OTC Modeling Committee Update
Spring 2024 OTC/MANEVU Stakeholders Meeting
April 22, 2024

OTC Modeling Committee

Chairs, Kevin Civerolo and Margaret LaFarr, NYS DEC
Committee Lead, Alexandra Karambelas, OTC/NESCAUM





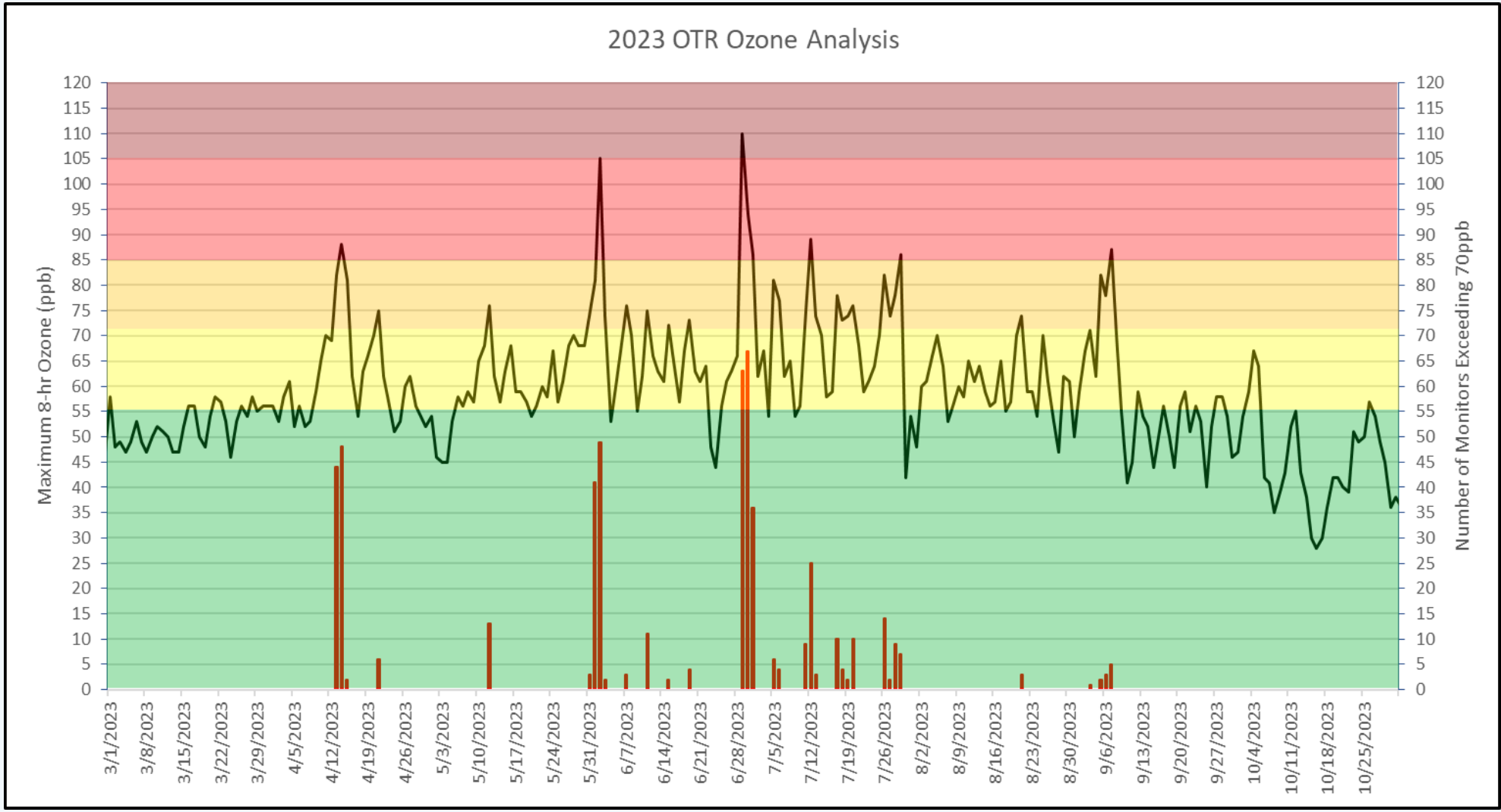
OZONE TRANSPORT COMMISSION

Accomplishments

- Tracked 2023 OTR O_3 levels and preliminary attainment status
- Completed 2016 & 2023 simulations with CMAQ and CAMx – V1 platform (Emissions Collaborative), with ERTAC v16.1
- Completed 2016/2023/2026 simulations with CMAQ and CAMx – EPA V2 platform with V3 updates to CMV & solvents (“V2/V3”), with ERTAC v16.2
- Both 2016V1 and V2/V3 Technical Support Documents are available on the OTC website
- 2023 (V1 & V2/V3) and 2026 (V2/V3) DVFs are available

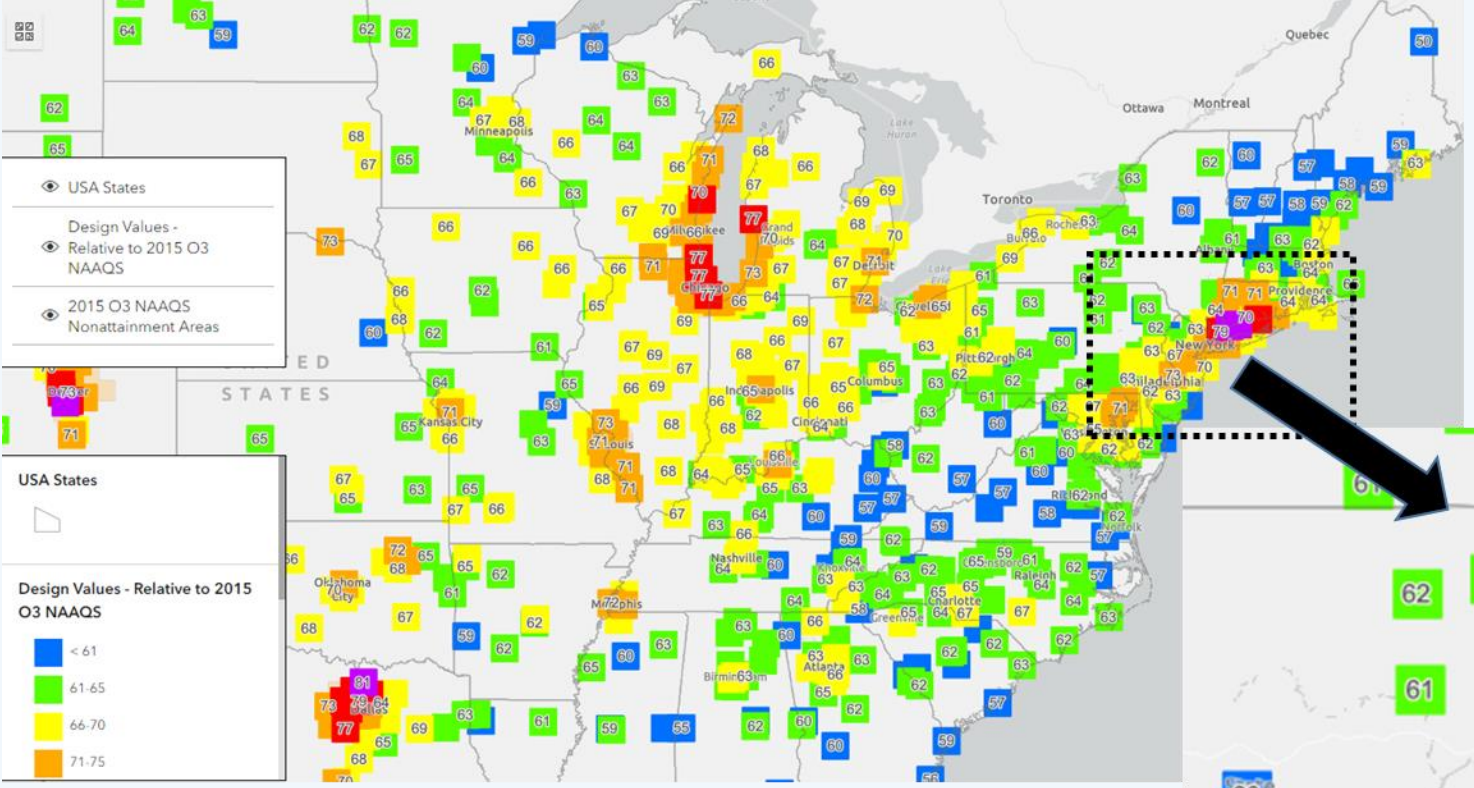
March-October 2023 OTR Summary

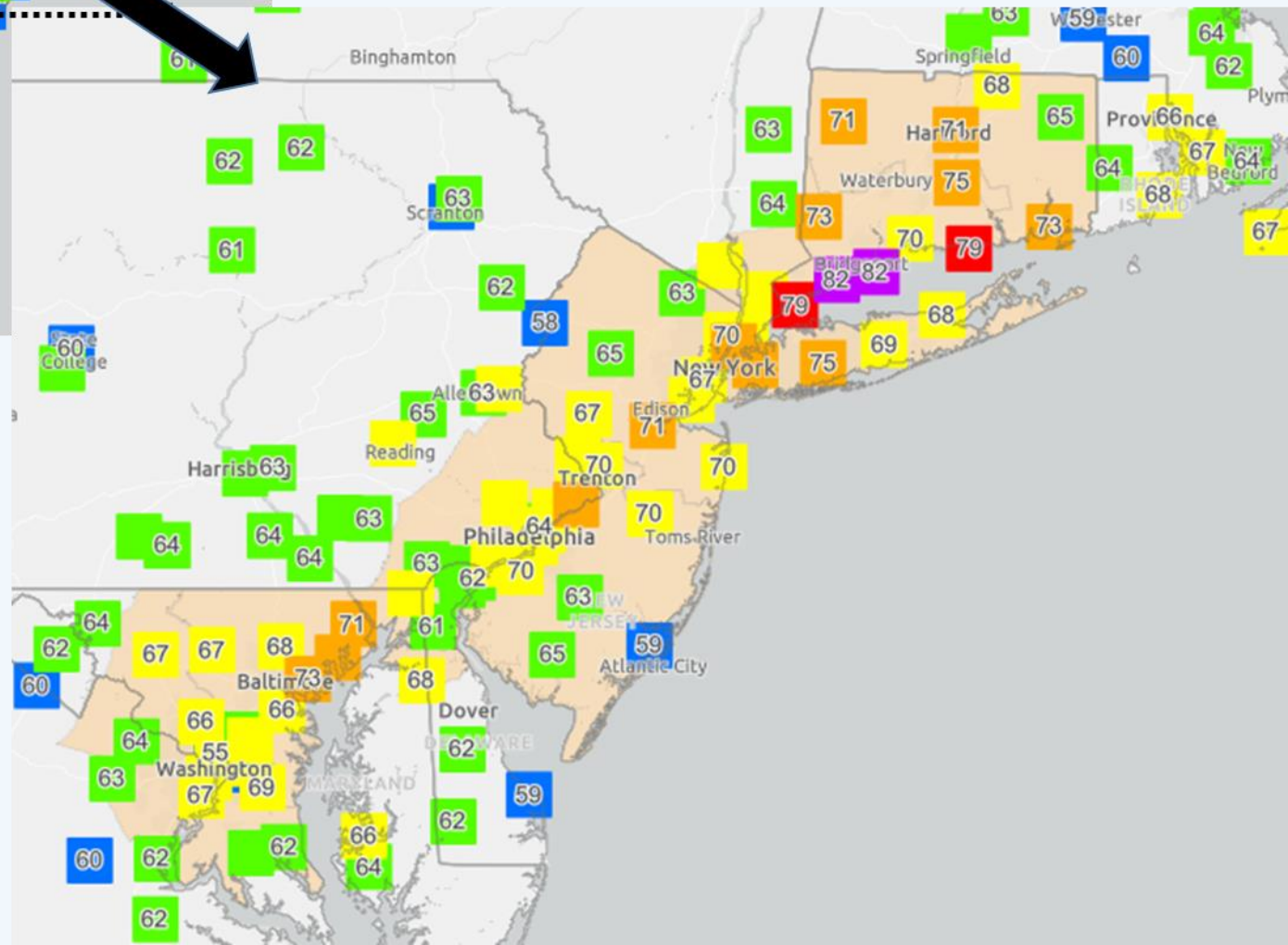
- 513 exceedances over 34 days
- 150 sites had at least one exceedance (all states except ME)
- Highest MDA8 of 110 ppb at Essex, MD on June 29 (one of 63 monitors to exceed on that day)
- 8 states + DC had one or more Unhealthy AQI days for O_3
- 19 sites with ***PRELIMINARY*** 21-23 DV that exceeds the 2015 NAAQS



Data prepared by Marcus Chase (NH DES)

Preliminary 2021-23 Design Values





"2023 Ambient Ozone Concentrations - Relative to the 2008 and 2015 8-Hr Ozone NAAQS" –
https://experience.arcgis.com/experience/502feb600b32460caee6bbd10f8f4559/page/2015-O3-NAAQS---Prelim-DV//

Data through December 2023
(Credit: Mark Prettyman and DE DNREC. Data available at https://experience.arcgis.com/experience/502feb600b32460caee6bbd10f8f4559/page/2015-O3-NAAQS---Prelim-DV/)

Model-Projected 2023 V2/V3 Design Values

Site/City Name	2020-22	2021-23 (prelim)*	OTC 2023 V2/V3 CMAQ	OTC 2023 V2/V3 CAMx	EPA 2023 V3 CAMx
Greenwich, CT	77	79	74.6	73.4	71.6
Danbury, CT	71	73	69.3	69.5	67.3
Stratford, CT	81	82	74.7	75.1	72.9
Westport, CT	80	82	76	75.6	73.3
East Hartford, CT	68	71	62.4	63.7	61.5
Cornwall (Mohawk Mt), CT	67	71	63.2	63.2	61.2
Middletown, CT	73	75	69.6	70.5	68.7
Madison, CT	79	79	71.1	72.7	70.5
Groton (Fort Griswold), CT	72	73	71	67.8	65.5
McMillan, DC	67	71	61.4	62.8	59.8
Essex, MD	68	73	63	63.8	61
Edgewood, MD	68	71	63.9	64.8	61.8
Aldino, MD	67	71	62.6	63.6	61.2
East Brunswick (Rutgers), NJ	68	71	66.9	66.7	63.8
NYC (CCNY), NY	70	71	65.8	65.1	63.7
NYC (Queens College), NY	70	72	66.4	68	66.3
East Farmingdale (Babylon), NY	74	75	67.7	68.5	66.2
Bristol, PA	72	73	70.2	71.6	67.9

Note: All 2023 design values computed with EPA's 3x3 "no water" method

*Some 21-23 preliminary DVs may be elevated due to the impacts of smoke from wildfires in Canada and the Midwest

Model-Projected 2026 V2/V3 Design Values

Site/City Name	2020-22	2021-23 (prelim)*	OTC 2026 V2/V3 CMAQ	OTC 2026 V2/V3 CAMx	EPA 2026 V3 CAMx
Greenwich, CT	77	79	73	72.2	69.5
Danbury, CT	71	73	67.9	68.1	64.9
Stratford, CT	81	82	73.2	73.8	70.4
Westport, CT	80	82	74.6	74.2	70.8
East Hartford, CT	68	71	60.9	62.3	59
Cornwall (Mohawk Mt), CT	67	71	61.9	61.9	58.9
Middletown, CT	73	75	68	69	66.1
Madison, CT	79	79	69.5	71.3	68.2
Groton (Fort Griswold), CT	72	73	70.9	66.5	63.3
McMillan, DC	67	71	59.6	61.1	57.2
Essex, MD	68	73	61.5	62.3	58.3
Edgewood, MD	68	71	62.3	63.4	59.1
Aldino, MD	67	71	61	62.1	58.6
East Brunswick (Rutgers), NJ	68	71	65.5	65.3	61.3
NYC (CCNY), NY	70	71	64.6	64.2	61.8
NYC (Queens College), NY	70	72	65.1	67.2	64.5
East Farmingdale (Babylon), NY	74	75	66.4	67.4	64.2
Bristol, PA	72	73	68.7	70.3	65.2

Note: All 2026 design values computed with EPA's 3x3 "no water" method

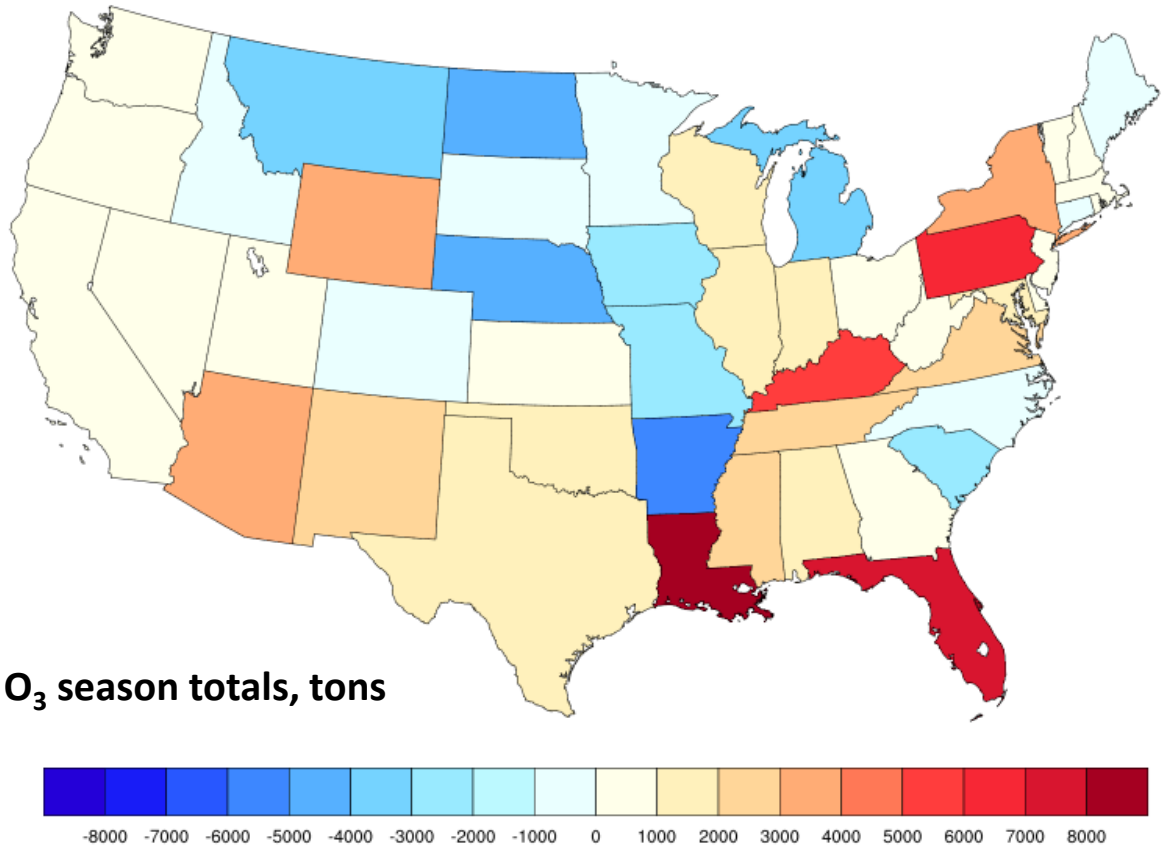
*Some 21-23 preliminary DVs may be elevated due to the impacts of smoke from wildfires in Canada and the Midwest

Ongoing Initiatives

- Work with EPA, states, MJOs on next regional modeling platform – 2022 base year, with analytic years 2026, 2032, 2038
  - 2022v1 out for state/MJO review in April
  - 2022v1 released June/July, analytic years later this year
  - 2022v2 released in 2025
- Comparisons of two EGU power production tools – ERTAC and IPM
- Collaborate with SAS to design episodic modeling scenarios
  - Whole home electrification – modeling complete, analyzing model results
  - ICI wood boilers – work in progress

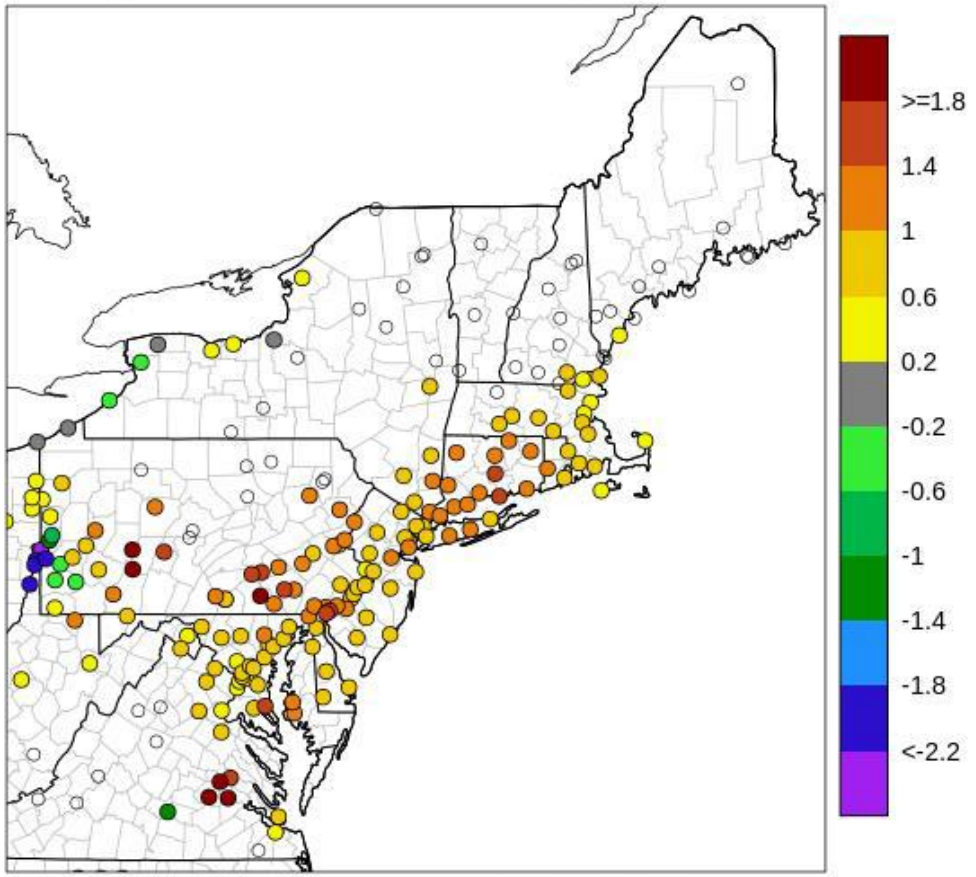
ERTAC vs IPM Projections

2026 EGU NOx Emissions Differences ERTAC minus EPA/IPM



O_3 season totals, tons

2026 avg.DVF diff (3x3 no water 1)
CMAQ533_v3_ERTAC - CMAQ533_v3_EPA



CMAQ533, 12OTC2, May to Sep

Whole-Home Electrification - Methods

- Following NESCAUM study using NREL ResStock tool.
- Whole Home Electrification electrifies space heating and cooling, water heating, and appliances, and eliminates fossil fuel consumption and emissions for these needs.
- Modeled results in CMAQ for summer (June and July) and winter (January and February) using 2026 projections.

Net Scenario Emissions Reductions

	Whole Home Conversion	
	NO_X	CO_2
CT	5,980	7,116,621
DC	632	871,786
DE	1,188	1,590,591
MA	11,350	12,563,587
MD	6,594	9,469,193
ME	3,101	2,916,986
NH	2,826	2,839,188
NJ	12,467	14,998,520
NY	29,406	33,802,947
PA	18,598	22,772,929
RI	1,824	1,974,895
VA	7,651	11,644,181
VT	1,470	1,188,347
Sum	**103,087**	**123,749,771**

Whole-Home Electrification – Results

- Changed electricity demand was applied per state and based on current fuel mix
- Electricity demand decreased 4-10% in summer (increased cooling efficiency), mostly increased in winter (higher space heating demand)
    - The exception is the southern OTR, where more efficient heat pumps would replace resistance heating
- Water heating spread evenly throughout the year
- Air quality modeling findings:
    - MDA8 O_3 decreased by about 0.5 ppb on high (>60 ppb) O_3 days, with isolated O_3 increases near NYC due to reduced NOx titration
    - Wintertime $PM_{2.5}$ decreased as much as 1 $\mu g/m^3$ regionally, and >1 $\mu g/m^3$ in NYC – reduced NO_3 accounts for a substantial portion of the $PM_{2.5}$ decrease

Summary

- Regional modeling with the 2016 emissions platform has been completed, new 2022 platform is coming this year
- Modeled O_3 design values are available for 2023 and 2026 analytic years using CMAQ and CAMx, with ERTAC EGU
- Non-attainment is still an issue in the OTR, and cross-committee efforts to develop emission sensitivity tests are ongoing

Thank you!

Model Committee Chairs

- Kevin Civerolo and Margaret LaFarr, NYSDEC (kevin.civerolo@dec.ny.gov and margaret.lafarr@dec.ny.gov)

OTC Committee Lead

- Alexandra Karambelas, OTC/NESCAUM (akarambelas@nescaum.org)

Emissions Inventory Lead

- Susan McCusker, MARAMA (smccusker@marama.org)

O_3 Season Updates

- Marcus Chase, NHDES (marcus.a.chase@des.nh.gov)