Modeling of Energy Sector in India

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Contents

• Brief historical perspective
• Policy environment
• Tools
• Bottom-up model development
• A projection for energy consumption
• Scenarios summary for 2050
• Status of energy modeling in India
• Forward path with ETSAP
**Brief historical perspective**

- Economic growth rising rapidly in recent years
  - Avg. 8.1% (2003/04-2005/06), Rapid growth of Services sector
- Energy consumption growth more than 5%pa
- Per capita levels much below the world average

![Graphs showing percent of world total consumption and average per capita consumption over years from 1970 to 2000.]

**High optimism for unprecedented economic growth and challenges for matching energy requirements**

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**Policy environment**

- Economic reforms (~ 15 years now)
  - Broad fiscal discipline and inflation control
- Electricity sector reforms
  - Restructuring of public sector utilities, deregulation
  - National Electricity Policy, Electricity Conservation Act
- Oil & Gas and Petroleum sector reforms
  - Dismantling of administered prices, Reforms in Exploration policy
  - Changes in tax structure for petroleum products
- Nuclear and renewables
  - Independent programmes of DAE and MNES resp., central and state government support
- International agreements
  - Very active in championing causes of international importance

**Broadly conducive and getting better**
Different models suit different needs…

Tools for energy sector policy analyses (contd.)

• Models are useful tools to aid policy articulation
• Top-down models combined with bottom-up models are capable of generating information of particular interest in this respect
• Current models reflect developing country dynamics inadequately, particularly the top-down models

What we need:
1. develop models that adequately represent the reality,
2. modeling to provide insights and identify optimal response actions for addressing the key policy Qs.

…a balanced development is required
Development of Bottom-up Model

- State-of-the-art tool has been developed for analyzing a variety of policy options in energy sector
- Multi-sector, multi-period cost minimization linear programming model
- 5 End-Use sectors: Agriculture, Residential, Commercial, Industry and Transport
- Detailed modeling of technologies in Electricity, Refining and Transport

India’s Energy System modeled in an integrated framework

Commercial Energy Demand in Base case

Primary energy demand increases 4x by 2030 & 9x by 2050
Energy intensity declines rapidly
Significant increase in energy imports in all scenarios
Scenarios summary (2050)

Flexibility to study a variety of scenarios

Status of energy modeling in India

- Good but dispersed modeling capabilities
- Good general databases, weak model relevant databases
- Largely scientist/analysts driven policy modeling agenda
- Short-term and fragmented policy perspectives
- Personalized and not institutionalized effort

What is needed:
- Detailed national models
- Global and Long-term modeling perspective
- Funding and forums
Forward path with ETSAP

- Review India components in global models
- Participation in global/regional modeling projects
- Informal exchange of ideas/data with network participants

Thank You