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The State of Oil & Natural Gas Rules

Air & Waste Management Association

Eastern New York Chapter

April 19, 2017

Ona Papageorgiou, P.E.

Agenda

1. Oil & Gas History in New York
2. Oil & Gas Emissions
3. Historic Oil & Gas Regulations
4. New Oil & Gas Regulations

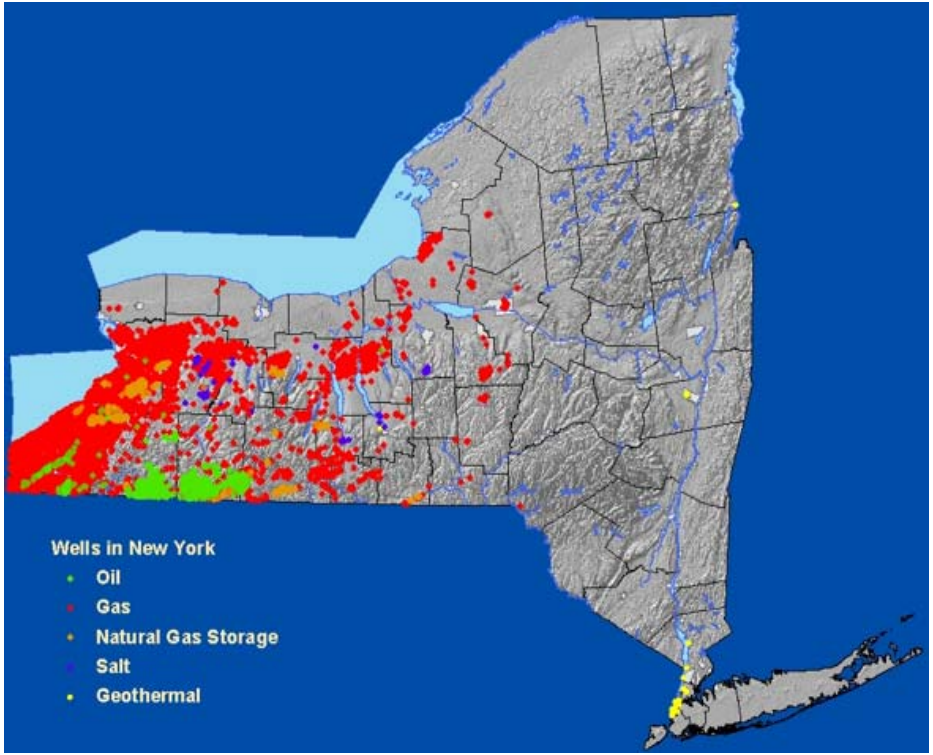
1626: Gas seeps, Lake Erie

1627: Oil Seeps, Cuba, NY

1821: First commercial natural gas well drilled near Fredonia

1863: First oil well drilled in Allegany County

New York State Wells



- 12,880 Wells reported in 2015
- Est. 75,000 Wells since 1820's
- Oil & gas produced in 2012 valued at ~ $103.61 million
- ~ $3.11 million generated for local gov't taxes

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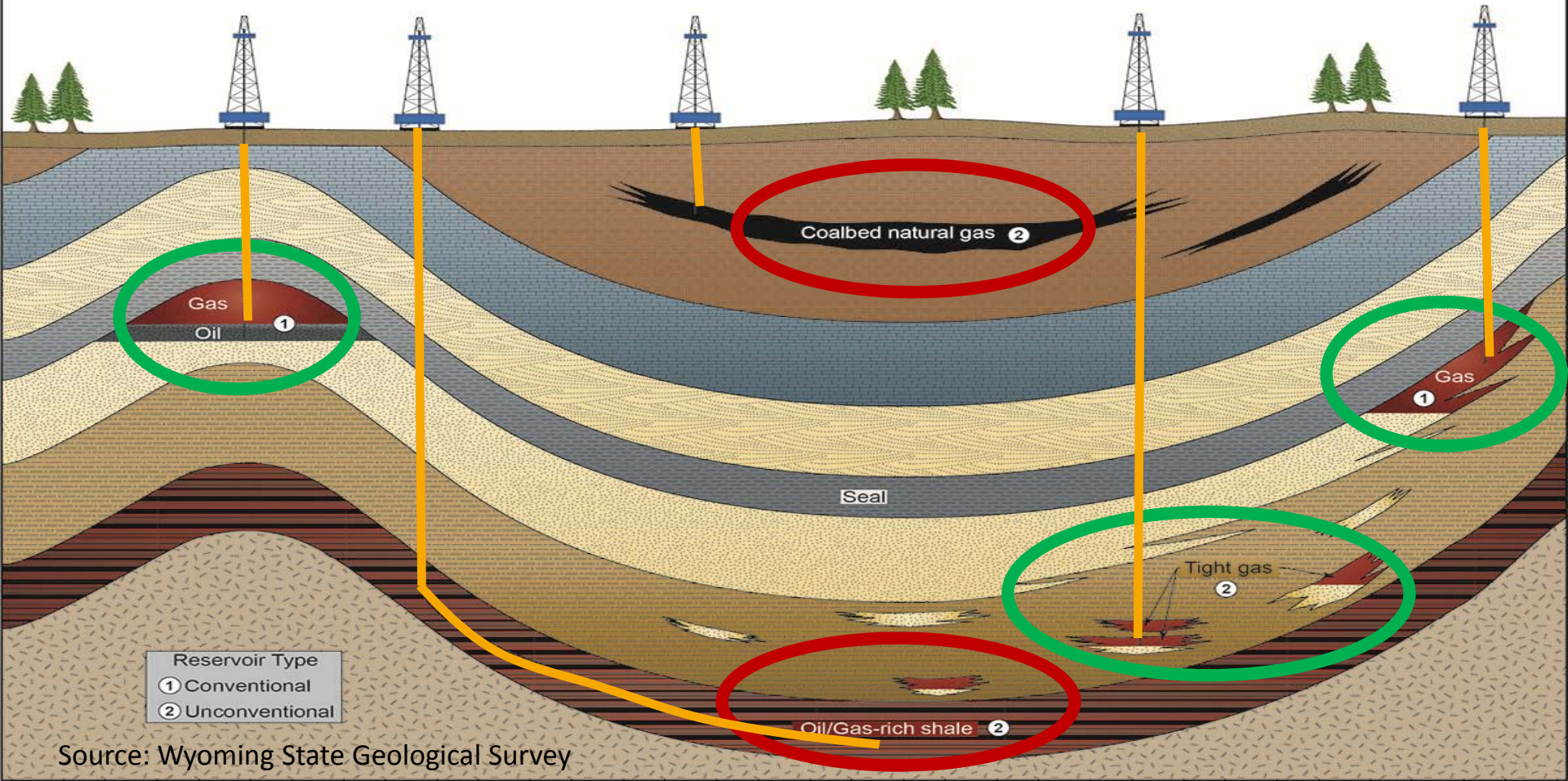
Conventional and Unconventional Reservoir Types



Source: Wyoming State Geological Survey

Semantics

“Fracking”

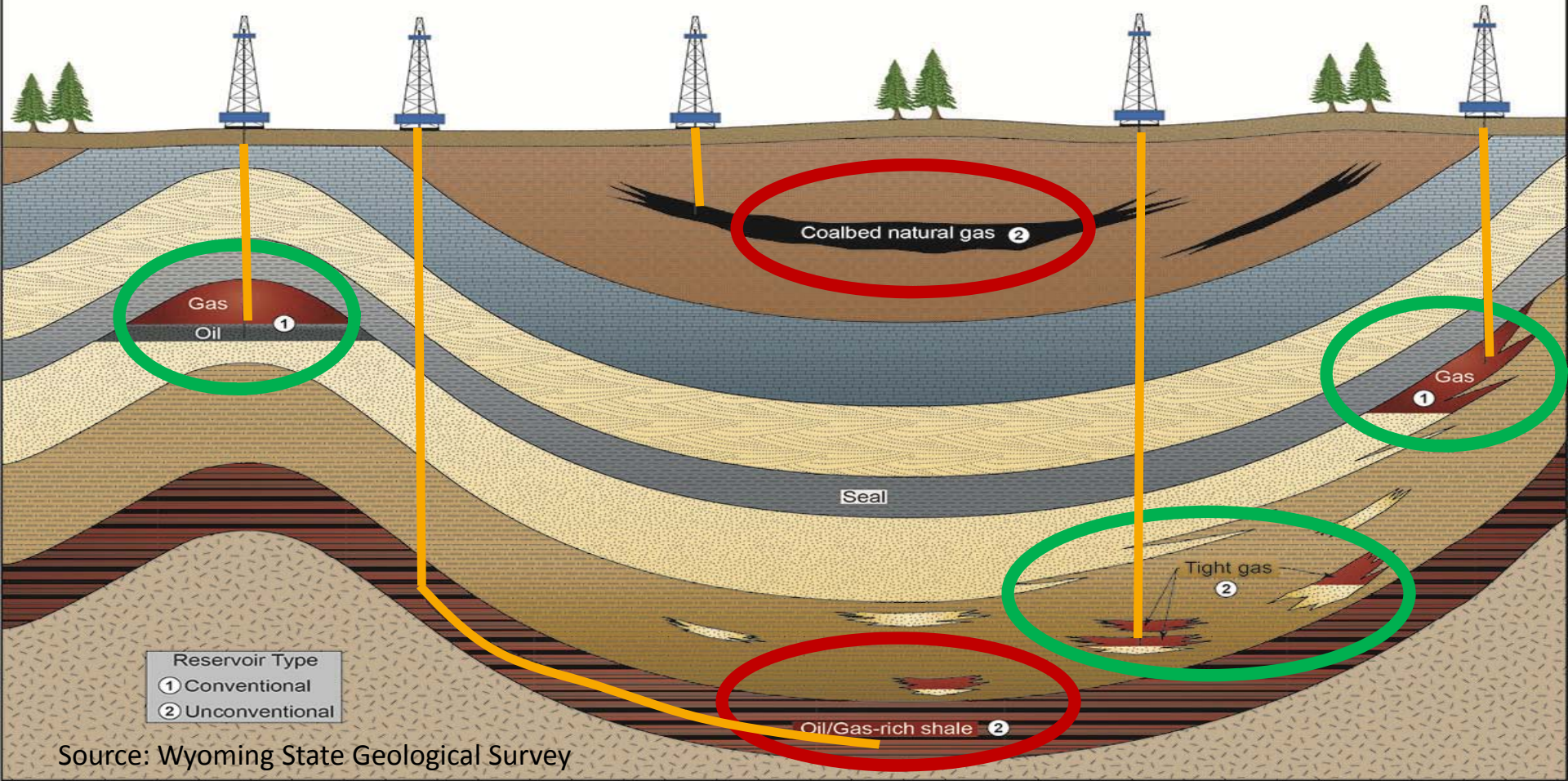
Hydraulic fracturing

High volume hydraulic fracturing

Conventional

Unconventional

Conventional and Unconventional Reservoir Types



Source: Wyoming State Geological Survey

Production & Processing

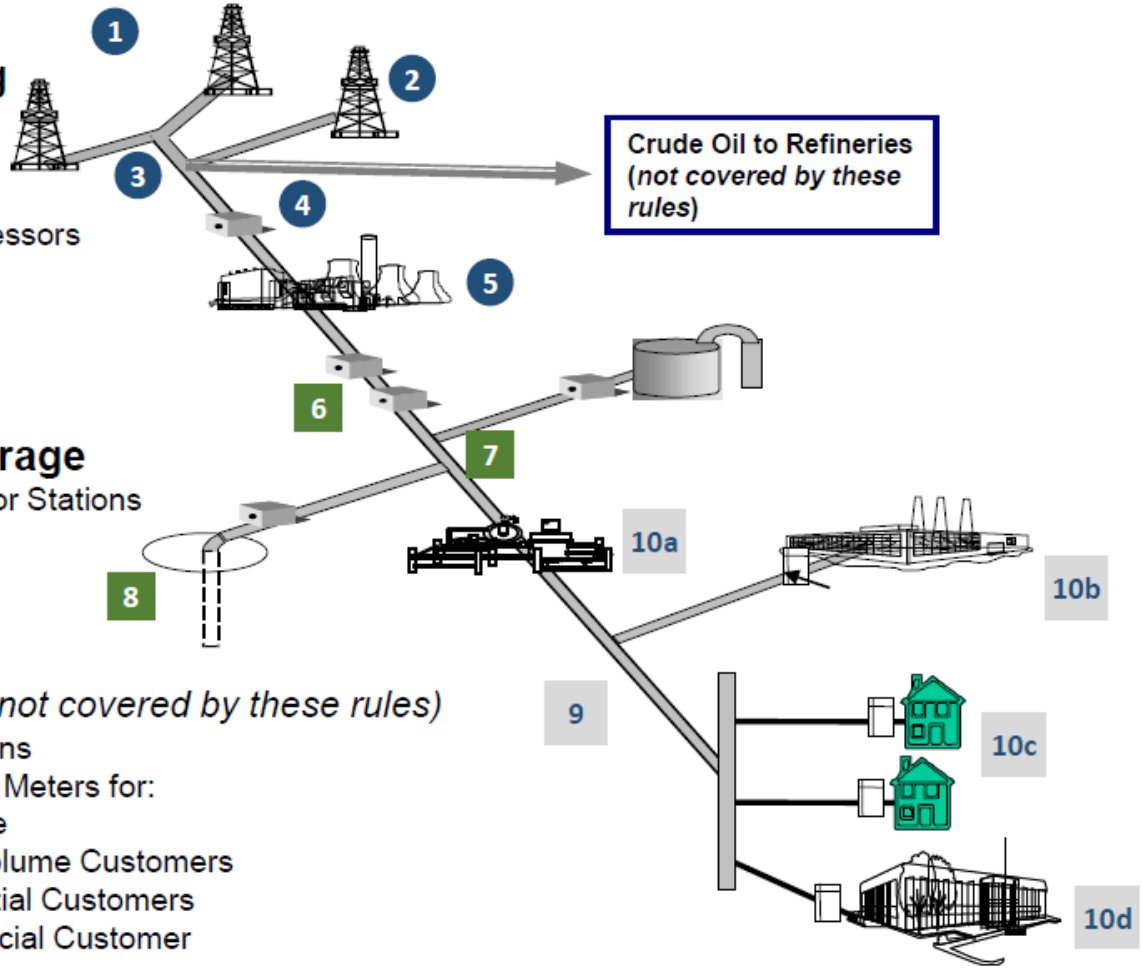
1. Drilling and Well Completion
2. Producing Wells
3. Gathering Lines
4. Gathering and Boosting Compressors
5. Gas Processing Plant

Natural Gas Transmission & Storage

6. Transmission Compressor Stations
7. Transmission Pipeline
8. Underground Storage

Distribution *(not covered by these rules)*

9. Distribution Mains
10. Regulators and Meters for:
    a. City Gate
    b. Large Volume Customers
    c. Residential Customers
    d. Commercial Customer



Source: Adapted from American Gas Association and EPA Natural Gas STAR Program

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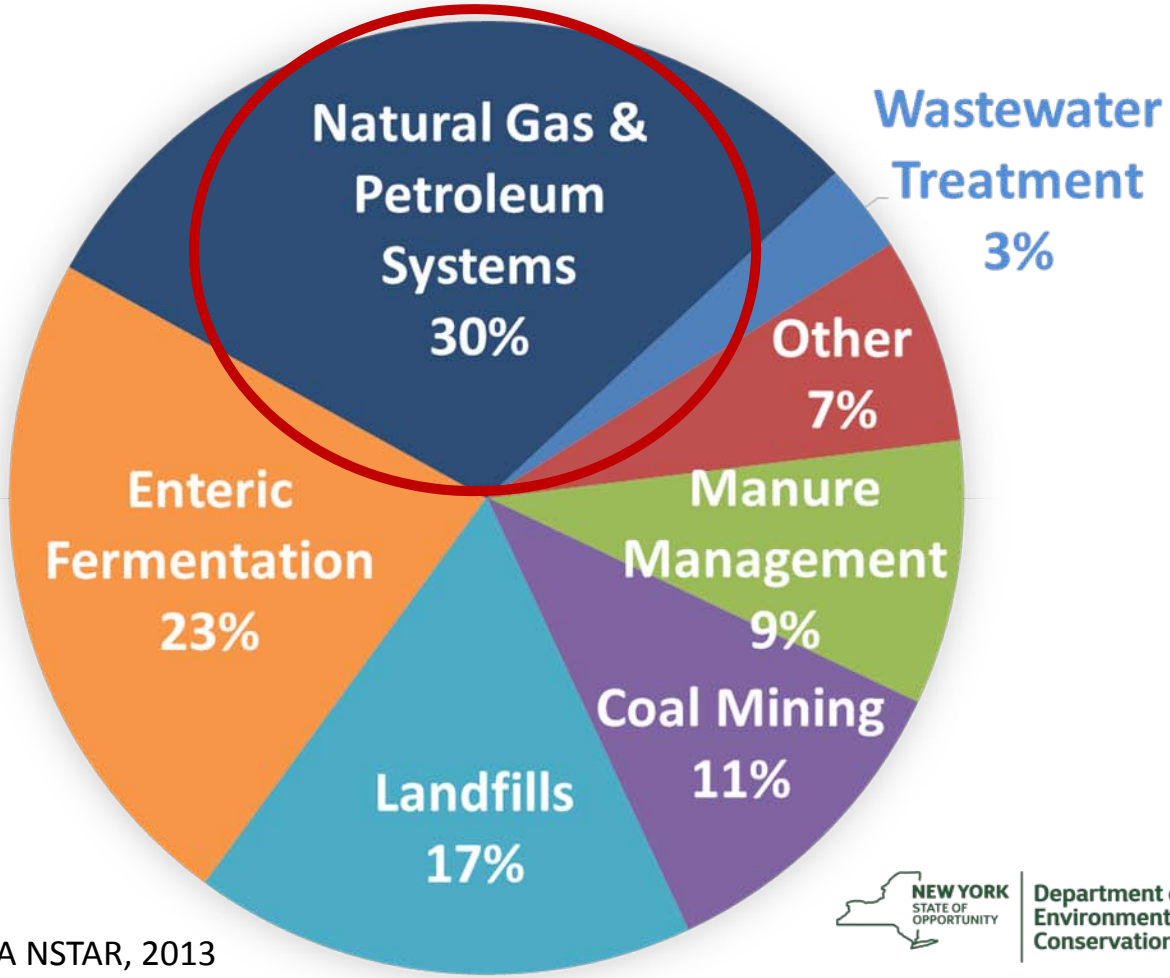
U.S. Methane Emissions by Source



Source: EPA NSTAR, 2013

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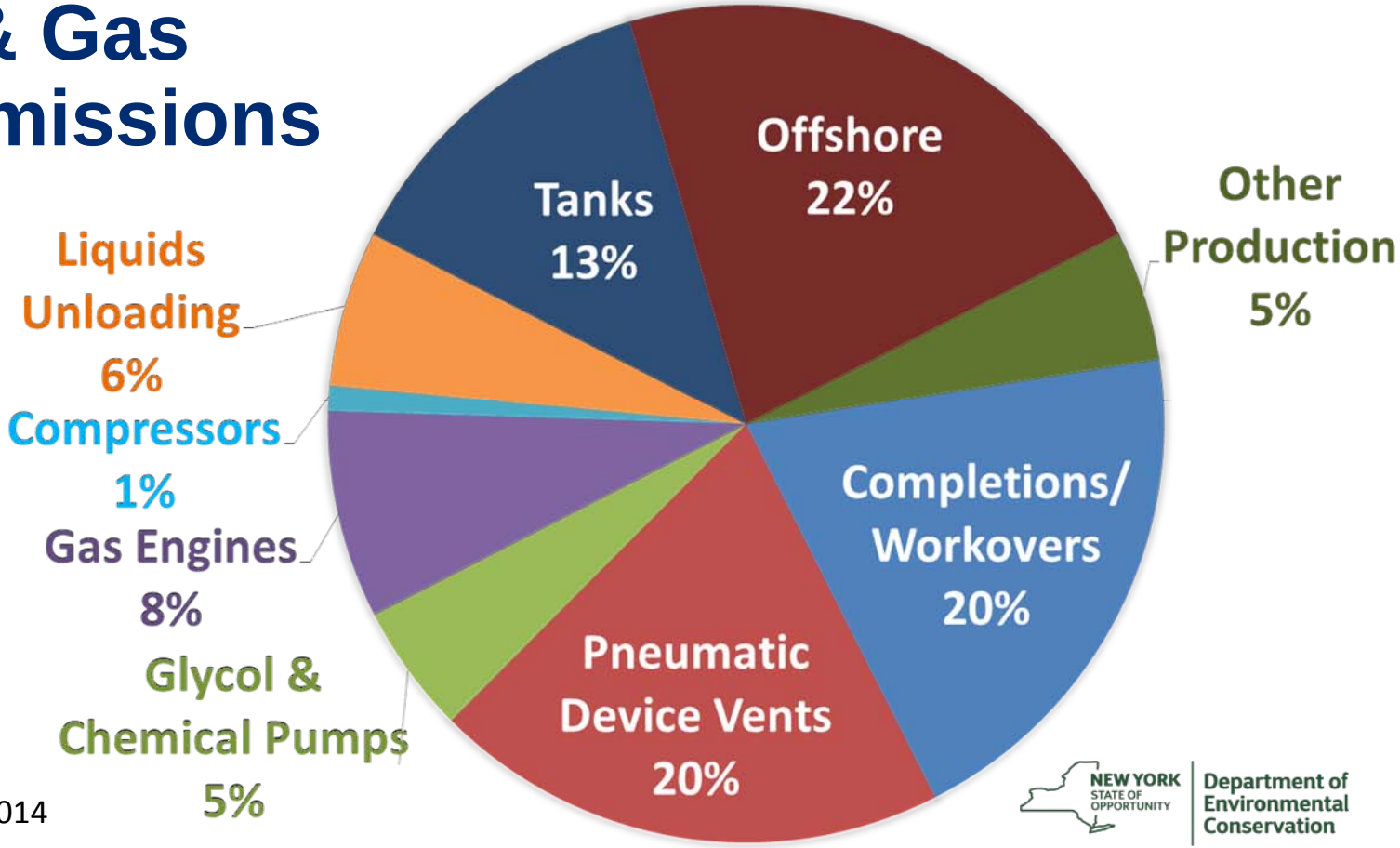
U.S. Oil & Gas Sector Emissions



Source: EPA NGSTAR, 2014

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Air Pollutants

Oil & Natural Gas sector regulations covered today:

- 2 pollutants: volatile organic compounds & methane
- VOCs mix with NOx to form ozone
- Methane is a potent greenhouse gas

Healthy lung tissue

Ozone impacted unhealthy lung tissue

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Types of emissions

Point Source emissions are collected under Title V of the Clean Air Act

CLEAN AIR ACT: INCENTIVE-BASED UTILITY EMISSIONS REDUCTIONS

HEARING

SUBCOMMITTEE ON CLEAN AIR, WETLANDS, PRIVATE PROPERTY AND NUCLEAR SAFETY

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

Nonpoint source emissions require engineering judgment and emission factors

AP 42, Fifth Edition
Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources

Air Pollution Calculation Basics

Activity rate may be:

- Number of units
- Fuel production
- Well count

Emission factor is developed through data collection

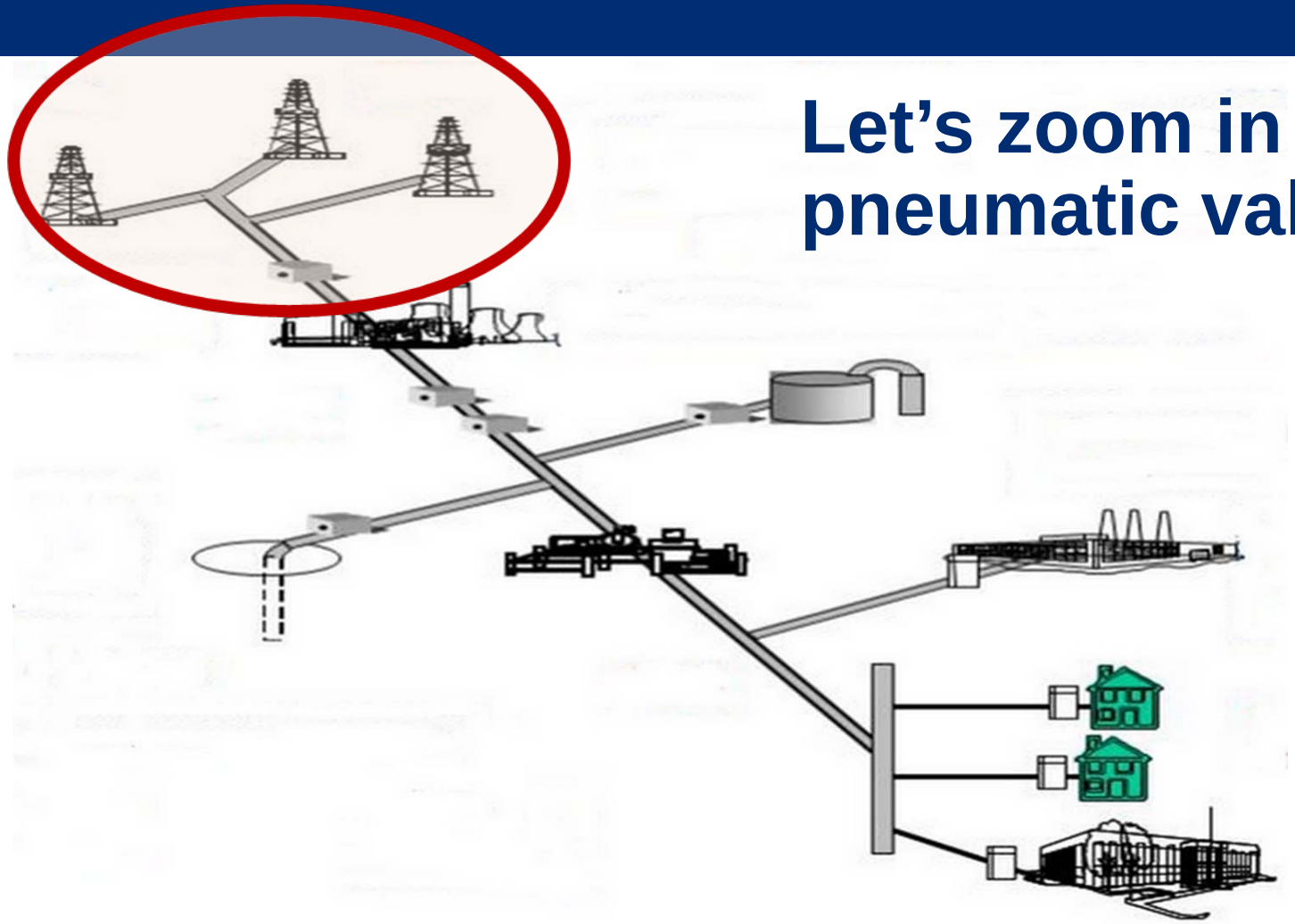
The general equation for emissions estimation is:

$$E = A \times EF \times (1-ER/100)$$

where:

- E = emissions;
- A = activity rate;
- EF = emission factor, and
- ER =overall emission reduction efficiency, %

Let’s zoom in on pneumatic valves…



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Zoom In…

Zoom In…

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Pneumatic Valves

Back to the inventory basics

The general equation for emissions estimation is:

$$E = A \times EF \times (1-ER/100)$$

where:

- E = emissions;
- A = activity rate;
- EF = emission factor, and
- ER =overall emission reduction efficiency, %

Pneumatic Inventory

$$E_{pneumatic,TOTAL,j} = E_{pneumatic,j} \times N_{well}$$

Where:

$E_{pneumatic,TOTAL,j}$ = Total pneumatic device emissions of pollutant j in the county [ton/yr]

$E_{pneumatic,j}$ = pneumatic device emissions of pollutant j for a type of well (oil/gas) [ton/yr]

N_{well} = total number of active gas (or oil) wells in county

Pneumatic Inventory Development

- $$E_{pneumatic,j} = \frac{f_j}{907{,}185}\left(\sum_i V_i \times N_i \times t_{annual}\right) \times \frac{P}{1000\left(\left({}^{R}/_{MW_{gas}}\right)\times T\times 3.5\times 10^{-5}\right)}$$

Where:

$E_{pnuematic,j}$ =emissions of pollutant j from pneumatic devices for type of well (oil/gas) [ton/yr/well]

f_i = the mass fraction of pollutant j in the vented gas (produced gas)

V_i = volumetric bleed rate from device I [SCF/hr/device]

N_i = average number of devices I found at a type of well [devices/well]

t_{annual} = number of hours per year that devices operate [hrs/yr]

P = atmospheric pressure [1 atm]

R = universal gas constant [0.082 L-atm/mol-K]

MW_{gas} = molecular weight of the gas [g/mol]

T = atmospheric temperature [298 K]

Numerical values are conversion factors

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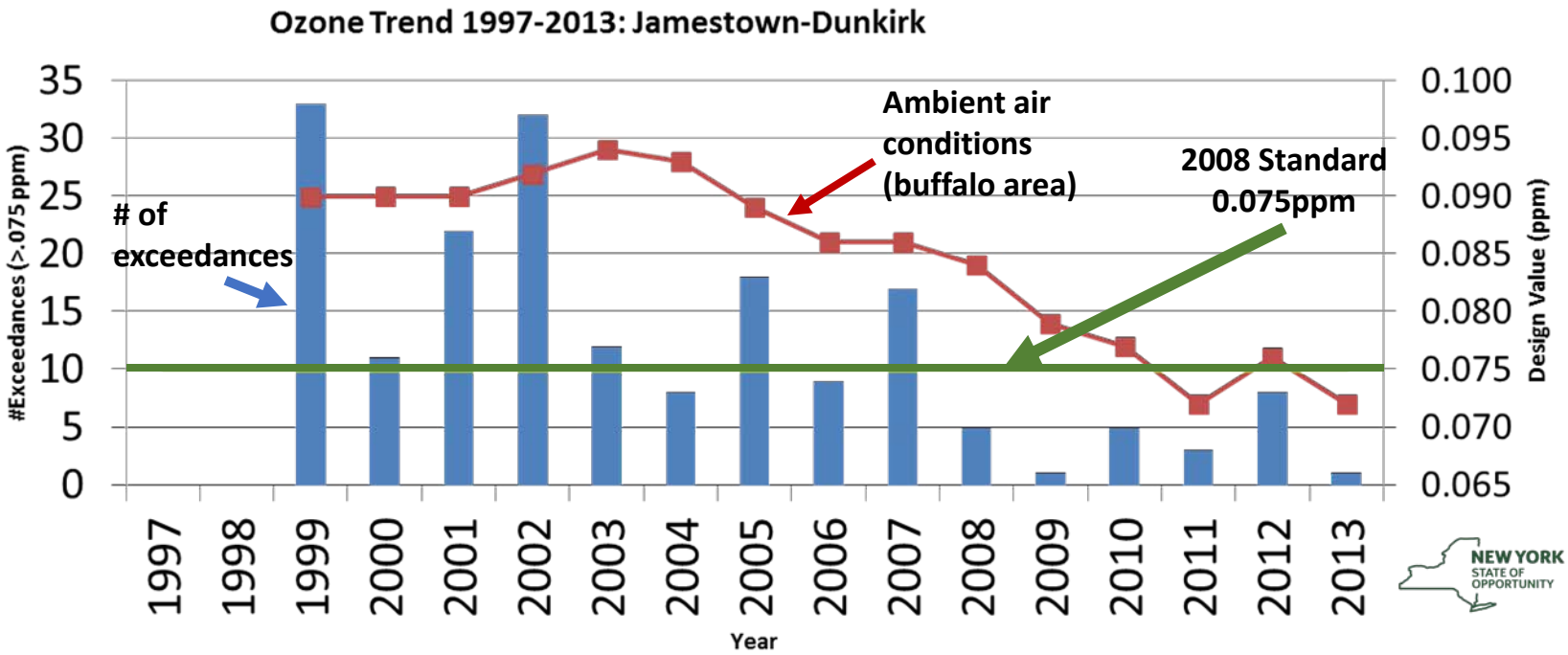
Why Inventory?

Inventory → Rules

The Path from Inventory to Regulation

STATE COUNTY FIPS	ATTAINMENT STATUS	BASIN	SCC	SCC_DESC	POLLUTANT	NONPOINT EMISSIONS TPY
36017	ATTAINMENT	Appalachian Basin	2310021300	PNEUMATIC DEVICES	100414	0.000623068
36017	ATTAINMENT	Appalachian Basin	2310021300	PNEUMATIC DEVICES	108883	0.009813922
36017	ATTAINMENT	Appalachian Basin	2310021300	PNEUMATIC DEVICES	1330207	0.002785622
36017	ATTAINMENT	Appalachian Basin	2310021300	PNEUMATIC DEVICES	71432	0.011006722
36017	ATTAINMENT	Appalachian Basin	2310021300	PNEUMATIC DEVICES	7783064	0.000147540
36017	ATTAINMENT	Appalachian Basin	2310021300	PNEUMATIC DEVICES	CH4	8.703950882
36017	ATTAINMENT	Appalachian Basin	2310021300	PNEUMATIC DEVICES	CO2	0.423936725

The Path from Inventory to Regulation



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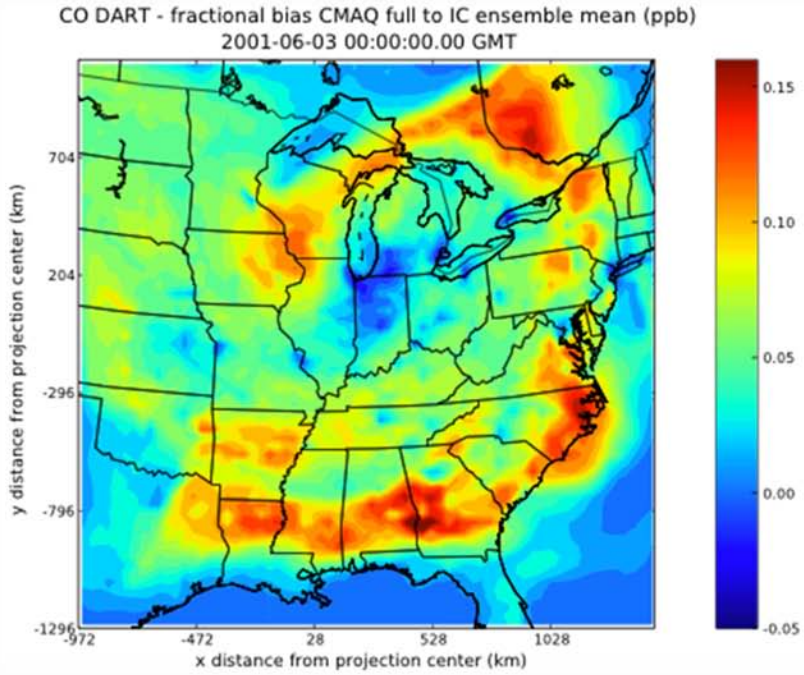
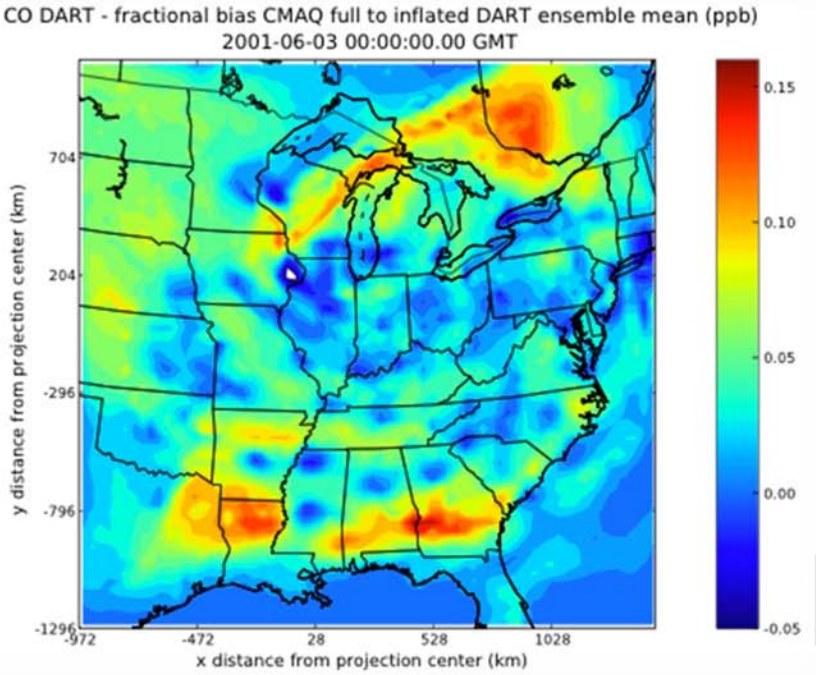
The Path from Inventory to Regulation

Inventory → Progress/ Growth → Modeling → Inform Policy





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The Inventory to Regulation Path

Inventory → Progress/ Growth → Modeling → Inform Policy

Types of Regulations

New Source Performance Standards (NSPS)

- Applies to new sources only

Control Technique Guidelines (CTG)

- Applies to existing sources
- Applies only to States with **non-attainment areas** or that are in the **Ozone Transport Region**
- Establishes minimum controls/requirements

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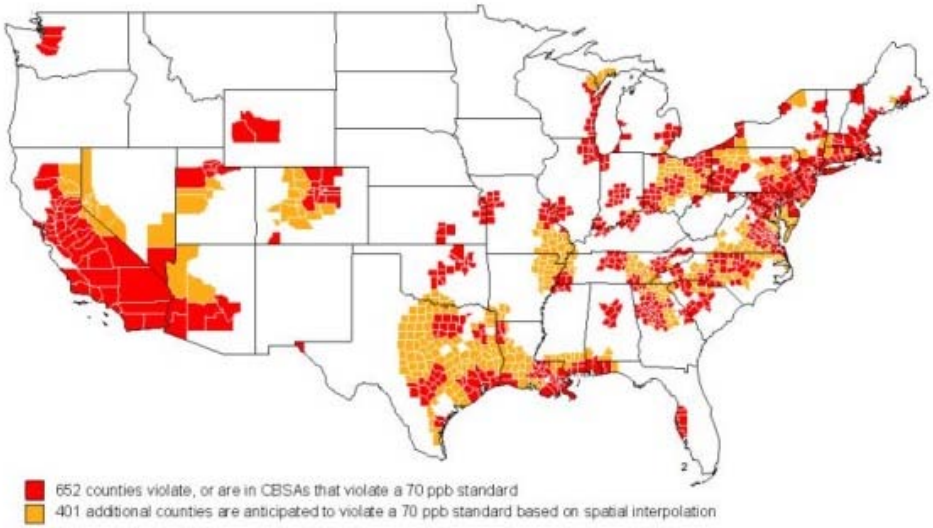
Non-attainment area

Areas in the United States that do not meet the national ambient air quality standard (NAAQS) for a criteria pollutant.

Detected and recorded through a monitoring network.

CBSA[1] and Rural Counties that Violate an Ozone Standard of 70 ppb based on 2008-2010 Data[2]



[1] Core Based Statistical Area (CBSA) refers collectively to both metropolitan statistical areas (MSA) and micropolitan areas
[2] 1053 counties violate a 70 ppb standard (three times the number of counties that violate the 2008 (75 ppb) standard)

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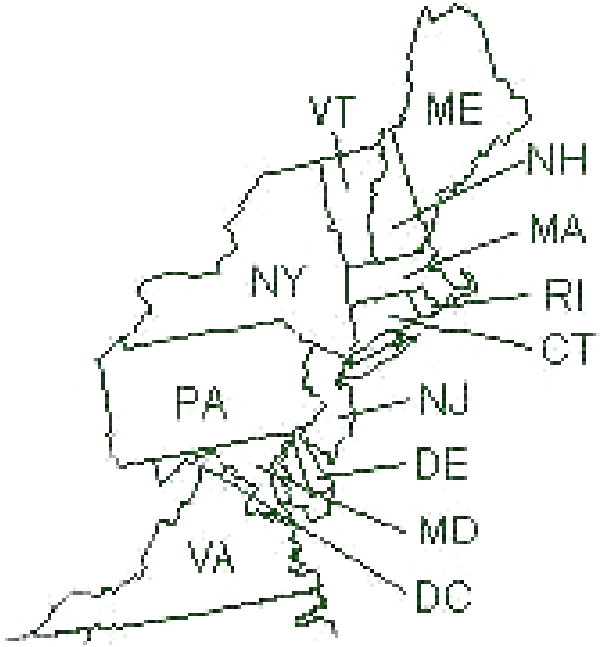
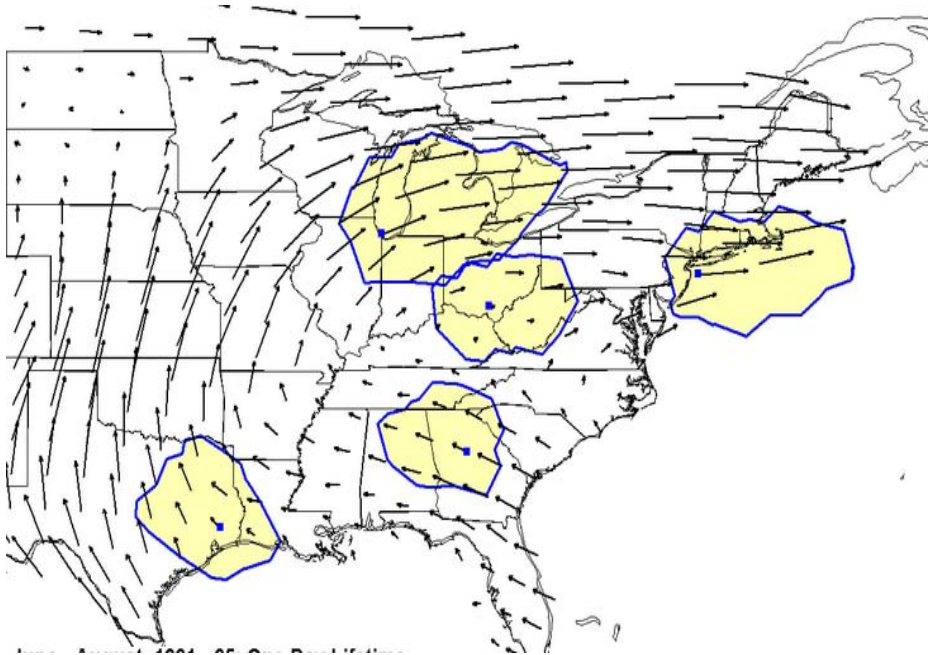
Ozone Transport Region





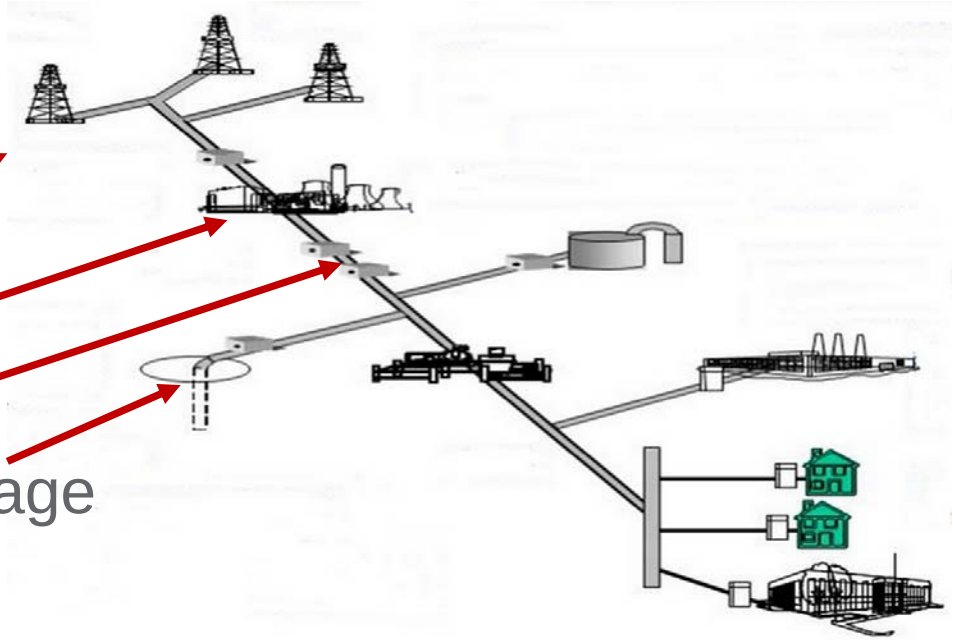
EPA's suite of regulations for Oil & Natural Gas

- June 3, 2016: New Source Performance Standard, NSPS OOOOa
- June 3, 2016: Source Determination Rule
- October 19, 2016: Control Technique Guideline (CTG)

NSPS OOOOa: Where does it apply?

Onshore only

- Oil Production
- NG Production
- NG Processing
- NG Transmission and Storage



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NSPS OOOO & NSPS OOOOa

NSPS OOOO

- 2012
- VOC only

NSPS OOOOa

- 2016
- Methane and VOC
- Expands regulation to other segments & processes

2016 NSPS OOOOa Revisions

- Now includes oil well sites
- Regulates methane
- Extends requirements to “downstream” NG equipment
  - Find and repair leaks
  - Green completions for oil wells
  - Limit emissions from new and modified pneumatic pumps
  - Limit emissions from compressors
  - Limit emissions from pneumatic controllers

2016 NSPS Revisions Comments

- Some changes were made due to comments:
  - Fixed schedule for monitoring leaks
  - Allows alternative approaches to finding leaks
  - Offers opportunity to use emerging and innovative technology to monitor leaks
  - Phases in some requirements

Source Determination Rule

- Clarifies how to categorize multiple pieces of equipment
- Defines the term “adjacent”

Published CTG

- EPA provided model rule language
- Same equipment/processes as proposed appropriate NSPS
- Not consistent with segments
  - Compressors
  - Covers production but not transmission

	NSPS		CTG	
Equipment	**Segment**	**Requirement**	**Segment**	**RACT Recommendation**
Centrifugal Compressors	All except well site	95% reduction from wet seal either capture or dry seal.	Between the wellhead and transmission & storage	95% reduction from wet seal either capture or dry seal.
Reciprocating Compressors	All except well site	change rod packing every 26,000 hrs or 36 months or capture	Between the wellhead and transmission & storage	change rod packing every 26,000 hrs or 36 months or capture
pneumatic controllers	production	required use of low-bleed controllers (not to exceed 6 scfh)	production	required use of low-bleed controllers (not to exceed 6 scfh)
pneumatic controllers	Processing	zero natural gas bleed rate	Processing	zero natural gas bleed rate
pneumatic pumps	All except processing	95% reduction if control device already available	Except processing from the wellhead to transmission & storage	95% reduction if control device already available
pneumatic pumps	processing	zero natural gas emissions	processing	zero natural gas emissions

Note: These are the revisions, there are other requirements associated with the 2012 NSPS OOOO.

Leak Detection & Repair (LDAR)

Air emissions

Greenhouse gas

Lost product!

That being said… times are changing…

~~Information Collection Request~~

New Source Performance Standard OOOOa ?

Control Technique Guideline

Summary

- New York State oil & gas production
- Semantics
- Oil & gas methane emissions
- How emissions are calculated
- What the new regulations hold

Questions?

Discussion

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