Market and Regulatory Decarbonization Pathways

Illinois Commerce Commission
Next Grid Working Group 6, Session 4
Illinois Chamber of Commerce
## Different Roads Taken

<table>
<thead>
<tr>
<th>Market-Based Trading</th>
<th>Pricing Carbon</th>
<th>Non-Pricing Paths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Market &amp; Registry</td>
<td>Carbon Tax - upstream - retail level</td>
<td>Efficiency</td>
</tr>
<tr>
<td>State Backed Registry</td>
<td>Shadow Pricing</td>
<td>Other DSM</td>
</tr>
<tr>
<td>Cap &amp; Trade - regulatory</td>
<td>NYISO/NYPSC</td>
<td>Renewables - Grid-scale - Distributed</td>
</tr>
</tbody>
</table>
Firms Have Different Abatement Costs

FIGURE 0.2  Example of Two Firms with Different Abatement Costs

Marginal Savings from Emissions for High-Cost Corp. (Avoided Marginal Abatement Costs, MAC)

Low-Cost Inc. (L) and High-Cost Corp. (H) have very different marginal savings from emissions given very different Marginal Abatement Cost curves (MAC)

High-Cost Corp.’s curve is steeper; its savings from not abating the 50th ton of emissions is almost twice as high as for Low-Cost Inc.’s. Its cost of having to go to zero emissions is too high to show on this graph.

Note: Two firms with different “abatement” (emissions reduction) costs: High-Cost Corp., with emissions shown from left to right, and hence abatement from baseline emissions in reverse, has a steeper incremental or marginal abatement cost curve and thus steeper marginal savings from emissions; Low-Cost Inc., with emissions plotted from right to left, has a flatter curve. Note that the total emissions are the same (and equal to 100) at every point along the horizontal axis; what changes is how those emissions are allocated between the two firms.
Market-Based Approaches Focus on Trading a Commodity (CO₂ credits)

Private Trading Exchange
- Chicago Climate Exchange (CCX)

Private Registries
- Voluntary Carbon Standards (VCS, Gold, CDM, CCX)

State Backed Registry
- The Climate Registry (TCR)
Carbon Emissions Trading Worldwide

Carbon Trading Worldwide


- Carbon pricing in place
- Carbon pricing in development
Regulatory CO₂ Markets Around the World

Emissions Trading Worldwide
The state of play of cap-and-trade in 2018

The ICAP ETS world map depicts emissions trading systems currently in force, scheduled to come under consideration, after China launched the world’s national carbon market in 2017, there are now systems covering 20 jurisdictions in force. Another five jurisdictions — Mexico, Kenya, South, Taiwan (China), Mississippi and Virginia — have an ETS officially scheduled. Finally, ten governments at different levels are considering the implementation of an ETS as part of their climate policy strategy, amongst them California, Washington State and Thailand.

A regularly updated, interactive version of the ICAP ETS map with detailed information on all systems is available at:

www.icapcarbonaction.com

Regional Greenhouse Gas Initiative - RGGI

Source: CNY Energy Challenge
RGGI – Caps, Compliance and Cost Containment

- Northeast and Mid-Atlantic states cap and reduce carbon dioxide emissions from the power sector
  - Power plants 25 MW or greater to hold one CO$_2$ allowance for each ton of CO$_2$
  - Three-year control periods starting with 2009-2011, currently in fourth control period (2018-2020)
  - 2015 was first year of interim compliance
RGGI – Caps, Compliance and Cost Containment (cont.)

• CO$_2$ Cap: 82.2 million short tons in 2018, and declines 2.5 percent each year until 2020
  • Interim adjustments to the cap (2014-2020) to account for banked allowances
  • 2018 RGGI adjusted cap is 60.3 million short tons
  • Cost containment reserve (CCR) of 10 million allowances
RGGI States Power Sector CO₂ Reductions with Economic Growth

Sources: Bureau of Economic Analysis (GDP Data) and RGGI COATs (CO₂ Emissions Data)
RGGI Mechanics and Administration

• Quarterly regional CO₂ allowance auctions
  • CO₂ allowances are issued by each state
  • Compliance occurs at the state level
  • One tradable CO₂ allowance market - CO₂ allowances are fungible across the multi-state region
  • CO₂ allowances issued by any participating state can be used for compliance in any of the participating states

• Centralized allowance tracking and emissions tracking platform (RGGI COATS)
  - Market monitoring of CO₂ allowance market
  - Limited use (3.3%) of offsets
RGGI Auction Clearing Prices Summary
RGGI’s Market-Based System - Auctions

- CO₂ allowance auctions are open to all prequalified bidders
- After 10 years, no evidence of anti-competitive conduct
- 40 quarterly auctions held since September 2008
  - Over 945 million CO₂ allowances sold
- CO₂ allowance auction clearing prices have ranged from $1.86 to $7.50
RGGI’s Auctions Proceeds Investments

- RGGI states have distributed approximately 90% of allowances by auction
- More than $2.9 billion in auction proceeds through 40 auctions
- Auction proceeds invested by states
- States have invested more than $1.77 billion of auction proceeds in energy efficiency, clean and renewable energy, direct bill assistance, GHG abatement programs through 2015
Delaware Uses RGGI Proceeds for Clean Transportation

- From launch in July to December 2015, program provided 72 Delawareans $170,000 in rebates for purchase of low- or zero-emission vehicles
- In 2015, program avoided over 600,000 pounds of carbon dioxide
RGGI: Market Monitor

- RGGI retains Potomac Economics as an independent market monitor (MM)
- MM issues reports on each auction with aggregate data on the auction results
- MM reports quarterly on the secondary market
- MM issues annual report on the RGGI allowance market
- Consistently found no evidence of market manipulation or collusion
Why Do a Multi-State Carbon Market?

- Proven model by RGGI, the EU, CA-Quebec
- Cost-effective
- Limit on emissions – easy to verify
- Simple, transparent, and verifiable tracking and compliance system
- Economic and consumer benefits focused on each state economy
- Aligns with regional nature of electricity grid
- Fosters regional cooperation
RGGI Program Review

- Regular program review has been a key to RGGI’s success
- New program improvements announced in 2017:
  - Additional 30% decline in RGGI cap from 2020-2030
  - Introduction of Emissions Containment Reserve (ECR)
  - Modifications to Cost Containment Reserve (CCR)
  - Post-2020 adjustment for banked allowances
RGGEI Experience: Total Generation Mix

Total generation mix in RGGI states

- Coal
- Gas
- Petroleum
- Nuclear
- Hydro
- Renewables
- Other

2005 vs 2016
RGGI States’ Generation Change

Change in total generation by fuel in RGGI states (2005-2016)

- Gas: -5% (82% increase)
- Non-hydro Renewables: -75% (44% decrease)
- Total: -96% (100% decrease)
NY ISO/PSC Discussion Proposal: Carbon adder collected from fossil units in dispatch stack
Shadow Pricing & Environmental Dispatch

Non-assessment systems

**Shadow Pricing**
- Definition: Adder for carbon (or other) price to carbon-emitting resource bids (but no collection of the adder)

**Environmental Dispatch**
- Definition: Dispatch of generation with constraints based on environmental criteria (e.g. carbon emissions, water protections, SO$_2$)
Feed-in Tariffs, Direct Subsidies, Tax Credits

Source: Flickr
Direct Renewable Support

Direct payments to support RE are often supported on carbon abatement

- OECD examined mechanisms to recue GHG in 15 OECD countries + China:


- OECD analysis: carbon markets are ~ 94% more efficient at reducing GHG emissions than direct subsidies and feed-in tariffs
## Carbon Tax – B.C. Tax at $35/tonne

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Tax Rate Based on $35/Tonne of Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>7.78 ¢/litre</td>
</tr>
<tr>
<td>Diesel (light fuel oil)</td>
<td>8.95 ¢/litre</td>
</tr>
<tr>
<td>Natural gas</td>
<td>6.65 ¢/cubic meter</td>
</tr>
</tbody>
</table>

Source: [https://www2.gov.bc.ca/gov/content/environment/climate-change/planning-and-action/carbon-tax](https://www2.gov.bc.ca/gov/content/environment/climate-change/planning-and-action/carbon-tax)
A Well Designed Framework Delivers Multiple Sets of Benefits

- Environmental Benefits
- Consumer Benefits
- Economic Benefits
RGGI’s Reinvestments: Environmental

- Reinvestment of auction proceeds helps reduce GHG and traditional Clean Air Act pollutant emissions
  - RGGI power sector CO₂ emissions declined over 50 percent since 2005
- RGGI cap helps drive transition to cleaner fuel and energy sources
  - In 2017, about half of total power generation in the RGGI states was clean or renewable
More than 3.7 million households and 17,800 businesses are participating in RGGI proceeds-funded programs.

RGGI proceeds invested in energy efficiency, clean and renewable energy, energy bill assistance and GHG abatement.
Maryland Uses RGGI Proceeds for Commercial Energy Retrofits: H&S Bakery

- In 2015, MEA awarded $500,000 in funding to H&S to purchase 25 Class 8 tractors powered by compressed natural gas (CNG)
- Estimated post-retrofit energy savings of 58% and cost savings of $8,000 annually
RGGI’s Energy, Fossil Fuel, CO₂ Outcomes Flowing from Consumer Benefits

Arising from lifetime impact of RGGI investments made in 2015, RGGI proceeds report estimates:

• $2.3 billion in lifetime energy bill savings
• 9 million MWh of electricity use avoided
• 28 million MMBtu of fossil fuel use avoided
• 5.3 million short tons of CO₂ emissions avoided
Independent reports from the Analysis Group (3) studied RGGI’s first, second and third control periods.

Analysis Group found total benefits on the order of $4 billion in net economic benefit, and tens of thousands of job-years.

Benefits in each state – but more with higher energy efficiency investments.
Shaker Regional School District awarded a rebate check of $200,000 for work, including spray foam insulation, a retrofit to energy-efficient LEDs, and new HVAC system controls.

Overall project estimated to save taxpayers over $100,000 per year.
Takeaways for Carbon Pathways

- Complementary programs matter!
- Understand energy and economic benefits and costs
- Abjure narrow focus on carbon, rates

Environment & Energy

- Carbon reductions
- NO$_x$, SO$_x$, PM$_{2.5}$
- Energy Savings
- Capacity Savings
- Public Health Benefits

Economic

- Customer Benefits
- State GDP growth
- Job growth
- Long-term growth
Resources on Decarbonization

- RAP, Carbon Markets 101: “How-to” Considerations for Regulatory Practitioners
- RAP, RGGI 2017 Program Review
- International Carbon Action Partnership (ICAP), Status Report 2018
- RGGI Inc., The Investments of RGGI Proceeds in 2015

Analysis Group reports for specific benefits from each control period:

- First Analysis Group Report
- Second Analysis Group Report
- Third Analysis Group Report
About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org