The Energy and Resources Institute

Choosing the Right Energy Mix

Challenges & Responses

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Outline of Presentation

- Sustainability concerns on the energy front
- Overview of energy scenario in India – Present status & future projections
- Strategies for fuel choices & energy planning and associated issues

Sustainability Concerns on Energy Front

- Demand for commercial energy increasing at a fast pace (especially in fast developing economies)
- Concerns of fuel availability & fuel price fluctuations
- Growing carbon footprint
- Need for improved access, quality & reliability of supply
- Efficiency in energy conversion, delivery & utilization
- Access to technology
- Physical & financial constraints in supply augmentation
- Social impacts of resource development

Need for country specific strategies depending on the demand growth & pattern, fuel availability, GHG reduction targets, social needs, geo-political issues, etc

Snapshot of the Current Scenario in India

- Consumption of commercial energy growing fast
- Fuels used:
  - Most dominant : coal (> 50%), followed by oil (Bulk petroleum products in transport sector).
  - High import dependency: Oil ~ 86%; Coal:~12%
  - Power sector: coal 70%, hydro, natural gas, nuclear, RE sources (wind, solar, biomass, waste, etc), hydro import from Bhutan/ Nepal
- Increasing concerns of GHG emissions, shortages (in quantity & quality) and social impacts of resource development
- Lack access to clean energy for over 400 m rural population
- Socio-political pressures in energy pricing

Looking Ahead

- Energy demand likely to increase over 4- fold by 2031
- Need for substantial augmentation of supply infrastructure
- Concerns of domestic fuel availability
- Growing import dependency (Coal 80% in BAU scenario)
- Managing environmental & social concerns
- Ensuring energy access to all at affordable prices
- Increasing efficiencies in energy conversion, supply & use
- Improving financial viability of utilities
- Geo-political issues associated with fuel & energy imports

What are We Trying to Do?

- Diversification of fuel basket
- Maximize domestic production
- Focus on R&D and technology transfer
- Strategic import/ acquisition of fuel & creation of reserves
- Optimal utilization of available resources considering both supply side & demand side options)
- Aggressive promotion of energy efficiency & conservation
- Regulatory & pricing reforms
- Regional cooperation in energy trade
- Integrated energy policy

Diversification of Fuel Basket

- Look out for all fuel options coal, hydro, nuclear, gas, various RE options

Electricity Act 2003: Central government to prepare National Electricity Policy in consultation with state governments for development of the power system based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and RE sources

- Main considerations: Fuel availability, energy security, fuel prices, environmental & social impacts, access, etc
- Special focus on RE resources
- scenario based studies an effective tool

The RE Power Option

Particulars	Est. potential (MW)	Status (MW) (Aug. 2011)
Wind power	48561	14989
Bio power (agro residues and plantations)	18000	1083.6
Bagasse Co-gen	5000	1779.03
SHP (< 25 MW)	15000	3153.93
Energy recovery from waste	3600	73.66
Solar power	–	46.16
Total	90161	21125.38

Drivers:

Mitigation of GHG emissions, improving access, policy & regulatory push, technology developments, etc

Concerns:

Relative cost, infirm nature, technology gaps, etc

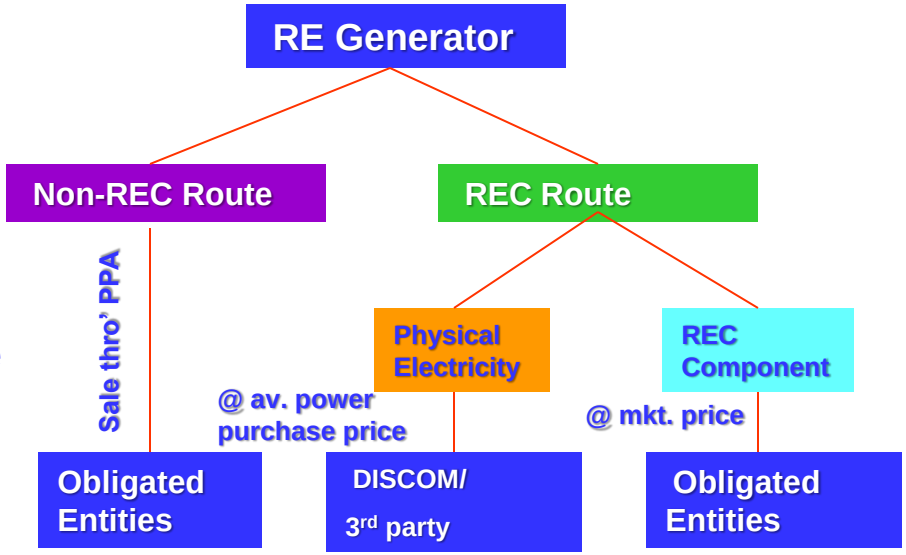
Feasibility of other resources being studied:

Off-shore wind, geo-thermal, tidal, etc

Policy & Regulatory Push

- Preferential tariffs
- Renewable Energy Purchase Obligation (RPO)
- Enabling provisions for GRID connectivity
- National Solar Mission. Target (2022): 20000 MW grid connected, 2000 MW off-grid, solar collectors: 20 million sq meters
- **Special focus on R&D**
- Renewable Energy Credit scheme

  - Market based certificates tradable across utilities/ States
  - Option for RE gen: sell electricity & REC (untied capacity) or separately
  - RPO compliance: 1 REC = 1 MU
  - Separate category of Solar REC
  - Provision of regulatory charge to enforce compliance of RPO
  - Operational framework in position



The Coal & Gas Options

Coal option

- **Main source in foreseeable future; share may come down**
- **Areas of concern:**

  Resource availability, environmental impacts, price fluctuations, inefficiencies in production & utilization, etc
- **Responses:**

  Focus on reassessment of utilizable resources, adoption of clean coal technologies and improved conversion technologies

Gas option

- **Distinct advantages over coal: Environmental impacts, better thermo-dynamic efficiency, operational flexibility, etc)**
- **Areas of concern : Availability, pricing, sourcing**
- **Responses: Special focus on exploration, optimum gas production from discovered fields & fuel transportation networks priorities in allocation, rationalization of prices, long term LNG contracts, etc**

The Hydro Option

- Rich exploitable potential; still a large part to be exploited
- Totally renewable & clean form of energy
- Several other intrinsic advantages

  (Emission reduction, operational flexibility, multiple benefits)
- Areas of Concern:
  - Environmental & social impacts
  - Climate change induced in hydro-meterological changes
- Responses:
  - Reassessment of potential (using advanced investigation tools & taking into account impact of climate change induced hydrology, etc)
  - Planning considering changes in hydrology & geo-political aspects
  - Structured sustainability assessment exercises
  - Special focus on R&R and federalism issues

The Nuclear Option

- **Current status:**
  - **~ 4800 MWe (PHWR indigenous) in operation**
  - **2*1000 MWe (VVER – Russia), 500 MWe (FBR indigenous) U/C**
- **Program of the future**
  - **- 20/ 30,000 Mwe (2020); ~ 60,000 MWe (2032) *as per DAE***
- **Areas of concern**
  - **Mining of uranium & fuel availability**
  - **Land acquisition & environmental issues**
  - **Adequacy of safety (especially post Fukushima)**
- **Responses:**
  - **NSG exemptions and IAEA safeguards in place**
  - **JV with Areva and NPCIL for 6*1000 MWe for implementation**
  - **Import of high capacity reactors**
  - **Revisiting safety standards**
  - **Seeking public acceptance**

Other Options

Strategic imports

- Drivers: Depleting domestic resources, need for maintaining strategic reserves
- Concerns: political stability of countries & diplomatic relationships, disruption risks in transportation route, etc
- Mixed results

Regional cooperation

- Already happening; bright future prospects
- Concerns: Harmonization of regulatory policies & trading framework, mutual trust, etc
- Efforts ongoing (bilateral efforts, regional forums, funding agencies)

New fuel sources/ approaches

- Shale gas, geo-thermal, ocean energy, in-situ gasification, etc
- Feasibility studies in progress

Concluding Note

- ✓ Choosing the right energy mix key to sustainable development
- ✓ Country specific strategies considering techno-economic viability (including social & environmental costs as well), security & safety aspects and geo-political aspects
- ✓ International cooperation & technology transfer a key facilitator

Terima kasih!

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