Policies for transformative change in energy & climate: Implications for public policy education and research

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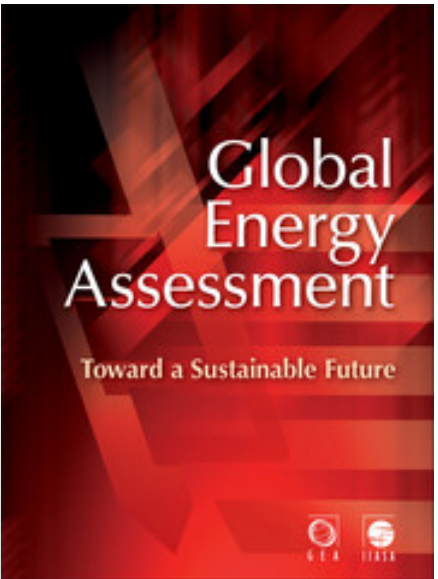
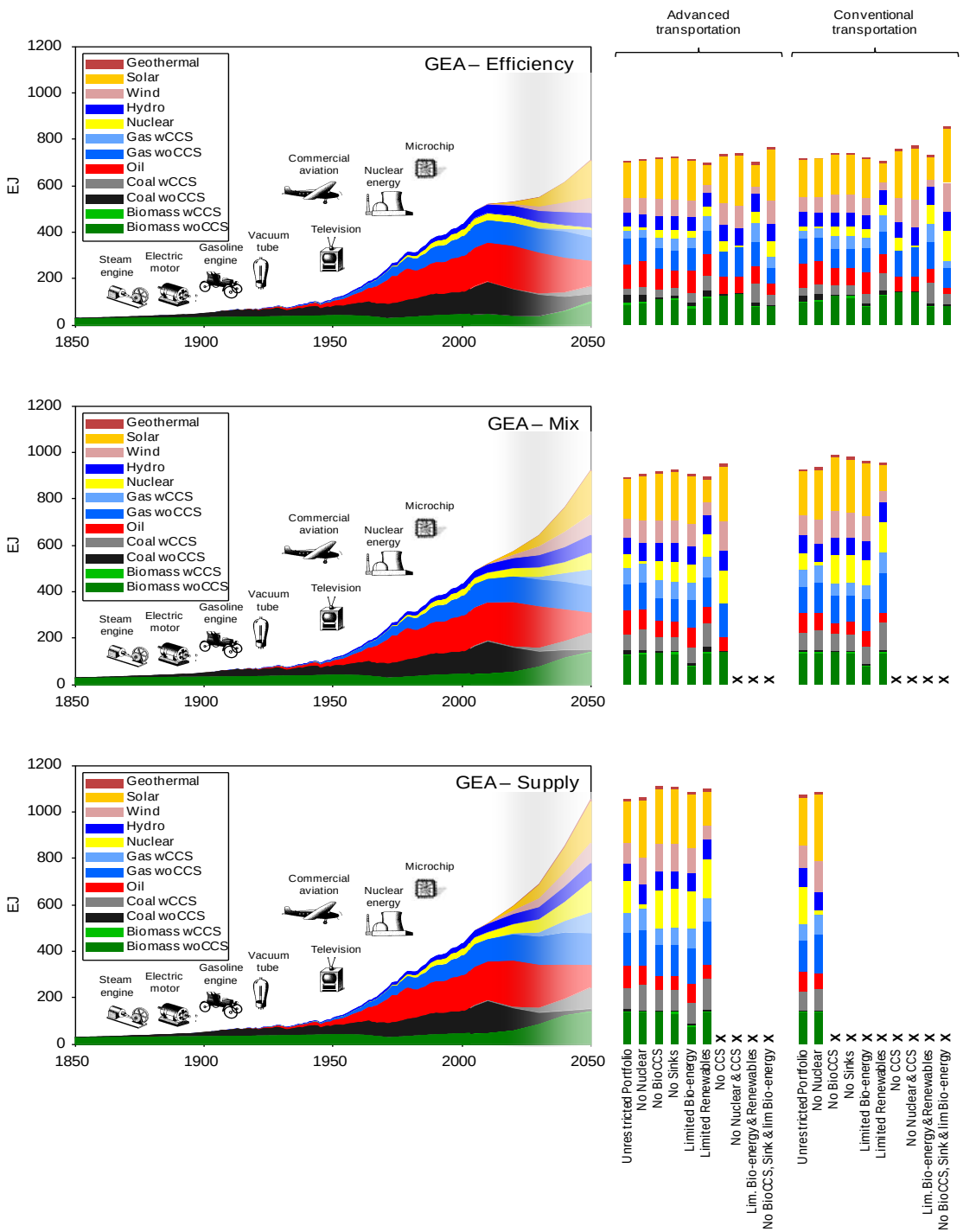
Outline

- Key findings and policy challenges
- Implications for policy design and human resource development
- Opportunities



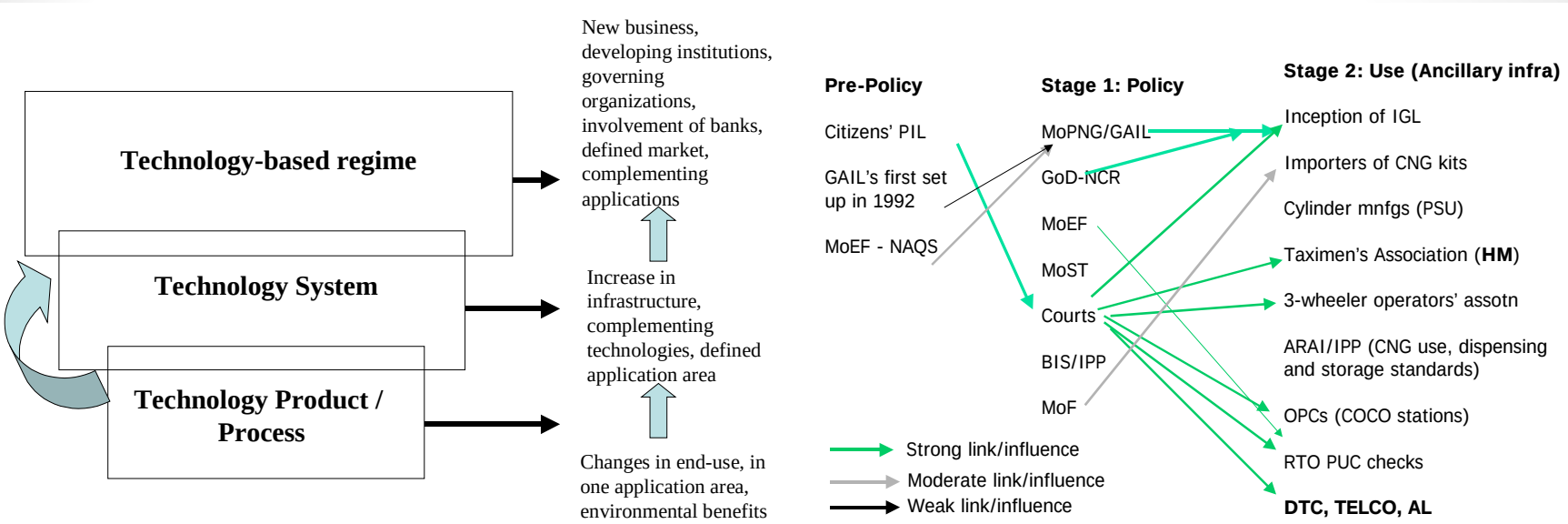
The magnitude of the challenge

- Need to meet multiple objectives and to do so simultaneously and not sequentially – energy access, energy security, environmental protection, climate mitigation
- Magnitude and speed of response required
- Incumbency, legacy infrastructure and legacy policies
- Transformative change required

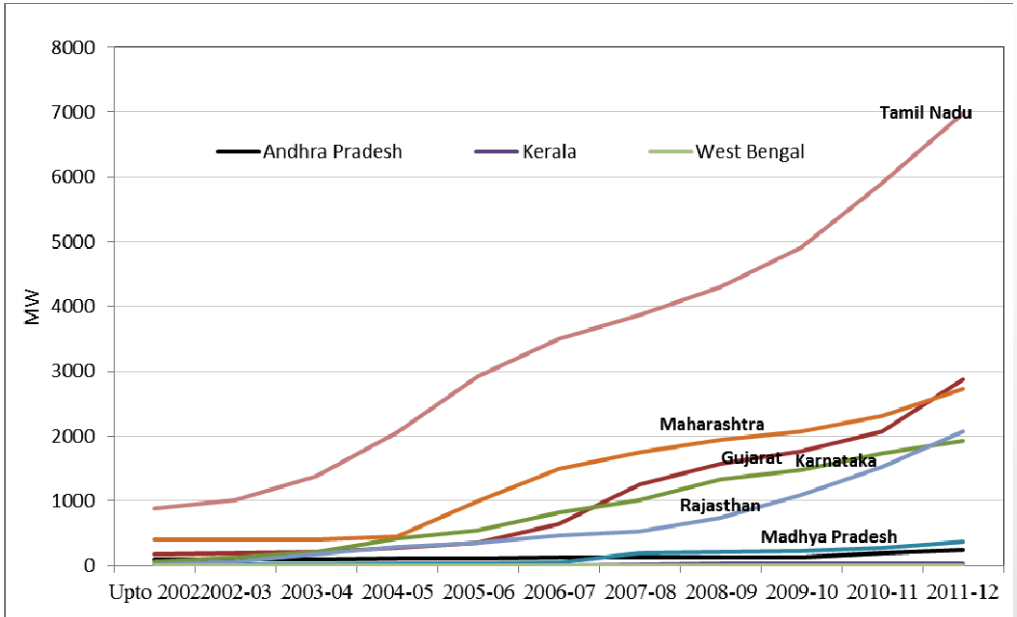


- There are many feasible pathways
- 3 broad clusters – efficiency focus, large heterogeneity, high demand; sensitivity analyses to evaluate different situations
- Common elements
  - ↑ Energy efficiency
  - ↑ Renewable energy
  - Modernization of fossil fuel system
  - Efficiency focus creates supply-side flexibility

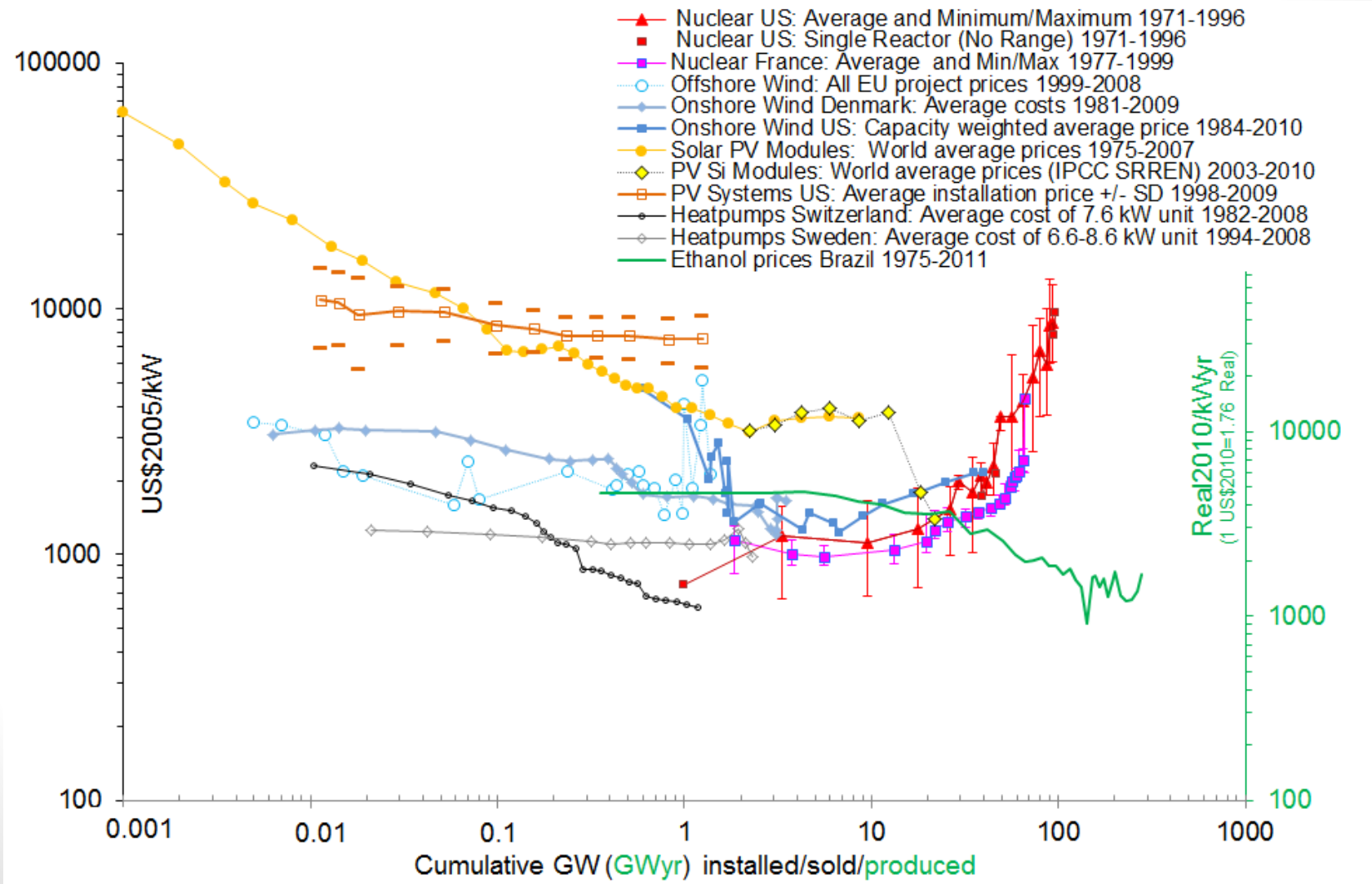
Large-scale transitions result from a complex interplay of technology change, institutions and actors with varying interests…



….involving the interaction of energy and non-energy policies, and innovation in the broadest sense

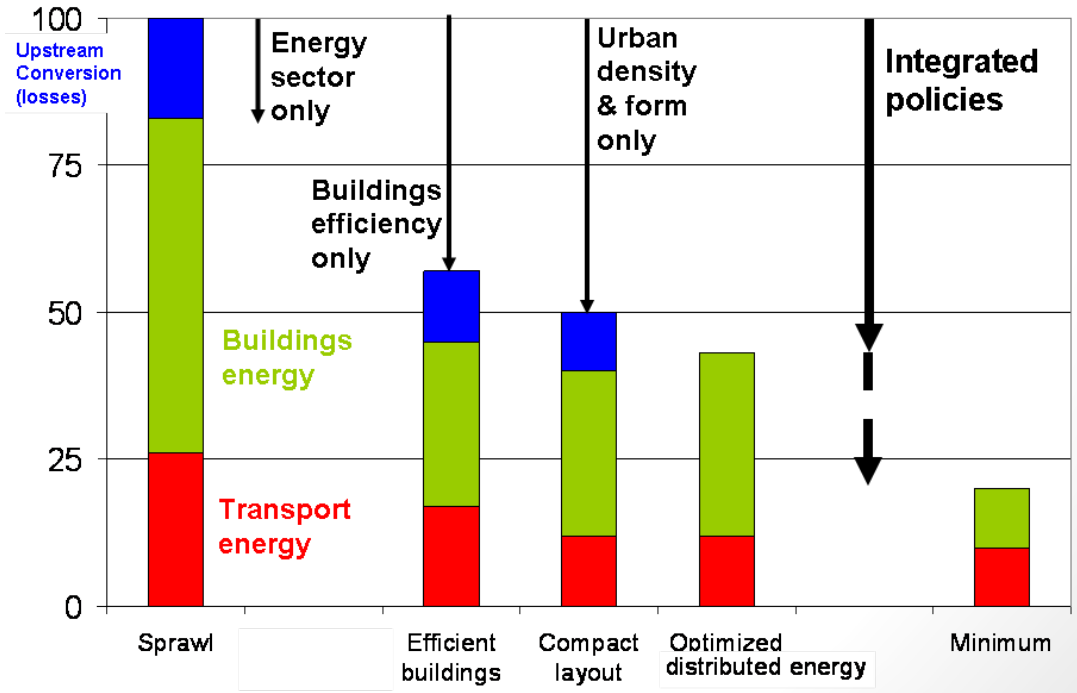


Understanding and managing learning: trends in supply technology costs



Sector	Component level EE	System level EE
Power	Plant efficiency	Smart grid and advanced power network
Industry	Facilities and production process efficiency	Structural change in the economy, diversification
Transport	Fuel efficiency	Public transportation and urban planning Behavioral changes
Buildings	Appliance and equipment efficiency	Architectural improvement and layout design Behavioral changes

System-level, multi-scale and integrated approaches may have greater potential for change



Multiple objectives & entry points: Solutions targeting more than one objective

- Access → electrification
- Renewable energy → support for RE

Distributed Generation

- Energy security → reduce oil dependency
- Reduce local pollution → Cleaner fuels

Electric Vehicles

- Infant and maternal mortality → clean cooking
- Renewable energy → Biomass

Advanced biomass cook stoves

- Energy efficiency → monetization of savings
- New ventures, job creation

Energy Service Companies

Tools to support policy design & implementation: Identifying and assessing multiple benefits

Energy option	Access	Energy Security	Health	Environment	Climate change
Efficiency					
Buildings (residential public and services)	Access to higher energy service levels from same budget and production capacity through efficiency	Reduced needs for imports due to saved energy; more resilient energy systems from building-integrated distributed generation	clean/efficient cooking; lower respiratory infectious morbidity in well-ventilated buildings; reduced noise exposure	Reduced energy-related emissions from saved energy; both local and regional	Reduced GHG emissions: CO2 from saved energy, non-CO2 from less cooling; more climate and heat resilience: adaptation gains
Systems and grids					
Advanced Electricity and Gas systems (possibly Hydrogen in future)	Inexpensive and more linked systems provide easier access. Distributed generation provides access where needed	Smart systems provide redundancy through rapid deployment of energy, and enhanced use of alternatives. Microgrids offer autonomy, stability, flexibility	Smart systems are more efficient reducing air pollution from sources	Smart systems reduce overall need for energy with less environmental impact. Can assimilate large amounts of variable RES	More efficient, use less energy and produce fewer GHGs
Supply					
Coal (with and without CCS and biomass)	Can provide the initial energy for access in many countries as most ubiquitous fossil	Coal and biomass are geographically rather equally available; can be imported easily	Health impacts through mining and burning-related emissions	Large particulate and other emissions, including radioactive; damages through mining	Highest specific emissions without CCS; CCS enables CO2-free power; with biomass can have negative emissions
Natural gas	provides access to more energy services if available locally	Might reduce reliance on other imported energy if available locally; more equally distributed than oil	Little or no impact due to relatively perfect combustion	Lower emissions than other fossil fuels	Lower emissions than other fossil fuels; lower CO2 emissions with CCS; CH4 emissions can be controlled
Renewables					
Solar (thermal and electricity)	PV: Provides interim power source until full access to grid is provided. Thermal: provides some hot water. Can be self-made	Security gains through reduced energy and fuel import needs	Improved health due to lower emissions and pollution	Reduced emissions from fossil fuels and resources depletion; lifecycle environmental impact for PV	Limited life-cycle GHG emissions except in production of PV

Source: Technical summary

Science tells us what needs to be done – and the "what" is quite complex and challenging

- Technically detailed – the **science** matters
- Integrated and inter-sectoral – **interdisciplinarity** matters
- Risk-based – **uncertainty** matters
- Iterative, adaptive and reflexive – **learning** matters
- Success will therefore depend on the "how" and the "who"

Public policy education & research in India

- Largely limited to economic and social policy
- Virtually no serious academic programmes
- Institutional uptake limited (permanent civil service)
- May have been OK as long as the job of the government was administration
- Today policy-makers find themselves in unfamiliar territory

Implications

- First, we need to recognize that public policy is an important, relevant and legitimate domain for academic institutions to be engaged in.
- Second, that it is an application area and applied discipline, resting on the theoretical underpinnings of other disciplines, much in the same way as business management.
- Third, that there are a variety of audiences and needs – entry-level and in-service
- Fourth, there are synergies and complementarities between our institutional strengths in science and engineering and public policy education and research

A modest proposal

- Science & technology are our starting points, in terms of our expertise and capabilities
  - Many policy domains that require a deep understanding of S&T issues: regulation, licensing, standards, finance
- Policy is the setting in which we would like to bring to bear our knowledge of science & technology and our analytical rigor for informed & effective decision-making
  - Policy analysis and policy research
- Development and well-being are the ultimate goals for these efforts.
  - Connection with the development agenda