



pennsylvania

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Air Quality

# Unconventional Natural Gas Emissions Inventory

Air Quality Technical Advisory  
Committee

February 14, 2013

# Unconventional Natural Gas Emissions Inventory

- Owners/operators of unconventional natural gas air contamination sources submitted source reports and emission inventories for 2011.
- Unconventional as defined in Act 13 of 2012.
- Emissions inventory of unconventional natural gas production facilities included:
  - 57 facilities involved in drilling and gas production.
  - 40 facilities involved in Mid-stream operations.

# ▶ Emissions Inventory Development

- Reporting requirement notifications were sent to owner/operators of unconventional natural gas development facilities.
- Source and emissions reports for calendar year 2011 mandated in 25 Pa. Code Chapter 135.
- Additional notifications were sent in January 2012.
- Notice of requirement published in the Pennsylvania Bulletin on January 28, 2012.

# Emissions Inventory Development

- Sources and activities subject to reporting requirement include:
  - Compressor Stations
  - Dehydration Units
  - Drill Rigs
  - Fugitive Sources
    - Connectors
    - Flanges
    - Pump Lines
    - Pump Seals
    - Valves
  - Heaters
  - Pneumatic Pumps
  - Stationary Engines
  - Tanks
    - Pressurized Vessels
    - Impoundments
  - Venting
  - Blowdown Systems
  - Well Heads
  - Well Completions

# Summary of Criteria Emissions

- The reported criteria pollutant emissions from the unconventional natural gas sector for 2011 are:

Name	Year	CO TPY	NOx TPY	PM10 TPY	PM2.5 TPY	SOx TPY	VOC TPY
Unconventional Gas	2011	6,852	16,542	577	505	122	2,820

# Summary of Criteria Emissions

- The emissions from the unconventional natural gas sector are compared to the emissions from all point sources and all electrical generating units (EGU) in Pennsylvania.

Name	Year	CO TPY	NOx TPY	PM10 TPY	PM2.5 TPY	SOx TPY	VOC TPY
All Point Sources	2011	85,990	192,275	22,588	11,820	353,480	20,363
EGU	2011	20,604	142,749	11,745	5,694	319,388	576
Unconventional Gas	2011	6,852	16,542	577	505	122	2,820

# Comparison of Criteria Emissions

- Emissions from point sources have decreased since the last complete emissions inventory was developed for 2008. The following table shows the emissions from all point sources has decreased since 2008. The SOx emissions have decreased as a result of the installation of control equipment on the electric generating units as well as the conversion to natural gas.

Category	Year	CO	NOx	PM10	SOx	VOC
All Point Sources	2008	94,409	235,485	30,719	864,789	24,671
All Point Sources	2011	85,990	192,275	22,588	353,480	20,363
Difference		(8,419)	(43,210)	(8,131)	(511,309)	(4,308)
Unconventional Gas	2011	6,852	16,542	577	122	2,820

# Summary of Criteria Pollutant Emissions

- The reported criteria pollutant emissions by source category from the unconventional natural gas sector for 2011 are:

Source	CO			NOX			PM10		
	Count	Tons	Avg	Count	Tons	Avg	Count	Tons	Avg
BLOWDOWN_VENT	572	1	0.0	572	2	0.0	572	0	0.0
COMPLETION	1000	3,097	3.1	1000	5,163	5.2	1000	198	0.2
DEHY	182	68	0.4	182	16	0.1	182	0	0.0
DRILL_RIG	1415	1,844	1.3	1415	8,341	5.9	1415	272	0.2
ENGINE	150	1,557	10.4	150	2,698	18.0	150	86	0.6
FUGITIVE	1713	0	0.0	1713	0	0.0	1713	0	0.0
HEATER	1172	285	0.2	1172	322	0.3	1172	21	0.0
PUMP	576	0	0.0	576	0	0.0	576	0	0.0
TANK-VESSEL	991	0	0.0	991	0	0.0	991	0	0.0



# Summary of Criteria Pollutant Emissions

- Additional reported criteria pollutant emissions by source category from the unconventional natural gas sector for 2011:

Source	PM2.5			SOX			VOC		
	Count	Tons	Avg	Count	Tons	Avg	Count	Tons	Avg
BLOWDOWN_VENT	572	0	0.0	572	0	0.0	572	52	0.1
COMPLETION	1000	139	0.1	1000	35	0.0	1000	527	0.5
DEHY	182	0	0.0	182	0	0.0	182	326	1.8
DRILL_RIG	1415	260	0.2	1415	79	0.1	1415	392	0.3
ENGINE	150	85	0.6	150	6	0.0	150	717	4.8
FUGITIVE	1713	0	0.0	1713	0	0.0	1713	319	0.2
HEATER	1172	21	0.0	1172	2	0.0	1172	18	0.0
PUMP	576	0	0.0	576	0	0.0	576	159	0.3
TANK-VESSEL	991	0	0.0	991	0	0.0	991	309	0.3

# Summary of HAPs Emissions

- The reported HAPs pollutant emissions from the unconventional natural gas sector for 2011:

Source	Benzene			Ethyl Benzene			Formaldehyde			n-Hexane		
	Count	Tons	Avg	Count	Tons	Avg	Count	Tons	Avg	Count	Tons	Avg
BLOWDOWN_VENT	572	0	0.0	572	0	0.0	572	0	0.0	572	5	0.0
COMPLETION	1000	2	0.0	1000	0	0.0	1000	1	0.0	1000	10	0.0
DEHY	182	9	0.0	182	4	0.0	182	0	0.0	182	6	0.0
DRILL_RIG	1415	3	0.0	1415	0	0.0	1415	2	0.0	1415	0	0.0
ENGINE	150	3	0.0	150	0	0.0	150	249	1.7	150	5	0.0
FUGITIVE	1713	2	0.0	1713	0	0.0	1713	0	0.0	1713	8	0.0
HEATER	1172	0	0.0	1172	0	0.0	1172	0	0.0	1172	6	0.0
PUMP	576	0	0.0	576	0	0.0	576	0	0.0	576	4	0.0
TANK-VESSEL	991	0	0.0	991	0	0.0	991	0	0.0	991	7	0.0

# Summary of HAPs Emissions

- Additional reported HAPs pollutant emissions from the unconventional natural gas sector for 2011:

Source	Toluene			Xylenes			2,2,4-Trimethylpentane		
	Count	Tons	Avg	Count	Tons	Avg	Count	Tons	Avg
BLOWDOWN_VENT	572	1	0.0	572	0	0.0	572	0	0.0
COMPLETION	1000	1	0.0	1000	1	0.0	1000	1	0.0
DEHY	182	22	0.1	182	14	0.1	182	0	0.0
DRILL_RIG	1415	1	0.0	1415	1	0.0	1415	0	0.0
ENGINE	150	2	0.0	150	1	0.0	150	1	0.0
FUGITIVE	1713	6	0.0	1713	8	0.0	1713	1	0.0
HEATER	1172	0	0.0	1172	0	0.0	1172	0	0.0
PUMP	576	0	0.0	576	0	0.0	576	0	0.0
TANK-VESSEL	991	1	0.0	991	0	0.0	991	0	0.0

# Emissions Summary by County

- Top ten counties for pollutant emissions from the unconventional natural gas sector for 2011:

County Emissions	CO	NOx	PM-10	PM-2.5	SOx	VOC	Benzene	Ethyl Benzene	Formaldehyde	n-Hexane	Toluene	Xylenes	2,2,4-Trimethyl pentane
Bradford	1,531	2,629	92	84	30	318	1.2	0.9	28.6	0.9	1.1	1.5	0.0
Susquehanna	864	2,440	59	57	17	313	1.3	1.0	12.6	7.7	0.9	6.5	0.1
Washington	712	1,838	61	60	8	510	3.0	0.3	52.5	14.7	4.6	6.2	0.8
Greene	751	1,746	82	55	8	227	3.6	1.1	23.3	3.3	8.4	3.4	0.4
Tioga	566	1,545	48	46	9	165	0.8	0.0	31.7	1.7	0.5	0.3	0.2
Lycoming	347	1,565	53	52	13	163	0.9	0.1	4.8	2.2	1.6	0.3	0.3
Westmoreland	367	742	21	21	4	145	3.0	0.8	23.3	1.9	7.3	2.5	0.2
Butler	185	527	21	22	1	268	1.2	0.1	7.9	9.2	1.5	2.1	0.8
Wyoming	205	633	20	20	3	36	0.4	0.0	0.4	0.2	0.2	0.2	0.0
Fayette	186	442	15	15	7	164	1.2	0.1	23.7	3.1	2.0	0.7	0.2

# Supplemental Emissions Information

- Additional information and data on air emissions from unconventional gas production and processing activities in Pennsylvania can be found at the following PA DEP website:

[www.\[\\*\\*\\*\\*\].state.pa.us](http://www.[****].state.pa.us)

# ➤ New Requirements for 2012 Inventory

- Expansion of Natural Gas Emissions Inventory for 2012.
  - Reporting will be required for **traditional** gas processing plants and compressor stations.
    - Traditional well development/production will be exempt from reporting.
  - Reporting of greenhouse gas (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O) emissions will be required for:
    - Unconventional gas well operations
    - Unconventional gas processing plants and compressor stations
    - Traditional gas processing plants and compressor stations



Bureau of Air Quality

**Direct questions and comments to:**

**Mike Rudawski**

**PA DEP**

**Bureau of Air Quality**

**Phone: 717-783-9241**

**Email: [mrudawski@pa.gov](mailto:mrudawski@pa.gov)**