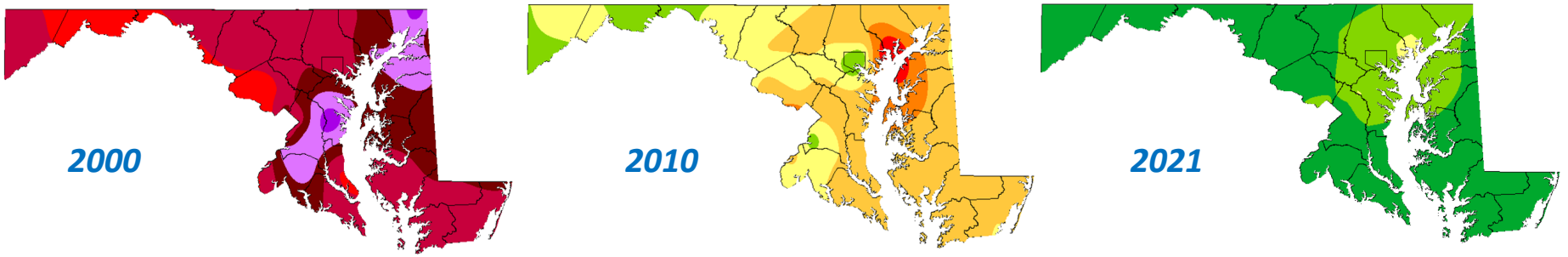
Maryland
Department of the Environment

Ozone and Climate Change Challenges and Opportunities

Maryland's "Shrinking Ozone" Success Story

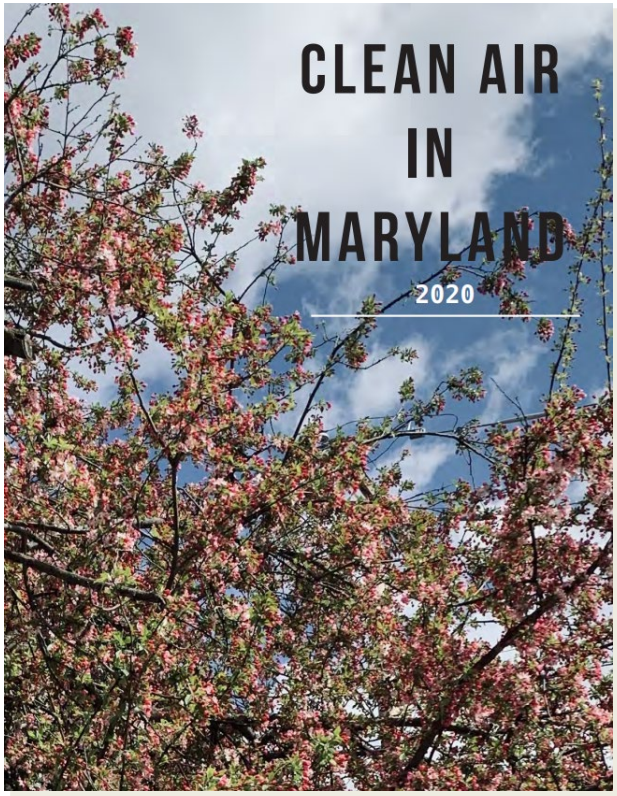


Health Effects Institute Annual Meeting
June 28, 2022

Tad Aburn, Air and Radiation Administration

Overview of Presentation

- Background: Where are we with ozone in Maryland (MD) and the Mid-Atlantic?
- The Climate Penalty: How serious is this issue?
- Next Steps for the Future: An optimistic prediction for ozone and other criteria air pollutants
- Opportunities: Rethinking the basic approach to develop and implement air pollution policy



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


Background

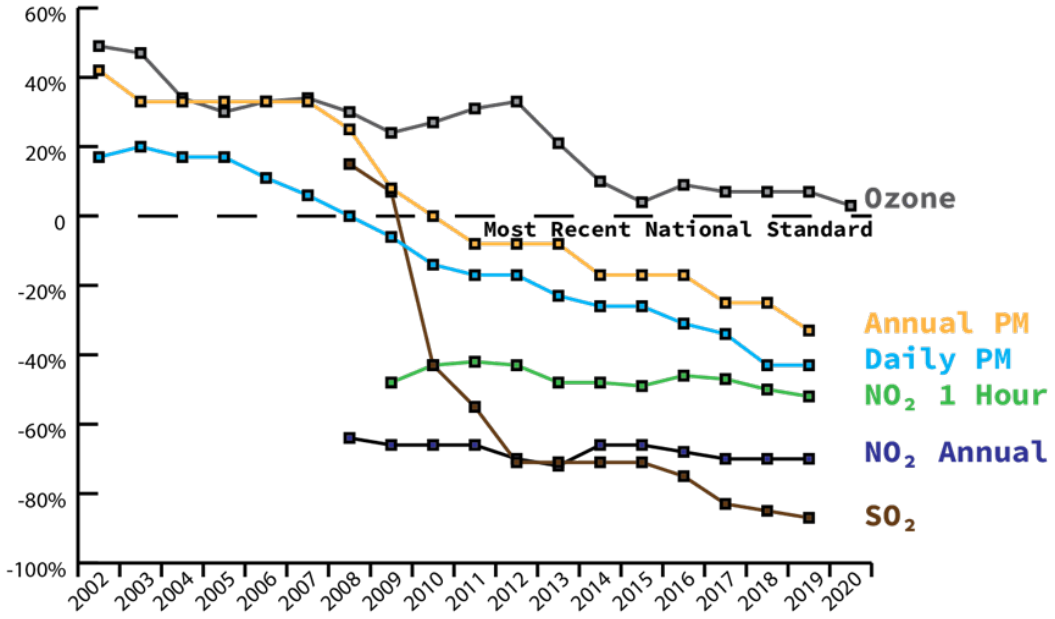
MD Air Pollution History

- **The Ugly:** From 1940 to 1970, you could see, smell, and taste the air pollution. Across the country, there were air pollution emergencies in areas like Denora, PA.
- **The Bad:** In 2005, MD was identified by the Massachusetts Institute of Technology (MIT) as having some of the riskiest air to breathe on the East Coast. In 2008, EPA designates Baltimore as the worst ozone area outside of California and Texas.
- **The Good:** From 2010 to present, MD has been in attainment for all standards except ozone. In 2020, Maryland recorded the fewest number of ozone days ever recorded in a year!


OZONE LEVELS IN MD AND THE MID-ATLANTIC

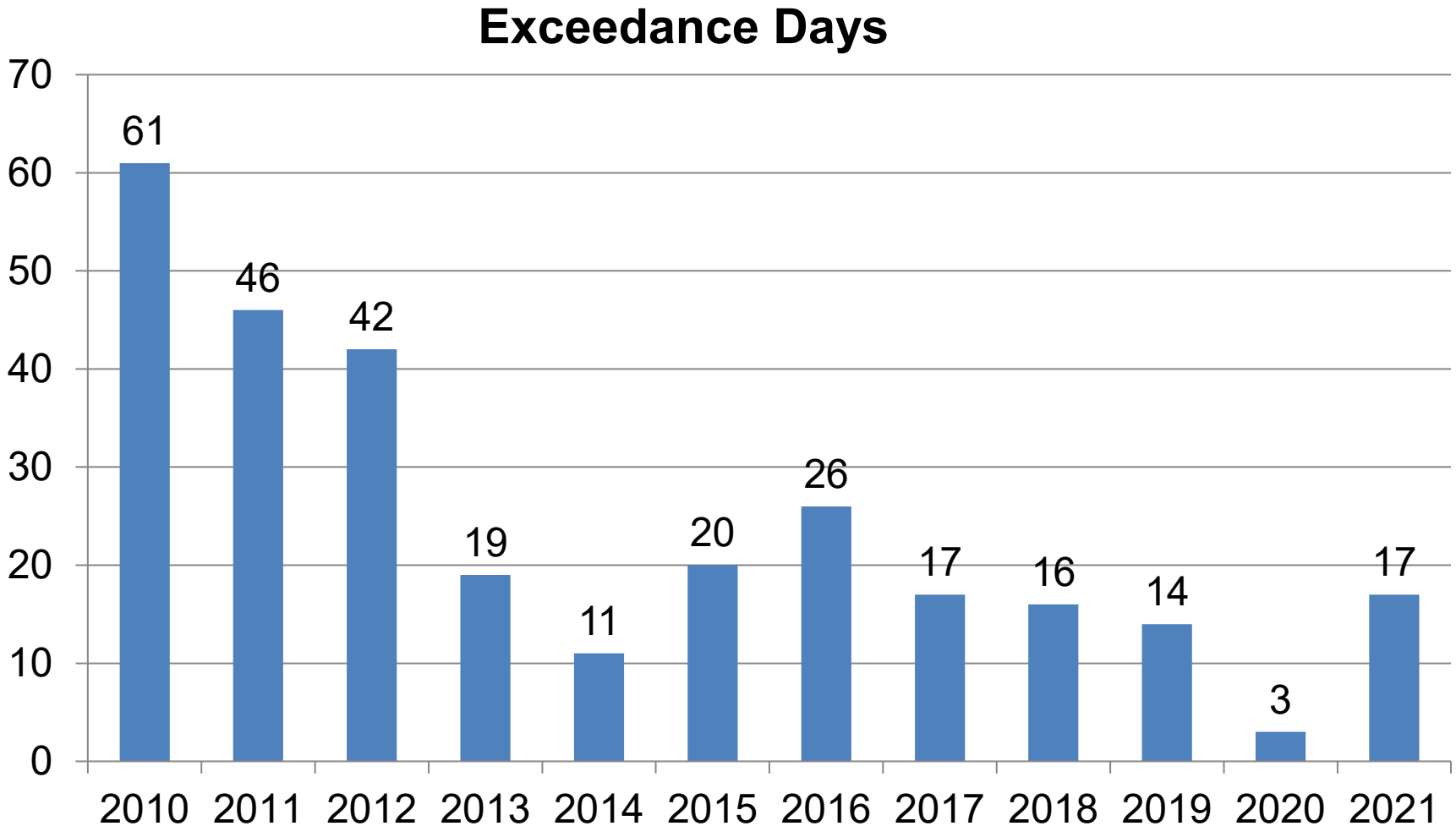
Clean Air Highlights

- For the last 20 years, MD's air quality has dramatically improved
- Air quality policies and regulations have lowered levels of the six common pollutants — particles, ozone, lead, carbon monoxide, nitrogen dioxide, and sulfur dioxide

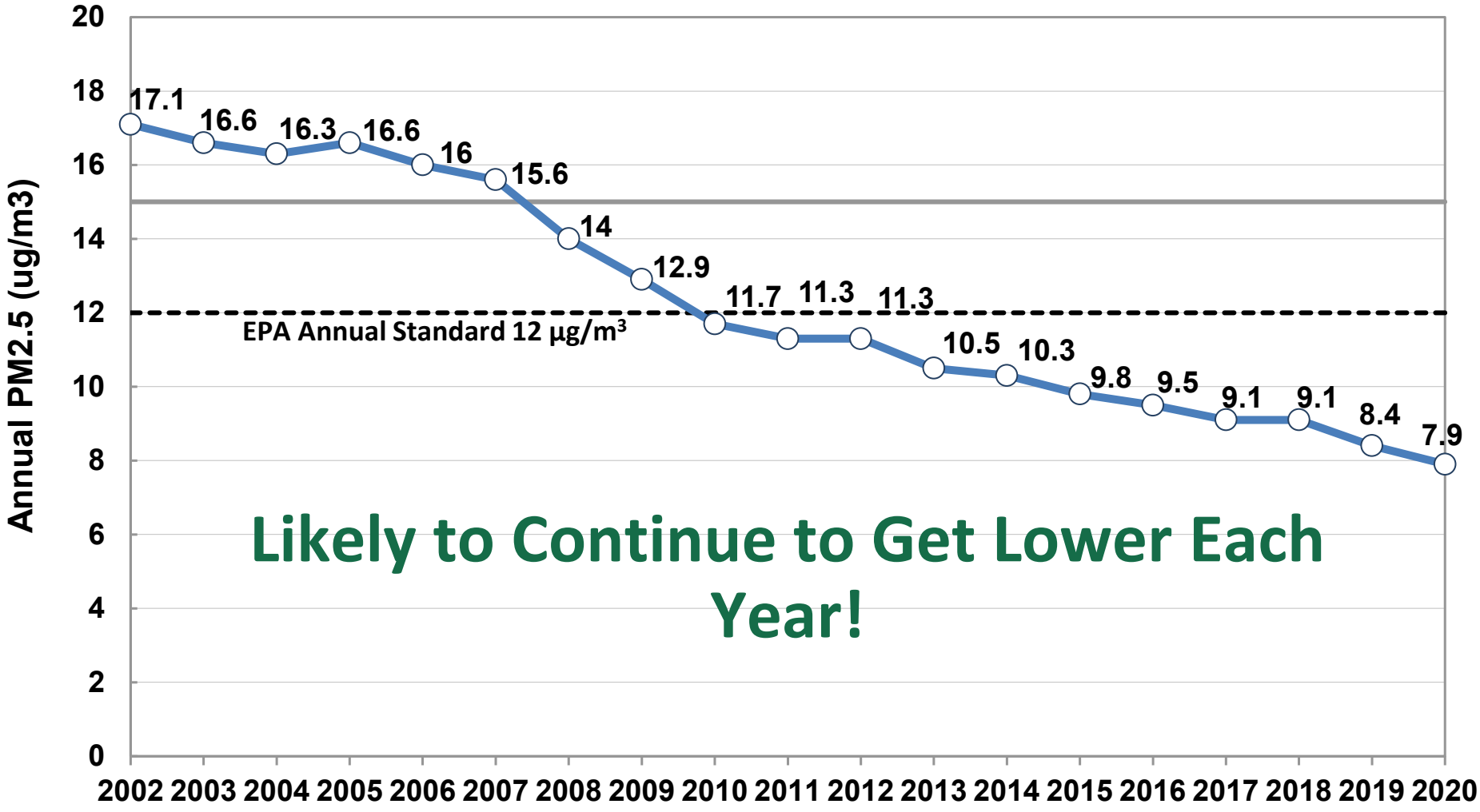


- ↓Nitrogen Dioxide (NO_2) Annual 16% (2008-2019)
- ↓Nitrogen Dioxide (NO_2) 1-Hour 8% (2009-2019
- ↓Ozone (O_3) 28% (2002-2020)
- ↓Particles ($PM_{2.5}$) Annual 53% (2002-2019)
- ↓Particles ($PM_{2.5}$) 24-Hour 51% (2002-2019)
- ↓Sulfur Dioxide (SO_2) 1-Hour 88% (2008-2019)

Maryland Ozone Days



Fine Particle Air Pollution
Lower Levels Across the State



Likely to Continue to Get Lower Each Year!

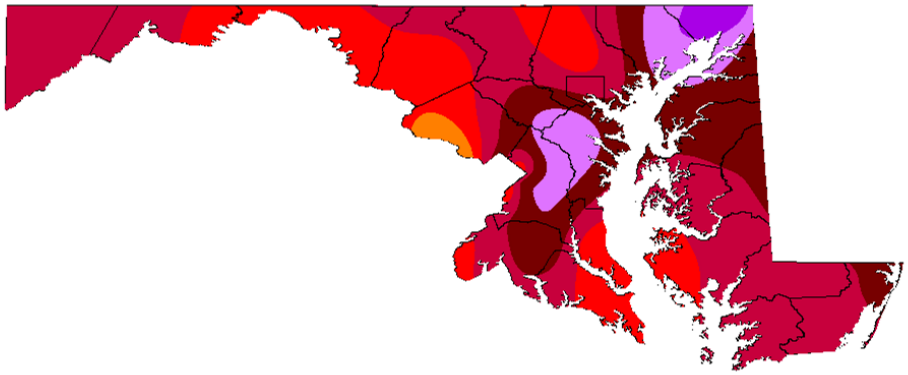
Fine Particle Air Pollution

Spatial Exposure and Risk Reduction

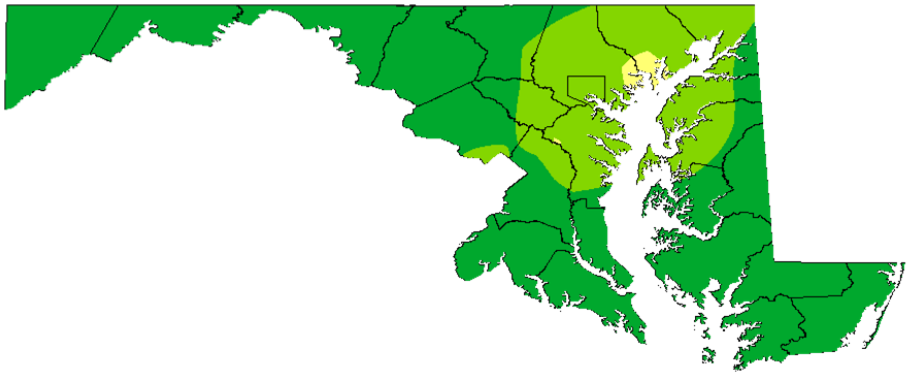
Annual PM2.5 Design Values: 2006

The Shrinking Ozone Problem

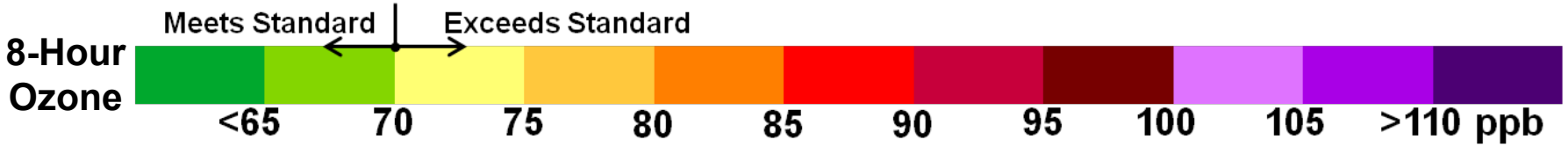
1998



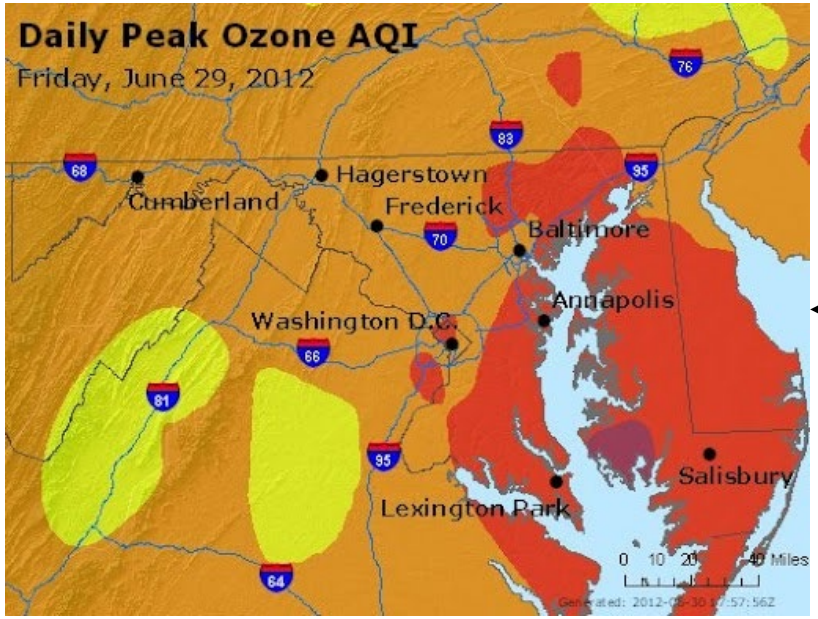
2021



Lower Ozone Levels and Significant Spatial Risk Reduction



What Does A Bad Ozone Day Look Like in 2022?



- Just 10 years ago, many bad ozone days looked like this

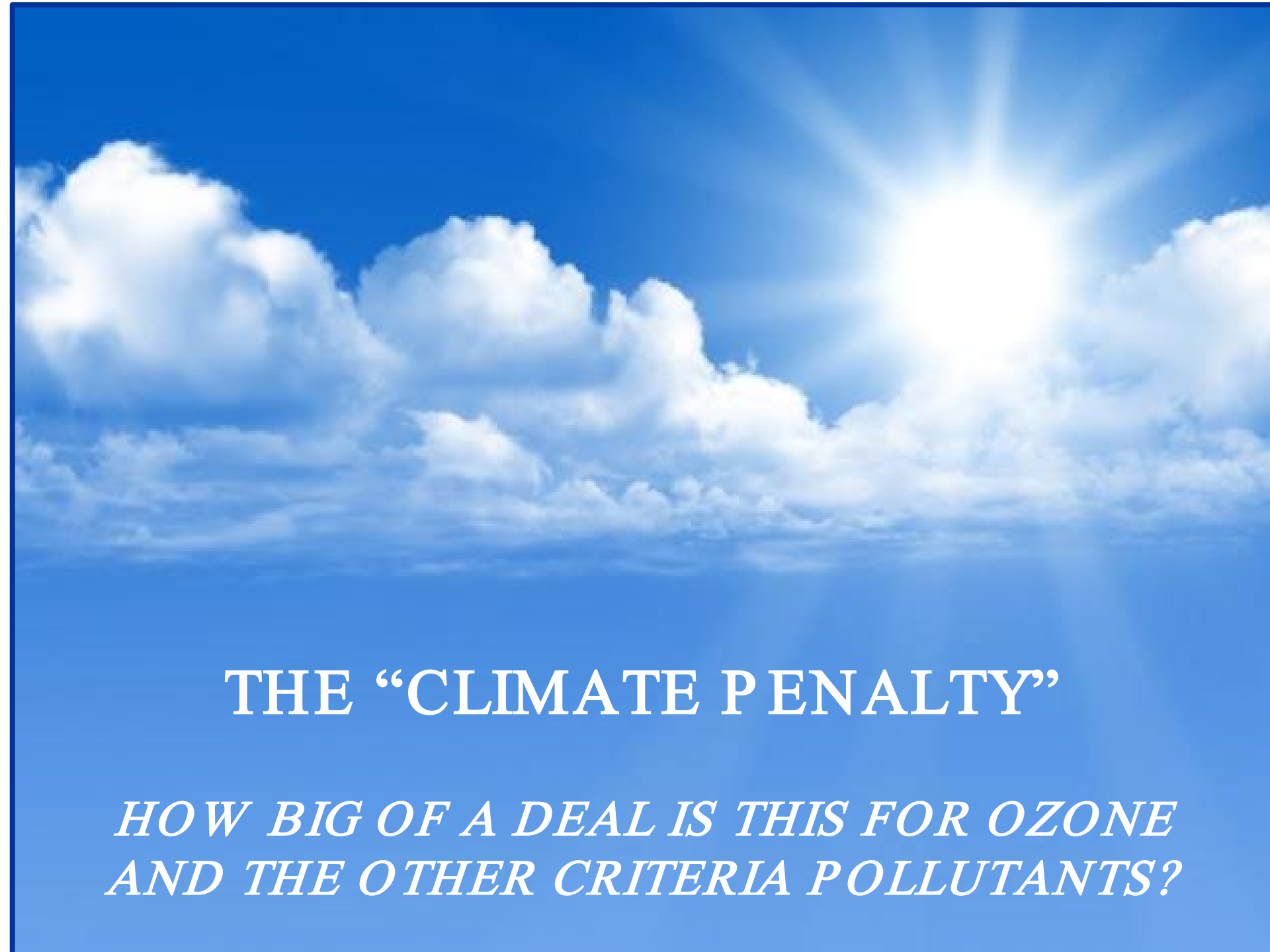
- In the summer of 2021, MD had 17 days where at least one monitor went above the standard
- Over half of those days looked like this

Why is Ozone Improving in MD and much of the East Coast?

- Improvements are associated with:
  - Fewer bad days
  - Dramatic reductions in spatial exposure and risk
  - Years of research and science paving the way
    - Widespread regional nitrogen oxide (NOx) reductions have worked
    - Local reductions help, but regional reductions need to be strengthened to move the needle
  - Power plants, mobile sources, and other sources
    - You can link the reduced ozone to specific power plant control deadlines
    - More difficult to do that for mobile as reductions are slowly phased in with vehicle turnover

The Game Changer

- What is slightly complicated is that the NOx reductions not only reduce ozone, but they have also changed the atmospheric chemistry
  - In 2022, a ton of NOx reductions drives significantly greater ozone reduction than that same ton would have done in 2000
- This change in the “ozone production efficiency” has been seen almost everywhere in the East, except the New York, New Jersey, and Connecticut area
  - This area is approaching the “tipping point” but has a way to go
  - Just too much NOx from mobile sources



THE "CLIMATE PENALTY"

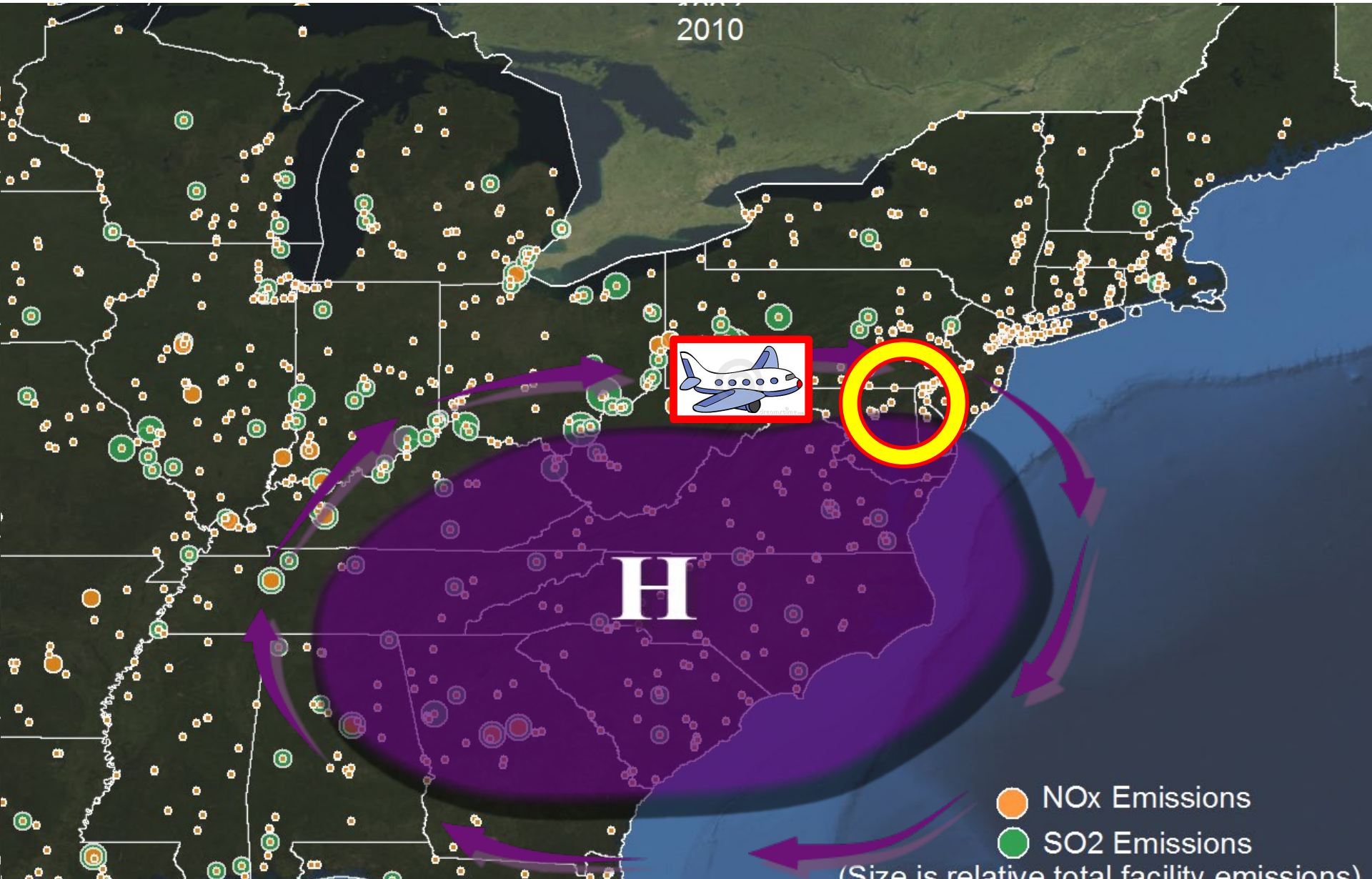
HOW BIG OF A DEAL IS THIS FOR OZONE AND THE OTHER CRITERIA POLLUTANTS?

The Climate Penalty

- It will make the “clean air progress” process for ozone and other criteria pollutants more challenging, but may not be as difficult as one may think
- Several basic reasons:
  - Climate change is changing more than temperature
    - In MD, some of these “non-temperature” issues have led to lower ozone
  - In the East, the policies needed to reduce ozone, fine particulate, and haze are very clear and being implemented. They will work, but the only question is how fast
  - The huge challenge is Climate Mitigation and is driving huge changes that will dramatically reduce air pollution. Again, the only question is how fast

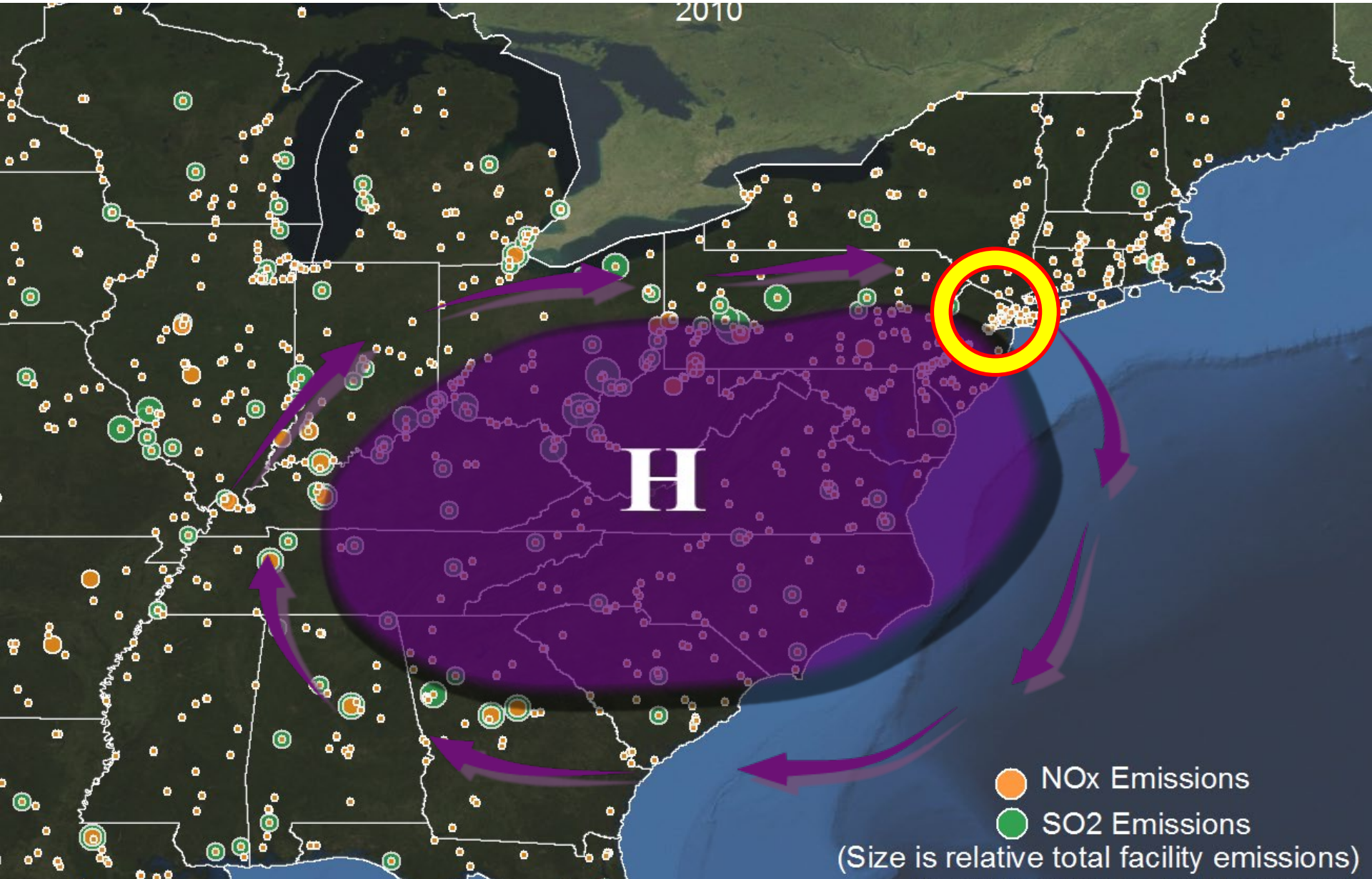
Westerly Transport – Before Around 2010

The Dominant Driver of High Ozone in MD



Westerly Transport – After Around 2015

Everything Is Shifting North



FORECASTING

Air quality in most of the country will continue to improve – despite the climate penalty – certain areas may have much greater challenges

Ozone, PM, and other Air Pollution Progress Will Continue

- While I can foresee this occurring on the Eastern U.S., California may have a tougher challenge in the future
- Super-regional programs to reduce NOx and sulfur dioxide emissions from power plants, mobile, and other sources will continue to get stronger each year
  - This will drive lower and lower ozone, PM and Haze levels
- Markets are driving major changes in certain sectors like energy and transportation
- Climate Change mitigation policies are also driving very significant changes in all sectors
  - Technology
  - Shifting consumer demand
  - A refreshed focus on making “zero emissions” a real goal


RETHINKING THE POLICY
PROCESS

Has the Time Come to Rethink the Air Pollution Policy Process?

- While I believe so, this is easier said than done Climate change is the big driver
  - The zero-emission concept is back on the table and policies that drive changes in society are right at the top of the list
- Climate mitigation strategies, like zero-emission vehicles and zero-emission renewable energy, will be huge drivers to push traditional air pollution to lower and lower levels
- The biggest challenge that I can foresee is the timing of all the moving parts

Recommendations

1. Fix the form of the ozone standard
2. Figure out how to address cumulative exposure
3. Include very short-term exposure scenarios when looking at standards and risk
4. Help figure out what the health benefits have been from the reductions in air pollution exposure over the past 10 years
5. Work with your state and local regulators to help them do a better job of communicating about public health protection and risk


QUESTIONS & DISCUSSION