Update on Modeling Activities related to the Power Sector

Outline

- Background on IPM
- EPA Update
- Example Update Areas
  - Natural Gas Supply
  - Nuclear Power Modeling
  - Mercury Emissions Modeling
  - Multipollutant Modeling Capability
- Example Results

Background on IPM

Background
What is IPM?

- The Integrated Planning Model (IPM) is a tool developed by ICF Consulting and used by EPA for policy analysis.
- IPM is a long-term capacity expansion and production costing model for analyzing the electric power and industrial, commercial, and institutional boiler sectors.
- **It is a multi-regional, deterministic, dynamic linear programming model.**
- IPM finds the least-cost solution to meeting electricity and steam demand subject to environmental, transmission, fuel, reserve margin, and other system operating constraints.

Model Size Comparison

	EPA 98 Base Case	EPA2000 Base Case
Constraints	36,199	140,225
Variables	320,688	1,980,251

Update of EPA Base Case and Modeling Capabilities

Types of Upgrade Activities

- Expand modeling universe
- Expand capabilities and usability
- Improve data quality
- Improve data handling efficiency

Types of Upgrade Activities (cont'd)

- Update model parameters
  - Technology costs and performance parameters
  - Supply and demand assumptions
    - Electric generation and transmission
    - Future gas availability
  - Characterization of expected developments in the power sector

Key Activity Areas

- Natural Gas Supply Update
- Nuclear Plant Modeling
- Cost and Performance of
  - Existing Units
  - New Units
  - Renewable Units
  - Environmental Retrofits
  - Combustion Optimization
- Electric Demand Forecasts
- Mercury Emissions Modeling ✓
- Multipollutant Modeling Capabilities ✓

Example Update Areas

Mercury Emissions Modeling

Key Activities

- EPA's year 2000 Information Collection Request used to update EPA's assumptions for IPM on
  - Mercury content of different types of coal
  - Removal efficiency of existing controls
- Latest DOE/EPA studies used to update performance of new mercury controls
- More detailed modeling of mercury emissions and controls incorporated into IPM

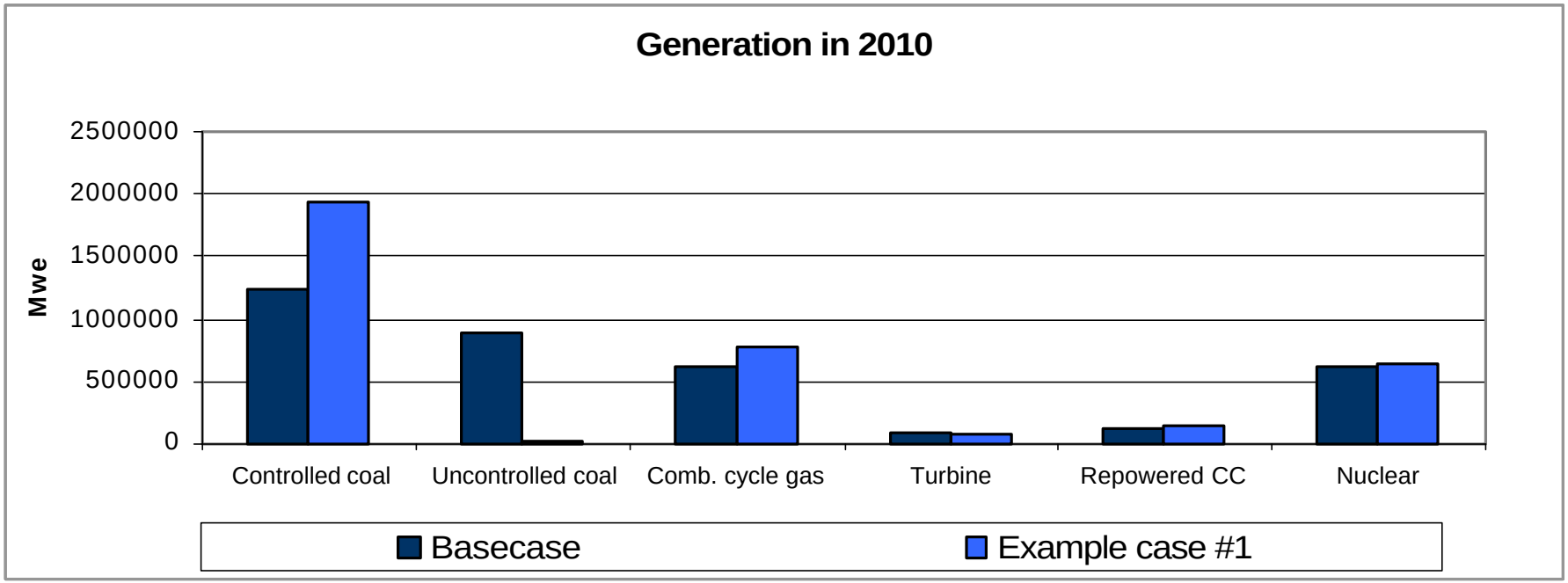
Multipollutant Modeling Capability

Capability of capturing emission control synergies

- SO2 and mercury from scrubbers
- NOx, SO2, and mercury from FGD + SCR
- CO2 and NOx from combustion optimization
- CO2 and SO2 from biomass co-firing
- All emissions from repowerings

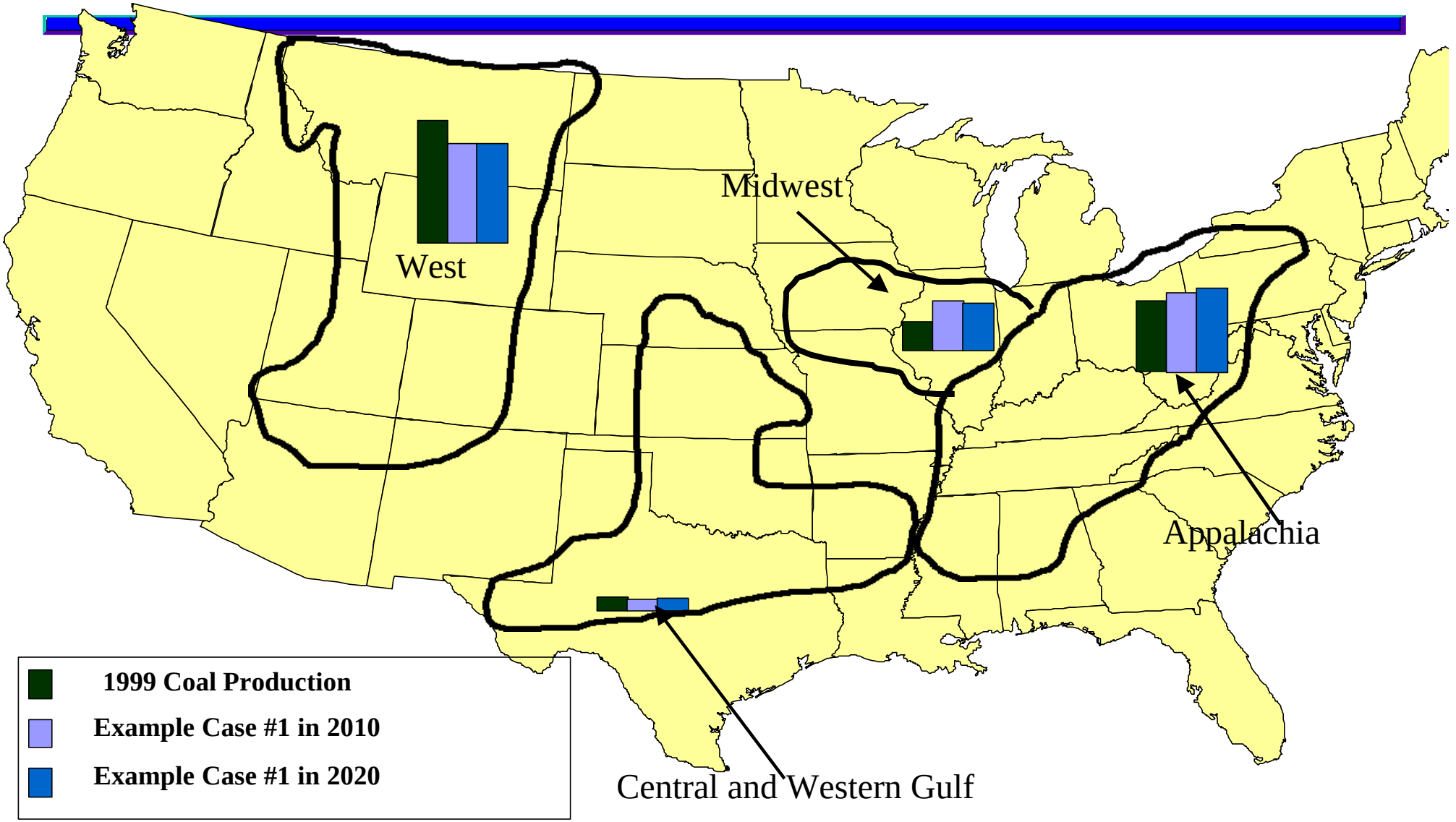
Example Results

Selection of Control Levels:
Generation Choices

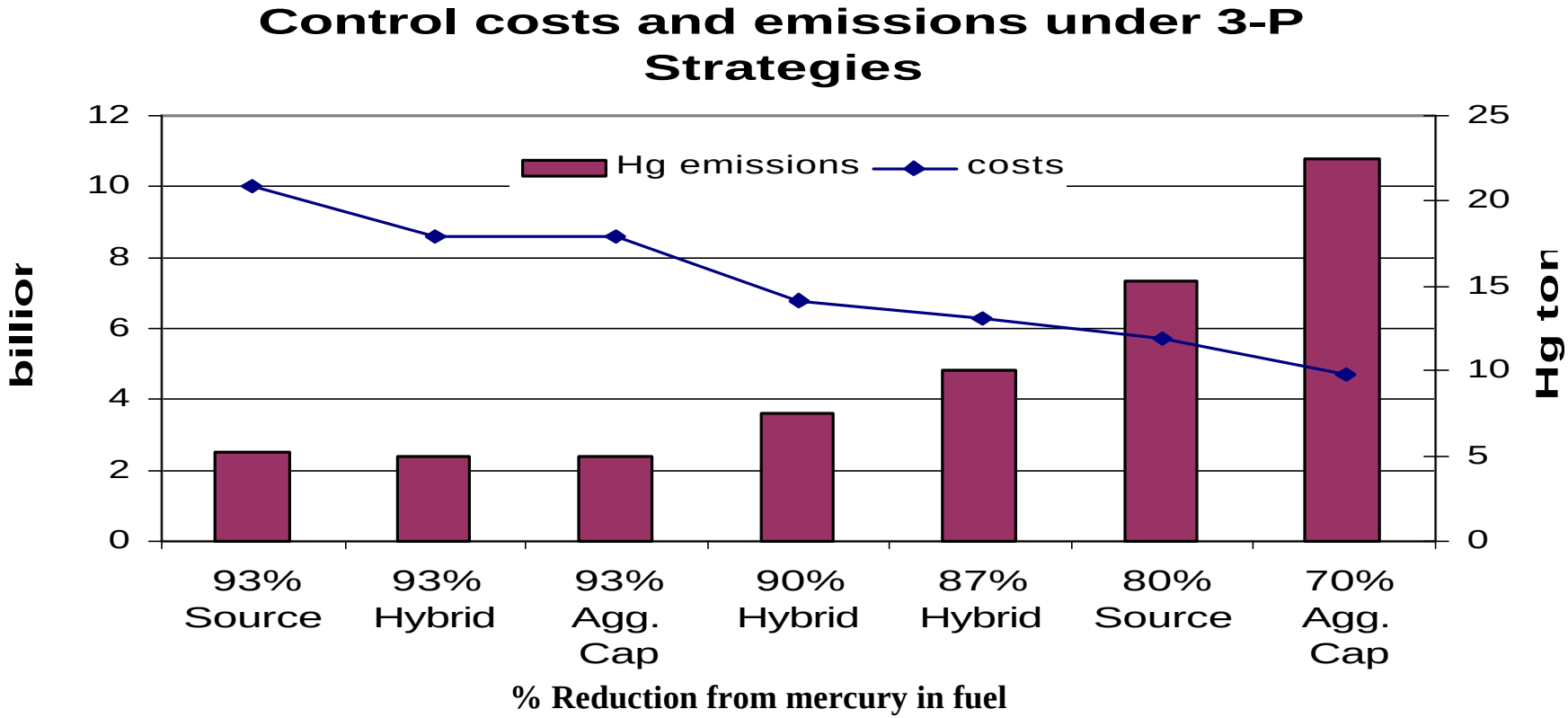


• Almost all coal generation is retrofitted with controls when the industry is required to meet a 60% reduction in SO_2 emissions, a national, annual NOx cap based on 0.15 lbs/mmBtu, and a 5 ton mercury cap.

Selection of control levels:
Impact on Coal production by coal supply region



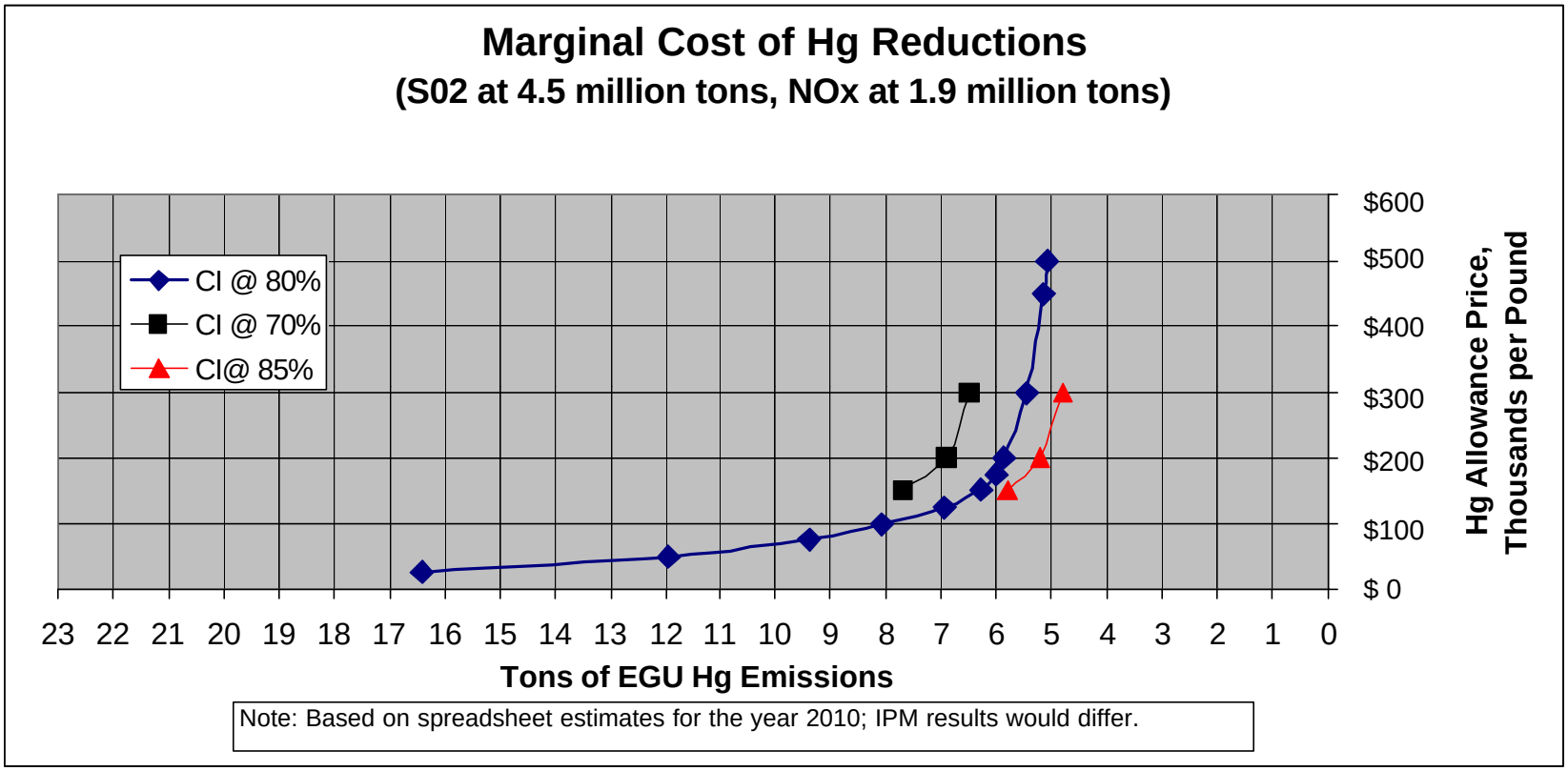
Implementation Mechanism: Source by source control and/or trading



- At a 93% reduction (5 ton cap) no cost difference between cases with a 70% facility specific limit ("93% Hybrid") and without one ("93% Agg. Cap").

*All strategies include a 60% reduction in SO_2 below Title IV and 0.15 lb/mmBtu annual national NOx cap. "Source" means a source specific reduction, "Agg. Cap" means an aggregate cap, "Hybrid" means a 70% source specific reduction plus an aggregate cap at the level indicated.

Marginal cost of Hg control levels



- Under the multi-pollutant scenario, the knee occurs between 5.0 - 7.5 tons depending on the mercury reductions associated with activated carbon injection