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January 14, 2021

Environmental Quality Board

P.O Box 8477

Harrisburg, PA 17105-8477

[via http://www.ahs.dep.pa.gov/eComment/]

Independent Regulatory Review Commission

333 Market Street, 14th Floor

Harrisburg, PA 17101

[via email to irrc@irrc.state.pa.us]

Subject: Proposed amendment to Chapter 145 (relating to interstate pollution transport reduction) to add Subchapter E (relating to CO2 budget trading program) to establish a program to limit the emissions of carbon dioxide (CO2) from fossil fuel-fired electric generating units (EGU) located in this Commonwealth, with a nameplate capacity equal to or greater than 25 megawatts (MWe) Amendments to 25 Pa. Code, Chapters 121 (relating to general provisions) and 127, Subchapters F and I (relating to operating permit requirements; and plan approval and operating permit fees)

Background

Olympus Power, LLC (Olympus) is a power plant investment and management firm with assets located throughout the United States. Olympus has been the owner and/or asset manager of projects with interests in 47 power plants across the U.S.

with over $3.5 billion in asset value and the responsibility for operating projects with a gross capacity in excess of 5,200 megawatts (MW) of electricity generation. Over time, these assets have included coal refuse reclamation to energy, natural gas-fired, coal-fired, biomass-fired, hydroelectric, solar, and wind-powered electric generating facilities. Specifically, Olympus has ownership interests in the Keystone and Conemaugh Plants, and the Panther Creek Power, Northampton Generating, and Scrubgrass Generating coal refuse reclamation to energy facilities in Pennsylvania.

Introduction

Governor Wolf has ordered that the Pennsylvania Department of Environmental Protection (PADEP) develop and finalize a rule to limit carbon dioxide (CO2) emissions from electric generating units in Pennsylvania. Olympus appreciates and supports the Department's and Administration's recognition of the great values provided by the coal refuse to energy plants through the establishment of the coal refuse set aside.

Olympus appreciates the effort in the proposed rule to allow the coal refuse to energy units to continue their efforts in reclaiming coal refuse and the remediation and reclamation of mining affected lands. Pennsylvania is unique relative to the other states participating in RGGI in that Pennsylvania powered the US for over 100 years with its abundant energy resources, including the mining of coal and the transmission of electricity to many of these same RGGI states. The mining and processing of coal, however, has left coal refuse behind as a legacy pollutant. Coal refuse that causes serious environmental damage and health and safety concerns for the residents that live in the coal regions of Pennsylvania. To allow the coal refuse to energy units to maximize the removal of coal refuse and the remediation and

reclamation of mining affected lands, the Department should consider simply excluding these units from the proposed CO2 budget trading program and reducing the 78 million ton Pennsylvania CO2 budget by an amount equal to the waste coal set aside and then managing the budget on that basis. By excluding these facilities from the proposed rule, the Department would not only continue to appropriately recognize the great environmental and safety and health benefits of this unique environmental remediation industry, the Department would provide environmental justice to the communities where the coal refuse is located and to areas downstream from the coal refuse.

Comments

Participation in RGGI is not about climate change.

This proposed rule has been represented as a measure being taken to address climate change, however, ***there is nothing that Pennsylvania can do that will provide CO2 reductions beyond those that have already occurred, or will occur through current market forces, or other non-carbon regulations that are already "on the books," that will result in CO2 reductions that provide any quantifiable local, regional or global effect on climate change.***

Pennsylvania's participation in RGGI does not accomplish climate change benefits because any CO2 reduction achieved by Pennsylvania's participation is such a tiny component of global and US anthropogenic greenhouse gas (GHG) emissions that any effect would be immeasurable. Even assuming that the PADEP/ICF overstated 21 million short tons of CO2 reduction in 2022 is "real," it is simply lost in

the estimated annual anthropogenic global emissions of 55 billion short tons as CO2 equivalents and the US annual anthropogenic greenhouse gas emissions which are estimated at 15% of the global emissions or 8.25 billion short tons as CO2 equivalents.

http://css.umich.edu/factsheets/greenhouse-gases-factsheet#:~:text=United%20States,anthropogenic%20GHG%20emissions%20in%202018.&text=GHG%20emission%20in%202018%20were,annual%20growth%20rate%20of%200.2%25.

We have reviewed the modeling results and reduction claims provided by PADEP's consultant, ICF. It is obvious that the claimed CO2 reductions achieved by Pennsylvania's participation in RGGI are overstated by at least 50%. Furthermore, the "leakage" of electricity generation and the corresponding emissions to other PJM states not participating in RGGI negates those emissions reductions even further. As noted above, the reduction is such a tiny component of global and US anthropogenic greenhouse gas (GHG) emissions that nothing greater than an immeasurable effect can occur locally, regionally or globally.

PADEP has not made the underlying ICF modeling assumptions available to the public.

Unfortunately, ***the modeling that has been performed for PADEP by ICF,*** to represent the impacts on CO2 emissions and further used to represent the monetized health benefits provided by Pennsylvania's participation in RGGI ***cannot be independently assessed because PADEP has not made the underlying model inputs available*** that are necessary to allow a rigorous evaluation of the

work product. This information was requested at a public meeting of the Air Quality Technical Advisory Committee (AQTAC) and also requested as part of a formal "Right to Know" request which at this time has been withdrawn as an agreement to allow the PADEP to provide the data in an informal fashion. However, ***as of January 14, 2021, the specific modeling inputs that have been requested have not been provided,*** confounding the ability to accomplish a rigorous and thorough review and analysis of this work and the reductions that have been represented.

The monetized health benefits from RGGI participation are grossly overstated.

The over-representation of CO2 emissions reductions also causes the over-representation of emissions reductions of other pollutants that will occur due to RGGI participation by Pennsylvania. Based on the assessment of the DEP's "Policy Case with Revenue Recycling" it is obvious that the CO2 reductions are overstated by 50% which means that ***the monetized benefits from the reduction of other pollutants is also overstated.*** But beyond that, the ***PADEP has used a methodology to calculate the health benefits that EPA has identified as being merely a "screening tool" with considerable limitations.*** A screening level assessment is a very conservative assessment used to determine if a more rigorous assessment is appropriate and necessary to determine actual effect and impacts. A screening level assessment does not result in accurate total monetized health benefits nor provide accurate monetized benefits for any particular region.

What EPA has also identified is that the same mortality rate is assigned to all fine particulate matter regardless of chemical composition. For instance, the fine

particulate matter precursors from electric generating units are dramatically different from the fine particulate matter and fine particulate matter precursors from the combustion of diesel fuel in engines. But even though there has been considerable research on this matter, EPA has stated they don't have enough information at this time to differentiate between the fine particulate matter and the health effects of those different fine particulate matter.

PADEP has assigned these same monetized benefits to all areas of the Commonwealth, regardless of the location of the reductions; regardless of the population; regardless of the exposure; regardless of the current health of the population; and regardless of whether or not that area is achieving and maintaining the National Ambient Air Quality Standards (NAAQS). Importantly, those air quality standards are established to protect all populations with an adequate margin of safety.

A presentation made by PADEP to the Small Business Compliance Advisory Committee on July 22, 2020, showed the great improvements that have been achieved in ambient air quality in Pennsylvania. Further, the 2017 – 2019 ambient monitoring data, aka 2019 design value, collected by the PADEP demonstrated that the ambient air quality standards, which are developed to protect all members of the population, were being met at the vast majority of monitoring sites. Consequently, further emissions reductions by the Pennsylvania electric generating units (EGUs) that would be retired due to RGGI participation would not likely provide the monetized benefits calculated by the PADEP. That PADEP presentation is included as Attachment 1.

Without participation in RGGI or any other regulatory obligations for existing electric generating units to control carbon dioxide (CO2) emissions, Pennsylvania's EGU 2019 had already reduced emissions from 2005 levels by 32.1%. As a sector EGUs have already exceeded the state, federal and international goals set by Governor Wolf, President Obama's Clean Power Plan and the Paris Accord.

I have also included as attachments to these comments, Attachment 2, the testimony that was presented to the PA House of Representatives Environmental Resources and Energy Committee on August 24, 2020, as well as Attachment 3, the testimony that was presented to the Pennsylvania Senate Environmental Resources and Energy Committee on June 23, 2020. In addition to the testimony presented, these attachments include the slides used for the testimony.

PADEP has not engaged PJM, the only source with the specific EGU pricing and operations information and transmission constraints information necessary to conduct an adequate assessment of Pennsylvania's, as well as New Jersey's and Virginia's, participation, in a PA RGGI participation analysis.

When PADEP and its modeling firm ICF assembled its analysis, New Jersey and Virginia had not yet formally joined RGGI. Thus, the financial, operational and emissions implications from those two states' participation in light of their participation in RGGI and presence in PJM service territories were not included alongside an analysis of the impact upon Pennsylvania. This data is necessary to understand the effects of PA participation in RGGI upon electric generating units in all PJM states, including PA

and to allow the determination of the actual CO2 and other pollutant emissions that will occur both with and without Pennsylvania's participation in RGGI.

Among the data requests and unasked questions which can only be resolved with accurate data from PJM are:

- Detailed, state specific operations impacts for all of the electric generating units in all of the PJM states, assuming New Jersey and Virginia join RGGI, and with and without Pennsylvania's participation in RGGI. This must include the generation already coming on line through 2022 and 2023, and expected to be on line prior to 2030;
- A list of electric generating units that are likely unable to compete in the PJM market due to their unit specific RGGI allowance price adder;
- Projected electricity pricing for each year;
- A projection of state-by-state carbon dioxide emissions for each scenario.
- PJM recently made a presentation to the Department of Environmental Protection's (DEP) Air Quality Technical Advisory Committee (AQTAC) on "PJM Generation Dispatch, Resource Mix, and Emissions." As we understand from the discussions with PJM representatives regarding their presentation, ***the information PJM presented was not prepared to assess the impacts upon Pennsylvania electric generation,*** but rather was information that had been part of a separate response to a PJM stakeholder's group regarding future pricing. That is an unfortunate circumstance considering the likely enormous impacts on Pennsylvania's energy resources and electric generation resources and the people that work in the Pennsylvania energy industries and in the

industries that support those energy industries from Pennsylvania participation in RGGI.

- It is anticipated that the most recent RGGI allowance clearing price will require a substantial increase in bid price for not only coal-fired electric generation, but also for a considerable amount of gas-fired electric generation in RGGI participating states. An analysis of this recent price increase, subsequent to the ICF modeling, has not been considered.

- Impacts, by state, on electric generation in the PJM states that won't be participating in RGGI, as well as, the generation already coming on line for 2022-23, and expected to be on line prior to 2030 in PJM.

- It is important to identify not only the amount of new or anticipated electric generation but also the specific fuels and emissions characteristics associated with those specific electric generating resources. A multiple year assessment is necessary to fully understand the consequences of Pennsylvania participation in RGGI.

- A list of electric generating plants, by state, that are likely unable to economically operate in the PJM market due to the RGGI allowance price adder. The RGGI allowance price adder is the unit specific additional cost that must be added to each bid price for the unit to recover their costs per net MWh sold into PJM. The RGGI allowance price adder is how RGGI accomplishes emissions reductions. The intent of RGGI is to drive certain electric generating resources out of the market and into retirement by artificially increasing their prices. ***I have included as Attachment 4, a unit by unit list of the RGGI allowance***

price adders for each unit in Pennsylvania based upon a recent RGGI allowance clearing price of $7.41 per allowance as well as some earlier RGGI allowance clearing prices. The unit specific RGGI allowance price adder must be added to the price of each megawatt hour (MWh) sold to recover the cost of the allowances used to generate the electricity. This unit specific price adder is a reflection of the fuel, the type of unit, and the efficiency of the unit and the price of the RGGI allowances.

- A projection of state-by-state carbon dioxide (CO2) emissions for the scenarios, which would allow the assessment of overall regional emissions impacts and the amount of revenue that would be collected by Pennsylvania.
- With respect to electric generation, the focus is not about installed capacity, but rather upon the specific location of the projected electric generation, the expected generation by facility, taking into account the RGGI price adder by unit and the specific Pennsylvania electric generating resources that would be retired or have increased or reduced electric generation given that both coal and many natural gas plants could be priced out of the market with RGGI participation.
- A proper analysis should also request that modeling firm include a pricing analysis for each of the above specific scenarios based upon PJM's best data.

Absent the data request and analysis outlined above, it is impossible to accurately determine the overall impacts and/or benefits of PA's RGGI participation.

PADEP has grossly overstated the PA benefits from PA participation in RGGI.

PADEP/ICF RGGI modeling grossly overstates PJM electric demand; grossly overstates the PA electric generation without RGGI; grossly underestimates the "leakage" of electric generation to non-RGGI PJM states; consequently, grossly overstates the health benefits and the amount of tax revenue that will result from PA participation in RGGI.

RGGI is distinguishable from previous actual "cap and trade" programs.

RGGI is not a "cap and trade" program. The pollutants regulated under the other cap and trade programs are regulated to meet Clean Air Act (CAA) § 108 and §109 requirements to achieve and maintain ambient air quality standards. CO2 is not regulated under § 108 and §109. In fact, the CAA does not regulate CO2 from existing units, CO2 is only regulated for new or modified units. The cap and trade programs for § 108 and §109 regulated pollutants include control technologies, providing the opportunity for companies to choose the most economical units to control to meet the overall program requirements. ***Succinctly, those other cap and trade programs were intentionally designed to control costs. RGGI, on the other hand, is specifically designed to increase costs to the level that some generating units' operations will be reduced and ultimately (in some cases immediately) retired and in the process create considerable revenue to be spent by the Commonwealth for activities well beyond the fees necessary to support the air pollution control program authorized by this act and not covered by fees required by section 502(b) of the Clean Air Act.***

- RGGI does not have control options other than fuel switching, reduced operations or retirement. Consequently, RGGI maximizes the costs to the certain generators. *The only potential for trading would be the speculative purchase of RGGI allowances.*
- The reduced operations and retired generation from RGGI participation would be replaced by other non-RGGI generation – the "leakage" that has been the case in the historic RGGI areas.
- An endangerment finding by the PADEP does not mandate this action, it simply acts as the cloak under which the PADEP chooses to proceed with this action. Other cap and trade programs were specifically mandated under the Clean Air Act, in particular Acid Rain, or to meet the requirements of § 108 and § 109 of the Clean Air Act which relate to the National Ambient Air Quality Standards (NAAQS).

RGGI does not save nuclear power plants.

NY, CT and ISO-NE have been RGGI participants since the beginning, yet all have provided substantial economic support to nuclear plants. The owner of Beaver Valley was the recipient of considerable economic support from Ohio HB6 which may be repealed or replaced due to bribery committed to achieve implementation. If that were to occur, Beaver Valley's owner would likely request economic support regardless of Pennsylvania's participation in RGGI.

RGGI does not result in renewable electricity development.

Based upon *PADEP's "best case vision" for implementation of RGGI*, *if all RGGI proceeds were to be invested in renewable electricity generation, the amount of renewable electric generation would only increase from 10 million MWh to 26 million MWH, or from 5% of PA's total generation in 2022 to 12% in 2030* after the investment of all RGGI proceeds. Quite simply, RGGI has not and will not result in significant renewable electricity development.

It is incumbent upon the PADEP that a program with such far reaching economic, fiscal and electricity pricing and reliability impacts upon PA should be thoroughly reviewed and assessed using available analytic tools that allow an unbiased assessment before implementation. The failure to employ appropriate analytic tools informed by transparent, acceptable data serving as the basis of the regulation creates an inherent flaw which can only be remedied by additional extensive work by the PADEP. Further, no such action as significant and far reaching as Pennsylvania's participation in RGGI should be adopted without the full engagement of the Pennsylvania Legislature.

For these reasons, the Regulation should be returned by the EQB for revision and reconsideration.

If the Agency has any questions about these comments, please contact me at vbrisini@olympuspower.com or at 814-322-6247.

Respectfully submitted,

Vincent J. Brisini
Director of Environmental Affairs

cc: Sean P. Lane, Olympus Power, LLC Dennis T. O'Donnell, Olympus Power, LLC

ATTACHMENT 1

Air Quality

A Perspective

Small Business Compliance Advisory

Committee

July 22, 2020

Harrisburg, PA

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Air Quality

Air Quality
A Perspective

Small Business Compliance Advisory Committee

July 22, 2020

Harrisburg, PA

Tom Wolf, Governor

Patrick McDonnell, Secretary

Agenda

- Perception of our Air
- Historical Emissions Trends
- Ozone Design Values
- Fine Particulate Matter ($PM_{2.5}$) Design Values
  - Annual
  - Daily
- Sulfur Dioxide (SO_2) Design Values
- Challenges
- EPA's View
- The AQI
- Then and Now

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Corner of 5th and Liberty circa 1940

Corner of Liberty and Fifth Avenue (Archives Services Center, U. of Pittsburgh)

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Perception

Recent Headlines-

- U.S. air quality is getting worse. Here are the costs- Oct 23, 2019
- 20 Pa. counties, including several near Clairton Coke Works, on code orange air quality alert –FEB 4, 2019
- Six mid-state counties on code orange air quality alert - FEB 5,2019
- Snow-less in Boston. From deep freeze to “air quality” alert in Philly. What is with this winter?- FEB 3, 2019
- Group says air quality in Pennsylvania is getting worse –JULY 15, 2018
- Editorial: We need to know what's in our air- APRIL 14,2019

https://stateimpact.npr.org/pennsylvania/2019/02/04/20-pa-counties-including-several-near-clairton-coke-works-on-code-orange-air-quality-alert/
http://www.witf.org/news/2019/02/six-midstate-counties-on-code-orange-air-quality-alert.php
http://www.witf.org/news/2018/07/group-says-air-quality-in-pennsylvania-is-getting-worse.php
https://www.philly.com/news/philadelphia-snow-boston-raleigh-winter-new-york-blizzard-equinox-20190203.html
https://poststar.com/opinion/editorial/editorial-we-need-to-know-what-s-in-our-air/article_e7512fd9-799a-59d0-a55c-b492d5144aeb.html
https://www.pbs.org/newshour/nation/u-s-air-quality-is-getting-worse-here-are-the-costs

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Perception

- The 2017 American Lung Association report ranks Philadelphia #24 nationally for ozone pollution
- Pittsburgh and Lancaster are tied for #8, Philadelphia at #12, Harrisburg at #15 and Johnstown at #18 for long term fine particulate pollution
- Pittsburgh is ranked at #10, Lancaster at #13 and Harrisburg at #22 for short term fine particulate pollution

https://www.lung.org/our-initiatives/healthy-air/sota/city-rankings/most-polluted-cities.html

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Perception

American Lung Association

- 14 counties are graded as an F, eight get a D, six get a C, six get a B and only two get an A (Bradford and Franklin) for Ozone pollution

- Four counties get an F, one gets a D, three get a C, seven get a B and nine get an A short term fine particulate pollution

https://www.lung.org/our-initiatives/healthy-air/sota/city-rankings/states/pennsylvania/

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Perception

The Penn Environment Policy and Research Center issued a report in July of 2018 named Trouble in the Air -

"The Gettysburg area experienced 81 days of degraded air quality. York and Hanover experienced 128 bad air days. Harrisburg suffered 132 days of bad air,.. and finally in Lebanon and Lancaster there were over 170 bad air days. That's one out of every two days," she said.

https://pennenvironmentcenter.org/reports/pae/trouble-air
http://www.witf.org/news/2018/07/group-says-air-quality-in-pennsylvania-is-getting-worse.php

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Emissions Trends

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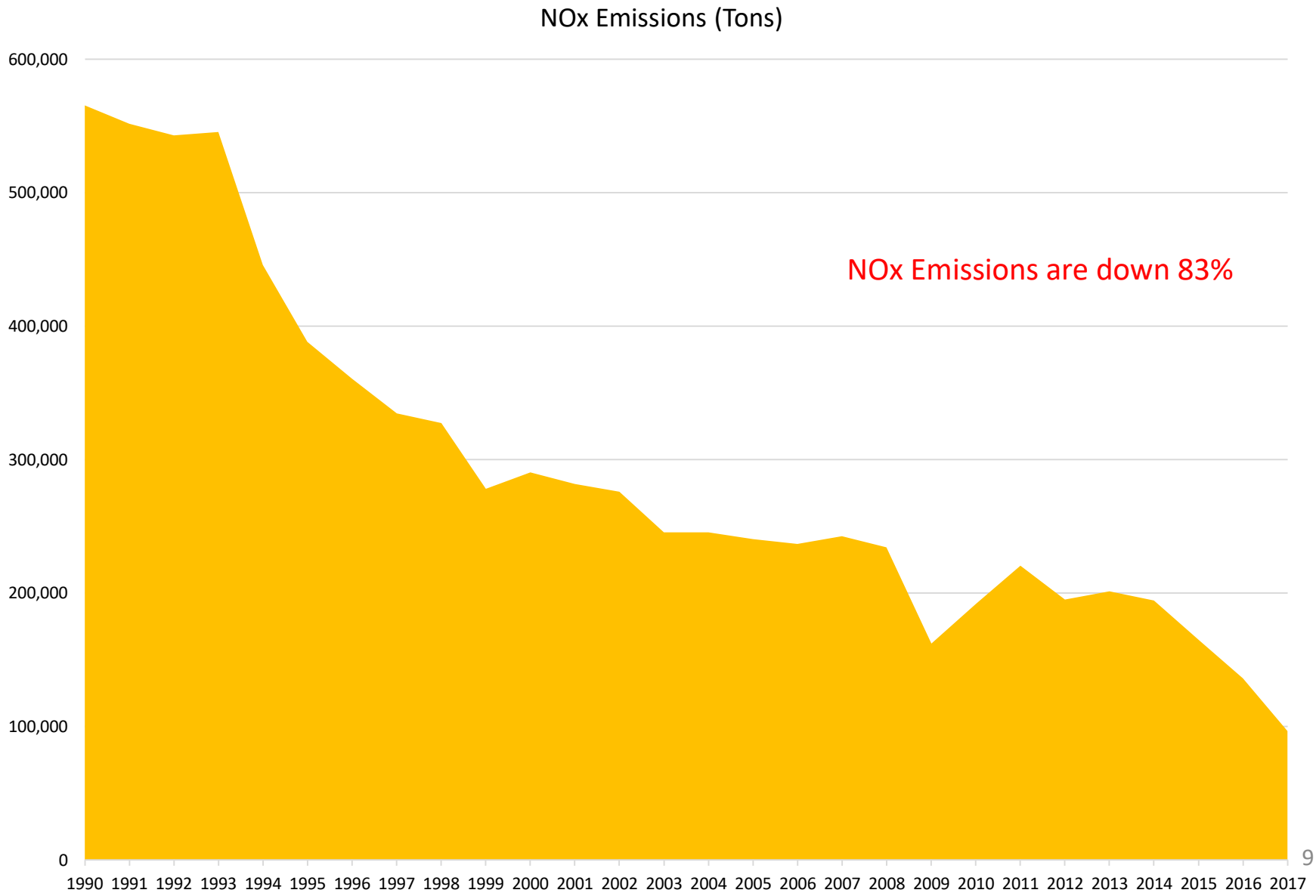
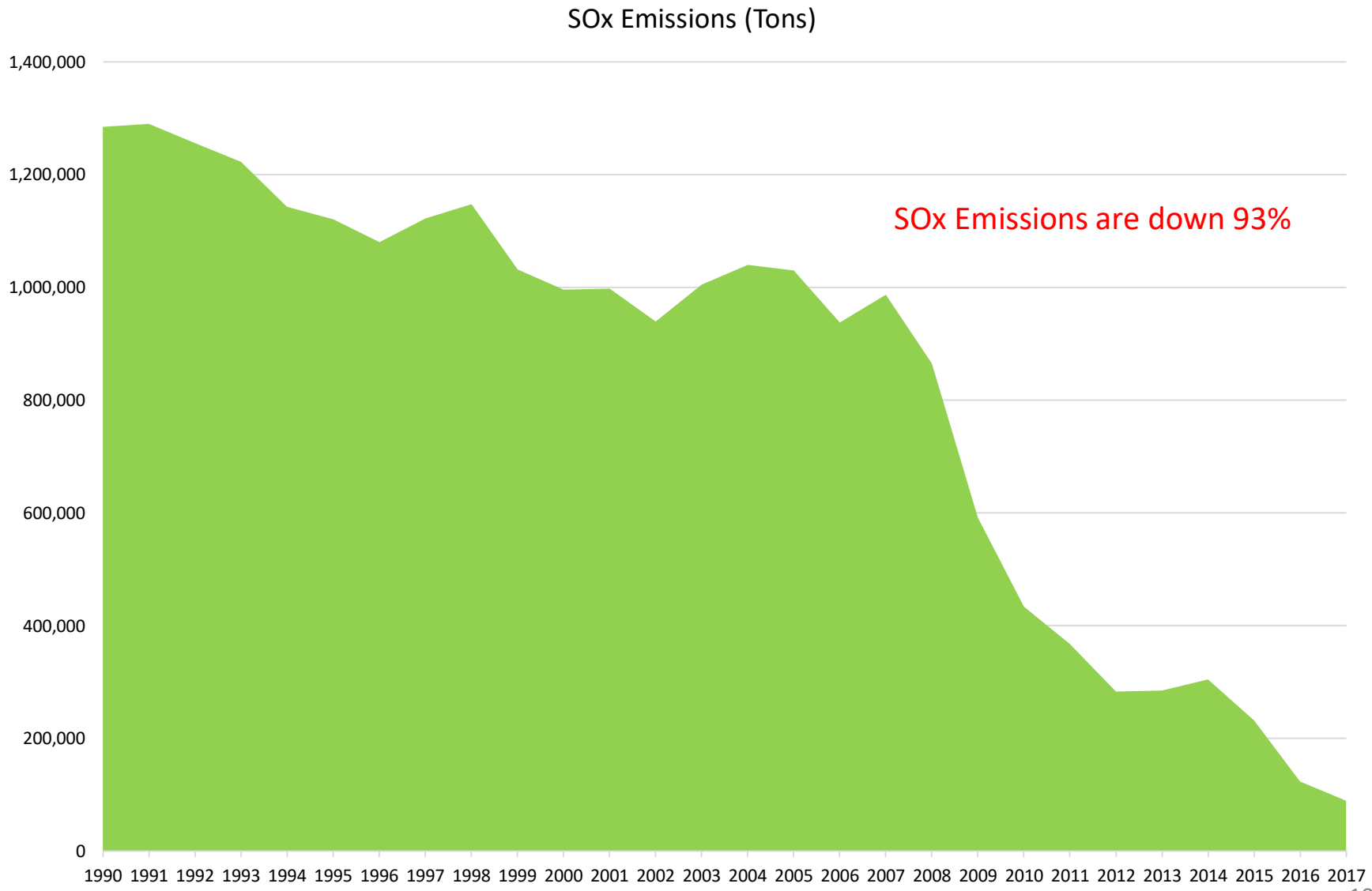
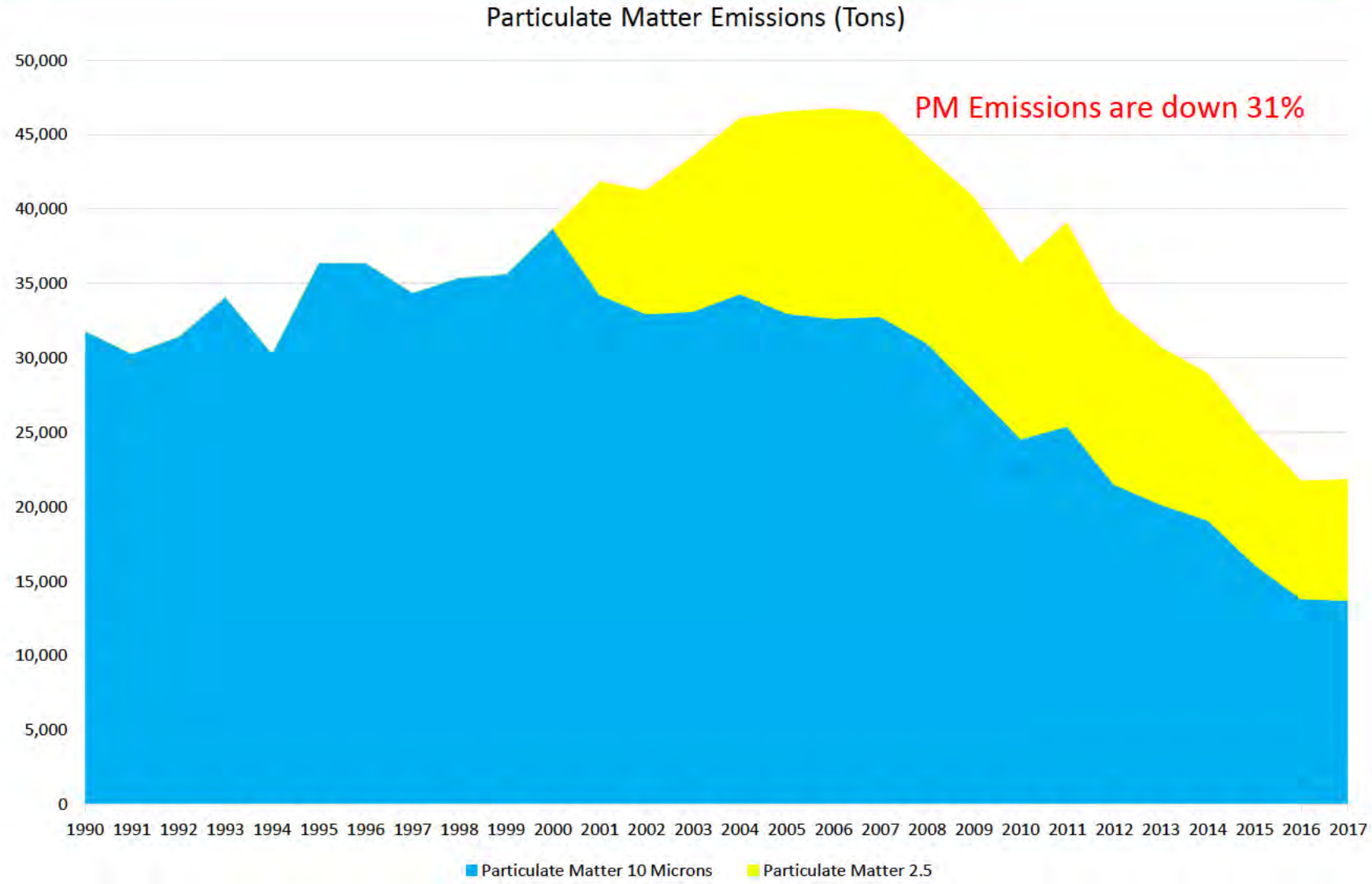
NOx Emissions (Tons)



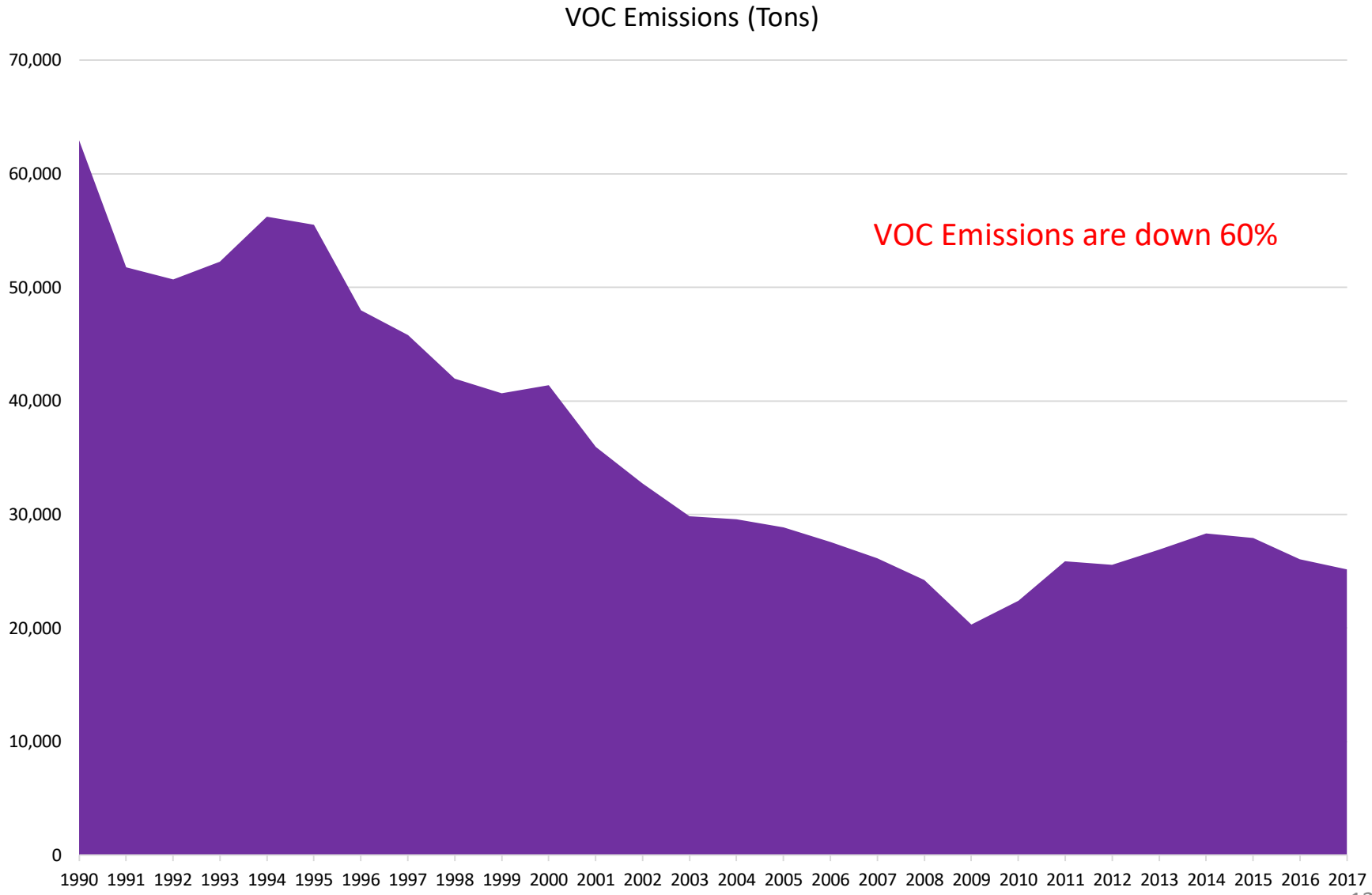
SOx Emissions (Tons)



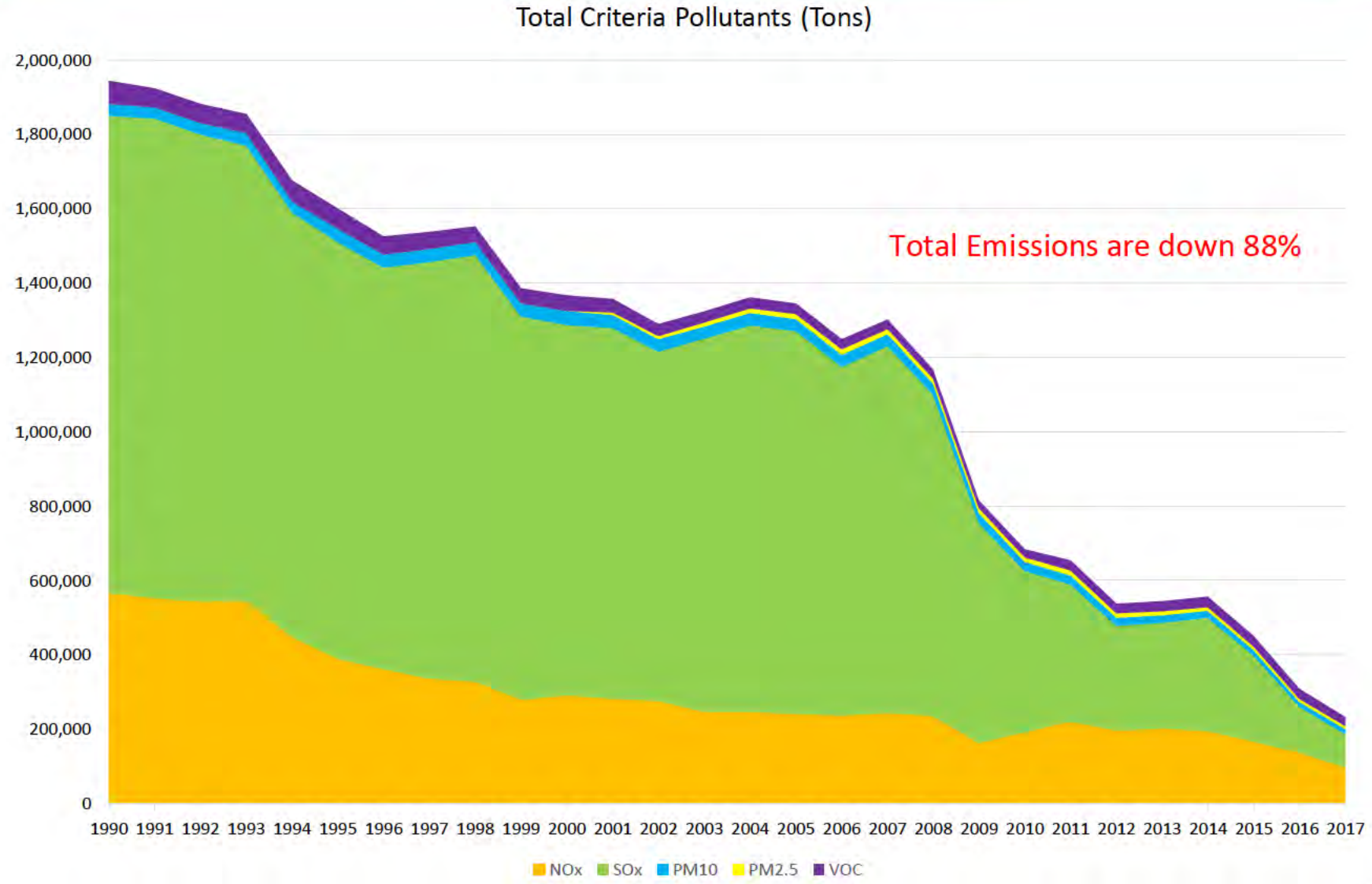
PM Emissions (Tons)



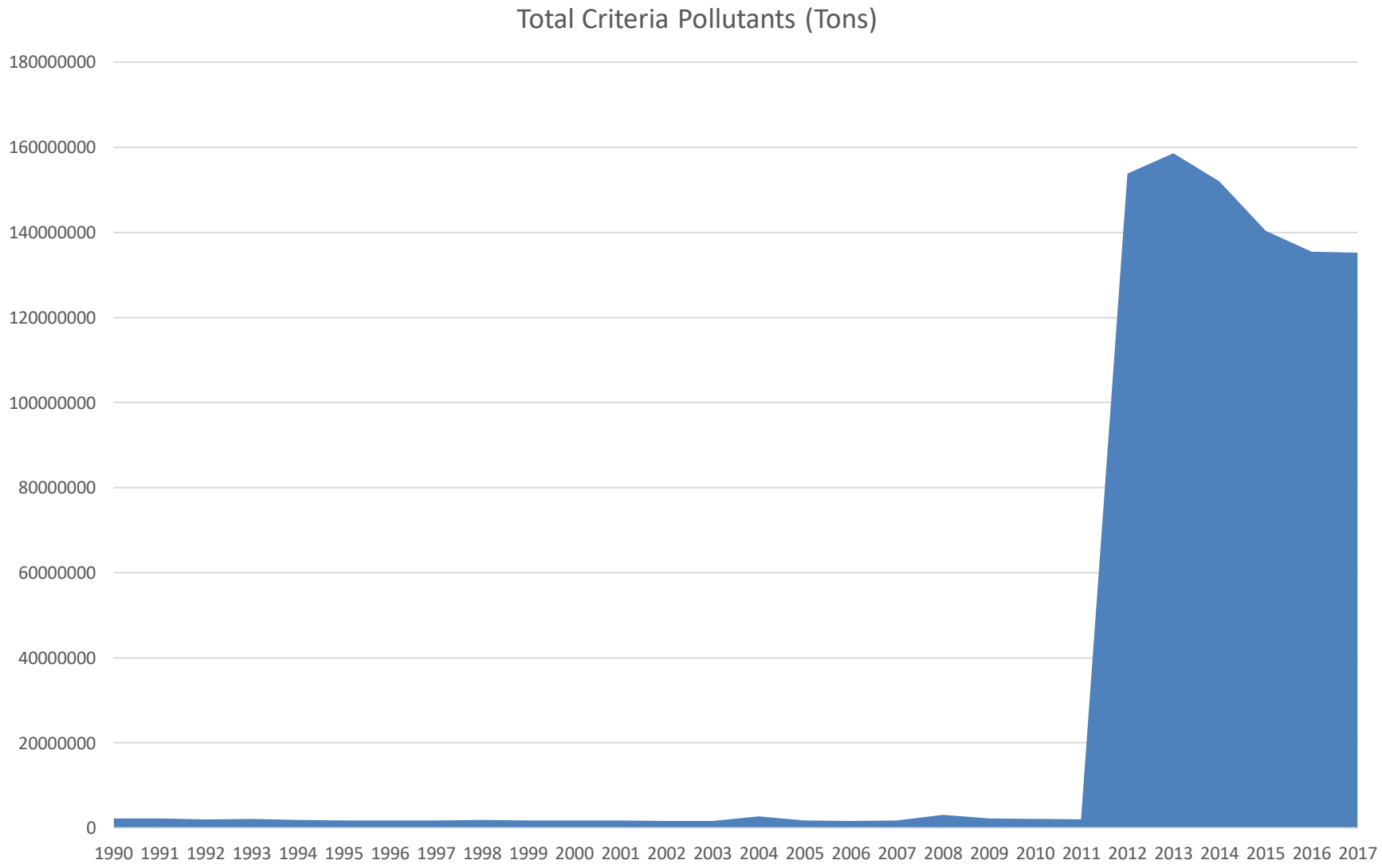
VOC Emissions (Tons)



Total Emissions (Tons)



Total Emissions (Tons)



Historical 8-hour Ozone Concentrations in PA

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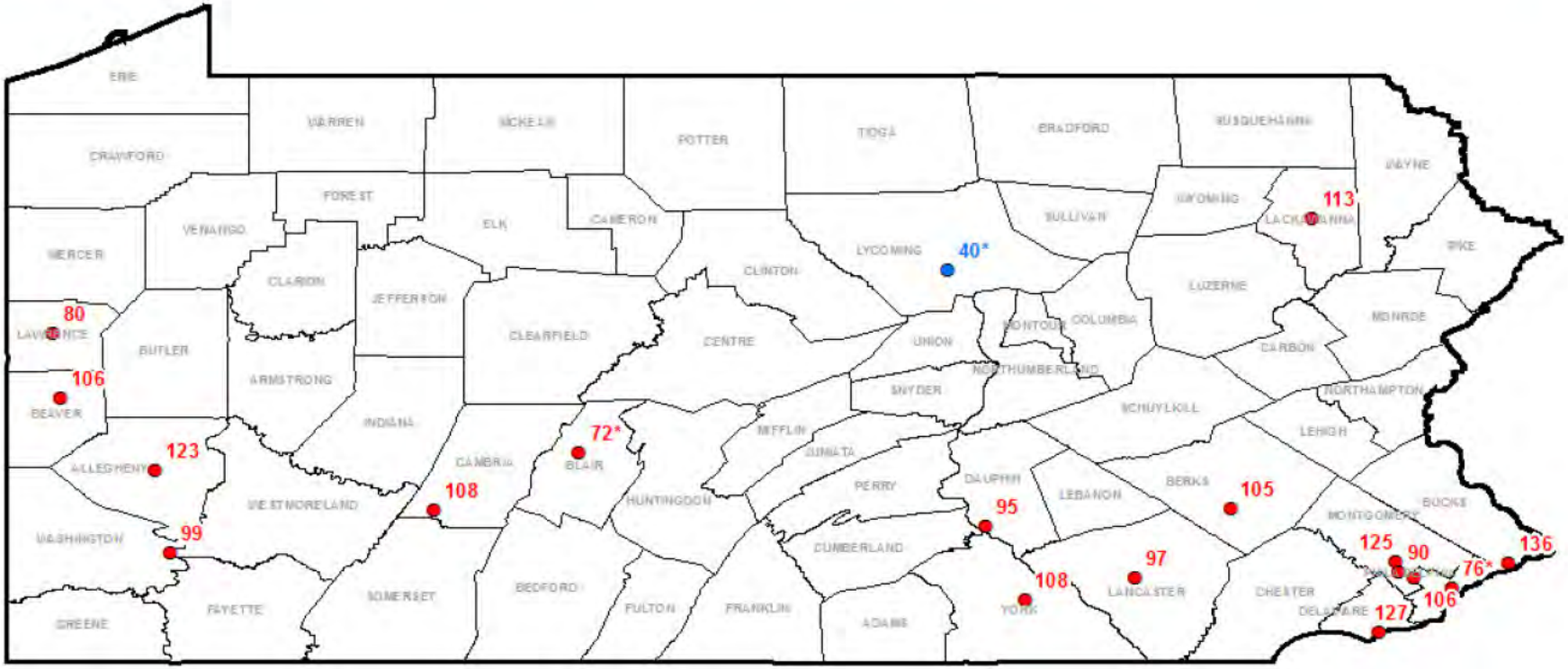
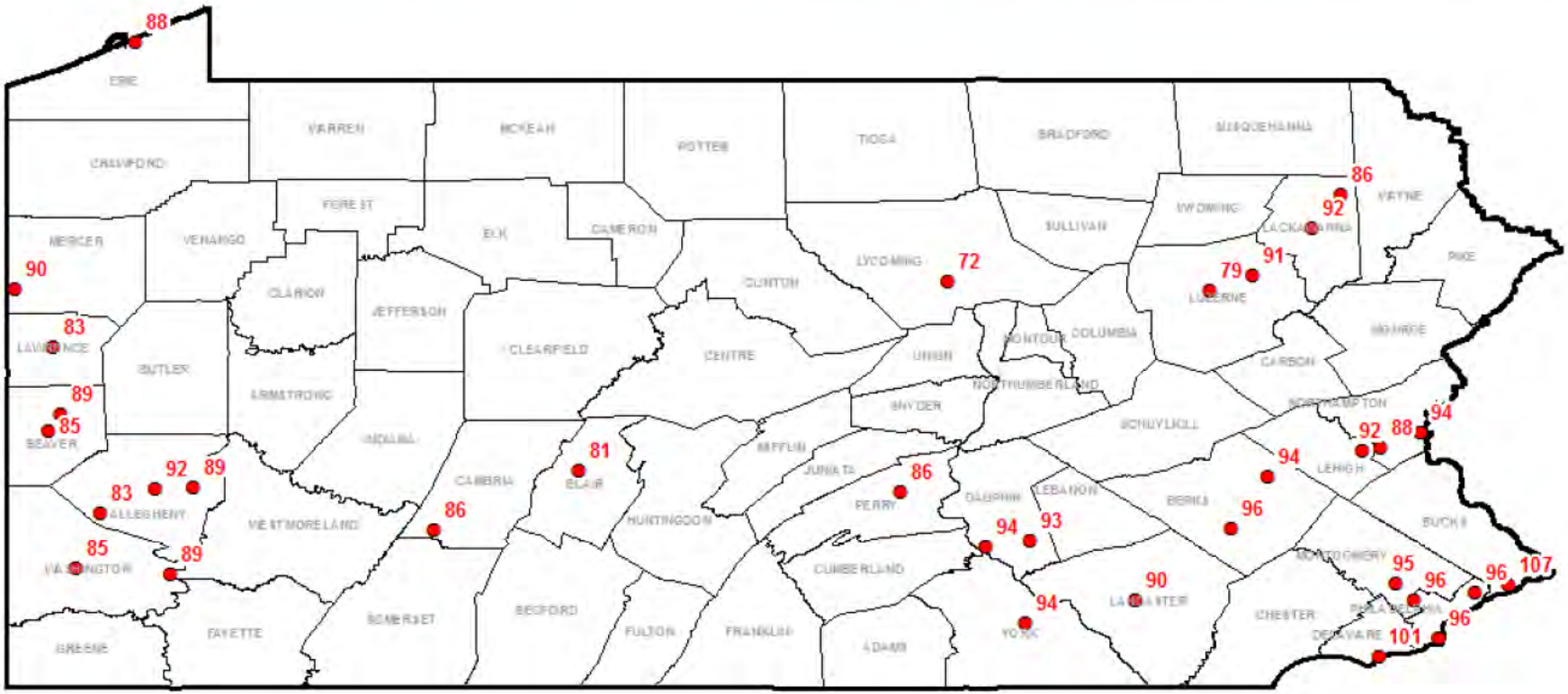
1980 8-Hour Ozone Design Values



Appearing in Red - 1980 8-Hour Ozone Design Value above 70 ppb (2015 Ozone Standard)

Appearing in Blue - 1980 8-Hour Ozone Design Value at or below 70 ppb (2015 Ozone Standard)

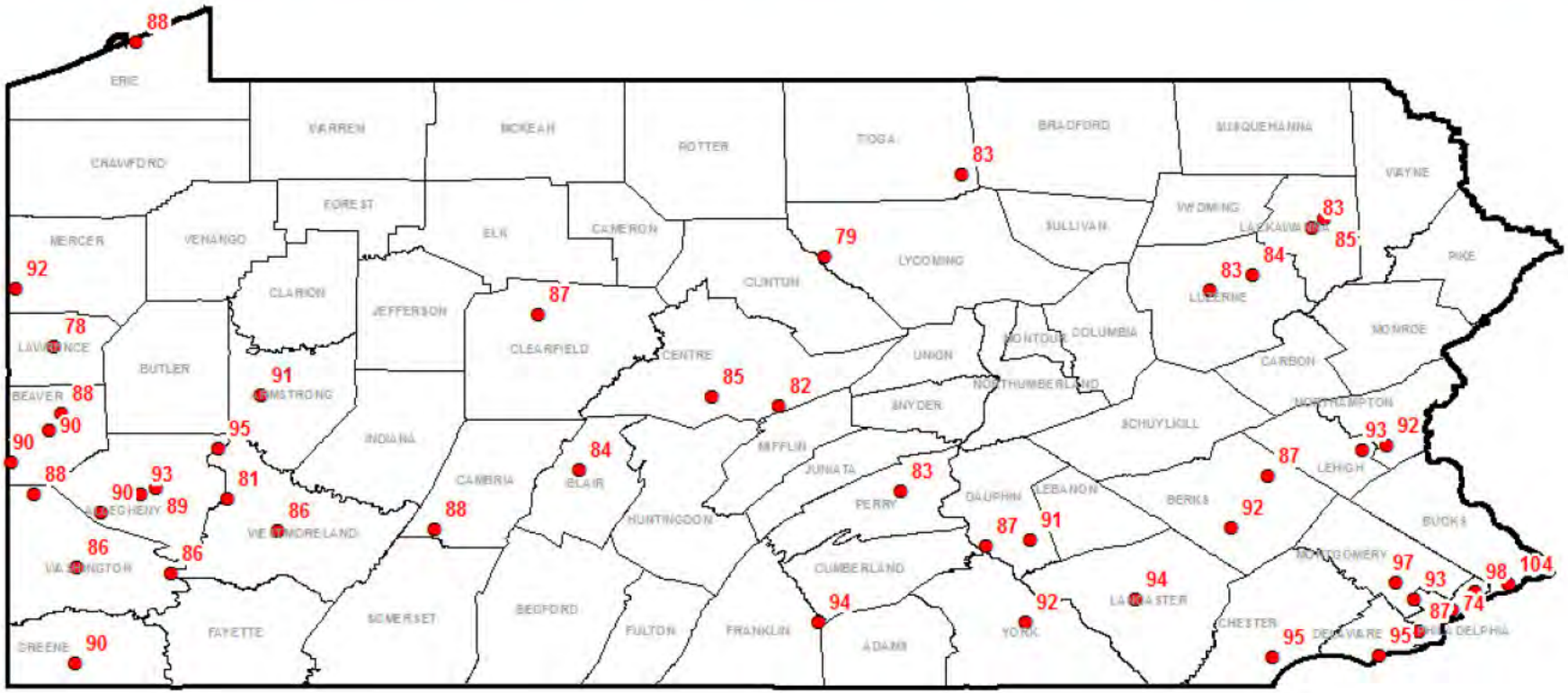
1991 8-Hour Ozone Design Values



Appearing in Red - 1991 8-Hour Ozone Design Value above 70 ppb (2015 Ozone Standard)

Appearing in Blue - 1991 8-Hour Ozone Design Value at or below 70 ppb (2015 Ozone Standard)

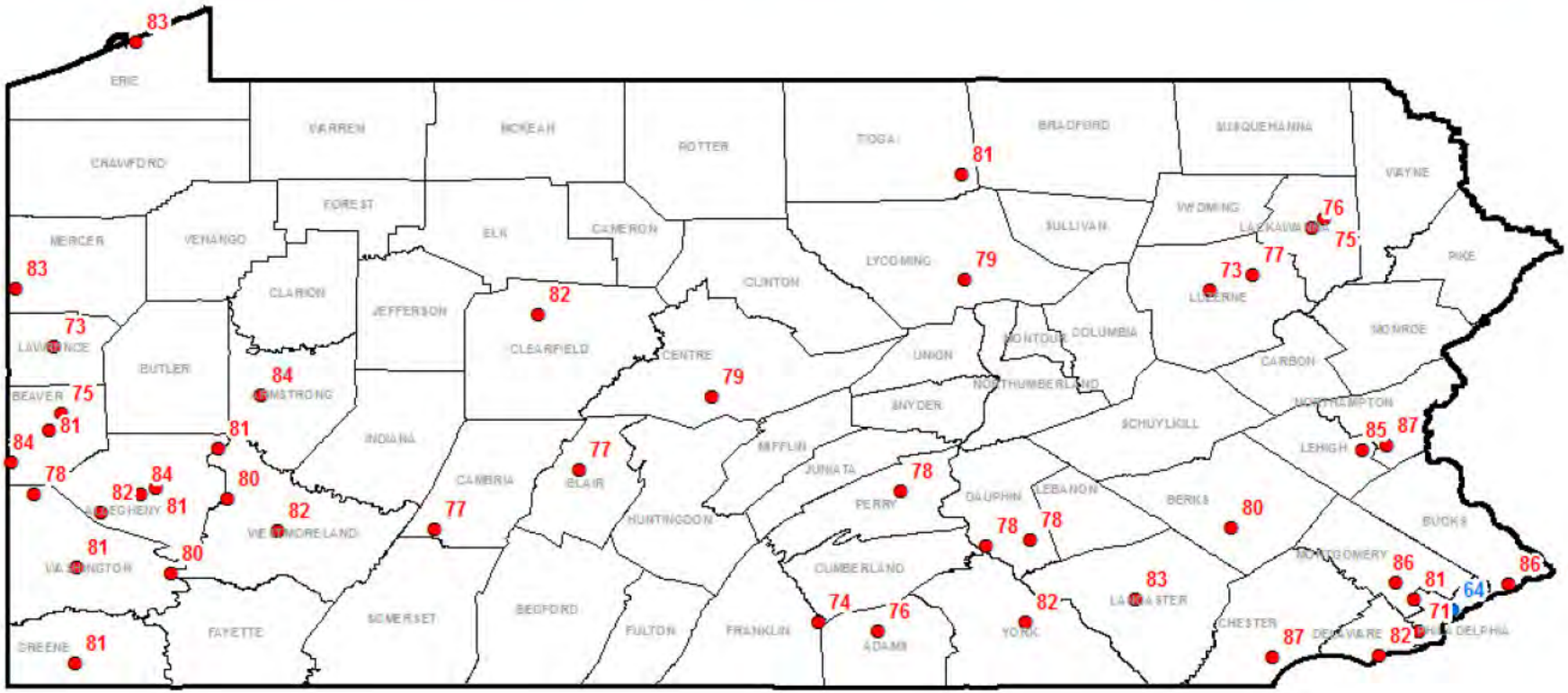
2002 8-Hour Ozone Design Values



Appearing in Red - 2002 8-Hour Ozone Design Value above 70 ppb (2015 Ozone Standard)

Appearing in Blue - 2002 8-Hour Ozone Design Value at or below 70 ppb (2015 Ozone Standard)

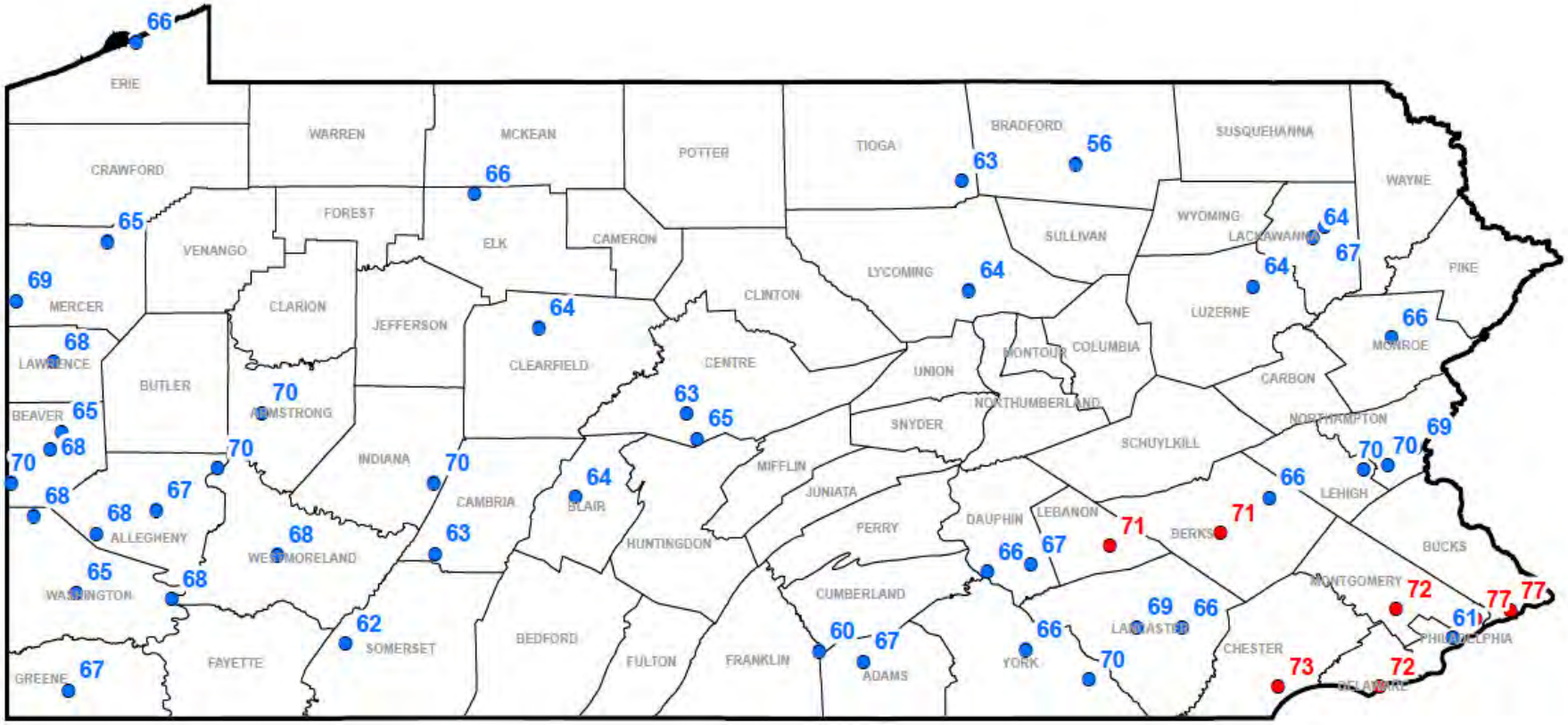
2005 8-Hour Ozone Design Values



Appearing in Red - 2005 8-Hour Ozone Design Value above 70 ppb (2015 Ozone Standard)

Appearing in Blue - 2005 8-Hour Ozone Design Value at or below 70 ppb (2015 Ozone Standard)

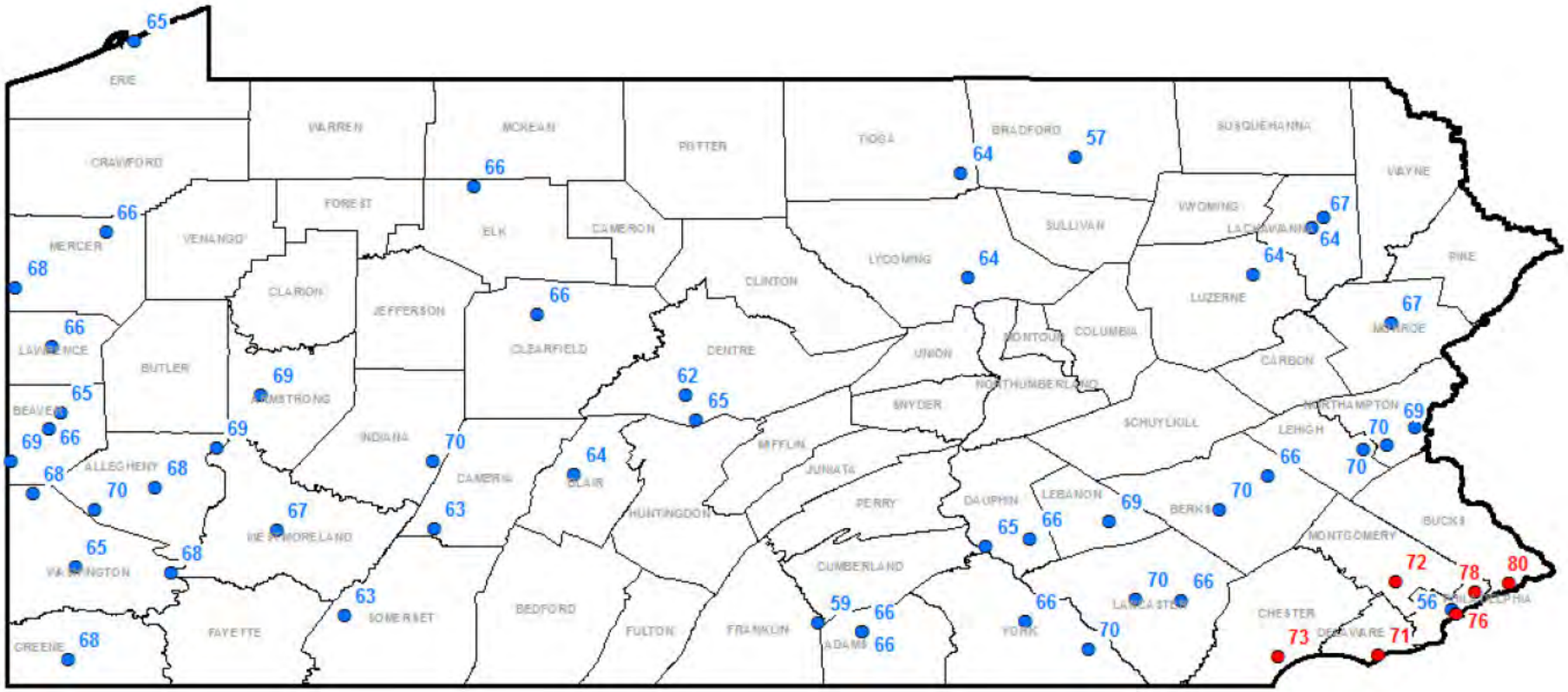
2016 8-Hour Ozone Design Values



Appearing in Red - 2016 8-Hour Ozone Design Value above 70 ppb (2015 Ozone Standard)

Appearing in Blue - 2016 8-Hour Ozone Design Value at or below 70 ppb (2015 Ozone Standard)

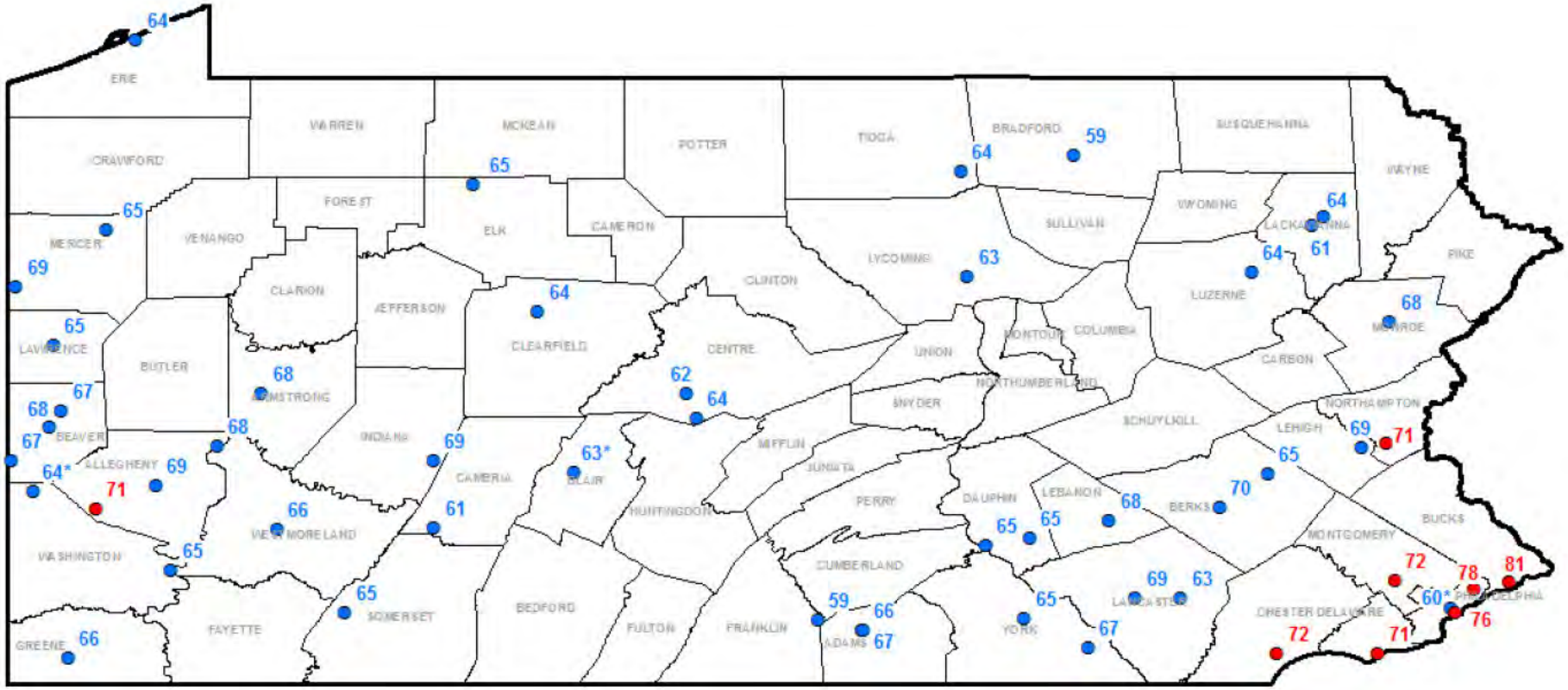
2017 8-Hour Ozone Design Values



Appearing in Red - 2017 8-Hour Ozone Design Value above 70 ppb (2015 Ozone Standard)

Appearing in Blue - 2017 8-Hour Ozone Design Value at or below 70 ppb (2015 Ozone Standard)

2018 8-Hour Ozone Design Values

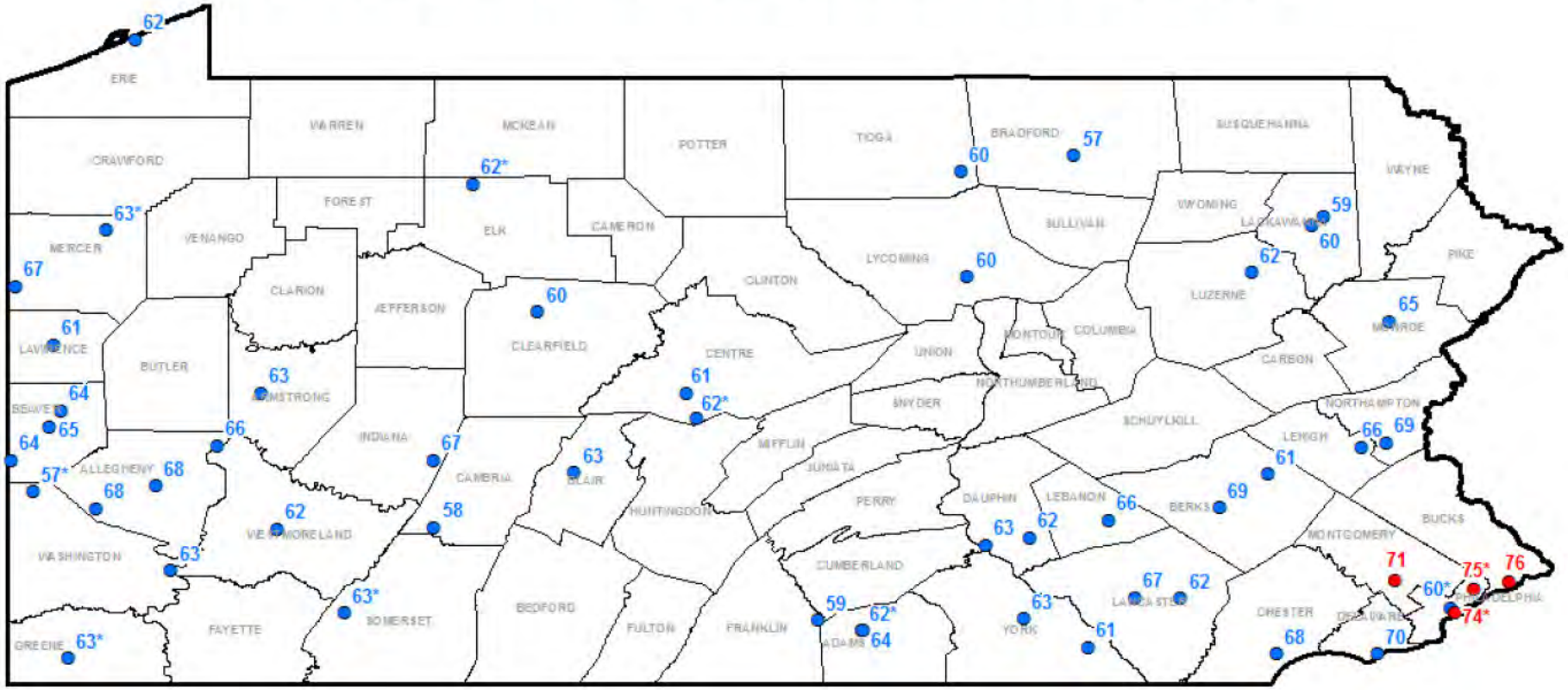


Appearing in Red - 2018 8-Hour Ozone Design Value above 70 ppb (2015 Ozone Standard)

Appearing in Blue - 2018 8-Hour Ozone Design Value at or below 70 ppb (2015 Ozone Standard)

2019 8-Hour Ozone Design Values

As of October 22, 2019 - 2019 Ozone Data Has Not Been Fully QA/QC'd



Appearing in Red - Projected 2019 8-Hour Ozone Design Value above 70 ppb (2015 Ozone Standard)

Appearing in Blue - Projected 2019 8-Hour Ozone Design Value at or below 70 ppb (2015 Ozone Standard)

Historical Annual $PM_{2.5}$ Concentrations in PA

pennsylvania
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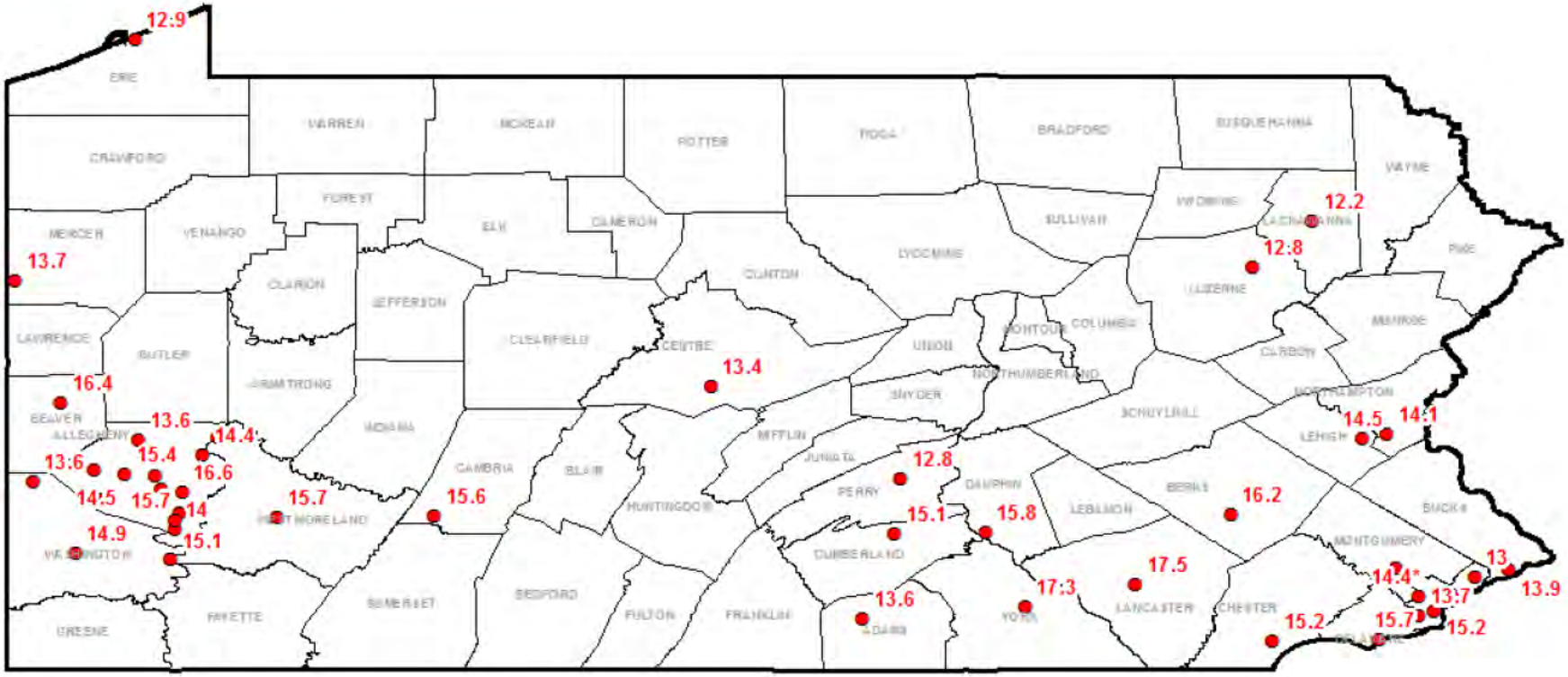
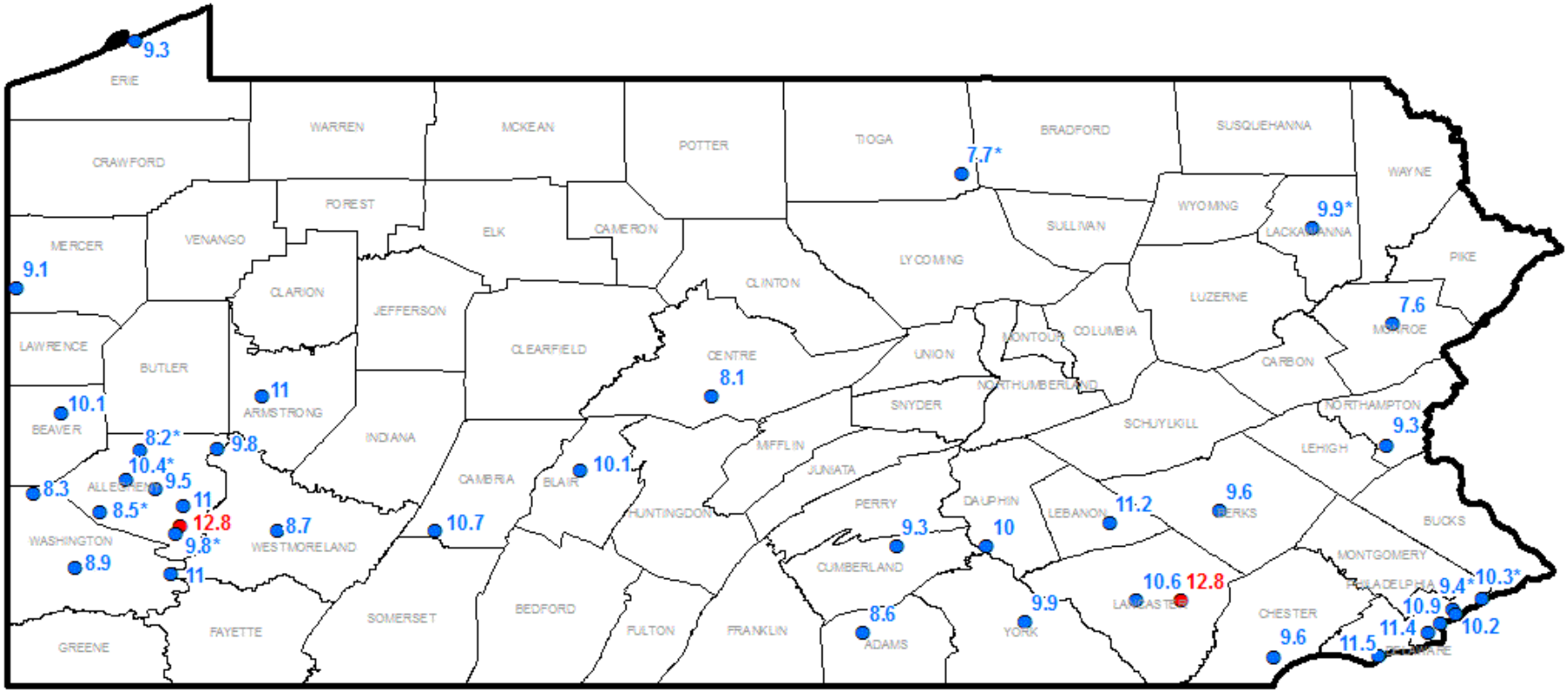
2005 Annual $PM_{2.5}$ Design Values



Appearing in Red - 2005 Annual PM2.5 Design Value above 12.0 ug/m3 (2012 PM2.5 Standard)

Appearing in Blue - 2005 24-Hour PM2.5 Design Value at or below 12.0 ug/m3 (2012 PM2.5 Standard)

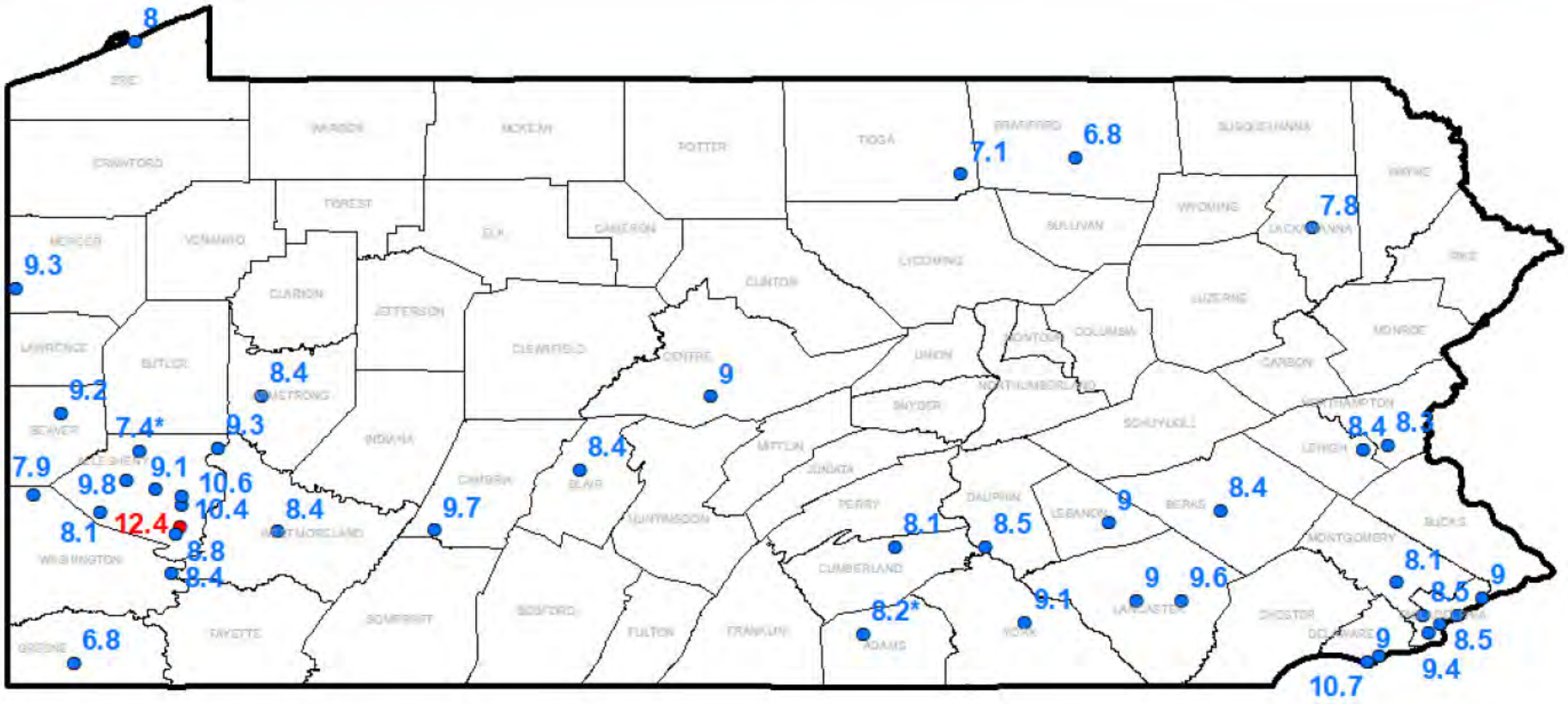
2016 Annual $PM_{2.5}$ Design Values



Appearing in Red - 2016 Annual $PM_{2.5}$ Design Values Above the Standard of 12.0 ug/m^3

Appearing in Blue - 2016 Annual $PM_{2.5}$ Design Values Below the Standard of 12.0 ug/m^3

2019 Annual $PM_{2.5}$ Design Values



Appearing in Red - 2019 Annual $PM_{2.5}$ Design Values Above the Standard of 12.0 ug/m^3

Appearing in Blue - 2019 Annual $PM_{2.5}$ Design Values Below the Standard of 12.0 ug/m^3

Historical 24-hour $PM_{2.5}$ Concentrations in PA

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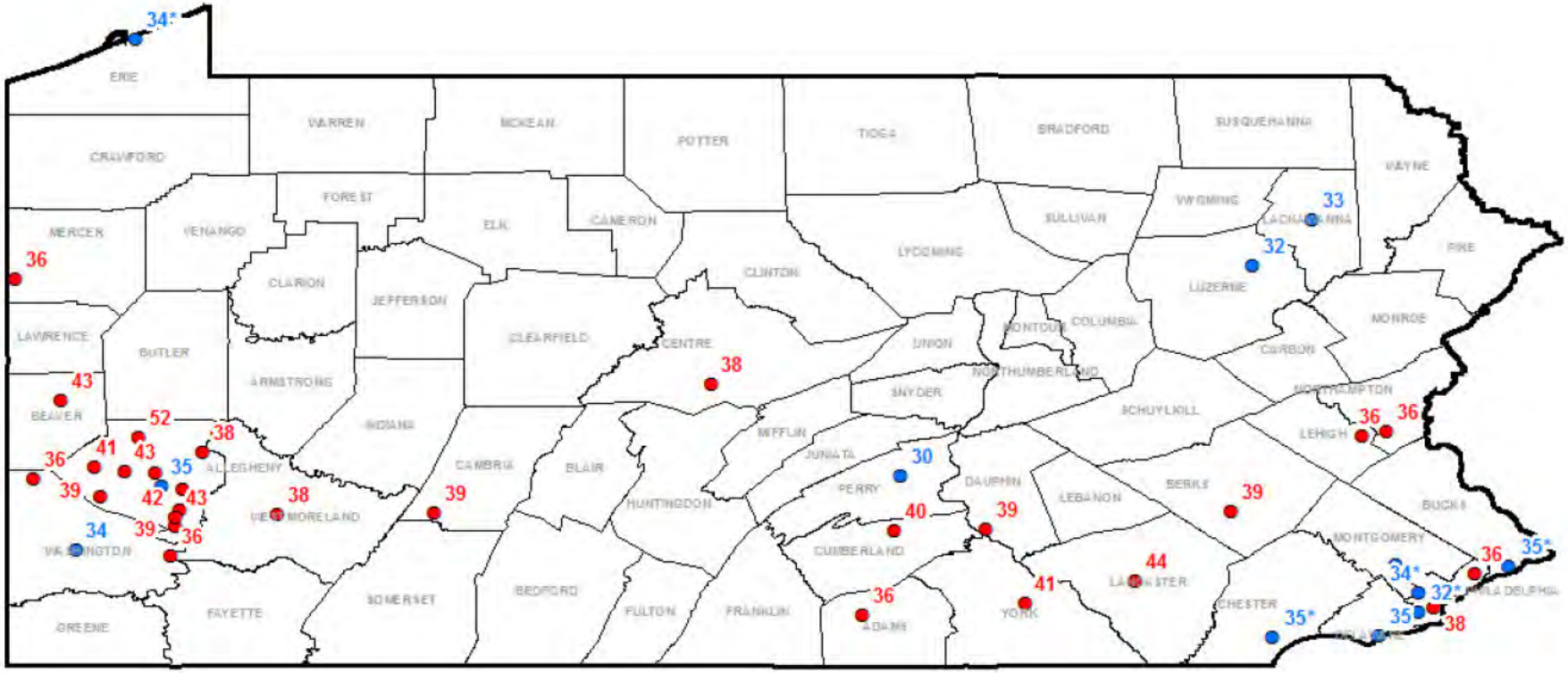
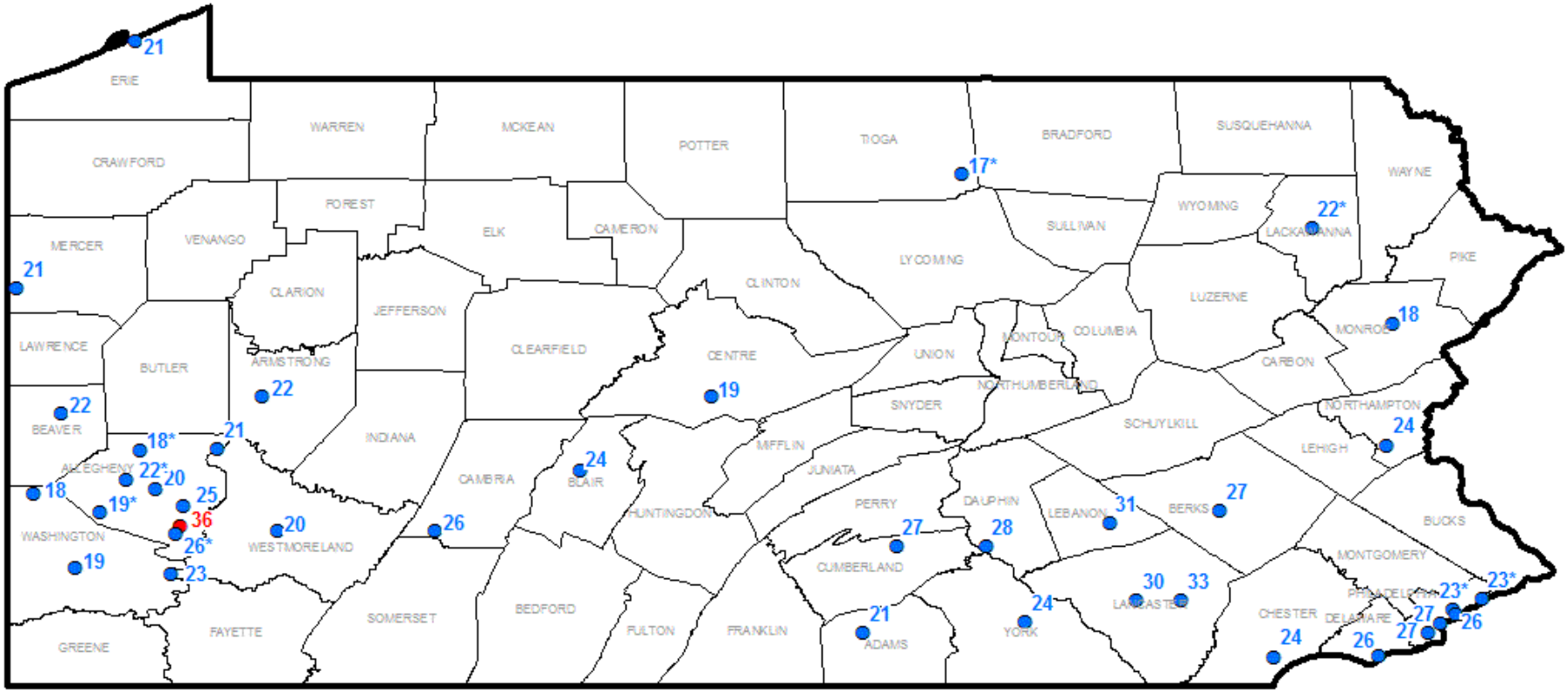
2005 24-hour $PM_{2.5}$ Design Values



Appearing in Red - 2005 24-Hour PM2.5 Design Value above 35 ug/m3 (2006 PM2.5 Standard)

Appearing in Blue - 2005 24-Hour PM2.5 Design Value at or below 35 ug/m3 (2006 PM2.5 Standard)

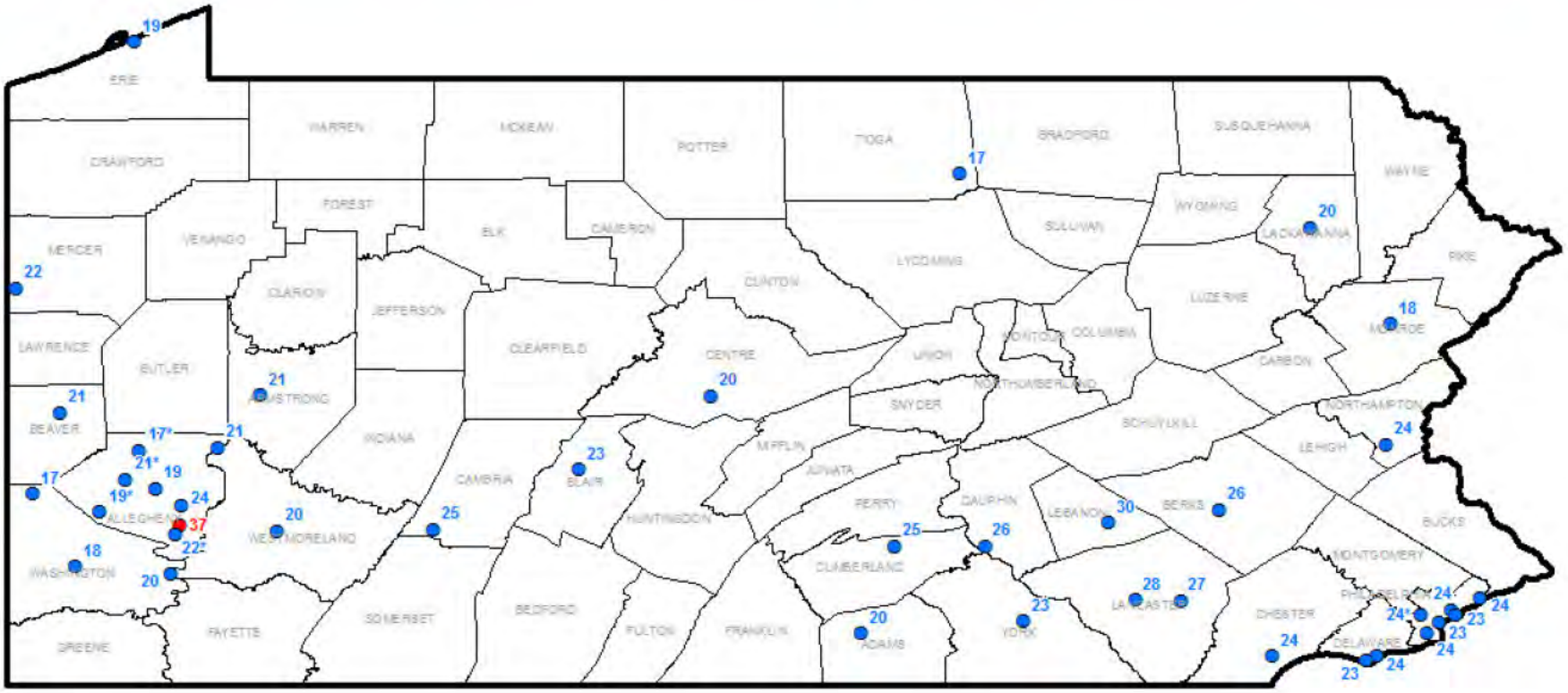
2016 24-hour $PM_{2.5}$ Design Values



Appearing in Red - 2016 24-hour $PM_{2.5}$ Design Values Above the Standard of 35 ug/m^3

Appearing in Blue - 2016 24-hour $PM_{2.5}$ Design Values Below the Standard of 35 ug/m^3

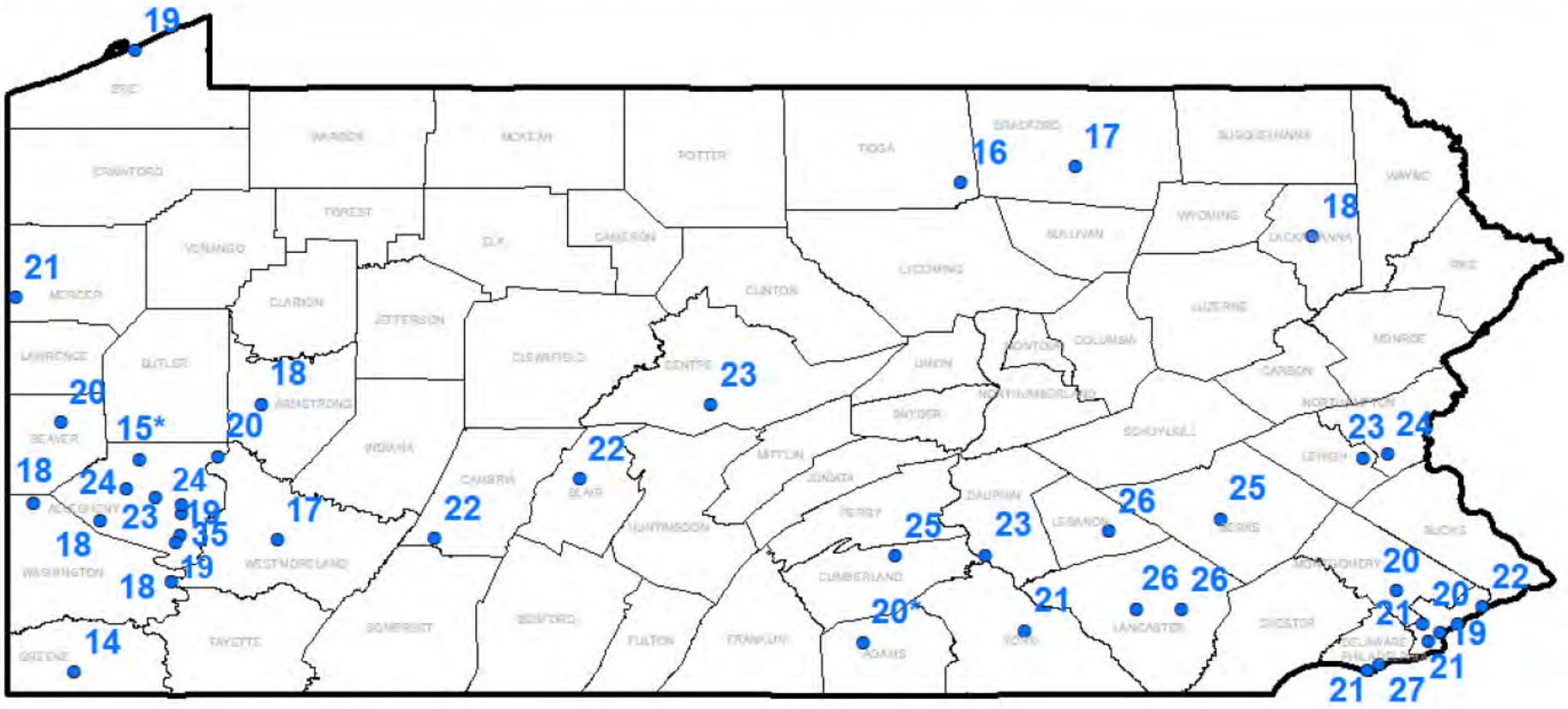
2017 24-hour $PM_{2.5}$ Design Values



Appearing in Red - 2017 24-hour $PM_{2.5}$ Design Values Above the Standard of 35 ug/m^3

Appearing in Blue - 2017 24-hour $PM_{2.5}$ Design Values Below the Standard of 35 ug/m^3

2018 24-hour $PM_{2.5}$ Design Values



Appearing in Red - 2019 24-hour $PM_{2.5}$ Design Values Above the Standard of 35 ug/m^3

Appearing in Blue - 2019 24-hour $PM_{2.5}$ Design Values Below the Standard of 35 ug/m^3

Historical 1-hour SO_2 Concentrations in PA

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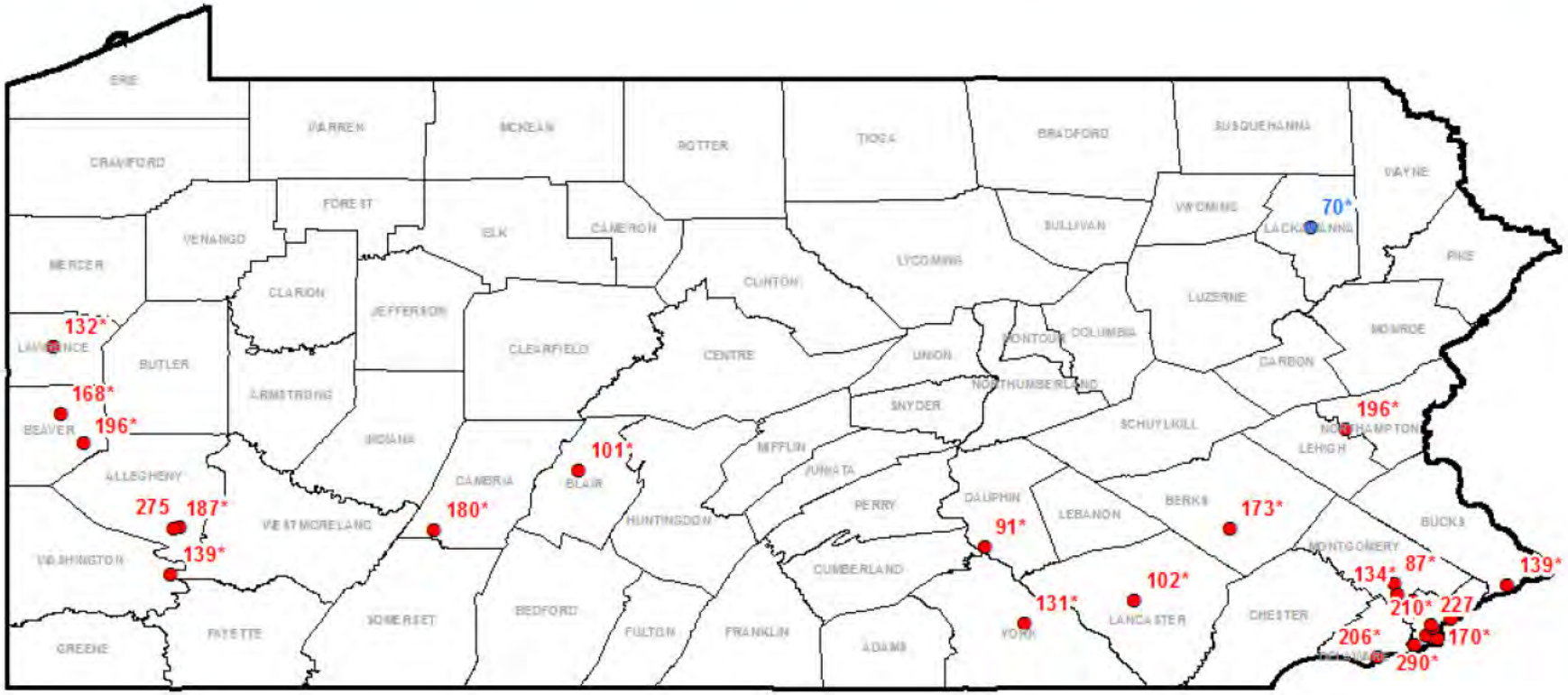
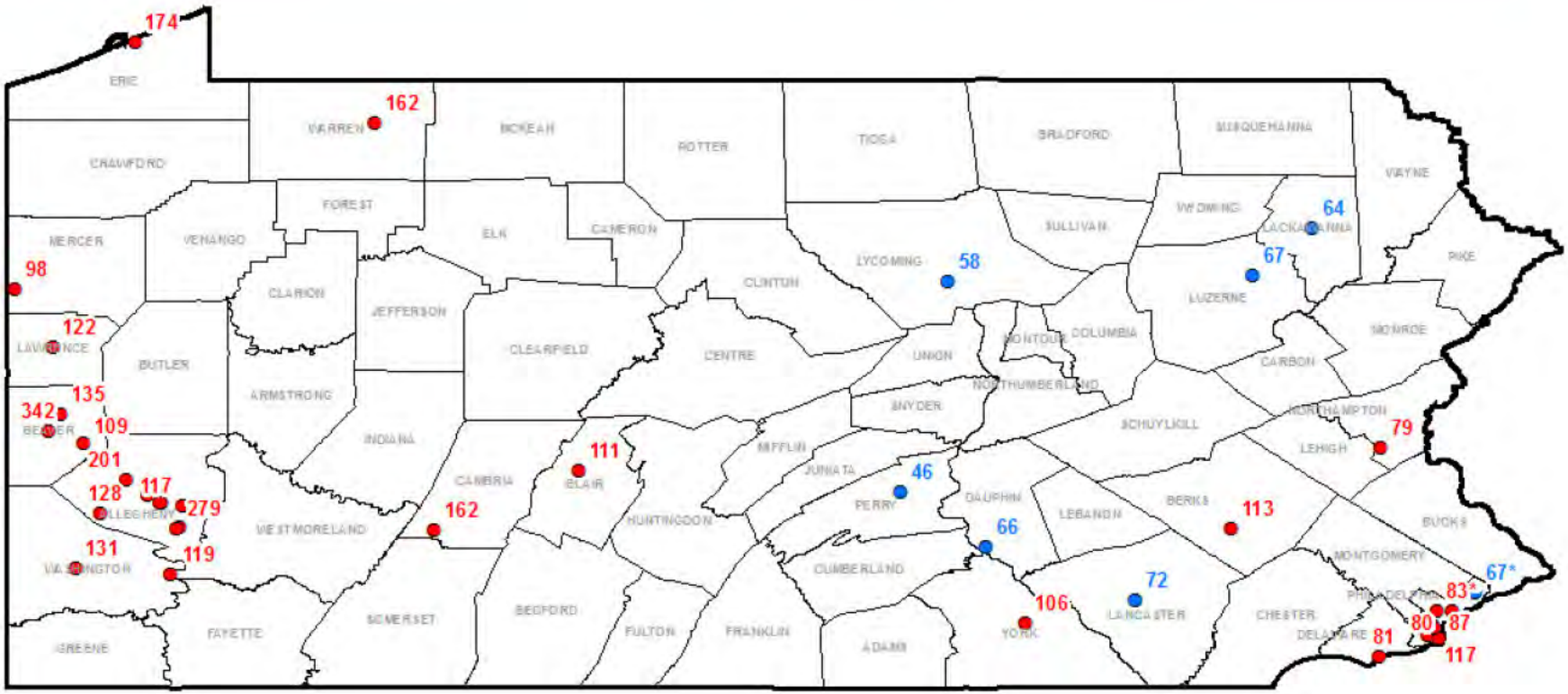
1980 1-hour SO_2 Design Values



Appearing in Red - 1980 1-Hour SO2 Design Value above 75 ppb (2010 SO2 Standard)

Appearing in Blue - 1980 1-Hour SO2 Design Value at or below 75 ppb (2015 SO2 Standard)

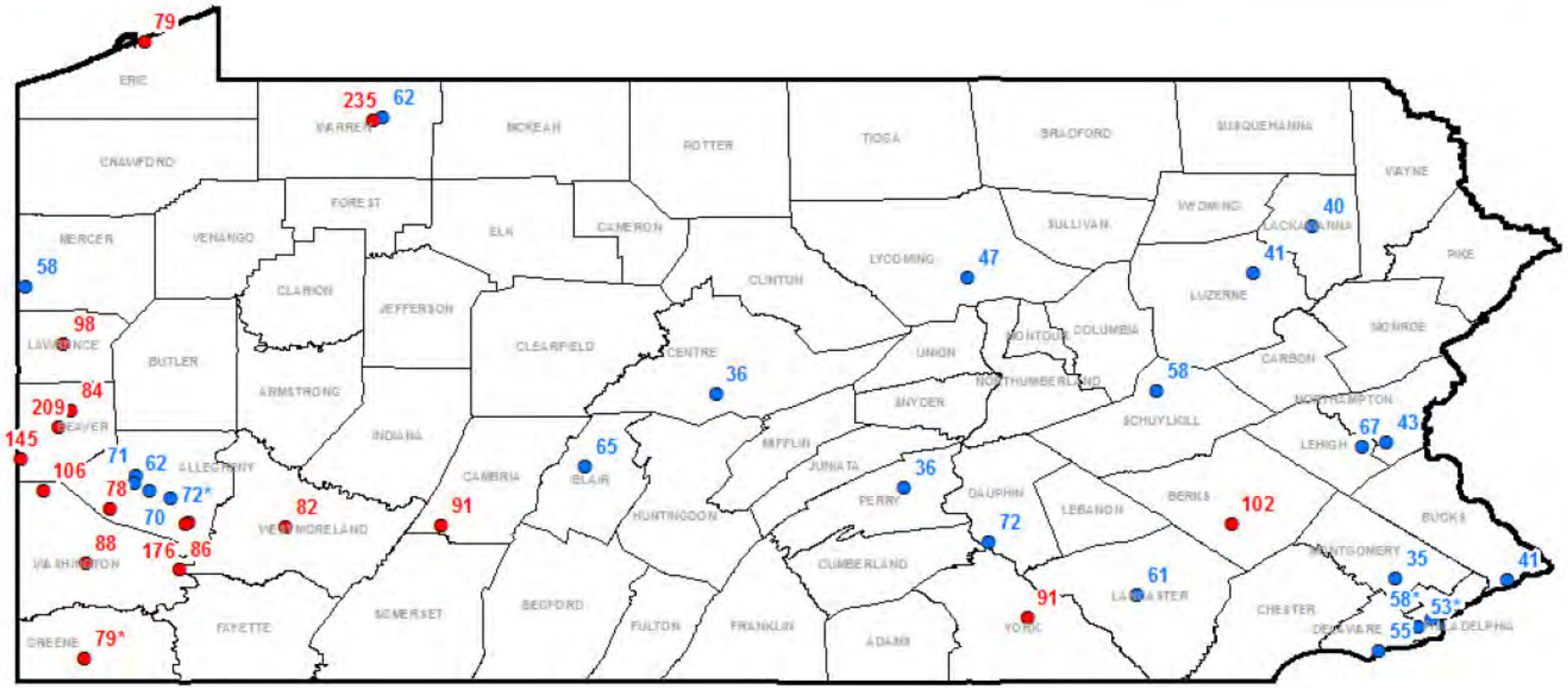
1991 1-hour SO_2 Design Values



Appearing in Red - 1991 1-Hour SO2 Design Value above 75 ppb (2010 SO2 Standard)

Appearing in Blue - 1991 1-Hour SO2 Design Value at or below 75 ppb (2015 SO2 Standard)

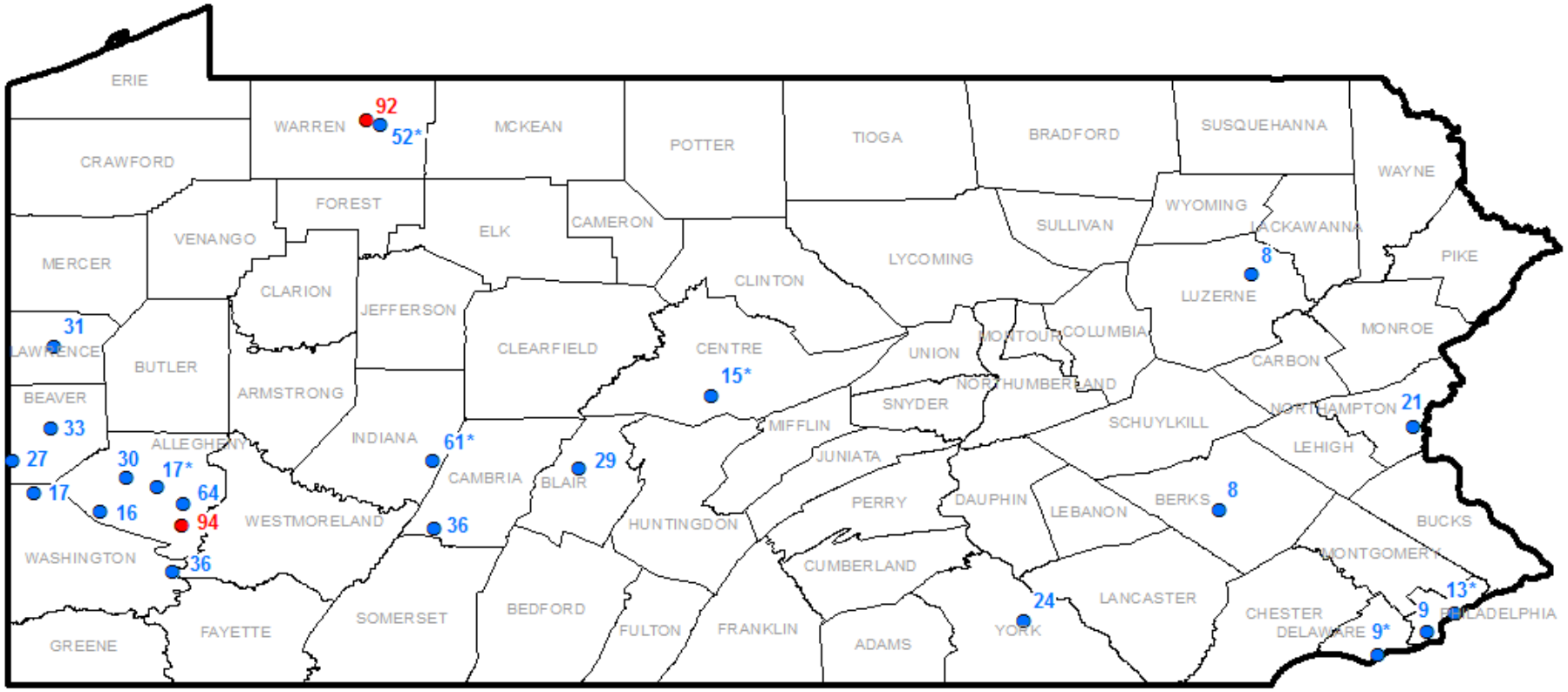
2005 1-hour SO_2 Design Values



Appearing in Red - 2005 1-Hour SO2 Design Value above 75 ppb (2010 SO2 Standard)

Appearing in Blue - 2005 1-Hour SO2 Design Value at or below 75 ppb (2015 SO2 Standard)

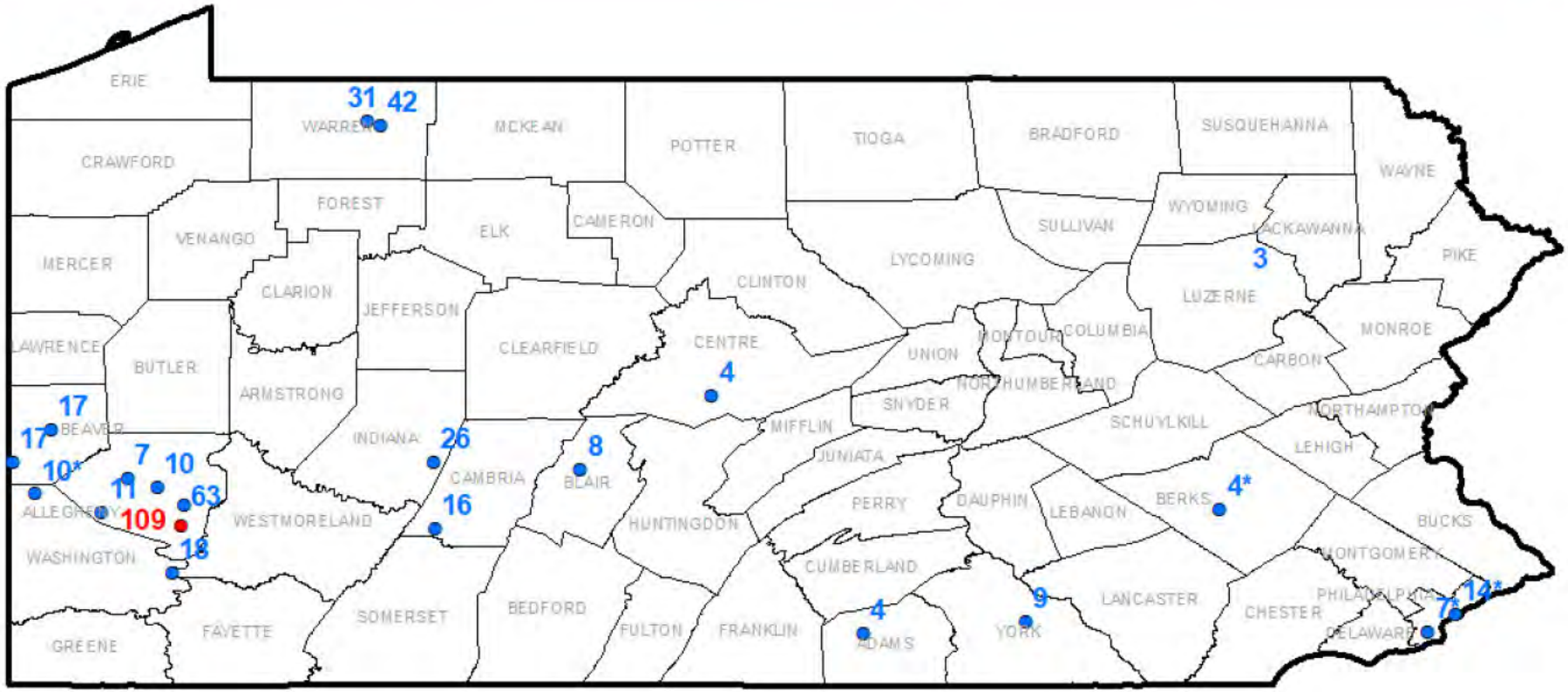
2016 1-hour SO_2 Design Values



Appearing in Red - 2016 1-Hour SO_2 Design Value above 75 ppb (2010 SO_2 Standard)

Appearing in Blue - 2016 1-Hour SO_2 Design Value at or below 75 ppb (2010 SO_2 Standard)

2019 1-hour SO_2 Design Values



Appearing in Red - 2019 1-Hour SO_2 Design Value above 75 ppb (2010 SO_2 Standard)

Appearing in Blue - 2019 1-Hour SO_2 Design Value at or below 75 ppb (2010 SO_2 Standard)

Asterick (*) Appearing Behind the 2019 1-Hour SO_2 Design Value Means the Data is Incomplete During 3-Year Period

Challenges

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Of course we still have challenges

- Staffing and funding are always a challenge.
- We have an ozone issue in Philadelphia that will not be easy to solve.
- There are facilities statewide that we spend quite a bit of time on from coke batteries to zinc smelters.
- We have picked the most of the low hanging fruit so future improvements will require a lot more effort.
  - Cars are cleaner.
  - Major facilities have emissions controls.
  - We have taken lead out of gasoline.
- Asthma rates have climbed from 3.1% in 1980 to 10.1% in 2015.
- Approximately 90% of adults from western countries spend almost 22 hours a day INDOORS where air pollution can be many times worse than outdoor air.
- Children spend half the time their parents did playing outside.
- Medical research indicates possible health effects at levels below the current NAAQS.

https://www.cdc.gov/asthma/most_recent_data_states.htm
https://www.usatoday.com/story/sponsor-story/velux/2018/05/15/indoor-generation-and-health-risks-spending-more-time-inside/610289002/
https://www.theguardian.com/environment/2016/jul/27/children-spend-only-half-the-time-playing-outside-as-their-parents-did

EPA's View

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EPA's View

Our Nation's Air

Air Quality Improves as America Grows

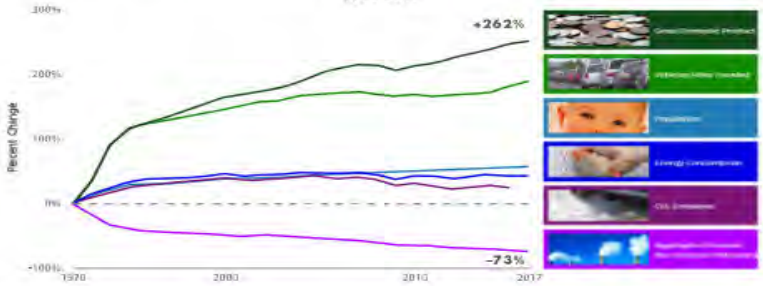
Status and Trends Through 2018

https://gispub.epa.gov/air/trendsreport/2018

Economic Growth with Clean Air

Between 1970 and 2017, the combined emissions of the six common pollutants ($PM_{2.5}$ and PM_{10}, SO_2, NO_x, VOCs, CO and Pb) dropped by 73 percent. This progress occurred while the U.S. economy continued to grow, Americans drove more miles and population and energy use increased.

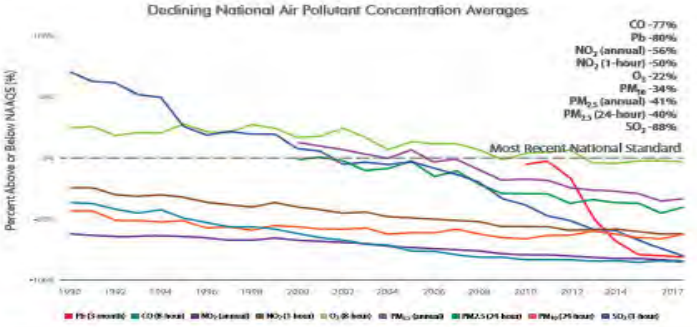
Comparison of Growth Areas and Declining Emissions
1970-2017



Air Quality Trends Show Clean Air Progress

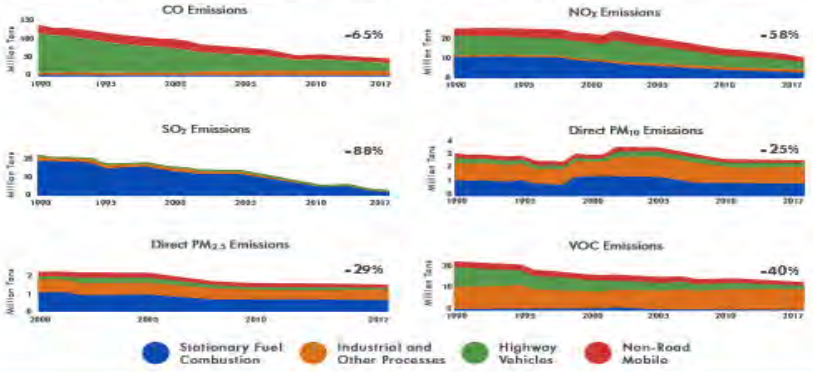
While some pollutants continue to pose serious air quality problems in areas of the U.S., nationally, criteria air pollutant concentrations have dropped significantly since 1990 improving quality of life for many Americans. Air quality improves as America grows.

Declining National Air Pollutant Concentration Averages



Air Pollutant Emissions Decreasing

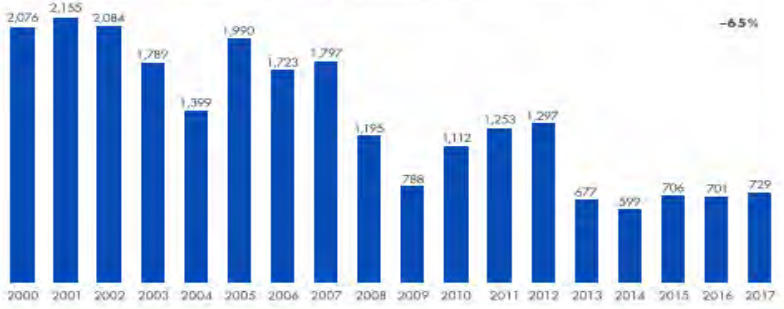
Emissions of key air pollutants continue to decline from 1990 levels. These reductions are driven by federal and state implementation of stationary and mobile source regulations.



Unhealthy Air Quality Days Trending Down

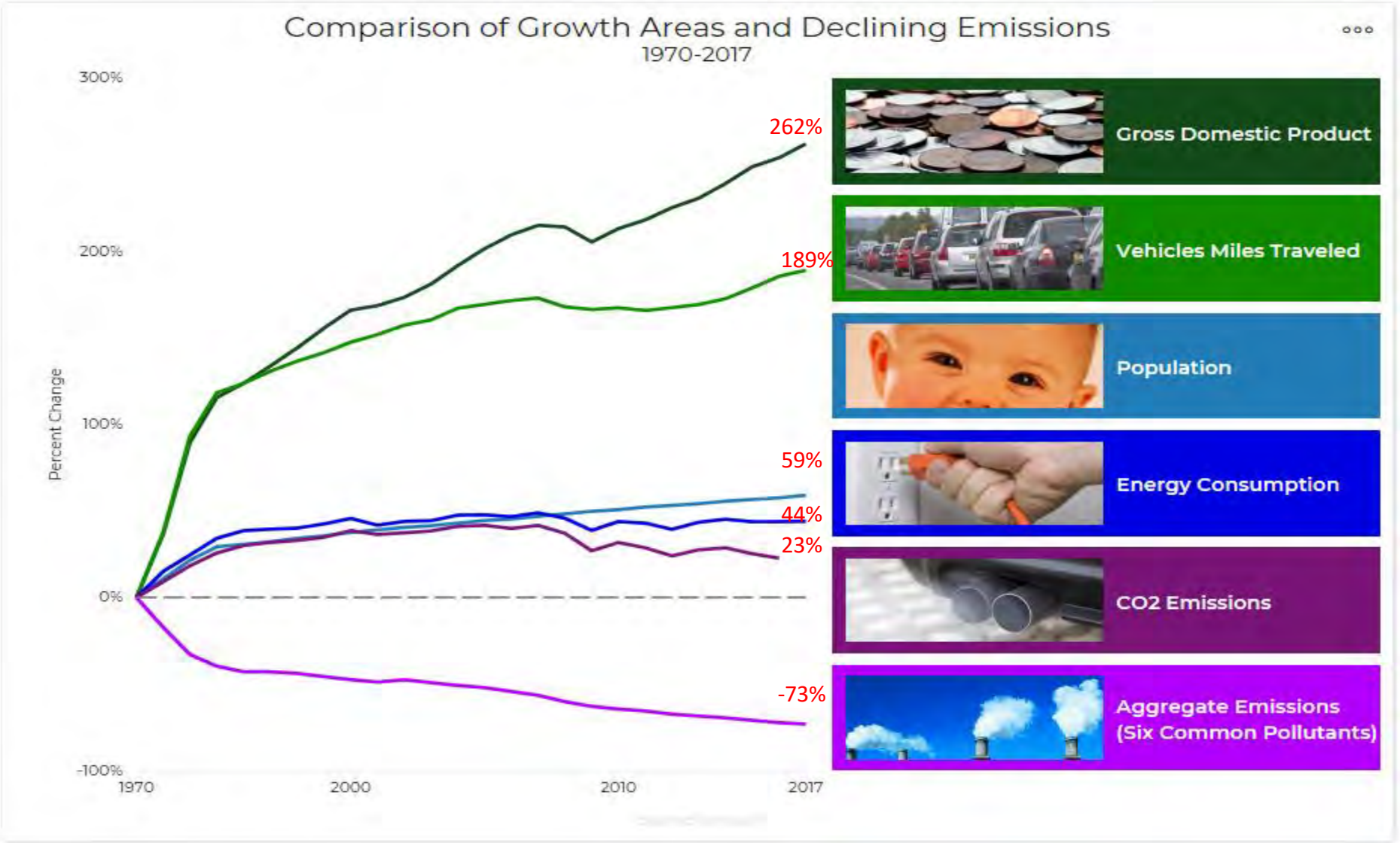
The Air Quality Index (AQI) is a color-coded index EPA uses to communicate daily air pollution for ozone, particle pollution, NO_2, CO, and SO_2. A value in the unhealthy range, above national air quality standard for any pollutant, is of concern first for sensitive groups, then for everyone as the AQI value increases. Fewer unhealthy air quality days means better health, longevity, and quality of life for all of us.

Number of Days Reaching "Unhealthy for Sensitive Groups" Level or Above on the Air Quality Index
(Among 35 Major U.S. Cities for Ozone and $PM_{2.5}$ Combined)



https://gispub.epa.gov/air/trendsreport/2018/documentation/AirTrends_Flyer.pdf

EPA's View



https://gispub.epa.gov/air/trendsreport/2018/#growth_w_cleaner_air

EPA's View

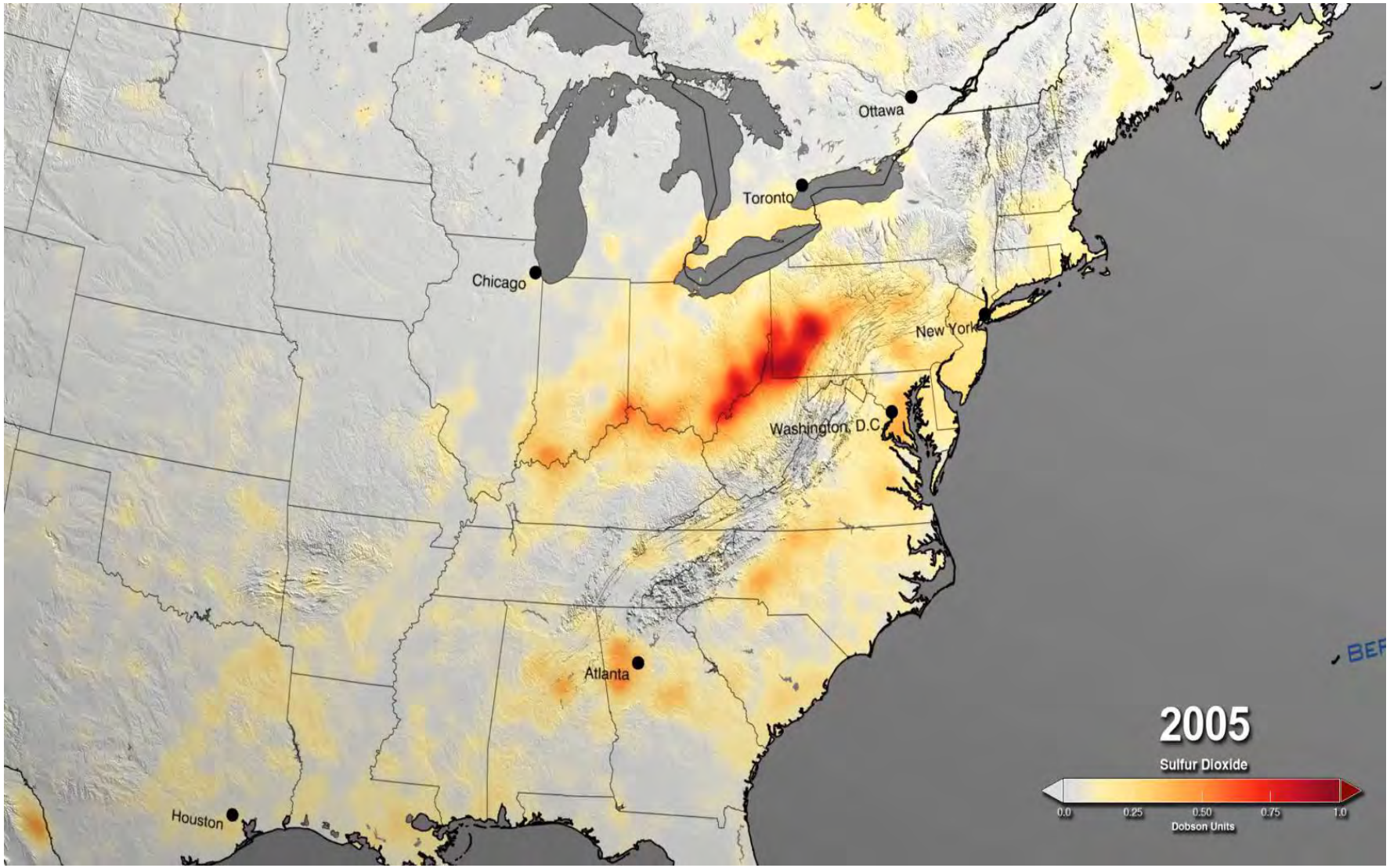
Nationally, concentrations of air pollutants have dropped significantly since 1990:

- Carbon Monoxide (CO) 8-Hour, ↓ 77%
- Lead (Pb) 3-Month Average, ↓ 80%
- Nitrogen Dioxide (NO_2) Annual, ↓ 56%
- Nitrogen Dioxide (NO_2) 1-Hour, ↓ 50%
- Ozone (O_3) 8-Hour, ↓ 22%
- Particulate Matter 10 microns (PM_{10}) 24-Hour, ↓ 34%
- Particulate Matter 2.5 microns ($PM_{2.5}$) Annual, ↓ 41%
- Particulate Matter 2.5 microns ($PM_{2.5}$) 24-Hour, ↓ 40%
- Sulfur Dioxide (SO_2) 1-Hour, ↓ 88%
- Numerous air toxics have declined with percentages varying by pollutant

During this same period, the U.S. economy continued to grow, Americans drove more miles and population and energy use increased.

https://gispub.epa.gov/air/trendsreport/2018/#growth_w_cleaner_air

SO2 Satellite Imagery



Air Quality Index

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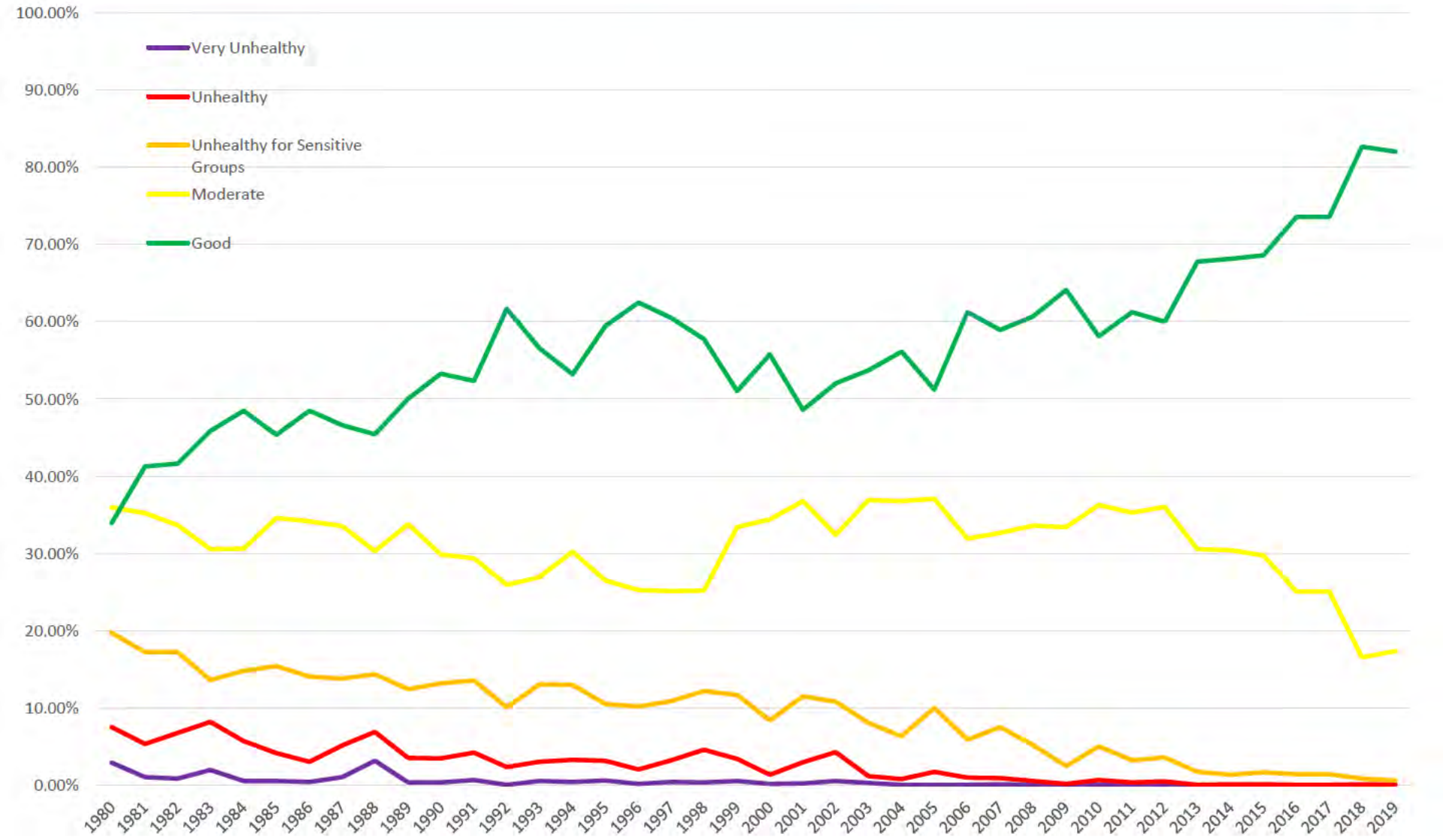
Historic AQI



Then and Now

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Corner of 5th and Liberty circa 1940

Corner of Liberty and Fifth Avenue (Archives Services Center, U. of Pittsburgh)

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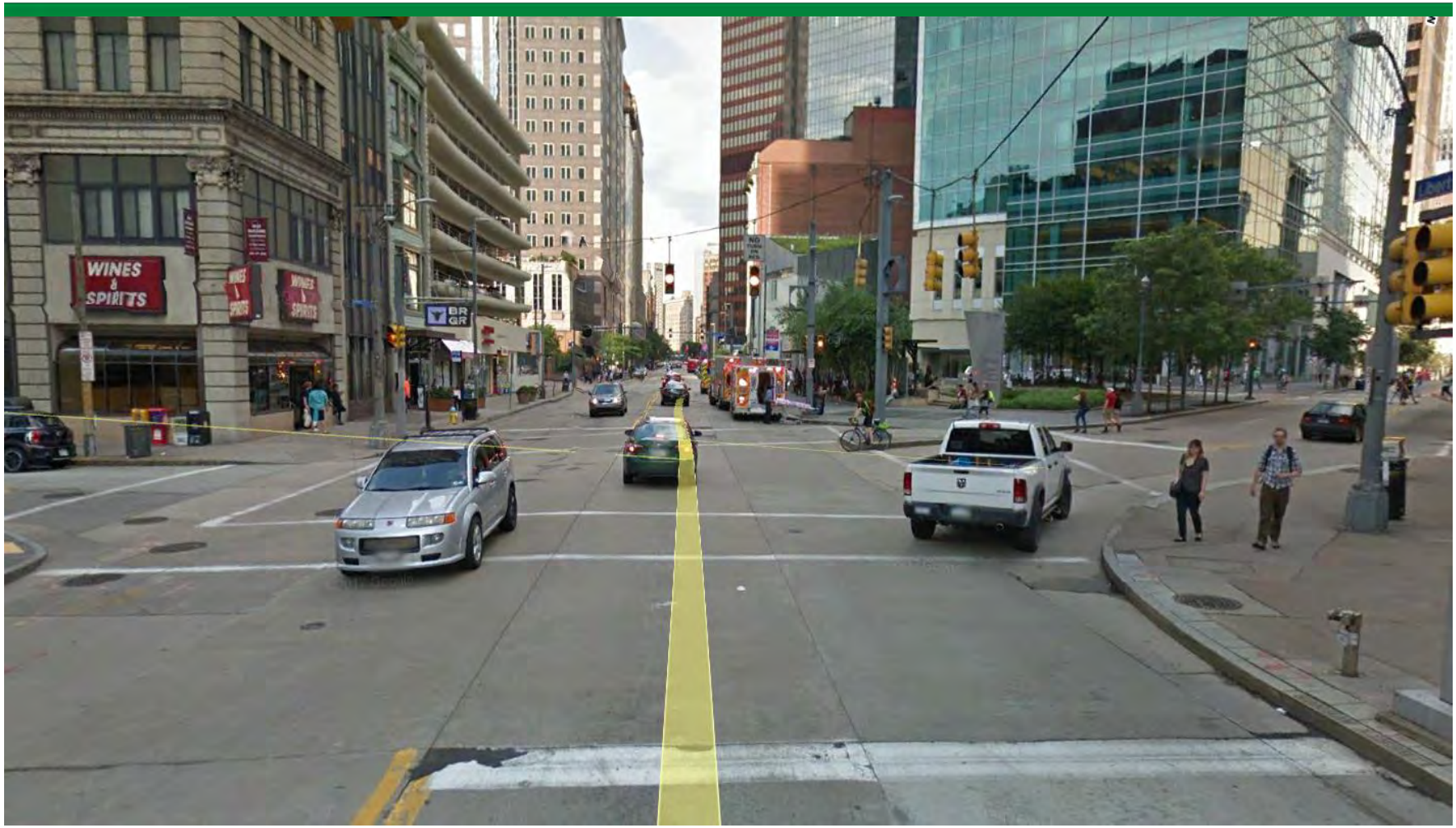
Corner of 5th and Liberty Today



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Air Quality Monitoring Division
717-783-9268
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ATTACHMENT 2

Testimony

PA House Environmental Resources and Energy Hearing

August 24, 2020 Testimony

Pennsylvania House Environmental Resources and Energy Committee

Hearing on Pennsylvania Participation in the Regional Greenhouse Gas Initiative (RGGI)

August 24, 2020

Testimony of Vincent J. Brisini

Director of Environmental Affairs, Olympus Power, LLC

Slide 001

Good morning Chairman Metcalfe and committee members. My name is Vince Brisini and I'm the Director of Environmental Affairs for Olympus Power. I appreciate the opportunity to provide testimony today regarding Pennsylvania's participation in RGGI.

Based upon my analysis of the ICF modeling performed for Pennsylvania DEP, it is clear to me that Pennsylvania's participation in RGGI will not produce carbon dioxide or other pollutant reductions that provide meaningful impact on local, regional, or global climate change; ambient air quality; or, provide the monetized health benefits that have been claimed.

Slide 002

I have previously testified before this committee regarding Pennsylvania's participation in RGGI, so for this testimony I will focus upon the new scenario identified as the "Policy Case with Revenue Recycling aka RGGI + Investment." Remember, RGGI history shows us that RGGI participation typically results in a

reduction in-state electric generation and the purchase of more electricity from non-RGGI participating areas.

Slide 003

The impact upon conventional generation, regardless of the expenditure on renewable generation, remains remarkably consistent between Policy Cases. That means that in the ICF modeling, the renewable generation under the "Policy Case with Revenue Recycling" will replace electric generation from some other PJM state rather than replacing Pennsylvania conventional generation. Because of the additional cost of the RGGI allowance price adder, this is predicting that higher cost electricity will be used rather than lower cost electricity. That simply doesn't make any sense to me.

Slide 004

I compared the annual Net Generation predictions for both the Reference Case and the "Policy Case with Revenue Recycling" to the 2018 Pennsylvania Net Generation. **The total summed difference in Net Generation for the Reference Case years 2022 through 2030 is 189.6 million megawatt-hours greater than the 2018 Net Generation level**. Clearly, the Reference Case Net Generation has been overstated in the modeling. Remember that in 2018, Pennsylvania was the #1 electricity exporter in the US.

Slide 005

I also looked at the Reference Case and the "Policy Case with Revenue Recycling" Net Generation. Contrary to ICF modeling, PJM system demand should be the same for all scenarios and the modeling should predict which generating sources in the various states in PJM will serve that demand.

In both cases, the combined increase in Net Generation in Pennsylvania, Virginia, Delaware, Maryland and New Jersey is greater than the overall Net Generation increase in PJM. **That means that the aggregate increase in Net Generation in Pennsylvania, Virginia, Delaware, Maryland and New Jersey is reducing the generation in non-RGGI PJM states. This doesn't makes sense because RGGI participation increases the price of conventional generation and has typically reduced generation in states after they begin participating in RGGI.**

Slide 006

Realizing that the Reference Case Net Generation is over-predicted, I calculated a Reference Case carbon dioxide emission factor to reflect the Reference Case generation mix and then calculated the Reference Case carbon dioxide emissions using the more realistic Net Generation of the Policy Case with Revenue Recycling.

I then calculated the missing years values, and compared the adjusted aggregated Reference Case emissions to the aggregated Policy Case with Revenue Recycling carbon dioxide emissions for 2022 through 2030, the RGGI affected years.

Slide 007

I calculated that the adjusted Reference Case would result in aggregated carbon dioxide emissions of 92 million tons rather than Pennsylvania DEP's 188 million tons.

Consequently, the emissions reductions and the corresponding monetized benefits are less than half of the inflated monetized benefits claimed by Pennsylvania DEP, regardless of the methodology used to calculate those benefits.

Slide 008

The second issue of concern regarding the calculated benefits are the methodologies used to monetize the emissions reductions attributed to Pennsylvania's participation in RGGI. Pennsylvania DEP used the benefit per ton and incidence per ton methodology.

Slide 009

I researched EPA data analysis for Benefit per Ton and Incidence per Ton. On this slide are some excerpts from the "Limitations" section describing the use of the benefits per ton (BPT) methodology.

Most importantly, EPA tells us that Benefit per Ton method is a "screening level assessment." A screening level assessment is a very conservative assessment used to determine if a more rigorous assessment is appropriate and necessary to determine actual effect and impacts. A screening level assessment does

not calculate accurate total monetized benefits nor the monetized benefits for any particular area.

Regardless of the location of the reductions; regardless of the population; regardless of the exposure; regardless of the current health of the population; the Benefit per Ton methodology will calculate the same monetized benefits.

Slide 010

What EPA has also identified is that they assign the same mortality rate to all fine particulate matter regardless of chemical composition. But they also identify that fine particulate matter precursors from electric generating units may differ significantly from fine particulate matter emitted directly from diesel engines. And while they are indeed dramatically different and there has been considerable research on this matter, EPA says they don't have enough information at this time to differentiate.

And they assign these monetized benefits to all areas regardless of whether or not they are meeting the National Ambient Air Quality Standards (NAAQS). Importantly, those air quality standards are established to protect all populations with an adequate margin of safety.

Slide 011

So I looked at the EPA's Technical Support Document which was updated in 2018 relative to using the benefit per ton and incidence per ton methodologies. What I found was, after

seven years EPA still doesn't consider the chemical composition of the fine particulate matter and still assigns a monetized value down to a concentration of zero in some cases. Even though the National Ambient Air Quality Standards have been established to provide an adequate margin of safety for all populations.

Slide 012

In the "Limitations and Uncertainties" section EPA again in 2018 let us know that they are applying the same benefit to all areas regardless of the current human conditions and ambient concentrations.

Slide 013

My question is, if EPA intends to apply this benefit per ton method to estimate monetized benefits to justify actions and allow others, like Pennsylvania DEP, to use it for the same purpose, then why hasn't EPA addressed the uncertainties that are identified in both the 2011 and 2018 documents? If they don't, it's obvious that over-estimations of monetized benefits like Pennsylvania's participation in RGGI will continue.

Alternatively, if there is a recognition that the methods used by Pennsylvania DEP are screening level efforts, why hasn't Pennsylvania DEP completed the area specific modeling and analyses that would allow the "real" monetized benefits to be calculated and represented as opposed to using these screening level results that are admittedly extremely

conservative and calculate a grossly inflated monetized benefits for emissions reductions?

Slide 014

As you can see on this slide, Pennsylvania electric generating unit emissions in 2019 were already at a 94 percent reduction of sulfur dioxide and 85 percent reduction of nitrogen oxides from 2002 emissions.

Slide 015

On July 22, 2020, the Pennsylvania DEP provided a presentation to the Small Business Compliance Advisory Committee regarding the state of measured air quality in Pennsylvania.

In this presentation they showed the measured “design values” for the various monitoring sites. A design value is established using data collected over a three year period. So 2019 Design Values are developed using monitoring data for 2017, 2018 and 2019.

Slide 016

What Pennsylvania DEP showed was that all monitors in Pennsylvania, except four monitors in the Philadelphia area which are primarily affected by mobile source emissions, have 2019 design values that show attainment of the 2015 Ozone National Ambient Air Quality Standard. Reductions from electric generating units won’t result in the Philadelphia monitors achieving attainment. So is there any RGGI participation benefit relative to ozone?

Slide 017

Every monitor in Pennsylvania, except one near Pittsburgh, which I have been told is impacted by a local industrial source, is demonstrating attainment of the Annual PM2.5 National Ambient Air Quality Standard. Reductions from electric generating units will not bring that monitor into attainment of the National Ambient Air Quality standard.

Slide 018

Here you can see that every monitor in the Commonwealth is already measuring attainment of the 24-Hour PM2.5 National Ambient Air Quality Standard.

Slide 019

Every monitor in Pennsylvania, except one near Pittsburgh which I have been told is impacted by a local industrial source, is demonstrating attainment of the 2010 Sulfur Dioxide National Ambient Air Quality Standard. Reductions from electric generating units will not bring that monitor into attainment with the National Ambient Air Quality standard.

Slide 020

My conclusion is that the ICF/Pennsylvania DEP Quantitative Modeling of Pennsylvania RGGI is Flawed and the following demonstrate those flaws:

The estimated level of Net Generation under the Reference Case is unreasonably high for Pennsylvania, as an aggregate it's

almost 190 million megawatt-hours greater than the aggregated 2018 Net Generation when Pennsylvania was the #1 exporter in the US

By simply adjusting the Pennsylvania Net Generation to reflect more realistic levels and considering just the 2022 through 2030 period, *the "real" RGGI affected period*, **the Pennsylvania DEP monetized benefits were reduced by more than 50%**

The increase in Net Generation in Pennsylvania, Virginia, Delaware, Maryland and New Jersey in 2022 as compared to 2020 is greater than the overall increase in PJM Net Generation in both the Reference Case and the RGGI +Investment Case. **This situation means the model is predicting that non-RGGI PJM states are generating less in both cases. That's highly unlikely considering the RGGI allowance price adder applied to all conventional generation. Remember history has shown us RGGI participating states generally generate less electricity after joining RGGI.**

ICF's Integrated Planning Model appears to change the total Net Generation in PJM by scenario when the **total Net Generation in PJM should be the same regardless of scenario and the subsequent state by state Net Generation should be estimated to satisfy that electricity demand based upon energy costs and Transmission and Distribution constraints**

<u>Slide 021</u>

Further, the estimations of monetized health benefits are grossly overstated by the ICF/Pennsylvania DEP Modeling and the benefit per ton methodology:

The Reference Case overstates Pennsylvania emissions **which inflates the represented reductions achieved by Pennsylvania RGGI participation which then inflates the monetized benefits**

The monetized health benefits are estimated using a methodology that EPA has identified as a **"screening tool"** with considerable limitations. I am unaware of any refined analysis by Pennsylvania DEP to substantiate their representations of monetized benefits.

The modeling and calculated monetized benefits **don't take into consideration important inputs, including particulate matter speciation; population densities; and, current local ambient air quality, including whether areas are measuring attainment of the various National Ambient Air Quality Standards**

In the event the lost Pennsylvania electric generation is replaced by generation in non-RGGI PJM states, then little or no regional monetized benefits will be achieved.

<u>Slide 022</u>

Thank you for the opportunity to provide testimony today. I would be happy to go into this topic in more detail at a future time. Ten minutes is simply too short a time to sufficiently discuss this matter.

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

PA House Environmental Resources & Energy Hearing August 24, 2020

Vince Brisini

Director of Environmental Affairs

Olympus Power, LLC

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

PA DEP Policy Case and Policy Case with Revenue Recycling aka RGGI + Investments Net Generation Estimations by ICF, Pretty Close!

PA DEP Policy Case

Net Generation (GWh)

PA	2020	2022	2025	2028	2030
Conventional Generation Total	***208,164***	***206,868***	***205,160***	***195,843***	***196,345***
Renewable Generation Total	*10,539*	*10,608*	*11,423*	*11,603*	*11,491*
Total	**218,704**	**217,476**	**216,583**	**207,446**	**207,836**

Policy Case with Revenue Recycling aka RGGI + Investments

Net Generation (GWh)

PA	2020	2022	2025	2028	2030
Conventional Generation Total	***208,149***	***207,478***	***203,493***	***192,634***	***191,073***
Renewable Generation Total	*10,512*	*10,843*	*19,912*	*24,563*	*26,939*
Total	**218,661**	**218,320**	**223,405**	**217,197**	**218,012**

Why is the Reference Case Net Generation So Much Higher Than the Policy Case with Revenue Recycling Net Generation?

PA DEP Reference Case
Net Generation (GWh)

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2022-2030
PA Total	216,581	231,080	245,578	244,077	242,576	241,076	238,174	235,272	232,370	227,100	221,829	2,128,052
PJM Total	831,038	842,581	854,124	858,623	863,123	867,623	869,939	872,256	874,573	872,624	870,674	7,803,559
PA Generation above 2018 Generation PA #1 Exporter		15,694	30,192	28,691	27,190	25,690	22,788	19,886	16,984	11,714	6,443	189,578
PA Generation above ICF 2020 Projected Generation		14,499	28,997	27,496	25,995	24,495	21,593	18,691	15,789	10,519	5,248	178,823

Policy Case with Revenue Recycling aka RGGI + Investments
Net Generation (GWh)

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2022-2030
PA Total	218,661	218,491	218,320	220,015	221,710	223,405	221,336	219,266	217,197	217,604	218,012	1,976,865
PJM Total	829,899	836,066	842,233	846,761	851,289	855,817	859,273	862,728	866,184	866,760	867,335	7,718,379
PA Generation above 2018 Generation PA #1 Exporter		3,105	2,934	4,629	6,324	8,019	5,950	3,880	1,811	2,218	2,626	38,391
PA Generation above ICF 2020 Projected Generation		-170	-341	1,354	3,049	4,744	2,675	605	-1,464	-1,057	-649	8,916

Why Does PJM Have Higher Net Generation and Why Do PA, VA, DE, MD, NJ Net Generation Increases Exceed the Total PJM Increase?

PA DEP Reference Case

Net Generation (GWh)

PJM	2020	2022	2025	2028	2030
Conventional Generation Total	*769,443*	*786,676*	*768,125*	*752,125*	*735,501*
Renewable Generation Total	*61,595*	*67,447*	*99,497*	*122,448*	*135,174*
Total	831,038	854,124	867,623	874,573	870,674
Difference from 2020		23,086			
Total Net Generation Increase PA, VA, DE,MD, NJ		38,914			

Policy Case with Revenue Recycling aka RGGI + Investments

Net Generation (GWh)

PJM	2020	2022	2025	2028	2030
Conventional Generation Total	*769,741*	*775,320*	*756,032*	*739,185*	*725,032*
Renewable Generation Total	*60,158*	*66,912*	*99,785*	*126,999*	*142,303*
Total	829,899	842,233	855,817	866,184	867,335
Difference from 2020		12,334			
Total Net Generation Increase PA, VA, DE,MD, NJ		15,578			

What Happens If The Reference Case Emissions Are Adjusted to Reflect The RGGI + Investment Generation (cont.)?

PA DEP Reference Case Using Policy Case with Revenue Recycling aka RGGI+Investment Net Generation

Affected CO2 Emissions (Million Short Tons)

PA	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2022-2030
Using PA CO2 Policy CaseNet Gen w/Rev Invest (CO2 million tons)	75	72	69	68	66	65	63	62	61	58	54	567

Policy Case with Revenue Recycling aka RGGI + Investments

Affected CO2 Emissions (Million Short Tons)

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2022-2030
Total CO2 Emissions PA	75	66	57	56	55	55	53	51	50	49	48	475

What Happens If The Reference Case Emissions Are Adjusted to Reflect The RGGI + Investment Generation and just 2022 -2030?

Reductions after Adjustment for Net Generation

Pollutant	CO2 (million tons)	SO2 (tons)	NOx (tons)	Reduced (%)
Reductions Claimed for benefits from PADEP Policy Case aka RGGI + Investment	188	67,000	112,000	
Reductions from PADEP Policy Case aka RGGI + Investment after Adjustment for Conv Gen and years	92	32,755	54,755	-51.1

Modeling Approach

- **Power Sector Modeling*** – Integrated Planning Model (IPM®)
  - Business-as-Usual (BAU) or Reference Case – No RGGI
  - RGGI Participation or Policy Case – RGGI Participation
  - RGGI + Investments – RGGI Participation + Revenue Reinvestment
- **Economic Modeling** – Regional Economics Model, Inc. (REMI®)
  - Balanced Approach – Investments in EE, RE and GHG abatement
  - Ratepayer Assistance – Strong focus on electric bill discounts
  - General Fund – Funds diverted- no strategic investment
- **Health Benefit Calculations** – U.S. Environmental Protection Agency
  - Benefit per Ton (BPT) Methodology
  - Incidence per Ton (IPT) Methodology

**See Appendix and www.dep.pa.gov/RGGI for detailed results.*

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Combined National and State-level Health Benefits for the Cross-State Air Pollution Rule and Mercury and Air Toxics Standards, December 2011 Limitations:

- **"This analysis is a *screening-level assessment* of the combined benefits of the CSAPR and MATS…"**
- **"The PM2.5-related benefits for MATS were derived through a BPT approach, *which does not fully reflect local variability in population density, meteorology, exposure, baseline health incidence rates, or other local factors that might lead to an over-estimate or under-estimate of the actual co-benefits of reducing ambient PM2.5*."**
- **Due to the use of the benefit per-ton method, there is more uncertainty with the state-level MATS results than for the CSAPR, and the added uncertainty in MATS contributes to the summed uncertainty.**

Combined National and State-level Health Benefits for the Cross-State Air Pollution Rule and Mercury and Air Toxics Standards, December 2011 Limitations (cont.):

- "We assume that all fine particles, regardless of their chemical composition, are equally potent in causing premature mortality. *This is an important assumption because the health benefits of these rules are primarily related to reductions of SO2, a precursor to ambient PM2.5. PM2.5 improvements produced via reductions in transported precursors (SO2 and NOX) emitted from EGUs may differ significantly from direct PM2.5 released from diesel engines and other industrial sources, but the scientific evidence is not yet sufficient to allow differential effects estimates by particle type.*"
- "Thus, the *estimates include health co-benefits from reducing fine particles in areas with varied concentrations of PM2.5, including both regions that are in attainment with the fine particle standard and those that do not meet the standard…*"
- **Source:** https://www3.epa.gov/ttn/ecas/regdata/Benefits/casprmats.pdf

Technical Support Document, Estimating the Benefit per Ton of Reducing PM2.5 Precursors from 17 Sectors, February 2018
Limitations and Uncertainties:

- In this analysis *we assume that all fine particles, regardless of their chemical composition, are equally potent in causing premature mortality*. *This is an important assumption, because PM2.5 produced via transported precursors emitted from EGUs may differ significantly from direct PM2.5 released from other industrial sources*. However, the scientific evidence is not yet sufficient to allow differentiation of effect estimates by particle type. *We also assume that the health impact function for fine particles is linear down to the lowest air quality levels modeled in this analysis.* Thus, the estimates include health benefits from reducing fine particles in areas with varied concentrations of PM2.5, including regions that are in attainment with fine particle standard.

Technical Support Document, Estimating the Benefit per Ton of Reducing PM2.5 Precursors from 17 Sectors, February 2018
Limitations and Uncertainties (cont.):

- It is also important to note that the monetized benefit per ton estimates used here reflect specific geographic patterns of emissions and specific air quality and benefits modeling assumptions. *Great care should be taken in applying these estimates to emission reductions occurring in any specific location, as these are all based on national emission reduction assumptions and therefore represent an average benefit per ton over the entire United States.* ***The benefit per ton for emission reductions in specific locations may be very different from the estimates presented here***. In addition, estimates do not capture important differences in marginal benefit per ton that may exist due to different combinations of reductions (i.e., all other sectors are held constant) or nonlinearities within a particular pollutant (e.g., non-zero second derivatives with respect to emissions).

Technical Support Document, Estimating the Benefit per Ton of Reducing PM2.5 Precursors from 17 Sectors, February 2018
Limitations and Uncertainties (cont.):

- ***When using these benefit per ton estimates in analyses, care should be taken to not overstate the accuracy of the total benefits estimates or estimates of avoided incidence.***

Source: https://www.epa.gov/sites/production/files/2018-02/documents/sourceapportionmentbpttsd_2018.pdf

PA EGU SO2 and NOx emissions 2002 vs 2019 from EPA CAMD

State Specific SO2 and NOx Emissions 2002 thru 2019

State	SO2 (tons) 2002	SO2 (tons) 2019	Percentage SO2 Reduction 2002-
PA	889,765.5	52,393.7	94.1

State	NOx (tons) 2002	OS NOx (tons) 2002	non-OS NOx (tons) 2002	NOx (tons) 2019	Percentage Annual NOx Reduction 2002-2019	OS NOx (tons) 2019	Percentage OS NOx Reduction 2002-2019	non-OS NOx (tons) 2019	Percentage non-OS NOx Reduction 2002-2019
PA	218,268.1	84,601.7	133,666.4	33,135.3	84.8	12,812.6	84.9	20,322.7	84.8


Air Quality
A Perspective

Small Business Compliance Advisory Committee

July 22, 2020

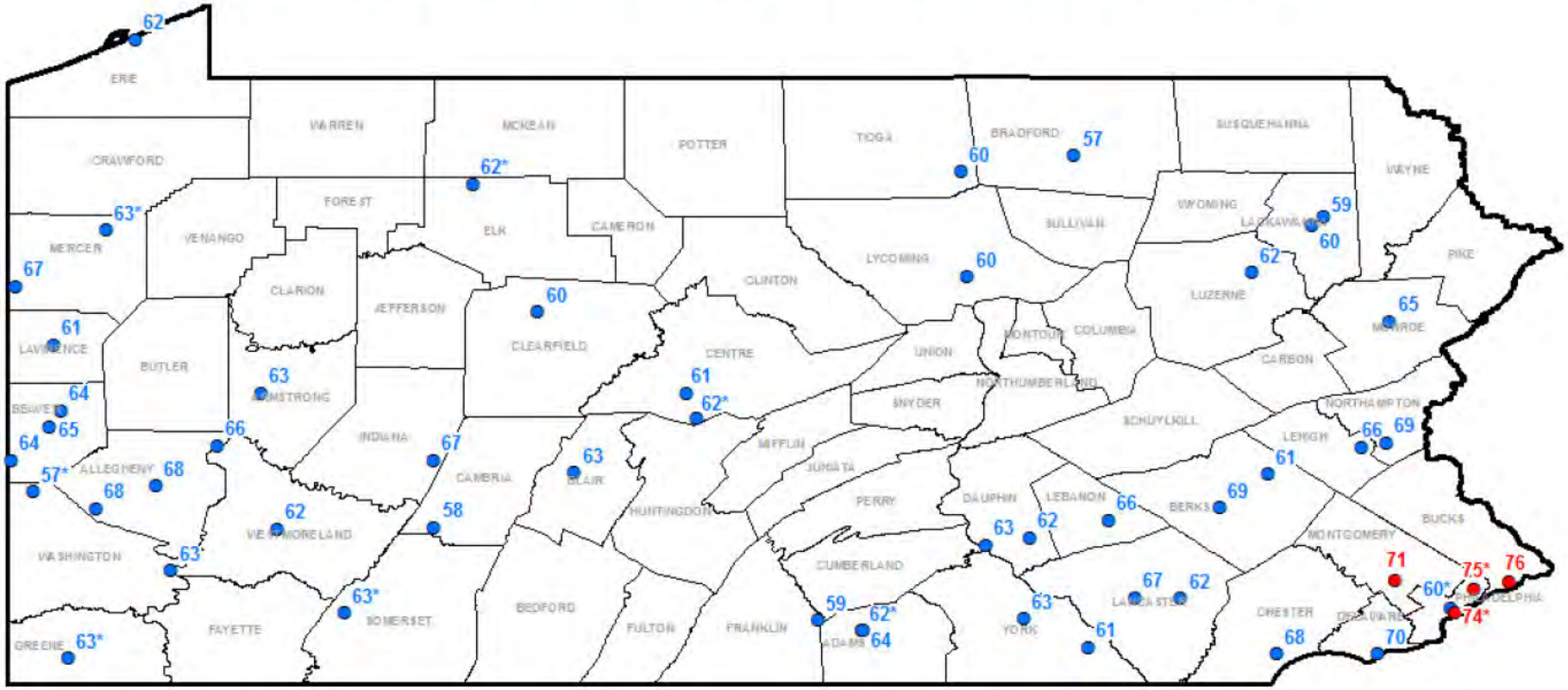
Harrisburg, PA

Tom Wolf, Governor

Patrick McDonnell, Secretary

2019 8-Hour Ozone Design Values

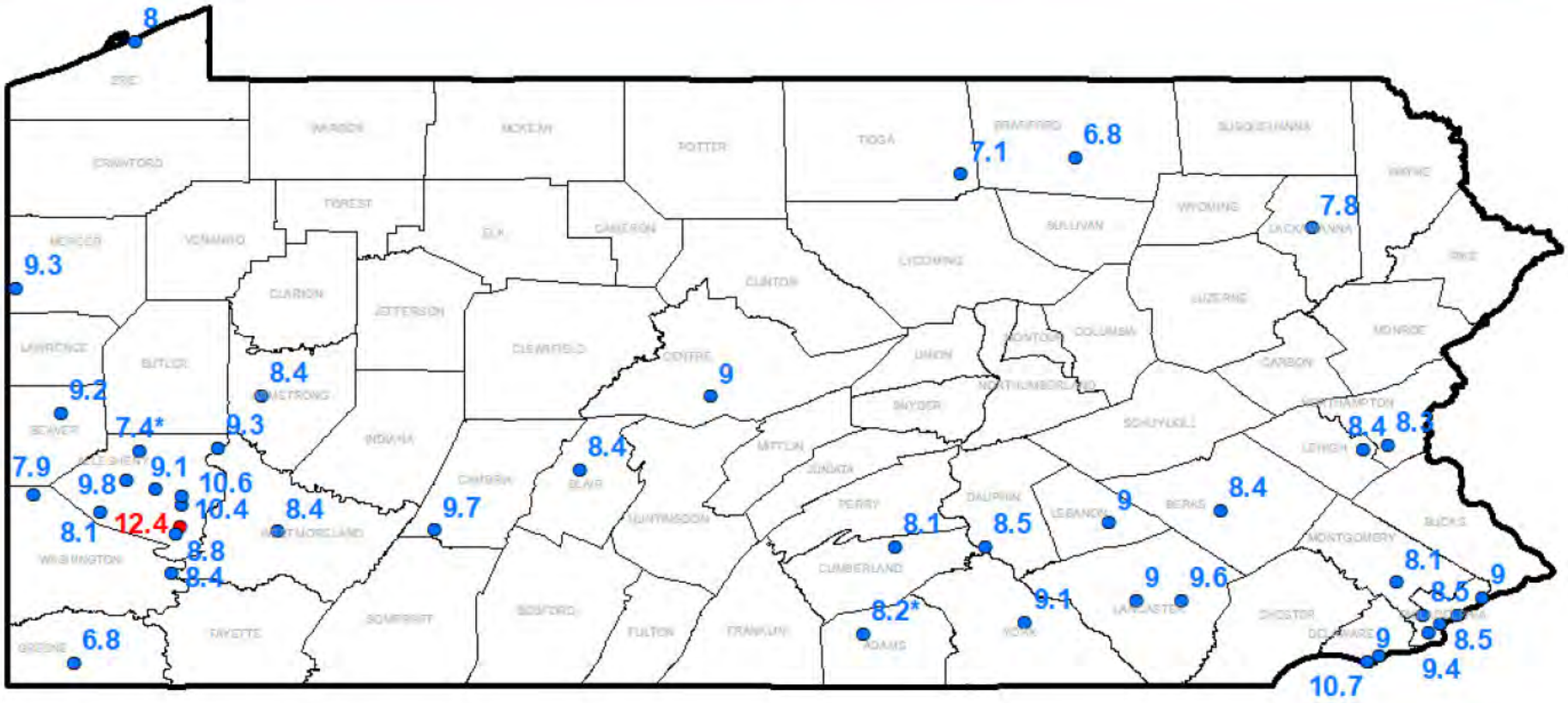
As of October 22, 2019 - 2019 Ozone Data Has Not Been Fully QA/QC'd



Appearing in Red - Projected 2019 8-Hour Ozone Design Value above 70 ppb (2015 Ozone Standard)

Appearing in Blue - Projected 2019 8-Hour Ozone Design Value at or below 70 ppb (2015 Ozone Standard)

2019 Annual $PM_{2.5}$ Design Values

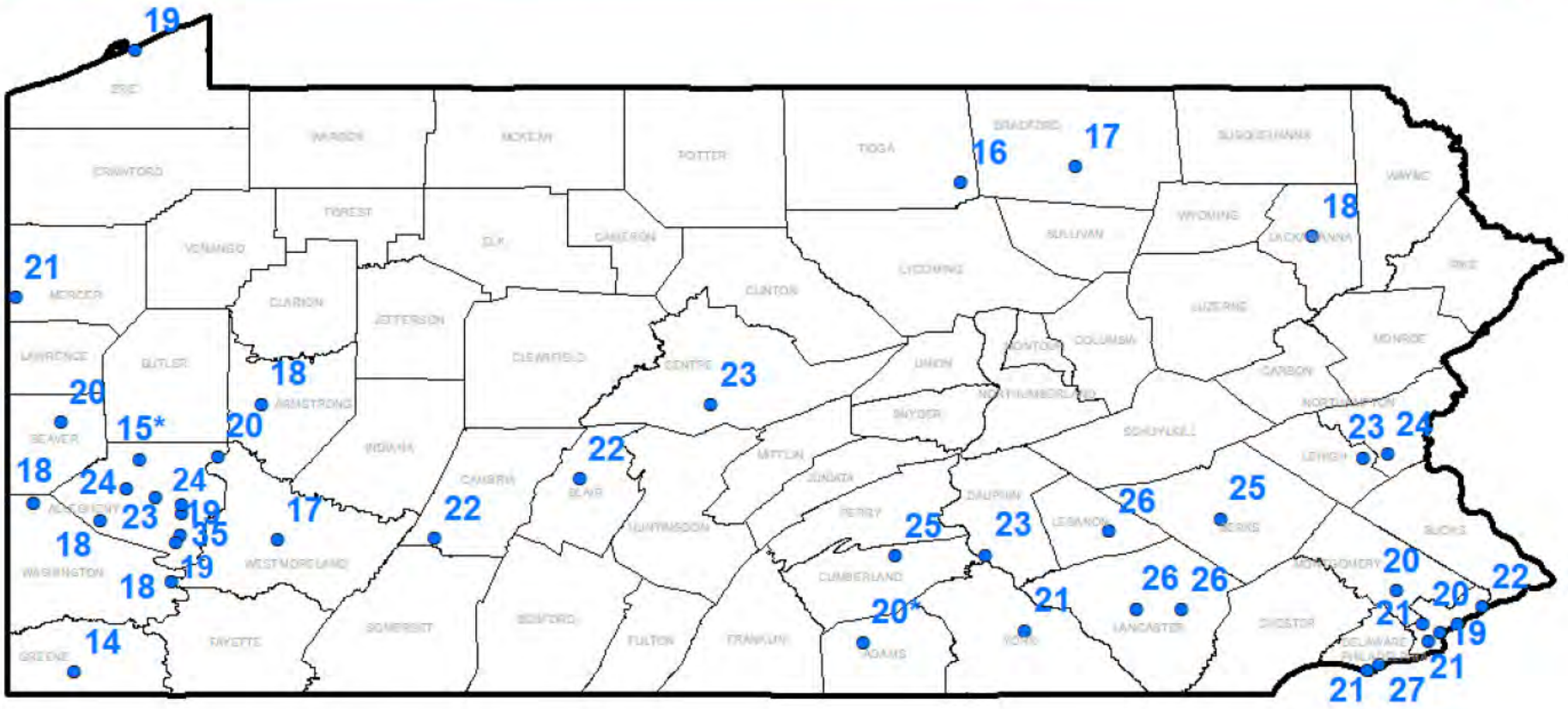


Appearing in Red - 2019 Annual $PM_{2.5}$ Design Values Above the Standard of 12.0 ug/m^3

Appearing in Blue - 2019 Annual $PM_{2.5}$ Design Values Below the Standard of 12.0 ug/m^3

017

2018 24-hour $PM_{2.5}$ Design Values

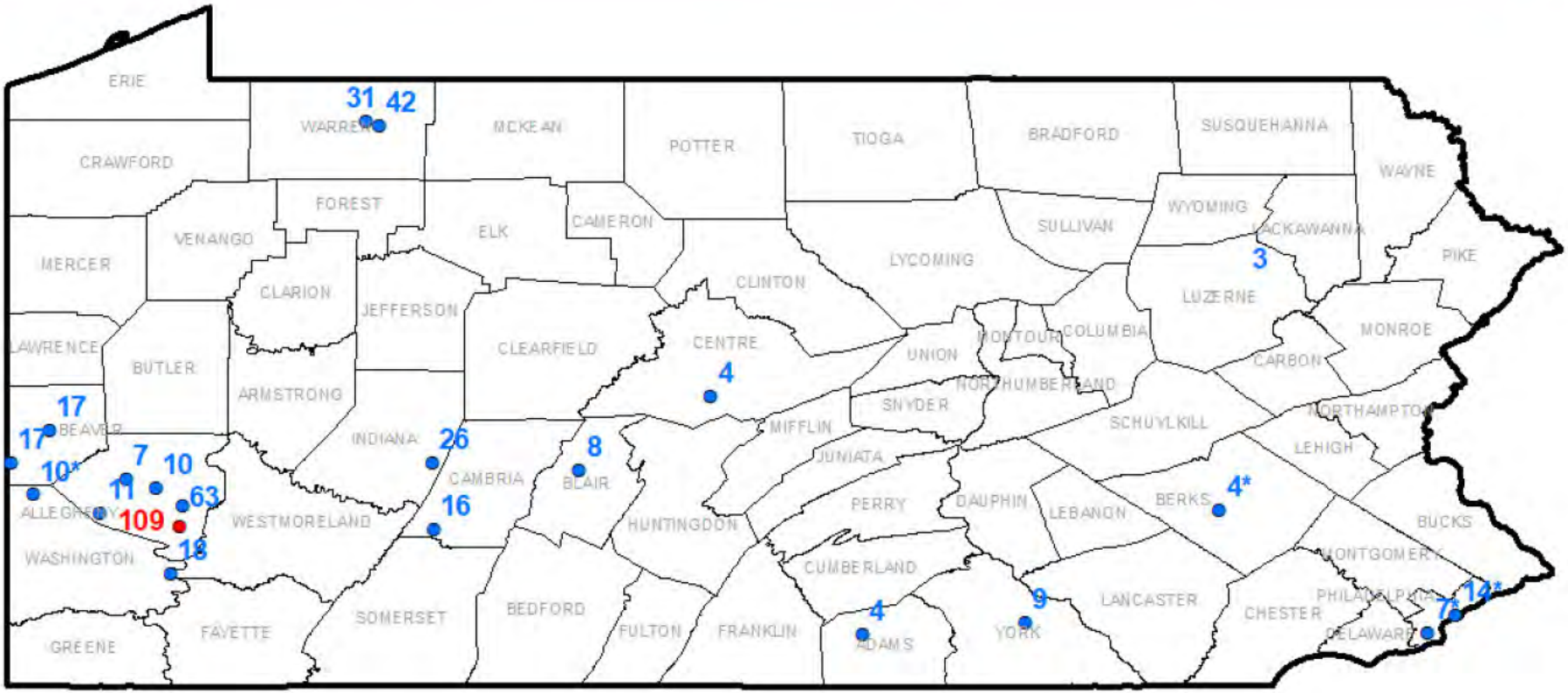


Appearing in Red - 2019 24-hour $PM_{2.5}$ Design Values Above the Standard of 35 ug/m^3

Appearing in Blue - 2019 24-hour $PM_{2.5}$ Design Values Below the Standard of 35 ug/m^3

018

2019 1-hour SO_2 Design Values



Appearing in Red - 2019 1-Hour SO_2 Design Value above 75 ppb (2010 SO_2 Standard)

Appearing in Blue - 2019 1-Hour SO_2 Design Value at or below 75 ppb (2010 SO_2 Standard)

019 Asterick (*) Appearing Behind the 2019 1-Hour SO_2 Design Value Means the Data is Incomplete During 3-Year Period

Findings of my analyses:

- **The ICF/PA DEP Quantitative Modeling of PA RGGI is Flawed**
  - The estimated level of Net Generation under the Reference Case is unreasonably high for Pennsylvania, **as an aggregate it's almost 190 million MWh greater than the 2018 Net Generation and PA was the #1 exporter in the US in 2018**
  - By simply adjusting the PA Net Generation to reflect more realistic levels and considering just the 2022 through 2030 period, the "real" RGGI affected period, **immediately reduces the estimated benefits by 50%**
  - The increase in Net Generation in PA, VA, DE, MD in 2022 as compared to 2020 is greater than the overall increase in PJM Net Generation in both the Reference Case and the RGGI +Investment Case. **This situation means the model is predicting that non-RGGI states are generating less in both cases. That's highly unlikely considering the RGGI allowance price adder.**
  - ICF IPM appears to change the total Net Generation in PJM by scenario when the total **Net Generation in PJM should be the same regardless of scenario and state by state Net Generation should be estimated to satisfy that electricity demand based upon energy cost and T&D constraints**

Findings of my analyses (cont):

- **The estimations of monetized health benefits are overstated by the ICF/PA DEP Modeling:**
  - The Reference Case overstates PA emissions **which inflates the reductions achieved through RGGI participation which inflates benefits**
  - The monetized health benefits are estimated using a methodology that admittedly is a **"screening tool"** and has considerable limitations
  - The modeling and calculated monetized benefits **don't take into consideration important inputs, including particulate matter speciation, population densities and current local ambient air quality, including whether areas are measuring attainment of the various NAAQS**
  - **In the event the lost PA electric generation is replaced by natural gas and/or coal-fired generation innon-RGGI PJM states, then no regional monetized benefits will be achieved**

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

PA House Environmental Resources & Energy Hearing
August 24,2020

Vince Brisini, Olympus Power, LLC

Thank you for the opportunity to testify today.

ATTACHMENT 3

PA Senate Environmental Resources and Energy Hearing

June 23, 2020

Pennsylvania Senate Environmental Resources and Energy Committee

Hearing on Pennsylvania Participation in the Regional Greenhouse Gas Initiative (RGGI)

June 23, 2020

Testimony of Vincent J. Brisini

Director of Environmental Affairs, Olympus Power, LLC

Slide 1

Good morning Chairman Yaw and committee members. My name is Vince Brisini and I'm the Director of Environmental Affairs for Olympus Power. I appreciate the opportunity to provide testimony today regarding Pennsylvania's participation in RGGI.

Slide 2

I've conducted considerable research and assessment regarding RGGI and have also reviewed the work performed by ICF International Inc. (ICF), a contractor to RGGI and the RGGI states since 2005, for the Department of Environmental Protection. Based on these efforts, it is clear Pennsylvania's participation in RGGI will not produce carbon dioxide or other pollutant reductions that provide any meaningful impact on local, regional or global climate change or ambient air quality.

Slide 3

The maximum amount of carbon dioxide reduction that would occur from the replacement of all Pennsylvania coal-fired electric generation by natural gas-fired electric generation is only about 1% of the total US electric generator carbon dioxide emissions. That is the maximum amount of carbon dioxide reduction that could occur regardless of where the replacement natural gas-fired electric generation is located. However, if the Pennsylvania coal-fired generation or natural gas-fired electric generation lost to RGGI participation are replaced by coal-fired electric generation in another non-RGGI PJM state, then there is no reduction in carbon dioxide and there could actually be increases in carbon dioxide as well as other pollutants.

Slide 4

What we also know is that any representation of emissions reduction benefits due to Pennsylvania RGGI participation are significantly over-estimated by the ICF modeling effort. If you look at the 2020 electric generation in the Policy Case, which represents RGGI participation, and in the Reference Case, which represents no RGGI participation, you can see a similar modeled total electric generation at levels that are consistent with Pennsylvania's electric generation in 2018. But then in 2022 under the Reference Case, generation inflates by 30 million megawatt-hours. That is a huge number of additional megawatt-hours without any logical basis for that increase in PJM system demand.

Slide 5

For context, that represents an almost 50% increase above the 2018 Pennsylvania generation which at that time made Pennsylvania the #1 exporter of electric power in the US. There is simply not an ability to sell that additional 30 million megawatt-hours of generation in the PJM market. As an example, Maryland would have to eliminate over 65% of its electric generation to provide a market for that much electricity.

That inflated generation results in inflated Reference Case emissions which results in ICF's grossly overstated benefits due to Pennsylvania's participation in RGGI. The PJM market defines the amount of electricity that can be sold, not the ICF integrated planning model. Clearly there is a problem with that model or possibly with the modelling inputs.

But RGGI history does show that RGGI participation typically results in less in-state electric generation and the purchase of more electricity from non-RGGI participating areas, Canada in the case of New York and the New England states or Pennsylvania in the case of Delaware and Maryland which are part of PJM.

Slide 6

The reason there is less generation in the RGGI states is the allowance dispatch price adder necessary to recover the cost of the RGGI allowances. To put the price adder into context, if the clearing price of electricity is $16.50 per megawatt-hour, then in the case of coal, the RGGI price adder alone is over 36% of the clearing price. Adding the RGGI allowance cost to the cost of generation means that the Pennsylvania coal-fired units will be immediately retired because they will not be called into service.

While the majority of the RGGI discussions have focused upon the impacts to the coal-fired plants, the RGGI price adders for a significant number of natural gas-fired units are over $3.50 per megawatt hours. That artificial price increase, 20% and more of the clearing price, necessary to recover RGGI allowance costs would considerably increase their prices which will reduce the amount of generation from those facilities and could even result in some retirements.

As an addendum to my testimony I am providing a listing of the Pennsylvania unit by unit RGGI price adders that I have developed which also identifies the fuel used by each unit.

Slide 7

RGGI history has shown us that if there is non-RGGI electricity available, that electricity will be used by RGGI participating states.

And as you can see on this slide, there are a number of natural gas-fired combined cycles permitted in Ohio, some of which are under construction, that are positioned to take away Pennsylvania's role as the #1 electricity provider in PJM and the US. And this slide doesn't even show the 2,200 megawatt W.H. Sammis coal-fired power plant located near the Pennsylvania/Ohio border or the 1,300 megawatt Pleasants coal-fired power plant in West Virginia, both of which have recently avoided deactivation and now stand ready to generate and sell power into PJM.

Slide 8

If you look back on the Policy Case generation slide, RGGI participation, the availability of non-RGGI electricity makes the projections unrealistically optimistic for future generation. Plus, the Policy Case generation shows no growth of natural gas fired electric generation in Pennsylvania over the period 2022 through 2030. This begs the question to the natural gas-fired developers that have just brought their plants into service or will soon bring their plants into service in Pennsylvania, "Would you have made this investment in Pennsylvania if you had known RGGI was any possibility in 2022?"

Slide 9

We know that the Pennsylvania Department of Environmental Protection has estimated the RGGI tax revenue at over $300 million dollars annually, but because of the RGGI price adder increase on natural gas-fired electric generation of $3.50 per megawatt-hour and more and the subsequent pricing of Pennsylvania electric generation compared to electric generation pricing in non-RGGI PJM states, the amount of RGGI tax revenue will be considerably less. I am estimating $175 - $200 million dollars annually. And importantly, those tax revenues are going to be placed into the Clean Air Fund so it's unlikely that without some very creative interpretations that these RGGI tax revenues could be used to assist those workers whose jobs will be lost to Pennsylvania RGGI participation as some have suggested.

Slide 10

We also know that the Pennsylvania electric generation industry has been reducing carbon dioxide emissions without Pennsylvania participation in RGGI. Pennsylvania electric generation has reduced carbon dioxide emissions below the targets set by Governor Wolf, the Paris Accord and the final target set by the Obama Administration's "Clean Power Plan" all ahead of schedule and without a carbon dioxide mandate on existing units.

Slide 11

We also know from RGGI history that RGGI does not result in the growth of renewable generation. The RGGI participating states are still legislating mandates for the development and implementation of renewable electric generation.

We also know that in a best case scenario, it would require an additional 3,300 land based wind turbines to replace the lost coal fired-capacity.

It's noteworthy that the Policy Case projected renewable generation is only 4.9% of total generation in 2020 and increases to only 5.5% of total generation in 2030. Clearly not even the ICF model predicts RGGI as a driver of renewable electric generation.

Slide 12

So what do we know about Pennsylvania participation in RGGI:

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

We know it will reduce the amount of electricity generated in and exported from PA.

We know it 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.

We know 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.

Slide 13

We know it won't cause a shift to renewable electric generation.

We know it won't help nuclear generation because the PJM market will dispatch the lowest cost units, minimizing any price increases.

We know it will result in companies moving the development of new natural gas-fired generating units to other non-RGGI PJM states, and the ICF modeling supports that assessment.

We know that any RGGI tax will be borne disproportionately by residential customers.

We know it won't results in local or regional CO2 emissions reductions that will meaningfully affect or benefit local, regional or global climates.

And, we know it will only generate $175-200 million per year in RGGI tax revenue.

Slide 14

And we know what the immediate economic impacts will be in western Pennsylvania if Pennsylvania participates in 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

With no meaningful benefits to show for the effort except $175 to $200 million dollar a year in RGGI tax revenue.

Slide 15

Thank you for the opportunity to testify today.

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

PA Senate Environmental Resources & Energy Hearing June 23, 2020

Vince Brisini

Director of Environmental Affairs

Olympus Power, LLC

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

Pennsylvania

	2020	2022	2025	2028	2030
Biomass	146	307	307	152	152
Coal	34,123	4,381	3,120	3,027	2,415
Combined	94,339	113,263	112,111	103,785	104,840
Combustic	312	970	810	810	868
Nuclear	76,125	76,125	76,125	76,125	76,125
Oil/Gas Ste	0	14	14	12	12
New Comb	1,448	10,111	10,970	10,236	10,236
New Comb	0	25	31	25	25
Other	1,671	1,671	1,671	1,671	1,671
Conventior	*208,164*	*206,868*	*205,160*	*195,843*	*196,345*
Hydro	4,327	4,012	4,010	4,027	3,805
Solar	122	122	122	122	122
LBW	5,156	5,156	5,156	5,156	5,156
New Solar	122	363	527	690	800
New LBW	0	142	795	795	795
Offshore V	0	0	0	0	0
Other Ren	812	812	812	812	812
Renewable	*10,539*	*10,608*	*11,423*	*11,603*	*11,491*
Total	**218,704**	**217,476**	**216,583**	**207,446**	**207,836**

Net Generation (GWh) - Reference

Pennsylvania

	2020	2022	2025	2028	2030
Biomass	146	307	307	152	152
Coal	34,123	20,265	14,621	16,540	6,925
Combined	92,259	124,127	123,392	114,236	113,125
Combustic	304	1,359	2,562	1,141	1,348
Nuclear	76,125	76,125	76,125	76,125	76,109
Oil/Gas Ste	0	8	14	12	12
New Comb	1,448	10,970	10,970	10,970	10,970
New Comb	0	20	10	6	16
Other	1,671	1,671	1,671	1,671	1,671
Conventior	*206,077*	*234,853*	*229,672*	*220,854*	*210,328*
Hydro	4,292	4,130	3,991	3,939	3,816
Solar	122	122	122	122	122
LBW	5,156	5,156	5,156	5,156	5,156
New Solar	122	363	527	690	800
New LBW	0	142	795	795	795
Offshore V	0	0	0	0	0
Other Ren	812	812	812	812	812
Renewable	*10,505*	*10,726*	*11,404*	*11,516*	*11,502*
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 CO_2 allowances to account for their CO_2 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

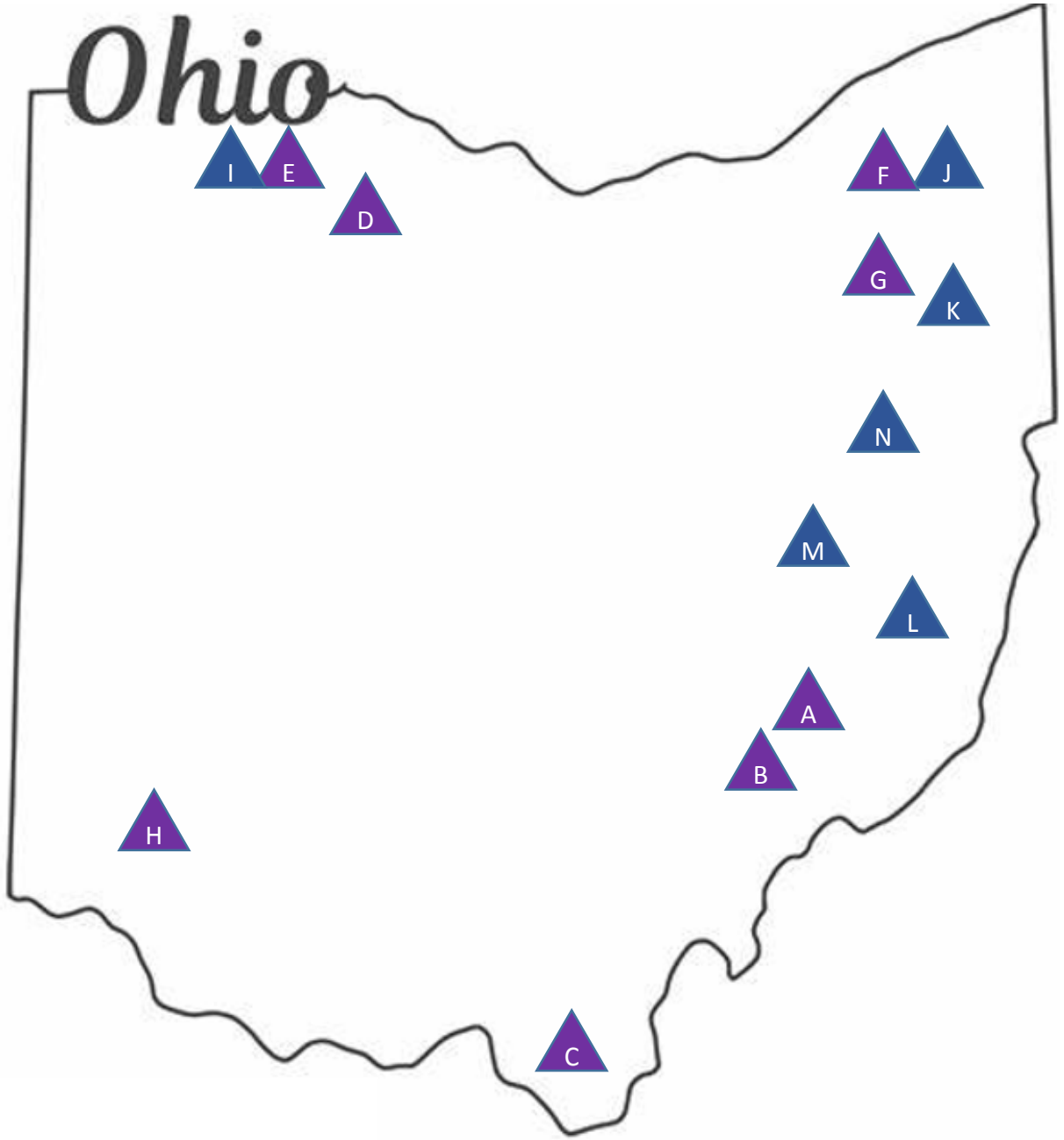
A) Washington Energy Facility (Beverly, OH), 715 MW
B) Waterford Plant (Waterford, OH), 921 MW
C) Hanging Rock Energy Facility (Ironton, OH), 1430 MW
D) Fremont Energy Center (Fremont, OH), 740 MW
E) Oregon Clean Energy Center (Oregon, OH), 1060 MW
F) Clean Energy Future Lordstown (Lordstown, OH), 962 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

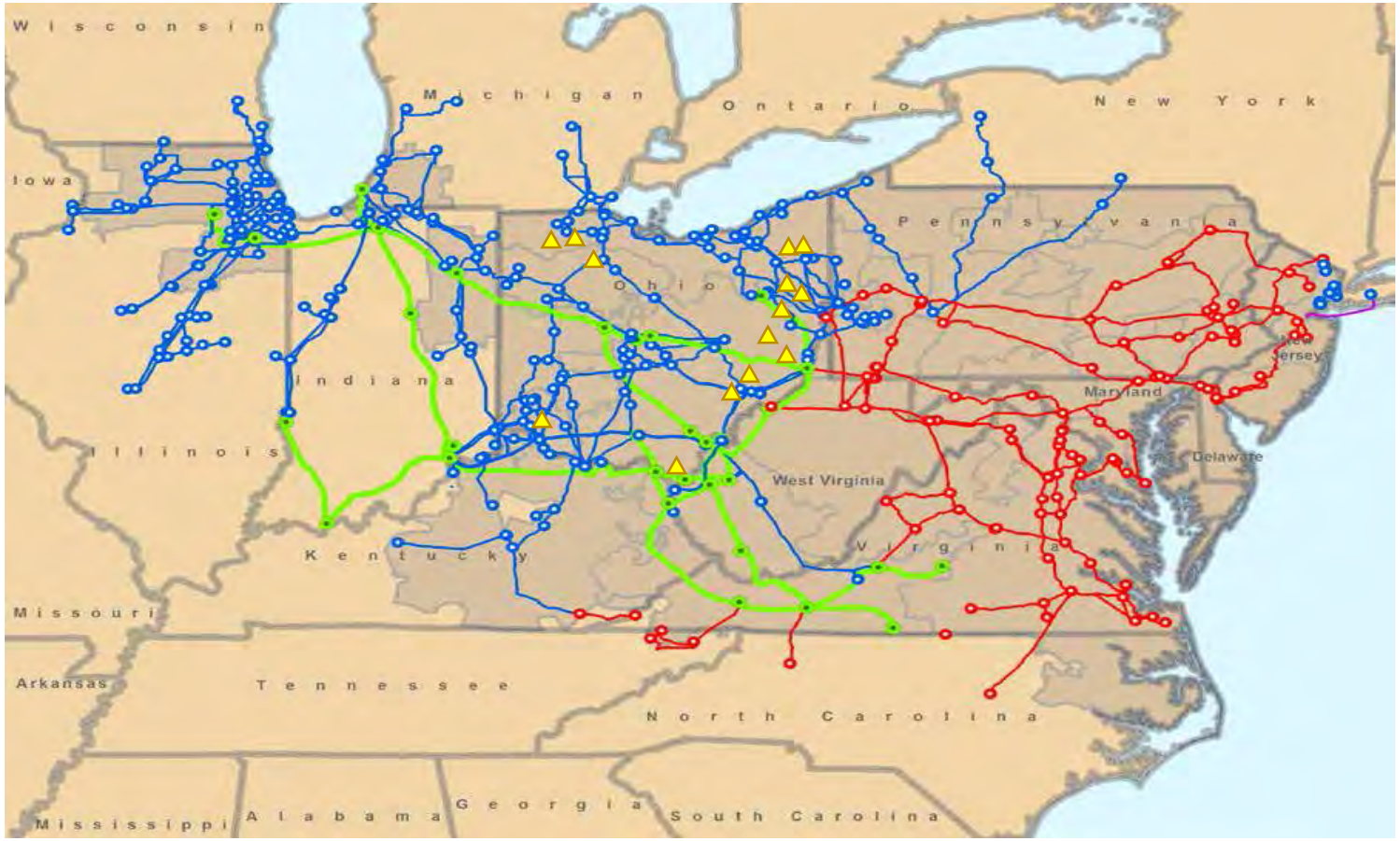
I) Oregon Energy Center (Oregon, OH), PTI issued March 2020, 955 MW net
J)Trumbull Energy Center (Lordstown, OH), PTI issued Feb 2020, 940 MW
K) South Field Energy (Wellsville, OH), PTI issued Sept 2016, 1150 MW – Broke Ground May 2019
L) Hannibal Port Power Station (Hannibal, OH), PTI issued Nov 2017
(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 CO_2 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 CO_2 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 CO_2, *But!!!*
either 33rd (lb/MMBtu) or 31st (lb/GMWh) in CO_2 intensity**.**

Without RGGI, PA EGUs have reduced CO_2 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 fator for 2019 coal-fired plants so replace installed capacity at a 1:1 ratio

8,025 MW/2.43 Mw/turbine = **3,302 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)

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

PA Senate Environmental Resources & Energy Hearing
June 23,2020

Vince Brisini, Olympus Power,LLC

Thank you for the opportunity to testify today.

ATTACHMENT 4

PA EGU Specific RRGI Allowance Price Adders

PA County	Facility Name	Facility ID (ORISPL)	Unit ID	Year	Gross Load (MW-h)	CO2 (short tons)	Heat Input (MMBtu)	Fuel Type (Primary)	RGGI Price Adder @$5.61/allowance ($/MWh net)	RGGI Price Adder @$6.67/allowance ($/MWh net)		RGGI Price Adder @$7.41/allowance ($/MWh net)				
Allegheny	Cheswick	8226	1	2019	914,138.2	1,019,075.5	10,010,738.8	Coal	$6.80	$8.08		$8.98		≥$6.00<$7.00		≥$8.00
Indiana	Homer City	3122	1	2019	2,487,061.3	2,526,819.1	24,627,891.8	Coal	$6.20	$7.37		$8.18				≥$7.00<$$8.00
Indiana	Homer City	3122	2	2019	1,914,388.4	1,984,088.5	19,338,078.7	Coal	$6.32	$7.51		$8.35				
Indiana	Homer City	3122	3	2019	3,142,920.6	3,151,883.6	30,720,107.5	Coal	$6.12	$7.27		$8.08				
Montour	Montour, LLC	3149	1	2019	445,268.2	440,498.2	4,293,340.5	Coal	$6.03	$7.17		$7.97				
					8,903,776.8	9,122,364.8	88,990,157.4		Tons CO2/net MWh	Tons CO2/net MWh	1.11364					
Beaver	Bruce Mansfield	6094	3	2019	834,305.9	864,496.4	8,425,913.0	Coal	$6.32	$7.51		$8.35				
					6,149,893.9	6,394,479.4	62,402,622.3									

Facility Name	Facility ID (ORISPL)	Unit ID	Year	Gross Load (MW-h)	CO2 (short tons)	Heat Input (MMBtu)	Fuel Type (Primary)	RGGI Price Adder @$5.61/allowance ($/MWh net)	RGGI Price Adder @$6.67/allowance ($/MWh net)		RGGI Price Adder @$6.87/allowance ($/MWh net)				
Allegheny	Brunot Island Power Station	3096	2A	2019	19,429.0	16,921.2	284,726.9	Pipeline Natural Gas	$5.20	$6.18		$6.87		≥$5.00<$6.00		
Delaware	Eddystone Generating Station	3161	3	2019	5,475.5	5,115.0	79,000.1	Pipeline Natural Gas	$5.58	$6.63		$7.36				
Delaware	Eddystone Generating Station	3161	4	2019	8,066.1	7,015.7	113,026.3	Pipeline Natural Gas	$5.19	$6.17		$6.86				
Northapmton	Portland	3113	5	2019	1,372.8	1,268.4	15,631.8	Pipeline Natural Gas	$5.51	$6.56		$7.28				
Warren	Warren	3132	5	2019	2,599.0	2,272.8	38,851.9	Pipeline Natural Gas	$5.22	$6.21		$6.89				
					36,942.4	32,593.2	531,237.0		Tons CO2/net MWh	Tons CO2/net MWh	0.93859					
Indiana	Conemaugh	3118	1	2019	5,807,857.5	5,694,467.8	55,580,417.4	Coal	$5.98	$7.11		$7.90				
Indiana	Conemaugh	3118	2	2019	6,004,753.7	5,764,801.9	56,233,721.3	Coal	$5.85	$6.96		$7.73				
Armstrong	Keystone	3136	1	2019	6,498,401.8	6,345,067.5	61,842,783.8	Coal	$5.95	$7.08		$7.86				
Armstrong	Keystone	3136	2	2019	5,377,298.3	5,181,173.0	50,498,750.4	Coal	$5.88	$6.99		$7.76				
Montour	Montour, LLC	3149	2	2019	762,060.8	710,178.0	6,921,808.8	Coal	$5.68	$6.76		$7.51				
					24,450,372.0	23,695,688.1	231,077,481.7		Tons CO2/net MWh	Tons CO2/net MWh	1.05341					
					24,487,314.3	23,728,281.2	231,608,718.7									

Facility Name	Facility ID (ORISPL)	Unit ID	Year	Gross Load (MW-h)	CO2 (short tons)	Heat Input (MMBtu)	Fuel Type (Primary)	RGGI Price Adder @$5.61/allowance ($/MWh net)	RGGI Price Adder @$6.67/allowance ($/MWh net)						
York	Brunner Island, LLC	3140	1	2019	678,641.2	538,727.3	6,909,032.0	Coal	$4.74	$5.63		$6.26		≥$4.00<$5.00		
York	Brunner Island, LLC	3140	2	2019	492,835.5	385,747.4	4,979,222.9	Coal	$4.67	$5.55		$6.17				
York	Brunner Island, LLC	3140	3	2019	1,734,126.8	1,445,273.2	16,727,508.9	Coal	$4.97	$5.91		$6.57				
Allegheny	Brunot Island Power Station	3096	2B	2019	19,008.8	15,115.8	254,349.2	Pipeline Natural Gas	$4.75	$5.64		$6.27				
Allegheny	Brunot Island Power Station	3096	3	2019	17,944.1	14,044.9	236,312.4	Pipeline Natural Gas	$4.67	$5.55		$6.17				
Philadelphia	Grays Ferry Cogen Partnership	54785	2	2019	789,466.4	586,669.4	9,871,839.3	Pipeline Natural Gas	$4.44	$5.27		$5.86				
Philadelphia	Grays Ferry Cogen Partnership	54785	25	2019	178,530.5	130,596.1	2,232,412.5	Pipeline Natural Gas	$4.37	$5.19		$5.77				
Venango	Handsome Lake Energy	55233	EU-1A	2019	13,991.6	10,133.9	171,790.6	Pipeline Natural Gas	$4.32	$5.14		$5.71				
Venango	Handsome Lake Energy	55233	EU-1B	2019	15,961.9	11,651.4	197,526.5	Pipeline Natural Gas	$4.36	$5.18		$5.75				
Venango	Handsome Lake Energy	55233	EU-2A	2019	8,460.8	6,190.0	104,956.6	Pipeline Natural Gas	$4.37	$5.19		$5.77				
Venango	Handsome Lake Energy	55233	EU-2B	2019	8,490.9	6,212.8	105,346.1	Pipeline Natural Gas	$4.37	$5.19		$5.77				
Venango	Handsome Lake Energy	55233	EU-3A	2019	7,927.5	5,797.0	98,255.6	Pipeline Natural Gas	$4.36	$5.19		$5.76				
Venango	Handsome Lake Energy	55233	EU-3B	2019	7,841.1	5,734.9	97,201.4	Pipeline Natural Gas	$4.37	$5.19		$5.77				
Venango	Handsome Lake Energy	55233	EU-4A	2019	8,972.7	6,587.4	111,676.6	Pipeline Natural Gas	$4.38	$5.21		$5.79				
Venango	Handsome Lake Energy	55233	EU-4B	2019	7,635.2	5,557.7	94,218.0	Pipeline Natural Gas	$4.34	$5.17		$5.74				
Venango	Handsome Lake Energy	55233	EU-5A	2019	14,878.3	10,769.5	182,621.4	Pipeline Natural Gas	$4.32	$5.14		$5.71				
Venango	Handsome Lake Energy	55233	EU-5B	2019	16,823.3	12,266.0	207,983.3	Pipeline Natural Gas	$4.35	$5.17		$5.75				
Luzerne	Hazleton Generation	10870	TURB2	2019	3,512.8	2,583.7	43,271.6	Pipeline Natural Gas	$4.39	$5.22		$5.80				
Luzerne	Hazleton Generation	10870	TURB3	2019	3,921.5	2,690.0	45,114.6	Pipeline Natural Gas	$4.09	$4.87		$5.41				
Luzerne	Hazleton Generation	10870	TURB4	2019	3,760.5	2,680.7	43,004.2	Pipeline Natural Gas	$4.25	$5.06		$5.62				
Luzerne	Hazleton Generation	10870	TURBIN	2019	3,679.2	2,980.9	49,352.3	Pipeline Natural Gas	$4.84	$5.75		$6.39				
Northampton	Martins Creek, LLC	3148	4	2019	145,726.0	98,400.1	1,642,559.0	Residual Oil see below	$4.03	$4.79		$5.32				
Clearfield	Shawville	3131	1	2019	49,799.1	33,850.0	569,572.6	Pipeline Natural Gas	$4.06	$4.82		$5.36				
Clearfield	Shawville	3131	2	2019	63,772.1	43,300.2	728,593.8	Pipeline Natural Gas	$4.05	$4.82		$5.35				
Philadelphia	Veolia Energy Philadelphia - Schuylkill	50607	26	2019	83,552.5	58,653.9	1,002,630.3	Pipeline Natural Gas	$4.19	$4.98		$5.53				
Philadelphia	Veolia Energy Philadelphia - Schuylkill	50607	RSB1	2019	22,423.4	15,741.2	269,080.9	Pipeline Natural Gas	$4.19	$4.98		$5.53				
Philadelphia	Veolia Energy Philadelphia - Schuylkill	50607	RSB2	2019	21,738.3	15,260.3	260,860.1	Pipeline Natural Gas	$4.19	$4.98		$5.53				
					4,423,421.8	3,473,215.8	47,236,292.7		Tons CO2/net MWh	Tons CO2/net MWh	0.83531					

Facility Name	Facility ID (ORISPL)	Unit ID	Year	Gross Load (MW-h)	CO2 (short tons)	Heat Input (MMBtu)	Fuel Type (Primary)	RGGI Price Adder @$5.61/allowance ($/MWh net)	RGGI Price Adder @$6.67/allowance ($/MWh net)						
Amstrong	Armstrong Power, LLC	55347	1	2019	202,253.1	121,926.5	2,048,153.0	Pipeline Natural Gas	$3.60	$4.28		$4.75		≥$3.50<$4.00		
Amstrong	Armstrong Power, LLC	55347	2	2019	258,509.4	157,715.1	2,647,934.6	Pipeline Natural Gas	$3.64	$4.33		$4.81				
Amstrong	Armstrong Power, LLC	55347	3	2019	212,112.2	131,284.4	2,195,026.0	Pipeline Natural Gas	$3.69	$4.39		$4.88				
Amstrong	Armstrong Power, LLC	55347	4	2019	161,535.2	100,190.2	1,675,606.7	Pipeline Natural Gas	$3.70	$4.40		$4.89				
Franklin	Chambersburg Units 12 & 13	55654	12	2019	111,733.4	65,646.6	1,104,628.0	Pipeline Natural Gas	$3.51	$4.17		$4.63				
Franklin	Chambersburg Units 12 & 13	55654	13	2019	116,680.7	70,959.7	1,194,008.4	Pipeline Natural Gas	$3.63	$4.32		$4.79				
Fayette	Gans Generating Facility	55377	8	2019	81,910.3	50,423.0	848,457.5	Pipeline Natural Gas	$3.67	$4.37		$4.85				
Fayette	Gans Generating Facility	55377	9	2019	83,186.5	49,776.6	837,556.3	Pipeline Natural Gas	$3.57	$4.25		$4.72				
Lebanon	Helix Ironwood LLC	55337	1	2019	1,692,362.1	1,089,754.0	18,337,205.2	Pipeline Natural Gas	$3.84	$4.57		$5.08				
Lebanon	Helix Ironwood LLC	55337	2	2019	1,603,605.9	1,041,455.4	17,524,534.1	Pipeline Natural Gas	$3.88	$4.61		$5.12				
Adams	Hunterstown Combined Cycle	55976	CT101	2019	1,300,553.8	821,680.8	13,826,378.6	Pipeline Natural Gas	$3.77	$4.48		$4.98				
Adams	Hunterstown Combined Cycle	55976	CT201	2019	1,282,532.5	812,169.0	13,666,268.0	Pipeline Natural Gas	$3.78	$4.49		$4.99				
Adams	Hunterstown Combined Cycle	55976	CT301	2019	1,294,371.9	828,499.1	13,941,064.5	Pipeline Natural Gas	$3.82	$4.54		$5.05				
Delaware	Liberty Electric Power Plant	55231	1	2019	1,275,370.6	850,983.5	14,319,537.8	Pipeline Natural Gas	$3.98	$4.73		$5.26				
Delaware	Liberty Electric Power Plant	55231	2	2019	1,281,133.1	853,069.4	14,354,592.7	Pipeline Natural Gas	$3.97	$4.72		$5.25				
Delaware	Marcus Hook 50, L.P.	50074	1	2019	993.7	638.0	10,905.8	Pipeline Natural Gas	$3.83	$4.56		$5.06				
Northampton	Martins Creek, LLC	3148	3	2019	328,939.6	209,337.4	3,515,350.2	Residual Oil see below	$3.80	$4.52		$5.02				
Lawrence	New Castle	3138	3	2019	108,315.5	69,001.8	1,161,090.8	Pipeline Natural Gas	$3.80	$4.52		$5.02				
Lawrence	New Castle	3138	4	2019	115,887.0	76,141.1	1,281,214.0	Pipeline Natural Gas	$3.92	$4.66		$5.18				
Lawrence	New Castle	3138	5	2019	151,452.9	95,694.3	1,610,211.3	Pipeline Natural Gas	$3.77	$4.48		$4.98				
Lackawanna	PEI Power Corporation	50279	2	2019	51,249.3	30,861.5	519,308.9	Pipeline Natural Gas	$3.59	$4.27		$4.75				
Clearfield	Shawville	3131	3	2019	102,531.2	64,033.2	1,077,474.9	Pipeline Natural Gas	$3.73	$4.43		$4.92				
Clearfield	Shawville	3131	4	2019	98,030.3	60,838.7	1,023,730.2	Pipeline Natural Gas	$3.70	$4.40		$4.89				
Allegheny	Springdale Generating Station (55196)	55196	1	2019	62,691.5	37,346.5	628,458.5	Pipeline Natural Gas	$3.56	$4.23		$4.70				
Allegheny	Springdale Generating Station (55196)	55196	2	2019	62,537.2	36,867.0	620,349.8	Pipeline Natural Gas	$3.52	$4.18		$4.65				
Allegheny	Springdale Generating Station (55710)	55710	4	2019	1,497,317.1	879,523.5	14,799,651.5	Pipeline Natural Gas	$3.51	$4.17		$4.63				
					13,537,795.6	8,605,816.4	144,768,697.2		Tons CO2/net MWh	Tons CO2/net MWh	0.67626					

Facility Name	Facility ID (ORISPL)	Unit ID	Year	Gross Load (MW-h)	CO2 (short tons)	Heat Input (MMBtu)	Fuel Type (Primary)	RGGI Price Adder @$5.61/allowance ($/MWh net)	RGGI Price Adder @$6.67/allowance ($/MWh net)						
Luzerne	Hunlock Unit 4	56397	4	2019	20,257.3	11,211.2	188,643.7	Pipeline Natural Gas	$3.30	$3.93		$4.36		≥$3.00 <$3.50		
Allegheny	Springdale Generating Station (55710)	55710	3	2019	1,457,685.6	846,066.7	14,236,725.0	Pipeline Natural Gas	$3.46	$4.12		$4.58				
York	York Energy Center	55524	5	2019	1,321,854.1	735,866.0	12,377,774.5	Pipeline Natural Gas	$3.32	$3.95		$4.39				
York	York Energy Center	55524	6	2019	1,271,479.6	709,111.9	11,905,283.2	Pipeline Natural Gas	$3.33	$3.96		$4.40				
					4,071,276.6	2,302,255.9	38,708,426.4		Tons CO2/net MWh	Tons CO2/net MWh	0.60158					

Facility Name	Facility ID (ORISPL)	Unit ID	Year	Gross Load (MW-h)	CO2 (short tons)	Heat Input (MMBtu)	Fuel Type (Primary)	RGGI Price Adder @$5.61/allowance ($/MWh net)	RGGI Price Adder @$6.67/allowance ($/MWh net)						
Northampton	Bethlehem Power Plant	55690	1	2019	841,153.2	397,567.8	6,689,865.8	Pipeline Natural Gas	$2.82	$3.35		$3.73		≥$2.50 <$3.00		
Northampton	Bethlehem Power Plant	55690	2	2019	806,923.5	381,444.8	6,418,283.9	Pipeline Natural Gas	$2.82	$3.35		$3.73				
Northampton	Bethlehem Power Plant	55690	3	2019	841,768.0	411,705.8	6,927,558.3	Pipeline Natural Gas	$2.92	$3.47		$3.86				
Northampton	Bethlehem Power Plant	55690	5	2019	689,300.5	323,206.7	5,428,503.6	Pipeline Natural Gas	$2.80	$3.33		$3.70				
Northampton	Bethlehem Power Plant	55690	6	2019	791,980.6	390,236.5	6,554,941.1	Pipeline Natural Gas	$2.94	$3.50		$3.88				
Northampton	Bethlehem Power Plant	55690	7	2019	753,863.7	376,217.9	6,319,410.5	Pipeline Natural Gas	$2.98	$3.54		$3.93				
Luzerene	Hunlock Creek Energy Center	3176	CT5	2019	58,332.4	27,299.8	459,359.3	Pipeline Natural Gas	$2.79	$3.32		$3.69				
Luzerene	Hunlock Creek Energy Center	3176	CT6	2019	58,537.8	27,789.9	467,629.2	Pipeline Natural Gas	$2.83	$3.37		$3.74				
Northampton	Lower Mount Bethel Energy, LLC	55667	CT01	2019	1,270,993.2	533,469.3	8,976,659.0	Pipeline Natural Gas	$2.50	$2.98		$3.31				
Northampton	Lower Mount Bethel Energy, LLC	55667	CT02	2019	1,209,803.5	506,026.5	8,514,821.4	Pipeline Natural Gas	$2.50	$2.97		$3.30				
					7,322,656.4	3,374,965.0	56,757,032.2		Tons CO2/net MWh	Tons CO2/net MWh	0.49031					

Facility Name	Facility ID (ORISPL)	Unit ID	Year	Gross Load (MW-h)	CO2 (short tons)	Heat Input (MMBtu)	Fuel Type (Primary)	RGGI Price Adder @$5.61/allowance ($/MWh net)	RGGI Price Adder @$6.67/allowance ($/MWh net)						
Berks	Birdsboro Power	61035	1	2019	2,023,515.1	788,391.6	13,266,210.9	Pipeline Natural Gas	$2.33	$2.76		$3.07		<$2.50		
Cambria	CPV Fairview, LLC	60589	CT-1	2019	188,670.7	74,138.1	1,247,527.9	Natural Gas	$2.35	$2.79		$3.10				
Cambria	CPV Fairview, LLC	60589	CT-2	2019	168,542.5	66,310.0	1,115,804.0	Natural Gas	$2.35	$2.79		$3.10				
Fayette	Dynegy Fayette II, LLC	55516	CTG1	2019	2,594,991.6	1,073,663.3	18,066,514.4	Pipeline Natural Gas	$2.47	$2.94		$3.26				

Fayette	Dynegy Fayette II, LLC	55516	CTG2	2019	2,578,149.4	1,045,407.8	17,591,002.8	Pipeline Natural Gas	$2.42	$2.88		$3.20				
Bucks	Fairless Energy Center	55298	1A	2019	1,974,988.6	758,048.8	12,755,644.3	Pipeline Natural Gas	$2.29	$2.72		$3.03				
Bucks	Fairless Energy Center	55298	1B	2019	1,627,335.6	649,653.9	10,931,687.2	Pipeline Natural Gas	$2.38	$2.83		$3.15				
Bucks	Fairless Energy Center	55298	2A	2019	1,805,526.9	715,680.2	12,042,748.8	Pipeline Natural Gas	$2.37	$2.81		$3.12				
Bucks	Fairless Energy Center	55298	2B	2019	1,848,126.2	754,742.5	12,700,031.5	Pipeline Natural Gas	$2.44	$2.90		$3.22				
Lackawanna	Lackawanna Energy Center	60357	1	2019	3,643,998.2	1,402,229.8	23,595,242.8	Pipeline Natural Gas	$2.30	$2.73		$3.03				
Lackawanna	Lackawanna Energy Center	60357	2	2019	3,539,453.8	1,360,764.4	22,897,481.5	Pipeline Natural Gas	$2.29	$2.73		$3.03				
Lackawanna	Lackawanna Energy Center	60357	3	2019	3,199,758.2	1,229,040.5	20,680,958.7	Pipeline Natural Gas	$2.29	$2.73		$3.03				
Delaware	Marcus Hook Energy, LP	55801	1	2019	1,471,098.2	608,442.0	10,238,242.7	Pipeline Natural Gas	$2.47	$2.93		$3.26				
Delware	Marcus Hook Energy, LP	55801	2	2019	1,553,064.7	641,536.1	10,795,138.7	Pipeline Natural Gas	$2.47	$2.93		$3.26				
Delaware	Marcus Hook Energy, LP	55801	3	2019	1,551,456.2	629,971.7	10,600,471.9	Pipeline Natural Gas	$2.42	$2.88		$3.20				
Luzerene	Moxie Freedom Generation Plant	59906	201	2019	3,661,674.5	1,426,988.2	24,011,754.7	Pipeline Natural Gas	$2.33	$2.77		$3.07				
Luzerene	Moxie Freedom Generation Plant	59906	202	2019	3,388,537.3	1,322,544.2	22,254,351.8	Pipeline Natural Gas	$2.33	$2.77		$3.08				
Berks	Ontelaunee Energy Center	55193	CT1	2019	2,062,194.0	854,670.2	14,381,258.9	Pipeline Natural Gas	$2.47	$2.94		$3.27				
Berks	Ontelaunee Energy Center	55193	CT2	2019	1,904,201.2	788,062.7	13,260,642.6	Pipeline Natural Gas	$2.47	$2.94		$3.26				
Snyder	Panda Hummel Station	60368	CT1	2019	2,122,264.2	880,176.0	14,810,695.0	Pipeline Natural Gas	$2.48	$2.94		$3.27				
Snyder	Panda Hummel Station	60368	CT2	2019	1,961,630.8	814,100.7	13,698,778.9	Pipeline Natural Gas	$2.48	$2.94		$3.27				
Snyder	Panda Hummel Station	60368	CT3	2019	1,642,061.9	669,198.4	11,260,543.3	Pipeline Natural Gas	$2.43	$2.89		$3.21				
Bradford	Panda Liberty Power Project	58420	CT1	2019	2,658,228.0	1,064,595.7	17,913,852.2	Pipeline Natural Gas	$2.39	$2.84		$3.16				
Bradford	Panda Liberty Power Project	58420	CT2	2019	2,405,110.8	965,642.1	16,248,732.2	Pipeline Natural Gas	$2.40	$2.85		$3.16				
Lycoming	Panda Patriot Generation Plant	58426	CT1	2019	2,053,884.5	809,399.3	13,619,767.4	Pipeline Natural Gas	$2.35	$2.80		$3.11				
Lycoming	Panda Patriot Generation Plant	58426	CT2	2019	1,965,537.4	772,174.2	12,993,261.7	Pipeline Natural Gas	$2.34	$2.79		$3.10				
Westmoreland	Tenaska Westmoreland Generating Station	60464	101	2019	2,489,694.2	1,023,716.4	17,226,041.7	Pipeline Natural Gas	$2.45	$2.92		$3.24				
Westmoreland	Tenaska Westmoreland Generating Station	60464	102	2019	2,798,989.8	1,148,532.7	19,326,270.1	Pipeline Natural Gas	$2.45	$2.91		$3.23				
					60,882,684.2	24,337,821.3	409,530,658.4			Tons CO2/net MWh	0.42527					