

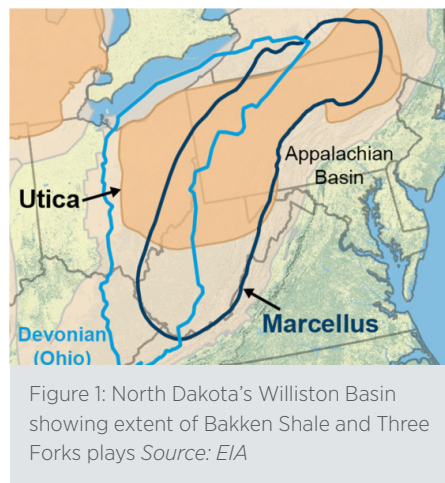


The U.S. Department of Energy’s Office of Fossil Energy (FE) supports research and development of technologies that can reduce the volume of natural gas (e.g., methane) flared or vented (released) into the atmosphere during crude oil and natural gas exploration, production, processing, transportation, and storage operations. This fact sheet was created by FE to inform stakeholders on state-level production and regulatory activity regarding natural gas flaring and venting. FE’s research portfolio includes efforts to reduce methane (and other hydrocarbon) flaring through the application of improved technologies to capture and utilize small volumes of natural gas at remote locations, as well as technologies to reduce (primarily) methane release during midstream gas processing and transportation. Intermittent flaring that occurs as a result of routine well testing, production facility process shutdowns, or facility and pipeline infrastructure maintenance, are normal aspects of safe oil and natural gas production. Increases in domestic oil and natural gas production have resulted in significant infrastructure buildouts, however, natural gas pipeline capacity constraints have led to regional increases in the flaring of associated gas in some unconventional plays (e.g., Permian Basin in Texas and New Mexico and Bakken Shale in North Dakota) in order to enable oil production.

Pennsylvania Producing Plays and Basins

According to the U.S. Energy Information Administration (EIA), Pennsylvania’s proved reserves are [91 million barrels of oil](#) and [90.79 trillion cubic feet \(Tcf\)](#) of natural gas (2017). In 2016, the [Potential Gas Committee](#) reported that the “most likely” recoverable shale gas resource for the entire Appalachian Basin is estimated to be 858.7 Tcf, with 27.6 Tcf in non-shale gas resource. These resources are contained within the Marcellus Shale, the Utica Shale, and the Devonian (Ohio) Shale ([Figure 1](#)).

The [Marcellus Shale](#) play extends from New York State in the north to southwestern West Virginia, and it is the most productive natural gas play in the Appalachian Basin.



The [Marcellus](#) currently produces in four states: Pennsylvania, West Virginia, Ohio, and New York. The Marcellus formation ranges in depth from 100–9,900 feet

and primarily produces gas in northeast Pennsylvania but becomes more liquid rich in less thermally mature areas of southwestern Pennsylvania, West Virginia, and southeastern Ohio. According to the [U.S. Geological Survey \(USGS\)](#), the Marcellus Shale play contains about 84 Tcf of natural gas and 3.4 billion barrels of natural gas liquids (both undiscovered, technically recoverable). However, the Institute for Energy Research has estimated that the [Marcellus](#) could hold as much as 500 Tcf of recoverable resource.

The [Utica Shale](#) is a stacked play underlying the Marcellus that includes both the Utica formation and the underlying Point Pleasant formation. The most productive areas of the Point Pleasant formation are located in eastern

Pennsylvania [Oil](#) and [Natural Gas](#) Statistics (EIA)

	2013	2014	2015	2016	2017	2018
Crude Oil Production (Average Thousand Barrels/Day)	15.0	19.0	19.0	17.0	18.0	17.5
Natural Gas Gross Withdrawals and Production (Average MMcf/Day)	8,929	11,665	13,186	14,275	14,970	17,005
Natural Gas Gross Withdrawals and Production (Vented and Flared) (MMcf/Day)	Pennsylvania does not maintain a database of actual volumes of gas vented or flared.					
Natural Gas Gross Withdrawals and Production (Oil Wells) (MMcf/Day)	8.2	9.7	7.2	7.0	8.3	N/A
Natural Gas and Gas Producing Oil Wells (Thousands)	69.0	76.1	77.7	75.9	74.3	N/A

MMcf – million cubic feet

2017 ranking among 32 U.S. oil and natural gas producing states — [Oil](#): 17 [Natural Gas](#): 2

Ohio and western Pennsylvania. The Utica extends over 115,000 square miles and the Point Pleasant slightly less, of which about 75 percent is prospective. The [Utica play](#) could hold technically recoverable volumes of 782 Tcf of natural gas and nearly 2 billion barrels of oil. [EIA estimates](#) that proved reserves are approximately 6.4 Tcf for the [Utica play](#) (2017).

The Devonian (Ohio) Shale is a shallower formation that extends across the Appalachian Basin, including parts of eastern Ohio, West Virginia, Kentucky, and Pennsylvania. This low-pressure shale has produced gas since the late 1800s, and large numbers of stripper gas wells continue to produce at low rates. Western Pennsylvania, eastern Ohio, and northern West Virginia also produce limited amounts of crude oil from shallow formations.

Pennsylvania Key Regulations Associated with Flaring and Venting

The Pennsylvania Department of Environmental Protection's [Bureau of Air Quality](#) is responsible for enforcing the [Pennsylvania Air Pollution Control Act](#), and the [Bureau of Oil and Gas Planning and Program Management](#) oversees compliance with the [Oil and Gas Conservation Law](#). These roles involve reviewing permits, as well as ensuring regulatory compliance through inspections of wells, storage facilities, pipelines, and compressor stations. The commonwealth requires permits for new and modified oil and gas wells. Although the commonwealth processes permits for venting and flaring, it does not maintain a database of actual volumes of gas vented or flared.

The commonwealth of Pennsylvania does not have any regulation specifically related to the flaring or venting of natural gas. However, most unconventional gas wells are authorized under [Exemption](#)

[38 of the Air Quality Permit Exemptions](#) list, which has requirements for flaring activities conducted at unconventional gas wells. Venting of natural gas is authorized as long as the conditions of Exemption 38 are met. The [GP-5A](#), entitled *Unconventional Natural Gas Well Site Operations and Remote Pigging Stations*, has additional requirements for well sites that cannot meet conditions of Exemption 38. Venting emissions are counted in the source emission when determining whether a control is required to be installed. There are also independent requirements for pigging operations and wellbore liquids operations. Specifically, all flaring operations using an open flare, which is only authorized for temporary flaring activities, must be conducted in accordance with the federal requirements in [40 Code of Federal Regulations \(CFR\) 60.18\(b\)](#).

In accordance with federal regulations, all permanent flaring operations must be conducted using an enclosed flare. In addition, the flares must comply with 40 CFR Part 60 Subpart OOOO or 40 CFR Part 60 Subpart OOOOa (Quad Oa), depending on the date of construction or installation. Federal requirements for flaring conducted at conventional wells include 40 CFR 60.18(b), 40 CFR Part 60 Subpart OOOO, and 40 CFR Part 60 Subpart OOOOa, again depending on the date of construction or installation.

In 2016, the Environmental Quality Board amended the rules involving oil and gas wells and added [guidance](#) related to unconventional wells. This guidance added new regulations to provide “standards for well development impoundments, a process for the closure or waste permitting for wastewater impoundments, onsite wastewater processing, site restoration, standards for borrow pits, and reporting and remediating spills and releases.” Air emissions from oil and gas operations were identified as out of scope of this rulemaking and were unaffected.

Emissions are regulated under Title 25 of the Pennsylvania Code within Subpart C, Article III, entitled [Air Resources](#).

Pennsylvania Points of Contact

Pennsylvania Department of Environmental Protection: Bureau of Oil and Gas Planning and Program Management

Contact the Bureau of Oil and Gas Planning and Program Management for questions pertaining to oil and gas related statutes and regulations.

Website: <https://www.dep.pa.gov/Business/Energy/OilandGasPrograms/Pages/default.aspx>

Email: ra-epoilandgas@pa.gov

Phone: 717-783-5640

Pennsylvania Department of Environmental Protection: Bureau of Air Quality

Contact the Bureau of Air Quality for information regarding air monitoring, permits, regulations, and clean air plans.

Website: <https://www.dep.pa.gov/Business/Air/BAQ/Pages/default.aspx>

Email: ra-epair@pa.gov

Phone: 717-787-9702

Visit energy.gov/fe/state-natural-gas-flaring-and-venting-regulations for a digital version of this fact sheet that includes hyperlinks to information sources.