



Natural Gas Production Report

First Quarter 2016

The Pennsylvania Department of Environmental Protection (DEP) publishes monthly production data submitted by natural gas extractors that operate in the state. Except as otherwise noted, this report uses those data, in conjunction with DEP data on wells spud, to develop statewide tabulations of production volume and well counts for the first quarter of 2016 and the calendar year-to-date. These data are current as of May 20, 2016 and pertain only to gas produced from unconventional formations, which include the Marcellus and Utica formations. The final page provides definitions of the technical terms used throughout this report.

Table 1: Production Volume

	<u>First Quarter</u>			<u>Calendar Year-to-Date</u>		
	<u>2016</u>	<u>2015</u>	<u>Growth</u>	<u>2016</u>	<u>2015</u>	<u>Growth</u>
Volume (bcf)						
Horizontal	1,275.2	1,130.0	12.8%	1,275.2	1,130.0	12.8%
Vertical	<u>9.1</u>	<u>10.1</u>	<u>-9.9%</u>	<u>9.1</u>	<u>10.1</u>	<u>-9.9%</u>
Total	1,284.3	1,140.0	12.7%	1,284.3	1,140.0	12.7%

Table 2: Well Count

	<u>First Quarter</u>			<u>Calendar Year-to-Date</u>		
	<u>2016</u>	<u>2015</u>	<u>Growth</u>	<u>2016</u>	<u>2015</u>	<u>Growth</u>
Number of Producing Wells						
Horizontal	6,584	5,705	15.4%	6,584	5,705	15.4%
Vertical	<u>528</u>	<u>530</u>	<u>-0.4%</u>	<u>528</u>	<u>530</u>	<u>-0.4%</u>
Total	7,112	6,235	14.1%	7,112	6,235	14.1%
Number of Non-Producing Wells						
Horizontal	2,127	2,331	-8.8%	2,127	2,331	-8.8%
Vertical	<u>484</u>	<u>482</u>	<u>0.4%</u>	<u>484</u>	<u>482</u>	<u>0.4%</u>
Total	2,611	2,813	-7.2%	2,611	2,813	-7.2%
Horizontal Detail						
Shut In	970	976	-0.6%	970	976	-0.6%
Spud But Not Completed	816	957	-14.7%	816	957	-14.7%
Plugged	304	249	22.1%	304	249	22.1%
Other	<u>37</u>	<u>149</u>	<u>-75.2%</u>	<u>37</u>	<u>149</u>	<u>-75.2%</u>
Total	2,127	2,331	-8.8%	2,127	2,331	-8.8%

Notes: The number of producing wells in each quarter does not directly correspond to the year-to-date total because some wells are not reported in every quarter. The year-to-date number represents wells that were producing in any quarter of that year. For non-producing wells, the year-to-date number represents wells that produced no gas for that entire period. "Other" includes wells with miscellaneous designations such as abandoned. All characterizations of wells are based on information submitted by the operator.

During the first quarter of 2016, year-over-year production volume from horizontal wells increased 12.8 percent. Production gains were driven by wells spud in 2014 (see Table 3). In that year, 1,352 wells were spud, of which 1,006 (74.4 percent) produced gas in the first quarter of 2016. These wells comprised slightly less than one-third (31.1 percent) of total production. The term “spud” denotes the beginning of the drilling process, and there is often a substantial lag before a well produces output. For example, 784 wells were spud in 2015, but only 219 (27.9 percent) produced gas in the first quarter of 2016. Figure 1 (next page) shows the share of total production from horizontal wells for the calendar year-to-date, based on the year wells were spud.

Table 3: First Quarter Production, by Spud Year

Spud Year	Production Volume (bcf)			Number of Wells			Producing Wells		
	2016	2015	Growth	2016	2015	Growth	2016	2015	Growth
2016	0	n.a.	n.a.	110	n.a.	n.a.	0	n.a.	n.a.
2015	87.2	0	n.a.	784	219	258.0%	219	0	n.a.
2014	397.1	202.9	95.7%	1,352	1,352	0.0%	1,006	432	132.9%
2013	295.0	360.1	-18.1%	1,184	1,184	0.0%	1,066	960	11.0%
2012	182.0	212.1	-14.2%	1,302	1,302	0.0%	1,028	1,010	1.8%
2011	<u>313.9</u>	<u>354.8</u>	<u>-11.5%</u>	<u>3,979</u>	<u>3,979</u>	<u>0.0%</u>	<u>3,265</u>	<u>3,303</u>	<u>-1.2%</u>
Total	1,275.2	1,130.0	12.8%	8,711	8,036	8.4%	6,584	5,705	15.4%

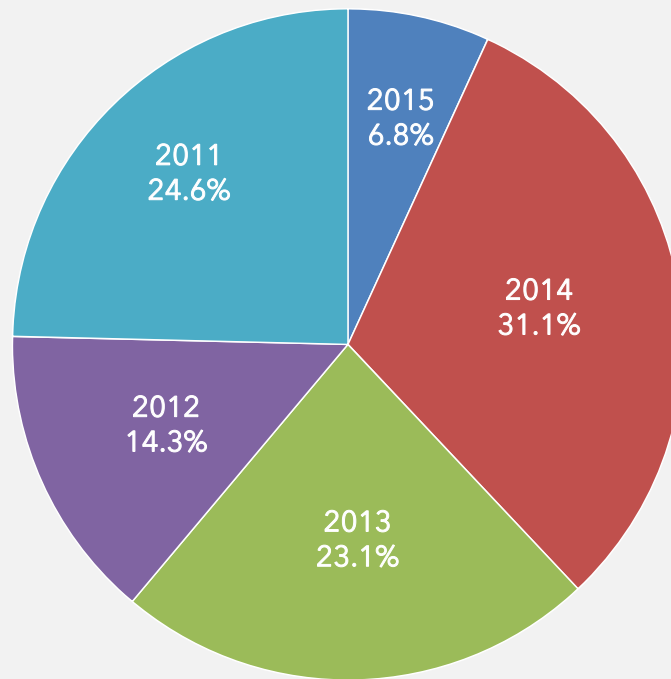
Notes: Horizontal wells only. This table displays 2016 and 2015 production based on the year wells were spud. For example, wells with spud year 2014 were spud during calendar year 2014, and their production is shown for the first quarter of 2016 and the first quarter of 2015. Spud year 2011 includes all wells spud in 2011 or earlier.

Table 4: Calendar Year-to-Date Production, by Spud Year

Spud Year	Production Volume (bcf)			Number of Wells			Producing Wells		
	2016	2015	Growth	2016	2015	Growth	2016	2015	Growth
2016	0	n.a.	n.a.	110	n.a.	n.a.	0	n.a.	n.a.
2015	87.2	0	n.a.	784	219	258.0%	219	0	n.a.
2014	397.1	202.9	95.7%	1,352	1,352	0.0%	1,006	432	132.9%
2013	295.0	360.1	-18.1%	1,184	1,184	0.0%	1,066	960	11.0%
2012	182.0	212.1	-14.2%	1,302	1,302	0.0%	1,028	1,010	1.8%
2011	<u>313.9</u>	<u>354.8</u>	<u>-11.5%</u>	<u>3,979</u>	<u>3,979</u>	<u>0.0%</u>	<u>3,265</u>	<u>3,303</u>	<u>-1.2%</u>
Total	1,275.2	1,130.0	12.8%	8,711	8,036	8.4%	6,584	5,705	15.4%

Notes: Horizontal wells only. This table displays 2016 and 2015 production based on the year wells were spud. For example, wells with spud year 2014 were spud during calendar year 2014, and their production is shown for the first quarter of 2016 and the first quarter of 2015. Spud year 2011 includes all wells spud in 2011 or earlier.

Figure 1: Share of 2016 Year-to-Date Production, by Spud Year



Note: Spud year 2011 includes all wells spud in 2011 or earlier.

Table 5 shows county-level tabulations for the calendar year-to-date. Susquehanna County was the top producing county in the state, representing nearly one quarter of all horizontal well production. Seven of the top ten producing counties registered production gains, while three counties (Bradford, Lycoming and Tioga) recorded declines.

Table 5: Calendar Year-to-Date Production, by County

Rank	County	Production Volume (bcf)				Number of Producing Wells			
		Year-to-Date		2016 Metrics		Year-to-Date		2016 Metrics	
		2016	2015	Share	Growth	2016	2015	Share	Growth
1	Susquehanna	308.3	288.8	24.2%	6.8%	950	812	14.4%	17.0%
2	Washington	198.0	135.7	15.5%	45.9%	1,089	894	16.5%	21.8%
3	Bradford	183.6	188.1	14.4%	-2.4%	1,005	970	15.3%	3.6%
4	Greene	175.4	126.7	13.8%	38.4%	696	529	10.6%	31.6%
5	Lycoming	116.0	142.4	9.1%	-18.5%	732	697	11.1%	5.0%
6	Wyoming	65.0	60.0	5.1%	8.3%	168	172	2.6%	-2.3%
7	Tioga	48.1	49.4	3.8%	-2.6%	523	513	7.9%	1.9%
8	Butler	43.1	32.3	3.4%	33.4%	322	219	4.9%	47.0%
9	Sullivan	24.3	20.9	1.9%	16.3%	68	54	1.0%	25.9%
10	Fayette	21.9	16.2	1.7%	35.2%	172	142	2.6%	21.1%
11	All Other Counties	91.5	69.3	7.2%	32.0%	859	703	13.0%	22.2%

Note: Horizontal wells only.

Tables 6 through 10 show historical production and well counts starting from 2011. Between 2011 and 2015, annual production increased at an average rate of 44.5 percent per annum (see Table 6). However, beginning in the first quarter of 2015, the number of new wells spud began to decline significantly (see Table 8). Therefore, the increase in production for the first quarter of 2016 derived from a combination of (1) increased efficiency of new wells and (2) non-producing wells being brought into production.

Table 6: Annual and Quarterly Production Volume (bcf)					
<u>Calendar Year</u>	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Total</u>
2016	1,275.2	n.a.	n.a.	n.a.	1,275.2
2015	1,130.0	1,099.9	1,148.0	1,188.6	4,566.4
2014	n.a.	1,918.5	n.a.	2,109.2	4,027.7
2013	n.a.	1,393.0	n.a.	1,682.2	3,075.2
2012	n.a.	883.6	n.a.	1,134.4	2,018.0
2011	n.a.	426.3	n.a.	621.5	1,047.8

Notes: Horizontal wells only. Vertical wells comprised roughly 0.7 percent of production in the first quarter of 2016. Data through 2014 were reported on a half-year basis, and the half-year values are shown as Q2 and Q4. Starting in 2015, data are reported on a monthly basis.

Table 7: Number of Producing Wells					
<u>Calendar Year</u>	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Full-Year Count</u>
2016	6,584	n.a.	n.a.	n.a.	6,584
2015	5,705	5,927	6,087	6,278	6,524
2014	n.a.	4,870	n.a.	5,520	5,549
2013	n.a.	3,697	n.a.	4,374	4,382
2012	n.a.	2,376	n.a.	3,037	3,068
2011	n.a.	1,161	n.a.	1,751	1,765

Notes: Horizontal wells only. Data through 2014 were reported on a half-year basis, and the half-year values are shown as Q2 and Q4. Starting in 2015, data are reported on a monthly basis. The full-year count of wells represents the number of wells that produced in any period of that year.

Table 8: Number of New Wells Spud					
<u>Calendar Year</u>	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Total</u>
2016	110	n.a.	n.a.	n.a.	110
2015	219	201	207	157	784
2014	298	325	373	356	1,352
2013	274	324	294	292	1,184
2012	401	372	224	305	1,302
2011	441	369	509	511	1,830

Note: Horizontal wells only.
Source: DEP spud data report.

Tables 9 and 10 show that, on an annual basis, the total number of shut-in and spud but not completed wells increased through 2015. Shut-in wells and spud but not completed wells peaked in the third and first quarters of 2015, respectively. The first quarter of 2016 represents year-over-year and quarterly declines for these categories of wells.

Table 9: Number of Shut-In Wells

<u>Calendar Year</u>	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Full-Year Count</u>
2016	970	n.a.	n.a.	n.a.	970
2015	976	1,073	1,142	1,134	894
2014	n.a.	773	n.a.	793	765
2013	n.a.	731	n.a.	520	520
2012	n.a.	522	n.a.	350	336
2011	n.a.	114	n.a.	135	134

Notes: Horizontal wells only. The full-year count of wells represents the number of wells that produced no gas in every period of that year. Data through 2014 are reported on a half-year basis.

Table 10: Number of Spud But Not Completed Wells

<u>Calendar Year</u>	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Full-Year Count</u>
2016	816	n.a.	n.a.	n.a.	816
2015	957	953	904	859	854
2014	n.a.	908	n.a.	977	976
2013	n.a.	818	n.a.	593	591
2012	n.a.	950	n.a.	790	786
2011	n.a.	472	n.a.	386	384

Notes: Horizontal wells only. The full-year count of wells represents the number of wells that produced no gas in every period of that year. Data through 2014 are reported on a half-year basis.

Table 11 displays a state comparison of gross production from all well types. Pennsylvania and Ohio recorded the largest year-over-year gains (14.4 and 84.1 percent, respectively). Four states (Texas, Louisiana, Wyoming and New Mexico) registered modest declines in production.

Table 11: State Production Comparison (bcf)

<u>Rank</u>	<u>State</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2016 Growth</u>
1	Texas	8,143.5	8,299.5	8,663.3	8,763.4	1,379.8	-1.8%
2	Pennsylvania	2,256.7	3,259.0	4,214.6	4,768.9	880.9	14.4%
3	Alaska	3,164.8	3,215.4	3,168.6	3,175.2	572.1	4.7%
4	Oklahoma	2,023.5	1,993.8	2,310.1	2,499.6	407.8	3.6%
5	Louisiana	2,955.4	2,366.9	1,987.6	1,941.7	309.9	-1.3%
6	Wyoming	2,225.6	2,047.8	1,997.7	1,979.1	306.5	-3.5%
7	Colorado	1,709.4	1,604.9	1,631.4	1,671.8	277.5	3.2%
8	Ohio	84.5	166.0	518.8	1,014.9	228.7	84.1%
9	West Virginia	539.9	741.9	1,040.2	1,318.8	222.9	6.9%
10	New Mexico	1,276.3	1,247.4	1,265.6	1,289.9	199.0	-1.3%

Notes: 2016 production and growth through February. Data for all other years are for the full calendar year.
Source: U.S. Energy Information Administration.

Glossary of Natural Gas Terminology

<u>Term</u>	<u>Definition</u>
Abandoned	No longer producing, but not plugged, and without an available operator.
Bcf	Billion cubic feet. Used as a measure of production volume.
Completed	Capable of producing. Includes drilling and casing and, in the case of an unconventional well, fracturing the shale formation to release gas.
Mcf	Thousand cubic feet. Used as a measure of production volume.
Observational	For the purpose of exploring the geology of an area. Wells that are "observational" produce gas only to test for productivity.
Plugged	Permanently sealed with cement or by some similar method.
Production	The natural gas recovered from a well.
Regulatory Inactive	Designated by the Department of Environmental Protection as inactive, after the operator properly filed for inactive status pursuant to Section 3214 of Act 13 of 2012.
Shut In	Temporary suspension of production activity. Directly corresponds to the term "capped," as defined in Act 13 of 2012.
Spud	The commencement of drilling activity. Often refers to the first stage at which casing is placed into the wellbore. "Spud year" refers to the year in which a well was spud, as reported to the Department of Environmental Protection.
Unconventional	Requiring technological methods that go beyond merely drilling a well and capturing the gas. These methods usually include horizontal drilling into deep formations and fracturing with fluids.