Study Significance

• First study to look at Maryland joining the Regional Greenhouse Gas Initiative (RGGI).

• Important not only to Maryland and states participating in RGGI, but also to states outside of RGGI and even the federal government.

• Maryland is the first state that derives most of its electricity from coal to commit to CO$_2$ reductions statewide. It is also the first state to adopt four-pollutant legislation.
Study Purpose

- **Maryland Healthy Air Act**
  - Maryland enacted the Healthy Air Act in April 2006, requiring the Governor to include the State in RGGI.

- **Maryland RGGI Study**
  - MDE is required to study reliability and cost issues that may result from joining RGGI.

- **University of Maryland**
  - MDE contracted with the University of Maryland through the Center for Integrative Environmental Research (CIER) to research reliability and cost impacts.
Study Purpose

MDE asked UMD to analyze potential impacts on:
- Electricity demand
- Energy supply
- Generating plant retirement and generator profits
- Electricity prices
- CO₂ allowance prices
- CO₂ emissions
- Emissions leakage
- Generator competitiveness
- Generation adequacy
- Ratepayer impacts
- Overall economic impacts
Research Team

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Key Findings

• Emissions modestly lower – about 10 percent for Maryland; for RGGI states as a whole, emissions will be about 4 percent lower than they would be if Maryland were not in RGGI.

• Electricity demand will decrease and we see consumers saving money.

• Profits for the electricity generating sector in aggregate will drop, though we expect very few plant closures, and those only among gas and oil plants.

• Overall there’s a slight positive effect for the Maryland economy.

• In short, this study would most likely lead to a conclusion that RGGI can offer benefits for Maryland and other RGGI states.
Three complementary models were employed:

1. **Haiku:**

   National simulation of the electric power grid & environmental policies (e.g., emissions control technologies) developed by Resources for the Future]

   *This model helps answer questions such as how will Maryland’s electrical power prices and fuel mix for power generation change due to the state joining RGGI.*
Three complementary models were employed:

2. **IMPLAN:**

Input-output model of Towson’s Regional Economic Study Institute (RESI) used to estimate the statewide economic and fiscal impacts of Maryland joining RGGI (this model is used frequently by the state)

*This model helps answer questions such as how will Maryland joining RGGI affect the average annual electricity bill, the state economy, etc.*
Three complementary models were employed:


Market equilibrium model for the PJM region, which includes Maryland and its neighbors; it allows analysis of the potential market power of large electric generating companies, and more detailed transmission capacity analyses.

*This model helps answer questions like whether market power of generation companies is affected by Maryland’s participation in RGGI.*
Study Design and Research Methodology

All the figures we give are a comparison between two primary modeling scenarios, used by all three models:

- “Maryland does not participate in RGGI”
  (baseline, business-as-usual)

- “Maryland joins RGGI”
  Assumes:
  • total amount of RGGI CO₂ emissions allowances increased by roughly 1/3
  • 25% of allowances will be auctioned by the state, remaining 75% given to electric generating companies
Study Design and Research Methodology

Comments were solicited from over 60 stakeholders representing more than 30 institutions (industry, gov’t, NGOs)

- Engagement techniques included a web site, email updates, briefings by conference call, and direct engagement.

- Much of the input came in the early stages
  - modeling assumptions
  - data parameters
  - recommendations for future alternative model runs

- Stakeholders will be invited to review the report and comments on its analysis
  - report will be available online at www.cier.umd.edu
  - comments are due three weeks after report release (by 5 p.m. on February 22, 2007)
  - addendum with comments will be provided online
Maryland Joining RGGI

[NOTE: All findings are relative to the baseline (business-as-usual) case]

**Electricity: Price and Demand**

- Has virtually no effect on electricity price in Maryland.
- Reduces electricity demand in Maryland through investments in energy efficiency, which contributes to the lack of a price effect.

**Reliability/Generator Adequacy**

- Is unlikely to raise generation capacity prices significantly in the central Maryland local demand area, because energy efficiency programs would reduce demand for capacity reserves.
Findings: Supply, Demand and Reliability

Maryland Joining RGGI

Utility Impacts

- Has a negative impact on profits of coal-fired generators, but does not prompt retirement of coal capacity in Maryland.

- Aggregate revenues for coal plants remain in excess of variable costs and estimated carrying costs of the original construction expense.

- Produces a very small amount of retirement of existing oil and gas steam capacity.

- Has a positive aggregate impact on the profits of oil and gas generators, who earn revenues from the sale of CO₂ emission allowances created by the program.
Electricity Demand in Maryland

Maryland joining RGGI lowers net electricity demand in the state by 1.5% in 2010 to 3.0% in 2025 as a result of increased energy efficiency investment.
Maryland joining RGGI reduces coal and natural gas generation in Maryland slightly by 2015 and raises net imports of power to the state, largely through a drop in exports of power to the east.
Maryland joining RGGI reduces CO$_2$ emissions from electricity generators in the state by roughly 13% by 2020.
Maryland joining RGGI results in total expected emission reductions (including offsets) for the expanded RGGI region of roughly 26 million tons between 2010 and 2025 (4.3% below baseline levels).
Findings: Emissions Leakage

“Leakage” refers to the change in CO$_2$ emissions outside of the expanded RGGI region.

Maryland Joining RGGI

- Has varying effects on leakage, positive or negative, depending on where it is measured (i.e., which states are included in the analysis).
- Results in little additional leakage in general, compared to the base case scenario.
Maryland joining RGGI reduces the price of CO₂ emissions allowances in the RGGI cap and trade program.
Findings: Generator Competitiveness

Maryland Joins RGGI

Generator Competitiveness

- There is no evidence that the effects of Maryland joining RGGI will amplify any potential market power in the generation market.

Transmission Assumptions

- Assumptions concerning the configuration of the transmission grid after 2015 can make as much difference in power prices and other market outcomes as “Maryland joins RGGI.”
- In this study, modelers included 2 out of 3 major transmission projects proposed in Maryland and its neighbors.
Findings: Economic Impacts

Maryland Joining RGGI

Costs to Consumers

- Overall, electricity bills will decrease over $100 million in 2010, and more than $200 million by 2025.

- More than half of the savings will go to industrial and commercial users (i.e., 53% of total savings in 2010, increasing to 63% in 2025).

- On average, residential ratepayers will save about $22 per household in 2010.

Job Creation

- Over 1,800 net new jobs are created in 2010 by Maryland joining RGGI, which is 0.06% of total forecasted employment in Maryland in 2010.

- In subsequent years, this rises to 0.1% of total forecasted employment in Maryland.
Findings: Economic Impacts

Maryland Joining RGGI

State Economy

- Gross State Product (GSP) is expected to increase by nearly $150 million in 2010 due to Maryland joining RGGI.

- The total economic impact is 0.06% of Maryland’s forecasted GSP for 2010, and remains less than 0.1% of total forecasted GSP in subsequent years.

- There is little fiscal impact on the state, aside from the revenue generated from auctioning allowances, which the model assumes is 100% dedicated to a new energy efficiency program.
Further review could help answer questions such as:

- Given the significance of energy efficiency found in this study, how might further changes in energy efficiency impact the economy, energy use and the environment?
  - What would be the effect of an allowance auction of more than 25% going to energy efficiency and public benefit (e.g., 75%)?
  - What would be the impact of technology, such as the new nuclear plants envisioned in 2005 Energy Policy Act, advanced combustion turbines, and gas combined cycle plants?
  - How would the inclusion of expanded energy efficiency data affect the results?
- How do the recently released studies from other states in RGGI compare?
- How sensitive are the results to higher natural gas prices?
Recommended Research

- What are optimal transition strategies for MD coal-fired generators in RGGI?
- What are optimal expansion strategies for non-fossil fuel based generation in MD?
- What would an updated MD Climate Change Action Plan look like, taking into account:
  - RGGI,
  - California mobile source emissions standard,
  - Renewable energy portfolios, and
  - Biomass-based energy?
Summary Study Results

Maryland joining RGGI will result in

- A modest positive environmental impact.
- No impact on electricity prices and lower average electricity bills.
- Mixed effects on profits for generators: coal-fired power plants will have lower profits, while oil and natural gas plants will make more profits.
- Relatively little change in carbon dioxide emissions displacement ("leakage") to non-RGGI states.
- A slightly positive economic impact overall for the state.
Comments

Download the full report at www.cier.umd.edu

We invite written comments. Please send them to dnees@umd.edu by 5:00pm on February 22.