Draft Final-Form Rulemaking
Chapter 145. Interstate Pollution Transport Reduction
Subchapter E. CO₂ Budget Trading Program

Air Quality Technical Advisory Committee
May 17, 2021
Power Sector Modeling- 2021 Update
The Department completed updated power sector modeling to ensure use of the most recent laws, policy changes, inputs & assumptions.

- **Power Sector Modeling**
  - Used same, advanced modeling software, Integrated Planning Model (IPM®), as original effort.
  - Included updated data, assumptions, and inputs that reflect recent changes in power sector.
  - Power sector modeling only, did not include economic modeling.
  - Results include a reference case (without regulation) and a policy case (with regulation) going out to 2030.
  - Results are publicly available on DEP RGGI webpage.
Modeling: Revised Assumptions & Inputs

- Reference Case (Business-as-Usual)
  - Updated PJM Demand Forecast
  - 2021 AEO Natural Gas Prices
  - Updated capacity additions and retirements
  - Revisions to state laws & policies
  - Updated NREL technology costs
  - New in-state generation requirement- AEPS Tier II

- Policy Case (RGGI)- includes all updates above AND
  - Adjusted Waste Coal Set-Aside Amount
  - New CHP Set-Aside Amount
Assumptions: Natural Gas Prices

EIA AEO and Futures Henry Hub Gas Prices

- AEO 2020 Average
- AEO 2021 Average
- Market Forwards
### Assumptions: Firm Capacity Additions

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Capacity (MW)</th>
<th>Fuel Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shell Chemical</td>
<td>250</td>
<td>Natural Gas</td>
</tr>
<tr>
<td>Towanda</td>
<td>163</td>
<td>Natural Gas</td>
</tr>
<tr>
<td>Renovo Energy Center</td>
<td>1,240</td>
<td>Natural Gas</td>
</tr>
<tr>
<td>Hill Top Energy Center</td>
<td>620</td>
<td>Natural Gas</td>
</tr>
<tr>
<td>Robinson Power (Beech Hollow)</td>
<td>1,000</td>
<td>Natural Gas</td>
</tr>
</tbody>
</table>

- **Firm Natural Gas Capacity Additions**: 3,273 MW (+142 MW)
- **Firm Solar Capacity Additions**: 719 MW (+468 MW)
- **Firm Wind Capacity Additions**: 200 MW (+200MW)
- **Firm Hydropower Capacity Additions**: 25 MW (+25MW)

**Total Firm Capacity Additions 2021**: 4,217 MW

**Total Firm Capacity Additions 2020**: 3,382 MW
2021 Modeling Results Key Takeaways

1. **Confirmed Starting Allowance Budget**: Original allowance budget confirmed at 78 million tons of CO₂.

2. **Significant Avoided Emissions through RGGI participation**: All modeling shows that PA would experience significant CO₂ reductions as a RGGI participating state.

3. **Sharp Decline in Coal Generation by 2025**: Overall PA coal generation decreases significantly with or without RGGI participation.

4. **Limited Impact on Natural Gas Generation**: Minor overall impact on natural gas generation with RGGI participation.

5. **PA Remains a Leading Energy Exporter**: Updated modeling showing a smaller impact on exports due to RGGI participation.

6. **Similar Minimal Impact on Electricity Prices Compared to Past Modeling**: PA’s wholesale power prices are projected to be slightly higher in the policy case, as seen with the 2020 modeling. This does not account for future program investments, which can reduce prices.
Original modeling, updated modeling scenarios, and actual PA 2020 emissions confirmed the validity of the proposed 78 million ton starting allowance budget.

<table>
<thead>
<tr>
<th>Modeling Scenario/Source</th>
<th>Short Tons CO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual 2020 PA RGGI Covered Emissions</td>
<td>77,400,000</td>
</tr>
<tr>
<td>2022 Reference Case Emissions (2020)</td>
<td>78,000,000</td>
</tr>
<tr>
<td>2022 Reference Case Emissions (2021)</td>
<td>81,100,000</td>
</tr>
<tr>
<td>2022 Reference Case Emissions (2021 Gas Futures)</td>
<td>77,400,000</td>
</tr>
</tbody>
</table>
## Calculating CO₂ Allowance Budget

<table>
<thead>
<tr>
<th>Year</th>
<th>Budget</th>
<th>Decline (Tonnage)</th>
<th>Annual Decline (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2022</td>
<td>78,000,000</td>
<td>2,489,370</td>
<td>-3.19%</td>
</tr>
<tr>
<td>2023</td>
<td>75,510,630</td>
<td>2,489,370</td>
<td>-3.30%</td>
</tr>
<tr>
<td>2024</td>
<td>73,021,260</td>
<td>2,489,370</td>
<td>-3.41%</td>
</tr>
<tr>
<td>2025</td>
<td>70,531,890</td>
<td>2,489,370</td>
<td>-3.53%</td>
</tr>
<tr>
<td>2026</td>
<td>68,042,520</td>
<td>2,489,370</td>
<td>-3.66%</td>
</tr>
<tr>
<td>2027</td>
<td>65,553,150</td>
<td>2,489,370</td>
<td>-3.80%</td>
</tr>
<tr>
<td>2028</td>
<td>63,063,780</td>
<td>2,489,370</td>
<td>-3.95%</td>
</tr>
<tr>
<td>2029</td>
<td>60,574,410</td>
<td>2,489,370</td>
<td>-4.11%</td>
</tr>
<tr>
<td>2030</td>
<td>58,085,040</td>
<td>2,489,370</td>
<td></td>
</tr>
<tr>
<td><strong>2022-2030 Total Reduction:</strong></td>
<td><strong>19,914,960</strong></td>
<td></td>
<td><strong>-25.532%</strong></td>
</tr>
<tr>
<td><strong>25.532% reduction from 2022:</strong></td>
<td><strong>58,085,040</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total tonnage reduction:</strong></td>
<td><strong>19,914,960</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Annual tonnage reduction:</strong></td>
<td><strong>2,489,370</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Key Takeaways: PA Avoided Emissions

- All modeling confirms significant avoided CO\textsubscript{2} emissions for Pennsylvania resulting from RGGI participation– ranging from nearly 100 million to 225 millions tons reduced between now and 2030.

- Updated modeling results heavily impacted by Alternative Energy Portfolio Standards Act legislation relating to Tier II requirements, decreased regional electricity demand, and fluctuating natural gas prices.

Cumulative Avoided Emissions (million tons CO\textsubscript{2}) 2021-2030

<table>
<thead>
<tr>
<th>Case</th>
<th>Avoided Emissions (million tons CO\textsubscript{2})</th>
</tr>
</thead>
<tbody>
<tr>
<td>PJM Demand Case (2021)*</td>
<td>227</td>
</tr>
<tr>
<td>2020</td>
<td>183</td>
</tr>
<tr>
<td>Gas Price Case (2021)*</td>
<td>107</td>
</tr>
<tr>
<td>2021</td>
<td>97</td>
</tr>
</tbody>
</table>

*These avoided emissions results were based on the difference between a reference case and a policy case that were the same as the 2021 case, except with a different electricity demand or natural gas price assumption.
Benefits of CO\textsubscript{2} Reductions

When power plants pollute less....

- CO\textsubscript{2} emissions decrease
- SO\textsubscript{2} emissions decrease
- NO\textsubscript{x} emissions decrease

Air and Water are Cleaner. People are Healthier.

- Reduced childhood asthma and respiratory disease
- More avoided hospital visits & premature deaths
- Less lost workdays
- Hundreds of millions in annual health savings for Pennsylvanians
Without RGGI participation, PA coal generation declines rapidly – with limited facilities operating beyond 2025. Intervening AEPS legislation results in sustained coal generation even with RGGI participation leading to less realized emissions reductions.
Key Takeaways: Gas Generation

Previous modeling showed the impact of Pennsylvania joining RGGI had relatively minor effect on gas generation. That trend is confirmed in the updated modeling, with only a single digit projected decrease in total natural gas generation in most years.

Impact of PA RGGI Participation on Gas Generation
Pennsylvania continues to be a leading electricity exporter in all modeled cases. The updated assumptions in the 2021 modeling leads to overall less exports in both the reference and policy cases, with minimal impact on exports from PA participating in RGGI.
Key Takeaways: Electricity Price Changes

- **Wholesale power prices** ($/MWh) are slightly higher with RGGI participation—though smaller than 2020 modeled price impacts.

<table>
<thead>
<tr>
<th></th>
<th>2022</th>
<th>2025</th>
<th>2028</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Case</td>
<td>$33.0</td>
<td>$34.8</td>
<td>$37.9</td>
<td>$40.3</td>
</tr>
<tr>
<td>Policy Case (RGGI)</td>
<td>$33.8</td>
<td>$36.0</td>
<td>$39.4</td>
<td>$41.0</td>
</tr>
<tr>
<td>$ Difference</td>
<td>+$.80 (2.42%)</td>
<td>+$1.20 (3.45%)</td>
<td>+$1.30 (3.96%)</td>
<td>+$.70 (1.73%)</td>
</tr>
</tbody>
</table>

- **Residential electricity bills** are slightly higher with RGGI participation—with bill impacts declining to just $.84- $1.19 per month by 2030.

<table>
<thead>
<tr>
<th>RGGI Price Changes</th>
<th>2022</th>
<th>2025</th>
<th>2028</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer A: Heats w/ other fuel</td>
<td>+$1.17</td>
<td>+$1.67</td>
<td>+$1.92</td>
<td>+0.84</td>
</tr>
<tr>
<td>Customer B: Heats w/ electric</td>
<td>+$1.65</td>
<td>+$2.36</td>
<td>+$2.70</td>
<td>+$1.19</td>
</tr>
</tbody>
</table>

*Does not include anticipated electricity price decreases resulting from energy sector investments.*
Regulatory Changes from Proposed to Final
Summary of Regulatory Changes

• Added Quarterly CO₂ Allowance Budgets for 2022 (§ 145.341)
• Made a slight modification to the Limited Exemption (§ 145.305)
• Expanded Cogeneration (now Combined Heat and Power) Set-Aside with Qualifiers (§ 145.342)
• Adjusted the amount of Waste Coal Set-Aside Allowances (§ 145.342)
• Refined and Clarified Strategic Use Set-Aside (§ 145.342)
• Added DEP Commitment to Annual Air Quality Impact Assessment (§ 145.306)
• Incorporated Equity Principles (preamble)
If Pennsylvania is a participating state on January 1, 2022, for 2022, the CO₂ Budget Trading Program base budget is 78,000,000 tons. If Pennsylvania is a participating state after January 1, 2022, then the CO₂ Budget Trading Program Base Budget for 2022 will be one of the following.

If PA is a participating state after:

- January 1, 2022, but before or on April 1, 2022, then the CO₂ Budget Trading Program Base Budget is 57,954,000 tons.

- April 1, 2022, but before or on July 1, 2022, then the CO₂ Budget Trading Program Base Budget is 40,716,000 tons.

- July 1, 2022, but before or on October 1, 2022, then the CO₂ Budget Trading Program Base Budget is 18,564,000 tons.
2022 Quarterly Emissions Calculation

Average Annual Emissions by Quarter (2016-2020)

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Emissions %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qtr 1 (Jan-Mar)</td>
<td>25.70%</td>
</tr>
<tr>
<td>Qtr 2 (Apr-Jun)</td>
<td>22.10%</td>
</tr>
<tr>
<td>Qtr 3 (Jul-Sep)</td>
<td>28.40%</td>
</tr>
<tr>
<td>Qtr 4 (Oct-Dec)</td>
<td>23.80%</td>
</tr>
</tbody>
</table>
NEW Changes to the Limited Exemption § 145.305

• An otherwise applicable EGU (25 MW+) that supplies ≤ 10% of its annual gross generation to the electric grid.

• An otherwise applicable combined heat and power EGU (25 MW+) that supplies ≤ 15% of its annual total useful energy to any entity - not including energy sent to an interconnected manufacturing, industrial, institutional or commercial facility.

• Required to have a permit issued by the Department containing a condition restricting the supply of the CO₂ budget unit's annual electrical output to the electric grid in order to qualify for the limited exemption.
Combined Heat and Power Set-Aside Account

A general account established by the Department for the allocation of CO₂ allowances in an amount sufficient to retire CO₂ allowances equal to the CO₂ emissions from Combined Heat and Power units under § 145.342(k).

Set-Aside Eligibility Criteria for Applicable Facilities

1. Units must be located in PA and be subject to the CO₂ Budget Trading Program.

2. Must meet definition of Combined Heat and Power (CHP) unit per § 145.302.
   - An electric-generating unit that simultaneously produces both electricity and useful thermal energy.

3. CHP unit may request retirement of CO₂ allowances equal to one of the following:
   - **Total amount of CO₂ emitted** as a result of providing useful thermal energy or electricity, or both, during the allocation year, OR
   - **Partial amount of CO₂ emitted** as a result of supplying useful thermal energy or electricity, or both, to an interconnected industrial, institutional or commercial facility during the allocation year.

4. Department will retire allowances for applicable CHP units.
A general account established by the Department for the allocation of CO₂ allowances in an amount sufficient to provide CO₂ allowances equal to the legacy emissions from all waste coal-fired units under § 145.342(i).

Defining Legacy Emissions

1. The amount of CO₂ emissions in tons equal to the highest year of CO₂ emissions from a waste coal-fired unit during the 5-year period beginning January 1, 2015 through December 31, 2019 as determined by the Department. § 145.302

2. Legacy emissions increased from 9,300,000 tons to 10,400,000 tons of CO₂ emissions. § 145.342
   a) Colver waste coal facility has withdrawn its deactivation notice to PJM
   b) Legacy emissions for Colver are 1.1 M tons CO₂
   c) 9.3 Million (original value) + 1.1 Million = 10.4 M tons CO₂

3. Any undistributed allowances are transferred to the Strategic Use set-aside account each year.
Allocation to Eligible Projects

1. Department will allocate undistributed CO₂ allowances to the strategic use set-aside account for each allocation year from the waste coal set-aside account.

2. Distributions may be made from the set-aside account to eligible projects located in Pennsylvania that result in a **Greenhouse Gas emission reduction** benefit including:
   a) **Implementation** of energy efficiency measures.
   b) **Implementation of** renewable and non-carbon emitting energy technologies.
   c) **Development** of innovative **greenhouse gas emission abatement technologies with significant greenhouse gas reduction potential**.

3. Established set-aside application process and requirements.

4. CO₂ allowances distributed upon completion of the eligible project which cannot be legally required.
The Department of Environmental Protection is making an annual commitment to assess changes in emissions and air quality in Pennsylvania as it relates to implementation of this regulation. § 145.306

- The Department will use the emissions measurements recorded and reported under Article III to determine whether areas of this Commonwealth have been disproportionately impacted by increased air pollution as a result of implementation of this subchapter.

- The Department will publish notice of the availability of a report of the emissions measurements and the determination in the Pennsylvania Bulletin on an annual basis to include at a minimum:
  - Baseline air emissions data from each CO₂ budget unit for the calendar year prior to the year Pennsylvania becomes a participating state.
  - Annual emissions measurements recorded and reported to the Department from each CO₂ budget unit.
DEP has developed and prioritized for implementation, a set of **RGGI Equity Principles** whereby the Department in development of this rulemaking and associated investment framework commits to:

- Inclusively gathering and considering input from the public related to decisions made under RGGI.
- Protecting public health and welfare, mitigating any adverse impacts on human health, especially in EJ communities.
- Working equitably and with intentional consideration to distribute environmental and economic benefits of the proceeds of allowance auctions.

*Environmental justice* ensures fair treatment and meaningful involvement of all people in development of environmental laws, regulations and policies and embodies the principle that populations should not be disproportionately exposed to environmental impacts.
Compliance & Implementation
1. Title V Permit Modifications

2. Establish CO₂ Allowance Tracking System (COATS) Account

3. Emissions Monitoring (EPA’s Clean Air Market Division)

4. Recordkeeping & Reporting

5. Application for Allowances from Qualifying Set-Asides (optional)

6. Transfer of Required Allowances to Compliance Account
   a) 50% during interim control periods
   b) 100% at the close of the control period

**CO₂ Allowance Transfer Deadline:** Midnight of March 1st is the deadline by which CO₂ allowances must be submitted for recordation in a CO₂ budget source’s compliance account for the source to meet the CO₂ requirements of § 145.306(c).
Pennsylvania Compliance Timeline

– 2022 – CO₂ Allowance Requirements Begin
January 1, 2022 or the 1st day of the next calendar quarter following publication of the final-form rulemaking, the CO₂ requirements start. Regulated facilities must obtain one CO₂ allowance for each ton of CO₂ emitted from this day onward.

– 2023 – Interim Compliance
Midnight of March 1, 2023/CO₂ allowance transfer deadline. Eligible facilities must hold allowances equal to at least 50% of interim control period (2022) CO₂ emissions.

– 2024 – Full Compliance
Midnight of March 1, 2024/CO₂ allowance transfer deadline. Eligible facilities must hold allowances equal to 100% of control period (2022 and 2023) CO₂ emissions.
If the Department determines that changes to the regulation are needed after implementation, the rulemaking would be amended through the regulatory process.

Regional Greenhouse Gas Initiative Program Review

- The RGGI participating states conduct periodic program reviews to consider program successes, impacts and design elements- two have been completed since 2009.
- Program review evaluates the RGGI Model Rule, the multistate auction process and emissions reduction targets, and other key policy considerations.
- The next program review is scheduled to commence later this year and will evaluate energy trends, emerging energy issues, and other program elements.
- The review includes extensive regional stakeholder engagement involving the regulated community, environmental groups, consumer and industry advocates, etc.
- Based on stakeholder input and feedback, RGGI states will develop program review objectives and embark upon policy deliberations and technical analyses in 2022.
Anticipated Rulemaking Schedule

Consultation with Department Advisory Committees

- Air Quality Technical Advisory Committee – May 17, 2021
- Citizens Advisory Council – May 19, 2021
- Small Business Compliance Advisory Committee – May 19, 2021
- Environmental Justice Advisory Board – May 20, 2021

Environmental Quality Board Considers Final Rulemaking

- Anticipated Third Quarter 2021 (July - September)

Final-Form Rulemaking Promulgated

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Visit the RGGI website @ www.dep.pa.gov/RGGI
Materiales también disponibles en español.

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