



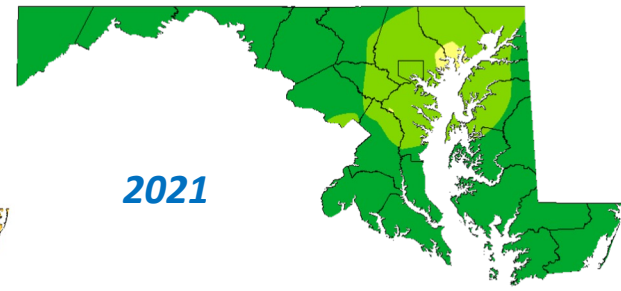
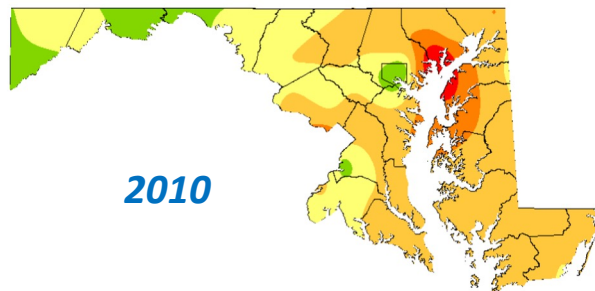
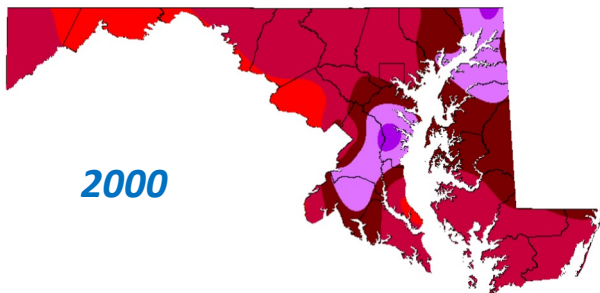
Maryland
Department of
the Environment

The Final Sprint

(In a 400 Mile – 40 Year - Ozone Marathon)

**Maryland's Peak Day Partnership Program and
Other Nontraditional Efforts to Achieve Attainment**

Maryland's "Shrinking Ozone" Success Story



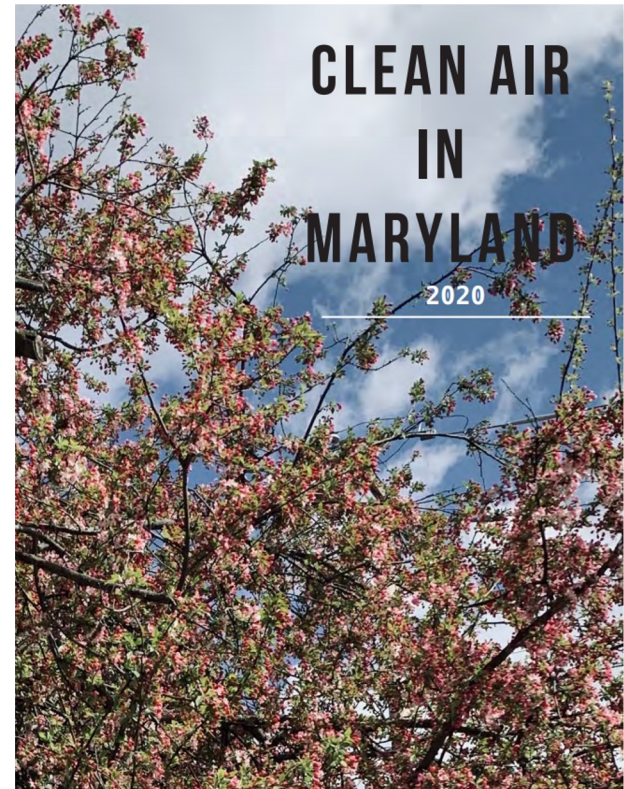
NACAA Fall Membership Meeting – October 19, 2022

Tad Aburn, Air and Radiation Administration



Overview of Presentation

- Background: Air Quality in Maryland – Our struggles with PM fine and ground level ozone
- Maryland’s strategy – The science that helped drive clean air progress
- Fighting the weather – Recognizing the need for extra effort on the worst ... or peak ... ozone days
- The Peak Day Partnership Program and other peak day initiatives



mde.maryland.gov/programs/Air/Pages/index.aspx



Background



MD Air Pollution History

- **The Ugly:** From 1940 to 1970, you could see, smell, and taste the air pollution. Across the country, there were air pollution emergencies in areas like Denora, PA.
- **The Bad:** In 2005, MD was identified by the Massachusetts Institute of Technology (MIT) as having some of the riskiest air to breathe on the East Coast. In 2008, EPA designates Baltimore as the worst ozone area outside of California and Texas.
- **The Good:** From 2010 to 2021, MD was in attainment for all standards except ozone. In 2022, Maryland for the first time ever is measuring attainment for all NAAQS across the State!





Ozone Policy Drivers
The Science/Conceptual Model

Maryland's Ozone Research Effort

- MDE works in partnership with local universities and other researchers (UMD, UMBC, GWU, Penn State and Howard University, NASA, NOAA, NIST) to study air pollution issues in Maryland and the Mid-Atlantic
 - Airplanes
 - Balloons
 - Lidar
 - Profilers
 - Satellites
 - Special monitors
 - Modeling ... More
- The focus of this research has been to provide policy relevant findings related to air pollution transport



Ozonesonde Measurements



Upper-Air Radar Wind Profiler & RASS (MDE)

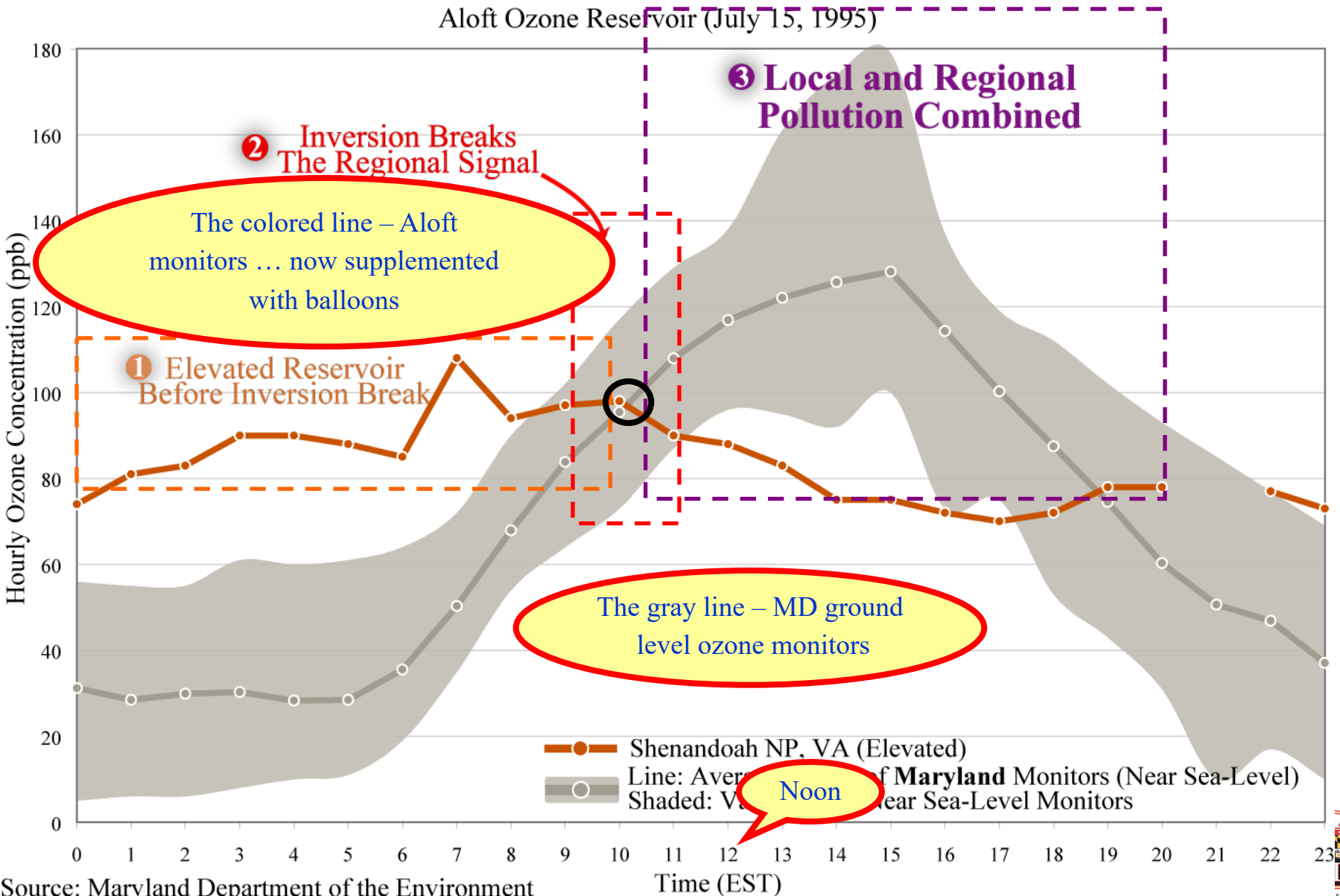




So How is Ozone Formed in Maryland – Our Conceptual Model

- Based upon almost 30 years of research ... on a very complicated process ... our conceptual model ended up being pretty simple
- There are two general drivers of high ozone in Maryland (and much of the East)
 - Widespread (as far away as Ohio, or Indiana) regional sources and background create about 70% of the ozone measured in Maryland on bad ozone days
 - Local sources (bigger than just nonattainment areas) create about 30% of the high ozone
- Reducing regional NO_x is key ... we know it works
 - Reducing VOC emissions helps a little but not without the NO_x reductions

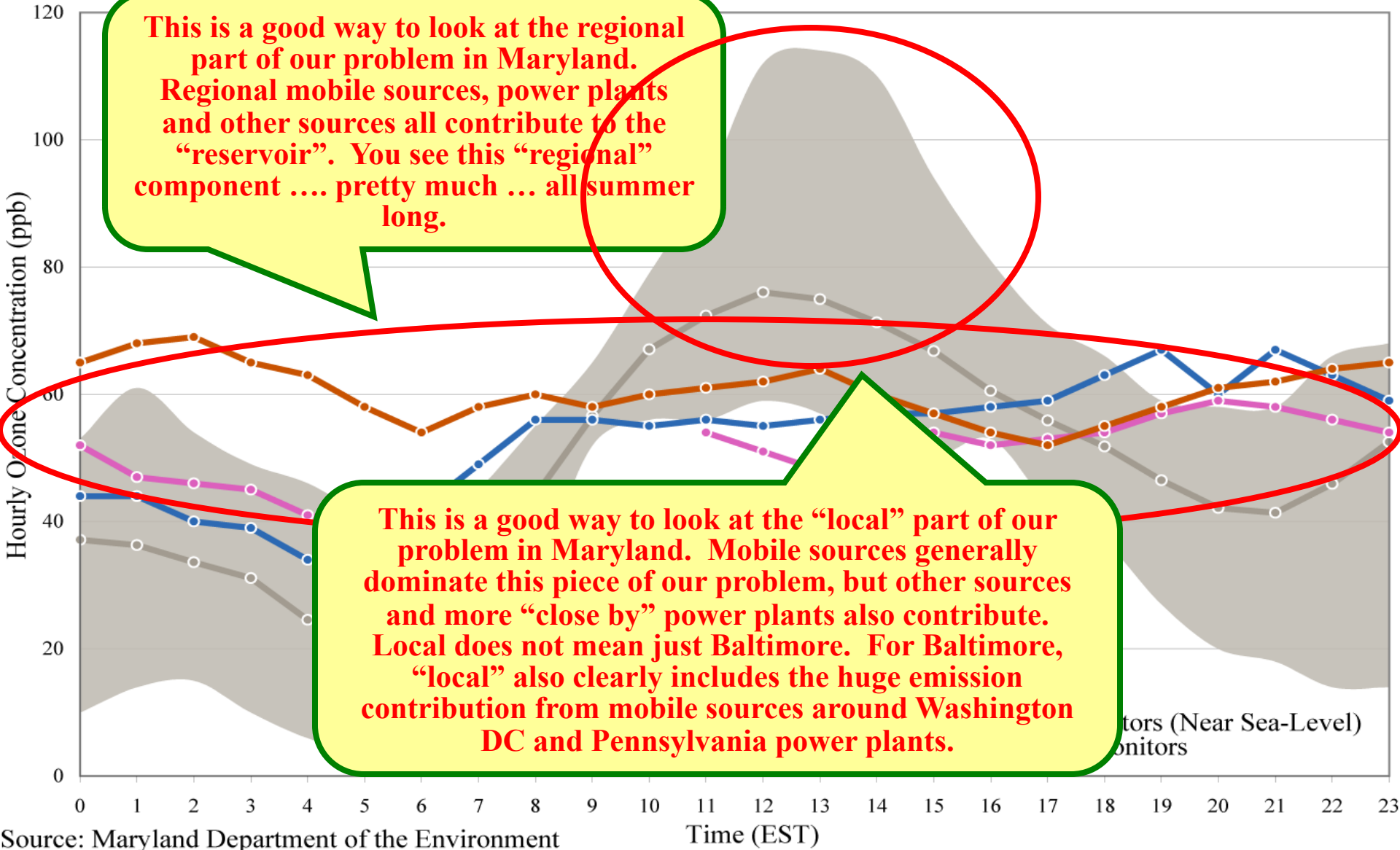
Understanding the Regional and Local Contributions to MD Ozone





Regional Versus Local – MD - 2011

Aloft Ozone Reservoir (June 1, 2011)

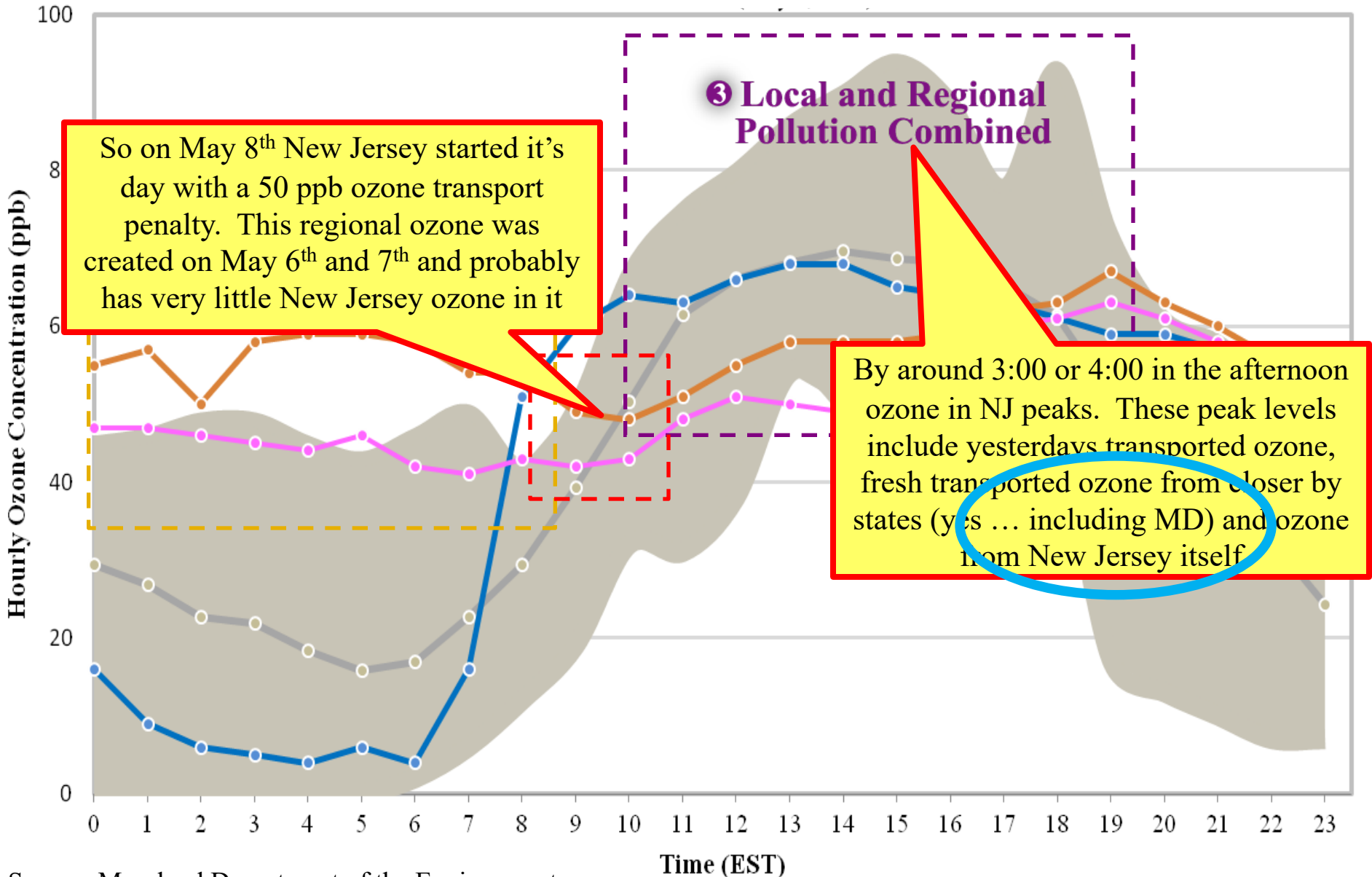


Source: Maryland Department of the Environment



Regional Versus Local – NJ - 2015

Aloft Ozone Reservoir (May 8, 2015)



A bright sun is positioned in the upper right quadrant of the image, casting a strong glow and creating a lens flare effect. The sky is a deep, clear blue, and several large, fluffy white cumulus clouds are scattered across the scene, particularly in the middle and lower portions. The overall atmosphere is bright and clear.

The Peak Day Partnership Program



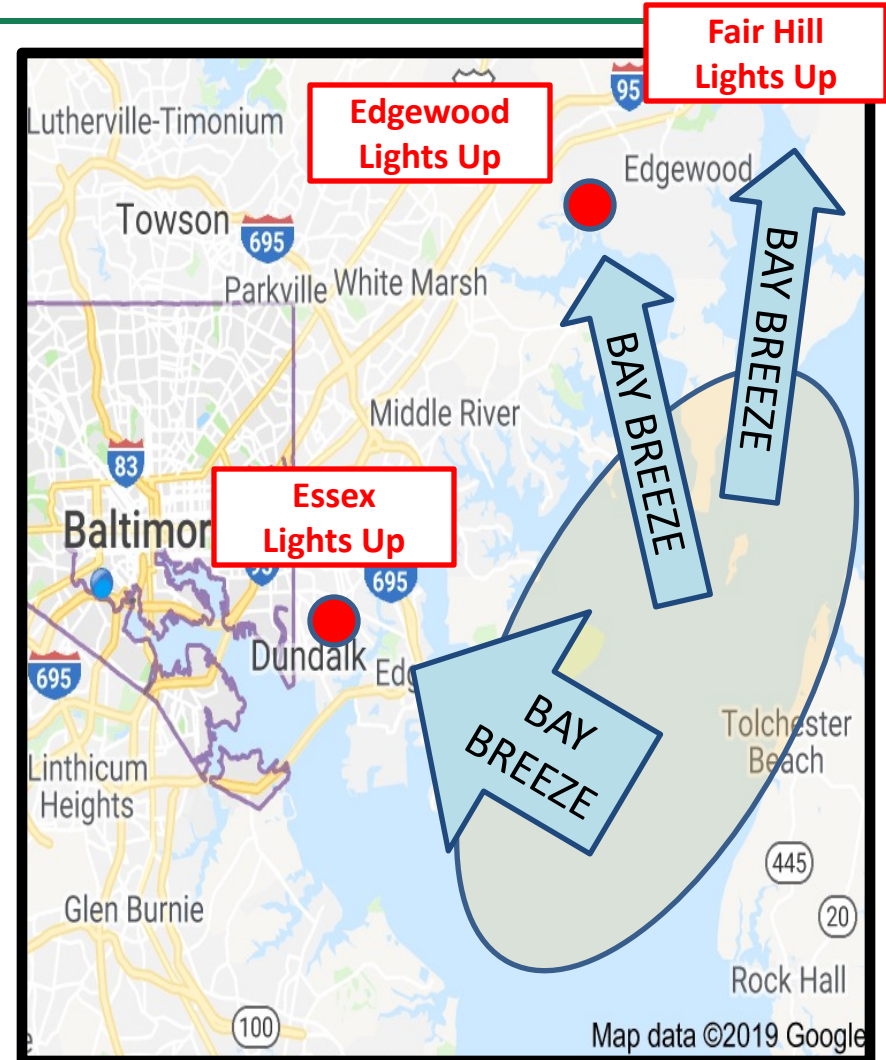
Why Peak Ozone Days?

- Four key reasons:
 - As the big reductions from regional NO_x controls get harder to find ... every fraction of a ppb we can reduce is important
 - Public health risks from ozone are highest on the worst days
 - The monitoring attainment test focuses on peak ozone days
 - We get to attainment if the 3-year average of the 4th highest level at individual monitors ... during three consecutive years ... is below 70 ppb
 - A meteorology and emissions perfect storm
 - Peak days for ozone happen when the weather is hot
 - When it's hot ... energy units run the most ... clean and less clean units
- Shaving the ozone peaks will reduce risk, help us towards attainment and reduce future regulatory burden on the energy sector



Our Theory for How High Ozone Days are Often Created in MD

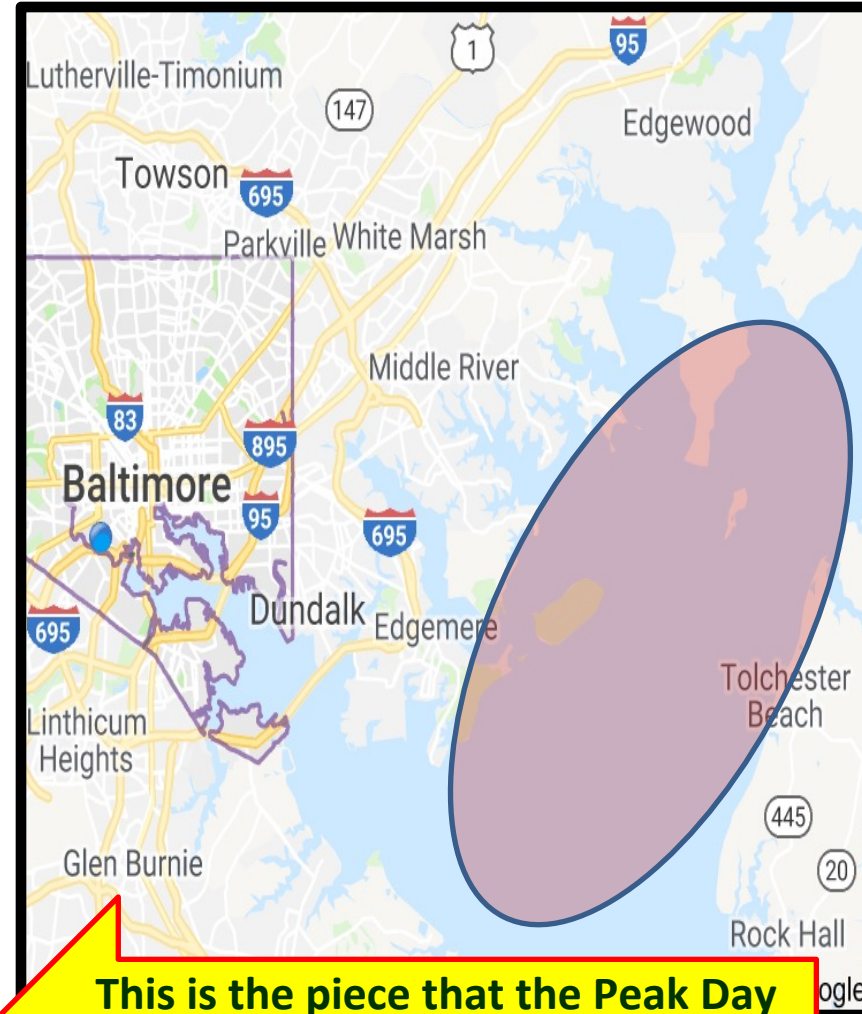
- Linked to our “OWLETS” research on the “Land-Water Interface”
 - Why are highest levels of ozone often right near the Bay ... close to water?
- The theory
 1. Ozone builds up over the Bay
 - Transport plays a role ... mobile plays a role ... but
 - How significant are stationary sources that may emit at higher levels on real hot days
 2. In the afternoon, Bay breezes push pollution over the Bay to the west, north, northwest or southwest
 3. Monitors directly downwind of Bay breeze record highest daily ozone





So Where Does the High Ozone Over the Bay Come From?

- We believe there are four major contributing emission sectors to the high ozone we measure over the Bay
 - Some research ... some expert judgment
- The four most likely contributors:
 - Longer distance transport ... probably about half
 - Cars and trucks - VA and MD - I-95 corridor - probably about a third
 - Big and small boats - maybe up to a quarter
 - Close-by High Electricity Demand Day (HEDD) Energy Units - Maybe 1/4



This is the piece that the Peak Day Partnership Program Focuses on



The Peak Day Partnership Program ... in Four Simple Steps

1. We forecast that bad ozone is expected in MD
 - Ozone forecasting begins mid-April and ends late-September
2. We send partners notices:
 - Multi-day advance warning notice when we can
 - Call To Action Notice for next day
3. We ask Partners do what they can... extra action... that is reasonable... to help reduce nitrogen oxide (NO_x) emissions on a few days each summer... send operational data to MDE
4. We attain the standard
 - Less risk to the public health
 - Less regulatory burden on partners



Sample Email Notices

Peak Ozone Day Reduction Partnership Program Multi-Day Advance Notice

High Ozone Expected Soon!

Thank you for your participation in MDE's 2020 Peak Ozone Day Reduction Partnership Program designed to reduce nitrogen oxide (NOx) emissions and lower ozone levels on peak ozone days.

Forecast conditions indicate rising ozone concentrations are expected to develop and an ozone air quality exceedance may occur in Maryland on [insert day, date]. Advance forecasts generally provide a good indication that an air quality exceedance may occur. 3-day public forecasts can be found on the MDE website at:

<http://mde.maryland.gov/programs/Air/AirQualityMonitoring/Pages/index.aspx>

As part of this program, please begin thinking about implementing the measures described below to minimize emissions ***on and before*** the forecast exceedance day.

Please optimize current NOx emission control technologies to minimize NOx emissions and make all other reasonable efforts to reduce NOx emissions. If feasible, do not run units during peak ozone days or switch to cleaner units.

For your units subject to the emission reduction optimization requirements of COMAR 26.11.38.03A(2), please make all reasonable efforts to run at rates that are at or below the indicator rates listed at COMAR 26.11.38.05A(2).

For Curtailment Service Providers (CSPs), do not advise clients to test or operate on-site generators, unless there is a true energy emergency. Advise clients to take any other reasonable actions that can be performed to reduce NOx emissions.

MDE will issue a Call to Action if the forecast continues to indicate that an air quality exceedance is likely to occur. **Any additional efforts to minimize TOTAL NOx emissions prior to the anticipated exceedance day would be greatly appreciated.**

If you have any questions about the Peak Ozone Day Reduction Partnership Program contact Randy Mosier at 410-537-4219 or randy.mosier@maryland.gov.

Please do not respond directly to this e-mail. The originating e-mail account is not monitored.

Peak Ozone Day Reduction Program Call-to-Action Notice

Curtail NOx Emissions Tomorrow if Possible!

Thank you for your participation in MDE's 2020 Peak Ozone Day Reduction Partnership Program designed to reduce nitrogen oxide (NOx) emissions and lower ozone levels on peak ozone days.

An ozone air quality exceedance day is forecast to occur in Maryland tomorrow, [insert day, date]. As requested, MDE is asking you to take all reasonable steps to minimize NOx emissions. Taking actions to minimize NOx emissions the day before and the day of a predicted ozone exceedance helps to reduce the possibility of poor air quality occurring in the region.

At a minimum, MDE is asking you to consider implementing the measures described below:

Please optimize current NOx emission control technologies to minimize NOx emissions and make all other reasonable efforts to reduce NOx emissions. If feasible, do not run units during peak ozone days or switch to cleaner units.

For your units subject to the emission reduction optimization requirements of COMAR 26.11.38.03A(2), please make all reasonable efforts to run at rates that are at or below the indicator rates listed at COMAR 26.11.38.05A(2).

For Curtailment Service Providers (CSPs), do not advise clients to test or operate on-site generators, unless there is a true energy emergency. Advise clients to take any other reasonable actions that can be performed to reduce NOx emissions.

Any efforts to minimize **TOTAL** NOx emissions would be greatly appreciated.

MDE kindly requests a summary report in Excel format the day following each Call to Action. In the report, please submit the hourly operating data for each Call to Action Day including: hourly averages of NOx Rate, MWg generated (as applicable), Heat Input (MMBTU), and urea injection rate (as applicable). Please also provide the daily NOx tons emitted. Note any special actions taken to minimize NOx emissions and note any malfunctions impacting NOx emissions during Call to Action days. If possible, include the anticipated reduction in NOx emissions attributable to actions taken. For CSPs, please indicate that clients were not called to test or operate on-site generators. If on-site generators operated, provide reason, hours of operation and the tons of NOx generated during the event

Information may be sent to Susan Nash at susan.nash@maryland.gov.

If you have any questions about the Peak Ozone Day Reduction Partnership Program contact Randy Mosier, MDE 410-537-4219 or randy.mosier@maryland.gov.



MDE's Ask of Partners

- Our basic ask: Continue to do everything you can to minimize NOx emissions on the day of ... and the days leading up to ... forecasted ozone exceedances
- Our simple specific asks:
 - For units subject to the emission reduction optimization requirements of COMAR 26.11.38.03A(2) ... please make all reasonable efforts to run at rates that are at or below the indicator rates listed at 26.11.38.05A(2)
 - If your regulatory daily limit is 0.08 LB/MMBtu ... Try and get to 0.04 or 0.05
 - For Municipal Waste Combustors (MWC), optimize the use of your current control technologies to minimize NOx emissions and make all other reasonable efforts to reduce NOx emissions
 - For other units that are not subject to COMAR 26.11.38, MDE asks that they not operate or limit their operating time, and make all reasonable efforts to minimize NOx emissions if required by PJM to operate
 - Report to MDE after each call-to-action notice



Curtailment Service Providers

- Our basic ask: Do everything you can to minimize NOx emissions from your clients on the day of... and the days leading up to... forecasted ozone exceedances
- MDE ask for CSPs:
 - Do not advise clients to perform any type of testing for on-site generators
 - Do not advise clients to operate on-site generators
 - Unless there is a true energy emergency
 - Advise clients to take any other reasonable actions that can be performed to reduce NOx emissions
 - Report to MDE after each call-to-action notice



Data We Collect from Sources After Each Call-To-Action Notice

Day After Reporting from Partners

- Work with your MDE contact - Data in EXCEL spreadsheet form including hours operated, hourly averages for the forecast day of NO_x Rate, MWg generated and Heat Input (MMBTU), and urea injection rate as applicable
- Include any notes - malfunctions, extra things done to minimize NO_x, avoided NO_x emissions, etc.
- Include the tons of NO_x generated during the event
- For CSPs, please indicate that clients were not called to test or operate on-site generators
 - If on-site generators operated, provide reason, hours of operation and the tons of NO_x generated during the event
- MDE will monitor PJM actions via PJM web site





Traditional Units in the Peak Day Program

Unit	COMAR 26.11.38 (MDs Optimization Reg)	MWC	Other Unit
E	×		
C	×		
Chalk Point Unit GT2			
H			
H			×
N	×		
Morgantown GT3, GT4, GT5, and GT6			×
Perryman CT1, CT3 and CT4			×
Vienna 8			×
Montgomery County RRF		×	
Wheelabrator Baltimore, LP		×	

**Already retired
or soon to retire**

One of the most important partners is a non-emitter ... PJM ... the regional transmission organization who is responsible for dispatching specific units



New Partners in 2021/2022

- As coal-fired units have retired or been run for significantly fewer days ... Smaller oil and gas combustion turbines have become more important peak day contributors. As the fleet evolved, new partners have been added

Unit	COMAR 26.11.38 (MDs Optimization Reg)	MWC	Other Unit
Chalk Point GT 3, 4, 5, & 6			✘
Dickerson GT 2 & 3			✘
Chalk Point 3 & 4			✘



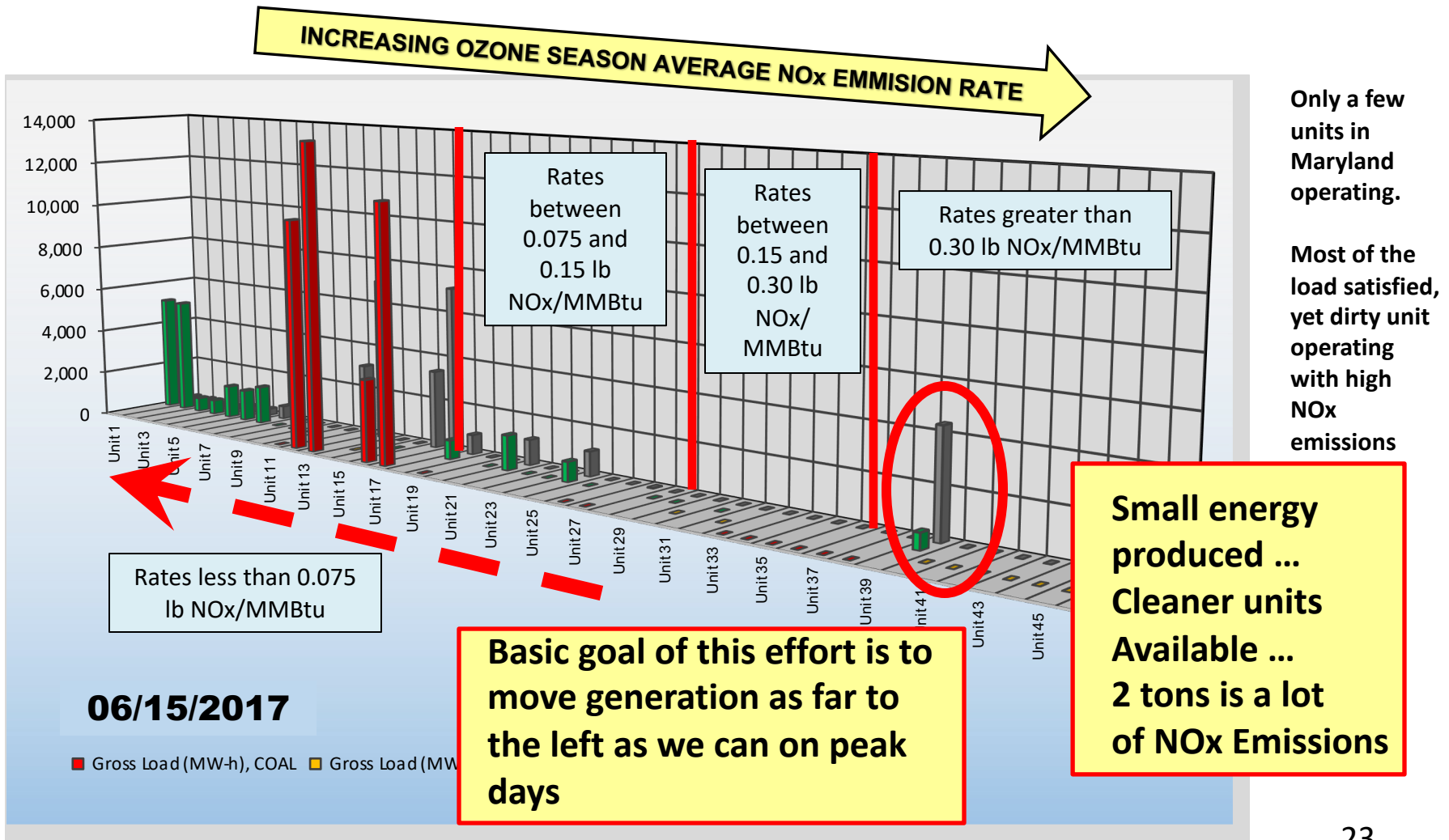
So How Do We Define Success?

- Of course ... in general ... lower ozone
- More specific to this partnership ...
 - Using the detailed emissions and operating data collected from each partner the day after a call-to-action-day ... We analyze individual source emissions to look at daily generation and emissions
 - If generation and emissions are coming from the cleanest units in the State ... that is success
 - If generation and emissions are coming from dirtier units – this is not success
 - We share all of the source specific generation and emissions analyses with all partners
 - We don't need to implement the regulatory threat



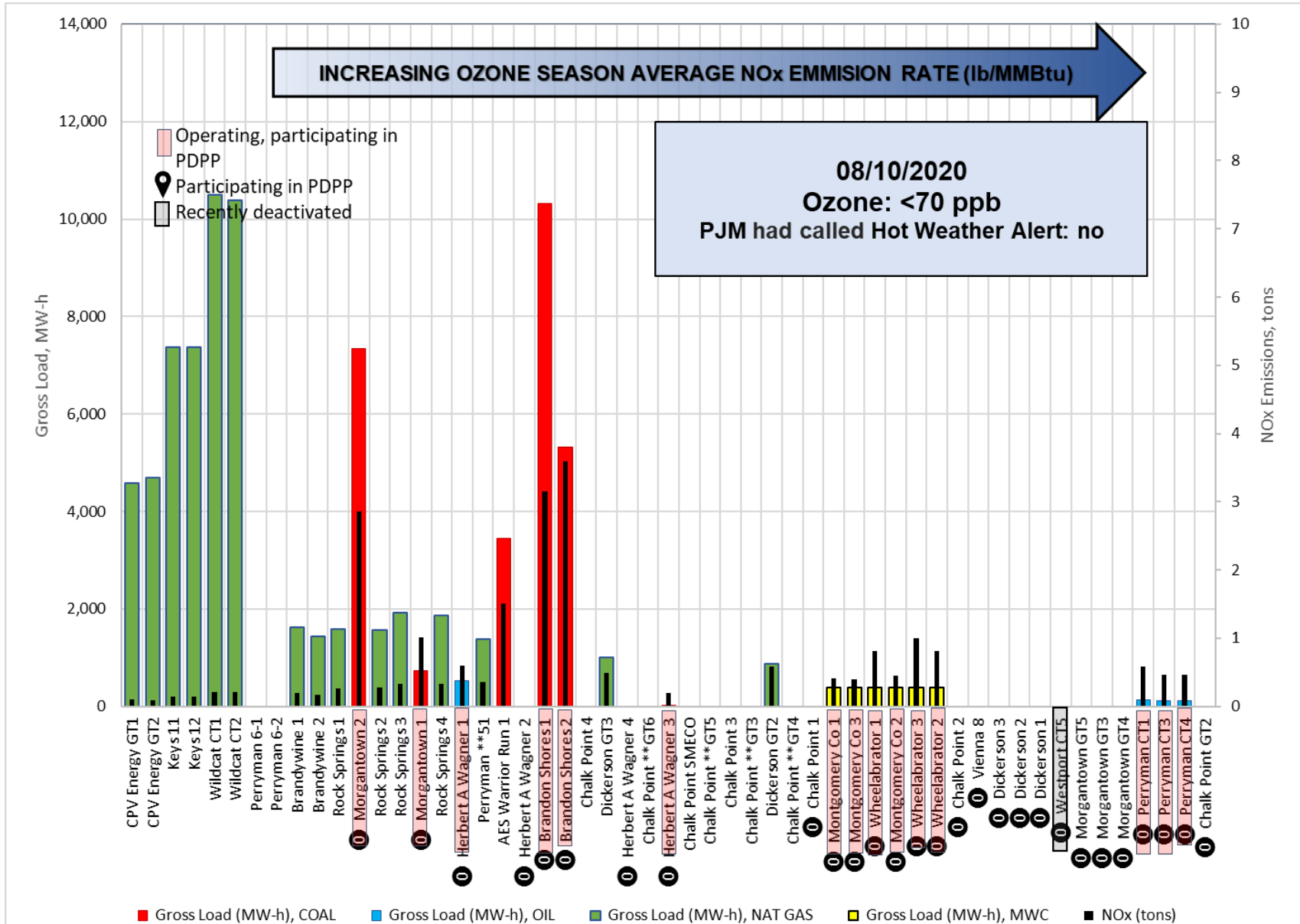
Who Emitted ... At What Rates

Emissions Data Collection and Analysis





August 10 - Are the Right Units Running?





August 10 Operational Data

Units That Ran

Unit	Duration	Rate	Comment
Brandon Unit 1	24 hours	0.06 lb/mmBTU	3.15 tons of NOx
Brandon Unit 2	24 hours	0.12 lb/mmBTU	3.61 tons of NOx
Wagner Unit 1	17 hours	0.09 lb/mmBTU	0.6 tons of NOx
Wagner Unit 3	10 hours	0.12 lb/mmBTU	0.20 tons of NOx
Morgantown U1	14 hours	0.17 lb/mmBTU	1.0 tons of NOx
Morgantown U2	24 hours	0.08 lb/mmBTU	2.9 tons of NOx
Perryman CT1	4 hours	0.58 lb/mmBTU	0.58 tons of NOx
Perryman CT3	4 hours	0.48 lb/mmBTU	0.47 tons of NOx
Perryman CT4	4 hours	0.47 lb/mmBTU	0.46 tons of NOx

Unit	Duration	Rate	Comment
Wheelabrator			Facility-wide total:
Unit 1	24 hours	144 ppm	2.63 tons of NOx
Unit 2	24 hours	143 ppm	
Unit 3	24 hours	143 ppm	
MCRFF			Facility-wide total:
Unit 1	24 hours	70 ppm	1.3 tons of NOx
Unit 2	24 hours	82 ppm	
Unit 3	24 hours	81 ppm	



So ... On This Day ... Did it Help?

August 10th



Forecast: 72 ppb

Observed: High at Padonia: 68 ppb

Weather

- 93 F High at BWI
- Winds S @ ~3-5 mph
- Mostly Sunny

- We think so
- Certainly, didn't hurt
- Forecast an exceedance ... Did not get one
- Additional, more detailed technical analyses also indicate that something is working to shave the peaks
- One of the indirect benefits has been to educate operators on why optimizing performance is critical on peak days

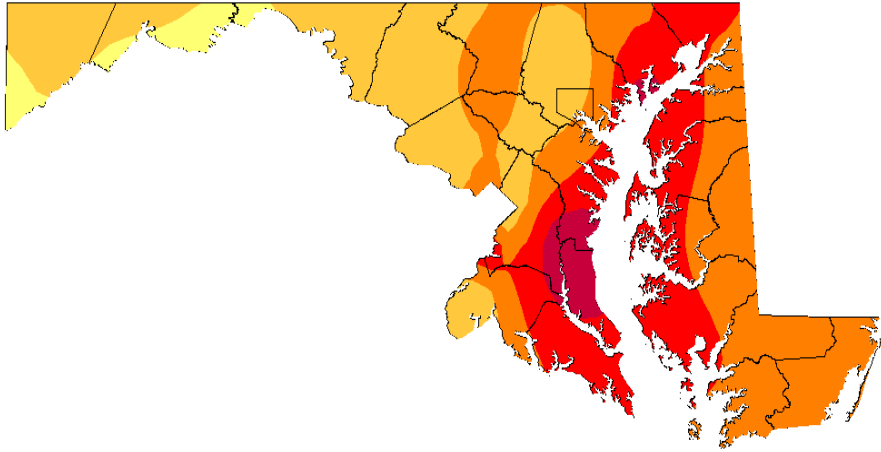


Other Peak Day Initiatives

- Legal action compelling EPA to insure that coal-fired EGU controls in upwind states are used and optimized on bad ozone days ... and days leading up to bad ozone days
 - CAA 176, 126 and 184C Petitions
 - Strong comments and litigation over federal rules like CSAPR and Pennsylvania EGU RACT on control technology optimization and daily limits
 - These efforts that drove reductions from coal-fired power plants upwind of Maryland have been the largest contributor ... by far ... to Maryland's success in reaching attainment
 - The concept of making sure controls are run and optimized on specific days was an interesting challenge for EPA, with their historical love affair with cap-and-trade
- Traditional ozone action days programs ... businesses and individuals ... implemented through Clean Air Partners, a public private partnership in the Baltimore/Washington area
- Several others ... just ran out of space

2005

**Reducing Ozone
2005 to 2021**



QUESTIONS?

DISCUSSION?

**Reducing Fine Particulate
2005 to 2021**

2006

