India’s need for power self sufficiency
A Supply and Demand Side Approach

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Theme of this presentation

- Electric power is a priority item for the PM Dr. Manmohan Singh
- India has many qualified experts and policy makers to help achieve this goal
- IEEE can offer assistance in bringing ideas about best practices from other countries, and help identify challenges and opportunities relevant to India
## Installed Capacity (end of Aug 2008)

<table>
<thead>
<tr>
<th>Type</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>77,199</td>
</tr>
<tr>
<td>Gas</td>
<td>14,716</td>
</tr>
<tr>
<td>Diesel</td>
<td>1,200</td>
</tr>
<tr>
<td>Nuclear</td>
<td>4,120</td>
</tr>
<tr>
<td>Hydro</td>
<td>36,198</td>
</tr>
<tr>
<td>Renewables</td>
<td>12,195</td>
</tr>
<tr>
<td>Total</td>
<td>145,627</td>
</tr>
</tbody>
</table>

Source: [http://www.cea.nic.in](http://www.cea.nic.in)

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## Capacity Addition Target in the Public Sector (during 11th Plan - until March 2012)

- Hydro: 15,627 MW
- Thermal: 59,693 MW
- Nuclear: 3,380 MW
- Total: 78,700 MW

This is 54% of existing capacity of 145,627 MW.

*Solar and wind are not mentioned*

In 2007 China added 100,000 MW of new capacity
In 2006 China added 75,000 MW of new capacity

Source: [http://www.cea.nic.in](http://www.cea.nic.in)

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Capacity Addition Target/Achievement
(Apr 07 - Aug 08)

Capacity Addition Target in the Public Sector
(during 10th Plan - Apr 2002-Mar 2007)

- Thermal: 25,417 MW
- Hydro: 14,393 MW
- Nuclear: 1,300 MW
- Total: 41,110 MW

Source: http://www.cea.nic.in

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Challenges Facing the US Electric Power Industry

- Current US electric power generation capacity is 1,022,000 MW (Average: 3 kW/person)
- By 2030 it is expected to grow to about 1,400,000 MW
- With retirements this means over 500 new 1,000 MW power plants
- Where can these be located?
- Can we find enough water to run these?
The Prospective Generation Capacity of China in 2020 and 2030-2050

- The total generation capacity of China in 2006 was 622,000 MW and the per capita value was 0.47kW.

- The total generation capacity in 2020 is expected to be around 1,500,000 MW and the per capita generation capacity 1kW.

- In 2030-2050 timeframe, when per capita generation capacity reach will reach 1.5 kW, the total generation capacity is expected to be 2,400,000 MW (1.6 Billion people the maximum in China). Needs to reduce dependency on Coal from 80% to 40%.

Energy Map of India

Source: http://www.globalsecurity.org/wmd/world/india/images/india-energy.gif
Energy Map of India by Region
(End of Aug 2008)

- **Northern**
  - Generation: 38.5 GW
  - Peak deficit: 9.5%
  - Energy deficit: 8.0%

- **Western**
  - Generation: 44.8 GW
  - Peak deficit: 20.5%
  - Energy deficit: 14.4%

- **Southern**
  - Generation: 39.7 GW
  - Peak deficit: 13%
  - Energy deficit: 10.2%

- **Eastern**
  - Generation: 20.1 GW
  - Peak deficit: 4.9%
  - Energy deficit: 6.2%

- **N. Eastern**
  - Generation: 2.4 GW
  - Peak deficit: 21.3%
  - Energy deficit: 15.7%

Source: [http://www.cea.nic.in](http://www.cea.nic.in)
Every house in India will be connected to the grid by 2012.

- 1/3 of the population is not connected today.
- Expanding the distribution network to remote rural customers is not cost effective from the viewpoints of return on investment and maintenance.
- An alternative must be found.
### Challenges that a Democracy faces

- 18,200 MW Three Gorges Dam in China
- 1450 MW Sardar Sarovar Dam in India

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### Three Gorges Dam in China

![Three Gorges Dam in China](image)
Sardar Sarovar Dam, India

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www.internationalrivers.org

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www.narmada.org
Small-Hydro

Grameen Shakit Projects in Bangladesh
**Village Level Solar Lighting**

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What is the Challenge?

- It will be difficult to keep on building large central station power plants in response to traditional demand projections.
- We need to start thinking about what help we can get from energy conservation and renewable energy.
- Renewable energy can not just be an afterthought. It needs to be a part of the plans for meeting the load.
### Policy Issues

<table>
<thead>
<tr>
<th>Diversification</th>
<th>Energy Efficiency</th>
<th>Renewable Portfolio Standards</th>
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</thead>
</table>

### Diversification

- Coal
- Natural Gas
- Nuclear
- Renewables
**Energy Efficiency**

Appliance Efficiency Standards  
Vehicle Fuel Efficiency Standards  
Buy Down Programs to reduce cost to the end-user

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**Renewable Portfolio Standards**

United States Energy Independence and Security Act of 2007 requires that fossil-fuel energy use in new federal buildings and major renovations be reduced 55% by 2010 – relative to 2003 levels – and be eliminated (100% reduction) by 2030.
Conclusions

- The following could make renewable energy technologies become more competitive with fossil fuel resources:
  - National policy, i.e. tax incentives, subsidies
  - Further price reduction
  - Public education campaigns, user trainings
  - Carbon credits

- A higher penetration of renewable energy sources could play a major role in reducing fossil fuel use.

Thank You!

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