

Modeling Committee Update

OTC Committee Meeting Stakeholders

April 17, 2018

Washington, DC/On-Line



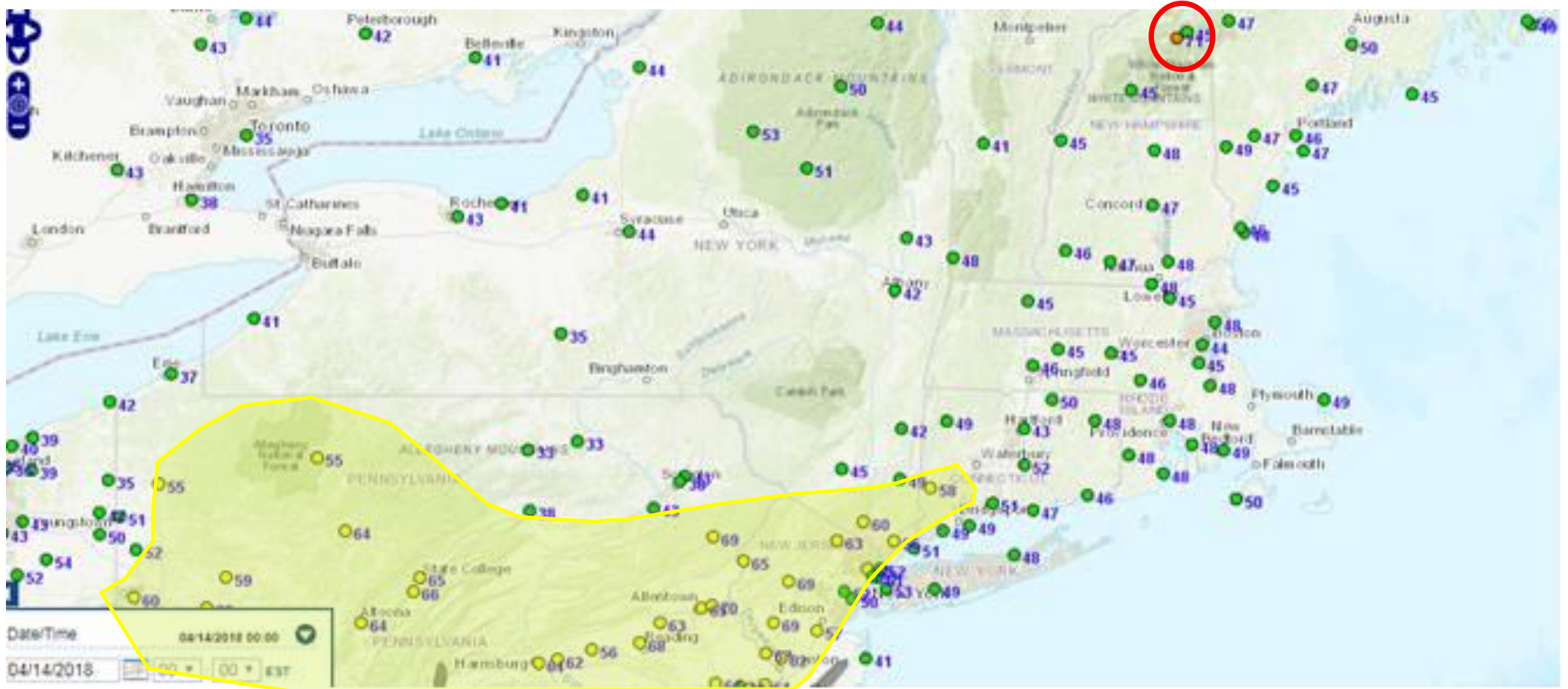
OZONE TRANSPORT COMMISSION

Overview

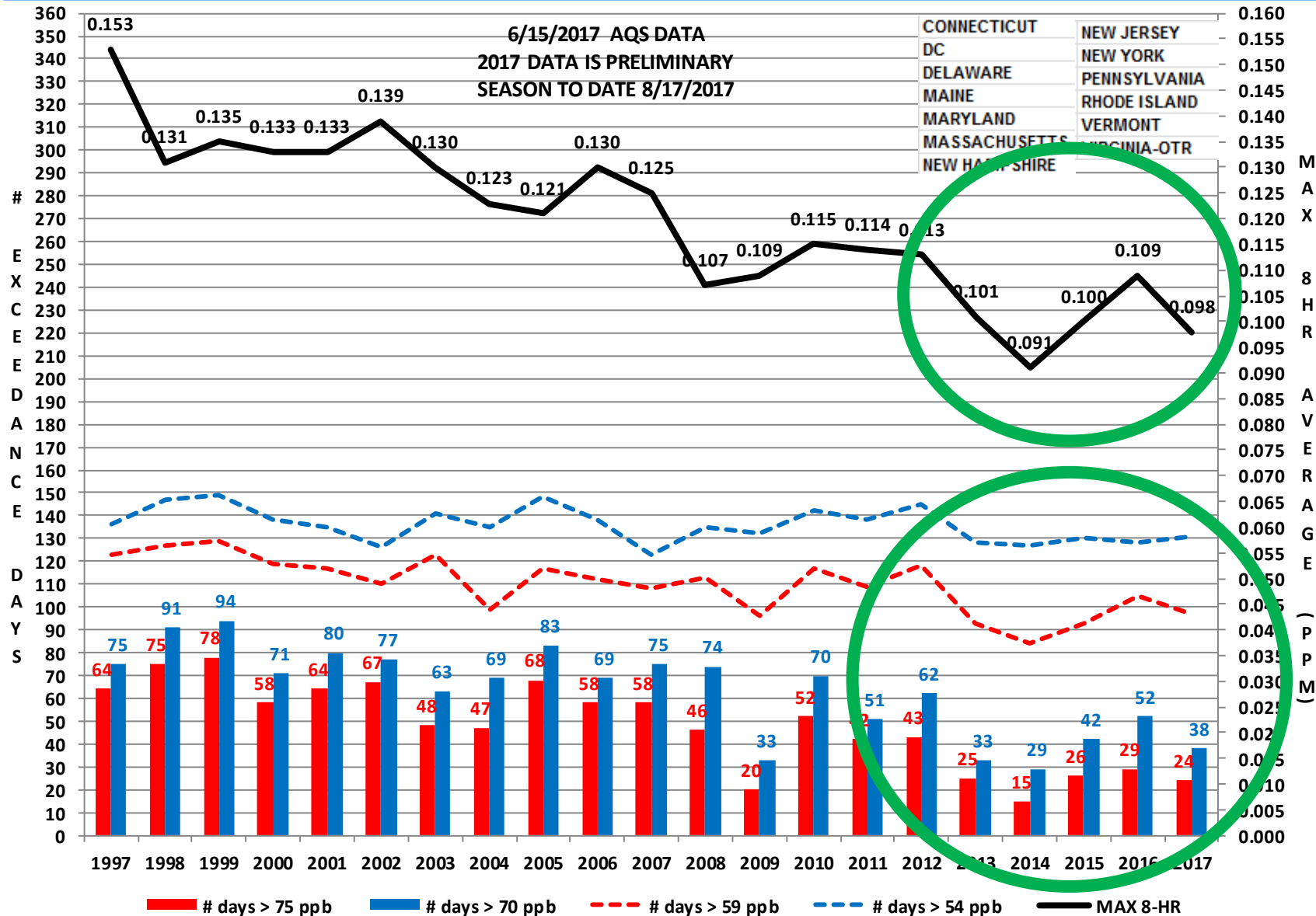
1. 2018 Ozone Season
2. OTC 2011 Modeling Platform
 - a) Inventory Status/Updates
 - b) Modeling Status
 - c) Source Apportionment Results
3. New Modeling Platform Update
4. Enhanced Monitoring Plan (EMP)
5. Conceptual Model

First 2018 Ozone Exceedance in the OTR!!!

- April 14, 71 ppb Mt. Washington Summit, NH



1. OTR 8-Hour Ozone Trend



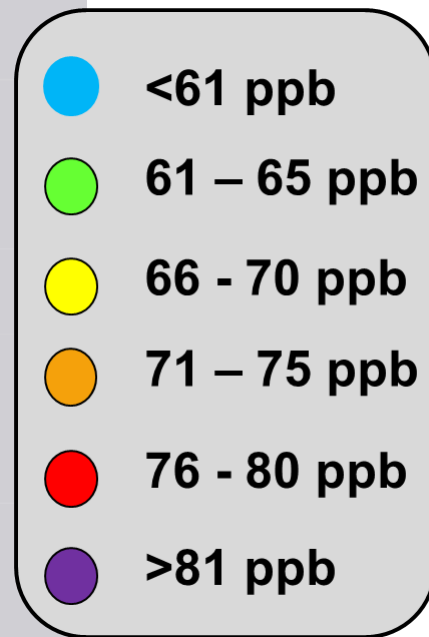
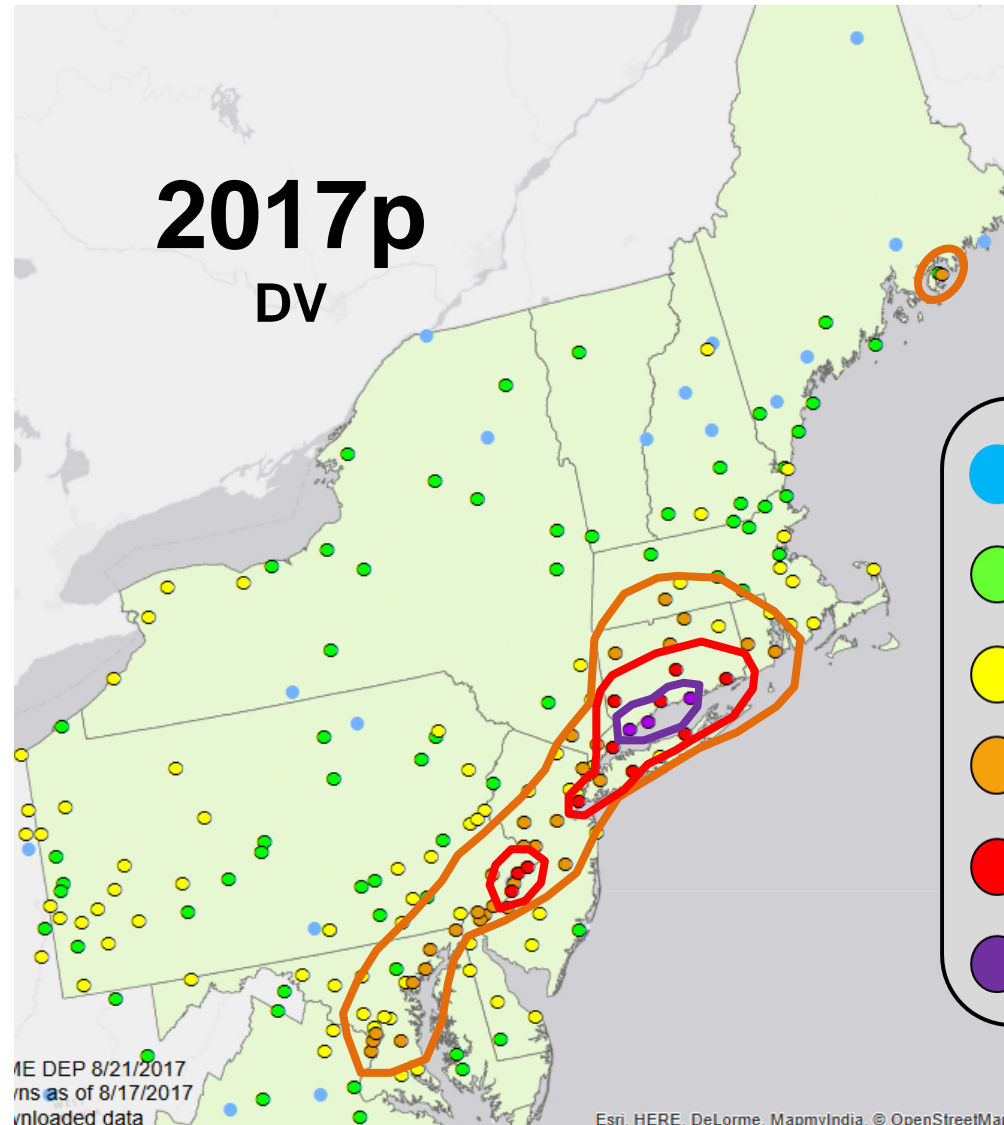
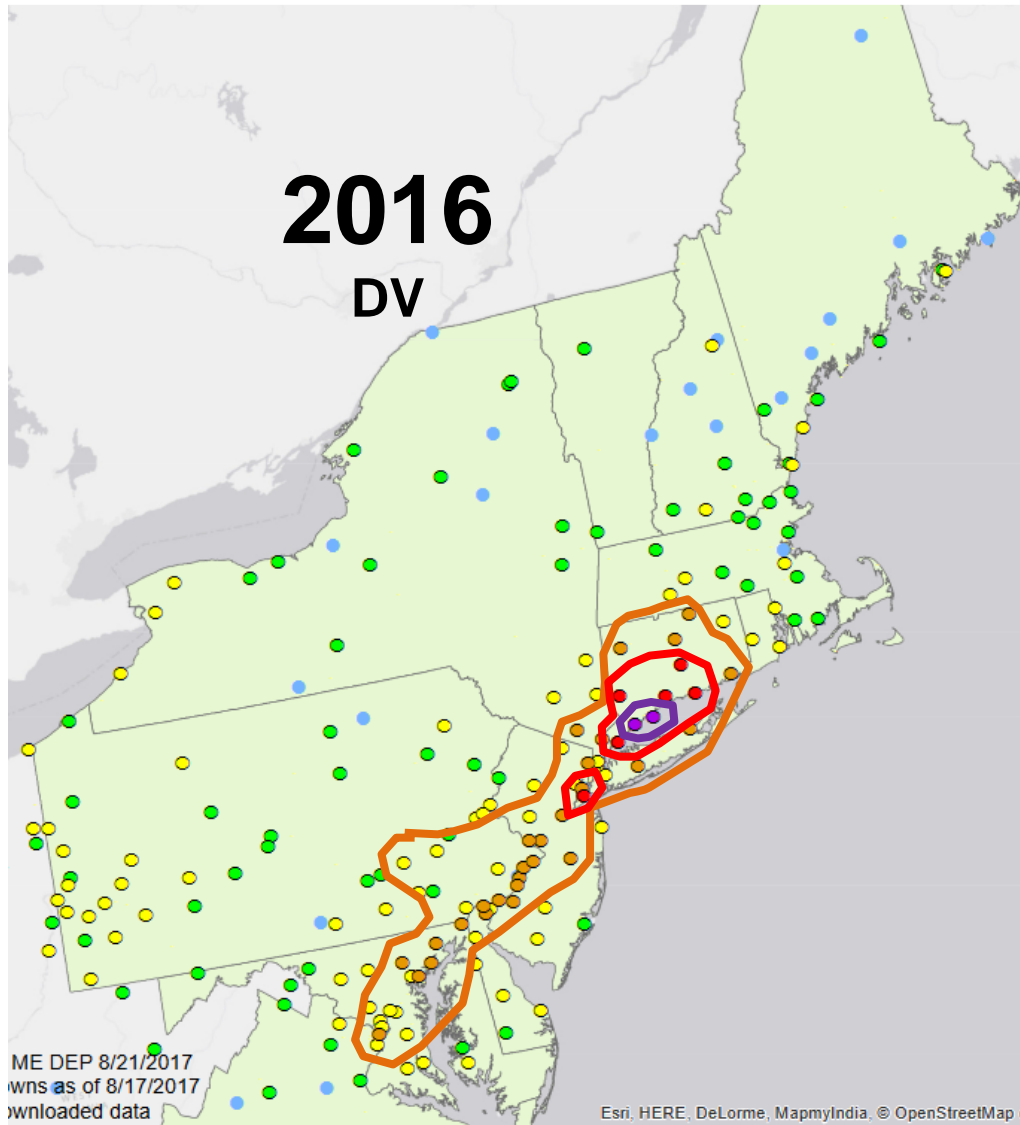
Ozone in the OTR has been relatively flat or up slightly over the past 5 years with the exception of:

- 2014 was a low ozone year
- 2016 was a little higher than the other years

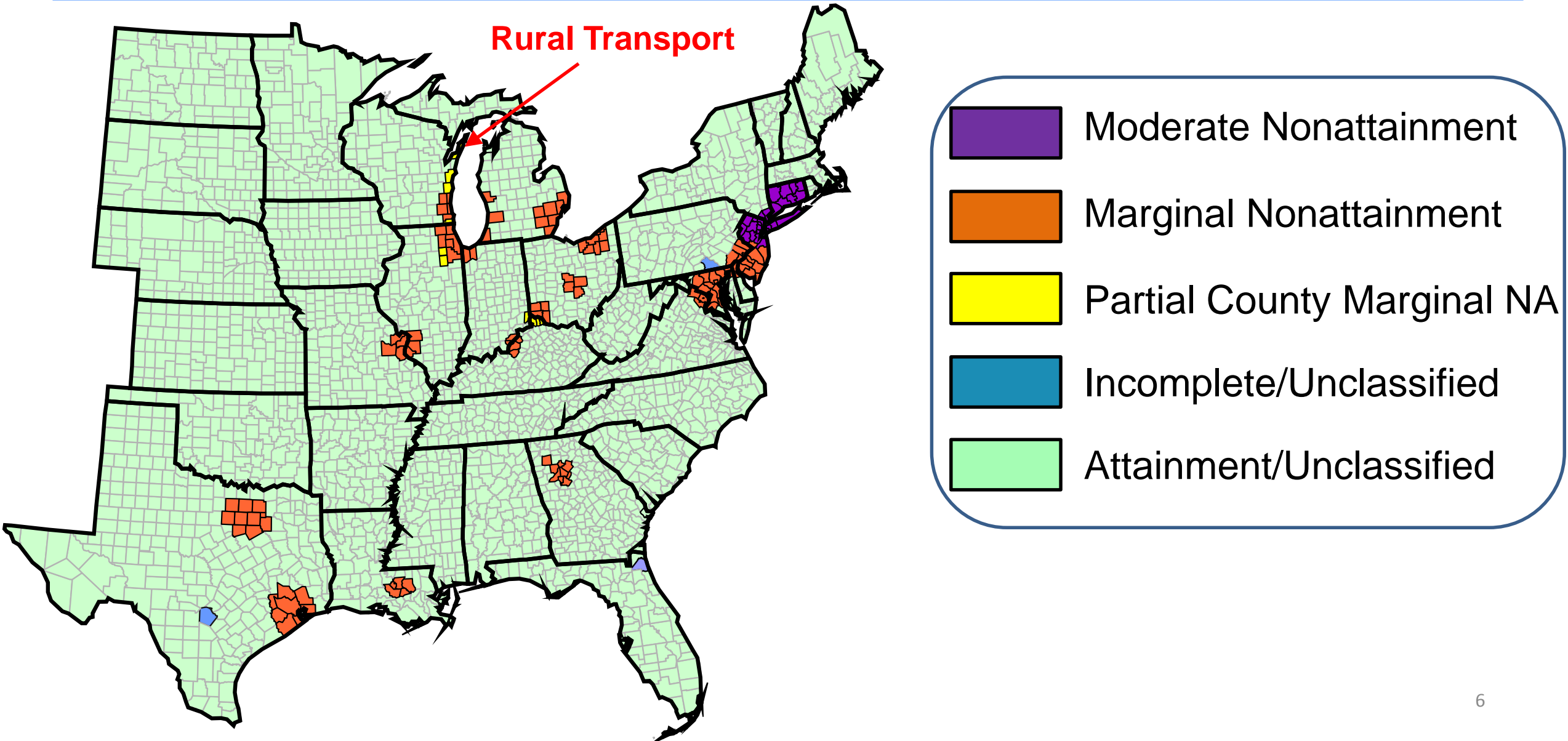
1. Change to 2015-17

Preliminary 8-hour Ozone Design Values

(excluding potential exceptional events)



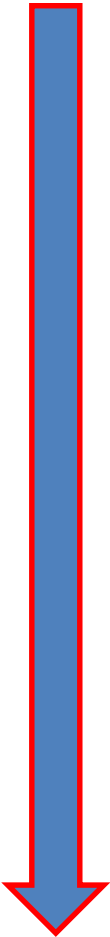
2015 Ozone NAAQS Designations



2011 Modeling Platform

- Still the focus of:
 - 2008 Ozone NAAQS SIP Modeling Efforts (primarily CMAQ)
 - 2015 Ozone NAAQS GN SIP Modeling Efforts (primarily CAMx)
 - 2018-21 Regional Haze SIP Modeling for MANE-VU (CMAQ)
 - Contribution assessment modeling (CAMx)
- Emission Inventories have been updated to Gamma for 2011, 2020, 2023, and 2028

Near-Term OTC/MARAMA Base Case Emission Inventories



Alpha

- 2011
- 2018
- 2028



Beta

- 2011
- 2017



Gamma

- 2011
- 2020
- 2023
- 2028



	2020	2023	2028
EGUs	ERTAC v2.7 w/ C-SAPR Optimization		
Small EGUs & Non-EGU Point	MARAMA EMF Growth	MARAMA EMF Growth	EPA 'el' re-split
Onroad/Nonroad	2017-> 2023 Interpolation	EPA 'en'	EPA 'el'
Other Sectors		EPA 'en' or 'el'	



OTC Photochemical Modeling Plan



2011 Gamma Emission Inventory Base Case

- To ensure consistent inventories and update chemistry



2020 Gamma Emission Inventory Base Case – CMAQ

- For use in Serious 2008 NAAQS Nonattainment Ozone SIPs



2023 Gamma Emission Inventory Base Case – CAMx Emission Tags

- For Use in Transport SIP Planning
- Guidance information for 2015 Ozone NAAQS



2023 Gamma Emission Inventory Screening Control Case – CAMx

- For Use in Good Neighbor SIP (Transport SIP) Planning



2028 Gamma Emission Inventory Base & Control Case – CMAQ

- For use in Regional Haze SIPs

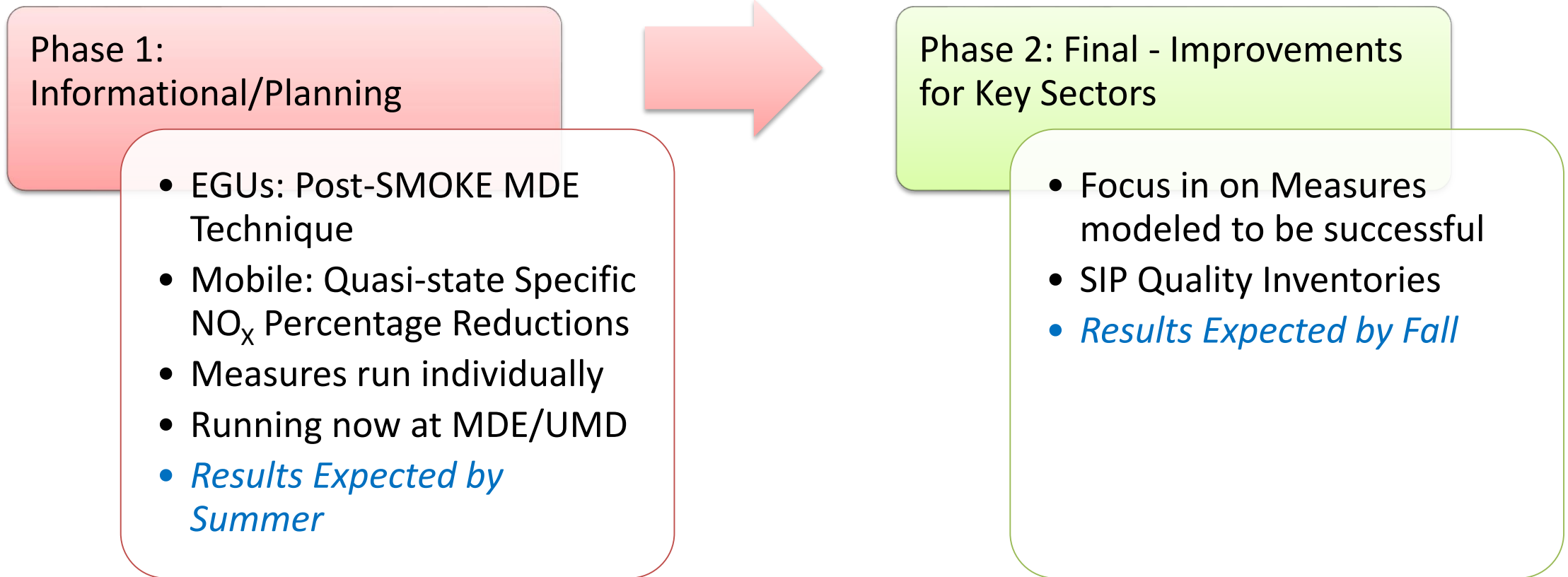
Update Modeling TSD

2020 CMAQ Update – 2008 NAAQS

- Preliminary 2020 CMAQ Runs are complete
- Strange RRFs have been calculated at many coastal monitors and a detailed review is underway

2023 GN SIP Control Case Emission Inventories

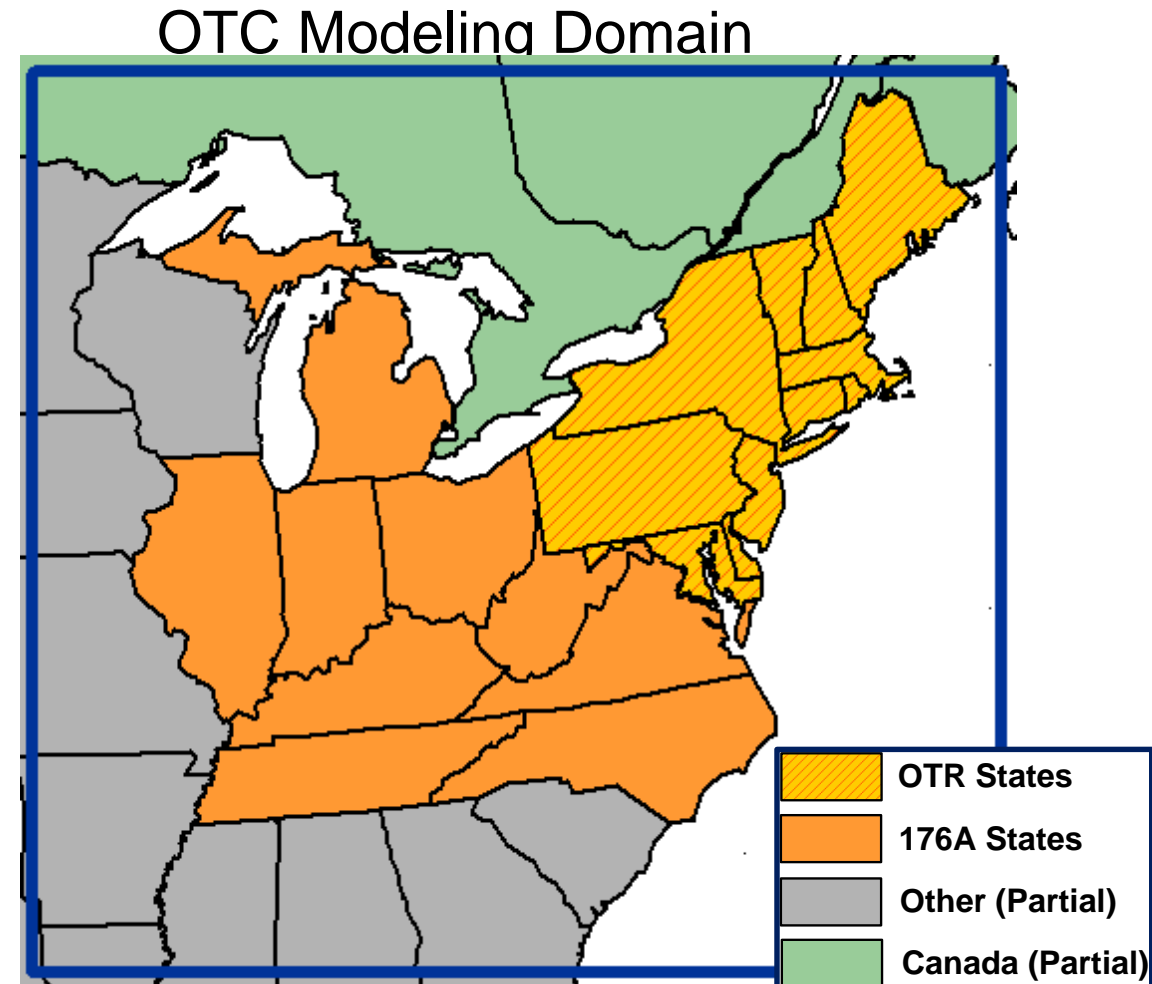
- Details to be covered in SAS and Mobile Committee Presentations



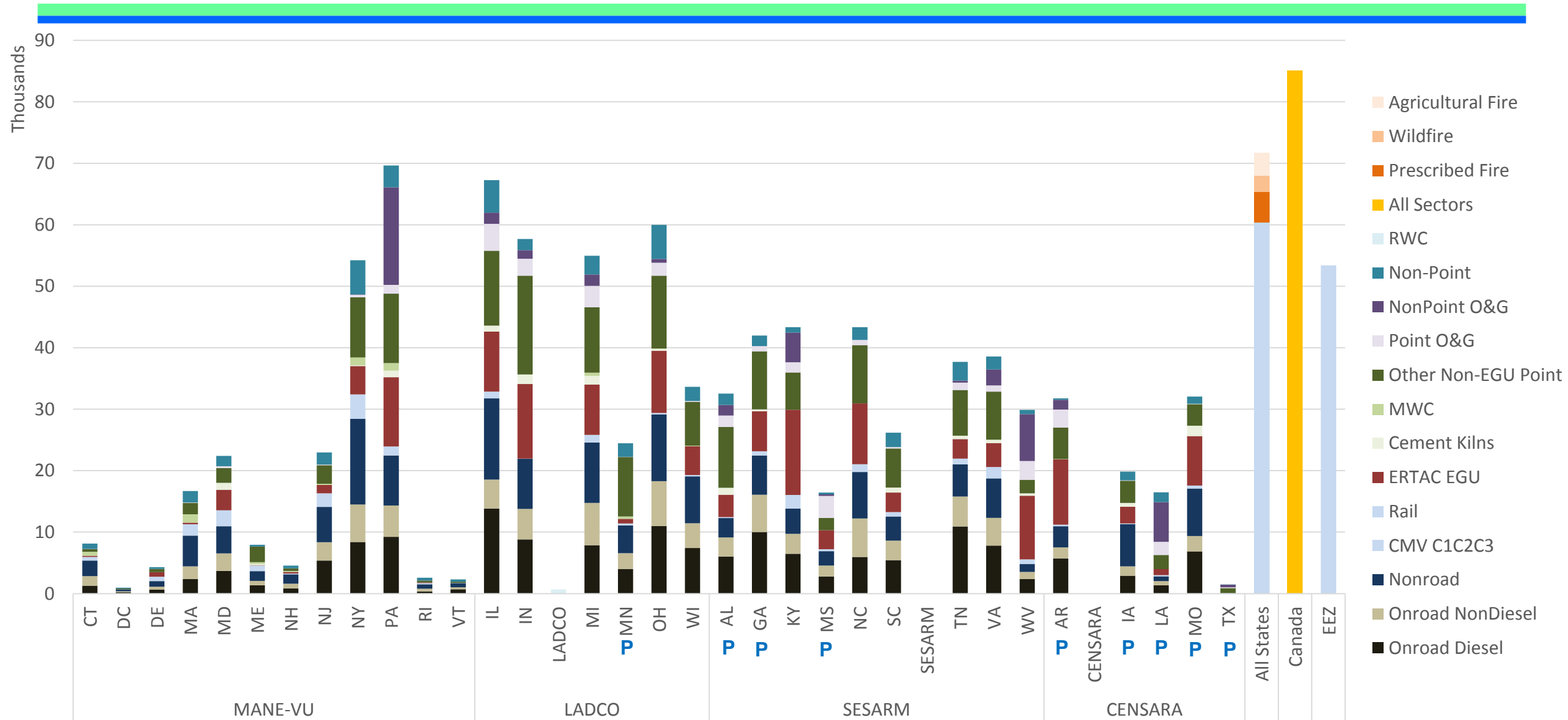
2023 Contribution Modeling – Emission Source Tagging

- States/Anthropogenic Sectors to tag
 - **All States (& partial states) in Domain**
 - EGU,
 - Area,
 - NonRoad,
 - Marine
 - Non-EGUs (Cement Kilns, MWC, & Others),
 - OnRoad (Diesel & Others),
 - Oil & Gas (Area & Point)
 - **Only OTC States individually**
 - RWC, Fires
 - **Entire Domain**
 - Biogenics, Initial Conditions, Boundary Conditions, Canada, EEZ (Exclusive Economic Zone – US Territorial Waters)

That's 385 Tags

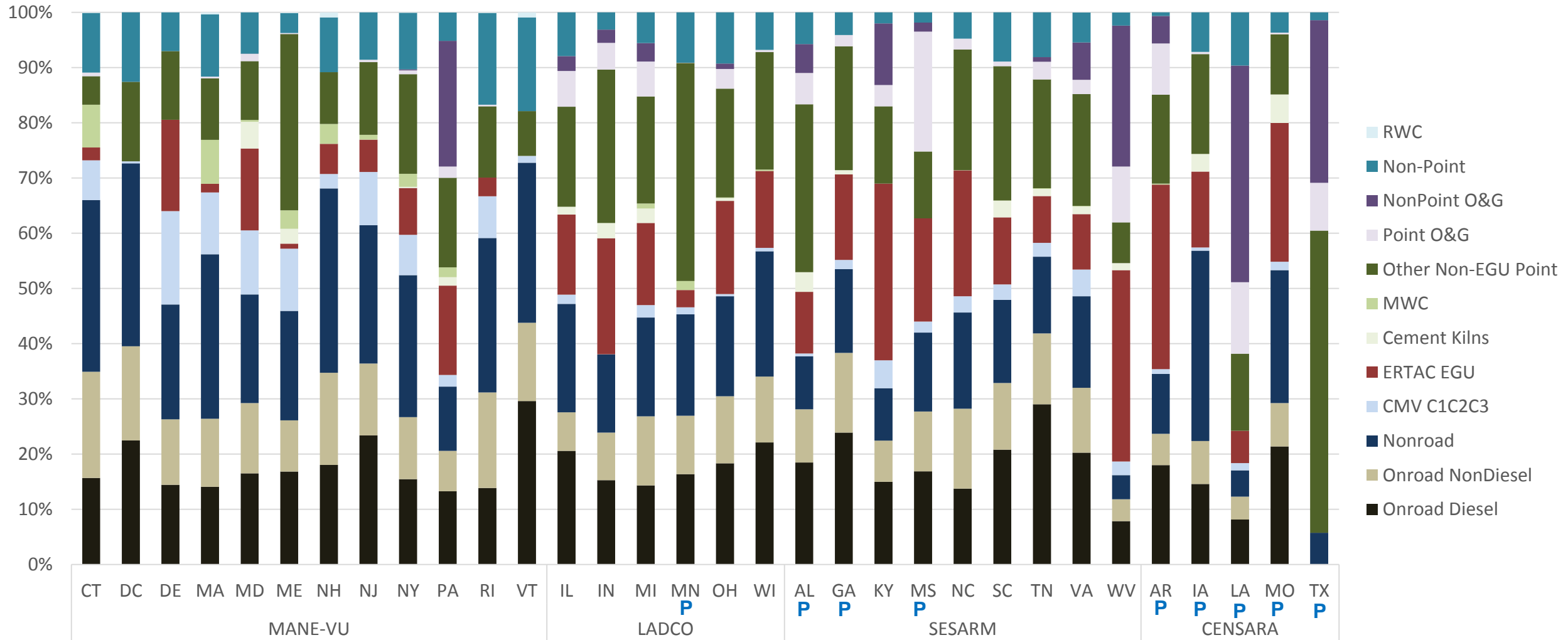


2023 Gamma NO_x Emissions (May 31 – September 1, Draft)



P: Partial State, Includes only inside domain emissions

2023 Gamma NO_x Emissions (May 31 – September 1, Draft)



P: Partial State, Includes only inside domain emissions

For the Record – Details of 2023 Simulation

Model	CAMx v6.4
Meteorology	2011
Anthropogenic Emissions	MARAMA Gamma
Biogenic Emissions	BEIS v3.61
Source Apportionment	APCA
Advection	PPM
Vertical Diffusion	K Theory
Chemistry	CB6r4 with EBI Solver
Dry Deposition	Zhang03
Sea Salt Emissions	EPA Gridded (following Gong, 2003)
Simulation Length	May 15-August 31 (Spin up until May 29)
Boundary Conditions	CONUS CAMx Simulation

2023 Tagged Modeling Monitors Selected for Review

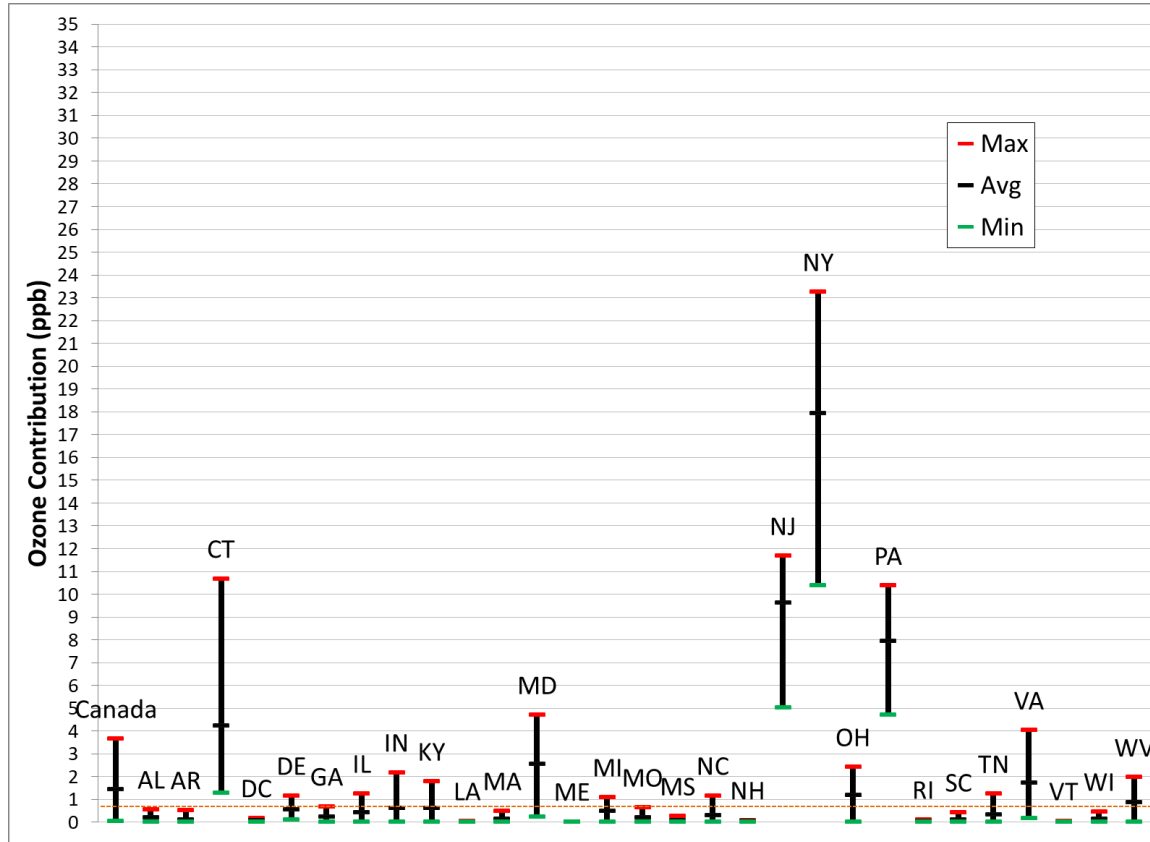
State	Site Code	Site	4 th High
CT	090010017	Greenwich	69.5
CT	090013007	Stratford	70.6
CT	090019003	Sherwood	71.9
CT	090093002	Madison	69.9
CT	090099002	Hammonasset	69.9
CT	090110124	Fort Griswold	65.2
DE	100031013	Bellevue	60.3
DC	110010043	McMillan	61.8
ME	230090102	Cadillac	59.8
MD	240251001	Edgewood	71.8

State	Site Code	Site	4 th High
MA	250051002	Fairhaven	60.3
NH	330074001	Mt Washington	56.7
NJ	340071001	Ancora	66.3
NJ	340290006	Colliers Mills	64.3
NY	360850067	Susan Wagner	71.1
NY	361030002	Babylon	72.0
NY	361030009	Holtsville	67.7
PA	421010024	Northeast Apt	67.1
RI	440030002	W. Greenwich	59.6
VA	510130020	Aurora Hills	64.8

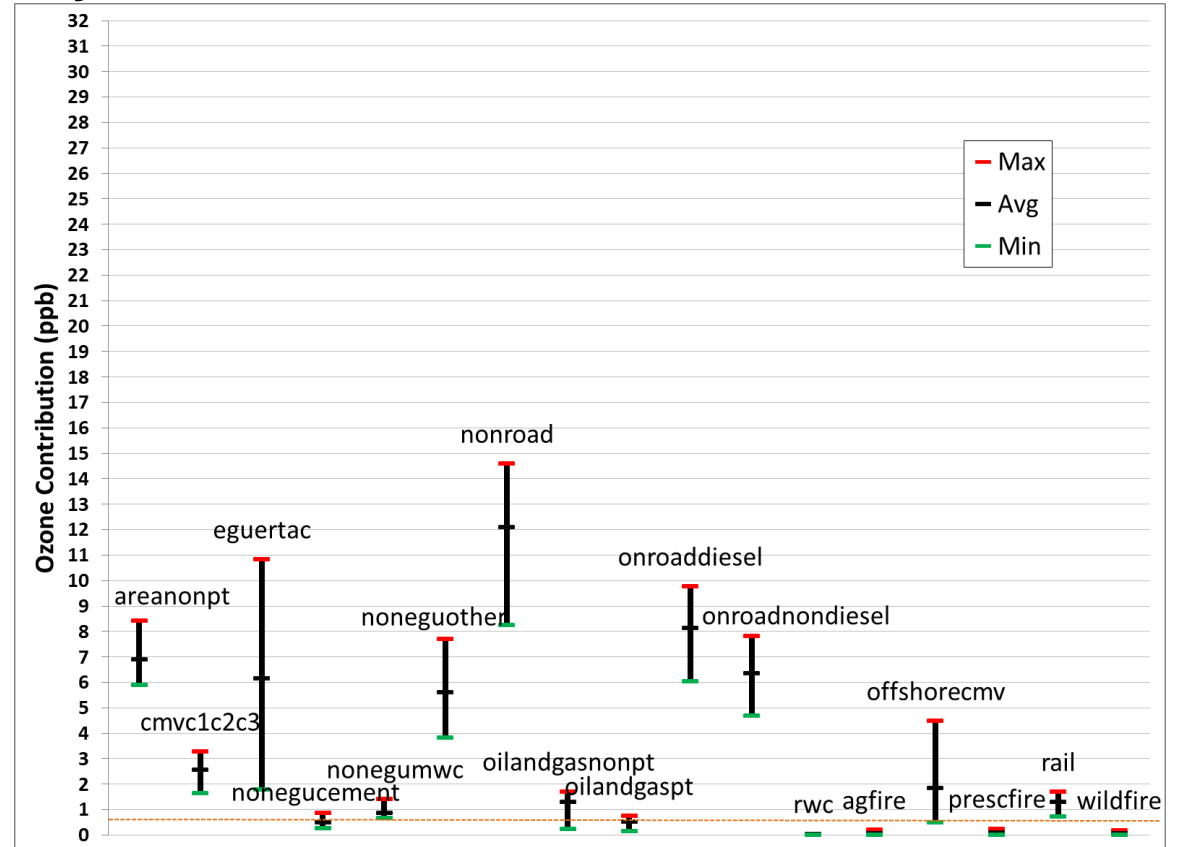
Red indicates an exceeding monitor in 2023, Bold indicates a monitor to be examined in presentation

Sherwood Island Connector (CT – 090019003)

By State



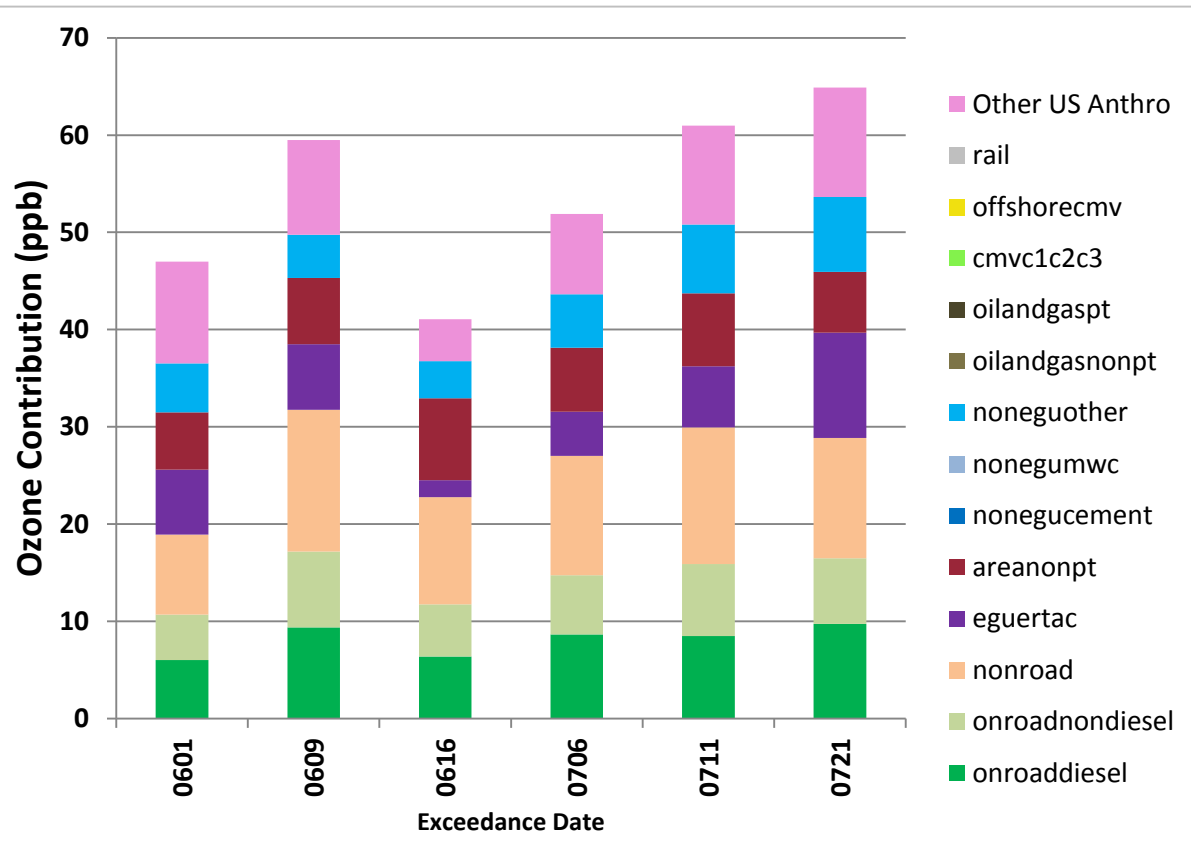
By Sector



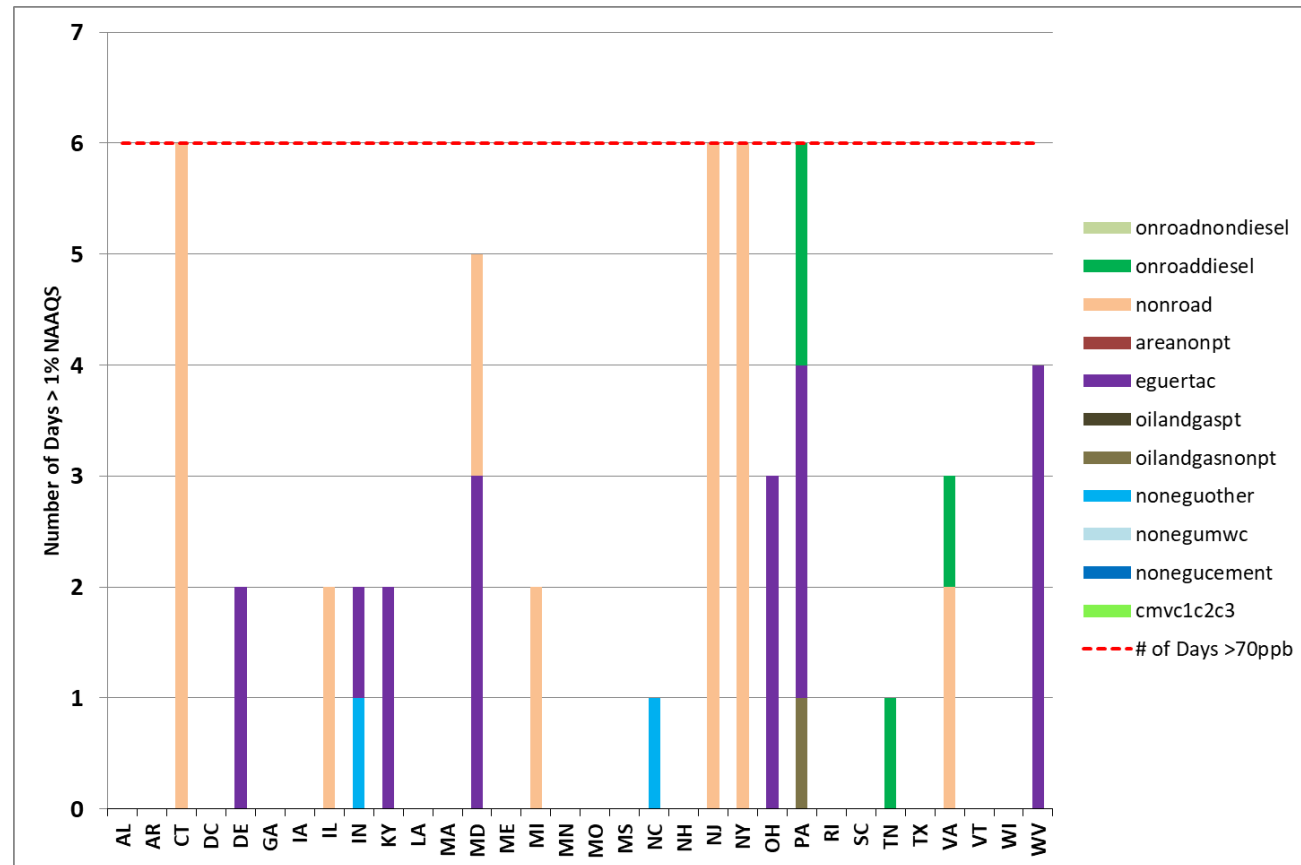
On days with Modeling Exceeding 71ppb

Sherwood Island Connector (CT – 090019003)

Ozone Contribution (ppb) by Sector on NAAQS Exceedance Days

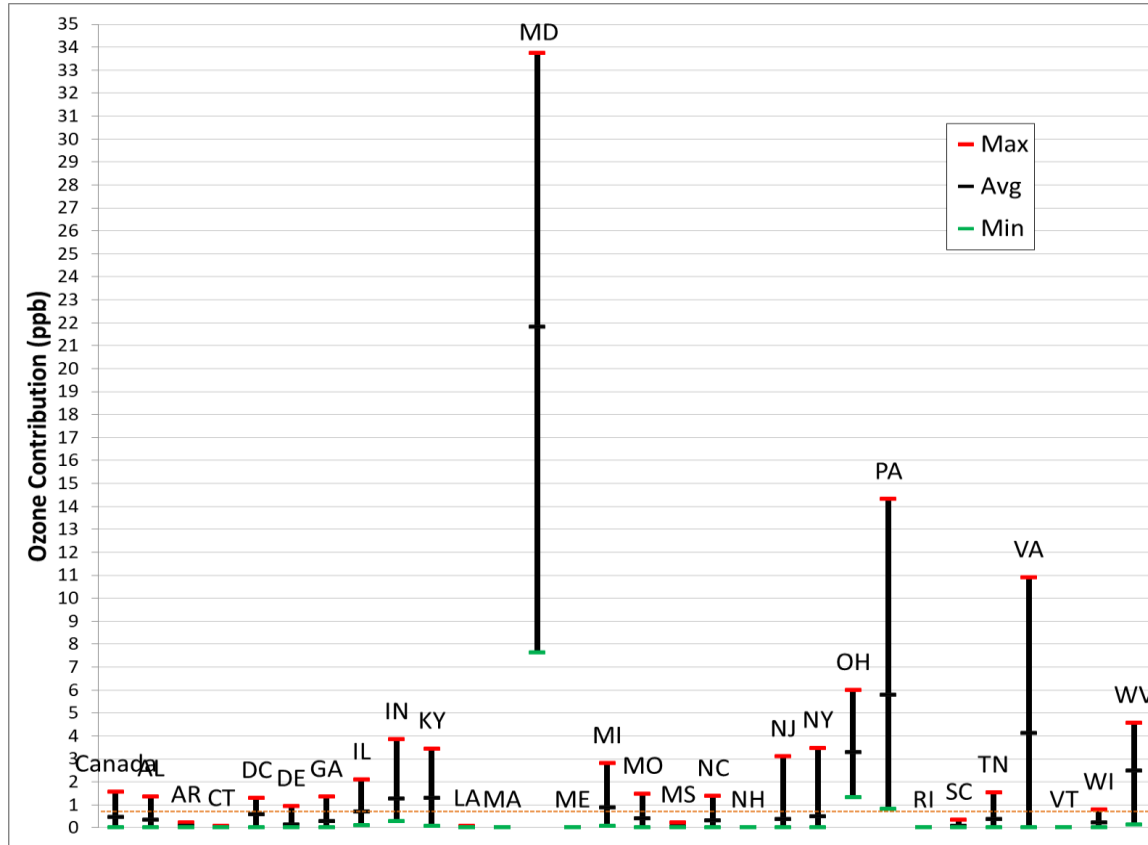


Number of Days >1% NAAQS by Sector

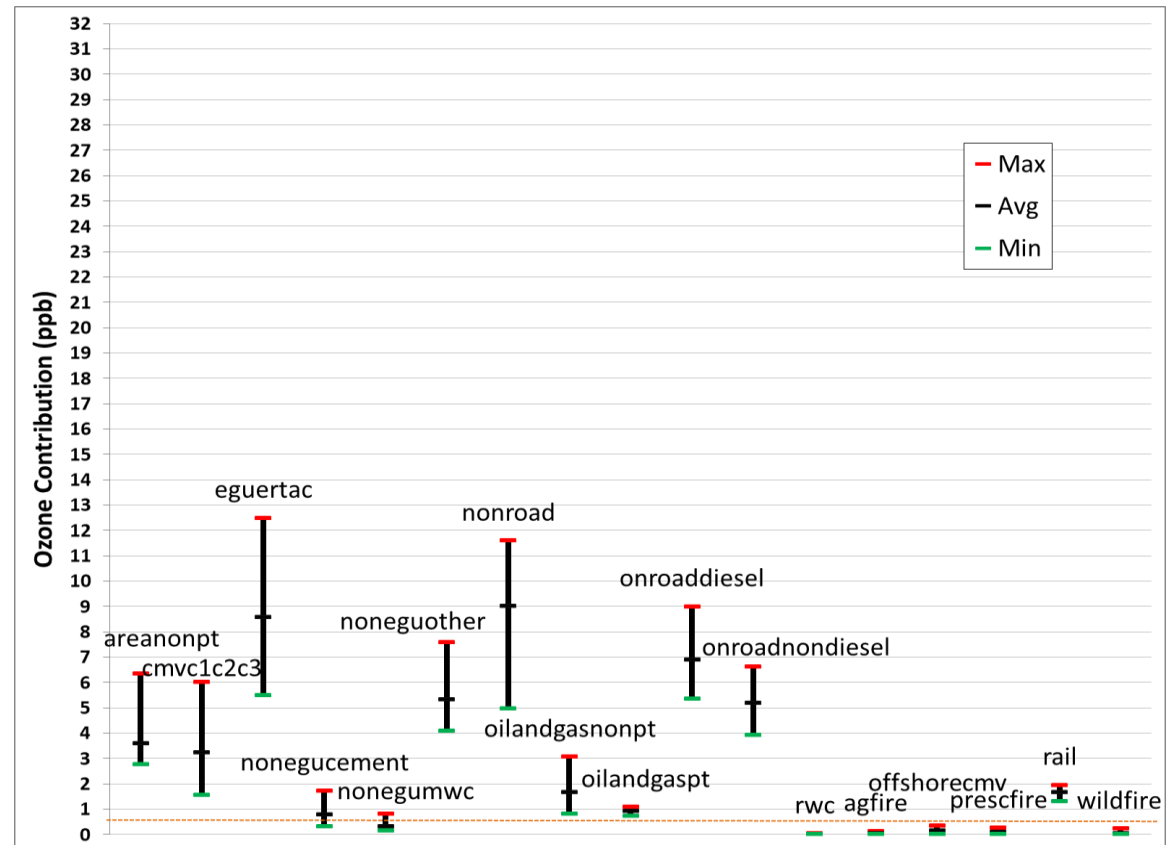


Edgewood (MD – 240251001)

By State



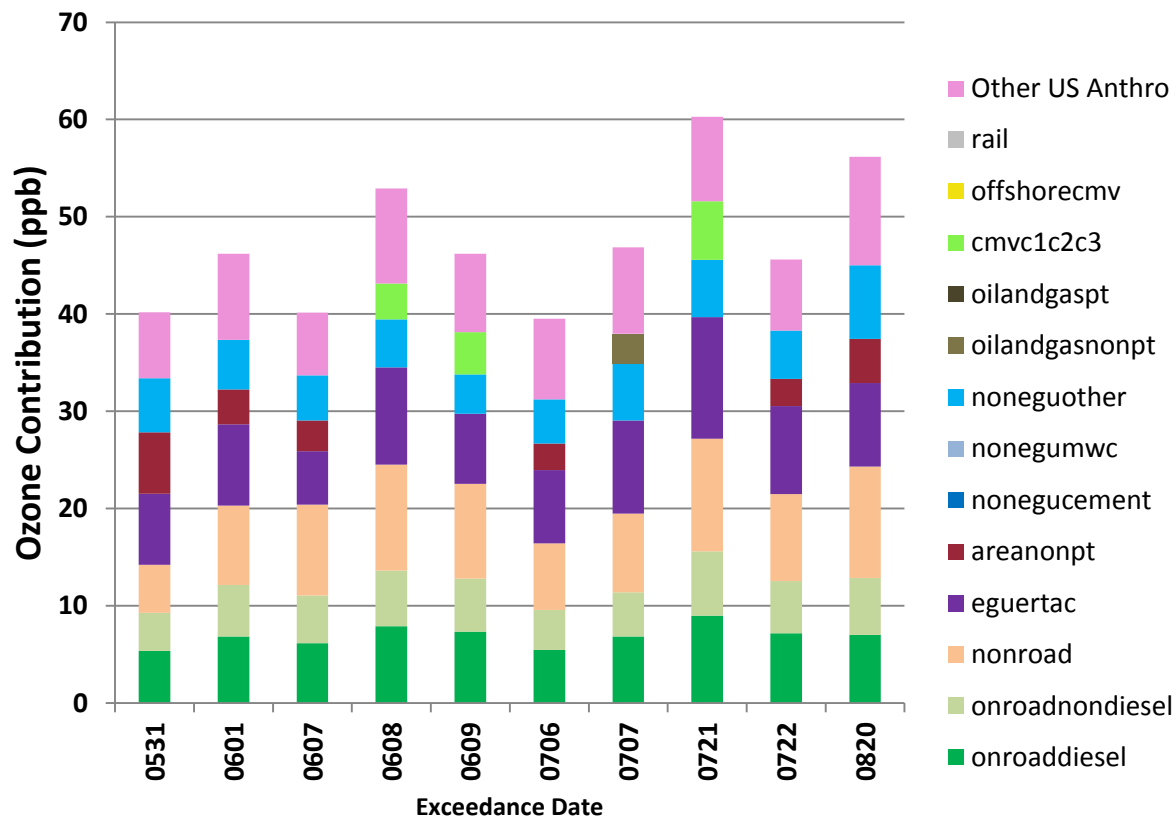
By Sector



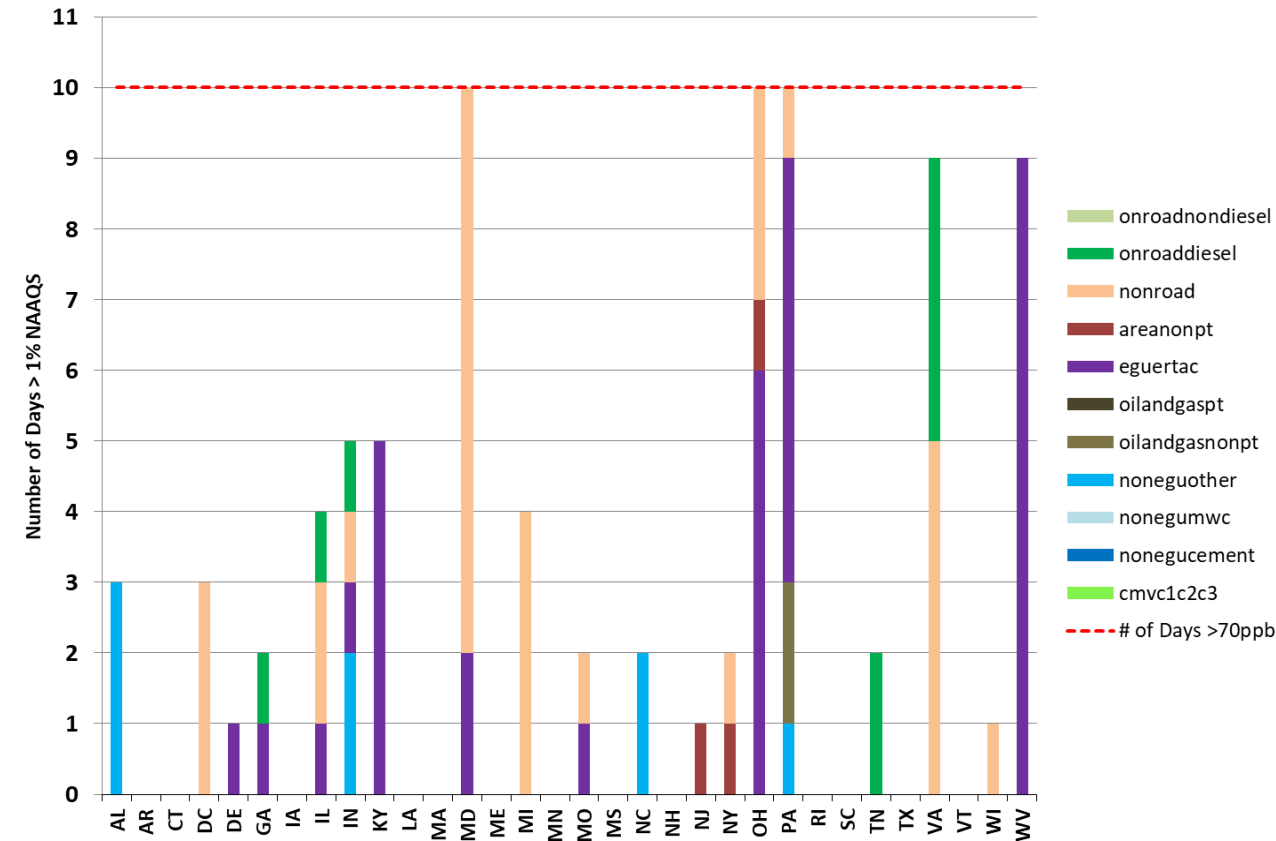
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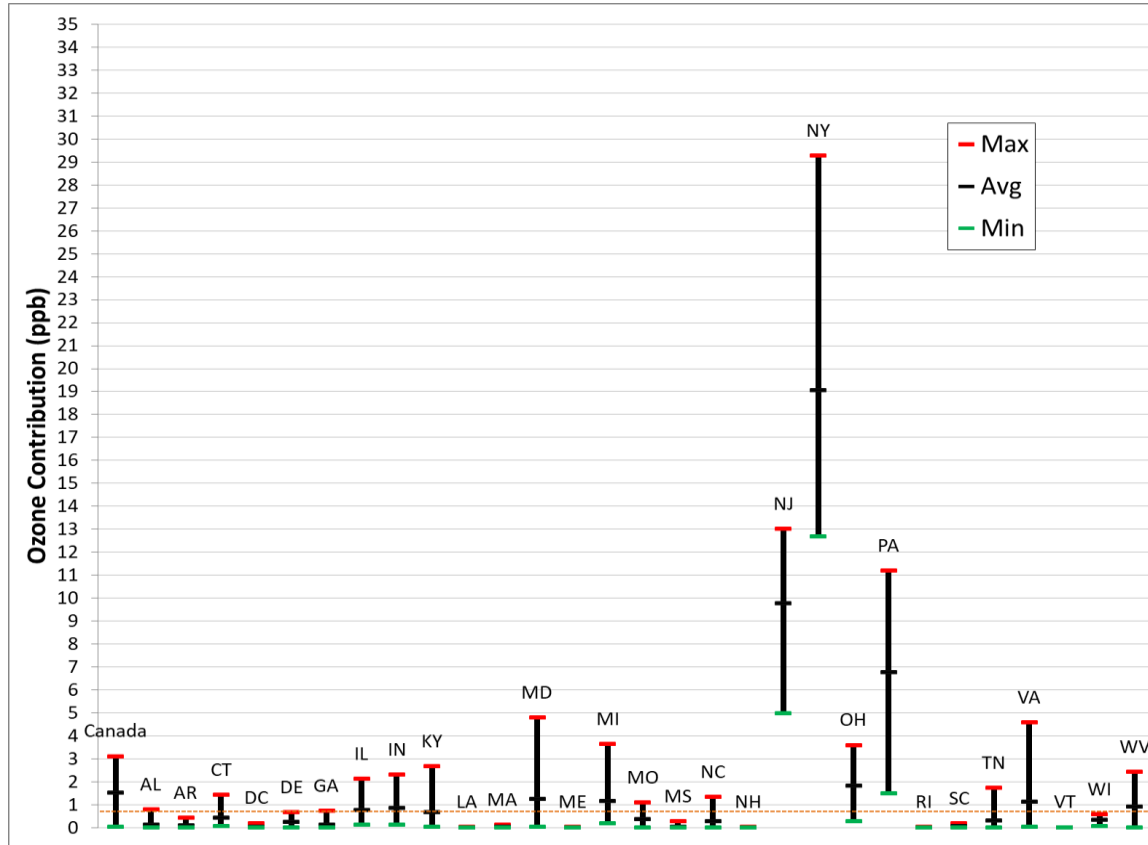


Number of Days >1% NAAQS by Sector

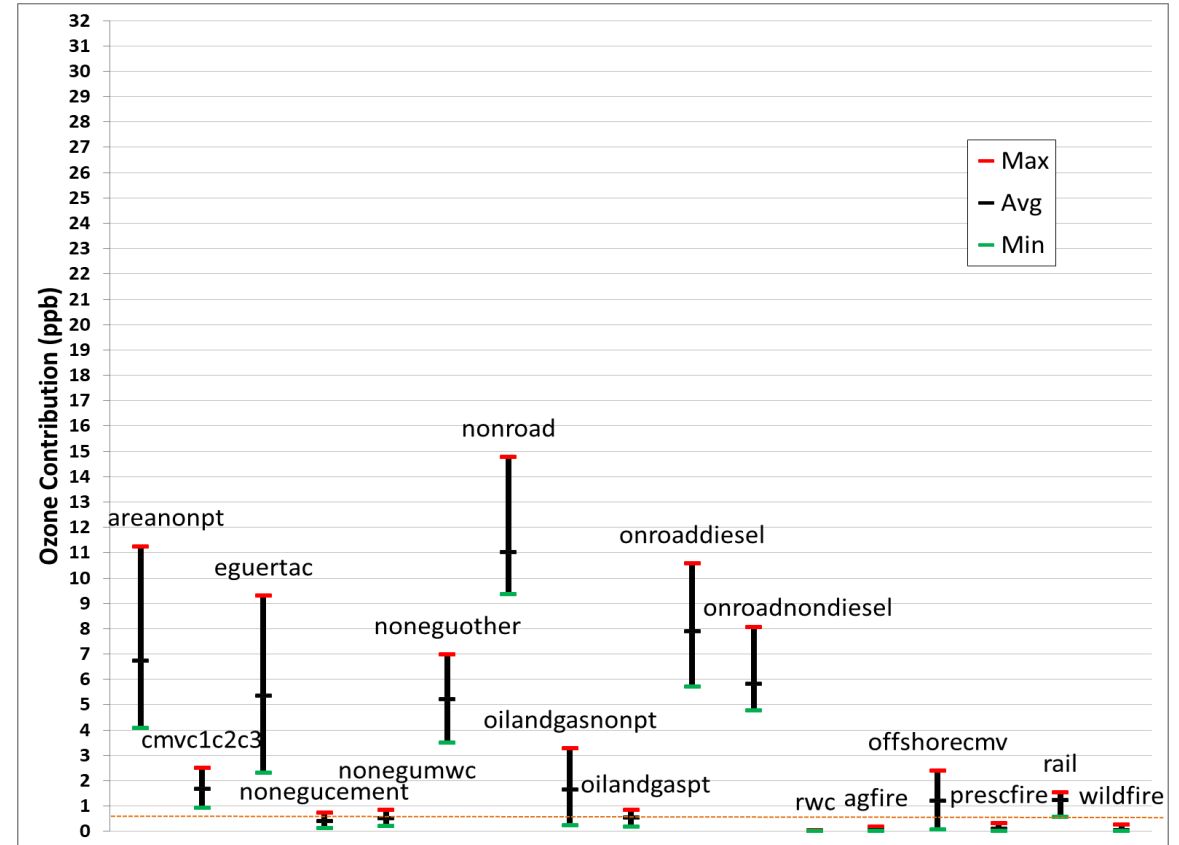


Babylon (NY – 361030002)

By State



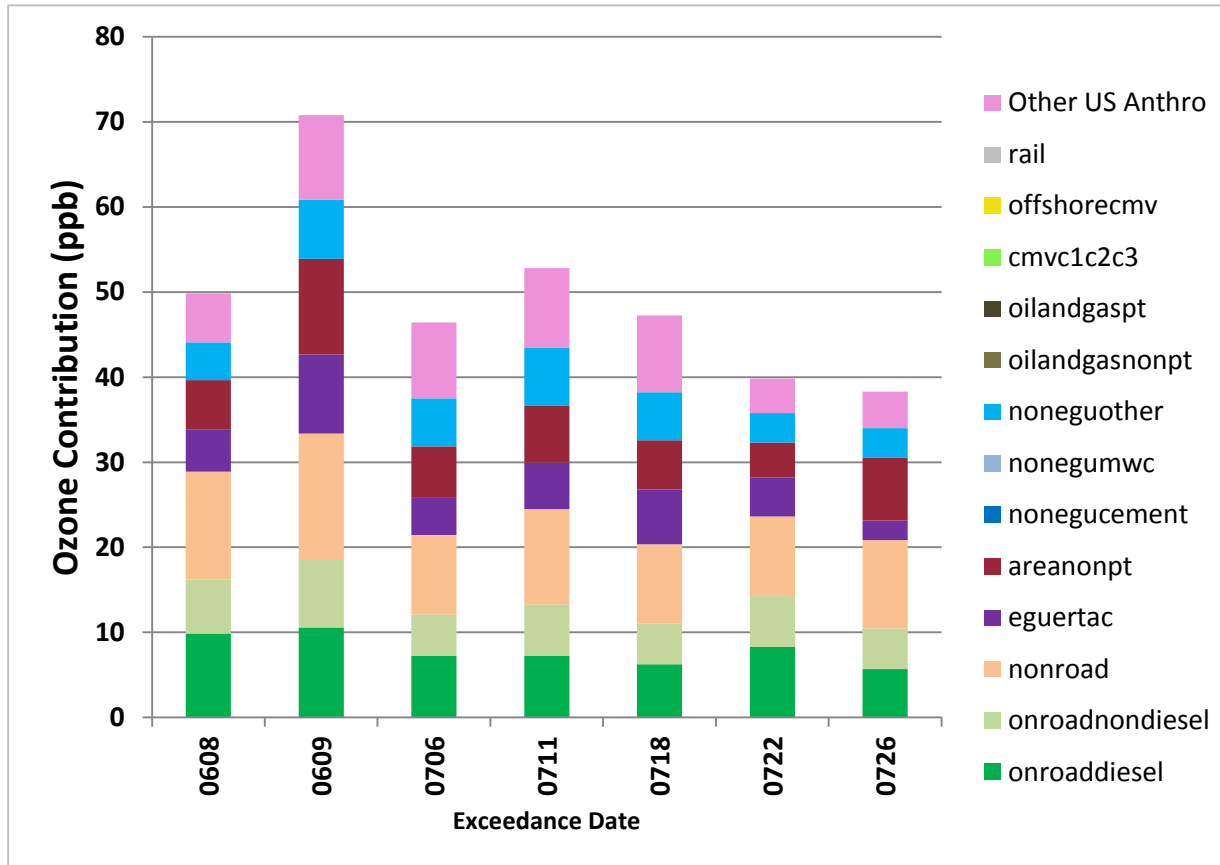
By Sector



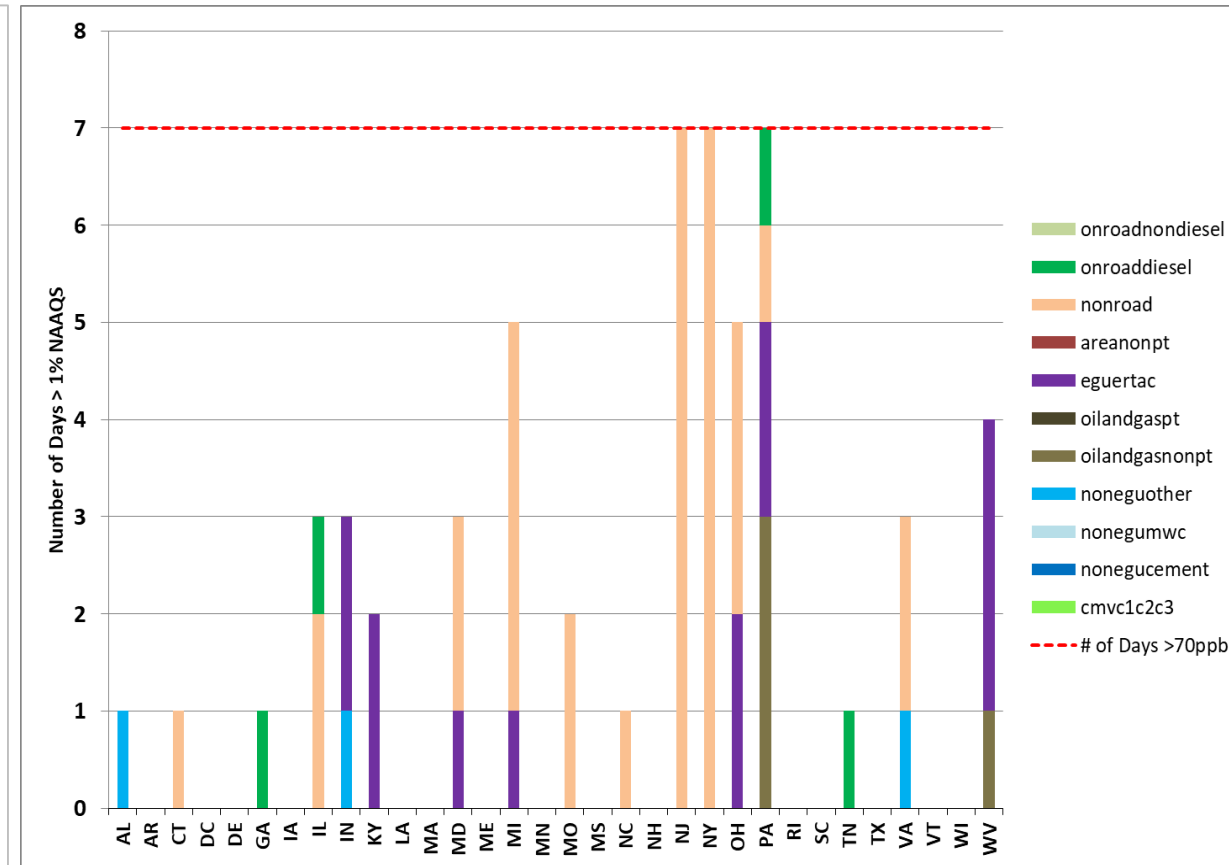
On days with Modeling Exceeding 71ppb

Babylon (NY – 361030002)

Ozone Contribution (ppb) by Sector on NAAQS Exceedance Days



Number of Days >1% NAAQS by Sector



2023 Contribution Modeling Preliminary Conclusions

Onroad and Nonroad are Heavy Contributors

- Nearly every day/monitor has onroad and nonroad contributions as a primary or secondary contributor

EGU and NonEGU Contributions are Still Significant

- Nearly every day/monitor has EGU and NonEGU contributions as a primary or secondary contributor

Importance of Oil and Gas is Growing

The Weather Matters

- Oil & Gas, EGUs, Other Point Sources can be a primary contributor at some monitors on certain days
- Nearby states may contribute to all exceedances, but other contributing states may vary depending on wind patterns

Other Points

- EGU contributions may be underestimated – C-SAPR Update Strategy may be too optimistic
- Onroad and Nonroad contributions may be overestimated – evidence points toward both inventories being high

2023 Contribution Modeling Next Steps

Pour through the data more

- Hundreds of GB of data
- Thousands of monitors
- Hundreds of tags

Look at hourly data

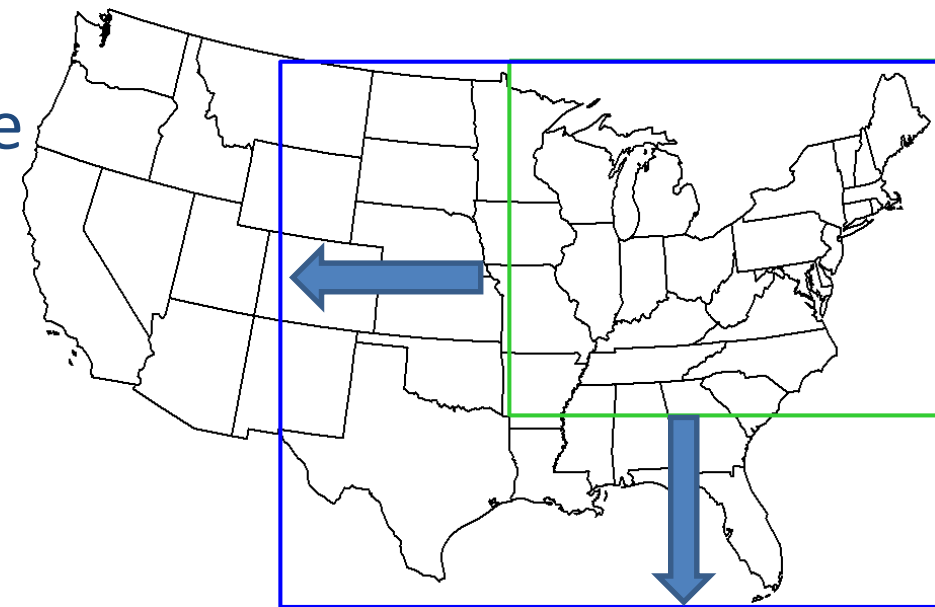
- Do different states contribute at different times of day?

See the effect of GN SIP strategies on contribution

- GN SIP strategies are being run with tags [?]

2016 Based OTC Modeling Platform Development

- In partnership with EPA and other regions nationally for 2015 Ozone NAAQS and for Regional Haze 2021 submittals
- Likely to use a unified domain
 - OTC likely to utilize a larger portion of the national domain than in the past (i.e., east of the Rocky Mountains)
 - Common emission inventories where possible
 - 2014 NEI represents update to 2011
 - 2017 NEI will not be available until 2019
 - 2016 meteorology focus, possibly supplemented with 2015 episodes
 - Projected years, TBD, probably 2023 & 2028



Enhanced Monitoring Plans (EMP)

- Required for all OTR states as part of 2015 Ozone NAAQS process
 - State plans are due October 2019, although EPA is encouraging early submittal by July 2018.
 - OTR states have been exploring options and coordinating.

April 2018 Update

- Required and Supplemental PAMS (10-13 locations)
- Partnerships with EPA/NASA for up to 12 Pandora Spectrometers
- Up to 6 upper air profilers, 2-3 lidars, potential coordinated O₃ sondes
- Additional formaldehyde and trace level CO monitoring, upgraded equipment
- LISTOS Study: Long Island Sound Monitoring Intensive
- MDE Owlets: Science intensive focused on Chesapeake Bay area

OTC Report: Conceptual Model

- Conceptual Model last updated August 2010
- Slide deck updated last cycle, currently updating written report
- Have been advances in our understanding of ozone since then
 - DISCOVER-AQ Campaign
 - Land-Water Interface
 - NO_x Tipping Point
 - Changing Weather Patterns
 - More Advanced Inventories

Conclusions & Next Steps

- Current modeling has been upgraded to MARAMA Gamma
 - 2011
 - 2020
 - 2023
 - 2028
- 2020 CMAQ modeling results under review
- 2023 CAMx Modeling is complete and analysis is under way
 - Very large data set!
- Enhanced Monitoring Plans (EMPs) are progressing and enhanced monitoring studies are being planned

Questions

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