

Renewable Energy in India

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**Changing Energy Scenario in India and its Environmental
Implications**

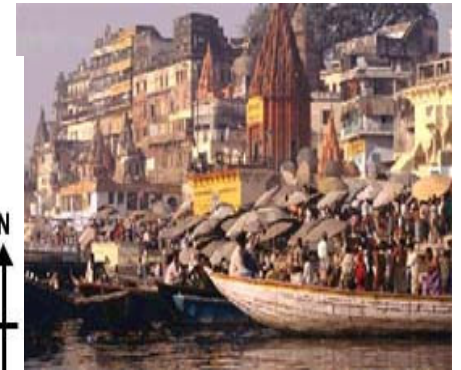
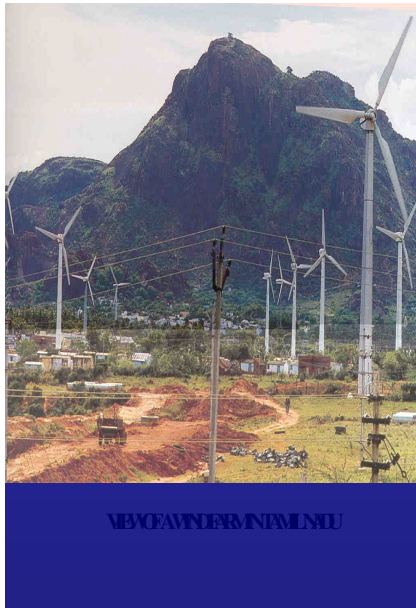
23 January 2009, Delhi



Mother Earth -- Our Home

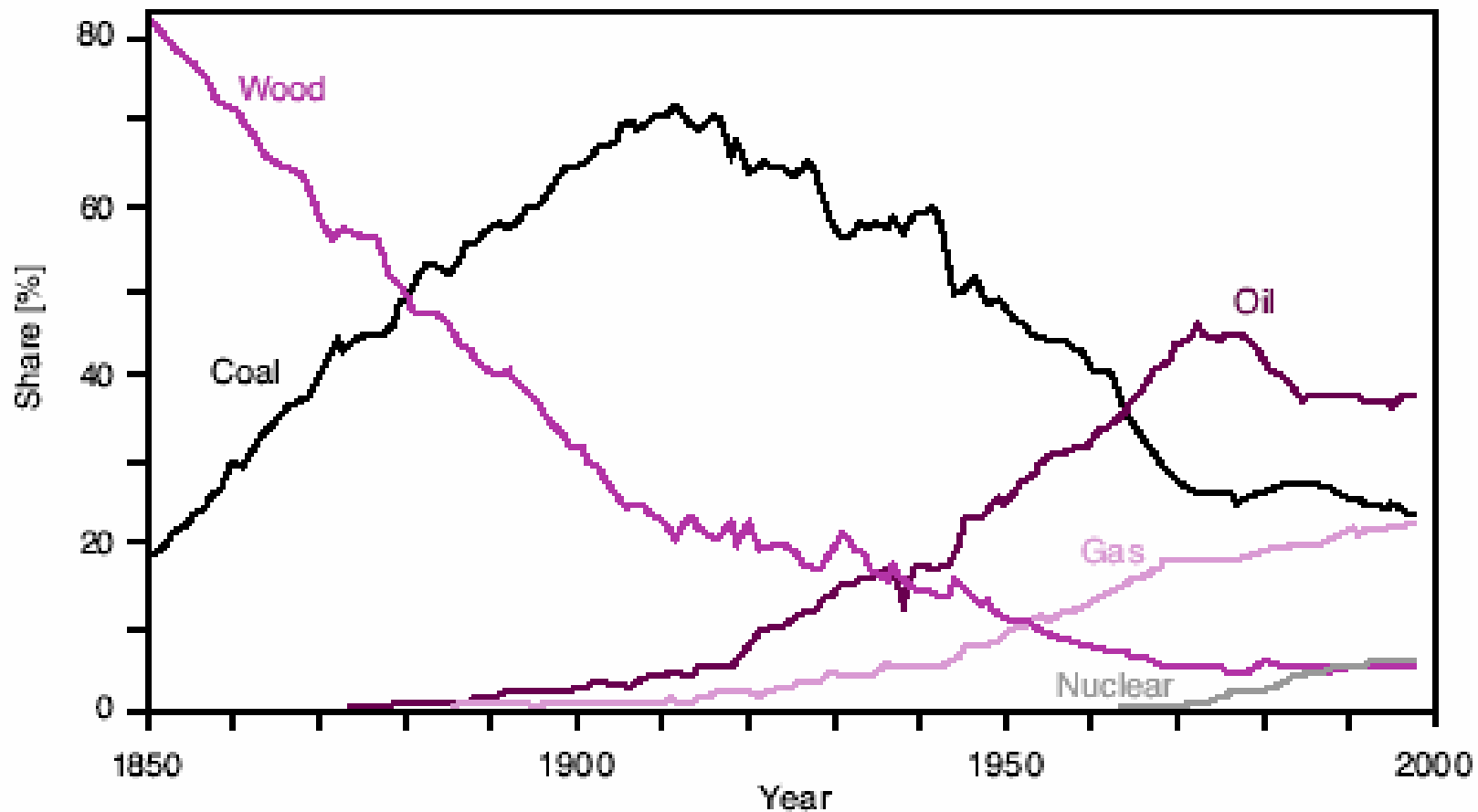
It is has water, oxygen and a hospitable climate

Population >1 billion



The Challenge: Sustainable Energy

Energy Consumption Trends (The Past)



Energy in India

- **Total Primary Energy Supply: 565.93 Mtoe**
(4.8 % of World)
- **Electricity generation: 557.97 TWh**
(3.2% of World)
- **Around 30% of Primary Energy Supply sourced from Biomass**
- **Gap in peak electricity demand and supply**

Energy Demand Projections (in Mtoe)

Year	Mtoe
2011-12	677
2016-17	861
2021-22	1,082
2026-27	1,417
2031-32	1,818

For 8% GDP growth

Electricity Demand Projections

Year	Electricity (billion kWhr)	Installed Capacity (MW)
2011-12	1,097	219,992
2016-17	1,524	305,623
2021-22	2,118	424,744
2026-27	2,866	574,748
2031-32	3,880	778,095

For 8% GDP growth

Commercial Energy Imports for 8 percent Growth - year 2031-32

Fuel	Range of Requirement in Scenarios	Assumed Domestic Production	Range of Imports	Import (Percent)
Oil (Mt)	350-486	35	315-451	90-93
Natural Gas (Mtoe)	100-197	100	0-97	0-49
Coal (Mtoe)	632-1022	560	72-462	11-45
Total Commercial Primary Energy	1351-1702	—	387-1,010	29-59

Source: Energy Policy Report, Planning Commission, India

India Needs More Energy for its Development



Renewable Energy Drivers

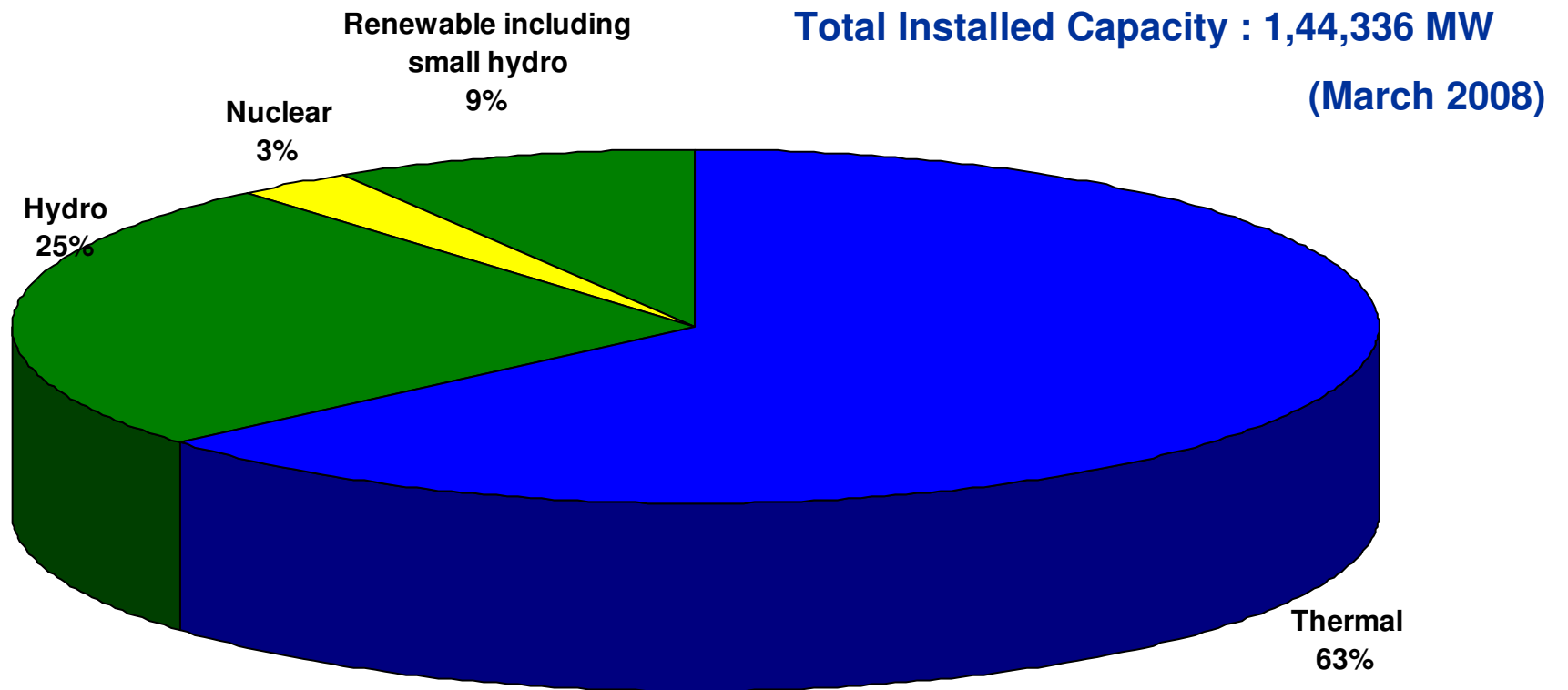
Rising energy demand: 6-7% year

Energy security : Net Import: 134.83 Mtoe
(Dependency on imported oil increasing)

Access to energy: Around 45 % household are still out of basic electricity services

Climate change: Although India's share is only 4.5% of global emissions (1.1tCO₂/capita –much less than world average of 4.28 t CO₂/capita)


Indian Power Sector



- Thermal 91,907
- Hydro 35,909
- Renewable 12,400
- Nuclear 4,120

Renewable Energy for Decentralized Application

We initiated our efforts in early 80s

- There are limitations
 - Different levels of success
 - Convenience and affordability major issues
 - Mainly subsidy driven
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Renewable Power : Proposal for 2007-2012

Renewable energy source	Proposed Target (MW)
Wind	10,500
Small Hydro (upto 25 MW)	1,400
Biomass & Cogeneration	1,700
Urban & Industrial Wastes	400
Total	14,000

Distributed Renewable Power & Other Applications (2007-2012)

Renewable energy source	Proposed Targets
Renewable Power Stand Alone Systems (Solar, wind, small hydro biomass etc)	1,000 MW
Solar Thermal Systems	5 million square metre Collector area
Family Type Biogas Plants	2 million plants
Remote Village Electrification	10,000 villages

FOCUS AREAS

- Grid-interactive renewable electricity generation systems
 - Renewable Energy for Urban, Industrial & Commercial Applications
 - Renewable Energy for Rural Applications
 - Research, Design & Development in New & Renewable Energy Generation and Applications
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Electricity Act 2003 and National Electricity Policy

- EA 2003
 - Section 86 (1) (e): promotion of co-generation and renewables through grid connectivity, sale of electricity to any person and by specifying minimum percentages for renewables
 - Section 61 (h): tariff determination for renewables
- NEP
 - 5.2.20 - Exploit feasible Renewable power potential, encourage private participation
 - 5.12.1 - Renewables being most environmentally friendly must be given adequate promotional measures. Try and reduce capital costs and promote competition
 - 5.12.2 - Progressively share of renewables would need to be increased

Renewable Power-Tariff Range

(in Rs. / kWh)

Wind Power

2.90 -4.08
(Tamil Nadu - Haryana)

Biomass Power

2.63- 4.00
(Andhra Pradesh- Haryana)

Small Hydro Power

2.25-3.66
(Madhya Pradesh - Punjab)



Energy for Rural Areas

Non-commercial fuel such as agro waste, fuel wood, dung cake etc. constitute around 30% of the total primary energy supply. This is mainly used for cooking purposes by over 84% of the rural population

Lighting

Around 45% rural households in the country still use kerosene as primary source of lighting despite of having grid in the most of these areas

Renewables are the best possible option for remote villages

Cooking

LPG connection for providing energy in the rural areas is very limited.


In view of the significant cattle population in the country biogas has a potential to meet cooking energy needs of around 25% of the rural population



Biogas: Socio-economic benefits

Approximate number of functional plants:	1.9 million
Annual fuel wood saving :	4.56 million tonne
Annual LPG consumption avoided: (normative consumption of 1LPG cylinder/month) (million cylinder)	22.8 million cylinder
Annual LPG subsidy avoided: (@Rs150/cylinder/month)	Rs 410.4 million
Enriched manure available for agriculture	22.9 million tonne
<u>In Addition:-</u>	
in time of collection and making of fuel:	2 Hrs
Reduced cooking time:	1 Hr
Slurry from biogas plant :	300 kg nitrogen equivalent/year
Employment generation :	30 person days per plant

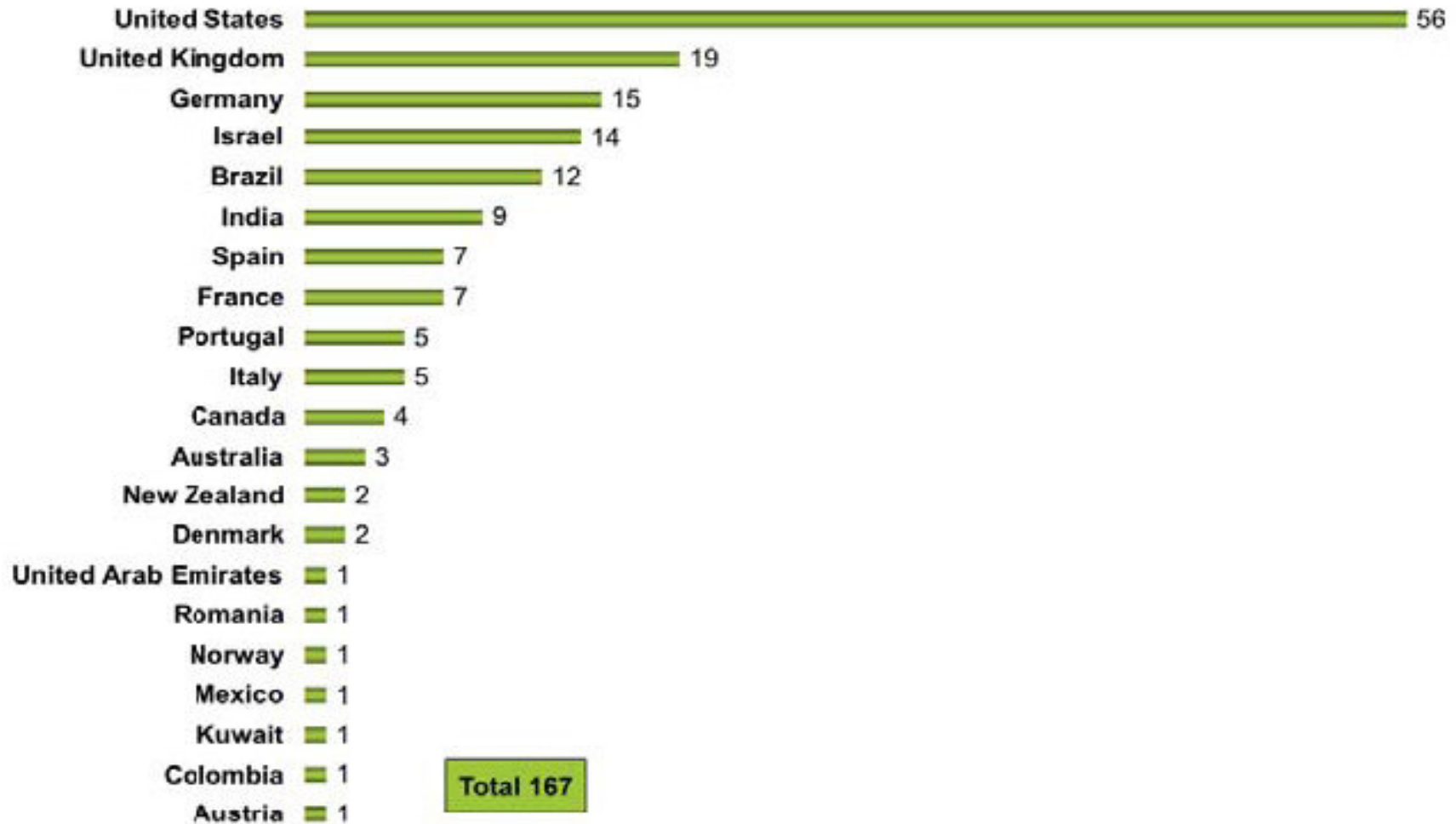
Investment in Renewables in India

- **India's Renewable energy programme is primarily private sector driven**
 - **The annual turnover of the renewable energy industry, including the power generating technologies for wind and other sources, has reached a level of over US\$ 10 billion**
 - **With increased focus on renewables market is expected to grow significantly**
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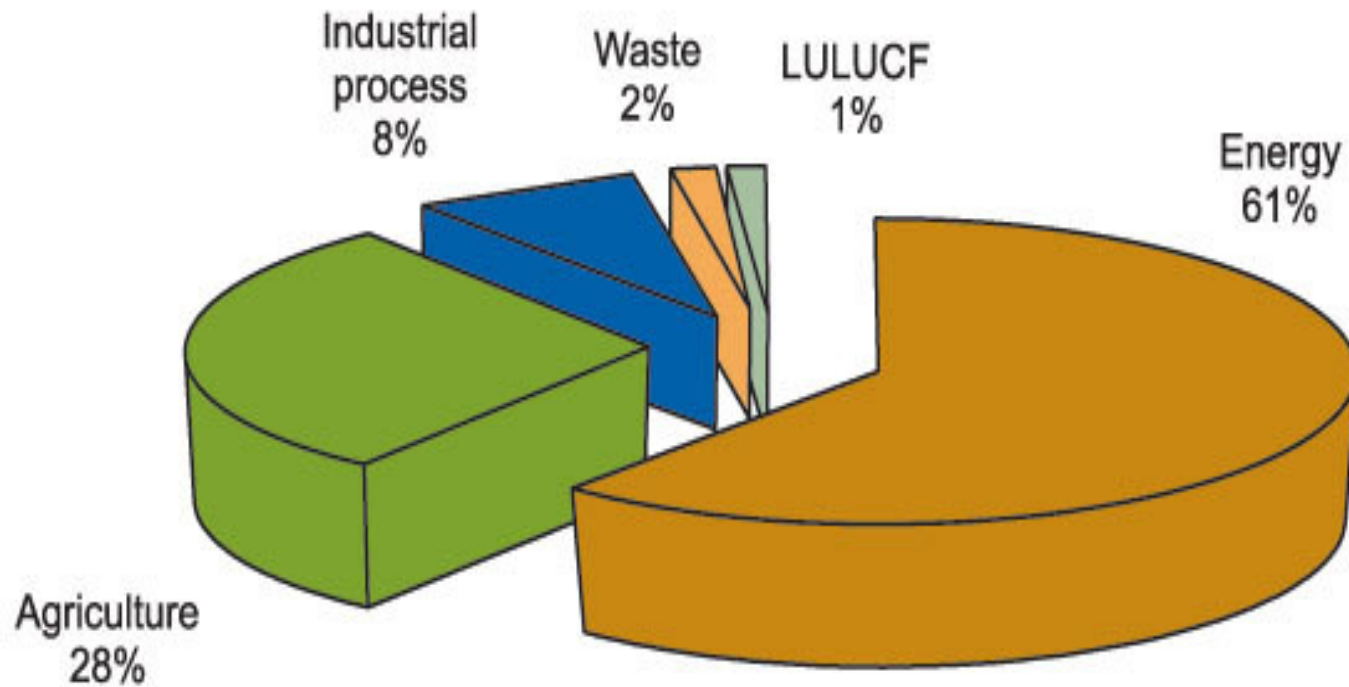
Investment in Renewables in India



Clean Energy Incubators 2007



Sectoral Distribution of GHG emissions




Emissions in terms of CO₂ equivalent

CDM Role

Impact on wind sector development

- **No primary trigger of investment decisions**
- **Interest and awareness among business stakeholders – ICING ON CAKE**
- **Marketing strategy (competitive edge) for manufacturers and GREEN IMAGE for industrial investors**

Impact on biomass sector development

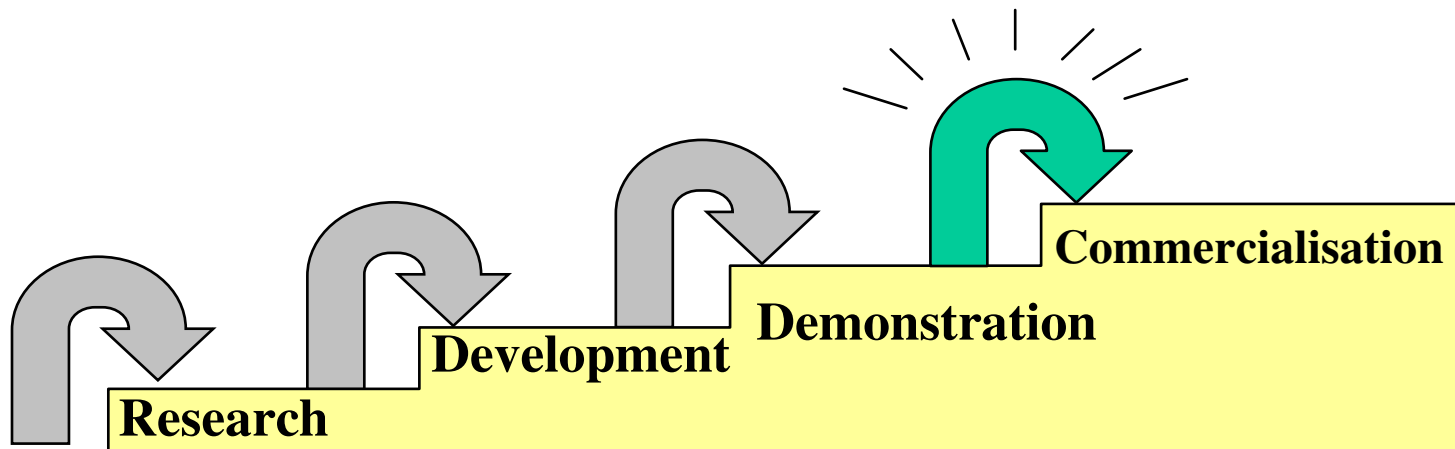
- **Replication effect within similar industry groups**
 - **Main considerations as of fuel supply issues; captive power generation; additional income; tax benefits**
 - **CDM gained more importance as risk mitigator as biomass prices hike and sugar prices decline**
 - **CER potential trigger secondary/complementary activities**
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National Action Plan on Climate Change

- **Released in June 2008**
- **Focuses on the principle of equity**
- **Welcomes international cooperation for R&D, sharing and transfer of technologies**
- **Outlines eight national missions**
- **National Solar Mission: To significantly increase the share of solar energy in the total energy mix while recognizing the need to expand the scope of other renewable and non-fossil options such as nuclear energy, wind energy and biomass.**

R&D in Renewables

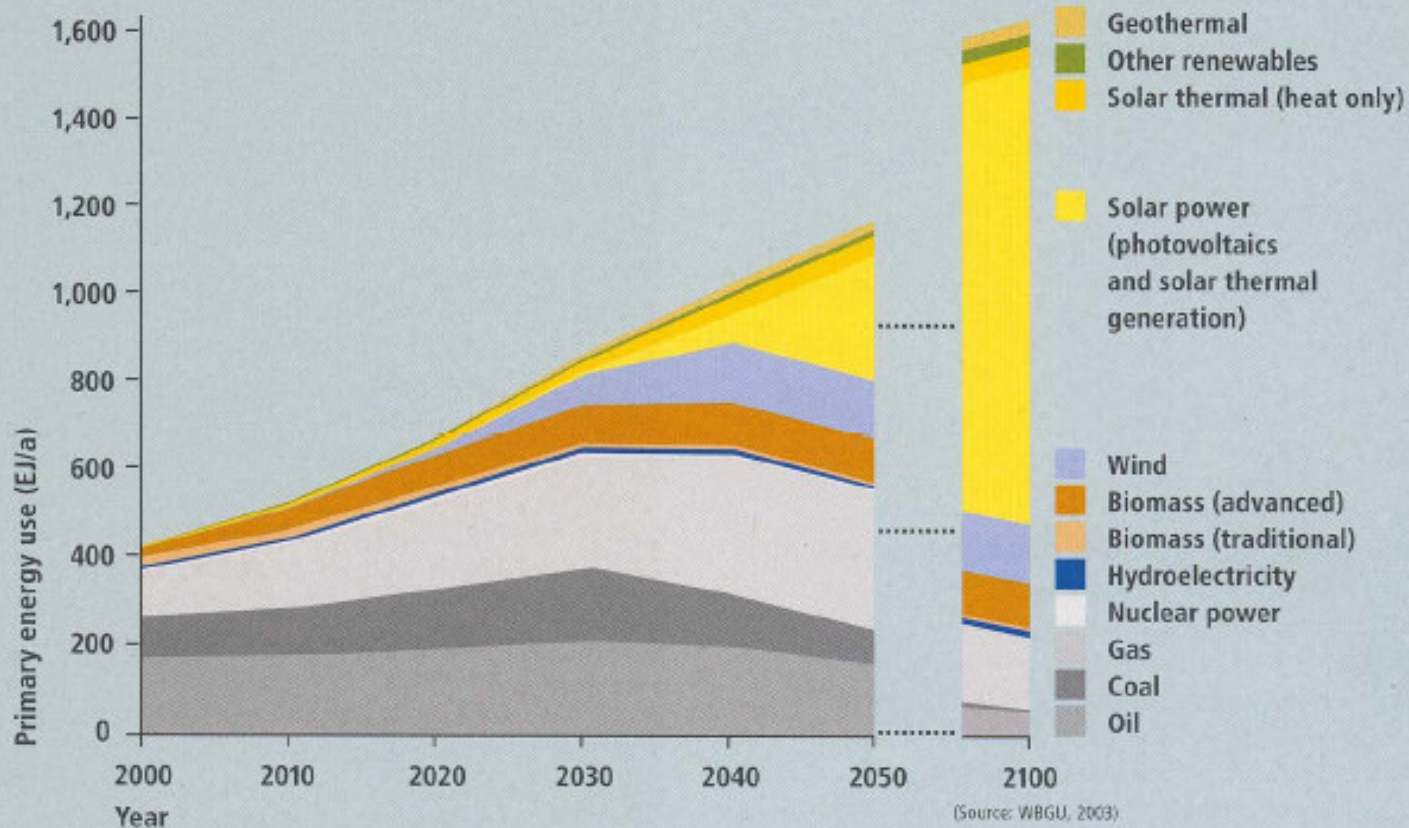
Technologies are at different Stages of Development



Renewables in New World Order

- Renewables are already seen as an important option for sustainable world with carbon-free energy economy
- Extensive R&D efforts are in progress to significantly reduce the cost of renewable systems
- India is one the major countries that have put in place major policies for R&D and deployment of renewables
- Renewables apart from as energy solutions are also seen as energy access vehicle-that ultimately leads to sustainable development.

A bright future for renewables



With appropriate promotion, renewable energies could supply half of the world's energy needs by 2050 and even more than 85% within the next 100 years. (Source: WBGU, 2003)

Thank You

