Technical Support Document for Hochul RGGI Affordability

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Background

The NYS RGGI Cost Impacts spreadsheet calculates the costs of RGGI to New Yorkers to evaluate the DEC and NYSERDA's press release that claimed RGGI investments have generated "nearly $12 billion in net ratepayer savings" against roughly $2 billion invested — a "nearly 6-to-1" return that supposedly proves affordability is being served. The "nearly 6-1" cost benefit ratio claim accounts for costs by simply multiplying the auction price by the allowances used. The spreadsheet also updates an earlier analysis of the way that RGGI costs are incorporated into the marginal-price wholesale electricity market that represents the actual way allowance costs are paid by consumers.

RGGI cost recovery makes the allowance price become a variable operating cost. In New York's marginal-price wholesale electricity market, when a generator with RGGI compliance obligations sets or influences the clearing price for an interval, its allowance cost gets bid in. That recovers the costs of the RGGI auction allowance purchases. However, this approach raises the price paid to every accepted resource in that interval. It does not merely reimburse the emitting unit for the allowances it bought. Non-emitting and even imported resources can collect the higher price despite bearing little or none of the underlying RGGI cost themselves. All those costs are passed on to consumers.

There is another aspect of the cost-benefit claim. The invested funds only come from the auction proceeds. The cost estimate does not account for the cost of allowances purchased on the secondary market from other entities with RGGI compliance obligations or investors who try to buy low and sell high. In either case ratepayers pay the going price of the allowances used to cover the compliance obligations. For example, the allowance clearing price jumped 40% from $24.99 in March to $35.00 in

June. If a compliance entity bought allowances from an investor who purchased then at the March auction, consumers pay the $35 plus the profit extracted by the investor, but the benefits only come from the original $25 auction price.

New York State RGGI Cost Impacts Spreadsheet

Calculation Methodology

Accurately accounting for RGGI costs requires hourly information for every generating unit in the state. That is proprietary NYISO information so I cannot precisely calculate the costs. This spreadsheet relies on annual emissions and operating data and a lot of assumptions to provide the estimated costs of the actual cost recovery process.

The basic calculation approach uses annual data from the EPA Clean Air Markets Program Division for every generating unit with RGGI compliance obligations to calculate the following parameters

- Annual average RGGI allowance price ($) from RGGI, Inc.
- Total annual electricity generated in New York State (GWh) NYISO Gold Book Table III-2a Energy
- Total annual CO2 emissions (tons) from EPA CAMPD data
- Total annual load (GWh) from EPA CAMPD data
- Total annual heat input (mmBtu) from EPA CAMPD data
- Calculated heat rate (mmBtu/MWh) from the observed heat input and load data
- Calculated average RGGI allowance cost (₵/kWh)
- The RGGI cost impact in dollars per year multiplies the total electricity generated by the calculated average RGGI allowance cost
- A typical New York residential electric customer used approximately 570 kWh per month **(a**bout 6.9 MWh annually) in 2024. Multiplying that annual energy use by the calculated average RGGI allowance cost produces a typical cost impact on ratepayer electric bills.
- In 2022 the New York State electrical load was 36.5% residential. I used that to calculate the cost of just the allowances for residential customers.

In short, the heat rate (mmBtu/MWh) categorizes the unit types. The RGGI allowance cost (₵/kWh) equals the tons of CO2 per MWh times the allowance costs ($/ton). The total RGGI cost equals the RGGI allowance cost multiplied by the load.

Table 1: NY RGGI Cost Impacts Spreadsheet Tabs

Tab	Description
Summary	Estimated wholesale electric cost impact of RGGI and direct allowance purchase cost through 2026
2024 Summary	Estimated wholesale electric cost impact of RGGI and direct allowance purchase cost through 2024 consistent with DEC RGGI amendment press release
Customer Costs	Estimated residential bill impact of RGGI and direct allowance purchase cost through 2024 consistent with DEC RGGI amendment press release

Totals	Annual total emissions and operating data by EPA unit type, primary fuel, and representative unit type
Input	Downloaded annual emissions and operating data from EPA CAMPD
Unit Types	Description of units by representative unit type
Allowance $	Downloaded quarterly RGGI, Inc. auction results (allowances sold and proceeds) used to calculate the annual average RGGI allowance price
Annual $	Annual roll-up combining EIA residential customer counts, RGGI auction data, and EPA CAMPD totals to calculate the fleet-wide and representative-unit-type RGGI cost impacts shown on the Summary tab

Clearing Unit Estimates

In a deregulated electric market such as that run by the New York Independent System Operator, power plants, load-serving entities, and other participants submit competing bids and offers to an auction that determines the least-cost set of resources needed to meet demand while respecting grid limits. NYISO's day-ahead energy market is a financially binding, security-constrained auction in which generators, loads, and other participants submit bids and offers for each hour of the following day. NYISO then runs an optimization that selects the least-cost portfolio of resources from those bids that can reliably meet forecasted demand given transmission limits and unit constraints, and the resulting locational marginal prices are used for settlement.

A useful way to picture the market is as a stack of generator offers, with the cheapest megawatts at the bottom and progressively more expensive plants piled on top until the stack is high enough to meet NYISO forecast load. At that point, the most expensive marginal unit needed sets the clearing price for the zone. If the marginal unit must add a CO2 allowance cost to its bid, then the clearing price rises accordingly, increasing the price paid to all accepted generators in that market interval. Lower-emitting generators still incur their own allowance costs, but their revenues also increase because they are paid the higher clearing price, and non-emitting units receive the clearing-price increase as pure profit without any direct CO2 compliance cost.

RGGI Cost Estimate

This section documents how the spreadsheet converts the RGGI allowance price into a wholesale electricity cost adder and, from there, into a typical residential bill impact. The calculation has two building blocks: (1) the average, fleet-wide RGGI-affected-unit heat rate and CO2 rate reported directly by EPA CAMPD, and (2) a weighted blend of three representative fossil-fired clearing-unit types intended to approximate which kind of generator is most often the marginal, price-setting unit in NYISO's day-ahead and real-time markets.

Why the clearing unit matters

The fleet-wide average heat rate and CO2 rate (the "RGGI Heat Input Average Cost Added" block in the spreadsheet) blend every RGGI-affected unit in New York together, regardless of whether that unit ever actually sets the clearing price. In the NYISO market, however, it is not the average generator that determines the price consumers pay — it is the marginal unit, the last (and typically least efficient, most expensive) resource dispatched to meet load in a given hour. A single fleet-wide average heat rate understates the allowance cost that gets bid into the price when a less-efficient unit is on the margin, and overstates it when a highly efficient combined-cycle unit is setting price instead. To bound this uncertainty, the spreadsheet does not rely on the fleet average alone. It also calculates the allowance cost contribution using three representative clearing-unit types that span the range of fossil units NYISO is likely to be leaning on at the margin: a modern combined-cycle gas turbine, a steam boiler burning natural gas, and an oil-fired combustion turbine.

The three representative clearing-unit types

- **Modern CCGT —** represented by the average of the two newest, most efficient combined-cycle units in the RGGI-affected fleet, Cricket Valley Energy Center and the Valley Energy Center. These units post the lowest heat rate in the dataset (roughly 6.8–6.9 mmBtu/MWh across 2021–2025) and therefore the lowest CO2 emitted per MWh generated, so they represent the best case for how little an allowance cost adds to the clearing price when an efficient gas unit is on the margin.
- **Steam boiler (gas) —** represented by the EPA CAMPD "Boiler Gas" unit category — older, less efficient steam boilers firing pipeline natural gas. Heat rates for this group run roughly 10–11 mmBtu/MWh, well above the modern CCGT units, so a given allowance price translates into a proportionally larger cost adder when one of these units is setting the clearing price.
- **Combustion turbine (oil) —** represented by the EPA CAMPD "Turbine Oil" category, the oil-fired peaking combustion turbines that typically run only during the highest-demand hours. These are the least efficient units in the comparison, with heat rates ranging from about 11.6 to nearly 14.6 mmBtu/MWh, so they represent the upper bound on how much an allowance cost can add to the clearing price when a peaking unit is on the margin.

For each of these three unit types, the spreadsheet uses the EPA CAMPD-rderived annual heat rate (mmBtu/MWh) and CO2 rate (tons/MWh) for that unit category, multiplies the CO2 rate by the annual average RGGI allowance price ($/ton) to get an allowance cost per MWh, and converts that to ¢/kWh. That per-kWh allowance cost is then multiplied by the Gold Book Table III-2a statewide generation total to produce a dollar cost impact for New York — the same basic calculation used for the fleet average, just applied separately to each representative unit type instead of the fleet-wide average heat rate and CO2 rate.

Weighting the three unit types into a single wholesale adder

Because no single unit type is on the margin all the time, the spreadsheet blends the three cost estimates into one "Wholesale Electric Adder RGGI Cost Impact" using fixed weights intended to reflect, on a rough annual basis, how often each unit type is likely to be the marginal resource: **60% Modern CCGT, 35% Steam Boiler Gas, and 5% Combustion Turbine Oil**. Combined-cycle gas units get the largest weight because they make up the bulk of New York's fossil-fired marginal generation in most hours; steam boilers get a meaningful secondary weight because older gas-fired steam units still set price in a substantial share of hours, particularly downstate; and oil-fired combustion turbines get only a small weight because they are peaking units that run — and therefore set price — relatively rarely, mainly on the highest-demand hours of the year.

These weights are a simplifying assumption, not a NYISO-published statistic — precisely which unit clears the market in each of the 8,760 hours of the year is proprietary dispatch information that is not publicly available. The 60/35/5 split is intended to be a reasonable, defensible approximation given that combined-cycle gas plants are known to supply the majority of New York's fossil generation and most frequently set price, while steam boilers and oil-fired turbines contribute smaller, well-bounded shares. Reasonable people could argue the split should be 55/40/5 or 65/30/5 instead; the CCGT-versus-steam-boiler line is the one most open to debate, while the combustion turbine oil share is small enough that its exact value has little effect on the final result.

Mechanically, the blended wholesale adder for each year is calculated as:

Wholesale Adder = (0.60 × Modern CCGT cost impact) + (0.35 × Steam Boiler Gas cost impact) + (0.05 × Combustion Turbine Oil cost impact)

This blended wholesale adder is then added to the direct allowance purchase cost (the amount NYSERDA-regulated entities pay at the quarterly RGGI auctions) to produce the "Total RGGI Cost Impact" shown on the Summary and 2024 Summary tabs, and it is that total that is carried forward into the Customer Costs tab to estimate the annual and monthly bill impact on a typical residential customer.

Sensitivity of the result to unit-type assumptions

Because the three representative unit types have such different heat rates — roughly 6.8 mmBtu/MWh for modern CCGT versus 10–11 mmBtu/MWh for gas steam boilers and 12–15 mmBtu/MWh for oil combustion turbines — the choice of weights matters more than the choice of allowance price. Shifting weight from CCGT toward steam boilers or combustion turbines increases the estimated wholesale cost impact, since less-efficient units emit more CO_2 per MWh and therefore bid in a larger allowance cost. The spreadsheet's 60/35/5 weighting is deliberately conservative relative to using the steam-boiler or combustion-turbine heat rate alone, and it produces a wholesale adder that is consistently lower than the simple fleet-wide heat-input average shown in the "RGGI Heat Input Average Cost Added" block — both are shown side by side on the Summary tab so the reader can see the range the assumption produces.

Total Annual RGGI Cost Estimate

Table 1 lists the total annual costs for the projection scenarios described above (NYS RGGI Cost Impacts Spreadsheet, Tab: Total Allowance Costs). The "Total Direct RGGI Allowance Costs" parameter in the "Auction Cost of Allowances for Annual Emissions" projection is the auction revenues (allowances sold times the allowance price). This is more than the costs admitted (see the Source of the "6-to-1 return" Claim section below) because they only include actual investments and not the administrative costs. More importantly it does not reflect the cost that consumers pay. Using the methodology described previously, five cost projections bracket potential costs assuming that a fossil unit is always setting the clearing cost. When the non-emitting and even imported resources collect the price that incorporates the RGGI adder costs increase sharply.

Table 2: Total Annual RGGI Costs($ millions)

Projection	Parameter	2009-2020	2021	2022	2023	2024	2026
	Annual Average RGGI Allowance Cost	$3.45	$9.64	$13.46	$13.58	$20.14	$35.00
Auction Cost of Allowances for Annual Emissions	Total RGGI Unit Gross Load (GWh)		55,106	60,290	57,532	64,921	
	RGGI Unit CO2 Emissions (tons)	32,721,165	28,370,370	30,586,148	28,656,857	30,979,144	
	Total Direct RGGI Allowance Costs ($ million)	$113	$274	$412	$389	$624	$1,084
Annual Total	Gold Book Table III-2a Energy (GWh)	125,361	125,361	124,449	122,469	129,238	
RGGI Heat Input Average Cost Added	RGGI Unit Heat Rate (mmBtu/MWh)	8.53	8.53	8.38	8.35	8.03	
	RGGI Unit CO2 Rate (tons/MWh)	0.51	0.51	0.51	0.50	0.48	
	Average RGGI Allowance Price (¢/kWh)	0.18	0.50	0.68	0.68	0.96	
	RGGI cost impact for New York ($ million)	$223	$622	$850	$828	$1,242	$2,158
Modern CCGT Annual Cost of Allowances (Average of Cricket Valley and Valley Energy)	Modern CCGT Heat Rate (mmBtu/MWh)	6.81	6.81	6.86	6.90	6.88	
	Modern CCGT CO2 Rate (tons/MWh)	0.40	0.40	0.40	0.40	0.40	
	Modern CCGT Allowance Price(¢/kWh)	0.14	0.39	0.54	0.55	0.81	
	Modern CCGTI cost impact for New York ($ million)	$175	$489	$678	$673	$1,048	$1,820
Steam Boiler Gas Annual Cost of Allowances	Steam Boiler Gas Heat Rate (mmBtu/MWh)	10.63	10.63	10.52	10.94	10.40	
	Steam Boiler Gas CO2 Rate (tons/MWh)	0.64	0.64	0.64	0.65	0.62	
	Steam Boiler Gas RGGI Allowance Price(¢/kWh)	0.22	0.62	0.87	0.89	1.25	
	Steam Boiler Gas RGGI cost impact for New York ($ million)	$278	$776	$1,077	$1,088	$1,615	$2,806
Combustion Turbine Oil Annual Cost of Allowances	Combustion Turbine Oil Heat Rate (mmBtu/MWh)	12.25	12.25	11.94	11.56	12.89	
	Combustion Turbine Oil CO2 Rate (tons/MWh)	0.92	0.92	0.87	0.83	0.94	
	Combustion Turbine OilRGGI Allowance Price(¢/kWh)	0.32	0.89	1.16	1.13	1.90	
	Combustion Turbine Oil RGGI cost impact for New York ($ million)	$400	$1,116	$1,449	$1,381	$2,457	$4,268
Wholesale Electric Adder RGGI Cost Impact - Modern CCGT at 60%, Boiler Gas at 35%, and Turbine Oil at 5%		**$222**	**$621**	**$856**	**$854**	**$1,317**	**$2,288**
	Wholesale Electric RGGi Cost Adder Increase Since 2021			$235	$233	$696	$1,667
				38%	37%	112%	268%

The article description extracts the direct allowance costs, the average cost adder and the estimated mix of unit projections (Table 3)

Table 3: Total Annual RGGI Costs($ millions) Extracted from Table 2 for Article

Year	2009-2020	2021	2022	2023	2024	2026
Total Direct RGGI Allowance Costs	$113	$274	$412	$389	$624	$1,084
Average of RGGI Units	$223	$622	$850	$828	$1,242	$2,158
Estimated Mix of Unit Types	$222	$621	$856	$854	$1,317	$2,288

Residential RGGI Costs

Table 4 lists the annual residential costs of RGGI for the projection scenarios described above (NYS RGGI Cost Impacts Spreadsheet, Tab: Customer Costs). The total RGGI cost equals the RGGI allowance cost multiplied by the annual total load. In 2022 the New York State electrical load was 36.5% residential. The "Total RGGI Allowance cost annual bill impact" parameter in the "Direct Cost of Allowances for Annual Emissions" projection is the total multiplied by the percentage that was residential load. As before, five cost projections bracket potential costs assuming that a fossil unit is always setting the clearing cost. In 2022 estimate that the allowance costs themselves added $17 to residential annual bills but the mix of unit types cost was $47 so the true cost of RGGI was underestimated by $30 in 2022 when the wholesale electric cost impact was not factored in.

Table 4: Annual Residential RGGI Costs

Projection	Parameter	Average 2009-2020	2021	2022	2023	2024	2026
	Annual Average RGGI Allowance Cost	$3.87	$9.64	$13.46	$13.58	$20.14	$35.00
Direct Cost of Allowances for Annual Emissions	RGGI Heat Rate (mmBtu/MWh)	9.33	8.80	8.64	8.61	8.25	
	RGGI CO2 Rate (tons/MWh)	0.51	0.51	0.51	0.50	0.48	
	Average RGGI Allowance Price (₵/kWh)	0.20	0.50	0.68	0.68	0.96	
	Total RGGI Allownace cost annual bill impact	$ 4.98	$ 12.39	$ 17.05	$ 16.88	$ 24.00	$41.70
Annual Total	Gold Book Table III-2a Energy (GWh)	125,361	125,361	124,449	122,469	129,238	
RGGI Heat Input Average Cost Adder	RGGI Unit Heat Rate (mmBtu/MWh)	8.53	8.53	8.38	8.35	8.03	
	RGGI Unit CO2 Rate (tons/MWh)	0.51	0.51	0.51	0.50	0.48	
	Average RGGI Allowance Price (₵/kWh)	0.20	0.50	0.68	0.68	0.96	
	RGGI Annual Bill Impact	$13.64	$33.95	$46.71	$46.26	$65.74	$114.24
Modern CCGT Annual Cost of Allowances (Average of Cricket Valley and Valley Energy)	Modern CCGT Heat Rate (mmBtu/MWh)	6.81	6.81	6.86	6.90	6.88	
	Modern CCGT CO2 Rate (tons/MWh)	0.40	0.40	0.40	0.40	0.40	
	Modern CCGT RGGI Allowance Price(₵/kWh)	0.16	0.39	0.54	0.55	0.81	
	Modern CCGT RGGI cost annual bill impact	$10.73	$26.71	$37.26	$37.58	$55.44	$96.33
Steam Boiler Gas Annual Cost of Allowances	Steam Boiler Gas Heat Rate (mmBtu/MWh)	10.63	10.63	10.52	10.94	10.40	
	Steam Boiler Gas CO2 Rate (tons/MWh)	0.64	0.64	0.64	0.65	0.62	
	Steam Boiler Gas RGGI Allowance Price(₵/kWh)	0.25	0.62	0.87	0.89	1.25	
	Steam Boiler Gas RGGI cost annual bill impact	$17.00	$42.32	$59.19	$60.78	$85.47	$148.50
Combustion Turbine Oil Annual Cost of Allowances	Combustion Turbine Oil Heat Rate (mmBtu/MWh)	12.25	12.25	11.94	11.56	12.89	
	Combustion Turbine Oil CO2 Rate (tons/MWh)	0.92	0.92	0.87	0.83	0.94	
	Combustion Turbine OilRGGI Allowance Price(₵/kWh)	0.36	0.89	1.16	1.13	1.90	
	Combustion Turbine Oil RGGI cost annual bill impact	$24.46	$60.89	$79.65	$77.15	$130.01	$225.91
Wholesale Electric Adder RGGI Cost Impact - Modern CCGT at 60%, Boiler Gas at 35%, and Turbine Oil at 5%		**$13.61**	**$33.88**	**$47.05**	**$47.68**	**$69.68**	**$121.07**
	Wholesale Electric RGGi Cost Adder Increase Since 2021			$13	$14	$36	$87
				39%	41%	106%	257%

Table 5: Annual Residential RGGI Costs Extracted from Table 4 for Article

Year	**2009-2020**	**2021**	**2022**	**2023**	**2024**	**2026**
Total Direct RGGI Allowance Costs	$4.98	$12.39	$17.05	$16.88	$24.00	$41.70
Average of RGGI Units	$13.64	$33.95	$46.71	$46.26	$65.74	$114.24
Estimated Mix of Unit Types	$13.61	$33.88	$47.05	$47.68	$69.68	$121.07

Source of the "6-to-1 return" Claim

I have written about the implications of the New York approval of RGGI amendments which finalized New York's alignment with the RGGI Third Program Review Model Rule on August 5, 2026. This documents the press release claim associated with the approval that:

> Net savings are expected to reach nearly $12 billion over the lifetime of the investments, providing a nearly 6-to-1 benefit based on investment of about $2 billion to date.

The "about $2 billion to date" value is from Table 4, "Available Funding and Financial Status through December 31, 2024 (Millions of Dollars)" in NYSERDA RGGI Semiannual Status Report through December 31,2024. Table 1 in the same document states that the expected lifetime total savings for the expended funds is $12,183.9 million. This benefit cost ratio only considers the ratepayer costs of RGGI allowance auction investments.

Table 1. Summary of Expected Cumulative Portfolio Benefits through December 31, 2024

Benefits through December 31, 2024[a]	Net Greenhouse Gas Emission Savings[b] (Tons CO_2e[c])	Total Net Fuel Savings (MMBtu)	Net Efficiency Electricity Savings (MWh)	Net Renewable Energy Generation (MWh)	Total Net Electricity Savings/Generation (MWh)	Energy Bill Savings to Participating Customers ($ Million)
Cumulative Annual Installed Savings[d]	2,094,817	16,419,238	1,121,942	644,851	1,766,792	$779.6
Cumulative Annual Pipeline Savings[e]	126,940	1,586,843	36,685	47,219	83,903	$20.4
Cumulative Annual Committed Savings[f]	2,221,757	18,006,081	1,158,626	692,070	1,850,696	$800.0
Expected Lifetime Total Savings[g]	38,004,105	259,648,763	24,706,920	14,531,862	39,238,782	$12,183.9

[a] Cross-program overlap for projects that received any combination of a Green Jobs - Green New York (GJGNY) assessment, a GJGNY loan, or a RGGI-funded incentive through the Home Performance with ENERGY STAR® Program, NY-Sun Program or Renewable Heat NY Program has been removed.

[b] These emission reductions are associated with both electric and fossil-fuel saving measures. Under a cap-and-trade system, the total number of emission allowances is determined by regulation. Regulated entities can purchase allowances and collectively emit up to the cap that is currently in place. Therefore, in the near term, electric efficiency projects may not decrease the overall amount of emissions going into the atmosphere. However, electric efficiency projects will reduce end users' responsibility or footprint associated with emissions from electricity production.

[c] CO_2e stands for carbon dioxide equivalent and describes the amount of CO_2 that would have the same global warming potential as a given mixture of gases based on factors published by the Intergovernmental Panel on Climate Change.

[d] Inclusive of savings from all currently operational projects installed since program inception.

[e] Inclusive of savings from all projects under a signed contract and projects with an application received that are not yet operational.

[f] The sum of savings from Installed Savings and Pipeline Savings.

[g] The expected benefits over the lifetime of all operational projects, projects under a signed contract, and projects with an application received that are not yet operational. See Table A-4 in appendix A for the measure-life assumptions.

Data Documentation

In 2022 the New York State electrical load was 36.5% residential.

A typical New York residential electric customer uses approximately **570 kWh per month** (about **6.9 MWh annually**). EIA monthly residential bill

The consistent source of residential electric customers is EIA's annual state retail-sales/customer series.. EIA's annual Form 861 is the appropriate dataset because it is a census of U.S. electric utilities and includes annual customer counts by state and sector. US EIA electric sector data. The following data were extracted by Perplexity.

Year	Residential electric customers/accounts	Rounded
2009	7,427,503	7.428 million
2010	7,430,810	7.431 million
2011	7,438,878	7.439 million
2012	7,448,536	7.449 million
2013	7,463,609	7.464 million
2014	7,477,708	7.478 million
2015	7,490,601	7.491 million
2016	7,500,057	7.500 million
2017	7,513,618	7.514 million
2018	7,528,433	7.528 million
2019	7,543,787	7.544 million
2020	7,561,770	7.562 million
2021	7,576,762	7.577 million
2022	7,589,304	7.589 million
2023	7,603,344	7.603 million
2024	7,420,214	7.420 million
2025	Not yet final in annual EIA-861	—