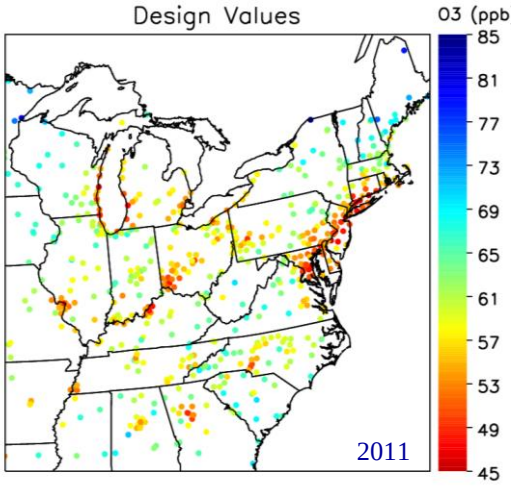
What Does the Modeling Tell Us About Good Neighbor SIPs and the New EPA Transport Guidance?

Before



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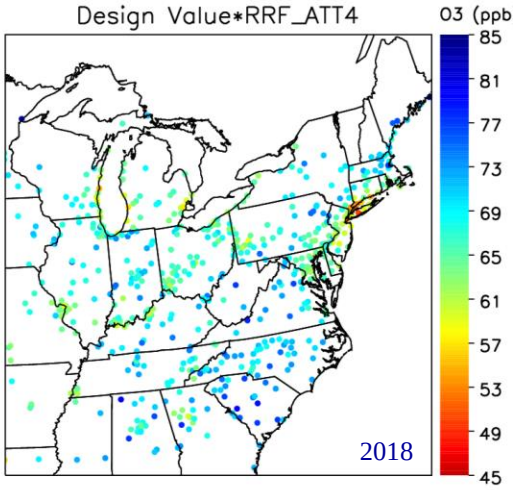


Tad Aburn, Air Director, MDE

EPA Transport Meeting – RTP NC - April 8, 2015

Topics

- Current modeling can help us get a feel for:
  - The way the EPA guidance on Good Neighbor SIPs will play out
  - How the effort on "Optimized EGU Controls" fits into the new EPA guidance
  - What measures different states may need in their Good Neighbor SIPs to satisfy the Clean Air Act

Why So Much Modeling From MD?

- Maryland has conducted a large amount of modeling – still preliminary but getting close to "SIP Quality"
  - Only state East of the Mississippi designated as a "Moderate" nonattainment area by EPA - Only area required to do modeling and a SIP by 2015
  - Maryland participates actively in the inter-regional modeling coordination process
  - EPA modeling and other regional modeling efforts (LADCO and SESARM) are consistent with Maryland's work
- We believe we have enough modeling to begin to identify what states may need to do for Good Neighbor SIPs & Attainment SIPs (just MD for now) to meet the 75 ppb std.

EPA's Recent Transport Initiative

- On January 22, EPA issued a guidance memo to begin a process that will require states to submit Good Neighbor SIPs to address ozone transport in the East
- The guidance builds from Supreme Court decisions … and provides preliminary analyses to identify which states are contributing significantly to downwind problem areas
- Today's meeting with states is part of the EPA Process and intended to focus on what measures may need to be included in Good Neighbor SIPs
- Our modeling can begin to give us a glimpse of how the EPA process may play out

Preliminary EPA Contribution Work

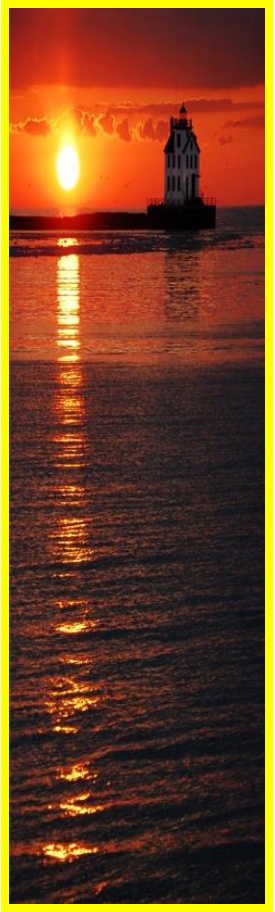
- EPA has performed preliminary modeling to identify which states may owe Good Neighbor SIPs for selected downwind problem areas … Future problems for **nonattainment** and **maintenance** both identified. Texas problem areas not included.

	Contributing States from Preliminary EPA Analyses																				
Problem Monitors	**AL**	**AR**	**DE**	**IA**	**IL**	**IN**	**KS**	**KY**	**LA**	**MD**	**MI**	**MO**	**NJ**	**NY**	**OH**	**OK**	**PA**	**TN**	**TX**	**VA**	**WI**	**WV**
Harford, MD						x		x			x				x		x		x	x		x
Fairfield, CT ★										x	x		x	x	x		x			x		x
Fairfield, CT ★										x			x	x	x		x			x		x
Suffolk, NY ★					x	x				x	x		x		x		x		x	x		x
Fairfield, CT ★					x	x				x			x	x	x		x			x		x
New Haven, CT ★						x				x			x	x	x		x			x		x
Jefferson, KY					x	x					x				x							
Allegan, MI		x		x	x	x	x					x				x			x		x	
St. Charles, MO	x	x			x				x							x		x	x			
Camden, NJ ★			x		x	x		x			x	x		x	x		x		x			x
Gloucester, NJ ★			x		x	x		x		x	x			x	x		x		x	x		x
Richmond, NY ★			x			x		x		x			x		x		x			x		x
Philadelphia, PA ★			x		x	x		x		x			x		x			x	x	x		x
Sheboygan, WI					x	x	x		x		x	x				x			x			

In the same nonattainment area … ★ = NY/NJ/CT ★ = Philadelphia

Control Measures in the MD Modeling

- More detail provided later …
  - But the current modeling focuses on 3 basic packages of control measures
- Measures that are “on the way” include:
  - Over 40 control programs: generally older federal programs that continue to generate deeper reductions as they phase in or as fleets turn over
- Optimized EGU reductions include:
  - All coal-fired units in selected eastern states (MD, PA, VA, NC, TN, KY, WV, OH, IN, IL, MI, CT, NJ, NY, WI, LA, MO) running controls in the summertime consistent with emission rates measured in earlier years
- New OTC and local Maryland measures include:
  - Nine new OTC model reduction programs for mobile sources and other sources implemented in just the OTC states … and
  - Additional EGU and mobile source reductions just in MD



Modeling Preliminary EPA Problem Areas

This is what Maryland presented at the March 15, 2015 collaborative meeting. We have now updated this modeling to add in optimized controls in other states, a surrogate for a local strategy around the NY/NJ/CT area and to recalculate future year design values with EPA's new guidance

Harford, MD	240251001	90	77.3	75.7	74.4
Fairfield, CT	090013007			74.0	72.9
Fairfield, CT	090019003				75.7
Suffolk, NY	361030002				79.1
Maintenance Problems - 2018					
Fairfield, CT	090010017			7.7	76.7
New Haven, CT	090099002			5.1	74.1
Jefferson, KY	211110067			9.7	69.7
Allegan, MI	260050003			3.1	73.1
Saint Charles, MO	291831002	82.3	72.2	71.9	71.9
Camden, NJ	340071001	82.		70.5	69.5
Gloucester, NJ	340150002	84.		71.7	70.6
Richmond, NY	360850067	81.		74.9	73.9
Philadelphia, PA	421010024	83.		9	70.8
Sheboygan, WI	551170006	84.3	75.6	75.4	75.4

These three counties are all in the NY/NJ/CT nonattainment area. Because these areas are downwind of MD, no new local reductions or optimized EGUs in NY, NJ or CT have been included in the current MD modeling.

No Optimized EGUs in WI, KS, LA, MO, OK or TX included in the MD modeling.

Updated - Modeling Preliminary EPA Problem Areas

County, State	AQS #	Design Value 2011	2018 Future Projections		
			Measures "on the way"	Add in Optimized EGUs	Add new OTC & local MD measures
Attainment Problems - 2018					
Harford, MD	240251001	90	76.0	74.5	73.5
Fairfield, CT	090013007	84.3	73.0	72.5	71.5
Fairfield, CT	090019003			75.1	74.1
Suffolk, NY	361030002			77.7	76.7
Maintenance Problems - 2018					
Fairfield, CT	090010017			75.9	74.9
New Haven, CT	090099002	85.7	74.1	73.8	72.8
Jefferson, KY	211110067	82.0	70.6	69.0	69.0
Allegan, MI	260050003	82.7	73.0	72.8	72.8
Saint Charles, MO	291831002	82.3	71.3	69.6	71.1
Camden, NJ	340071001	82.5	71.3	69.6	68.6
Gloucester, NJ	340150002	84.1	72.8	70.9	69.9
Richmond, NY	360850067	81.5	71.3	74.0	73
Philadelphia, PA	421010024	83.5	72.4	72.4	70.4
Sheboygan, WI	551170006	84.3	75.4	75.2	75.2

New EPA guidance on calculating future year design values added. Optimized EGU strategy in NY, NJ and CT added.

Optimized EGUs added in WI, KS, LA, MO, OK or TX when possible

Other Difficult Monitors in the East - Updated

County, State	AQS #	Design Value 2011	2018 Measures "on the way"	2018 – Add in Optimized EGUs	2018 – Add new OTC and local MD measures
Prince Georges, MD	240338003	82.3	68.6	67.0	66.0
New Castle, DE	100031010	78.0	66.6	65.1	64.1
Bucks, PA	420170012	80.3	69.3	68.0	67
Fairfax, VA	510590030	82.3	69.4	68.1	67.1
Wayne, MI	261630019	78.7	72.9	72.8	72.8
Mecklenburg, NC	371191009	79.7	63.5	63.0	63.0
Fulton, GA	131210055	81.0	70.3	70.1	70.1
Knox, TN	470931020	71.7	61.7	61.2	61.2
Hamilton, OH	390610006	82.0	69.7	67.5	67.5
Franklin, OH	390490029	80.3	69.7	69.2	69.2

All values in parts per billion (ppb)

NY/NJ/CT Nonattainment Area

- There are very preliminary analyses started that begin to look at how a strategy that targets smaller combustion sources … with relatively large peak day NOx emissions … might help the NY/NJ/CT nonattainment area
- This sensitivity run was designed to get a very rough idea of how that kind of a strategy might work
  - Extra 10% NOx reduction in just NY, NJ, CT, PA and MD

County, State	AQS #	Design Value 2011	2018 Future Projections			
			Measures "on the way"	Add in Optimized EGUs	Add new OTC & local MD measures	Add in 10% Extra NOx Reduction in NY, NJ, CT, PA and MD
Fairfield, CT	090013007	84.3	73.0	72.5	71.5	71.0
Fairfield, CT	090019003	83.7	75.5	75.1	74.1	73.6
Suffolk, NY	361030002	83.3	78.2	77.7	76.7	75.7
Fairfield, CT	090010017	80.3	76.4	75.9	74.9	74.5
New Haven, CT	090099002	85.7	74.1	73.8	72.8	71.7

New EPA guidance on calculating future year design values added. Optimized EGU strategy in NY, NJ and CT added. Surrogate for new local strategy also added (NY, NJ, CT, PA and MD)

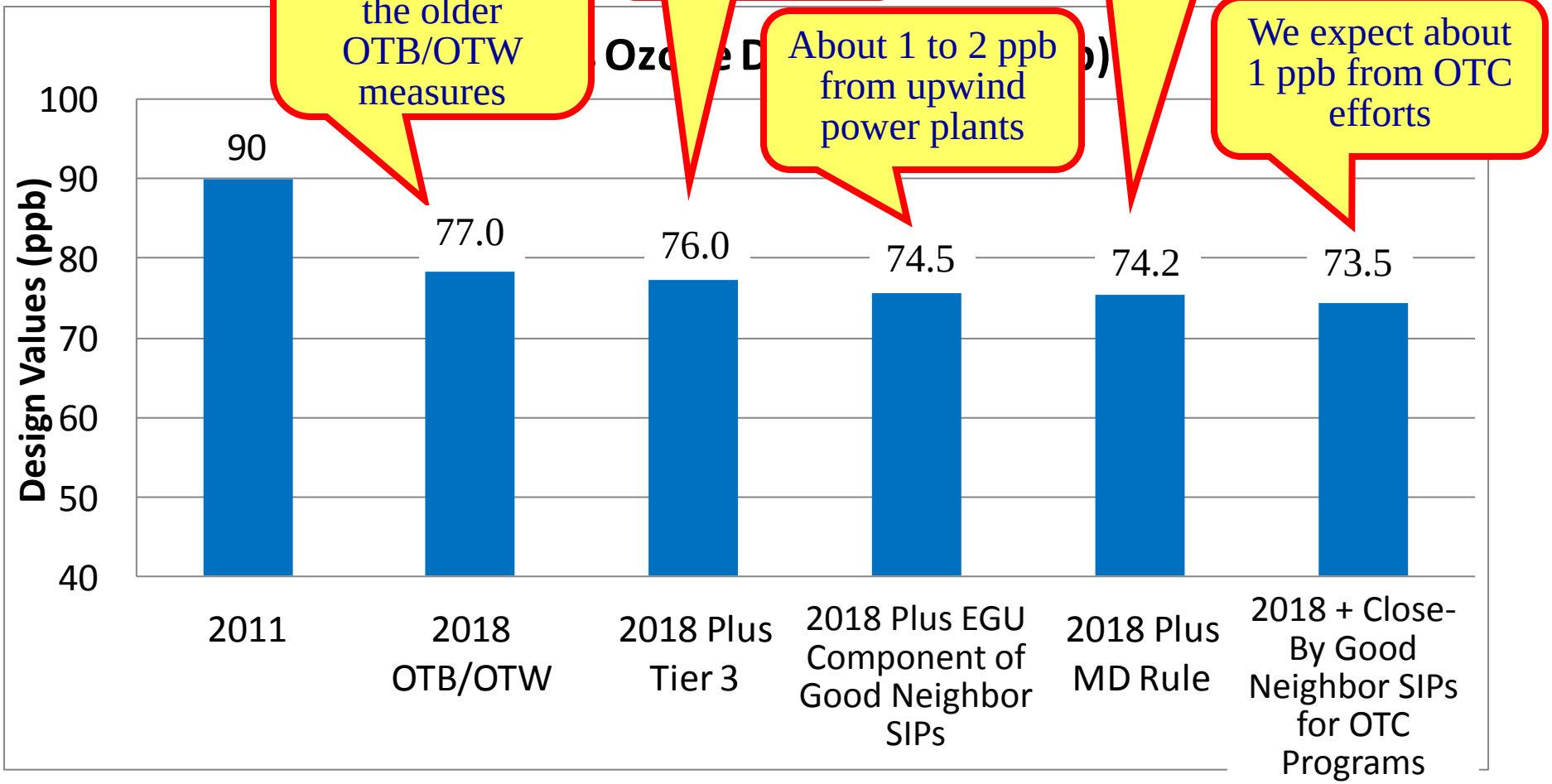
Good Neighbor SIPs …

… What does the MD modeling say about what control measures states may need to include in their Good Neighbor SIPs?

- Very preliminary – Based upon current modeling effort
- For all of the toughest areas: Harford County, MD - NJ/NY/CT nonattainment area – Sheboygan, WI … all of the other tough areas in the east … except Texas

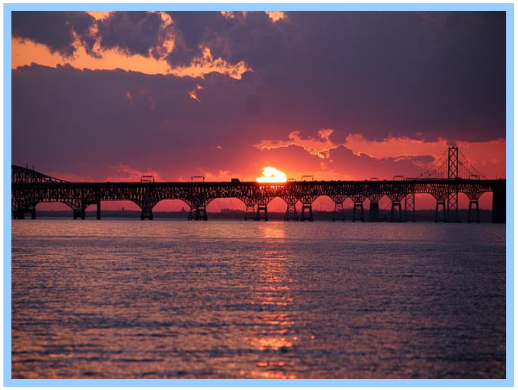
Control Programs Needed	CT	DE	IL	IN	KY	MD	MI	MO	NJ	NY	OH	PA	TN	TX	VA	WV
Optimized EGU controls	x	x	x	x	x	+	x	x	x	x	x	x	x	x	x	x
Aftermarket Catalyst	x	x				x			x	x		x			x	
On- and off-road idling	x	x				x			x	x		x			x	
OTC VOC initiatives	x	x				x			x	x		x			x	
SmartWays	x	x				x			x	x		x			x	
Smaller Combustion	?					?			?	?		?			?	

Where Do Reductions Come From?



Where Do the OTB/OTW Reductions Come From?

- There are over 40 control programs in this piece of our modeling
  - Generally older control programs that continue to generate deeper reductions as they are phased in or as fleets turn over
- By far, the largest contributors to NOx reductions in the OTB/OTW category are mobile sources
  - Tier 2 Vehicle Standards
  - Federal fuel economy (CAFÉ) standards
  - Heavy Duty Diesel Standards
  - Marine Diesel Engine Standards
  - Emission Control Area (ECA) requirements
  - Many more …
- VOC reductions from the OTB/OTW category come from programs like
  - Federal consumer product and paint regulations
  - Tier 2 Vehicle Standards
  - VOC RACT … Many more …



What "Inside MD" Reductions are Included?

- New EGU regulation for NOx
  - Required for RACT and Attainment
- Maryland efforts on mobile sources
  - Electric vehicle initiatives
  - ZEV efforts
  - "Beyond Conformity" partnerships
- Primarily NOx reductions from EGU regulation

Reductions in Transport Included?

- Three new significant transport strategies are included
- The Federal Tier 3 Vehicle and Fuel Standards … maybe the most significant new transport strategy
- New OTC Regional Measures … just in OTC states
- "Good Neighbor Partnerships" that address coal-fired power plants in 10 states upwind of MD are also included in the modeling (PA, VA, NC, TN, KY, WV, OH, IN, IL, MI)*
  - Focuses primarily on the large potential reductions from insuring that currently installed technologies are run well
    - Also includes significant reductions from units scheduled for retirement (or other major changes) by 2018
  - Already a discussion item between states and EGU operators

* Recent sensitivity runs added in optimized EGUs in CT, NJ, NY, WI, LA and MO to look at other tough nonattainment issues in CT, NY and WI

What Inside the OTC Measures are Included?

- Mobile Source Initiatives
  - Aftermarket Catalyst effort
  - ZEV/CALEV state programs
  - Onroad and offroad idling
  - Heavy Duty I&M
  - Smartways
- NOx and VOC reductions
- New potential initiatives like Ports are not included

- Stationary and Area Source Efforts
  - Third Generation OTC/SAS Initiatives
    - Consumer products
    - Architectural and Industrial Maintenance (AIM) Coatings
    - Auto coatings
    - Ultra Low NOx burners
- NOx and VOC reductions

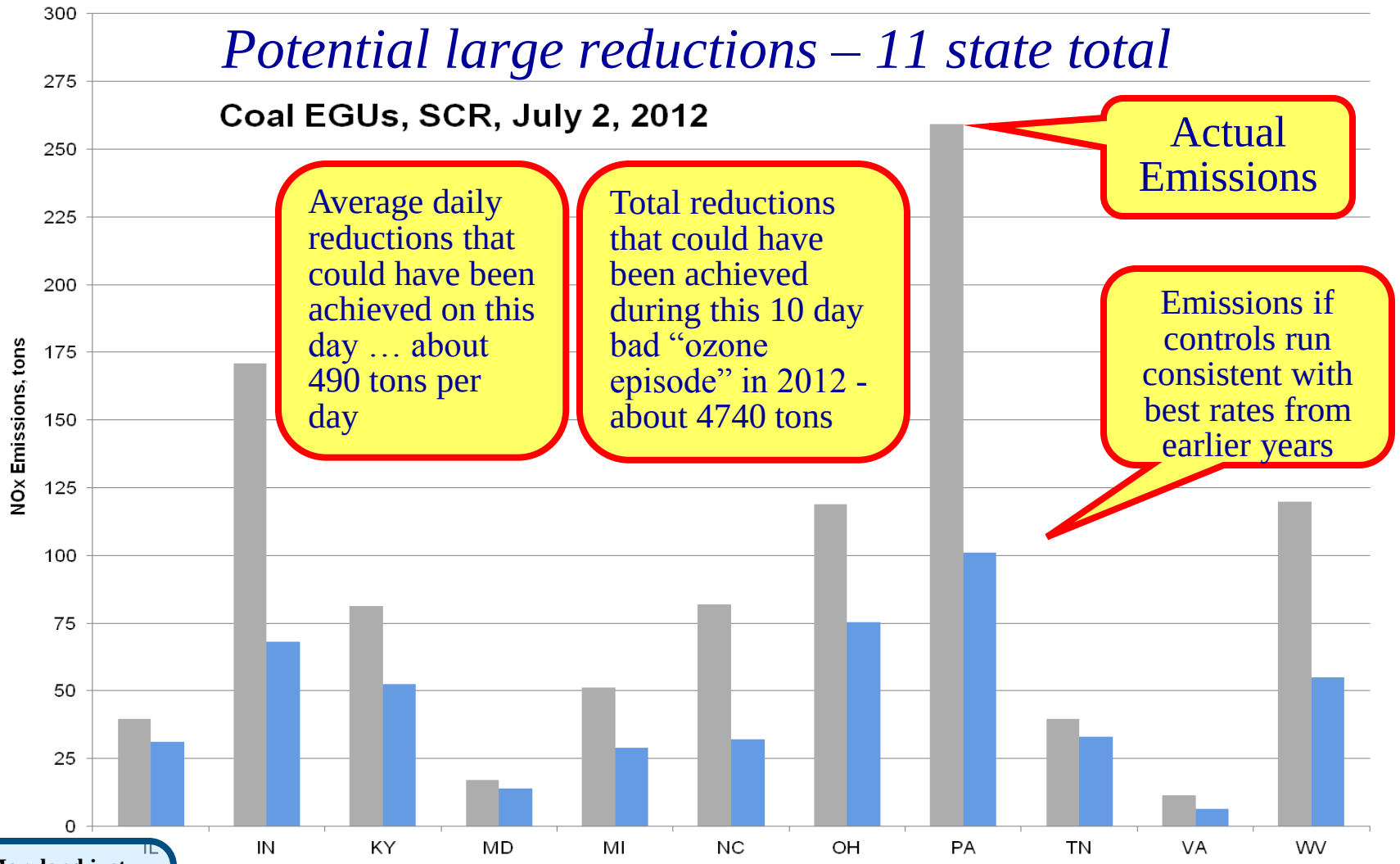
Reductions from OTC Measures

OTC Model Control Measures	Regional Reductions (tons per year)	Regional Reductions (tons per day)
Aftermarket Catalysts	14,983 (NOx) 3,390 (VOC)	
On-Road Idling	19,716 (NOx) 4,067 (VOC)	
Nonroad Idling	16,892 (NOx) 2,460 (VOC)	
Heavy Duty I & M	9,326 (NOx)	
Enhanced SMARTWAY	2.5%	
Ultra Low NOx Burners	3,669 (NOx)	10 (NOx)
Consumer Products	9,729 (VOC)	26 (VOC)
AIM	26,506 (VOC)	72 (VOC)
Auto Coatings	7,711 (VOC)	21 (VOC)

… About a 150 ton per day total NOx Emission Reduction in the 13 OTC states

- Just in the OTC states – for now
- Reductions developed as part of OTC Committee work
- Thanks to Roger Thunell. Emily Bull, Marcia Ways, Joseph Jakuta and Julie McDill
- These emission reduction estimates are being updated as we speak

Reductions – Optimized EGU Controls



Maryland just distributed a third update to this data analysis package for all 11 states.

To put 490 tons per day in context, the expected reductions from the Tier 3 Vehicle and Fuel Standards in 2018 is projected to be 324 tpd (in OTC and 176A states) and 486 tpd for all states in SE and MW and OTC

MARYLAND DEPARTMENT OF THE ENVIRONMENT

The Next Ozone Standard - Updated

... will optimized EGU controls help with how areas might be designated under a revised ozone standard?

- EPA may be designating areas as "nonattainment" under a new 65 to 70 ppb standard
- The data for 2015 and 2016 could be very important - EPA uses 3 years of data for designations
- Having power plants run their controls well may be very important for some areas and how they might be designated

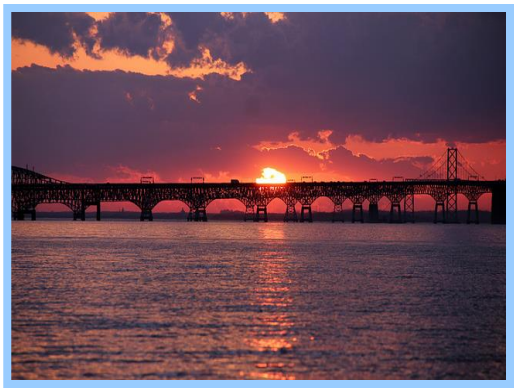
Monitor (County, State)	AQS Number	2014 Design Value	Potential Lost Ozone Benefit – Without Optimized EGUs*
Greene, IN	180550001	71 ppb	5 to 7 ppb
Boone, KY	210150003	65 ppb	5 to 7 ppb
Centre, PA	420270100	67 ppb	5 to 6 ppb
Person, NC	371450003	66 ppb	3 to 11 ppb
Hamilton, OH	390610010	73 ppb	4 to 6 ppb
Cambria, PA	420210011	66 ppb	6 to 7 ppb
Kanawa, WV	540390010	69 ppb	2 to 5 ppb
Garrett, MD	240230002	68 ppb	2 to 3 ppb

* From latest MD preliminary modeling

Other Control Programs …

… that could help reduce transport by 2018?

- What does the modeling tell us about remaining contribution in 2018?
- Is there any "low hanging fruit" that could be considered in the short run
  - 2017 or 2018 reductions
- A chance for EPA to be a "Good Neighbor Helper"



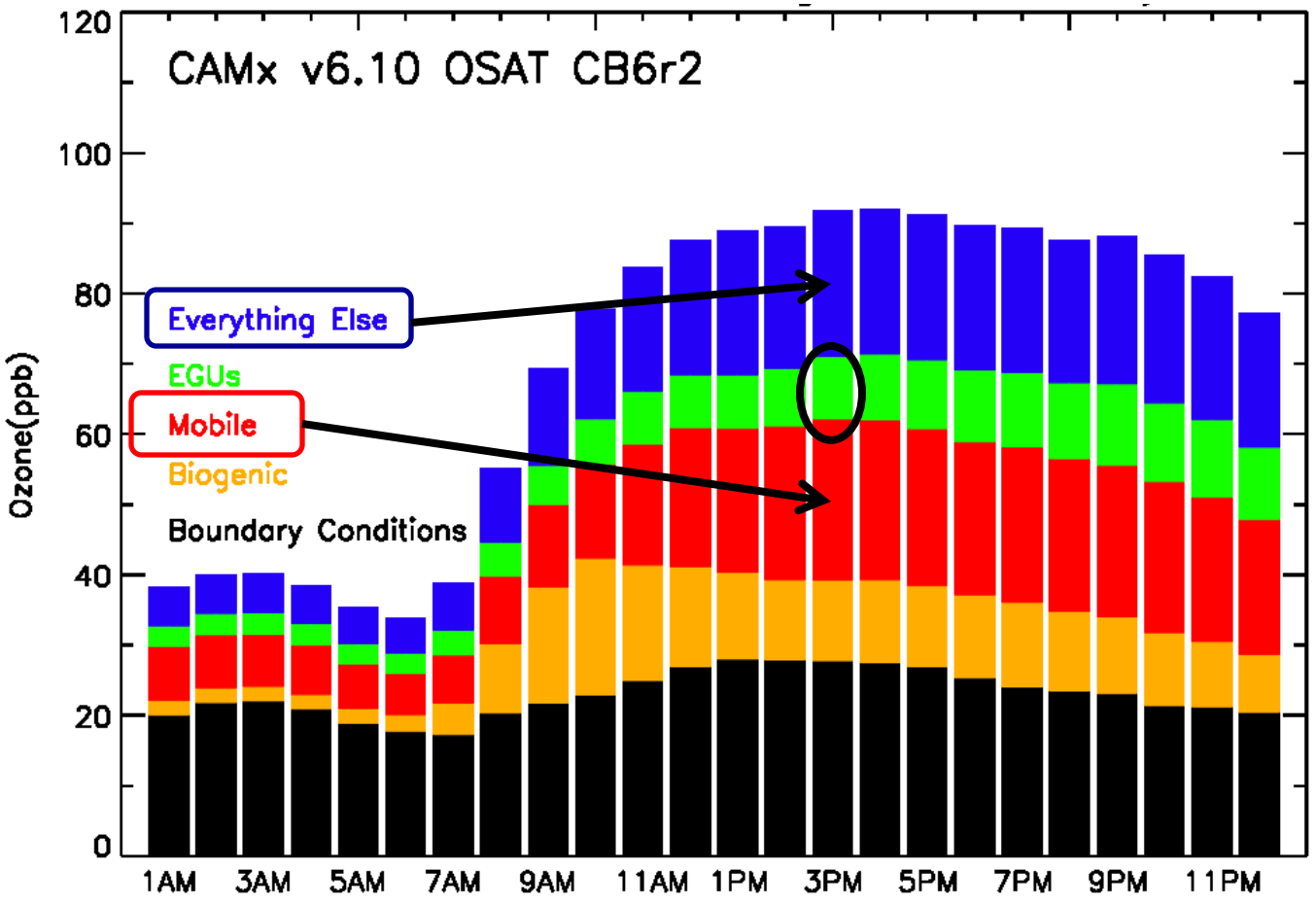
LADCO OSAT - Edgewood, MD

- The CAMX model has a source apportionment tool called OSAT (Ozone Source Apportionment Tool) that allows the model to work backwards and ask questions like “what states” or “what source sectors” sent the ozone to Edgewood MD – or Sheboygan WI – or Atlanta GA?
- The following series of OSAT runs from Maryland and LADCO generate similar answers and are designed to help identify …
  - “What source sectors are remaining significant contributors to eastern, mid-west and southern problem areas.
- Helpful for current Good Neighbor efforts, but also informative for looking ahead to the next standard

Ozone Contribution (%)

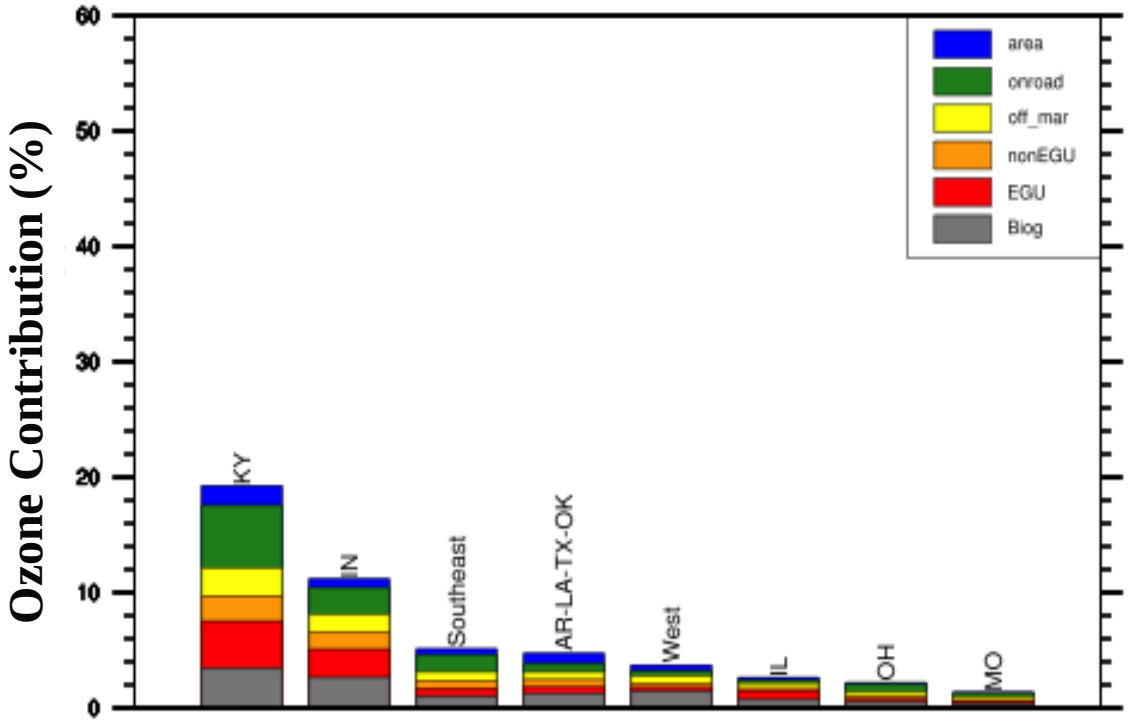
UMD OSAT - Edgewood, MD

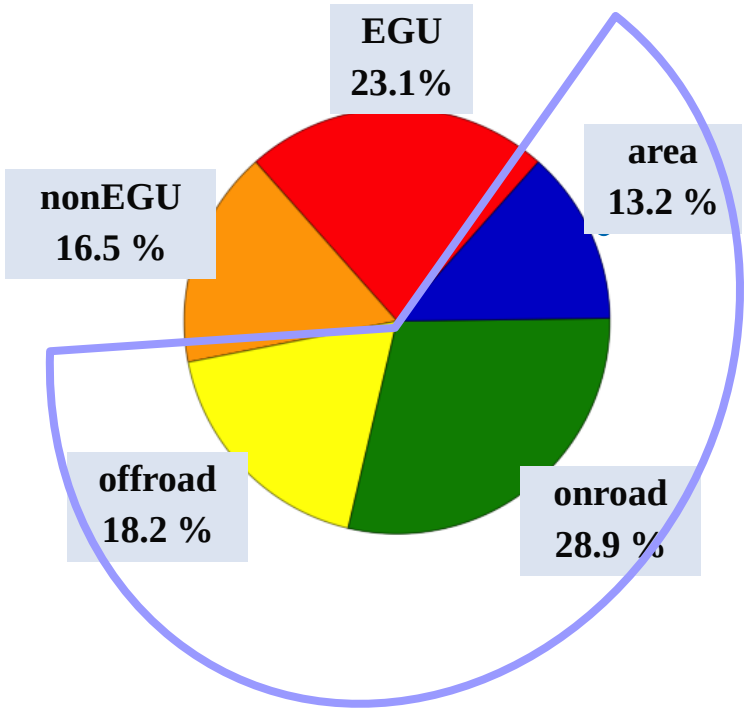
- Daily contribution from OSAT – July 7, 2011
- Anthropogenic contribution dominated by "other than EGU" source sectors



LADCO OSAT - Louisville, KY

75 ppb O_3 threshold-ERTAC 2.2

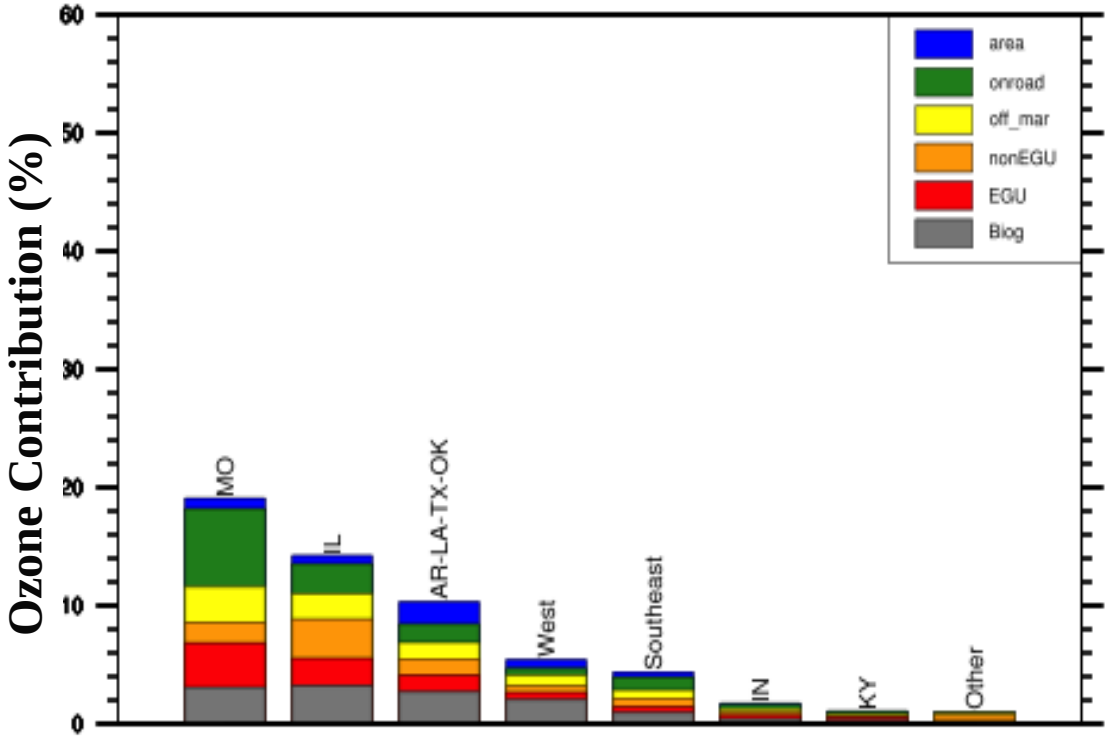


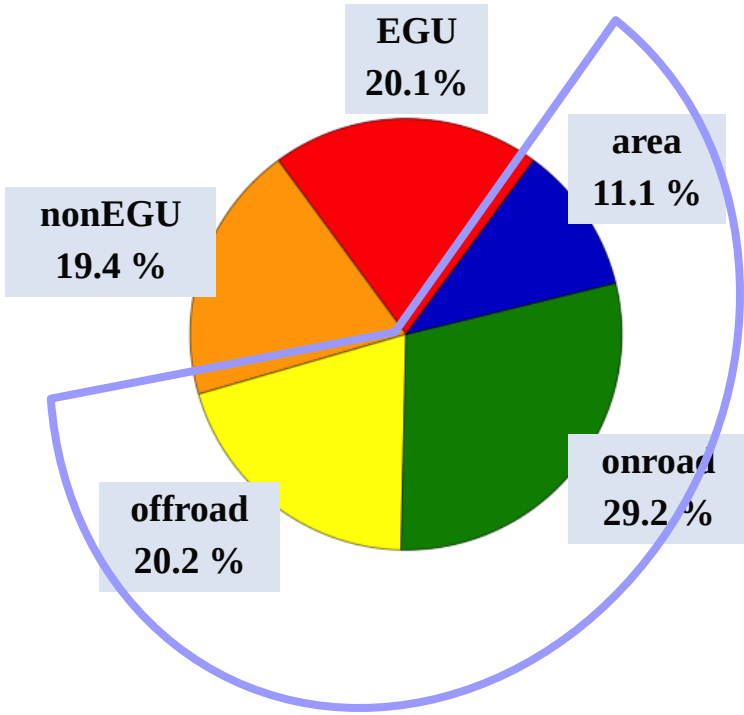


Boundary condition contribution not shown

LADCO OSAT - St. Louis, MO

75 ppb O_3 threshold-ERTAC 2.2

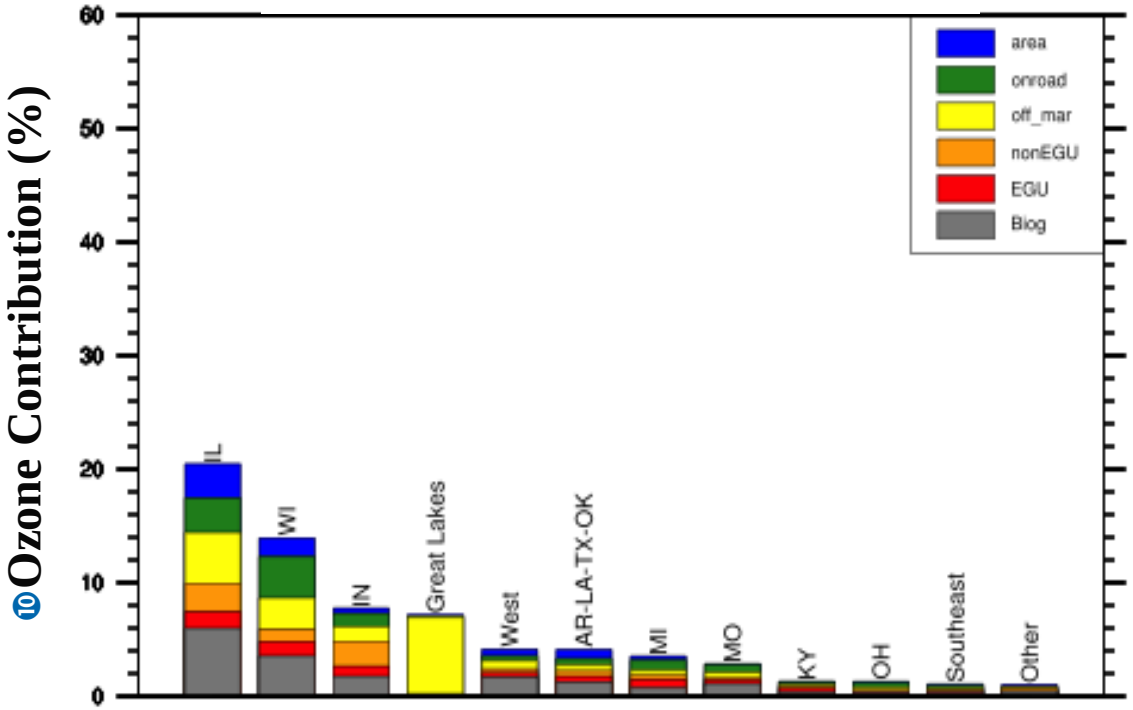




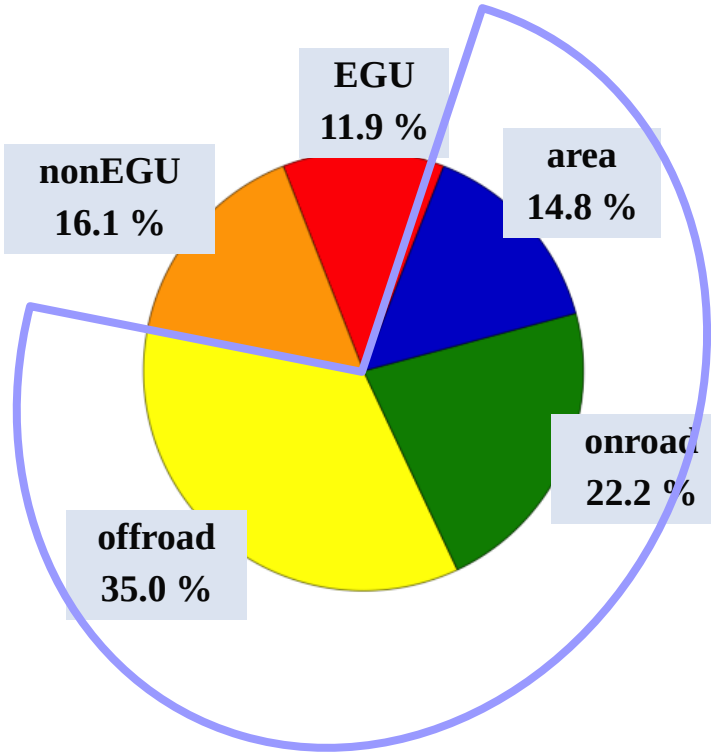
Boundary condition contribution not shown

LADCO OSAT - Sheboygan, WI

75 ppb O_3 threshold-ERTAC 2.2

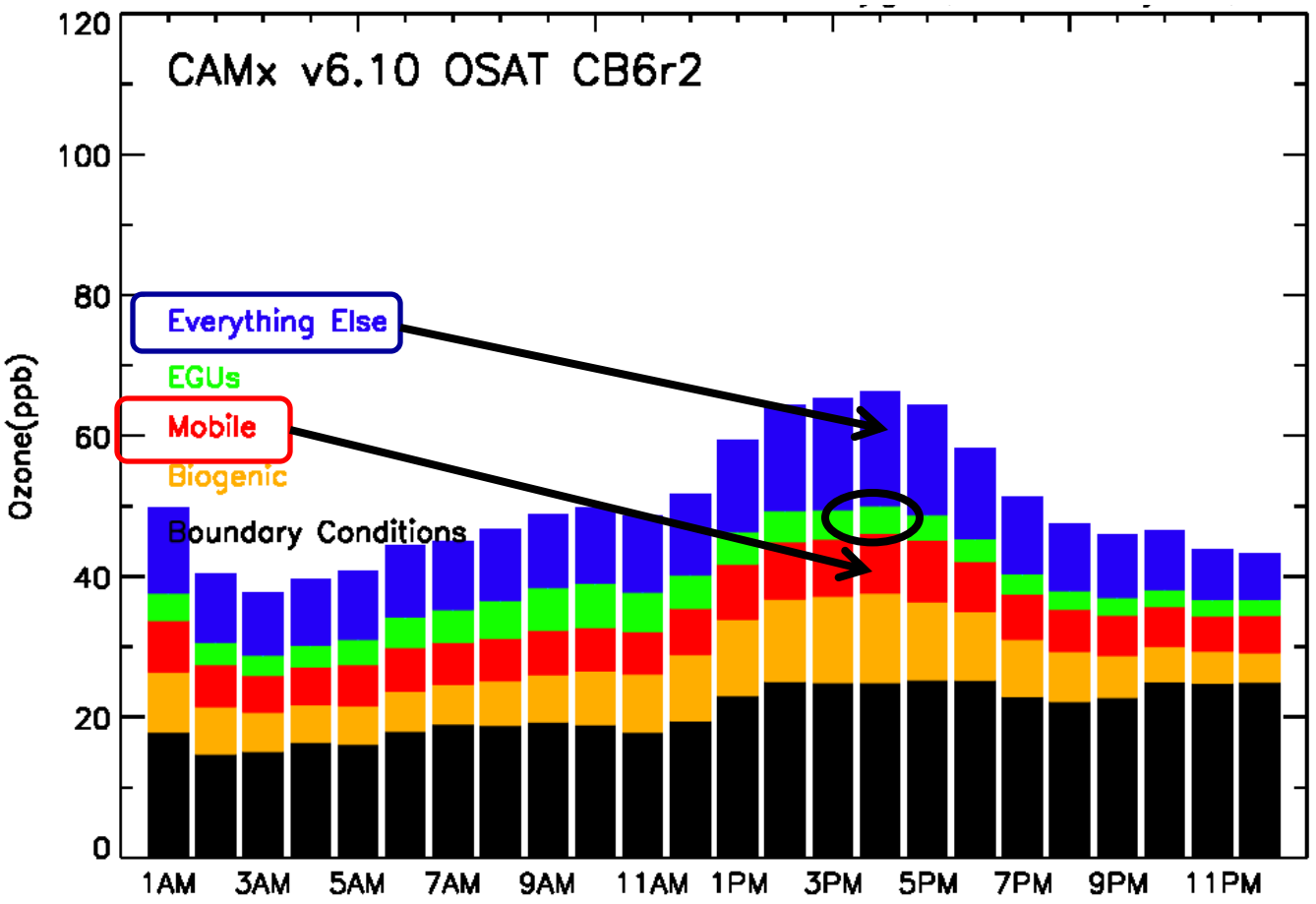


Boundary condition contribution not shown



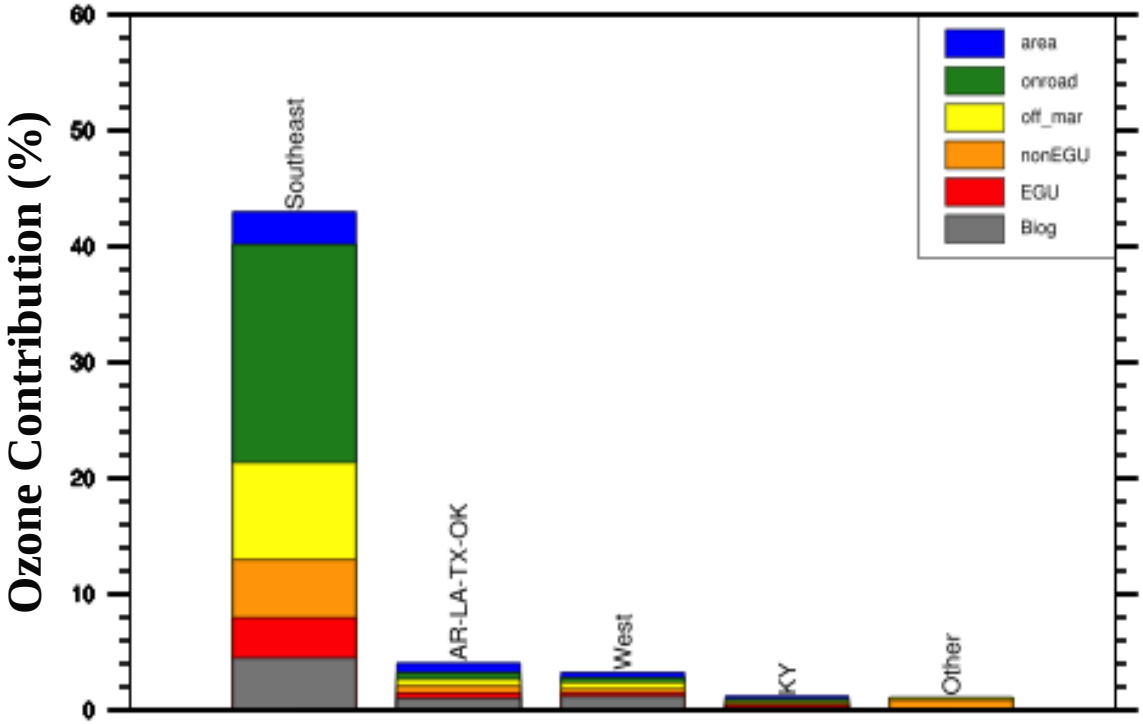
UMD OSAT – Sheboygan, WI

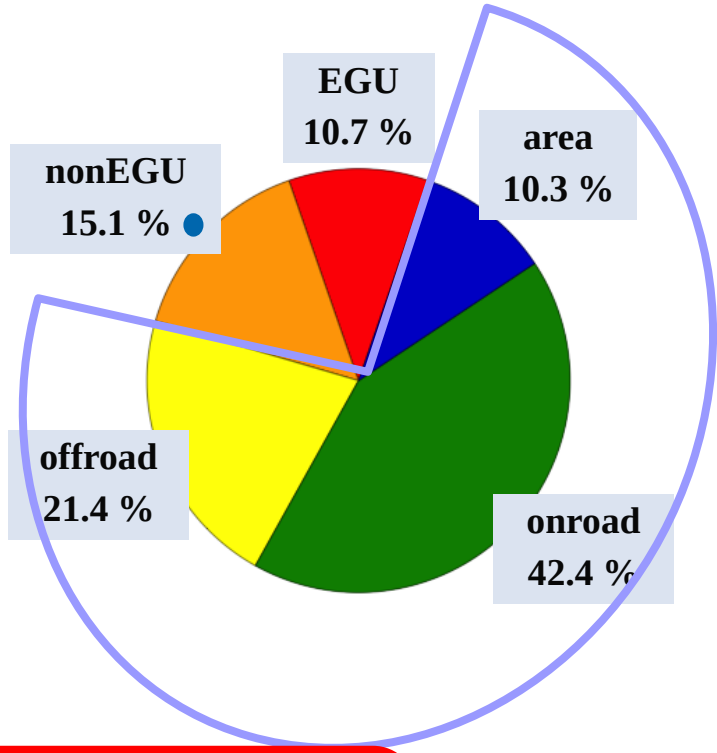
- Daily contribution from OSAT – July 7, 2011
- Anthropogenic contribution dominated by "other than EGU" source sectors



LADCO OSAT - Atlanta, GA

75 ppb O_3 threshold-ERTAC 2.2





It appears that contribution from onroad and offroad mobile and area sources are … or will be … meaningful contributors to eastern ozone transport

Three Additional Early Actions for Consideration

- The OTC states have developed model regional programs for several mobile and area source control programs.
- Three appear to be low hanging fruit as they are supported by affected sources … with one common complaint …
  - "This OTC Model Program would work best if implemented by EPA - through a Federal Rule"
- The Three:
  - OTC Model Aftermarket Catalyst Rule
    - About 150 tons per day (tpd) of new NOx reduction across the East
  - The Third Generation OTC Model Consumer Product Rule
    - About 90 tpd of new VOC reductions across the East
  - The Third Generation OTC Model AIM Rule
    - Over 220 tpd of new VOC reductions across the East

Summary – MD Thoughts on Control Measures

… What does the Maryland modeling tell us about short-term control measures that may be needed for Good Neighbor SIPs?

- Running EGU controls well (Optimized EGUs) appears to be a common sense strategy that would be beneficial to many areas …
  - For Good Neighbor responsibilities and for future potential designations
    - At a minimum, EGUs should be expected to run their controls well enough to at least meet 30-day rolling average rates consistent with better rates seen in earlier years when controls were run more efficiently
      - Generally in the .06 to .10 lb/MMBtu range as a 30-day rolling average
      - This can be done very simply as a constraint on the Federal trading programs
  - Up to 500 tpd of NOx reductions in the East
- The nine OTC measures appear to be important for inclusion in Good Neighbor SIPs for states in the OTR – Maybe other areas?
  - About 150 tpd NOx reduction in the 13 OTC states. VOC reductions as well.
- Three control programs may be very helpful if implemented as a Federal Rule
  - Expanded OTC Aftermarket Catalysts – across the East
  - Expanded OTC Consumer Products – across the East
  - Expanded OTC AIM Rule – across the East

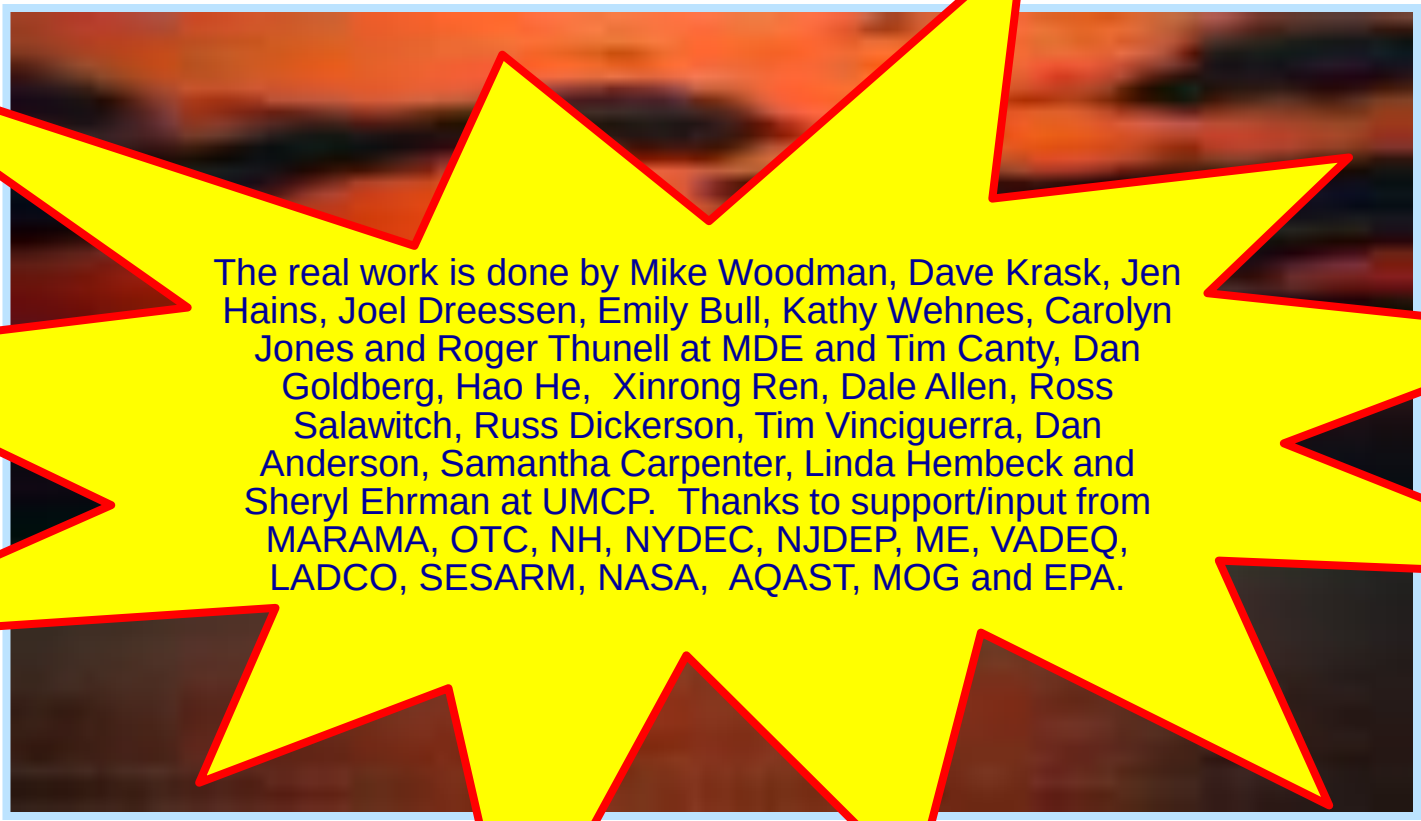
Other Potential Future Control Measures

- The OTC states continue to study new control measures that may be needed in the future
- NOx focused – looking for biggest bang for the buck strategies
- Several other strategies to think about:
  - Heavy Duty Truck Engines – EPA and California are both studying this issue. Potentially very significant for transport reductions/Good Neighbor SIPs in the future.
    - Potentially large NOx reductions
  - Ports, Ships, Boats and other Marine Engine strategies
    - Both LADCO and MD have identified this as a priority for the future. Potentially large NOx reductions
  - Peak Day NOx Emission Strategies
    - Very significant issue that needs continued study
    - An OTC priority
    - Fixing the current exemptions in the RICE rule may be a good place to start

Next Steps with the Modeling

- Maryland, LADCO, SESARM, CENSARA and OTC … in partnership with EPA … will continue to work together through the State Air Directors Collaborative to refine and improve the inventories and photochemical modeling – A dialogue with Texas may be important
- There are some important updates to the modeling that are in the works as part of the Maryland effort:
  - These updates will result in minor changes to the model results, but they are unlikely to change the overarching conclusions from the current effort
    - Better chemistry inputs
    - New biogenic (trees and natural stuff) inventory
    - Updates to other parts of the inventory including ERTAC updates and MOVES 14
    - New work on projecting power plant emissions using ERTAC (Eastern Regional Technical Advisory Committee)

Thanks



The real work is done by Mike Woodman, Dave Krask, Jen Hains, Joel Dreessen, Emily Bull, Kathy Wehnes, Carolyn Jones and Roger Thunell at MDE and Tim Canty, Dan Goldberg, Hao He, Xinrong Ren, Dale Allen, Ross Salawitch, Russ Dickerson, Tim Vinciguerra, Dan Anderson, Samantha Carpenter, Linda Hembeck and Sheryl Ehrman at UMCP. Thanks to support/input from MARAMA, OTC, NH, NYDEC, NJDEP, ME, VADEQ, LADCO, SESARM, NASA, AQAST, MOG and EPA.