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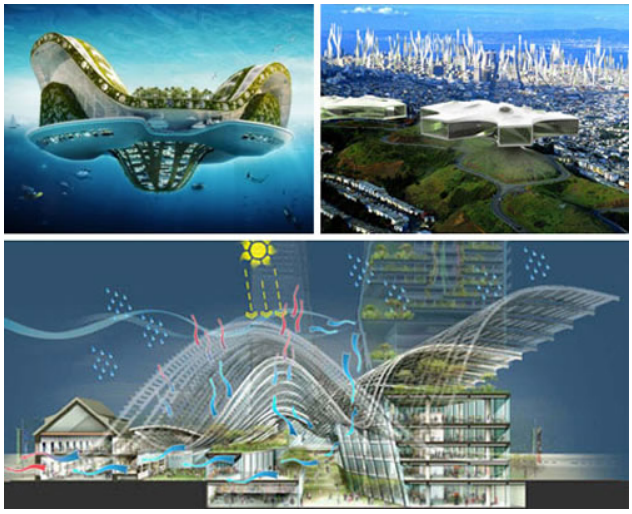
Wind & Biomass Power in India
Profile 2009



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INDIAN WIND & BIOMASS POWER PROGRAMME – AN OVERVIEW

Indian Energy Scenario - The Challenge

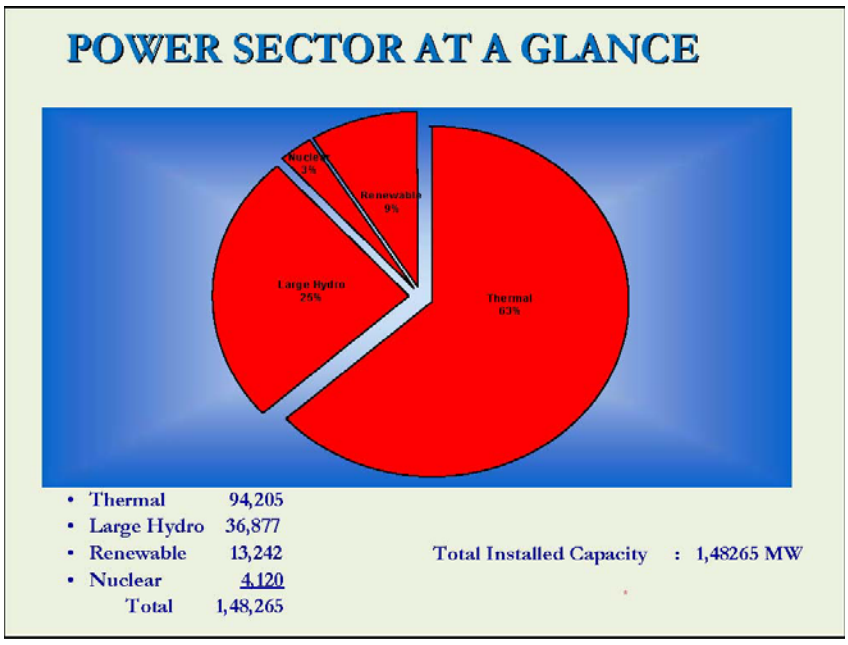
India is facing formidable challenges in meetings its energy needs and providing adequate energy of desired quality in a sustainable manner and at reasonable costs.

India-Some Facts

Total Population - 10.6 billion
Rural Population - 7.0 billion
Total Villages - 610,000
Un-electrified Villages - 125,000
Un-electrified Households - 45% total
56% rural

Indian power scenario

- Total installed capacity 1,48,265 mw
- Gross generation 640 bus
- per capita consumption 620 kwh/ annum
- Energy shortage about 8%
- Peaking shortage about 13-14 %



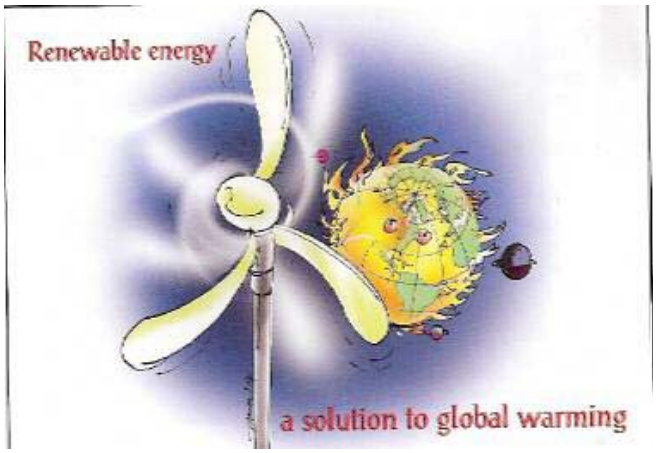
Power Growth Perspective

- Electricity demand growing @ 8% annually
- Capacity addition of about 92,000 MW required in the next 10 years
- Challenge is to meet the energy needs in a sustainable manner

Energy Consumption in India

- Non-commercial energy constitutes over one-third of total energy
- Three-fourths of total energy used in rural areas is in the domestic sector
- Traditional biomass- fuel-wood, animal dung, crop residues account for over 90% of domestic energy used in rural India

Renewable Energy Developments



Renewable Based Grid Interactive Power
Electricity generation from

- Wind
- Small Hydro
- Biomass

These sources are becoming increasingly competitive with some preferential treatment being meted out to them.

Renewable Energy in India - Potential

- Wind Power - 48000 MW
- Small Hydro - 15000 MW
- Biomass Power - 16000 MW
- Bagasse Cogen - 5000 MW
- Solar Energy - 20 MW/Sq Km
- Waste to Energy - 2500 MW

Present Policy Framework for Renewable Power

- Electricity Act (2003)
  1. SERCs to fix certain minimum percentages for purchase of renewable power in the area of each Distribution License.
- National Electricity Policy (2005)
  1. Progressive increase in the share of renewable power
  2. SERCs to fix preferential tariffs for purchase of renewable power as it will take some time before it becomes cost competitive
- Tariff Policy (2006)

1. CERC to lay down guidelines for pricing renewables.

Grid Interactive Renewable Power

- The Government aim is that 10-12 percent of the grid interactive power generation installed capacity should come from renewable by the end of the 11th Plan (2007-2012).
- Deployment of renewable power during the 10th plan has made it the second largest source after conventional power.
- A target of 14,000 MW capacity additions has been planned for the 11th Plan.

WIND ENERGY

Wind Resource in India

- Winds in India influenced by
  1. Strong South-West Summer Monsoon (April-September)
  2. Weaker North-East Winter Monsoon
- 1150 wind monitoring stations in 25 States/UTs established. 50 are in operation.
- Seven handbooks on Wind Energy Resource
- States with high potential - Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu
- 216 sites with annual average wind power density > 200 Watts/m2

Wind Power

- India characterized by low wind regime.
- Cumulative capacity is now 10300 MW.
- Addition of capacity up to 10th Plan was 200 MW/year, which has now reached 1600-1700 MW / year.
- Private Sector investment during the 10th Plan was to the tune of INR 330 billion. Investment levels now at INR 85 billion / year.
- Wind Resource Assessment opened up for Private sector recently.
- Testing & Certification System in place, implemented by Centre for Wind Energy Technology, Chennai.
- Cost plus Tariff offered by States.

WIND RESOURCE IN INDIA

S.No.	State	Gross Potential * (MW)	Achievement upto May 2009 (MW)
1	Andhra Pradesh	8968	122
2	Gujarat	10645	1586
3	Karnataka	11531	1340
4	Kerala	1171	27
5	Madhya Pradesh	1019	213
6	Maharashtra	4584	1961
7	Rajasthan	4858	738
8	Tamil Nadu	5530	4337
9.	Others	255	4
	Total	48561	10328

* Assuming 1% of land availability for wind power generation. • Majority of the potential lies in areas having moderate wind power density ranging from 200 – 300 watt per squire metre.

Wind Power Programme

- Gross potential (>200 W/Sq.mt): 48000 MW
- Potential (>225 Watt per Sq.mt): 30775 MW
- India's Global Position: 5th
- Achievement: 10,242 MW
- Achievement during 10th Plan: 5426 MW
- Achievement during 11th Plan: 3148
- Target 11th Plan: 10,500 MW

4.2 MW Wind Farm Project set up in Chitradurga District, Karnataka

Manufacturing Base & Fiscal Incentives

- About 13 manufacturers of 250 kw- 1650 kw unit capacity
- Production capacity – about 3000 MW annually
- Major components indigenously manufactured
- Available wind turbine models capable of average PLF of 21% in the country
- Import / Export – INR 22 billion / INR 45 billion
- Wind power is supported only through fiscal incentives and no capital subsidy
  1. 80% accelerated deprecation
  2. 10 years tax holiday
  3. Concessional custom and excise duty on specified components

Centre for Wind Energy Technology (C-WET)

- Established in Chennai as an autonomous institution of Government of India (Registered under Societies act of Tamil Nadu) in 1998; operational since 1999.
- Objectives:
  1. Technical focal point for wind power development.
  2. Wind Resource Assessment.
  3. Standardization and certification.
  4. Testing facilities as per international standards.
  5. Type approval for wind turbines.
  6. Information, Training & Commercial Services.
  7. Research & Development.

BIOMASS

Types of Biomass which can be used

- Agricultural Field Residues
- Agro Industrial Residues
- Bagasse
- Wood from plantation
- Waste wood from industrial operations

Potential of Biomass Power

- Biomass based power generation from surplus biomass – 18,000 MW
- Additional power generation through optimum bagasse cogeneration – 5000 MW

Biomass Resource Assessment

Developed a Digital Biomass Resource Atlas for Agro and Forest Residues by Indian Institute of Science, Bangalore with Financial Support from the Ministry. This includes:

- Mapping of biomass from agro residues and updating with existing usages
- Statistical Biomass data analysis.
- Graphical presentation
- Integrating remote sensing data into GIS layers
- Create strategic query response for a variety of users.

Biomass programme Components

The Programme has the following components:

- Biomass based power generation in grid connected mode
- Bagasse based cogeneration for export of surplus power to grid
- Biomass gasification systems for thermal and electrical applications, primarily in off-grid mode, for industry and village electrification

Conversion Technologies

Biomass Technologies Currently Deployed:

- Grid Power
  1. Combustion
  2. Gasification
- Off-grid / Distributed Power
  1. Gasification
- Cogeneration
  1. Bagasse cogeneration in sugar mills
  2. Non-bagasse cogeneration in other industries

Biomass Power / Co-Generation Status

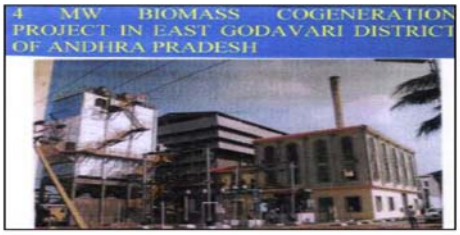
PROGRAMME	COMMISSIONED PROJECTS (MW)	UNDER IMPLEMENTATION PROJECTS (MW)
BAGASSE CO-GENERATION	109 (1048)	118 (1591)
BIOMASS POWER	102 (704)	60 (578)
TOTAL	211 (1752)	178 (2169)

Equipment Manufacturing Status

- Biomass Gasifier
  1. 12 manufacturers – indigenous
  2. Unit size – from a few KW-1 MW
  3. Annual Production capacity – 10 MW
  4. Commercialized 100% producer gas and biogas engines with enhanced reliability
  5. Gas cleaning / scrubbing systems Developed

Promotional Incentives for Biomass Projects

- Accelerated Depreciation 80% in first year (Boiler and Turbine).
- Income Tax Holiday under Section 80 1A for 10 years.
- Concessional import duty; excise duty exemptions on equipments & components required for initial setting of the project.
- Sales tax exemption in some states.
- IREDA Provide Loan For Biomass Power / Cogenration Projects.
- Capital subsidy.
- Preferential Tariff in 14 States.


4 MW BIOMASS COGENERATION
PROJECT IN EAST GODAVARI DISTRICT
OF ANDHRA PRADESH


16.7 MW Bagasse Co-generation
Project in A.P. using 87 ata Boiler


6 MW BIOMASS POWER PROJECT IN A.P.

22 MW COGENERATION PROJECT, NAGPUR DISTRICT, MAHARASHTRA

24 MW BAGGASE COGENERATION POWER PROJECT, DAVENGERE DISTRICT, KARNATAKA