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SHALE INVESTMENT DASHBOARD IN OHIO Q3 AND Q4 2024

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LIST OF TABLES

LIST OF FIGURES

Executive Summary

This report presents findings from an investigation into shale-related investment in Ohio. The investment estimates are cumulative from July through December of 2024. Prior investments have been included in previous reports that are available from Cleveland State University.[1] Subsequent reports will estimate additional investment since the date of this report. Investment in Ohio into the Utica during the second half of 2024 can be summarized as follows:

Total Estimated Upstream Utica Investment: July – December 2024

Lease Renewals and New Leases	$88,365,000
Drilling	$2,177,400,000
Roads	$29,872,400
Lease Operating Expenses	$173,989,210
Royalties	$767,256,000
Total Estimated Upstream Investment	**$3,236,882,610**

Total Estimated Midstream Investment: July – December 2024

Gathering Lines	$124,373,500
Compression and Dehydration	$155,728,300
Total Estimated Midstream Investment	**$280,101,800**

Total Estimated Downstream Investment: July – December 2024

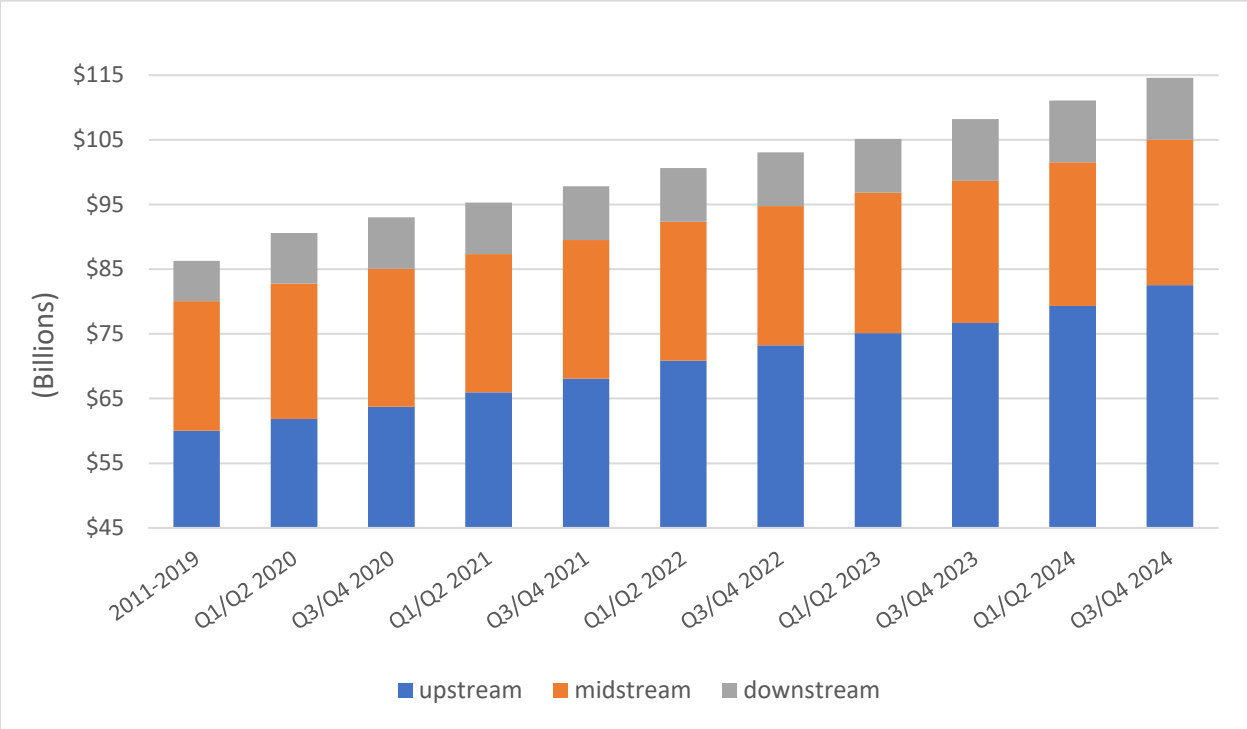
LPG Stations	$1,800,000
Total Estimated Downstream Investment	**$1,800,000**

Total investment from July through December 2024 was approximately $3.5 billion, including upstream, midstream, and downstream. Indirect downstream investment, such as development of new manufacturing as a result of lower energy costs, was not investigated as part of this Study. Together with previous investment to date, cumulative shale-related oil and gas investment in Ohio through December of 2024 is estimated to be around $114.6 billion. Of this, $82.5 billion has been in upstream, $22.5 billion in midstream, and $9.5 billion in downstream industries.[2] Figure 1 shows the growth in cumulative shale-related investment for Ohio since the release of the first Shale Dashboard.

[1] The seventeen previous reports on shale investment in Ohio up to June 2024 can be found at https://levin.csuohio.edu/epc

[2] Numbers may not add up precisely due to rounding.

Figure 1: Cumulative Shale Investment in Ohio Over Time



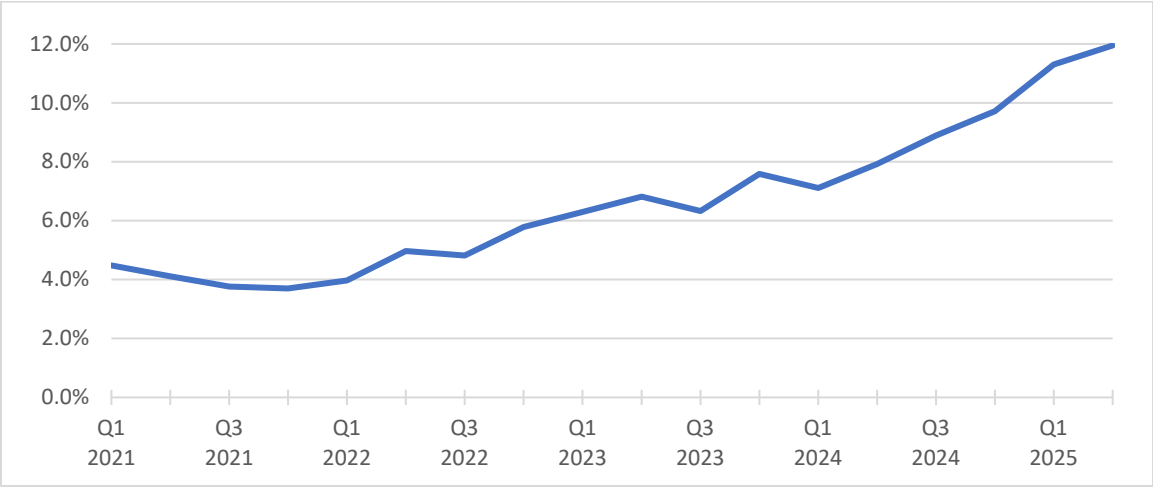
Overall upstream investments were up by about $615 million in the second half of 2024 compared to the first half of 2024, reflecting continued growth in drilling activity, especially for oil-producing wells, with new wells accounting for 29% of the 19,319,481 barrels of oil produced overall during the Study period. (New wells accounted for 11% of total Utica oil production in the first half of 2024.) Also, royalties rose modestly in the second half of the Study period (+4.2%), reflecting increased oil production and higher natural gas prices compared to the previous 6-month period.

Although this report tracks investment only through the end of 2024, early-2025 company statements offer insight into operator expectations heading into the next reporting period. Despite softening oil prices, continued production efficiencies—driven in part by artificial intelligence and by the Utica's structural cost advantages relative to other shale plays—are likely to sustain oil-related development, which accounted for more than 10% of total gas-equivalent production in the first half of 2025 (see Figure 2). Infinity Natural Resources (INR), for example, reported in May 2025 a breakeven realized oil price of about $28 per barrel for its Ohio Utica oil inventory, suggesting that development remains economically attractive even in a lower-price environment.[3] In a separate filing, INR stated that the Utica's *volatile* oil window—the portion of the play producing very light crude that vaporizes easily—"maintains one of the lowest

[3] Infinity Natural Resources. (2025, May 12). *Q1 2025 Earnings Presentation*. https://s204.q4cdn.com/940357400/files/doc_financials/2025/q1/INR-1Q25-Earnings-Presentation.pdf

breakeven costs amongst all oil resource plays in the United States."[4] EOG Resources similarly noted on its Q1 2025 earnings call that, while it planned to modestly reduce capital spending in other basins, it expected to maintain its current level of activity in the Utica—highlighting the play's competitive cost position.[5]

Figure 2. Oil's Share of Quarterly Gas-Equivalent Utica Production, Q1 2021 - Q2 2025



Data source: ODNR (2025).

Figure 3 shows the geographic distribution of high-productivity oil wells for the second half of 2024. (In more established shale oil basins, initial production rates above 1,500 barrels per day are often cited as representing the highest-productivity wells, while rates of 1,000 barrels per day or higher are viewed as indicating strong performance. [6]) These wells fall within a narrow band extending diagonally through western Carroll, Columbiana, and Harrison Counties in the north, down into the central and eastern portions of Guernsey County and the western part of Noble County in the south.

In the second half of 2024, 11 Utica wells had oil productivity of greater than 1,500 bbl/day during the 6-month period, while 37 had oil productivity of 1,000-1,500 bbl/day.[7] In the second half of

[4] Infinity Natural Resources. (2024, October 4). Registration Statement on Form S-1 filed with the U.S. Securities and Exchange Commission. https://www.sec.gov/Archives/edgar/data/2029118/000119312524232829/d826795ds1.htm

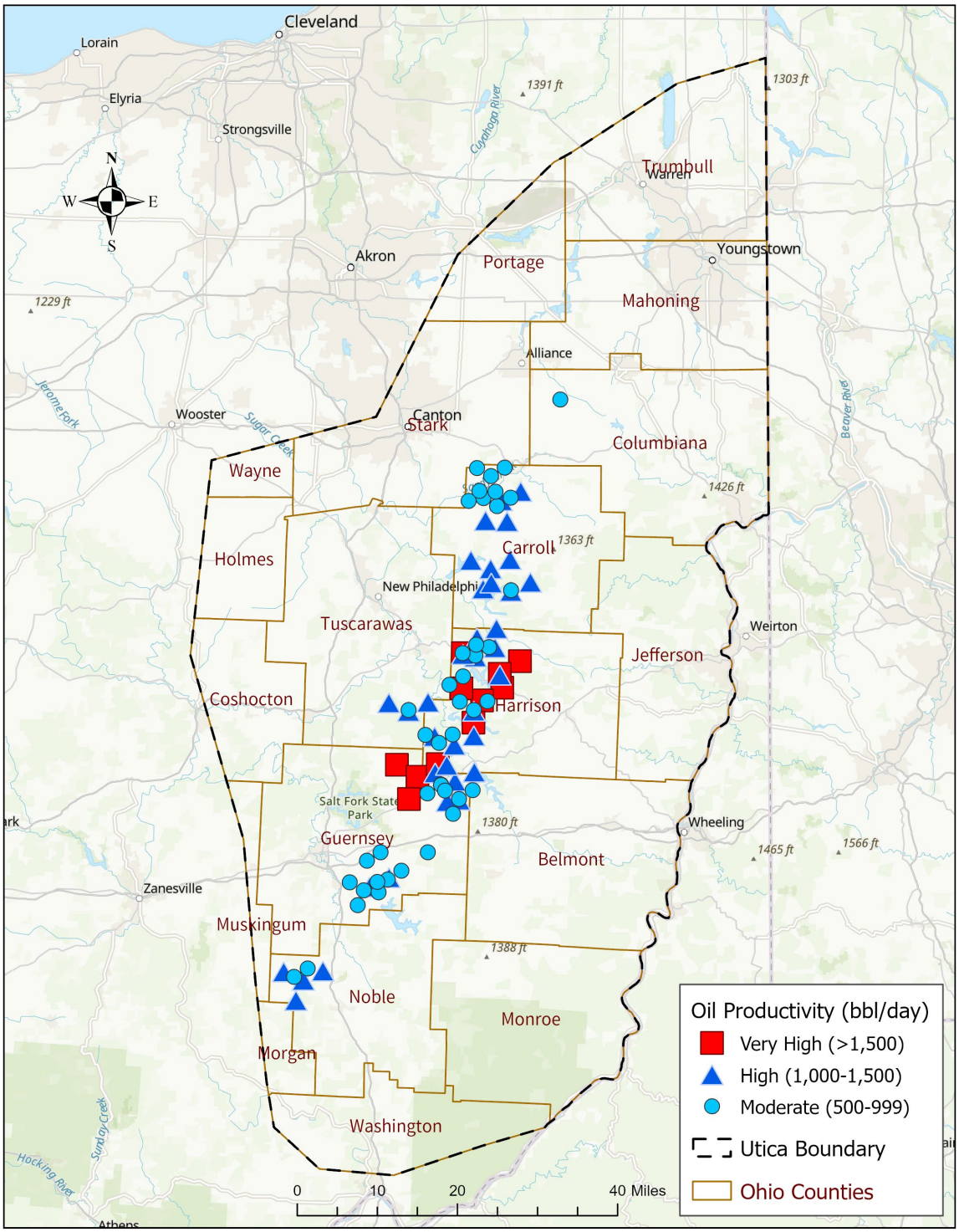
[5] Seeking Alpha. (2025, May 2). *EOG Resources, Inc. (EOG) Q1 2025 Earnings Call Transcript.* https://seekingalpha.com/article/4781287-eog-resources-inc-eog-q1-2025-earnings-call-transcript

[6] *See* RBN Energy. (2025, June 9). *Might as Well Jump! - EOG Resources, Upbeat on Utica Condensate, Doubles Down With Encino Deal*. https://rbnenergy.com/daily-posts/blog/eog-resources-upbeat-utica-condensate-doubles-down-encino-deal. *See also* Hart Energy. (2021, June 23). *Marketed: Eddy County ORRI, New Mexico, Permian Basin*. https://www.hartenergy.com/exclusives/marketed-eddy-county-orri-new-mexico-permian-basin-194778/

[7] Oil productivity (bbl/day) was calculated as the volume of oil produced divided by the number of days in operation for the combined third and fourth quarters as gathered from Ohio Department of Natural Resources (ODNR) data for horizontal well production, available at https://ohiodnr.gov/discover-and-learn/safety-conservation/about-odnr/oil-gas/oil-gas-resources/production.

2023, by comparison, there were 2 Utica wells with oil productivity of greater than 1,500 bbl/day and 13 wells with oil productivity of 1,000-1,500 bbl/day (see Table 1).

Figure 3: High-Productivity Utica Oil Wells for the Second half of 2024



Data source: ODNR (2025).

Table 1. Counts of Utica Wells by Daily Oil Productivity

Period	Moderate Productivity (500 - 999 bbl/day)	High Productivity (1,000 - 1,500 bbl/day)	Very High Productivity (>1,500 bbl/day)
Q3/Q4 2021	15	2	0
Q3/Q4 2022	41	10	2
Q3/Q4 2023	36	13	2
Q3/Q4 2024	44	37	11

Data from the Ohio Department of Natural Resources Division of Oil and Gas (ODNR) shows that 191 new wells were drilled during the third and fourth quarters of 2024. ODNR production data also indicates that total gas-equivalent shale production in the second half of 2024 was 2.4% higher than the first half of 2024. This increase was driven almost entirely by a 26.8% increase in oil production, while natural gas output rose 0.4% over the same timeframe.

For the second half of 2024, Guernsey County had the highest number of new wells with 50, followed by Harrison County with 35, Carroll County with 33, Belmont County with 25, Columbiana County with 23, and Jefferson County with 11. Tuscarawas County had 7 new wells, while Noble and Monroe Counties had 6 new wells and 1 new well, respectively. No other new wells were drilled during the second six months of 2024.

Ascent and EAP Ohio were the top producers for Q3 and Q4 of 2024, having produced 459 and 222 billion cubic feet equivalent (Bcfe), respectively.[8] Gulfport was third in production at 196 Bcfe. SWN Production (Expand Energy) and Rice Drilling produced 95 Bcfe and 59 Bcfe, respectively.[9] Antero had the sixth highest production during the Study period at 35 Bcfe. These six companies represented 91% of total production in Ohio for the second half of 2024. Altogether, 1.1 trillion cubic feet of natural gas and 19.3 million barrels of oil were produced in the second six months of 2024.

Midstream investment reached $280.1 million in the second half of 2024, up from $235.8 million in the first half of the year. This continues a pattern of elevated spending: six-month totals have consistently averaged well over $200 million since the first half of 2023. Midstream investment during the Study period went toward gathering system buildout and transportation, with $124.4 million spent on gathering lines and $155.7 million spent on compression.

[8] The acquisition of Encino Acquisition Partners, EAP Ohio's parent company, by EOG Resources was completed in August 2025. See EOG Resources. (2025, August 8). *Q2 2025 Earnings Presentation*. https://filecache.investorroom.com/mr5ir_eogresources2/425/EOG-0825.pdf

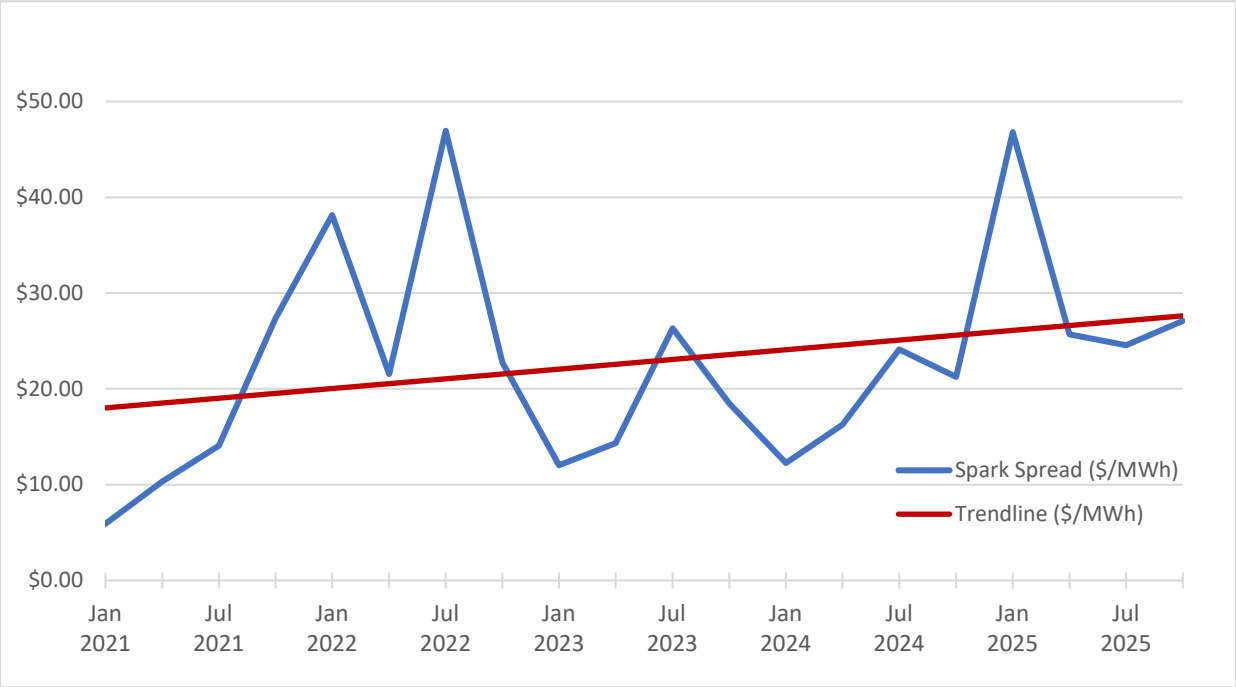
[9] Expand Energy was formed through the merger of Chesapeake Energy and Southwestern Energy, completed in October 2024. See Expand Energy Corporation. (2024, October 1). *Chesapeake Energy and Southwestern Energy Complete Merger and Provide Third Quarter Earnings Conference Call Information, Company Rebranded as Expand Energy.* https://investors.expandenergy.com/news-releases/news-release-details/chesapeake-energy-and-southwestern-energy-complete-merger-and

There was little downstream investment in the second half of 2024, with $1.8 million in liquified petroleum gas (LPG) fueling stations opening throughout the state. However, growth in demand for electricity—particular by data centers—is poised to drive gigawatt-scale deployment of gas-fired power generation in the coming years. Although natural gas prices have gradually risen over the past year and are projected to continue rising into 2026, the difference between the cost of natural gas as a fuel to generate power and the wholesale price of that power has also been widening. As the dollar-per-megawatt-hour ($/MWh) price of electricity increases relative to the cost of the natural gas needed to produce that MWh, gas-fired generation becomes more economically attractive.

More recently, this difference—known as the *spark spread*—has trended towards levels supportive of further gas-fired development, particularly amid growing regional electricity demand. Figure 4 shows an estimated Ohio Utica spark spread in $/MWh based on the spot price of natural gas at the Columbia Gas Transmission and Eastern Gas South regional hubs, Columbia Gas Transmission's current reservation charge for firm transportation service, the real-time price of wholesale power in American Electric Power's transmission zone, and the average MMBtu-per-MWh heat rate of the seven gas-fired power plants in Ohio that have become operational since 2017.[10]

[10] Regional natural gas prices were calculated as the average of the daily cash market prices for the Columbia Gas Transmission and Eastern Gas South hubs for January, April, July, and October of 2021–2025. These prices were derived from Intercontinental Exchange (ICE) trade data as published in weekly natural gas market reports by Snyder Brothers Gas Marketing, available at https://www.snyderbrothersinc.com. Columbia Gas Transmission's current rate schedule for firm transportation service (FTS) is available at https://www.hostedtariffs.com/tco/. Regional wholesale power prices were estimated using the 24-hour average of the real-time hourly locational marginal price (LMP) for the AEP transmission zone within PJM, available at https://dataminer2.pjm.com/feed/rt_hrl_lmps/definition. For consistency with the natural gas price selection, the same calendar days used in the Snyder Brothers daily spot-price reports were used to calculate the corresponding daily average LMP. The average heat rate for the seven Ohio gas-fired power plants from January 2023 through August 2025 has been 6.6 MMBtu/MWh according to U.S. Energy Information Administration power plant data, available at https://www.eia.gov/electricity/data/eia923/).

Figure 4. Ohio Utica Spark Spread ($/MWh), 2021-2025



In recent periods, the regional spark spread has exhibited a consistent floor approaching $20/MWh. This level is broadly supportive of continued gas-fired development in the region, as sustained spark spreads in the mid-to-high teens have been sufficient to meet capital recovery requirements for the combined-cycle units already operating in Ohio.[11]

Some of this development occurred in 2025 and is therefore not included in this report's investment totals, which reflect activity only through the end of 2024. However, recent 2025 approvals illustrate emerging trends that will be captured in subsequent editions of the Shale Dashboard. For example, 736 MW of gas-fired generation across four facilities was approved by the Ohio Power Siting Board in 2025—with construction starting soon thereafter—to serve data centers in western Licking County. These behind-the-meter projects will rely entirely on on-site gas-fired generation rather than interconnecting to the electric utility grid. A widening spark spread increases the value of avoided wholesale electricity purchases, improving the cost-competitiveness of these projects relative to grid-supplied power.

[11] See S&P Global. (2024, June 11). *Carroll County Energy LLC's Senior Secured Term Loan B Assigned Preliminary 'BB-' Rating, Outlook Stable*. https://www.spglobal.com/ratings/pt/regulatory/article/-/view/type/HTML/id/3195637

1. INTRODUCTION

This is the eighteenth CSU study reporting investment resulting from oil and gas development in Ohio related to the Utica, Point Pleasant, and Marcellus formations (hereinafter, the "Utica").[12] This analysis looks at investments made in Ohio between July 1 and December 31, 2024, separately considering the upstream, midstream, and downstream portions of the industry. For the upstream part, the Study Team estimated spending primarily based upon the likely costs of drilling new and operating existing wells, together with royalties and lease bonuses.

For midstream estimates, the Study Team looked at new infrastructure built during the relevant time period downstream of production, from gathering to the point of hydrocarbon distribution. This included pipelines, processing, natural gas liquid storage, and intermodal transloading facilities.

For the downstream analysis, the Study Team considered those industries that directly consume large amounts of oil, natural gas or natural gas liquids. Since hydrocarbon consumption may or may not be related to shale development, the examination of downstream investment has been limited to those projects that have been deemed by the Study Team to be dependent on, or directly the result of, the large amount of oil and gas being developed in the region as a result of the Marcellus and Utica shale formations.

This eighteenth Study includes as Appendix A the cumulative investment made in Ohio resulting from shale development, based upon all previous reports that tracked total investment from early 2011 through December 2024.[13] The methodology for determining the investments is set forth in Appendix B, and has been updated since the last report. Subsequent reports will include incremental spending on a six-month basis.

2. SHALE INVESTMENT UPDATES

A. UPSTREAM DEVELOPMENT

1. Overview

A total of 191 new wells were classified by the Ohio Department of Natural Resources as "drilled," "drilling," or "producing" between July 1 and December 31, 2024.[14] This represents a 34%

[12] This and other Investment Dashboard reports include drilling into the Marcellus and other shale units, but these comprise a very small portion of shale development in Ohio to date. This will be revisited as necessary in future iterations of the Investment Dashboard reports.

[13] See fn. 1*, supra*.

[14] The number of new wells was determined using ODNR's report of cumulative permitting and drilling activity for the beginning and end of the 6-month period. (The most recent report of cumulative permitting and drilling activity is available at https://ohiodnr.gov/business-and-industry/energy-resources/oil-and-gas-wells/horizontal-wells.) Wells are assigned an American Petroleum Institute API number, which is included in the ODNR reports. Wells were considered new if they had a status of Drilled, Drilling, or Producing at the end of the 6-month period but did not have any one of these status designations at the beginning of it.

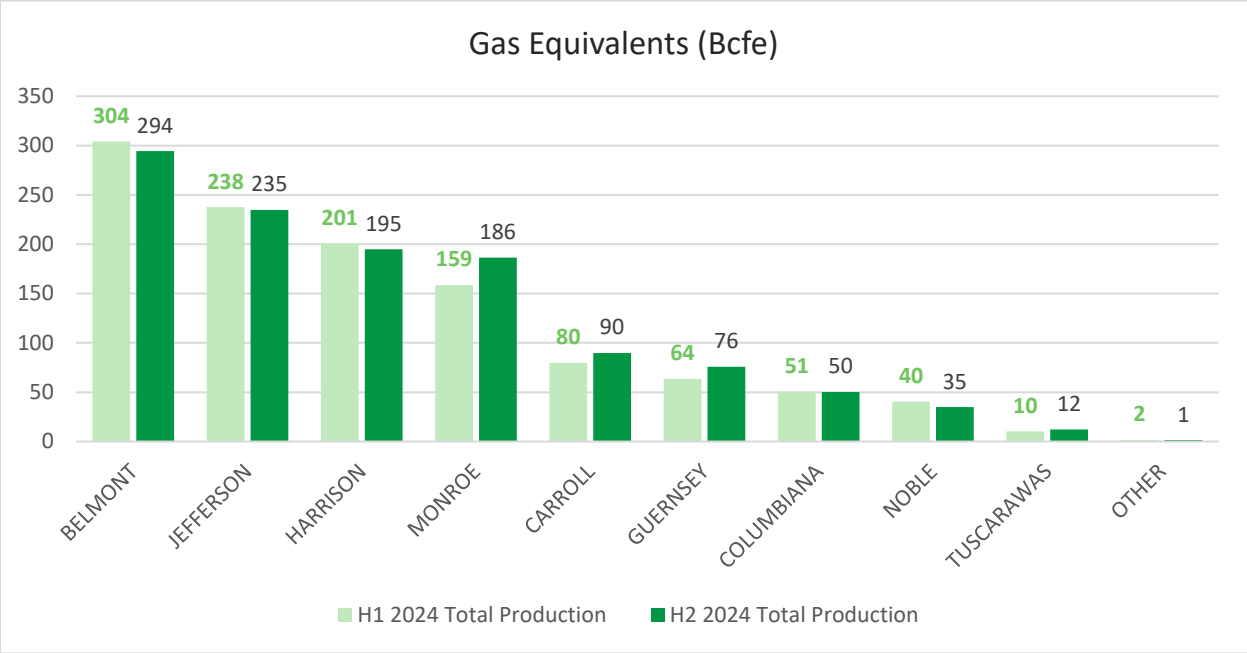
increase in new well development compared to the first half of 2024 (143 new wells), and a more than three-fold increase compared to the second half of 2023 (52 new wells). The total number of producing shale wells in Ohio was 3,420 as of December 31, 2024, representing a 7.6% increase compared to June 2024. The Marcellus shale formation accounted for 57 of these producing wells (1.7%) in the second half of 2024. Total shale-related oil and gas production in billion cubic feet equivalent (Bcfe) for this period was 1,174 Bcfe, led by Belmont County with 294 Bcfe. Jefferson County was second with 235 Bcfe, followed by Harrison and Monroe Counties with 195 and 186 Bcfe, respectively.[15]

The Ohio Department of Natural Resources (ODNR), Division of Oil and Gas Resources Management, issues weekly reports on well status and quarterly reports on production. The ODNR production reports for the third and fourth quarters of 2024 provide the foundation for the upstream analyses presented in this Study.

The Utica is currently identified by the ODNR as producing in eighteen eastern Ohio counties with the vast majority (more than 98%) of producing wells located in eight counties, stretching from Columbiana in the north, to Monroe and Noble at the southern end of the play. Total production in quarters 3 and 4 for 2024 is set forth by county and operator in Figures 5 and 6 below. (Figure 5 includes a comparison of total production by county for the second half of 2024 and the preceding 6-month period.) Total cumulative production in billions of cubic feet equivalent (Bcfe) by county through December 2024 can be found in Appendix A as Figure 12.

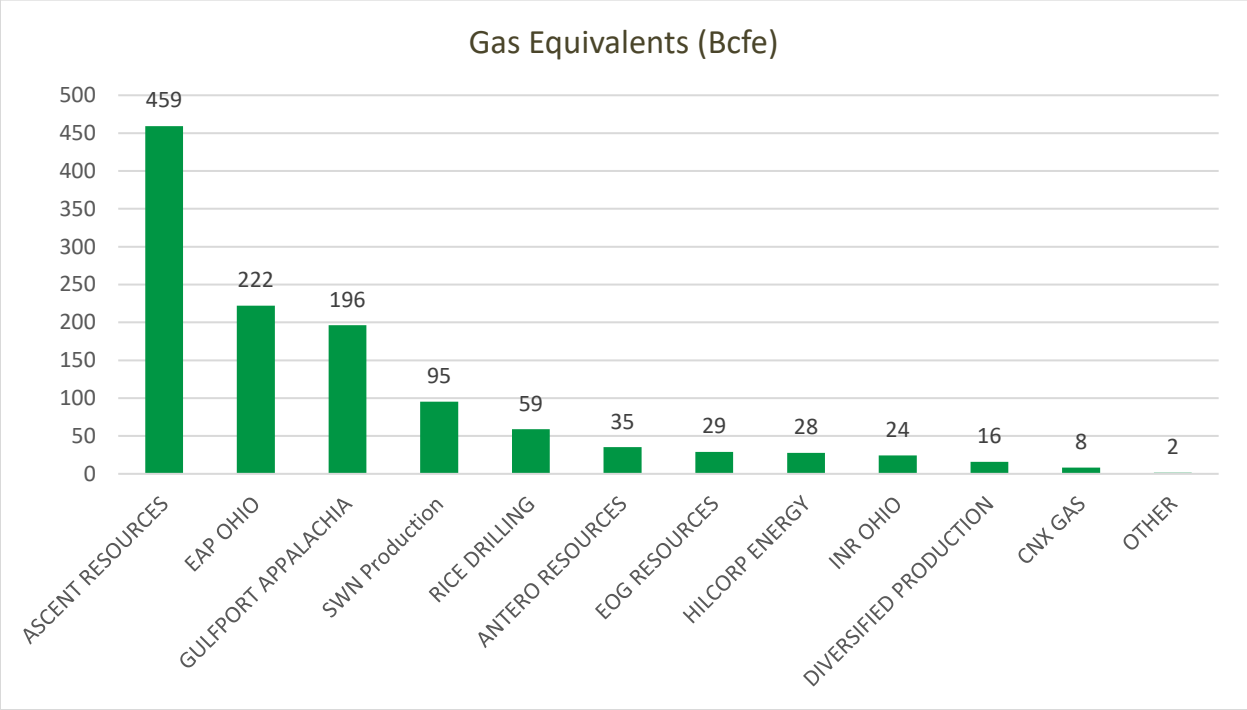
[15] Production is reported to the ODNR at the wellhead as gas measured in thousands of cubic feet (Mcf) and as oil measured in barrels (bbl). The Utica also produces significant volumes of natural gas liquids (NGLs) such as ethane, propane, butane and natural gasoline. These NGLs are separated from the natural gas stream at midstream cryogenic and fractionation plants and not included in the ODNR production reports. For the purposes of this Study, oil and gas production is combined as gas equivalents (Mcfe) based on the energy content of oil and gas, measured as British thermal units (Btu). Gas equivalents were calculated using the following formula: Gas Equivalents (Mcfe) = Oil (bbl) x 5.659 Mcf/bbl + Gas (Mcf).

Figure 5: Production by County for First Half 2024 and Second Half 2024



Data Source: ODNR (2025).

Figure 6: Production by Operator for Q3 and Q4 of 2024



Data Source: ODNR (2025).

2. Production Analysis

Production can be summarized using tables that show gas equivalent production measured in billions of cubic feet equivalent as a function of time. This summary, for both production in the third and fourth quarters of 2024, and also for cumulative production since 2011, is set forth in Table 2. Table 3 sets forth production by county for the second half of 2024. Figure 7 sets forth the geographic distribution of production for the same period.

Table 2: Ohio's Shale Production by Reporting Period

Year	Quarter	Production Wells	Gas (Mcfe)	Oil (bbl)	Gas Equivalents (Mcfe)	Gas Equivalents % Change from Previous Quarter
2024	4	3,466	535,908,661	10,195,461	593,604,775	2.2
2024	3	3,410	529,170,757	9,124,020	580,803,586	1.5
2024	2	3,371	526,591,624	8,013,287	571,938,815	-0.5
2024	1	3,310	534,029,105	7,227,503	574,929,544	-1.0
2023	4	3,265	536,767,896	7,789,411	580,848,173	-0.5
2023	3	3,195	547,039,311	6,527,247	583,977,002	1.6
2023	2	3,131	535,540,115	6,921,158	574,706,949	-2.4
2023	1	3,074	551,830,848	6,549,638	588,895,250	2.8
2022	4	3,033	539,681,875	5,855,323	572,817,148	-0.6
2022	3	3,014	548,326,581	4,908,109	576,101,570	0.8
2022	2	2,921	543,019,311	5,018,523	571,419,133	1.3
2022	1	2,850	541,815,020	3,957,294	564,209,347	-5.8
2021	4	2,818	576,496,677	3,912,593	598,638,041	5.2
2021	3	2,765	547,540,443	3,781,319	568,938,927	-0.6
2021	2	2,736	549,211,398	4,154,041	572,332,375	-0.2
2021	1	2,671	548,129,151	4,543,462	573,417,606	-6.4
2020	4	2,722	586,878,969	4,625,639	612,624,813	-1.3
2020	3	2,688	588,630,465	5,713,477	620,431,107	3.6
2020	2	2,643	569,396,136	5,182,481	598,723,796	-2.6
2020	1	2,573	581,634,083	5,887,032	614,948,797	-14.1
2019	ANNUAL	2,385	2,575,318,404	24,906,277	2,716,263,025	--
2018	ANNUAL	2,077	2,354,848,381	19,786,375	2,466,819,477	--
2017	ANNUAL	1,703	1,721,550,621	16,298,234	1,813,857,486	--
2016	ANNUAL	1,406	1,386,584,598	17,847,818	1,487,651,097	--
2015	ANNUAL	1,034	923,908,838	20,698,159	1,041,039,721	--
2014	ANNUAL	612	449,966,930	10,893,625	511,613,948	--
2013	ANNUAL	236	99,050,302	3,635,419	119,623,141	--
2012	ANNUAL	82	12,831,292	635,874	16,429,703	--
2011	ANNUAL	9	2,561,524	46,326	2,823,683	--
Total			**20,544,259,316**	**234,635,125**	**21,870,428,035**	--

Source: ODNR (2025).

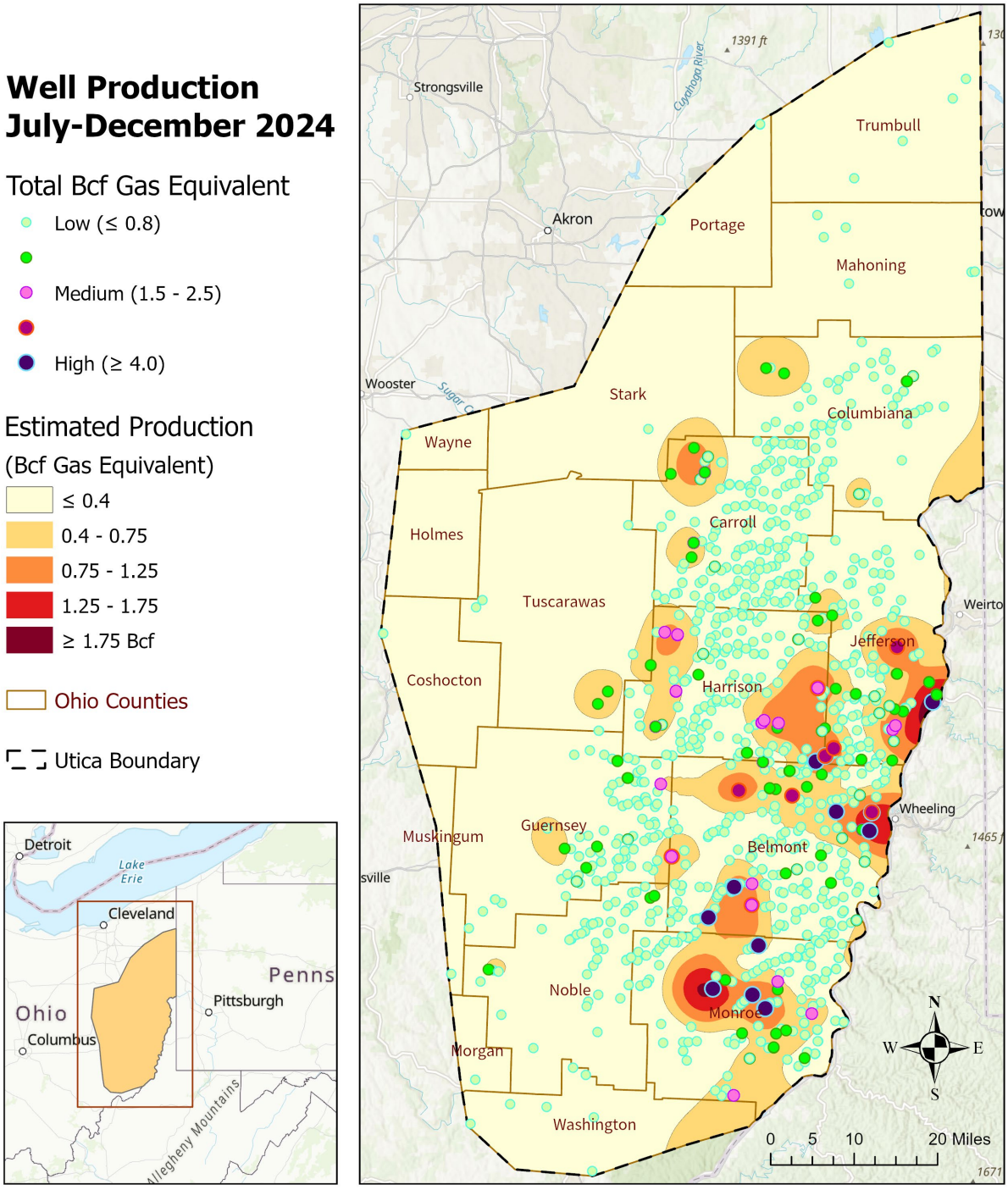
Table 3: Production by County for July – December 2024

County	Gas (Mcfe)	Oil (bbl)	Gas Equivalents (Mcfe)	Production Wells[16]
BELMONT	292,763,319	279,903	294,347,290	695
CARROLL	61,671,085	4,960,779	89,744,133	578
COLUMBIANA	46,361,429	678,882	50,203,222	177
COSHOCTON	11,788	115	12,439	1
GUERNSEY	42,702,085	5,839,252	75,746,412	322
HARRISON	164,117,951	5,424,305	194,814,093	563
JEFFERSON	234,421,814	62,943	234,778,008	382
MAHONING	389,556	1,941	400,540	11
MONROE	184,794,984	262,308	186,279,385	471
MORGAN	41,707	1,554	50,501	3
MUSKINGUM	99,659	803	104,203	1
NOBLE	30,501,624	773,084	34,876,506	195
PORTAGE	106,717	154	107,588	3
STARK	24,815	236	26,151	1
TRUMBULL	161,217	501	164,052	6
TUSCARAWAS	6,369,001	1,029,868	12,197,024	17
WASHINGTON	524,493	2,853	540,638	11
WAYNE	16,174	0	16,174	1
Total	**1,065,079,418**	**19,319,481**	**1,174,408,361**	**3,438**

Source: ODNR (2025).

[16] Represents the average number of production wells for the third and fourth quarters of 2024.

Figure 7: Distribution of Gas Equivalent Production for July – December 2024



Note: *Estimated Production* reflects the expected average production for a new well located within each of the color-coded contour zones. Estimates are based on a spatial interpolation of ODNR production records.

Of the 3,703 total wells identified from the ODNR records for cumulative drilling activity as of December 2024, 146 were in the process of drilling, 137 wells had been drilled and were awaiting

markets, and 3,420 were in the production phase.[17] (*See* Table 4, Ohio Utica Well Status.) Belmont County continued to lead in total wells. (*See* Table 5.)

Table 4: Ohio Utica Well Status as of December 2024

Well Status	No. of Wells
Drilled	137
Drilling	146
Producing	3,420
Total	**3,703**

Source: ODNR (2025).

Table 5: Well Status by County (December 2024)

County	Drilled	Drilling	Producing	Total
ASHLAND	1	0	0	1
BELMONT	32	5	700	737
CARROLL	6	28	572	606
COLUMBIANA	10	2	176	188
COSHOCTON	1	0	1	2
GUERNSEY	9	44	316	369
HARRISON	15	34	537	586
JEFFERSON	13	7	395	415
KNOX	1	0	0	1
MAHONING	1	0	12	13
MEDINA	1	0	0	1
MONROE	32	9	474	515
MORGAN	0	0	2	2
MUSKINGUM	0	0	2	2
NOBLE	1	10	192	203
PORTAGE	6	0	3	9
STARK	3	0	3	6
TRUMBULL	4	0	7	11
TUSCARAWAS	1	7	16	24
WASHINGTON	0	0	11	11
WAYNE	0	0	1	1
Total	**137**	**146**	**3,420**	**3,703**

[17] The difference between the 3,420 wells reported as "Producing" in Table 4 and the 3,438 wells reported as having "Production" in Table 3 reflects differences in how wells are recorded across two ODNR datasets. One dataset reports permitting and status information for horizontal wells (e.g., Drilling, Drilled, Producing), while the other reports oil and gas production volumes. At a given point in time, a well may appear as producing oil and/or gas in the production dataset even if its status in the permitting dataset has not yet been updated to "Producing" (for example, if it is still listed as Drilling or Drilled). In addition, the Study Team did not attempt to identify and remove wells classified as "Producing" in the permitting dataset that may no longer be actively producing.

B. Upstream Investment Estimates

Upstream investments have been broken down into four areas: investments into drilling, including road construction associated with well development; lease operating (post-production) expenses; new lease and lease renewal bonuses; and royalties on hydrocarbon production. The methodology used for each calculation is set forth in Appendix B.

Average drilling costs were re-evaluated for this study and remain unchanged on a per-well basis. Although drilling costs per lateral foot continue to decline, lateral lengths have continued to increase, often exceeding three miles. A recent review of ODNR drilling surveys indicated that wells in northern counties—while around one thousand feet shallower on average than wells in southern counties—also tend to have longer laterals (by roughly 1,500 feet on average). These opposing differences in well geometry effectively offset each other, resulting in no material difference in spending on drilling per well between northern and southern parts of the play.

Based on an average lateral length of approximately 14,900 feet for the eight most active shale-producing counties in Ohio during the second half of 2024, and average drilling and completion costs of $770 per lateral foot reported by Utica operators in 2024, we continue to assume an average drilling cost of $11.4 million per well. [18]

This section covers upstream investments between July – December 2024. Cumulative upstream investments to date in Ohio, including 2011 through the second half of 2024, are set forth in Table 18 of Appendix A.

1. Investments into Drilling

The following tables set forth estimated investments for the Study period made into drilling shale wells in Ohio. Guernsey and Harrison Counties were the leaders in new upstream investment, with 50 and 35 new wells and an investment of around $577.8 million and $404.5 million, respectively, between July – December 2024. Carroll was third, with 33 new wells, and approximately $381.4 million invested. Belmont and Columbiana were fourth and fifth with upstream investment of $288.9 million and $265.8 million for 25 and 23 new wells (*See* Table 6.) Jefferson, Tuscarawas, Noble, and Monroe Counties had 11, 7, 6, and 1 new wells in the second half of 2024, respectively, for a combined $288.9 million invested. Road-related investments for this version of the Shale Investment Dashboard reflect average road costs per well determined from the Ohio Oil and Gas Association's (OOGA) 2017 report *Ohio's Oil & Gas Industry Road Improvement Payments*, in conjunction with OOGA's 2022 report *Community Impact & Sustainability Report*.[19] Based on information from these reports, and after adjusting for price

[18] See Upstream Methodology in Appendix B.

[19] OOGA's 2017 report indicated that oil and gas companies in Ohio had spent $300 million on roads from 2011 through 2017. OOGA's 2022 report indicated that cumulative spending by the industry on roads had reached $400 million by the end of 2021. This suggests that $100 million was spent on roads from 2018 through 2021, a period during which the Study Team tracked 846 new wells, indicating an average investment of $118,200 per well. See The Ohio Oil & Gas Association and Energy In Depth. (2017). *Ohio's Oil & Gas Industry Road Improvement Payments.* https://energyindepth.org/wp-content/uploads/2017/11/2017-Utica-Shale-Local-Support-Series-Ohios-Oil-and-

changes specific to road construction, road costs related to drilling were assumed to be $156,400 per well.[20]

EAP Ohio was the leading operator during the six-month Study period, with 89 new wells and an estimated $1.03 billion invested.[21] Ascent had the second highest investment, with 31 new wells and an estimated $358.2 million invested. Gulfport and INR Ohio invested $242.7 million and $208.0 million in 21 and 18 wells, respectively. EOG invested approximately $184.9 million across 16 new wells, followed by Hilcorp Energy with $150.2 million for 13 new wells.[22] Rice Drilling recorded a total investment of $23.1 million in two new wells, while Utica Resource Operating invested an estimated $11.6 million for 1 new well (*See* Table 7.)

Table 6: Estimated Upstream Shale Investment by County, July – December 2024

County	New Wells	Drilling ($)	Roads ($)	Total Amount ($)
BELMONT	25	$285,000,000	$3,910,000	$288,910,000
CARROLL	33	$376,200,000	$5,161,200	$381,361,200
COLUMBIANA	23	$262,200,000	$3,597,200	$265,797,200
GUERNSEY	50	$570,000,000	$7,820,000	$577,820,000
HARRISON	35	$399,000,000	$5,474,000	$404,474,000
JEFFERSON	11	$125,400,000	$1,720,400	$127,120,400
MONROE	1	$11,400,000	$156,400	$11,556,400
NOBLE	6	$68,400,000	$938,400	$69,338,400
TUSCARAWAS	7	$79,800,000	$1,094,800	$80,894,800
Total	**191**	**$2,177,400,000**	**$29,872,400**	**$2,207,272,400**

Source: The Authors (2025).

Gas-Industry-Road-Payments.pdf. See also The Ohio Oil & Gas Association. (2022). *Community Impact & Sustainability Report*. https://members.ooga.org/blog/Details/ohio-oil-gas-association-releases-community-impact-sustainability-report-190894

[20] Road-related spending per well in prior reports was indexed using the Federal Highway Administration's National Highway Construction Cost Index (NHCCI). Since the release of the last Shale Dashboard, the Ohio Department of Transportation (ODOT) has issued an update to its state-level construction cost index—which is issued less frequently but is more reflective of Ohio-specific materials and labor costs. The Study Team adjusted road spending to align with the ODOT index. This resulted in a revision of the per-well road spending estimate from $170,200 to $156,400. Cumulative totals shown in Appendix A that were calculated using the previous $170,200 rule-of-thumb have been updated accordingly to reflect this revised, Ohio-based cost index. See Ohio Department of Transportation. (2025, October 31). *2025 Q3 ODOT Chained-Fisher Construction Cost Index (CCI) Summary.* https://www.dot.state.oh.us/Divisions/ConstructionMgt/Estimating/TrendsAndForecasts/2025%20Q3%20ODOT%20Chained-Fisher%20CCI%20Summary.pdf

[21] EAP Ohio's increase in new well investment is consistent with its announcement in Q2 2024 of securing a $300 million equity investment to accelerate Utica oil development. See The Business Journal. (2024, April 24). *Encino Secures $300M Investment for Oil Exploration in Utica*. https://businessjournaldaily.com/encino-secures-300m-investment-for-oil-exploration-in-utica/

[22] Ownership of EAP Ohio's new wells is transferring to EOG Resources following EOG's completed $5.6 billion acquisition in August 2025. See The Business Journal. (2025, August 12). *EOG Resources Completes $5.6B Acquisition of Encino.* https://businessjournaldaily.com/eog-resources-completes-5-6b-acquisition-of-encino/

Table 7: Estimated Upstream Shale Investment in Ohio by Company, July – December 2024

Operator	New Wells	Drilling ($)	Roads ($)	Total Amount ($)
ASCENT RESOURCES	31	$353,400,000	$4,848,400	$358,248,400
EAP OHIO	89	$1,014,600,000	$13,919,600	$1,028,519,600
EOG RESOURCES	16	$182,400,000	$2,502,400	$184,902,400
GULFPORT ENERGY	21	$239,400,000	$3,284,400	$242,684,400
HILCORP ENERGY	13	$148,200,000	$2,033,200	$150,233,200
INR OHIO	18	$205,200,000	$2,815,200	$208,015,200
RICE DRILLING	2	$22,800,000	$312,800	$23,112,800
UTICA RESOURCE OP.	1	$11,400,000	$156,400	$11,556,400
Total	**191**	**$2,177,400,000**	**$29,872,400**	**$2,207,272,400**

Source: The Authors (2025).

2. Lease Operating Expenses

Post-production investments have been estimated on a half-year basis, assuming an average cost of $0.148/Mcf-equivalent.[23] This estimate is based upon recent operator reports.[24] These investments are set forth below. Belmont County and Jefferson County led the lease operating expense investment, with an estimated $43.6 million and $34.8 million invested, respectively.

Table 8: Estimated Lease Operating Expenses for July – December 2024 by County

County	Gas Equivalents (Mcfe)	Lease Operating Expense for Period
BELMONT	294,347,290	$43,607,704
JEFFERSON	234,778,008	$34,782,484
HARRISON	194,814,093	$28,861,809
MONROE	186,279,385	$27,597,388
CARROLL	89,744,133	$13,295,640
GUERNSEY	75,746,412	$11,221,870
COLUMBIANA	50,203,222	$7,437,633
NOBLE	34,876,506	$5,166,973
TUSCARAWAS	12,197,024	$1,806,995
OTHER	1,422,286	$210,712
Total	**1,174,408,361**	**$173,989,210**

[23] Previous reports relied on a per-well rule-of-thumb to calculate lease operating expenses, which attributed an equal amount to both low- and high-producing wells. A production-based rule of thumb more accurately captures the expenses that companies are likely to incur while operating wells.

[24] The per-Mcfe rule-of-thumb for lease operating expenses is based on average production costs for Ascent's and Gulfport's Utica operations in the second half of 2024 as reported in quarterly financial statements for both companies. *See* Appendix B.

Table 9: Estimated Lease Operating Expenses for July – December 2024 by Operator

Operator	Gas Equivalents (Mcfe)	Lease Operating Expense for Period
ASCENT RESOURCES	459,393,536	$68,059,391
EAP OHIO	221,979,108	$32,886,320
GULFPORT APPALACHIA	196,427,601	$29,100,851
SWN Production	95,179,628	$14,100,911
RICE DRILLING	58,898,364	$8,725,823
ANTERO RESOURCES	35,229,443	$5,219,260
EOG RESOURCES	29,155,308	$4,319,374
HILCORP ENERGY	27,819,800	$4,121,518
INR OHIO	24,399,639	$3,614,819
DIVERSIFIED PRODUCTION	15,992,169	$2,369,248
CNX GAS	8,380,705	$1,241,606
OTHER	1,553,060	$230,087
ASCENT RESOURCES	459,393,536	$68,059,391
TOTAL	**1,174,408,361**	**$173,989,210**

3. Royalties

Royalty investments have been estimated on a per quarter basis, assuming the formulas set forth in Appendix B. Total estimated royalties spent on Ohio properties between July and December 2024 were $767 million, or about 4.2% higher than the amount dispersed in the first half of 2024. The breakdown by quarter for oil, residue gas (i.e., gas left after extracting liquids), and natural gas liquids is set forth in Tables 10, 11, and 12 below. The average price for natural gas was $1.75/MMBtu during the second half of 2024, up from $1.64 in the first half of 2024.[25] Regional oil prices decreased from an average of $63.26/bbl during the third quarter of 2024 to $58.33/bbl for the fourth quarter, averaging $60.80/bbl over the 6-month Study period.[26] For comparison, regional oil prices averaged $68.17 per barrel during the first half of 2024, and $69.30 in the second half of 2023.

[25] Reflects average natural gas prices over the respective periods across the Columbia Gas and Eastern Gas South (formerly Dominion South) trading hubs as derived from Intercontinental Exchange (ICE) trade data published in regular weekly market reports by Snyder Brothers Gas Marketing, available at https://www.snyderbrothersinc.com.
[26] Reflects average prices reported by Ergon for Marcellus-Utica light crude, available at https://ergon.com. See Appendix B.

Table 10: Total Royalties from Oil, July – December 2024 (in millions)

Year	Quarter	Oil Price $/bbl	Oil Royalty (20%) $/bbl	Royalty ($mm)
2024	4	$58.33	$11.67	$118.94
2024	3	$63.26	$12.65	$115.44
			Subtotal	**$234.38**

Table 11: Total Royalties from Residue Gas, July – December 2024 (in millions)

Year	Quarter	Residue Gas Price $/Mcf	Residue Gas Royalty (20%) $/Mcf	Royalty ($mm)
2024	4	2.24	$0.45	$211.23
2024	3	1.62	$0.32	$150.74
			Subtotal	**$361.97**

Table 12: Total Royalties from Natural Gas Liquids, July – December 2024 (in millions)

Year	Quarter	NGL Price $/bbl	NGL Royalty (20%) $/bbl	Royalty ($mm)
2024	4	17.50	3.50	$82.53
2024	3	18.98	3.80	$88.38
			Subtotal	**$170.90**

4. Lease Renewals and New Leases

New leases and lease renewal investments have been estimated for the Utica region based upon the drilling activity of the top seven drilling companies in the region. These seven companies have together drilled over 90% of the Utica wells to date, and it is assumed that they likewise control over 90% of the leases. The estimated investments into new leases and lease renewals are set forth below in Table 13.

There are several potential sources of error in these estimates. Because operators do not report lease bonus information, the Study Team was required to estimate investments into lease bonuses based upon some industry rules of thumb, together with information found in public leases. One important rule of thumb we deployed in estimating lease bonus investment is that "primary" lease terms average about 5 years. The primary term is that period of time during which the operator may conduct drilling operations but hold the lease without producing. Once a lease is drilled and production begins, the lease moves into its "secondary term," and may be thereafter "held by production" (HBP) for the life of that production. Using this rule of thumb, we determined that each operator will, on average, every year replace about 20% of its undeveloped acreage that is not HBP.

However, it is possible to hold undeveloped acreage without producing it. This can be done through the process of unitization. An operator may, for instance, have a 750-acre unit that is designed to drain a reservoir by 3 wells draining 250 acres each. The operator may drill the first well and begin to pay royalties therefrom to all the unit leases, thereby moving all the unit leases into HBP status, even though only one third of the reservoir is actually producing. Under this scenario, 500 acres would be classified as "undeveloped acreage," while 250 acres would be "developed acreage."

Most operators report undeveloped acreage.[27] However, they generally do not distinguish what portions of their undeveloped acreage are HBP or under primary term. Some do, however, report what percentage of their overall acreage is HBP, and this number can be used to estimate the likely acreage of leases that required bonuses. Based on the most recent annual financial reports for Antero, Ascent, and Gulfport, the Study Team found that on average 13% of a Utica operator's net Utica acreage was not classified as "Held-By-Production." Accordingly, for purposes of this Study, and using the 5-year primary term assumption, we assumed that operators, on average, paid lease bonuses on 20% of such non-HBP acreage for the year (i.e. ~3% of the total net acreage), and 10% over the half-year Study period.

Another important assumption is the lease bonus rate. For this Study, we have assumed bonuses to average $5000/acre lease for renewals and new leases. From 2013-2019, this was a pretty conservative number in the Utica, and therefore likely to still be conservative for renewals of older leases. In 2020, sustained low natural gas prices slowed new well development, putting downward pressure on lease bonus rates. More recent publicly reported information on lease bonuses suggests, however, that $5000/acre continues to be a reasonable Utica-wide estimate.[28] Ohio's Oil & Gas Land Management Commission, for example, approved multiple leases in the second half of 2024 with bonus payments of $5,500 and $6,000 per acre for state acreage in Belmont County.[29] In October 2024, the Jefferson County Commissioners agreed to mineral rights lease terms of $5,000/acre; that same month, the Muskingum Watershed Conservancy District leased mineral rights on acreage in Carroll County for $5,500/acre.[30]

[27] *Undeveloped acreage* is defined by operators as that acreage on which wells have not been drilled or completed to a point that would permit the production of economic quantities of oil and natural gas regardless of whether the acreage contains proved reserves. Accordingly, undeveloped acreage can have a wide range of meaning, ranging from highly speculative to proven. Operators use a different, more rigorous classification system to account for proven or potential reserves.

[28] The bonus of $10,250/acre received by ODNR for a lease awarded in early 2024 to drill under Salt Fork State Park in Guernsey County is likely an outlier. See Ohio Department of Natural Resources. (2024, February 27). *State Commission Awards Leasing Rights Following Competitive Bidding Process*. https://ohiodnr.gov/discover-and-learn/safety-conservation/about-ODNR/news/leasing-rights

[29] Ohio Oil & Gas Land Management Commission. (2024, August 12). *Selected Bids – August 12, 2024 Meeting*. https://dam.assets.ohio.gov/image/upload/odnr/oil-gas/lmc/meetings/24-0812-Selected-Bids.pdf

[30] See Riley, J. (2024, October 3). *Jefferson County Secures New Oil and Gas Leases.* https://wtov9.com/news/local/jefferson-county-secures-new-oil-and-gas-leases. See also Springer, G. (2024, October 25). *MWCD Approves New Oil and Gas Lease at Leesville Lake in Carroll County*. https://www.cantonrep.com/story/news/local/2024/10/25/mwcd-approves-oil-and-gas-lease-with-encino-at-leesville-lake/75839522007

One additional factor that may make the lease bonus estimate inaccurate is the use of only "net" non-HBP lease acreage data to avoid possible double counting of leases. Operating companies often collaborate on development with non-operators but report only their own portion of the lease. However, bonuses must be paid on the "gross" lease acreage. So long as the non-operators are among the top six operators (which is commonly the case), their own net acreage reports will capture all the acreage. But if they are not, the acreage will not be captured, and the bonuses estimated herein will be under reported.

Table 13: Total Estimated Investments into New Leases and Lease Renewals July – December 2024 (in millions)

Operator	Acreage not held for production[31]	Estimated Bonus Investment ($mm)
ANTERO RESOURCES[32]	19,596	$9.8
ASCENT RESOURCES[33]	44,167	$22.1
EAP OHIO[34]	29,649	$14.8
GULFPORT ENERGY[35]	29,120	$14.6
INR Ohio[36]	10,033	$5.0
RICE DRILLING (EQT)[37]	20,824	$10.4
SOUTHWESTERN ENERGY (EXPAND)[38]	23,342	$11.7
Total	**176,731**	**$88.4**

[31] Antero and Southwestern did not distinguish between Ohio, Pennsylvania, and West Virginia acreage for their Appalachian operations in their FY2024 10-K reports. EAP Ohio was privately held during the second half of 2024 and did not release this sort of annual financial report. Gross developed acreage in Ohio for these companies was assumed to be equivalent to the total acreage for their horizontal drilling units in the state, data for which is available through the ODNR's Oil & Gas Well Viewer at https://gis.ohiodnr.gov/mapviewer/?config=oilgaswells. For operators who *do* file 10-K reports in which Appalachian acreage is differentiated by state, this estimate for gross developed acreage has been within ±10% of the actual amount. Total net acreage for Antero, Southwestern Energy, and EAP Ohio was estimated based on the average ratio of total-net-acres-to-gross-developed-acres in Ohio for Ascent, Gulfport, INR, and Rice Drilling.

[32] Fourteen percent of Antero's total net Ohio acreage was assumed to not be held by production as this was the percentage of the company's overall net Appalachian acreage not held by production in FY2024 based on its most recently filed 10-K.

[33] Twelve percent of Ascent's total net Ohio acreage was not held by production based on the company's FY2024 Consolidated Financial Statements.

[34] See fn. 31*, supra.* Approximately 5% of EAP's acreage in Ohio was not held by production. See Encino Energy, *Utica Oil* (archived May 27, 2025), https://web.archive.org/web/20250527190131/https://encinoenergy.com/utica-oil/.

[35] Fourteen percent of Gulfport's net Ohio acreage was not held by production based on its FY2024 10-K, available at https://www.gulfportenergy.com/investors/sec-filings/all-sec-filings/content/0001628280-25-008043/0001628280-25-008043.pdf

[36] Sixteen percent of INR Ohio's net Ohio acreage was not held by production based on its FY2024 10-K, available at https://d18rn0p25nwr6d.cloudfront.net/CIK-0002029118/99b1faf1-4631-4c3b-901c-78b0a227f082.pdf

[37] Acreage not held by production was not identified in the FY2024 10-K for Rice Drilling or Southwestern Energy. This percentage was assumed to be 12%, which was the average for Antero, Ascent, EAP, Gulfport, and INR.

[38] *Id.*

C. Estimated Midstream Investments

Midstream investment includes natural gas processing and fractionation facilities, including rail and transloading facilities for storing and handling natural gas liquids. Midstream also includes transmission and gathering pipelines, storage facilities, compressor stations (including compressor engines), dehydration units, and generators installed as part of these stations.

Pipeline investments were estimated using mileage and size information from the Public Utilities Commission of Ohio, and cost information from the Interstate Natural Gas Association of America (INGAA). Similarly, compressor station investments were based on estimated cost per unit of power output for the region as obtained from the INGAA. A full description of the methodology can be found in Appendix B.

Additional investment information was collected from midstream company investor presentations, news reports, and other sources including Ohio EPA permits. Table 14 summarizes midstream investments identified by the Study Team for the second half of 2024. Some costs related to these projects may have occurred outside the six-month window for this study. However, because the investments cannot easily be separated and tracked while construction is ongoing, the investments are treated as though made entirely during the Study period if construction on the project was begun then.

Table 14: Midstream Investment, July – December 2024

Company	Additions to Infrastructure	Total Amount ($mm)
Blue Racer Midstream (Williams)	• 0.23 miles of 12.75" gathering pipeline • 1.52 miles of 16" gathering pipeline • 13.27 miles of 20" gathering pipeline	$85.4
Cardinal Gas Services (Williams)	• 2.43 miles of 8.63" gathering pipeline • 0.71 miles of 8.75" gathering pipeline • 1.07 miles of 12.75" gathering pipeline • 5.26 miles of 16" gathering pipeline • 21,900 hp of compression at the new-build Bloom Compressor Station in Columbiana County	$162.6
EOG Resources	• 0.68 miles of 12.75" gathering pipeline	$2.5
MarkWest (MPLX)	• 12,500 hp of additional compression at the existing Harrison West Compressor Station in Harrison County	$29.6
	Total	**$280.10**

Source for Gathering Line Mileage and Diameter Data: PUCO Gathering Construction Reports (2025).

Midstream investments of $280 million in the second half of 2024 maintained a steady pace of spending for this segment, following estimated expenditures of $236 million in the first half of 2024 and $290 million in the second half of 2023. Investment during the Study period continued to concentrate on gathering systems and transportation rather than on other midstream infrastructure such as processing or storage, a pattern that has been consistent since 2021. Spending totaled $124 million for gathering lines and $156 million for compression.

The near-term outlook for midstream capital spending in the region remains focused on transportation infrastructure to improve access to markets. Approximately 32 miles of high-pressure steel pipeline—ranging from 12 to 24 inches in diameter—are currently in various stages of development in Licking County, northeast of Columbus, to supply fuel for 736 MW of behind-the-meter gas-fired electric generation across four facilities that will serve as the primary power source for nearby data centers.[39] An additional 2 miles of 8-inch high density polyethylene pipeline—along with a metering and regulator station—will be constructed to serve a fuel-cell facility providing on-site electric power to a data center through a partnership between AEP and Chesapeake Utilities.[40]

Projects in earlier stages of development that aim to enhance the region's access to markets include the Borealis Pipeline Project, which would connect Utica production to the Texas Gas Transmission system and, ultimately, to Gulf Coast markets through a proposed 180-mile extension from Lebanon, Ohio (north of Cincinnati) to Clarington in Monroe County.[41] A final investment decision on this proposed 2 Bcf/d takeaway project is anticipated in the first quarter

[39] The nearly 5-mile Clover Valley Pipeline Project will supply natural gas to the 120 MW PowerConneX 1 and 216 MW PowerConneX 2 facilities. See The Energy Cooperative. (n.d.) *Clover Valley Pipeline Project*. https://myenergycoop.com/clover-valley-pipeline-project. See also PowerConneX New Albany, LLC. (2025, June 4). *Response to First Data Request from Staff of the Ohio Power Siting Board*. OPSB Case No. 25-0090-EL-BLN. PUCO docket. https://dis.puc.state.oh.us/ViewImage.aspx?CMID=A1001001A25F04B62445C02786. The nearly 18-mile Aristotle South Pipeline Project will supply gas to Williams' 200 MW Socrates South facility; an additional 9.4 miles of pipeline via the Aristotle Central Pipeline Project will connect the 200 MW Socrates North Power Generation Facility to Socrates South. See Will-Power Pipeline OH, LLC. (2025, June 23). *Letter of Notification Application Narrative – Aristotle South Pipeline Temporary Laydown Yard Project.* OPSB Case No. 25-0604-GA-BLN. PUCO docket. https://dis.puc.state.oh.us/ViewImage.aspx?CMID=A1001001A25F23B45400G01252. See also Will-Power Pipeline OH, LLC. (2025, September 16). *Letter of Notification Application Narrative – Aristotle Central Pipeline Project*. https://dis.puc.state.oh.us/ViewImage.aspx?CMID=A1001001A25I16B31657D01029

[40] See Chesapeake Utilities Corporation. (2025, July 8). *Chesapeake Utilities Corporation Expands Energy Infrastructure in Ohio to Support New Data Center*. https://www.chpk.com/chesapeake-utilities-corporation-expands-energy-infrastructure-in-ohio-to-support-new-data-center/. See also Aspire Energy Express, LLC. (2025, June 13). *Application for Approval of a Natural Gas Transportation Service Agreement*. PUCO Case No. 25-0660-PL-AEC. PUCO docket. https://dis.puc.state.oh.us/ViewImage.aspx?CMID=A1001001A25F13B05033B00187

[41] See Natural Gas Intelligence. (2025, April 3). *Texas Gas Gauging Support to Move More Appalachian Natural Gas to Midwest, Gulf Coast Markets*. https://naturalgasintel.com/news/texas-gas-gauging-support-to-move-more-appalachian-natural-gas-to-midwest-gulf-coast-markets

of 2026.[42] Eastern Gas Transmission and Storage's Appalachian Reliability Project—now under review at the Federal Energy Regulatory Commission (FERC)—would expand existing infrastructure in Ohio, including adding 11,100 horsepower of compression in Monroe County to enable deliveries into the Rockies Express Pipeline.[43] Also noteworthy is the Eastgate Regional Council of Governments' forthcoming Oil & Gas Pipeline Feasibility Study, a $300,000 General Assembly–supported effort to assess the technical and economic potential of developing a hydrocarbon pipeline corridor from the Ohio River in southern Columbiana County to deepwater ports on Lake Erie in Ashtabula County.[44] Ohio's recently established $100 million Energy Opportunity Initiative, which focuses on offsetting engineering, right-of-way, and construction costs for natural gas infrastructure, could spur additional midstream development, particularly for projects supporting electric power generation.[45]

No major gas-processing expansions have been identified in the region since the onset of COVID. More recently, midstream operators have been using a rising share of existing capacity—recovering from utilization levels of 30–40 percent in 2022 to more than 70 percent in 2025 for Utica-based plants that extract NGLs such as ethane and propane from the gas stream (see Figure 8). However, with relatively muted NGL prices occurring alongside higher natural gas prices, the fractionation spread (i.e., the price difference between NGLs and natural gas) has narrowed. This likely moderates momentum for new processing investment, while also indicating that current processing capacity remains adequate for wet-gas producers.

Figure 8 shows MPLX's reported utilization of Utica gas-processing assets, which serves as a representative indicator of broader midstream trends in the play.[46] Figure 8 also shows estimated fractionation spreads derived from EIA historical data on Henry Hub natural gas and Mont Belvieu propane spot prices, as well as the agency's most recent Short-Term Energy Outlook (STEO), which includes projections for 2026.[47] Because propane typically trades at

[42] The American Oil & Gas Reporter. (November 2025). *Regional, National Indicators Suggest Greater Demand Call for Appalachian Natural Gas*. https://www.aogr.com/magazine/editors-choice/regional-national-indicators-suggest-greater-demand-call-for-appalachian-natural-gas

[43] See Eastern Gas Transmission and Storage. (n.d.) *Appalachian Reliability Project.* https://aboutarp.com/downloads/EGTS%20Appalachian%20Reliability%20Project%20Fact%20Sheet.pdf

[44] Eastgate Regional Council of Governments. (2025, September 4). *Request for Proposals for Lake to River: Oil & Gas Pipeline Feasibility Study*. https://eastgatecog.org/media/a22fa949-a229-4be3-87f9-4d4d40da6767/kF2phg/pdfs/Eastgate%20COG_Lake%20to%20River%20oil%20gas%20pipeline%20feasibility%20study%20RFP_FINAL.pdf?download=false

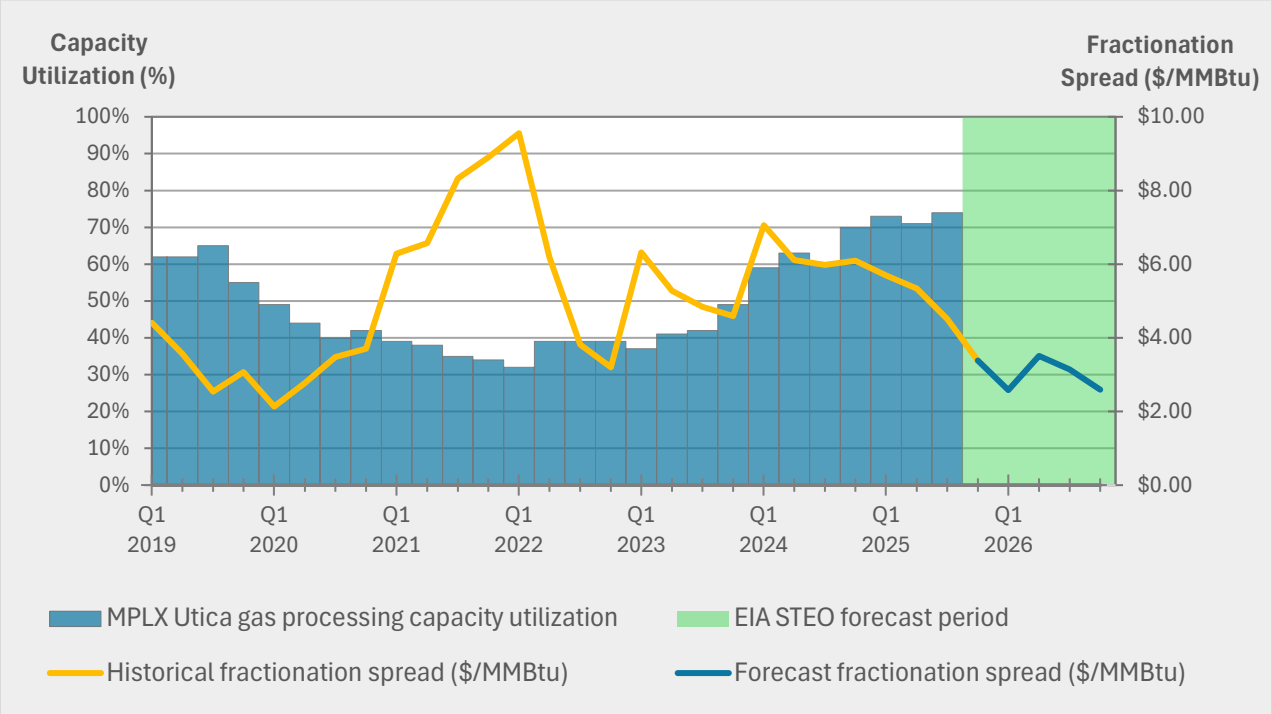
[45] State of Ohio, Office of the Governor. (2025, October 29). *Governor DeWine, JobsOhio Announce $100 Million Energy Opportunity Initiative*. https://governor.ohio.gov/media/news-and-media/governor-dewine-jobsohio-announce-$100-million-energy-opportunity-initiative

[46] MPLX's utilization of available gas processing capacity for its Utica operations from Q1 2019 through Q3 2025 was retrieved from the company's quarterly earnings release slides available at https://www.mplx.com/Investors/Events-and-Presentations/.

[47] U.S. Energy Information Administration. (2025, November 12). *Short-Term Energy Outlook.* https://www.eia.gov/outlooks/steo/

roughly twice the MMBtu price of ethane, a propane-based fractionation spread represents an upper bound on the incremental economic value from NGL extraction.[48]

Figure 8. MPLX Utica Gas Processing Utilization and Propane-Based Fractionation Spread (2019-2026)



Midstream projects to be included in future shale reports are listed below in Table 15. Cumulative midstream investments through the end of December 2024 are set forth in Table 19 in Appendix A.

[48] See U.S. Energy Information Administration. (2023, August 1). *Hydrocarbon Gas Liquids Explained: Prices for Hydrocarbon Gas Liquids.* https://www.eia.gov/energyexplained/hydrocarbon-gas-liquids/prices-for-hydrocarbon-gas-liquids.php. For more on fractionation spreads, see RBN Energy. (n.d.) *Gas Processing Frac Spread*. https://rbnenergy.com/market-data/gas-processing-frac-spread?page=96

Table 15: Future Ohio Midstream Projects

Project	Description	Estimated Construction Start
Additional gathering system buildout[49]	• 7.3 miles of gathering pipeline with 12.4" avg. diameter in Carroll, Harrison, Jefferson, Mahoning, and Tuscarawas Counties • 20,330 hp of compression in Noble and Monroe Counties • 200 MMscfd of dehydration in Noble County	First half of 2025
Appalachian Reliability Project[50]	• Modifies existing compression and metering regulation facilities in Monroe County	First half of 2027
Aristotle Central and South Pipelines[51]	• Support pipeline to deliver Utica gas to 400 MW of power-generation facilities in Licking County.	Second half of 2025
Aspire Energy Express[52]	• Construction of intrastate natural gas pipeline in central Ohio to serve a new fuel-cell facility that will provide electric power to a datacenter campus.	Second half of 2026
Borealis pipeline extension[53]	• Texas Gas, a subsidiary of Boardwalk Pipelines, announced an open season (April 1-30, 2025) to test support for this pipeline expansion. Project would transport Marcellus and Utica gas to demand centers across service territory from Ohio to Louisiana.	N/A
Clover Valley Pipeline[54]	• Support pipeline to deliver Utica gas to 336 MW of power-generation facilities in Licking County.	Second half of 2025

D. Downstream Development

1. Combined Heat and Natural Gas Power Plants

Over the past seventeen reports, we have noted 8 new natural gas-fired power plants in Ohio that were in the construction or operational stages since 2015. The seven of these plants that

[49] Pipeline estimate reflects construction starts through the end of June 2025 as gathered from the PUCO's Gathering Construction Reports. Compression and dehydration estimates reflect projects receiving Final Issuance of Permit-to-Install and Operate from Ohio EPA as of June 30, 2025.
[50] U.S. Energy Information Administration. (2025, October 31). *Natural Gas Pipeline Projects Database*. https://www.eia.gov /naturalgas/pipelines/EIA-NaturalGasPipelineProjects_Oct2025.xlsx. See also fn. 43, *supra.*
[51] See fn. 39, *supra*.
[52] *Id*. Construction on Aspire Energy Express is planned to commence within twelve months of the target in-service date of July 1, 2027. See fn. 40, *supra.*
[53] See fn. 50, *supra*.
[54] See fn. 39, *supra.*

are currently operational consumed 147 Bcf of natural gas for power generation during the second half of 2024, or the equivalent of about 14% of Ohio Utica gas production for this period.[55]

These seven plants generated 23,339 gigawatt hours of electricity over the second six months of 2024, or the equivalent of about 34% of the electricity consumed in Ohio across all sectors during the Study period.[56]

Expected growth in data center electricity demand continues to drive new natural-gas-fired power development in Ohio. PJM, the regional grid operator, projects 32 gigawatts (GW) of load growth across its footprint from 2024 to 2030, 30 GW of which it attributes to data centers.[57] Although no new natural gas plants advanced to construction in the second half of 2024, activity has since accelerated in 2025.

While not reflected in this report's investment totals, which cover activity only through the end of 2024, construction began on the 200 MW Socrates South generation project in Licking County in June 2025, followed by a companion facility—the 200 MW Socrates North project—which broke ground in September 2025.[58] Together with their associated pipeline infrastructure, these projects represent roughly $2 billion in investment aimed at supplying dedicated power to large-scale data center campuses in central Ohio.[59]

Also not reflected in this report's investment totals—but to be captured in upcoming editions of the Dashboard—construction on the 120 MW PowerConneX 1 generation facility in Licking County began in August 2025. A companion project—the 216 MW PowerConneX 2 facility on an adjacent parcel—received its final certificate from the Ohio Power Siting Board (OPSB) in November 2025, authorizing the start of construction.[60] Both facilities will provide behind-the-meter electric supply to a co-located data center.[61]

[55] See Energy Information Administration. (2025, May 22). *Form EIA-923 Detailed Data with Previous Form Data (EIA-906/920)*. https://www.eia.gov/electricity/data/eia923. Form EIA-923 data include monthly and annual fuel consumption and electricity generation at the power plant level.

[56] *Id.* See also See also Public Utilities Commission of Ohio. (2025, November 1). *Electric Choice Activity Dashboard*. https://app.powerbigov.us/view?r=eyJrIjoiZTliZDEzNGEtZjlhYi00YWEzLThjZjktMGZmNDg4OWE4ZDFkIiwidCI6IjUwZjhmY2M0LTk0ZDgtNGYwNy04NGViLTM2ZWQ1N2M3YzhhMiJ9

[57] PJM. (2025, September 17). *PJM Kicks Off Initiative to Balance Reliability with Large Load Growth*. https://insidelines.pjm.com/pjm-kicks-off-initiative-to-balance-reliability-with-large-load-growth/

[58] Ohio Power Siting Board. (2025, November 2025). *Natural Gas-Fired Power Plant Map and Statistics* [interactive map]. https://opsb.ohio.gov/about-us/resources/natural-gas-fired-power-plant-map-and-statistics

[59] See The Williams Companies. (2025, May 6). *Edited Transcript: 1Q 2025 Earnings Call.* https://investor.williams.com/static-files/8caa7892-03c5-47f8-9ee6-0a4d1c5a70e9. See also The Williams Companies. (2025, November 3). *Williams Delivers Strong Third-Quarter 2025 Results* [press release]. https://investor.williams.com/static-files/6ccfa77e-69ad-4bea-a56e-42f2f13bf8e8

[60] Ohio Power Siting Board. (2025, November 20). *Natural Gas & Combined Heat and Power Projects in Ohio.* https://dam.assets.ohio.gov/image/upload/puco.ohio.gov/empliibrary/files/OPA/Mapping/OPSB/Solar%20Facilities%20Map/Natural_Gas_Map_and_Stats.pdf

[61] See Ohio Power Siting Board. (2025, July 24). *OPSB Authorizes Construction of Licking County Behind-the-Meter Power Plant.* https://opsb.ohio.gov/news/opsb-*authorizes-construction+of-licking-county-behind-the-meter-power-*

Recent natural gas generation projects supporting data center development in central Ohio will operate as fully islanded systems, relying exclusively on on-site generation rather than interconnecting to the electric utility grid. Because these data center loads will not be connected to the PJM system, they do not require PJM's load-interconnection approval process, and the only state-level approval needed has been a certificate from the OPSB.

The lead time for these projects to receive an OPSB certificate has ranged from roughly three to five months.[62] Following enactment of House Bill 15 in 2025, OPSB's standard certificate process now includes an explicit statutory timeline requiring a completeness determination within 45 days and a final decision within 150 days thereafter, for a maximum of 195 days from application to decision.[63]

By contrast, PJM is still developing an expedited pathway for large load interconnections.[64] Under PJM's proposed "Expedited Interconnection Track" for large loads, even projects that bring their own generation and request grid interconnection would face a minimum study-and-approval timeline of approximately six to ten months before construction could begin.[65]

Thus, while PJM's new process would accelerate grid-connected data center development relative to traditional interconnection procedures, its longer approval timelines compared with Ohio's streamlined state-level process may encourage more large loads to pursue fully islanded, behind-the-meter solutions.

Figure 9 summarizes existing and planned natural gas-fired generation facilities developed in Ohio since the emergence of shale gas, including the CHP project currently under construction at Ohio State.

plant. See also Ohio Power Siting Board. (2025). *25-302-EL-BGN: PowerConneX II New Albany Energy Center Project*. https://opsb.ohio.gov/cases/25-302-el-bgn

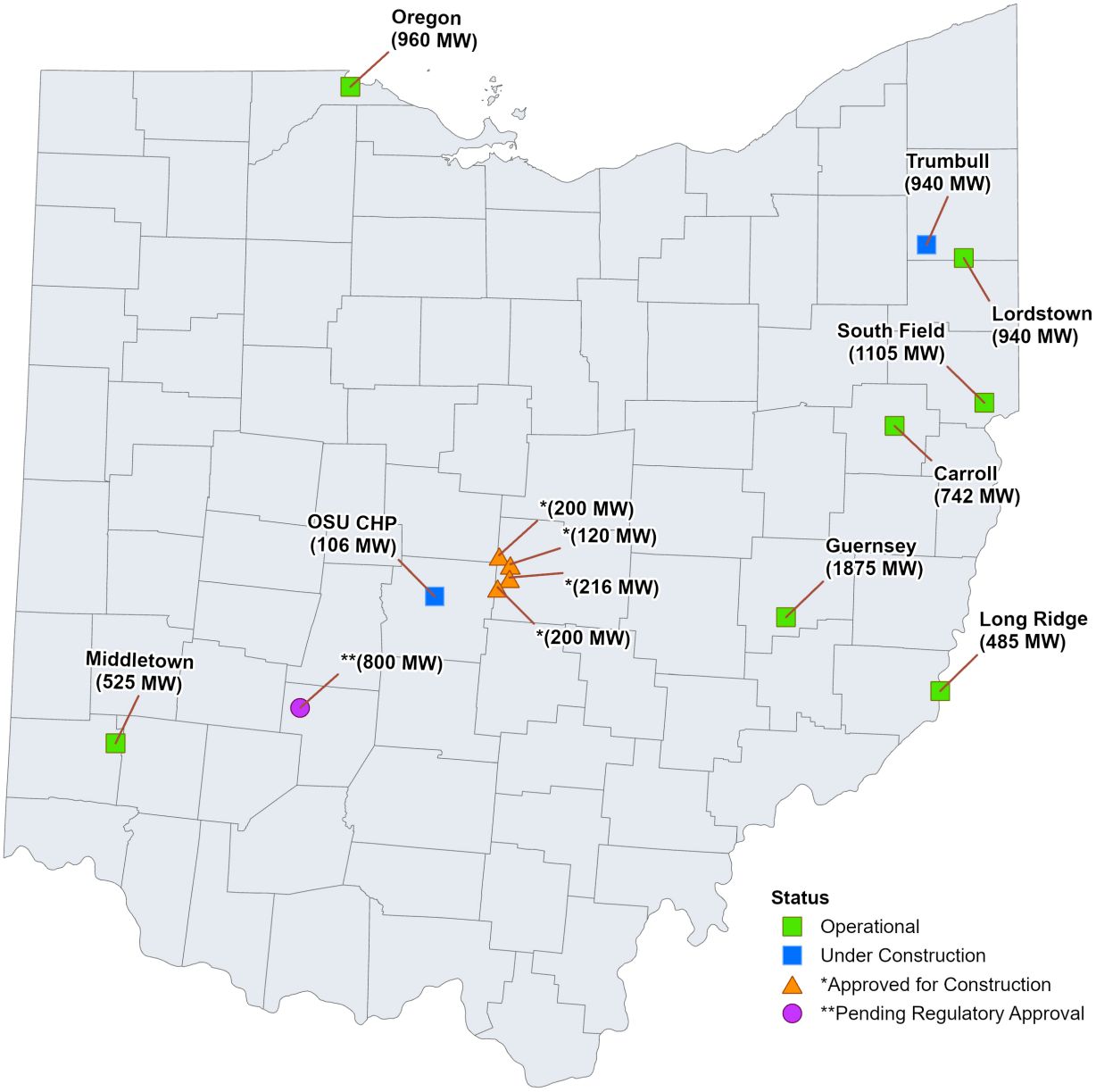
[62] See fn. 58, *supra*.

[63] Ohio Legislative Service Commission. (2025). *Final analysis of Amended Substitute House Bill 15, 136th General Assembly (as enrolled).* https://www.legislature.ohio.gov/download?key=25768

[64] See PJM. (2025, November 11). *Executive Summary: PJM Large Load Additions CIFP (Critical Issue Fast Path) Stage 4 Package.* https://www.pjm.com/-/media/DotCom/committees-groups/cifp-lla/2025/20251119/20251119-item-02a---pjm-lla-cifp-stage-4-package---executive-summary.pdf

[65] *Id*. See also PJM. (2025, November 18). *Critical Issue Fast Path – Large Load Additions – Options and Packages Matrix.* https://www.pjm.com/-/media/DotCom/committees-groups/committees/mc/2025/20251119/20251119-item-03---critical-issue-fast-path---large-load-additions---options-and-packages-matrix.xlsx

Figure 9: Existing and Projected Natural Gas Power Plants



Source: Ohio Power Siting Board (2025).
Note: Projects marked "Approved for Construction" or "Pending Regulatory Approval" represent future development and are therefore not included in current investment totals, which cover activity only through December 31, 2024.

2. Other Downstream Investment

Six public liquefied petroleum gas (LPG) fueling stations opened across the state in the second half of 2024.[66] These stations are located at U-Haul self-storage and vehicle rental centers in Lucas, Montgomery, and Stark Counties. Costs for equipment purchases and site work for LPG refueling stations such as those installed during the Study period are around $300,000 per station, for a total investment of $1.8 million across six stations. [67]

No other significant downstream investments took place in the second half of 2024. However, Ohio will likely see continued new development activity in gas-fired power generation in the near future. For example, Advanced Power—developer of nearly 2 GW of gas-based generation currently operating in Ohio—submitted initial filings in November 2025 to the OPSB for its proposed 1.3 GW Chestnut Run Energy facility in Carroll County. [68] Construction on the estimated $2 billion project could begin as early as late 2026.[69]

Also in November 2025, Williams submitted its application to the OPSB for the 350 MW behind-the-meter Apollo Project in Lucas County.[70] These and other projects falling within the scope of downstream activities will be tracked for inclusion in future shale reports.

Cumulative downstream investments reported to date in Ohio, including 2011 through the second half of 2024, are set forth in Table 20 in Appendix A. An outline of the key products and processes for this sector within the shale gas value chain is set forth in Appendix B.

3. CONCLUSION

Total upstream shale investment in Ohio increased by 23.5% in the second half of 2024 relative to the first half of the year and was more than double the level recorded in the second half of 2023. This growth was driven primarily by continued expansion in drilling activity: 191 new wells were drilled in the second half of 2024, 48 more than in the first half of the year and 139 more than in the second half of 2023. Belmont County led all counties in production for the third consecutive Study period. Guernsey County had the highest number of new wells developed, largely within the Ohio Utica's volatile oil window, which has seen consistently increasing activity

[66] Alternative Fuels Data Center. (2025). *Station Locator* [station data by state]. https://afdc.energy.gov/data_download

[67] *See* U-Haul. (2025). *Propane AutoGas Trip Planner – U-Haul Business Accounts for Autofuel Fleets*. https://www.uhaul.com/Propane/AutoGas

[68] See Chestnut Run Energy, LLC. (2025, November 12). *In the Matter of the Application of Chestnut Run Energy LLC for a Certificate of Environmental Compatibility and Public Need to Construct a Natural Gas Electric Generation Facility*. https://dis.puc.state.oh.us/ViewImage.aspx?CMID=A1001001A25K12B35521G00468. See also Chestnut Run Energy. (2025). *About Chestnut Run Energy.* https://chestnutrunenergy.com/

[69] *Id*.

[70] See Will-Power OH, LLC. (2025, November 5). *Letter of Notification Application Narrative – Apollo Power Generation Facility*. OPSB Case No. 25-0973-EL-BLN. PUCO docket. https://dis.puc.state.oh.us/ViewImage.aspx?CMID=A1001001A25K05B15407H03596. See also The Williams Companies. (n.d.) *Apollo Power Generation Project.* https://www.williams.com/expansion-project/apollo-power-generation-project/

since the first half of 2023. Altogether, upstream shale investment totaled $3.2 billion for the second half of 2024.

Midstream investment increased moderately (+18.8%) from the first half of 2024, remaining in line with post-COVID annualized spending levels of roughly $500 million. Operators continued to expand gathering and transportation capacity, with an estimated $124.4 million invested in gathering lines and $155.7 million in compression during the second six months of 2024. Construction began in 2025 on more than 30 miles of high-pressure intrastate pipeline, consisting of multiple projects undertaken to deliver gas to power generation facilities serving data centers in central Ohio; these projects will be included in future shale reports.[71] Looking ahead, a final investment decision on roughly 180 miles of east-west interstate pipeline in southern Ohio is expected in early 2026.[72] These and other projects aimed at expanding takeaway capacity will continue to be tracked in subsequent shale reports.

The second half of 2024 saw a continued pause in downstream investment, with six LPG fueling stations representing a total investment of around $1.8 million being placed into service. However, the growing demand for electricity—largely by data centers—is accelerating development of gas-fired generation in Ohio. More than 700 MW of such utility-scale generation received final construction approval by the OPSB in 2025, including the 200 MW Socrates South project which broke ground in June 2025. Since Q1 2025, more than 2 GW of additional gas generation has come before the OPSB.[73] As long as wholesale power prices remain sufficiently above the delivered cost of gas on a per-MWh basis, market conditions will continue to support investment in gas-fired generation.

Altogether, shale-related investment in Ohio for the second half of 2024, including upstream, midstream, and downstream, was a little over $3.5 Billion. Cumulative total shale related investment since 2012 is around $114.6 billion.

[71] See fn. 39, *supra*.
[72] See fn. 42, *supra*.
[73] See fn. 60, *supra* (OPSB map of approved and proposed natural-gas generation facilities), including the Chestnut Run Energy, Bluegrass, and Apollo projects.

About the Study Team

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About the Energy Policy Center

The Energy Policy Center is housed within the Levin College of Public Affairs and Education at Cleveland State University. The mission of the EPC is to help overcome social and institutional barriers to the implementation of solutions to energy challenges by providing an objective channel for the free exchange of ideas, the dissemination of knowledge, and the support of energy related research in the areas of public policy, economics, law, business and social science. For more information, go to https://levin.csuohio.edu/epc.

4. APPENDICES

APPENDIX A. CUMULATIVE OHIO SHALE INVESTMENT

Figure 10: Total Utica Production in Bcfe (Gas Equivalent) by County through December 2024

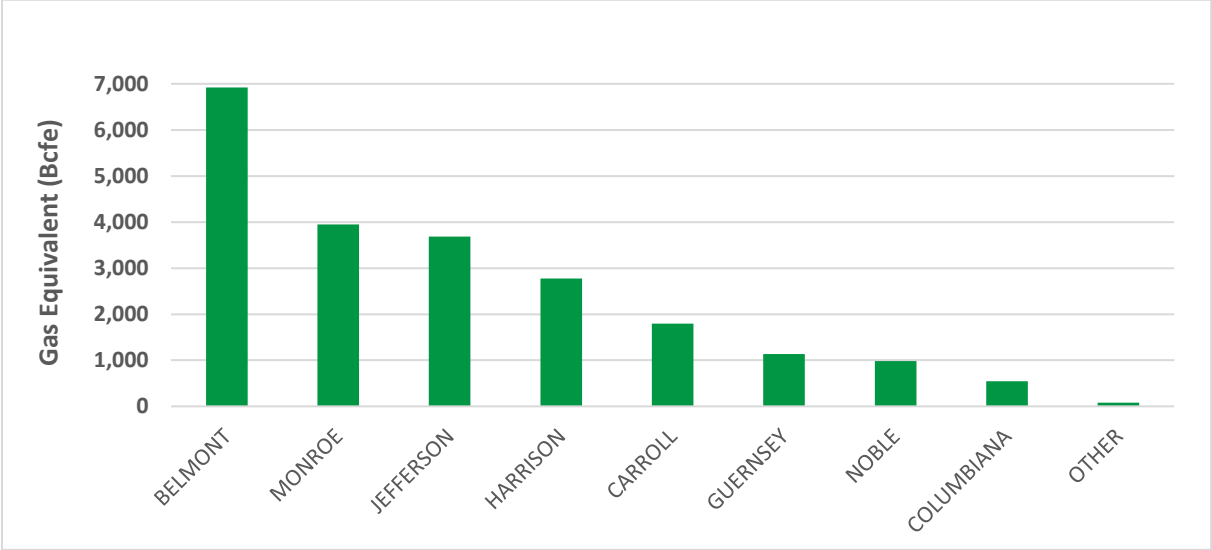
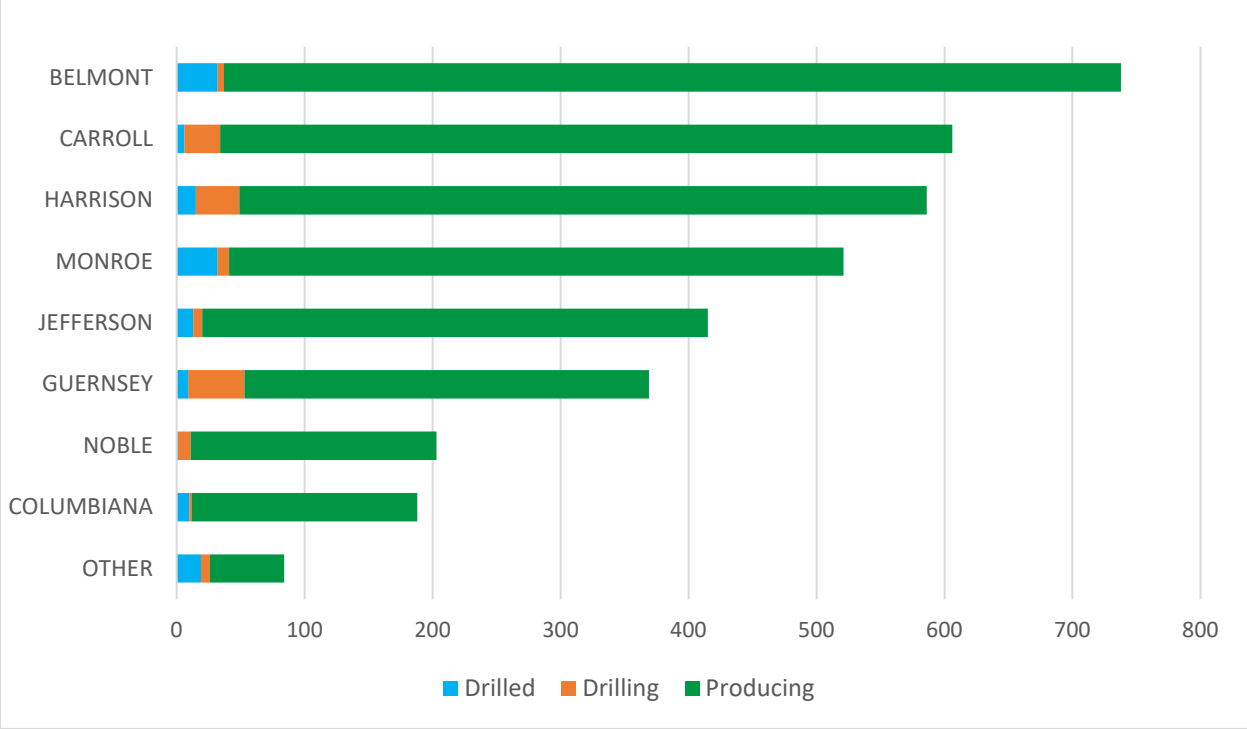
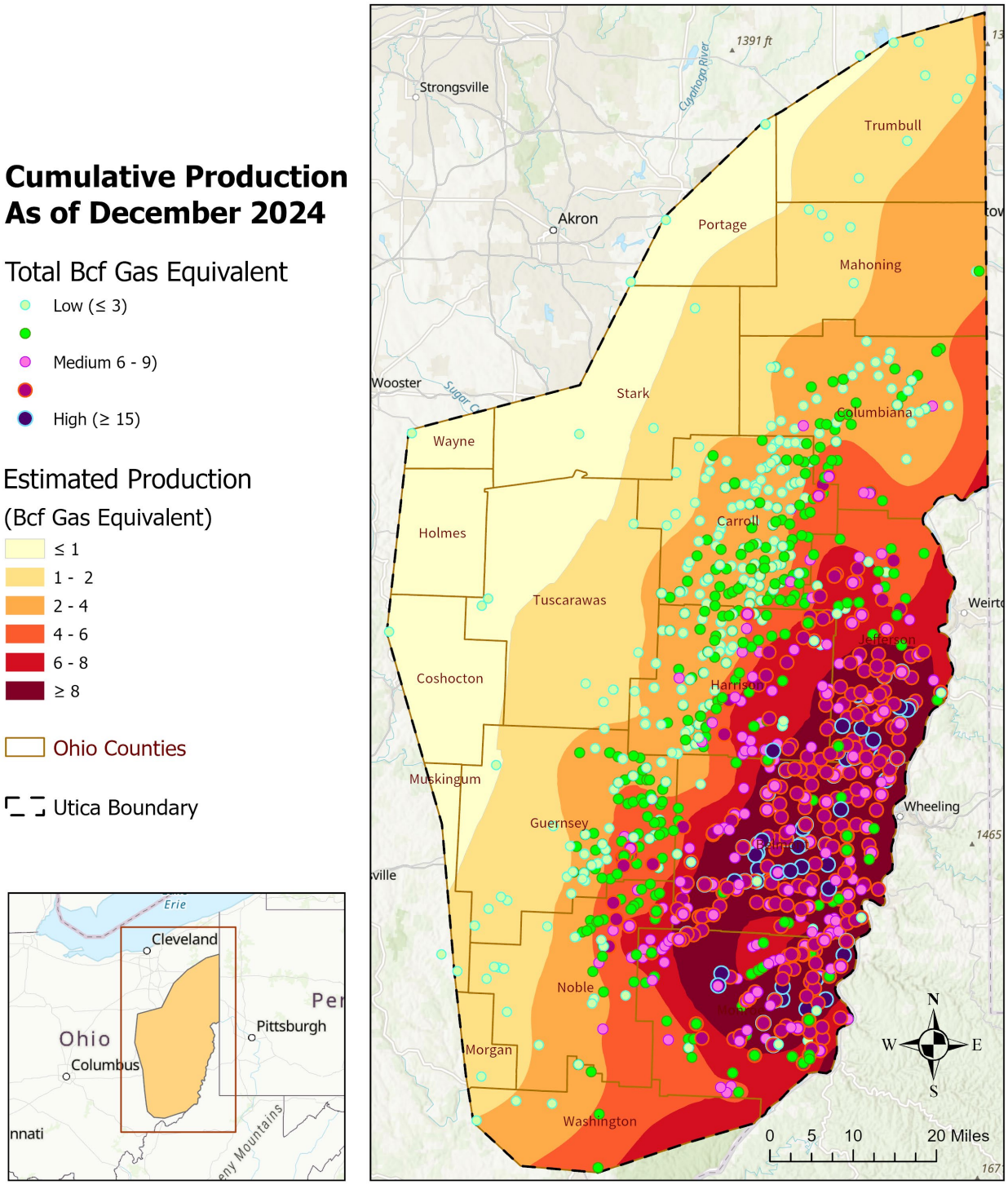


Figure 11: Cumulative Number of Wells by County through December 2024



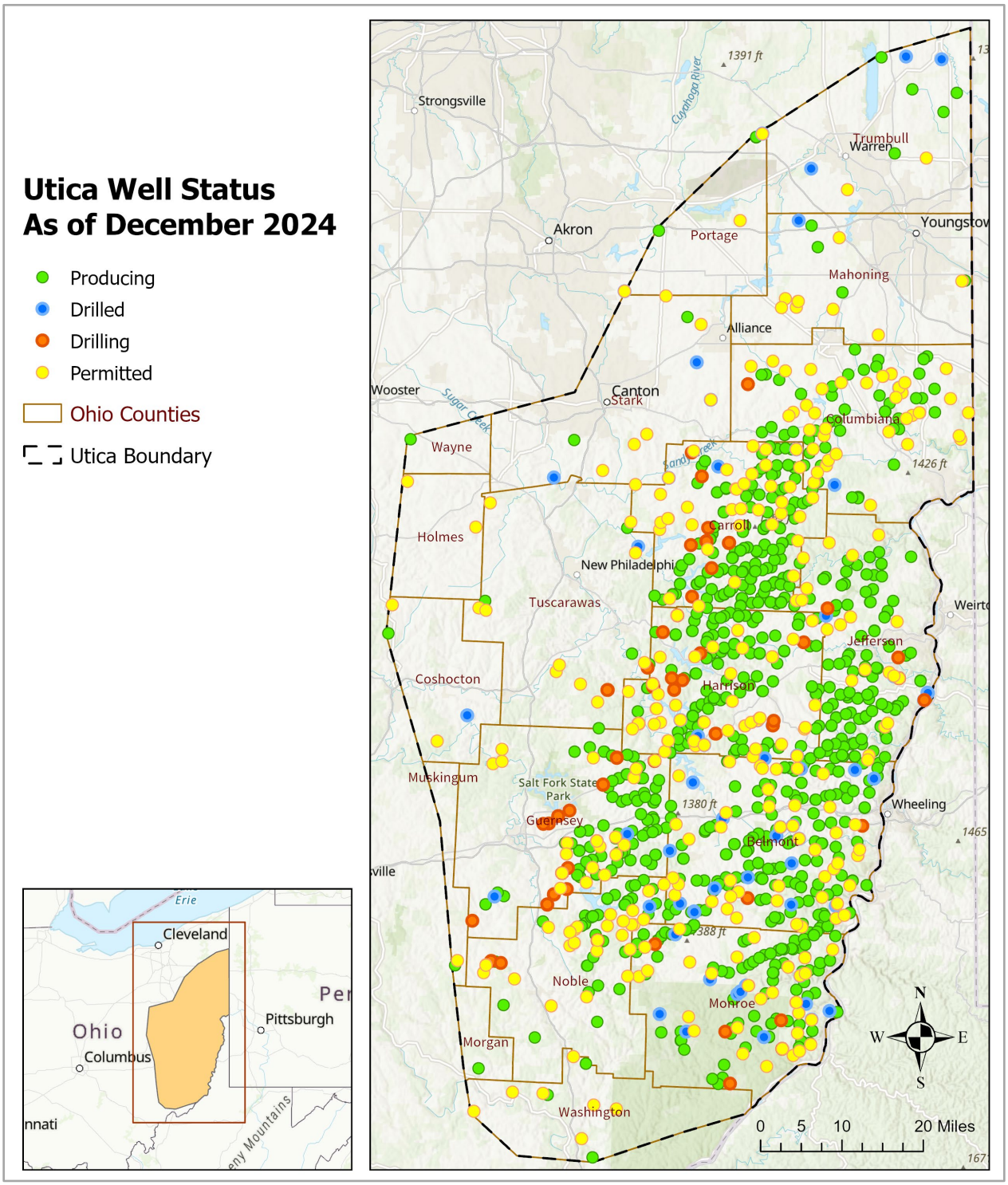
Source: Ohio Department of Natural Resources (2025).

Figure 12: Distribution of Gas-Equivalent Production for 2011 through December 2024



Source: ODNR (2025).

Figure 13: Distribution of Utica Wells by Status as of December 2024



Source: ODNR (2025).

Table 16: Utica Upstream Companies Drilling in Ohio as of December 31, 2024

Operator	Cumulative no. of Wells
EAP OHIO LLC	1,112
ASCENT RESOURCES UTICA LLC	969
GULFPORT APPALACHIA LLC	479
SWN PRODUCTION (OHIO) LLC	255
ANTERO RESOURCES CORPORATION	243
RICE DRILLING D LLC	151
INR OHIO LLC	120
HILCORP ENERGY COMPANY	89
EQUINOR USA ONSHORE PROPERTIES INC.	61
EOG RESOURCES INC.	57
CNX GAS COMPANY LLC	47
DIVERSIFIED PRODUCTION LLC	38
PIN OAK ENERGY PARTNERS LLC	25
GEOPETRO LLC	17
GULFPORT ENERGY CORPORATION	14
NORTHWOOD ENERGY CORP	6
HOLBROOK LLC	4
CHESAPEAKE EXPLORATION LLC	3
DEVON ENERGY PRODUCTION CO LP	3
BRAMMER ENGINEERING INC	2
EQT PRODUCTION COMPANY	2
SUMMIT PETROLEUM INC	2
AMERICAN ENERGY UTICA LLC	1
BP AMERICA PRODUCTION COMPANY	1
ENERGEX POWER, INC.	1
UTICA RESOURCE OPERATING LLC	1
Total	**3,703**

Note: Cumulative Number of Wells are calculated based upon the total number Drilled, Drilling, or Producing. Source: ODNR (December 31, 2024).

Table 17: Total Lease Operating Expenses through December 2024 (in millions)

Year	Period	Production Wells	Lease Operating Expenses ($mm)
2024	Q3 and Q4	3,438	174.0
2024	Q1 and Q2	3,341	173.2
2023	Q3 and Q4	3,230	186.4
2023	Q1 and Q2	3,103	194.3
2022	Q3 and Q4	3,024	150.2
2022	Q1 and Q2	2,886	178.6
2021	Q3 and Q4	2,792	151.8
2021	Q1 and Q2	2,704	205.7
2020	Q3 and Q4	2,705	206.1
2020	Q1 and Q2	2,608	266.2
2019	Annual	2,385	490.2
2018	Annual	2,077	422.2
2017	Annual	1,703	263.1
2016	Annual	1,406	198.8
2015	Annual	1,034	148.9
2014	Annual	612	88.1
2013	Annual	236	34.1
2012	Annual	82	30.0
2011	Annual	9	3.0
		Total	**3,564.9**

Table 18: Cumulative Utica-Related Upstream Investments in Ohio through December 2024

Estimated Investments	Total Amount
Mineral Rights	$26,066,772,000
Drilling	$35,777,120,000
Roads	$1,196,061,130
Lease Operating Expenses	$3,535,237,939
Royalties	$15,968,298,000
Total	**$82,543,489,069**

Table 19: Cumulative Utica-Related Midstream Investments in Ohio through December 2024

Estimated Investments	Total Amount
Midstream Gathering	$8,763,630,800
Processing Plants	$1,259,300,000
Fractionation Plants	$1,697,360,000
NGL Storage	$261,000,000
Rail Loading Terminals	$150,270,000
Transmission Pipelines	$10,367,236,000
Total	**$22,498,796,800**

Table 20: Cumulative Utica-Related Downstream Investments in Ohio through Dec. 2024

Estimated Investments	Total Amount
Petrochemical Plants and Refineries	$679,443,000
Other Industrial Plants	$760,000,000
Natural Gas Refueling Stations	$83,775,000
Natural Gas Power Plants	$7,642,500,000
Combined Heat and Power (CHP) Plants	$383,159,910
Total	**$9,548,877,910**

APPENDIX B. METHODOLOGY

1. Upstream Methodology.

Investment into the upstream for this fourth report has been broken down into four categories.

a. Wells and Related Roads. The first category is investment into wells and includes one-time investments into drilling and road construction related to well development. They were estimated as:

- Drilling:
  - Drilling and completion costs of $11.4 mm/well. [74]
  - Vertical depth differences across counties have minimal effect on total well cost.
  - Average drilling and completion costs of $770 per lateral foot.[75]
  - Average lateral length of 14,900 ft.[76]

- Roads:
  - Average investments of $156,400 per well based on recent OOGA reports after adjusting for inflation using the Ohio Department of Transportation's Construction Cost Index.[77]

[74] Previous shale reports distinguished between drilling costs in northern counties (e.g., Carroll, Harrison, Jefferson, and Columbiana) and southern counties (e.g., Noble, Guernsey, Belmont, and Monroe) based on the assumption that the Utica is substantially deeper in the south and therefore requires more expensive drilling in higher-pressure formations. The Study Team reviewed ODNR drilling surveys associated with completion reports for wells drilled in the second half of 2024 and found that wells in southern counties had an average true vertical depth (TVD) of approximately 8,700 feet, compared to approximately 7,700 feet in northern counties. However, wells in northern counties had an average lateral length of approximately 15,500 feet, compared to approximately 14,100 feet in southern counties. A review of ODNR unitization applications for these same wells, which include planned capital costs and well geometry, indicates that expected drilling and completion (D&C) cost per completed lateral foot differs only modestly between deeper and shallower wells when lateral length is held roughly constant (approximately $800/ft for wells with TVDs of 10,000-10,500 feet and approximately $740/ft for wells with TVDs of 7,500–8,000 feet, centered around a basin-wide average of ~$770/ft). When these cost-per-foot values are applied to representative lateral lengths from ODNR completion reports, estimated D&C costs converge to approximately $11.3–$11.5 million per well in both northern and southern development areas.

[75] Estimated drilling costs per lateral foot in the Appalachian Basin based on drilling and completion costs for Ascent Resources, Encino Acquisition Partners, EOG Resources, and Gulfport Energy as reported in recent investor materials. See the following: Ascent Resources. (2025, August 6). *Investor Presentation*. https://web-storage.ascentresources.com/documents/Ascent_Resources_Investor_Presentation_2Q2025_vFF.pdf; EOG Resources. (2025, May 30). *EOG Resources Encino Acquisition Conference Call – Presentation.* https://filecache.investorroom.com/mr5ir_eogresources2/414/EOG_Encino_Acquisition_Presentation.pdf; Gulfport Energy. (2024, November 6). *Q3 2024 Gulfport Energy Corp Earnings Conference Call – Investor Presentation*. https://d1io3yog0oux5.cloudfront.net/_7a756c009e812adfe6b3a556f1af3f13/gulfportenergy/db/269/2688/presentation/GPOR_3Q24_vFinal.pdf

[76] Calculated using well completion reports obtained from the ODNR's *Ohio Oil & Gas Well Database,* available at https://ohiodnr.gov/discover-and-learn/safety-conservation/about-ODNR/oil-gas/oil-gas-resources/featured-content-3

[77] See fns. 19-20, *supra.*

The number of new wells developed in the Study period were accounted for by subtracting the number of wells in the *drilled*, *drilling*, or *producing* categories as of July 1, 2024, from the number existent as of December 31, 2024. This information was downloaded from the ODNR's weekly *Combined Utica/Point Pleasant Shale Permitting Report*.[78]

b. Lease Operating Expense. The second estimated upstream cost identified by operators is the "lease operating expense." This includes post-production costs such as the storage, processing and disposal of produced water, among other expenses. Lease operating expenses for Utica wells were estimated to be a production-based $0.148/Mcf-equivalent. This average expense was developed by the Study Team based on an analysis of Ascent's and Gulfport's lease operating expenses in the Utica for the second half of 2024 as reported in their quarterly financial statements.[79]

c. Oil and Gas Production Royalties. A third area of upstream investment, royalty calculation, is more complicated. The estimate is based upon the total production over the six-month period and the likely price received for sales of the hydrocarbon during that same period. However, because much of the natural gas has been processed, Ohio Department of Natural Resources production records cannot be readily converted to royalty payments. Accordingly, a number of assumptions are required to estimate the royalties paid. These include estimating the local market conditions at the time hydrocarbons were sold. Royalties were estimated on a per quarter basis for Utica production based upon the hydrocarbon content for a typical Utica well.

To estimate the royalties, the following assumptions were made based upon industry interviews, industry investor presentations, and Energy Information Agency reports:

- Production for each well was similar to that found in the wet gas region, and not the dry gas or condensate regions. This represents the average situation.
- The average production shrinkage after processing was 12%, thereby making the residue gas volume 88% of the total natural gas production. [80]
- The residue energy content was around 1.1 MMBtu/Mcf.[81]
- Residue gas in the Utica was selling at an average price of $1.47/MMBtu for Q3 and $2.04/MMBtu for Q4.[82] These prices were used to estimate royalties.

[78] Ohio Department of Natural Resources. (2024). *Horizontal Wells.* https://ohiodnr.gov/business-and-industry/energy-resources/oil-and-gas-wells/horizontal-wells

[79] *See* Ascent Resources' financial reports at https://ascentresources.com/financials. *See also* Gulfport Energy's financial reports at https://www.gulfportenergy.com/investors/sec-filings/quarterly-reports.

[80] Based on industry interviews, experts citing API 12.3, Manual of Petroleum Measurements and Standards.

[81] EIA estimates a conversion rate of 1.037 MMBtu/Mcf (*see* https://www.eia.gov/tools/faqs/faq.php?id=45&t=8). However, industry interviews suggest 1.1 is closer to the average conversion for the Utica Shale.

[82] Reflects average price across the Columbia Gas and Eastern Gas South trading hubs as derived from ICE trade data published by Snyder Brothers Gas Marketing, available at https://www.snyderbrothersinc.com. Hub prices reflect the delivered price of natural gas to the respective pipeline systems and so do not require further deductions for transportation costs. See U.S. Energy Information Administration. (2014, October 15). *Some Appalachian Natural Gas Spot Prices Are Well Below the Henry Hub National Benchmark*. https://www.eia.gov/todayinenergy/detail.php?id=18391

- Around 44 barrels of liquids were recovered per million cubic feet of gas produced.[83]
- Natural gas liquids were selling for around 30% of the listed price for Marcellus-Utica light crude oil.[84]
- Oil in the Utica region was selling for $63.26 and $58.33 per barrel, on average, during the third and fourth quarters of 2024, respectively.[85]
- Royalty rates are 20% of gross production.

d. New and Renewal Lease Bonuses. Finally, a fourth form of upstream investment was estimated: new and renewal lease bonuses. For this purpose, we assumed that the average new lease or renewal bonus paid was $5000/acre, and that the typical lease has a five-year primary term. In prior studies, based upon the assumption that most undeveloped acreage was in the primary term of the least, we assumed that approximately 20% of the undeveloped acreage identified will need to be renewed each year or is otherwise new.[86] Since this Study covered six months, we assumed that half of this 20% was renewed or new during the Study period. However, as units have developed in the Utica, we have changed this estimate going forward to assume that 25% of the operator's total acreage is in its primary term, and that 20% of this acreage must be renewed or replaced very year (10% for a six-month period). This estimate may be high insofar as companies are not renewing or replacing all their primary term acreage. However, it may also be low insofar as the studies have only identified net acreage for the top six to nine operators in Ohio and may not be capturing all of the non-operator net acreage. (Acreage status is typically reported in company 10-K and other financial statements).

2. Midstream Methodology.

Midstream investments include pipeline construction (intrastate, gathering lines and inter-state), processing plants (compression, dehydration, fractionation, and others), natural gas liquid storage facilities, and railroad terminals and transloading facilities. Midstream expenditures were estimated based upon a combination of midstream company investor reports, media reports, and industry "rules of thumb" obtained from industry interviews, government reports, and industry trade journals. Estimated investments were then compared against investor presentations and other information gleaned from public sources to confirm their accuracy. Interviews were also used to confirm ranges of expenditures.

[83] Based on industry data.

[84] Based on industry interviews. Ascent recently indicated that it expects NGL prices to range from between 30% and 35% of the WTI price for crude oil. See Ascent Resources. (2025, March 6). *Ascent Resources Reports Fourth Quarter and Full-Year 2024 Operating and Financial Results and Issues Initial 2025 Guidance*. https://www.ascentresources.com/news/ascent-resources-reports-fourth-quarter-and-full-year-2024-operating-and-financial-results-and-issues-initial-2025-guidance.

[85] *See* Marcellus/Utica prices for light crude at http://ergon.com/prices. More than 95% of Ohio oil production is light crude by API gravity. See U.S. Energy Information Administration. (2025, November 28). *Crude Oil and Lease Condensate Production by API Gravity.* https://www.eia.gov/dnav/pet/pet_crd_api_adc_mbblpd_m.htm

[86] This estimate was confirmed through industry interviews. New operator undeveloped acreage reports are likely to be made available over time that may suggest these estimates could be either too high or too low.

a. Processing plants. Processing plant information was obtained by searching a wide range of resources including Ohio and US EPA permit databases, news agencies, and company web sites and presentations. For purposes of estimating the investments for midstream processing plants, rules of thumb were developed based upon facility throughput capacities. These rules of thumb were applied to the processing plants that have been built in Ohio, using the throughput capacity estimates cited in permit documents, or made available from public literature. Likewise, rules of thumb based upon throughput capacity were used to estimate investments downstream of the processing plants, such as storage facilities and loading terminals. Dehydration processing plants were estimated using average cost per Mcf capacity for similarly designed and recently built plants in the Appalachian region.

Compressor station investments were calculated based on the horsepower rating listed in Ohio EPA air permit data and estimated spending per horsepower of $5,761 for the Midwest Region for a new-build compressor station and $2,366 for expansion at an existing station as projected by the Interstate Natural Gas Association of America (INGAA) for 2024 after adjusting for inflation.[87]

The approximate capital cost for TEG dehydration units based on throughput was obtained from Carroll's *Natural Gas Hydrates: A Guide for Engineers* (2014, 3rd ed.). Facilities receiving a final permit-to-install or permit-to-install-and operate were assumed to be constructed during the same 6-month period in which the permit was issued by the Ohio EPA.

The following assumptions were used to estimate midstream-related investments:

- Processing Plants.
  - $400,000 per MMcf/d throughput
  - $80 MM per 200 MMcf/d plant (typical skid size)
- Fractionation Plants: $3,542 per bbl/d[88]
- Storage Tankage: $80 MM for 1 Bcf/d throughput
- Rail Loading Terminals: $40 MM for 1 Bcf/d throughput

[87] See The INGAA Foundation, Inc. (2018). *North America Midstream Infrastructure through* 2035. https://ingaa.org/wp-content/uploads/2018/06/34703.pdf. See also The INGAA Foundation, Inc. (2024). *Impact of Electrifying Natural Gas Transmission Compression*. https://ingaa.org/wp-content/uploads/2024/01/Impact-of-Electrifying-Natural-Gas-Compression-1.pdf. INGAA's projections for new-build compressor station costs from its 2018 study are reported in 2016 dollars; its 2024 report on compressor station replacement costs did not specify a dollar-year base, so the Study Team assumed the figures were expressed in 2023 dollars (i.e., the most recent full year). These projections were converted to 2024 dollars using the Bureau of Labor Statistics' Producer Price Index for *Other Pipeline Transportation*, available at https://fred.stlouisfed.org/series/PCU48694869.

[88] The Study Team reviewed the published investment costs and throughput capacities of eight different fractionation facilities that have been developed since 2018, all of which are in Texas. The assumed unit cost for fractionation reflects the median investment per barrel of processing capacity per day for these eight facilities. See Natural Gas Intelligence. (2018, November 12). *Targa Building Two New Fractionation Trains at Mont Belvieu.* https://www.naturalgasintel.com/news/targa-building-two-new-fractionation-trains-at-mont-belvieu/. See also Phillip 66. (2019 November 6). *Investor Day – Presentation.* https://s22.q4cdn.com/128149789/files/doc_presentations/2019/11/Investor-Day-Slides-for-Website-11.06.2019-vF.pdf).

b. Pipelines. Pipeline investments were estimated by applying "inch-mile" cost estimates to known pipeline diameter and length for both inter- and intrastate projects. Interstate pipeline diameters and mileage can be determined from Federal Energy Regulatory Commission data. These estimates were confirmed from investor presentations, when available. Intrastate mileage and diameter were determined using data for gathering system construction that was obtained from the Public Utilities Commission of Ohio.

For this report, up-to-date cost projections for natural gas transmission and gathering line pipelines, per inch-mile, was obtained from the INGAA. The estimated cost for natural gas pipelines for the Midwest Region as used in this analysis was $291,698 per inch-mile, which included labor, raw materials, and permitting costs, as projected by the INGAA for 2024 after adjusting for inflation.[89] This cost estimate was applied to both transmission and gathering pipelines, as modern high-pressure gathering lines in shale basins such as the Utica are constructed, operated, and pressurized in a manner comparable to intrastate transmission lines.[90]

No investments into distribution lines were included in the Study since it is assumed that these have not grown as a direct result of shale development. For pipelines carrying liquids, the investment assumption is that expenditures will be comparable to those seen for gas pipelines. These were also corroborated by industry investor reports.

3. Downstream Methodology.

For estimating downstream expenditures, the Study Team relied upon publicly available reports gathered from news media, trade association publications, company websites and investor presentations. The Study Team also used interviews, and Ohio EPA permits and public notices to identify projects and support investment estimates. Search terms included identified company names, and key words associated with specific facility types and industries.

As of this report, downstream investment is categorized into eight categories:

- Natural Gas Power Plants
- Combined Heat and Power Plants
- Ethane Cracker Plants
- Methanol Plants
- Refineries
- Natural Gas refueling stations
- Petrochemical Plants
- Other industrial plants with natural gas inputs

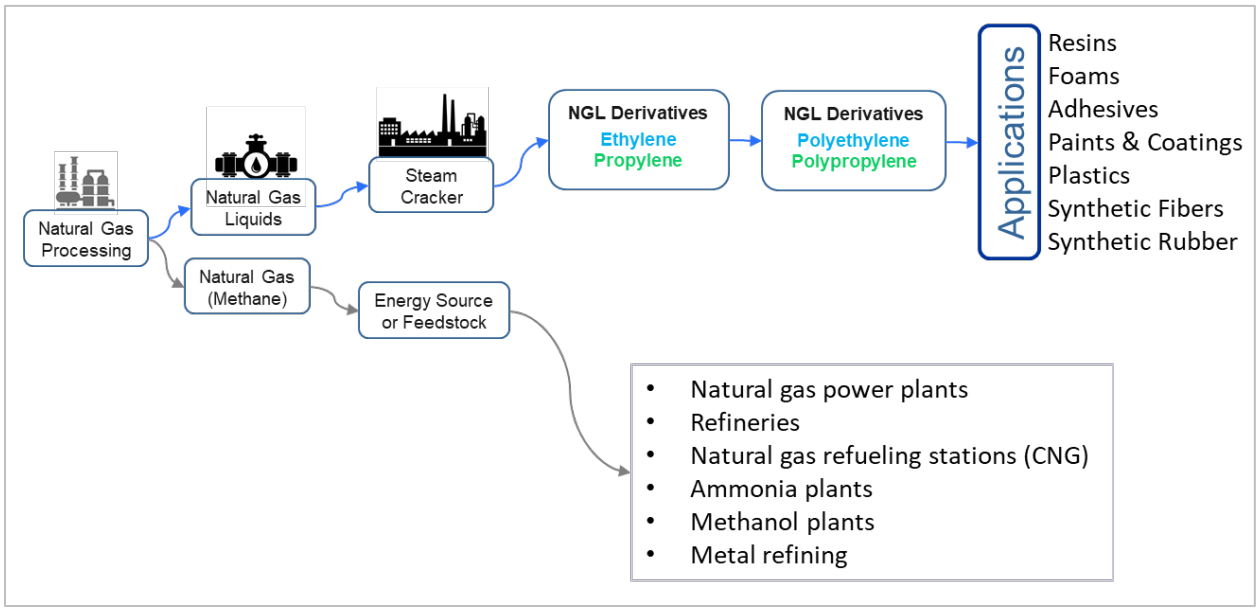
[89] See fn. 87, *supra*.

[90] *See* Pipeline and Hazardous Materials Safety Administration. (2021, November 15). *Pipeline Safety: Safety of Gas Gathering Pipelines: Extension of Reporting Requirements, Regulation of Large, High-Pressure Lines, and Other Related Amendments*. Federal Register. https://www.federalregister.gov/documents/2021/11/15/2021-24240/pipeline-safety-safety-of-gas-gathering-pipelines-extension-of-reporting-requirements-regulation-of

NAICS codes used to generate keywords for searches included the following:
3251 – Basic Chemical Manufacturing
3252 – Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing
3253 – Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing
3255 – Paint, Coating, and Adhesive Manufacturing
3259 – Other Chemical Product and Preparation Manufacturing
3261 – Plastics Product Manufacturing

Downstream activities include the deployment of processes that turn hydrocarbons— natural gas (methane) and natural gas liquids (ethane, propane, butanes)—into higher-valued fuels and petrochemicals. Shale gas may be monetized into numerous resulting value-added products. Figure 14 shows the primary intermediates and products that can be manufactured from the main hydrocarbon components in shale gas as part of downstream production.[91]

Figure 14: Shale/Natural Gas Value Chain for Petrochemicals



[91] See U.S. Department of Energy. (June 2020). *The Appalachian Energy and Petrochemical Renaissance: An Examination of Economic Progress and Opportunities*. https://www.energy.gov/sites/prod/files/2020/06/f76/Appalachian%20Energy%20and%20Petrochemical%20Report_063020_v3.pdf