

# OTC /MANE-VU Committees' Meeting

September 7, 2017

Hall of States, Washington DC.

Ali Mirzakhali, P.E.  
Stationary and Area Sources Committee



## OZONE TRANSPORT COMMISSION

# Stationary and Area Sources Committee (SAS)

- SAS Workgroup Products
  - Control Measures
    - Model Rule on NatGas Compressors
    - Cement Kiln Recommendations
    - GN SIP Statement
  - HEDD
    - Whitepaper with Strategies and Recommendations for Formal Action (Statement/Resolution/MOU)
- Future Work

# SAS Workgroups → Recommendations & Model Rules → Consider in GN SIPs Due in 2018

Largest Contributors Workgroup	Control Measures Workgroup	HEDD Workgroup
<p><u>2017 SAS Charge</u>            Report on OTC, EPA, &amp; individual state efforts on:            1. Optimal operation of existing EGU controls to ensure maximum NOx emission reductions, focusing on EGUs in OTC modeling domain            2. Addition of controls to large uncontrolled EGUs inside &amp; outside of the OTR.</p> <p><u>Units Covered</u>            EGUs ≥25 MW that report to CAMD            EGUs having no post-combustion controls            EGUs not running existing controls optimally</p> <p><u>Fuel Type</u>    Coal                              Residual Oil</p> <p><u>Performance Metric for Controls</u>            SCR = 0.10 lb/mmBTU            SNCR = 0.30 lb/mmBTU</p> <p><u>Geography</u>    States in CSAPR U + OTR + NC</p> <p style="text-align: center;"><b>Work in Progress</b></p>	<p><u>2017 SAS Charge</u>            3. Develop recommendations &amp; model rules for SAS strategies for 2018 Good Neighbor SIPs considering sector NOx/VOC emissions, potential emissions reduction, cost, ease of implementation, etc.</p> <p><u>Source sectors</u>            Pipeline Compressors            Cement Kilns</p> <p><u>Fuel type</u>    Coal                              Residual Oil                              Natural Gas</p> <p><u>Geography</u>            States in CSAPR U + OTR</p>	<p><u>2017 SAS Charge</u>            4. Develop recommendations for at least one specific strategy to reduce HEDD emissions and an implementation mechanism.</p> <p><u>Units covered</u>            boilers serving EGUs            ICI boilers            simple cycle &amp; combined cycle combustion turbines            landfill/digester gas-fired reciprocating engines            other fuel-burning equipment</p> <p><u>Fuel type</u>    Coal                              Residual Oil or Other Oils                              Natural Gas</p> <p><u>Strategies</u>    Rule-Based (enforceable)                              Outreach-Based (voluntary)</p> <p><u>Geography</u>    States in OTR</p>

# Top 25 2016 Ozone Season OTR/CSAPR State NOx Emitters with SCR or SNCR

	State	Facility Name	Facility - Unit ID	Avg. NOx Rate (lb/MMBtu)	NO <sub>x</sub> (tons)	2017 Allocations	SCR?	SNCR?	Best Observed Rate (lb/mmBTU)	Year
1	MO	New Madrid Power Plant	2167-2	0.457	3,832	695	Yes		0.094	2009
2	OH	W H Zimmer Generating Station	6019-1	0.199	3,239	1,063	Yes		0.056	2006
3	MO	New Madrid Power Plant	2167-1	0.709	3,000	681	Yes		0.090	2008
4	PA	Montour, LLC	3149-1	0.379	2,316	478	Yes		0.044	2003
5	MO	Thomas Hill Energy Center	2168-MB3	0.233	2,225	907	Yes		0.054	2009
6	PA	Montour, LLC	3149-2	0.233	2,225	432	Yes		0.047	2003
7	PA	Cheswick	8226-1	0.302	2,791	1,000	Yes		0.060	2003
8	VA	Clover Power Station	7213-1	0.356	2,460	349		Yes	0.232	2003
9	WV	Harrison Power Station	3944-3	0.277	2,052	696	Yes		0.066	2005
10	MO	Thomas Hill Energy Center	2168-MB2	0.186	2,033	397	Yes		0.066	2009
11	PA	Bruce Mansfield	6094-3	0.185	2,009	656	Yes		0.074	2005
12	WV	Harrison Power Station	3944-2	0.241	2,004	648	Yes		0.067	2006
13	KY	Paradise	1378-3	0.221	1,933	1,280	Yes		0.100	2005
14	OH	Gen J M Gavin	8102-1	0.113	1,912	1,132	Yes		0.069	2004
15	OH	Killen Station	6031-2	0.233	1,904	572	Yes		0.089	2005
16	VA	Clover Power Station	7213-2	0.268	1,867	344		Yes	0.229	2003
17	PA	Keystone	3136-1	0.183	1,859	657	Yes		0.042	2003
18	PA	Homer City	3122-3	0.267	1,854	439	Yes		0.087	2005
19	PA	Conemaugh	3118-1	0.197	1,822	616	Yes		0.069	2017
20	PA	Keystone	3136-2	0.190	1,749	665	Yes		0.043	2008
21	WV	Mountaineer (1301)	6264-1	0.108	1,688	579	Yes		0.039	2007
22	LA	Dolet Hills Power Station	51-1	0.200	1,663	1,239	Yes		0.178	2011
23	PA	Bruce Mansfield	6094-2	0.156	1,626	599	Yes		0.080	2004
24	IA	George Neal South	7343-4	0.188	1,568	910	Yes		0.187	2015
25	AL	Gorgas	8-10	0.164	1,543	577	Yes		0.064	2004

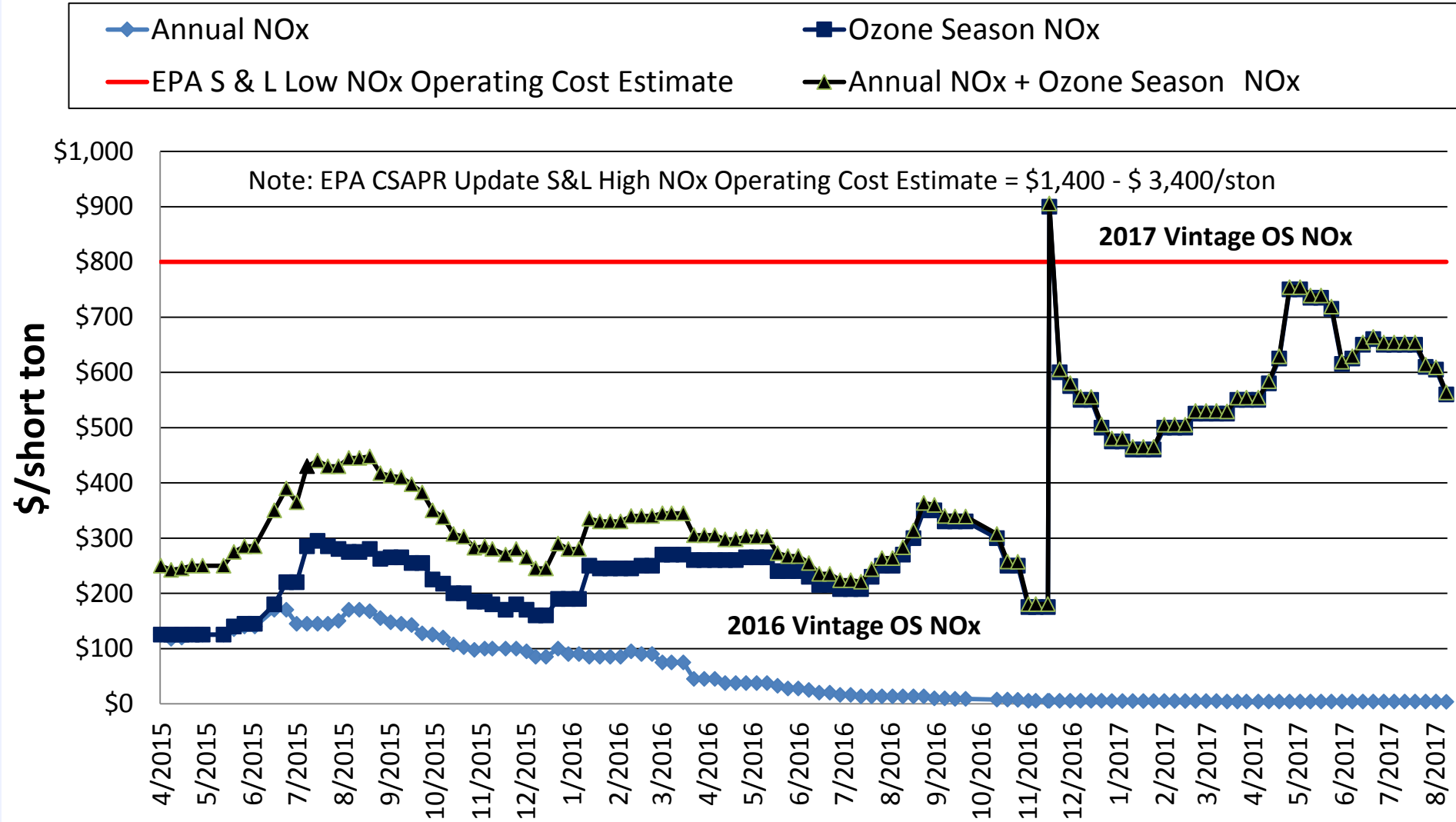
**Many Units with SCR Continue to Operate above the Best Observed Rate (BOR)**

# Top 25 2016 Ozone Season CSAPR State NO<sub>x</sub> Emitters

	State	Facility Name	Facility - Unit ID	Avg. NO <sub>x</sub> Rate (lb/MMBtu)	NO <sub>x</sub> (tons)	2017 Allocations
1	LA	Ninemile Point	1403-4	0.394	3,918	662
2	IN	Rockport	6166-MB2	0.195	3,444	2,153
3	LA	Ninemile Point	1403-5	0.346	2,922	746
4	TX	Oklunion Power Station	127-1	0.302	2,791	1,000
5	AR	Independence	6641-1	0.273	2,686	980
6	IN	Rockport	6166-MB1	0.197	2,578	2,229
7	AR	Independence	6641-2	0.247	2,528	1,006
8	AR	White Bluff	6009-1	0.356	2,460	1,084
9	WV	Fort Martin Power Station	3943-1	0.293	2,416	590
10	PA	Brunner Island, LLC	3140-3	0.401	2,414	452
11	TX	Limestone	298-LM2	0.198	2,369	1,482
12	IN	Cayuga	1001-2	0.296	2,320	723
13	IA	Walter Scott Jr. Energy Center	1082-3	0.401	2,414	1,052
14	VA	Clover Power Station	7213-1	0.709	3,000	349
15	IN	IPL - Petersburg Generating Station	994-4	0.272	1,966	894
16	AR	White Bluff	6009-2	0.307	1,874	1,063
17	VA	Clover Power Station	7213-2	0.268	1,867	344
18	TX	Limestone	298-LM1	0.197	1,854	1,350
19	LA	Little Gypsy	1402-3	0.407	1,848	415
20	MI	Belle River	6034-2	0.207	1,840	1,031
21	TX	H W Pirkey Power Plant	7902-1	0.157	1,791	1,186
22	TX	Martin Lake	6146-1	0.153	1,783	1,363
23	NC	Marshall	2727-4	0.230	1,778	526
24	WV	Fort Martin Power Station	3943-2	0.313	1,762	582
25	IN	Cayuga	1001-1	0.314	1,690	740

- All Coal Units Except in LA (NG Units)
- SCR Units Excluded

# CSAPR Allowance Prices (4/17/15 – 8/25/17)

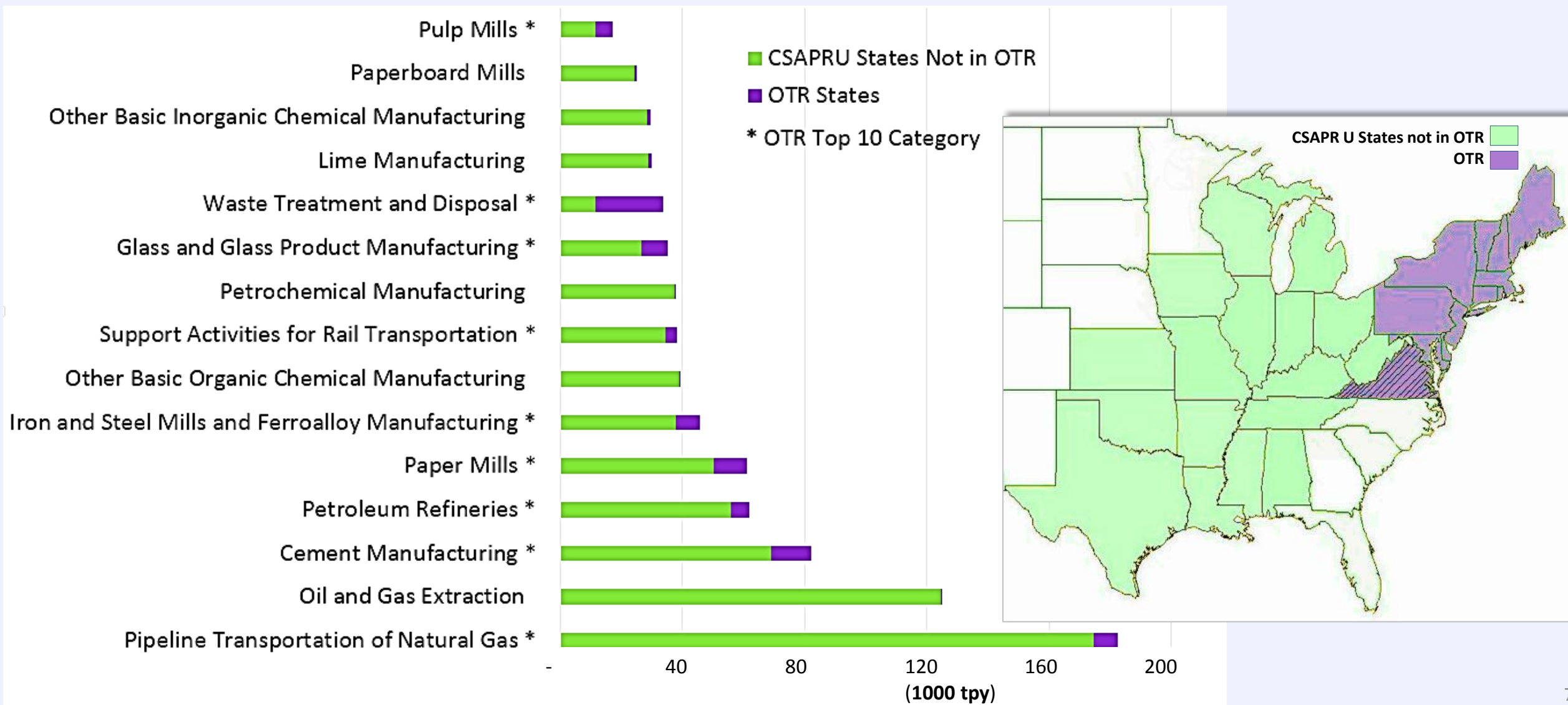


Allowance Price Data Source: Argus Air Daily, Control cost estimates calculated using Sargent and Lundy method

**Still Cheaper to Buy Allowances than to Run Controls in most cases!**

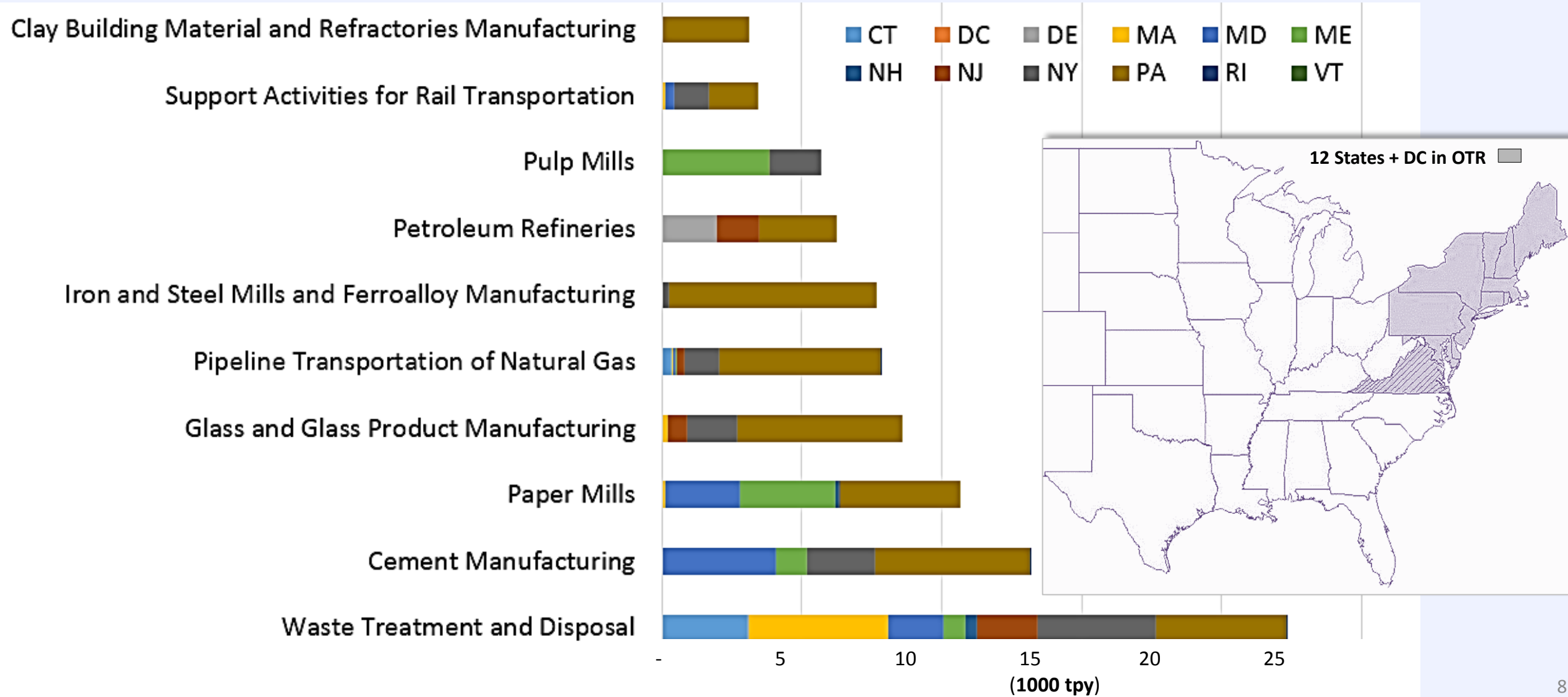
# Control Measures Workgroup

Top 15 NOx Emitting Stationary Source Categories in CSAPR Update & OTR States (Excluding EGUs, Airport LTO, & Sources from VA); Source: 2014 NEI v.1



# Control Measures Workgroup (Continued)

Top 10 NOx Emitting Stationary Source Categories in OTR (Excluding EGUs, Airport LTO, & Sources from VA); Source: 2014 NEI v.1





# Control Measures Workgroup & Recommendations

## 2017 SAS Charge #3

Develop recommendations & model rules for SAS strategies for 2018 Good Neighbor SIPs considering sector NOx/VOC emissions, potential emissions reduction, cost, ease of implementation, etc.

### Source sectors

Pipeline Compressors  
Cement Kilns

Fuel type      Coal  
                     Residual Oil  
                     Natural Gas

Geography   States in CSAPR U + OTR

## Whitepaper summarizing Control Measures for Two Sources

- A. Good Neighbor provision for the 2015 Ozone NAAQS under the CAA
- B. Two NOx Emissions Source Categories
  - 1. Natural Gas Pipeline Compressor Prime Movers
    - i. Emissions Control
    - ii. Opportunities for Further Emissions Reductions
  - 2. Cement Manufacturing
    - i. Cement Plants in the OTR and CSAPR Update States
    - ii. Existing NOx Emissions Control
    - iii. Recommendations for NOx Emissions Control

- ✓ **Model Rule for Control of NOx Emissions from Natural Gas Pipeline Compressor Fuel-Fired Prime Movers (Two & Four Stroke Lean & Rich Burn ICE, Combustion Turbines)**
- ✓ **Recommendations on Cement Kilns (Wet, Long Dry, Dry Preheater & Precalciner Kilns)**

# NOx Limits in the Model Rule for NatGas Pipeline Compressor Fuel-Fired Prime Movers

## Four-Stroke Rich Burn ICE

Nameplate Rating (HP)	NOx Rate (g/BHP-hr) or (% Reduction)
200 - 499	1.5 (90%)
500 - 1999	1.5 (90%)
≥2000	1.0 (95%)

## Four-Stroke Lean Burn ICE

Nameplate Rating (HP)	NOx Rate (g/BHP-hr) or (% Reduction)
200 - 499	1.5 (90%)
500 - 1999	1.5 (90%)
≥2000	1.5 (90%)

## Two-Stroke Lean Burn ICE

Nameplate Rating (HP)	NOx Rate (g/BHP-hr) or (% Reduction)
200 - 499	2.0 (80%)
500 - 1999	1.5 (80%)
≥2000	1.5 (90%)

## Combustion Turbines\*

Nameplate Rating (HP) (MW)	NOx Rate (ppmvd @ 15% O <sub>2</sub> )
≤2000 (1.5)	150.0 (6.0 lb/MW-hr)
2000 - 4999 (1.5-3.7)	50.0 (2.0 lb/MW-hr)
≥5000 (3.7)	25.0 (1.0 lb/MW-hr)

# Recommendations to Reduce NOx from Cement Kilns

- Adopt Emission Guidelines for Cement Kilns per 2006 OTC Resolution

Kiln Type	Emission Rate (lbs NOx/ton of clinker produced)	% Reduction from Uncontrolled
Wet Kiln	3.88	60
Long Dry Kiln	3.44	60
(Dry) Preheater Kiln	2.36	60
(Dry) Precalciner Kiln	1.52	60

- Install low NOx burners on all kilns
- Modify each kiln to implement mid-kiln firing
- Install post-combustion SNCR
- Convert and retrofit a wet process cement kiln to dry cement manufacturing process.

# High Electricity Demand Day (HEDD) Workgroup & Recommendations

## 2017 SAS Charge

Develop recommendations for at least one specific strategy to reduce High Electricity Demand Day (HEDD) emissions & an implementation mechanism.

### WHITEPAPER

- **Enforceable Rule-Based Strategy** to Limit NOx Emissions from Boilers, Turbines, and Other Combustion Devices
  1. Applicability: (a) Sources not Major for NOx; (b) Exemptions
  2. Daily NOx Mass Emissions Limit
  3. Emission Rate Limitations: (a) Boilers serving EGUs; (b) ICI boilers; (c) Simple cycle combustion turbines; (d) Combined cycle combustion turbines; (e) Reciprocating engines; (f) Additional fuel burning devices.
  4. Tune-up Requirements
  5. Record Keeping and Reporting
- **Enforceable Rule-Based Strategy** to Further Limit NOx from Non-Emergency Generators Powered by Reciprocating Engines

<b>Installed before June 1, 2018:</b>
<b>4.0 lb/MWh (1.3 g/bk hp-hr)</b>
<b>Installed on or after June 1, 2018:</b>
<b>0.6 lb/MWh (0.2 g/bk hp-hr)</b>

  1. Applicability
  2. Emissions Limitations
  3. Record Keeping and Reporting
  4. Registration
- **Voluntary Outreach-Based Strategy**
  1. General Public; 2. Facility Owners
- **3 Options for an Implementation Mechanism**
  1. Statement, 2. Resolution, Option 3. MOU
- Reciprocating Engines and Federal New Source Performance Standards

# Consumer Products Workgroup

- CARB 2008, parts of 2009, 2010, 2012 and 2013 rules reviewed
- Nearly 40 Product Categories identified for update
- Considering excluding:
  - a. Anti-seize lubricant**
  - b. Cutting or tapping oil**
  - c. Gear, chain or wire lubricant**
  - d. Rust preventative or rust control lubricant**
- Approximately 25 tons per day reduction of VOCs within OTR

# Recommendations for Future Work / 2018 SAS Charges

<b>Largest Contributors</b>	<ul style="list-style-type: none"><li>• Complete analysis for EGU status reports 1&amp;2 before making recommendations</li><li>• 24h averaging</li></ul>
<b>Control Measures</b>	<ul style="list-style-type: none"><li>• Estimate potential reductions &amp; costs for each measure</li><li>• All GN SIPs should contain the recommended measures</li></ul>
<b>HEDD</b>	<ul style="list-style-type: none"><li>• Compile database of Major and non-Major non-CAMD sources that supply to, or offset from, the electricity grid</li><li>• Evaluate potential daily emission reductions from control strategies</li></ul>
<b>Consumer Products</b>	<ul style="list-style-type: none"><li>• Update Model Rule by 1<sup>st</sup> Quarter of 2018</li><li>• Recommend inclusion in GN SIPs</li></ul>
<b>AIM</b>	<ul style="list-style-type: none"><li>• Monitor CARB survey results and update model rule as appropriate</li><li>• Recommend inclusion in GN SIPs</li></ul>

# Questions?

