OTC /MANE-VU Committee Meeting

September 20, 2016

Hall of the States

Washington DC

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Stationary and Area Source Committee





OZONE TRANSPORT COMMISSION

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Stationary and Area Source Committee

Progress of SAS Workgroups since Spring Meetings:

- Status Updates on Efforts and on Completing Charge
- Moving Forward - Next Steps for the Workgroups

High Electricity Demand Days (HEDD)

More electricity generation than usual required for reliability

- More generation → more emissions
- Hot, humid days already conducive to ozone
- Higher emissions often occur during critical periods

Some emissions not reported in CAMD or other typical mechanisms

- Need to be added to the inventory or redistributed during HEDD periods to reflect actual emissions

HEDD Workgroup Update

Three separate but related HEDD analyses:

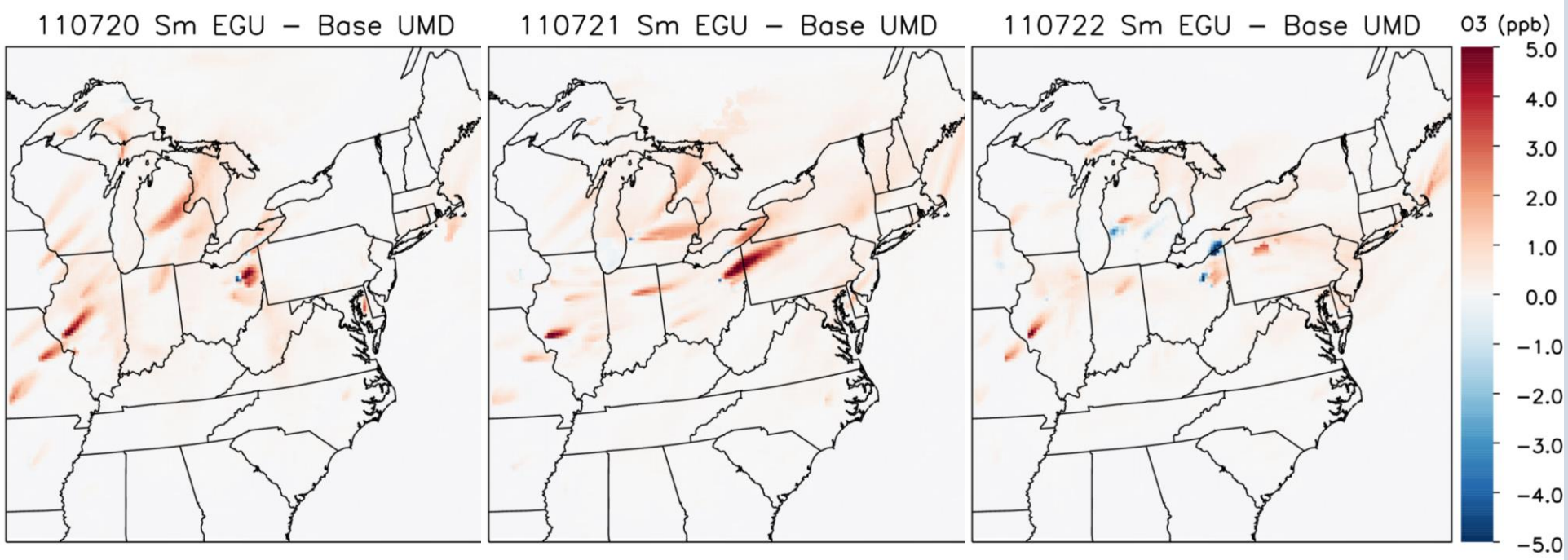
1. Smaller EGUs not in CAMD (<25 MW)
    - Annual emissions and locations known
    - In the modeling inventory, but not temporally allocated properly
    - MDE created improved temporal profiles

2. Back-up Generators (BUGs)
    - Estimated total emissions for each ISO (ISO-NE, NY-ISO, PJM)
    - Apportioned emissions to the county level
    - Assigned emissions to model episode days
    - Apportioned daily emissions to hours of day
3. Peaking Units EGUs in CAMD (>25 MW)
    - Hourly emissions and locations known
    - In modeling inventory
    - Old EPA definition of peaking unit = operating <10% over 3 years and <20% annually

Ozone Impact of Small EGUs (<25 MW)

July 20 – 22, 2011 Event Period

Preliminary Modeling Results



Additional NO_X Added by Re-temporalization: 7/20

MANE-VU: +25 Tons
SESARM: +20 Tons
LADCO: +211 Tons
CenSARA: +83 Tons

Additional NO_X Added by Re-temporalization: 7/21

MANE-VU: +41 Tons
SESARM: +23 Tons
LADCO: +230 Tons
CenSARA: +42 Tons

Additional NO_X Added by Re-temporalization: 7/22

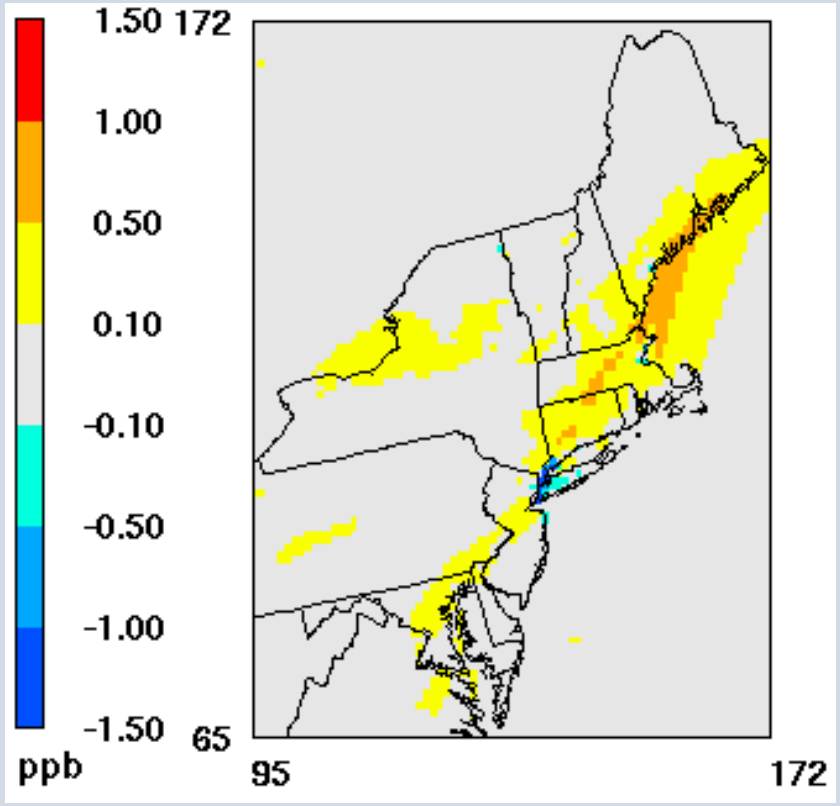
MANE-VU: +48 Tons
SESARM: +19 Tons
LADCO: +186 Tons
CenSARA: +38 Tons

- Small EGU units can have an impact of up to **5 ppb** in some areas on HEDDs.
- On non-HEDDs impact of small EGU units is insignificant.

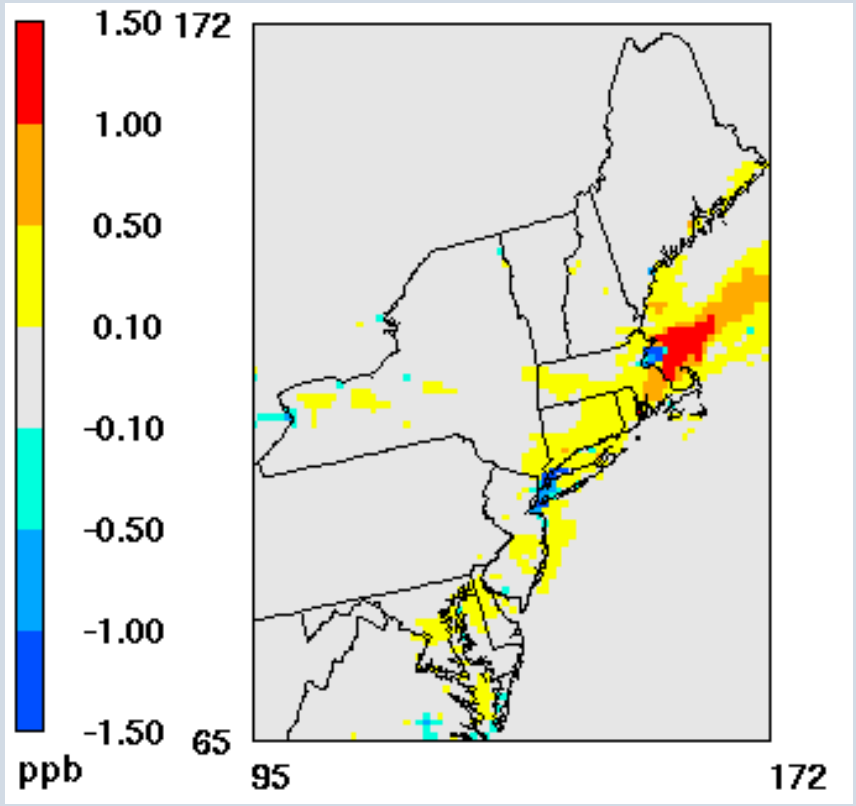
Ozone Impact of BUGs

Difference in Daily Maximum 8-hour Ozone
2011 Base w/ BUGs minus 2011 Base

July 21, 2011



July 22, 2011



Thanks to NYSDEC for performing the SMOKE and CMAQ processing

Peaking Units

What is the NO_X contribution from peaking units in the OTR on HEDDs?

What are the NO_X reductions that could be achieved if peaking units were controlled more effectively?

What is the NO_X contribution from other EGU types in the OTR on HEDDs?

What are the NO_X reductions that could be achieved if these units operated their controls more effectively?

EGU Categorization

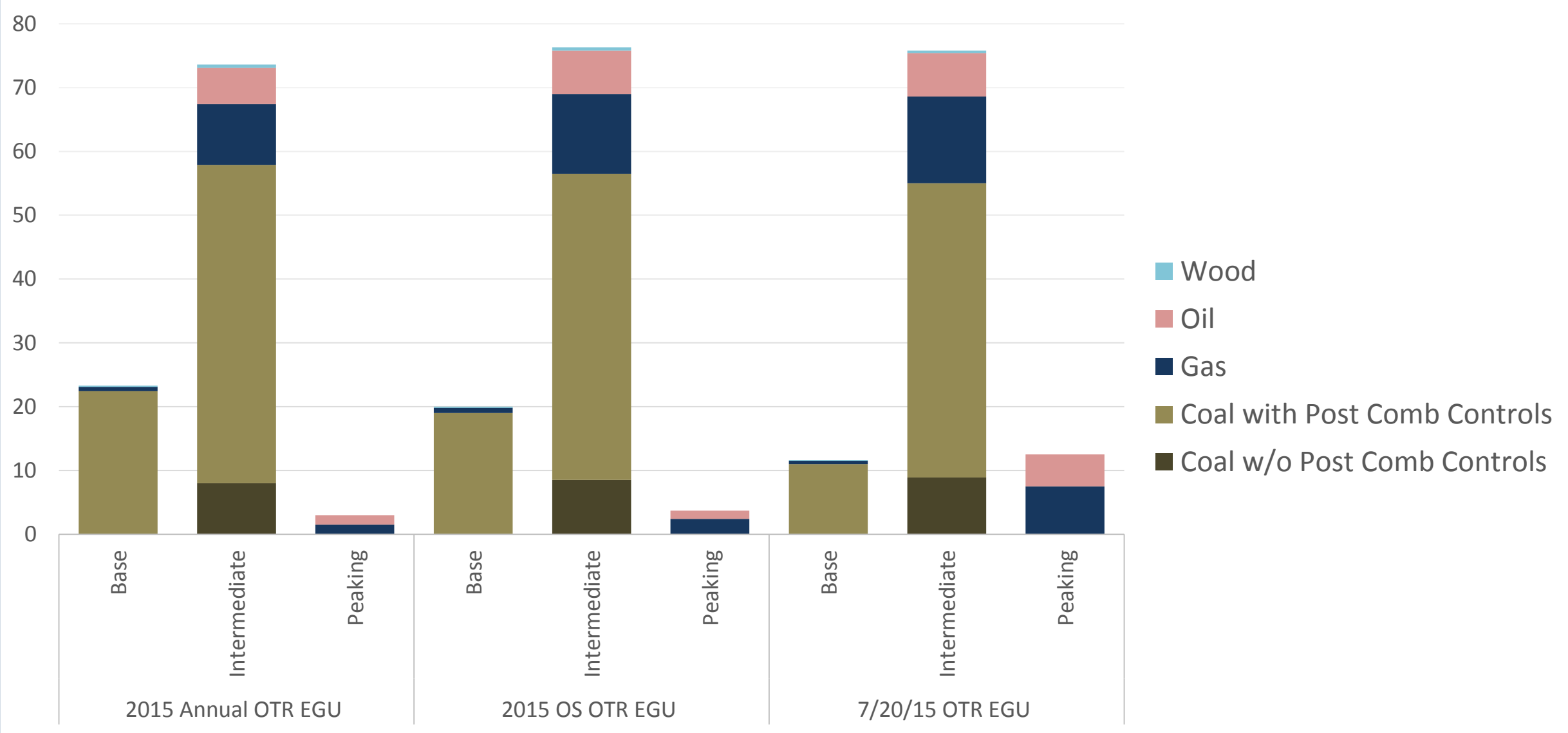
Operational Categories (based on on-line factor)

- Baseload (annual on-line factor of ≥89%)
- Intermediate (annual on-line factor between 10 - 89%)
- Peaking (annual on-line factor <10%)

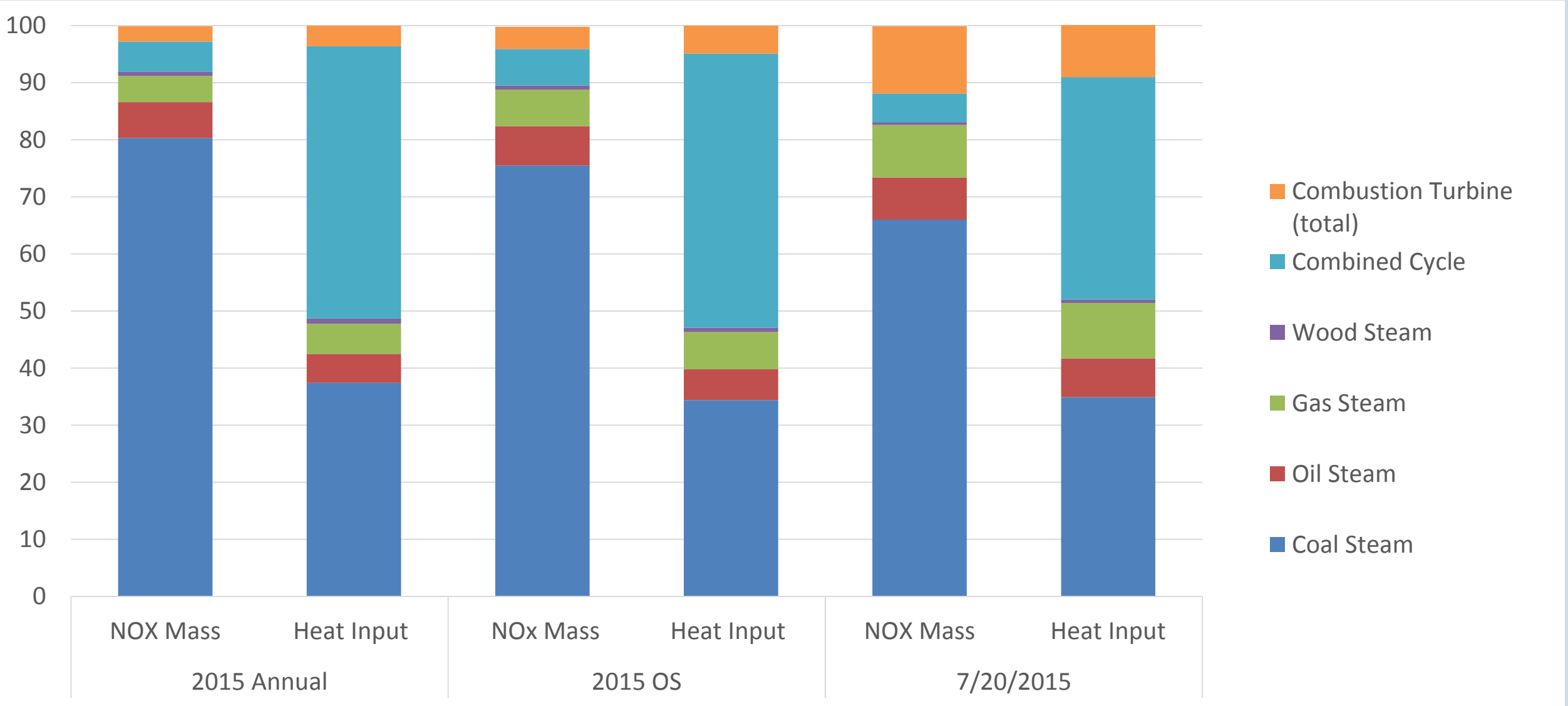
Fuel/Control/Configuration Type Categories

- Wood
- Gas
- Oil
- Coal (with & without post combustion controls)
- Combined cycle
- Combustion turbines

EGU Category, % Contribution to NO_X Mass, 2015



EGU Category, % Contribution to NOx, 2015



EGU Control Optimization Analysis

July 20, 2015 Episode Day *in the OTR*

Combustion Turbines

What if CTs listed in AMPD as having no NO_X controls used controls (e.g. water injection, low-NO_X combustors) to meet "moderate RACT" levels of 42 ppm NO_X for gas and 88 ppm NOx for oil?

- Estimated 21 ton NO_X reduction (34% reduction) for 7/20/15 in the OTR

Coal Units

What if all coal-fired EGUs with existing NOx controls operated at or near their best historic NO_X rates?

- NOx reduction potential for 7/20/15:
  - Coal units with SCR ~167 tons
  - Coal units with SNCR ~7 tons
- Adding controls to uncontrolled units provides an additional ~10 tons
- Total NO_X reduction potential ~184 tons
  - ~32% of all fossil EGUs operating in OTR on 7/20/15

Workgroup Summary & Conclusions

Small EGUs

- Improved temporal profiles → 7-fold increase in peak day NO_X compared to default profiles
- Increase in predicted peak day O_3 concentrations of up to 5 ppb with improved profiles

BUGs

- ~22 - 91 tons per "event" of additional NO_X in the Northeast if BUGs responded to a widespread demand event in an unlimited manner
- Increase in predicted event day O_3 concentrations of 1 ppb
- Review of state regulations → states are doing well in regulating these types of engines, i.e. true emergency use only, otherwise must be permitted and/or meet strict NO_X limits

Peaking Units

- Peaking units contributed ~6 - 34% of total OTR EGU NO_X mass for the episode days analyzed
- Estimated NO_X reduction potential in the OTR on 7/20/15:
  - 21 tons for combustion turbines
  - 184 tons for coal-fired EGUs

Workgroup Recommendations

Small EGUs

- ✓ Incorporate improved temporal profiles into photochemical modeling platforms - Complete

BUGs

- ➢ Maintain and improve both:
  - ➢ State regulations pertaining to the use of stationary diesel engines
  - ➢ Enforce efforts
- ➢ Conduct outreach and education regarding the proper use of such engines

Peaking Units

- ➢ Where not done so already, adopt NO_X RACT for gas and oil combustion turbines
- ➢ Pursue rulemaking or other mechanisms to ensure that all EGU types meet their best historic NO_X rates at all times during the ozone season
- ➢ Pursue HEDD-based rules (e.g. New Jersey's HEDD Rule)

HEDD Workgroup - Next Steps

- **Finalize White Paper**

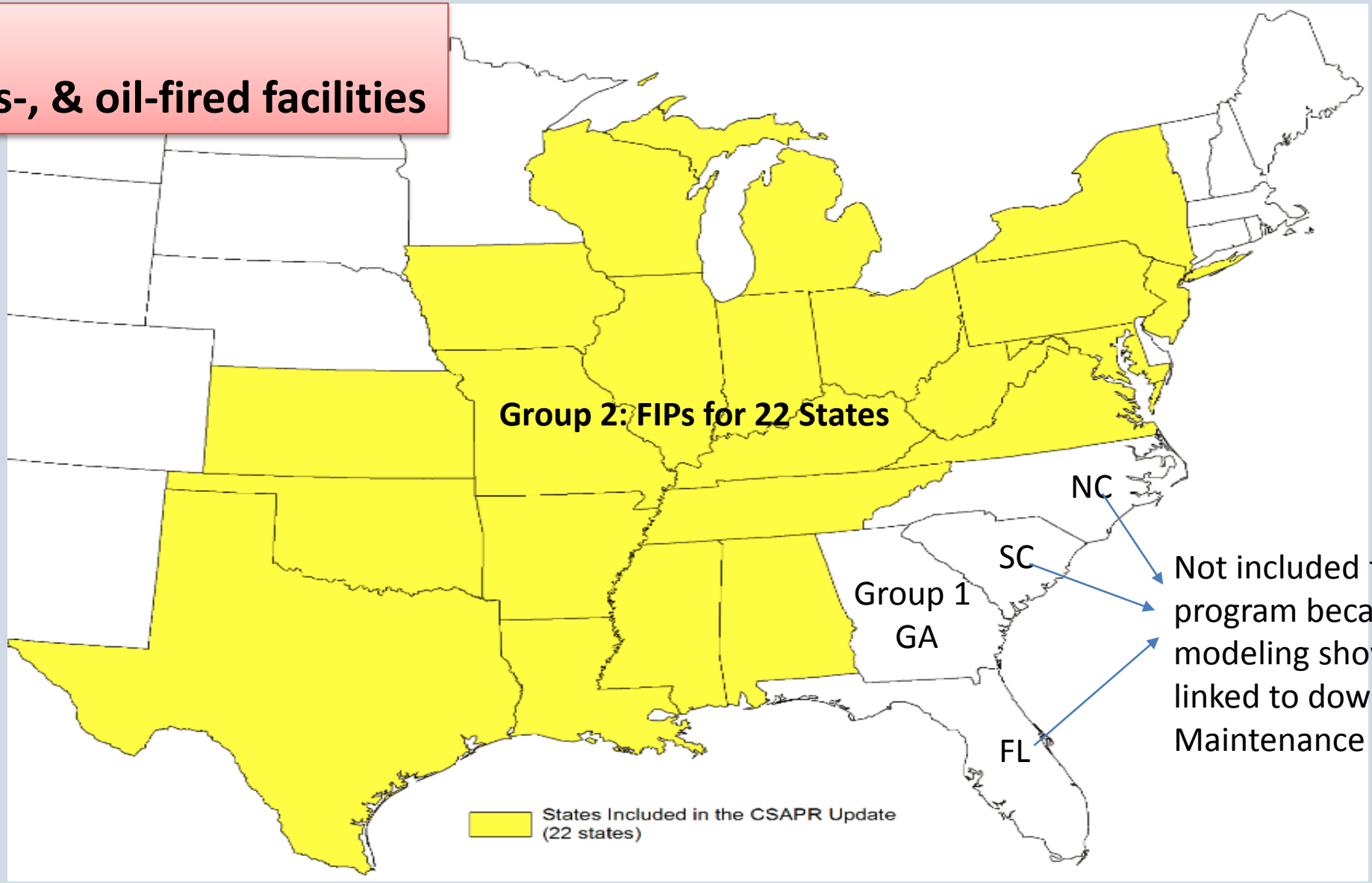
  Ready for public comment - deadline for comments 10/21/2016

- **Possible Future Study Topics:**

  - Peaking units on peak days outside of OTR
  - Diesel engines, installed with or without permits, where owner/operators don't know that certain operations are not permitted
  - The expanding use of microgrids
  - HEDD-based rules
  - Rules or limits based around forecasted high ozone-potential days

Final CSAPR Update for 2008 Ozone NAAQS - 9/7/2016

2,875 EGUs
886 coal-, gas-, & oil-fired facilities



Not included for NOx OS program because final modeling showed states not linked to downwind NA or Maintenance Receptors

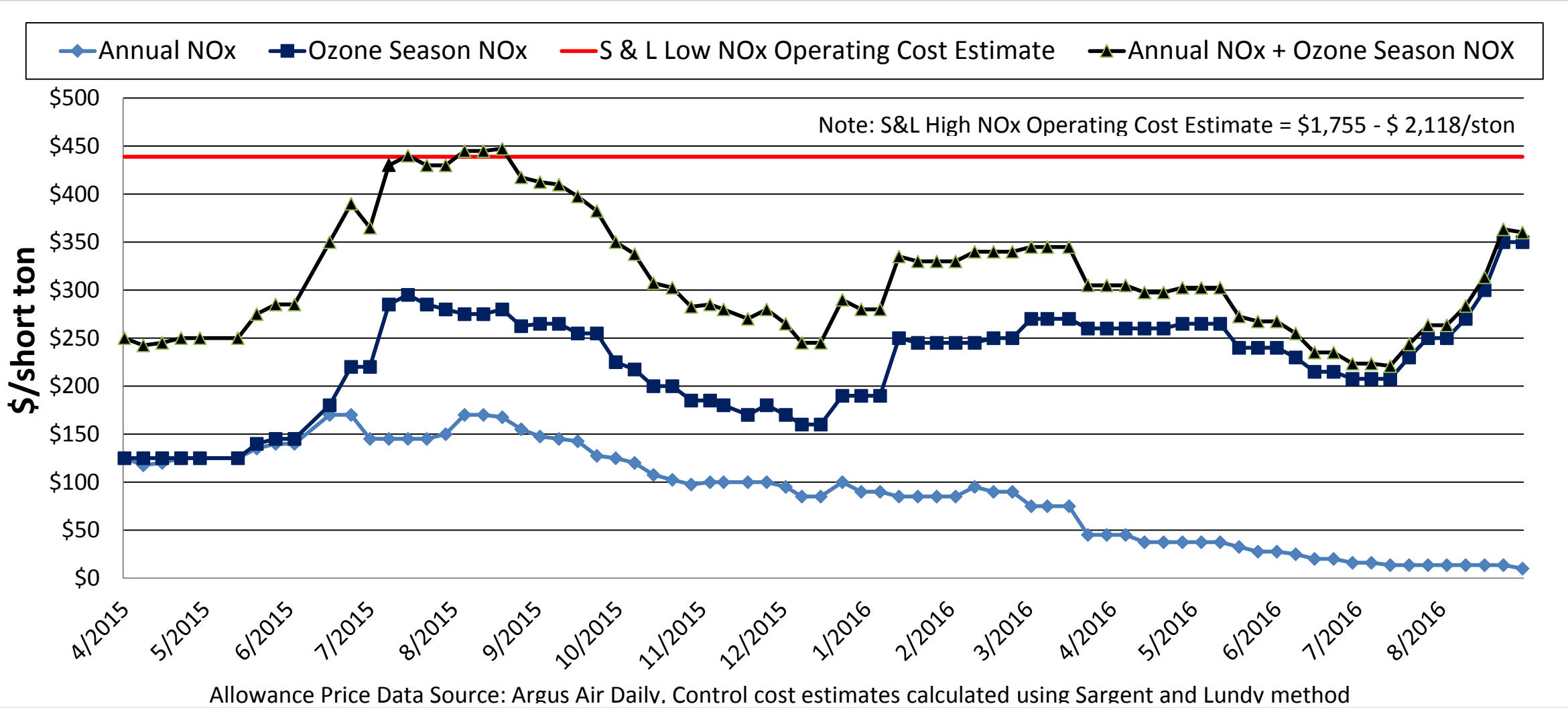
OS = Ozone season

Final CSAPR Update for 2008 Ozone NAAQS (Cont'd)

- Aligns compliance with July 2018 moderate attainment date for 2008 O3 NAAQS
- Focus on:
  - Eastern US (will handle on a case-by-case in western US)
  - EGUs, but will continue to review availability, cost-effectiveness, & timing of emission reductions from other sectors
- Uses 4-step framework to help states address interstate transport
- Allows states to replace FIPs starting in 2018 by submitting approvable SIPs
- Sets OS NO_X Statewide Budgets using historic data + projections of improvements in NO_X emission rates in each state
- Refinements lead to changes in individual state budgets, and increased combined total NO_X budgets by <5%
- Allowance Bank:
  - One-time conversion of a limited number of banked 2015 & 2016 NOx allowances for use in Group 2 states
  - Conversion limits banked NO_X allowances to 99,700 tons
- Benefits:
  - Update & other changes already underway with EGUs 20% or ~80,000 ton OS NOx reduction in eastern US in 2017 relative to 2015
  - Total benefits of $880 million/year (2011$) mostly from health care issues.

OTC → EPA: Update helps upwind states meet "Good Neighbor" obligations but still only a partial remedy

CSAPR Allowance Prices (4/17/15 - 9/2/16)



Allowance Price Data Source: Argus Air Daily. Control cost estimates calculated using Sargent and Lundy method

Still Cheaper to Buy Allowances than to Run Controls!

Top 25 NO_X Emitters: May-June 2016

Many Units with SCR Continue to Operate above the Best Observed Rate (BOR)

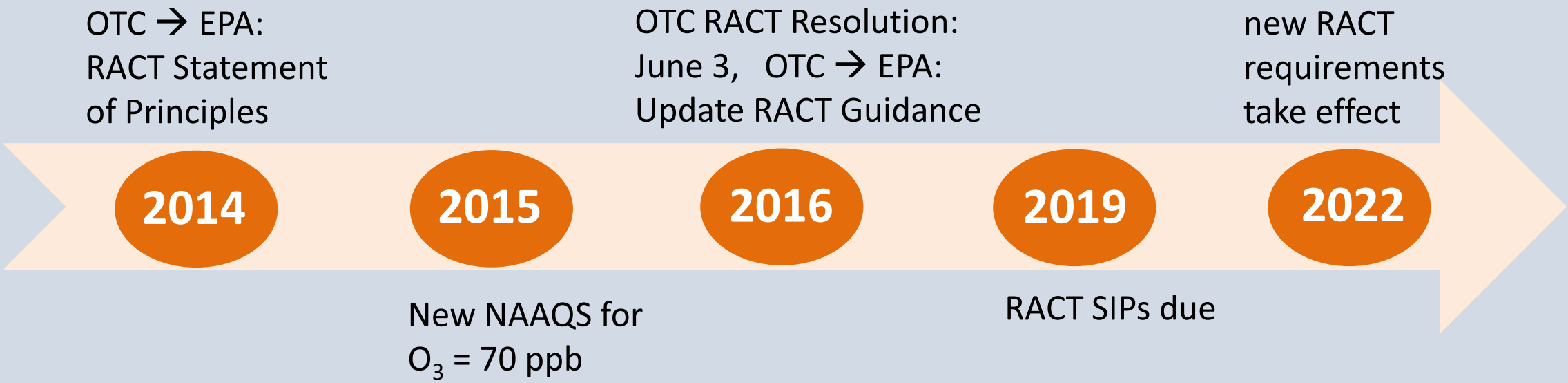
State	Facility Name	Facility - Unit ID	Avg. NOx Rate (lb/MMBtu)	NOx (tons)	SCR?	Best Observed Rate (lb/mmBTU)	Year
MO	New Madrid Power Plant	2167-2	0.653	2,201	Yes	0.094	2009
LA	Ninemile Point	1403-4	0.387	1,671			
IN	Rockport	6166-MB2	0.188	1,233			
OH	W H Zimmer Generating Station	6019-1	0.211	1,224	Yes	0.056	2006
LA	Ninemile Point	1403-5	0.356	1,122			
IN	Cayuga	1001-2	0.344	1,120			
FL	St. Johns River Power	207-1	0.429	997	Yes	0.127	2010
AR	Independence	6641-1	0.261	920			
TX	Limestone	298-LM2	0.194	895			
PA	Montour, LLC	3149-2	0.369	894	Yes	0.047	2003
PA	Bruce Mansfield	6094-3	0.186	879	Yes	0.074	2005
PA	Keystone	3136-1	0.220	858	Yes	0.042	2003
WV	Harrison Power Station	3944-2	0.235	858	Yes	0.066	2005
IN	Rockport	6166-MB1	0.191	842			
WV	Fort Martin Power Station	3943-1	0.281	828			
AR	Independence	6641-2	0.233	817			
VA	Clover Power Station	7213-1	0.276	803			
TX	Oklaunion Power Station	127-1	0.299	792			
PA	Keystone	3136-2	0.218	783	Yes	0.043	2008
PA	Conemaugh*	3118-1	0.199	764	Yes	0.199	2016
IN	IPL - Petersburg Generating Station	994-4	0.287	751			
NC	Marshall	2727-4	0.221	724			
OH	Gen J M Gavin	8102-1	0.120	724	Yes	0.069	2004
TX	Martin Lake	6146-1	0.153	714			
VA	Clover Power Station	7213-2	0.276	713			

*Conemaugh should be capable of achieving its sister plant Keystone's BORs, but has not been operated to that level.

RACT Workgroup

Committee Charge:

- Develop list of emission rates in each OTR state for significant NO_X and VOC categories;
- ID emissions range that each state has determined to be RACT.



➢ **Will send RACT paper to EPA for use in Guidance**

Reasonably Available Control Technology (RACT)

Draft NO_X RACT Whitepaper:

A. Text describes (non-EGU) sources and their control technologies:

1. Industrial/Commercial/Institutional Boilers
2. Stationary Gas (Combustion) Turbines
3. Stationary Reciprocating Engines
4. Municipal Waste Combustors
5. Cement Kilns
6. Hot Mix Asphalt Production Facilities
7. Glass Furnaces
8. Natural Gas Pipeline Compressors

B. Appendices present data on NO_X RACT emissions limits that OTC states have adopted to comply with the 2008 O_3 NAAQS.

Draft whitepaper ready for public comment – deadline for comments: 10/21/2016

- **Next Step for RACT Workgroup – VOC RACT white paper**

Technical Support Documents

✓ Work Product from OTC Stationary and Mobile Sources Committee: Draft NO_X and VOC Technical Support Documents

TSDs ready for public review and posted on the OTC website

These TSDs cover OTC Model Rules (2009 – 2014) for the following Mobile & Stationary Area Sources

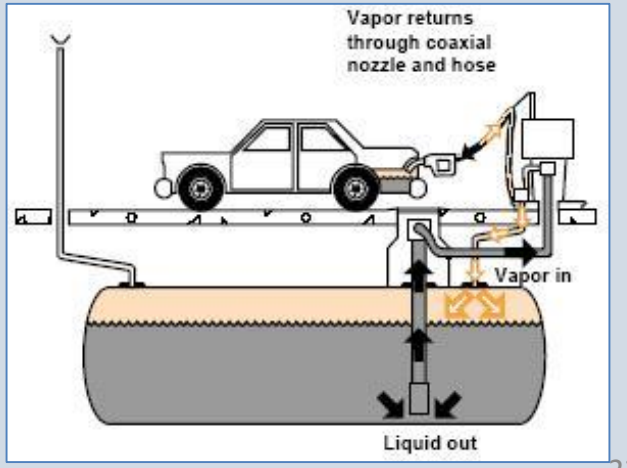
VOC Source Categories Stationary Sources	**NO_X Source Categories**	
	Stationary Sources	Mobile Sources
Stationary Above Ground Storage Tanks	Stationary Generators	Aftermarket Catalytic Converters
Consumer Products Motor Vehicle and Mobile Equipment Non-assembly Line Coating Operations	New Natural Gas-Fired Boilers, Steam Generators, Process Heaters, and Water Heaters, (75,000 - 5,000,000 BTU/hr)	Nonroad Anti-Idling
Architectural, Industrial and Maintenance (AIM) Coatings	High Electric Demand Day Combustion Turbines (HEDDCT)	
Solvent Degreasing	Oil & Gas Boilers Serving Electricity Generating Units (EGUs)	

VOC Workgroups Update

- Consumer Products (CP)
  - Met with CARB to discuss updates to their CP regulations
    - Considering updates to the OTC model rule
    - Recent CARB analysis → CARB regulations will significantly reduce VOCs & eliminate toxics by up to 99%
  - Several states are moving forward with adopting 2014 model rule

Vapor Recovery

- Continuing to provide a forum for states to discuss Vapory Recovery technologies and Stage II Removal



Extra Slides

Small Electric Generating Units (EGUs)(<25 MW)

SMOKE processing of small EGUs (<25 MW): is the model getting peak day emissions right?

- Annual emissions are known
- Typically operate for limited time periods:
    - HEDD periods (aka peak days)
    - When larger units are offline for maintenance
    - When necessary to ensure grid reliability

Large units' operating profiles developed from hourly CEMS data, but what about the smaller units – those without CEMS?

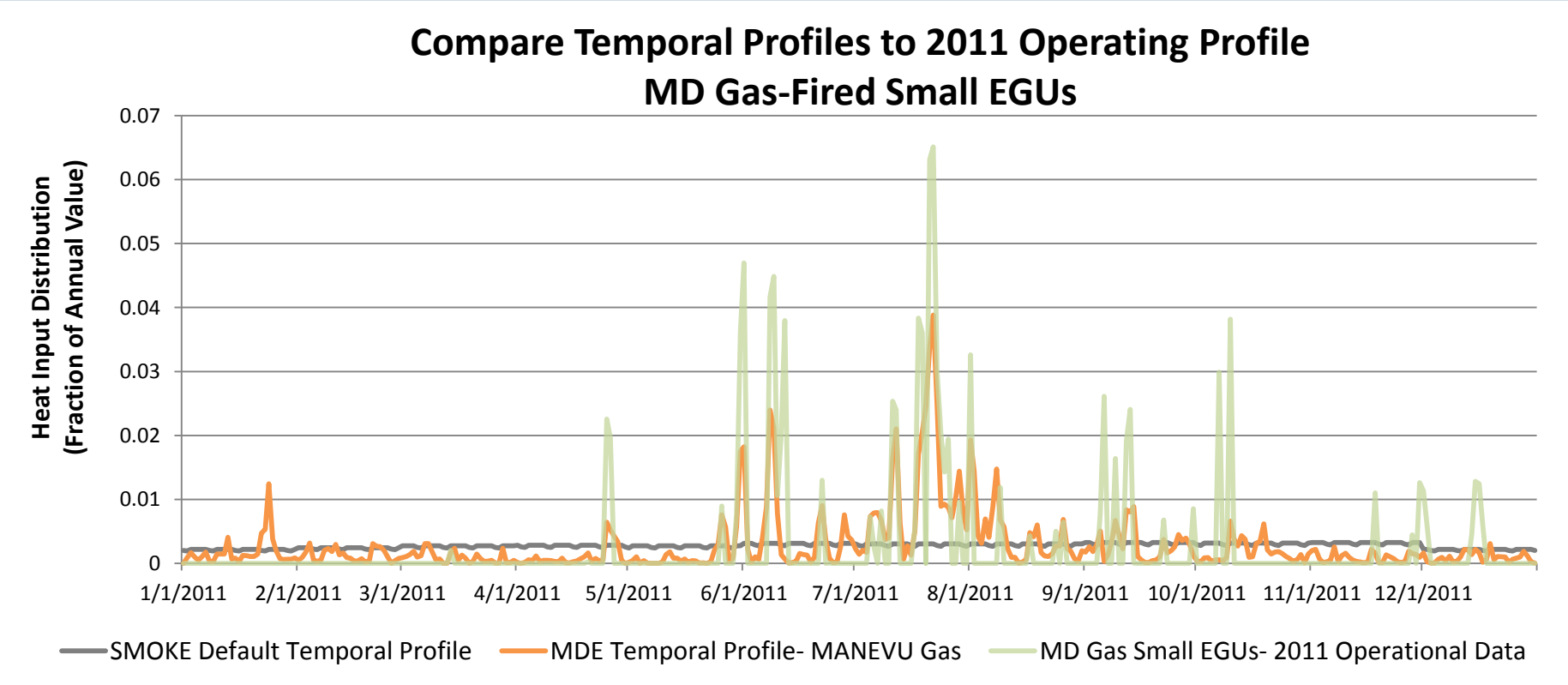
- Annual emissions known
- Temporal profiles used to distribute emissions to the hour

MDE developed more realistic temporal profiles for coal, oil, and gas-fired EGUs <25 MW.

- Profiles for these units should show limited annual operation, but high peak day operation

Temporal Profiles for Small EGUs (<25 MW)

- Not adding additional emissions to the inventory – simply changing the hourly distribution of annual emissions
- Default temporal profiles smear emissions fairly evenly throughout the year
- MDE's new temporal profiles allocate emissions based on CAMD data from peaking units
    - MDE also collected 2011 operating data from MD gas-fired small EGUs. New temporal profile closely matches actual operating profile.



Emissions Estimates for BUGs

NO_X Emissions in Tons/Day (or Tons/"Event")

Region	Low Bound	High Bound
ISO-NE	8	32
NY-ISO	7	30
PJM	7	29

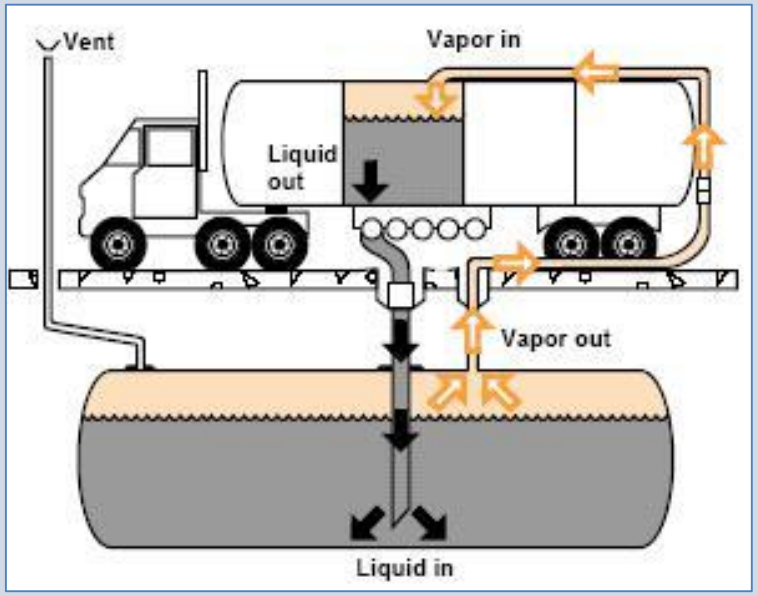
EGU Category, % Contribution to NOx, 2015

Unit Configuration	2015 Annual NO_X Mass (%)	2015 Annual Heat Input (%)	2015 OS NOx Mass (%)	2015 OS Heat Input (%)	7/20/15 NO_X Mass (%)	7/20/15 Heat Input (%)
Coal Steam	80.3	37.4	75.5	34.4	66	34.9
Oil Steam	6.3	5.1	6.9	5.4	7.4	6.8
Gas Steam	4.6	5.3	6.4	6.5	9.2	9.7
Wood Steam	0.7	0.9	0.7	0.8	0.5	0.6
Combined Cycle	5.3	47.7	6.4	48	5	39
Combustion Turbine (total)	2.7	3.6	3.9	4.9	11.8	9.4
Total	**100**	**100**	**100**	**100**	**100**	**100**
Subgroup Combustion Turbine:						
Oil	0.7	0.2	7	0.2	3.9	1.1
Gas	2	3.4	3.2	4.7	7.9	8.3
AMPD <25 MW	0.4	0.1	0.8	0.2	3.6	0.1
Subgroup Coal:						
All Post Combustion controls	71.9	33.8	66.6	31.4	56.8	31.4
SCR	64.7	30.2	59.9	27.9	48.8	27.1
SNCR	7.4	4	6.8	3.6	8.5	4.9
No Post Combustion Controls	8.2	3.1	8.7	2.6	9.1	2.9

Vapor Recovery Workgroup

Vapor Recovery from Gasoline Dispensing Facilities

Stage I ← **bulk fuel delivery** | **vehicle refueling & fuel storage** → **Stage II**



EPA:

Phase-in onboard refueling vapor recovery (ORVR) controls → Decommission Stage II VR systems.

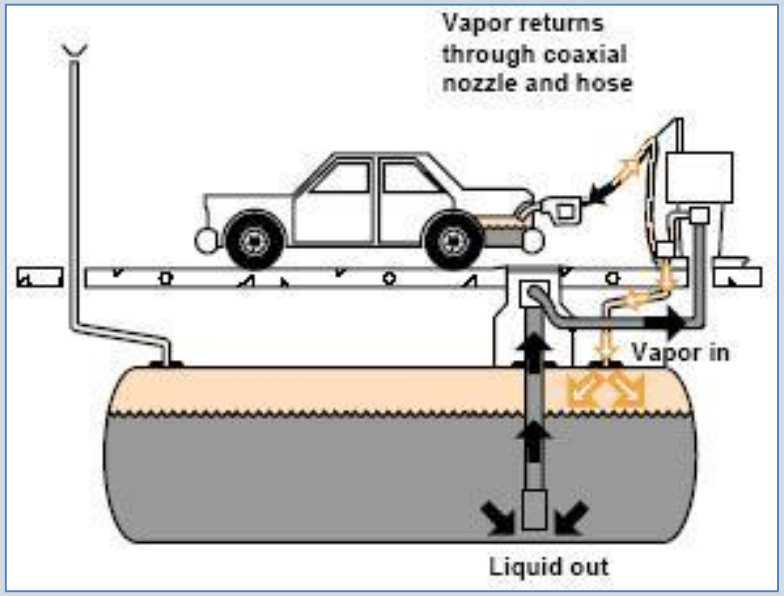
OTR:

Stage II Decommissioning Status:

- Mandatory: CT, MA, ME, NH, RI, VT;
- Optional: DE, MD, NY, VA;
- Not Allowed: NJ, some PA counties;

Enforcement Discretion & Options

- Enhanced inspection/monitoring regimen
- Stage I Enhanced Vapor Recovery (EVR)
- Continuous pressure monitoring (CPM)
- CARB-certified components



VR Components

- tanker truck ←→ underground tank couplers
- spill containment drain valves
- vent pressure/vacuum (P/V) valves
- overfill prevention devices

VR Components

- gas dispensers
- nozzles
- piping, break away valves, hoses, face plates
- vapor processors
- system monitors