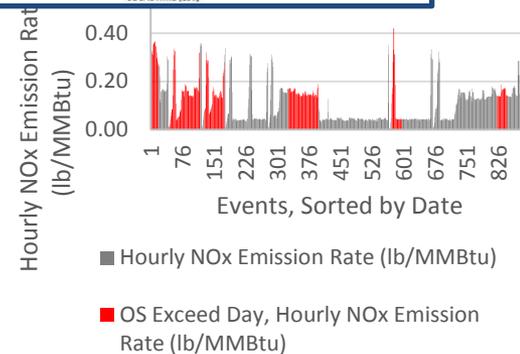
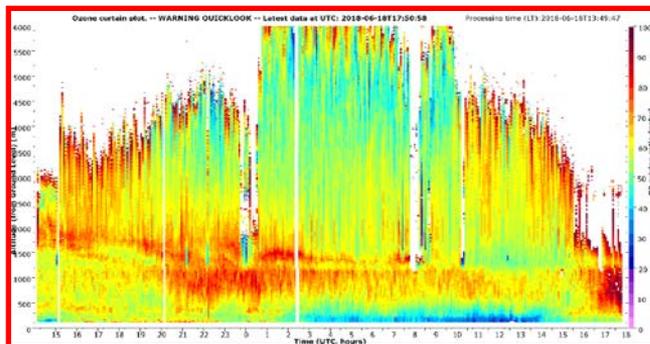
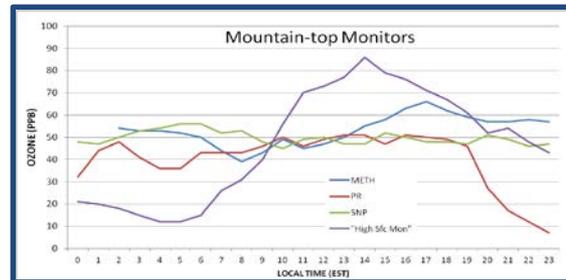
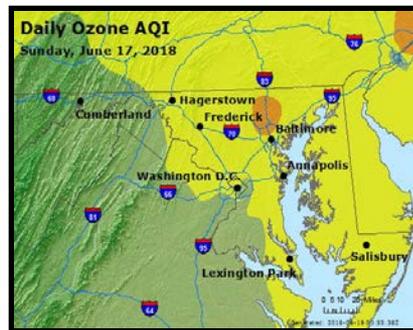




Maryland
Department of
the Environment

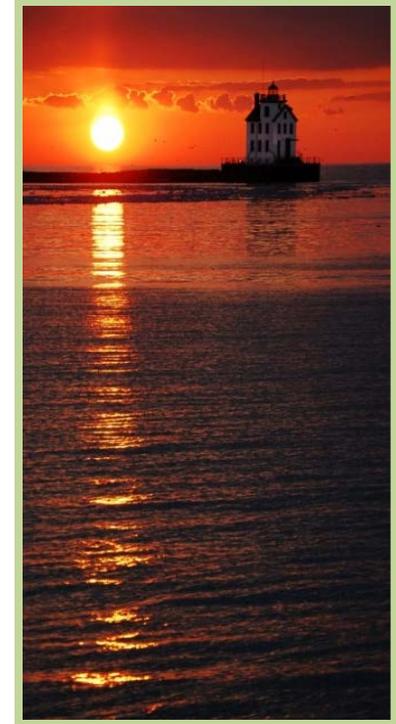
The Peak Ozone Day Reduction Partnership





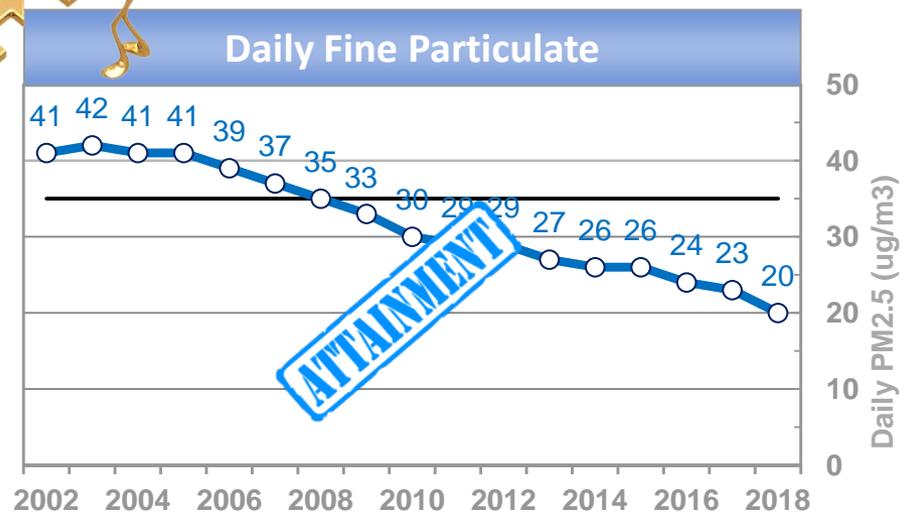
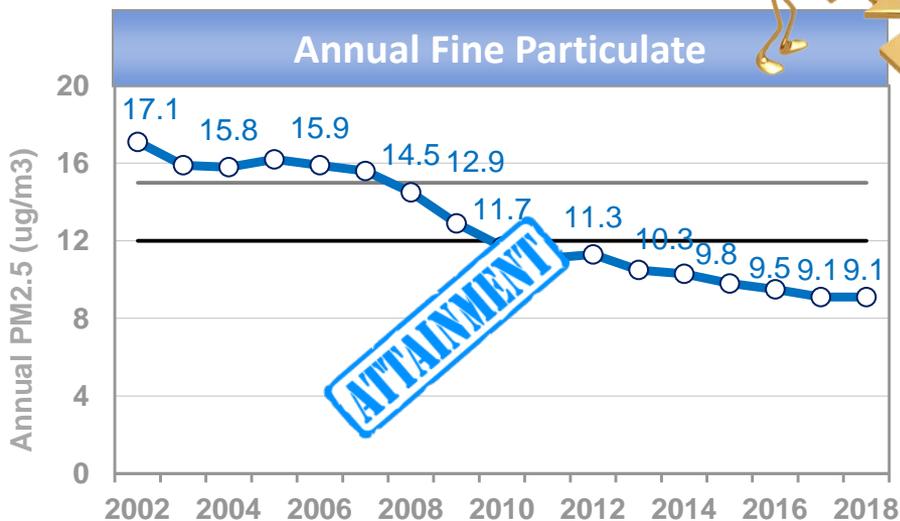
Overview of Presentation

- Our Theory
 - The science behind our peak day reduction effort
- The Peak Day Partnership Pilot
 - What we did in 2018
 - 2019 Updates
- What our analyses tells us to date
 - Who operated
 - Optimized controls or not optimized
 - Other emission sources like upwind power plants, mobile sources and marine engines
 - Ozone Water Land Environmental Transition Study (OWLETS 2)
- What's next in 2020 and beyond?





Progress in Cleaning Maryland's Air



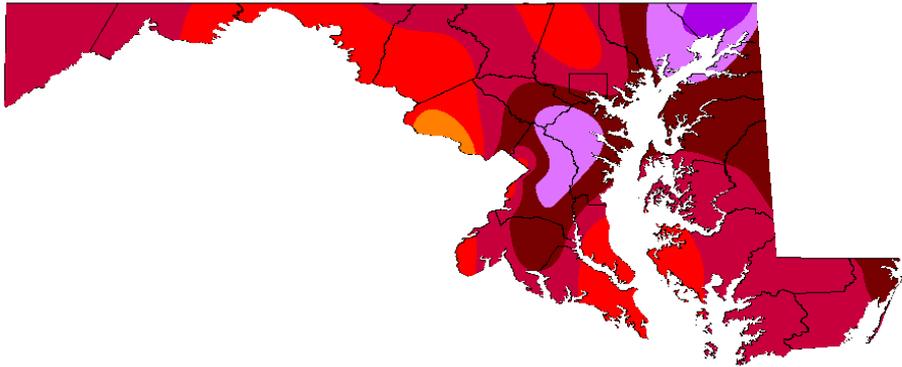
What Have We Learned from All of This?

* 2018 data is preliminary

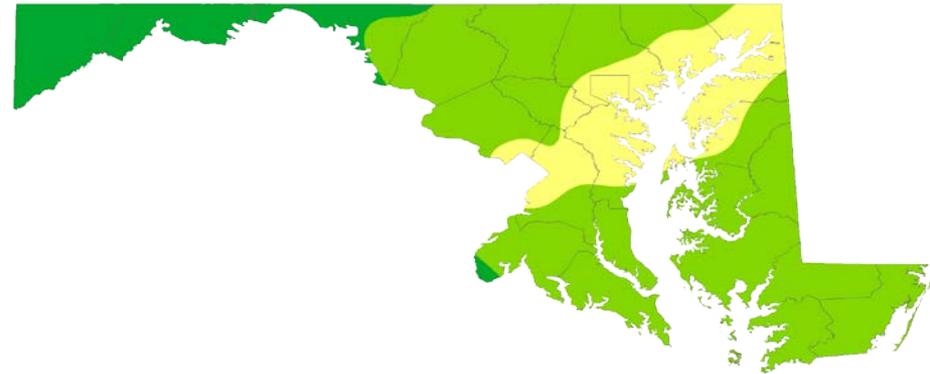


Shrinking Ozone

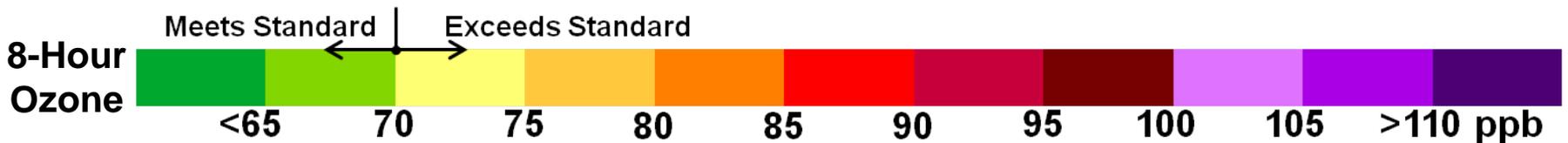
1998



2018*



The Shrinking Ozone Problem: Not just the magnitude, but its nature: “We’re going local”

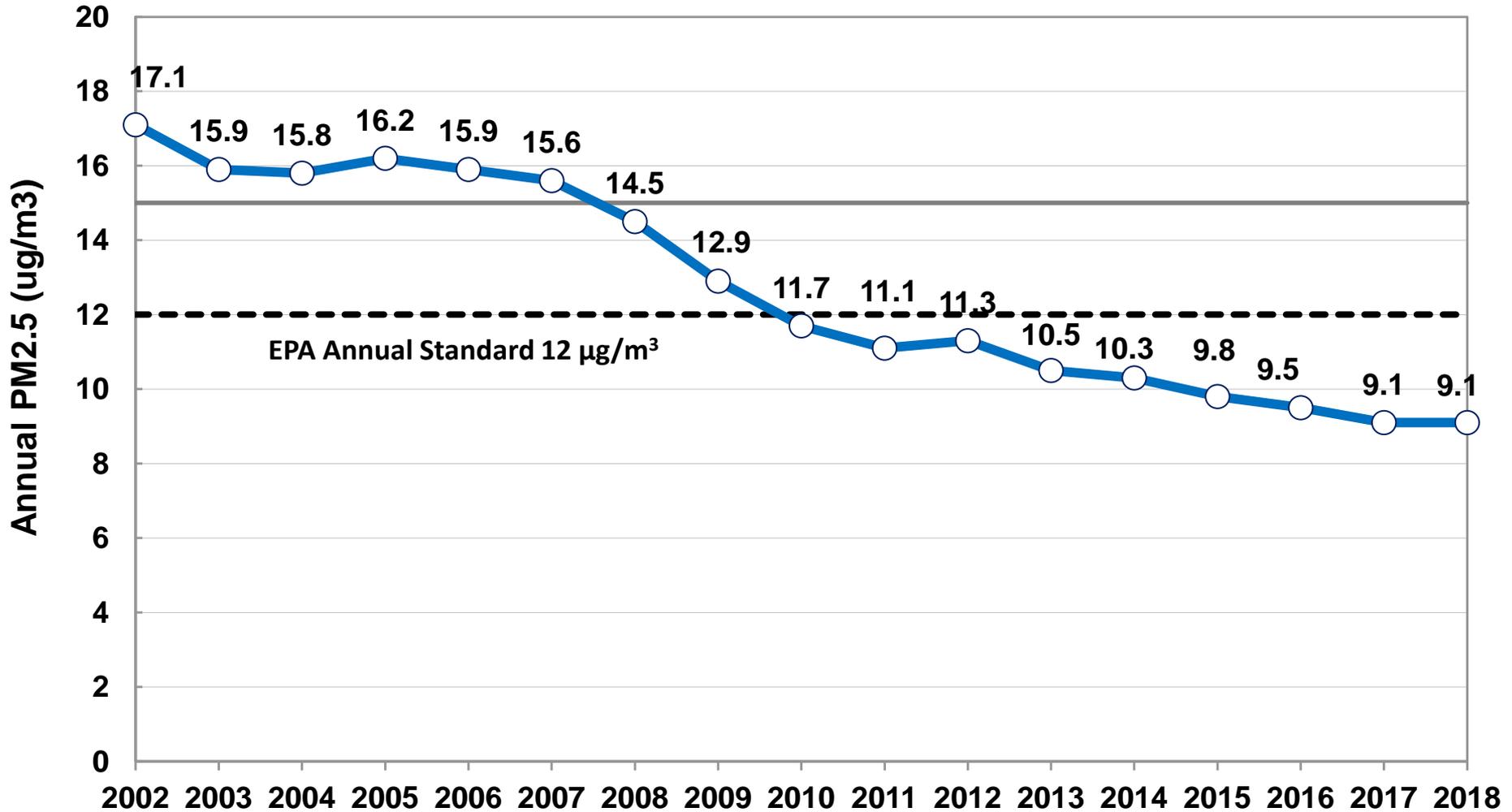


*Preliminary Data: Subject to Change



Fine Particle Air Pollution

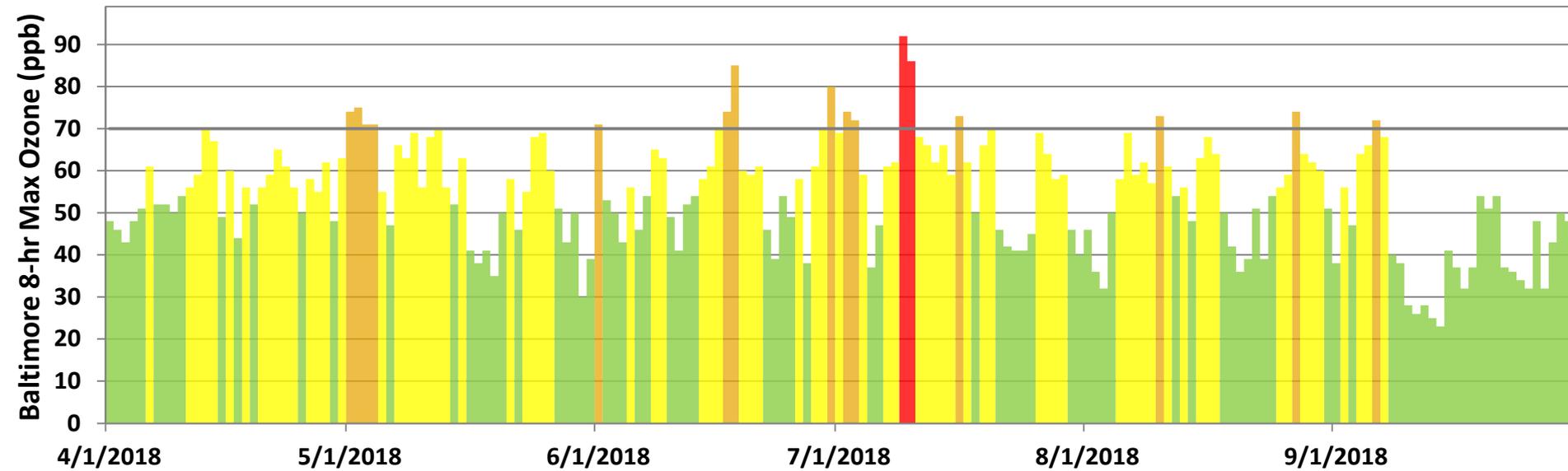
Lower Levels Across the State



* 2018 data is preliminary



2018 SEASON AT A GLANCE

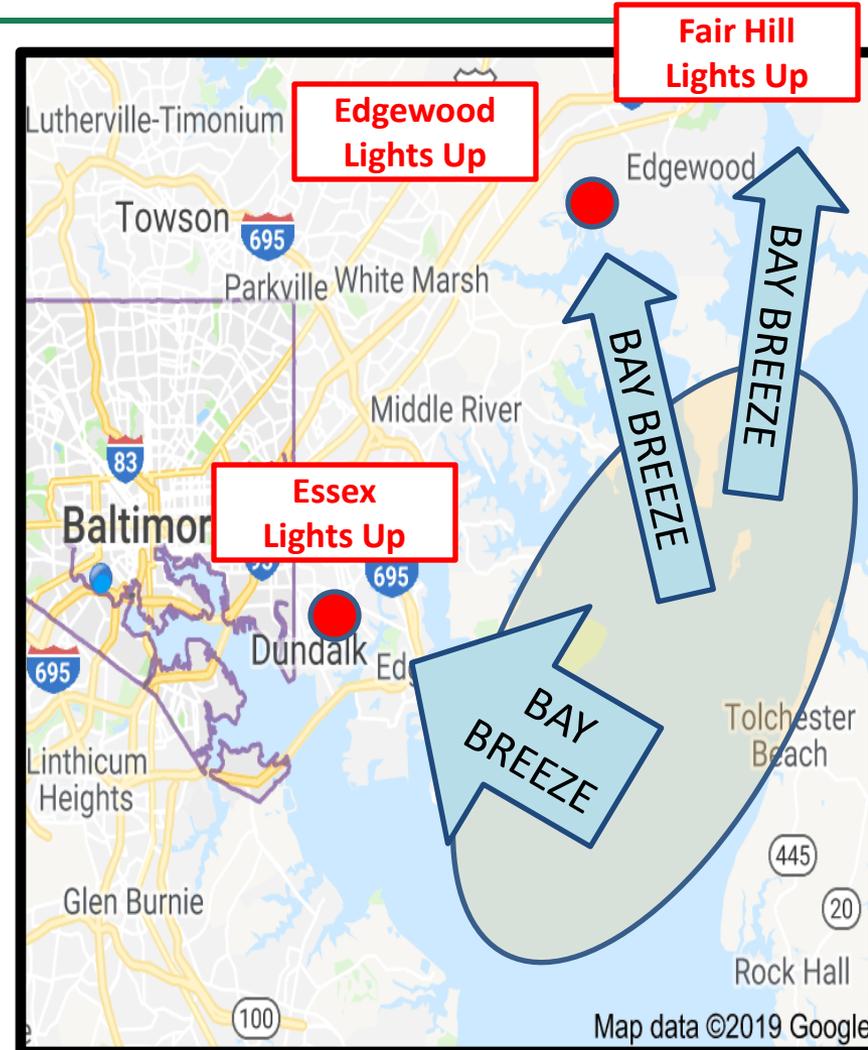


- 2018: 16 Exceedance Days
 - Second fewest ever
- Record wettest for most of Maryland and Mid-Atlantic
- Randomness continues...
- OWLETS-2 Campaign: June 6 – July 6



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

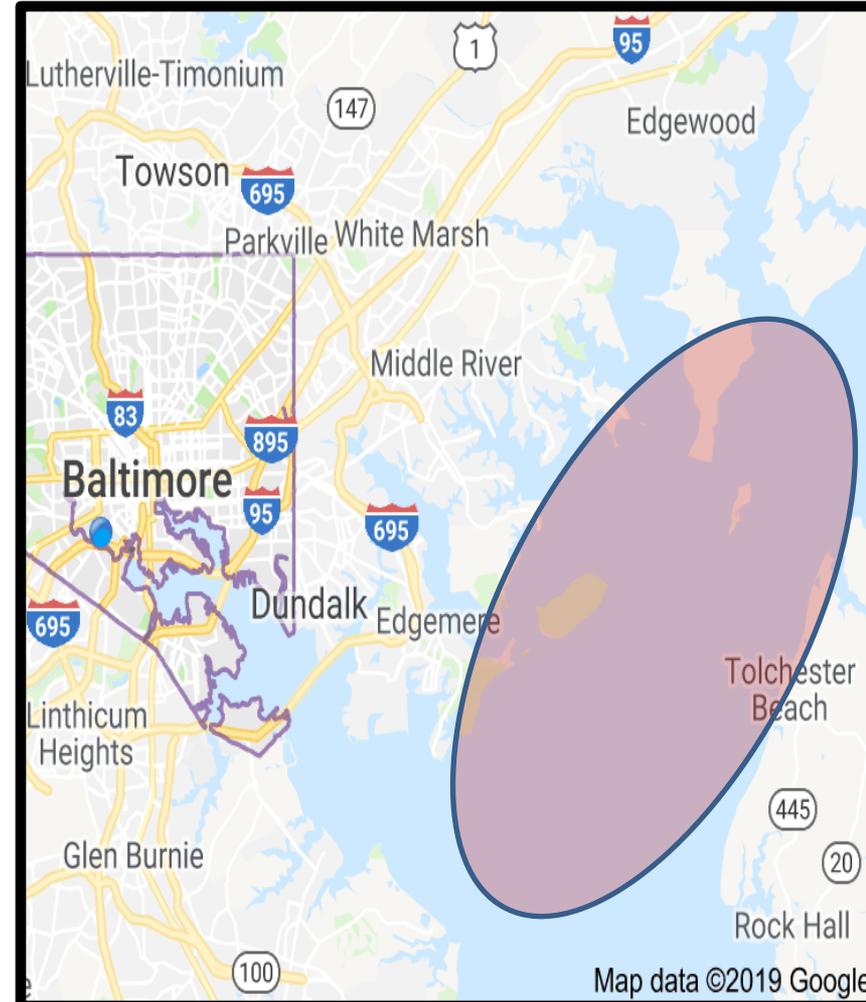
- Linked to our research on the “Land-Water Interface”
 - Why are highest levels of ozone often right near the Bay ... close to water?
- The theory
 1. Ozone builds up over the Bay
 - Transport plays a role ... mobile plays a role ... but
 - How significant are stationary sources that may emit at higher 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 HEDD Units - Maybe a quarter





So What is Maryland Doing About These Sectors?

- Long Distance Transport
 - Huge effort - 126 Petitions, multiple legal challenges related to EPA actions on Good Neighbor SIPs ... Pushing for a SAS initiative on PA power plants that run controls poorly or not at all on peak ozone days
- Cars and Trucks
 - Huge effort - partially driven by climate change - Clean Cars Programs, EVs, multiple legal challenges related to EPA backsliding on mobile source control programs
- Close-by High Electricity Demand Day (HEDD) Sources
 - Several initiatives including daily optimization of controls on power plant units in Maryland and ... The Peak Day ozone reduction partnership (the rest of this presentation)
- Small and Large Boats
 - Not doing much - still a research issue and an area of major uncertainty



The 2018 Peak Day Partnership Pilot

- A Partnership Pilot Program
 - 2018 ... truly a “get-your-feet-wet” pilot
 - 2019 and beyond ... track progress ... refine ... adjust
- Based on recent ozone research
 - Reduce ozone levels on worst days
- The Peak Ozone Day Reduction Partnership
 - The Partners
 - The Notices
 - What we are asking of participants

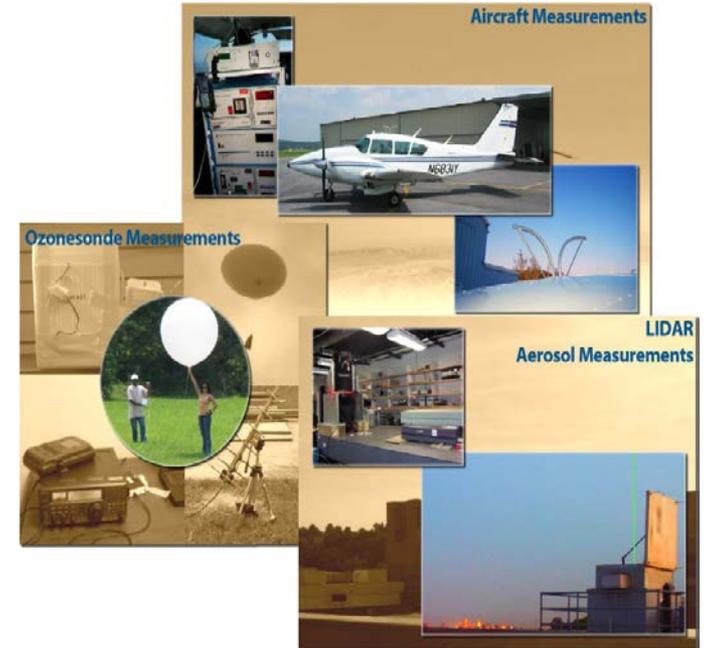




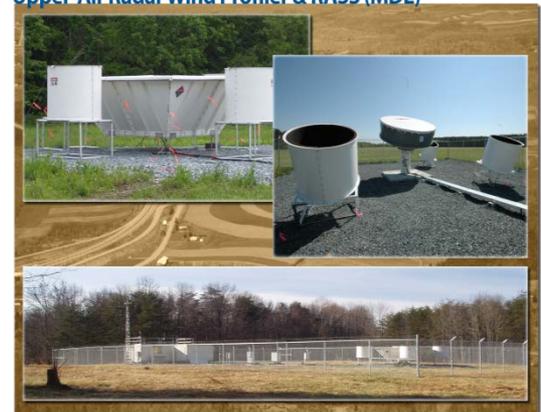
The Maryland Research Partnership

30 years ... Driving policy with science

- MDE works in partnership with other states, local universities (UMD at College Park, UMBC, SUNY, Rutgers, Penn State and Howard University), NASA and NOAA to study ozone and fine particulate air pollution problems
- Major focus ... Transport
 - Airplanes ... Balloons ... Lidar (laser based measurements)
 - Profilers ... Satellites ... Special monitors ... Modeling
 - Much, much more



Upper-Air Radar Wind Profiler & RASS (MDE)





Our Latest Research

- Transport is still our #1 issue to resolve
 - Probably 70% of our problem on any given day
- Since ~ 2013 our ozone exceedance days are very different
- Not big ... not super-regional ... less transport ... one or 2 monitors just above the 70 ppb standard ... location is random
- This has lead us to look at the 30% or 40% of our problem that is more local - especially on “Peak” Days
 - Ozone Water-Land Environmental Transition Study (OWLETS2) - A 2018 research effort that focused on land-water interface issues and contribution on peak days - local and transport.



Why Peak Days?

- Three reasons:
 - 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 ... We are very close to achieving this
 - 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 units and less clean units
- Shaving the peaks will reduce risk, help us towards attainment and reduce future regulatory burden on the energy sector



The Program in Four Simple Steps

1. We forecast that bad ozone is coming in MD
2. We send partners notices:
 - Multi-day advance warning when we can
 - Call To Action Notice for next day
3. Partners do what they can... extra action... that is reasonable... to help reduce nitrogen oxide (NO_x) emissions on a few days each summer
4. We attain the standard
 - Less risk to the public
 - Less regulatory burden on partners



2019 Program Updates

1. 3-day advance warning notice changes:

- 3-day notice often challenging to forecast; will now be labeled as “Multi-Day Advance Notice”; MDE will make effort to issue 2-3 days in advance of a “Call To Action”
- 1-day ahead notice now labeled “Call to Action Notice”

2. 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 NOx Rate, MWg generated and Heat Input (MMBTU), and urea injection rate as applicable.
- Include any notes - malfunctions, extra things done to minimize NOx, avoided NOx emissions, etc.
- Include the tons of NOx generated during the event.

3. Asking Gould Street Unit 3 and Lehigh Cement to join the partnership



Units in the 2018 Pilot

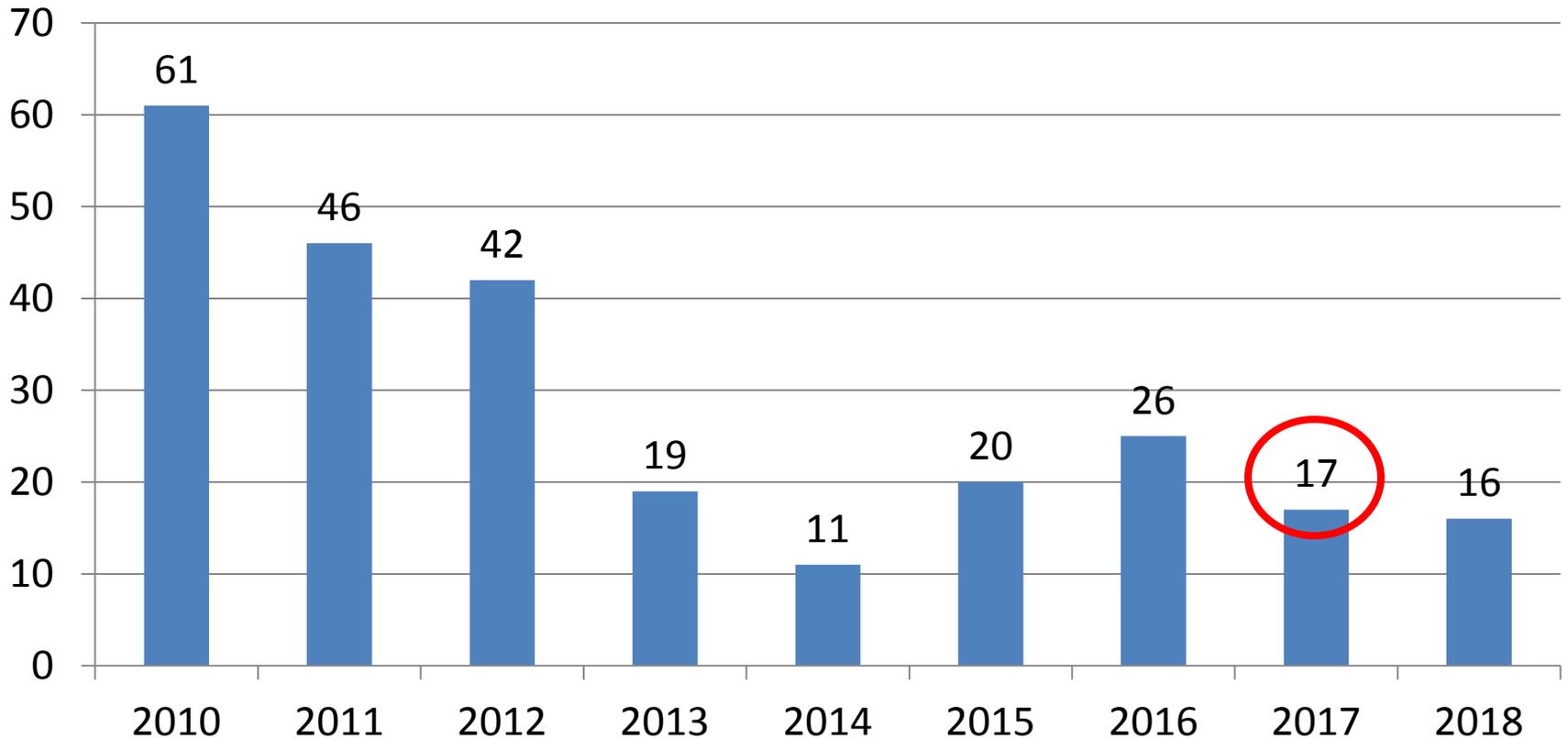
Unit	COMAR 26.11.38 (MDs Optimization Reg)	MWC	Other Unit
Brandon Shores Units 1 and 2	✘		
Chalk Point Units 1 and 2	✘		
Chalk Point Unit GT2			✘
Dickerson Units 1, 2, and 3	✘		
H.A. Wagner Units 1, 2, 3 and 4	✘		
Morgantown Units 1 and 2	✘		
Morgantown GT3, GT4, GT5, and GT6			✘
Perryman CT1, CT3 and CT4			✘
Vienna 8			✘
Westport CT5			✘
Montgomery County RRF		✘	
Wheelabrator Baltimore, LP		✘	

Total - 29 units that are likely to impact the Baltimore, Washington and Philadelphia nonattainment areas



Maryland Bad Ozone Days

Exceedance Days





Peak Days are Often Bunched

Really not 17 individual events

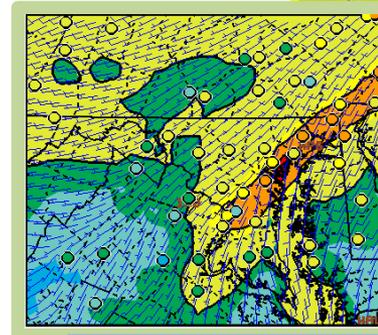
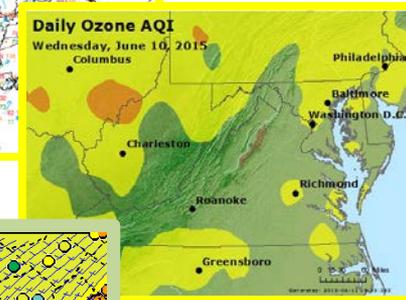
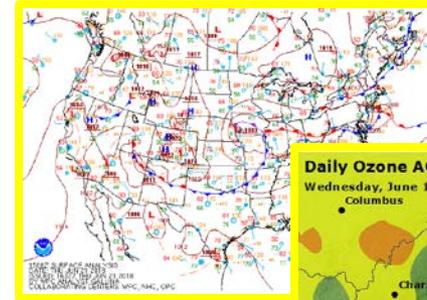
Maryland's Air Quality – Summer 2017





The Air Quality Forecast

- MDE has been forecasting future ozone for over 20 years
- We are actually quite good at it
- What we do:
 - Prepare a weather forecast using various meteorological models and data.
 - Look at air quality measurements, both local and where the winds are coming from.
 - Look at air quality forecast model predicted ozone concentrations.
 - Met and AQ data, use in-house developed statistical models to come up with a final forecast number.
 - Forecast submitted to national system run by EPA and disseminated to the public.



2013-2015 MODEL		F		F	
Total O3	Intercept	Climo	Previous Day O	BWI Tmax	BWI Tdmax
Coefficient		0.33731	0.37403	0.79693	-0.68546
Value	-3.19	56	70	93	72
EquationVAL		18.88936	26.18	74.11	-49.35
	64.74				





The 2019 Notices

- Multi-Day Advance Notice
 - Only issued when significant event is highly probable
 - “High Ozone Expected Soon”
 - Offers additional timing to prepare to take action
- The Day Before Notice – Call to Action
 - “To the extent you can ... implement the actions we are asking you to take... tomorrow”
 - Very high probability of high ozone
- The meteorologist’s dilemma
 - “If I forecast high ozone and voluntary action keeps ozone lower ... did I blow the forecast ???”



Sample Email Notices

Peak Ozone Day Reduction Program Multi-Day Advance Notice

High Ozone Expected Soon!

Thank you for your interest in MDE's 2019 Peak Ozone Day Reduction Partnership program designed to reduce nitrogen oxide (NO_x) emissions and lower ozone levels on peak ozone days (the Peak Ozone Day Reduction Program).

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

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 26.11.38.05A(2).

For Municipal Waste Combustors (MWCs), optimize the use of your current control technologies to minimize NO_x emissions and make all other reasonable efforts to reduce NO_x emissions.

For other units that are not subject to COMAR 26.11.38 and not an MWC, MDE is asking that you either choose not run the unit or to make all reasonable efforts to minimize NO_x emissions from the unit if it does run.

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

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

Please do not respond to this email as it is not monitored.

Peak Ozone Day Reduction Program Call-to-Action Notice

Curtail NO_x Emissions Tomorrow if Possible!

Thank you for your participation in MDE's 2019 Peak Ozone Day Reduction Partnership program designed to reduce nitrogen oxide (NO_x) 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 NO_x emissions. Taking actions to minimize NO_x 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:

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 26.11.38.05A(2).

For Municipal Waste Combustors (MWCs), optimize the use of your current control technologies to minimize NO_x emissions and make all other reasonable efforts to reduce NO_x emissions.

For other units that are not subject to COMAR 26.11.38 and not an MWC, MDE is asking that you either choose not run the unit tomorrow or to make all reasonable efforts to minimize NO_x emissions from the unit if it does run.

Any efforts to minimize TOTAL NO_x emissions would also 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 NO_x Rate, MWg generated (as applicable), Heat Input (MMBTU), and urea injection rate (as applicable). Please also provide the daily NO_x tons emitted. Note any special actions taken to minimize NO_x emissions and note any malfunctions impacting NO_x emissions during Call to Action days. If possible, include the anticipated reduction in NO_x emissions attributable to actions taken.

Information may be sent to Susan Nash at susan.nash@maryland.gov. If you have any questions about the Peak Ozone Day Reduction Program contact Randy Mosier, MDE 410-537-4219 or randy.mosier@maryland.gov.

Please do not respond to this email as it is not monitored.



MDE's Ask of Participants

- This is a voluntary program... we asked sources to do what they can
 - If we succeed, then the next round of regulations needed to comply with the 70 ppb ozone standard can be avoided.
- Our simple 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)
 - For Municipal Waste Combustors (MWC) and Lehigh, 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 asked that they either choose to not run the unit or to make all reasonable efforts to minimize NOx emissions from the unit if it does run
 - Take any other reasonable actions that you can to reduce NOx emissions



Program Analysis

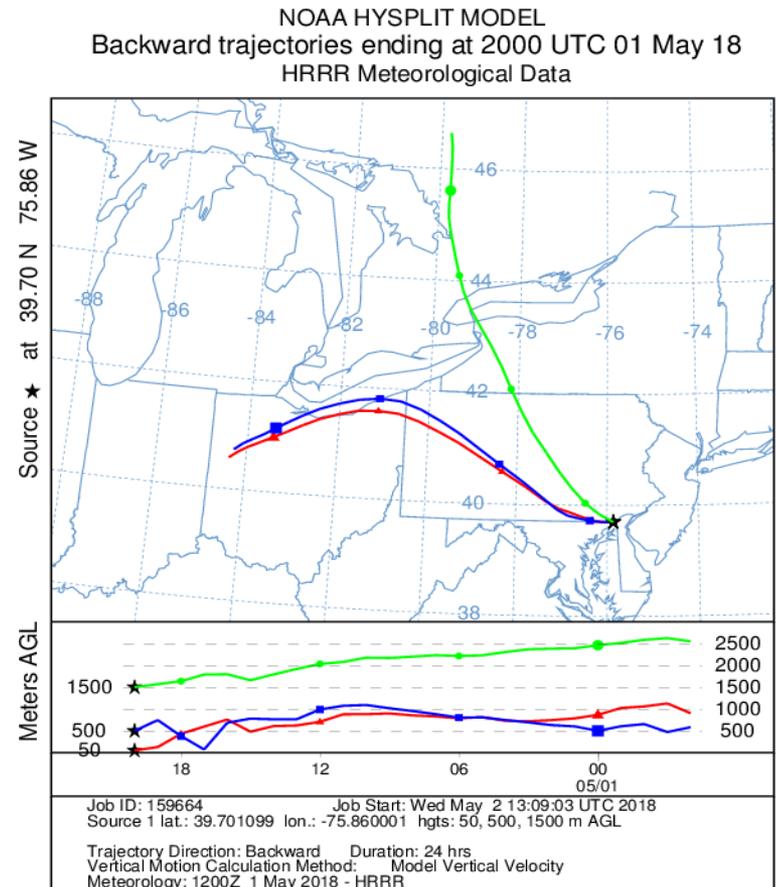
- MDE is working on a comprehensive data analysis for the 2018 pilot
 - Episodic meteorological analysis focusing on winds and other criteria that allow us to link regional transport and specific local emission sources to high ozone events
 - Detailed analysis of hourly and daily unit specific emissions and control technology optimization
 - Numerous other analyses
- Potential Future Program Enhancements:
 - Adding or deleting units
 - Improving forecasting and notices
 - Refined, additional ozone forecast areas
 - A more focused ask (targeting fewer units for action for certain days)
 - More...



The “Post Mortem”

Detailed Analysis of Meteorology for Every Exceedance Day

- A comprehensive meteorological analysis is completed after each bad air day.
- If desired, we can provide a one page summary that includes:
 - Back trajectories
 - Measurements taken (aloft and surface)
 - Analysis of transport or local contribution ... or a combination of the two
 - Number and location of monitors that exceeded
 - Much more

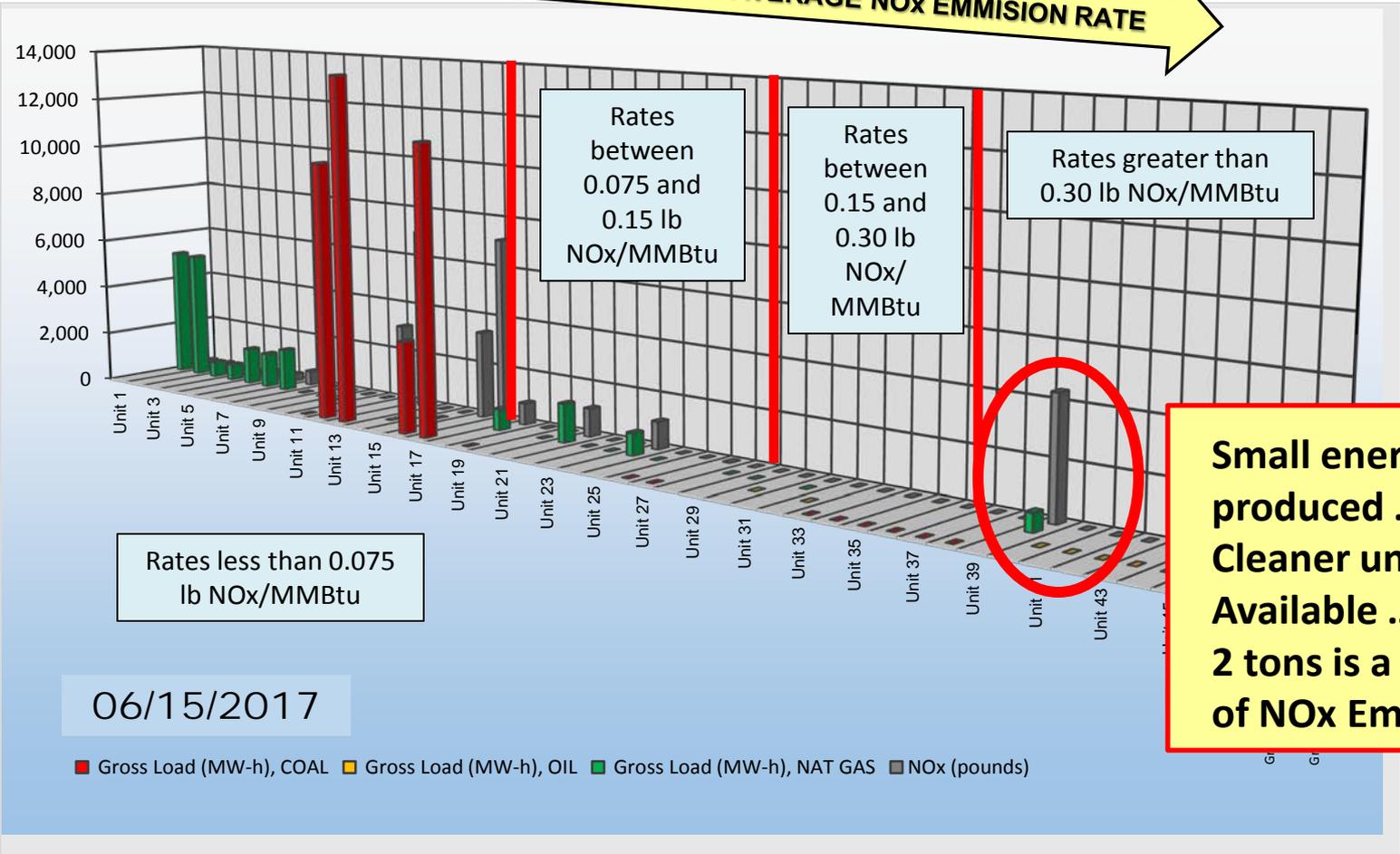




Emissions Analyses - Example 1

Who Emitted ... At What Rates

INCREASING OZONE SEASON AVERAGE NO_x EMISSION RATE →



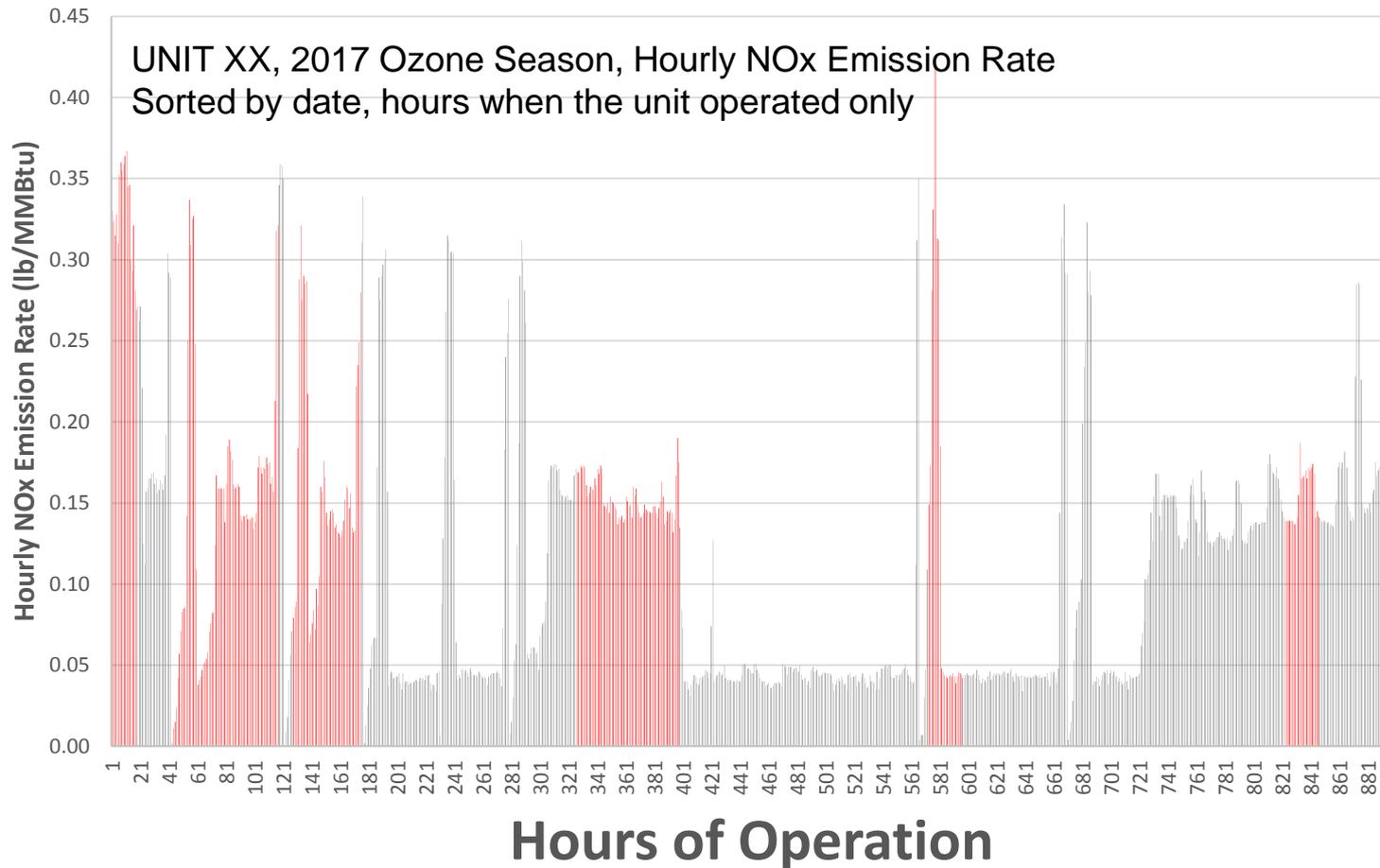
Only a few units in Maryland operating.

Most of the load satisfied, yet dirty unit operating with high NO_x



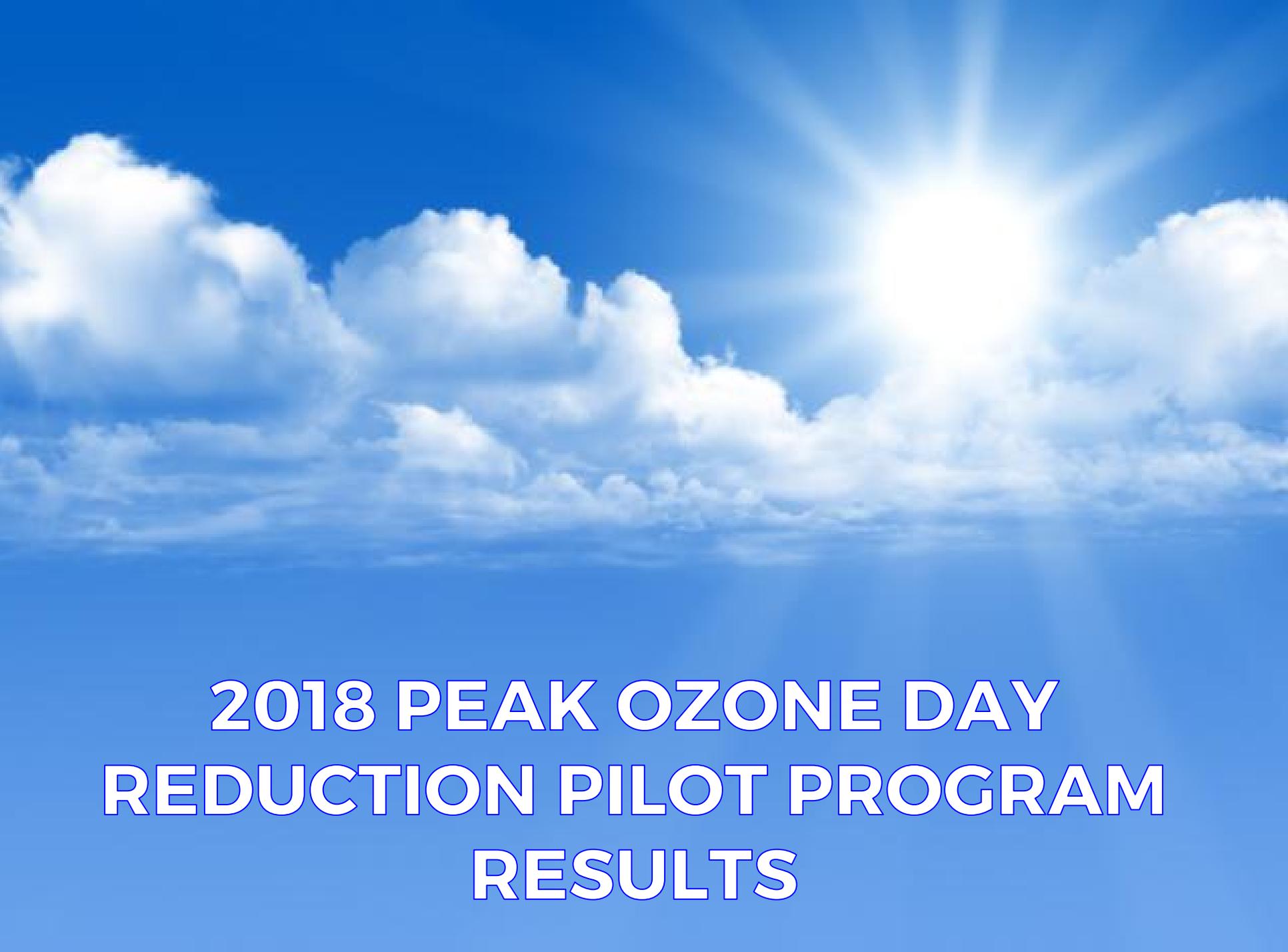
Emissions Analysis ... Example 2

Are Controls Optimized on Bad Days?



NO_x emission rates during ozone exceedance days can be higher than demonstrated best achievable NO_x emission rate.

■ Hourly NO_x Emission Rate (lb/MMBtu) ■ OS Exceed Day, Hourly NO_x Emission Rate (lb/MMBtu)



**2018 PEAK OZONE DAY
REDUCTION PILOT PROGRAM
RESULTS**



What Happened in General

- Pilot Program began July 16th
- When exceedance was forecast, emails were sent out to partners requesting action and more detailed record keeping
- System was only used 4 times ... so this is a small sample size
- Had exceedances on 8/27 and 9/6 that were not forecast

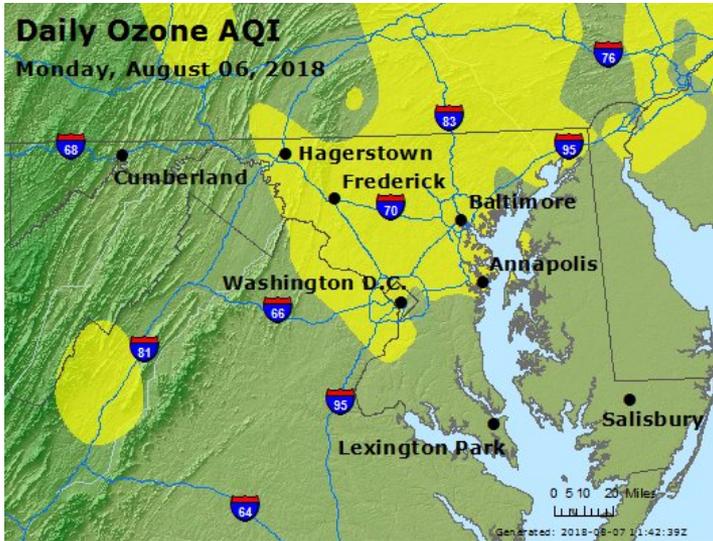
Date	Forecast MD Max O3 (ppb)	Actual MD Max O3 (ppb)
Aug 6 th	72	69
Aug 10 th	71	73
Aug 16 th	73	68
Aug 28 th	80	64



**Did extra
action help ???**



August 6th - Post Mortem - Near Exceedance



Summary

Forecast: 72 ppb

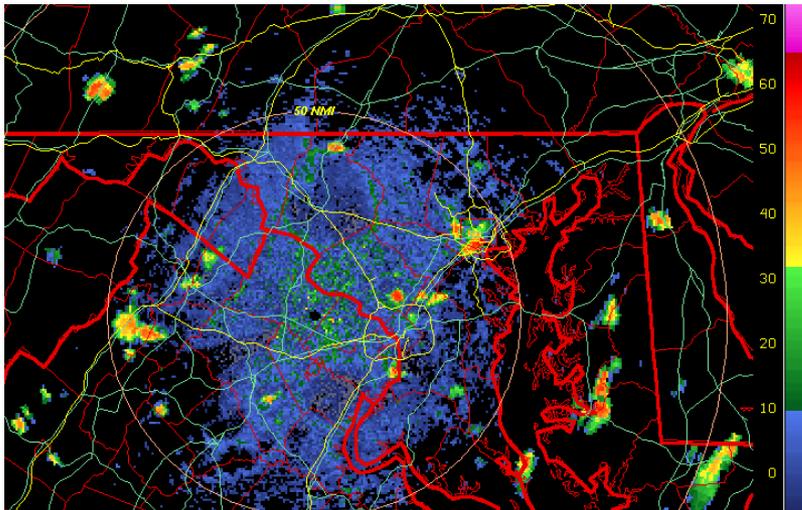
Observed: Padonia: 69 ppb

Furley: 67 ppb

Beltsville Castnet: 67 ppb

Weather

- 91F High at BWI
- SSW 5-7 mph
- Partly Sunny, Scattered PM Showers/Storms



Radar imagery from August 6th, 2:25PM showing scattered thunderstorms across the region

Unanticipated Thunderstorm Activity

- Weather models did a poor job with convection
- Urban heat island aided in convection where ozone concentrations were highest

Did HEDD units do anything?



August 6 Operational Data

Units That Did Not Run

Unit	Comment
Wagner Units 1, 2 and 4	Did Not Operate
Morgantown Units 1 and 2	Did Not Operate
Mogantown GT3, 4, 5, and 6	Did Not Operate
Chalk Point Units 1 and 2	Did Not Operate
Perryman CT 1, 3, and 4	Did Not Operate
Westport CT5	Did Not Operate

- 15 of 29 units did not operate



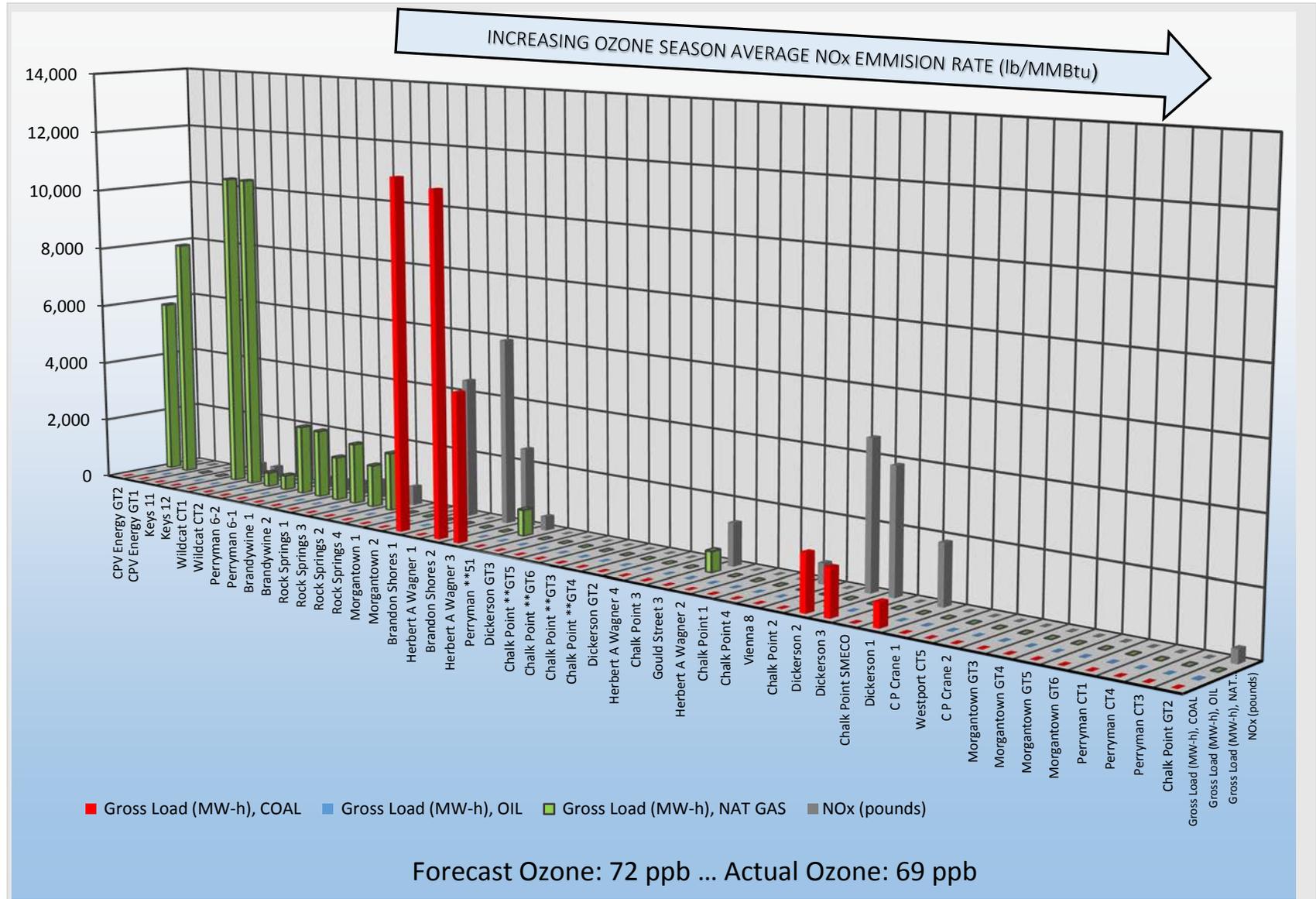
August 6 Operational Data

Units That Ran

Unit	Duration	Rate	Comment
Brandon Unit 1	24 hours	0.04 lb/mmBTU	
Brandon Unit 2	24 hours	0.05 lb/mmBTU	
Wagner Unit 3	24 hours	0.06 lb/mmBTU	
Chalk Point GT2	76 minutes	1.2 lb/mmBTU	
Dickerson 1,2&3	24 hours	0.25 lb/mmBTU	Unit 1 malfunction
Vienna 8	10 hours	0.16 lb/mmBTU	excluding 4 startup/shut hours
Wheelabrator Unit 1 Unit 2 Unit 3		166 ppm 151 ppm 140 ppm	24-hour average May have doubled urea rate
MCRFF Unit 1 Unit 2 Unit 3		96 ppm 106 ppm 106 ppm	24-hour average

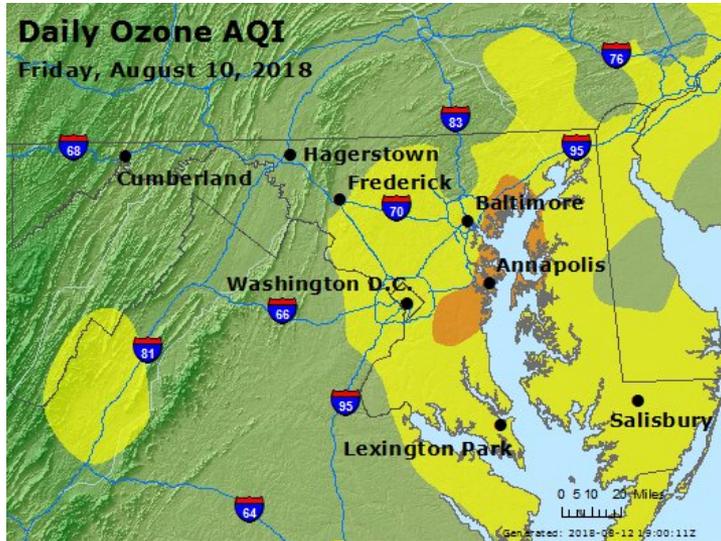


August 6 - Are the Right Units Running?





August 10th - Post Mortem - Exceedance



Summary

Forecast: 71 ppb

Observed: Edgewood: 72 ppb

Essex: 73 ppb

PG EQ Center: 73 ppb

Weather

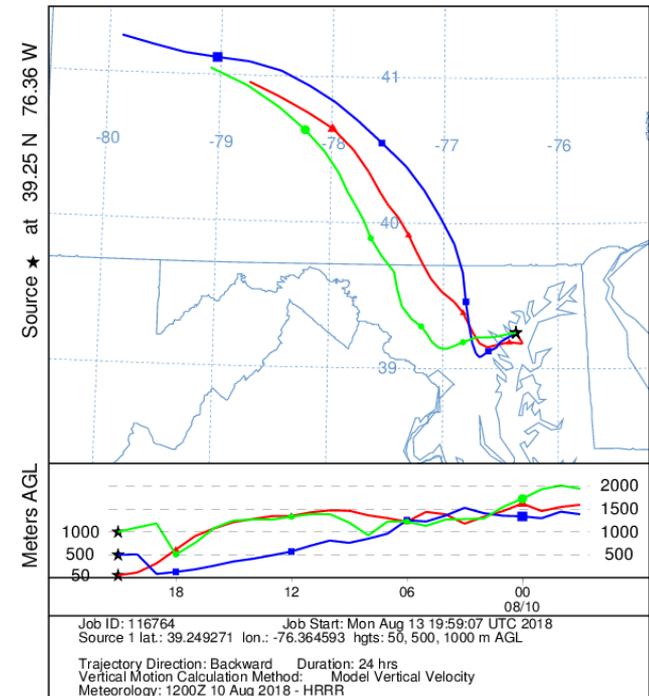
- 91F High at BWI
- WNW ~ 5 mph
- Thin Cirrus

Local; City to Suburb – Classic Bay Breeze Setup

- Upstream concentrations low (below 50 ppb)
- Bay concentrations however were rising
- Day 2 of high ozone over the bay with light NW and warm temps
- Ozone bled ashore as bay breezes developed, PG was downwind of DC plume

Did HEDD units do anything?

NOAA HYSPLIT MODEL
Backward trajectories ending at 2100 UTC 10 Aug 18
HRRR Meteorological Data





August 10 Operational Data

Units That Did Not Run

Unit	Comment
Wagner Units 2 and 4	Did Not Operate
Morgantown Units 1 and 2	Did Not Operate
Mogantown GT3 and 6	Did Not Operate
Chalk Point Units 1 and 2	Did Not Operate
Chalk Point GT2	Did Not Operate
Vienna 8	Did Not Operate
Perryman CT 1, 3, and 4	Did Not Operate
Westport CT5	Did Not Operate

- 14 of 29 units did not operate



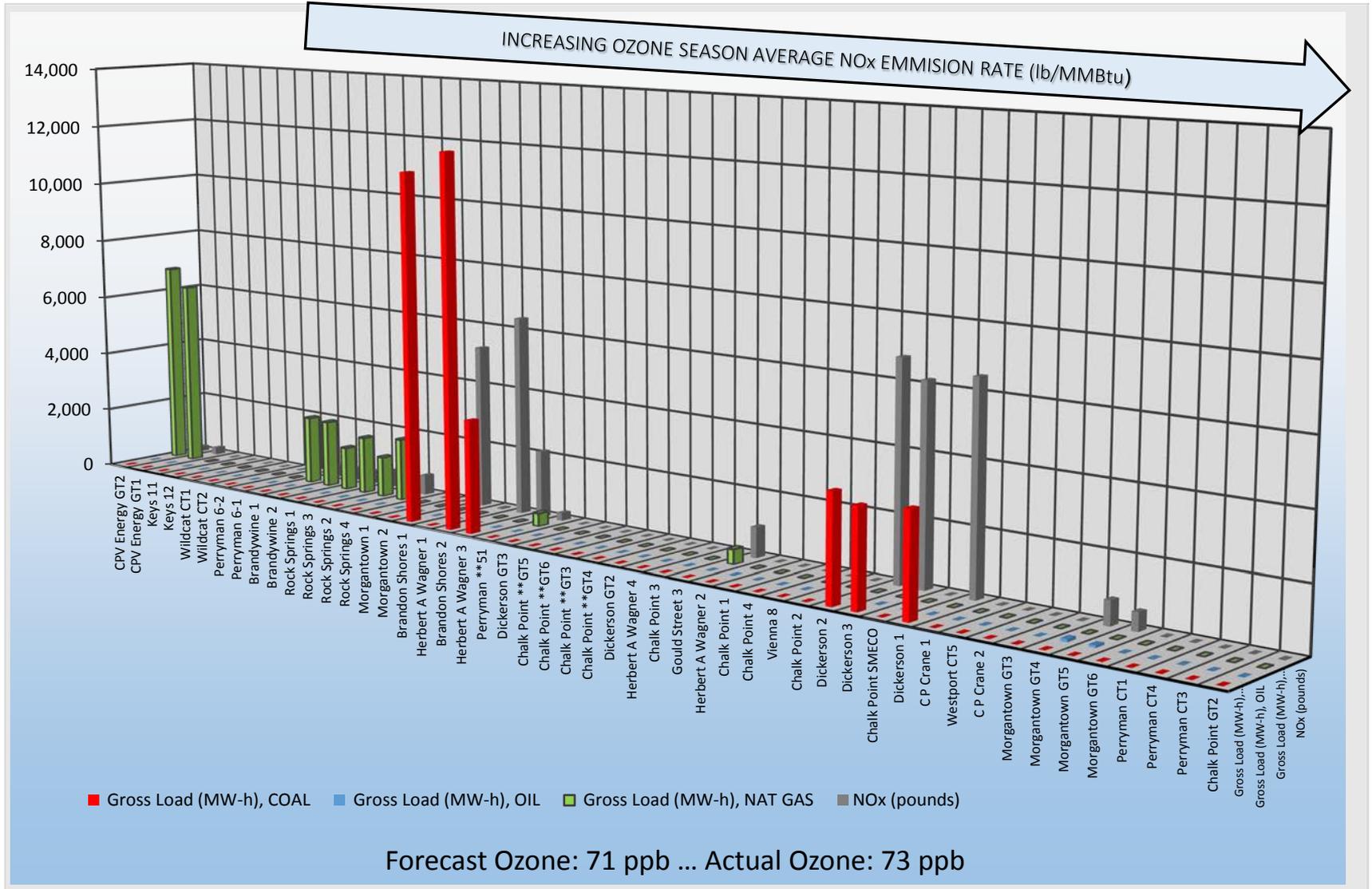
August 10 Operational Data

Units That Ran

Unit	Duration	Rate	Comment
Brandon Unit 1	23.83 hours	0.04 lb/mmBTU	
Brandon Unit 2	24 hours	0.05 lb/mmBTU	
Wagner Unit 1	10.35 hours	0.03 lb/mmBTU	
Wagner Unit 3	19.92 hours	0.06 lb/mmBTU	
Morgantown GT4	151 minutes	0.54 lb/mmBTU	
Morgantown GT5	104 minutes	0.54 lb/mmBTU	
Dickerson 1,2&3	24 hours	0.21 lb/mmBTU	
Wheelabrator Unit 1 Unit 2 Unit 3		152 ppm 145 ppm 126 ppm	24-hour average May have doubled urea rate
MCRFF Unit 1 Unit 2 Unit 3		96 ppm 106 ppm 106 ppm	24-hour average

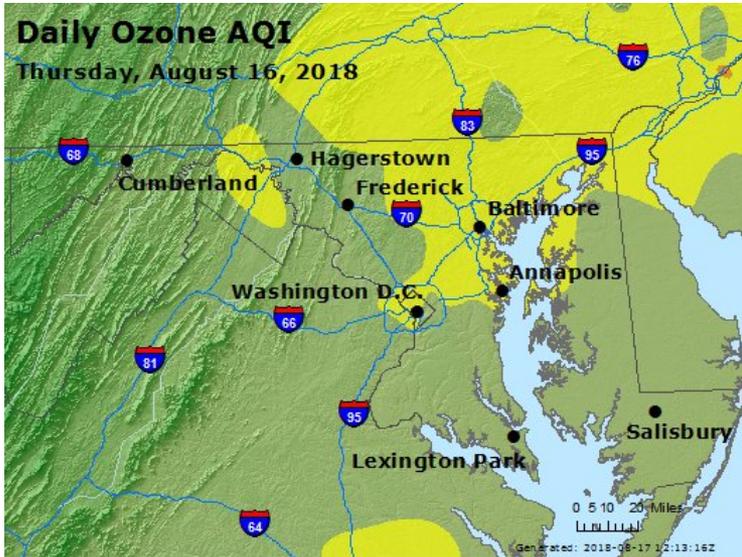


August 10 - Are the Right Units Running?





August 16th - Post Mortem - Near Exceedance



Summary

Forecast: 73 ppb

Observed: Glen Burnie: 68 ppb

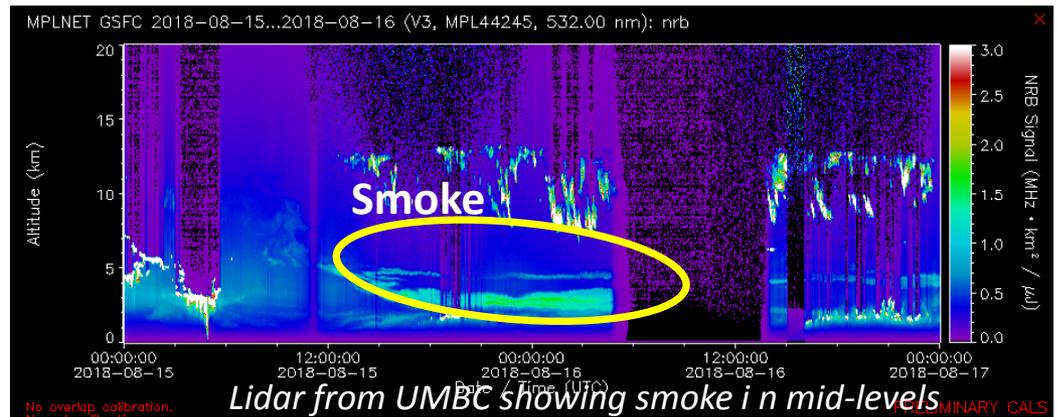
Weather

- 92F High at BWI
- Winds Calm, becoming S ~5 mph
- Cloudy to start, clearing, heavy smoke/aerosol screening

Unknown suspect smoke screening and vertical mixing

- Slow start to ozone formation (morning clouds)
- Afternoon mix out
- Smoke screening limiting UV light: 10-15% Reduction

**Did HEDD units
do anything?**



Lidar from UMBC showing smoke in mid-levels



August 16 Operational Data

Units That Did Not Run

Unit	Comment
Wagner Units 1, 2, 3 and 4	Did Not Operate
Mogantown GT3, 4, 5 and 6	Did Not Operate
Dickerson Units 1, 2, and 3	Did Not Operate
Vienna 8	Did Not Operate
Perryman CT 1, 3, and 4	Did Not Operate
Westport CT5	Did Not Operate

- 16 of 29 units did not operate



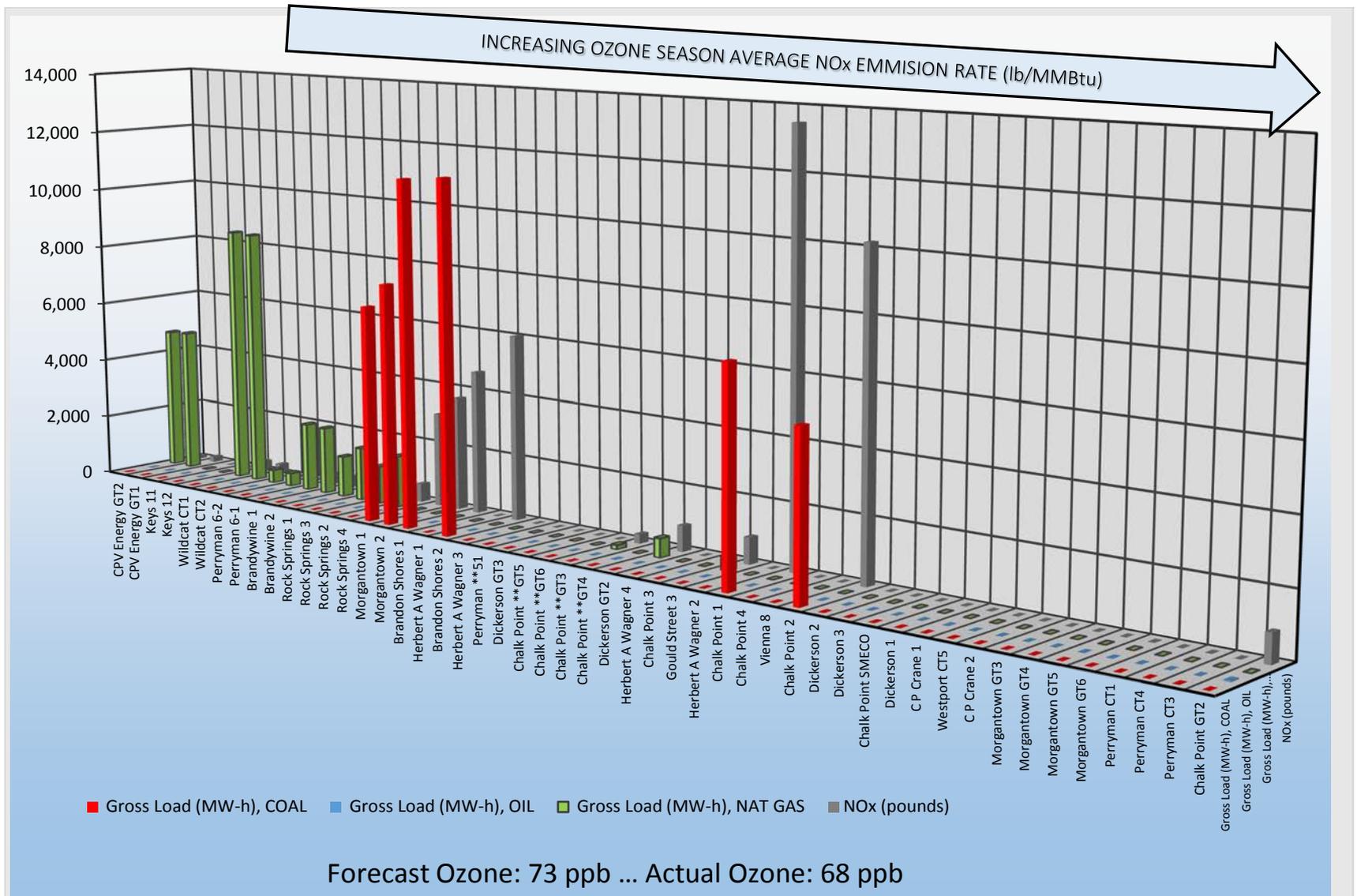
August 16 Operational Data

Units That Ran

Unit	Duration	Rate	Comment
Brandon Unit 1	24 hours	0.04 lb/mmBTU	
Brandon Unit 2	24 hours	0.05 lb/mmBTU	
Morgantown U1	23.77 hours	0.05 lb/mmBTU	
Morgantown U2	24 hours	0.05 lb/mmBTU	
Chalk Units 1&2	24 hours	0.19 lb/mmBTU	Chalk 2 only ran 19.08 hours
Chalk GT2	108 minutes	1.2 lb/mmBTU	
Wheelabrator Unit 1 Unit 2 Unit 3		155 ppm 149 ppm 129 ppm	24-hour average May have doubled urea rate
MCRFF Unit 1 Unit 3		87 ppm 67 ppm	24-hour average

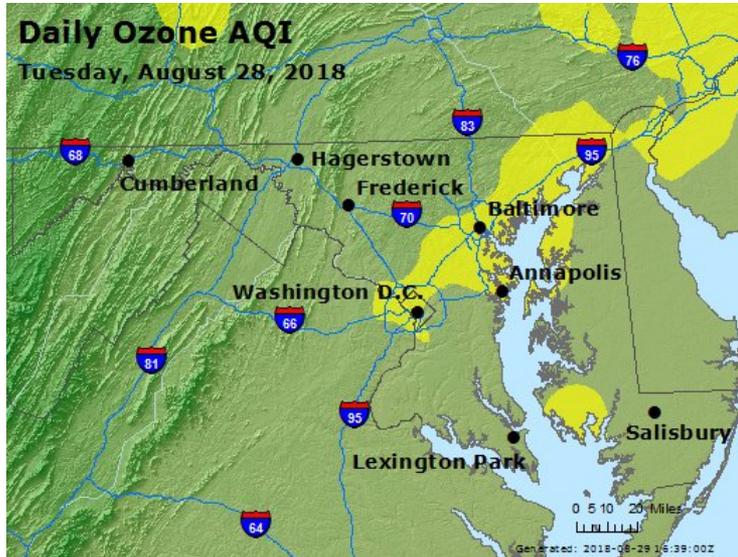


August 16 - Are the Right Units Running?





August 28th - Post Mortem - Near Exceedance



Summary

Forecast: 80 ppb

Observed: Furley: 64 ppb

Weather

- 95F High at BWI
- Winds Calm, becoming SW ~5 mph
- Sunny, hazy

Transient Plume of Very Local Ozone

- Ozone around 90ppb developed over the Bay by midday, impacted Edgewood
- Concentrations dropped 40ppb in a matter of 60 mins between 2 and 3 pm.
- Limited fair weather CU suggest vertical mixing was not the culprit for sudden drop
- No change in wind direction when the ozone dropped
- This supports a theory of a sudden “shut off” either early Tuesday or carry over from Monday

Did HEDD units do anything?



August 28 Operational Data

Units That Did Not Run

Unit	Comment
Wagner Units 2 and 4	Did Not Operate
Morgantown Unit 1	Did Not Operate
Mogantown GT4, 5 and 6	Did Not Operate
Chalk Point Units 1 and 2	Did Not Operate
Chalk Point GT2	Did Not Operate
Vienna 8	Did Not Operate
Perryman CT 1, 3, and 4	Did Not Operate
Westport CT5	Did Not Operate

- 14 of 29 units did not operate



August 28 Operational Data

Units That Ran

Unit	Duration	Rate	Comment
Brandon Unit 1	24 hours	0.04 lb/mmBTU	
Brandon Unit 2	24 hours	0.05 lb/mmBTU	
Wagner Unit 1	20.72 hours	0.19 lb/mmBTU	
Wagner Unit 3	24 hours	0.06 lb/mmBTU	
Morgantown U2	24 hours	0.04 lb/mmBTU	
Morgantown GT3	22 minutes	0.54 lb/mmBTU	
Dickerson 1,2&3	21.73 hours	0.19 lb/mmBTU	Unit 1 ran 0 hrs, 2 ran 2.2 hrs, 3 ran 21.73 hrs
Wheelabrator Unit 1 Unit 2 Unit 3		125 ppm 120 ppm 100 ppm	24-hour average May have doubled urea rate
MCRFF Unit 2 Unit 3		97 ppm 86 ppm	24-hour average



Next Steps - 2019 and Beyond

- Full summer implementation in 2019 - Still a pilot
- Webinars with partners on what we saw and what we learned
- Add several new partners ... think about mobile and boats
- Adjust messages in notices and other communications slightly
- Continue to collect data and refine analyses
- Explore ... based upon OWLETS 2 ... whether we can be even more targeted in pushing for extra action





The 2019 Peak Day Partnership Pilot

- Ozone season starts on April 1, 2019
- Partners will receive a test email notification before the end of March
 - Feel free to add email addresses for other individuals in your company who would like to be cc'd
- Unlikely ... but possible ... for voluntary action notifications in April ... More likely May
- Talk to your MDE contact to establish a clear communication process on this partnership
- Feel free to set up individual calls or meetings if desired





Quick Note on 2018 Owlets Effort

Much more in a few minutes

OWLETS-2

Ozone Water-Land Environmental Transition Study





OWLETS-2 Participants

Data available: <https://www-air.larc.nasa.gov/missions/owlets/reports.2018/index.html>

- Maryland Department of the Environment (MDE)
- Maryland Environmental Services (MES)
- Maryland Port Administration (MPA)
- Maryland Department of Natural Resources (DNR)
- National Aeronautics and Space Administration (NASA)
- National Oceanic and Atmospheric Administration (NOAA)
- University of Maryland Baltimore County (UMBC)
- University of Maryland College Park (UMCP)
- Howard University (HU)
- Hampton University (HU)
- Virginia Commonwealth University (VCU)
- Anne Arundel County (AAC)
- Peninsula Drone Services, LLC
 - PENINSULA DRONE SERVICES, WILLIAMSBURG, VA, 23185, UNITED STATES
 - INFO@PENINSULADRONES.COM
- Bill's Boats
- Tolchester Marina
- Interns
- Many More...



MARYLAND PORT ADMINISTRATION



Maryland Department of the Environment



OWLETS2

What Are Some Early Take Away Messages

- The one you always get from researchers ...
 - More Research Needed !!!
- Still very early ... definitely beginning to put the pieces together
- Some early conclusions
 - Ozone above the Bay is high and fairly complicated
 - We saw incredible vertical gradients in ozone above the Bay
 - Did see linkages between high ozone over the Bay and specific HEDD partner sources on some days
 - Also saw linkage between high ozone and large and small boats -- much more to be done
 - More data analysis ongoing ... much more later

Questions ... Comments ... Discussion

