Introduction to the Issues

David G. Victor
Director, Program on Energy and Sustainable Development, Stanford University
http://pesd.stanford.edu

http://pesd.stanford.edu/
1. **Electricity Market reforms**
   - Five-country comparison
     (Brazil, China, India, Mexico, South Africa)
   - Plant-level experience (2 Indian states; 3 Chinese provinces)
   - IPPs

2. **Geopolitics of Natural Gas**
   - Looking to 2030
   - Gasification of China and India

3. **Rural energy supply**
   - Shift from traditional to modern fuels and technologies

4. **Climate change policy**
   - Beyond Kyoto
World CO₂ Emissions by Rank (2000)

Source: Data from Oak Ridge; Analysis by PESD
Economic Growth and Energy Intensity

Graph showing the relationship between GDP per capita and energy intensity for India, China, and the United States over historical periods.
Carbon Intensity of Major Economies

Data Sources: CDIAC, WB
China: Carbon Intensity of GDP\textsubscript{MER} and GDP\textsubscript{PPP}

Data Sources: CDIAC, WB
Carbon Intensity of Major Economies

Data Sources: CDIAC, WB
Anthropogenic emissions of CO$_2$, CH$_4$, N$_2$O and SO$_2$ for the six SRES scenarios
CDM Project Status

- In Development: High number of projects
- Project Design Document: Moderate number of projects
- Commented: Fewer projects
- Registered: Very few projects
- Credits Issued: Minimal number of projects
CO$_2$ Emissions by Sector, 1999

- **China** (2827 MtCO$_2$)
- **Mexico** (414 MtCO$_2$)
- **India** (1078 MtCO$_2$)
- **Brazil** (303 MtCO$_2$)
- **South Africa** (333 MtCO$_2$)
- **USA** (5507 MtCO$_2$)
India & China: Comparative Study
Plant-level Factors in Two States (India) and Three Provinces (China)
Unit Size and Efficiency: Coal Units above 100MW much more efficient
Efficiency of Coal, Oil and Gas Fired Generation in India & China

![Graph showing efficiency of generation in India and China]
Comparative Carbon Intensities of Electricity Industry in India & China

![Graph showing the comparative carbon intensities of electricity industry in India & China from 1990 to 2010. The graph plots Kg (C)/KWh versus years from 1990 to 2010. The states/regions plotted include Guangdong, Gujarat, Hubei, Liaoning, and AP. The data shows a decline in carbon intensity over the years.]
Our Agenda

• Today
  – The record with power sector reform
    • India
    • China
    • Synthesis: five developing countries
  – Goal: Explain economic and political forces that determine technology choice

• Tomorrow
  – The technological potentials
  – Policy instruments
  – Goal: Identify carbon-reducing potentials and explore how they may be realized