

Emission and Modeling Update

OTC 2010 Annual Meeting

June 3

Baltimore, MD



OZONE
TRANSPORT
COMMISSION

OZONE TRANSPORT COMMISSION

Overview

1. Ozone Design Values
2. Conceptual Model Update
3. Emissions Inventory Updates
4. Coming Attractions

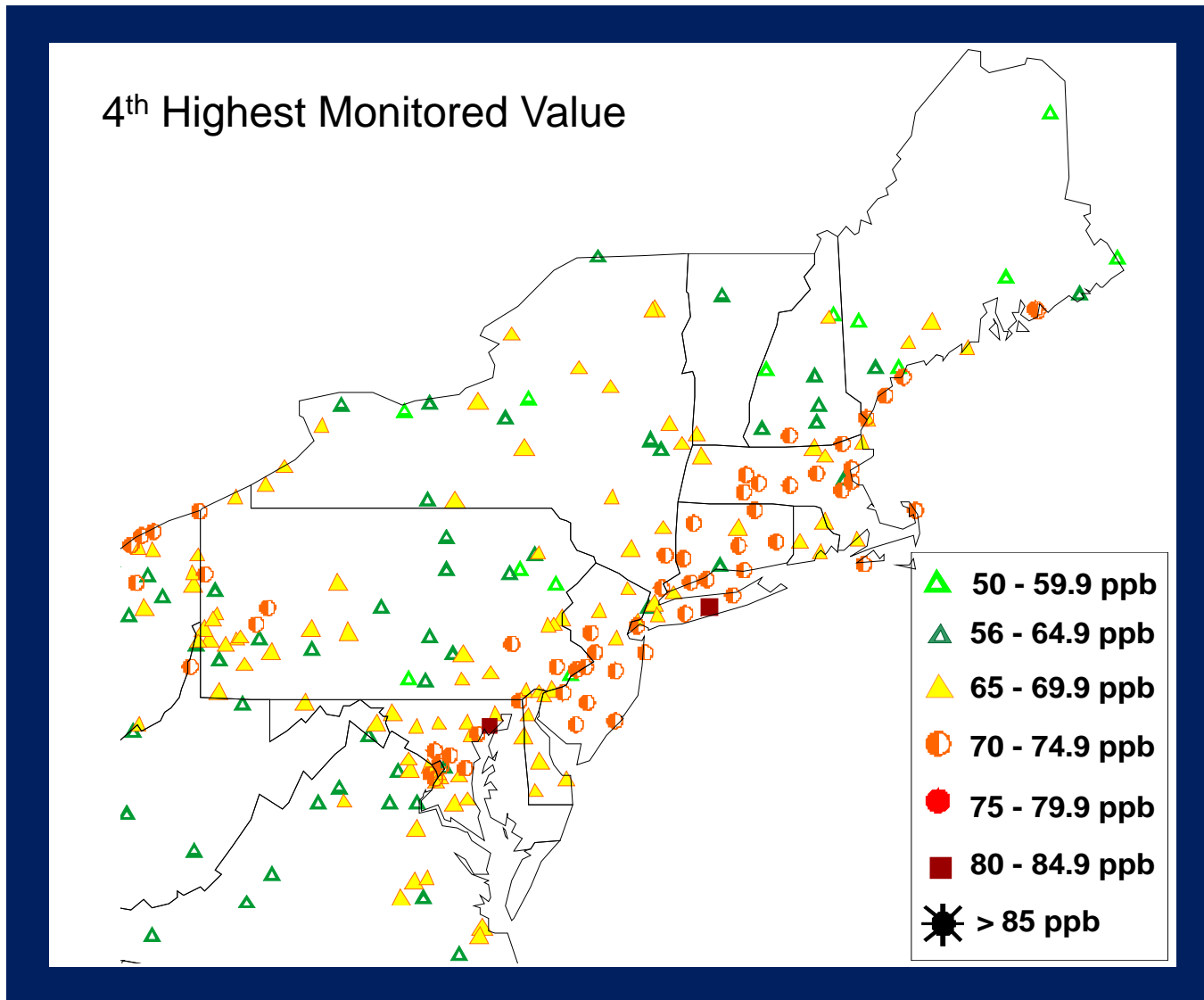
We thank the following organizations for their work and contributions to this presentation:

- *Maine Department of Environmental Protection*
- *New Hampshire Department of Environmental Services*
- *Maryland Department of the Environment*
- *New York Department of Environmental Conservation*
- *Northeast States for Coordinated Air Use Management*
- *Mid-Atlantic Regional Air Management Association*

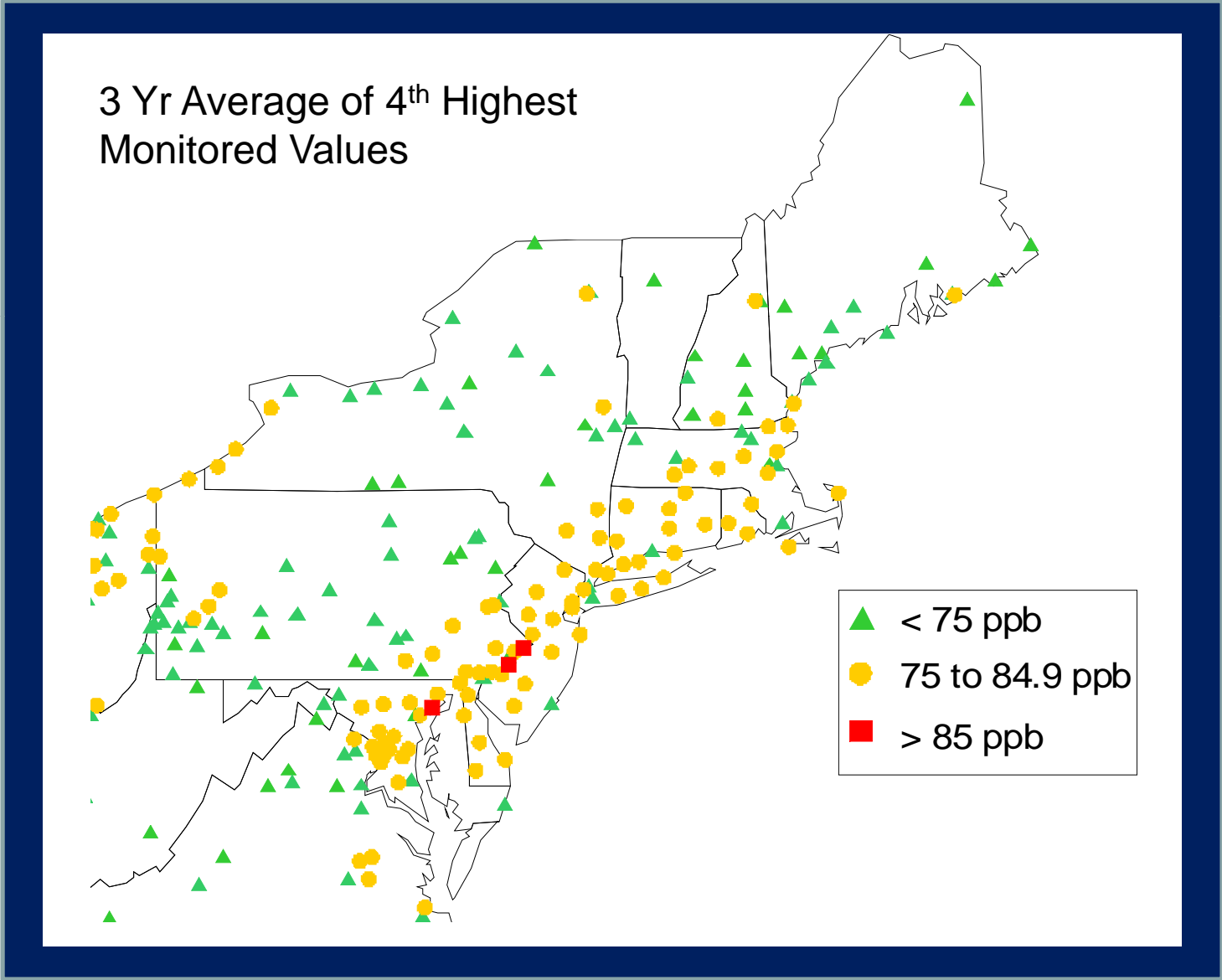
Overview

1. Ozone Design Values
 - a. 2009 Ozone Season
 - b. 2009 Design Values
 - c. Potential Nonattainment Areas for Reconsidered Ozone Standard
2. Conceptual Model Updates
3. Emissions Inventory Updates
4. Coming Attractions

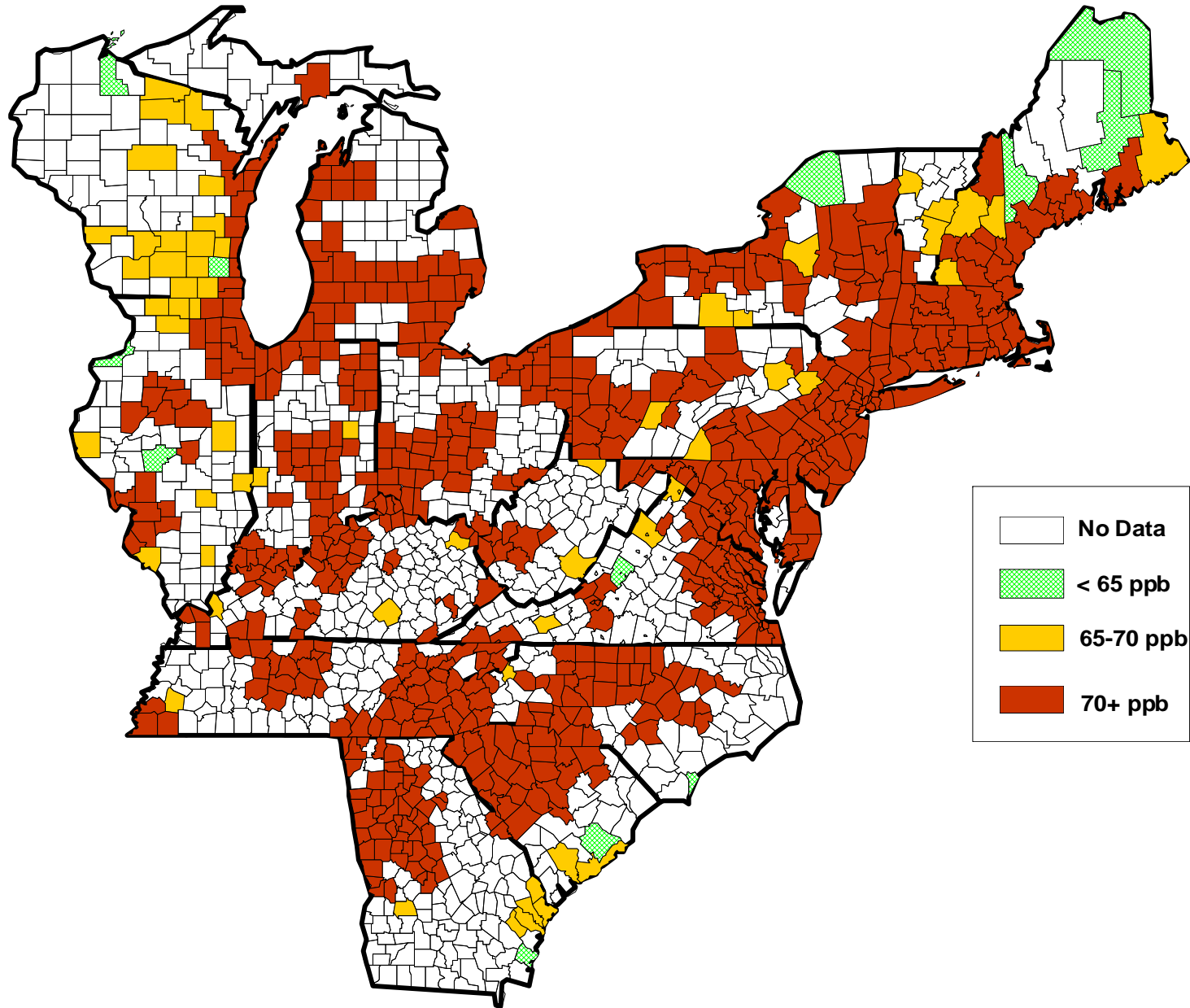
2009 Ozone Season Was Fairly Clean



2009 Ozone Design Values Indicate Attainment with 0.8 ppm Standard for Most of OTC



Potential Nonattainment By CSA (2007-2009 DV)



Overview

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- 2. Conceptual Model Update**
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Ozone Conceptual Model

- Update to “The Nature of the Ozone Air Quality Problem in the Ozone Transport Region: A Conceptual Description” NESCAUM report - October 2006
- A qualitative synthesis of existing information, not a new analysis
- It seeks to address questions posed by the original EPA guidance, e.g.:
 - Is O₃ problem local or regional in character?
 - Is transport important?
 - What types of weather lead to high O₃?
 - Is O₃ limited by NO_x, VOCs, or both?

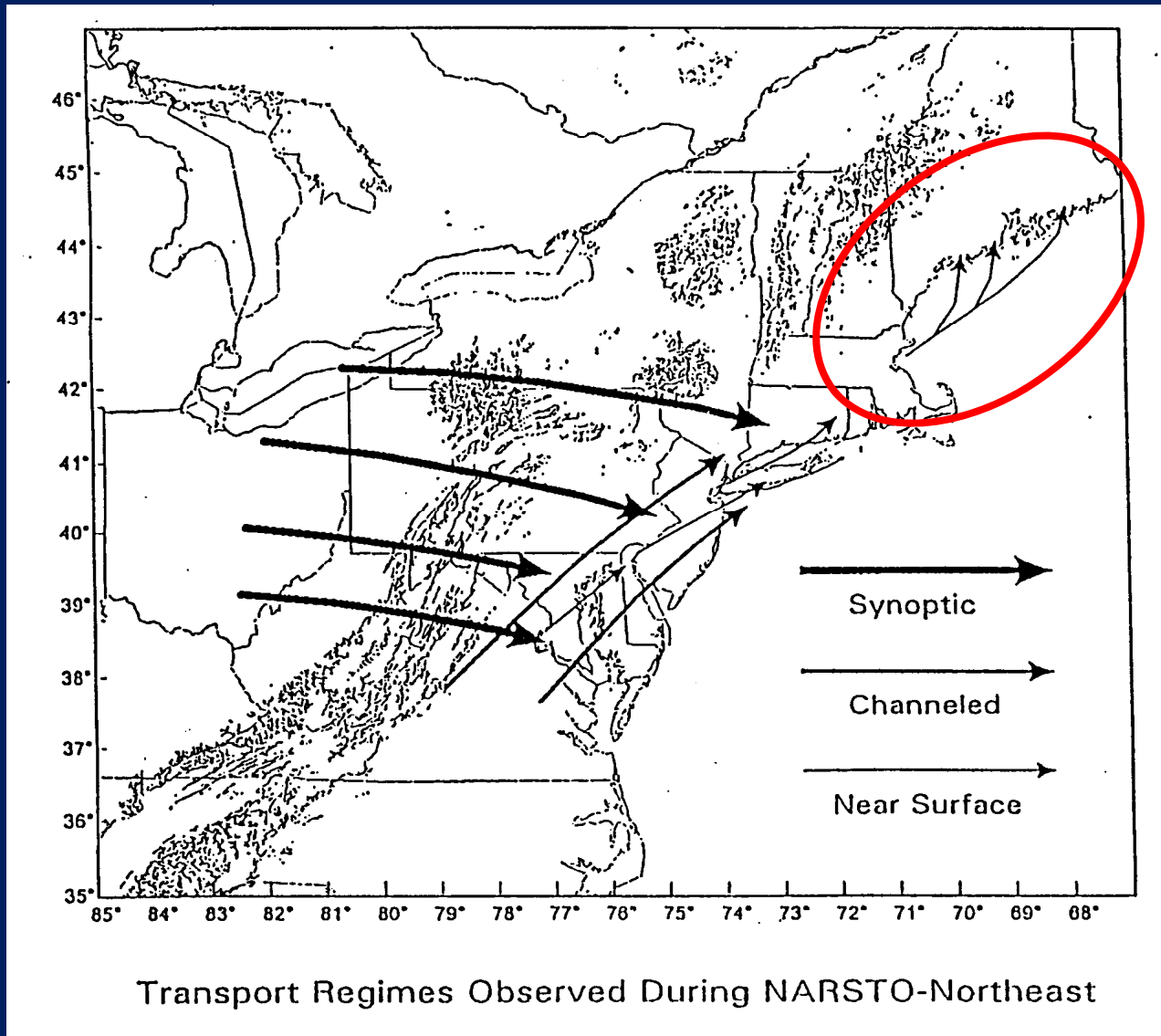
Ozone Conceptual Model Update

- Incorporates post-2005 scientific literature and revised EPA guidance
- Overview of transport meteorology, pathways, and exceptional events
- Post-NO_x SIP Call and CAIR Phase I ozone trends in OTR
- Summarizes recent studies projecting future climate impacts on ozone in eastern US
- Will need to address reconsidered ozone standard

Transport Pathways

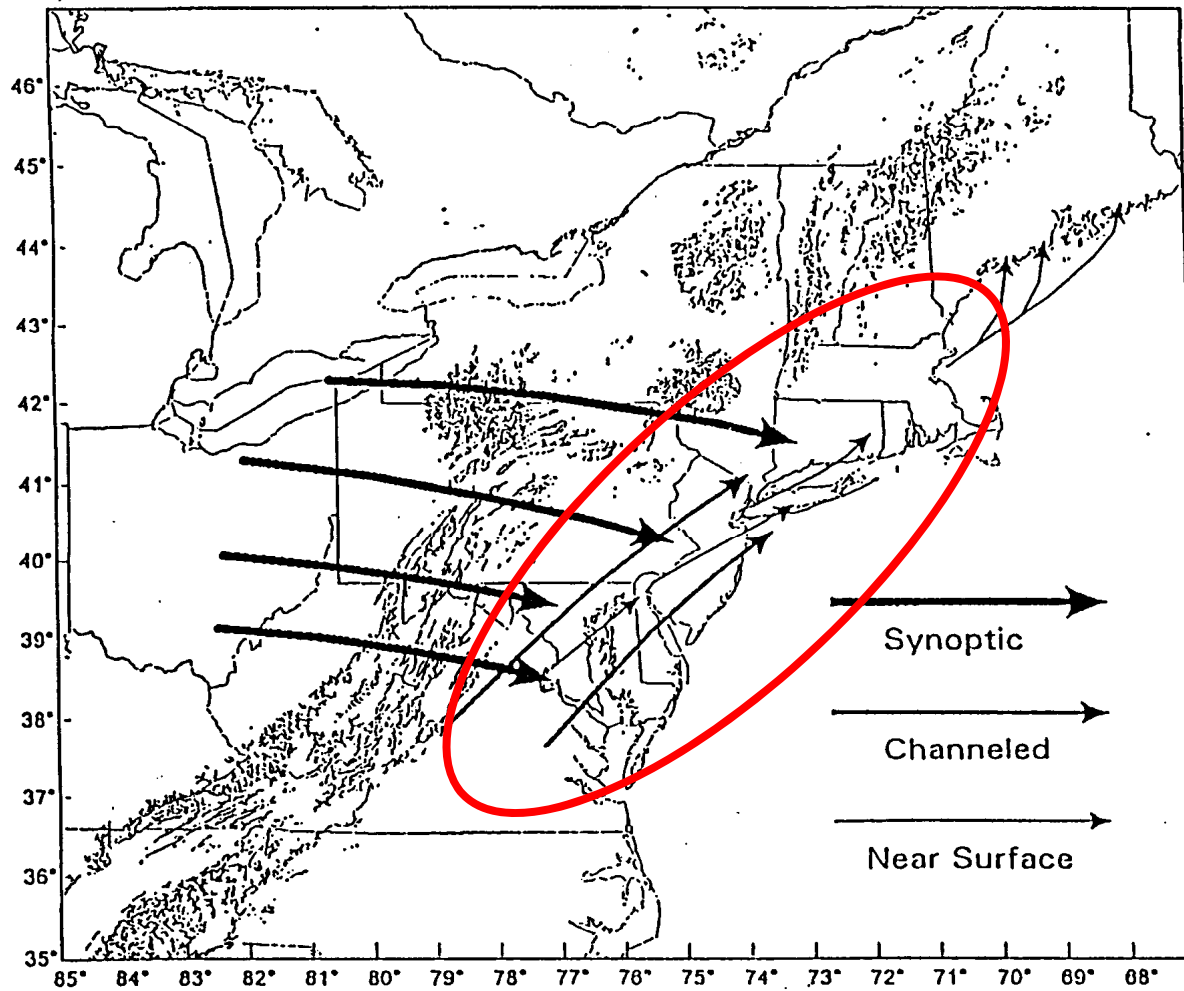
- Smaller scale - seabreeze/surface winds
- Larger scale - channeled; nocturnal low level jets
- Largest scale - synoptic; upper level ozone reservoir

Meteorological & Transport Paths



Surface transport

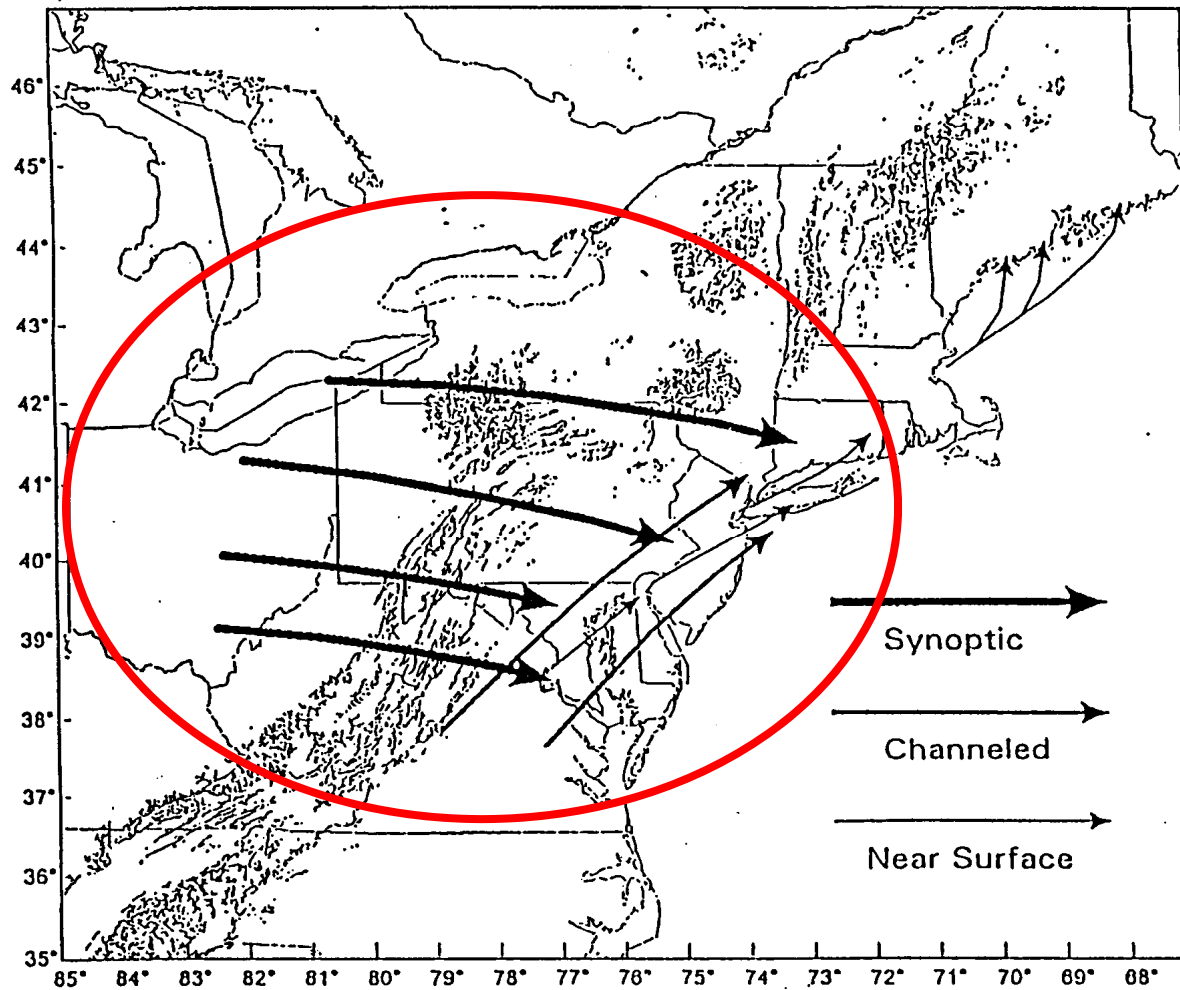
Meteorological & Transport Paths



Nocturnal
low level
jet

Transport Regimes Observed During NARSTO-Northeast

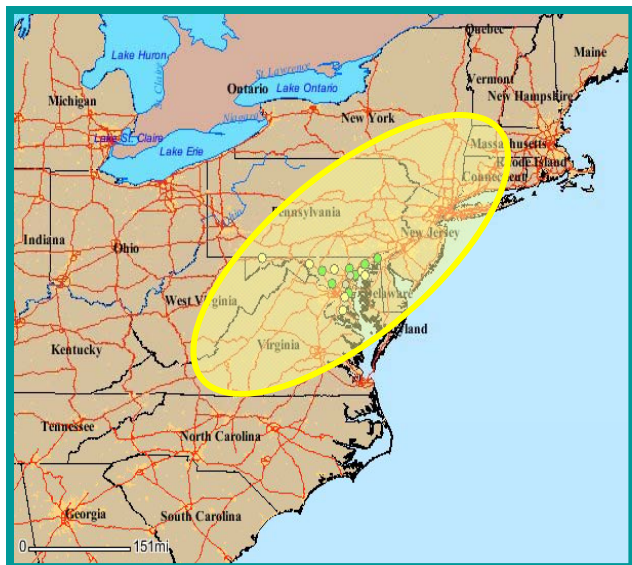
Meteorological & Transport Paths



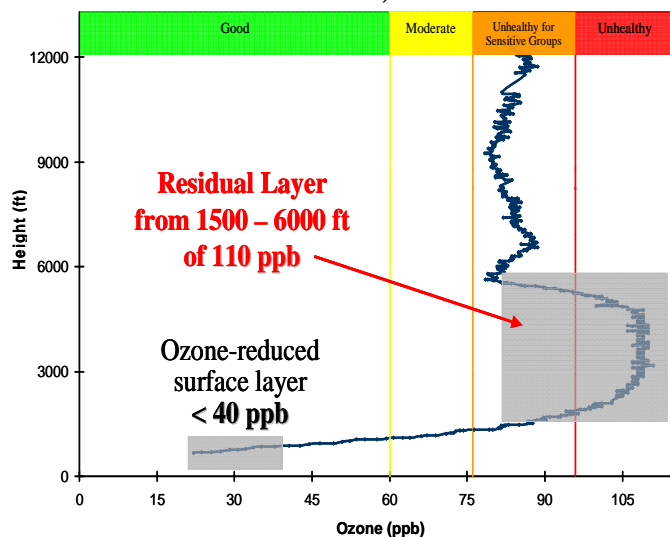
Transport Regimes Observed During NARSTO-Northeast

Upper
level
ozone
reservoir

The Elevated Ozone Reservoir



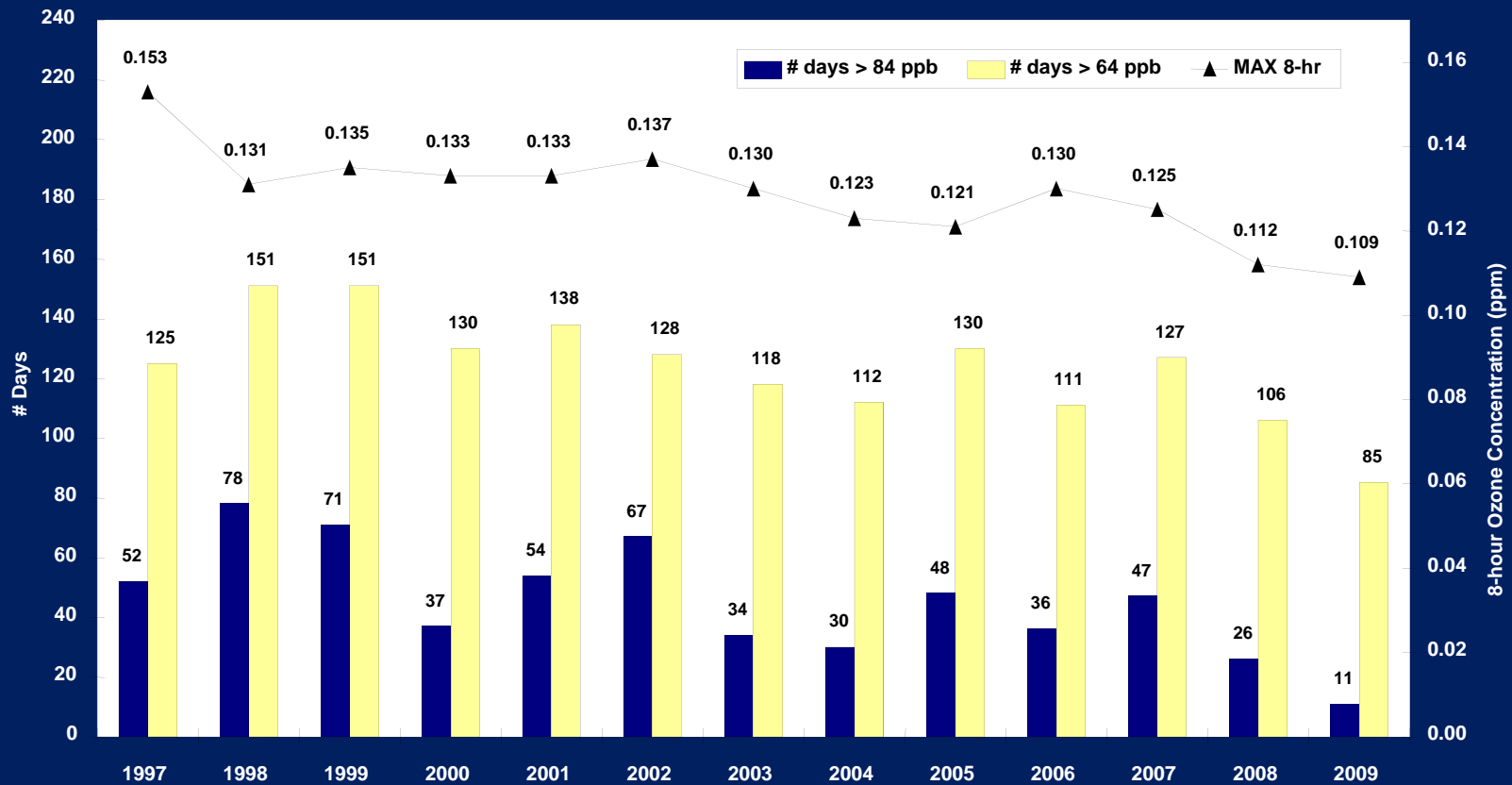
Incoming Ozone
August 2, 2005 (7:00 AM EDT)
Beltsville, MD



Source: Maryland Department of the Environment & Howard University

- Every bad ozone day, in the morning hours, a large reservoir of ozone sits above the Mid-Atlantic area waiting to mix down.
 - Ozone levels in the reservoir can routinely reach 60 to 100 ppb.
 - In the morning, ozone levels at the surface are very low.
- Around 10:00 or 11:00 AM, air begins to mix vertically allowing ozone in the reservoir to mix down to the surface and degrade air quality.

Trends in 8-hour Ozone in the OTR: 1997-2009



Ozone Conceptual Model Update: New Considerations & Conclusions

Lower Ozone NAAQS

- More ozone exceedances and a longer ozone season
- Transport will play a greater role
 - Transport component can often be > 70 ppb standard
- High ozone levels at remote and high elevation area monitors are indicative of transport and may also require action under the secondary standard
- Need for national rules in addition to regional rules will increase and is critical

Ozone Conceptual Model Update: New Considerations & Conclusions

Ozone Formation and Controls

- Ozone formation can be NO_x-sensitive during some times of day and VOC-sensitive during others
- Need for NO_x reductions across a larger region, combined with localized VOC reductions in urban centers
- Regional NO_x SIP Call reductions showed greater ozone improvements than predicted by modeling

Ozone Conceptual Model Update: New Considerations & Conclusions

Climate Change

- Warmer temperatures enhance ozone formation
- Methane reductions might become a potentially effective future approach to address both global ozone levels and climate change

Overview

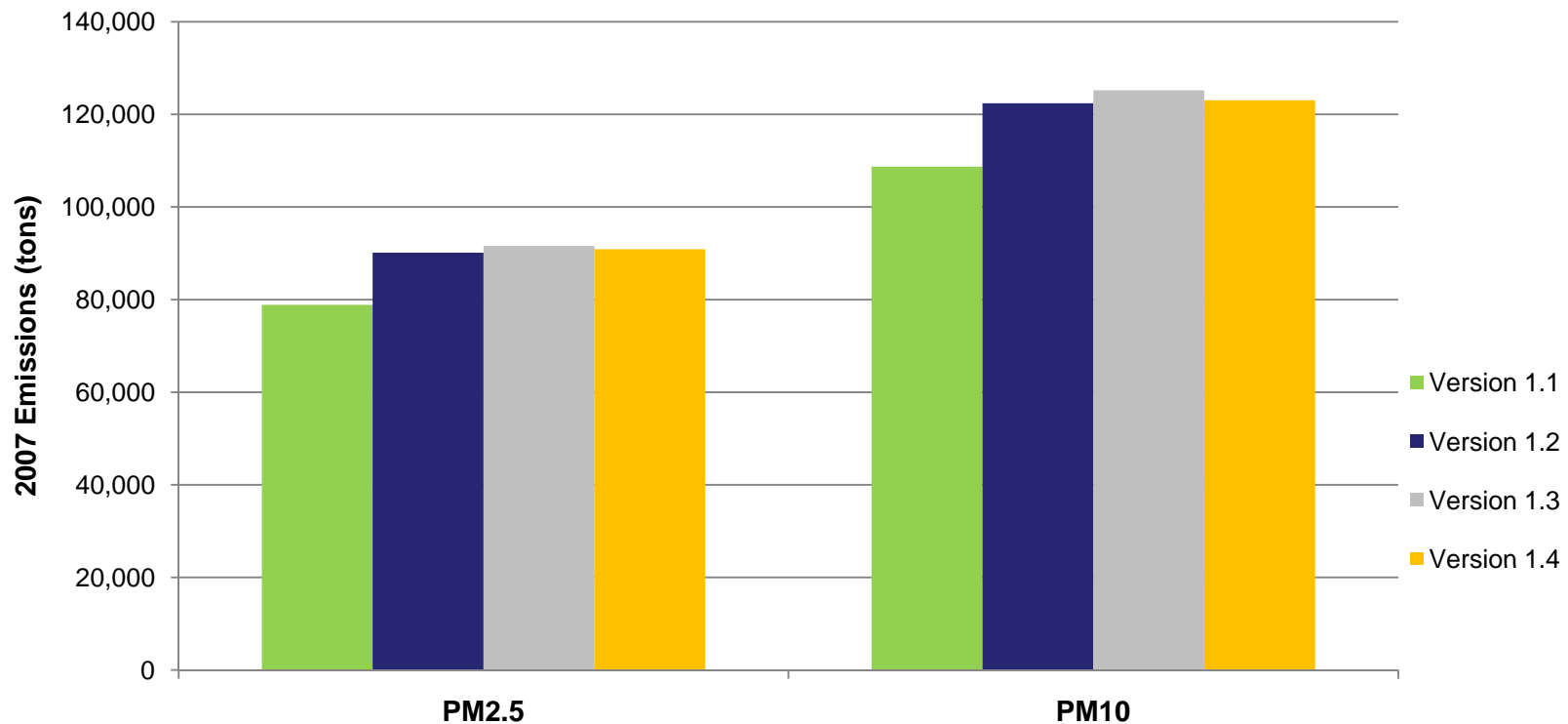
1. Ozone Design Values
2. Conceptual Model Update
3. Emissions Inventory Updates
 - a. Point Source Stakeholder Comments
 - b. Hourly Point Source Inventory
 - c. Area, Nonroad and Onroad Inventories
4. Coming Attractions

Point Source Stakeholder Comments

- About 30 comments received
- Relatively minor revisions to emissions
- Improvements to PM emissions (PM_{2.5}, condensables)
 - Limited new stack test data available to better quantify PM_{2.5}
- Revisions to stack parameters used for modeling
- Identification of sources that have shut down
 - Most were post-2007, so emissions kept in 2007 actual inventory
 - States to consider shutdowns in future year inventories
- Nearly all Stakeholder comments were accepted by States

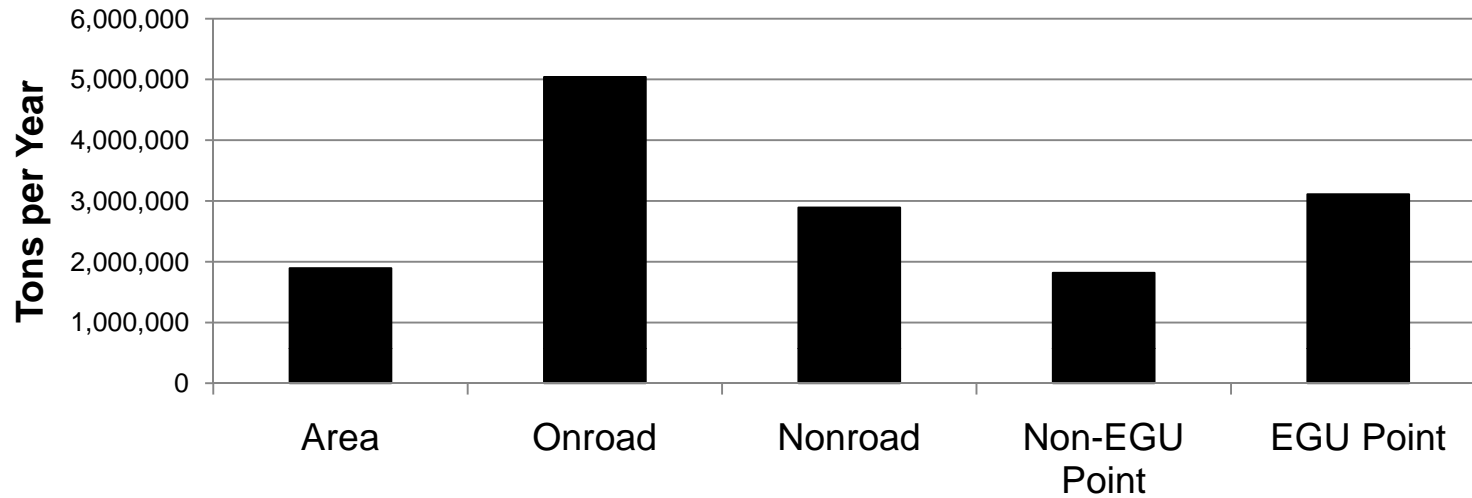
Change in Annual Emissions

- Regionally, very little change in SO₂, NO_x, VOC, CO from original State submittals
- PM₁₀ and PM_{2.5} increased due to addition of condensables and gap-filling for PM_{2.5} when PM_{2.5} not provided

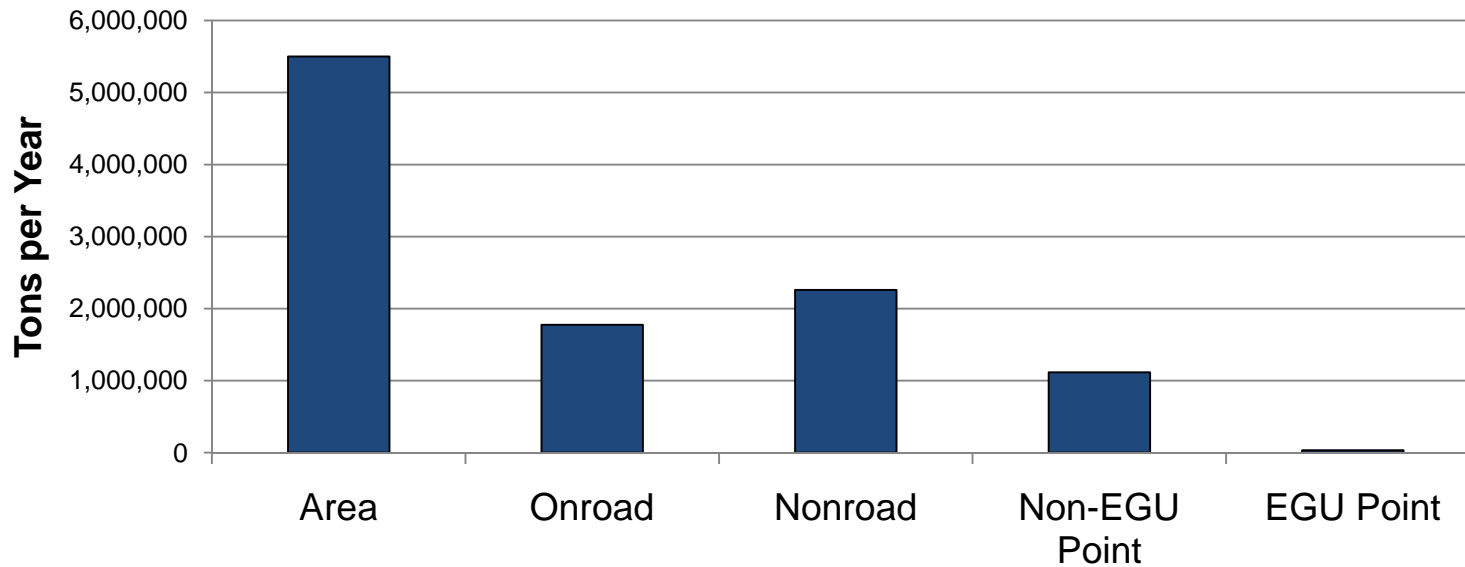


NOx and VOC Emissions Inventory

NOx

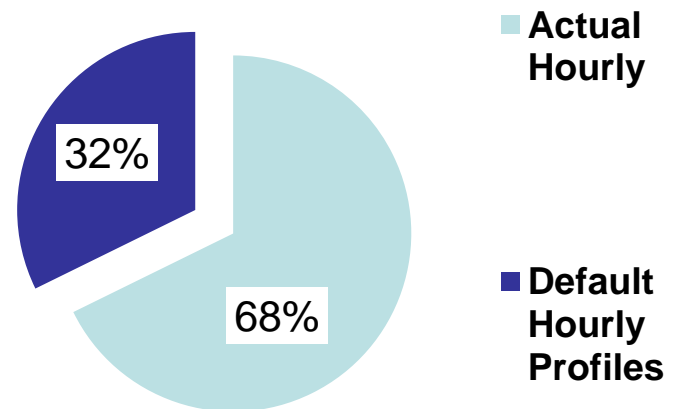
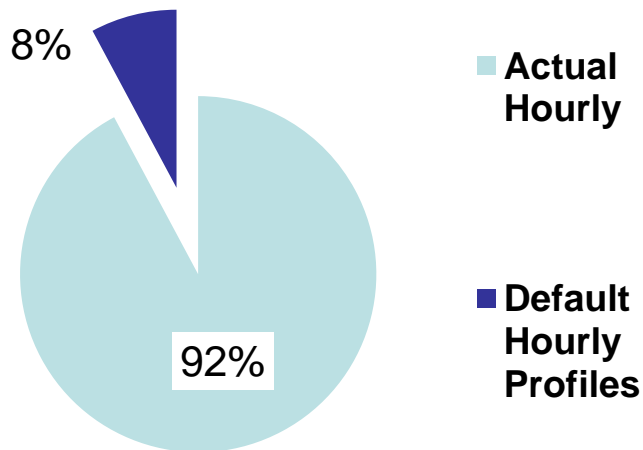


VOC



High % of SO₂ and NO_x Emissions will be Modeled using Actual 2007 Hourly Data

- 92% of Point Source SO₂ has 2007 actual hourly data
- 68% of Point Source NO_x has 2007 actual hourly data



Remaining Emission Inventory Tasks

- 2007 Inventory
 - Complete area source, marine, air, rail, and on-road mobile
 - Continue to work with EPA on MOVES
 - Inventories for other regions & Canada
- Future baseline inventories – 2013, 2017, 2020
 - Projections for non-EGU point, area, marine, air, and rail
 - Run NONROAD for future years
 - Run MOVES for future years
 - Inventories for other regions & Canada

Inventory Schedule

- Summer 2010
 - Stakeholder review of additional 2007 inventory elements as completed
 - Stakeholder review of future year projections as developed
 - Analysis of inventory data
 - Updates and corrections in response comments

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4. **Coming Attractions:**
 - a. **Screening Runs**
 - b. **EGU Analysis**

Screening Runs

Purpose

Investigate the level of emissions reductions needed to achieve the current NAAQS of 75 ppb and the potentially lower new NAAQS in the 60 to 70 ppb range

Design of the exercise

Perform screening simulations with existing data based on across-the-board reduction in emissions, as well as a simulation incorporating OTC-recommended national and local measures

Approach

- Meteorology based on WRF for 2007
- Emissions data scaled to 2007
- Biogenic emissions based on MEGAN
- Photochemical model – CMAQ with CB5

Results - will be presented in a webinar early this summer.

Emissions Data Analysis

Purpose:

Investigate the level and variability of emissions from EGUs with differing operating characteristics

Inform the on-going High Electric Demand Day work of the OTC

Questions

Conceptual Model:

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Emissions Inventory:

Susan Wierman (Swierman@marama.org)

Screening Modeling Lead:

Gopal Sistla (Gxsistla@gw.dec.state.ny.us)

Committee Work and Schedule:

Barbara Kwetz (Barbara.Kwetz@state.ma.us)

Stakeholder Involvement

About 30 Comments Received from these Companies:

- Sikorsky Aircraft
- Covanta Energy
- Hamilton Sundstrand
- NRG Energy
- Transcontinental Gas
- Saint Gobain Containers
- RRI Energy
- BASF
- Merck & Co.
- Georgia Pacific Gypsum
- E.R. Squibb and Sons
- Schering Corp.
- ConocoPhillips
- Air Engineering
- Actavis
- PSEG Power
- National Lime Association
- Michigan Cogen Systems