Economic modeling issues

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Why is this happening

• There is a major externality associated with the use of fossil fuel, especially coal.
  – The social cost of CO2 (SCC) has been estimated by US Government at $43/ton, rising over time.

• The effective way to deal with this would be through national legislation that imposed a price on CO2.
  – Whether a tax, keyed to the SCC, or cap-and-trade.

• National legislation is currently not possible.

• The Clean Power Program is a second-best approach based on existing administrative authority.
  – Inevitably, a more costly approach than a national approach involving a carbon price.
Analyzing the effects of a regulation

New regulation → Change in the regulated sector → Change in the rest of the economy
If the main focus is on the rest of the economy, need a computable general equilibrium (CGE) model.
Economic analysis approaches

• Partial equilibrium (considers a single sector) versus general equilibrium (considers economy-wide interactions).

• Flavors of general equilibrium model
  – Input-output
    • Metrics covered are output, income, jobs
    • Less general structure of production function
  – Computable General Equilibrium (CGE)
    • Metrics covered also include profit (producer surplus) and consumer surplus (consumer welfare impact)
    • More general structure of production function
In the regulation of lead in gasoline and SO2, the main action occurred within the regulated sector.

• For this, one needs a model of the regulated sector – in this case a model of the Western Power grid.
Issues raised in comments on CPP submitted to EPA

• High efficiency of existing power plants in AZ precludes attaining Building Block 1 efficiency improvement.
• BB2 overstates amount of natural gas generating capacity available during peak periods.
• Dispatch analysis is faulty.
• Fails to recognize that half of NGCC generation in AZ is merchant-owned and contracted for.
• Lack of capacity in natural gas pipelines and electricity transmission.
• Reduced security of supply from less diversified portfolio of power sources
• Inadequate credit given to existing nuclear power generating capacity in AZ
• Overstates potential for increased renewable energy in AZ
• Overstates potential for further reductions in energy demand in AZ due to increased energy efficiency.
• Overlooks financial and timing constraints in expanding capacity.
• High magnitude of stranded assets.
These issues all require the use of a power sector model

• Various power sector models are available.
• Vary in extent of coverage, degree of detail, type of decisions simulated, and economic metrics accounted for.
• Vary, also, in transparency and availability.
  – Most are proprietary to a greater or lesser degree.
  – Research at ASU may well require a partnership with a model owner
Some issues raised in existing economic analyses
Haiku electricity market model

- Covers electricity sector in the contiguous 48 states by 22 regions
- Calibrated to AEO 2013
- Simulation to 2035 for 3 seasons per year, 4 time block per season
- Dynamic, price-responsive demand side with 3 customer classes
- Each region is cost-of-service regulated or competitive
- Supply-side investment, retirement, system operation
- Endogenous investment in air pollution abatement technologies
• Rate-based
  – Tradable emissions rate performance standard
• Mass-based
  – Emissions fee
  – Cap and trade with allocation to all generators, to covered regulators, allocation to local distribution companies, or allocation to energy efficiency, or with auction.
  – Updated output based allocation
• Role of complementary policies (renewables, energy efficiency)
• Individual state approach or coordinated regional approach
Coordination challenge in regional approach exists in two markets

1. **Compliance markets**
   - Mass-based programs
     - If costs vary, linking could lead to substantial revenue and investment flows
     - Exchange rate approach leads to uncertain emissions outcome
   - Rate based programs
     - A weighted average regional (“blended”) rate improves compliance market
     - If blended rate is unacceptable, an exchange rate approach is promising
     - Neither approach not solves problem of revenue and investment flows in power market....

2. **Power markets**
   - Differences in rate targets provides production (dis)advantages
Issues

- Individual states acting alone are vulnerable to predatory behavior by other states
- Leakage can occur, whereby emissions are merely transferred to another geographic area
WORKSHOP ON OPTIONS FOR RESPONDING TO THE CLEAN POWER PROGRAM IN THE WESTERN STATES

Location: ASU
Time: Early-mid May 2015

Overview of the Climate Action Plan and the Clean Power Plan -- context, goals and likely next steps.

Solar and wind: where do we stand, what are the prospects, and what are states’ options?

Energy efficiency: where do we stand, what are the prospects, and what are states’ options?

Coal: where do we stand, what are the prospects, and what are states’ options?

Technology standards: where do we stand, what are the prospects, and what are states’ options?

Cap-and-trade: where do we stand, what are the prospects, and what are states’ options?
  Trading under an emissions rate standard vs an emissions mass standard
  Alternative ways to allocate allowances
  Alternative ways to update allowance allocations
  Alternative ways to allocate revenues/asset values

Economic analyses of the design and outcomes of the Clean Power Plan

Utility perspectives (panel)

State regulators’ perspectives (panel)

Pros and cons of multi-state collaborations (panel)

Issues going forward -- what do we need to know? Towards an agenda (panel)