



Green Growth Strategies Insights from Indian Industries

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Green Growth in industries?

Output growth strategy that promotes low carbon technologies and practices

Green Growth '*Criteria*' ?

- Energy efficiency
- Clean technology
- Fuel switch/use of renewable
- Waste reduction
- Recycling
- Technology leapfrogging
- Product design for demand side management etc.



India: Major policies linked to Green Growth

Industry Sector:

Direct

- **Manufacturing industries** - Energy efficiency -Energy Conservation Awards (since 1991), Energy Conservation Act (EC Act 2001), Perform Achieve and Trade (PAT 2010)

Indirect

- **Power generation**- Energy efficiency (EC Act, PAT), Renewable (National Solar Mission 2010, Renewable Purchase Obligation -RPO), reduction in transmission and distribution losses

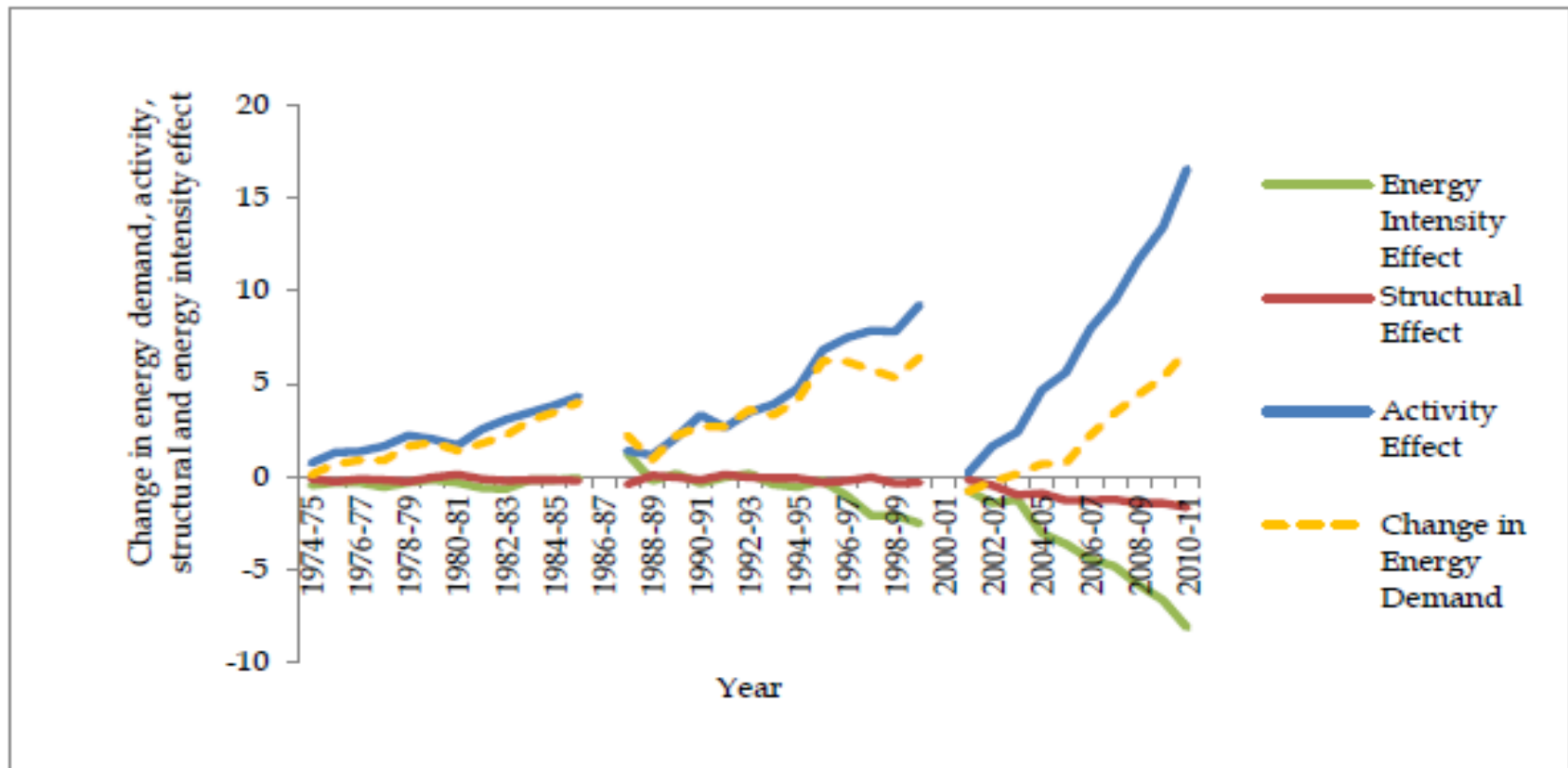
Other:

- Standard and labelling of appliances - Star labelling
- Energy conservation building code
- Enhanced fuel efficiency in transport -Car labelling (forthcoming)
- Expanding the forest cover - National Mission for a Green India



Energy Efficiency: Important Green Growth Criterion

Decomposition of energy demand -Indian manufacturing industries

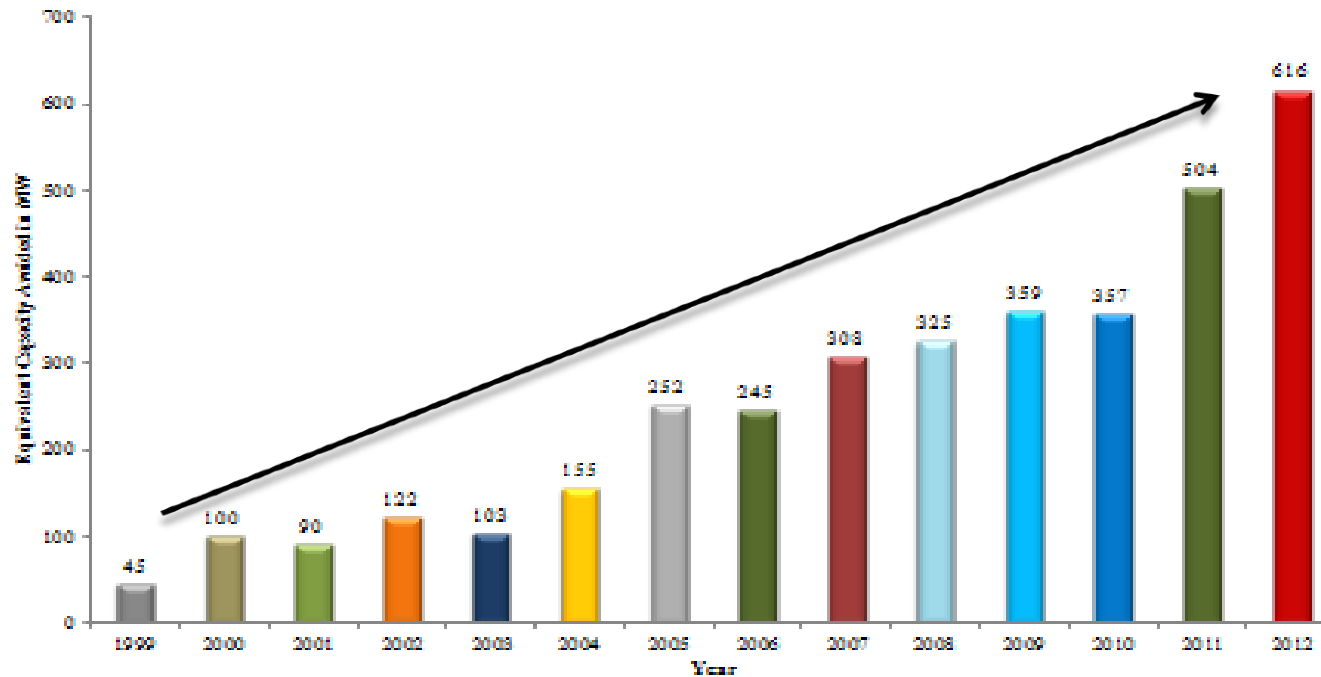


► Based on Annual Survey of Industries, India 1973-74 – 2010-11



Energy Conservation Awards

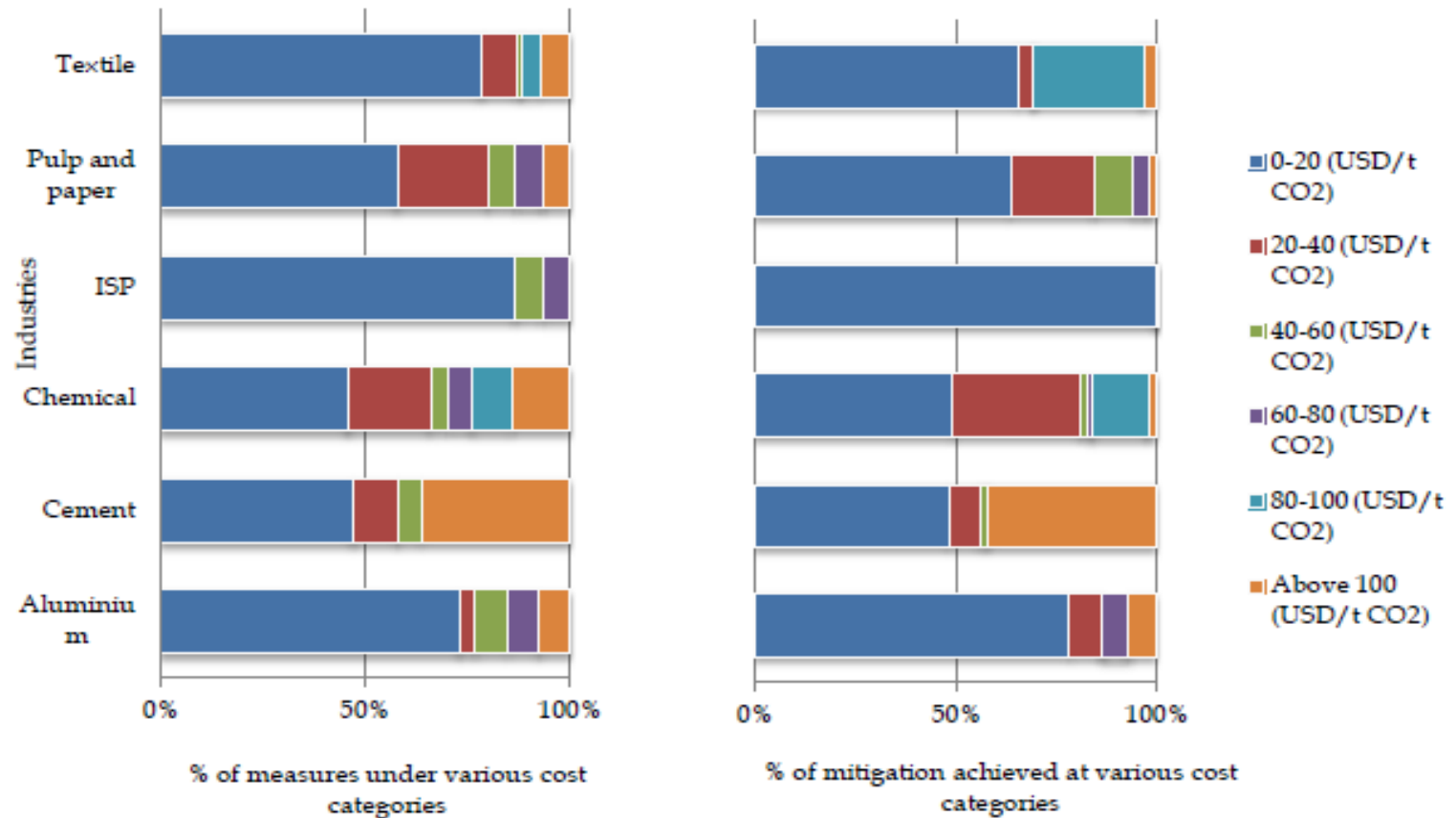
- Participation (voluntary) increased from 123 units in 1999 to 773 in 2012
- Investment energy conservation in 2012 = INR. 1948 Crores
- Monetary saving achieved in 2013 = INR. 2886 Crores in 2013
- A payback period of 8 months



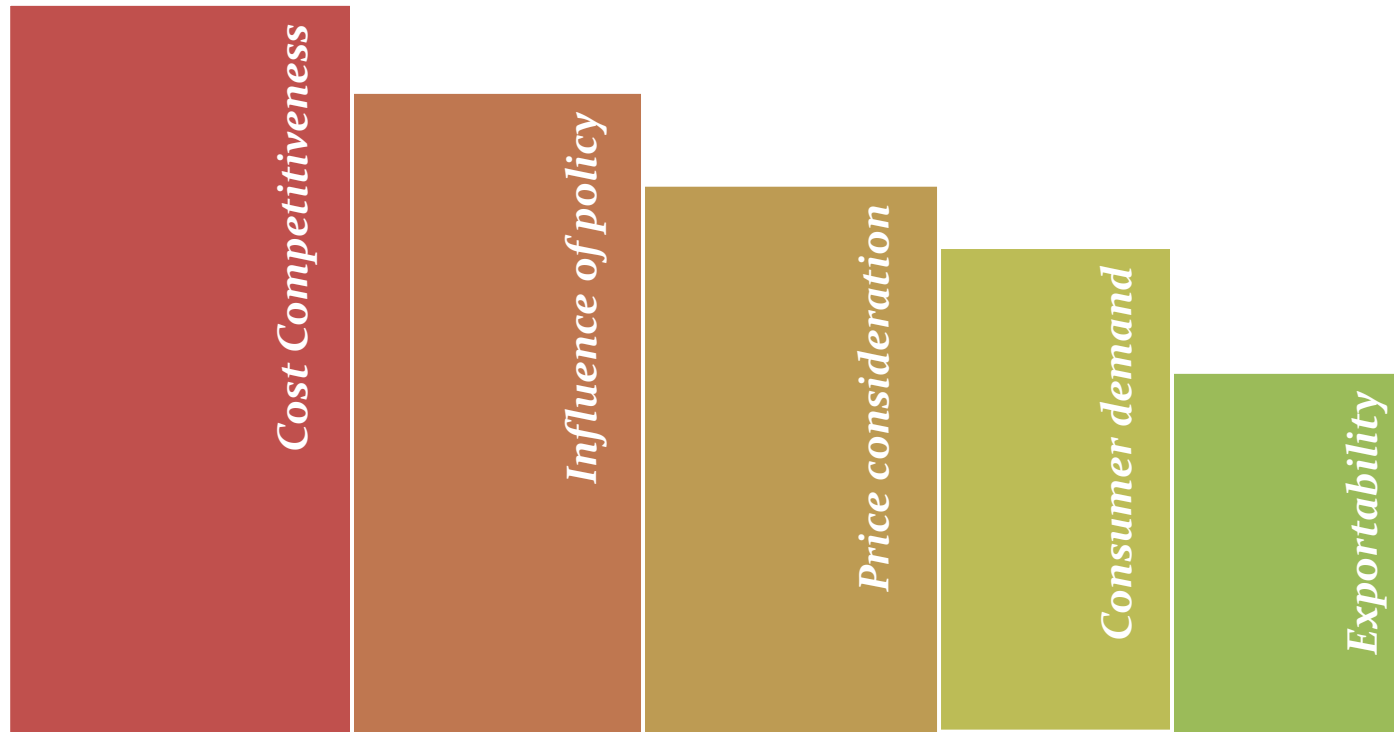
Electrical energy saving in terms of equivalent avoided Capacity in MW



Initiatives ranged from low to high cost



Driving forces behind actions



► Source: Chakraborty & Roy 2012

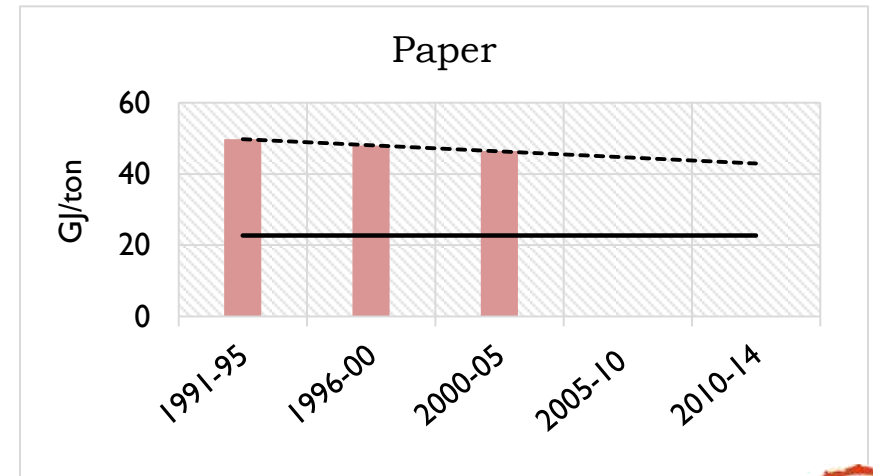
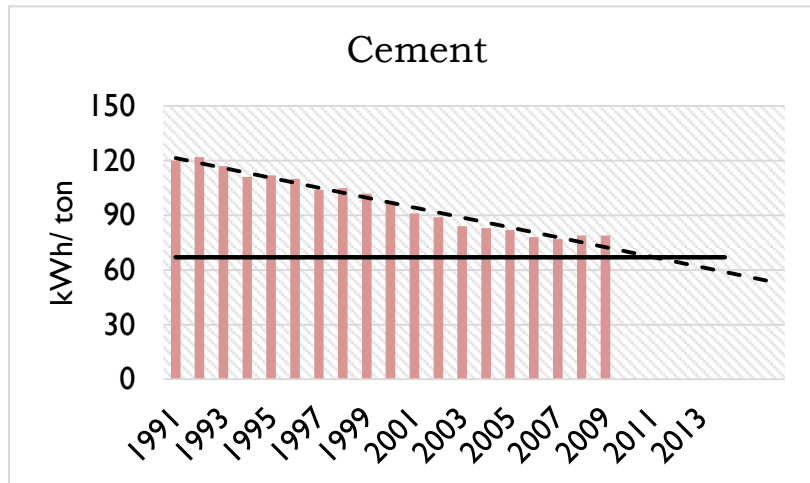
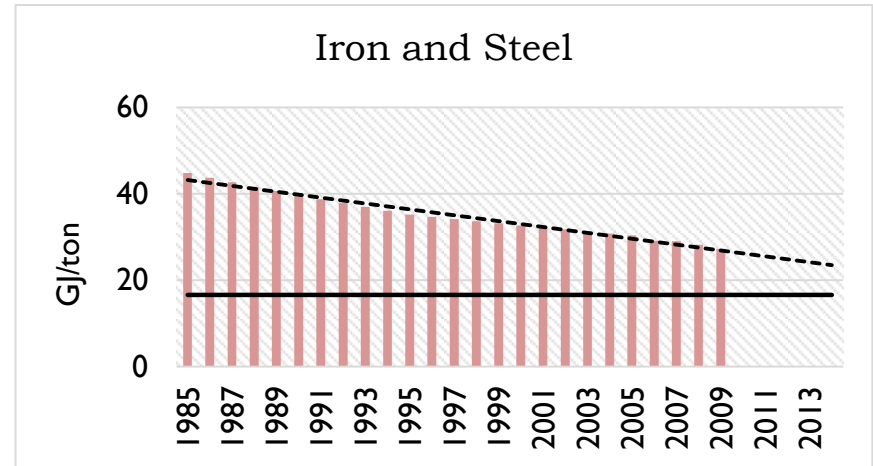
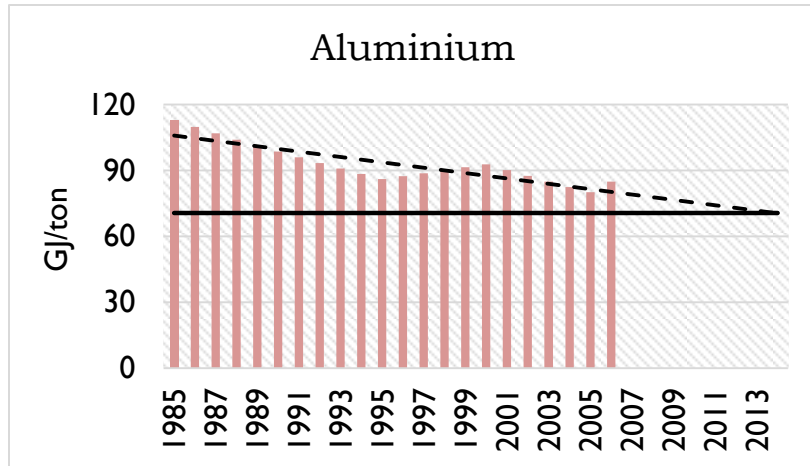


Energy Conservation Act (2001)

- ▶ Provides for the legal framework, institutional arrangement and a regulatory mechanism at the central and state level
- ▶ Both voluntary and mandatory provision of energy efficiency
- ▶ Identified the Designated Consumers with energy consumption over and above a threshold
- ▶ Created the nodal institutional set-up – Bureau of Energy Efficiency (BEE) and State Designated Agencies
- ▶ Mandatory appointment of Energy Managers and Energy Audit done by accredited auditors
- ▶ Created Energy Conservation Fund for implementation of Energy Conservation measures and sustain awareness creation



Energy efficiency performance of Indian industries vis-à-vis world

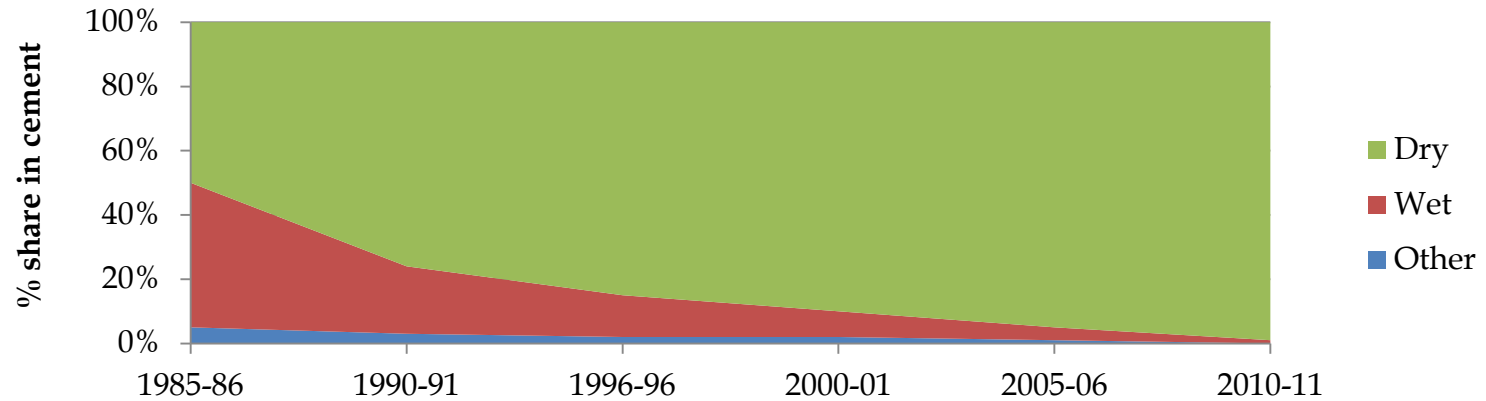


► Source: Dasgupta 2014

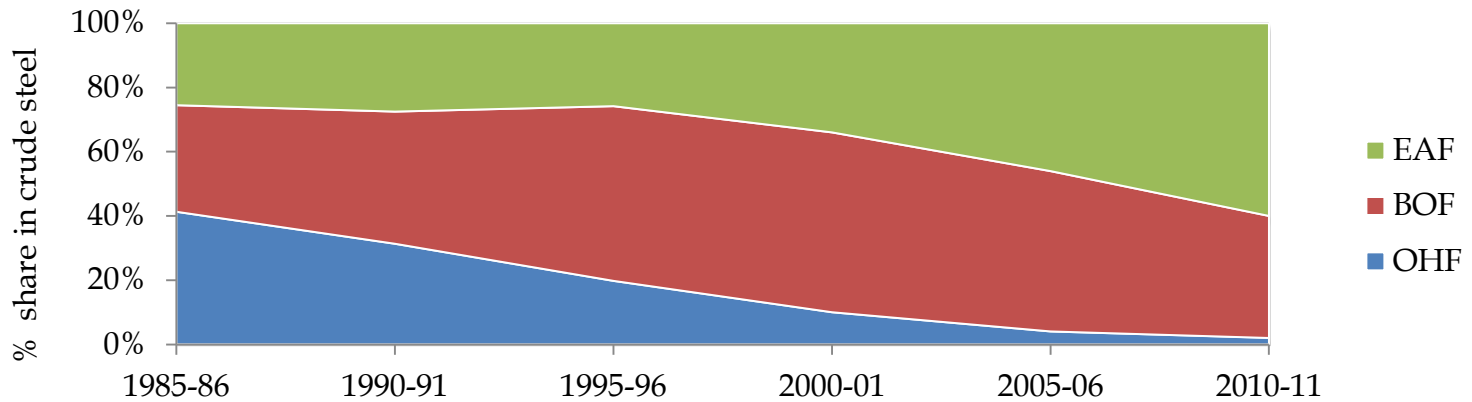


Pace of process change - not similar for all industries

Cement



Steel

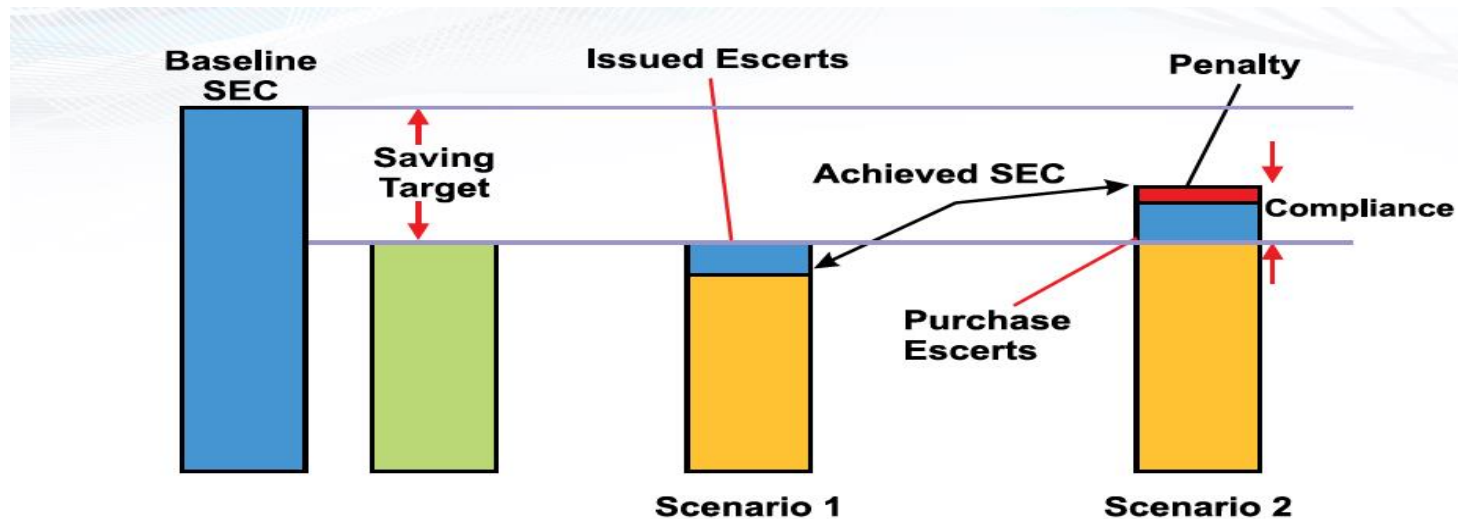


► Source: Dasgupta 2014



Perform Achieve and Trade

- ▶ Genesis – EC Act, 2001
- ▶ Industries covered – Aluminium, Cement, Chlor Alkali, Fertilizer, Iron and Steel, Pulp and Paper and Textile along with Power sector
- ▶ The 478 large energy consuming units -Base line for each unit
- ▶ A market based mechanism through certification of energy savings that could be traded



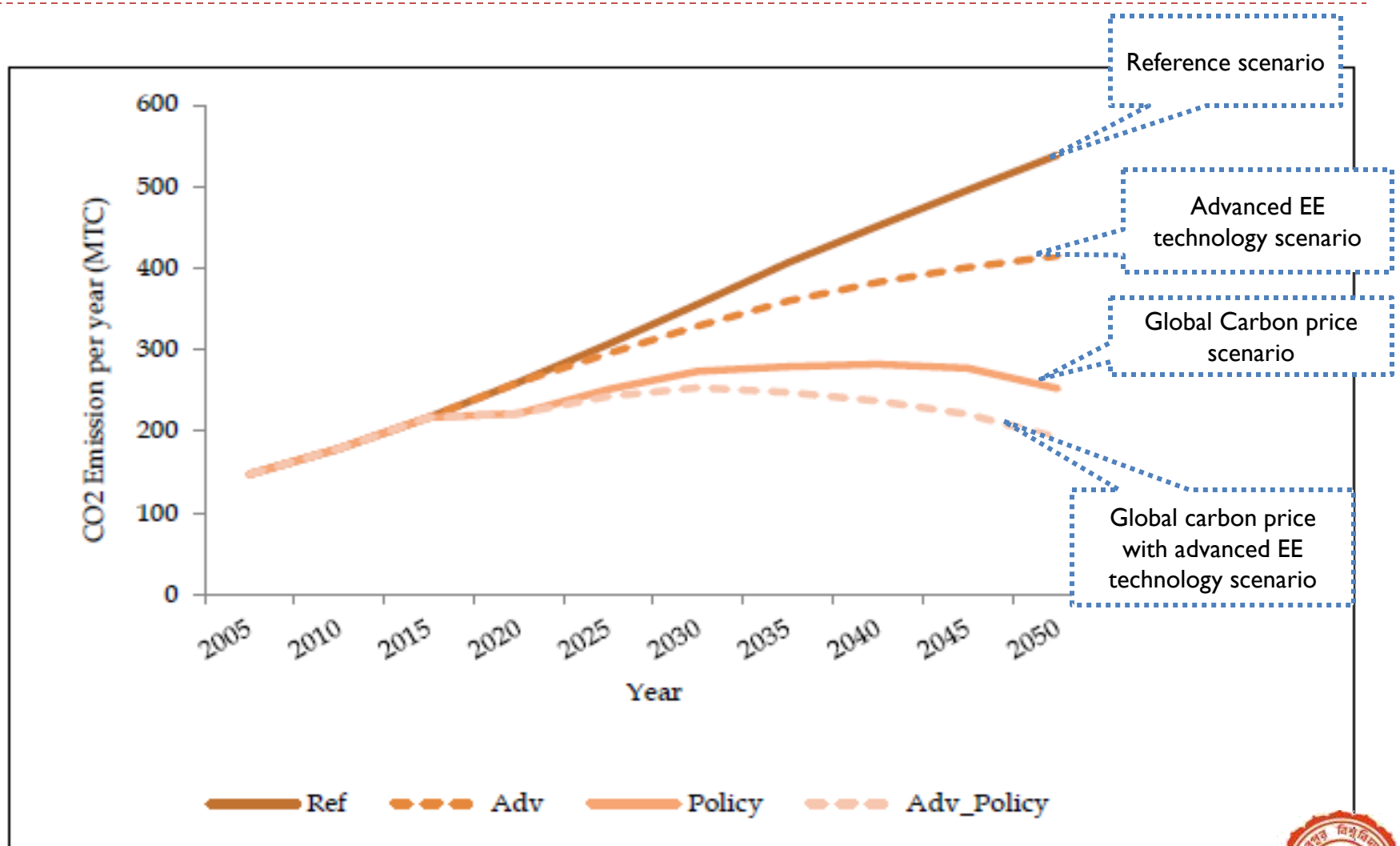
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- ▶ Target setting – 2010-12, compliance – 2012- 15, then trading
 - ▶ Trading mechanism will play an important role
 - ▶ Trading can be carried out bilaterally, or on special platforms in the power exchanges
 - ▶ Fungibility with Renewable Energy Certificates can be provided
 - ▶ Financial penalty for non compliance linked to quantum of non-compliance
 - ▶ Energy Efficiency Services Ltd. (EESL) has been created as a corporate entity to provide market leadership
 - ▶ Venture Capital Fund – under consideration
 - ▶ Target- saving of 6.6 MTOE at the end of the first cycle of PAT



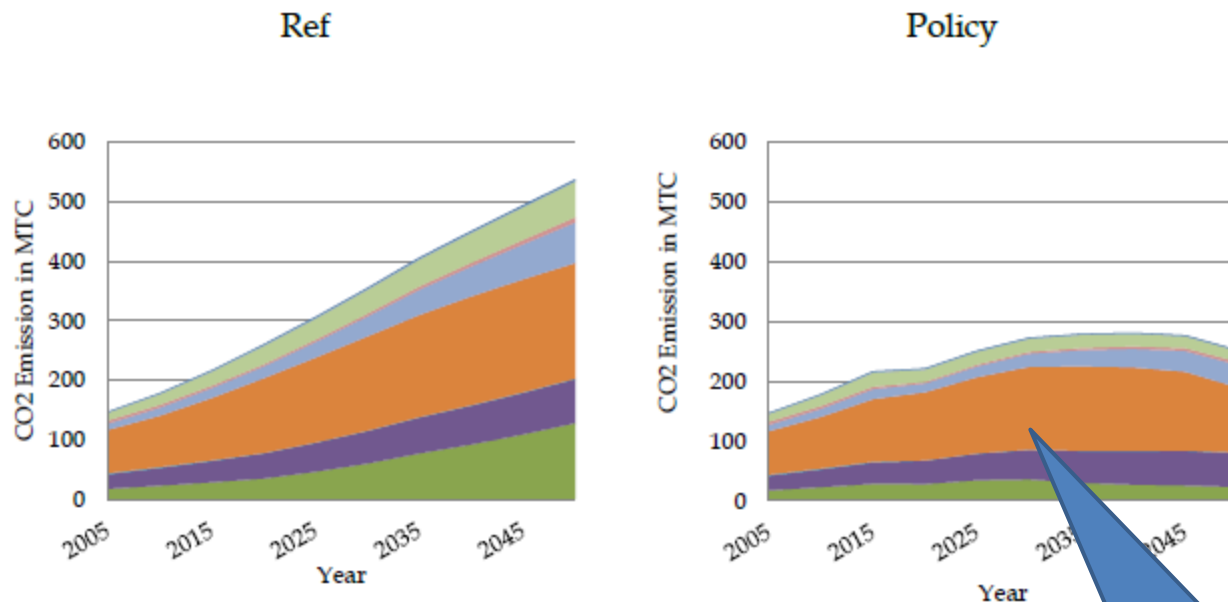
Potential beyond energy efficiency: Role of carbon price



Results from GCAM



Potential beyond energy intensive industries

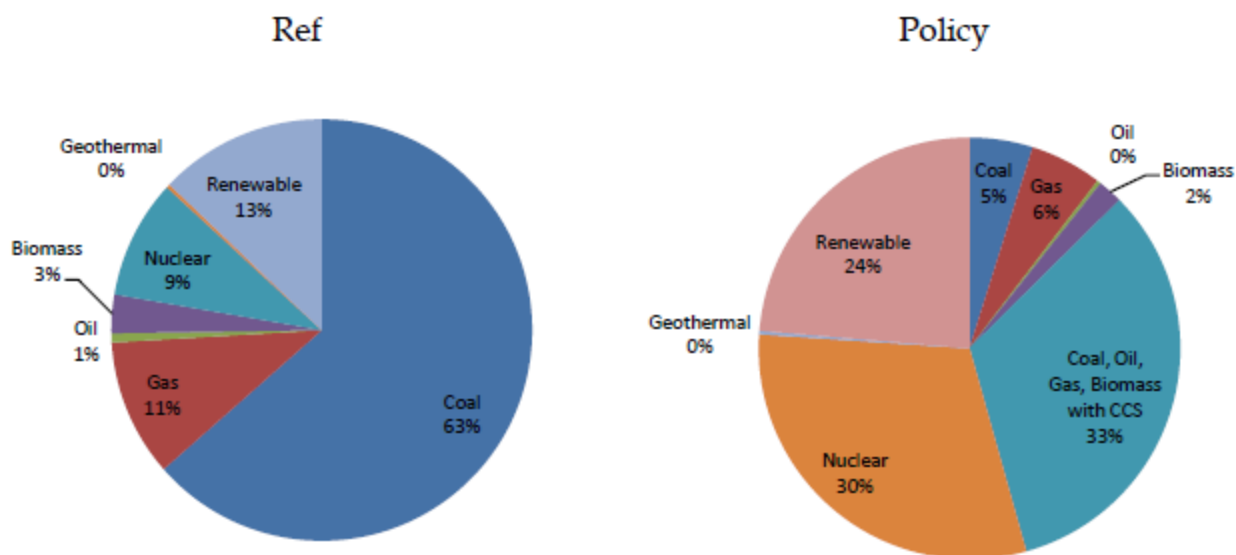


- Cement
- Machine drive
- Process heat cement
- Process heat iron and steel
- Process heat paper pulp and print
- Feedstock
- Other industrial energy use
- Process heat chemical and pet
- Process heat non ferrous metals
- Process heat textile and leather



Implications for power generation

Long run green growth in industry requires large scale electrification



Projected consumption of fuel use for electricity generation in Indian in 2050: comparison of Reference scenario and green growth policy scenario



Concluding Remarks

- So far energy efficiency is in focus as a green growth strategy for Indian industries
- Evolution of initiatives – from voluntary participation in Energy Conservation Award to mandatory PAT
- PAT is emerging as an important market based mechanism to enhance energy efficiency in industries – with accommodating fiscal and financial policies
- Our research shows that non-PAT sectors have equally important green growth potential
- Results from GCAM show global carbon price can induce further response to reduce direct and indirect emission from industries
- Adoption of CCS and other high cost technologies will become an imperative in achieving green growth



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Thank you

