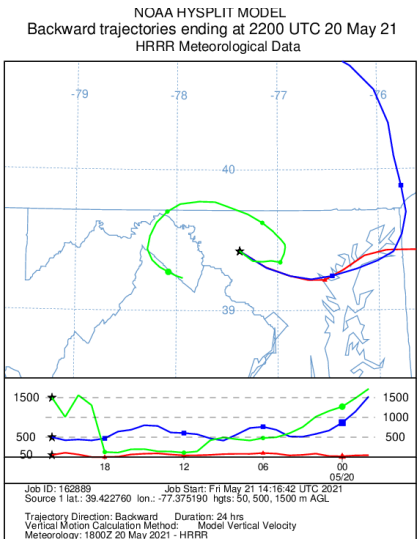
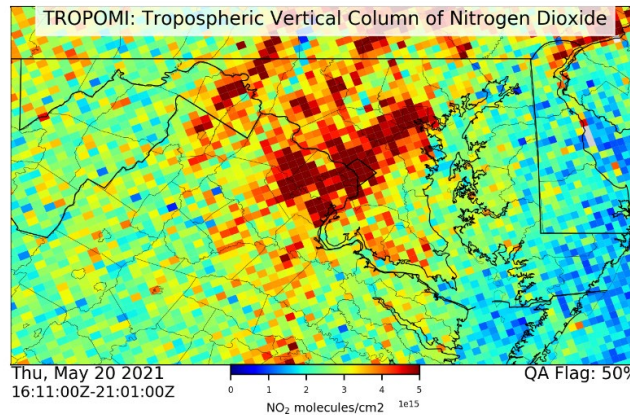
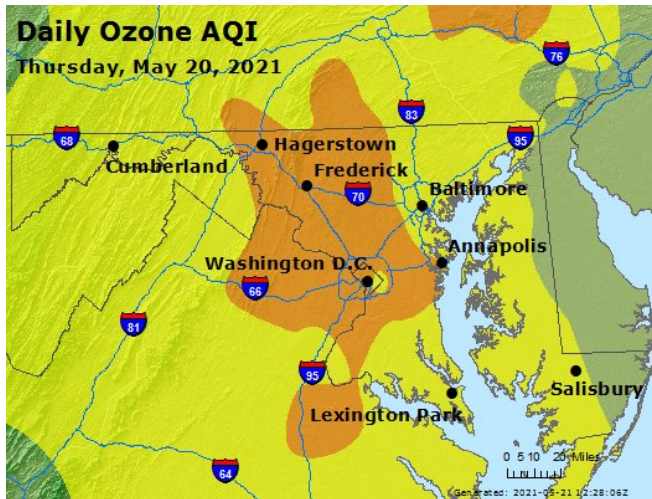




Maryland
Department of
the Environment

Peak Ozone Day Partnership 2021 Season Summary





Overview of Presentation

- The Peak Ozone Day Partnership Program
 - Overview of Program
 - Moving Towards Attainment
 - 2021 Air Quality update
 - How the Program Works
 - Regulatory Helpers
- What our 2021 analyses tells us to date
 - Units that operated on peak day partnership action days - Did cleanest units run?
- Moving Forward
 - Follow-up calls with PJM and operators
 - Can CT operations be curtailed on Peak Days?
 - Are regulations needed?





The Peak Ozone Day Partnership

- Since 2018, a voluntary partnership between MDE and key Maryland industries that has helped to limit NOx emissions when air quality is forecasted to be unhealthy
- MDE's ask is that industry either maximize their emission controls on peak days, run their most efficient units or not operate when possible
- Partner efforts have been helpful as well as transition to cleaner fuels in the energy sector
- Voluntary program has become a key focus of MDE's efforts to reach ozone attainment



Why Peak Days are Important

- There are more summer days on average in Maryland when temperatures exceed 90 degrees
 - The potential for poor air quality increases when temperatures are high
 - When it's hot ... energy units run the most
 - Public health risks from ozone are elevated on peak days
 - MD is getting closer to attaining the ozone standard each year
 - Attaining the ozone standard equals cleaner air, improved health, a better economy and less regulatory burdens
 - In 2021, roughly half of the ozone exceedances occurred at a single monitoring location
 - Shaving peak emissions during these crucial times are becoming more and more important



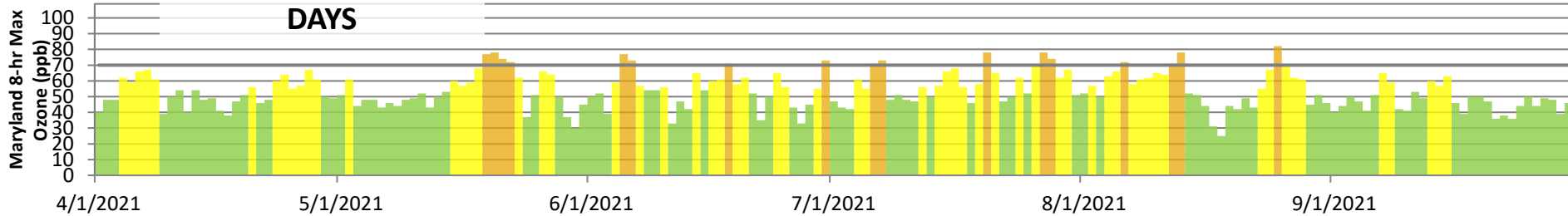
Moving Towards Attainment

- Maryland is very close to attaining the ozone standard
 - Record low ozone levels for Maryland in 2020
 - 2021 saw an increase in the number of ozone days, but the trend continues downward
 - Peak day efforts can be a huge factor towards attainment in Maryland
 - A handful of days where exceedances at a single monitor and by just a couple of ppb
- Retirement of coal-fired EGUs and transition to cleaner energy sources will continue improvements
- Need to ensure that turbine engines coming online are being run efficiently and not impeding progress

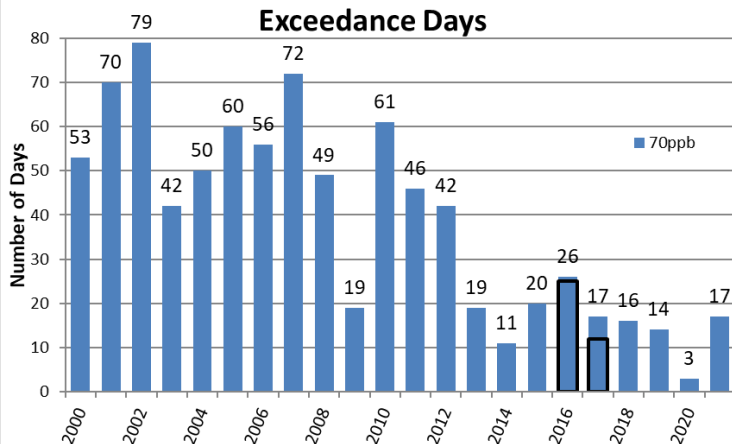


2021* Season at a Glance

17 EXCEEDANCE DAYS

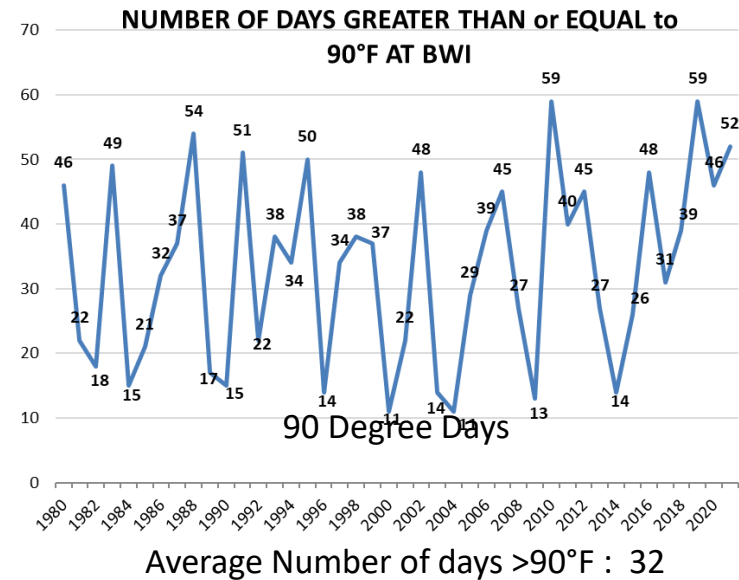


The summer of 2021 was warm; **4th most** number of 90 degree days at BWI. Maryland tied for **5th fewest** exceedances ever in 2021. Summer weather comparable to 2020, though cooler July



"Recovery Bounce"

- 2021 had a warm and early season smoke episode, resulting in 4 exceedance days. (not present in 2020)
- Overall the 2021 season maintained more 90 degree days than 2020
- 9 days one-monitor exceedances



*Through October 5; Preliminary Data, subject to change



Single Monitor Exceedances

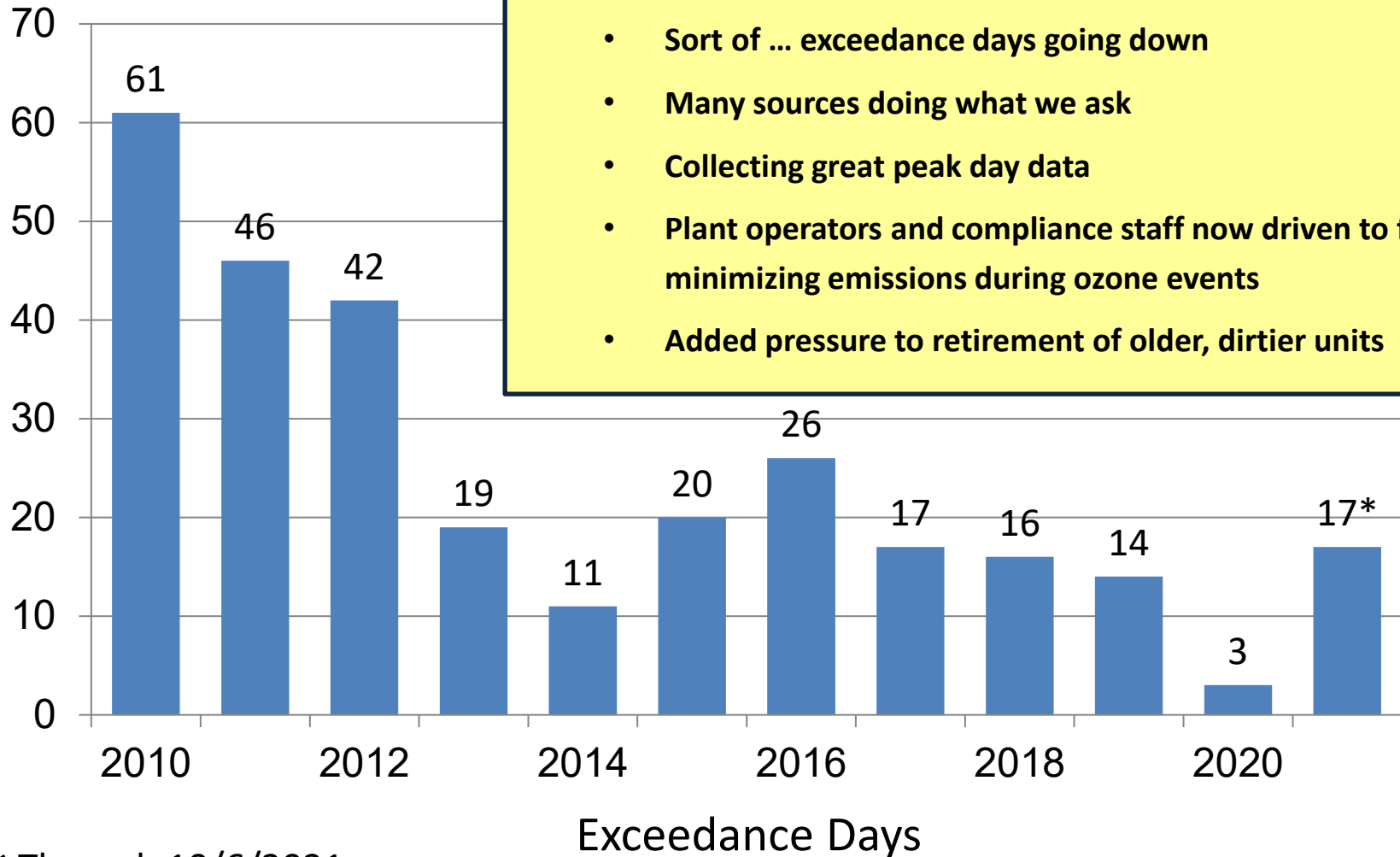
MARYLAND'S OZONE MAX 8-HOUR AVERAGE IN 2021

Last updated:08/26/2021 Raw data, subject to change. 2020 3-year Design Values are preliminary and subject to change.

| | Metropolitan Statistical Area (Group Number) | | | | | | | | | | | | | | | | | | | | Daily max 8-hour ozone (ppb) | Daily number of sites with an occurrence |
|---|--|----------|-------|--------|-------------|---------|---------------|---------|-----------------|-----------|-----------|-------------|-----------|--------------|-----------|-----------------|------------|------------|------------|-----------|------------------------------|--|
| | 1 | | | | | 2 | | | | | 3 | 4 | | | 5 | 6 | | | | | | |
| | Aldino | Edgewood | Essex | Furley | Glen Burnie | Padonia | South Carroll | Calvert | PG Equest. Ctr. | Frederick | Howard U. | Beltsville* | Rockville | So. Maryland | Fair Hill | Blackwater NWR* | Millington | Horn Point | Hagerstown | Piney Run | | |
| 2020 Design Value | 67 | 72 | 69 | 70 | 72 | 68 | 64 | 59 | 65 | 65 | 68 | 71 | 63 | 60 | 68 | 63 | 65 | 65 | 60 | 60 | conc. | |
| 05/19/2021 | 77 | 71 | 75 | | | | | | | | | | | | 72 | | | | | | 77 | 4 |
| 05/20/2021 | | | | | | | 74 | | 73 | 78 | 76 | 76 | 76 | | | | | 75 | | | 78 | 7 |
| 05/21/2021 | | | | | | | | | | | | | 74 | | | | | | | | 74 | 1 |
| 05/22/2021 | 72 | | | | | | | | | | | | | | | | | | | | 72 | 1 |
| 06/05/2021 | 77 | 74 | 74 | | 71 | | | | 73 | | | 72 | | | 75 | | 73 | | | | 77 | 8 |
| 06/06/2021 | | | 73 | 73 | | | | | | | | | | | | | | | | | 73 | 2 |
| 06/18/2021 | 71 | | | | | | | | | | | | | | | | | | | | 71 | 1 |
| 06/30/2021 | | | 73 | | | | | | | | | | | | | | | | | | 73 | 1 |
| 07/06/2021 | | | | | | | | | | | | | | | 71 | | | | | | 71 | 1 |
| 07/07/2021 | | | | 73 | | | | | | | | | | | | | | | | | 73 | 1 |
| 07/20/2021 | | | | 78 | | | | | | | | | | | | | | | | | 78 | 1 |
| 07/27/2021 | | | 73 | 78 | | | | | | | | 71 | | | | | | | | | 78 | 3 |
| 07/28/2021 | | | | 73 | | | 72 | | 72 | 74 | | | | 72 | | | | 72 | | | 74 | 6 |
| 08/06/2021 | 72 | 71 | 72 | | | | 72 | | | | | | | | | | | | | | 72 | 4 |
| 08/12/2021 | 71 | | | | | | | | | | | | | | | | | | | | 71 | 1 |
| 08/13/2021 | | | | 78 | | | | | | | | | | | | | | | | | 78 | 1 |
| 08/25/2021 | | | | 71 | | | 82 | | | | 71 | 79 | 74 | | | | | | | | 82 | 5 |
| <p>Due the spatial nature of ozone and exceedances, emissions from a single source are becoming increasingly important.</p> | | | | | | | | | | | | | | | | | | | | | | |
| Number of occurrence days | | | | | | | | | | | | | | | | | | | | | | |
| 2021: 17 | 6 | 6 | 10 | 0 | 1 | 3 | 1 | 1 | 3 | 1 | 2 | 4 | 3 | 1 | 3 | 0 | 1 | 1 | 1 | 0 | | |
| 2020: 3 | | | | | | | | | | | | | | | | | | | | | | |



Maryland Bad Ozone Days



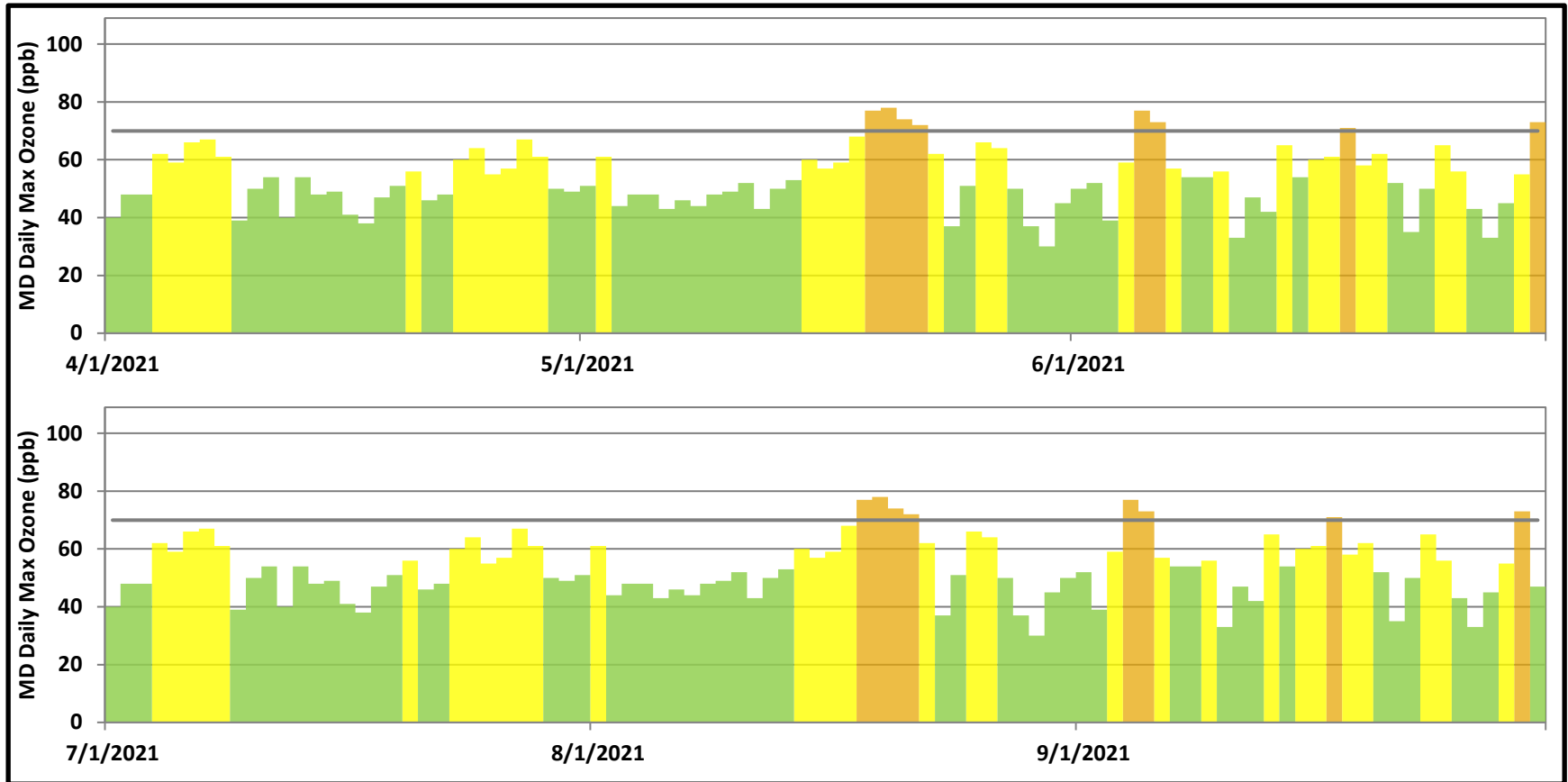
- **So ... Is it working?**
 - **Sort of ... exceedance days going down**
 - **Many sources doing what we ask**
 - **Collecting great peak day data**
 - **Plant operators and compliance staff now driven to focus on minimizing emissions during ozone events**
 - **Added pressure to retirement of older, dirtier units**

* Through 10/6/2021



Maryland's Air Quality

Summer 2021*

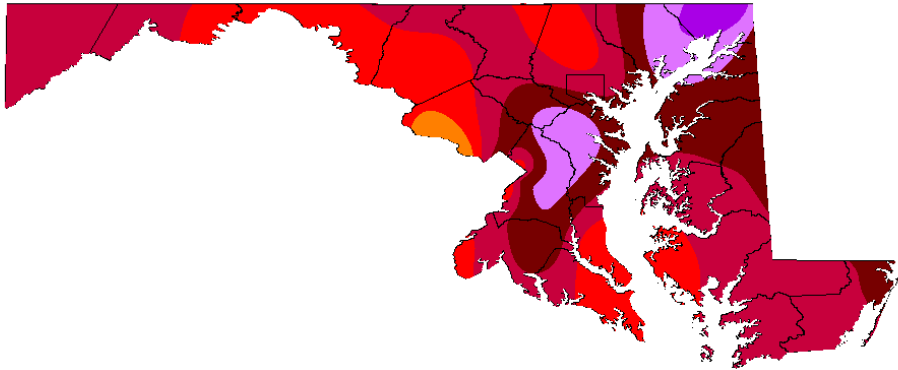


* 2021 data is preliminary

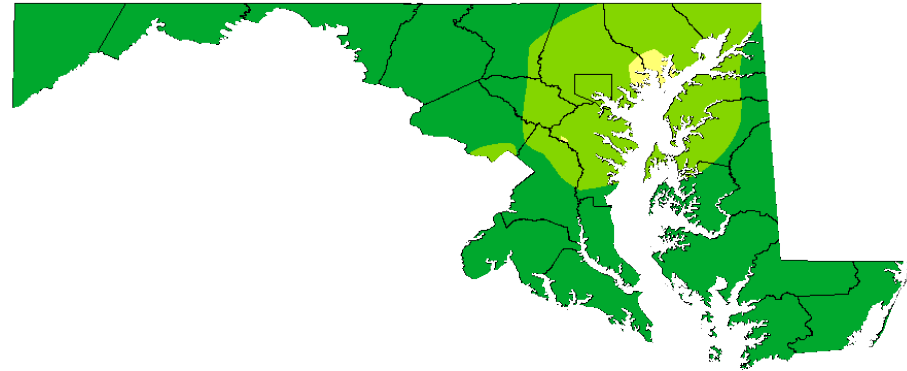


Shrinking Ozone

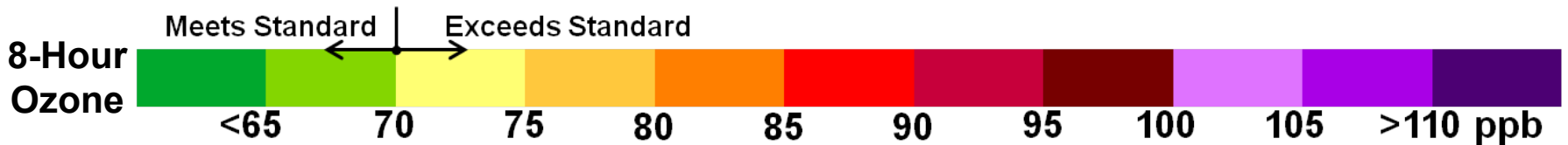
1998



2021*



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

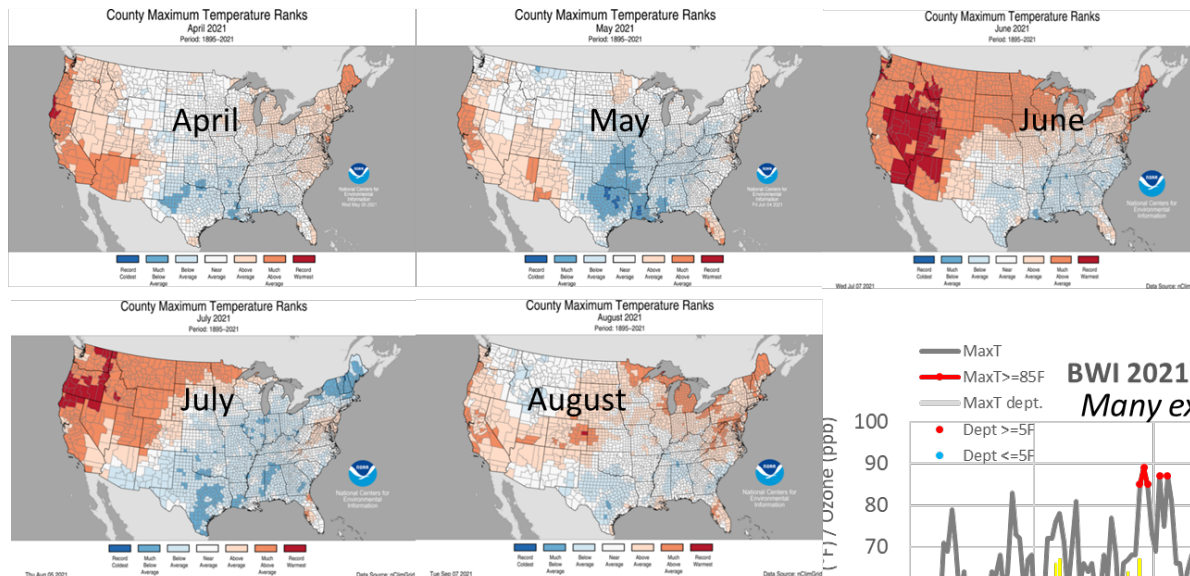


*Preliminary Data: Subject to Change



2021 Weather Synopsis

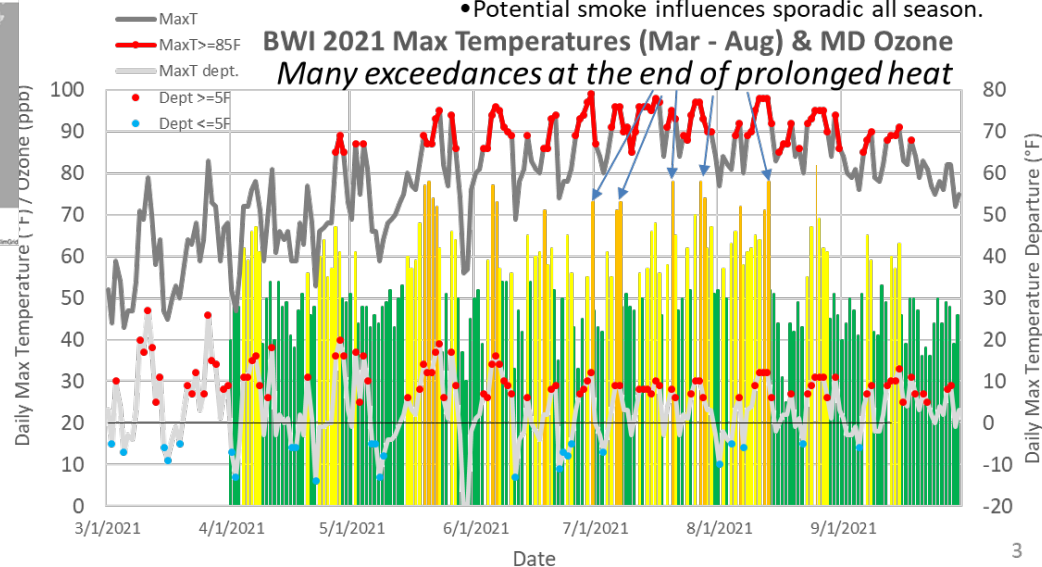
2021 Weather Synopsis



- 52 days $\geq 90^\circ\text{F}$
 - Started in late May, earlier than 2020
 - April, June, August, September all top within top 20 hottest all time in Maryland
 - Despite cold start to May, warm episode mid-late May enough for exceedances
 - August 10th warmest MaxT of all time

- 2021 was a return to weather / emissions normals
- Warm May episode with associated transported smoke led to a multi-day exceedance event (absent in 2020)
- **Overall summer (JJA) was warmer than normal, 12 warmest on record (2020 was 7th warmest)**

- Ozone season “effectively” underway early spring
 - Potential smoke influences sporadic all season.





Emissions trends in 2021?

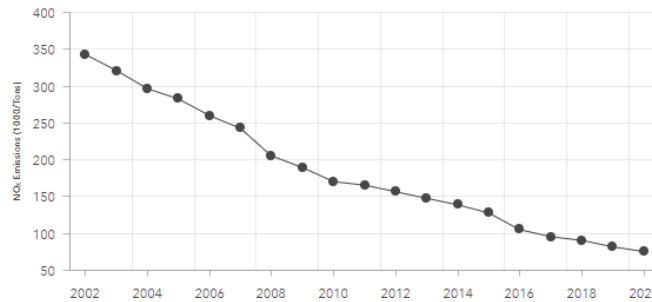
Maryland Emissions Trends

MDE's air monitoring network measures air pollutant values all over the state. This data is used to demonstrate how Maryland's air pollutant values compare to the NAAQS. In the graph to the right, each line represents, in percentages, how far above or below Maryland's pollutant values are relative to the federal standards. Keep in mind it is better to be below the NAAQS line.

Overall, from 2002 to 2020, values of these six pollutants have dropped drastically, and almost all values are below the NAAQS, which is a great accomplishment.

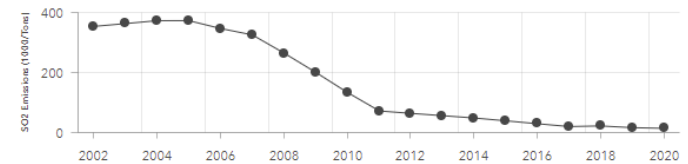
- ↓ Nitrogen Dioxide (NO₂) Annual 16% (2008-2019)
- ↓ Nitrogen Dioxide (NO₂) 1-Hour 8% (2009-2019)
- ↓ Ozone (O₃) 8-Hour 28% (2002-2020)
- ↓ Particles (PM_{2.5}) Annual 53% (2002-2019)
- ↓ Particles (PM_{2.5}) 24-Hour 51% (2002-2019)
- ↓ Sulfur Dioxide (SO₂) 1-Hour 88% (2008-2019)

NO_x Emissions



Last update: a minute ago

SO₂ Emissions



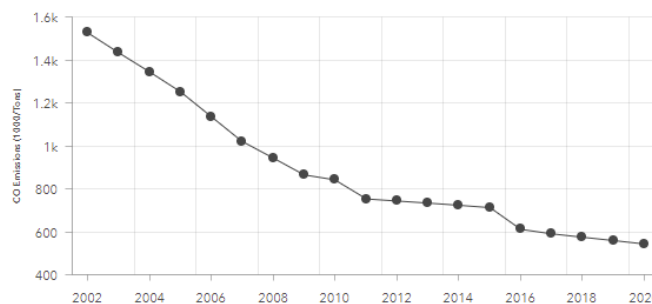
Last update: a minute ago

PM_{2.5} Emissions



Last update: a minute ago

CO Emissions



Last update: a minute ago

PM₁₀ Emissions



Last update: a minute ago

Maryland Air Pollutants Trends

Maryland Emissions Trends

- Emissions continue to decrease over time
- Did 2021 have a “bounce”?



2021 PEAK DAY PARTNERSHIP

HOW THE PROGRAM WORKS



The 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 2021 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 2021 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 Existing 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)
 - 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

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 Need 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





Units in the Peak Day Program

| Unit | COMAR 26.11.38 (MDs Optimization Reg) | MWC | Other Unit |
|---------------------------------|---|-----|------------|
| Brandon Shores Units 1 & 2 | ✘ | | |
| Chalk Point GT 2, 3, 4, 5, & 6 | | | ✘ |
| Chalk Point Units 3 & 4 | | | ✘ |
| Dickerson GT2 & 3 | | | ✘ |
| H.A. Wagner Unit 3 | ✘ | | |
| H.A. Wagner Units 1, 2 & 4 | | | ✘ |
| Morgantown Units 1 & 2 | ✘ | | |
| Morgantown GT3, GT4, GT5, & GT6 | | | ✘ |
| Perryman CT1, CT3 & CT4 | | | ✘ |
| Vienna 8 | | | ✘ |
| Montgomery County RRF | | ✘ | |
| Wheelabrator Baltimore, LP | | ✘ | |

Total - 31 units that are likely to impact the Baltimore, Washington and Philadelphia nonattainment areas ¹⁹



CSPs in the Peak Day Program

| Company | Active in 2021 |
|---------------------------|----------------|
| CPower | ✘ |
| Enel X | ✘ |
| NRG Curtailment Solutions | ✘ |



**REGULATORY HELPERS
AND PJM DEACTIVATIONS**



PJM Deactivations

- Maryland recent Peak Day units deactivated:
 - Westport 5
 - Shutdown confirmed June 1, 2020
 - Wagner 2
 - Ceased coal combustion June 1, 2020
 - Will no longer burn coal, but will continue to burn NG for on-site utilities
 - Notch Cliff GT1 – GT8
 - Shutdown confirmed June 1, 2020
 - Chalk Point Units 1 and 2
 - Shutdown confirmed June 1, 2021
 - Dickerson Units 1, 2 and 3
 - Shutdown confirmed August 13, 2020
- Will increase the use of cleaner units operating during peak days



Other Announcements

- Coal-fired EGU retirements:
 - Morgantown units 1 and 2 slated to retire in 2022
 - Brandon Shores and H.A. Wagner 3 slated to switch to fuel oil by December 31, 2025
- AES Warrior Run is the only coal plant left in the state without public plans to cease operating
 - Power contract scheduled to end on December 31, 2030
- GenOn will continue to run its gas and oil-fired plants at Morgantown, Chalk Point and Dickerson
 - GT units are Peak Day partners and encouraged to optimize or curtail during Peak Days



2021 PEAK DAY WEATHER SUMMARY

| Valid Date | Forecast MD Max O3 (ppb) | Actual MD Max O3 (ppb) |
|------------|------------------------------------|------------------------|
| May 19* | 68 | 77 |
| May 20 | 72 | 78 |
| May 21* | 69 | 74 |
| May 22* | 68 | 72 |
| June 5* | 65 | 77 |
| June 6 | 75 | 73 |
| June 18* | 68 | 71 |
| June 30* | 68 | 73 |
| July 4 | Multi-day Call to Action (July 6) | |
| July 6 | 71 | 71 |
| July 7 | 73 | 73 |
| July 12 | Multi-day Call to Action (July 15) | |
| July 15 | 73 | 66 |
| July 16 | 72 | 68 |
| July 20* | 58 | 78 |
| July 27 | 73 | 78 |
| July 28* | 63 | 74 |
| Aug 6 | 71 | 72 |
| Aug 9 | 71 | 59 |
| Aug 12 | 71 | 71 |
| Aug 13 | 74 | 78 |
| Aug 23 | Multi-day Call to Action (Aug 25) | |
| Aug 25 | 72 | 82 |
| Aug 26 | 74 | 69 |

* Emails not sent out for these days

What Happened in 2021?

- Pilot Program began April 1st
- Call to Action issued 16 times
 - ✓ Three multi-day advance notices
 - ✓ 13 day ahead emails
 - Nine resulted in exceedances
 - ✓ Two days captured in multi-day advance notice
- Nine of 17 exceedances were one-monitor (53%!!!)



Did extra action help ???



Peak Day Ozone: Day Ahead

Day-advanced notices were sent out 13 separate times during the 2021 ozone season...

| Date Forecast | Forecast MD Max O3 (ppb) | Actual MD Max O3 (ppb) | Hit/False Alarm |
|---------------|--------------------------|------------------------|-----------------|
| May 20 | 72 | 78 | Hit |
| June 6 | 75 | 73 | Hit |
| July 6 | 71 | 71 | Hit |
| July 7 | 73 | 73 | Hit |
| July 15 | 73 | 66 | False Alarm |
| July 16 | 72 | 68 | False Alarm |
| July 27 | 73 | 78 | Hit |
| Aug 6 | 71 | 72 | Hit |
| Aug 9 | 71 | 59 | False Alarm |
| Aug 12 | 71 | 71 | Hit |
| Aug 13 | 74 | 78 | Hit |
| Aug 25 | 72 | 82 | Hit |
| Aug 26 | 74 | 69 | False Alarm |



Peak Day Ozone: Multi-Day

Multi-Day advanced notices were sent out 3 times for 3 unique days during the 2021 ozone season...

| Date Issued | Date Forecast | Actual MD Max O3 (ppb) | Hit/False Alarm |
|-------------|---------------|------------------------|-----------------|
| July 4 | July 6 | 71 | Hit |
| July 12 | July 15 | 66 | False Alarm |
| Aug 23 | Aug 25 | 82 | Hit |



Peak Day Ozone: Misses

There was only 8 days during the 2021 ozone season where Peak Day Ozone Pilot email was not sent out, yet Maryland saw ozone exceedances....

| Date | Forecast MD Max O3 (ppb) | Actual MD Max O3 (ppb) |
|----------|--------------------------|------------------------|
| May 19 | 68 | 77 |
| May 21* | 69 | 74 |
| May 22* | 68 | 72 |
| June 5 | 65 | 77 |
| June 18* | 68 | 71 |
| June 30* | 68 | 73 |
| July 20* | 58 | 78 |
| July 28 | 63 | 74 |

- Nine of 17 exceedance days were at one monitor, making the call for issuing exceedances over a wide region difficult
- Five of eight misses were on days with a one-monitor exceedance

* Single monitor exceedances



2021 PEAK DAY PARTNERSHIP

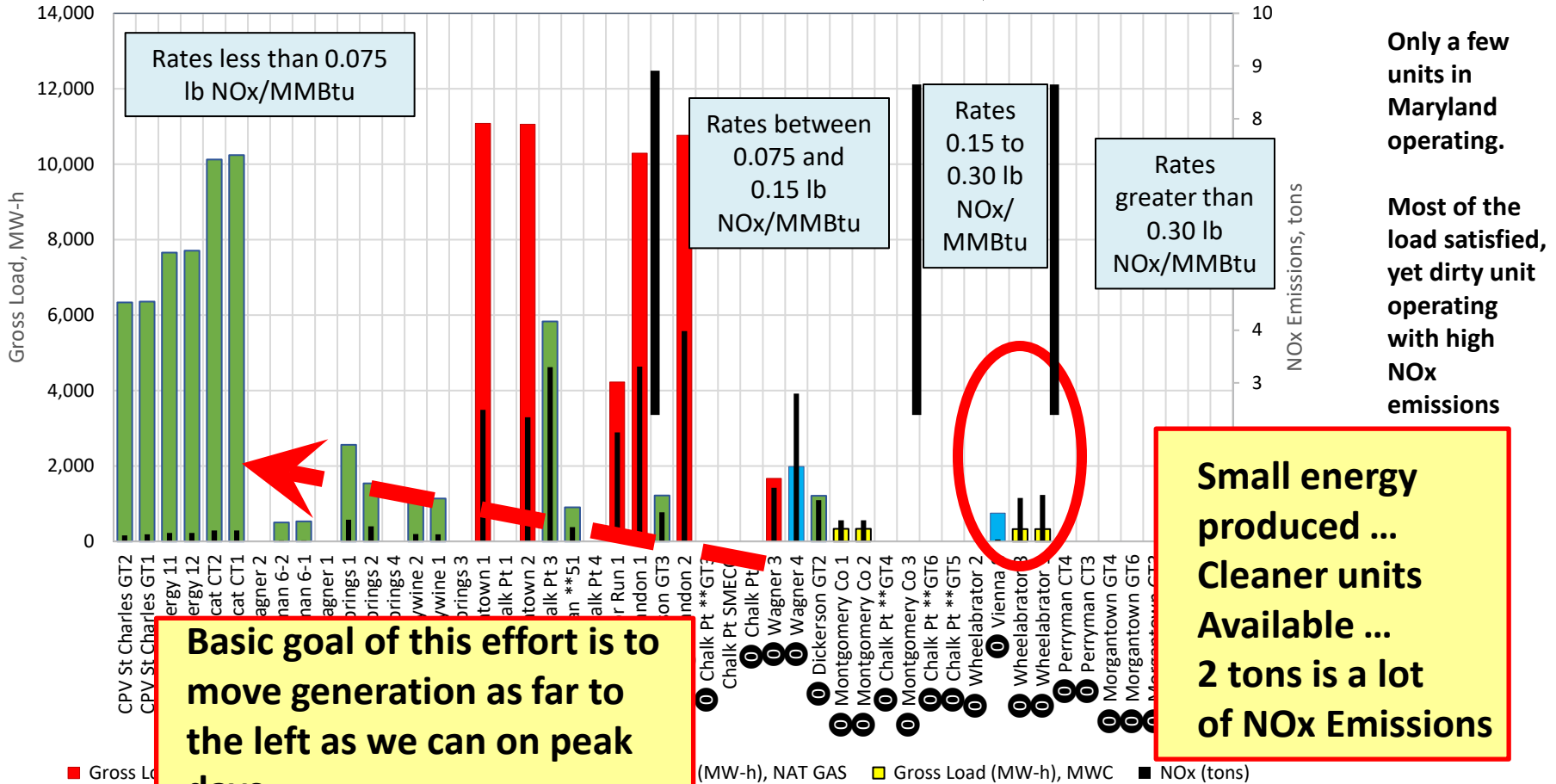
WHAT HAPPENED? WHO DID WHAT?



Who Emitted ... At What Rates

Emissions Data Collection and Analysis

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

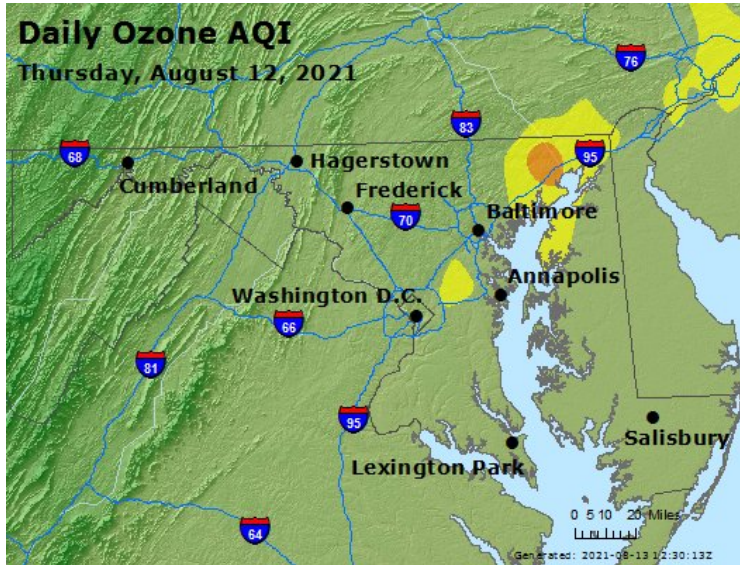
Basic goal of this effort is to move generation as far to the left as we can on peak days

Small energy produced ... Cleaner units Available ... 2 tons is a lot of NO_x Emissions



Peak Day Ozone: Day Ahead

August 12 Exceedance (Thursday)



Local – Downwind Baltimore

Near record heat (record high 99°F) only led to an isolated pocket of ozone concentrations briefly touching up to 100 ppb in minute data before moving on and past the monitors northeast of Baltimore. The ozone led to only 1 site exceeding 70ppb for an 8-hour average. For several days in the past week, one site (Padonia: Monday, Aldino: Wednesday) were the one and only sites to flirt with ozone above 70 ppb, despite temperatures continually in the 90s, and abundant sun. Note concentrations at mountain-top monitors were below 40ppb!

The exceedance at Aldino on this Thursday appeared to be precipitated from morning NOx concentrations from Baltimore producing a pocket of ozone that moved northeastward. Mixing was slightly inhibited in the Aldino area due to southwest surface winds off the Bay. This was in contrast to other areas where the PBL may have mixed to as high as 3km! However, at Aldino, the combination of suspected weaker mixing and spatial distance from NOx sources around Baltimore (allowing ozone formation to peak) brought a just long enough and high enough period of ozone to raise the 8-hour average above 70 ppb. Note that at 2pm, a 53ppb difference existed between Aldino and Padonia, with Padonia measuring a 40 ppb hourly average, and Aldino measuring 93 ppb!

Summary

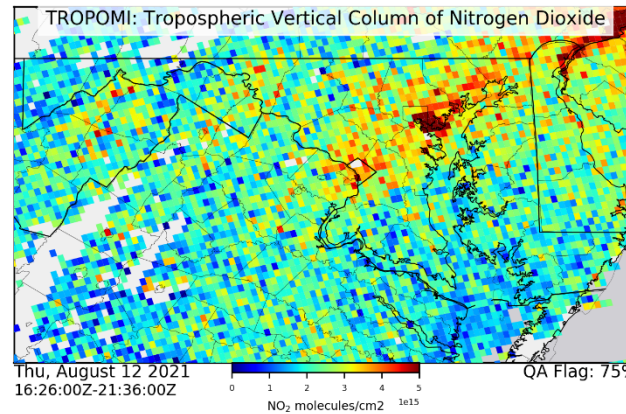
Forecast: 71 ppb

Observed: Aldino: 71 ppb

Single monitor exceedance

Weather

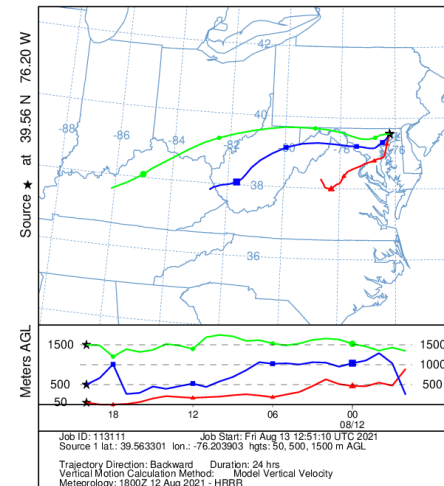
- 98°F High Temperature at BWI
- Avg surface winds: SW @ ~5mph
- Mostly Sunny



Verified

Did EGUs do anything?

NOAA HYSPLIT MODEL
Backward trajectories ending at 2000 UTC 12 Aug 21
HRRR Meteorological Data





August 12 Operational Data

Units That Did Not Run

| Unit | Comment |
|------------------------------|-----------------|
| Wagner Units 2 and 4 | Did Not Operate |
| Morgantown Unit 2 | Did Not Operate |
| Morgantown GT3, 4, 5 and 6 | Did Not Operate |
| Chalk Units 3 | Did Not Operate |
| Chalk Point GT2, 3, 4, 5 & 6 | Did Not Operate |
| Vienna 8 | Did Not Operate |
| MCRFF Unit 1 | Did Not Operate |

- 15 of 31 units did not operate

CSPs did not dispatch demand response customers or call for test operations



August 12 Operational Data

Units That Ran

| Unit | Duration | Rate | Comment |
|----------------|----------|---------------|-----------------------------------|
| Brandon Unit 1 | 24 hours | 0.08 lb/mmBTU | 3.74 tons of NOx – low temp/load |
| Brandon Unit 2 | 24 hours | 0.06 lb/mmBTU | 3.52 tons of NOx – low temp/load |
| Wagner Unit 1 | 24 hours | 0.08 lb/mmBTU | 0.72 tons of NOx – MW gen 9 hours |
| Wagner Unit 3 | 23 hours | 0.09 lb/mmBTU | 1.3 tons of NOx – startup/SD |
| Morgantown U1 | 24 hours | 0.04 lb/mmBTU | 1.9 tons of NOx |
| Chalk Unit 3 | 24 hours | 0.07 lb/mmBTU | 4.7 tons of NOx |
| Dickerson GT2 | 8 hours | 0.11 lb/mmBTU | 0.59 tons of NOx |
| Dickerson GT3 | 9 hours | 0.08 lb/mmBTU | 0.48 tons of NOx |
| Perryman CT1 | 4 hours | 0.59 lb/mmBTU | 0.95 tons of NOx |
| Perryman CT3 | 7 hours | 0.52 lb/mmBTU | 1.48 tons of NOx |
| Perryman CT4 | 4 hours | 0.49 lb/mmBTU | 0.88 tons of NOx |



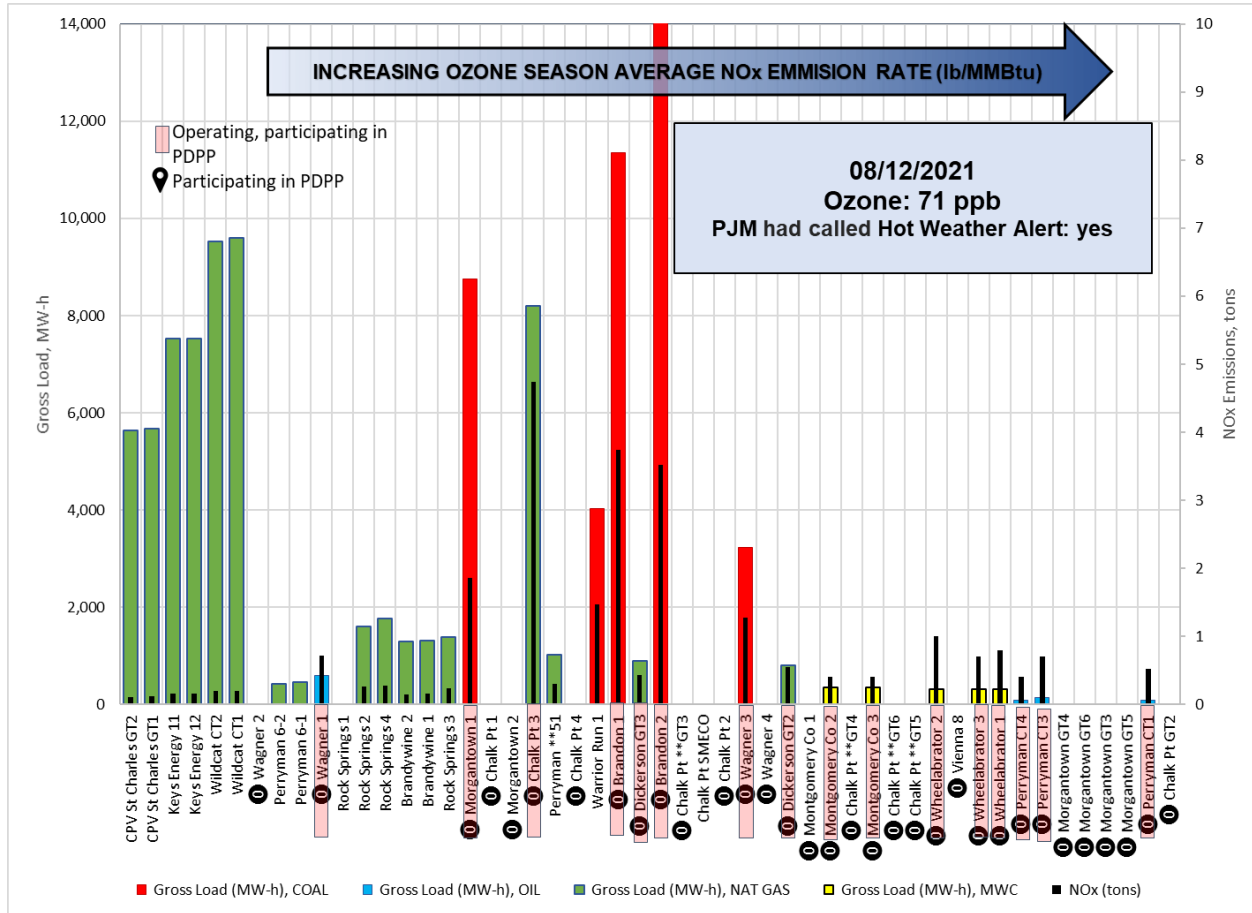
August 12 Operational Data

Units That Ran

| Unit | Duration | Rate | Comment |
|--------------|----------|---------|----------------------|
| Wheelabrator | | | Facility-wide total: |
| Unit 1 | 24 hours | 136 ppm | 2.49 tons of NOx |
| Unit 2 | 24 hours | 144 ppm | |
| Unit 3 | 24 hours | 136 ppm | |
| MCRFF | | | Facility-wide total: |
| Unit 2 | 24 hours | 66 ppm | 0.8 tons of NOx |
| Unit 3 | 24 hours | 71 ppm | |



August 12 - Are the Right Units Running?





Peak Day Ozone: Day Ahead

August 13 Exceedance (Friday)



Summary

Forecast: 74 ppb

Observed: Essex: 78 ppb

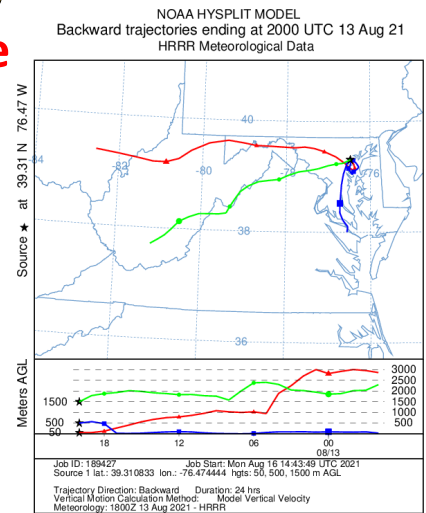
Single monitor exceedance

Weather

- 98°F High Temperature at BWI
- Avg surface winds: W @ ~5mph
- Partly Sunny

Verified

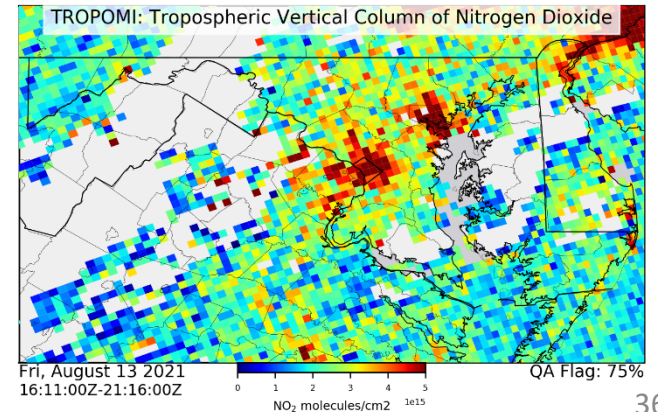
Did EGUs do anything?



Local – Downwind Baltimore

Meteorologically, conditions were very similar to the previous day's exceedance. Very warm temperatures (98 @ BWI) and ample morning/early afternoon sunshine helped to set the stage. Like the previous day, ozone was very local to downwind of Baltimore. Residual ozone and high elevation monitors were quite low. High elevation monitors around the area were generally in the 30-40s ppb. Prevailing westerly flow along with Bay breezes acted as a convergence zone, leading to very high ozone levels measured just east of Baltimore City. Hourly ozone concentrations at Essex peaked at 103ppb! The dirty air from the Baltimore plume was able to briefly wrap around to Padonia (north of Baltimore City) where 2 consecutive hours measured ozone at 93ppb.

By the afternoon hours a line of convection fired up across the mountains and began to push eastward (see radar below). Ozone levels quickly dropped by the late afternoon as heavy rain and thunderstorms help to mix the air at the surface. Despite this late afternoon mixing, ozone concentrations were high enough prior to result in an ozone exceedance at Essex at 78ppb.





August 13 Operational Data

Units That Did Not Run

| Unit | Comment |
|----------------------------|-----------------|
| Wagner Units 2 and 3 | Did Not Operate |
| Morgantown Unit 2 | Did Not Operate |
| Morgantown GT3, 4, 5 and 6 | Did Not Operate |
| Chalk Units 3 & 4 | Did Not Operate |
| Chalk Point GT3, 4, 5 & 6 | Did Not Operate |
| Vienna 8 | Did Not Operate |
| Perryman CT1, 3 and 4 | Did Not Operate |
| MCRFF Unit 1 | Did Not Operate |

- 18 of 31 units did not operate

CSPs did not dispatch demand response customers or call for test operations



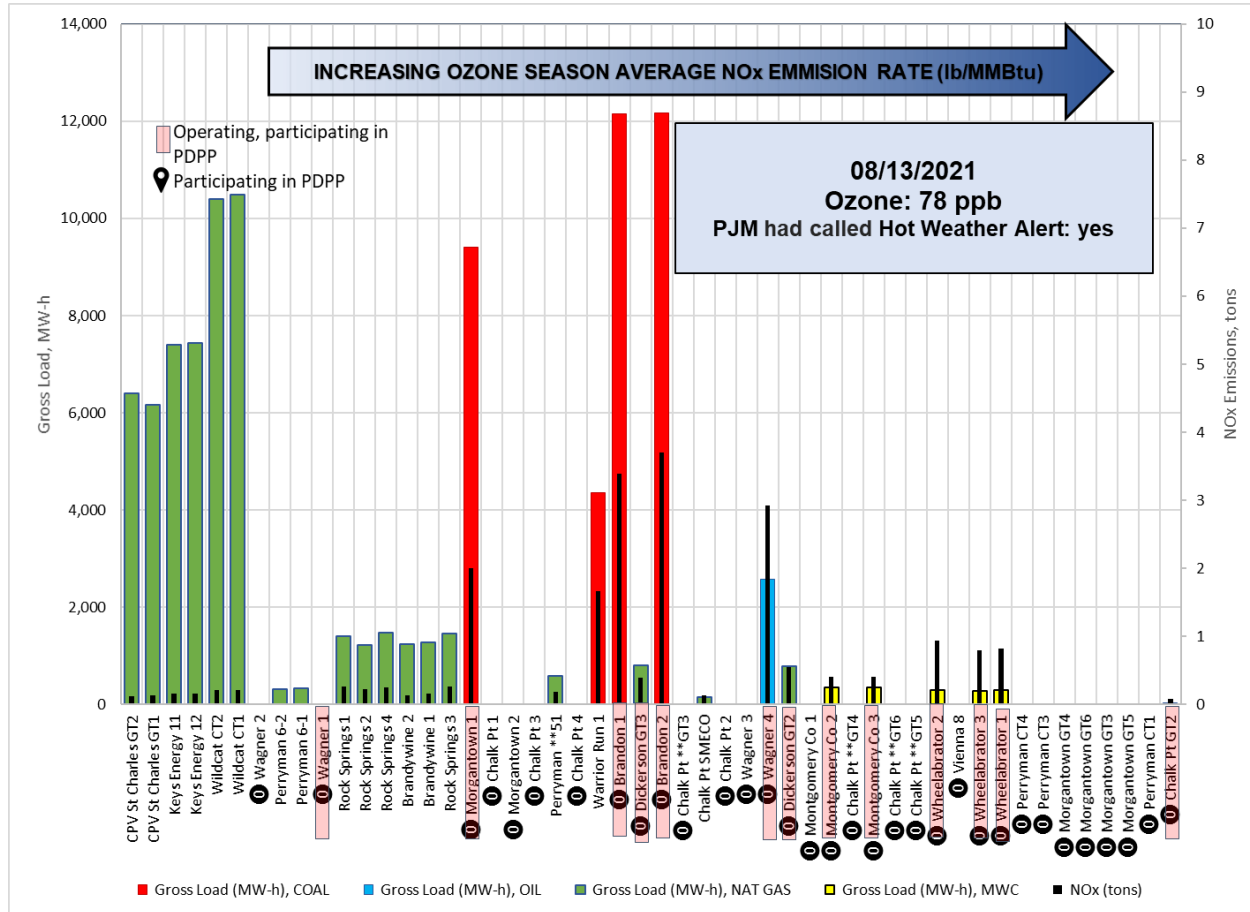
August 13 Operational Data

Units That Ran

| Unit | Duration | Rate | Comment |
|----------------|----------|---------------|-----------------------------------|
| Brandon Unit 1 | 24 hours | 0.06 lb/mmBTU | 3.39 tons of NOx – low temp/load |
| Brandon Unit 2 | 24 hours | 0.08 lb/mmBTU | 3.71 tons of NOx – low temp/load |
| Wagner Unit 1 | 6 hours | 0.02 lb/mmBTU | 0.0 tons of NOx – NG support |
| Wagner Unit 4 | 19 hours | 0.11 lb/mmBTU | 3.11 tons of NOx – MW gen 10 hrs. |
| Morgantown U1 | 23 hours | 0.02 lb/mmBTU | 0.04 tons of NOx |
| Chalk GT2 | 2 hours | 1.2 lb/mmBTU | 0.12 tons of NOx |
| Dickerson GT2 | 9 hours | 0.11 lb/mmBTU | 0.59 tons of NOx |
| Dickerson GT3 | 9 hours | 0.08 lb/mmBTU | 0.44 tons of NOx |
| Unit | Duration | Rate | Comment |
| Wheelabrator | | | Facility-wide total: |
| Unit 1 | 24 hours | 141 ppm | |
| Unit 2 | 24 hours | 145 ppm | 2.54 tons of NOx |
| Unit 3 | 24 hours | 141 ppm | |
| MCRFF | | | Facility-wide total: |
| Unit 2 | 24 hours | 66 ppm | |
| Unit 3 | 24 hours | 74 ppm | 0.8 tons of NOx |



August 13 - Are the Right Units Running?





Is the Potential Peak Day Regulation Still an Option?

- It is ... but the potential regulation is linked to voluntary action. Efforts in 2017 through 2020 have been reasonable
 - In 2021, dirtier oil and gas fired units brought online during peak days
 - If voluntary action in 2022 is adequate ... the regulation will remain “on hold”
- If needed, it would be a simple regulation:
 - Target units with large emissions and high rates
 - Limit the units that can run on any day when air quality is forecast to be code yellow, orange, red or purple
 - Only units with a rate less than 0.09 LB/MMBtu (or equivalent) would be allowed to run on those days
 - The potential regulation will include provisions to ensure that true energy emergencies are avoided

Questions ... Comments ... Discussion



A bright sun shining through a blue sky with scattered white clouds. The sun is positioned in the upper right quadrant, creating a lens flare effect. The clouds are fluffy and white, scattered across the sky. The overall scene is bright and clear.

**DETAILED SLIDES FOR
2021 PEAK DAYS**



Peak Day Ozone: Day Ahead

May 20th Exceedance (Thursday)

Summary

Verified

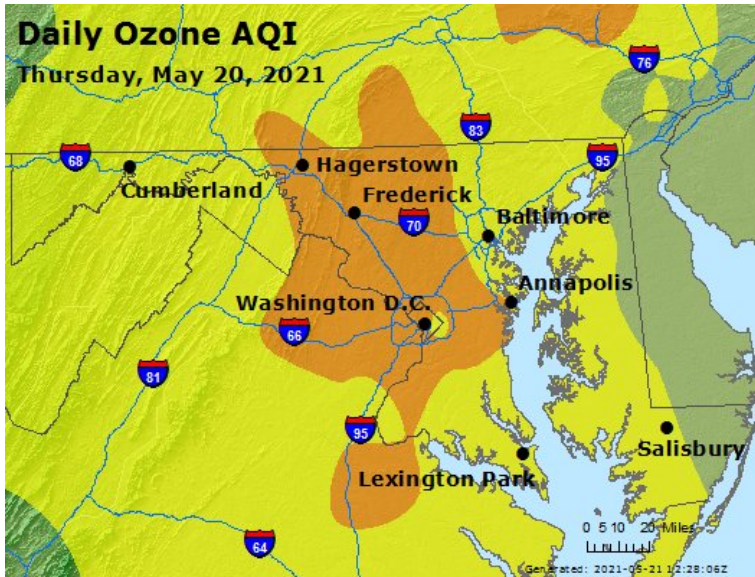
Forecast: 72 ppb

Did EGUs do anything?

Observed: Frederick: 78 ppb

Weather

- 87°F High Temperature at BWI
- Avg surface winds (6 to 6): Variable, turning east 5-7mph
- Mostly Sunny

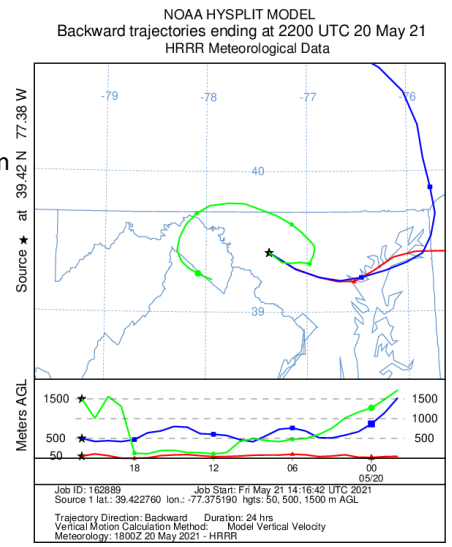
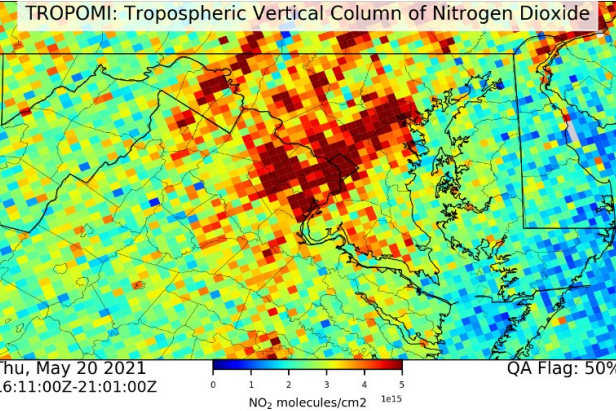


Maryland-regional recirculation-Carryover from previous day-Smoke

High pressure remained in control of the region. This along with an already dirty residual air mass provided an ideal ozone formation environment. Ozonesonde from the early morning hours on the 20th showed ozone in excess of 80ppb in the residual air mass at around 1.5km.

This is the highest we have seen from an early morning ozonesonde in years. It is suspected that the lifting of the reformulated gas restrictions due to the Colonial Pipeline hack may have aided in how dirty the regional air mass became.

Plentiful sunshine, warm temperatures and weak winds continued into the 20th. Ozone first began to climb along the I-95 corridor with the 1-hour concentrations spiking into the low to mid-80s ppb. During the late morning hours, winds began to turn easterly as cleaner maritime air was brought in from the Atlantic. As the clean air began to march west, the dirty air originally along the I-95 corridor began to follow suit. Large spikes in ozone were seen across the monitoring network as the slug of dirty air began to push westward. The majority of ozone exceedances in the state occurred west of the I-95 corridor, which is a rarity. The slug of dirty air was even able to make it all the way to Hagerstown. This was the first ozone exceedance at Hagerstown since 2017. In total, 7 monitors in the state exceeded the 8-hour ozone standard with Frederick Airport recording the highest at 78ppb.





May 20 Operational Data

Units That Did Not Run

| Unit | Comment |
|------------------------------|-----------------|
| Brandon Unit 2 | Did Not Operate |
| Wagner Units 1, 2, 3 and 4 | Did Not Operate |
| Morgantown Unit 2 | Did Not Operate |
| Morgantown GT3, 4, 5 and 6 | Did Not Operate |
| Chalk Point Unit 2, 3 & 4 | Did Not Operate |
| Chalk Point GT2, 3, 4, 5 & 6 | Did Not Operate |
| Vienna 8 | Did Not Operate |
| Perryman CT1, 3 and 4 | Did Not Operate |

**CSPs did not
dispatch demand
response customers
or call for test
operations**

- 22 of 33 units did not operate



May 20 Operational Data

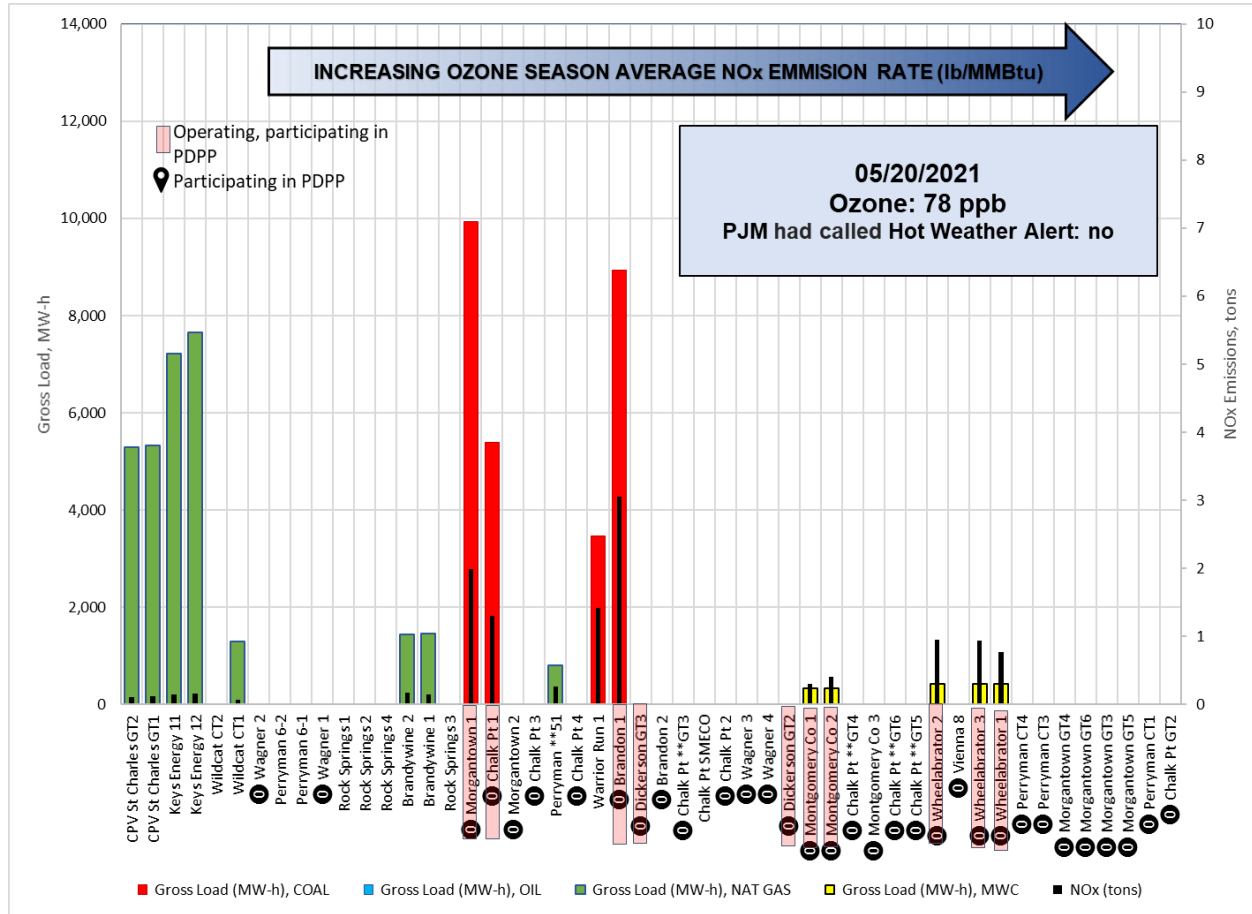
Units That Ran

| Unit | Duration | Rate | Comment |
|----------------|----------|---------------|---------------------------------|
| Brandon Unit 1 | 24 hours | 0.07 lb/mmBTU | 3.06 tons of NOx |
| Morgantown U1 | 24 hours | 0.04 lb/mmBTU | 2.0 tons of NOx |
| Chalk Point U1 | 24 hours | 0.04 lb/mmBTU | 1.3 tons of NOx – min. load gas |
| Dickerson GT2 | 1 hour | 0.11 lb/mmBTU | .02 tons of NOx |
| Dickerson GT3 | 1 hour | 0.08 lb/mmBTU | .01 tons of NOx |

| Unit | Duration | Rate | Comment |
|--------------|----------|---------|----------------------|
| Wheelabrator | | | Facility-wide total: |
| Unit 1 | 24 hours | 136 ppm | |
| Unit 2 | 24 hours | 132 ppm | 1.99 tons of NOx |
| Unit 3 | 24 hours | 135 ppm | |
| MCRFF | | | Facility-wide total: |
| Unit 1 | 24 hours | 69 ppm | |
| Unit 2 | 24 hours | 69 ppm | 1.2 tons of NOx |
| Unit 3 | 24 hours | 69 ppm | |



May 20 - Are the Right Units Running?





June 6 Operational Data Units That Did Not Run

| Unit | Comment |
|------------------------------|-----------------|
| Wagner Units 1 and 4 | Did Not Operate |
| Morgantown GT3, 4, 5 and 6 | Did Not Operate |
| Chalk Units 3 & 4 | Did Not Operate |
| Chalk Point GT2, 3, 4, 5 & 6 | Did Not Operate |
| Dickerson GT 2 & 3 | Did Not Operate |
| Vienna 8 | Did Not Operate |
| Perryman CT1, 3 and 4 | Did Not Operate |

- 19 of 31 units did not operate

CSPs did not dispatch demand response customers or call for test operations



June 6 Operational Data

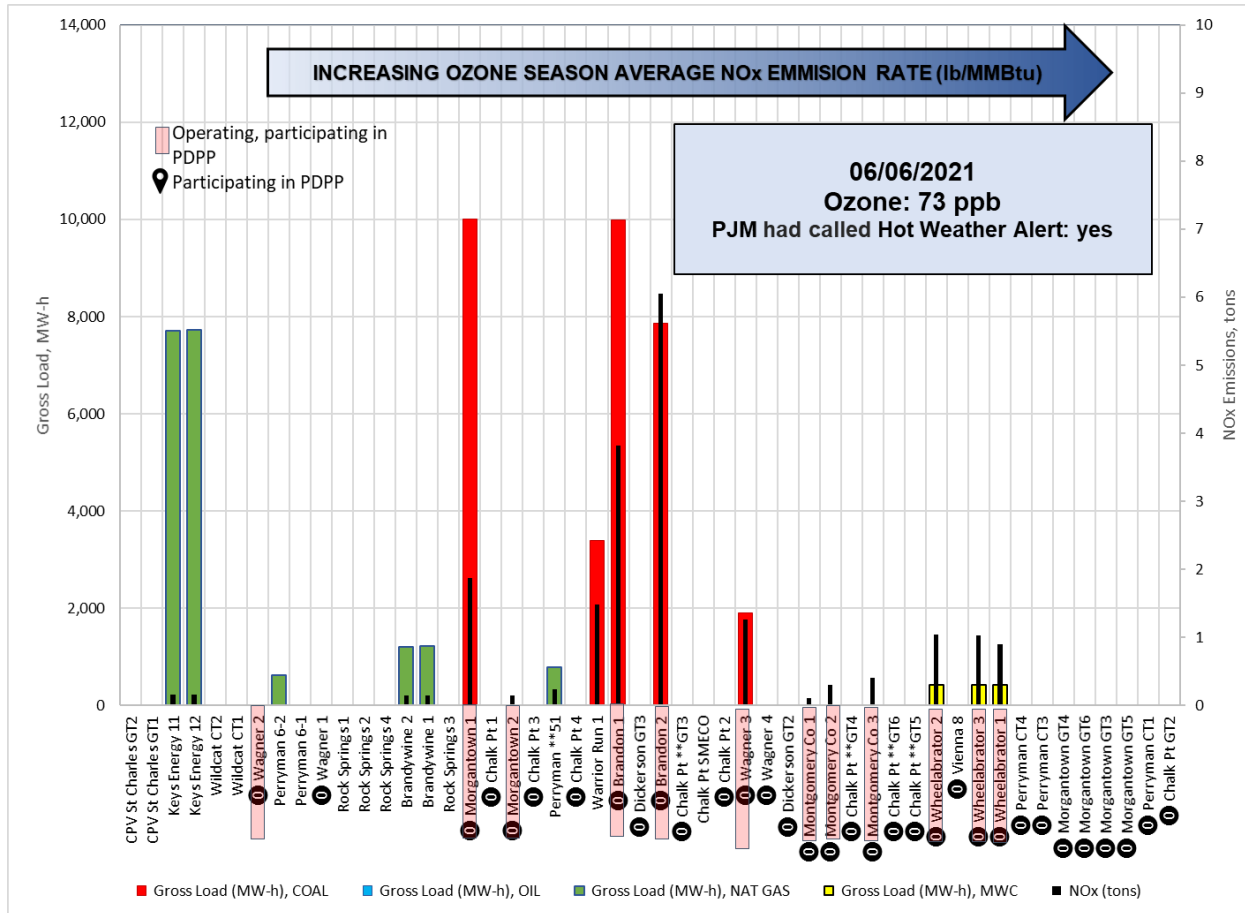
Units That Ran

| Unit | Duration | Rate | Comment |
|----------------|----------|---------------|--------------------------------------|
| Brandon Unit 1 | 24 hours | 0.08 lb/mmBTU | 3.81 tons of NOx – low load/SCR temp |
| Brandon Unit 2 | 24 hours | 0.18 lb/mmBTU | 6.05 tons NOx – Startup/NOx control |
| Wagner Unit 2 | 5 hours | 0.02 lb/mmBTU | 0.002 tons of NOx |
| Wagner Unit 3 | 24 hours | 0.14 lb/mmBTU | 1.25 tons of NOx |
| Morgantown U1 | 24 hours | 0.04 lb/mmBTU | 1.9 tons of NOx |
| Morgantown U2 | 3 hours | 0.25 lb/mmBTU | 0.1 tons of NOx – Startup cut short |

| Unit | Duration | Rate | Comment |
|--------------|----------|---------|----------------------|
| Wheelabrator | | | Facility-wide total: |
| Unit 1 | 24 hours | 143 ppm | 2.89 tons of NOx |
| Unit 2 | 24 hours | 141 ppm | |
| Unit 3 | 24 hours | 143 ppm | |
| MCRFF | | | Facility-wide total: |
| Unit 1 | 9 hours | 69 ppm | 0.8 tons of NOx |
| Unit 2 | 24 hours | 67 ppm | |
| Unit 3 | 24 hours | 65 ppm | |



June 6 - Are the Right Units Running?





Peak Day Ozone: Multi Day & Day Ahead

July 6 Exceedance (Tuesday)

Summary

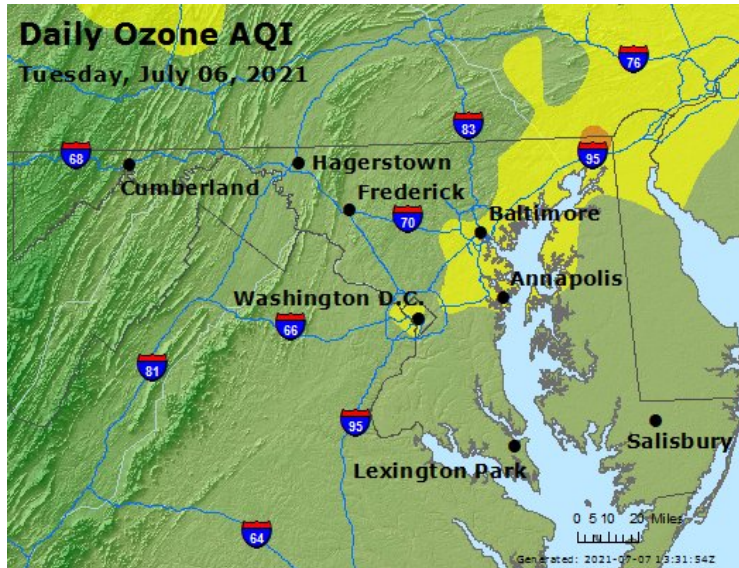
Forecast: 71 ppb

Observed: Fairhill: 71 ppb

Single monitor exceedance

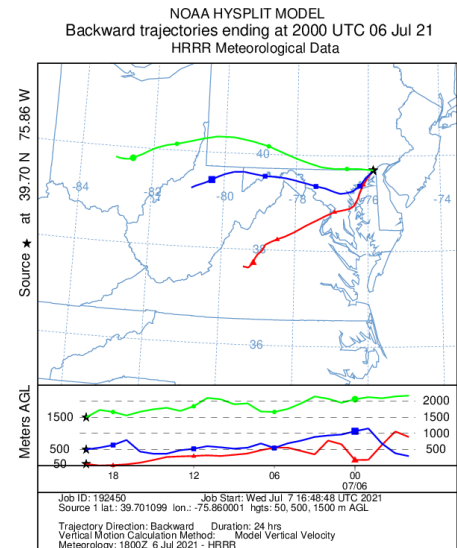
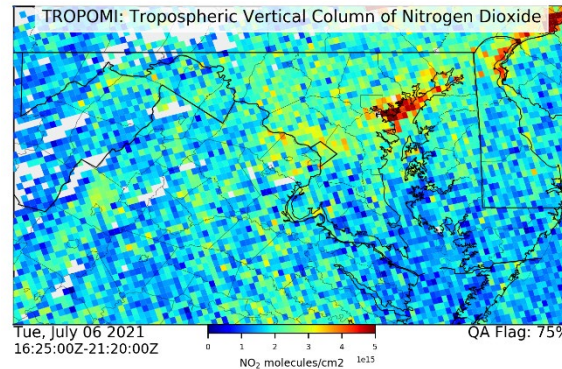
Verified

Did EGUs do anything?



Weather

- 96°F High Temperature at BWI
- Avg surface winds: SW 5-8mph
- Mostly Sunny



Local/I-95 transport/Smoke Enhancement?

Unseasonal warmth and plentiful sunshine helped to set the stage as high pressure settled over the Southeast several days prior to the event. The residual air mass, in terms of ozone, was still quite clean however. High elevation monitors around the area were hovering around 40ppb with a maximum 8-hr ozone concentration on the previous day (Monday) only reaching 55ppb.

A quick turnaround in ozone was expected Tuesday, July 6th as folks returned to work after the long holiday weekend. Surface winds helped to focus ozone along the I-95 corridor. Bay breezes in the northern part of the Bay helped to tap into the Baltimore plume as ozone was able to “cook”. TROPOMI vertical column NO₂ on the 6th (see below) shows elevated NO₂ readings in the Inner Harbor and the northern Chesapeake Bay. This may be a ship traffic signature, although there is no data to support this claim. Spikes in ozone were seen at all the monitors north and east of Baltimore that saw that more southerly Bay breeze influence. Fairhill, unlike the other Baltimore monitors was able to maintain elevated ozone long enough to exceed the standard.

It is worth noting that HMS did analyze smoke across our area. PM_{2.5} numbers were quite high with concentrations generally in the 15-20 µg/m³ range across the entire state. It is difficult to determine how much this played a role in ozone however since the overall residual airmass in terms of ozone remained quite clean with most monitors apart from the I-95 corridor remained in the Good AQI range.



July 6 Operational Data Units That Did Not Run

| Unit | Comment |
|------------------------------|-----------------|
| Wagner Units 1 and 4 | Did Not Operate |
| Morgantown GT3, 4, 5 and 6 | Did Not Operate |
| Chalk Units 3 & 4 | Did Not Operate |
| Chalk Point GT2, 3, 4, 5 & 6 | Did Not Operate |
| Vienna 8 | Did Not Operate |
| Perryman CT1, 3 and 4 | Did Not Operate |

- 17 of 31 units did not operate

CSPs did not dispatch demand response customers or call for test operations



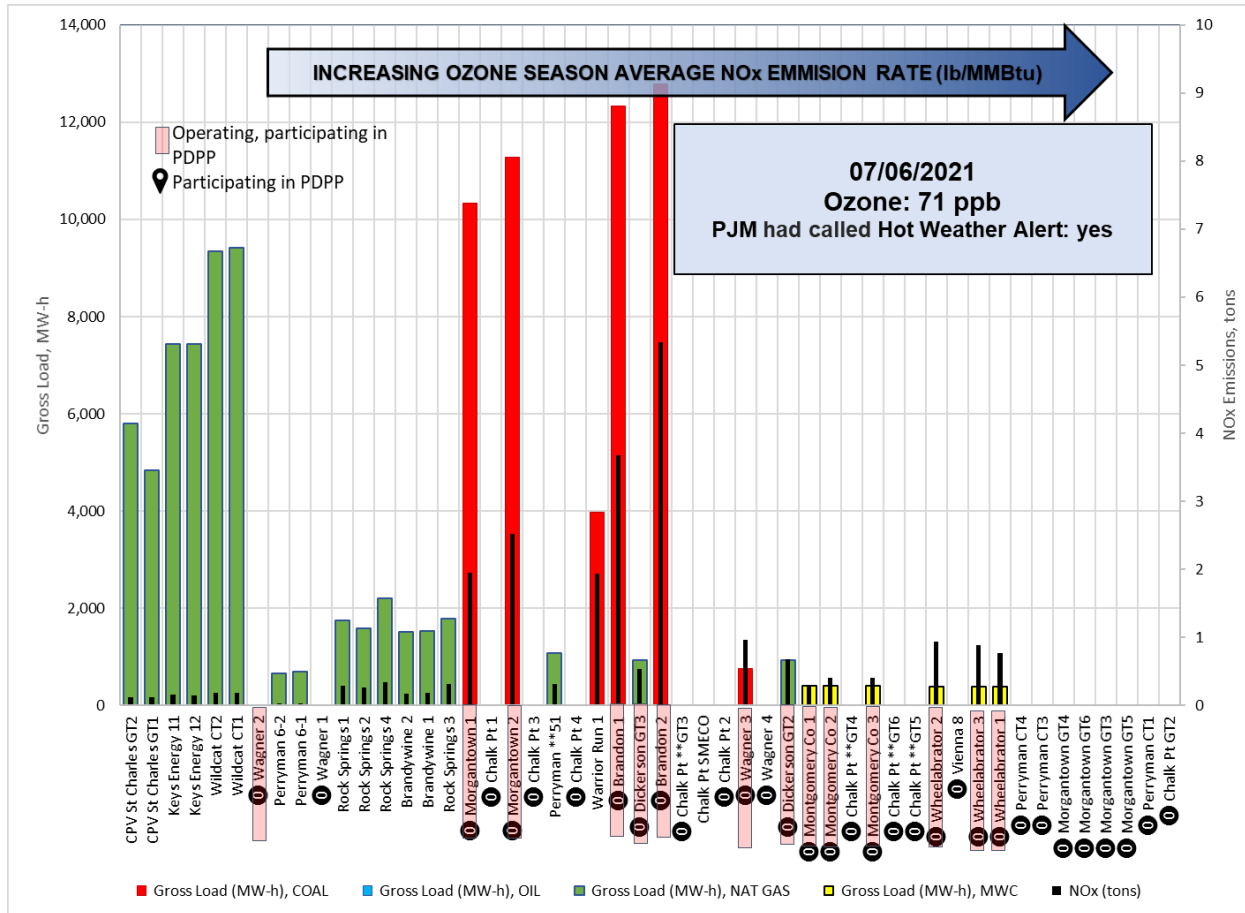
July 6 Operational Data

Units That Ran

| Unit | Duration | Rate | Comment |
|----------------|----------|---------------|------------------------------------|
| Brandon Unit 1 | 24 hours | 0.06 lb/mmBTU | 3.67 tons of NOx – low load |
| Brandon Unit 2 | 24 hours | 0.11 lb/mmBTU | 5.34 tons NOx – Startup |
| Wagner Unit 2 | 24 hours | 0.02 lb/mmBTU | 0.01 tons of NOx – Startup support |
| Wagner Unit 3 | 21 hours | 0.21 lb/mmBTU | 0.93 tons of NOx – Startup |
| Morgantown U1 | 24 hours | 0.04 lb/mmBTU | 2.0 tons of NOx |
| Morgantown U2 | 3 hours | 0.05 lb/mmBTU | 2.5 tons of NOx |
| Dickerson GT2 | 11 hours | 0.11 lb/mmBTU | 0.71 tons of NOx |
| Dickerson GT3 | 11 hours | 0.09 lb/mmBTU | 0.54 tons of NOx |
| Unit | Duration | Rate | Comment |
| Wheelabrator | | | Facility-wide total: |
| Unit 1 | 24 hours | 141 ppm | |
| Unit 2 | 24 hours | 144 ppm | 2.43 tons of NOx |
| Unit 3 | 24 hours | 138 ppm | |
| MCRFF | | | Facility-wide total: |
| Unit 1 | 24 hours | 61 ppm | |
| Unit 2 | 24 hours | 74 ppm | 1.1 tons of NOx |
| Unit 3 | 24 hours | 77 ppm | |



July 6 - Are the Right Units Running?





Peak Day Ozone: Day Ahead

July 7 Exceedance (Wednesday)



Summary

Forecast: 73 ppb

Observed: Essex: 73 ppb

Single monitor exceedance

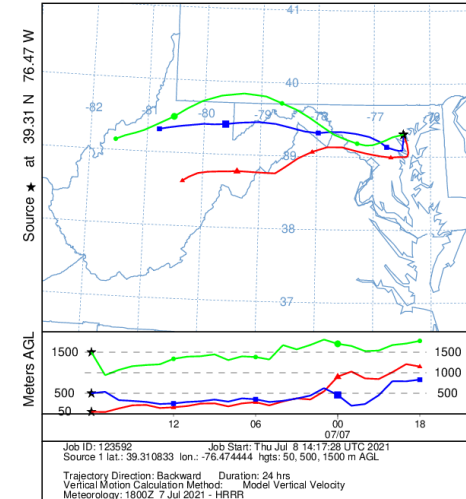
Verified

Did EGUs do anything?

Weather

- 96°F High Temperature at BWI
- Avg surface winds: W 4-6mph
- Partly Sunny/Isolated T-Storms

NOAA HYSPLIT MODEL
Backward trajectories ending at 1800 UTC 07 Jul 21
HRRR Meteorological Data



Local Emissions/Smoke Enhancement?

Meteorological conditions were very similar to the previous day's exceedance with high pressure persisting to our south. Winds however turning a bit more westerly and weaker. Temperatures still very warm, pushing into the mid-90s. As temperatures began to climb during the late morning, Bay breezes developed. Unlike the previous day where the bulk of the dirty air pushed north and east of Baltimore, given the surface winds being west and a bit weaker, the Bay breeze and dirty air associated with it was able to push back towards the city. Ozone quickly spiked at Essex (just east of Baltimore) with 1-minute ozone concentrations reaching 106ppb.

Around the time of maximum daytime heating, a lone thunderstorm was able to develop right around Baltimore City aided by the Bay breeze convergence boundary and the urban heat island (see radar image below). Ozone levels quickly dropped across the Baltimore area as cleaner air was mixed down towards the surface. This thunderstorm was short lived but provided some relief from high ozone. Sunshine returned at Essex later in the afternoon which helped to keep ozone just high enough to reach exceedance levels.

Again, smoke may have played a role in this exceedance. HRRR did analyze quite a bit of smoke at the surface from Canadian wildfires (see figure below). PM2.5 concentrations were well into the Moderate AQI range statewide. Unlike more classic smoke event cases, we did not see it correlate to widespread high ozone. Most monitors in the state stayed in the Good AQI range except around the Baltimore area giving reason to believe this was much more heavily induced by the local Baltimore plume.



July 7 Operational Data Units That Did Not Run

| Unit | Comment |
|------------------------------|-----------------|
| Wagner Units 1, 3 and 4 | Did Not Operate |
| Morgantown GT3, 4, 5 and 6 | Did Not Operate |
| Chalk Units 3 & 4 | Did Not Operate |
| Chalk Point GT2, 3, 4, 5 & 6 | Did Not Operate |
| Vienna 8 | Did Not Operate |
| Perryman CT1, 3 and 4 | Did Not Operate |

- 18 of 31 units did not operate

CSPs did not dispatch demand response customers or call for test operations



July 7 Operational Data

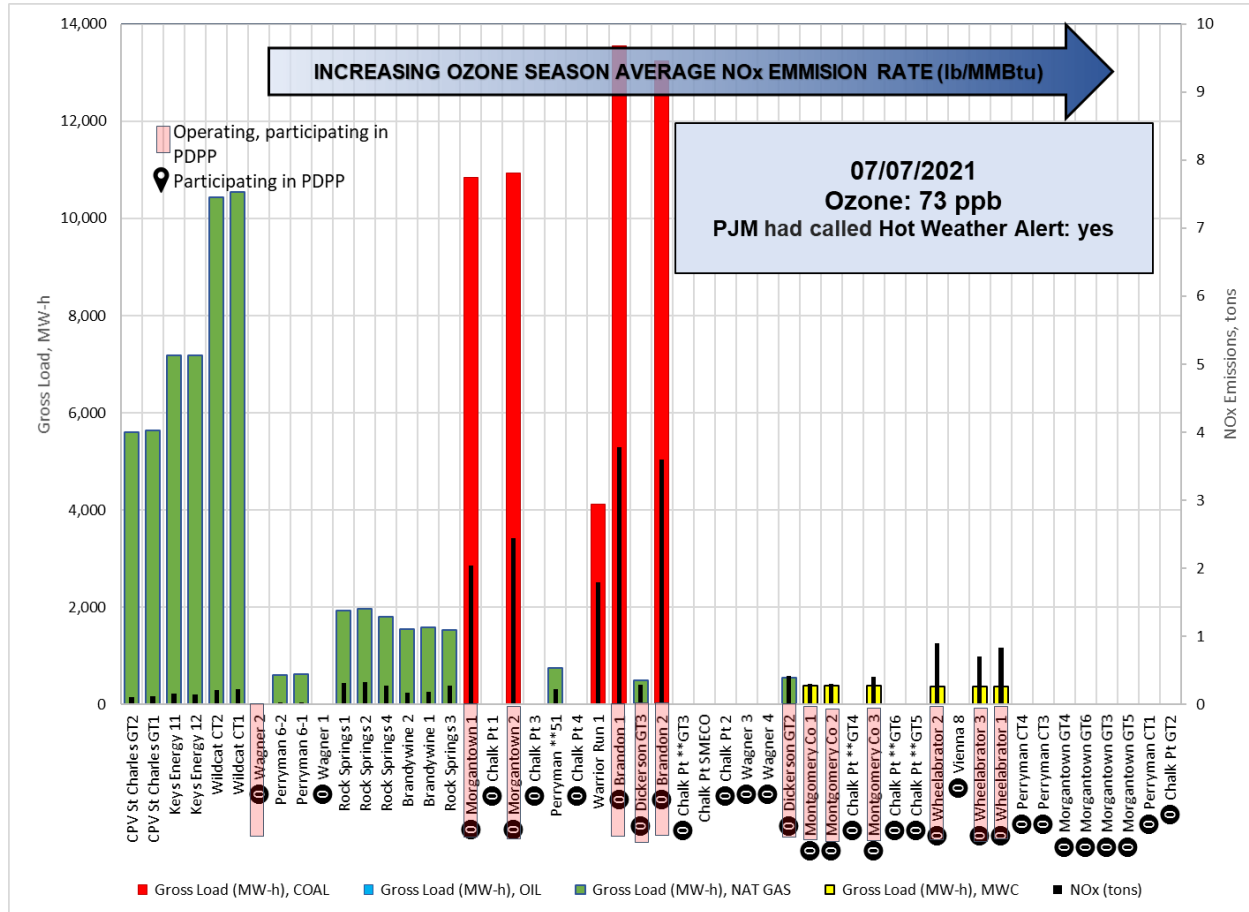
Units That Ran

| Unit | Duration | Rate | Comment |
|----------------|----------|---------------|------------------|
| Brandon Unit 1 | 24 hours | 0.06 lb/mmBTU | 3.77 tons of NOx |
| Brandon Unit 2 | 24 hours | 0.07 lb/mmBTU | 3.59 tons of NOx |
| Wagner Unit 2 | 7 hours | 0.01 lb/mmBTU | 0.0 tons of NOx |
| Morgantown U1 | 24 hours | 0.04 lb/mmBTU | 2.01 tons of NOx |
| Morgantown U2 | 24 hours | 0.04 lb/mmBTU | 2.44 tons of NOx |
| Dickerson GT2 | 7 hours | 0.11 lb/mmBTU | 0.42 tons of NOx |
| Dickerson GT3 | 6 hours | 0.09 lb/mmBTU | 0.29 tons of NOx |

| Unit | Duration | Rate | Comment |
|--------------|----------|---------|----------------------|
| Wheelabrator | | | Facility-wide total: |
| Unit 1 | 24 hours | 142 ppm | 2.43 tons of NOx |
| Unit 2 | 24 hours | 134 ppm | |
| Unit 3 | 24 hours | 135 ppm | |
| MCRFF | | | Facility-wide total: |
| Unit 1 | 24 hours | 54 ppm | 1.0 tons of NOx |
| Unit 2 | 24 hours | 62 ppm | |
| Unit 3 | 24 hours | 67 ppm | |



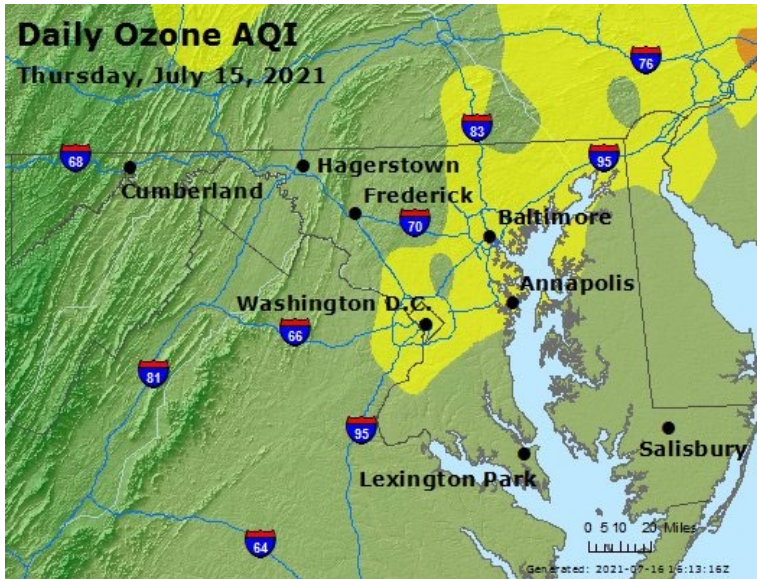
July 7 - Are the Right Units Running?





Peak Day Ozone: Day Ahead & Multi Day

July 15 Non-Exceedance (Thursday)



Summary

Forecast: 73 ppb

Observed: Essex: 66 ppb

False Alarm
Did EGUs do anything?

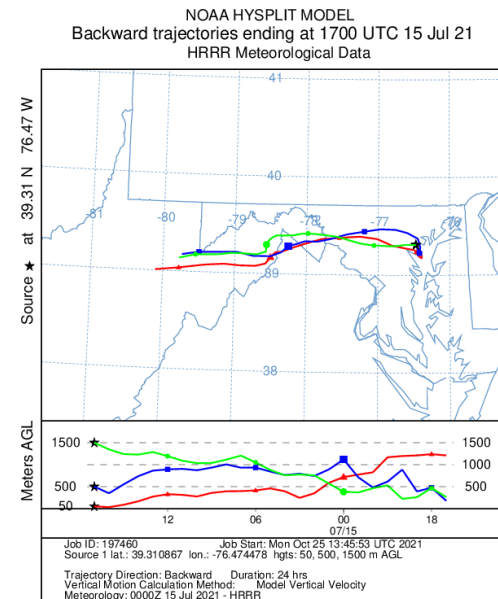
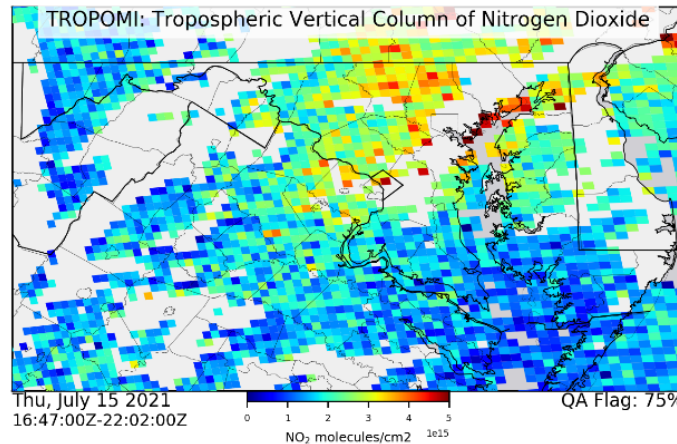
Weather

- 95°F High Temperature at BWI
- Avg surface winds: S/SW @ 5mph
- Cirrus Overcast, BB cumulus convection

Very local, Non-Exceedance, Bay centric

It appears that local weather reduced the impacts from local source(s) near Essex, keeping the site from exceeding. The highest hourly concentration at Essex reached 79 ppb, but began to fall thereafter. Clouds, a clean Bay, or local mixing prevented sustained ozone at the site.

Trajectories indicate a westerly fetch, with air dropping to the surface before impacting Essex during the highest concentrations.





July 15 Operational Data

Units That Did Not Run

| Unit | Comment |
|------------------------------|-----------------|
| Wagner Units 1, 2, 3 and 4 | Did Not Operate |
| Morgantown Unit 2 | Did Not Operate |
| Morgantown GT3, 4, 5 and 6 | Did Not Operate |
| Chalk Units 3 & 4 | Did Not Operate |
| Chalk Point GT2, 3, 4, 5 & 6 | Did Not Operate |
| Vienna 8 | Did Not Operate |
| Perryman CT1, 3 and 4 | Did Not Operate |

- 20 of 31 units did not operate

CSPs did not dispatch demand response customers or call for test operations



July 15 Operational Data

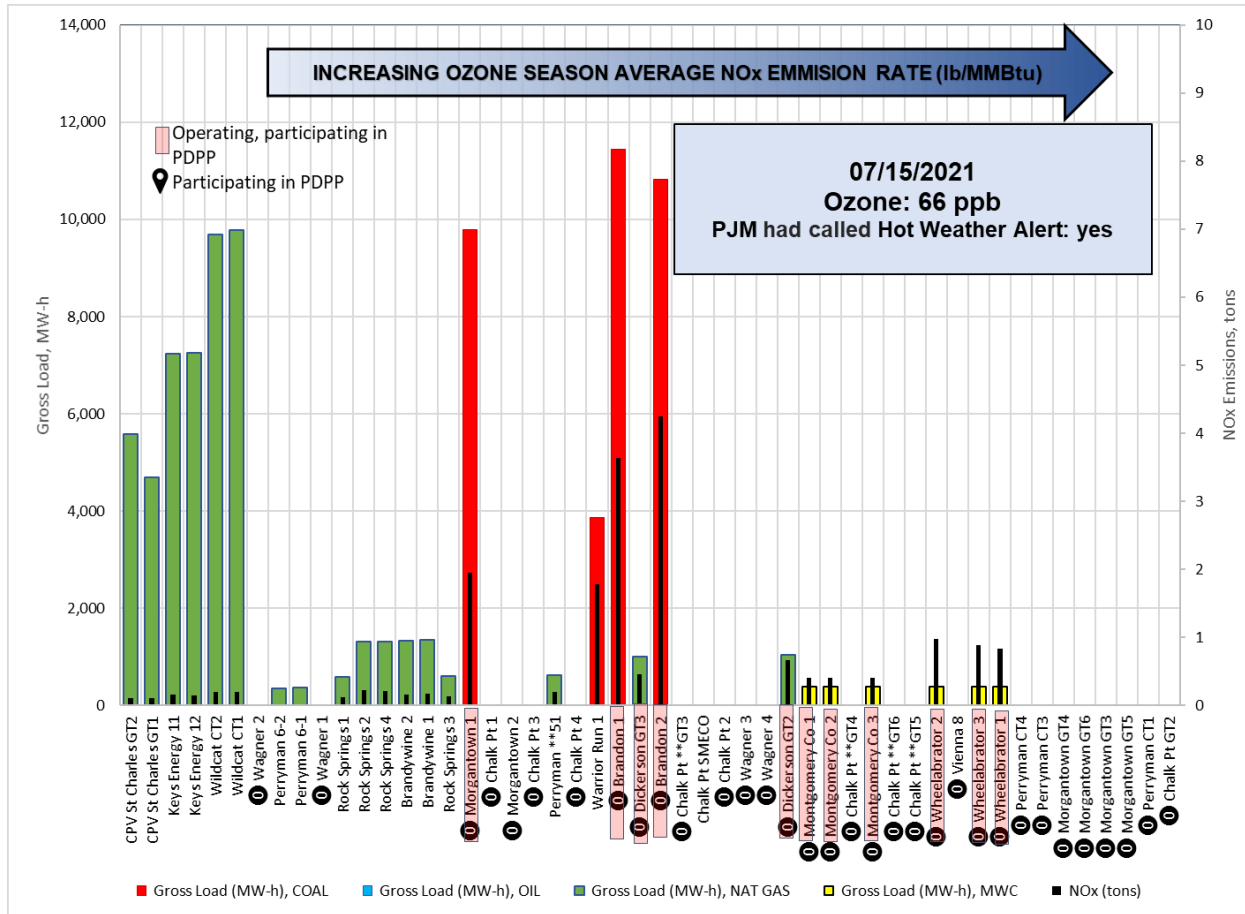
Units That Ran

| Unit | Duration | Rate | Comment |
|----------------|----------|---------------|------------------|
| Brandon Unit 1 | 24 hours | 0.07 lb/mmBTU | 3.63 tons of NOx |
| Brandon Unit 2 | 24 hours | 0.09 lb/mmBTU | 4.24 tons NOx |
| Morgantown U1 | 24 hours | 0.04 lb/mmBTU | 1.9 tons of NOx |
| Dickerson GT2 | 9 hours | 0.11 lb/mmBTU | 0.71 tons of NOx |
| Dickerson GT3 | 9 hours | 0.08 lb/mmBTU | 0.48 tons of NOx |

| Unit | Duration | Rate | Comment |
|--------------|----------|---------|----------------------|
| Wheelabrator | | | Facility-wide total: |
| Unit 1 | 24 hours | 138 ppm | 2.68 tons of NOx |
| Unit 2 | 24 hours | 140 ppm | |
| Unit 3 | 24 hours | 132 ppm | |
| MCRFF | | | Facility-wide total: |
| Unit 1 | 24 hours | 70 ppm | 1.2 tons of NOx |
| Unit 2 | 24 hours | 70 ppm | |
| Unit 3 | 24 hours | 71 ppm | |



July 15 - Are the Right Units Running?





Peak Day Ozone: Day Ahead

July 16 Non-Exceedance (Friday)



Summary

Forecast: 72 ppb

Observed: Essex/Edgewood: 68 ppb

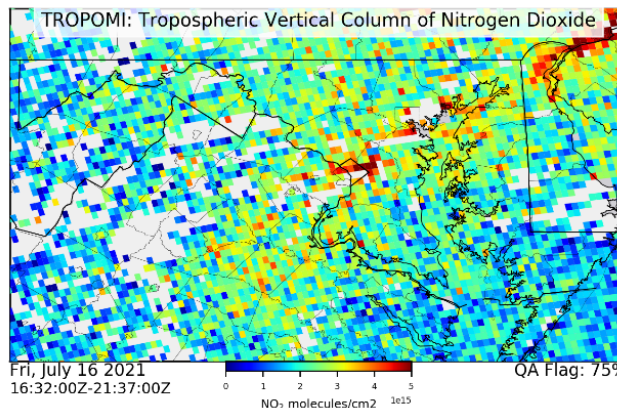
False Alarm
Did EGUs do anything?

Weather

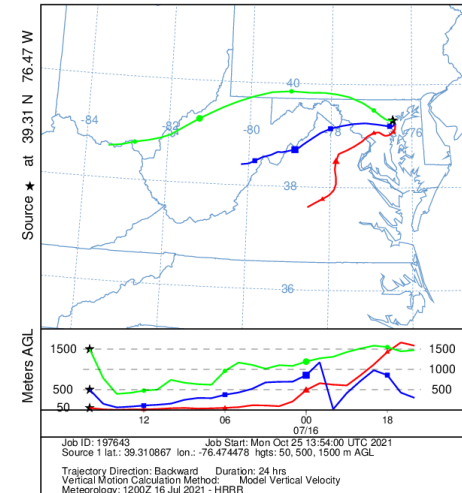
- 98°F High Temperature at BWI
- Avg surface winds: W @ 8 mph
- Fair wx cumulus field – clear BB area

Non-Exceedance, Bay centric

Here, it appears that despite the westerly winds at BWI, there was enough of a southerly fetch in the trajectories that it brought in cleaner air to the Essex and Edgewood areas to prevent an exceedance there.



NOAA HYSPLIT MODEL
Backward trajectories ending at 1600 UTC 16 Jul 21
HRRR Meteorological Data





July 16 Operational Data

Units That Did Not Run

| Unit | Comment |
|------------------------------|-----------------|
| Wagner Units 1, 2, 3 and 4 | Did Not Operate |
| Morgantown Unit 2 | Did Not Operate |
| Morgantown GT3, 4, 5 and 6 | Did Not Operate |
| Chalk Units 3 & 4 | Did Not Operate |
| Chalk Point GT2, 3, 4, 5 & 6 | Did Not Operate |
| Vienna 8 | Did Not Operate |
| Perryman CT1, 3 and 4 | Did Not Operate |

- 20 of 31 units did not operate

CSPs did not dispatch demand response customers or call for test operations



July 16 Operational Data

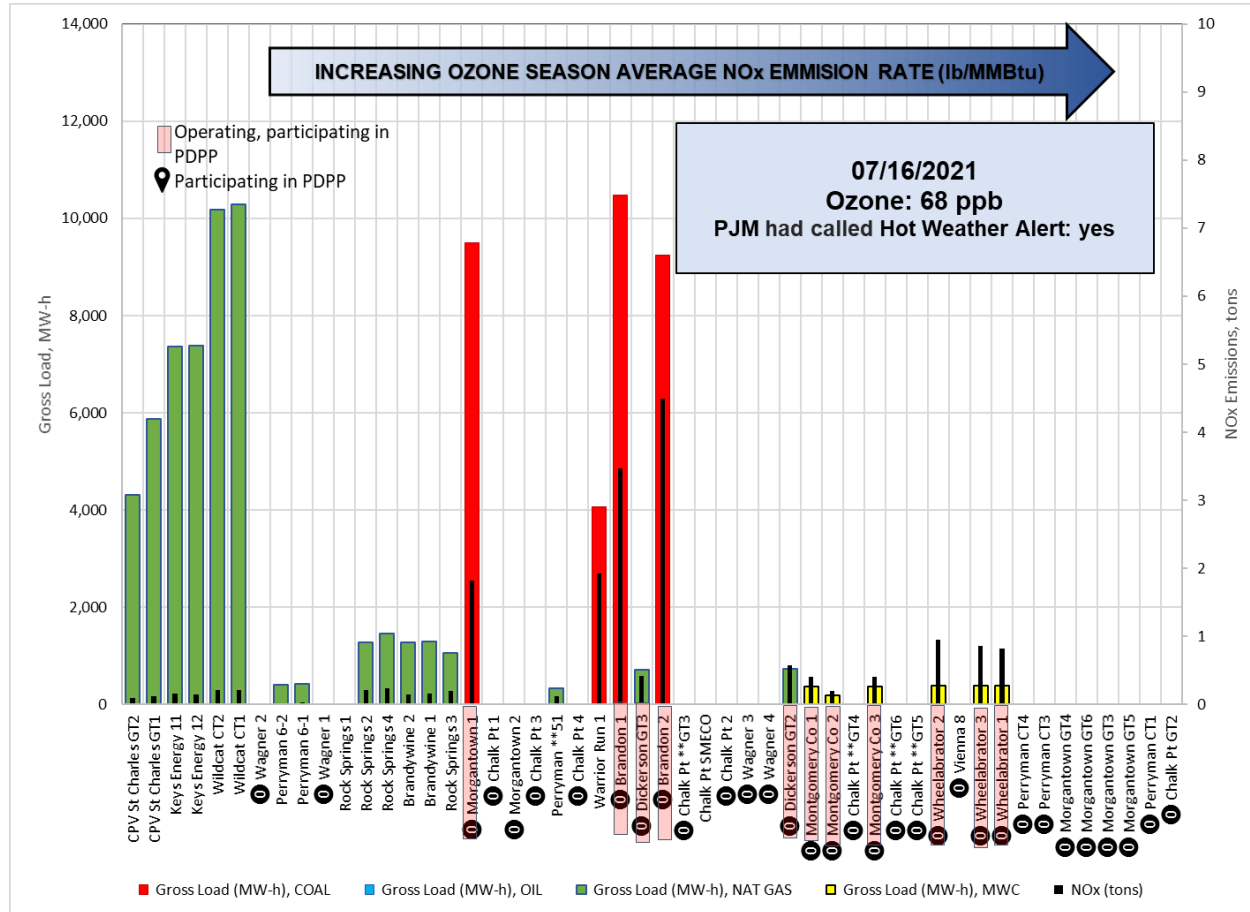
Units That Ran

| Unit | Duration | Rate | Comment |
|----------------|----------|---------------|---------------------------------|
| Brandon Unit 1 | 24 hours | 0.07 lb/mmBTU | 3.47 tons of NOx |
| Brandon Unit 2 | 24 hours | 0.13 lb/mmBTU | 4.64 tons NOx – tripped/restart |
| Morgantown U1 | 24 hours | 0.04 lb/mmBTU | 1.8 tons of NOx |
| Dickerson GT2 | 10 hours | 0.11 lb/mmBTU | 0.61 tons of NOx |
| Dickerson GT3 | 10 hours | 0.09 lb/mmBTU | 0.45 tons of NOx |

| Unit | Duration | Rate | Comment |
|--------------|----------|---------|----------------------|
| Wheelabrator | | | Facility-wide total: |
| Unit 1 | 24 hours | 134 ppm | 2.69 tons of NOx |
| Unit 2 | 24 hours | 142 ppm | |
| Unit 3 | 24 hours | 133 ppm | |
| MCRFF | | | Facility-wide total: |
| Unit 1 | 24 hours | 71 ppm | 1.0 tons of NOx |
| Unit 2 | 13 hours | 73 ppm | |
| Unit 3 | 24 hours | 76 ppm | |



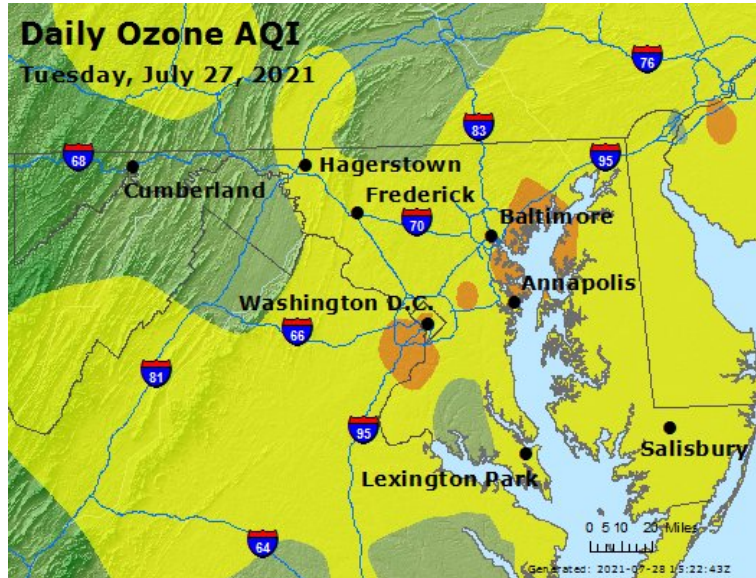
July 16 - Are the Right Units Running?





Peak Day Ozone: Day Ahead

July 27 Exceedance (Tuesday)



Summary

Forecast: 73 ppb

Observed: Essex: 78 ppb

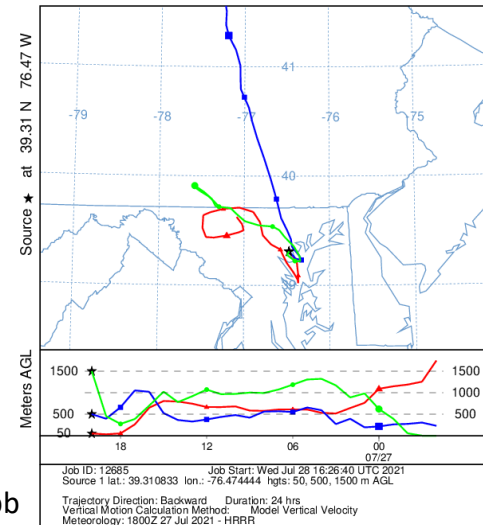
Verified

Did EGUs do anything?

Weather

- 97°F High Temperature at BWI
- Avg surface winds: N/NW 3-5mph
- Partly Sunny

NOAA HYSPLIT MODEL
Backward trajectories ending at 2000 UTC 27 Jul 21
HRRR Meteorological Data



Degraded smoky airmass/Local enhancement

High pressure developed just to our west on the 26th, persisting into the 27th. Favorable meteorology (weak winds, very warm temperatures, and plentiful sunshine) helped to set the stage. Smoke, primarily from Canadian wildfires, lingered around the area for several days prior to the exceedance event. Fine particulate levels were in the Moderate range across most of the eastern CONUS. The regional air mass was quite degraded at this point in time. Early morning ozonesonde (see below) showed roughly 60-70ppb ozone between 0.5-1.5km above the surface. The degraded regional air mass, combined with favorable meteorology allowed for a quick spike in ozone levels across the state. Weak northerly flow helped to focus ozone along and just south of the I-95 corridor.

Ozone levels were slightly enhanced around the Baltimore area, aided by local emissions and the Bay influence. A hot spot in NO₂ was noted around the Inner Harbor area by TROPOMI satellite (see plot below). Essex, which saw the highest ozone readings in the state, saw a late surge in ozone. An anomalous spike in SO₂ was noted at this same time (see plot below). It is unsure what lead to this spike in SO₂. 27th was a day where peak ozone day reduction program emails were sent out. It will be interesting to see if there were any EGUs that were not running at peak efficiency. In total, 3 monitors in the state exceeded the ozone standard (Beltsville, Essex and Edgewood) with several near exceedances noted as well.



July 27 Operational Data

Units That Did Not Run

| Unit | Comment |
|------------------------------|-----------------|
| Wagner Units 2 and 4 | Did Not Operate |
| Morgantown GT3, 4, 5 and 6 | Did Not Operate |
| Chalk Units 3 & 4 | Did Not Operate |
| Chalk Point GT2, 3, 4, 5 & 6 | Did Not Operate |
| Perryman CT1, 3 and 4 | Did Not Operate |

- 16 of 31 units did not operate

CSPs did not dispatch demand response customers or call for test operations



July 27 Operational Data

Units That Ran

| Unit | Duration | Rate | Comment |
|----------------|----------|---------------|-----------------------------------|
| Brandon Unit 1 | 24 hours | 0.06 lb/mmBTU | 3.31 tons of NOx |
| Brandon Unit 2 | 24 hours | 0.07 lb/mmBTU | 3.23 tons of NOx |
| Wagner Unit 1 | 24 hours | 0.02 lb/mmBtu | 0.02 tons of NOx – support, no MW |
| Wagner Unit 3 | 24 hours | 0.07 lb/mmBtu | 1.55 tons of NOx - startup |
| Morgantown U1 | 24 hours | 0.04 lb/mmBTU | 1.8 tons of NOx |
| Morgantown U2 | 24 hours | 0.05 lb/mmBTU | 2.2 tons of NOx |
| Dickerson GT2 | 7 hours | 0.11 lb/mmBTU | 0.56 tons of NOx |
| Dickerson GT3 | 14 hours | 0.15 lb/mmBTU | 1.15 tons of NOx – Oil test run |
| Vienna 8 | 14 hours | 0.24 lb/mmBTU | 0.02 tons of NOx |



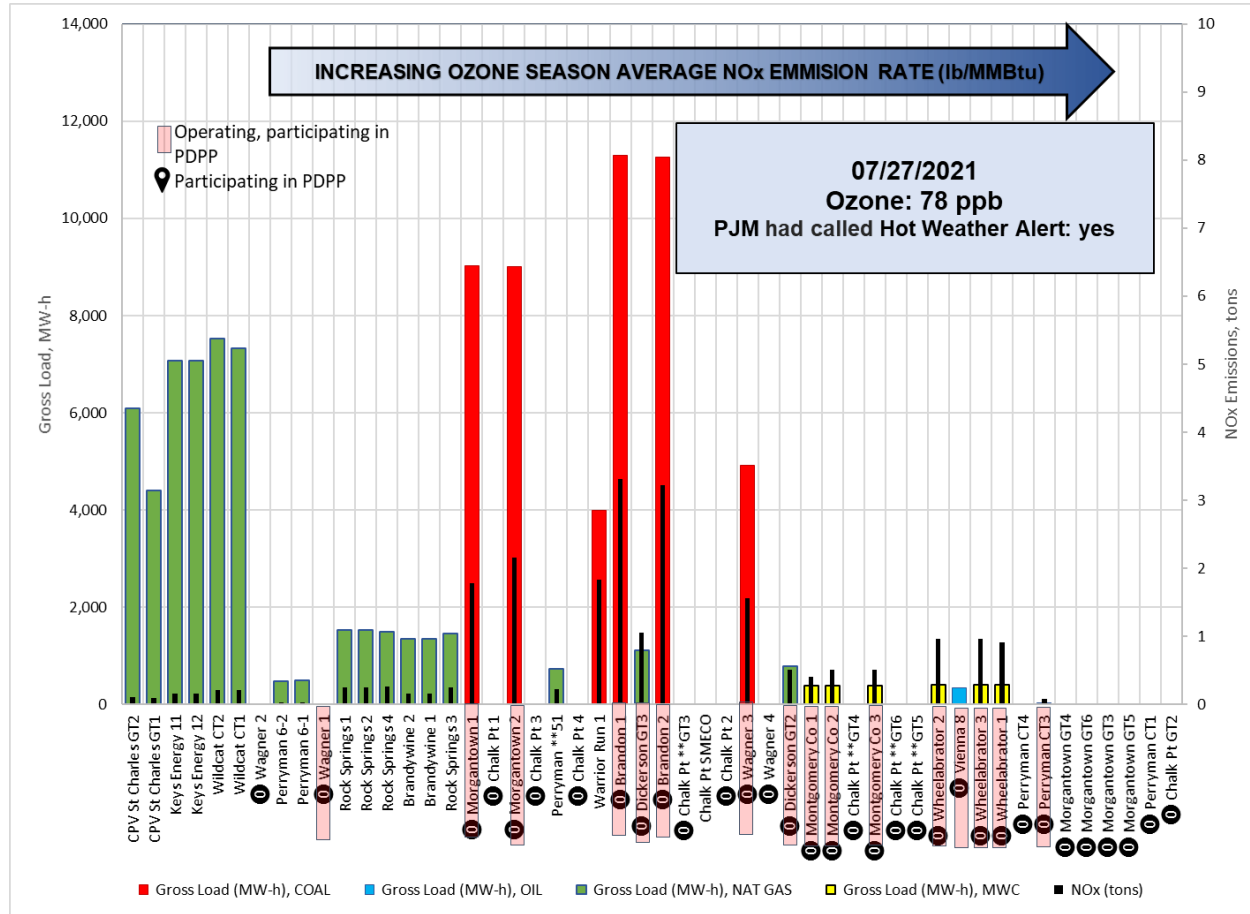
July 27 Operational Data

Units That Ran

| Unit | Duration | Rate | Comment |
|--------------|----------|---------|----------------------|
| Wheelabrator | | | Facility-wide total: |
| Unit 1 | 24 hours | 141 ppm | 2.82 tons of NOx |
| Unit 2 | 24 hours | 140 ppm | |
| Unit 3 | 24 hours | 142 ppm | |
| MCRFF | | | Facility-wide total: |
| Unit 1 | 24 hours | 67 ppm | 1.4 tons of NOx |
| Unit 2 | 24 hours | 84 ppm | |
| Unit 3 | 24 hours | 81 ppm | |



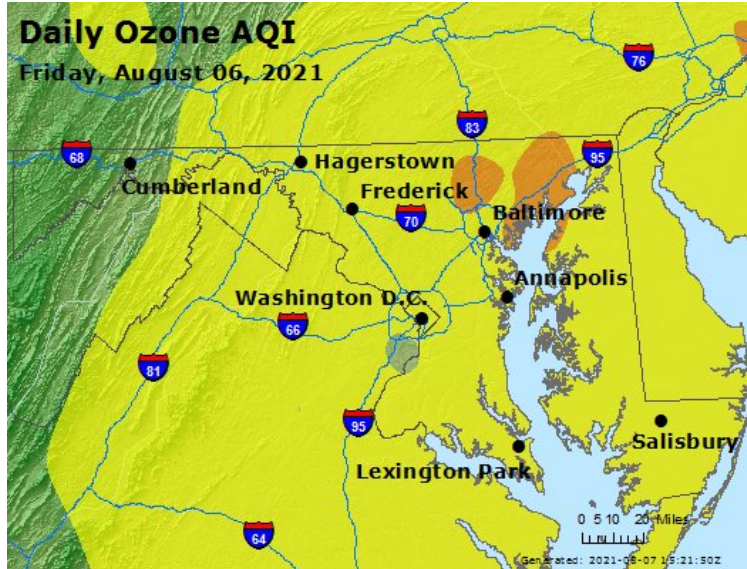
July 27 - Are the Right Units Running?





Peak Day Ozone: Day Ahead

August 6 Exceedance (Friday)



Summary

Forecast: 71 ppb

Observed: 3 Sites: 72 ppb

Verified

Did EGUs do anything?

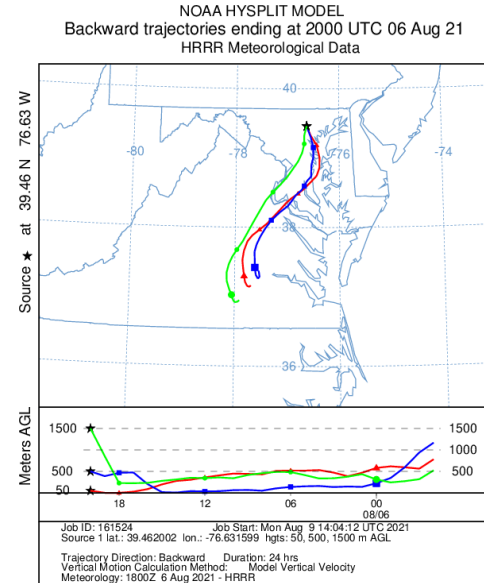
Weather

- 92°F High Temperature at BWI
- Avg surface winds: S @ 6-8mph
- Partly Sunny

Urban corridor recirculation/Smoke enhancement?

High pressure was set up just to Maryland's west on the previous day (August 5th). Favorable meteorology (weak winds/plentiful sunshine) provided suitable ozone formation. Weak northerly flow on the 5th brought the bulk of the high ozone to southern Maryland/Virginia. No ozone exceedances took place in Maryland on the 5th, although there was one exceedance in northern Virginia at the Aurora Hills monitor. Additionally, this northerly flow brought ozone and ozone precursors from Baltimore/I-95 corridor to cook in the Bay. Elevated ozone was measured by boat in the Bay in excess of 80 ppb on the 5th. Smoke may have also played a role in the air mass deterioration. Diffuse smoke continued to linger around the area from Canadian wildfires (see figure below). PM_{2.5} concentrations, were not overly impressive on the 5th and 6th with 24-hr concentrations averaging around threshold Good to low Moderate. It's difficult to say if and how much this smoke played a role in the enhancement of ozone.

Winds shifted southerly on the 6th as high pressure shifted off the East Coast. This southerly wind shift provided an additional boost in temperatures with highs reaching the low 90s. This wind shift also brought the slug of dirty air from the previous day back northward. Although the hourly ozone observations were not very impressive (max 1-hr ozone concentration of 82ppb), concentrations were able to reach exceedance thresholds downwind of Baltimore (Padonia) and at the monitors northeast of Baltimore City (Essex, Edgewood and Aldino) where they were able to tap into some of the dirtier air over the Bay. In total 4 monitors, all in the Baltimore region climbed above the ozone standard with a maximum 8-hr concentration peaking at 72 ppb at Aldino, Padonia and Essex.





August 6 Operational Data

Units That Did Not Run

| Unit | Comment |
|------------------------------|-----------------|
| Brandon Shores Unit 1 | Did Not Operate |
| Wagner Units 1, 2, 3 and 4 | Did Not Operate |
| Morgantown Units 1 & 2 | Did Not Operate |
| Morgantown GT3, 4, 5 and 6 | Did Not Operate |
| Chalk Units 3 & 4 | Did Not Operate |
| Chalk Point GT2, 3, 4, 5 & 6 | Did Not Operate |
| Dickerson GT3 | Did Not Operate |
| Vienna 8 | Did Not Operate |
| Perryman CT1, 3 and 4 | Did Not Operate |

- 23 of 31 units did not operate

CSPs did not dispatch demand response customers or call for test operations



August 6 Operational Data

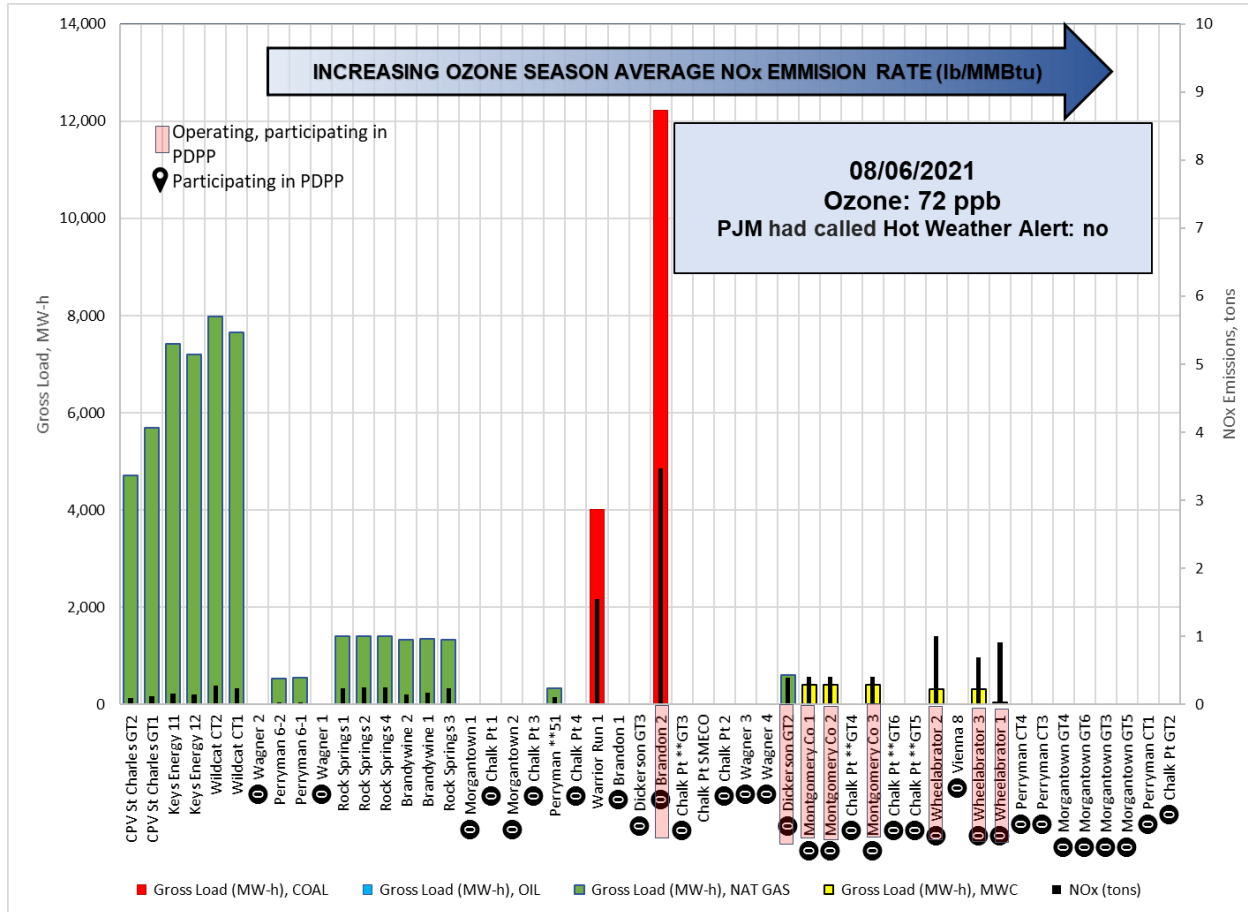
Units That Ran

| Unit | Duration | Rate | Comment |
|----------------|----------|---------------|----------------------------------|
| Brandon Unit 2 | 24 hours | 0.07 lb/mmBTU | 3.46 tons of NOx – low temp/load |
| Dickerson GT2 | 6 hours | 0.11 lb/mmBTU | 0.45 tons of NOx |

| Unit | Duration | Rate | Comment |
|--------------|----------|---------|----------------------|
| Wheelabrator | | | Facility-wide total: |
| Unit 1 | 3 hours | 143 ppm | 1.78 tons of NOx |
| Unit 2 | 24 hours | 141 ppm | |
| Unit 3 | 24 hours | 130 ppm | |
| MCRFF | | | Facility-wide total: |
| Unit 1 | 24 hours | 73 ppm | 1.2 tons of NOx |
| Unit 2 | 24 hours | 68 ppm | |
| Unit 3 | 24 hours | 68 ppm | |



August 6 - Are the Right Units Running?





Peak Day Ozone: Day Ahead

August 9 Non-Exceedance (Monday)



Summary

Forecast: 71 ppb

Observed: Frederick: 62 ppb

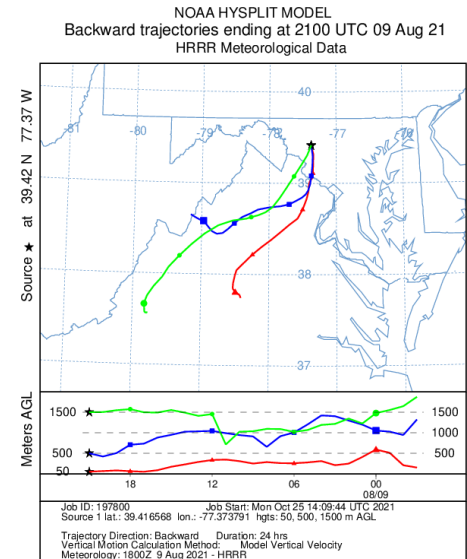
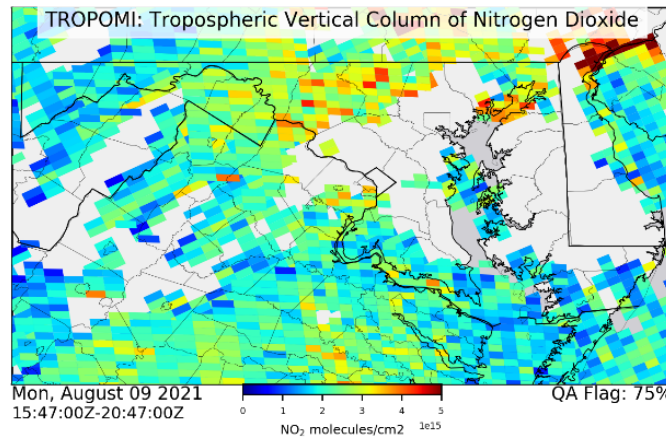
False Alarm
Did EGUs do anything?

Weather

- 90°F High Temperature at BWI
- Avg surface winds: E/SE @ 8-10mph
- Partly Cloudy

Non-Exceedance

Southeast winds were strong and cloud cover prevented larger ozone concentrations.





August 9 Operational Data

Units That Did Not Run

| Unit | Comment |
|------------------------------|-----------------|
| Wagner Units 1, 2, 3 and 4 | Did Not Operate |
| Morgantown GT3, 4, 5 and 6 | Did Not Operate |
| Chalk Units 3 & 4 | Did Not Operate |
| Chalk Point GT2, 3, 4, 5 & 6 | Did Not Operate |
| Vienna 8 | Did Not Operate |
| Perryman CT1, 3 and 4 | Did Not Operate |

- 19 of 31 units did not operate

CSPs did not dispatch demand response customers or call for test operations



August 9 Operational Data

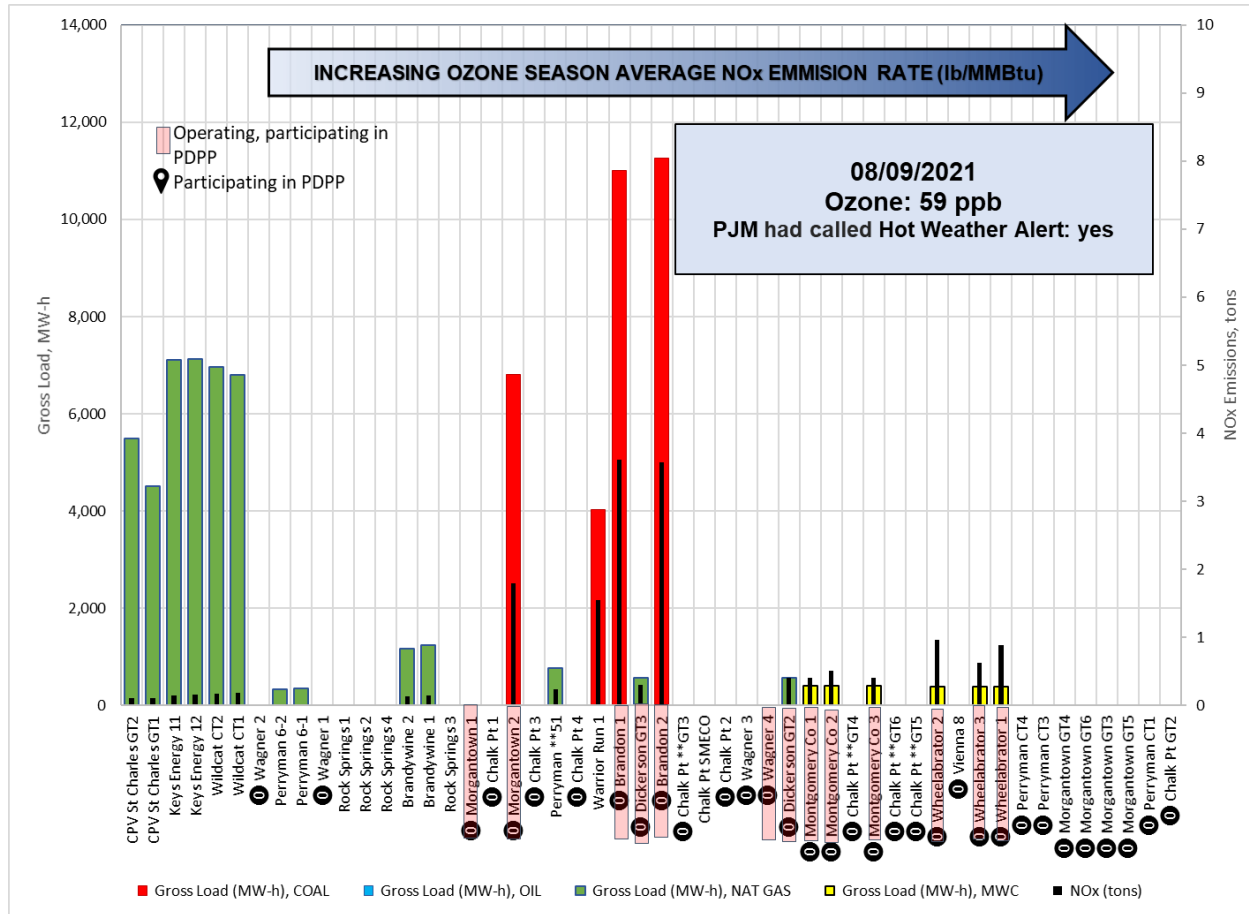
Units That Ran

| Unit | Duration | Rate | Comment |
|----------------|----------|---------------|----------------------------------|
| Brandon Unit 1 | 24 hours | 0.07 lb/mmBTU | 3.61 tons of NOx – low temp/load |
| Brandon Unit 2 | 24 hours | 0.08 lb/mmBTU | 3.57 tons of NOx – low temp/load |
| Morgantown U1 | 6 hours | 0.02lb/mmBTU | 0.01 tons of NOx - startup |
| Morgantown U2 | 19 hours | 0.06 lb/mmBTU | 1.8 tons of NOx - shutdown |
| Dickerson GT2 | 7 hours | 0.11 lb/mmBTU | 0.45 tons of NOx |
| Dickerson GT3 | 7 hours | 0.08 lb/mmBTU | 0.33 tons of NOx |

| Unit | Duration | Rate | Comment |
|--------------|----------|---------|----------------------|
| Wheelabrator | | | Facility-wide total: |
| Unit 1 | 24 hours | 145 ppm | 2.47 tons of NOx |
| Unit 2 | 24 hours | 141 ppm | |
| Unit 3 | 24 hours | 129 ppm | |
| MCRFF | | | Facility-wide total: |
| Unit 1 | 24 hours | 66 ppm | 1.3 tons of NOx |
| Unit 2 | 24 hours | 81 ppm | |
| Unit 3 | 24 hours | 75 ppm | |



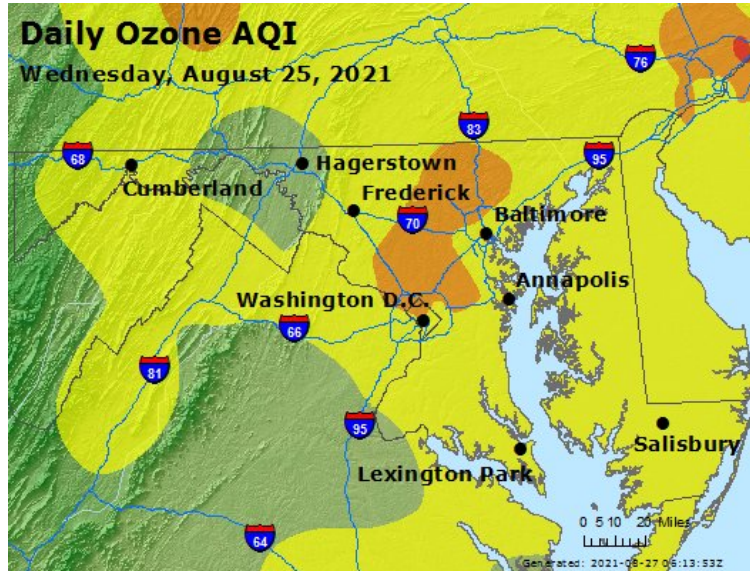
August 9 - Are the Right Units Running?





Peak Day Ozone: Multi-Day Ahead

August 25 Exceedance (Wednesday)



Summary

Forecast: 72 ppb

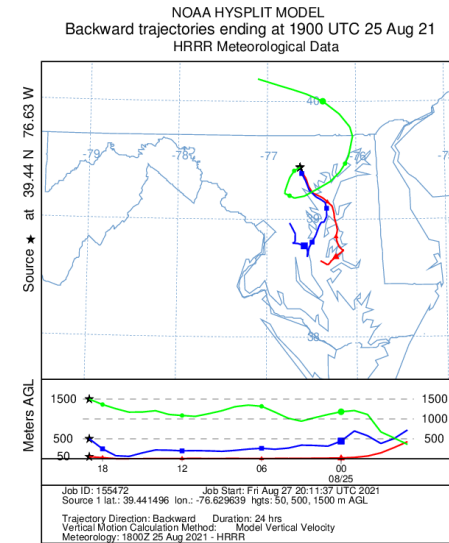
Observed: Padonia: 82 ppb

Weather

- 95°F High Temperature at BWI
- Avg surface winds: Var @ ~5mph
- Sunny/Smoke-Hazy

Verified

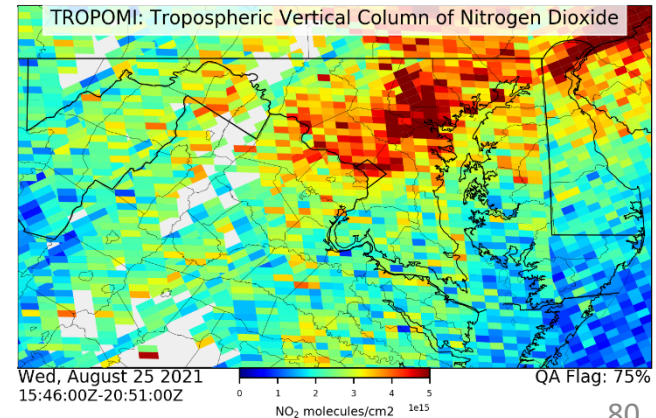
Did EGUs do anything?



Regional Buildup & Smoke

Very light winds and noticeable transport/airmass modification beginning the previous day set the stage for a regional episode of enhanced ozone with concentrations exceeding the standard downstream of major NO_x sources, such as the urban areas.

Variable winds became light from the south on Wednesday. Bay breeze circulations and the local transport patterns dominated in the light wind fields, though in this case the Bay was actually cleaner and prevented exceedances at the typical sites of Essex and Edgewood. Instead, the UMD plane observed the highest ozone (100-110ppb) in a narrow corridor (verbally conveyed – not yet seen on a plotted map) confined to an area from roughly Elkridge to Liberty Reservoir. This was also the area where the “edge” of the Bay meteorological influence was observed via a cumulus line on visible satellite. (See below). In the end, a wide area of monitors exceeded as NO_x precursors, augmented by precursors in the smoke, became concentrated over a two-day period.





August 25 Operational Data

Units That Did Not Run

| Unit | Comment |
|----------------------------|-----------------|
| Wagner Units 1 and 2 | Did Not Operate |
| Morgantown GT3, 4, 5 and 6 | Did Not Operate |
| Chalk Unit 4 | Did Not Operate |
| Chalk Point GT3, 4, 5 & 6 | Did Not Operate |
| Perryman CT1, 3 and 4 | Did Not Operate |
| Wheelabrator Unit 2 | Did Not Operate |
| MCRFF Unit 3 | Did Not Operate |

- 16 of 31 units did not operate

CSPs did not dispatch demand response customers or call for test operations



August 25 Operational Data

Units That Ran

| Unit | Duration | Rate | Comment |
|----------------|----------|---------------|----------------------------------|
| Brandon Unit 1 | 24 hours | 0.07 lb/mmBTU | 3.31 tons of NOx – low temp/load |
| Brandon Unit 2 | 24 hours | 0.08 lb/mmBTU | 3.23 tons of NOx – low temp/load |
| Wagner Unit 3 | 21 hours | 0.12 lb/mmBTU | 1.04 tons of NOx – startup/SD |
| Wagner Unit 4 | 21 hours | 0.14 lb/mmBTU | 1.04 tons of NOx – startup/SD |
| Morgantown U1 | 24 hours | 0.05 lb/mmBTU | 2.5 tons of NOx |
| Morgantown U2 | 24 hours | 0.05 lb/mmBTU | 2.4 tons of NOx |
| Chalk Unit 3 | 24 hours | 0.07 lb/mmBTU | 3.3 tons of NOx |
| Dickerson GT2 | 10 hours | 0.11 lb/mmBTU | 0.84 tons of NOx |
| Dickerson GT3 | 10 hours | 0.08 lb/mmBTU | 0.59 tons of NOx |
| Vienna 8 | 14 hours | 0.37 lb/mmBTU | 0.04 tons of NOx |



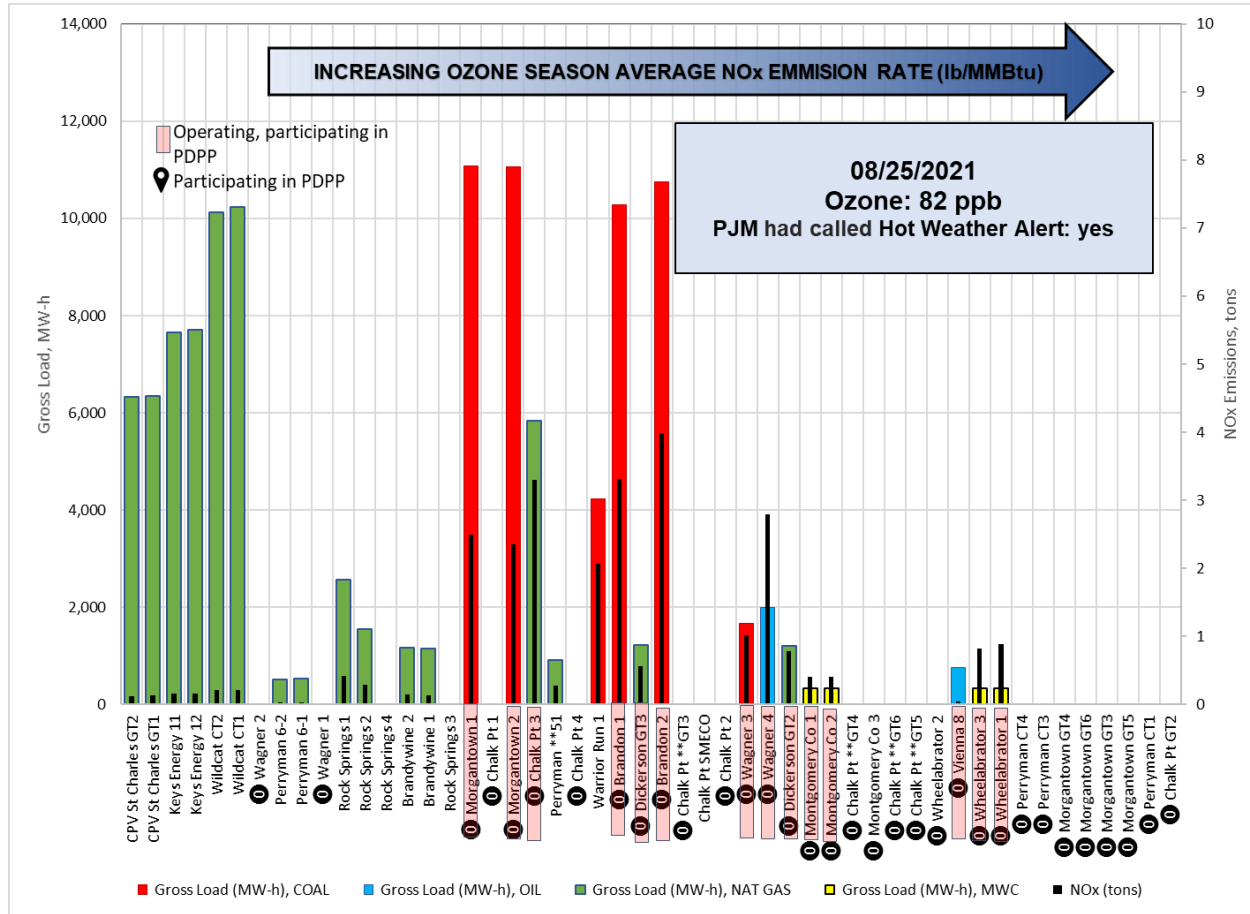
August 25 Operational Data

Units That Ran

| Unit | Duration | Rate | Comment |
|------------------------|----------|---------|--|
| Wheelabrator Unit 1 | 24 hours | 144 ppm | Facility-wide total: 1.71 tons of NOx |
| Unit 3 | 24 hours | 137 ppm | |
| MCRFF Unit 1 | 24 hours | 66 ppm | Facility-wide total: 0.8 tons of NOx |
| Unit 2 | 24 hours | 66 ppm | |



August 25 - Are the Right Units Running?





Peak Day Ozone: Day Ahead

August 26 Non-Exceedance (Thursday)



Summary

Forecast: 74 ppb

Observed: Aldino: 69 ppb

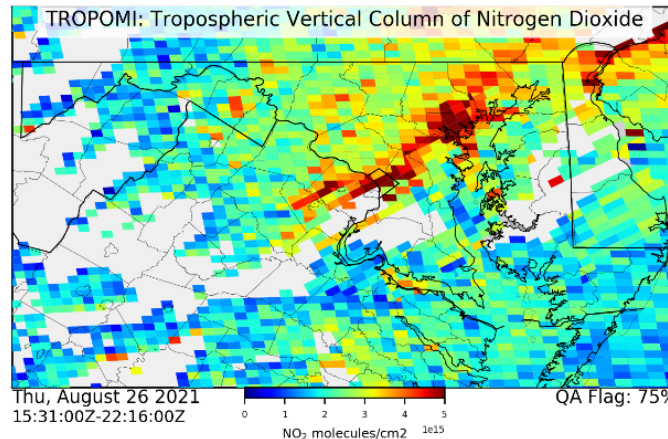
False Alarm
Did EGUs do anything?

Weather

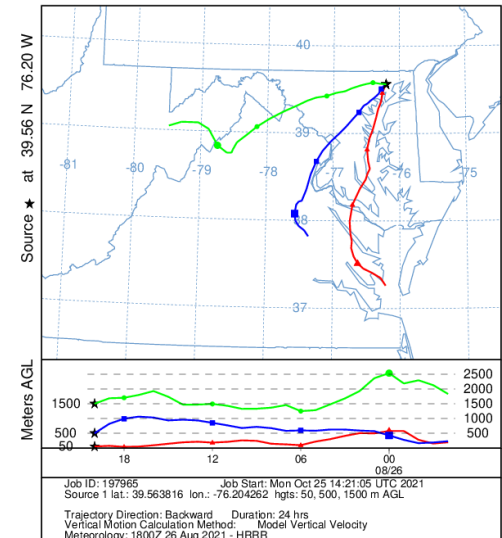
- 95°F High Temperature at BWI
- Avg surface winds: S/SW @ ~5mph, except in gust front
- Mostly Sunny, late-day storms south/gust front

Local Non-Event, Baltimore induced

Storms to the south kicked a gust front northward and swept out the region after 5pm. Bay air/ gust front air was clean with it arrived.



NOAA HYSPLIT MODEL
Backward trajectories ending at 2000 UTC 26 Aug 21
HRRR Meteorological Data





August 26 Operational Data

Units That Did Not Run

| Unit | Comment |
|----------------------------|-----------------|
| Wagner Units 1, 2 and 4 | Did Not Operate |
| Morgantown GT3, 4, 5 and 6 | Did Not Operate |
| Chalk Unit 4 | Did Not Operate |
| Chalk Point GT3, 4, 5 & 6 | Did Not Operate |
| Vienna 8 | Did Not Operate |
| MCRFF Unit 3 | Did Not Operate |

- 14 of 31 units did not operate

CSPs did not dispatch demand response customers or call for test operations



August 26 Operational Data

Units That Ran

| Unit | Duration | Rate | Comment |
|----------------|----------|---------------|----------------------------------|
| Brandon Unit 1 | 24 hours | 0.06 lb/mmBTU | 3.35 tons of NOx |
| Brandon Unit 2 | 24 hours | 0.07 lb/mmBTU | 3.32 tons of NOx – low temp/load |
| Wagner Unit 3 | 15 hours | 0.14 lb/mmBTU | 1.08 tons of NOx – startup/SD |
| Morgantown U1 | 24 hours | 0.05 lb/mmBTU | 2.3 tons of NOx |
| Morgantown U2 | 24 hours | 0.04 lb/mmBTU | 2.1 tons of NOx |
| Chalk Unit 3 | 24 hours | 0.05 lb/mmBTU | 3.0 tons of NOx |
| Dickerson GT2 | 5 hours | 0.11 lb/mmBTU | 0.31 tons of NOx |
| Dickerson GT3 | 10 hours | 0.08 lb/mmBTU | 0.51 tons of NOx |
| Perryman CT1 | 2 hours | 0.56 lb/mmBTU | 0.21 tons of NOx |
| Perryman CT3 | 2 hours | 0.48 lb/mmBTU | 0.25 tons of NOx |
| Perryman CT4 | 2 hours | 0.46 lb/mmBTU | 0.22 tons of NOx |



August 26 Operational Data

Units That Ran

| Unit | Duration | Rate | Comment |
|--------------|----------|---------|----------------------|
| Wheelabrator | | | Facility-wide total: |
| Unit 1 | 24 hours | 146 ppm | 2.36 tons of NOx |
| Unit 2 | 15 hours | 140 ppm | |
| Unit 3 | 24 hours | 143 ppm | |
| MCRFF | | | Facility-wide total: |
| Unit 1 | 24 hours | 66 ppm | 0.7 tons of NOx |
| Unit 2 | 24 hours | 66 ppm | |



August 26 - Are the Right Units Running?

