How can India achieve a low carbon society with sustainable development?

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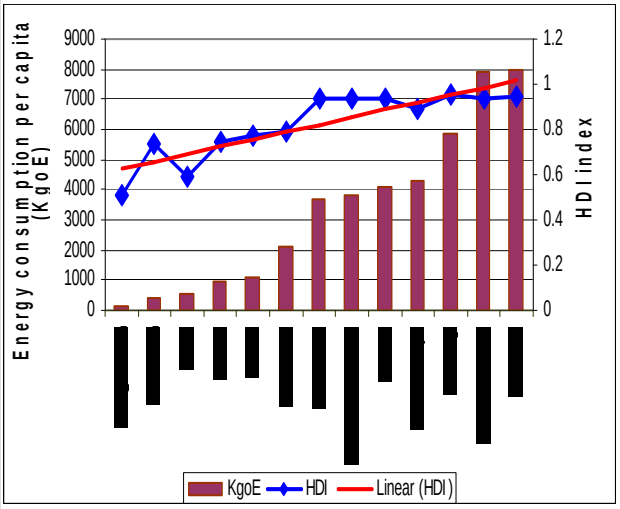
India's Current Energy Status

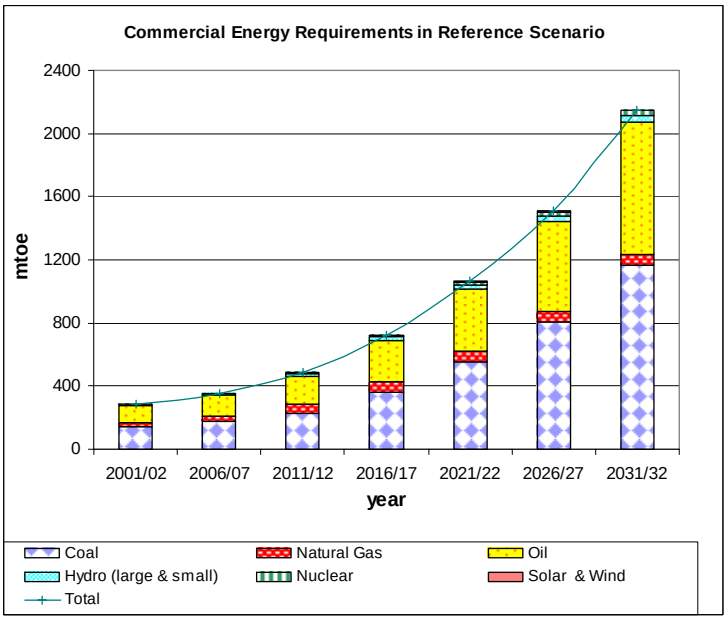
- Installed generating capacity ~ 150,000 MW
- Per capita consumption of electricity of 733 units
  - North America: 13994, Europe: 6009, World average: 2596 (2005 data)
- Suffering from huge shortages (2008/09) of
  - ~ 11% in energy terms
  - ~ 12% in peak energy
- Over 400 million people with no access to electricity
- 90% of rural India dependent on traditional fuels for cooking

Increase in commercial energy needs – an inevitability !



- Huge population with unmet demands
- Developmental goals and energy access to all
- High targets for economic growth
- How much?
  - Population in 2031/32 of 1.4 billion
  - Rate of Growth of GDP of 8% per annum
  - Structural shifts towards services
  - Energy to All
  - Lifestyle improvements

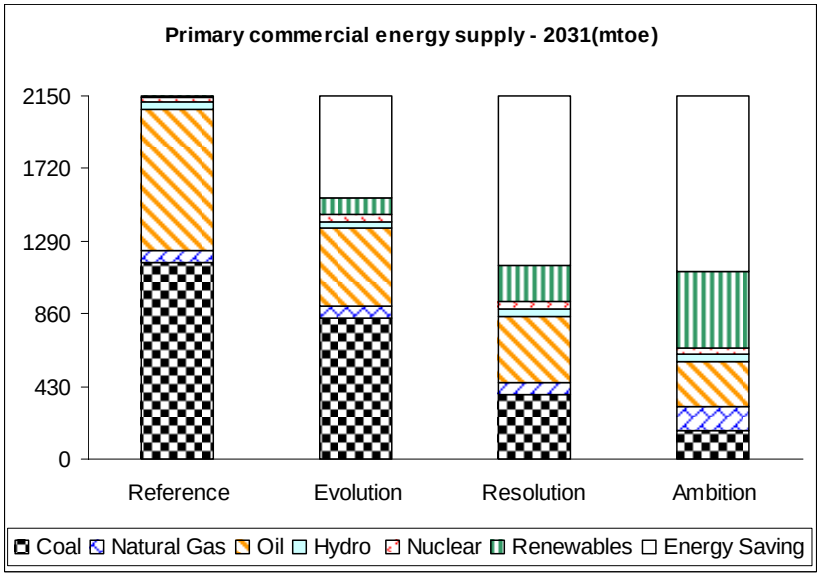
Reference Energy Demand Projections



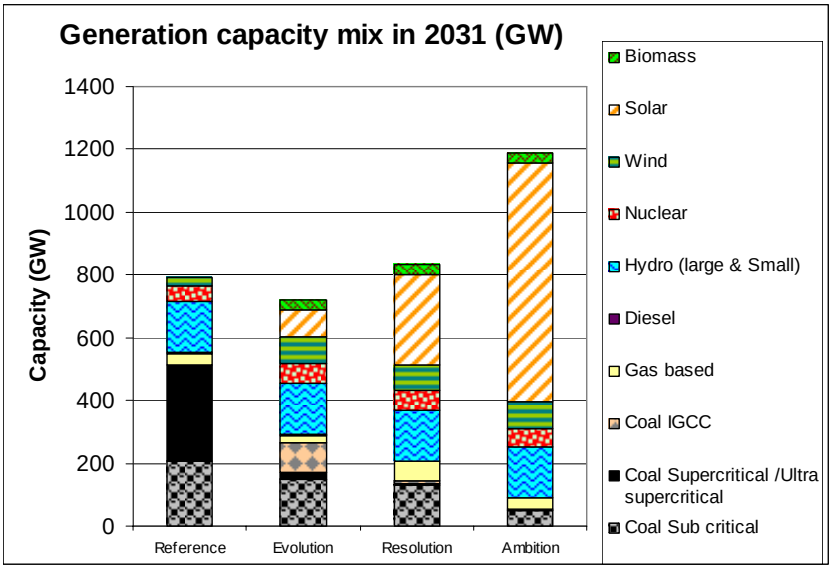
So What Shape Can The Future Take?

Scenario names	***Storyline***
Reference	Life continues pretty much as we know it with autonomous efficiency improvements taking place where feasible. Increase in use of renewable energy carries on at the same pace. Defined policy priorities are implemented with no real sense of urgency
Evolution	A determined effort is provided for efficiency improvements both on the supply and demand sides. Considers an accelerated push for renewable energy, nuclear and new technologies such as CTL (Coal to liquids) and GTL (Gas to liquids). Energy Security concerns are paramount in this scenario.
Resolution	This scenario honors the Prime Minister of India's commitment that *India's per capita carbon emissions would never exceed those of the developed world* and it is optimistically assumed here that the developed world would be able to bring down its emissions to a level of 2 tonnes/capita.
Ambition	This scenario considers that India conditionally sets aside its legitimate arguments on "common but differentiated responsibilities" & equitable per capita rights, and takes on even more stringent emission reduction targets

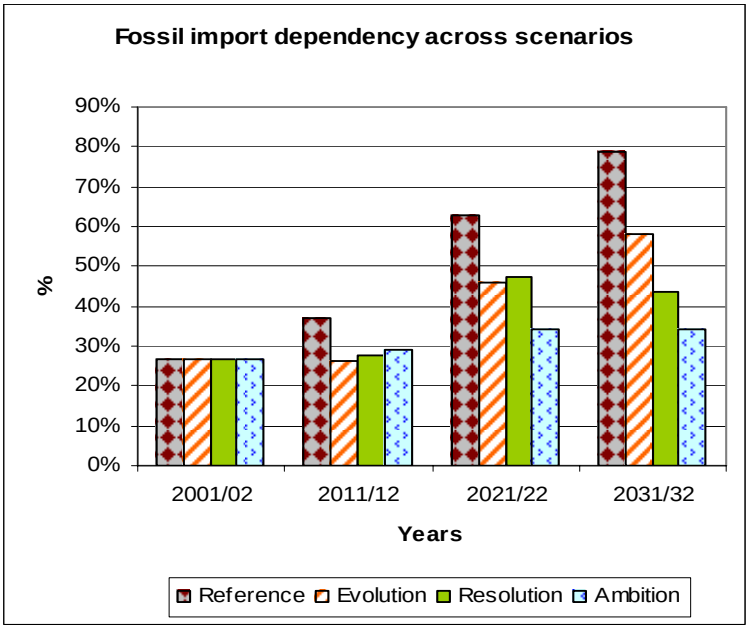
Energy Mix Under Alternative Scenarios



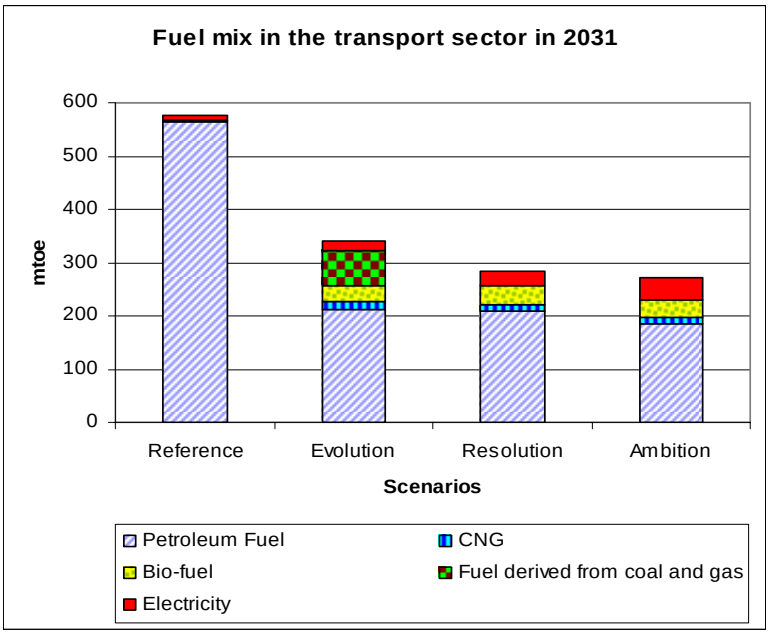
Power Generation Technology Deployment…



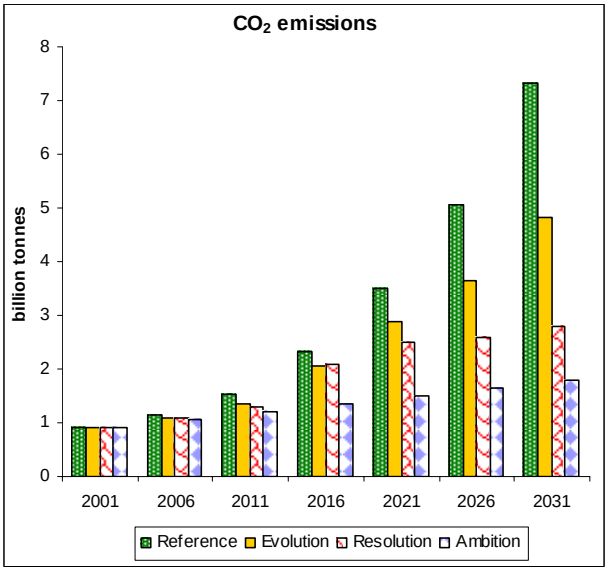
Energy Security…..



Transport Energy….



CO_2 Emissions



- Drop in CO_2 emissions dramatic with emissions in the Ambition scenario in 2031/32 only doubling from the 2001/02 levels against a nearly 8 fold increase in the Evolution Scenario.
- In per capita terms, in the year 2031/32, India would have a CO_2 emission level of ~ 2 tonnes in the Resolution Scenario versus 1.3 tonnes in the Ambition Scenario!

Key Modelling Results

- Achieving a feasible solution to the climate driven scenarios needed relaxations in several boundary conditions.
- India does not have enough degrees of freedom in its fuel-technology choices to be able to significantly change its energy development pathway till the year 2016 at the earliest.

Way Forward Strategies

- Accelerated Renewable Energy Use
- With ~ 80% of its capacity needs to be added between now and 2031/32 and 60% between 2017/18 and 2031/32, India's electricity sector lends itself well to clean interventions. Renewable energy technologies of solar, wind and biomass and nuclear power plants most desirable
- Need to move towards solar thermal with storage to meet the base load requirements.
  - Technology development, demonstration & deployment required
  - Need cost reductions

Way Forward Strategies

- Technology development: manufacture of wind turbines to suit India's wind profile and large capacity wind turbines of over 5 MW needed
- Need for mapping & exploiting India's off-shore wind energy potentia
- India's also needs accelerate the tapping of its hydro power potential of 160 GW. Its current installed capacity is only 36 GW.
- Decentralised provision of energy must be the 'mantra'

Way Forward Strategies

- Energy Efficiency and DSM
  - A large scale program, supported by multilateral organizations, and well-designed market mechanisms could further accelerate deployment of energy efficient technologies.
- Biofuels
  - address productivity enhancement & R&D in second generation technologies
- Moving to cleaner transport

Challenges to be addressed

- Incremental Finance
  - Alternative energy paths imply higher capital costs but lower operating costs
- Technology

Thank you!