3.40 to Rs. 5.30/kwh (7-11 US cents/kwh)
- The purchase of renewable power in the near term would be based on competitive bidding within each renewable resource and in the medium term within all renewables. In the long term, however, would need to compete with conventional power.

Forecasting

- Scheduling and forecasting is essential with effect from January 2012,
- For projects that signed PPA after May 2010
- Aggregate capacity 10 MW and above at connection point
- Connected with Grid at 33 KV or above
- One day ahead forecast to be made for each 15 minute block of next day
- Revision allowed 3 hours in advance – max. 8 in a day
- Deviation allowed upto +/- 30%

Other Major Policies

- Renewable Purchase Obligation (RPOs) announced in most states (upto 10%)
- Penalties for non-compliance announced by few states
- Renewable Energy Certificate (REC) mechanism in place.
- RECs to be purchased through bidding process and can be used by Utilities/Distribution Licensees for meeting their RPOs

Off-Shore Wind Power in India

- Cost is major consideration as lot of on-shore potential sites still untapped
- Private developers shown interest to take up off-shore projects.
- Policies to be framed – sea rights, coast guards, security issues, marine life etc.
- Efforts on for establishing specific pockets with good winds
  - to conduct a feasibility study for possible offshore wind turbines, 15 days wind profile study was made during July 2009 by using SODAR (Sound Detection And Ranging) instrument at Dhanuskodi ,Rameshwaram
  - INCOIS carried out preliminary studies and concluded that 6-8 m/s along the coast at 80 m height. Tamilnadu region has winds > 8 m/s for 200 days. Gujarat coast has winds > 8 m/s for about 100 days
  - Project with Riso-DTU for SAR study. Also measurements at 100 m near coast regions. MNRE/C-WET and Risø DTU -mapping the offshore winds near the coast in South India. –
- Task Force constituted for suggesting draft policy framework.

Future Growth

- Target for 12th Five Year Plan Plan (2012-17) is 15000 MW
- Impact of withdrawal of Accelerated Depreciation
- Continuation of GBI scheme
- Repowering
- Large projects in IPP mode
- Forecasting models – has financial bearing
- Re-assessment of wind power potential
- REC mechanism and RPO
- Compete with conventional power


THANK YOU