OTC /MANE-VU Fall Meeting

Nov. 14-15, 2017

Washington, DC

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





OZONE TRANSPORT COMMISSION

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Stationary and Area Sources Committee (SAS)

- SAS Workgroup Products
- Recommendations for Future Work

SAS Workgroup Products

- Largest Contributors/EGUs (SAS Charges #1 & 2)
  - ❖ Reports on Optimal Operation/Installation of Controls on EGUs

Work in Progress

- Control Measures
  - ✓ Model Rule on Natural Gas Compressor Prime Movers
  - ✓ Cement Kiln Recommendations

- High Electricity Demand Day (HEDD)
  - ✓ Strategies & Implementation Recommendations

Top 25 2016 Ozone Season CSAPR State NOx Emitters

	State	Facility Name	Facility - Unit ID	Avg. NOx Rate (lb/MMBtu)	NO_x (tons)	2017 Allocations	SCR?	Best Observed Rate (lb/mmBTU)	Year
1	LA	Ninemile Point	1403-4	0.394	3,918	662			
2	MO	New Madrid Power Plant	2167-2	0.457	3,832	695	Yes	0.094	2009
3	IN	Rockport	6166-MB2	0.195	3,444	2,153			
4	OH	W H Zimmer Generating Station	6019-1	0.199	3,239	1,063	Yes	0.056	2006
5	MO	New Madrid Power Plant	2167-1	0.709	3,000	681	Yes	0.090	2008
6	LA	Ninemile Point	1403-5	0.346	2,922	746			
7	TX	Oklaunion Power Station	127-1	0.302	2,791	1,000			
8	AR	Independence	6641-1	0.273	2,686	980			
9	IN	Rockport	6166-MB1	0.197	2,578	2,229			
10	AR	Independence	6641-2	0.247	2,528	1,006			
11	AR	White Bluff	6009-1	0.356	2,460	1,084			
12	WV	Fort Martin Power Station	3943-1	0.293	2,416	590			
13	PA	Brunner Island, LLC	3140-3	0.401	2,414	452			
14	TX	Limestone	298-LM2	0.198	2,369	1,482			
15	IN	Cayuga	1001-2	0.296	2,320	723			
16	PA	Montour, LLC	3149-1	0.379	2,316	478	Yes	0.044	2003
17	MO	Thomas Hill Energy Center	2168-MB3	0.233	2,225	907	Yes	0.054	2009
18	PA	Montour, LLC	3149-2	0.233	2,225	432	Yes	0.047	2003
19	IA	Walter Scott Jr. Energy Center	1082-3	0.373	2,129	1,052			
20	PA	Cheswick	8226-1	0.196	2,128	310	Yes	0.060	2003
21	VA	Clover Power Station	7213-1	0.356	2,460	349			
22	WV	Harrison Power Station	3944-3	0.277	2,052	696	Yes	0.066	2005
23	MO	Thomas Hill Energy Center	2168-MB2	0.186	2,033	397	Yes	0.066	2009
24	PA	Bruce Mansfield	6094-3	0.185	2,009	656	Yes	0.074	2005
25	WV	Harrison Power Station	3944-2	0.241	2,004	648	Yes	0.067	2006

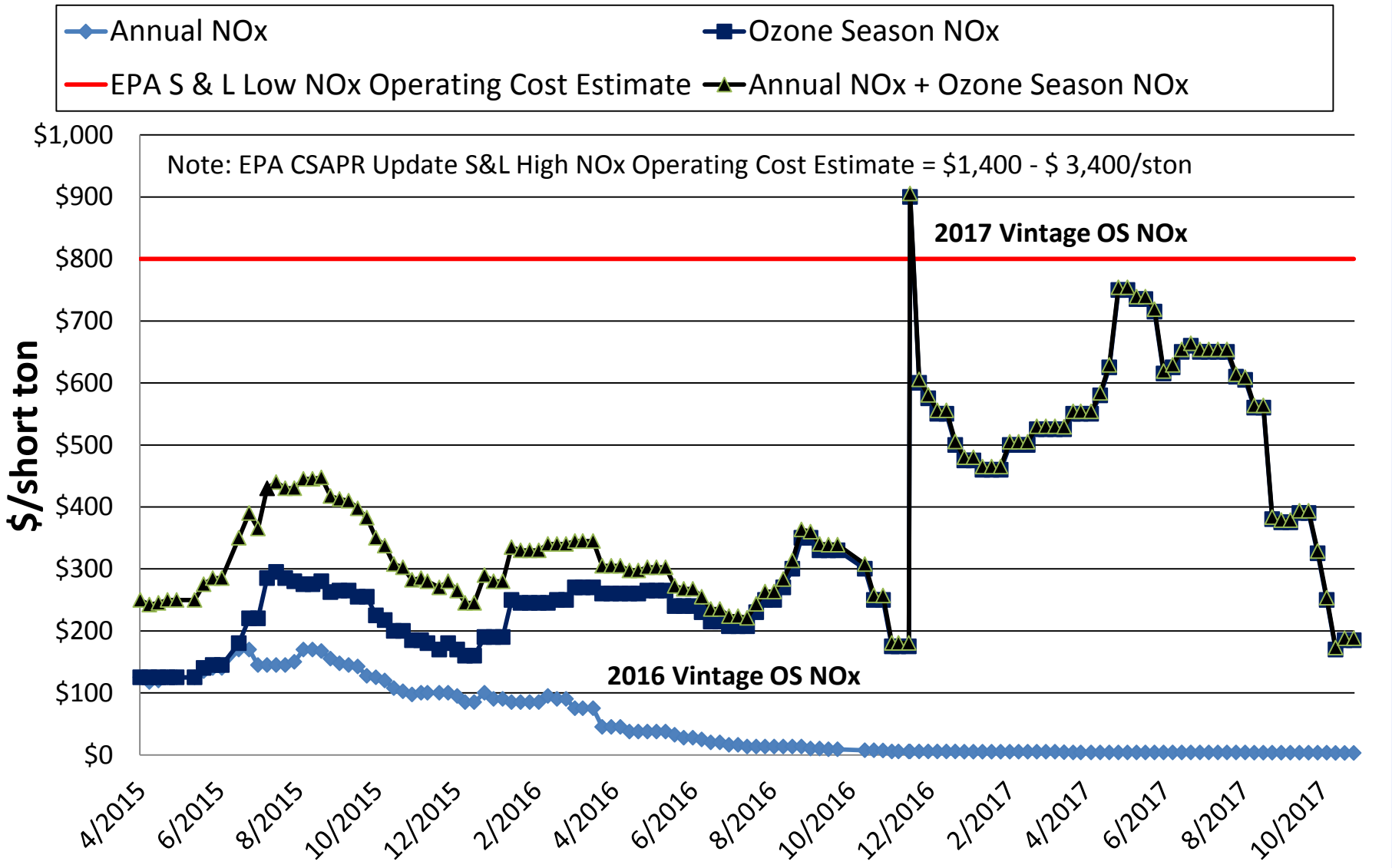
Many Units with SCR Continue to Operate above the Best Observed Rate (BOR)

Top 25 2017 Ozone Season CSAPR State NOx Emitters

	State	Facility Name	Facility - Unit ID	Avg. NOx Rate (lb/MMBtu)	NO_x (tons)	SCR?	Best Observed Rate (lb/mmBTU)	Year	2017 Allocations
1	AR	White Bluff	6009-1	0.296	3,748				2,116
2	IN	Rockport	6166-MB2	0.203	3,421				1,858
3	AR	Independence	6641-2	0.245	3,009				2,017
4	OH	W H Zimmer Generating Station	6019-1	0.191	2,972	Yes	0.056	2006	1,325
5	WV	Fort Martin Power Station	3943-2	0.312	2,584				875
6	OH	Killen Station	6031-2	0.267	2,561	Yes	0.089	2005	719
7	IA	Walter Scott Jr. Energy Center	1082-3	0.221	2,499				1,517
8	KY	Paradise	1378-3	0.231	2,425	Yes	0.100	2005	1,303
9	TX	Limestone	298-LM2	0.185	2,373				1,329
10	LA	Ninemile Point	1403-5	0.276	2,037				994
11	WV	Fort Martin Power Station	3943-1	0.302	1,870				912
12	TX	Limestone	298-LM1	0.168	1,850				1,206
13	MI	Belle River	6034-2	0.221	1,825				926
14	IA	Louisa	6664-101	0.191	1,817				1,523
15	OH	Gen J M Gavin	8102-1	0.105	1,806	Yes	0.069	2004	1,517
16	OK	Muskogee	2952-6	0.269	1,778				624
17	WV	Mountaineer (1301)	6264-1	0.099	1,773	Yes	0.039	2007	1,979
18	TX	Martin Lake	6146-1	0.160	1,714				1,166
19	IN	IPL - Petersburg Generating Station	994-4	0.237	1,696				750
20	IN	Rockport	6166-MB1	0.176	1,673				1,823
21	AR	Independence	6641-1	0.240	1,671				1,840
22	TX	Martin Lake	6146-2	0.160	1,631				1,126
23	LA	Ninemile Point	1403-4	0.237	1,618				877
24	MI	Belle River	6034-1	0.197	1,608				875
25	TX	H W Pirkey Power Plant	7902-1	0.166	1,598				1,090

Fewer Units with SCR Continue to Operate Substantially Above the Best Observed Rate (BOR)

CSAPR Allowance Prices (4/17/15 – 11/10/2017)



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

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

Control Measures Workgroup

2017 SAS Charge: 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.

Whitepaper on Control Measures for Two Source Categories

A. Good Neighbor provision for the 2015 Ozone NAAQS under the CAA

B. Recommendations for NOx Emissions Control for 2 Source Categories

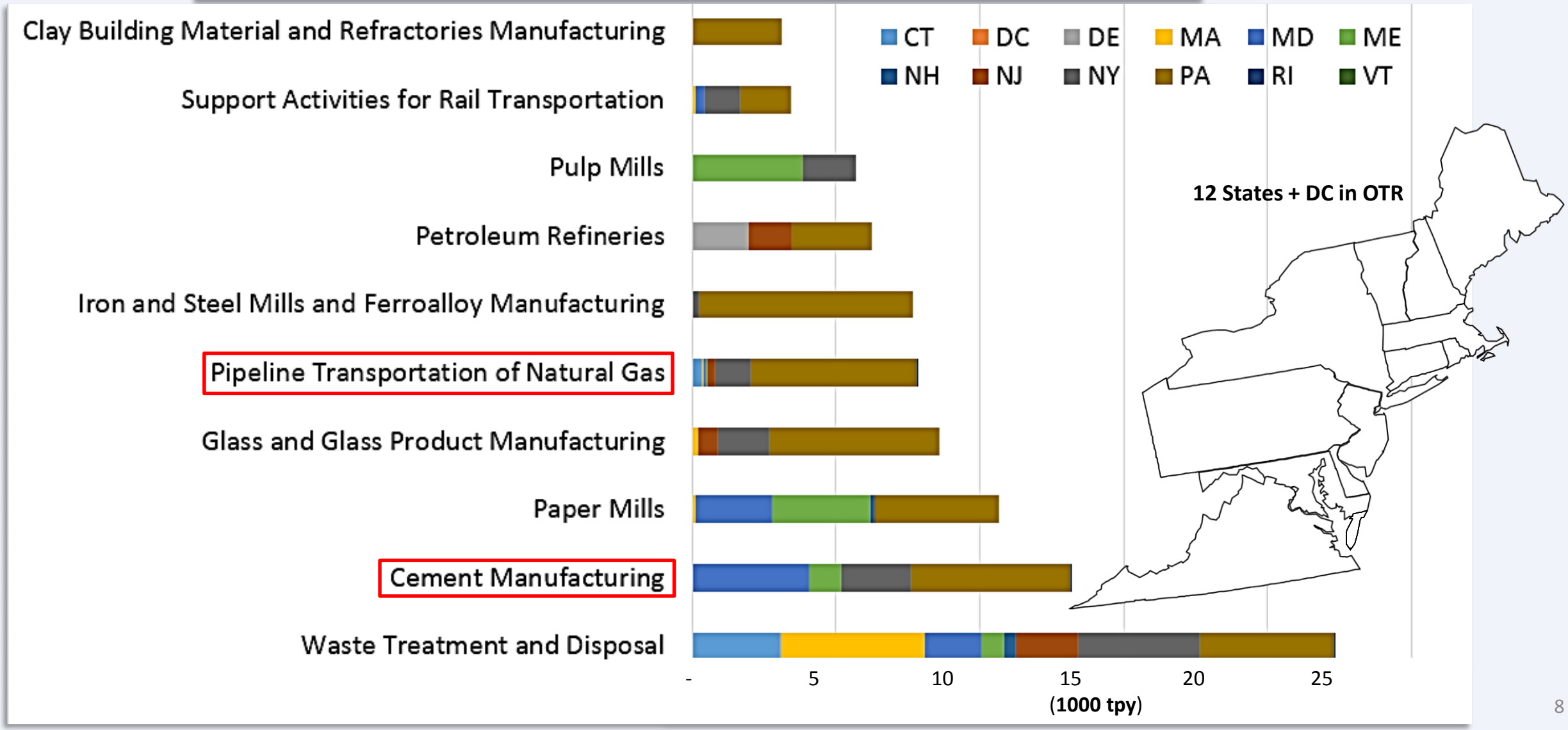
1. **Model Rule for Control of NOx Emissions from Natural Gas Pipeline Compressor Fuel-Fired Prime Movers** – ***included in GN SIP resolution***

2. **Recommendations on Cement Kilns** – ***not included in GN SIP resolution***

Control Measures Workgroup

Top 10 NOx Emitting Stationary Source Categories in OTR

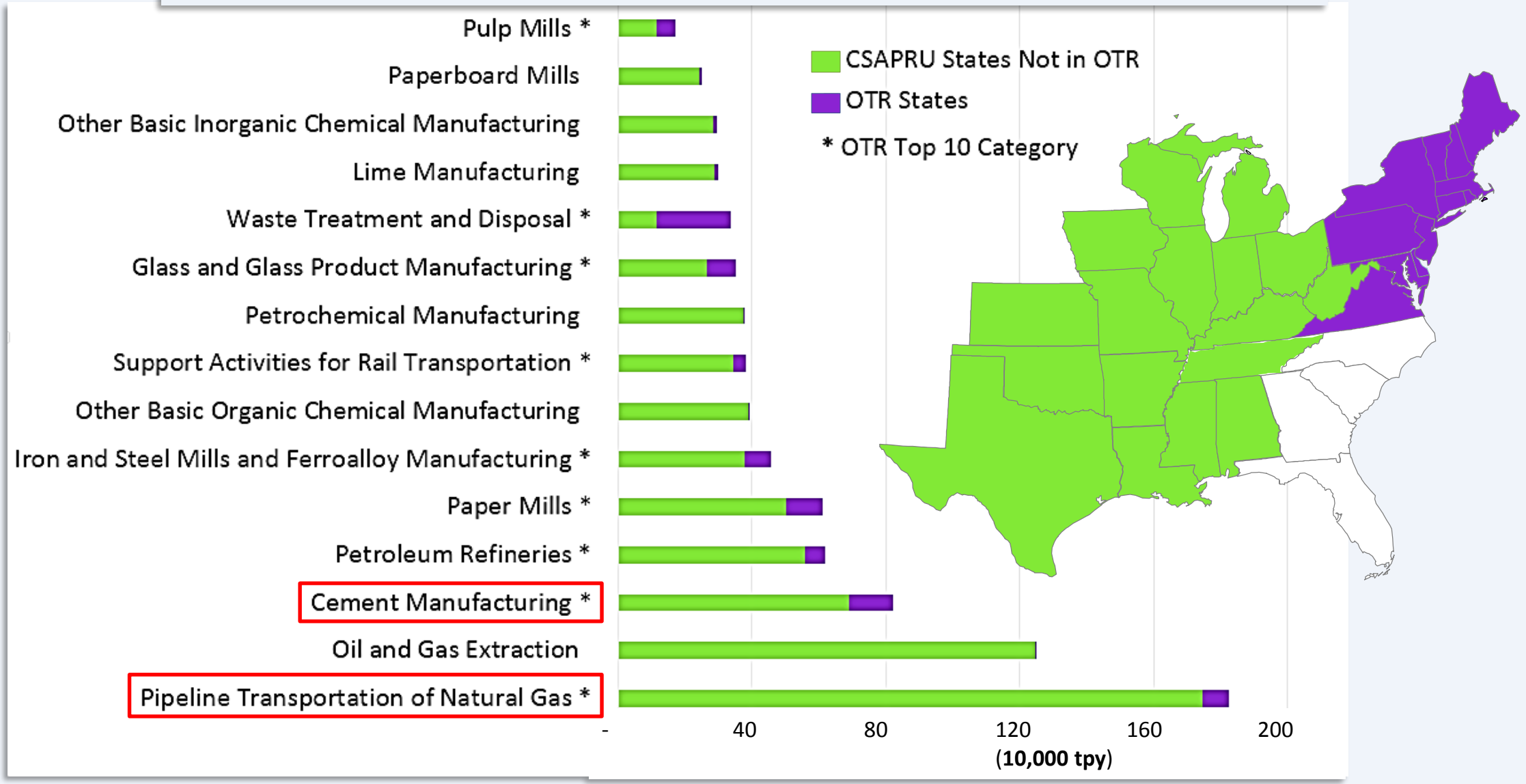
(Excluding EGUs, Airport LTO, & Sources from VA; Source: 2014 NEI v.1)



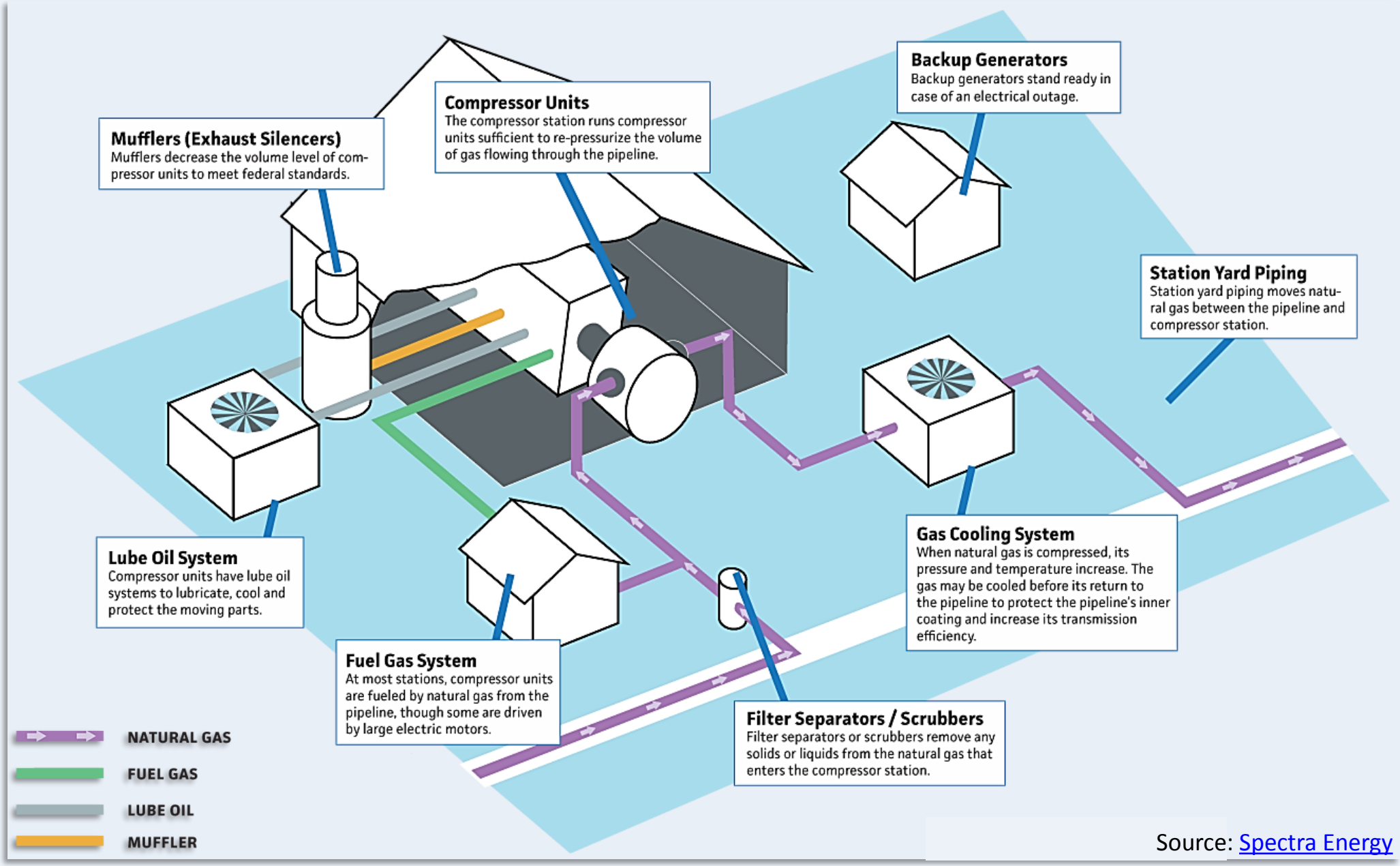
Control Measures Workgroup

Top 15 NOx Emitting Stationary Source Categories in CSAPR U & OTR

(Excluding EGUs, Airport LTO, & Sources from VA; Source: 2014 NEI v.1)

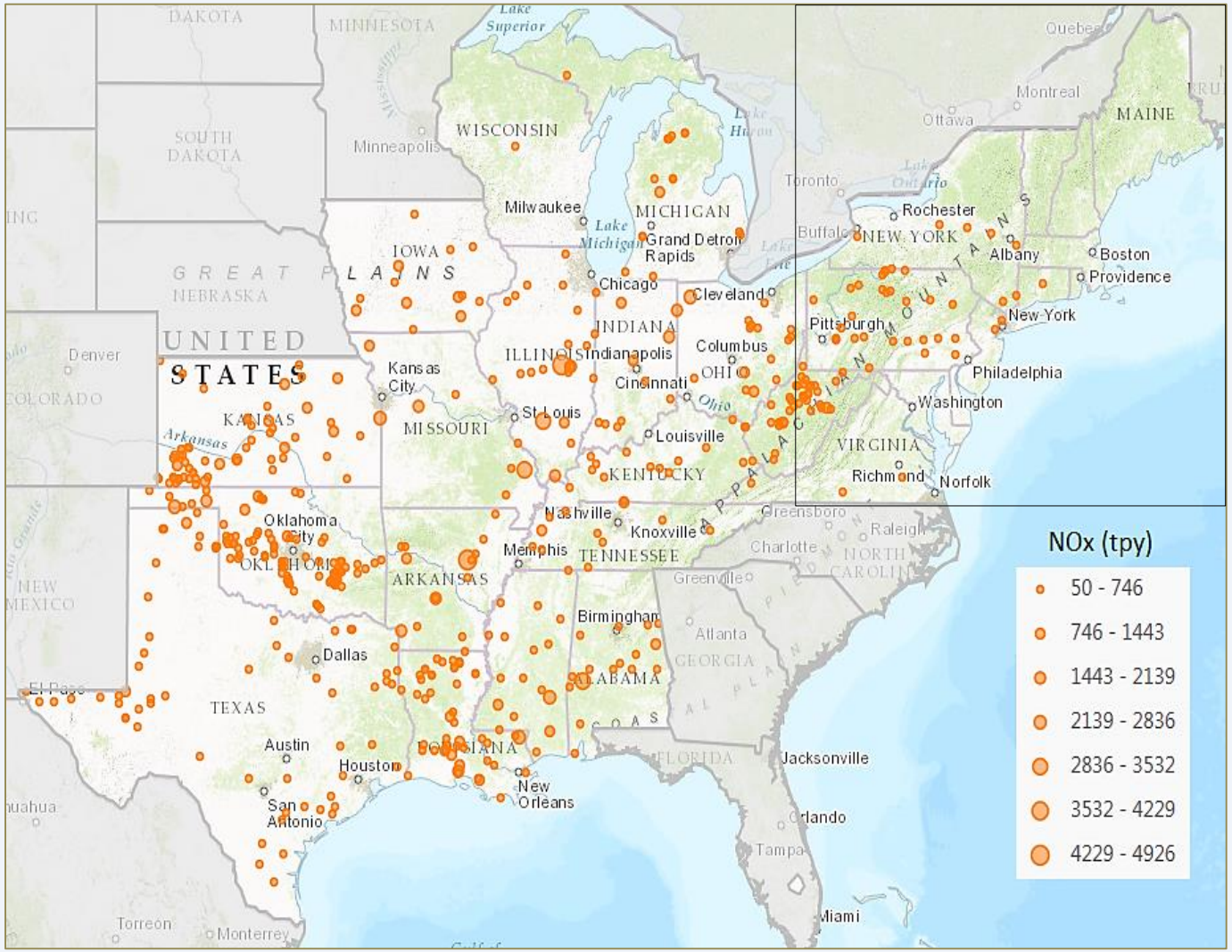


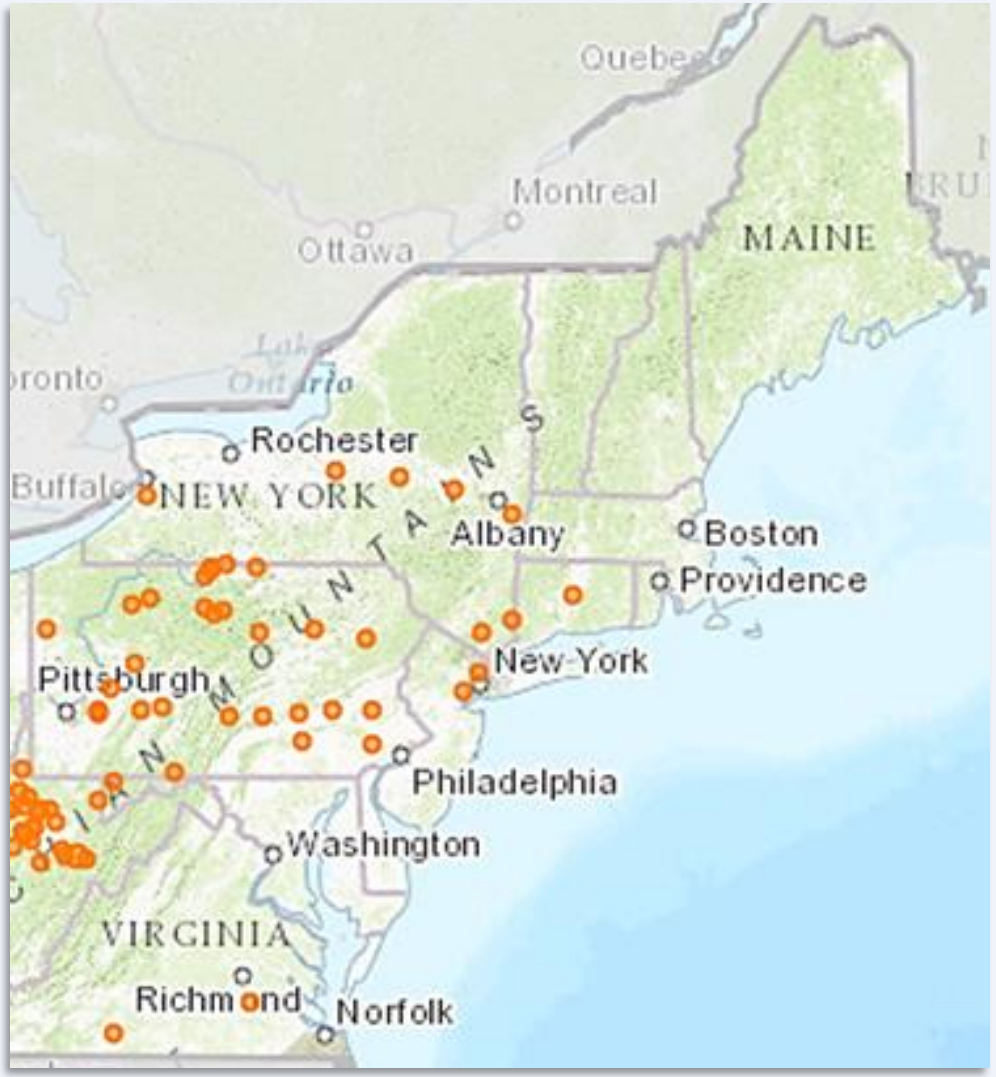
Natural Gas Pipeline Compressor Station Overview



Source: Spectra Energy

Pipeline Transportation of Natural Gas





Facilities emitting ≥50 tpy NOx in CSAPR U & OTR States

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

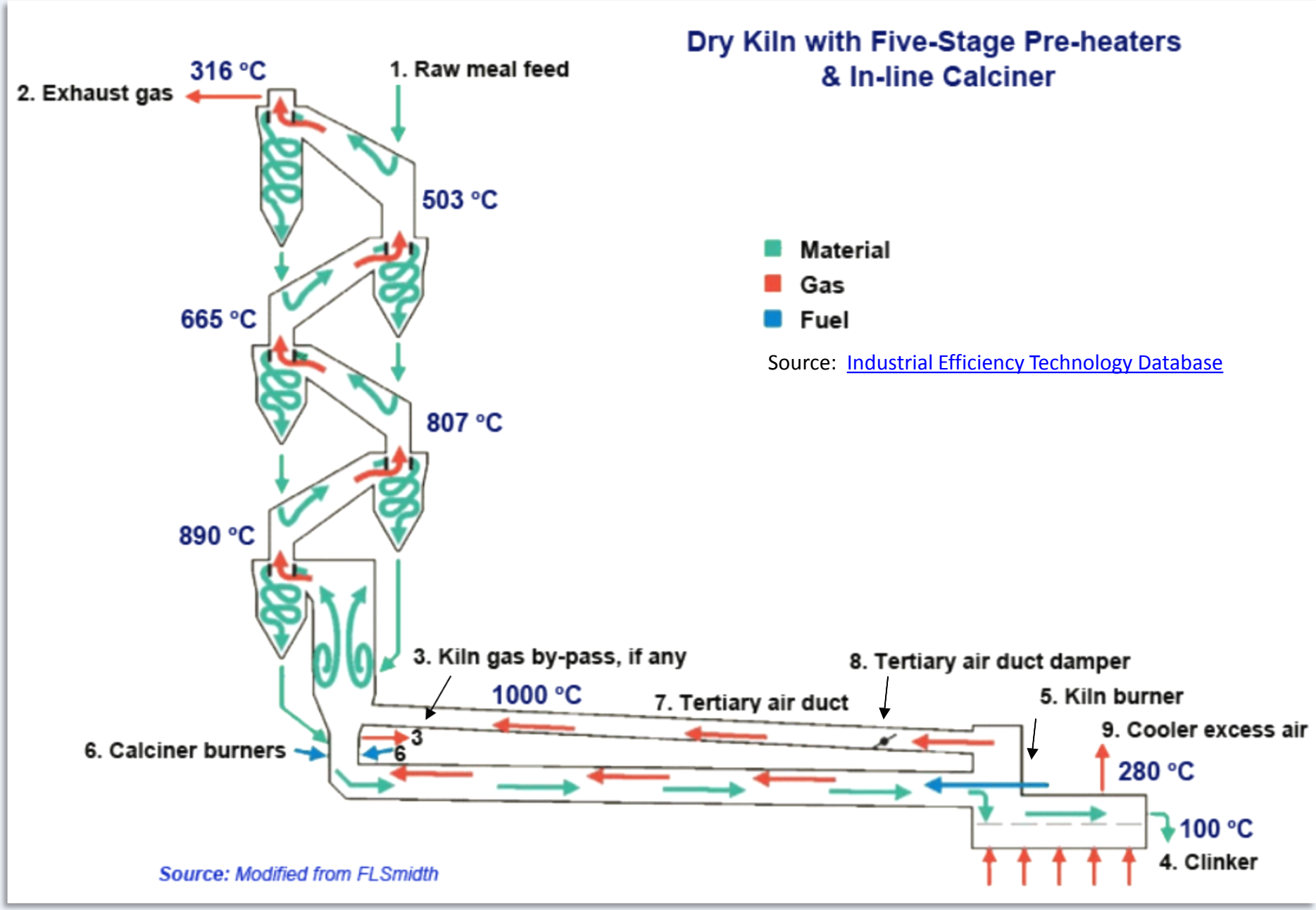
Four-Stroke Rich Burn ICE	
Nameplate Rating in HP	**NOx Rate in g/BHP-hr (% Reduction)**
200 - 499	1.5 (90)
500 - 1999	1.5 (90)
≥2000	1.0 (95)

Four-Stroke Lean Burn ICE	
Nameplate Rating in HP	**NOx Rate in g/BHP-hr (% Reduction)**
200 - 499	1.5 (90)
500 - 1999	1.5 (90)
≥2000	1.5 (90)

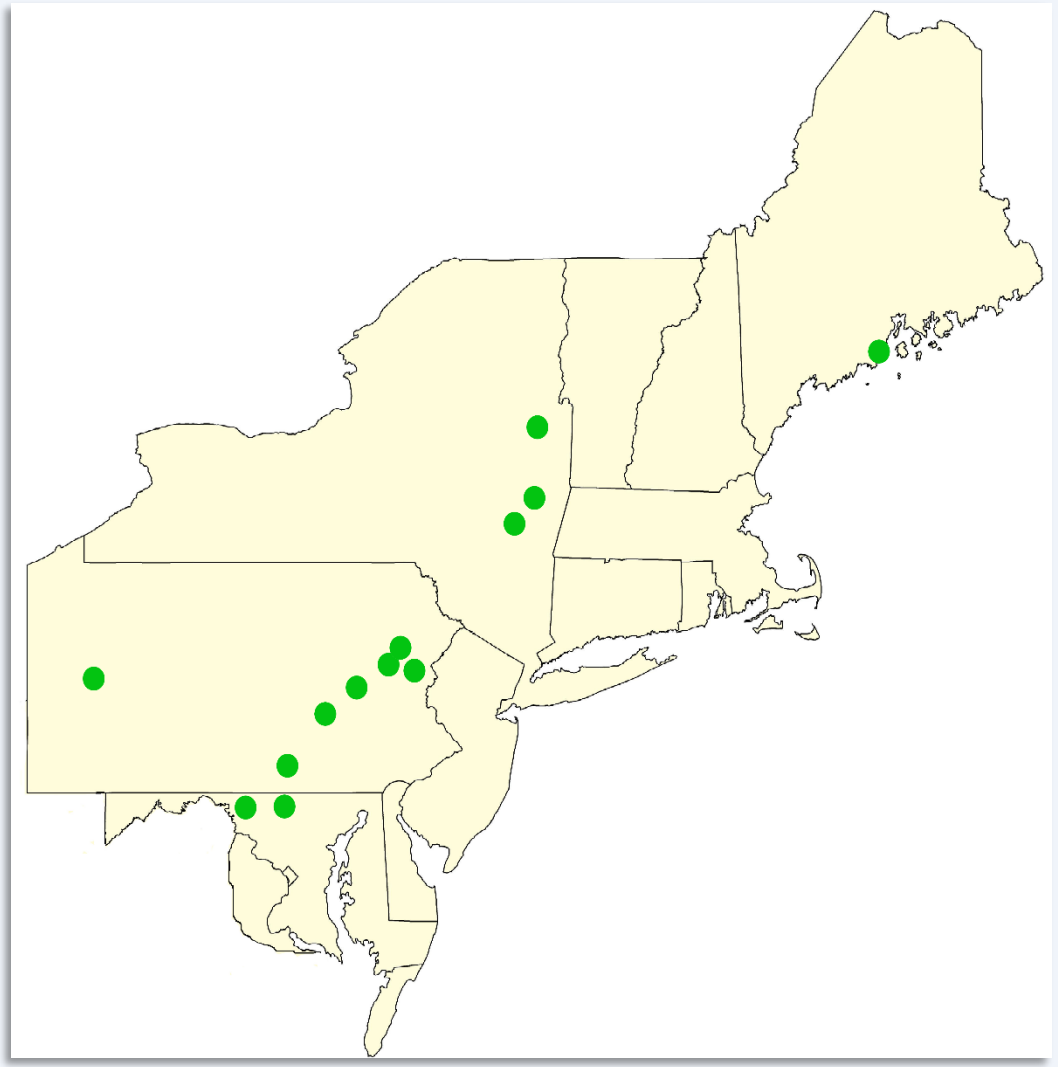
Two-Stroke Lean Burn ICE	
Nameplate Rating in HP	**NOx Rate in g/BHP-hr (% Reduction)**
200 - 499	2.0 (80)
500 - 1999	1.5 (80)
≥2000	1.5 (90)

Combustion Turbines	
Nameplate Rating in HP (MW)	**NOx Rate in ppmvd @ 15% O_2 (lb/MWhr)**
≤2000 (1.5)	150.0 (6.0)
2000 - 4999 (1.5-3.7)	50.0 (2.0)
≥5000 (3.7)	25.0 (1.0)

Dry Process Precalciner Cement Kiln



United States Cement and Concrete Industry



- Production Plants
- Sales Offices / Headquarters
- Distribution Terminals / Silos

Data: [Portland Cement Association (PCA), 2017]

Recommendations to Reduce NOx Emissions from Cement Kilns

Adopt Emission Guidelines for Cement Kilns per 2006 OTC Resolution

Kiln Type	Emission Rate in 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 kilns
- Modify kilns to implement mid-kiln firing
- Install post-combustion SNCR
- Convert / retrofit wet process to dry cement manufacturing

Potential NOx reductions – 8 tpd from OTC and 18 tpd from CSAPR U outside OTC

High Electricity Demand Day (HEDD) Workgroup

2017 SAS Charge: Develop recommendations for at least one specific strategy to reduce High Electricity Demand Day (HEDD) emissions & an implementation mechanism.

WHITEPAPER - ***not included as an action item***

1. Enforceable Rule-Based Strategy → **Daily per-device NOx mass limit = 137 lb per day**

Applicability: Sources not Major for NOx: boilers serving EGUs, ICI boilers, simple cycle and combined cycle combustion turbines, reciprocating engines, & additional fuel burning devices.

Exemptions, Tune-up Requirements, Record Keeping & Reporting

2. Enforceable Rule-Based Strategy

Applicability: Non-Emergency generators powered by reciprocating engines

Record Keeping & Reporting, Registration

Installed

before June 1, 2018: 4.0 lb/MWh (1.3 g/bk hp-hr)

on or after June 1, 2018: 0.6 lb/MWh (0.2 g/bk hp-hr)

3. Voluntary Outreach-Based Strategy

Applicability: General Public & Facility Owners

Implementation Mechanism: MOU / Resolution / Statement

Consumer Products (CP) Workgroup

- CARB 2008, parts of 2009, 2010, 2012 & 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
- Reduction of ~25 tpd of VOCs within OTR

Recommendations for Future Work

Largest Contributors	• Complete analysis for EGU status reports 1&2 before making recommendations • Analysis of short-term averaging
Control Measures	• Estimate potential reductions & costs for each measure • All GN SIPs should contain the recommended measures
HEDD	• Compile database of Major and non-Major non-CAMD sources that supply to, or offset from, the electricity grid • Evaluate potential daily emission reductions from control strategies
Consumer Products	• Update Model Rule by 1st Quarter of 2018 • Recommend inclusion in GN SIPs
AIM	• Monitor CARB survey results and update model rule as appropriate • Recommend inclusion in GN SIPs

2018 Proposed SAS Charges

1. Calculate & document emissions reductions inside & outside OTR for the recommended SAS GN SIP strategies formalized in the GN SIP Resolution for use in photochemical modeling & develop recommendations for additional strategies for consideration.

2. Provide analysis & briefings to ADs on critical federal & state SAS strategies that may be needed for attaining & maintaining the 2015 O_3 standard including, but not limited to; EPA's CSAPR U, Sec. 126 Petitions submitted by MD, CT & DE, and NY's small generator initiative.

Standing charge: Evaluate and make recommendations to OTC member states of updates to any previously developed OTC model rule that is based on a CARB rule & shall update any such model rules to include any product categories or standards adopted by CARB.

QUESTIONS?