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House Environmental Resources and Energy

Public hearing on Regional Greenhouse Gas Initiative (RGGI) and HB 2025

February 5, 2020

Slide 1 - Good Morning. I'm Vince Brisini the Director of Environmental Affairs for Olympus Power.

I'd like to thank Chairman Metcalfe and the committee for allowing me to provide testimony today.

This testimony provides insights into the Regional Greenhouse Gas Initiative, known as RGGI, and what we know and don't know about the effects of Pennsylvania joining RGGI or developing and implementing a "RGGI-like" program.

Slide 2 – While we have the website description of RGGI, a much more simple way to understand RGGI is that it's a program that imposes costs upon the carbon dioxide emissions from electric generating units to price certain electric generation out of the wholesale electric markets to the benefit of other types of electric generation. It is one of a number of efforts that are "re-regulating" the electric markets to achieve politically desired outcomes.

Slide 3 – As others have previously stated, there are a number of other "cap and trade" programs implemented by statute and regulation, but RGGI is different than those programs in some very significant ways.

A big difference is that with rare exception the affected sources aren't allocated allowances, they are required to buy allowances in an auction to account for every ton of carbon dioxide they emit.

Also, there aren't commercially available technologies to capture and store or otherwise manage captured carbon dioxide which is not the case for sulfur dioxide or nitrogen oxides which are the pollutants typically regulated by cap and trade programs.

The significant control of carbon dioxide can only be achieved by fuel switching, reduced utilization or retirement.

Consequently, RGGI is unlike those other cap and trade programs in that RGGI is designed to increase the price of the electricity from the affected units, while the other cap and trade programs were designed to control the cost of the emission reductions and the price of electricity.

Slide 4 – We do know that based upon the current RGGI prices for carbon dioxide allowances that certain electric generators in PJM will be made non-competitive in the PJM market. As you can see on this slide that was developed prior to the release of the draft preliminary rule that was released on January 30th, the coal refuse-fired plants were the most significantly affected. But coal-fired and certain fuel-switched and older natural gas-fired electric generation will also be artificially challenged to remain economically viable in the PJM market, even at reduced operating levels. In the case of coal-fired electric generation, Pennsylvania's participation in RGGI will result in their retirement as quickly as PJM approves them for retirement.

Slide 5 – As you can see on this slide, in most but not all cases, the RGGI states and Pennsylvania electric generators reporting to EPA's Clean Air Market Division have reduced carbon dioxide emissions. In the case of New Jersey, they left RGGI and now generate considerably more electricity with a

corresponding increase in carbon dioxide emissions, but with New Jersey re-joining RGGI it will be interesting to see if those trends continue.

Slide 6 – Pennsylvania electric generators, **without** Pennsylvania participating in RGGI, have reduced carbon dioxide emissions by 33.2% from 2005 emission levels while at the same time maintaining over 30% of the electricity generated being exported to other states that no longer generate or never did generate enough electricity for their own state's needs. And that 33.2% reduction surpasses the targets set by Governor Wolf, the Paris accord and even the vacated Clean Power Plan, well ahead of all of their respective schedules.

Slide 7 - We know how these carbon dioxide reductions have occurred in Pennsylvania. The reductions are due to the retirement of coal and coal refuse-fired electric generation and replacement by natural gas.

Slide 8 – What we also know, by looking at generation and sales data, is that most of the RGGI states now import more electric power on a percentage basis than they did prior to participation in RGGI. **And when compared to the previous slide which identified state by state carbon dioxide emissions, those RGGI participating states that aren't importing more electricity in 2018 when compared to 2008 have carbon dioxide emissions that have either increased above 2005 levels or they have had a reduction that is far less on a percentage basis than the reduction achieved in Pennsylvania, without Pennsylvania's participation in RGGI.**

Slide 9 – This is a map of the PJM service territory. The point of this slide is to let you know that Pennsylvania in not an "island." We know from the generation and sales data provided on the previous slide that the RGGI

participating states that can, will import more electric power from non-RGGI participating states or areas. **Consequently, we really don't know if Pennsylvania's participation in RGGI will actually result in any regional carbon dioxide reductions.** That's because the lost Pennsylvania electric generation can be replaced by electric generation in other PJM states not participating in RGGI and those electric generating plants could be coal or coal refuse-fired or natural gas-fired. Plus, because those other states aren't part of the Ozone Transport Region there could actually be higher nitrogen oxides emissions and for other reasons higher sulfur dioxide emissions.

Slide 10 – We can also be certain that the Pennsylvania electric generation that will be lost due to RGGI participation won't be replaced by renewables. Using land-based wind powered electric generation for analysis purposes, because it it's the most cost effective renewable electric generation at a price between $26 and $54 per megawatt hour, **it would take about 3,300 wind turbines to replace the Pennsylvania electric generation lost due to RGGI participation by Pennsylvania.** To put that number into context, according to the Pennsylvania Department of Environmental Protection, there are currently 1,300 megawatts of installed wind turbine capacity in Pennsylvania. That amount of installed capacity represents approximately 600 to 700 existing wind turbines.

The failure of RGGI to achieve mass renewable electric generation installation is demonstrated by the variety of continuing state legislative efforts by the RGGI states to mandate more renewable generating sources. RGGI simply does not provide that outcome.

Slide 11 – Recognizing that the Pennsylvania lost generation would be replaced in the lowest emitting case by natural gas-fired electric generation, **the maximum tonnage of carbon dioxide reduction that would occur would be about 19.8 million tons**, or 1.0% of the annual carbon dioxide

emitted by electric generators in the United States. This is ignoring all other sources of carbon dioxide which if considered would make that amount an even smaller percentage of US greenhouse gas emissions. And remember that **this is the maximum amount** of carbon dioxide reduction that will occur because there is a high likelihood that some of the lost generation from Pennsylvania coal-fired plants that are retired will be replaced by other coal or coal refuse-fired plants located in other PJM states that aren't participating in RGGI.

Slide 12 – For perspective, it's worth knowing that coal and coal refuse-fired electric generation in the United States together represent about 12.5% of global coal-fired electric generating capacity. That provides some additional insight into how small a 1.0% carbon dioxide reduction from the electric generating sector in the United States really is on a global scale.

Slide 13 – I have heard presentations that project the Pennsylvania tax revenue that would be received from RGGI participation to be about $277 to $315 million dollars per year. I believe that is a gross overestimation. If **all** of the Pennsylvania coal-fired electric generation lost due to participation in RGGI were to be replaced entirely by natural gas-fired electric generation <u>located in Pennsylvania</u> **AND** all of the existing natural gas-fired electric generation, including the coal switched to natural gas and the older natural gas-fired plants with the nearly $4.00 per megawatt hour RGGI price adder, were to operate at the same level as occurred in 2018, then the **maximum amount** of annual RGGI tax revenue for Pennsylvania would be **$267 million**. However, remember what we know, <u>those states that can import from states or areas not participating in RGGI will end up doing exactly that</u>, which means the lost generation is unlikely to all be replaced by Pennsylvania-based electric generation. Consequently, I believe a more realistic projection for RGGI tax revenue is about $175 to $200 million annually.

Slide 14 – Also, I've heard people talk about the price of electricity being reduced in the RGGI states so I researched that statement. I found there were some reductions in the average price of electricity but there were mostly increases to the residential price of electricity, including in Pennsylvania which doesn't participate in RGGI at this time. The only RGGI participating states with reductions in the residential price of electricity as well as the average price of electricity are Delaware and Maryland, both of which are in the PJM territory and both of which have increased the amount of electricity they import since joining RGGI. A very important correlation to understand and appreciate.

Slide 15 - We know that PA joining RGGI…

…will force the early retirement of coal-fired electric generating units in Pennsylvania

…will not cause a shift to renewable electric generation in Pennsylvania

…will reduce the amount of electricity exported by Pennsylvania

…will result in lost Pennsylvania coal-fired electric generation being replaced by generation from other non-RGGI PJM states

Slide 16 –

…will result in the lost PA coal-fired generation being replaced by natural gas-fired electric generating units or other coal or coal refuse-fired units either in or outside of PA

…will result in companies moving the development of new natural gas-fired generating units to other non-RGGI PJM states

…will not result in CO2 emissions reductions that will affect local, regional or global climate

…will only generate $175-200 million per year in RGGI tax revenue for Pennsylvania

Slide 17 - Thank you for allowing me the opportunity to provide this testimony to the committee today.

“PA RGGI – OBSERVATIONS, INFORMATION AND INSIGHTS”

HOUSE ENVIRONMENTAL RESOURCES AND ENERGY COMMITTEE HEARING

REGIONAL GREENHOUSE GAS INITIATIVE (RGGI) AND HB 2025

FEBRUARY 5, 2020

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Olympus Power, LLC

Regional Greenhouse Gas Initiative (RGGI)

FROM THE RGGI WEBSITE - RGGI IS A COOPERATIVE EFFORT AMONG THE STATES OF CONNECTICUT, DELAWARE, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW YORK, RHODE ISLAND, AND VERMONT TO CAP AND REDUCE CO_2 EMISSIONS FROM THE POWER SECTOR.

A MORE SIMPLISTIC EXPLANATION – IT'S A PROGRAM TO INCREASE THE MARKET PRICE OF SOME ELECTRIC GENERATION ASSETS HIGH ENOUGH TO MAKE THEM UNECONOMICAL FOR THE BENEFIT OF OTHER ELECTRIC GENERATION ASSETS.

IT IS IN A SENSE A STRANGE SORT OF RE-REGULATION OF THE ELECTRIC GENERATION MARKET BY IMPOSING A TAX ON LESS POLITICALLY FAVORED ELECTRIC GENERATION.

We know that RGGI is different from other “Cap and Trade” programs!

WE KNOW THAT THE AFFECTED FACILITIES AREN’T ALLOCATED ALLOWANCES, THEY MUST BUY THEM

WE KNOW THERE AREN’T COMMERCIAL TECHNOLOGIES TO CAPTURE AND STORE CO2 EMISSIONS

IT’S REALLY LIMITED TO FUEL SWITCHING, REDUCING OPERATIONS OR RETIREMENT – EFFICIENCY UPGRADES ARE LIMITED

WE KNOW THIS MAKES ELECTRIC PRICES HIGHER RATHER THAN CONTROLLING THE COST OF THE REDUCTIONS WHICH WAS THE INTENT OF THE OTHER CAP AND TRADE PROGRAMS

We know what participation in RGGI actually does to the bid price of electricity!

RGGI WORKS BY REQUIRING ALL FOSSIL FUEL-FIRED EGUs TO PURCHASE CO2 ALLOWANCES TO ACCOUNT FOR THEIR CO2 EMISSIONS.

THIS HAS RESULTED IN HIGHER PRICES BEING BID INTO THE MARKETS WHICH HAS RESULTED IN MOST COAL-FIRED GENERATION BEING RETIRED OR USED AT VERY LOW CAPACITY FACTORS IN RGGI STATES.

RGGI PRICE ADDERS:

COAL-FIRED - $6.00/MWh

COAL REFUSE FIRED - $8-$12/MWh

COAL SWITCHED TO PIPELINE NATURAL GAS - $3.70 -$3.80/MWh

OLDER PIPELINE NATURAL GAS-FIRED - $3.50 -$3.90/MWh

NEWER PIPELINE NATURAL GAS-FIRED - $2.35 - $2.50/MWh

NEWEST PIPELINE NATURAL GAS-FIRED - $2.00/MWh

We know EGU CO2 emissions have been reduced compared to 2005 emissions in most states!

CO2 REDUCTIONS BY STATE:

State	Year	CO2 (short tons)	Year	CO2 (short tons)	CO2 Tons Reduction 2005 to 2018 (%)
CT	2005	9,645,877	2018	8,743,239	-9.4
DE	2005	6,688,310	2018	2,820,305	-57.8
MA	2005	26,290,987	2018	8,343,986	-68.3
MD	2005	31,984,008	2018	18,465,825	-42.3
ME	2005	4,587,113	2018	1,183,215	-74.2
NH	2005	8,972,027	2018	3,584,976	-60.0
NY	2005	56,018,928	2018	28,023,412	-50.0
RI	2005	2,472,078	2018	3,539,026	43.2
VT	2005	372,739	2018	425,128	14.1
RGGI	2005	147,032,069	2018	75,129,110	-48.9
NJ	2005	14,594,603	2018	19,010,023	30.3
PA	2005	121,858,351	2018	81,413,440	-33.2

We know CO2 emissions from PA EGUs have been decreasing without RGGI!

WE KNOW U.S. EGU CO2 EMISSIONS IN 2018 WERE 1,993.6 MILLION SHORT TONS WHILE PENNSYLVANIA EGUs EMITTED 81.4 MILLION SHORT TONS.

WE KNOW IN 2018 PA EGUs WERE:
THE 5TH LARGEST EMITTER BY STATE OF EGU CO2, BUT!!!
31ST IN CARBON INTENSITY.

WITHOUT RGGI PA EGUs HAVE REDUCED CO2 MASS EMISSIONS IN 2018 BY 33.2% FROM 2005 EMISSIONS.

Governor Wolf's CO2 Reduction Goal	26% from 2005 emissions by 2025
Paris Agreement CO2 Reduction Goal	26-28% from 2005 emissions by 2025
Obama CPP PA Target	90,931 tons CO2 - PA is 10.5% Lower

We know how the PA EGU CO2 emissions reductions happened!

IT'S MOSTLY ABOUT COAL AND COAL REFUSE-FIRED PLANT RETIREMENTS AND REPLACEMENT BY NATURAL GAS-FIRED ELECTRIC GENERATION.

STATE	TYPE OF PRODUCER	ENERGY SOURCE	2005 GENERATION (Megawatthours)	2005 GENERATION CONTRIBUTION BY FUEL (%)	2018 GENERATION (Megawatthours)	2018 GENERATION CONTRIBUTION BY FUEL (%)	DIFFERENCE BETWEEN GENERATION CONTRIBUTION (%)
PA	Total Electric Power Industry	Total	218,091,125		215,385,830		
PA	Total Electric Power Industry	Coal	120,933,254	55.45	44,086,284	20.47	-34.98
PA	Total Electric Power Industry	Pumped Storage	-711,041	-0.33	-659,143	-0.31	0.02
PA	Total Electric Power Industry	Hydroelectric Conventional	2,232,179	1.02	4,261,757	1.98	0.96
PA	Total Electric Power Industry	Natural Gas	10,807,750	4.96	76,390,859	35.47	30.51
PA	Total Electric Power Industry	Nuclear	76,289,432	34.98	83,476,744	38.76	3.78
PA	Total Electric Power Industry	Other Gases	540,065	0.25	528,492	0.25	0.00
PA	Total Electric Power Industry	Other	730,615	0.34	780,847	0.36	0.03
PA	Total Electric Power Industry	Petroleum	4,939,562	2.26	625,647	0.29	-1.97
PA	Total Electric Power Industry	Solar Thermal and Photovoltaic	0	0.00	62,475	0.03	0.03
PA	Total Electric Power Industry	Other Biomass	1,357,703	0.62	1,816,682	0.84	0.22
PA	Total Electric Power Industry	Wind	284,241	0.13	3,566,917	1.66	1.53
PA	Total Electric Power Industry	Wood and Wood Derived Fuels	687,364	0.32	448,269	0.21	-0.11

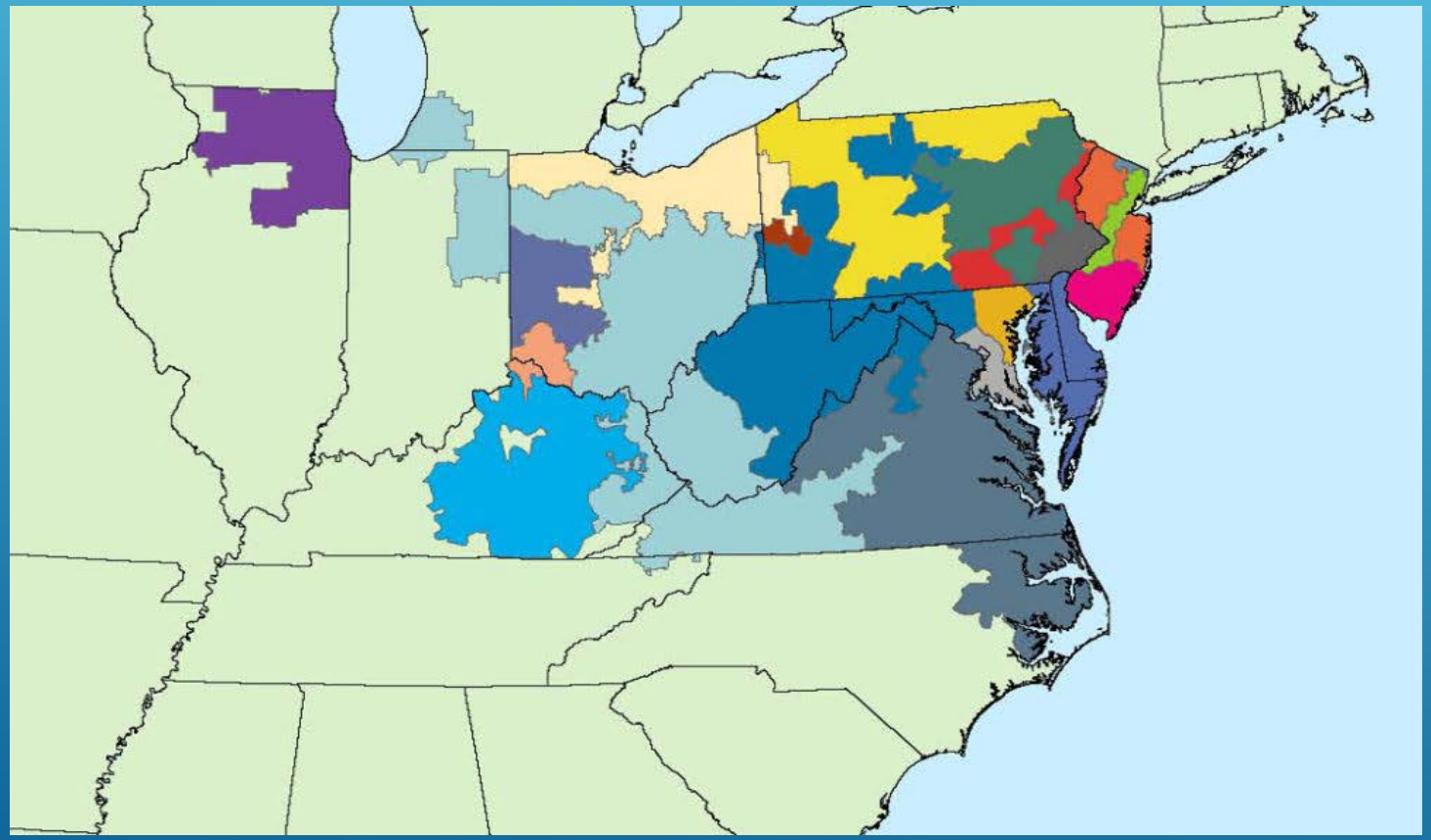
We know joining RGGI typically results in less generation of electricity in the RGGI participating states!

THE RGGI HISTORY:

State	2008 Total Electric Sales (MWh)	2008 Net Total Electric Generation (MWh)	2008 Net Total Electric Generation vs Total Electric Sales - Import or Export (%)	2018 Total Electric Sales (MWh)	2018 Net Total Electric Generation (MWh)	2018 Net Total Electric Generation vs Total Electric Sales - Import or Export (%)
CT	30,956,544	30,409,473	-1.8	28,833,925	39,453,552	26.9
DE	11,748,783	7,523,839	-36.0	11,773,100	6,240,644	-47.0
MA	55,884,105	42,505,478	-23.9	53,285,029	27,172,882	-49.0
MD	63,325,777	47,360,953	-25.2	62,086,455	43,809,646	-29.4
ME	11,673,673	17,094,919	31.7	12,354,819	11,280,700	-8.7
NH	10,977,289	22,876,992	52.0	11,046,284	17,087,156	35.4
NY	144,052,936	140,322,100	-2.6	149,929,851	132,520,498	-11.6
RI	7,818,594	7,387,266	-5.5	7,583,339	8,375,257	9.5
VT	5,741,204	6,820,216	15.8	5,530,948	2,178,915	-60.6
RGGI Total	342,178,905	322,301,236	-5.8	342,423,750	288,119,250	-15.9
NJ	80,519,543	63,674,789	-20.9	76,016,762	75,033,600	-1.3
PA	150,400,589	222,350,925	32.4	148,976,731	215,385,830	30.8

We don’t know if PA joining RGGI will result in reductions of CO2 or other emissions!

PJM SERVICE TERRITORY – ALL OR PORTIONS OF PA, NJ, DE, MD, VA, NC, WV, KY, OH, IL, IN, MI, TN AND DC



We do know that the lost PA electric generation due to RGGI participation will not be replaced by renewables!

IF ALL OF THE REMAINING COAL-FIRED INSTALLED MW ARE RETIRED, WHAT WOULD IT TAKE TO REPLACE THE POWER?

CURRENTLY THERE ARE ABOUT 1,300 MW INSTALLED WIND GENERATION IN PA ACCORDING TO PADEP. NEED OVER 7 TIMES MORE THAN CURRENT INSTALLED WIND CAPACITY

COAL-FIRED AND WIND TURBINES – CURRENTLY ABOUT THE SAME CAPACITY FACTOR SO REPLACE INSTALLED CAPACITY AT A 1:1 RATIO

8,025 MW/2.43 MW/TURBINE = **3,302 TURBINES NEEDED**

We do know that CO2 reductions in PA and the region due to PA RGGI participation will not be meaningful relative to global, regional or local climate

THE MAXIMUM CO2 REDUCTION IF ALL REMAINING COAL AND COAL REFUSE LOST GENERATION WERE REPLACED BY NATURAL GAS-FIRED GENERATION:

PIPELINE NATURAL GAS – 31.5 MILLION TONS CO2/67.7 MW-H = 0.465 TON CO2/MW-H

39.2 MILLION MW-H (COAL-FIRED) X 0.465 = 18.2 MILLION TONS OF CO2

38.0 MILLION TONS CO2 (COAL-FIRED) – 18.2 MILLION TONS CO2 (FROM NATURAL GAS) = 19.8 MILLION TONS OF CO2 WOULD BE ELIMINATED: OR,

1.0% OF ALL US EGU CO2 EMISSIONS IN 2018 WOULD BE ELIMINATED

HOWEVER, IF RETIRED PA COAL OR COAL REFUSE-FIRED GENERATION IS REPLACED BY COAL OR COAL REFUSE-FIRED IN ANOTHER PJM STATE THEN THERE ISN'T ANY CO2 REDUCTION

We know that the US coal and coal refuse-fired generation is only about 12.5% of the total worldwide!

AS OF JULY 2019:

COUNTRY	INSTALLED COAL-FIRED CAPACITY (MW)
GLOBALLY	2,027,224
CHINA	987,364
UNITED STATES	254,332
INDIA	225,638
PENNSYLVANIA	9,368

We know the maximum amount of RGGI tax revenue that would be generated if lost generation were replaced by natural gas-fired generation in PA!

31.5 MILLION TONS OF CO2 FROM PA NATURAL GAS-FIRED EGUs + 18.2 MILLION TONS OF CO2 FROM NATURAL GAS-FIRED REPLACEMENT GENERATION PLUS = 49.7 MILLION TONS OF CO2 EMITTED

49.2 MILLION TONS OF CO2 X $5.42 (RECENT RGGI ALLOWANCE CLEARING PRICE) = $267 MILLION/YEAR

$267 MILLION IS THE **MOST** THAT WOULD BE GENERATED ANNUALLY BY THE **RGGI TAX IN PA. BUT!!! BECAUSE RGGI HISTORY HAS SHOWN THOSE THAT CAN IMPORT FROM NON-RGGI AREAS DO, THE AMOUNT IS LIKELY TO BE CONSIDERABLY LESS - $175-200 MILLION MORE LIKELY AMOUNT.**

We know who is going to pay the most if PA joins RGGI!

RESIDENTIAL CUSTOMERS WILL BEAR MOST OF THE BURDEN.

State	2008 Average Total Electric Price (¢/kWh)	2008 Residential Total Electric Price (¢/kWh)	2018 Average Total Electric Price (¢/kWh)	2018 Residential Total Electric Price (¢/kWh)	Increase or Decrease of Average Total Electric Price 2018 vs 2008 (%)	Increase or Decrease of Residential Total Electric Price 2018 vs 2008 (%)
CT	17.80	19.54	18.41	21.20	3.4	8.5
DE	12.38	13.93	10.55	12.53	-14.8	-10.1
MA	16.23	17.56	18.50	21.61	14.0	23.1
MD	13.01	13.84	11.57	13.30	-11.1	-3.9
ME	13.80	16.24	13.44	16.84	-2.6	3.7
NH	14.63	15.68	17.01	19.69	16.3	25.6
NY	16.47	18.31	14.83	18.52	-10.0	1.1
RI	16.04	17.45	18.10	20.55	12.8	17.8
VT	12.33	14.48	15.13	18.02	22.7	24.4
NJ	14.43	15.66	13.23	15.41	-8.3	-1.6
PA	9.33	11.35	10.10	13.89	8.3	22.4

We know that the loss of economic benefits due to loss of the coal and coal refuse-fired plants will be very large!

ON AN ANNUAL BASIS THE SIX PLANTS IDENTIFIED IN THE FOLLOWING TABLE GENERATE THESE ECONOMIC ACTIVITY BENEFITS IN PA:

Plant	2018 Gross Generation (MWh)	Annual Operating Expenses ($M)	Total Direct Employees	Employee Compensation ($M)
Cheswick	1.2	$56	60	$9
Conemaugh	12.1	$363	166	$24
Homer City	8.1	$294	230	$35
Keystone	11.8	$359	166	$24
Seward	2.6	$110	180	$17
Ebensburg	0.3	$12	28	$3
Total	**36.1**	**$1,194**	**830**	**$112**

We know that PA joining RGGI…

…WILL FORCE THE EARLY RETIREMENT OF COAL-FIRED ELECTRIC GENERATING UNITS

…WILL NOT CAUSE A SHIFT TO RENEWABLE ELECTRIC GENERATION

…WILL REDUCE THE AMOUNT OF ELECTRICITY EXPORTED BY PA

…WILL RESULT IN LOST PA COAL-FIRED GENERATION BEING REPLACED BY GENERATION FROM OTHER NON-RGGI PJM STATES

We know that PA joining RGGI…

(cont.)

… WILL RESULT IN THE LOST PA COAL-FIRED GENERATION BEING REPLACED BY NATURAL GAS-FIRED ELECTRIC GENERATING UNITS OR OTHER COAL OR COAL REFUSE-FIRED UNITS EITHER IN OR OUTSIDE OF PA

…WILL RESULT IN COMPANIES MOVING THE DEVELOPMENT OF NEW NATURAL GAS-FIRED GENERATING UNITS TO OTHER NON-RGGI PJM STATES

…WILL NOT RESULT IN CO2 EMISSIONS REDUCTIONS THAT WILL AFFECT LOCAL, REGIONAL OR GLOBAL CLIMATE

…WILL ONLY GENERATE $175-200 MILLION PER YEAR IN RGGI TAX REVENUE

Thank You!

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