


Pennsylvania's Strategies to Regulate Methane Emissions From Oil and Natural Gas Sources

New Jersey Clean Air Council

April 10, 2019

Tom Wolf, Governor

Patrick McDonnell, Secretary

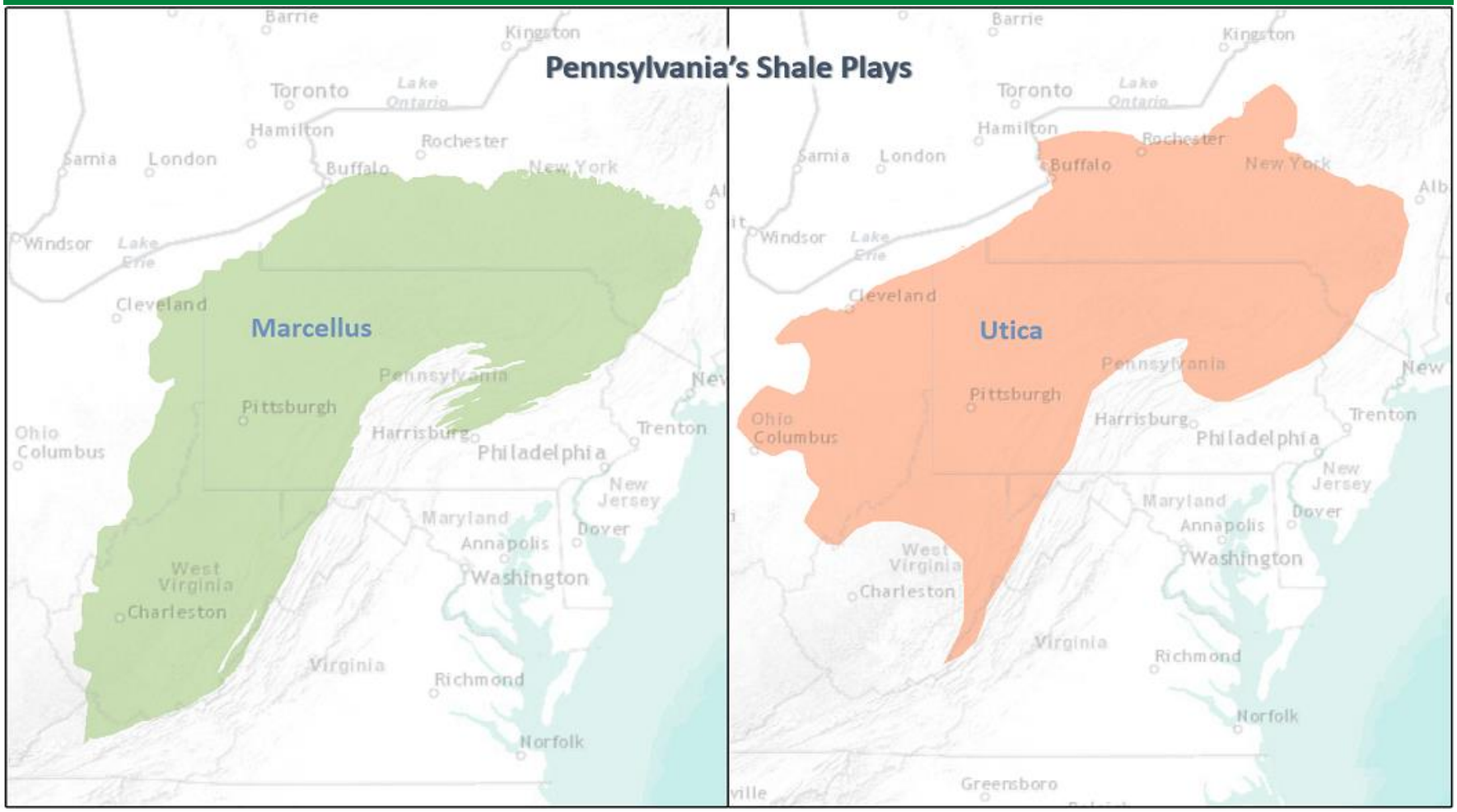
History of Oil and Natural Gas in Pennsylvania

- The first oil well in Pennsylvania was the Drake Well in Venango County just south of Titusville. The Drake Well was drilled in 1859, and is considered to be the first commercial oil well in the United States.

- Since then, approximately 123,000 wells have been drilled in Pennsylvania for storage, testing, and producing coalbed methane, oil, and natural gas.

- Approximately 11,000 of those wells are unconventional natural gas wells that were drilled as part of the Marcellus Shale Boom beginning in 2008.

Pennsylvania Shale Plays



pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

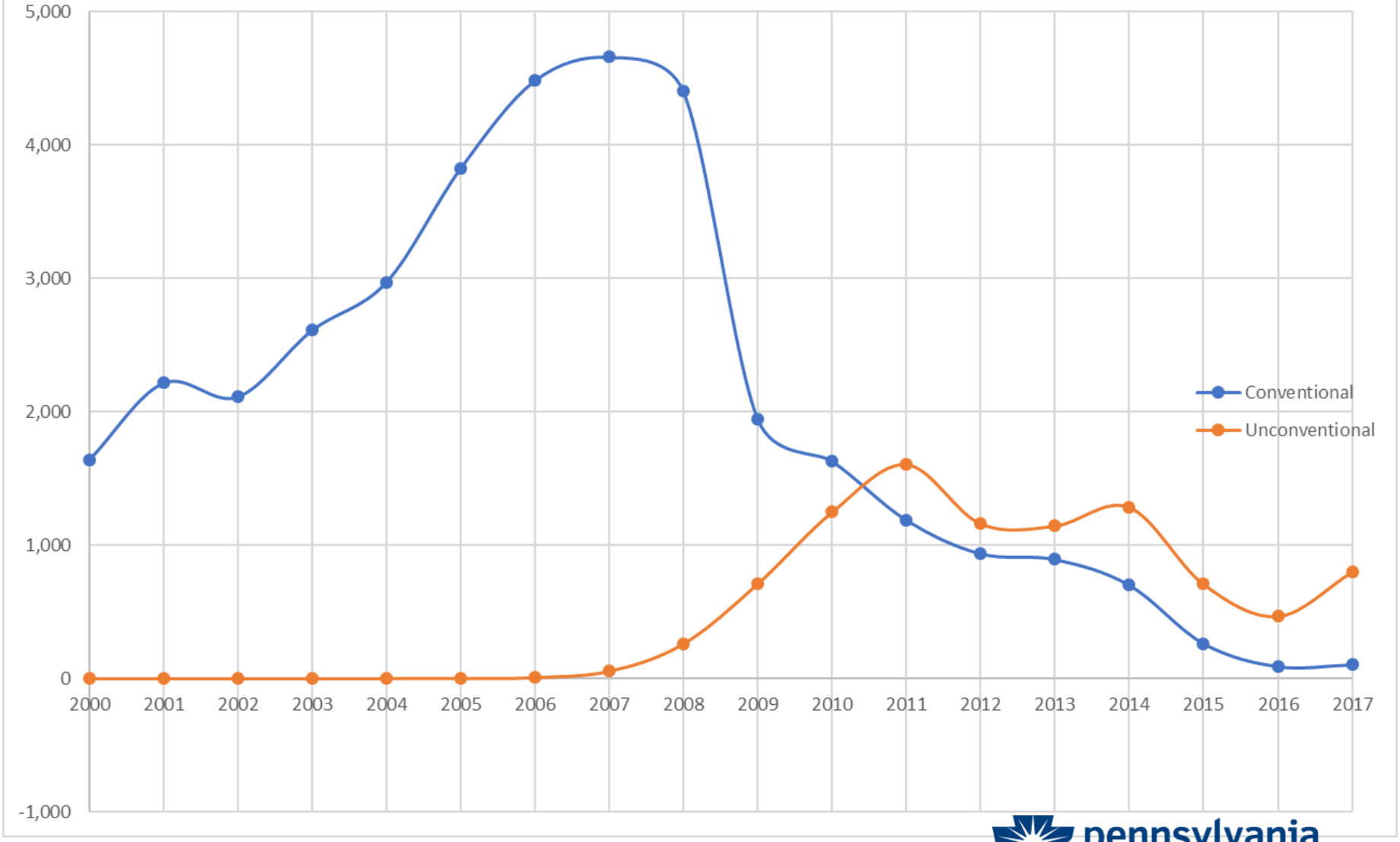
Conventional and Unconventional Wells

- A conventional well is typically a well that is drilled vertically into a shallow oil or gas reservoir

- An unconventional well refers to a well that is drilled deep (5,000 to 9,000 feet vertically and up to 10,000 feet horizontally) into shale formations to produce natural gas. This involves horizontal drilling and use large volumes of water under high pressure to hydraulically fracture. In 2004, first unconventional well was drilled in Pa.

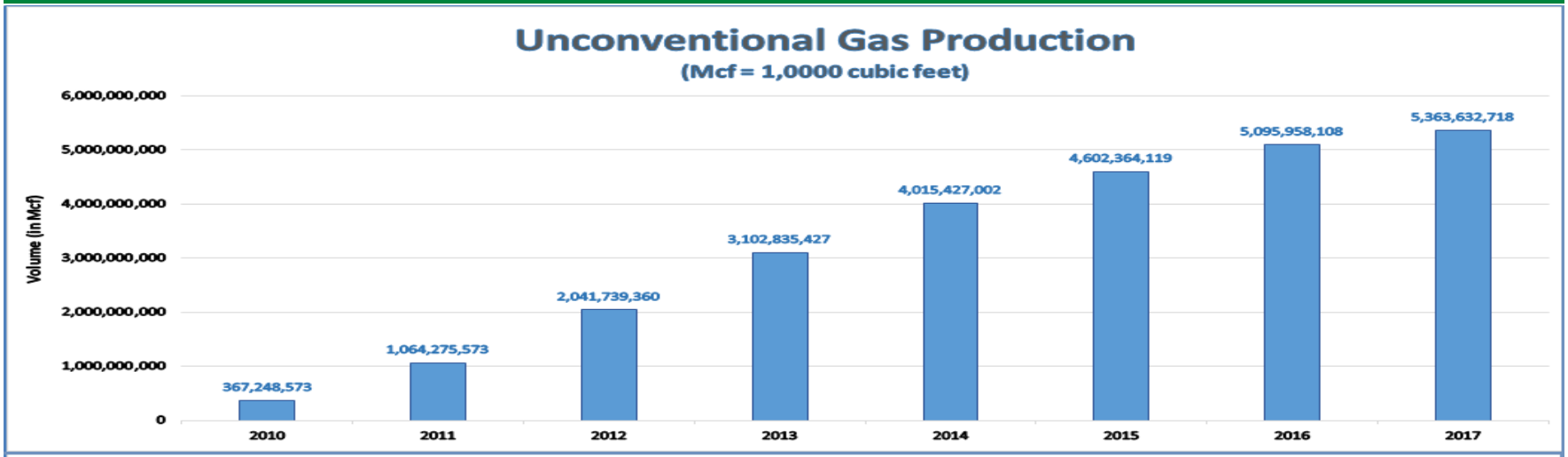
pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

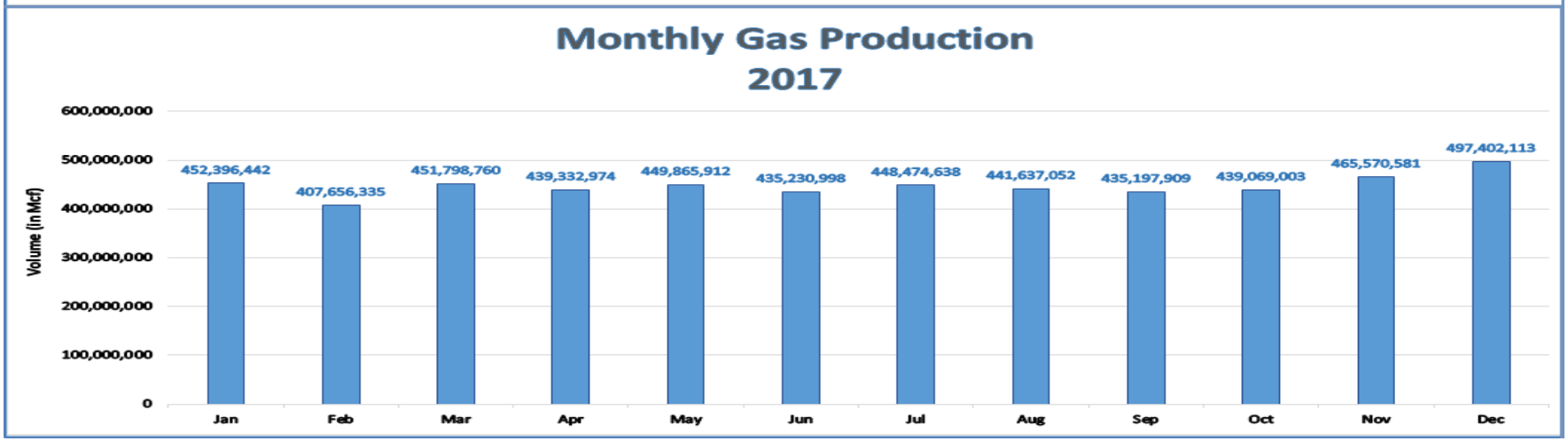
Wells Drilled Since 2000



pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

How much Natural Gas is Produced in Pennsylvania





pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Pennsylvania's Regulatory History

- Prior to the 1997 General Plan Approval/General Permit-5 (GP-5), natural gas production, gathering, processing, transmission, or distribution did not have specific regulatory requirements.

- Pennsylvania has a best available technology (BAT) requirement for new sources, which has been in effect since 1971.

- Since February 2, 2013, GP-5 is applicable to midstream gas compression and processing facilities, primarily addressing VOC and NO_X emissions.

Air Quality Permitting of Oil and Gas Operations

- Air pollution sources at natural gas production sites except for stationary compressor engines were exempted by the Pennsylvania Department of Environmental Protection (PA DEP) from air permitting requirements prior to August 10, 2013.

- On February 1, 2013, PA DEP issued a comprehensive General Plan Approval and/or General Operating Permit (GP-5) for natural gas compression and processing facilities.

- On August 10, 2013, the PA DEP finalized comprehensive permit exemption criteria for sources located at natural gas well sites.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

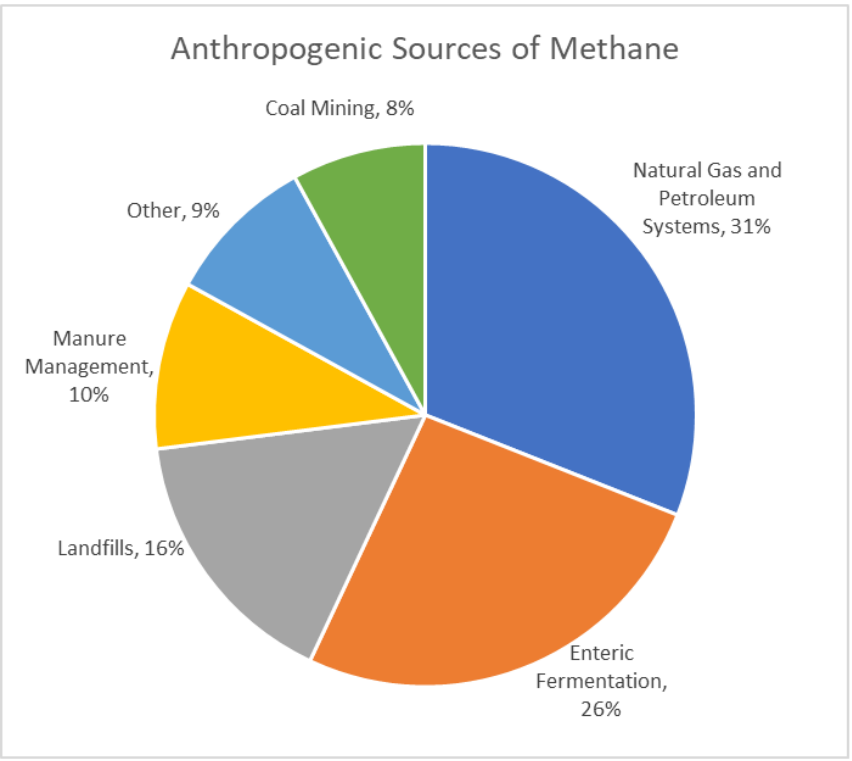
Pennsylvania's Methane Reduction Initiatives

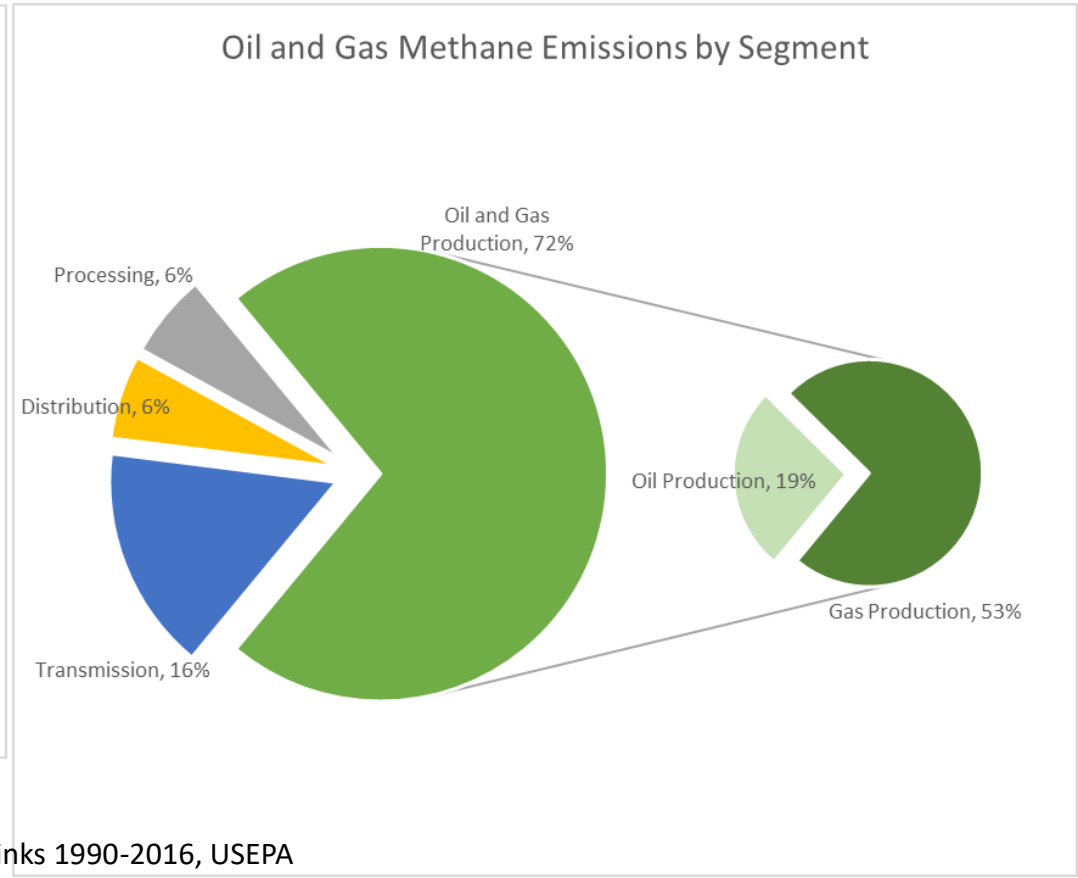
- Pennsylvania was the first state to programmatically require methane specific leak detection and repair (LDAR) at unconventional natural gas well sites, compression stations, and processing plants.

- The 2013 version of the GP-5 required monthly audible, visual, and olfactory (AVO) inspections coupled with quarterly instrument-based inspections. Repair was required to be implemented as quickly as possible, but no longer than 15 days, unless there was a legitimate reason to delay repair.

- Conditional Exemption 38 required an annual instrument-based inspection with similar repair requirements. Exemption 38 was also the first to identify a methane-specific leak definition.

National Methane Emissions





Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2016, USEPA

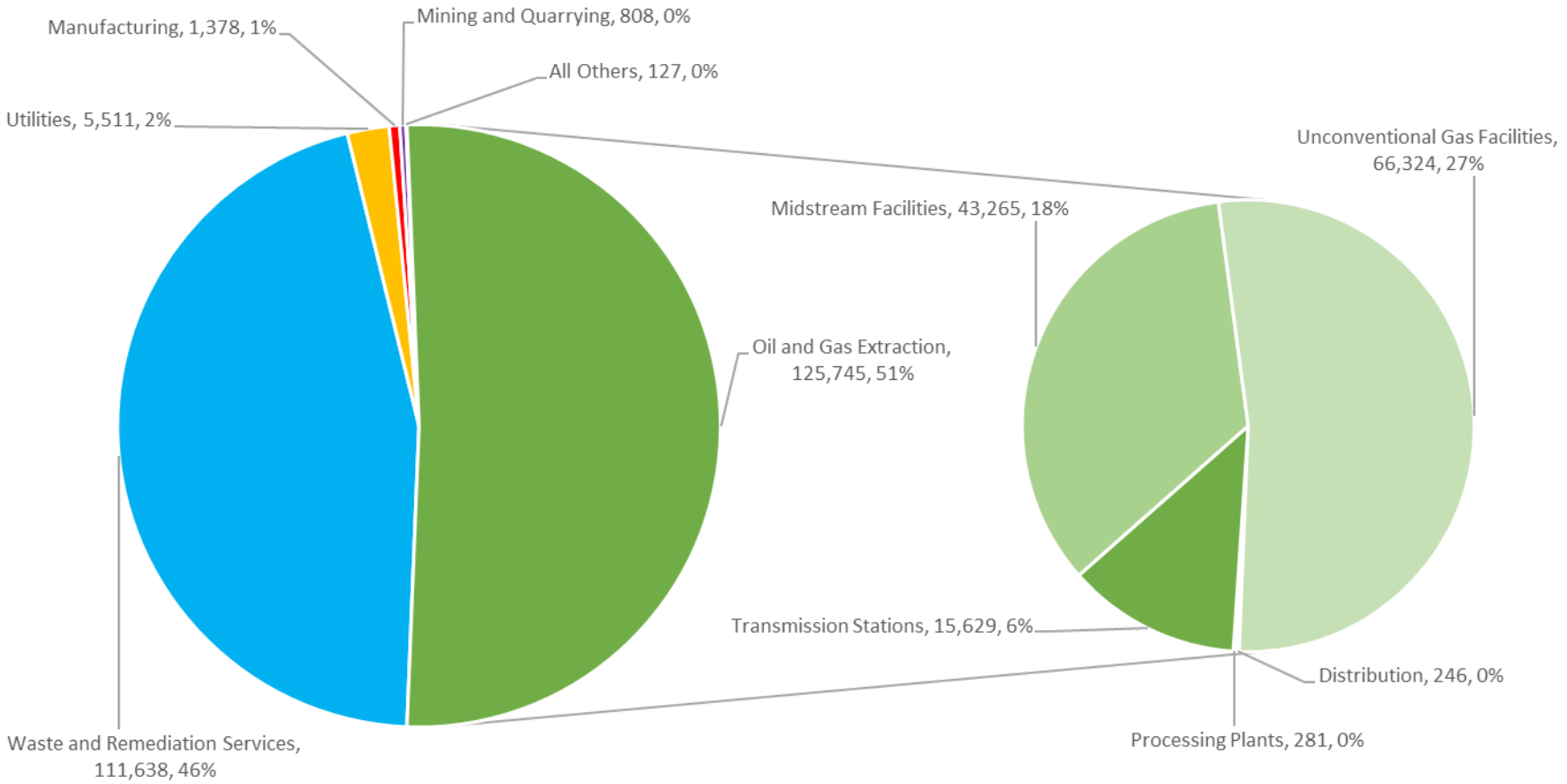
pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PA Methane Emissions from Oil and Gas Sector

Methane Emissions Reported to Pennsylvania's Emission Inventory

Year	Unconventional Well Facilities		Midstream Facilities		Processing Plants		Transmission Stations		Distribution Facilities		Total Methane (Tons)
	No.	CH4	No.	CH4	No.	CH4	No.	CH4	No.	CH4	
2012	3,464	74,922	380	43,890	5	60	78	11,657	3	235	130,765
2013	4,154	50,967	382	52,761	4	62	82	8,320	4	241	112,351
2014	4,997	59,843	397	41,654	6	137	98	9,766	5	211	111,611
2015	5,392	66,878	441	52,089	6	138	116	11,694	5	247	131,046
2016	5,587	69,156	445	46,765	7	256	120	18,247	5	276	134,700
2017	6,089	66,324	435	43,265	7	281	119	15,629	5	246	125,745

PA Methane Emissions



Source: Pennsylvania Air Emission Inventory

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Methane Emission Distribution

Facility Average Methane Emissions (Tons per Year)

	2012	2013	2014	2015	2016	2017
Unconventional Well Facilities	21.63	12.27	11.98	12.40	12.38	10.89
Midstream Facilities	115.50	138.12	104.92	118.12	105.09	99.46
Processing Plants	11.95	15.41	22.88	23.01	36.64	40.14
Transmission Stations	149.45	101.47	99.65	100.81	152.06	131.34
Distribution Facilities	78.43	60.27	42.17	49.44	55.23	49.14

Methane Loss from the Natural Gas production

Approximate Percentage of Natural Gas Losses

Year	Total Facilities Reporting	Natural Gas Produced (Mcf)	Natural Gas Produced (Tons)	Estimated Natural Gas Emissions (Tons)	Estimated Natural Gas Loss (%)
2012	3,930	2,043,279,286	45,156,472	151,999	0.34%
2013	4,626	3,104,168,767	68,602,130	130,595	0.19%
2014	5,503	4,070,390,209	89,955,624	129,735	0.14%
2015	5,960	4,600,905,454	101,680,011	152,326	0.15%
2016	6,164	5,096,092,075	112,623,635	156,574	0.14%
2017	6,655	5,363,633,585	118,536,302	146,164	0.12%

Governor Wolf's Methane Emission Reduction Strategy

On January 19, 2016, Governor Tom Wolf announced a four-point methane emission reduction strategy for oil and natural gas operations.

- Develop a new general permit for new or modified unconventional well pad operations.
- Revise the current GP-5 to update the permitting requirements for sources at natural gas compression, processing, and transmission facilities.
- Develop a regulation for existing sources for consideration by the Environmental Quality Board.
- Establish best management practices (BMP), including LDAR programs to reduce emissions along production, gathering, transmission, and distribution lines.

New GP-5A

- The GP-5A is applicable to unconventional natural gas well site operations and remote pigging stations which addresses sources which are not addressed in recently finalized EPA's NSPS offers a general permit for.

- Permitted sources include stationary internal combustion engines, compressors, storage vessels, dehydrators, tanker truck load-out operations, equipment leaks, pneumatic controllers, pneumatic pumps, pigging operations, and wellbore liquids unloading operations.

- Programmatically, the GP-5A is the first to include a methane emission control threshold of 200 tpy per source.

The Existing Source Regulation

- Despite EPA's proposal to withdraw the Control Techniques Guidelines (CTG) issued October 27, 2016 to address VOC emissions from oil and natural gas industry, Pennsylvania is moving forward with a regulation for existing sources.

- There will be significant collateral reduction of methane emissions.

- Affected natural gas well sites, gathering and boosting stations, and processing plants will be required to perform monthly AVO inspections and quarterly instrument-based LDAR inspections.

- This requirement is more stringent for natural gas well sites than the CTG recommendation.

Voluntary Methane Emission Reduction Initiatives

- Since 2013, the Center for Responsible Shale Development offers certification based on 15 performance standards.
  - Currently certified companies include Chevron, Consol Energy, EQT, and Shell.

- ONE Future Coalition was formed in 2014 with a goal of achieving an average methane intensity across member facilities equivalent to 1% or less of total natural gas production by 2025.
  - ONE Future currently consists of 16 companies. The coalition's 2017 methane intensity was 0.552%, meeting their 2025 goal well ahead of time.
  - In September 2018, Shell announced a target to maintain methane emissions intensity below 0.2% by 2025.

- Oil and Gas Climate Initiative companies set a target to reduce the collective average methane intensity of their aggregated upstream gas and oil operations to below 0.25% by 2025, with the ambition to achieve 0.20%

- The American Petroleum Institute launched a methane reduction initiative in 2017. The initiative is to monitor methane leakage with the most advanced methods, update high-emitting pneumatic controllers, and limit emissions from manual liquids unloading.

Governor Wolf's Executive Order

- On January 8, 2019, Governor Wolf issued Executive Order 2019-01 titled "Commonwealth Leadership in Addressing Climate Change and Promoting Energy Conservation and Sustainable Governance".

- The Order establishes the goal of achieving a 26% reduction of net greenhouse gas (GHG) emissions statewide by 2025 and an 80% reduction of net GHG emissions by 2050, both as measured from a 2005 baseline.

- The Order also establishes the GreenGov Council to serve as a central coordinating body to promote the implementation of the executive order.

- The Order tasks State Agencies to develop policies to achieve energy efficiency performance goals and to support the GreenGov Council in its mission.


Questions and Contacts

Krishnan Ramamurthy, Director
Department of Environmental Protection, Bureau of Air Quality
Rachel Carson State Office Building
400 Market Street, Harrisburg, PA 17105
Phone: 717.787.9702 | Fax: 717.772.2303
kramamurth@pa.gov