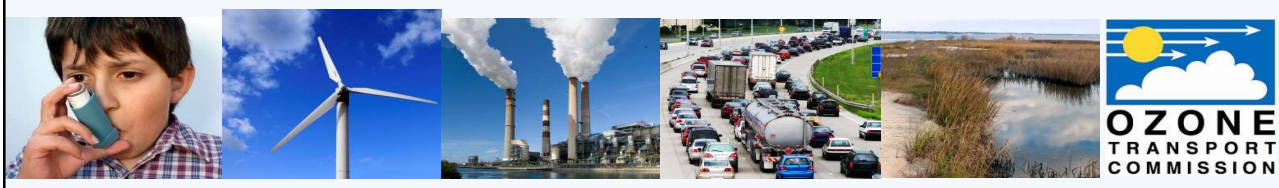
OTC Modeling Committee Update
OTC/MANEVU Annual Spring Meeting
June 13, 2024

OTC Modeling Committee

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



OZONE TRANSPORT COMMISSION

1

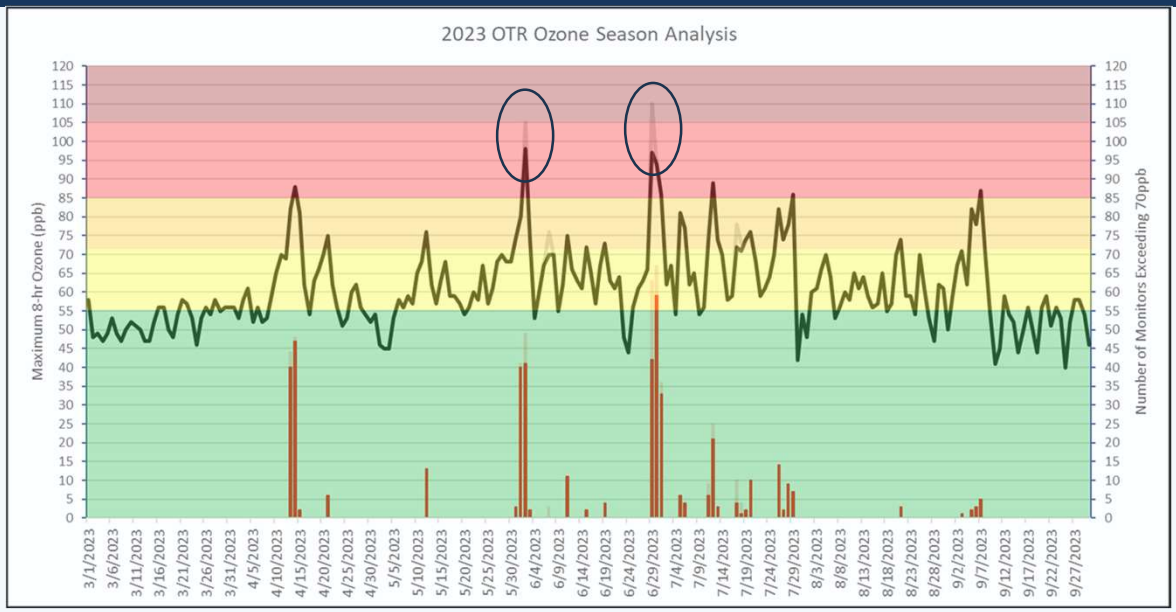
Accomplishments

- Action Plan available
- 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

2

2

March-October 2023 OTR Summary



Data prepared by Marcus Chase (NH DES)

3

3

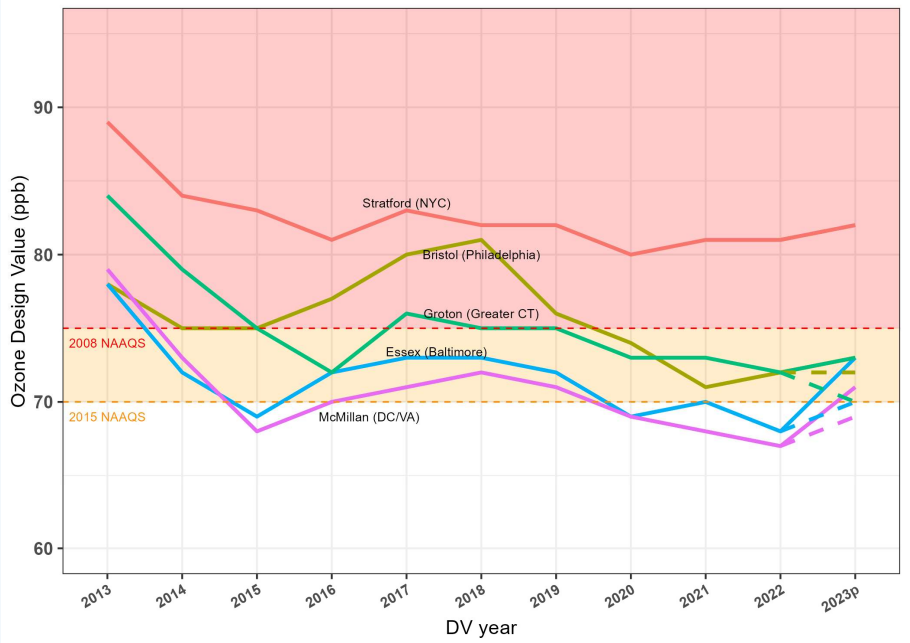
Preliminary 2021-23 Design Values (ppb)

Site/City Name	All Data	EE Data Excluded
Greenwich, CT	79	79
Danbury, CT	73	73
Stratford, CT	82	82
Westport, CT	82	82
East Hartford, CT	71	70
Cornwall (Mohawk Mt), CT	71	68
Middletown, CT	75	75
Madison, CT	79	79
Groton (Fort Griswold), CT	73	70
McMillan, DC	71	69
Essex, MD	73	70
Edgewood, MD	71	68
Aldino, MD	71	69
East Brunswick (Rutgers), NJ	71	71
NYC (CCNY), NY	71	71
NYC (Queens College), NY	72	72
East Farmingdale (Babylon), NY	75	75
Old Field (Flax Pond), NY	73	73
Bristol, PA	73	72

4

4

Time Series of Ozone Design Values (ppb)



Stratford (NYC)
Bristol (Philadelphia)
Groton (Greater CT)
Essex (Baltimore)
McMillan (DC/VA)

5

5

Model-Projected 2023 V2/V3 Design Values (ppb)

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

6

6

Model-Projected 2026 V2/V3 Design Values (ppb)

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

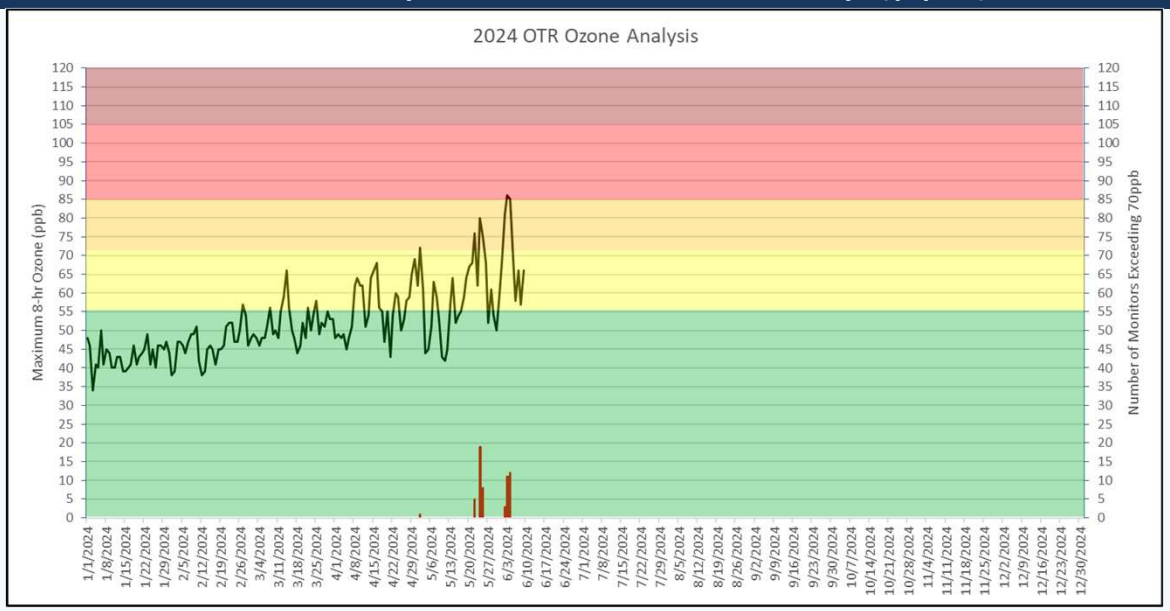
Note: All 2026 design values computed with EPA's 3x3 "no water" method

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

7

7

Preliminary 2024 OTR Summary (ppb)



Data prepared by Marcus Chase (NH DES)

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8

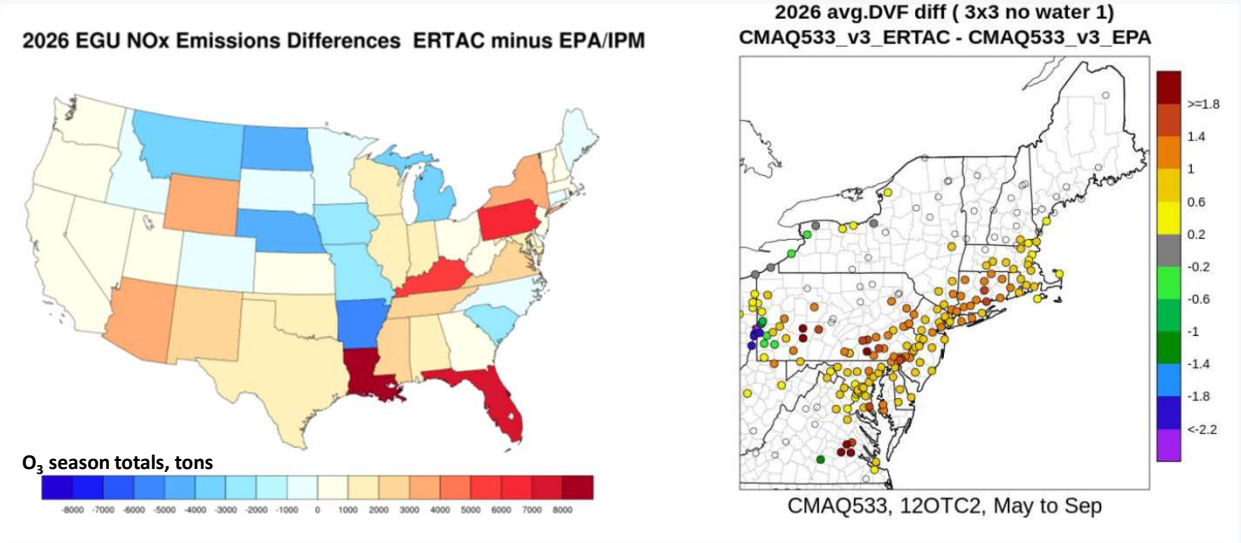
Ongoing Initiatives

- Work with EPA, states, MJOs on next regional modeling platform – 2022 base year, with analytic years 2026, 2032, 2038
  - 2022v1 underwent state/MJO review in April
  - 2022v1 to be released June/July, analytic years by end of 2024
  - 2022v2 to be released in 2025, including base and analytic years
  - Initial AQ modeling to focus on base year evaluation and 2026
- Comparisons of two EGU power production tools – ERTAC and IPM
- Collaborate with SAS Committee to design episodic modeling scenarios
  - Whole home electrification – modeling complete, analyzing results
  - ICI wood boilers – initial modeling results

9

9

ERTAC vs IPM Projections



- ERTAC NOx emissions are greater than those from IPM, leading to higher 2026 DVFs for ozone 10

10

Whole-Home Electrification - Methods

- Expanding on 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 using CMAQ for summer (June and July) and winter (January and February) using 2026 projections.
  - Ozone season emissions reductions are estimated to be 15% of the annual totals

Net Annual Emissions Reductions (tons)

	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**

11

11

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

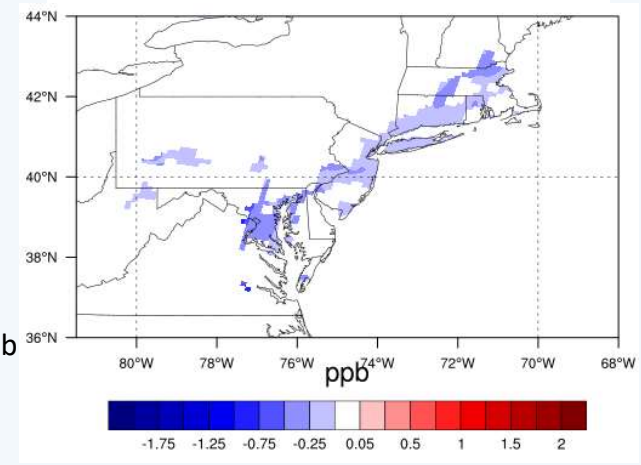
12

12

ICI Wood Boiler Screening Modeling

- Test case to see domain-wide impact from ICI Wood Boilers
  - Zeroed out known SCCs containing ICI Wood Boilers. SCCs determined in collaboration with NESCAUM, MARAMA, OTC SAS.
- Modeled July-August 2023 with CMAQ 2016v2 emissions platform
- Impacts on MDA8 O_3 greater than 60 ppb are less than 1 ppb

July 2023 ICI Wood Boiler Impact when MDA8 > 60 ppb



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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

14

14

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)

15

15