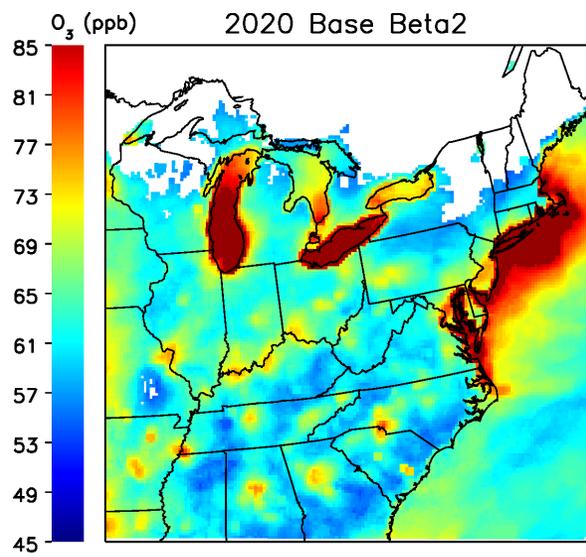
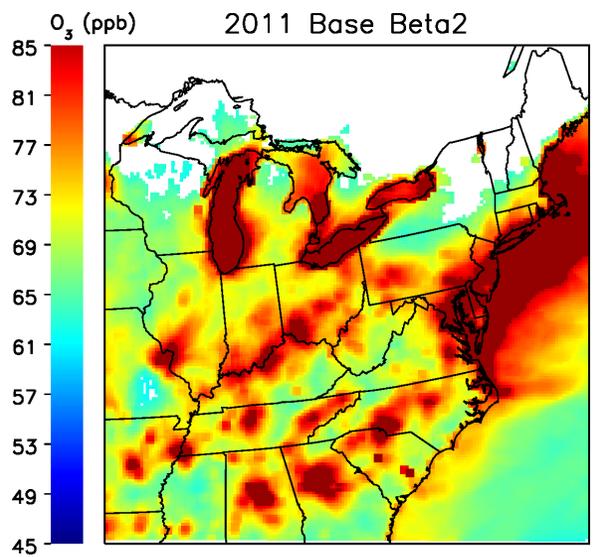


# Modeling Committee Update

## OTC Spring Meeting

June 6, 2017



OZONE TRANSPORT COMMISSION

# Overview

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1. Ozone Monitoring Data
2. Enhanced Monitoring Plan (EMP)
3. Ozone NAAQS Schedule
4. OTC 2011 Modeling Platform
  - a) Recent Modeling
  - b) Emission Inventory
  - c) Planned Modeling
5. 2015/2016 Platform

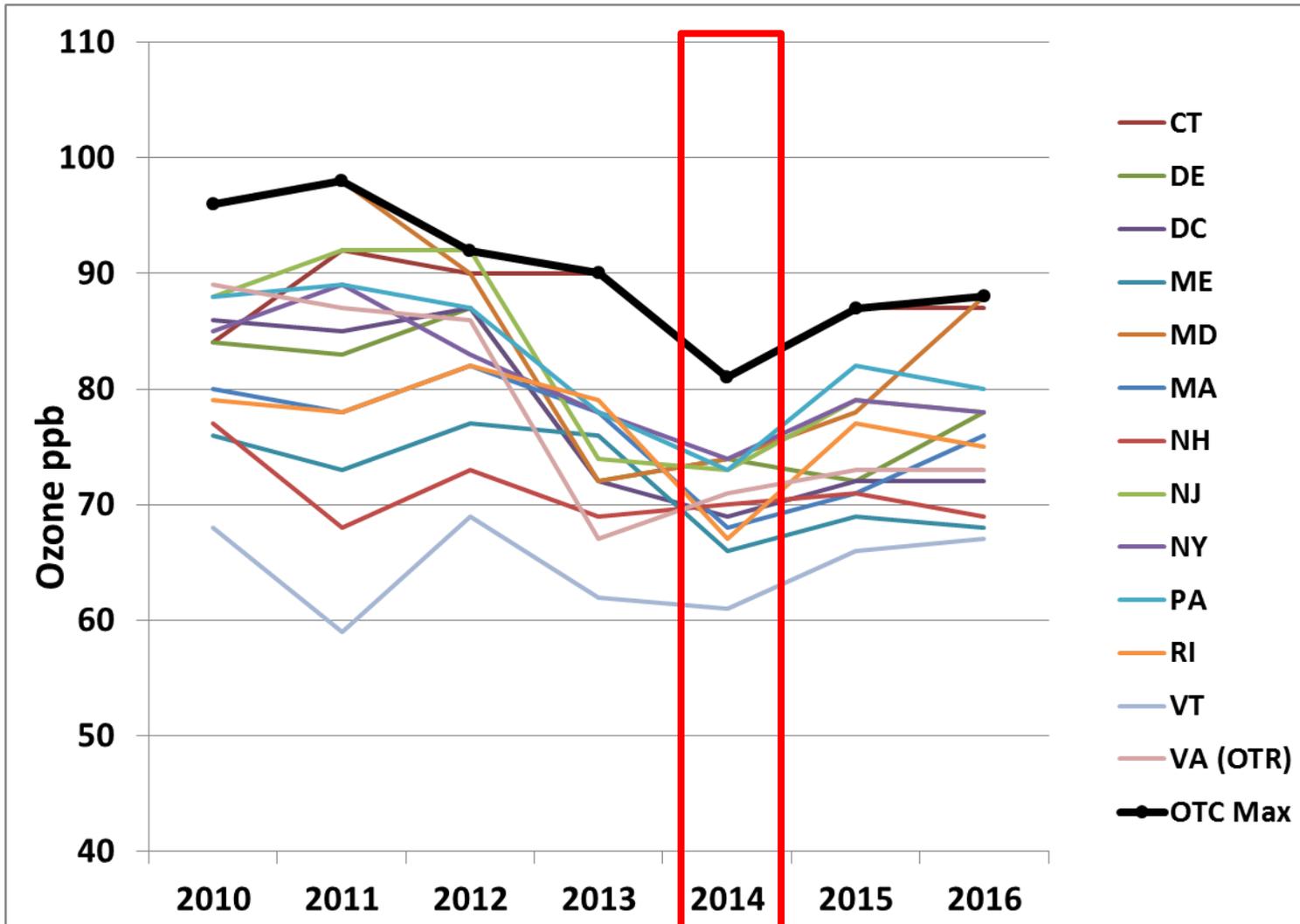
# 1. 2017 Ozone Se

- 9 Exceedance days
- 86 Monitors in All OTR states
  - 50 exceeded more than once
- 18 Monitors in 5 states already violate for 2015-17 (2015 NAAQS)
  - 15 others need just one more exceedance to violate
- Strong likelihood of warmer than normal summer in the eastern US

State	Monitor	Prelim 2015-17 DV
CT	Greenwich	73
<b>Exceedance Dates</b>		<b>States Exceeding</b>
		4
		6
		7
March 17	NH(1)	1
March 18	NH(1)	3
April 10	VT(1)	3
April 11	ME(1), MD(3), MA(1), NH(2), NJ(5), PA(2)	4
		2
April 14	PA(1)	1
		3
April 30	NH(1)	3ppb
May 18	CT(8), MA(9), ME(1), NJ(9), NY(3), RI(1)	184ppb
		275ppb
May 19	CT(10), MA(11), ME(5), NJ(7), NY(5), RI(3)	270ppb
		1ppb
		4
PA	NEA	75

# 1. 2015-2017 Design Values Updating

Maximum 4<sup>th</sup> High Ozone Concentration by State

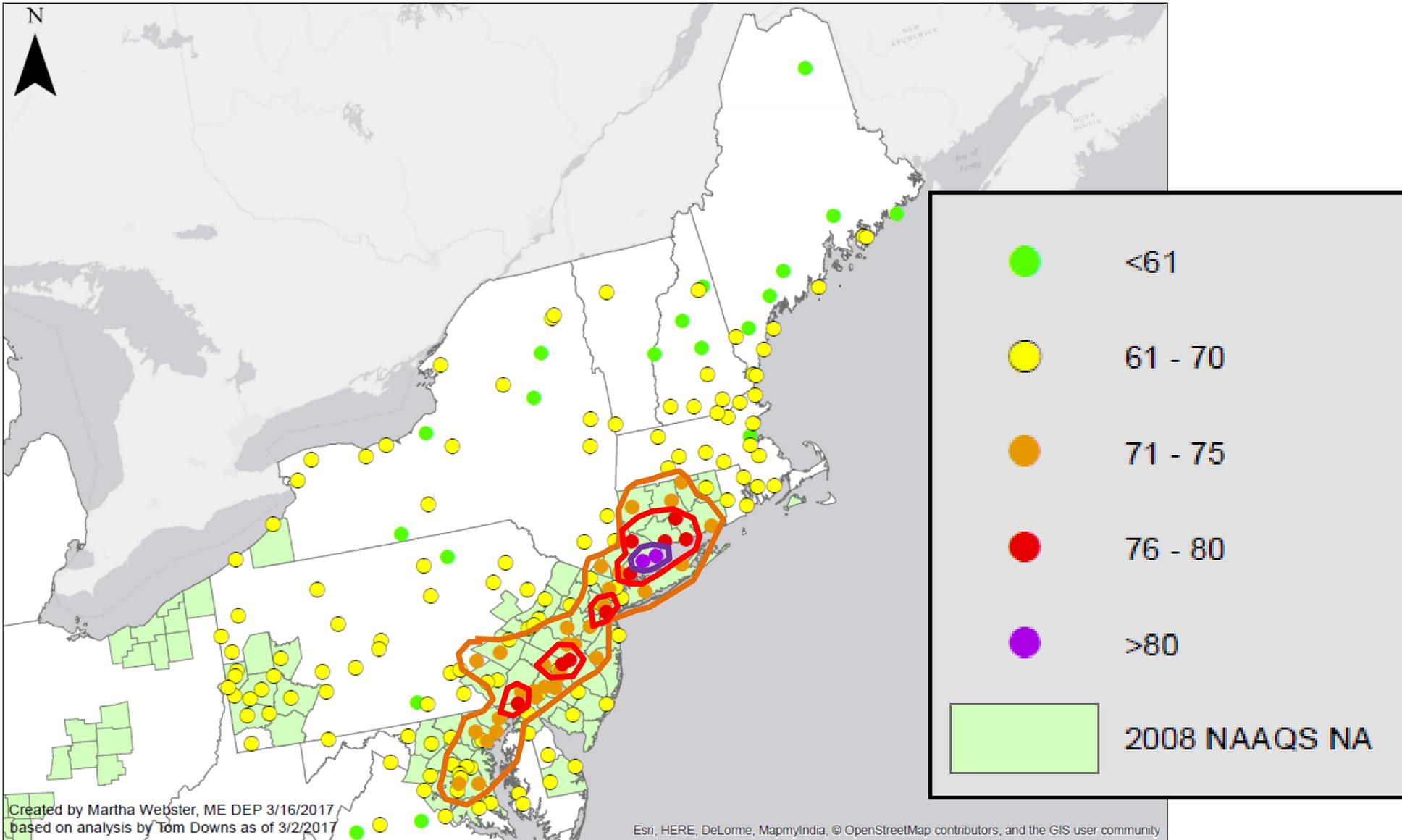


2017 ozone season will replace data from 2014 in the three year design value calculation.

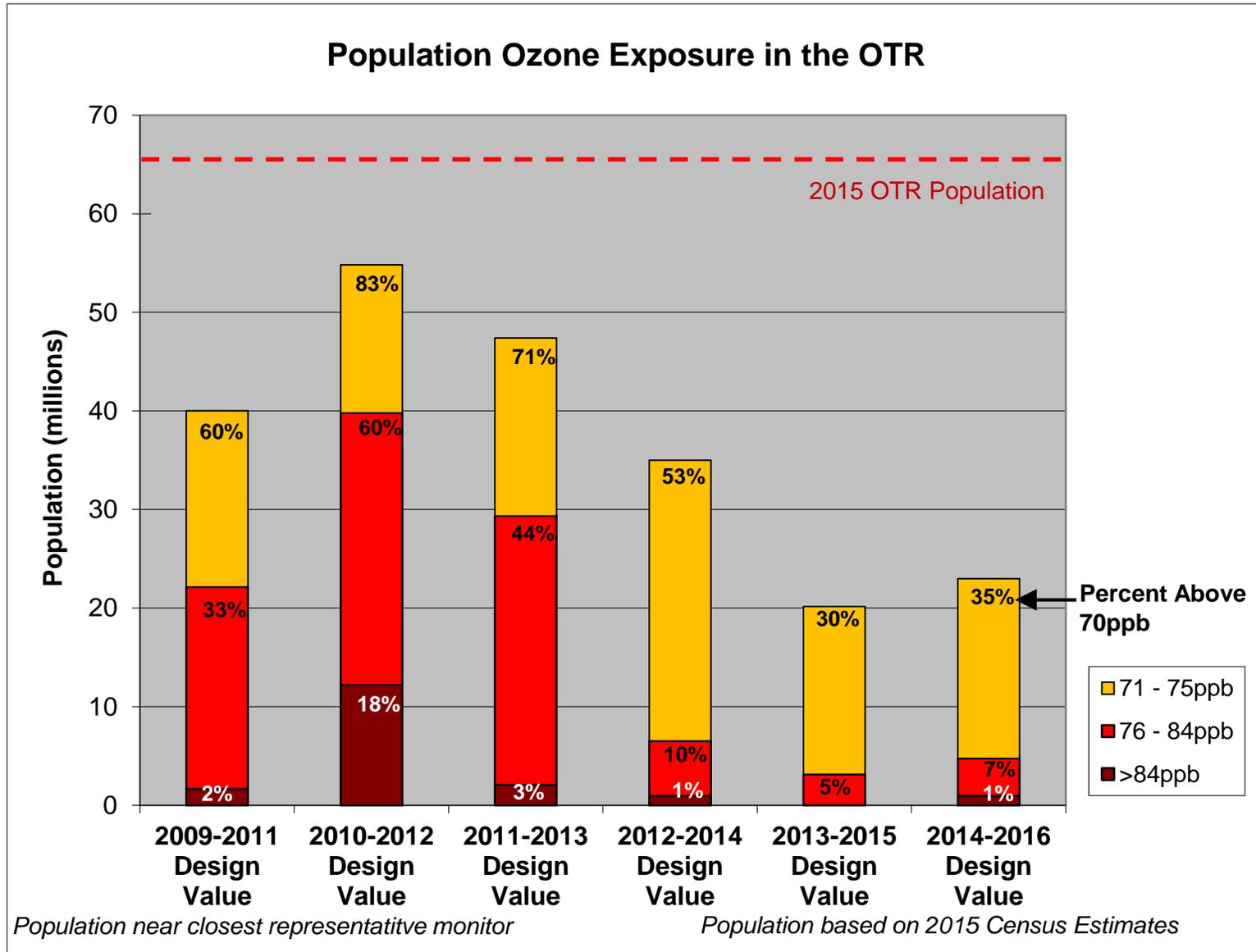
If 4<sup>th</sup> maximum ozone concentrations for 2017 are higher than those being replaced in 2014, new Design Values will go up!

Ozone during 2014 was relatively low!

# 1. 2014-16 8h Ozone Preliminary Design Value



# 1. Population Exposed to Ozone Violations



# Ozone Health Effects

Healthy airway



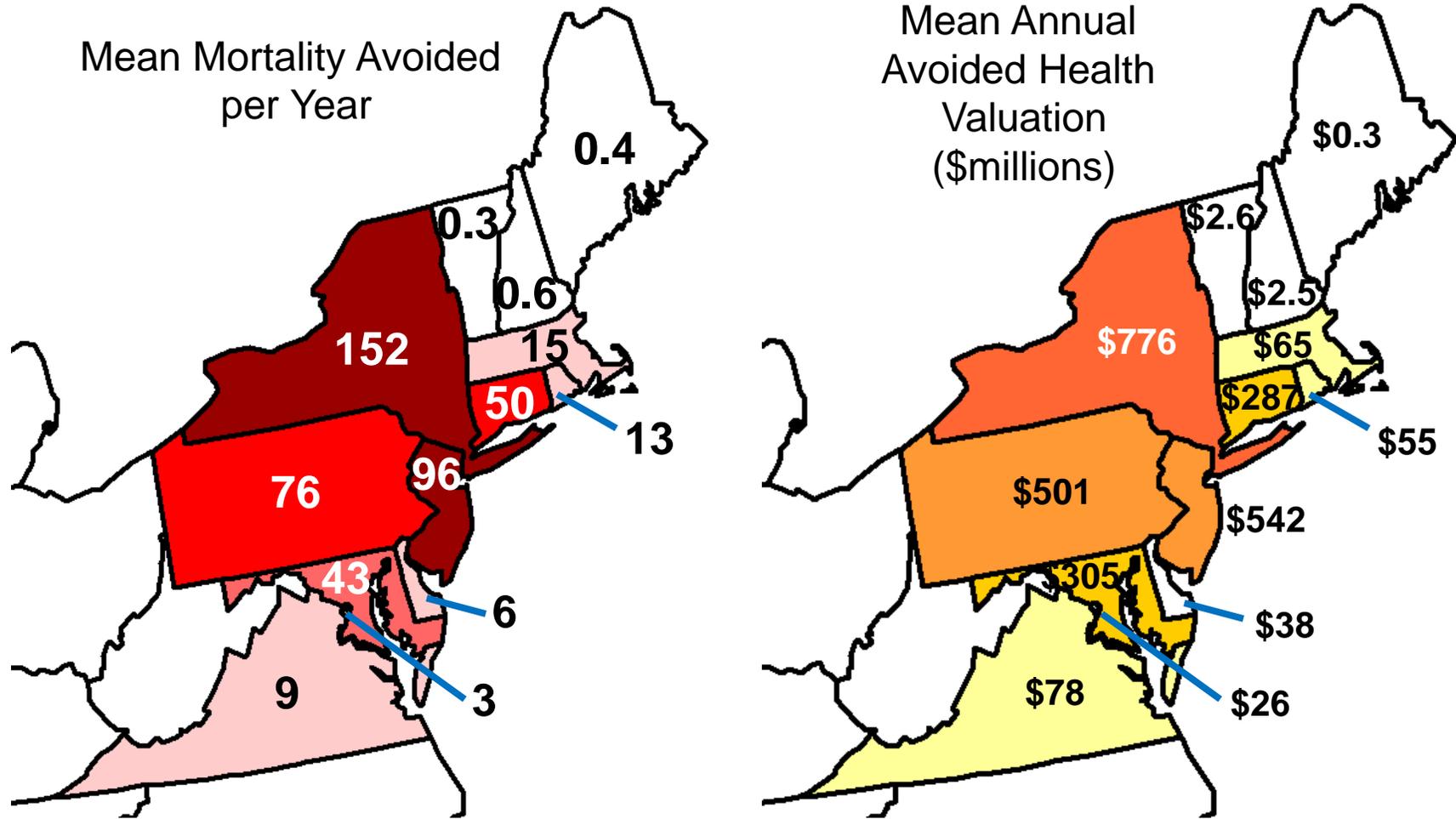
Inflamed airway due to ozone inhalation



## Ozone Health Effects

- Decreases lung function
- Coughing and pain in the chest
- Increases susceptibility to respiratory infections
- Permanent damage to lungs
- Promotes allergic reactions
- Death

# 1. BenMap Modeled Benefits of Fully Meeting the 2015 Ozone NAAQS (70ppb) during 2013-15



*Values presented are the mean of calculations and does not reflect uncertainties inherent in the process. Analysis based on techniques employed by EPA in Regulatory Impact Analyses*

# 1. BenMap Modeled Benefits of Fully Meeting the 2015 Ozone NAAQS (70ppb) during 2013-15

	Avoided Mortality		Avoided Health Costs (millions \$2011)	
	Mean	Range ( $\pm 2$ STD)	Mean	Range ( $\pm 2$ STD)
CT	49.9	0 - 99.9	\$287.4	\$0 - \$665.3
DC	3.2	0 - 6.5	\$25.7	\$0 - \$59.5
DE	5.8	0 - 11.6	\$37.5	\$0 - \$87.2
MA	14.7	0 - 29.5	\$64.9	\$0 - \$162.2
MD	42.7	0 - 86.0	\$305.1	\$0 - \$709.0
ME	0.4	0 - 0.9	\$0.3	\$0 - \$0.9
NH	0.6	0 - 1.2	\$2.5	\$0 - \$5.8
NJ	95.5	0 - 191.1	\$541.5	\$0 - \$1,251.0
NY	151.8	8.8 - 294.8	\$775.9	\$0 - \$1,791.0
PA	75.7	0 - 151.8	\$501.2	\$0 - \$1,168.3
RI	13.1	0.2 - 26.0	\$55.0	\$0 - \$127.3
VT	0.3	0 - 0.6	\$2.6	\$0 - \$6.0
VA	9.2	0 - 18.9	\$78.3	\$0 - \$179.3

Values are 3-year averages for the period of 2013 to 2015

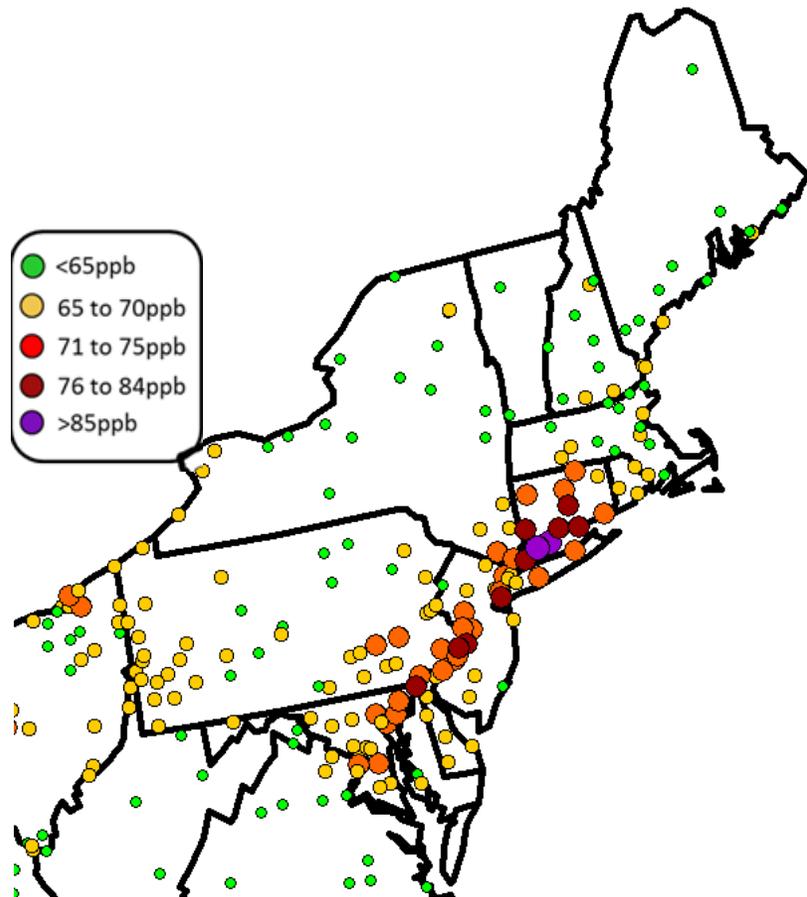
## 2. Enhanced Monitoring Plans (EMP) (PAMS)

- Requires states with moderate or above ozone NAA & OTR states to submit an EMP as part of 2015 Ozone NAAQS process
- Plans due to EPA on 10/1/2019\*, or 2 years after moderate or above designation
- Effort underway to coordinate between states & EPA through OTC workgroup
  - Gain regional benefits from plans
  - More knowledge on transport
  - More knowledge of air/sea affect on ozone
  - Information to improve model performance

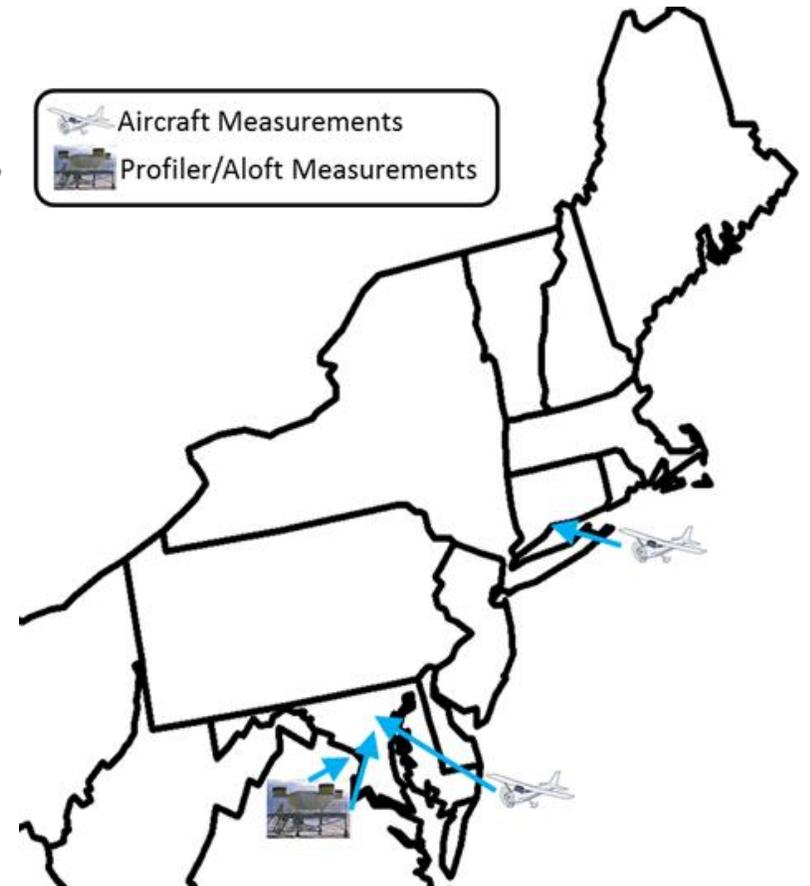
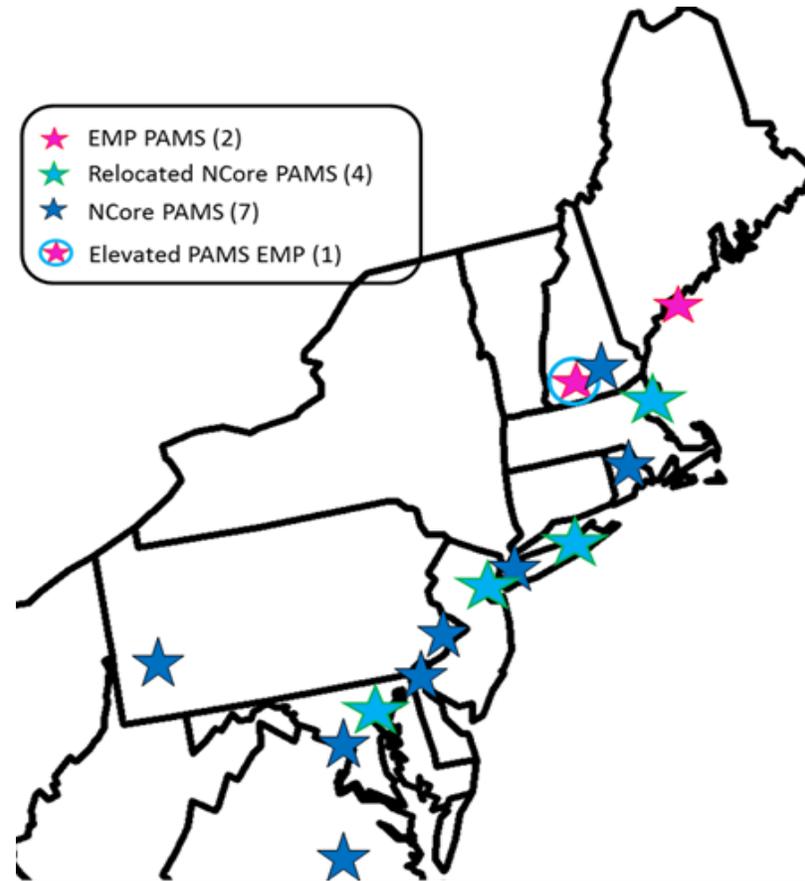


## 2. Enhanced Monitoring Plans (EMP) (PAMS)

### Design Values



### Preliminary state suggestions



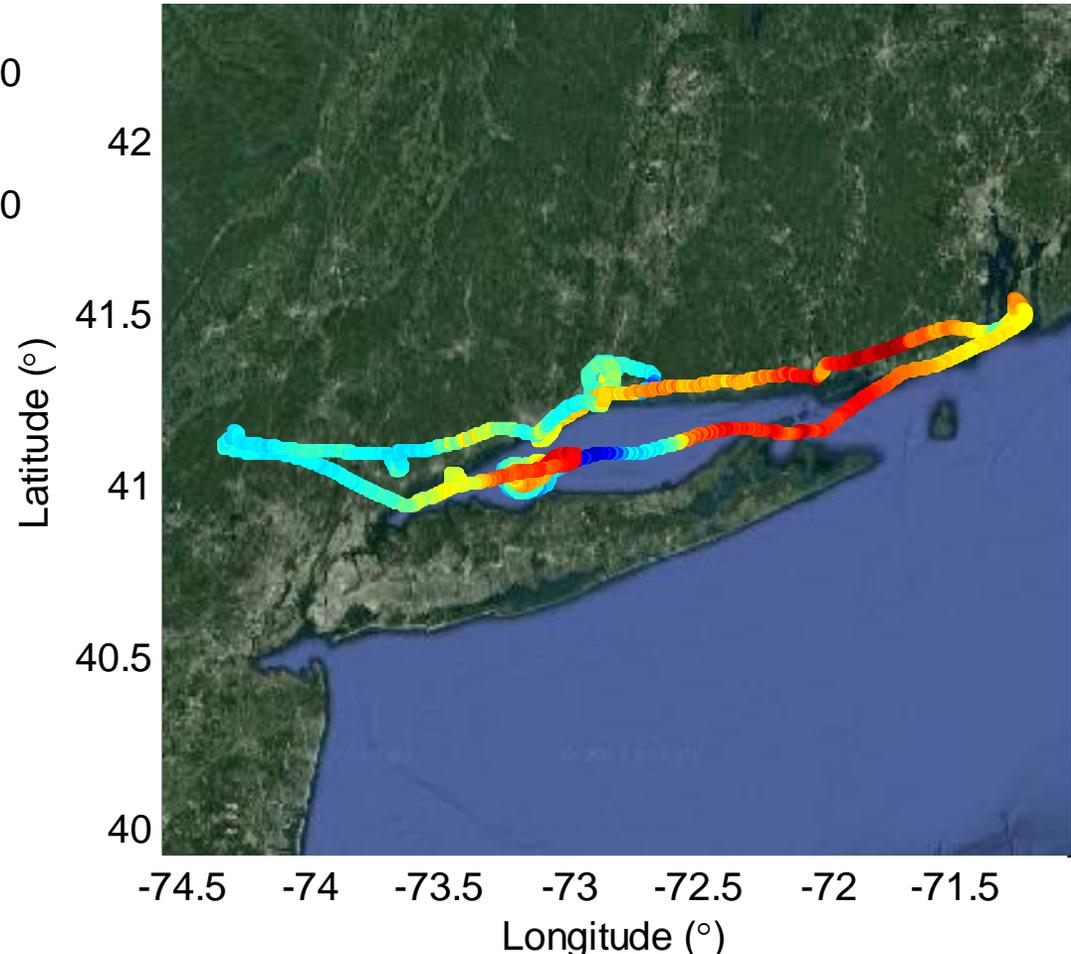
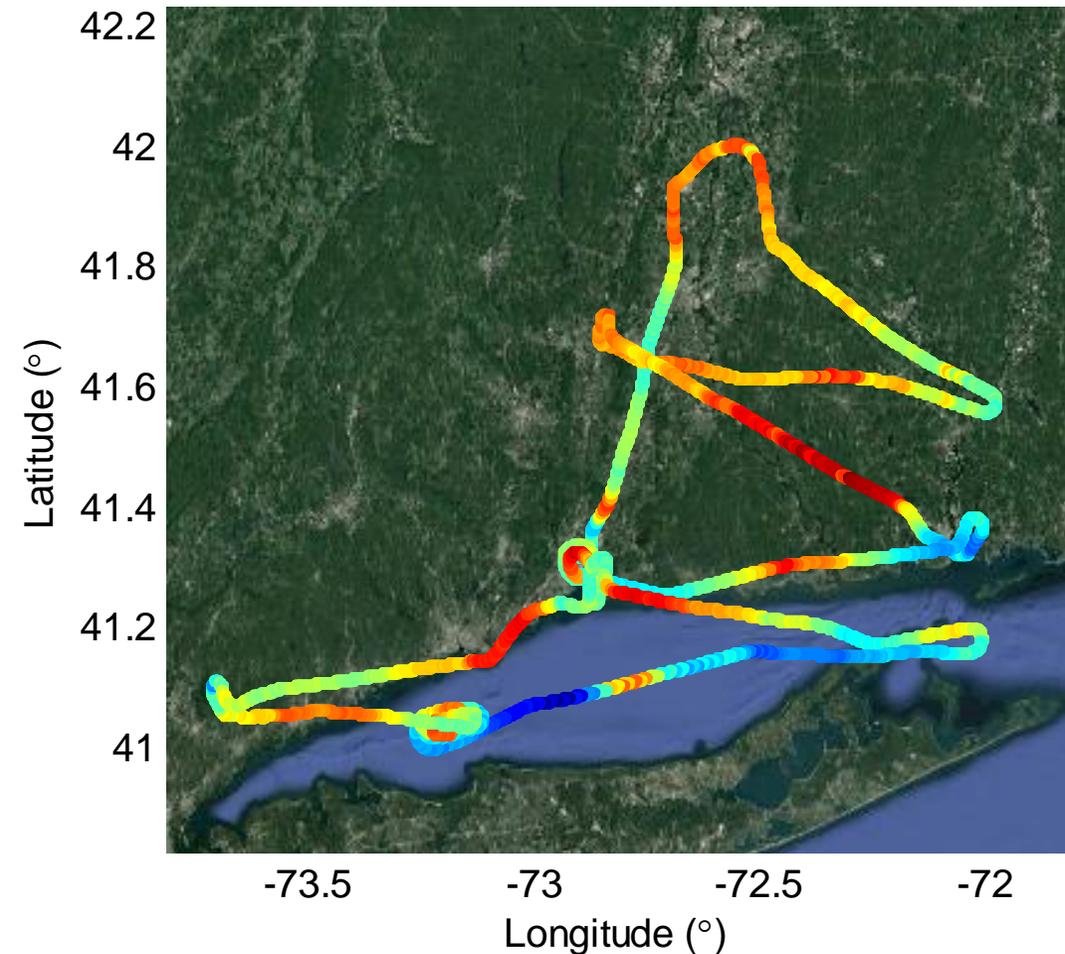
# 2. Long Island Sound Project

## Preliminary University of Maryland Aircraft Observations

May 17, 2017

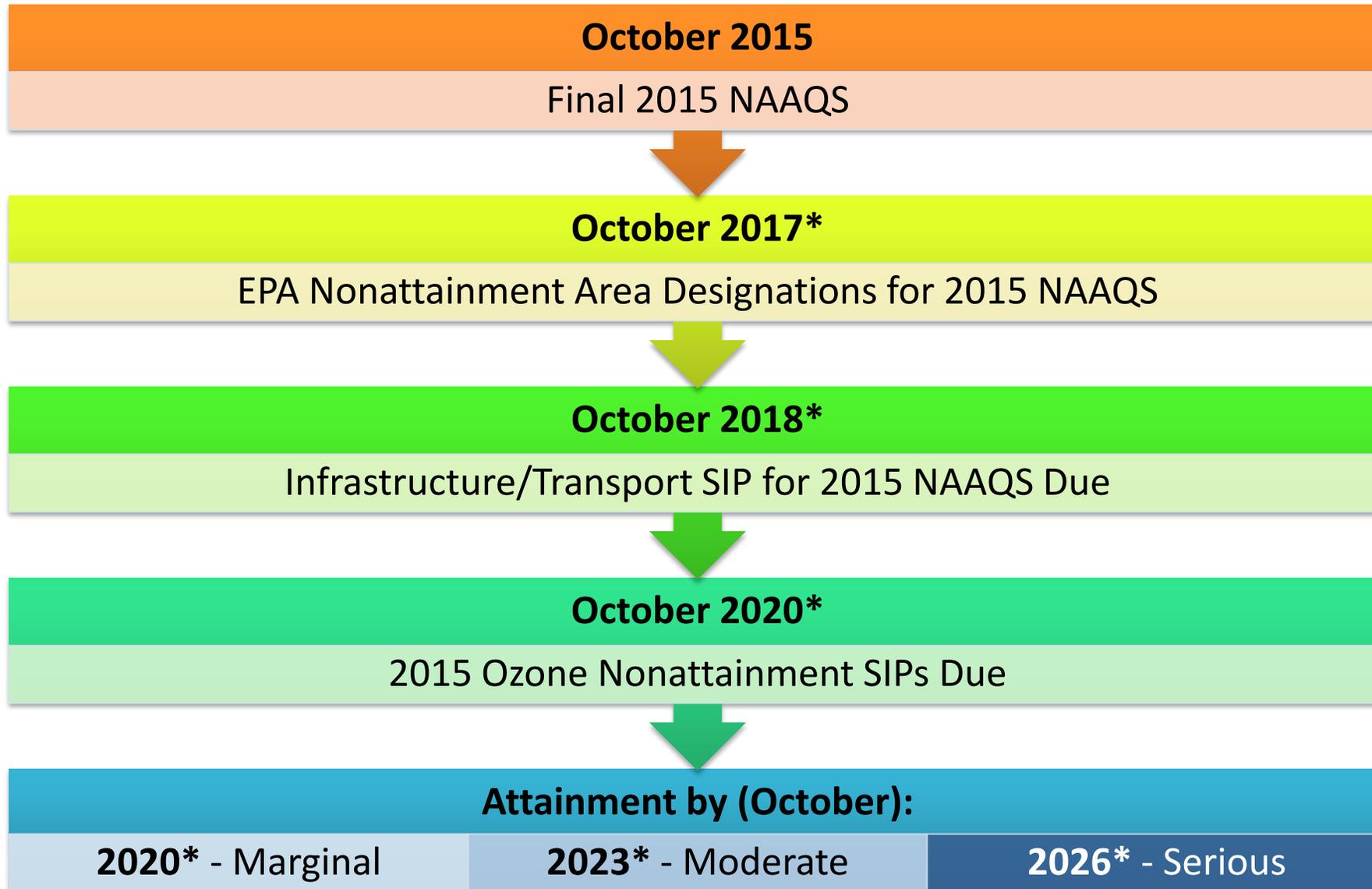
[O<sub>3</sub>] (ppbv)

May 18, 2017



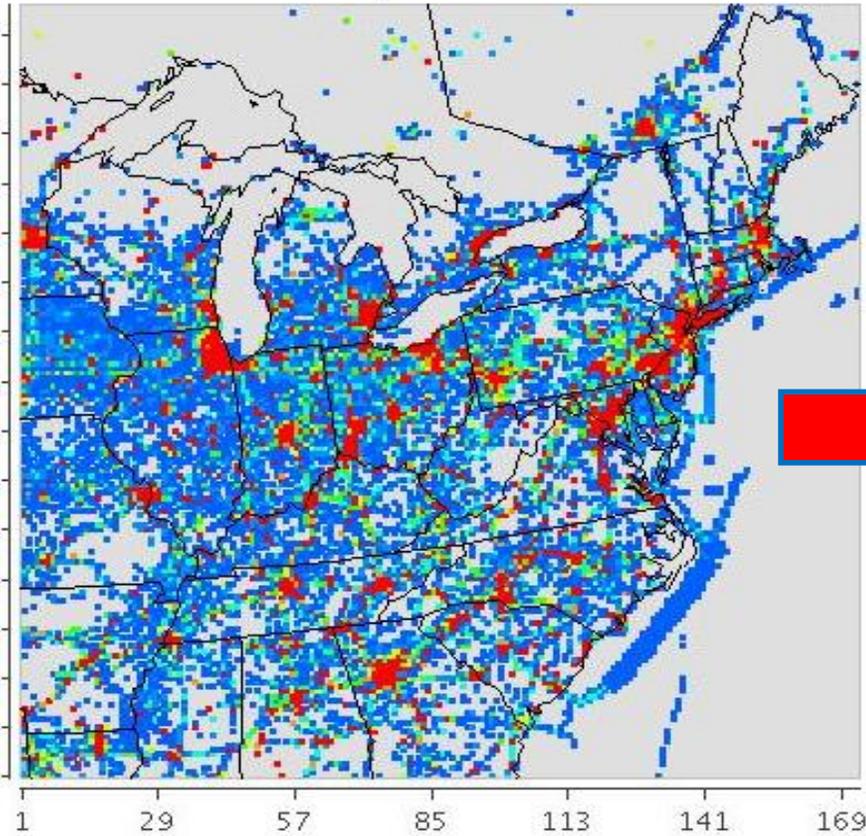
*Data have not yet been quality checked. Investigators: University of Maryland, Supported by NESCAUM and States.*

# 3. Ozone NAAQS Planning Timeline



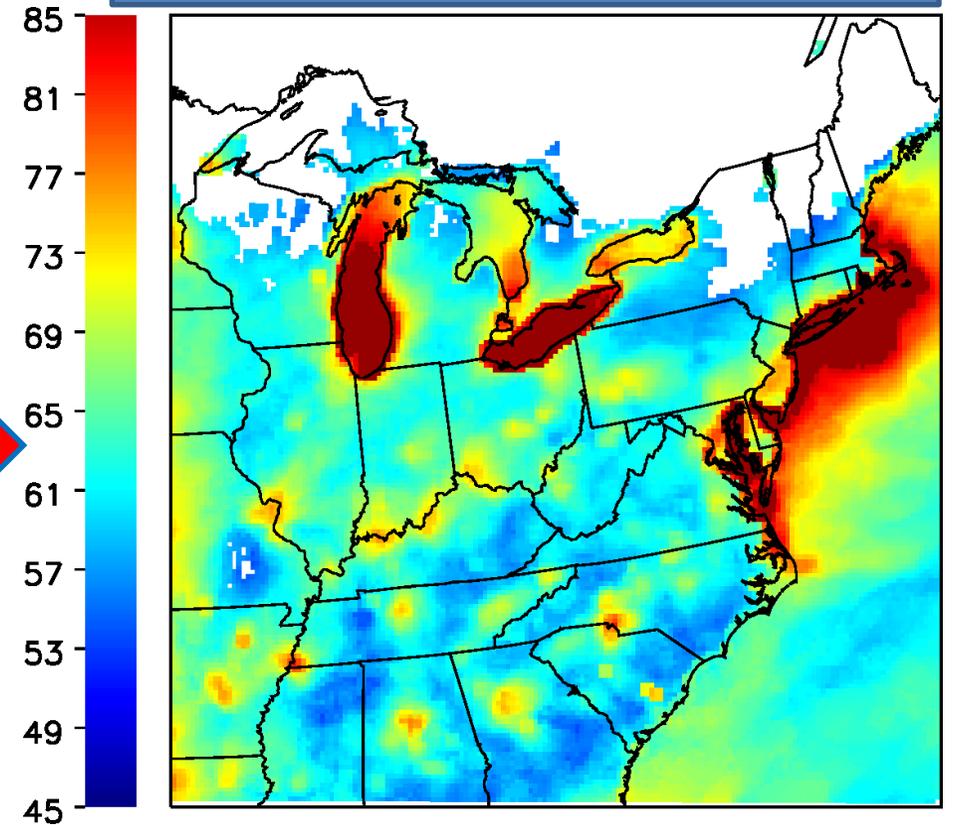
# 4. OTC Modeling

## Emissions



Modeling

## Ozone



# 4. 2020 and 2023 Modeling Needs

- **2020** projected modeling needed for:
  - 2008 Serious nonattainment area SIP planning
  - 2015 Marginal nonattainment area projection
- **2023** projected modeling needed for:
  - 2015 Moderate nonattainment area SIP planning
- **Phase 1:** Modeling performed with interpolated emissions for near term information
  - Results will be shown today
- **Phase 2:** Modeling performed with MARAMA “Gamma” emissions
  - Emissions will be tagged for contribution modeling with CAMx
  - Results targeted for OTC Fall Meeting

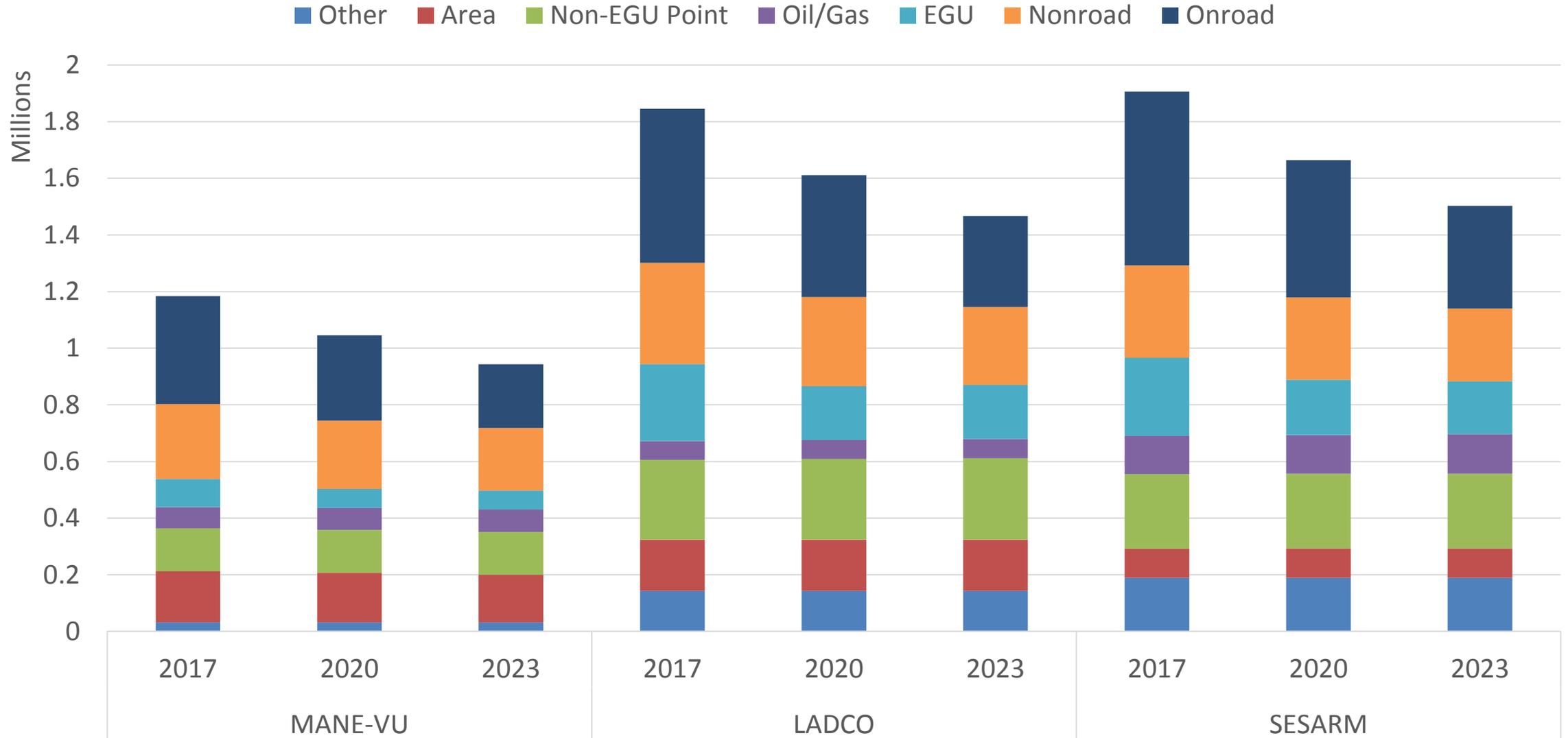
# 4. Phase 1 OTC 2020/2023 Screening Modeling

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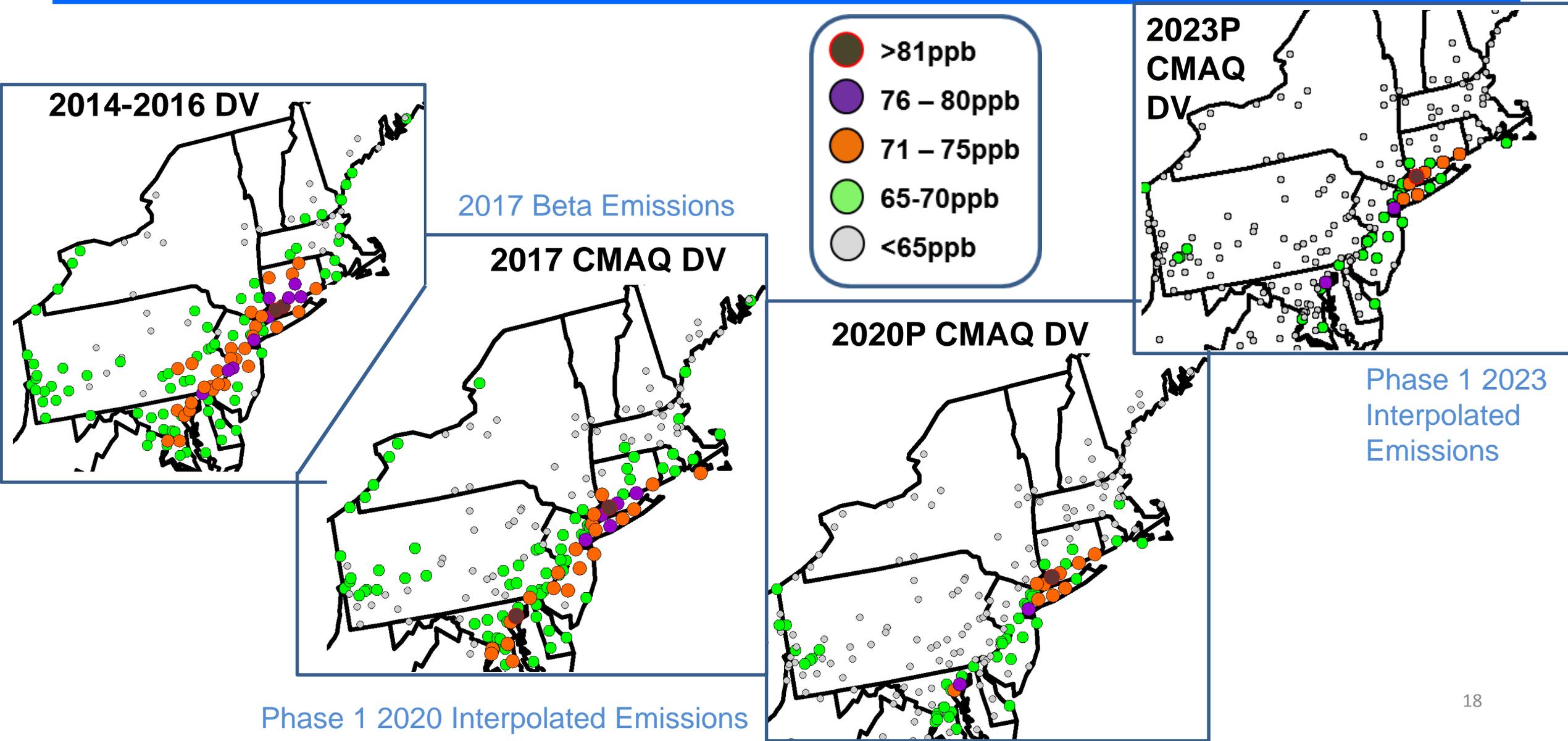
## **Phase 1 modeling intended to provide early direction & SIP support**

- 2020 and 2023 interpolated projections
- Approach taken to develop inventories:
  - Interpolation between EPA 2017 & EPA 2023 inventories applied to beta 2017
  - IPM data to be replaced with ERTAC for EGUs
  - CSAPR-U Cap estimated adjustment factor

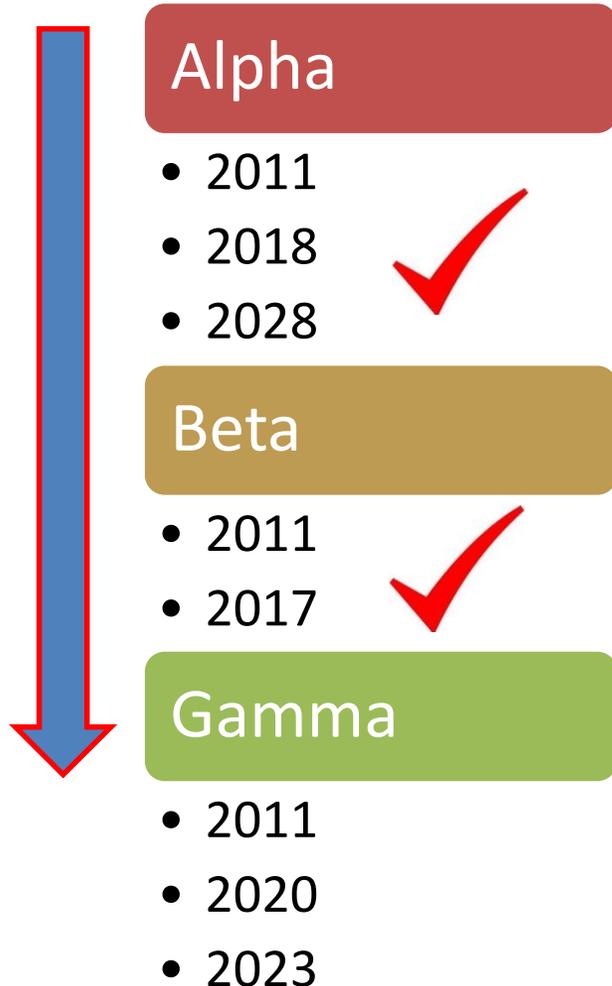
# 4. Annual NOx Emissions Inventories



# 4. Recent OTC Modeling – Projected Year Comparison



# 4. Phase 2 “Gamma” Emission Inventories



## ■ Gamma Inventory Improvements are Beginning

- Project future year to **2023 & 2020**
- Upgrade to **ERTAC v2.6**
- 2023 Mobile: EPA MOVES & Nonroad
- 2020 Mobile: 2017→2023 Interpolation
- Remove rules no longer considered OTB
- EMF Growth for point & maybe area
- For 2020 some sectors interpolated
- Other updates for 2011/2023 from EPA v6.3

# 4. Phase 2 Gamma Emission Inventory Modeling Plan

## 2011 Gamma Emission Inventory Base Case

- To ensure consistent inventories and update chemistry

## 2020 Gamma Emission Inventory Base Case

- For use in
  - Serious 2008 NAAQS Ozone SIPs
  - Marginal 2015 NAAQS Ozone planning

## 2023 Gamma Emission Inventory Base Case

- For use in Moderate 2015 NAAQS Ozone SIP planning

## Update Documentation

Some Runs will be Tagged to Assess Contribution for 110(a)(2)(d) SIPs

# 4. Who Contributes to Us?/Who do we Contribute to?

## OTC is using this modeling tool to explore ozone contributions for:

### ■ Emission Years (listed in order of priority)

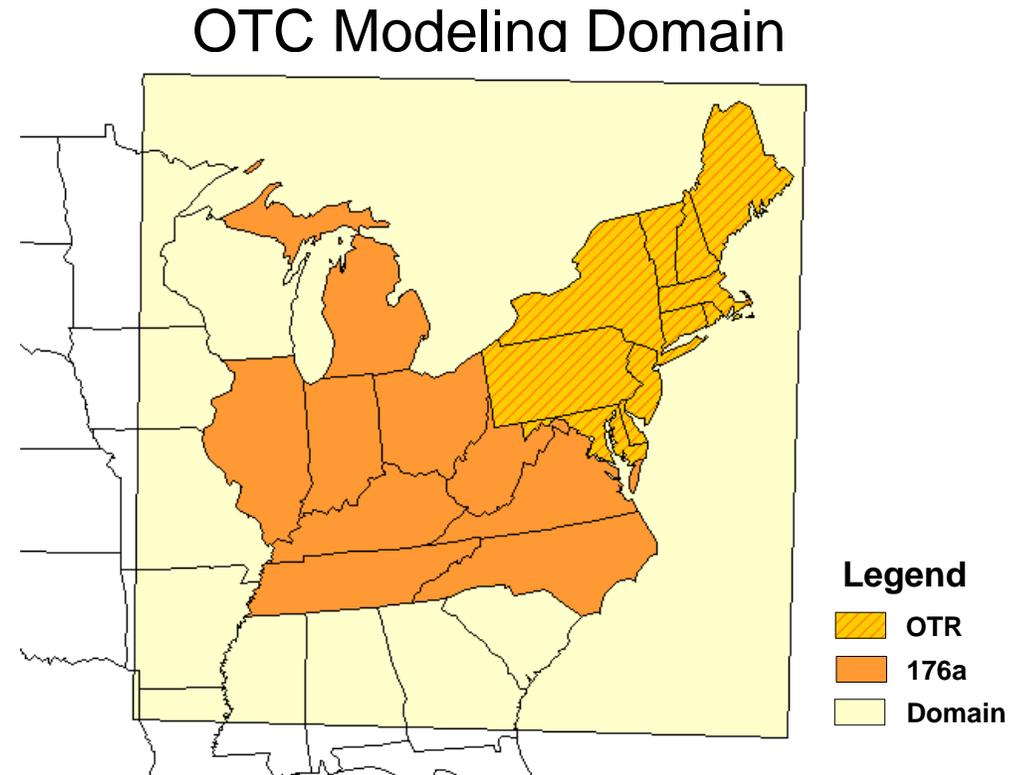
1. 2017 – Least Projected
2. 2023 – Moderate 2015 NAAQS
3. 2020 – Marginal 2015 NAAQS

### ■ States to tag

1. OTR states + DC (13)
2. 176A States (9)
3. Southern and western partial states (2)
4. Canada & offshore (2)

### ■ Anthropogenic Sectors to tag

- EGU, Non-EGUs (compressor stations, cement kilns, pulp/paper, and others), OnRoad (diesel & others), NonRoad, Oil & Gas (9)



# 5. Collaborative New 2015/2016 Modeling Platform

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- Seek to collaborate with upwind RPOs on development
- 2014 (most recent NEI year) was not recommended due to it being not conducive for ozone formation
- Recommended using both 2015 & 2016 as dual base years
  - Primary focus on 2016
  - Supplemented with 2015
  - EPA is expected to model both
- OTC will need to extend modeling domain to the west and south which will increase computing resources needed
  - Texas always shows up as a contributor to OTC
  - Will reduce impact of western and southern boundary conditions

## 6. Conclusions & Next Steps

- Ozone exceedances in OTR in 2016 ozone season were similar to 2015
- Already several monitors are violating the 2015 NAAQS for 2015-2017
- OTC modeling results:
  - 2020 sensitivity modeling shows modest improvement from 2017
  - 2023 sensitivity modeling shows even more progress, but nowhere near the improvement that EPA 2023 modeling indicates in key areas
  - Modeling indicates projected ozone NAAQS violations for:
    - 2020 emissions – CT, MD & NY 2008 NAAQS – CT, MD, NJ & NY 2015 NAAQS
    - 2023 emissions – CT, MD & NY 2008 NAAQS – CT, MD & NY 2015 NAAQS
- Enhanced Monitoring Plans (EMPs) undergoing preliminary discussions
- High quality emission inventory projections to 2020 & 2023 being prepared for transport & attainment SIP
  - The MARAMA Gamma Emission Inventory is being tagged for source apportionment contribution modeling

# Questions

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