

Cost Impacts of 2013 RGGI Rule Changes in Delaware

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Executive Summary

Each electric generator in Delaware, over 25 megawatts in size, must buy permits to generate each ton of carbon dioxide released based on 2007 legislation establishing Delaware's participation in the Regional Greenhouse Gas Initiative (RGGI, 7 DE Administrative Code 1147). Quarterly auctions are run by RGGI, Inc. with nine states currently participating. This report describes how the electric generators pass the cost of the permits onto electric distributing companies, such as Delmarva Power and the Delaware Electric Cooperative, who in turn pass the cost onto electric customers. The report also considers the higher cost of permits resulting from reductions in the number of permits available, and of other RGGI rule changes promulgated by the Delaware Department of Natural Resources & Environmental Control through an Administrative Procedure in 2013.

In addition to the direct cost of the permits, indirect costs and benefits can be estimated. Potential indirect benefits arise from investment of RGGI revenues in energy efficiency and renewable energy projects that reduce carbon dioxide and air pollution yielding potential health benefits and economic benefits from potential lower sea level rise, and from lowering electric demand that might lower electric prices.

Indirect costs arise from higher prices for Delaware generators making local power generators uncompetitive in regional power markets thus, lowering local power generation. Importing power results in higher electric prices from a series of pricing penalties from the regional electric grid manager, PJM Interconnection, including transmission congestion charges and line loss charges from longer transmission distances.

Our conclusion, to reasonable degree of economic and electric industry certainty, is the 2013 RGGI rule changes increased direct electric rates in Delaware by \$33.6 million between March of 2013, and March of 2016, or about \$11 million a year. In addition, the net effect of indirect costs and benefits may have raised electric rates another \$28.5 million a year for a total of \$39.5 million a year in cost that is passed from generators, to distributors, to electric customers, or roughly \$42 a year for residential customers. We note, higher electricity costs are an important consideration in the location decisions of certain business types, particularly manufacturing customers. With considerably less mobility, lower income households have to absorb higher electricity costs.

No offsetting benefits accrued from RGGI permit sale revenue. The revenue raised from the cost premium to permits from the new auction rules triggered by the 2013 RGGI regulation amendments sits unspent and will not likely be spent in the future.

Section I: The New RGGI Regulations Directly Influence Electric Rates Charged by Delmarva Power & Delaware Electric Cooperative to Consumers

The RGGI Auction Process

The regional cap and trade program began in 2007 with ten states agreeing to reduce carbon dioxide emissions from power plants by 10% by 2018. Power plants in these states would need to buy permits in quarterly auctions for each ton of emissions. Each state had an allotment of permits roughly equal to their average emissions between 2002 and 2006. The full permit allotment was to be auctioned through 2014, followed by a cut back of 2.5% a year through 2018. The cost of the permits is passed on to electric distributors who pass the cost on in electric bills. The auctions are run by RGGI, Inc. for a fee. New Jersey dropped out of RGGI in 2011. RGGI allotments, goals, and emissions by state are shown in Table 1.

Table 1: Original RGGI Cap and Trade Permit Budget – Million Tons

State	Original Budget	2019 Target Budget	RGGI 10% Reduction
DE	7,760	6,804	756
CT	10,696	9,626	1,070
MA	26,660	23,994	2,666
MD	37,504	33,754	3,750
ME	5,949	5,354	595
NH	8,620	7,758	862
NY	64,311	57,880	6,431
RI	2,659	2,393	266
VT	1,226	1,103	123
Total	165,185	148,667	16,519

Source: RGGI.org

The permits are offered in total with no specific designation of the state of origin. Bids for a number of permits at a specific price are submitted for the available permits by the required electric generating facilities (over 25 megawatts in size) prior to each auction. Electric generators are called Compliance Entities. Depending on market conditions, speculators can also bid for permits hoping to re-sell the permits in a secondary market at a higher price. The lowest price bid that covers the last available permits becomes the “Clearing” price and every winning bidder pays the Clearing Price.

A “Reserve” price was established as a minimum price in each auction with the price rising 2%/year. For example the Reserve Price for auctions in 2012 was \$1.93. Between 2007 and 2012 auction prices ranged between \$1.86 and \$3.38. Compliance Entities must submit the permits by the end of three year Compliance Periods (2009-2011, 2012-2015, 2016-2018, etc.).

RGGI Costs Flow to Electric Bills

DNREC submitted a report as evidence in a lawsuit before the Superior Court titled “The Economic Impacts of the Regional Greenhouse Gas Initiative on the Ten Northeast and Mid-Atlantic States” published Nov. 15, 2011, and authored, in part, by its expert witness Susan Tierney who works for the Analysis Group. The report tracks how auction money flowed to the States, how it was used, and how the cost flowed from electric generators to electric consumers.

The authors concluded on page 15 “Within the electric system, the impacts of these initial (RGGI) auctions show up during the 2009-11 period, as power plant owners priced the value of CO₂ allowances into prices they bid in regional wholesale prices”. A flow diagram on page 22 shows how the auction costs flow from the electric generators to the electric distributors, and on to consumers. So, DNREC’s own expert witness supports the fact RGGI auction costs show up on customer’s electric bills.

Electric generating units that buy the allowances pass the cost on to electric distributors such as Delmarva Power, the Delaware Electric Cooperative, and municipal utilities. There can be an intermediate step between generators and distributors. For example, Delmarva buys power in three year contracts from Market Sellers, buying one third of estimated demand every year. The market Sellers buy from the generators and charge a premium for assuming the risks of market swings. The Market Sellers are adept at forecasting and pricing in all costs including RGGI permit fees, though there might be some lag time as contract costs catch up to RGGI CO₂ allowance increases.

On January 30, 2014, Stevenson received an e-mail forwarded by Bill Andrew, President/CEO of the Delaware Electric Cooperative from D. Richard Beam, Senior Vice President, Power Supply, for the Old Dominion Electric Cooperative. Old Dominion generates power and sells it to the Delaware Electric Cooperative. Mr. Beam stated RGGI cost, “Can and will be included in energy bid prices by ODEC”. He further stated, “In reviewing the current ODEC RGGI costs, we are expensing about \$100,000 per year, but that is expected to grow to about \$500,000 per year as those costs are expected to grow”. Mr. Andrew assures me the full supply cost of power, including those RGGI charges, are passed on in electric bills.

One of us (Stevenson) was an intervener in Public Service Commission Docket 13-250 regarding “Electric Bill Transparency”, and attended workgroup sessions held by Delmarva Power. Delmarva Power has clearly stated in these workgroup meetings RGGI fees are being passed on to customers though they cannot be accurately tracked. Todd Goodman of Delmarva Power stated in a June 9, 2016 e-mail why it is so difficult to track the RGGI cost:

“Delmarva does not generate electricity, it only delivers electricity. As a result, Delmarva does not purchase any CO₂ allowances pursuant RGGI. Delmarva’s customers can obtain their electric supply in one of two ways: (1) they can choose their own retail

electricity supplier or (2) they can take SOS service.

1. If a Delmarva customer wishes to choose his own retail electricity supplier, he enters into a supply agreement with his chosen supplier. Delmarva is not aware of the particular sources of generation used by the various retail electricity suppliers.

2. If a Delmarva customer does not choose his own electricity supplier, then he is supplied with electricity by Delmarva through SOS (about 94% of power). Because Delmarva does not generate electricity, it acquires electricity to supply to its SOS customers through PSC regulated SOS auctions. The lowest bidders in the multiple bid tranches are awarded three year SOS electric supply contracts, which are reviewed and approved by the PSC. Delmarva is not aware of the particular sources of generation from which the winning SOS suppliers obtain their electricity.

The electricity provided to Delmarva's SOS customers is sourced through PJM. Because the electricity provided to Delmarva's SOS customers is sourced through PJM, Delmarva's SOS fuel resource mix is the same as the PJM fuel resource mix. "Fuel resource mix" refers to, on an overall PJM basis: (a) the types of fuels used to generate electricity within PJM and (b) each fuel type's percentage of the total generation within PJM. Delmarva Power is required to inform its customers of the fuel resource mix for electricity supplied to its customers each year. I have attached a link to the most recent fuel resource mix bill stuffer provided to our customers."

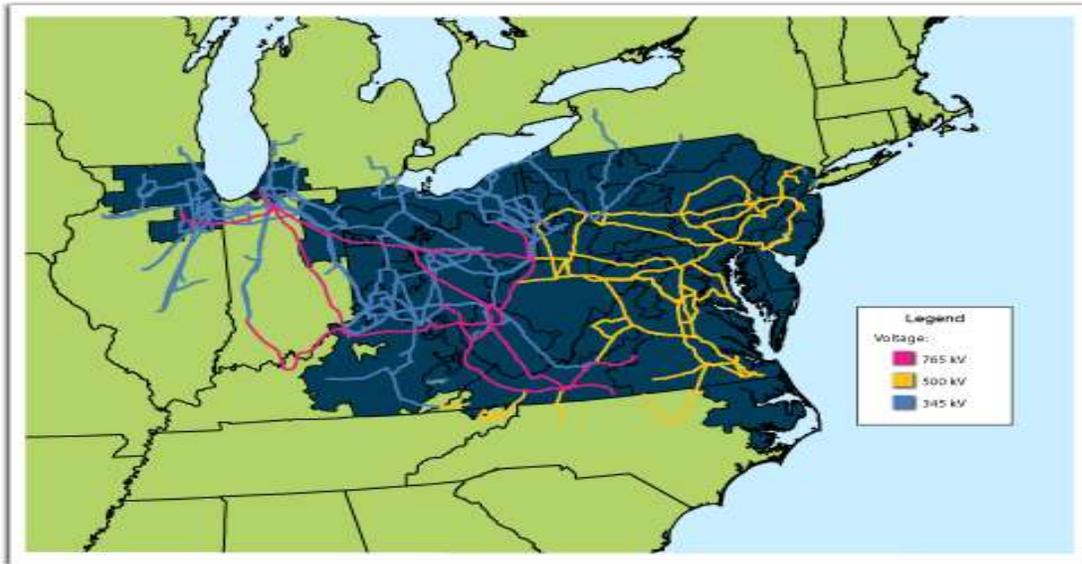
Following the link we find Delmarva's current fuel mix and 60% comes from carbon dioxide emitting sources (includes 40.5% coal, 19.4% natural gas, and 0.2% oil) all of which require permits if the power is generated in Delaware or Maryland. For power generated in Delaware in 2015, according to the US Energy Information Agency Electric Power Monthly for February 2016, 98% comes from carbon dioxide emitting fuels (includes 7.8% coal, 85.3% natural gas, 2% oil, 3% other gases).

One of us (Stevenson) was also an intervener in Public Service Commission Docket 14-559, "Delmarva Power 2014 Integrated Resource Plan". On April 29, 2015, Delmarva Power filed a "Response of Delmarva Power Company to Comments filed by Intervening Parties". Two statements are pertinent:

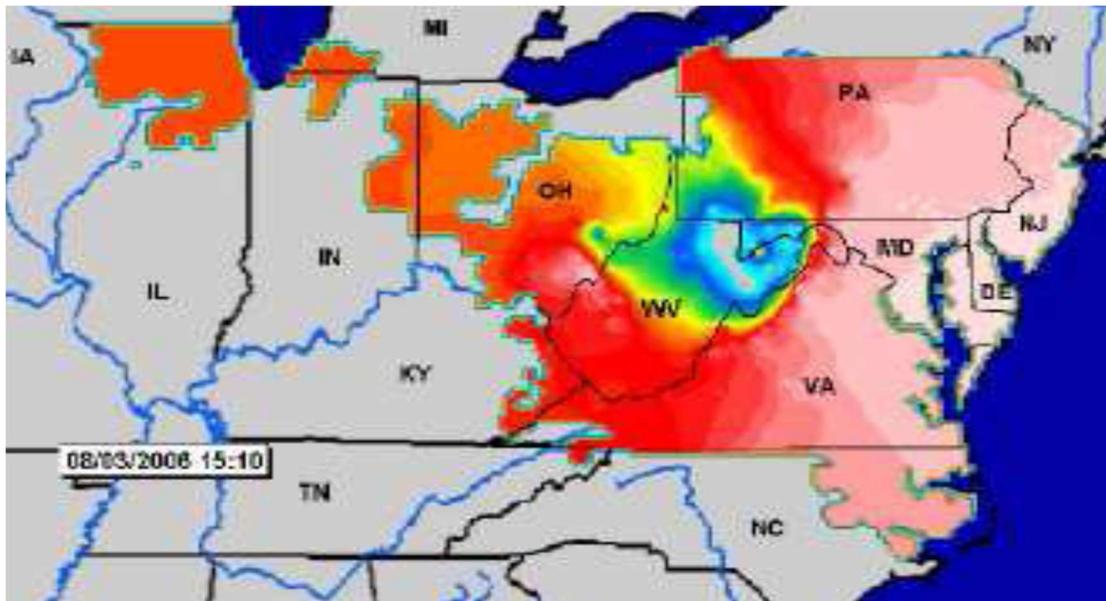
- The IRP forecasts future electric rates. Delmarva asserted on page 10 they used a forecast price for RGGI permits of \$4/ton in 2015, \$6/ton in 2016, \$7/ton in 2017, \$8/ton in 2018, \$9/ton in 2019, and \$10/ton thereafter to allow for the impact of higher allowance prices on the price consumers will be forecasted to pay in the future.
- Further Delmarva's comments went on to concur, "Delaware EGU's (electric generating units) are able to purchase allowances offered in RGGI regional allowance auctions from any other RGGI state and use them for compliance purposes" confirming there are not Delaware specific permits.

We also must consider the way PJM Interconnection dispatches power. The maps below show the location of PJM Transmission Lines, and how power generation is distributed in the PJM network in a high demand period. The second map shows blue and green tinted regions in West Virginia and western Pennsylvania generate more power than is needed locally. The light pink areas in Delaware and parts of Maryland and New Jersey are importing power. Power moves from the west and north. When Delaware generators kick in the electrons move locally and south through the state dragging the cost of RGGI permits along to Delaware electric customers.

PJM Primary Transmission Line Map



Where Our Power Comes From



Source: PJM Interconnection

Clearly the plaintiff's expert witness, Delaware electric distributors, and PJM distribution patterns all confirm the cost of RGGI permits required of Delaware electric generators flows to the electric bills of Delaware business and residential customers.

2013 Auction Changes

The Memorandum of Understanding between the RGGI states required periodic reviews by the Board of Directors comprised of members from each state. The 2012 review found auction revenue was much lower than originally expected.

A technical revolution in natural gas drilling technology combining horizontal drilling with hydro-fracturing of shale formations led to abundant natural gas. Prices for natural gas dropped from a high of \$15/million BTU to as low as \$2. Suddenly, natural gas fired electric generators became the cheapest way to produce electricity. Coal prices also dropped to compete.

At the same time new EPA regulations required additional investment to reduce pollution from coal fired electric generators. A wave of closings for coal fired generators was offset by a construction wave of new natural gas fired generators. Natural gas fired units emit about half the amount of carbon dioxide as coal fired units so the need for RGGI permits declined rapidly.

In Delaware, the closing of the electric generation facility at the Delaware City Refinery resulted in the state meeting the 2019, 10% carbon dioxide reduction goal two weeks after the first auction in 2007. Lower demand resulted in lower auction prices. Starting in 2010 RGGI saw auction prices fall to the reserve price for ten consecutive quarters.

The RGGI board announced recommended rule changes before the first auction in 2013. There would be a 45% reduction in the number of permits available starting in 2014, followed by a 2.5% reduction each year through 2019, a 53% total reduction from the original goal. The Reserve price would be increased each year by 2.5%. To protect electric rate payers from a rapid rise in prices, additional allowances were set aside in a Cost Containment Reserve (CCR) to be released if auction prices hit a trigger price with the trigger price rising each year. The trigger price is set at \$4/ton in 2014, rising to \$6/ton in 2015, \$8/ton in 2016, \$10/ton in 2017, and rising 2.5 percent/year thereafter.

A review of RGGI enabling legislation in each state shows slightly different requirements to approve changes in the RGGI program. In Maryland, Vermont, Connecticut, Rhode Island, and New York environmental regulators have clear authority to adopt the changes and did so. Maine, New Hampshire, Massachusetts, and Delaware required legislative approval. Maine and New Hampshire passed legislation. Massachusetts and Delaware regulators met objections to approval without legislative approval, but no litigation challenging the Massachusetts

Department of Environmental Protection rules was filed. In Delaware, DNREC Secretary Collin O’Mara issued order 2013-A-0054, November 19, 2013, which immediately resulted in a legal challenge.

Reduced Permit Supply Results in Higher Auction Prices

RGGI, Inc. announced the rule changes in a press release dated February 7, 2013. They stated the new rules would increase auction revenue from \$1.55 billion to \$3.78 billion over the 2014 to 2020 period, an increase of \$2.2 billion. DNREC repeated those numbers May 14, 2013 at a Workgroup Meeting on the RGGI rule amendments. This is exactly what one would expect from the economic law of supply and demand which states if the supply is reduced while demand remains the same, the price will increase. Every permit offered since the first quarter of 2013 has been bought.

The number of available permits dropped from 147 million in 2012 to 78 million in 2014, below the 88 million needed by electric generators to meet their expected emissions. However, speculators entered the market attempting to buy permits for resale at a higher price driving demand up to 202 million permits in 2014. This imbalance in supply versus demand raised prices from \$1.93/ton in 2012 to \$2.92 in 2013, \$4.73/ton in 2014, and \$6.10 in 2015. Table 2 shows how the supply/demand imbalance has driven up permit prices.

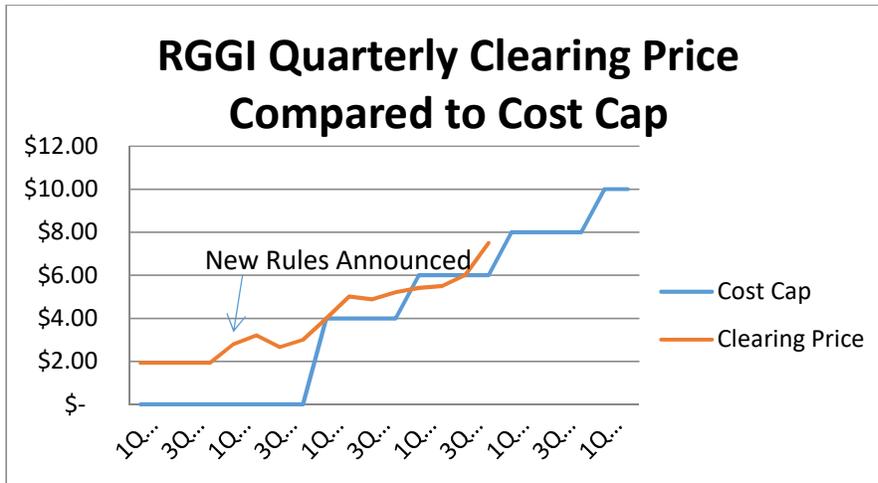
Table 2 RGGI Permit Supply, Demand, and Prices 2011 to 2015

Year	Available Permits-MM	Permits Bid-MM	Demand to Supply Ratio	Permits Sold-MM	Permits Needed-MM Based on Emissions	% Permits Sold to Compliance Entities	Permit Price - \$/ton
2011	169.2	93.5	0.55	89.3	121	92	1.89 ¹
2012	146.8	87	0.59	86.9	94.9	99	1.93 ¹
2013	153.4	345	2.25	153.4	88.3	58	2.92
2014	77.8	201.6	2.6	77.8	88.3	67	4.72
2015	71.5	190.2	2.75	71.5	84.9	81	6.10

Source: RGGI.org Note 1: 2011 and 2012 sold at the Reserve Price

With demand far exceeding supply how were prices determined? The graph below, based on data from RGGI.org, shows how prices are rising in the quarterly auctions in direct relation to the cost caps. Basically, the RGGI States are setting auction prices.

Graph 1



The Direct Cost Increase of RGGI permits

Table 3 below shows the RGGI Revenue in Delaware from the first quarter of 2013 through the first quarter of 2016 with the impact of the rule change, and the estimate of what the cost would have been under the old rules assuming generators bought the number of permits they needed based on their emissions of carbon dioxide at the reserve price. The reserve price is used as the number of permits available would have greatly exceeded demand by about two to one. The direct impact of the RGGI rule change is estimated to be \$33.6 million (actual revenue of \$58.8 minus estimated revenue under the old rules of \$25.2 million).

Table 3: Actual RGGI Revenue 1/12013 to 3/31/2016 vs. Estimated Revenue Under Old Rules

Year	Actual Revenue-\$MM	CO2 Emissions-tons	Reserve Price-\$	Est. Revenue Old Rules-\$MM
2013	16.2	4,285,050	1.97	8.4
2014	18.0	3,937,000	2.01	7.9
2015	20.8	3,519,111	2.05	7.2
2016 1Q	3.8	803,980	2.09	1.7
Total	58.8			25.2

Source: RGGI COATS

Indirect Costs of the RGGI Rule Change

Electric supply and demand must be in absolute balance every second to avoid black outs and brown outs. PJM combines all electric generators and users over a thirteen state region. To ensure the lowest price and adequate reliability they use a Reliability Pricing Model described in PJM Manual 1, "Energy Ancillary Services Market Operations". PJM describes their philosophy on page 76, "The PJM scheduling philosophy in the Day-ahead Energy Market is to schedule generation to meet aggregate Demand bids that result in the least-priced generation mix, while maintaining the reliability of the PJM-RTO". Electric generators bid to supply power

based on a PJM Day-ahead forecast. The lowest price that fulfills the forecasted demand becomes the Market Clearing Price and all lower bidders receive the Clearing Price. Actual demand is adjusted with bids every five minutes for incremental increases in generation which becomes the System Energy Price.

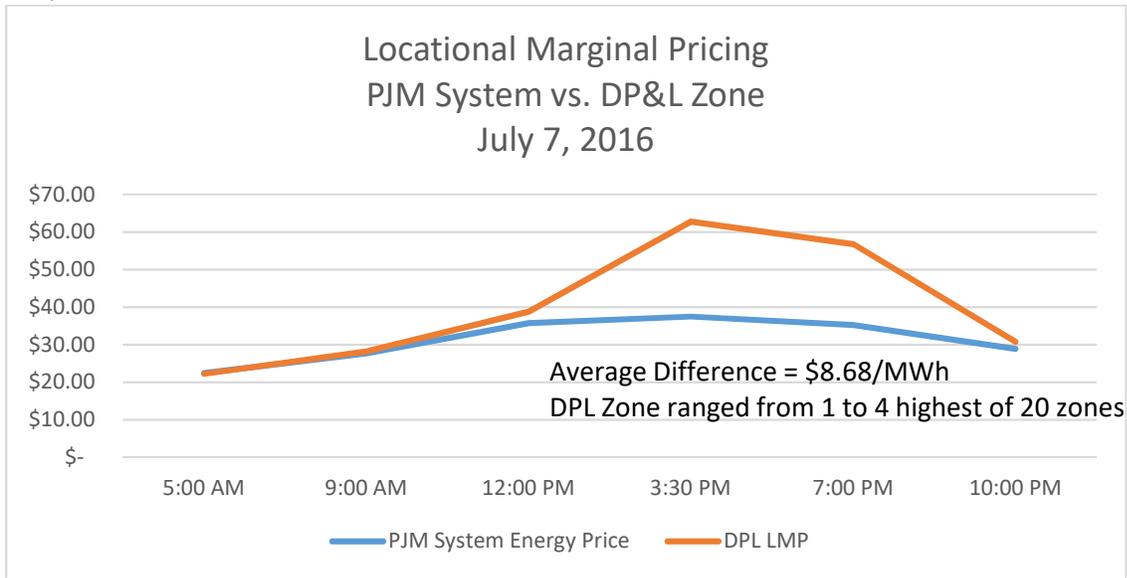
The System Energy Price is adjusted positively or negatively for the cost of system transmission congestion, and for transmission line losses for the distance power travels. The net cost is the Locational Marginal Price (LMP) for each of twenty zones, which can be seen in real time on the PJM website. Delaware is in the DPL Zone which is often the highest cost, or near highest cost zone in PJM because we are the fifth highest electricity importing state in the country – *i.e.* Delaware causes significant transmission congestion and line losses.

In 2015, RGGI added \$6/megawatt-hour to the cost of coal fired electric generation in Delaware, or more than 15% of average PJM wholesale cost, with about half that impact added on natural gas fired power plants. This cost premium causes existing plants to operate less hours per year. In 2015, electric demand in Delaware was 11.4 million megawatt-hours but production was only 7.7 million megawatt-hours requiring the import of 32% of our power.

Existing generating units in Delaware are capable of producing all the power we need if RGGI price constraints are lifted. If Calpine's Edgemoor/Hay Road operating hours increased 29%, its new Dover unit operated for a full year, and the NRG facility doubled operating hours, existing units (still operating below demonstrated potential) would meet existing demand.

We estimate line loss and congestion charges are adding \$2.50/megawatt-hour to electric rates in Delaware on an annual basis. The number could be considerably higher as demonstrated by Graph 2 below showing the premiums during the day of July 7, 2016. In 2015, RGGI induced operating constraints added about \$28.5 million a year to electric bills for line losses and congestion.

Graph 2



Source: PJM Interconnection Real Time Statistic

Section I Conclusion

Our conclusion, to reasonable degree of economic and electric industry certainty, is the 2013 RGGI rule changes increased consumer electric rates in Delaware by \$33.6 million between March of 2013, and March of 2016, or about \$11 million a year. In addition, the net effect of indirect costs and benefits may have raised electric rates another \$28.5 million a year for a total of \$39.5 million a year in cost that passed from generators, to distributors, to electric customers, or roughly \$42 a year for residential customers.

Section II – The Report Submitted by DNREC is Incorrect; RGGI Does Not Lower Electric Rates Charged by Delmarva Power & Delaware Electric Cooperative or Provide Indirect Benefits to Offset Higher Electric Rates

DNREC's expert witness claims RGGI revenue is used for multiple benefits including:

- Low income fuel assistance
- Jobs created from work on energy efficiency and renewable energy projects
- Health and social benefits from lower carbon dioxide emissions
- Lower overall electric rates from reduced electric demand
- Lower electric rates for those who directly use the funds for "green" energy projects

A number of arguments can be made to counter these supposed benefits including:

- Low income fuel assistance just about offsets higher electric prices caused by RGGI. The findings of the research literature on price and the consumption of electricity over the past 30 years has been consistent: the relationship is small. That is, demand is relatively inelastic to price. And demand is inelastic in both the short-run and long-run. There are few options available to the consumer in response to changes in the price of electricity. So the increase in electricity prices from the arbitrary cap imposed on permits will not reduce electric demand substantially in the long run. Higher electric prices will in the long run encourage households and businesses that are mobile to relocate.
- The principles of supply and demand apply throughout the U.S. economy, including the highly regulated electricity industry. There is no doubt that the final supplier will attempt to pass on to the final consumer the higher costs generated by CO₂ fees. And since demand for electricity is inelastic, the supplier will be able to transfer more of this additional cost to consumers due to lack of substitutes.
- The cost structure of the electric generation industry is a classic case of economies of scale. This means that any reduction in electric demand that reduces supply drives up the unit costs of electricity and will result in higher electric prices.
- The American Council for an Energy Efficient Economy advises not to assume job creation from energy efficiency projects as money is simply being re-directed from other parts of the economy. The same is true for renewable energy projects.
- Energy efficiency forecasts need to be tempered by offsets such as people who would have done projects anyway without RGGI grants, and the rebound effect where efficiency actually leads to more energy use. A University of Maryland study found grants for more efficient heating and air conditioning were completely offset by people opting to use the cost savings for warmer winter and cooler summer thermostat settings.
- Grants merely shift wealth from utility customer losers paying higher bills to grant winning winners, often upper income people.
- The Delaware auditor reviewed energy efficiency projects in state buildings and found savings were far below forecast.
- A Federal audit of low income weatherization projects found wide spread shoddy workmanship and incomplete work that led to a 100% redo of projects.
- A report for the Delaware Energy Efficiency Advisory Council estimated electric demand fell only 0.5 % in total from energy efficiency in Delaware from all known programs, not just RGGI based programs, over a four year period from 2010 to 2013. Such a small amount, about 0.1% a year, will have no impact on electricity prices. Electricity demand can vary +/- 5% a year just because of weather variability.

Competing experts could have a lively debate over how effective RGGI spending has been in providing the expected benefits, however the argument is a moot point. The more basic issue is the added revenue from the auction rule change has not been spent! There can be no benefit from unspent revenue, either from energy efficiency lowering demand, or from indirect benefits.

A DNREC response on May, 9, 2016, to an inquiry from state Senator Gregory Lavelle describes how much RGGI revenue was raised and how it was spent by DNREC administered programs. These results were combined with Financial Reports from the Sustainable Energy Utility (SEU) available on the Energize Delaware website to provide a complete picture of RGGI program spending during the period covered by the RGGI rule change and is shown below in Table 4.

Table 4: RGGI revenue and Spending 2013 Fiscal Year through May 9, 2016

RGGI Allocation	Type of Spending	Revenue - \$	Expenditure - \$
LIHEAP - 5%	Client Program	2,867,242	2,867,242 ¹
"	Administration		
Low Income Weatherization- 10%	Client Program	4,465,727	2,979,190
"	Administration	893,757	893,757
DNREC Administration - 10%	Administration	7,851,725	2,253,245
DNREC GHG reduction – 10%	Client Program	7,851,725	800,000
Sustainable Energy Utility – 65%	Client Program	32,748,919	5,185,680
	Administration	2,087,725	2,087,725
	Loan		10,122,561 ²
Total Client Programs		47,933,613	21,954,673
Total Administration		10,833,207	5,234,727
Total		58,766,820	27,189,400

Notes: 1. Administrative costs requested but not received, 2. Loan is not an expense but an asset

Actual expenditures of RGGI funds totaled \$27 million including \$5 million for administrative overhead, \$12 million for client programs, and a questionable \$10 million in SEU loans. The SEU is authorized to borrow money in private equity markets with bonds free of state taxes, and loans were to be made from that source, not RGGI. The federal government, most state and local governments, and businesses regularly use money from private equity markets to fund energy efficiency projects. The SEU loans are not critical to energy efficiency projects moving forward in Delaware. The loans do allow the SEU to make their pot of unspent RGGI revenue look smaller, and offer the SEU a better rate of return on the unspent funds. However, loans are an asset, not an expenditure.

The \$27 million in expenditures were covered by \$12 million in unspent funds from prior years and \$15 million in new RGGI revenue. Had DNREC not changed the auction rules there would have been about \$25 million in revenue over the three year period leaving a net \$10 million unspent! With the higher revenue from the auction rule change there is now \$44 million left unspent.

Keep in mind the RGGI program is a decade old and DNREC and the SEU have still not figured out how to spend the revenue they were receiving under the old auction rules. There can be no expectation they will significantly improve performance in the future. Spending is at about a \$7 million annualized rate, about what would be seen in revenue under the old auction

rules. Annual revenue should continue at \$20 million a year minimum and could go as high as \$40 million using the contested new rules, so the trove of unspent funds will continue to grow.

To put the current \$44 million in unspent revenue in perspective compare it to the entire state Bond Bill Budget for Fiscal Year 2017 of less than \$30 million! The extra revenue from the new auction rules has not been spent, and is unlikely to be spent in the future. There can be no benefits calculated from unspent funds.

Section II Conclusion

Our conclusion, to reasonable degree of economic and electric industry certainty, is no offsetting benefits accrued from RGGI permit sale revenue as the revenue raised from the cost premium to permits from the new auction rules triggered by the 2013 RGGI regulation amendments sits unspent and will not likely be spent in the future.

About the Authors

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KEY QUALIFICATIONS | A self-starting policy analyst with strong strategic thinking, communication, and leadership skills.

**RELEVANT PUBLIC
SERVICE COMMISSION
EXPERIENCE**

- 1) Testified for the Public Advocate in Docket 13-99, Delmarva Power application to purchase Solar Renewable Energy Credits from Washington Gas & Electric on very short notice.
- 2) Consulted for the Public Advocate on the 2014, 2015, and 2016 Solar Renewable Energy Credits Procurement Programs requested by Delmarva Power
- 3) Participated in numerous Delaware Public Service Commission Dockets as an intervener. Many of those dockets involved participating in workshops, providing testimony, and entering challenges to the testimony of other witnesses.
 - A. Solar Renewable Energy Credits Procurement Programs requested by Delmarva Power in 2012 (Docket 11-399), 2013 (Docket 12-526)
 - B. Intervened in 2010, 2012, and 2014 Delmarva Power Integrated Resource Plan Dockets 10-2 and 12-544, 14-559, and a workshop for the 2016 IRP
 - C. Participated in legislative workshops and as an intervener in Delmarva Power application for a Qualified Fuel Cell Provider Tariff Docket 11-362
 - D. Intervened in natural gas base rate and service expansion workshops for Chesapeake Utilities Docket 12-292, and Delmarva Power Docket 12-546
 - E. Intervened in Delmarva Power electric base rate Docket 13-115
 - F. Intervened in Delmarva Power billing transparency Docket 13-250
 - G. Intervened in Delmarva Power Investigation into Distribution Infrastructure Investment Docket 13-152
 - H. Intervened in Delmarva Power Forward Looking Rate Plan Docket

GENERAL EXPERIENCE | **POLICY DIRECTOR, CAESAR RODNEY INSTITUTE**
2010 TO PRESENT

Published over 125 analytical papers on energy policy both within Delaware and nationally. Have been published or on air for every news outlet in Delaware as well as the Washington Times, and Forbes Magazine. Successfully influenced cost reductions in solar subsidies while seeing the solar market grow in Delaware. Participated in successful efforts to expand energy efficiency programs with a special emphasis on subsidies for low income families.

PRESIDENT, ALTERNATIVE STRATEGIES CONSULTING, LLC
2013 TO PRESENT

Served as a consultant for the Delaware Public Advocate in four energy related Dockets. Also consulted with an electric utility, and several large energy users in Delaware.

ENTREPRENEUR MULTIPLE COMPANIES
1993 TO 2010

Founded six successful companies in the following industries: sewing workroom, interior decorating, flooring sales & installation, remodeling, property leasing, and consulting. Each business is a leader in its market.

VARIOUS SALES, TECHNICAL & MANAGEMENT POSITIONS DUPONT
1970 to 1993

Primarily worked on market expansion and business startups along with one business turn around. Ranked number one in peer rankings at each job level. Started one business that grew to \$60 million a year in sales with a 25% net profit in one year with no investment required other than working capital.

EDUCATION | **RUTGERS UNIVERSITY, NEW BRUNSWICK, NJ**
BS IN AGRICULTURAL ECONOMICS

COMMUNICATION | Extensive experience in communication verbally one on one or speaking before a crowd or on the radio and TV, and in writing technical papers and Op Eds. Have appeared on WBOC, WHY, and have been interviewed numerous times on radio stations WDEL, WGMD, and WILM. Have been published numerous times in newspapers around the state and the Washington Times and Forbes Magazine. Have a good relationship with journalist in each medium. Have testified before the legislature and numerous regulatory bodies, and have made speeches to numerous community and business groups nationally and internationally with the largest audience over 1000 people.

HOBBIES | Astronomy, mineral collection, bicycling, and backpacking

Credentials for John E. Stapleford

Dr. John E. Stapleford (Director) – Ph.D. in urban and regional economics (University of Delaware), M.A. in government and planning (Southern Illinois University) and B.S. in chemistry (Denison University), is the principal of DECON *First* LLC, a Delaware economic consulting firm. He was previously president of the Caesar Rodney Institute and he is a professor emeritus of economic development from Eastern University.

Most recently Dr. Stapleford worked as an associate director and senior economist with Moody's Analytics. He was Director of the Bureau of Economic Research at the University of Delaware for two decades and the co-founder of the Delaware Small Business Development Center. He worked as a staff economist for the Economic Policy Council in the New Jersey governor's office.

Dr. Stapleford is author of a book, numerous articles in professional journals, and over one hundred applied research monographs. He did analysis that supported the deregulation of the telephone industry in Delaware.

Dr. Stapleford has been recognized as an economic expert in Federal District Court, the Delaware Supreme Court, the Delaware Court of Chancery, and Delaware Superior Court.