

PA RGGI – Information, Observations and Outcomes relating to Pennsylvania’s participation in RGGI

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PA Regional Greenhouse Gas Initiative (RGGI)

The following information and observations are not about climate change belief or denial

The information and observations address the outcomes from Pennsylvania participating in RGGI or having a “RGGI-Like” rule for Pennsylvania EGUs based upon the history of RGGI participation by other states

The PADEP/ICF April 23, 2020 modeling presentation to AQTAC did not quantify meaningful climate change benefits or other environmental benefits as likely outcomes of PA participation in RGGI

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-fired generation lost to RGGI were replaced by natural gas-fired generation, **based on 2019 data**:

Pipeline natural Gas – 42.1 million tons CO2/90.3 million GMWh = 0.466 ton CO2/GWWh

32.8 million GMWh (Coal-fired) X 0.466 = 15.3 million tons of CO2

32.8 million tons CO2 (from coal-fired) – 15.3 million tons CO2 (from natural GAS) = **17.5 million tons of CO2 reduction; Or,**

1.0% of all US EGU CO2 emissions in 2019 would be eliminated

*However, if retired PA coal generation or if PA natural Gas-fired generation is replaced by coal or coal refuse-fired generation in another non-RGGI PJM state then there is **no CO2 reduction and there could be increases in CO2 and the emissions of other pollutants***

Policy Case Generation vs Reference Case Generation

Net Generation (GWh) - Policy						Net Generation (GWh) - Reference					
Pennsylvania						Pennsylvania					
	2020	2022	2025	2028	2030		2020	2022	2025	2028	2030
Biomass	146	307	307	152	152	Biomass	146	307	307	152	152
Coal	34,123	4,381	3,120	3,027	2,415	Coal	34,123	20,265	14,621	16,540	6,925
Combined	94,339	113,263	112,111	103,785	104,840	Combined	92,259	124,127	123,392	114,236	113,125
Combustion	312	970	810	810	868	Combustion	304	1,359	2,562	1,141	1,348
Nuclear	76,125	76,125	76,125	76,125	76,125	Nuclear	76,125	76,125	76,125	76,125	76,109
Oil/Gas Steam	0	14	14	12	12	Oil/Gas Steam	0	8	14	12	12
New Combined	1,448	10,111	10,970	10,236	10,236	New Combined	1,448	10,970	10,970	10,970	10,970
New Combustion	0	25	31	25	25	New Combustion	0	20	10	6	16
Other	1,671	1,671	1,671	1,671	1,671	Other	1,671	1,671	1,671	1,671	1,671
Conventional	208,164	206,868	205,160	195,843	196,345	Conventional	206,077	234,853	229,672	220,854	210,328
Hydro	4,327	4,012	4,010	4,027	3,805	Hydro	4,292	4,130	3,991	3,939	3,816
Solar	122	122	122	122	122	Solar	122	122	122	122	122
LBW	5,156	5,156	5,156	5,156	5,156	LBW	5,156	5,156	5,156	5,156	5,156
New Solar	122	363	527	690	800	New Solar	122	363	527	690	800
New LBW	0	142	795	795	795	New LBW	0	142	795	795	795
Offshore Wind	0	0	0	0	0	Offshore Wind	0	0	0	0	0
Other Renewables	812	812	812	812	812	Other Renewables	812	812	812	812	812
Renewable	10,539	10,608	11,423	11,603	11,491	Renewable	10,505	10,726	11,404	11,516	11,502
Total	218,704	217,476	216,583	207,446	207,836	Total	216,581	245,578	241,076	232,370	221,829

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

The RGGI History 5.8% imported to 15.9% imported electric sales:

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

RGGI works by requiring fossil fuel-fired EGUs to purchase CO2 allowances to account for their CO2 emissions.

This results in higher prices being bid into the markets which causes most coal-fired generation to be retired or to be used at very low capacity factors in RGGI participating states.

PA RGGI Price Adders at a recent RGGI allowance clearing price

(see the separate attachment for PA unit by unit RGGI price adders):

Coal-fired - ≈\$6.00/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

Natural Gas Combined Cycle Plants In Ohio (11/3/17)

Operating Facilities ▲

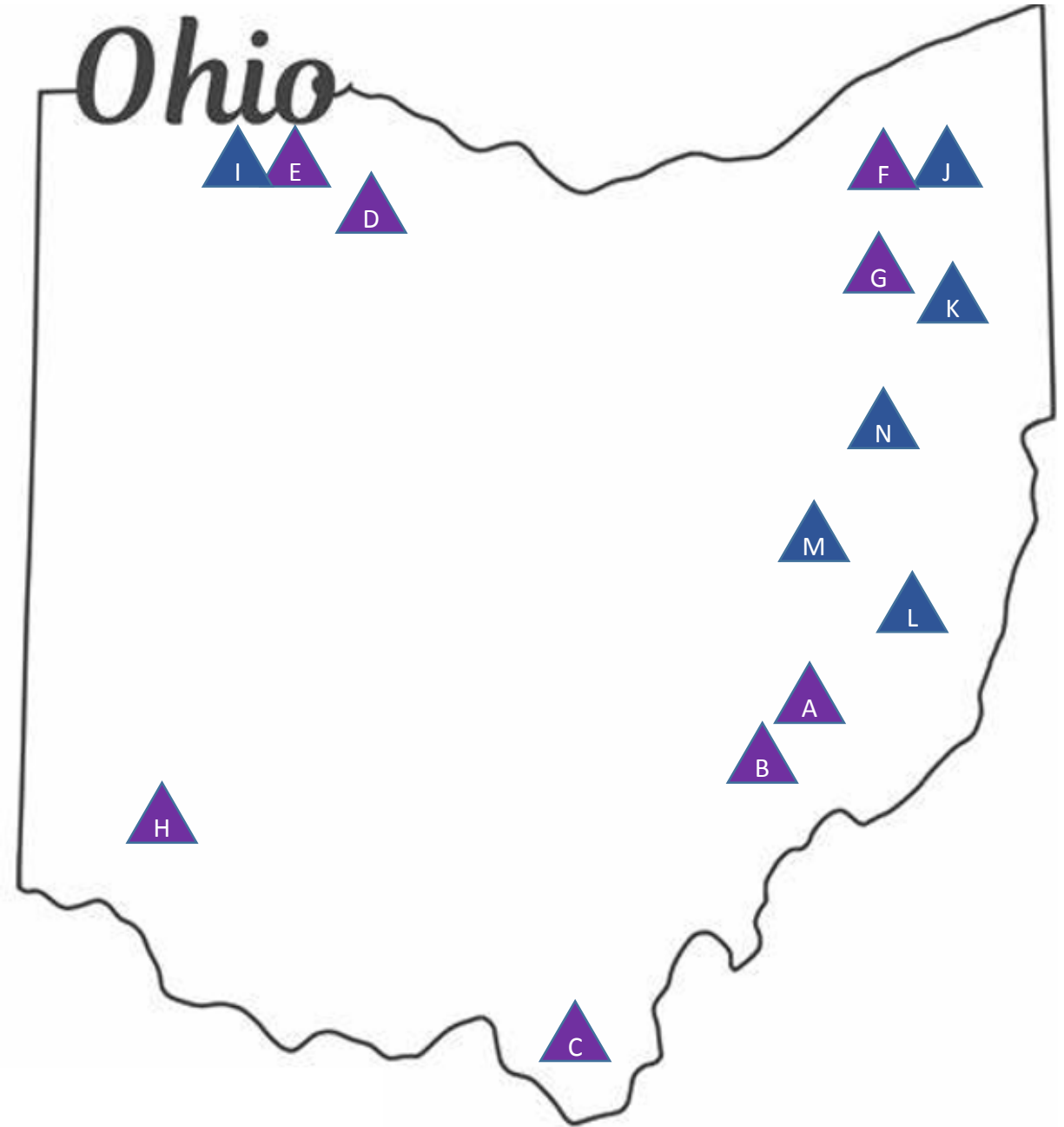
- A) Washington Energy Facility (Beverly, OH), 715 MW
- B) Waterford Plant (Waterford, OH), 921 MW
- C) Hanging Rock Energy Facility (Ironton, OH), 1430 MW
- D) Fremont Energy Center (Fremont, OH), 740 MW
- E) Oregon Clean Energy Center (Oregon, OH), 1060 MW
- F) Clean Energy Future Lordstown (Lordstown, OH), 962 MW
- G) Carroll County Energy, LLC (Washington Twp., OH), 832 MW
- H) NTE Ohio, LLC - Middletown Energy Center (Middletown, OH), 544 MW

Total – 7204 MW

Recently Permitted Facilities ▲

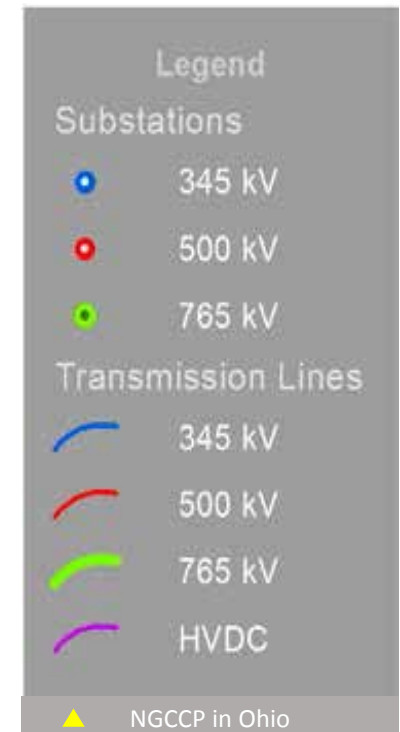
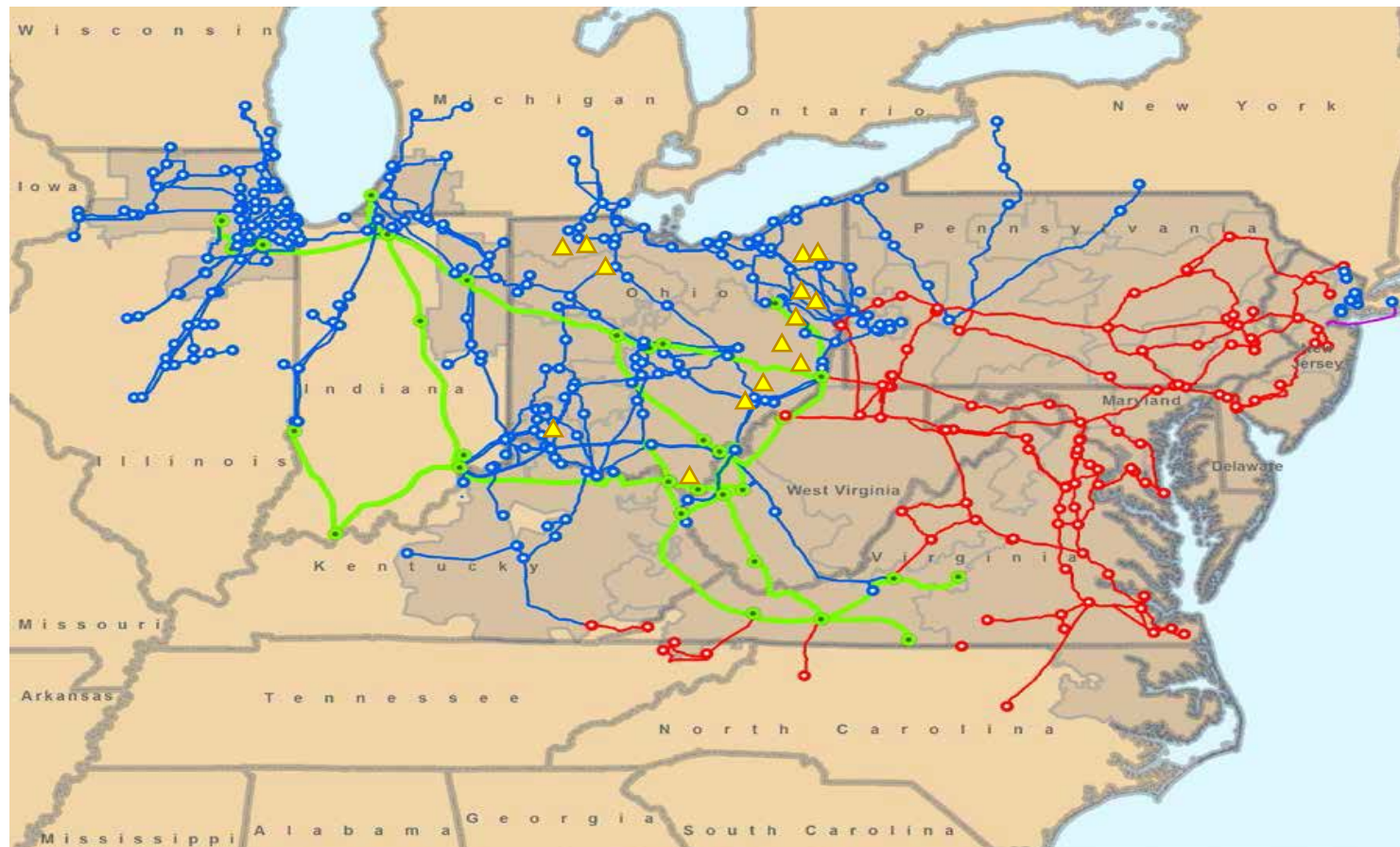
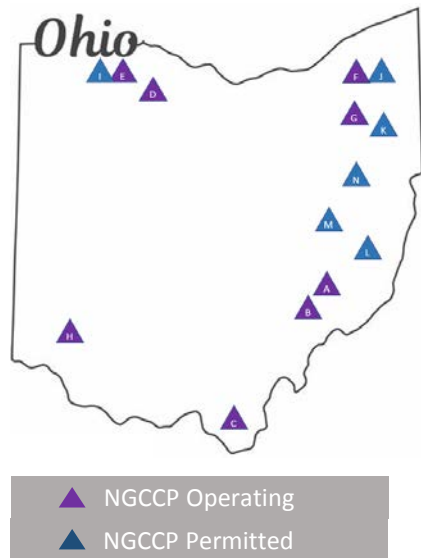
- I) Oregon Energy Center (Oregon, OH), PTI issued March 2020, 955 MW net
- J) Trumbull Energy Center (Lordstown, OH), PTI issued Feb 2020, 940 MW
- K) South Field Energy (Wellsville, OH), PTI issued Sept 2016, 1150 MW – Broke Ground May 2019
- L) Hannibal Port Power Station (Hannibal, OH), PTI issued Nov 2017
(Long Ridge Energy Generation LLC – Hannibal Power), 485 MW – Broke Ground May 2019
- M) Guernsey Power Station (Byesville, OH), PTI issued Oct 2017, 1650 MW
- N) Ohio River Partners LLC: Harrison Power (Cadiz, OH), PTI issued April 2018, 1000 MW

Total – 6180 MW



We don't know if PA joining RGGI will result in regional reductions of CO₂ or any 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 know the maximum amount of RGGI tax revenue that would be generated if all lost coal –fired generation were replaced by natural gas-fired generation in PA!

42.1 million tons of CO₂ from PA natural gas-Fired EGUs + 15.3 million tons of Co₂ from natural gas-fired replacement generation plus = 57.4 million tons of CO₂ emitted

57.4 million tons of CO₂ X \$5.61 (December RGGI allowance clearing price) = **\$322.0 million/year Maximum**

\$322.0 million is the **most** that would be generated annually by the **RGGI taX in PA. *But!!!* Because RGGI history has shown those states that can import from non-RGGI areas do, and because of high PA natural gas-fired unit RGGI price adders which will affect their operations - the amount is likely to be considerably less - \$175 to \$200 million/year is a more likely range.**

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

We know U.S. EGU CO2 emissions in 2019 were 1,773.3 million short tons while Pennsylvania EGUs emitted 82.8 million short tons.

We know in 2019 PA EGUs were:
the 3rd largest emitter by state of EGU CO2, *But!!!*
either 33rd (lb/MMBtu) or 31st (lb/GMWh) in CO2 intensity.

Without RGGI, PA EGUs have reduced CO2 Mass emissions in 2019 by 32.1% from 2005 emissions *while remaining the #1 Electricity Exporting state!*
Consequently, PA emits CO2 for other PJM states !

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	90,931,637 tons CO2 - PA is 8.9% Lower

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

if all of the remaining PA coal-fired installed MWs are retired, what would it take to replace the power?

Assuming replacement by land-based wind turbines because they are the lowest priced and highest capacity factor renewable generator.

Currently there are about 1,300 MW installed wind generation capacity in PA according to PADEP. Consequently at current capacity factors PA Needs about 6 times more installed wind capacity than is currently installed.

Coal-fired and wind turbines – Newest wind turbine at about the same capacity factor for 2019 coal-fired plants so replace installed capacity at a 1:1 ratio

$8,025 \text{ MW} / 2.43 \text{ Mw/turbine} = \mathbf{3,302 \text{ turbines needed}}$

We know that PA joining RGGI...

...will artificially accelerate the retirement of coal-fired electric generating units that will likely all be retired before 2030 **without RGGI** and will also affect the operations of some PA natural gas-fired units including possible retirements

...will reduce the amount of electricity generated in and exported by PA

...will result in some or all lost PA coal-fired generation and some natural gas-fired generation being replaced by generation from other RGGI and non-RGGI PJM states

...that the lost PA coal-fired and natural gas-fired generation being replaced by non-RGGI PJM states generation can be replaced by either coal-fired or natural gas-fired electric generation

We know that PA joining RGGI ... (cont.)

...won't cause a shift to renewable electric generation

...won't help nuclear generation because the PJM market will dispatch the lowest cost units

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

...results in a RGGI tax that will be borne disproportionately by residential customers

...won't result in local or regional CO2 emissions reductions that meaningfully affect or benefit local, regional or global climates

...will only generate \$175-200 million per year in RGGI tax revenue

We know the immediate economic impacts in western Pennsylvania of PA joining RGGI...

- >the loss of 8,000 plus jobs
- >the loss of \$2.87 billion in total economic impact
- >the loss of \$539 million in employee compensation
- >the loss of \$34.2 million to state and local taxes base

Source: IMPLAN (2015), Econsult Solutions (2019)

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Thank you for the opportunity to testify today.