



Air Regulations Impacting the Pipeline Industry

Presented by **Jim McCarthy**



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Agenda

- Overview of federal air regulations that drive requirements for pipeline facilities
 - Update on air regulations that drive requirements – e.g., control requirements for reciprocating engines and turbines
- Greenhouse gas (GHG) regulations
- Reporting and recordkeeping examples for rules
 - Data management is a significant component of air quality compliance

Introductory thoughts on air quality compliance and information flow...

- Environmental staff: Information and data are integral to influencing rule development, communicating and implementing new rules, and managing ongoing compliance
- Operations shares compliance responsibility
- Moving target as regulatory coverage broadens, emission targets become more stringent, and reporting obligations grow
- Air quality data management and integration with company systems continue to evolve – Ongoing challenges as rules evolve

“Air Emissions” Context for Pipeline Facilities

- Multi-state presence, thus some rules differ along the pipeline
- “Grandfathered” equipment is common and its regulatory status is changing
 - New control requirements for existing infrastructure over next 5 – 10 yrs
- NOx and formaldehyde are primary emissions of concern
 - By-products of natural gas combustion; regulatory framework differs
- Methane (from leaks & vents) is a GHG and 21 – 25 times more potent than CO₂
 - New federal reporting requirements for CO₂ and methane

Overview of Primary Federal Drivers

- National Ambient Air Quality Standard (NAAQS) are ambient air standards for six “criteria pollutants”
 - Ozone (NO_x is a precursor) and NO₂ NAAQS important for gas-fired sources
 - EPA defines “nonattainment areas” and oversees state implementation
 - States / local districts develop plan (to EPA) & rules to “attain” the NAAQS
 - Rules affect *EXISTING* sources and vary by state or local air district
- New Source Performance Standards (NSPS) are federal rules that address *NEW* sources – NO_x, CO, and/or VOC standards
 - Also affect “modified or reconstructed” units – i.e., need engine “history”
 - Spark Ignited Recip Engine NSPS and Turbine NSPS are two examples

Overview of Primary Federal Drivers

- National Emission Standard for Hazardous Air Pollutants (NESHAPs) are federal HAP standards
 - e.g., RICE NESHAP addresses formaldehyde emissions
 - 2010 revision will add many existing engines: Emission controls or “work practices” to comply (depending on engine type)
- New Source Review (NSR) can require stringent controls if new equipment exceeds defined emission thresholds
 - “Best Available Control” or “Lowest Achievable Emission Rate”
 - State / local permitting process (so decisions can differ)

Overview of Primary Federal Drivers

- New Player – Greenhouse Gas emissions
- Federal GHG reporting rule adopted in 2009
 - 2010 rule adds methane reporting for oil & gas operations
 - Annual reporting of GHG emissions using prescribed methods
 - Separate from GHG permitting and control rules (being litigated)
- EPA has authority to regulate (i.e., control) GHGs
 - Courts agreed that GHGs are a pollutant under the Clean Air Act
 - Permitting (and “control” decisions) begin in 2011
 - EPA will develop “NSPS-like” rules by sector

Primary Drivers and Geography

- NSPS and NESHAP apply *everywhere* in the U.S.
- NAAQS nonattainment results in state / local rules for *existing* units - e.g., to reduce NO_x and attain the ozone NAAQS
 - New ozone NAAQS in 2011 will re-invigorate this process and result in another round of NO_x rules
 - Rules vary across the U.S. – Federal “regional” rule may add some commonality
- NSR permitting is implemented by states / local districts so decisions vary (EPA reviews permits and oversees process)
- GHG reporting is a national rule

The Never Ending Story...

- Regular review and update of NAAQS (5 yrs) and NSPS and NESHAPs (8 yrs) is *required* by the Clean Air Act
 - In recent years, lawsuits have driven EPA to meet previously ignored schedules, so new / revised rules have proliferated
 - For example, 2010 – 11 proposed or final EPA rules include: RICE NESHAP, Boiler NESHAP, ozone NAAQS, NO₂ NAAQS, regional NOx rule, oil & gas operations NESHAP and NSPS, GHG reporting rule, GHG permitting threshold rule

More details on key / recent rules...

Compliance Requirements / Records

- Compliance with air regulations includes multiple facets:
 - Emission limits (periodic tests and associated plan & report)
 - Compliance assurance (e.g., parameter monitoring, maintenance plan, monitoring plan, and related records)
 - Recordkeeping and Compliance Reports
 - Notifications (test notices, etc.)
- “Records” burden to compile, manage, and report information can be more challenging than emission limit
- Historical records required to document “applicability”
 - Many dates & applicability criteria can apply to a single piece of equipment

Spark-Ignition Engine NSPS

- 2008 Final Rule
 - Applicability based on facility construction date and engine manufacture date
- NO_x, CO and VOC limits for new, modified, or reconstructed engines
 - Based on non-selective catalytic reduction for rich burns and low emission combustion for lean burns
- Compliance based on periodic test and maintenance plan
 - Criteria differ depending on “certification” status of engine

Engine NSPS Emission Limits

Engine Type	Maximum Engine Power	Manufacture Date	Emission Standards ^a					
			g / bhp-hr			ppmv (at 15% O ₂)		
			NOx	CO	VOC	NOx	CO	VOC
Non-Emergency Engines	$100 \leq \text{hp} < 500$	7/1/2008	2.0	4.0	1.0	160	540	86
		1/1/2011	1.0	2.0	0.7	82	270	60
Non-Emergency, Lean Burn Engines	$500 \leq \text{hp} < 1,350$	1/1/2008	2.0	4.0	1.0	160	540	86
		7/1/2010	1.0	2.0	0.7	82	270	60
Non-Emergency Engines ^c	$\text{hp} \geq 500$	7/1/2007	2.0	4.0	1.0	160	540	86
		7/1/2010	1.0	2.0	0.7	82	270	60
Emergency	$25 < \text{hp} < 130$	1/1/2009	10 ^b	387	N/A	N/A	N/A	N/A
	$\text{hp} \geq 130$		2.0	4.0	1.0	160	540	86

Engine NSPS – Examples of Records

- Notification required for non-certified engines ≥ 500 hp
- For affected units, operator is required to keep records of:
 - Engine certification documentation
 - Maintenance records (and Maintenance Plan)
 - Engine operating hours and basis of emergencies for emergency engines
 - Records that standard is met (certification info, test results, etc.)
 - Notice of performance test; Test report that documents emission results and operating load during test
 - Reporting can be coordinated with *other* state or Title V permit reports
- Records of engine status – especially for *exempt* equipment
 - Importance grows as time passes; retaining NSPS exemption has value

RICE NESHAP

- 2004 Final Rule was amended in 2008 and 2010
 - Where does your engine fit with these dates as well as NSPS dates?
- 2004 rule mainly focused on catalytic control of *new* engines >500 hp at “major HAP sources” (also *existing* 4SRB >500 hp)
 - Major usually triggered by 10 TPY of formaldehyde (e.g., ~3500 hp total site capacity of uncontrolled LBs)
- 2008 rule addressed new units not covered by 2004 rule
- 2010 rule adds requirements for many *existing* engines
 - All existing area source engines and major source engines ≤ 500 hp
 - EPA will address existing major source LBs >500 hp during 8-year review

RICE NESHAP

- 2004 Rule requires oxidation catalyst (LB) or NSCR (RB)
- Emission limits include percent reduction or concentration limit that applies at $100 \pm 10\%$ load
 - 2SLB: 58% CO reduction or 12 ppmv H_2CO (at 15% O_2)
 - 4SLB: 93% CO reduction or 14 ppmv H_2CO (at 15% O_2)
 - 4SRB: 76% H_2CO reduction or 350 ppbv H_2CO (at 15% O_2)
- Parameter monitoring: continuous measurement of catalyst inlet T and monthly catalyst ΔP measurement
 - Temperature range limit (depending on engine type) based on rolling 4-hour average; Limit in ΔP variation relative to a baseline test

RICE NESHAP – 2010 Rule

- Affects existing engines, which must comply by Oct 2013
 - Applies to major source engines ≤ 500 hp and all area source engines
- Emission limits apply to major source engines from 100 – 500 hp and 4-stroke area source engines >500 hp
 - Parameter monitoring applies for catalyst based standards
- “Management Practices” apply to other engines: Prescribed maintenance schedule (change oil; check plugs, belts & hoses)
 - “Condition-based” maintenance for oil change schedule is allowed
- Recordkeeping and reporting requirements

RICE NESHAP – 2010 Standards

Engine Type	Area Source Engines		Major Source Engines
	100 to 500 hp	>500 hp	100 to 500 hp
2SLB	Management Practice	Management Practice	225 ppmv CO
4SLB	Management Practice	47 ppmv CO or 93% CO reduction	47 ppmv CO
4SRB	Management Practice	2.7 ppmv H ₂ CO or 76% H ₂ CO reduction	10.3 ppmv H ₂ CO
<u>Small RICE</u>	<100 hp		
All Types	Management Practice		

Concentration (ppmv) limits are dry, corrected to 15% O₂

RICE NESHAP – Reporting

- Example *reporting* requirements:
 - Initial Notification
 - Semi-annual Compliance Report
 - Notification of Intent to conduct performance test or CPMS performance evaluation
 - Notification of Compliance Status
- Additional *recordkeeping* is required and records must be available for review / submittal upon request

Ozone NAAQS and NOx Rules Overview

- Ozone NAAQS
 - 0.12 ppmv, 1-hour NAAQS was in place for many years
 - 1997 NAAQS revision: 0.08 ppmv or 84 ppbv, 8-hr
 - 2008 NAAQS revision: 75 ppbv , 8-hr
 - Pending 2011 NAAQS revision: 60 – 70 ppbv , 8-hr
- Clean Air Transport Rule – Eastern U.S. regional rule could evolve to include existing engine & turbines
- State NOx rules to implement 2011 ozone NAAQS will be developed in ~2012 – 2018

2011 Ozone NAAQS Revision

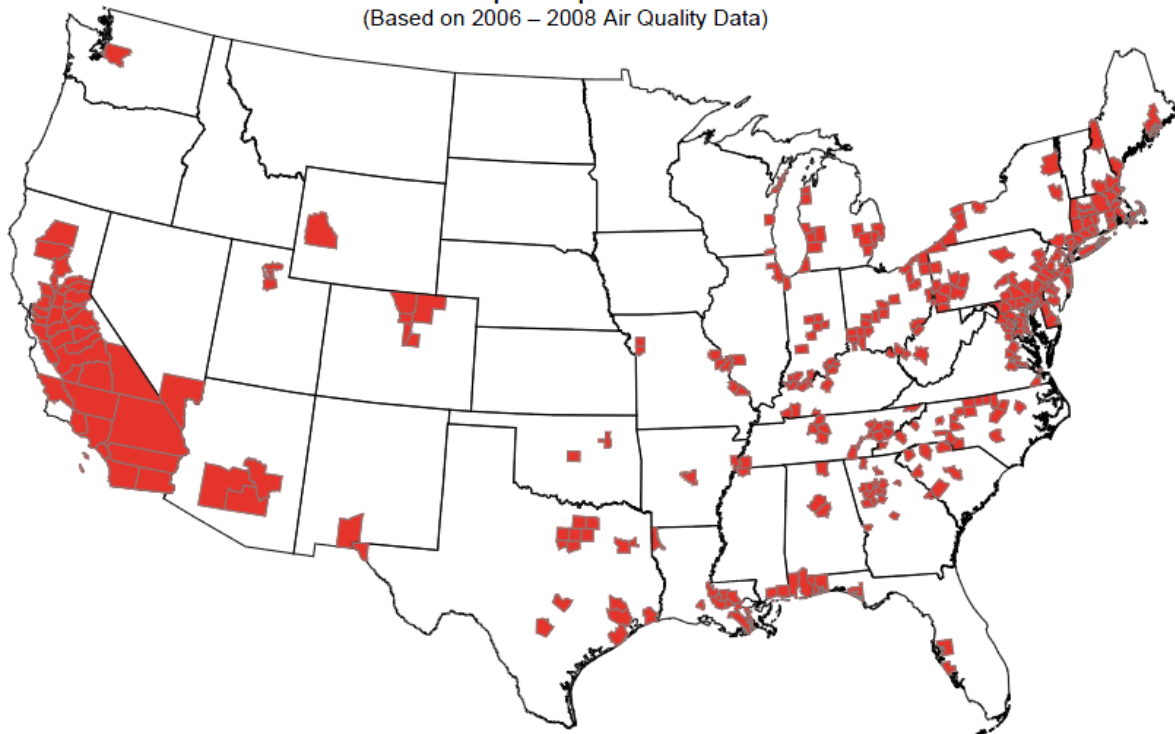
- EPA plans to finalize rule in late July
- Nonattainment implications are significant
- Based on 2006 – 2008 monitoring data:
 - 322 of 675 monitored counties exceed 75 ppbv
 - 515 counties exceed 70 ppbv
 - 608 counties exceed 65 ppbv
 - 650 of 675 counties exceed 60 ppbv
 - Vast majority of U.S. counties do not include a monitor

EPA Ozone Nonattainment Map – 75 ppbv

Counties With Monitors Violating the March 2008 Ground-Level Ozone Standards

0.075 parts per million

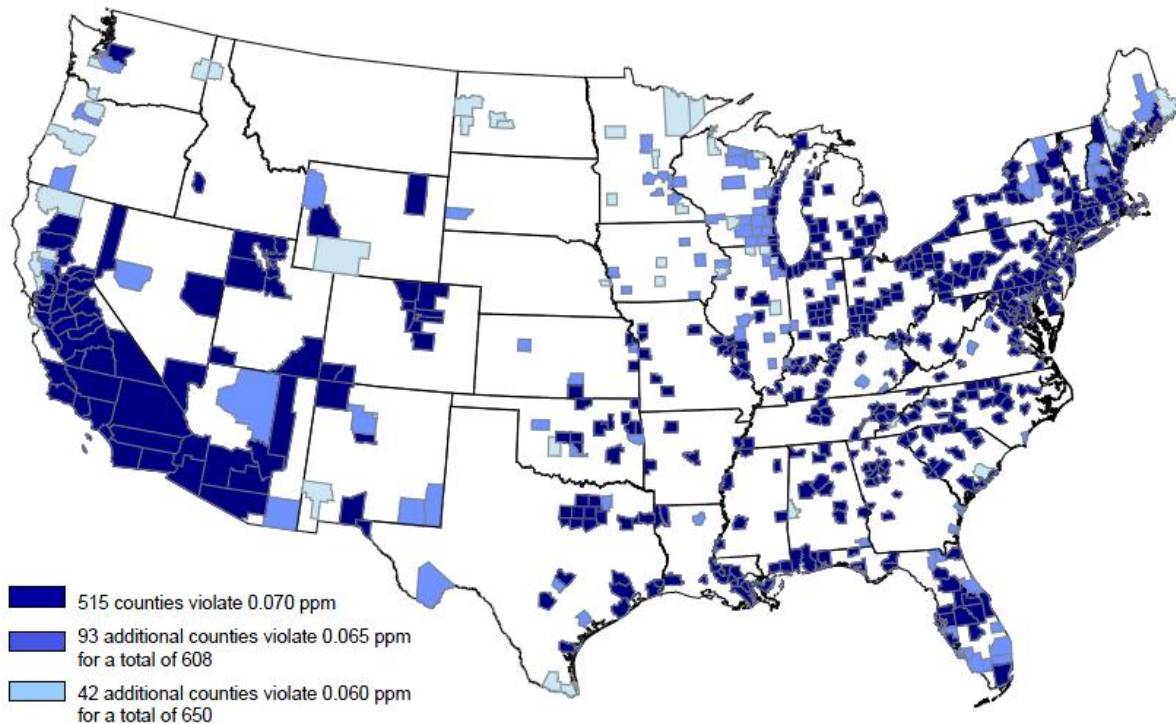
(Based on 2006 – 2008 Air Quality Data)



- More localized control rules could still be viable to address nonattainment areas

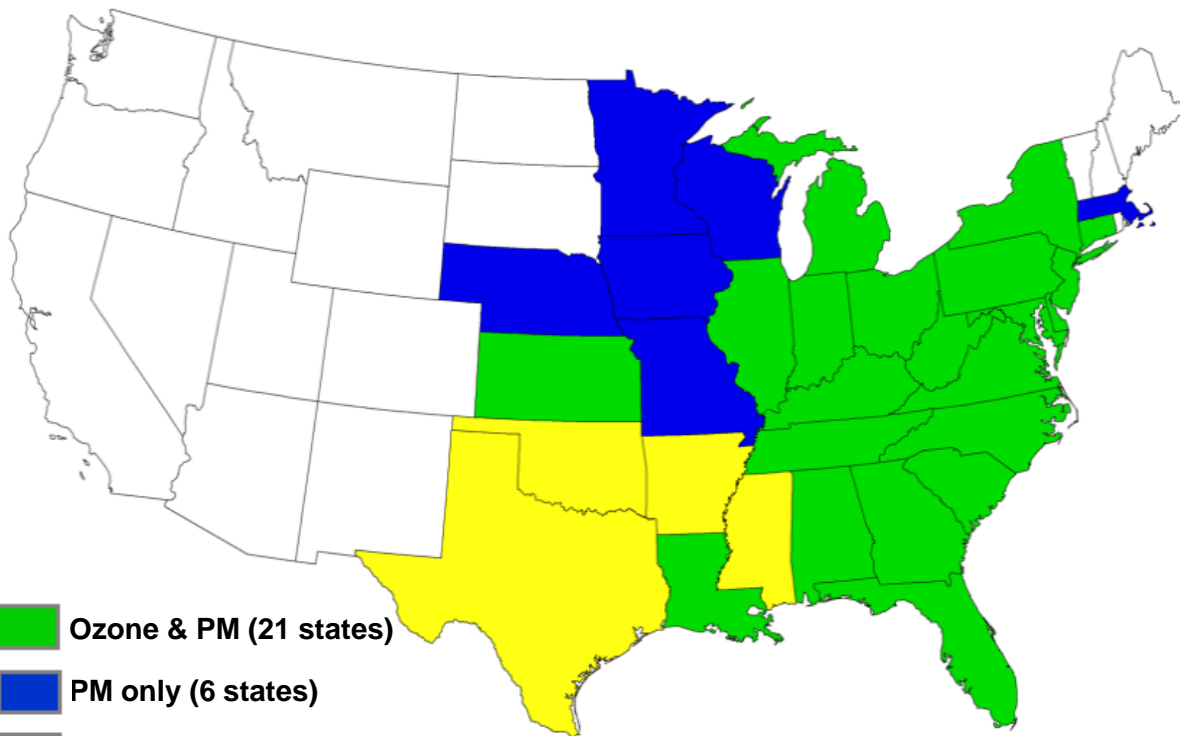
2011 NAAQS: Nonattainment Projections

- Counties with violating monitor at 60 - 70 ppb (2006-2008 data)



- Only 675 U.S. counties have a monitor, so “white areas” more indicative of no monitoring than a conclusion that NAAQS would be attained
- Broader nonattainment suggests regional rules may be needed

EPA Clean Air Transport Rule



- EPA proposed rule for eastern U.S. – NO_x and SO₂ reductions from Electric Generating Units
- EPA plans to re-propose the rule in 2011 or 2012 to add other sources
 - After EGUs, NO_x inventory from reciprocating engines and turbines exceeds any other stationary source category

Ozone NAAQS Dates

- 2011 Ozone NAAQS Revision (tentative dates)
 - Final Rule (revised deadline) July 29, 2011
 - EPA Proposed Implementation Rule ~July 2011
 - State designation recommendations ~December 2011
 - EPA nonattainment designations ~December 2012
 - State Plans to EPA ~November 2014 or later
 - Attainment dates 2015-2031 (depending upon severity)

State NOx Rules (for existing equipment)

- State actions and schedules will vary
- Some states will be late with rules
- Some states are planning now:
 - 12 northeast states (VA to ME) recently initiated development of a “model rule” for NOx control from *natural gas compressor stations* (recip engines & turbines)
 - Usually rules are equipment based (engines, boilers, etc.) but this effort specifically targets compressor drivers
 - The northeast states plan to adopt the model rule
 - Many other states would likely copy this rule

State NOx Rules

- Agencies are ill-informed and do not understand our sources
- Engagement in rule development is key
 - Education on equipment and operations
 - Data / info on actual emission levels, operating profiles (i.e., utilization), control performance, and retrofit limitations
- Rule flexibility and reasonable NOx targets are goals
 - Many success stories in last process (~mid-90's to '05)

Federal GHG Reporting Rule

- EPA GHG Reporting Rule adopted in 2009
 - Requires reporting of 2010 emissions by September 2011
 - Only combustion emissions for year 1 – Based on fuel use estimates for compressor station operations
 - “Subpart C” of rule prescribes methods
- Monitoring Plan must document company processes and calculation methodologies
- November 30, 2010: “Subpart W” adds vents / leaks

GHG Reporting Rule – Applicability

- Rule applies if facility annual CO₂e emissions $\geq 25,000$ metric tons
 - For 2010, use Subpart C emissions factors to determine combustion emissions of CO₂, CH₄ and N₂O
 - Cumulative emission factor equivalent to 53.07 kg CO₂e/MMBtu, or or ~1.0 lb CO₂e / bhp-hr at 8500 Btu/hp-hr (HHV based)
- Example facility size and utilization for 25,000 metric tons based solely on *natural gas combustion*
 - Annual tonnes = $\text{HP} \times \text{BSFC} / 1 \times 10^6 \times \text{annual hrs} \times 53.07 / 1000$
 - e.g., 6500 hp at 8250 Btu/hp-hr (HHV-based) and 100% utilization
- Subpart W emissions included for 2011 applicability
 - Compressor station vented and fugitive GHGs comprise ~25 – 60% of total

Subpart W: Reporting for Oil and Gas Sector from Wellhead through Distribution

- Gas transmission sector reports for 6 source types
 - (1) Reciprocating compressor venting
 - (2) Centrifugal compressor venting and wet seal degassing vent
 - (3) Transmission storage tanks (venting from faulty dump valve seal)
 - (4) Blowdown vent stacks
 - (5) Natural gas pneumatic device venting
 - (6) Fugitive emissions from connectors, block valves, control valves, compressor blowdown valves, PRVs, orifice meters, other meters, regulators

Emission Source	Monitoring Method	Emission Quantification Method
Natural Gas Pneumatic Devices	Component Count for Low, High, and Intermittent Bleed Devices	Population EF (scfh) x device count x 8,760 hr/yr
Blowdown Vent Stacks	Engineering Estimation for Compressors, ESD	Equipment specific EF (based on volume, T, P) x number of events
Condensate Tanks (Transmission)	Leak Detection & Direct Flow Measurement	For leaking tanks; measured emission rate x operating hours
Centrifugal Compressor Blowdown Valve & Unit Isolation Valve Leaks, and Wet Seal Oil Degassing Vent	Direct Measurement of Vented Gas Emissions in TWO Modes	Measured emission rate (or Emission Factor if mode not measured) x operating hrs (by operating mode)
Reciprocating Compressor Rod Packing Vents, Blowdown Valve Leak, and Unit Isolation Valve Leak	Direct Measurement of Vented Gas Emissions THREE Operating Modes: -Operating, Standby, pressurized, Not operating, depressurized	Measured emission rate (or Emission Factor if mode not measured) x operating hrs (by operating mode)
Equipment Leaks	Leak Detection to ID "Leakers"	Leaking components count x Leaker EF x operating hours

Subpart W

- Data intensive activity
- Requires Monitoring Plan by March 31, 2011
 - Processes and methods for GHG emission estimates
 - Plan will evolve as Rule is clarified (e.g., negotiations are ongoing; rule is unclear & several parties challenged the rule)
- Electronic reporting required (EPA tool not yet ready)
 - EPA tool will identify data fields for *reporting* requirements
 - Significant additional data are required to develop the GHG estimates; those records are also important

Closing thoughts...

- How is your company managing air quality regulatory data to ensure compliance?
- For federal rules, 2010 and 2011 activity is at all time high – Environmental staff are swamped
 - For “exempt” compressor drivers, next round of NOx rules may change that status - potentially huge capital investment
- Evolving rules, state-specific rules, and influx of regulation carries the risk of “information bins”

Questions?

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Thank you

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