The Economic Contribution of Independent Operators in the United States

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Prepared for:

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Executive summary

With the advent of unconventional resources, about 90% of the United States oil and natural gas activity is and will continue to be performed by U.S. independent oil and natural gas companies, which are defined as companies that are not vertically integrated with refining. The production and capital spending activities of the independent operators stimulate significant contributions to the U.S. economy.

The Independent Petroleum Association of America ("IPAA") has commissioned IHS Markit ("IHSM") to update a previous study performed in 2011, wherein IHSM assessed the economic impact of independents' oil and natural gas production and related activities. For this study, IHSM subdivided the total United States and state-level contributions into the following five operator type and size classifications which include the global integrated and the remaining independent classifications based on the average daily barrels of oil equivalent ("boe") production for the previous year. Note that independent size is determined based on daily production rates which do not necessarily equate with market capitalization.

- **Global (8 companies):** Fully integrated companies (non-independents), generally includes the super majors such as Chevron, XOM, Shell, BP, etc.
- **Large Independent (18 companies):** Large companies (> 200,000 boe/d) that would be classified as an independent
- **Mid-sized Independent (35 companies):** Independents with 100,000 – 200,000 boe/d plus large private companies with >50,000 boe/d
- **Small Independent (75 companies):** Independents with 20,000 – 100,000 boe/d plus mid-sized private companies with >20,000 boe/d and < 50,000 boe/d
- **Small Private (2,079 companies):** Companies with < 20,000 boe/d

The independents' combined share of the oil production was about 83%, and about 90% of the dry natural gas and natural gas liquids ("NGL") production, each with its respective revenue contributions, which are also expected to increase. Large independents hold and will continue to hold the largest share of the oil production at about 35%, while the mid-sized independents will control the largest share of the natural gas production at about 31%.

Similarly, the independent classes account for about 91% of current and future wells with a similar share of the costs. While the number of new wells is expected to remain stable, capital expenditures are expected to increase for all groups as cost rates are expected to rise alongside an oil price recovery, and there will continue to be a trend toward more expensive drilling.

Oil, natural gas and NGL production, as well as drilling and operations were analyzed for 2016, 2017 and 2018, and were forecasted for 2020 and 2025. The associated annual value of production and capital expenditures was used to develop state-level inputs with which to model the economic contributions of the independents. The national results for five critical economic metrics are summarized in the table below. Overall, the independents influenced almost $1.2 trillion of sales activity in the United States during 2018. This, in turn, contributed about $573 billion or 2.8% of U.S. GDP and supported 4.5 million jobs (3.0% of non-agricultural employment). IHS Markit estimates the independents initiated economic activity that generated over $101 billion in federal, state and local taxes in 2018. As the findings of this study bear out, the independent producers will continue to drive solid contributions to the U.S. economy over the remainder of the study period (2025) and, quite likely, beyond.

Contribution of the independent operators to the U.S. economy

Millions of 2018 dollars and number of workers	2016	2017	2018	2020	2025	CAGR (2018 - 2025)
Sales (output)	$675,524	$927,253	$1,170,131	$1,285,461	$1,634,978	4.9%
Contribution to GDP (value added)	$340,641	$463,921	$572,581	$643,674	$823,287	5.3%
Labor income (wages)	$203,187	$277,548	$345,585	$394,697	$493,851	5.2%
Employment	2,622,476	3,599,553	4,470,960	4,921,726	6,070,759	4.5%
Federal, state & local taxes	$59,539	$83,323	$101,445	$114,816	$146,819	5.4%

Note: CAGR, the compound annual growth rate, is defined in Appendix G

Introduction

With the advent of unconventional resource production, about 90% of the U.S. oil and natural gas activity is and will continue to be performed by U.S. independent oil and natural gas companies, which are defined as companies that are not vertically integrated with refining. Consequently, IHS Markit subdivided the total U.S. and state-level contributions into five operator type and size classifications which include the global integrated and the remaining independent classifications based on the average daily barrel of oil equivalents (boe) production for the previous year.

- Global – Fully integrated companies (non-independents) – 8 companies
- Large Independent (> 200,000 boe/d) – 18 companies
- Mid-sized Independent (100,000 – 200,000 boe/d) – 35 companies
- Small Independent (20,000 – 100,000 boe/d) – 75 companies
- Small Private (< 20,000 boe/d) – 2,079 companies

Note that size classifications are based on recent daily production rates, not market capitalization. Specific company names pertaining to the global, large and mid-sized independents are listed in Appendix A.

Oil, natural gas and NGL production, drilling and operations were analyzed for years 2016, 2017 and 2018, and were forecasted for years 2020 and 2025. The analysis of historical and current years was performed using information from IHSM's proprietary well and production databases, in-house research and capital and operating cost modelling and research. Projections for years 2020 and 2025 were calibrated with IHSM's production and drilling forecasts, with slight adjustment of oil production from the Permian Basin which incorporated some recent research. Since the IHSM production and drilling forecasts are generated at the basin and play levels, the analysis for this study was also done at the basin and play levels to coincide with and tie into the IHSM forecasts. However, given the requirements of this study, the results have been tabulated and presented at the national and state levels by operator class.

Daily production for oil, natural gas and NGLs and new wells and operated wells was determined for years 2016, 2017, 2018, 2020 and 2025. The table below shows a steady increase in the daily production of each commodity throughout the decade that the study encompassed, beginning in 2016.

Daily production levels

Product	2016	2017	2018	2020	2025
Oil – bbls/d	8,750,501	9,656,132	10,746,529	12,685,336	14,554,774
Natural gas – mcf/d	68,187,593	72,633,675	76,343,425	82,342,186	87,213,591
NGL – bbls/d	3,677,412	4,006,912	4,156,142	4,935,243	5,625,795

There was some adjustment in each operator class participation share over the term of the study, but not significant variation as independents were projected to continue funding the lion's share of the activity. The four classes of independents' combined share of the oil production was about 83%, and about 90% of the dry natural gas and NGL production, each with its revenue contributions, which are also expected to increase. Large independents hold and will continue to hold the largest share of the oil production at about 35%, while the mid-sized independents will control the largest share of the natural gas production at about 31%.

Similarly, the four independent classes account for about 91% of current and future wells with a similar share of the costs. While the number of new wells is expected to remain stable, capital expenditures are expected to increase for all groups as cost rates are expected to rise alongside of an oil price recovery, and there will continue to be a trend toward more expensive drilling. Annual capital and operating costs are summarized in the following table.

Annual capital and operating costs

Expenses	2016	2017	2018	2020	2025
Capital Expense ($MM)	$73,970	$110,650	Est $123,000	$134,822	$138,237
Operating Expense ($MM)	$77,690	$85,526	$91,866	$102,786	$116,820

Similarities in cost per well, operating expenses and productivity per producing well are evident for the global and three independent operator classes, but are considerably different for the small private companies, where per well capital and operating expenses are lower, and productivity per producing well is less than half that of the overall average. Our observation is that small private companies are more entrenched in older, more conventional resources, including the operation of marginal wells, whereas, the focus of the larger independents is clearly directed to unconventional tight oil, tight natural gas and shale natural gas resources.

Independent companies have pioneered the technologies and innovations that have made unconventional plays the backbone of current and future growth in oil and natural gas production and investment. Had this pioneering not occurred, we would never have seen the dramatic increases in oil, natural gas and NGL production and in oil and natural gas drilling. Indeed, we have shown that these trends will continue through 2025 and beyond. Projected increases (for all companies) from 2016 to 2025 are as follows:

- Wells drilled 35%
- Producing wells 16%
- Capital investment 87%
- Operating expenses 40%
- Oil production 66%
- Natural gas production 28%
- NGL production 57%

The impact of these trends on the U.S. economy cannot be overstated.

The body of this report focuses primarily on high-level observations and conclusions, with more detailed information and graphs provided in Appendices B and C. This upstream section of the report includes (1) oil, natural gas and NGL production, (2) drilling and operations, and (3) participation in current trends.

How economic contribution assessments are reported

In this study, IHS Markit traced three levels of economic contribution that accrue from the streams of economic activity initiated by the independent operators in the United States. The first level, designated as **direct contributions**, encompasses the economic contributions that result from independent operators' production activities and from spending directly with suppliers and service providers on operational and capital projects. The second level, **indirect contributions**, captures the ripple effects through subsequent tiers of the supply chain and purchasing network. Finally, the third level, **induced contributions**, covers the economic contributions that accrue due to the consumer activity of the operators' employees as well as the employees at the companies in the supply chain and purchasing network.

Unless noted otherwise, the direct, indirect and induced contributions are reported for the following economic indicators.

Employment. To produce their goods and services, companies must hire and retain employees. This indicator measures the number of workers required to support a given level of sales activity within the economy.

Sales activity (output). In the context of an economic contribution analysis, output represents the value of sales (i.e., revenue) that occurs in the United States that is ultimately attributable to transactions initiated by independent operators.

Value added contribution to Gross Domestic Product / Gross State Product. Value added is the revenue received for a product or service less its material and services input costs. In this report, Gross Domestic Product (GDP) is the sum of value added across the U.S. economy. Similarly, summing value added across a given state yields Gross State Product (GSP). GDP or GSP are generally used to gauge the overall size and health of the U.S. economy or a state economy, respectively.

Labor income. A subcomponent of value added, labor income captures the compensation and other related income paid to workers. A common measure of the relative contribution of an industry to the overall economy is labor income per worker. The higher the ratio, the greater is each worker's quality and contribution to growth.

Oil, natural gas and NGL production

Because of the unconventional oil and natural gas boom, we are seeing and will continue to see increases in oil, natural gas and NGL production through 2025. These increases will not be uniform among the operator classifications, as the relative contributions and impact of each class will change as described below.

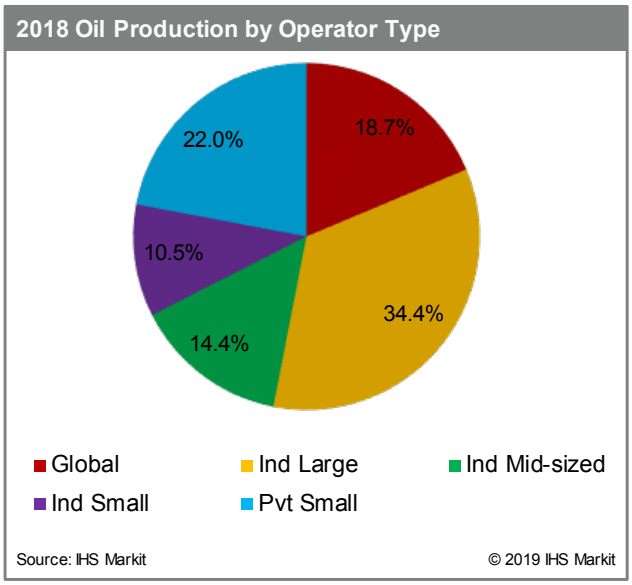
Oil production

Daily oil production for all company groups (in bbls of oil per day) for the designated years is indicated in Table 1. Oil production increases, which began in 2012, are expected to steadily increase by 35.4% from 2018 to 2025. In terms of production increases, mid-sized independents will see the largest increase at 49.1%, followed by small independents. Small private companies and global companies are only expected to see a 23.1% and 21.3% increase, respectively, from 2018 to 2025.

Table 1: Oil production

	2016	2017	2018	2020	2025
Daily oil production (bbls/d)	8,750,501	9,656,132	10,746,529	12,685,336	14,554,774

Global companies contribute only an 18.7% share of the current oil production, with their share expected to drop to 16.7% by 2025 (see Figure 1). This means that independent oil companies will carry 83.3% of the 14.5 MMbbls/d-load of oil production in 2025. Large independent operators, which control the biggest share of the oil production, currently contribute a 34.4% share of the oil production in 2018 and will see their share increase by 1.6% in 2025. By 2025, small private and global companies will see their overall shares of oil production drop.



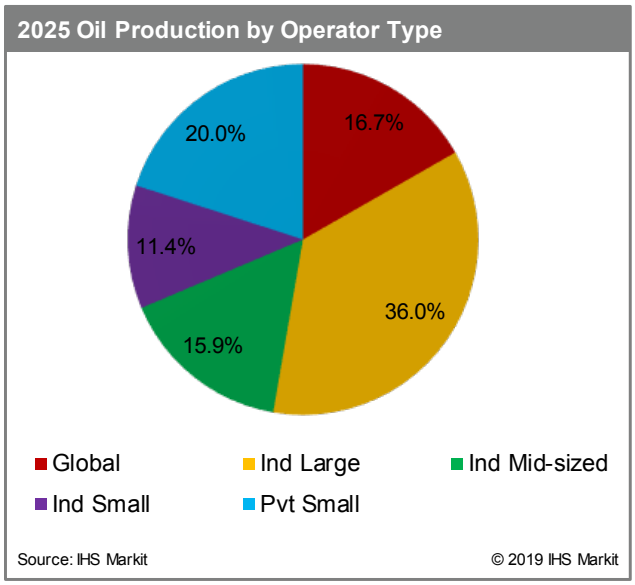


Figure 1 – Oil production share by operator type and size

Ten states currently contribute 95% of the total U.S. oil production. Texas, which currently has 42% of the oil production, will continue to lead all states in 2025 with 46% of all oil production, due largely to massive increases in the Permian Basin, where production is projected to be over 6 MMbbls/d or about 42% of all U.S. oil production; this will also affect New Mexico, where the oil production will double. California, with only a 3.8% share of U.S. oil production, will see its share decrease to 2.2% by 2025, as the oil production there decreases by 19.3%. (See Appendix C for specific state totals and contribution percentages.)

Dry natural gas production

Dry natural gas production is herein defined as natural gas that is sold into the market after the NGLs and other by-products have been extracted. Daily dry natural gas production for all company groups (in mcf of natural gas per day) for the designated years is indicated in Table 2 below. Natural gas production increases, which began in 2008, are expected to steadily increase by 14.2% from 2018 to 2025. In terms of production increases, large independents will see the largest increase at 21.6%, followed by small independents. Small private companies and global companies are only expected to see a 3.3% and 3.8% increase, respectively, from 2018 to 2025.

Table 2: Dry natural gas production

	2016	2017	2018	2020	2025
Daily dry natural gas production (in mcf/d)	68,187,593	72,633,675	76,343,425	82,342,186	87,213,591

Global companies currently contribute only a 10.7% share of the current natural gas production, with their share expected to drop to 9.7% by 2025 (see Figure 2). This means that independent oil and natural gas companies will carry over 90% of the 87.2 bcf/d-load of U.S. natural gas production in 2025. While large independents control the largest share of the oil production, mid-sized independents control the biggest share of natural gas production; they currently contribute 30.0% of the dry natural gas production and will see their share increase by 1.4% in 2025. Small private and global companies will see their overall share of production drop.

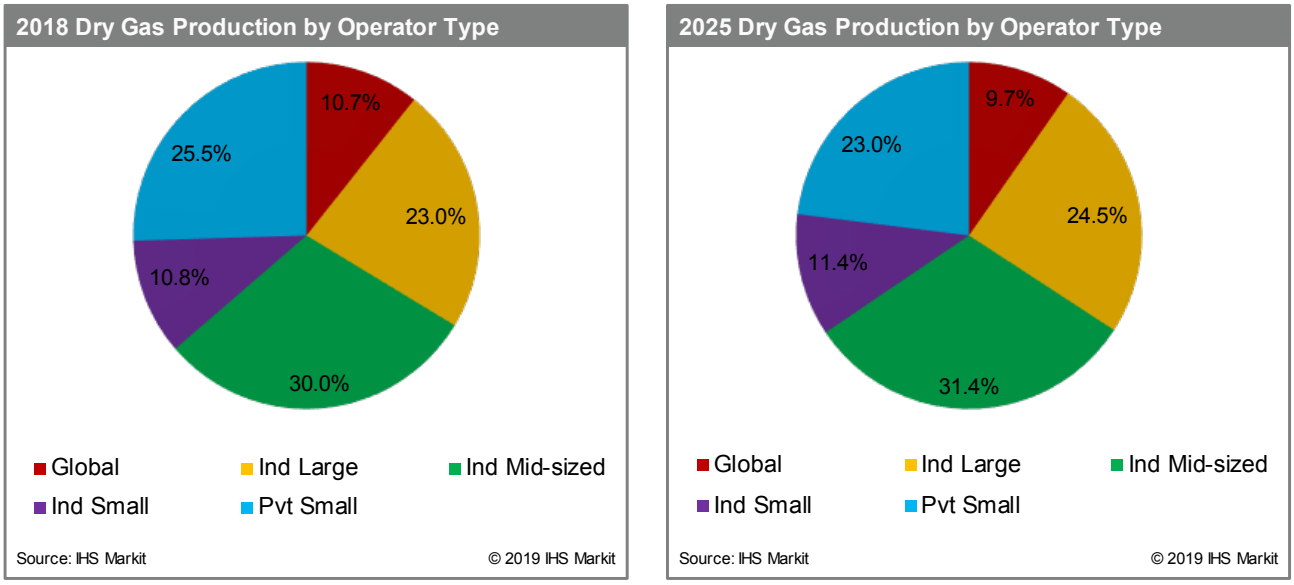


Figure 2 – Natural gas production share by operator type and size

Ten states currently contribute 92% of the U.S. dry natural gas production. Texas (including Texas Permian), which currently has 25% of the dry natural gas production, will continue to lead all states in 2025 with 27% of all natural gas production, driven solely by massive increases of associated natural gas in the Permian Basin, where natural gas production is projected to be over 11.7 bcf/d by 2025. On the other hand, we expect to see decreases in Texas gas production outside the Permian Basin, along with some decrease from Louisiana. Pennsylvania, where the Marcellus Shale play is primarily located, is the second leading natural gas producing state, with a current 15.6 bcf/d rate expected to increase to 18.5 bcf/d (or about 21%) by 2025. Other states with expected increases by 2025 include Ohio, where the Utica Shale play is centered, and New Mexico, which also includes a portion of the Permian. Despite the high oil production rates from North Dakota, this state does not rank in the top ten for natural gas production. (See Appendix C for specific state totals and contribution percentages).

NGL production

NGLs (natural gas liquids) are derived mainly from natural gas processing, so their production is largely a function of natural gas production. However, some areas and plays contain more liquids-rich natural gas where higher amounts of NGLs can be produced per mcf of natural gas production. This is especially true of natural gas associated with oil production, which is richer in NGL content; therefore, a large portion of the NGL current and forecasted production increases are attributable to oil production increases as well. Daily NGL production (in barrels per day) for the designated years is indicated in Table 3 below. NGL production increases which began in 2008 are expected to accelerate by 39.6% from 2018 to 2025. In terms of production increases, large independents will see the largest increase at 52.2%, followed by small independents. Small private companies and global companies are only expected to see a 25.6% and 25.5% increase, respectively, from 2018 to 2025.

Table 3: NGL production

	2016	2017	2018	2020	2025
Daily NGL production (bbls/d)	3,677,412	4,006,912	4,156,142	4,935,243	5,625,795

Global companies currently contribute only a 10.8% share of the current NGL production, with their share expected to drop to 9.7% by 2025 (see Figure 3). This means that independent oil and natural gas companies will carry over 90% of the 5.63 MMbbl/d-load of U.S. NGL production in 2025. Large independent operators, which currently contribute 28.4% to NGL production in 2018, will see their share increase by 2.5% in 2025. Small private and global companies will see their overall share of NGL production drop.

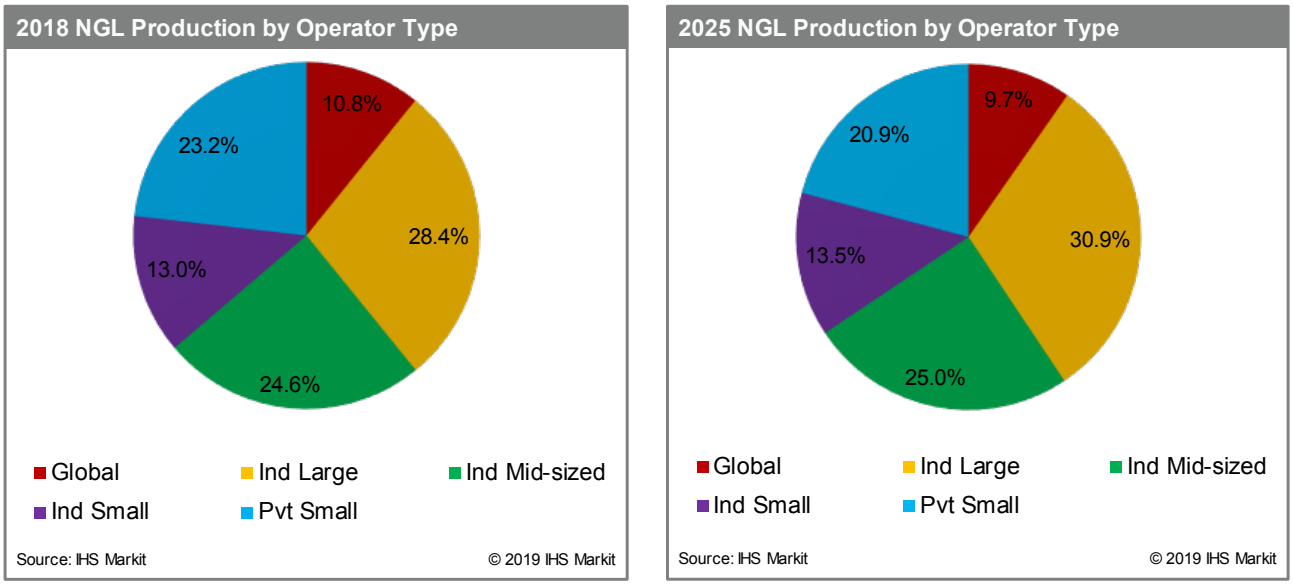


Figure 3 – NGL production share by operator type and size

Ten states currently contribute 96% of the U.S. NGL production. Texas, which currently has 46% of the NGL production, will continue to lead all states in 2025 with 47% of all NGL production, due largely to significant increases of associated natural gas from the Permian Basin, where NGL production is projected to be over 2.65 MMbbls/d by 2025. This means that the Permian Basin's (both Texas and New Mexico) share of NGL production will grow from the current 30% to 43% by 2025. Pennsylvania, where the Marcellus Shale play is primarily located, will only see a modest increase of its 7% share, as most of the play produces non-rich or NGL-poor natural gas. NGL share decreases will occur primarily in the Gulf Coast and offshore Gulf of Mexico. (See Appendix C for specific state totals and contribution percentages.)

Historical and forecasted commodity prices

The IHSM base case oil and natural gas price forecasts were applied to the daily production to project revenue for the economic impact analysis. Prices for 2016-2018 are actual annual averages, whereas the prices for 2020 and 2025 are forecasted nominal prices with a 2.5% inflation rate. Since we converted all NGLs to barrels, we applied a price for NGLs which is 36% of the oil price. Table 4 below shows the overall West Texas Intermediate (WTI) oil prices and Henry Hub (HH) natural gas prices we applied to each commodity's production for each year.

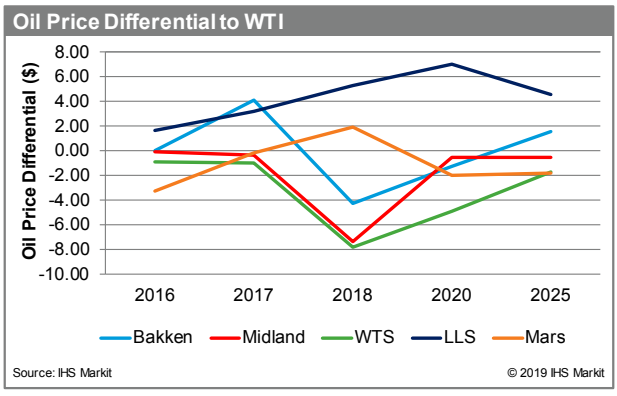
Table 4: Pricing assumptions

Commodity	2016	2017	2018	2020	2025
Oil - WTI	$43.32	$50.78	$66.41	$66.26	$72.68
Natural gas - HH	$2.48	$2.96	$3.06	$2.51	$4.55
NGL	$15.59	$18.28	$23.91	$23.85	$26.17

Note: WTI = West Texas Intermediate; HH = Henry Hub

When using the respective prices to generate cash flow, we wanted to be certain that they were applied properly to respective sales points, as the actual revenue per barrel or mcf received by the operator could vary considerably by region due to discounting or differentiation of the price (see Figure 4). As we analyzed production from each basin and state, we applied differentials to the WTI or HH commodity price to reflect the actual market price for the oil and natural gas being sold. For example, due to the increased production in the Permian Basin, there are infrastructure constraints which result in discounting of the crude oil sold there. Hence, an $8.00 discount or differential was applied for 2018, but as infrastructure constraints are expected to ease in 2019, the differential would decrease to only a few cents by 2020 (see Figure 4 for Midland spot price). We did not apply any price hedging to our calculations of cash flow or economic impact.

Given the regional diversity of producing locations among all the operator classes, both historic and forecasted natural gas prices are about the same for each, with all groups showing some discounting. Historically, the oil prices for all operator groups are nearly identical as well; however, beginning in 2018 and beyond, forecasted prices begin to differ, with prices for global companies and large independents ranging from $0.25 to $0.90 lower than the mid-sized, small independents and the small private companies. This difference may be due to the larger company's more focused presence in areas of more discounted differentials, such as the Permian Basin and Bakken, where production is increasing more rapidly and competition for takeaway is fierce.



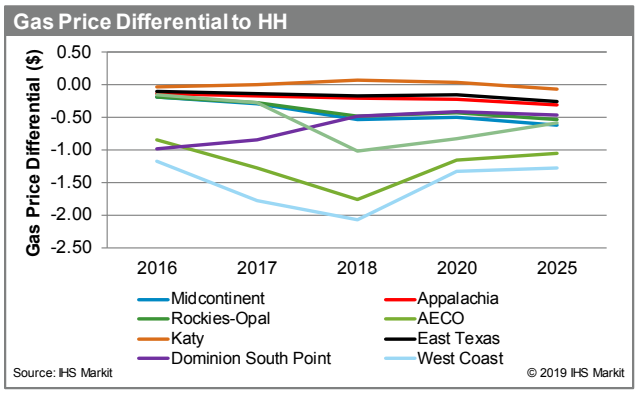


Figure 4 – Oil and natural gas price differentials that were applied to various U.S. regions for the economic impact analysis

Drilling and operations

Drilling and well operations, with their respective capital expenditures (capex) and operating expenditures (opex), were also analyzed for each operator class, as these expenditures also will have an economic impact.

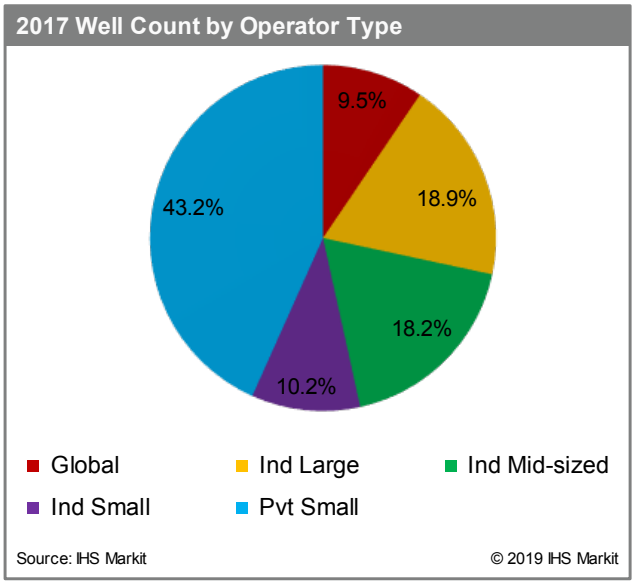
Drilling and capex

The total number of new wells spudded (and currently completed) increased dramatically in 2017 as oil prices recovered. As of this writing, a complete set of 2018 data was not available; therefore, we took a current snapshot of 2018 wells to document those that are completed as well as those in various stages of drilling and completion. A portion of these 2018 non-completed wells were spudded in previous years, but for some reason have not yet been completed. Given that some wells will not be completed until next year, we estimate that the total for 2018 will be about 27,000 wells. Future wells for 2020 and 2025 have been projected from the IHS Markit production and drilling forecasts.

Table 5: Well counts and capital expenditures

	2016	2017	2018 (Drilling plus drilled uncompleted wells)	2018 (Total completed wells)	2020	2025
Total wells	19,840	26,580	17,253	13,832	27,911	26,842
Capex ($MM)	$73,970	$110,650	$86,041	$51,152	$134,822	$138,237
Avg. cost/ well ($MM)	$3.73	$4.16	$4.99	$3.70	$4.83	$5.15

The forecast of wells and capital expenditure (shown in Table 5 above) suggests that, from 2017 to 2025, the number of wells to be completed will remain relatively flat, increasing by only 1.2%; however, capital expenditures for drilling and completion will increase by nearly 25%. This disproportionate increase is due partly to the increase in cost rates related to the recovery of oil prices and partly because wells are becoming and will continue to be more complex with a higher percentage of wells being drilled horizontally and larger, more expensive "fracks" taking place. Note the average well cost increases each year as shown in Table 5. In 2018, average well costs will be lower for completed wells since these represent a larger share of onshore vertical wells, which can be drilled and completed much more quickly than the more expensive horizontal wells and offshore wells.



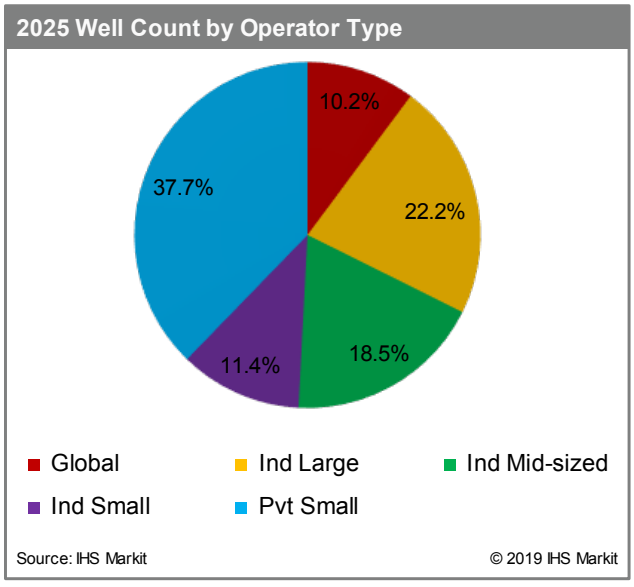


Figure 5 – New well spuds and total capex spend by operator type for the years 2017 and 2025

Global companies currently contribute only a 9.5% share of the new well count and 9.1% of the capex. Their share of new wells is expected to increase to 10.2% of total new wells, while their share of capex will decline to 9.0% by 2025. This means that independents will bear 91.0% of future U.S. capital costs for drilling and completion. From 2017 to 2025, large independents will see an 18.6% increase in new wells drilled, with a commensurate increase in capital spend of 33.5% during the same period. While small private operators contributed the most in new well counts in 2017, their share decreases by 5.5% from 2017 to 2025, but this 5.5% is made up for by the large independents, small independents and global companies.

When comparing new wells drilled and capital expenditures of the various operator classifications for 2017, we note that there are key differences. For example, small private companies comprise 43.2% of the wells drilled and only 28.7% of the capital expenditures, while large independents are just the opposite with 18.9% of the new wells drilled and 29.5% of the capital expenditures (see Figure 5). Companies that have higher capital expenditure shares relative to new well shares are those engaged in drilling more complex horizontal wells which are more costly to drill.

Ten states currently contribute 91% of the total U.S. new well counts and 84% of the total capex. Texas, which currently has 45% of the new wells, will continue to lead all states in 2025 with 51% of all new wells. Likewise, Texas, which currently has 46% of the capex, will also continue to lead all states in 2025 with 53% of all capex. The largest increase through 2025 will be seen in the Permian Basin, where new wells will grow by 23% and capex will grow by 59.3% due to the complexity of the new wells that will be drilled there.

Producing wells and opex

The total number of new producing wells projected over the next few years will result in a 13.2% increase in the number of active wells in operation from 2018 to 2025, as shown in Table 6 below. Over the same period, operating expenses will increase by 27.2%. These disproportional increases result as expenses include a fixed expense directly attributable to each well and a variable expense associated with the transport, processing, water disposal and other expenses tied directly to each barrel of oil and NGL and each mcf of natural gas. Since we expect increases both in the number of operating wells and in the production of oil and natural gas, we would also expect operating expenses to increase more rapidly than the number of wells.

From 2018 to 2025, large independents will see a 29.6% increase in operated wells, with a commensurate increase in operational spend of 38.9% during the same period. Small private companies and global companies will see the lowest increases in operated wells at 7.1% and 6.7%, respectively. Similarly, small private companies and global companies will experience the lowest increases in operational expense of 16.0% and 18.4%, respectively.

Table 6: Producing wells and Opex

	2016	2017	2018	2020	2025
Producing wells	691,535	704,308	711,186	734,732	804,881
Opex ($MM)	$77,690	$85,526	$91,866	$102,786	$116,820

Global companies currently contribute only an 8.8% share of the current producing well count and 12.0% of the opex. Their share of new wells is expected to drop to 8.3% of total new wells, while their share of opex will decline to 11.2% by 2025. This means that independents will bear about 89% of future oil, NGL and natural gas production. While small private operators contribute the most in operated wells and opex in 2018, their share decreases by 3% from 2018 to 2025, but this 3% is made up for by the large independents.

When comparing operated wells and capital expenditures of the various operator classifications for 2018, we note that there are key differences. For example, small private companies comprise 46.8% of the operated wells and only 29.4% of the operating expenses, while large independents are just the opposite with 14.8% of the operated wells and 26.8% of the operating expenses (see Figure 6). Large and mid-sized independents and global companies have higher operating expenditure shares than operated well shares, which points to them operating the more expensive and complex wells than the small private companies.

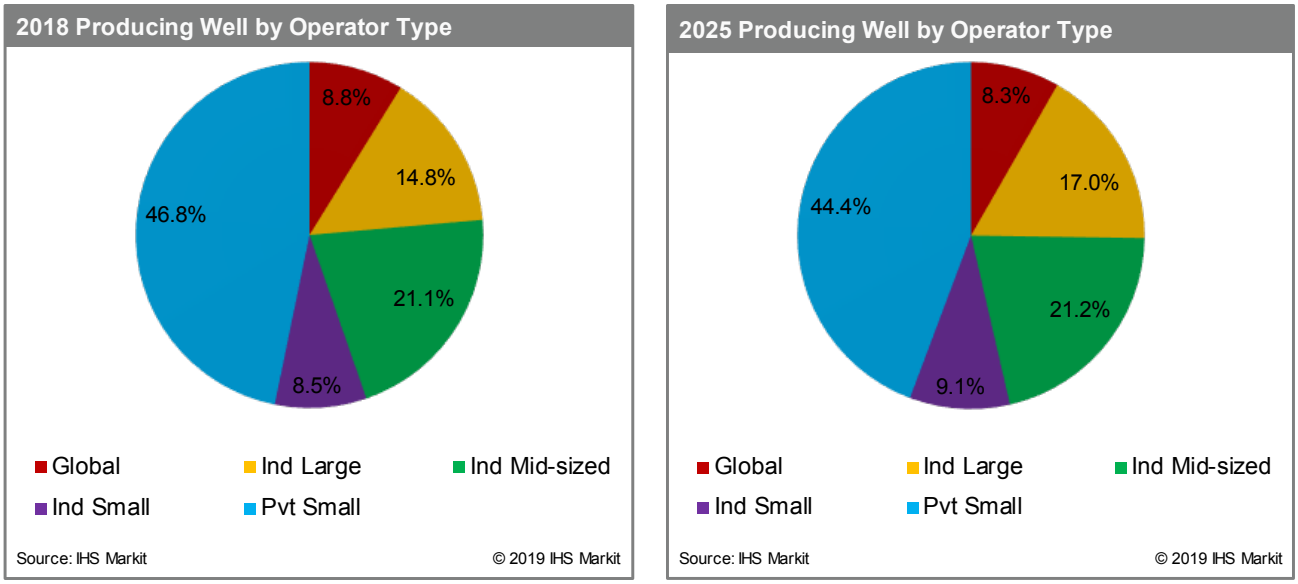


Figure 6 – Current producing wells and estimated total opex spend by operator type for the years 2018 and 2025

Comparing production per well is important when analyzing the various company classes. The current overall average boe per well is about 37 boe/d rising to 40 boe/d by 2025. Large independents are almost twice the average in this well performance benchmark, while small private companies are only producing at about one-half the average rate per well (Figure 7). Furthermore, small private companies also operate older, more mature wells, including the majority of marginal wells (wells producing less than 15 boe/d of oil, or 90 mcf/d of gas).

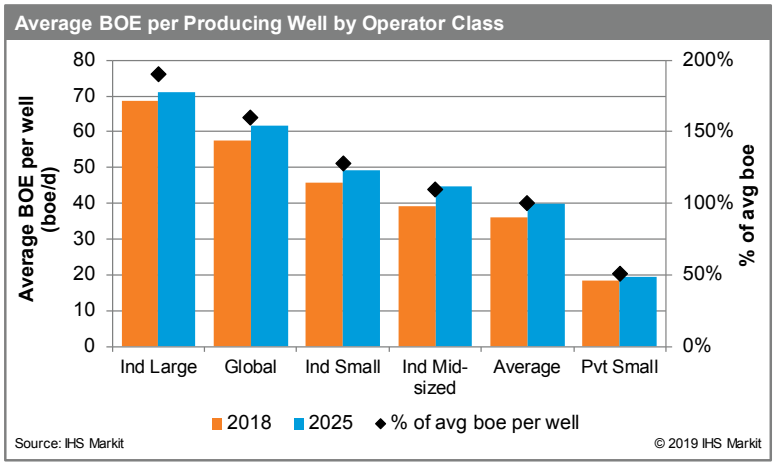


Figure 7 – BOE per producing well by operator class

Ten states currently contain 86% of the total U.S. producing wells. Texas, which currently has 31% of the producing wells, will continue to lead all states in 2025 with 35% of all producing wells. The largest increases will be in North Dakota (with the Bakken Shale play) and the Permian Basin, where producing well counts will grow by 49% and 32%, respectively. The largest increases in opex will also be in the Permian Basin, where opex will grow by nearly 70%. California and Louisiana will see decreases in their respective shares of the producing well count and opex.

Participation in current trends

Because of the unconventional oil and natural gas boom and the large production increases in the Permian Basin, we are seeing and will continue to see an increase in associated natural gas relative to well natural gas. In the future we will see an increased gravitation to horizontal drilling and an emphasis by all operator classes on production of unconventional resources which include tight oil, shale natural gas and tight sand natural gas as illustrated below.

Natural gas types

U.S. dry natural gas production has grown from 69 bcf/d to the current 78 bcf/d since 2016 and is forecasted to increase to 87 bcf/d by 2025. Historical growth has been primarily in the natural gas plays such as the Marcellus, Utica and Haynesville, but future overall natural gas production growth through 2025 is projected to occur through the addition of associated natural gas, primarily from the Permian Basin. We can expect that associated natural gas, which currently makes up about 23% of natural gas production, will comprise just under 30% of all natural gas production by 2025 (see Figure 8).

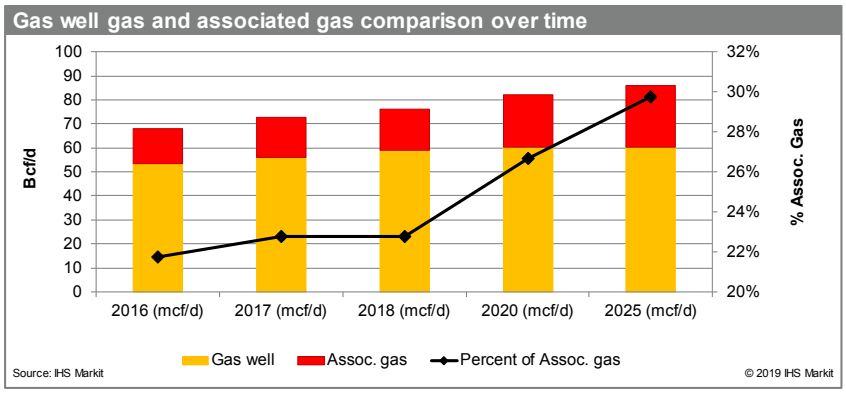


Figure 8 – Daily production of natural gas well natural gas and associated natural gas

Each of the operator classes will participate in this growth of associated natural gas within their respective daily production portfolios (see Table 7). Large independents, which have the largest participation in oil production, currently have the highest percentage of associated natural gas at 32.6%. By 2025, associated natural gas will comprise 42.1% of their daily production portfolios, a growth trend commensurate with their increased production and increased participation in oil plays.

Table 7: Associated natural gas production portfolio share by operator class

Operator Class	2018	2025
Global	23.8%	30.7%
Independent Large	32.6%	42.1%
Independent Mid-sized	16.5%	21.9%
Independent Small	28.0%	35.9%
Private Small	18.6%	24.1%
Average	**22.8%**	**29.8%**

Meanwhile, mid-sized independents, which have the highest participation in daily natural gas production, have the lowest percentage of associated natural gas in their portfolios at only 16.5%. By 2025, the share of associated natural gas within their daily production portfolios will also increase, but only to just under 22%, which is only about half that of large independents. We also note that associated natural gas percentages for global companies are slightly above average. For small private companies, associated natural gas only comprises 18.6% of their current natural gas production, rising to about a quarter of their average daily production portfolios by 2025.

Drilling trends

Horizontal drilling, which has been gaining market share, comprises about 55% of all wells spud this year. This percentage will increase slightly to 60% for 2020 and 2025 (Figure 9). For all groups we are seeing and will continue to see higher proportions of horizontal drilling.

Large independents have been leading the charge with steady increases of horizontal wells in their drilling portfolios. Now at 80%, horizontal wells will comprise about 85% of their portfolios by 2025. Likewise, small independents are drilling horizontal wells, but at a slightly lesser rate. Mid-sized companies are slightly above average (Figure 9). Clearly, the independents have been the leaders in horizontal drilling.

While we see recent growth in the percentage of horizontal wells for global and small private companies, these groups' percentages of horizontal wells are well below average.

Figure 10 shows a similar pattern of operator class participation and increased emphasis directed to unconventional plays, as we observed with horizontal drilling. We note that the group with the lowest U.S. unconventional portfolio participation is the global operator class, which is due in part to their overall higher involvement in the deepwater Gulf of Mexico and Alaska.

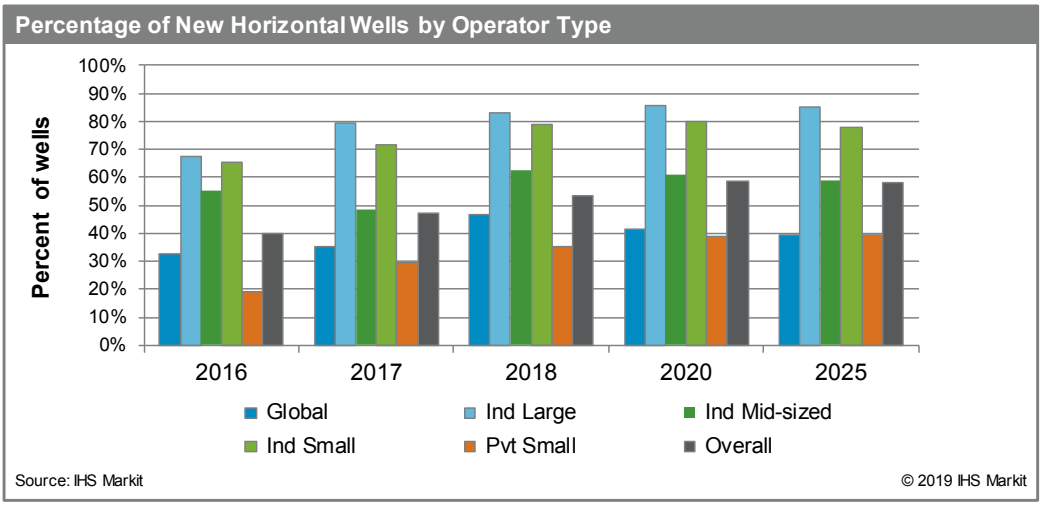


Figure 9 – Percentage of new horizontal wells by operator type trends

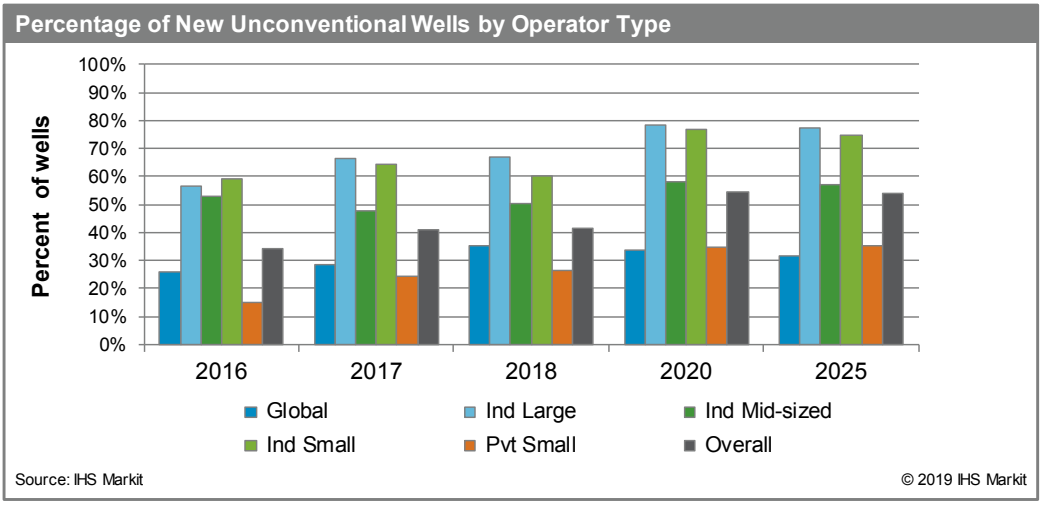


Figure 10 – Percentage of new unconventional wells by operator type trends

Production trends

Increased drilling in unconventional plays yields increased unconventional production, as depicted in Figures 11 and 12. By 2025, approximately 80% of all oil and natural gas production will come from unconventional plays for large, mid-sized and small independents. Approximately 65-70% of natural gas production for the global and small private companies will come from shale natural gas or tight natural gas sands. Tight oil, comprising 20% of small private companies' portfolios, will only increase to 30% by 2025. This also points to their participation in residual conventional oil, including the vast bulk of low-producing marginal wells.

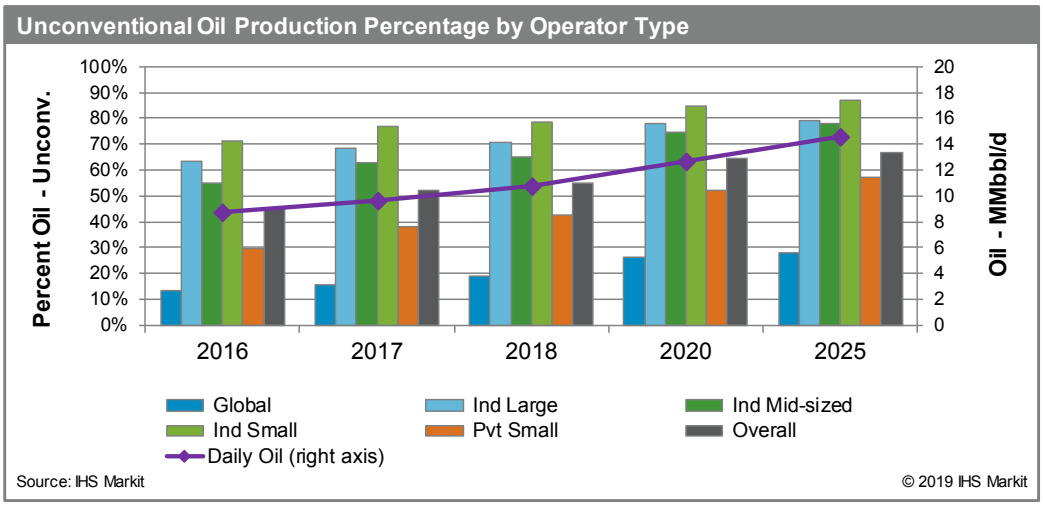


Figure 11 – Trend of producing unconventional oil by operator type – diamond line depicts daily production by year

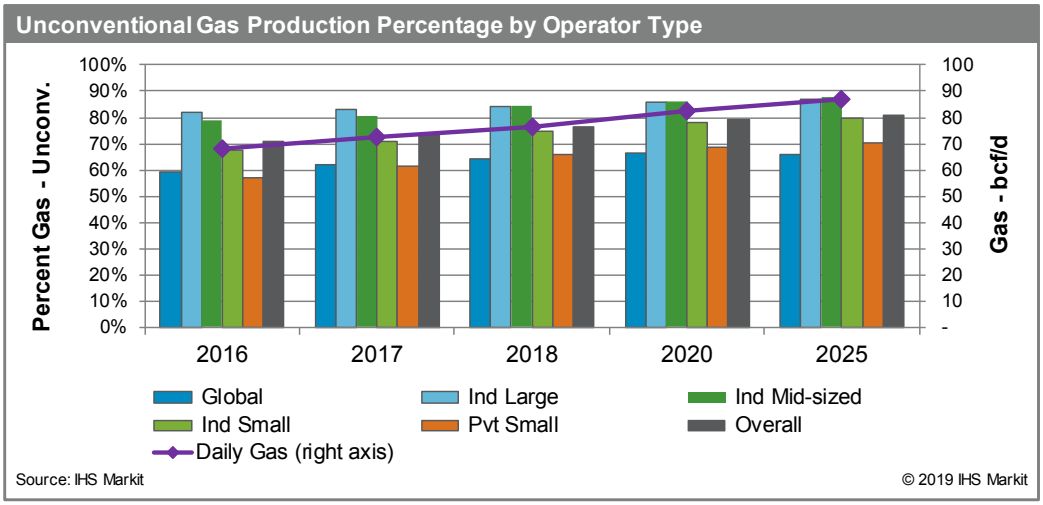


Figure 12 – Trend of producing unconventional natural gas by operator type – diamond line depicts daily production by year

Economic contribution assessment

In this study, IHS Markit traced three levels of economic contribution that accrue from the streams of economic activity initiated by the independent operators in the United States. The first level, designated as direct contributions, captures the economic contributions that result from independent operators' (a) production activities, and (b) direct spending with local suppliers and service providers on operational and capital projects. The second level, indirect contributions, captures the ripple effects through subsequent tiers of the supply chain and purchasing network. Finally, the third level, induced contributions, covers the economic contributions that accrue due to the consumer activity of the operators' employees as well as the employees at the companies in the supply chain and purchasing network. A more detailed explanation of the methodology IHS Markit used for this study is included in Appendix F.

Referring to Table 8 below, IHS Markit estimates that, in 2018, the independent operators directly influenced about $486.8 billion of sales activity in the United States. Roughly 70% or $344.7 billion of that stimulus was due to the value of the oil, dry natural gas and NGLs produced by the independents. This set in motion a cascade of follow-on indirect and induced activity that totaled $437.9 billion in 2018. Thus, every dollar of production by the independents resulted in an additional $1.27 of follow-on sales activity.

The independents also spent more than $142.0 billion on capital expenditures in 2018. This means that over 41% of the independents' production revenues was directly reinvested in local economies on capital expenditures. The direct capex spending led to another $245.5 billion of indirect and induced sales activity, a multiplier of 1.73.

Table 8: Sales activity stimulated by the independent operators

Millions of 2018 dollars	2016	2017	2018	2020	2025	Average
Independents' direct sales activity	**$283,200**	**$386,524**	**$486,771**	**$536,380**	**$692,454**	**$477,066**
Production	$206,573	$271,921	$344,689	$396,757	$549,288	$353,845
Capital expenditures (capex)	$76,627	$114,603	$142,082	$139,623	$143,166	$123,220
Capex/production value ratio	37.1%	42.1%	41.2%	35.2%	26.1%	34.8%
Follow-on indirect and induced activity	**$392,324**	**$540,729**	**$683,360**	**$749,081**	**$942,524**	**$661,604**
Stimulated by production	$259,935	$342,544	$437,889	$507,687	$695,053	$448,622
Stimulated by capital expenditures (capex)	$132,389	$198,186	$245,471	$241,394	$247,471	$212,982
Sales multiplier	**1.39**	**1.40**	**1.40**	**1.40**	**1.36**	**1.39**
Stimulated by production	1.26	1.26	1.27	1.28	1.27	1.27
Stimulated by capital expenditures (capex)	1.73	1.73	1.73	1.73	1.73	1.73

Sales activity drives four other key economic contribution metrics:

Employment. To produce their goods and services, companies must hire and retain employees. This indicator measures the number of workers required to support a given level of sales activity within the economy.

Value added contribution to Gross Domestic Product / Gross State Product. Value added is the revenue received for a product or service less its material and service input costs. Gross Domestic Product (GDP) is the sum of value added across the U.S. economy. Gross State Product (GSP) is the corresponding measure for a state economy.

Labor income. A subcomponent of value added, labor income, captures the compensation and other related income paid to workers. A common measure of the relative contribution of an industry to the overall economy is labor income per worker. The higher the ratio, the greater is each worker's quality and contribution to growth.

Taxes (government revenues). In general, taxes and fees to state, local and federal agencies are paid from the value added.

Table 9 shows the direct, indirect and induced economic contributions to sales, GDP, wages and employment that are stimulated by the independent producers' production and capex. Overall, IHS Markit estimates the independents helped support almost 4.5 million jobs in the United States during 2018. This represents about 3.3% of the 149.1 million U.S. non-agricultural jobs. Similarly, the independents helped contribute almost $573 billion or 2.8% to U.S. GDP in 2018. Detailed breakouts of these economic contribution metrics by state are included in Appendix D.

Table 9: Contribution of the independent operators to the U.S. economy

Millions of 2018 dollars and number of workers	2016	2017	2018	2020	2025
Contributions from production activities					
Sales (output)	**$466,508**	**$614,464**	**$782,578**	**$904,444**	**$1,244,341**
Direct	$206,573	$271,921	$344,689	$396,757	$549,288
Indirect	$121,300	$159,931	$198,022	$225,613	$321,444
Induced	$138,635	$182,612	$239,867	$282,075	$373,609
Contribution to GDP (value added)	**$250,195**	**$327,819**	**$406,209**	**$478,105**	**$653,796**
Direct	$124,516	$162,498	$197,577	$234,015	$320,510
Indirect	$58,727	$77,058	$92,773	$107,669	$152,530
Induced	$66,951	$88,263	$115,859	$136,422	$180,757
Labor income (wages)	**$146,890**	**$193,065**	**$242,592**	**$292,173**	**$388,877**
Direct	$67,675	$88,891	$111,709	$139,200	$179,239
Indirect	$41,086	$53,917	$64,906	$75,306	$106,739
Induced	$38,128	$50,256	$65,978	$77,666	$102,900
Employment	**1,660,105**	**2,160,105**	**2,714,872**	**3,177,236**	**4,283,850**
Direct	281,774	346,058	408,263	476,210	615,324
Indirect	507,119	664,857	798,758	923,983	1,313,458
Induced	871,212	1,149,191	1,507,851	1,777,043	2,355,067
Contributions from capital projects					
Sales (output)	**$209,016**	**$312,789**	**$387,553**	**$381,017**	**$390,637**
Direct	$76,627	$114,603	$142,082	$139,623	$143,166
Indirect	$81,214	$122,895	$152,017	$150,191	$153,825
Induced	$51,176	$75,291	$93,453	$91,203	$93,645
Contribution to GDP (value added)	**$90,446**	**$136,103**	**$166,372**	**$165,569**	**$169,490**
Direct	$31,940	$48,152	$58,413	$58,515	$59,868
Indirect	$33,757	$51,495	$62,727	$62,882	$64,271
Induced	$24,749	$36,456	$45,232	$44,172	$45,352
Labor income (wages)	**$56,297**	**$84,483**	**$102,993**	**$102,524**	**$104,973**
Direct	$21,494	$32,155	$38,788	$38,834	$39,758
Indirect	$20,707	$31,569	$38,446	$38,537	$39,392
Induced	$14,097	$20,760	$25,759	$25,152	$25,824
Employment	**962,371**	**1,439,448**	**1,756,088**	**1,744,490**	**1,786,909**
Direct	307,609	457,973	550,468	550,999	564,269
Indirect	332,790	506,814	616,845	618,271	632,081
Induced	321,973	474,660	588,775	575,220	590,559
Total contributions					
Sales (output)	**$675,524**	**$927,253**	**$1,170,131**	**$1,285,461**	**$1,634,978**
Direct	$283,200	$386,524	$486,771	$536,380	$692,454
Indirect	$202,514	$282,826	$350,040	$375,804	$475,269
Induced	$189,810	$257,903	$333,320	$373,278	$467,254
Contribution to GDP (value added)	**$340,641**	**$463,921**	**$572,581**	**$643,674**	**$823,287**
Direct	$156,457	$210,650	$255,990	$292,529	$380,378
Indirect	$92,484	$128,553	$155,500	$170,551	$216,801
Induced	$91,700	$124,719	$161,091	$180,593	$226,108
Labor income (wages)	**$203,187**	**$277,548**	**$345,585**	**$394,697**	**$493,851**
Direct	$89,169	$121,046	$150,496	$178,035	$218,996
Indirect	$61,793	$85,486	$103,352	$113,843	$146,130
Induced	$52,225	$71,016	$91,737	$102,819	$128,724
Employment	**2,622,476**	**3,599,553**	**4,470,960**	**4,921,726**	**6,070,759**
Direct	589,383	804,031	958,730	1,027,210	1,179,593
Indirect	839,908	1,171,670	1,415,603	1,542,254	1,945,540
Induced	1,193,185	1,623,851	2,096,626	2,352,263	2,945,626
Contributions to taxes					
Federal taxes	**$31,082**	**$43,865**	**$54,083**	**$62,612**	**$81,457**
Personal	$24,469	$34,573	$42,666	$49,366	$64,041
Corporate	$6,614	$9,292	$11,417	$13,246	$17,415
State & local taxes	**$28,456**	**$39,458**	**$47,362**	**$52,204**	**$65,362**
Personal	$2,284	$3,168	$3,794	$4,104	$5,507
Corporate (including state severance taxes)	$26,173	$36,290	$43,568	$48,100	$59,855
Federal, state & local taxes	**$59,539**	**$83,323**	**$101,445**	**$114,816**	**$146,819**

Source: IHS Markit

Conclusions

With the advent of unconventional resources, about 90% of the U.S. oil and natural gas activity is and will continue to be performed by independent oil and natural gas companies, which are defined as companies that are not vertically integrated with refining. The production and capital spending activities of the independent operators stimulate significant contributions to the U.S. economy.

An important conclusion of this study is the very high participation rates of small, mid-sized and large independent companies in unconventional tight oil, shale natural gas and tight natural gas plays. These companies have pioneered the technologies and innovations that have made unconventional plays the backbone of current and future growth in oil and natural gas production and investment. Had this pioneering not occurred, we would never have seen the dramatic increases in oil, natural gas and NGL production and in oil and natural gas drilling. Indeed, we have shown that these trends will continue through 2025 and beyond.

When comparing activity within the decade that is the range of this study beginning in 2016 and extending through 2025, we see the following dramatic increases:

- Wells drilled 35%
- Producing wells 16%
- Capital investment 87%
- Operating expenses 40%
- Oil production 66%
- Natural gas production 28%
- NGL production 57%

The national results for five critical economic metrics are summarized in the table below. Overall, the independents influenced almost $1.2 trillion of sales activity in the United States during 2018. This, in turn, contributed about $573 billion or 2.8% of U.S. GDP and supported almost 4.5 million jobs (3.0% of non-agricultural employment). IHS Markit estimates the independents initiated economic activity that generated over $101 billion in federal, state and local taxes in 2018. As the findings of this study bear out, the independent producers will continue to drive solid contributions to the U.S. economy over the remainder of the study period (2025) and, quite likely, beyond.

Contribution of the independent operators to the U.S. economy

Millions of 2018 dollars and number of workers	2016	2017	2018	2020	2025	CAGR (2018 - 2025)
Sales (output)	$675,524	$927,253	$1,170,131	$1,285,461	$1,634,978	4.9%
Contribution to GDP (value added)	$340,641	$463,921	$572,581	$643,674	$823,287	5.3%
Labor income (wages)	$203,187	$277,548	$345,585	$394,697	$493,851	5.2%
Employment	2,622,476	3,599,553	4,470,960	4,921,726	6,070,759	4.5%
Federal, state & local taxes	$59,539	$83,323	$101,445	$114,816	$146,819	5.4%

Appendix A – Operator classes

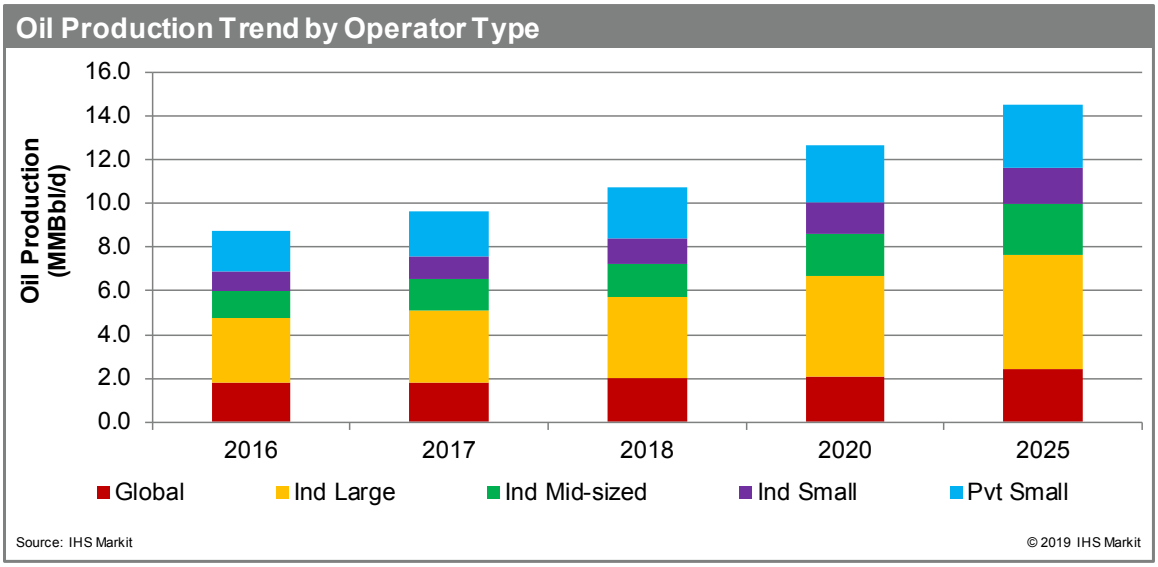
- Global – Fully integrated companies, generally includes the super majors such as Chevron, XOM, Shell, BP, etc. and National Oil Companies that may be operating in the U.S.
- Large Independent (> 200,000 boe/d)
- Mid-sized Independent (100,000 – 200,000 boe/d), includes large private companies with (>50,000 boe/d)
- Small Independent (20,000 – 100,000 boe/d), includes mid-sized private companies with (>20,000 boe/d)
- Small Private (< 20,000 boe/d)

Operator size classifications were determined based on recent (2017) average daily production which may not equate with market capitalization. In other words, some companies with smaller capitalization may be producing at larger daily rates and therefore be classified in a larger class than some of their similarly capitalized peers.

Global (8)	Large Independent (18)	Mid-sized Independent (24)	Large Private (15)
• BHP	• Anadarko	• Antero	• Chief
• BP	• Apache	• Atlas Energy	• Citation
• Chevron	• Chesapeake	• Cabot	• Endeavor
• ENI	• ConocoPhillips	• Cimarex	• Fieldwood
• ExxonMobil[1]	• Continental Resources	• Comstock	• Hilcorp
• Shell	• Denbury	• Concho	• Lewis Pet.
• Statoil	• Devon	• Consol	• LLOG
• Total	• EOG	• Cox[2]	• Merit
	• Encana	• Crescent Point	• Mewbourne
	• Exco	• EQT	• Petro-Hunt
	• Hess	• Energen	• Sabine O&G
	• Marathon	• EP Energy	• Samson Resources
	• Murphy	• Kinder Morgan	• Sheridan
	• OXY	• Linn	• Slawson
	• Pioneer Resources	• National Fuel	• Vine
	• QEP	• Newfield	
	• Southwestern	• Noble	
	• WPX Energy	• Range Resources	
		• SandRidge	
		• SM Energy	
		• Talisman	
		• Ultra Pet	
		• W&T Offshore	
		• Whiting Pet	

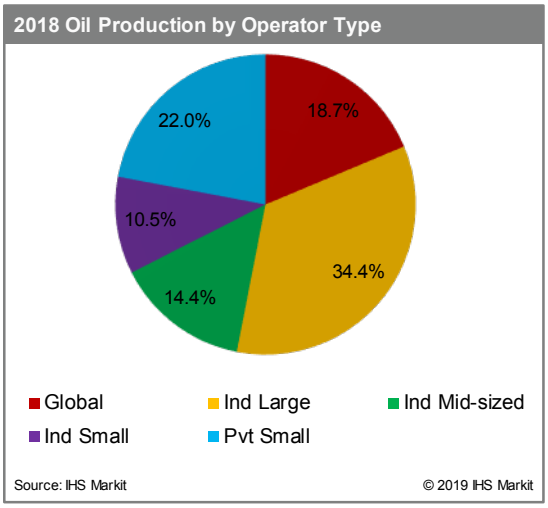
[1] ExxonMobil includes XTO
[2] Cox is the former Energy XXI

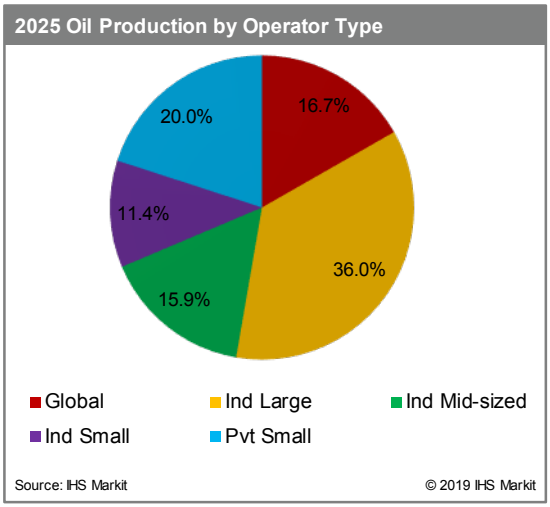
Appendix B – Operator class - production, drilling and operation

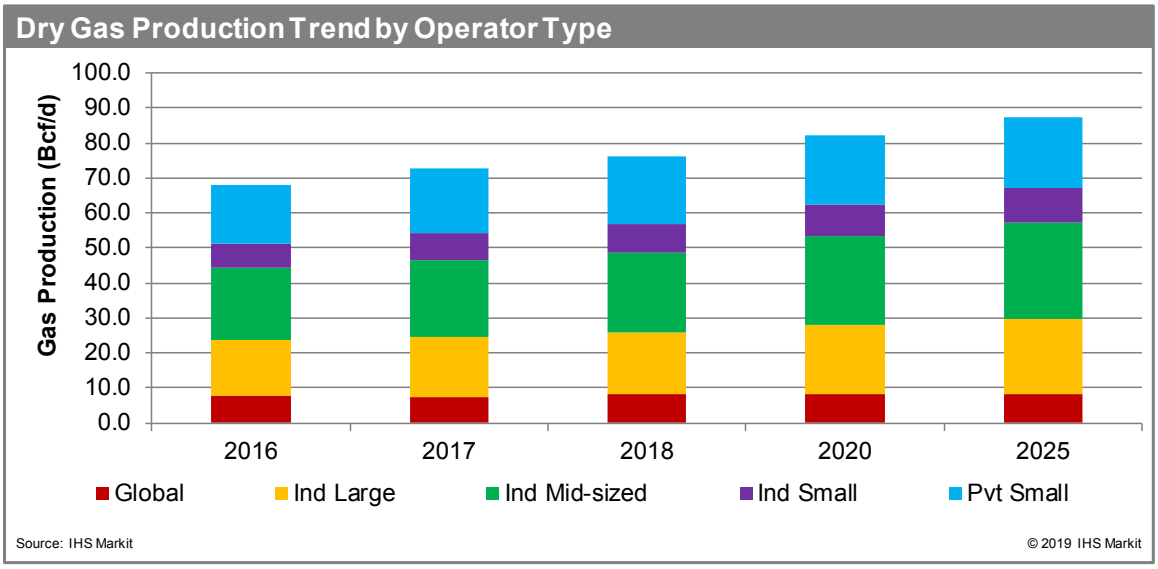


Daily oil production by operator type (bbls/day)					
Operator Class	**2016**	**2017**	**2018**	**2020**	**2025**
Global	1,779,170	1,774,558	2,007,450	2,103,497	2,435,714
Independent Large	2,981,691	3,321,914	3,695,374	4,565,787	5,237,525
Independent Mid-sized	1,243,394	1,453,114	1,552,427	1,940,951	2,314,782
Independent Small	874,588	1,023,763	1,124,281	1,441,939	1,654,130
Pvt Small	1,871,657	2,082,783	2,366,998	2,633,162	2,912,622
Total	**8,750,501**	**9,656,132**	**10,746,529**	**12,685,336**	**14,554,774**

Note: column totals may not sum exactly due to rounding



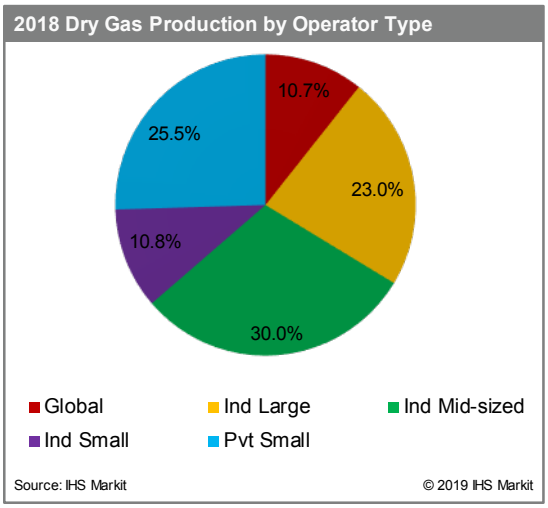


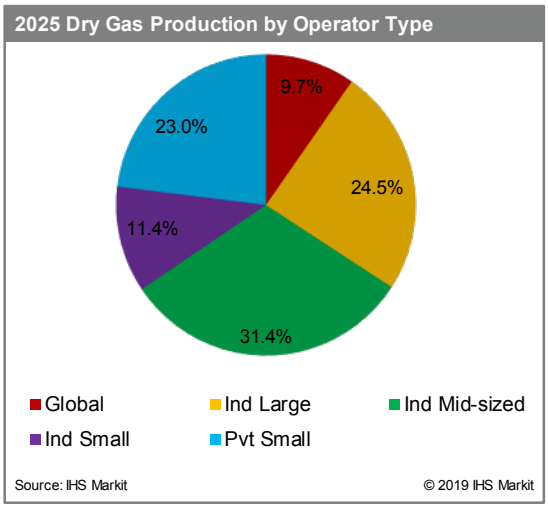


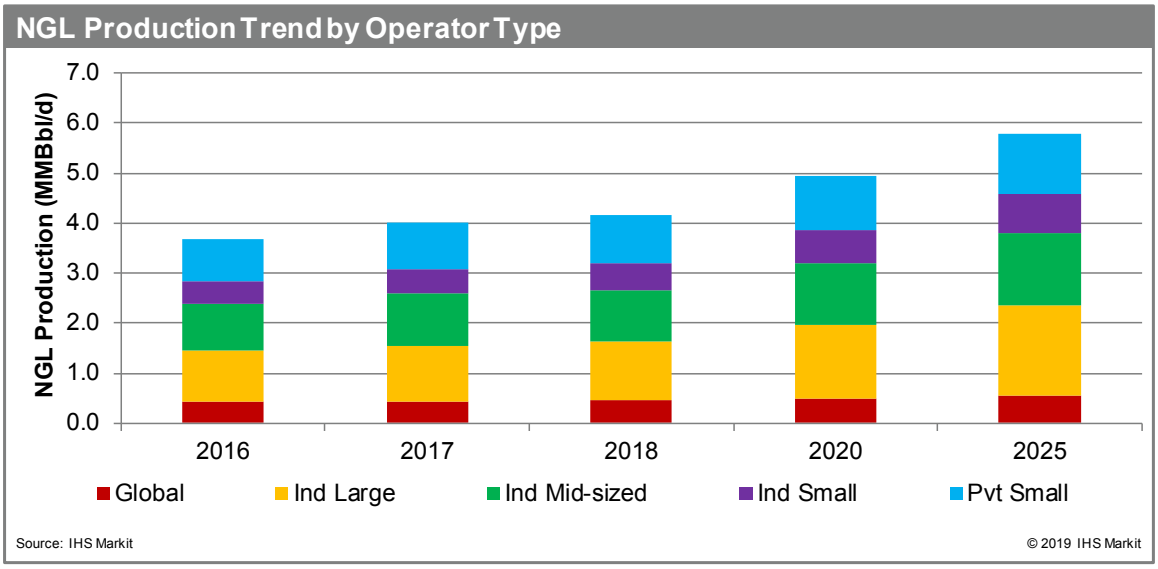
Daily dry gas production by operator type (mcf/day)

Operator Class	2016	2017	2018	2020	2025
Global	7,694,574	7,583,914	8,150,360	8,390,875	8,462,797
Independent Large	16,262,242	17,224,615	17,553,920	19,634,191	21,341,522
Independent Mid-sized	20,385,329	21,683,705	22,906,087	25,268,525	27,374,839
Independent Small	6,969,771	7,761,449	8,280,440	9,180,681	9,945,643
Pvt Small	16,875,676	18,379,992	19,452,619	19,867,914	20,088,790
Total	**68,187,593**	**72,633,675**	**76,343,425**	**82,342,186**	**87,213,591**

Note: column totals may not sum exactly due to rounding

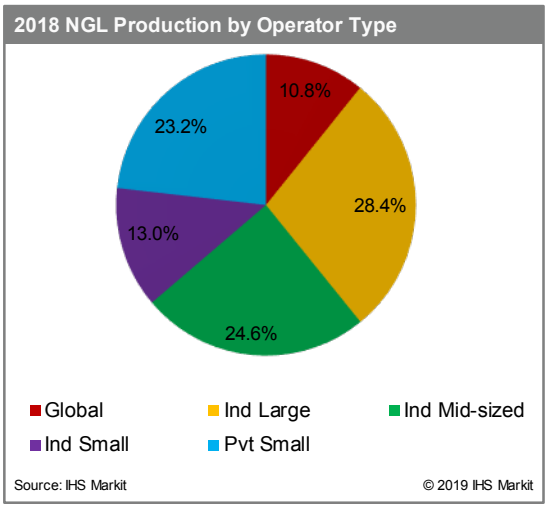


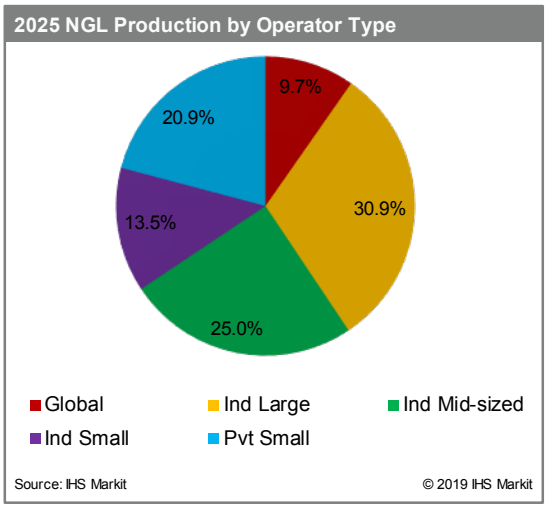


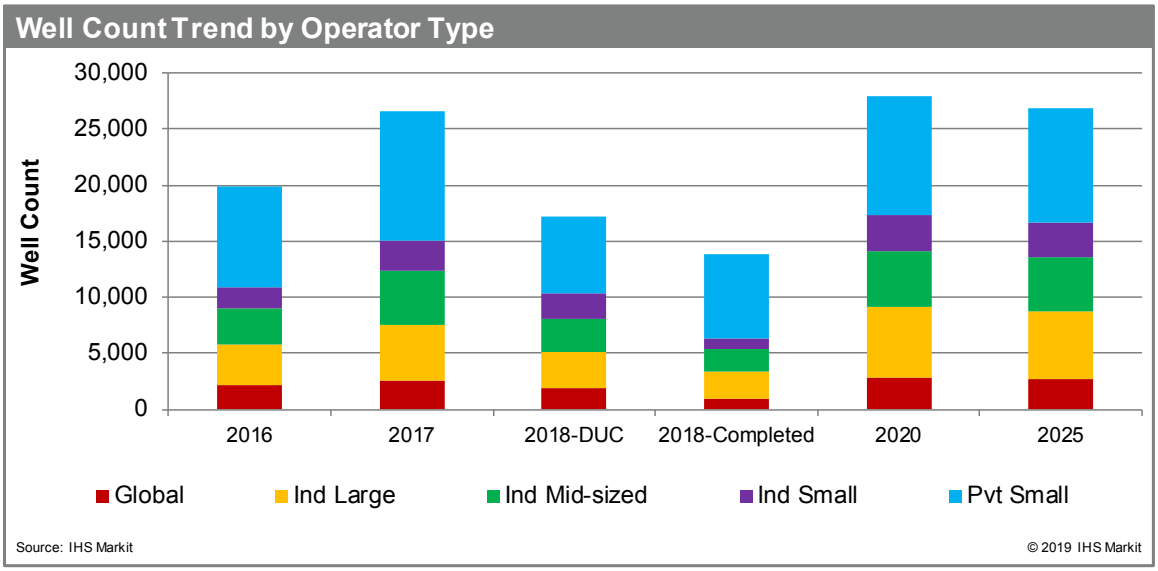


Daily natural gas liquids (NGL) production by operator type (bbls/day)					
Operator Class	**2016**	**2017**	**2018**	**2020**	**2025**
Global	441,580	419,204	447,881	499,592	562,073
Independent Large	1,007,741	1,128,962	1,174,442	1,473,650	1,787,491
Independent Mid-sized	928,608	1,031,404	1,021,517	1,234,058	1,447,663
Independent Small	463,463	506,768	539,629	660,767	780,361
Pvt Small	836,020	920,574	961,715	1,074,074	1,208,183
Total	**3,677,412**	**4,006,912**	**4,145,184**	**4,942,142**	**5,785,771**

Note: column totals may not sum exactly due to rounding



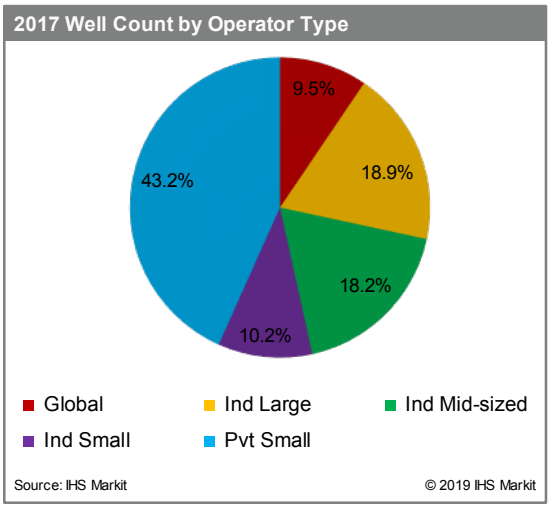


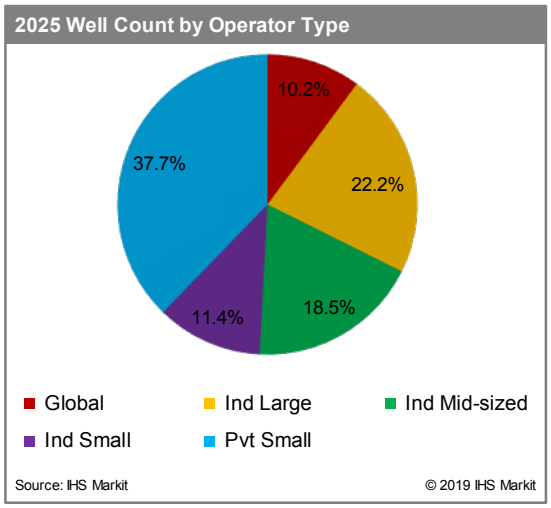


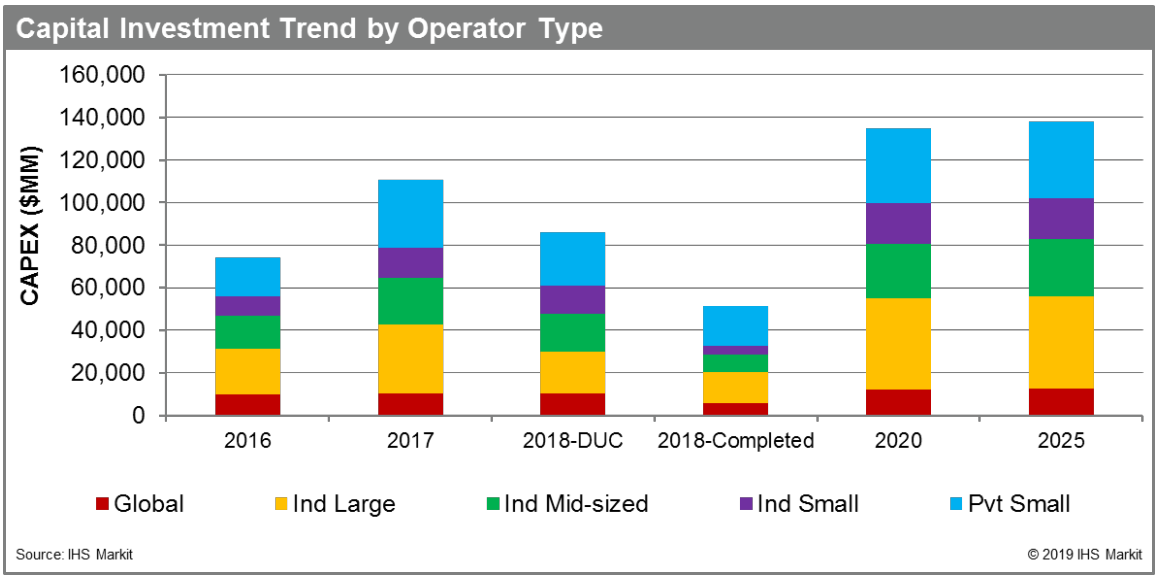
Annual new wells by operator type (wells/year)

Operator Class	2016 total well	2017 total well	2018 total DUC well	2018 total completed well	2020 total well	2025 total well
Global	2,147	2,516	1,923	999	2,805	2,726
Independent Large	3,583	5,025	3,185	2,390	6,285	5,958
Independent Mid-sized	3,218	4,830	2,933	2,017	5,005	4,958
Independent Small	1,965	2,699	2,266	862	3,203	3,067
Pvt Small	8,927	11,510	6,946	7,564	10,612	10,132
Total	**19,840**	**26,580**	**17,253**	**13,832**	**27,910**	**26,841**

Notes: "DUC well" is an abbreviation for drilled uncompleted well;
column totals may not sum exactly due to rounding



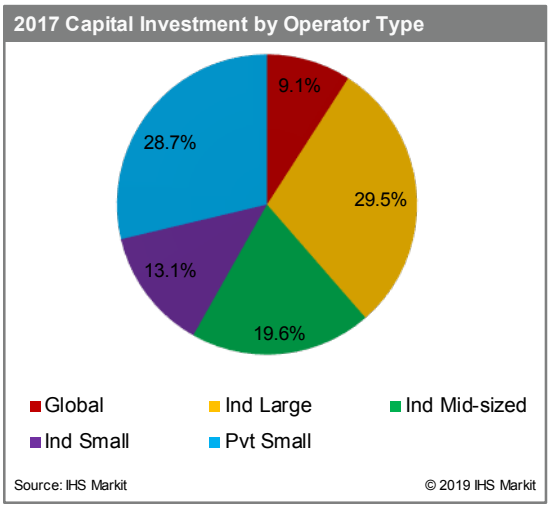


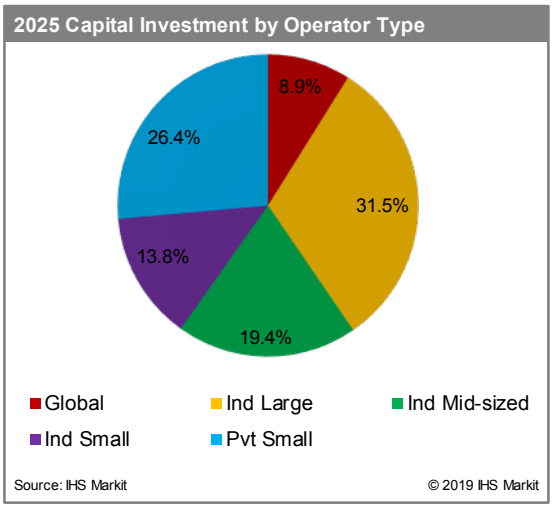


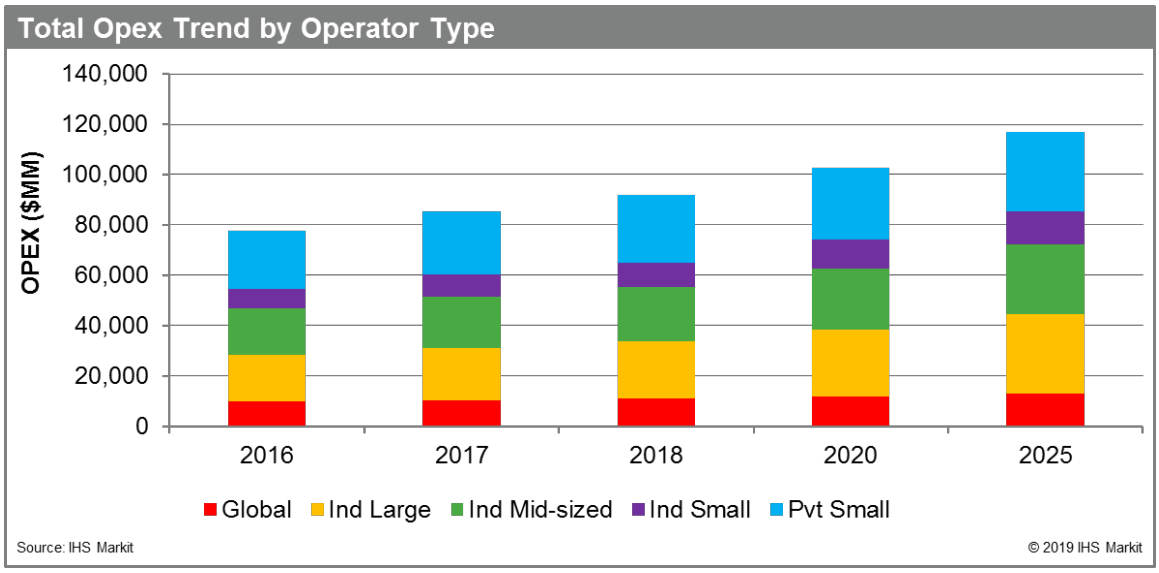
Annual capital investment (capex) by operator type ($MM/year)

Operator Class	2016	2017	2018 total DUC well	2018 total completed well	2020	2025
Global	9,884	10,070	10,319	5,587	12,127	12,349
Independent Large	21,438	32,646	19,742	14,936	42,838	43,575
Independent Mid-sized	15,580	21,656	17,499	7,977	25,701	26,878
Independent Small	8,908	14,503	13,592	4,084	19,014	19,014
Pvt Small	18,160	31,775	24,889	18,569	35,143	36,420
Total	**73,970**	**110,650**	**86,041**	**51,152**	**134,822**	**138,237**

Note: column totals may not sum exactly due to rounding



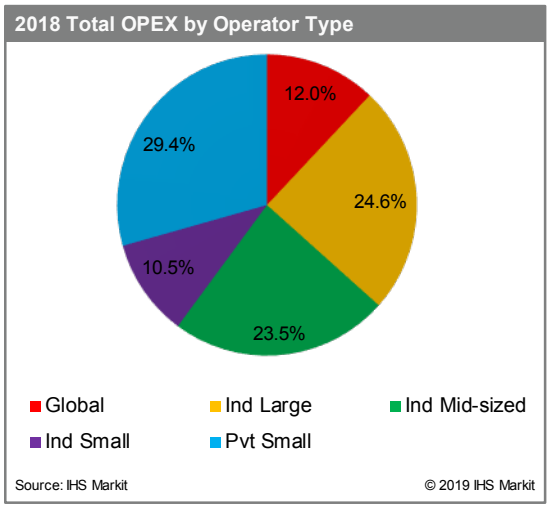


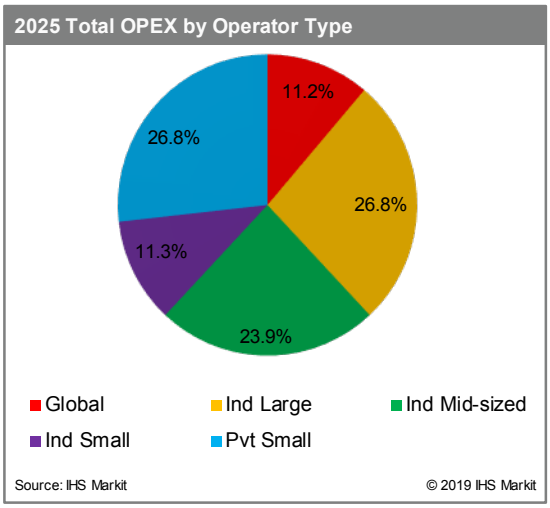


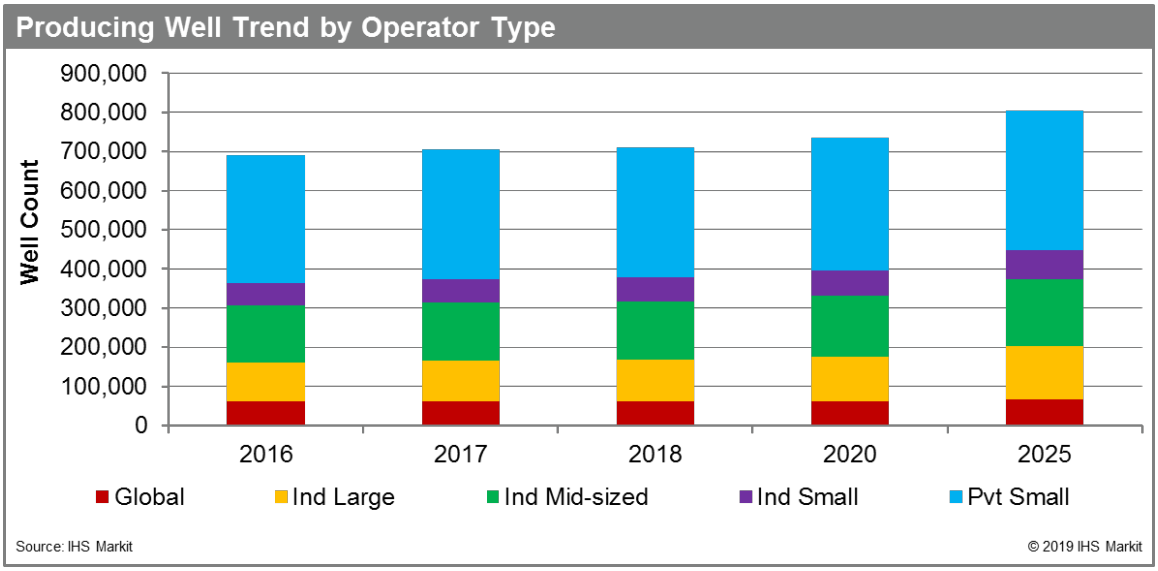
Annual operating expenses (opex) by operator type ($MM/year)

Operator Class	2016	2017	2018	2020	2025
Global	9,885	10,185	11,038	11,716	13,072
Independent Large	18,554	20,852	22,577	26,682	31,365
Independent Mid-sized	18,429	20,425	21,638	24,404	27,946
Independent Small	7,771	8,846	9,636	11,312	13,150
Pvt Small	23,052	25,218	26,977	28,672	31,287
Total	**77,690**	**85,526**	**91,866**	**102,786**	**116,820**

Note: column totals may not sum exactly due to rounding



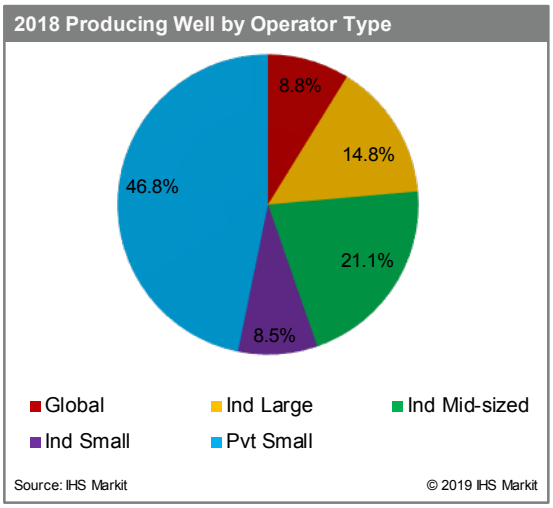


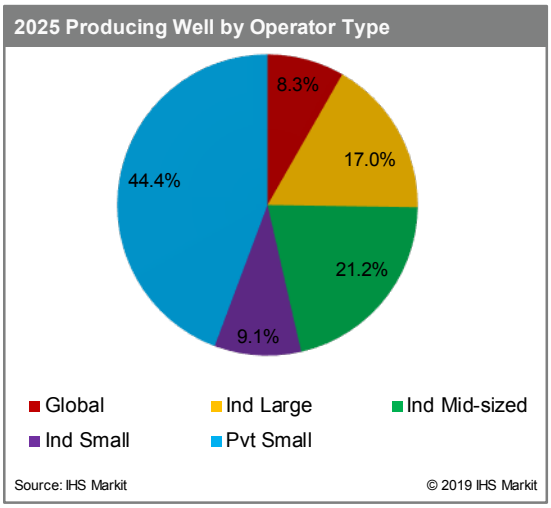


Producing wells - total wells by operator type

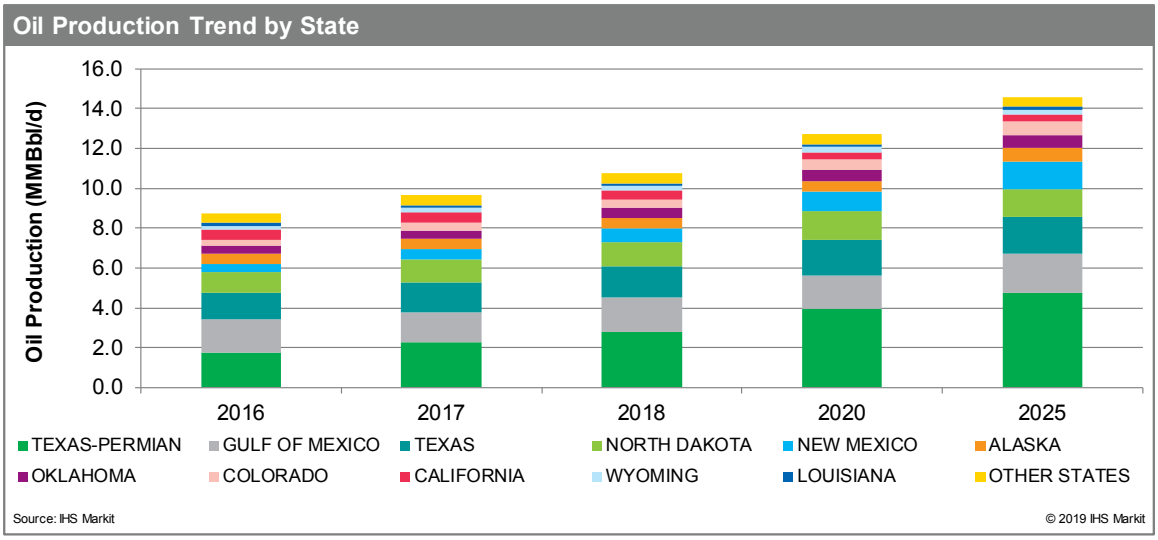
Operator Class	2016	2017	2018	2020	2025
Global	61,121	62,117	62,535	62,785	66,732
Independent Large	99,023	103,153	105,302	113,854	136,442
Independent Mid-sized	146,034	148,656	149,953	154,981	170,235
Independent Small	57,365	59,649	60,636	64,648	75,065
Pvt Small	327,992	330,733	332,760	338,464	356,407
Total	**691,535**	**704,308**	**711,186**	**734,732**	**804,881**

Note: column totals may not sum exactly due to rounding





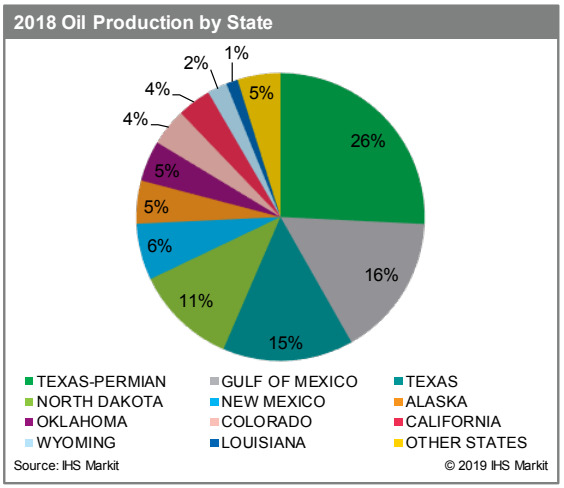
Appendix C – State breakouts - production, drilling and operation

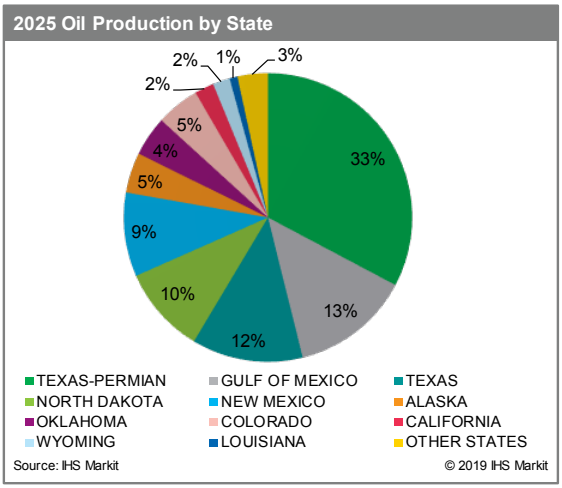


Oil production by state (bbls/day)*

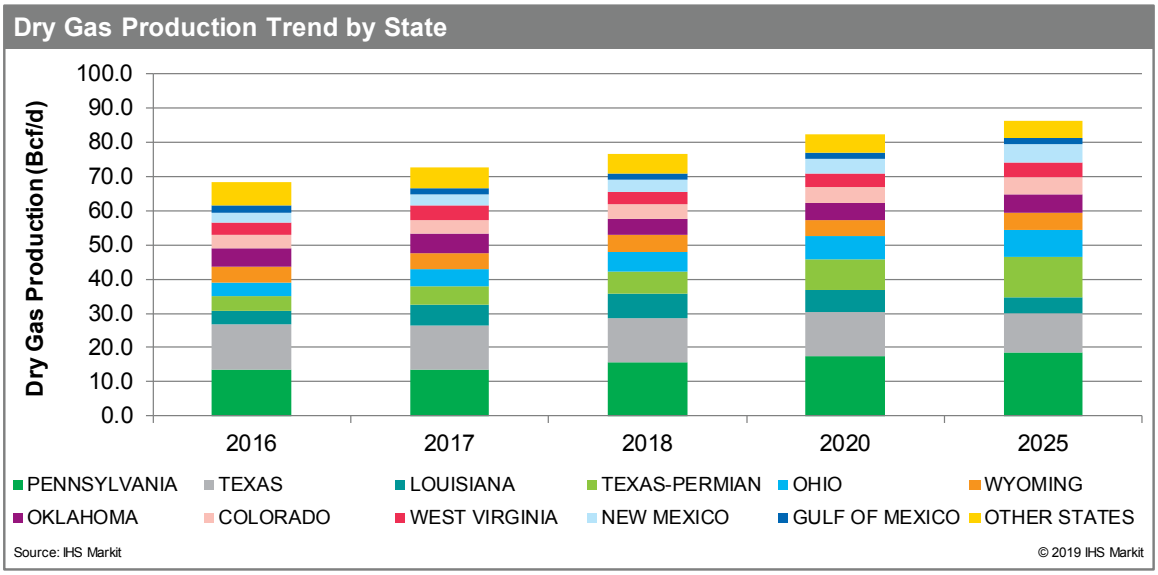
State	2016	2017	2018	2020	2025
TEXAS-PERMIAN	1,743,870	2,287,035	2,776,122	3,921,597	4,779,128
GULF OF MEXICO	1,651,183	1,483,504	1,725,592	1,676,957	1,952,684
TEXAS	1,383,576	1,479,138	1,581,119	1,806,501	1,817,389
NORTH DAKOTA	1,024,076	1,170,961	1,229,408	1,432,221	1,429,071
NEW MEXICO	415,300	523,327	683,530	1,007,563	1,372,442
ALASKA	492,473	506,624	521,531	497,656	658,947
OKLAHOMA	420,557	447,130	492,747	574,211	651,485
COLORADO	302,214	404,926	451,120	547,245	709,439
CALIFORNIA	506,575	482,995	408,618	359,872	315,405
WYOMING	192,728	220,641	238,485	256,520	279,882
LOUISIANA	133,327	132,203	141,724	131,828	130,002
OTHER STATES	484,623	517,649	519,445	504,224	497,461
Grand Total	**8,750,501**	**9,656,132**	**10,769,440**	**12,716,394**	**14,593,336**

**Ranked by 2018 production*
Note: column totals may not sum exactly due to rounding





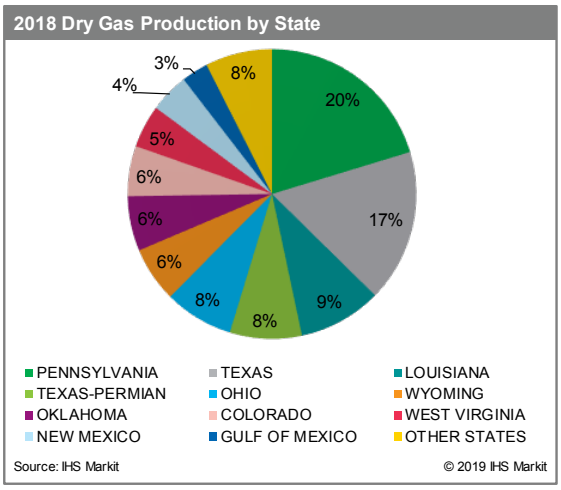
Note – Texas includes all portions of the State of Texas located outside the Permian Basin, whereas Texas-Permian includes only the Permian Basin portion of the State of Texas

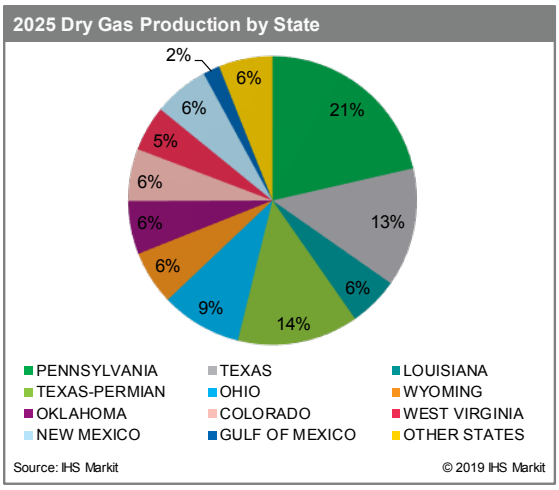


Dry gas production by state (mcf/day)*

State	2016	2017	2018	2020	2025
PENNSYLVANIA	13,657,740	13,690,639	15,626,050	17,425,945	18,467,605
TEXAS	13,001,523	12,815,604	13,097,783	12,811,100	11,470,406
LOUISIANA	4,203,080	6,153,581	7,171,742	6,718,570	4,812,167
TEXAS-PERMIAN	4,086,996	5,243,835	6,198,594	8,976,624	11,704,898
OHIO	3,974,686	5,077,727	5,949,108	6,632,634	7,813,188
WYOMING	4,707,543	4,622,599	4,752,920	4,755,741	5,209,665
OKLAHOMA	5,291,071	5,648,654	4,704,694	4,823,033	5,149,140
COLORADO	3,961,772	4,079,499	4,317,829	4,545,608	5,044,987
WEST VIRGINIA	3,672,315	4,236,278	3,674,644	4,109,576	4,383,171
NEW MEXICO	2,885,374	3,025,500	3,368,944	4,347,582	5,354,551
GULF OF MEXICO	2,208,431	1,774,073	1,874,942	1,652,956	1,626,715
OTHER STATES	6,537,062	6,265,685	5,767,647	5,594,269	5,199,512
Grand Total	**68,187,593**	**72,633,675**	**76,504,897**	**82,393,639**	**86,236,005**

**Ranked by 2018 production*
Note: column totals may not sum exactly due to rounding





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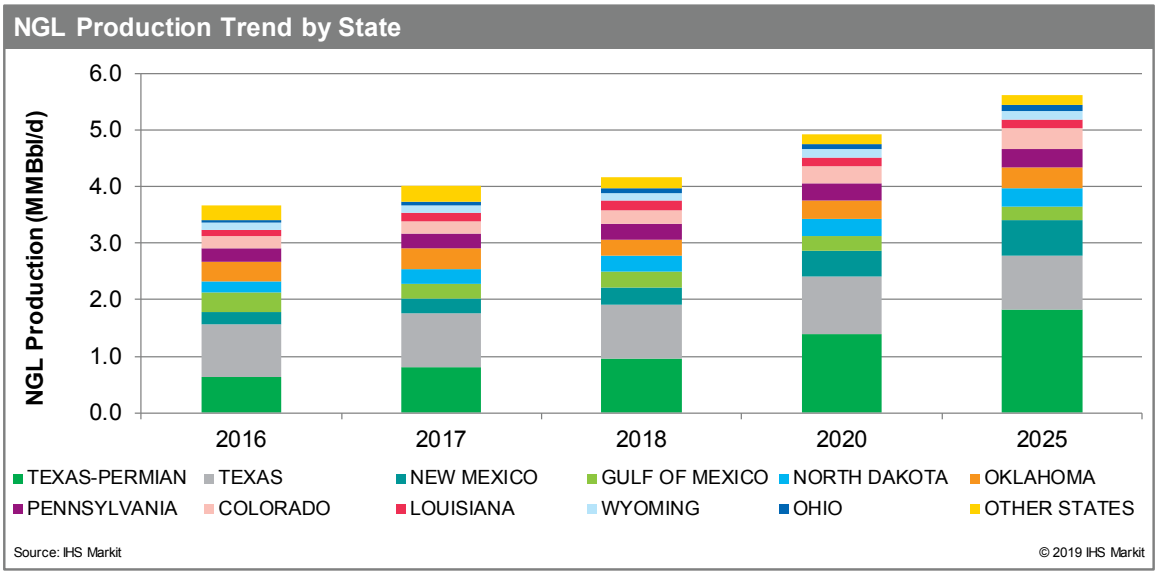
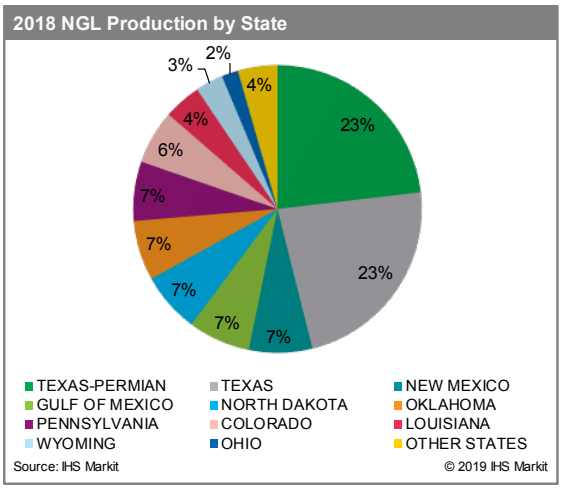
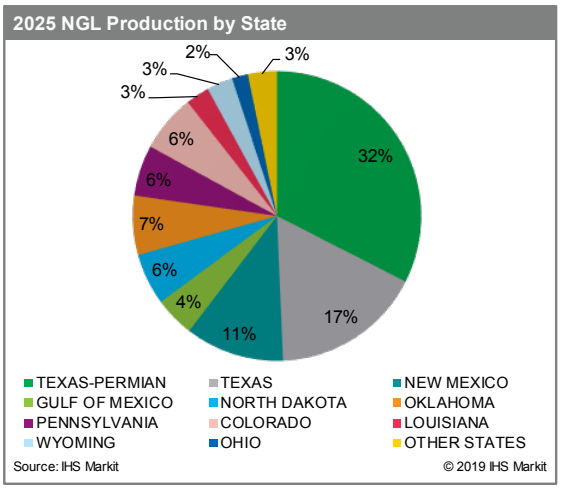


Natural gas liquids (NGL) production by state (bbls/day)*

State	2016	2017	2018	2020	2025
TEXAS-PERMIAN	628,052	811,424	961,788	1,398,046	1,827,291
TEXAS	936,521	956,377	954,051	1,011,308	948,146
NEW MEXICO	215,472	243,841	295,129	455,641	623,604
GULF OF MEXICO	341,521	274,350	289,949	255,620	251,562
NORTH DAKOTA	209,291	247,888	280,498	317,809	323,955
OKLAHOMA	330,403	377,901	280,274	321,377	372,224
PENNSYLVANIA	244,359	249,723	277,269	307,421	320,251
COLORADO	217,480	230,159	251,832	289,651	361,531
LOUISIANA	110,583	155,857	174,192	161,662	148,637
WYOMING	119,728	122,673	129,492	142,998	165,030
OHIO	55,383	69,125	76,883	85,717	100,964
OTHER STATES	268,617	267,594	184,784	187,993	182,600
Grand Total	**3,677,412**	**4,006,912**	**4,156,142**	**4,935,243**	**5,625,795**

**Ranked by 2018 production*
Note: column totals may not sum exactly due to rounding





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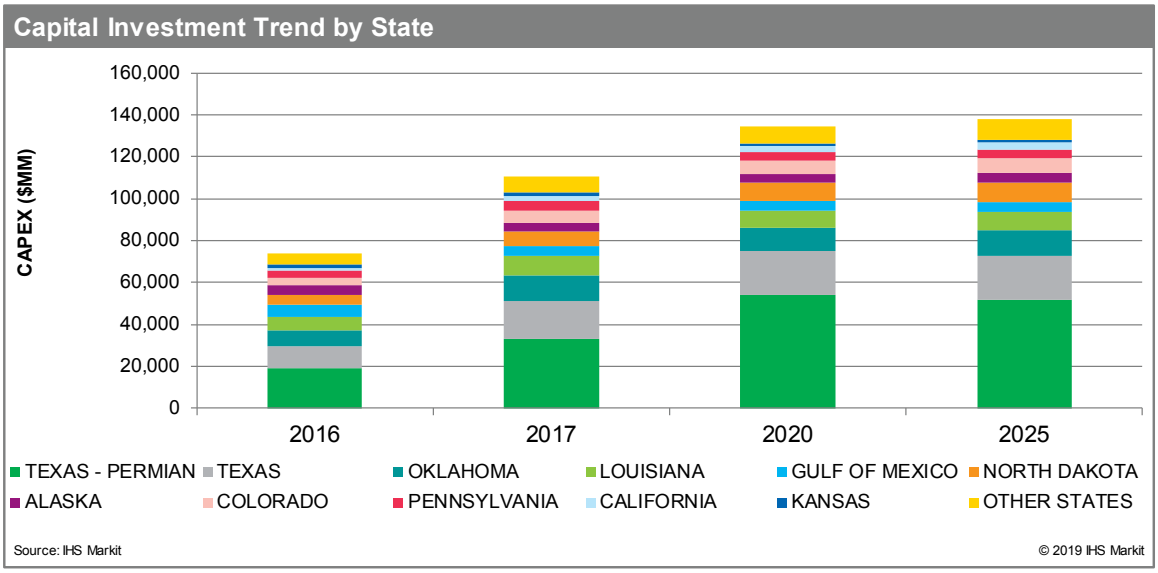
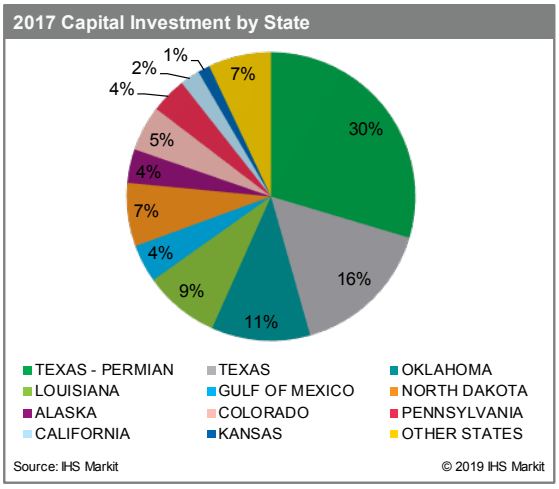
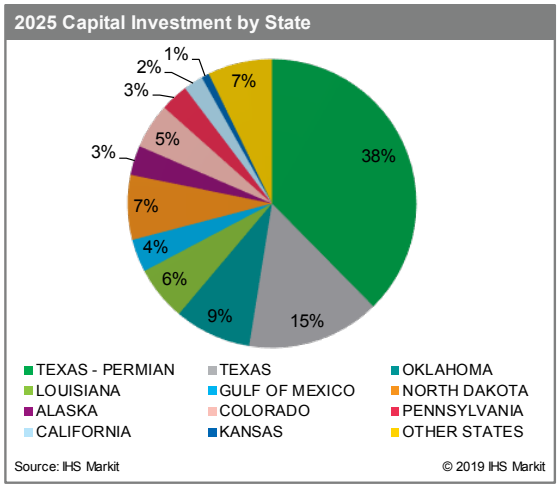


Capital Investment (capex) by state ($MM/year)

State	2016	2017	2020	2025
TEXAS-PERMIAN	19,145	33,098	53,889	51,658
TEXAS	10,379	17,880	21,174	21,031
OKLAHOMA	7,312	12,381	11,238	12,143
LOUISIANA	6,766	9,463	8,031	8,601
GULF OF MEXICO	5,795	4,755	4,825	5,204
NORTH DAKOTA	4,737	6,828	8,611	8,852
ALASKA	4,317	4,226	4,268	4,662
COLORADO	3,927	5,691	6,036	7,169
PENNSYLVANIA	3,029	4,483	4,335	4,416
CALIFORNIA	1,695	2,460	2,867	3,092
KANSAS	1,570	1,519	1,166	1,224
OTHER STATES	5,297	7,866	8,384	10,185
Grand Total	**73,970**	**110,650**	**134,822**	**138,237**

Notes: column totals may not sum exactly due to rounding;
2018 not included since capex is difficult to estimate due to wells being in various states of completion at year end





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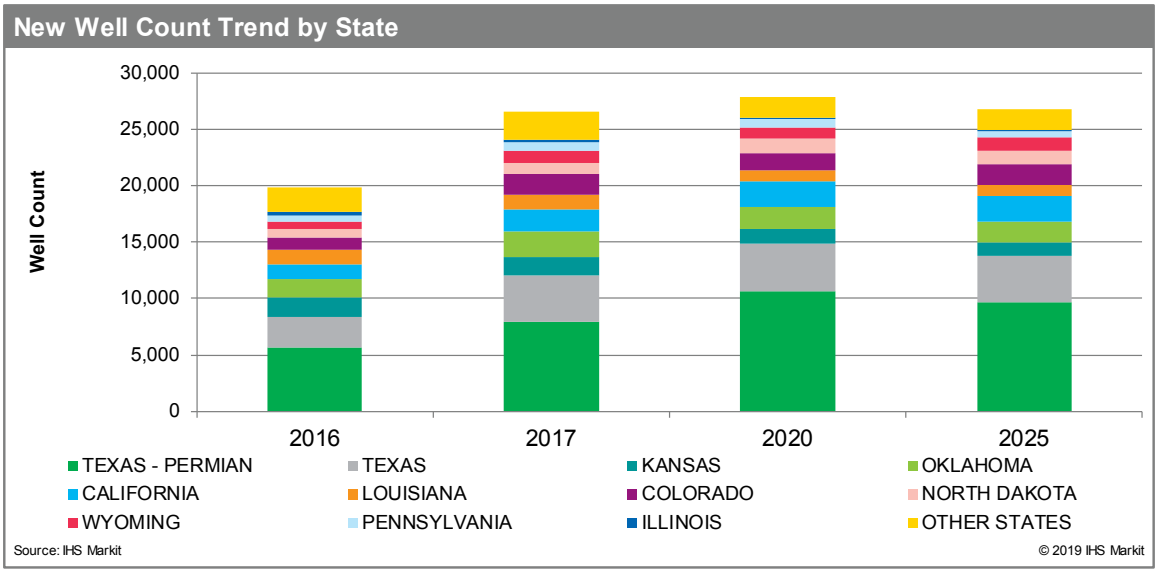
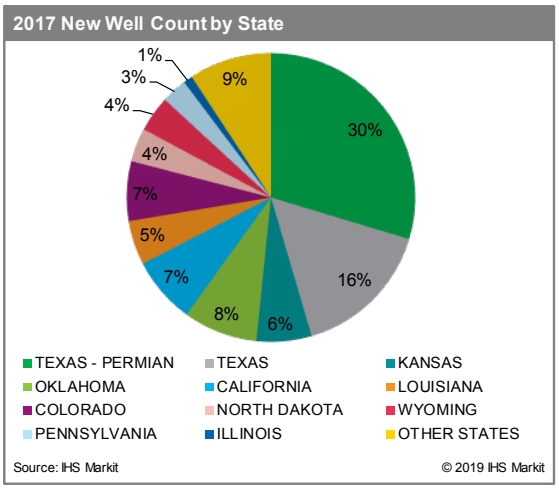
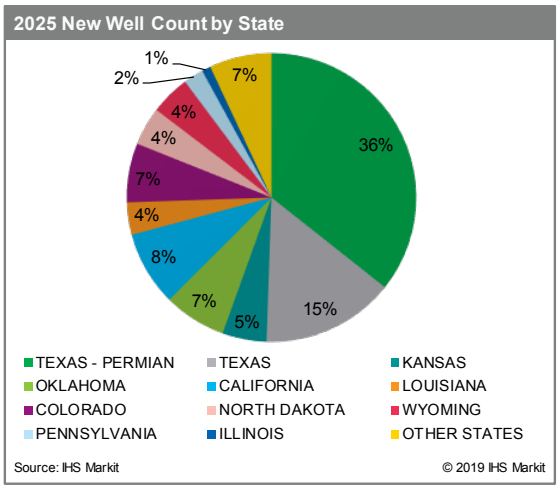


New well count by state (wells/year)				
State	**2016**	**2017**	**2020**	**2025**
TEXAS-PERMIAN	5,618	7,882	10,639	9,698
TEXAS	2,772	4,200	4,282	4,043
KANSAS	1,711	1,638	1,239	1,206
OKLAHOMA	1,637	2,215	1,912	1,898
CALIFORNIA	1,306	1,980	2,274	2,274
LOUISIANA	1,246	1,322	999	986
COLORADO	1,164	1,775	1,584	1,800
NORTH DAKOTA	707	1,003	1,213	1,167
WYOMING	646	1,069	1,037	1,207
PENNSYLVANIA	568	763	692	608
ILLINOIS	320	272	178	62
OTHER STATES	2,145	2,461	1,863	1,892
Grand Total	**19,840**	**26,580**	**27,912**	**26,841**

Notes: column totals may not sum exactly due to rounding;
2018 not included in well count since new wells were in various states of completion at year end





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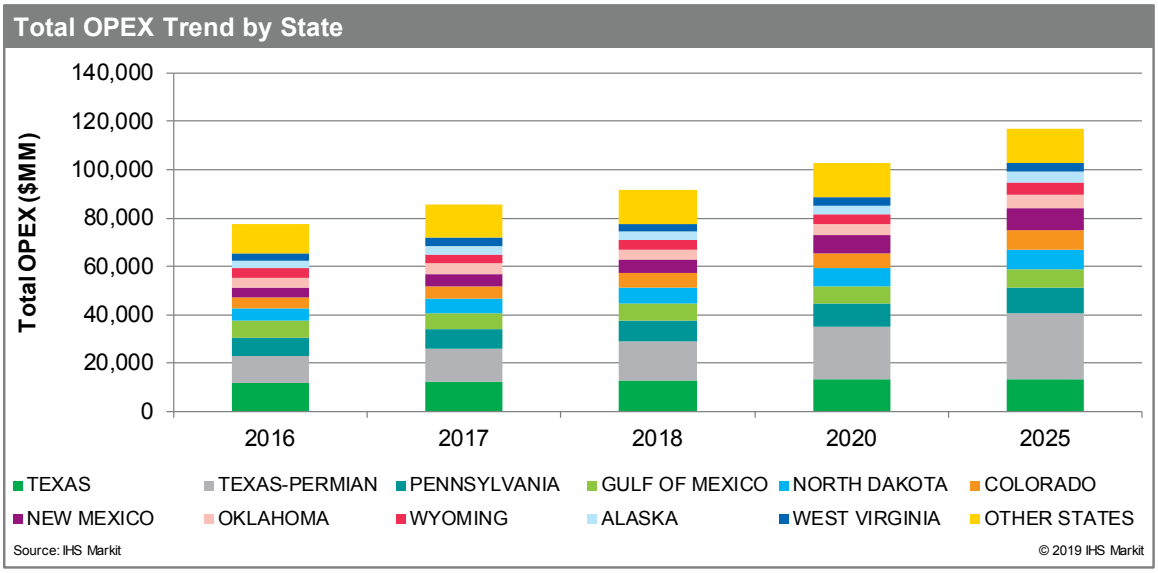
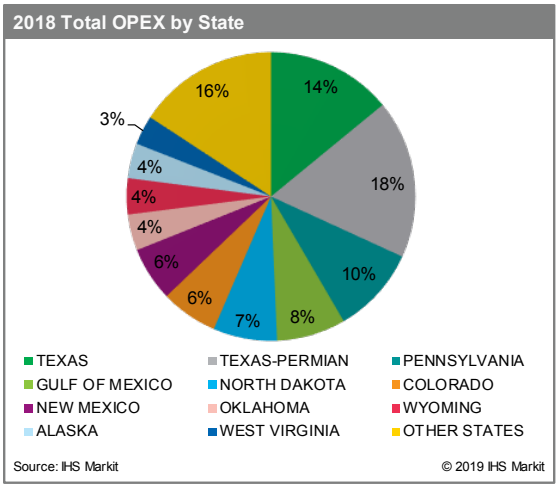
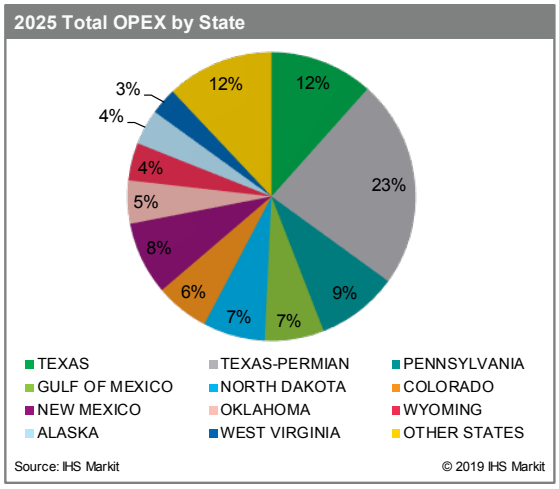


Operating expenses (opex) by state ($MM/year)					
State	**2016**	**2017**	**2018**	**2020**	**2025**
TEXAS	11,670	12,199	12,760	13,367	13,482
TEXAS-PERMIAN	11,292	13,833	16,139	21,398	27,136
PENNSYLVANIA	7,504	7,823	8,862	9,836	10,590
GULF OF MEXICO	6,894	6,716	7,017	6,977	7,736
NORTH DAKOTA	5,057	5,930	6,495	7,574	8,091
COLORADO	4,681	5,282	5,795	6,443	7,699
NEW MEXICO	4,254	4,759	5,517	7,095	9,525
OKLAHOMA	4,099	4,589	4,233	4,701	5,609
WYOMING	3,739	3,942	4,207	4,378	4,898
ALASKA	3,343	3,491	3,563	3,543	4,597
WEST VIRGINIA	2,841	3,222	2,974	3,242	3,478
OTHER STATES	12,316	13,739	14,304	14,231	13,979
Grand Total	**77,690**	**85,526**	**91,866**	**102,786**	**116,820**

Note: column totals may not sum exactly due to rounding





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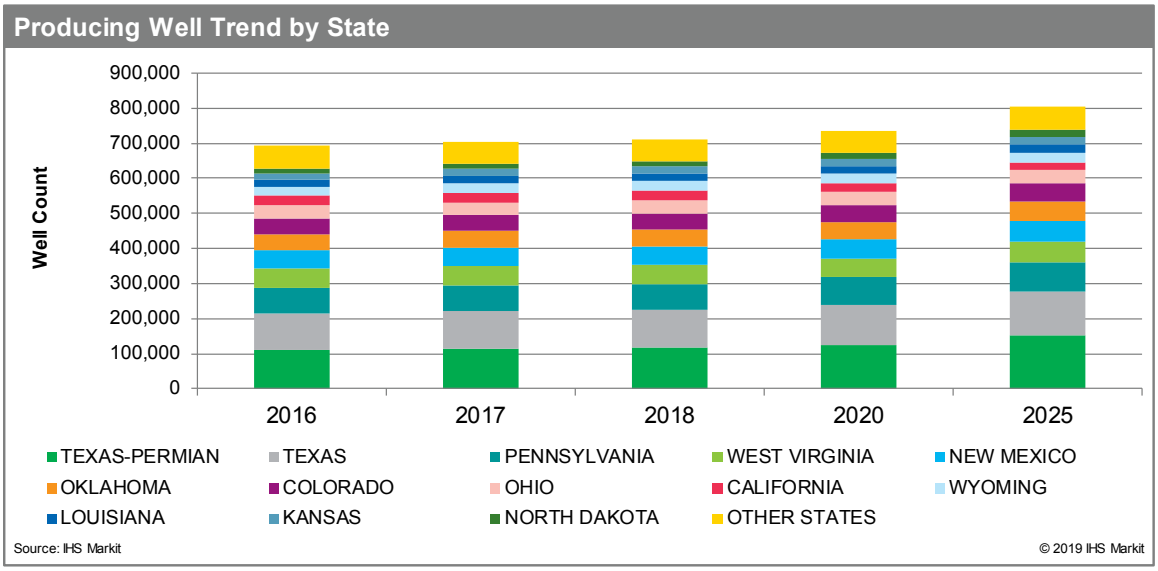
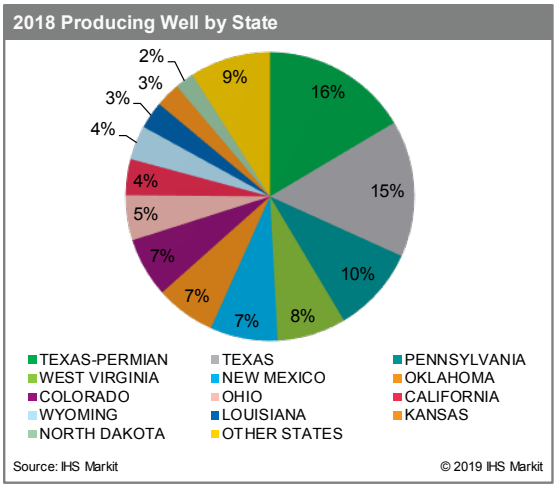
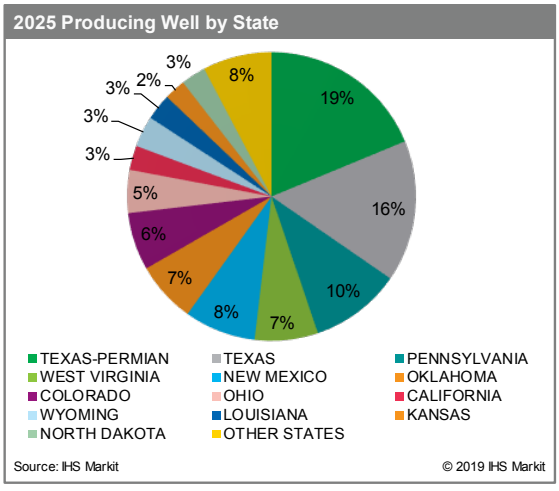


Producing wells by state (number of wells)

State	2016	2017	2018	2020	2025
TEXAS-PERMIAN	110,953	114,039	115,934	125,570	150,994
TEXAS	103,928	106,727	107,733	113,861	127,640
PENNSYLVANIA	73,364	74,770	75,267	77,577	81,865
WEST VIRGINIA	55,416	54,342	54,289	55,379	57,097
NEW MEXICO	52,228	52,629	53,331	54,322	60,337
OKLAHOMA	43,733	47,069	47,170	49,243	54,900
COLORADO	44,366	45,812	46,984	47,972	51,988
OHIO	38,284	35,382	35,531	36,600	38,762
CALIFORNIA	27,423	28,486	28,486	25,088	21,988
WYOMING	25,869	26,557	26,941	26,779	28,009
LOUISIANA	20,257	21,386	21,563	22,272	23,660
KANSAS	19,254	19,403	19,421	19,151	19,166
NORTH DAKOTA	13,352	14,322	14,997	17,264	22,397
OTHER STATES	63,108	63,384	63,668	63,790	66,227
Grand Total	**691,535**	**704,308**	**711,315**	**734,867**	**805,030**

Note: column totals may not sum exactly due to rounding





Note – Texas includes all portions of the State of Texas located outside the Permian Basin, whereas Texas-Permian includes only the Permian Basin portion of the State of Texas

Appendix D – Economic contributions of production activity and capex by state

Economic contributions of production activities and capex, 2016

	Output (millions of 2018 dollars)				Value Added (millions of 2018 dollars)			
Region	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
United States	**283,199.8**	**202,514.0**	**189,810.2**	**675,523.9**	**156,456.7**	**92,484.3**	**91,699.9**	**340,640.9**
Alabama	841.8	497.1	278.5	1,617.4	332.3	222.7	130.8	685.8
Alaska	9,912.2	3,114.1	2,929.9	15,956.2	6,291.1	1,605.6	1,511.1	9,407.8
Arizona	0.5	0.5	0.2	1.2	0.0	0.2	0.1	0.3
Arkansas	2,187.7	1,594.3	557.8	4,339.8	1,092.8	790.2	271.3	2,154.3
California	7,777.8	5,792.2	7,159.4	20,729.4	4,146.1	2,668.1	3,629.3	10,443.5
Colorado	13,224.2	11,238.0	10,968.7	35,430.9	6,929.8	5,704.0	5,455.4	18,089.2
Florida	148.4	220.0	83.4	451.8	-23.1	91.2	40.9	108.9
Idaho	22.1	23.8	16.9	62.8	-0.2	7.6	7.7	15.0
Illinois	550.8	572.1	469.6	1,592.5	96.6	264.2	240.6	601.4
Indiana	143.5	108.0	104.3	355.8	49.3	40.9	49.1	139.3
Kansas	3,725.8	7,411.3	3,038.9	14,176.0	-689.0	3,233.8	1,446.0	3,990.7
Kentucky	132.8	87.3	66.3	286.4	43.7	40.8	30.7	115.2
Louisiana	13,410.9	10,556.3	6,765.5	30,732.7	6,284.7	4,766.8	3,369.5	14,421.0
Michigan	898.5	2,188.7	929.6	4,016.8	-450.6	996.2	425.6	971.2
Mississippi	1,255.6	1,149.0	868.4	3,273.0	359.1	486.6	403.2	1,248.8
Montana	1,197.9	731.0	693.0	2,621.9	603.8	361.6	320.9	1,286.4
Nebraska	260.5	200.7	174.8	636.0	28.7	113.0	89.0	230.8
Nevada	8.6	14.0	7.8	30.4	-2.3	7.4	4.1	9.3
New Mexico	10,104.8	5,043.9	4,192.2	19,340.9	6,001.4	2,552.5	2,057.6	10,611.5
New York	63.1	61.0	41.9	166.0	8.8	30.3	23.8	62.9
North Dakota	22,952.8	8,947.1	7,522.6	39,422.4	14,649.7	4,846.8	3,758.5	23,255.0
Ohio	5,558.3	5,878.3	2,891.1	14,327.7	2,053.2	2,658.1	1,380.6	6,091.9
Oklahoma	20,294.2	14,652.3	11,202.8	46,149.4	10,471.3	6,925.1	5,330.4	22,726.8
Oregon	1.4	0.0	0.0	1.4	0.0	0.0	0.0	0.0
Pennsylvania	15,248.1	9,496.6	5,720.0	30,464.7	9,016.9	4,513.1	2,883.7	16,413.8
South Dakota	81.8	46.3	21.2	149.3	10.6	17.5	10.4	38.6
Tennessee	21.6	22.9	14.5	59.1	6.9	9.4	6.9	23.1
Texas	102,471.2	88,064.9	86,067.7	276,603.8	60,382.1	38,437.7	41,275.9	140,095.7
Utah	2,441.7	1,765.6	1,725.0	5,932.3	1,291.3	820.8	804.7	2,916.8
Virginia	370.3	463.4	152.2	985.8	-11.3	222.2	78.2	289.1
West Virginia	4,605.2	2,289.6	785.8	7,680.6	2,580.1	692.2	381.8	3,654.1
Wyoming	8,814.3	4,092.8	2,229.0	15,136.0	5,272.1	2,017.3	1,098.2	8,387.6
Sum of States	248,728.5	186,323.1	157,679.0	592,730.6	136,825.8	85,144.0	76,516.0	298,485.8
Gulf of Mexico	34,471.3	16,190.8	32,131.2	82,793.3	19,630.8	7,340.4	15,183.9	42,155.1
Grand Total	**283,199.8**	**202,514.0**	**189,810.2**	**675,523.9**	**156,456.7**	**92,484.3**	**91,699.9**	**340,640.9**

	Labor Income (millions of 2018 dollars)				Employment			
Region	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
United States	**89,168.9**	**61,793.3**	**52,224.8**	**203,186.9**	**589,383**	**839,908**	**1,193,185**	**2,622,476**
Alabama	125.2	163.4	69.8	358.5	1,976	2,320	1,878	6,174
Alaska	1,992.8	851.9	833.2	3,677.9	17,468	13,090	18,797	49,355
Arizona	0.1	0.1	0.1	0.3	2	3	1	6
Arkansas	208.4	506.9	141.4	856.6	3,186	8,385	4,053	15,624
California	3,095.4	1,824.4	2,109.4	7,029.2	16,404	23,094	38,709	78,208
Colorado	4,515.7	4,074.2	3,126.3	11,716.2	25,705	49,959	68,689	144,352
Florida	20.2	60.6	22.8	103.6	655	1,248	552	2,454
Idaho	8.5	8.1	4.4	21.0	68	176	128	372
Illinois	193.2	172.7	135.9	501.8	2,700	2,499	2,774	7,973
Indiana	53.6	25.4	26.3	105.2	618	462	675	1,755
Kansas	1,195.2	2,325.7	798.2	4,319.1	14,999	41,056	21,091	77,146
Kentucky	33.5	26.0	17.2	76.7	665	526	451	1,641
Louisiana	3,546.4	3,147.9	1,837.7	8,532.0	39,080	50,091	49,006	138,178
Michigan	220.8	716.1	245.3	1,182.2	3,417	10,715	5,785	19,917
Mississippi	535.7	345.3	206.8	1,087.8	3,823	6,647	6,446	16,916
Montana	403.5	242.3	184.2	830.1	2,133	3,908	5,435	11,476
Nebraska	84.6	98.7	46.7	230.0	1,406	1,454	1,206	4,067
Nevada	4.1	4.1	2.1	10.3	59	71	52	181
New Mexico	2,644.7	1,630.0	1,057.4	5,332.2	12,444	26,632	30,861	69,938
New York	20.9	22.3	14.0	57.3	243	258	237	737
North Dakota	5,497.5	2,883.1	2,063.4	10,444.1	31,671	38,645	51,134	121,450
Ohio	847.3	1,677.0	752.6	3,276.8	13,972	27,176	18,097	59,245
Oklahoma	6,115.3	4,860.9	3,009.9	13,986.0	46,378	72,609	77,480	196,467
Oregon	0.0	0.0	0.0	0.0	0	0	0	0
Pennsylvania	1,957.9	3,122.2	1,721.9	6,802.0	20,085	39,734	35,832	95,651
South Dakota	11.3	11.8	5.5	28.6	233	336	151	719
Tennessee	5.4	6.0	4.1	15.6	128	107	91	325
Texas	39,108.2	25,555.3	23,859.5	88,522.9	175,252	312,590	524,492	1,012,335
Utah	757.8	535.5	441.6	1,734.9	4,151	9,185	11,383	24,719
Virginia	46.4	147.9	42.4	236.7	1,323	2,164	982	4,469
West Virginia	462.5	455.4	213.9	1,131.8	6,488	8,384	6,091	20,963
Wyoming	1,964.9	1,357.2	544.0	3,866.1	12,252	20,710	15,983	48,945
Sum of States	75,676.9	56,858.6	43,538.0	176,073.5	458,982	774,233	998,543	2,231,758
Gulf of Mexico	13,492.0	4,934.7	8,686.7	27,113.4	130,401	65,675	194,642	390,718
Grand Total	**89,168.9**	**61,793.3**	**52,224.8**	**203,186.9**	**589,382.8**	**839,908.1**	**1,193,185.0**	**2,622,475.8**

Economic contributions of production activities and capex, 2017

	Output (millions of 2018 dollars)				Value Added (millions of 2018 dollars)			
Region	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
United States	**386,523.8**	**282,826.0**	**257,903.3**	**927,253.1**	**210,649.8**	**128,552.7**	**124,718.7**	**463,921.2**
Alabama	1,185.6	863.5	438.4	2,487.5	452.8	351.7	205.7	1,010.2
Alaska	11,406.1	3,258.7	3,156.1	17,820.8	7,449.0	1,703.3	1,628.7	10,781.0
Arizona	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arkansas	2,310.8	1,697.4	595.5	4,603.7	1,140.0	838.1	289.7	2,267.7
California	9,729.6	7,462.2	8,912.9	26,104.7	5,111.5	3,440.0	4,522.9	13,074.4
Colorado	19,113.2	15,900.3	16,290.9	51,304.3	10,033.3	8,084.1	8,107.9	26,225.4
Florida	187.6	291.3	106.2	585.1	-34.3	122.4	52.0	140.1
Idaho	13.2	12.6	8.2	34.0	0.9	4.5	3.7	9.1
Illinois	588.1	600.5	504.8	1,693.4	89.1	278.9	258.8	626.8
Indiana	144.3	98.3	106.7	349.2	49.8	37.5	50.2	137.6
Kansas	3,898.4	7,641.6	3,148.5	14,688.5	-597.4	3,306.7	1,498.8	4,208.0
Kentucky	90.2	57.5	46.2	193.9	29.2	25.9	21.5	76.6
Louisiana	19,768.9	15,580.5	9,405.1	44,754.5	9,281.9	7,077.7	4,687.1	21,046.7
Michigan	1,059.0	2,563.1	1,094.4	4,716.5	-502.3	1,166.8	500.7	1,165.1
Mississippi	1,249.6	1,161.0	887.7	3,298.2	358.0	491.9	412.1	1,262.1
Montana	1,468.1	1,000.2	831.9	3,300.2	721.1	447.6	385.2	1,554.0
Nebraska	284.0	293.4	192.1	769.4	27.5	125.3	97.9	250.8
Nevada	10.9	18.0	9.9	38.8	-2.9	9.5	5.2	11.9
New Mexico	14,388.2	7,239.5	6,186.0	27,813.7	8,403.8	3,690.9	3,035.6	15,130.4
New York	59.4	57.9	39.5	156.8	6.2	28.9	22.4	57.5
North Dakota	33,181.6	12,916.5	10,815.8	56,913.8	21,096.0	6,980.5	5,403.7	33,480.2
Ohio	8,507.4	8,941.4	4,302.5	21,751.4	3,127.8	4,077.3	2,056.1	9,261.1
Oklahoma	28,839.2	21,120.6	15,670.8	65,630.6	14,326.8	9,910.0	7,458.3	31,695.1
Oregon	1.2	0.0	0.0	1.2	0.0	0.0	0.0	0.0
Pennsylvania	19,579.8	12,498.5	7,593.3	39,671.6	11,308.8	5,931.0	3,829.7	21,069.5
South Dakota	92.0	56.9	25.8	174.7	12.9	21.6	12.7	47.1
Tennessee	25.3	26.1	16.7	68.1	8.0	10.8	7.9	26.7
Texas	150,992.3	131,709.7	126,588.8	409,290.8	86,776.9	57,893.5	60,746.6	205,417.0
Utah	3,278.8	2,320.5	2,405.0	8,004.4	1,736.5	1,076.9	1,122.2	3,935.5
Virginia	491.5	595.0	207.3	1,293.8	7.5	285.0	106.6	399.1
West Virginia	6,325.0	4,756.3	1,126.3	12,207.6	3,548.6	980.5	547.5	5,076.6
Wyoming	12,162.0	5,789.1	3,250.9	21,202.1	7,052.1	2,813.7	1,601.9	11,467.7
Sum of States	350,431.4	266,528.1	223,964.0	840,923.5	191,019.0	121,212.4	108,679.7	420,911.0
Gulf of Mexico	36,092.4	16,298.0	33,939.3	86,329.6	19,630.8	7,340.4	16,039.0	43,010.3
Grand Total	**386,523.8**	**282,826.0**	**257,903.3**	**927,253.1**	**210,649.8**	**128,552.7**	**124,718.7**	**463,921.2**

	Labor Income (millions of 2018 dollars)				Employment			
Region	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
United States	**121,046.0**	**85,486.3**	**71,015.9**	**277,548.2**	**804,031**	**1,171,670**	**1,623,851**	**3,599,553**
Alabama	202.4	240.4	109.7	552.5	3,680	3,758	2,950	10,388
Alaska	2,182.4	890.7	898.3	3,971.4	17,425	13,424	20,258	51,106
Arizona	0.0	0.0	0.0	0.0	0	0	0	0
Arkansas	227.1	537.7	150.9	915.7	3,434	8,946	4,328	16,708
California	3,827.4	2,347.9	2,630.2	8,805.4	21,862	30,014	48,183	100,059
Colorado	6,896.0	5,765.5	4,643.1	17,304.7	37,550	70,865	102,124	210,539
Florida	24.6	80.8	29.0	134.4	834	1,639	701	3,173
Idaho	3.9	4.2	2.1	10.2	39	92	62	193
Illinois	211.5	183.3	146.1	540.8	2,862	2,661	2,986	8,508
Indiana	56.0	23.7	26.9	106.6	588	432	691	1,712
Kansas	1,269.7	2,383.6	826.9	4,480.3	15,397	42,213	21,874	79,483
Kentucky	24.3	16.8	12.0	53.1	414	342	316	1,073
Louisiana	4,823.4	4,695.9	2,553.6	12,072.9	54,649	74,259	68,189	197,096
Michigan	264.9	838.3	288.7	1,391.9	4,067	12,588	6,795	23,450
Mississippi	551.1	352.6	211.4	1,115.1	3,509	6,736	6,590	16,836
Montana	480.7	298.4	221.1	1,000.1	2,816	4,916	6,525	14,257
Nebraska	93.2	111.0	51.3	255.6	1,530	1,625	1,329	4,484
Nevada	5.2	5.3	2.7	13.2	75	91	66	233
New Mexico	3,928.4	2,357.1	1,560.3	7,845.8	18,912	38,958	45,543	103,414
New York	19.8	21.5	13.2	54.5	213	249	224	685
North Dakota	7,922.2	4,159.5	2,966.3	15,047.9	45,851	56,008	73,566	175,425
Ohio	1,242.0	2,574.8	1,120.1	4,936.8	21,113	41,769	26,951	89,834
Oklahoma	8,518.3	6,860.3	4,207.4	19,585.9	72,627	105,798	108,447	286,872
Oregon	0.0	0.0	0.0	0.0	0	0	0	0
Pennsylvania	2,653.8	4,092.7	2,285.3	9,031.8	27,831	52,685	47,613	128,130
South Dakota	13.7	14.5	6.7	35.0	287	414	183	884
Tennessee	6.2	7.0	4.7	17.9	150	123	104	377
Texas	57,358.0	38,280.7	35,098.7	130,737.4	280,071	479,297	772,359	1,531,727
Utah	1,081.4	700.1	615.8	2,397.3	5,812	12,069	15,872	33,753
Virginia	69.0	189.5	57.8	316.2	1,850	2,784	1,338	5,972
West Virginia	679.2	649.2	306.8	1,635.1	8,342	11,830	8,739	28,911
Wyoming	2,918.1	1,868.9	793.1	5,580.1	19,839	29,411	23,324	72,573
Sum of States	107,554.0	80,551.7	61,840.2	249,945.8	673,631	1,105,995	1,418,231	3,197,857
Gulf of Mexico	13,492.0	4,934.7	9,175.8	27,602.4	130,401	65,675	205,620	401,696
Grand Total	**121,046.0**	**85,486.3**	**71,015.9**	**277,548.2**	**804,031.4**	**1,171,670.4**	**1,623,851.1**	**3,599,552.9**

Economic contributions of production activities and capex, 2018

	Output (millions of 2018 dollars)				Value Added (millions of 2018 dollars)			
Region	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
United States	**486,770.9**	**350,039.5**	**333,320.1**	**1,170,130.6**	**255,990.0**	**155,500.3**	**161,091.1**	**572,581.4**
Alabama	1,246.7	820.9	435.6	2,503.2	477.6	350.5	204.5	1,032.6
Alaska	10,033.5	2,540.4	2,565.2	15,139.1	6,772.8	1,349.2	1,324.7	9,446.7
Arizona	1.6	1.5	1.1	4.1	0.5	0.7	0.5	1.7
Arkansas	2,135.1	1,549.9	544.1	4,229.1	1,054.8	767.4	265.0	2,087.1
California	7,911.7	6,251.4	7,256.0	21,419.1	4,173.5	2,810.5	3,692.8	10,676.7
Colorado	24,230.6	20,017.3	20,640.8	64,888.7	12,694.5	10,104.8	10,284.2	33,083.4
Florida	232.0	332.8	127.3	692.1	-27.6	137.7	62.4	172.5
Idaho	17.1	20.3	16.8	54.1	-1.8	6.1	7.6	11.9
Illinois	775.3	787.5	658.0	2,220.8	107.0	362.9	337.5	807.4
Indiana	151.6	81.0	116.0	348.6	53.7	30.9	54.7	139.3
Kansas	5,069.3	8,465.7	3,814.3	17,349.3	-134.3	3,663.9	1,817.9	5,347.5
Kentucky	108.0	66.5	55.4	229.9	34.7	30.0	25.8	90.5
Louisiana	21,277.4	16,486.8	9,898.4	47,662.5	10,343.5	7,572.8	4,937.7	22,854.1
Michigan	1,172.3	2,683.4	1,177.6	5,033.3	-486.9	1,219.5	539.1	1,271.6
Mississippi	1,546.6	1,359.6	1,088.9	3,995.1	477.4	579.4	506.3	1,563.1
Montana	1,819.3	1,059.7	1,012.6	3,891.6	885.2	544.3	469.1	1,898.6
Nebraska	229.6	234.5	174.7	638.7	-2.5	114.5	89.1	201.0
Nevada	11.2	16.4	9.3	37.0	-2.1	9.0	4.9	11.8
New Mexico	20,065.1	10,116.0	8,966.7	39,147.8	11,586.6	5,180.1	4,406.4	21,173.1
New York	22.1	20.3	14.0	56.4	7.6	10.1	8.0	25.6
North Dakota	41,787.5	16,528.9	13,574.2	71,890.6	26,227.6	8,829.6	6,785.0	41,842.2
Ohio	10,099.2	10,493.1	4,872.4	25,464.7	3,685.0	4,784.0	2,326.6	10,795.7
Oklahoma	33,897.8	25,061.8	19,425.1	78,384.7	16,653.2	11,659.8	9,252.3	37,565.3
Oregon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pennsylvania	26,180.3	17,873.7	10,583.1	54,637.1	14,629.2	8,259.4	5,340.4	28,229.0
South Dakota	140.5	75.1	41.2	256.8	23.6	34.4	20.3	78.4
Tennessee	6.7	7.0	4.4	18.1	2.1	2.9	2.1	7.1
Texas	195,588.8	168,394.3	165,919.6	529,902.7	112,992.4	73,730.3	79,718.6	266,441.3
Utah	3,638.4	2,429.6	2,681.3	8,749.2	1,964.1	1,130.2	1,252.9	4,347.2
Virginia	313.5	383.9	128.8	826.1	0.2	184.3	66.3	250.8
West Virginia	7,843.1	4,345.4	1,677.0	13,865.5	3,893.9	1,343.2	816.2	6,053.4
Wyoming	14,553.6	6,985.9	4,007.0	25,546.5	8,274.1	3,357.7	1,976.5	13,608.2
Sum of States	432,105.2	325,490.6	281,486.7	1,039,082.4	236,359.2	148,159.9	136,595.6	521,114.7
Gulf of Mexico	54,665.7	24,549.0	51,833.5	131,048.1	19,630.8	7,340.4	24,495.5	51,466.8
Grand Total	**486,770.9**	**350,039.5**	**333,320.1**	**1,170,130.6**	**255,990.0**	**155,500.3**	**161,091.1**	**572,581.4**

	Labor Income (millions of 2018 dollars)				Employment			
Region	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
United States	**150,496.2**	**103,351.7**	**91,737.2**	**345,585.1**	**958,730**	**1,415,603**	**2,096,626**	**4,470,960**
Alabama	201.2	246.1	109.1	556.4	3,478	3,717	2,928	10,123
Alaska	1,797.8	697.0	730.4	3,225.1	12,776	10,259	16,454	39,489
Arizona	0.4	0.4	0.3	1.1	8	8	7	23
Arkansas	213.2	493.7	138.0	845.0	2,970	8,186	3,954	15,111
California	3,107.5	1,903.3	2,151.5	7,162.3	18,676	24,662	39,050	82,388
Colorado	8,858.9	7,145.3	5,884.9	21,889.2	48,745	88,929	129,238	266,912
Florida	32.5	91.6	34.8	158.9	1,032	1,909	838	3,779
Idaho	8.8	7.3	4.3	20.4	65	160	126	351
Illinois	277.9	238.8	190.5	707.2	3,712	3,469	3,884	11,065
Indiana	63.6	20.5	29.3	113.4	511	371	751	1,634
Kansas	1,665.8	2,640.0	1,002.2	5,308.0	19,475	47,147	26,500	93,122
Kentucky	29.6	19.6	14.4	63.6	470	399	380	1,249
Louisiana	5,093.0	5,093.4	2,686.8	12,873.2	51,861	78,614	71,685	202,160
Michigan	301.8	873.5	311.0	1,486.3	4,546	13,188	7,286	25,020
Mississippi	689.7	417.6	259.6	1,366.9	3,978	7,943	8,083	20,004
Montana	588.3	360.1	269.0	1,217.4	3,639	6,028	7,930	17,598
Nebraska	83.1	111.2	46.8	241.0	1,174	1,544	1,210	3,928
Nevada	4.8	5.0	2.6	12.4	73	86	62	222
New Mexico	5,784.4	3,300.2	2,263.7	11,348.2	27,733	54,947	65,962	148,642
New York	7.2	6.9	4.7	18.7	117	81	79	277
North Dakota	9,900.4	5,253.1	3,721.2	18,874.6	62,497	72,521	92,247	227,265
Ohio	1,379.2	3,036.5	1,267.7	5,683.4	23,533	49,132	30,421	103,085
Oklahoma	10,848.3	8,010.9	5,214.2	24,073.4	88,824	124,714	134,383	347,922
Oregon	0.0	0.0	0.0	0.0	0	0	0	0
Pennsylvania	3,768.9	5,647.7	3,183.0	12,599.5	42,766	74,325	66,336	183,427
South Dakota	21.8	22.0	10.7	54.5	519	588	292	1,399
Tennessee	1.7	1.8	1.3	4.8	40	33	28	100
Texas	76,304.2	48,835.6	46,034.6	171,174.3	356,804	610,204	1,012,222	1,979,231
Utah	1,232.6	740.3	687.5	2,660.4	6,029	12,724	17,660	36,413
Virginia	42.4	122.3	35.9	200.6	1,143	1,795	831	3,768
West Virginia	1,041.0	870.7	456.1	2,367.8	15,384	16,788	13,020	45,192
Wyoming	3,654.4	2,204.6	977.7	6,836.7	25,753	35,456	28,744	89,953
Sum of States	137,004.2	98,417.0	77,723.6	313,144.8	828,330	1,349,928	1,782,592	3,960,849
Gulf of Mexico	13,492.0	4,934.7	14,013.6	32,440.2	130,401	65,675	314,034	510,110
Grand Total	**150,496.2**	**103,351.7**	**91,737.2**	**345,585.1**	**958,730.3**	**1,415,602.8**	**2,096,626.4**	**4,470,959.5**

Economic contributions of production activities and capex, 2020

	Output (millions of 2018 dollars)				Value Added (millions of 2018 dollars)			
Region	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
United States	**536,380.0**	**375,803.6**	**373,277.8**	**1,285,461.4**	**292,529.5**	**170,551.0**	**180,593.5**	**643,673.9**
Alabama	1,222.4	930.0	447.0	2,599.5	452.4	356.4	209.7	1,018.6
Alaska	11,946.6	3,339.2	3,175.5	18,461.2	7,821.9	1,743.8	1,639.4	11,205.0
Arizona	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arkansas	1,642.7	1,201.6	452.1	3,296.3	775.1	587.0	220.2	1,582.3
California	8,450.0	6,629.2	7,543.8	22,623.0	4,363.6	3,081.7	3,846.5	11,291.9
Colorado	24,918.9	19,224.4	21,622.1	65,765.5	13,413.5	9,895.2	10,790.5	34,099.2
Florida	208.5	291.4	112.3	612.1	-17.7	120.2	55.0	157.5
Idaho	15.1	18.0	14.4	47.4	-1.6	5.5	6.5	10.4
Illinois	654.0	653.0	549.3	1,856.2	80.1	305.5	281.7	667.3
Indiana	150.3	86.8	111.2	348.3	52.5	33.6	52.3	138.4
Kansas	4,090.5	6,719.2	3,013.9	13,823.6	73.3	2,823.5	1,437.1	4,334.0
Kentucky	83.0	51.2	42.6	176.8	26.5	22.4	19.9	68.7
Louisiana	19,001.7	14,468.9	8,970.7	42,441.3	8,980.3	6,622.8	4,474.0	20,077.1
Michigan	1,006.3	2,318.1	1,004.2	4,328.7	-412.2	1,055.0	459.0	1,101.8
Mississippi	1,477.6	1,221.2	1,008.4	3,707.2	497.7	515.5	469.2	1,482.4
Montana	1,825.5	923.8	1,012.0	3,761.3	896.5	538.8	468.6	1,903.9
Nebraska	261.8	220.7	183.2	665.7	10.7	123.4	93.4	227.6
Nevada	9.9	16.3	8.6	34.8	-2.6	8.6	4.6	10.6
New Mexico	30,507.8	15,763.2	13,795.2	60,066.2	17,534.1	7,851.2	6,784.4	32,169.8
New York	11.4	10.1	7.2	28.7	3.9	5.1	4.1	13.1
North Dakota	46,251.5	17,535.6	14,530.7	78,317.8	29,422.9	9,421.7	7,249.7	46,094.3
Ohio	9,964.4	10,214.7	4,885.9	25,065.0	3,557.7	4,691.9	2,330.4	10,580.0
Oklahoma	31,434.9	22,355.0	18,467.6	72,257.5	15,917.7	10,544.6	8,796.6	35,258.9
Oregon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pennsylvania	21,431.4	13,023.6	7,803.6	42,258.6	12,190.1	6,236.4	3,941.2	22,367.6
South Dakota	94.4	56.7	24.7	175.8	12.9	21.7	12.2	46.8
Tennessee	16.8	16.8	10.9	44.5	5.2	7.1	5.2	17.5
Texas	250,498.3	205,227.5	213,268.7	668,994.5	144,404.0	91,288.5	102,647.7	338,340.2
Utah	3,162.1	2,111.7	2,267.8	7,541.6	1,693.4	983.0	1,060.9	3,737.3
Virginia	252.1	306.6	102.8	661.5	3.9	147.3	52.9	204.1
West Virginia	5,415.5	4,083.2	939.0	10,437.6	2,941.2	829.7	456.8	4,227.7
Wyoming	14,647.8	6,997.8	4,134.2	25,779.8	8,201.6	3,343.5	2,038.7	13,583.9
Sum of States	490,653.3	356,015.5	329,509.4	1,176,178.2	272,898.6	163,210.6	159,908.7	596,017.9
Gulf of Mexico	45,726.7	19,788.0	43,768.4	109,283.1	19,630.8	7,340.4	20,684.8	47,656.0
Grand Total	**536,380.0**	**375,803.6**	**373,277.8**	**1,285,461.4**	**292,529.5**	**170,551.0**	**180,593.5**	**643,673.9**

	Labor Income (millions of 2018 dollars)				Employment			
Region	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
United States	**178,034.9**	**113,843.2**	**102,818.5**	**394,696.6**	**1,027,210**	**1,542,254**	**2,352,263**	**4,921,726**
Alabama	212.3	243.7	111.7	567.6	3,861	3,850	3,008	10,719
Alaska	2,219.6	905.0	903.1	4,027.8	17,902	13,774	20,458	52,134
Arizona	0.0	0.0	0.0	0.0	0	0	0	0
Arkansas	195.8	374.5	114.5	684.8	2,881	6,398	3,293	12,571
California	3,230.4	2,082.5	2,241.3	7,554.1	21,509	27,421	40,771	89,701
Colorado	9,665.2	7,075.6	6,166.9	22,907.8	45,711	86,434	135,781	267,927
Florida	30.0	80.0	30.6	140.5	947	1,696	737	3,381
Idaho	7.5	6.4	3.7	17.6	57	142	108	307
Illinois	235.3	201.2	158.9	595.4	3,147	2,940	3,246	9,333
Indiana	60.3	21.7	28.1	110.1	552	399	721	1,672
Kansas	1,375.2	2,041.6	791.5	4,208.3	15,055	36,857	21,016	72,928
Kentucky	23.2	14.7	11.1	49.0	352	304	294	949
Louisiana	4,758.5	4,430.7	2,431.8	11,621.1	50,554	70,057	65,215	185,826
Michigan	259.6	753.9	265.0	1,278.5	3,974	11,477	6,183	21,634
Mississippi	652.9	370.2	240.3	1,263.4	3,844	7,134	7,495	18,474
Montana	595.3	358.2	268.4	1,221.9	3,543	6,023	7,931	17,497
Nebraska	88.9	113.1	49.0	251.0	1,391	1,636	1,275	4,302
Nevada	4.5	4.8	2.4	11.7	69	83	57	209
New Mexico	9,026.3	5,041.2	3,481.3	17,548.8	42,010	84,755	101,685	228,451
New York	3.7	3.5	2.4	9.6	63	42	41	145
North Dakota	10,741.7	5,629.7	3,977.9	20,349.3	61,745	76,659	98,891	237,296
Ohio	1,444.9	2,982.0	1,269.1	5,696.0	24,412	48,718	30,529	103,660
Oklahoma	10,617.6	7,373.8	4,951.5	22,942.9	74,458	111,970	127,952	314,380
Oregon	0.0	0.0	0.0	0.0	0	0	0	0
Pennsylvania	2,795.9	4,318.9	2,350.4	9,465.2	29,213	55,860	49,075	134,148
South Dakota	13.3	14.5	6.4	34.2	288	415	176	879
Tennessee	4.1	4.5	3.1	11.7	101	81	68	250
Texas	100,761.0	60,981.4	59,252.5	220,995.0	448,352	762,809	1,308,397	2,519,558
Utah	1,049.6	643.4	581.3	2,274.3	5,185	11,155	14,966	31,306
Virginia	35.3	97.7	28.6	161.6	977	1,439	664	3,080
West Virginia	579.8	547.1	255.3	1,382.2	7,537	10,195	7,302	25,034
Wyoming	3,855.1	2,192.9	1,007.1	7,055.1	27,117	35,855	29,730	92,703
Sum of States	164,542.9	108,908.5	90,985.2	364,436.6	896,809	1,476,578	2,087,064	4,460,451
Gulf of Mexico	13,492.0	4,934.7	11,833.3	30,260.0	130,401	65,675	265,199	461,275
Grand Total	**178,034.9**	**113,843.2**	**102,818.5**	**394,696.6**	**1,027,209.5**	**1,542,253.5**	**2,352,262.8**	**4,921,725.9**

Economic contributions of production activities and capex, 2025

	Output (millions of 2018 dollars)				Value Added (millions of 2018 dollars)			
Region	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
United States	**692,454.1**	**475,269.4**	**467,254.5**	**1,634,977.9**	**380,377.6**	**216,800.5**	**226,108.4**	**823,286.5**
Alabama	1,345.0	1,016.5	488.2	2,849.7	500.9	397.7	228.7	1,127.3
Alaska	18,626.0	4,268.0	4,500.6	27,394.6	12,762.1	2,290.1	2,322.5	17,374.8
Arizona	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arkansas	2,403.1	1,794.5	637.1	4,834.7	1,130.7	877.0	310.2	2,317.9
California	9,860.7	7,644.5	8,953.2	26,458.4	5,134.4	3,555.4	4,562.9	13,252.7
Colorado	36,814.8	28,579.7	31,899.1	97,293.6	20,002.2	14,899.2	15,909.5	50,810.9
Florida	235.4	348.5	129.5	713.4	-25.6	145.3	63.4	183.0
Idaho	20.7	23.0	16.6	60.3	-0.6	7.5	7.5	14.5
Illinois	435.2	445.6	373.9	1,254.7	45.5	207.0	191.9	444.4
Indiana	95.5	50.2	73.4	219.2	33.7	19.5	34.5	87.7
Kansas	4,603.2	8,793.0	3,636.5	17,032.7	-384.2	3,756.2	1,732.9	5,104.9
Kentucky	47.1	29.0	25.2	101.4	14.9	12.4	11.8	39.1
Louisiana	21,484.9	16,716.8	10,034.6	48,236.2	10,203.3	7,668.3	5,002.1	22,873.7
Michigan	910.9	2,395.8	933.9	4,240.5	-479.2	1,096.8	427.2	1,044.9
Mississippi	1,581.8	1,423.1	1,109.2	4,114.1	496.4	601.9	515.3	1,613.6
Montana	2,164.6	1,132.4	1,165.5	4,462.5	1,050.3	675.5	539.2	2,265.0
Nebraska	281.4	216.6	199.2	697.2	10.9	135.3	101.6	247.8
Nevada	12.0	20.3	10.6	43.0	-3.1	10.7	5.6	13.2
New Mexico	49,353.0	25,558.0	21,513.7	96,424.7	28,440.5	12,705.5	10,575.6	51,721.6
New York	4.3	3.8	2.7	10.9	1.5	1.9	1.6	5.0
North Dakota	52,864.9	20,127.1	16,513.9	89,505.9	33,759.2	10,861.4	8,227.5	52,848.1
Ohio	18,348.2	19,203.4	8,502.6	46,054.3	6,533.6	8,857.4	4,064.2	19,455.1
Oklahoma	40,298.4	28,568.8	23,133.5	92,000.7	20,863.5	13,602.7	11,015.4	45,481.6
Oregon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pennsylvania	35,697.4	20,171.7	11,809.9	67,679.0	20,864.0	9,907.7	5,962.0	36,733.7
South Dakota	114.5	57.1	24.7	196.3	12.6	21.8	12.2	46.6
Tennessee	6.3	6.4	4.1	16.8	2.0	2.7	2.0	6.6
Texas	306,803.0	245,740.0	260,516.4	813,059.4	180,743.7	109,472.4	125,310.6	415,526.6
Utah	3,968.9	2,924.5	2,651.7	9,545.1	2,055.7	1,359.3	1,239.5	4,654.5
Virginia	284.2	355.7	116.4	756.3	2.7	171.0	60.0	233.7
West Virginia	8,904.2	4,399.7	1,308.0	14,611.9	5,042.7	1,268.3	636.0	6,947.0
Wyoming	21,040.8	10,106.1	5,491.4	36,638.3	11,932.3	4,872.3	2,706.0	19,510.7
Sum of States	638,610.7	452,119.9	415,775.3	1,506,505.9	360,746.8	209,460.2	201,779.2	771,986.2
Gulf of Mexico	53,843.4	23,149.5	51,479.2	128,472.0	19,630.8	7,340.4	24,329.1	51,300.3
Grand Total	**692,454.1**	**475,269.4**	**467,254.5**	**1,634,977.9**	**380,377.6**	**216,800.5**	**226,108.4**	**823,286.5**

	Labor Income (millions of 2018 dollars)				Employment			
Region	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
United States	**218,996.2**	**146,130.1**	**128,724.4**	**493,850.7**	**1,179,593**	**1,945,540**	**2,945,626**	**6,070,759**
Alabama	227.9	273.9	121.9	623.7	4,145	4,261	3,277	11,683
Alaska	3,195.0	1,187.1	1,282.3	5,664.4	20,808	17,142	28,949	66,900
Arizona	0.0	0.0	0.0	0.0	0	0	0	0
Arkansas	262.9	559.8	161.5	984.3	4,126	9,514	4,637	18,277
California	3,827.2	2,410.3	2,660.6	8,898.1	24,326	31,467	48,327	104,120
Colorado	14,085.8	10,780.3	9,103.5	33,969.6	62,200	128,535	200,298	391,033
Florida	33.1	95.9	35.2	164.2	1,077	2,004	848	3,930
Idaho	8.4	7.9	4.3	20.5	71	176	124	371
Illinois	160.5	136.7	108.4	405.6	2,089	1,993	2,211	6,293
Indiana	40.2	12.9	18.5	71.6	322	235	475	1,033
Kansas	1,559.6	2,715.9	955.7	5,231.2	16,897	48,503	25,322	90,722
Kentucky	13.9	8.3	6.6	28.8	184	171	173	528
Louisiana	5,229.2	5,161.0	2,722.4	13,112.6	55,217	80,513	72,855	208,585
Michigan	214.1	780.8	246.8	1,241.6	3,555	11,752	5,753	21,060
Mississippi	701.5	432.2	264.3	1,397.9	4,157	8,285	8,228	20,670
Montana	665.1	450.3	309.2	1,424.5	4,102	7,516	9,123	20,740
Nebraska	95.8	125.0	53.3	274.2	1,490	1,789	1,384	4,664
Nevada	5.5	6.0	2.9	14.4	84	103	71	258
New Mexico	13,849.2	8,209.0	5,433.4	27,491.6	65,926	137,447	158,593	361,966
New York	1.4	1.3	0.9	3.6	24	16	15	55
North Dakota	12,077.8	6,512.8	4,522.6	23,113.1	67,594	87,460	112,157	267,210
Ohio	2,367.9	5,654.5	2,215.1	10,237.5	41,472	91,524	53,229	186,225
Oklahoma	13,103.9	9,641.8	6,208.8	28,954.5	86,772	142,449	160,157	389,378
Oregon	0.0	0.0	0.0	0.0	0	0	0	0
Pennsylvania	4,103.6	6,943.7	3,560.4	14,607.7	38,939	87,207	74,199	200,346
South Dakota	13.1	14.6	6.4	34.1	286	417	175	879
Tennessee	1.6	1.7	1.2	4.4	38	31	26	94
Texas	122,713.5	73,990.6	72,393.0	269,097.1	490,827	895,290	1,595,249	2,981,367
Utah	1,162.9	889.9	679.9	2,732.8	6,514	15,433	17,484	39,430
Virginia	39.5	113.4	32.4	185.3	1,094	1,666	752	3,512
West Virginia	776.5	842.7	356.0	1,975.2	10,113	15,327	10,160	35,600
Wyoming	4,967.7	3,235.3	1,338.8	9,541.8	34,743	51,639	39,446	125,829
Sum of States	205,504.2	141,195.4	114,806.3	461,505.9	1,049,193	1,879,864	2,633,699	5,562,756
Gulf of Mexico	13,492.0	4,934.7	13,918.1	32,344.7	130,401	65,675	311,927	508,003
Grand Total	**218,996.2**	**146,130.1**	**128,724.4**	**493,850.7**	**1,179,593.3**	**1,945,539.6**	**2,945,625.9**	**6,070,758.9**

Appendix E – Estimated taxes by state

State & local and federal taxes, 2016 (millions of 2018 dollars)

Tax Type	State & Local			Federal			Overall
Region	Personal	Corporate *	Total	Personal	Corporate	Total	Grand Total
United States	**2,283,512,828**	**26,172,805,925**	**28,456,318,752**	**24,468,940,083**	**6,613,555,296**	**31,082,495,379**	**59,538,814,131**
Alabama	9,422,204	56,734,405	66,156,609	65,818,120	17,573,541	83,391,661	149,548,270
Alaska	36,990,071	2,642,385,868	2,679,375,939	637,103,107	395,960,470	1,033,063,577	3,712,439,516
Arizona	5,584	37,866	43,450	44,914	11,187	56,101	99,551
Arkansas	25,607,456	192,006,894	217,614,350	167,324,482	48,148,623	215,473,105	433,087,455
California	205,667,442	668,373,841	874,041,283	934,855,306	183,239,152	1,118,094,458	1,992,135,741
Colorado	254,816,870	1,488,333,022	1,743,149,891	1,489,810,099	319,888,224	1,809,698,323	3,552,848,214
Florida	707,750	20,801,618	21,509,368	16,330,445	3,209,984	19,540,429	41,049,797
Idaho	285,174	1,315,268	1,600,442	1,819,134	367,717	2,186,851	3,787,294
Illinois	10,279,000	51,974,869	62,253,868	61,902,340	10,467,945	72,370,285	134,624,154
Indiana	2,119,312	5,795,141	7,914,453	12,543,059	1,743,655	14,286,714	22,201,166
Kansas	54,429,374	465,396,285	519,825,660	453,114,991	61,752,563	514,867,554	1,034,693,214
Kentucky	1,970,381	8,215,064	10,185,445	9,068,983	4,675,229	13,744,212	23,929,657
Louisiana	129,556,601	1,701,286,577	1,830,843,178	1,054,636,852	321,362,875	1,375,999,727	3,206,842,905
Michigan	13,485,577	94,018,208	107,503,785	92,461,166	19,674,495	112,135,661	219,639,445
Mississippi	16,458,806	145,642,276	162,101,083	105,557,738	17,469,869	123,027,607	285,128,689
Montana	18,714,186	177,631,199	196,345,384	108,984,154	25,311,324	134,295,477	330,640,862
Nebraska	5,228,829	14,848,871	20,077,700	30,819,899	3,505,369	34,325,268	54,402,968
Nevada	35,377	959,969	995,346	721,781	249,064	970,845	1,966,191
New Mexico	92,496,744	893,949,021	986,445,765	743,799,292	232,151,026	975,950,318	1,962,396,082
New York	1,955,363	3,471,190	5,426,552	7,463,906	791,855	8,255,761	13,682,314
North Dakota	181,937,998	2,609,526,399	2,791,464,397	2,012,180,644	540,904,369	2,553,085,013	5,344,549,411
Ohio	78,912,554	382,265,482	461,178,035	443,900,390	134,736,886	578,637,276	1,039,815,311
Oklahoma	256,536,537	2,278,492,966	2,535,029,503	1,719,778,962	491,690,239	2,211,469,200	4,746,498,704
Pennsylvania	209,641,482	797,945,874	1,007,587,356	1,373,157,208	377,364,859	1,750,522,067	2,758,109,422
South Dakota	304,672	7,119,427	7,424,099	6,429,059	1,510,310	7,939,369	15,363,468
Texas	548,387,772	9,625,947,542	10,174,335,314	11,575,593,593	3,044,091,952	14,619,685,546	24,794,020,859
Utah	36,505,602	258,486,296	294,991,898	236,567,323	58,363,503	294,930,826	589,922,724
Virginia	4,729,919	22,905,458	27,635,376	31,356,836	6,975,267	38,332,103	65,967,479
West Virginia	47,963,544	382,198,991	430,162,535	287,343,226	93,662,525	381,005,750	811,168,285
Wyoming	38,360,649	1,174,740,039	1,213,100,687	788,453,077	196,701,218	985,154,295	2,198,254,982

* Includes estimate of state severance taxes

State & local and federal taxes, 2017 (millions of 2018 dollars)

Tax Type	State & Local			Federal			Overall
Region	Personal	Corporate *	Total	Personal	Corporate	Total	Grand Total
United States	**3,167,653,468**	**36,290,045,676**	**39,457,699,143**	**34,572,784,731**	**9,292,021,897**	**43,864,806,627**	**83,322,505,771**
Alabama	11,855,391	95,024,569	106,879,959	81,609,385	20,549,418	102,158,803	209,038,762
Alaska	44,868,719	2,790,977,642	2,835,846,360	772,331,700	473,696,315	1,246,028,016	4,081,874,376
Arizona	0	0	0	0	0	0	0
Arkansas	26,982,281	202,414,954	229,397,236	176,246,036	50,608,598	226,854,634	456,251,869
California	257,975,636	829,775,781	1,087,751,417	1,168,983,977	223,212,782	1,392,196,759	2,479,948,176
Colorado	368,326,951	2,151,885,526	2,520,212,477	2,153,228,345	462,256,301	2,615,484,647	5,135,697,123
Florida	892,739	25,250,963	26,143,702	20,589,322	4,025,475	24,614,798	50,758,500
Idaho	175,861	768,094	943,955	1,107,094	205,634	1,312,727	2,256,682
Illinois	10,846,684	58,137,902	68,984,586	66,192,599	11,863,929	78,056,528	147,041,114
Indiana	2,085,848	5,811,434	7,897,282	12,636,305	1,904,343	14,540,648	22,437,930
Kansas	55,731,456	486,670,652	542,402,108	465,759,170	65,019,098	530,778,268	1,073,180,376
Kentucky	1,308,246	6,013,885	7,322,131	6,274,015	2,895,826	9,169,841	16,491,972
Louisiana	192,172,581	2,386,816,875	2,578,989,456	1,567,999,307	471,077,836	2,039,077,144	4,618,066,600
Michigan	15,926,929	110,990,041	126,916,970	109,099,960	23,053,791	132,153,751	259,070,721
Mississippi	15,842,299	141,604,209	157,446,508	103,483,995	18,785,165	122,269,160	279,715,667
Montana	23,073,287	219,985,313	243,058,600	133,123,849	29,624,853	162,748,702	405,807,302
Nebraska	5,635,165	16,307,142	21,942,307	33,385,599	3,834,372	37,219,970	59,162,277
Nevada	45,001	1,221,130	1,266,131	918,143	316,822	1,234,965	2,501,097
New Mexico	131,632,041	1,286,106,119	1,417,738,160	1,057,541,670	326,984,161	1,384,525,831	2,802,263,992
New York	1,837,708	3,310,207	5,147,915	7,088,894	789,264	7,878,158	13,026,073
North Dakota	263,073,140	3,765,513,970	4,028,587,110	2,909,616,235	782,205,913	3,691,822,148	7,720,409,257
Ohio	120,407,602	590,880,503	711,288,105	677,073,004	205,497,604	882,570,608	1,593,858,713
Oklahoma	365,279,872	3,253,268,916	3,618,548,789	2,425,484,096	705,854,920	3,131,339,016	6,749,887,804
Pennsylvania	263,603,911	1,040,914,944	1,304,518,855	1,723,805,357	478,190,944	2,201,996,301	3,506,515,155
South Dakota	342,647	8,006,823	8,349,471	7,230,404	1,698,562	8,928,966	17,278,437
Texas	810,546,459	14,189,108,570	14,999,655,029	17,050,477,042	4,448,563,328	21,499,040,370	36,498,695,399
Utah	49,025,808	350,811,450	399,837,258	317,075,800	77,440,316	394,516,116	794,353,373
Virginia	6,082,701	32,429,124	38,511,825	40,124,062	8,507,774	48,631,836	87,143,661
West Virginia	70,303,037	548,303,990	618,607,027	422,175,722	132,474,978	554,650,701	1,173,257,727
Wyoming	51,773,468	1,691,734,949	1,743,508,416	1,062,123,644	260,883,573	1,323,007,218	3,066,515,634

* Includes estimate of state severance taxes

State & local and federal taxes, 2018 (millions of 2018 dollars)

Tax Type	State & Local			Federal			Overall
Region	Personal	Corporate *	Total	Personal	Corporate	Total	Grand Total
United States	**3,793,723,505**	**43,568,431,474**	**47,362,154,979**	**42,665,568,068**	**11,416,955,610**	**54,082,523,679**	**101,444,678,657**
Alabama	13,139,806	92,721,028	105,860,834	91,093,484	23,608,383	114,701,867	220,562,701
Alaska	41,711,681	2,212,109,864	2,253,821,545	717,554,906	434,270,720	1,151,825,626	3,405,647,171
Arizona	10,877	40,862	51,739	79,557	106,228	185,785	237,523
Arkansas	25,452,319	190,146,795	215,599,113	166,743,906	48,732,731	215,476,637	431,075,750
California	210,487,072	689,530,191	900,017,263	950,085,108	175,358,653	1,125,443,761	2,025,461,023
Colorado	467,766,431	2,746,137,222	3,213,903,653	2,729,149,880	584,021,901	3,313,171,781	6,527,075,434
Florida	1,105,233	31,228,008	32,333,241	25,495,277	4,996,430	30,491,707	62,824,948
Idaho	225,543	997,267	1,222,810	1,424,025	269,712	1,693,738	2,916,547
Illinois	14,198,318	78,727,719	92,926,037	87,341,038	16,181,970	103,523,009	196,449,046
Indiana	2,072,085	6,109,800	8,181,885	13,343,498	2,402,592	15,746,091	23,927,975
Kansas	71,028,419	632,497,498	703,525,916	595,778,408	85,026,203	680,804,611	1,384,330,527
Kentucky	1,547,060	7,450,660	8,997,720	7,572,364	3,298,221	10,870,585	19,868,305
Louisiana	211,564,784	2,510,158,043	2,721,722,827	1,740,572,569	496,569,349	2,237,141,918	4,958,864,745
Michigan	17,694,094	123,935,959	141,630,053	121,010,364	25,255,841	146,266,205	287,896,258
Mississippi	19,067,559	172,327,419	191,394,978	126,508,773	24,659,627	151,168,400	342,563,378
Montana	28,705,449	274,470,448	303,175,898	164,617,015	35,583,599	200,200,614	503,376,511
Nebraska	4,105,869	14,040,158	18,146,026	25,535,610	3,195,185	28,730,795	46,876,821
Nevada	48,417	1,191,615	1,240,032	986,867	289,165	1,276,032	2,516,064
New Mexico	183,533,407	1,799,686,778	1,983,220,185	1,474,075,170	454,334,015	1,928,409,185	3,911,629,370
New York	692,501	1,124,814	1,817,315	2,481,627	182,084	2,663,710	4,481,025
North Dakota	326,666,579	4,929,819,110	5,256,485,689	3,604,163,360	964,106,060	4,568,269,420	9,824,755,109
Ohio	147,400,269	675,990,105	823,390,374	831,806,055	252,628,961	1,084,435,015	1,907,825,390
Oklahoma	429,578,390	3,828,708,335	4,258,286,725	2,845,187,572	831,888,858	3,677,076,430	7,935,363,155
Pennsylvania	336,548,929	1,438,188,382	1,774,737,311	2,192,659,974	621,246,776	2,813,906,750	4,588,644,061
South Dakota	493,372	10,576,643	11,070,015	10,197,525	2,250,905	12,448,429	23,518,445
Texas	1,048,906,264	18,031,104,466	19,080,010,730	22,089,056,185	5,777,889,119	27,866,945,304	46,946,956,034
Utah	54,384,802	376,205,490	430,590,292	353,943,733	89,220,027	443,163,759	873,754,051
Virginia	3,924,478	20,216,617	24,141,095	25,935,268	5,598,974	31,534,242	55,675,336
West Virginia	70,625,316	592,521,971	663,147,287	420,610,339	149,934,302	570,544,641	1,233,691,928
Wyoming	61,038,179	2,080,468,211	2,141,506,390	1,250,558,613	303,849,019	1,554,407,632	3,695,914,022

* Includes estimate of state severance taxes

State & local and federal taxes, 2020 (millions of 2018 dollars)

Tax Type	State & Local			Federal			Overall
Region	Personal	Corporate *	Total	Personal	Corporate	Total	Grand Total
United States	**4,104,247,147**	**48,100,036,509**	**52,204,283,656**	**49,365,978,464**	**13,245,586,257**	**62,611,564,721**	**114,815,848,377**
Alabama	12,393,528	96,155,907	108,549,435	85,476,065	21,692,492	107,168,557	215,717,992
Alaska	47,486,459	2,869,953,284	2,917,439,743	817,296,043	499,996,440	1,317,292,483	4,234,732,227
Arizona	0	0	0	0	0	0	0
Arkansas	18,745,241	141,283,210	160,028,451	122,031,746	34,328,706	156,360,452	316,388,903
California	225,544,916	748,952,814	974,497,730	1,014,238,227	180,949,616	1,195,187,842	2,169,685,573
Colorado	477,161,404	2,738,485,263	3,215,646,666	2,809,470,288	610,079,163	3,419,549,451	6,635,196,117
Florida	992,807	28,753,672	29,746,479	22,900,497	4,484,809	27,385,306	57,131,786
Idaho	197,393	884,212	1,081,605	1,250,202	241,658	1,491,860	2,573,464
Illinois	11,884,122	68,279,221	80,163,343	73,736,125	14,136,484	87,872,609	168,035,952
Indiana	2,097,001	6,013,771	8,110,772	13,211,707	2,242,656	15,454,363	23,565,136
Kansas	54,241,655	509,645,673	563,887,328	459,712,027	69,630,118	529,342,146	1,093,229,473
Kentucky	1,176,026	5,911,271	7,087,297	5,868,033	2,415,035	8,283,069	15,370,365
Louisiana	187,193,436	2,355,885,219	2,543,078,655	1,534,893,226	447,315,842	1,982,209,068	4,525,287,723
Michigan	15,077,909	107,085,180	122,163,090	103,458,716	22,143,871	125,602,587	247,765,677
Mississippi	18,251,512	165,292,720	183,544,232	120,966,431	23,470,097	144,436,529	327,980,761
Montana	28,679,809	273,363,755	302,043,564	165,567,133	36,945,029	202,512,161	504,555,725
Nebraska	4,938,748	15,524,079	20,462,827	29,950,619	3,589,654	33,540,273	54,003,100
Nevada	40,904	1,109,949	1,150,853	834,548	287,976	1,122,524	2,273,377
New Mexico	279,287,171	2,694,017,299	2,973,304,470	2,246,205,323	702,227,818	2,948,433,140	5,921,737,610
New York	358,648	582,543	941,190	1,285,238	94,301	1,379,540	2,320,730
North Dakota	369,105,260	5,178,490,011	5,547,595,271	4,086,918,503	1,101,210,322	5,188,128,824	10,735,724,095
Ohio	145,281,902	660,369,914	805,651,817	819,754,724	248,963,310	1,068,718,034	1,874,369,851
Oklahoma	397,332,353	3,528,617,561	3,925,949,914	2,664,662,488	761,296,926	3,425,959,414	7,351,909,328
Pennsylvania	293,931,017	1,123,620,430	1,417,551,447	1,924,893,668	529,566,383	2,454,460,052	3,872,011,499
South Dakota	351,568	8,215,283	8,566,851	7,418,650	1,742,784	9,161,434	17,728,285
Texas	1,341,535,357	21,861,522,051	23,203,057,409	28,294,960,667	7,427,251,399	35,722,212,066	58,925,269,475
Utah	47,261,680	324,222,330	371,484,010	308,047,389	78,227,597	386,274,986	757,758,995
Virginia	3,123,763	16,601,125	19,724,887	20,609,228	4,377,371	24,986,599	44,711,486
West Virginia	59,342,832	464,966,966	524,309,797	356,178,850	112,688,258	468,867,109	993,176,906
Wyoming	61,232,725	2,106,231,798	2,167,464,523	1,254,182,104	303,990,140	1,558,172,244	3,725,636,767

* Includes estimate of state severance taxes

State & local and federal taxes, 2025 (millions of 2018 dollars)

Tax Type	State & Local			Federal			Overall
Region	Personal	Corporate *	Total	Personal	Corporate	Total	Grand Total
United States	**5,507,144,158**	**59,854,784,266**	**65,361,928,424**	**64,041,455,484**	**17,415,136,356**	**81,456,591,840**	**146,818,520,264**
Alabama	13,720,093	104,910,216	118,630,309	94,703,587	24,116,029	118,819,616	237,449,925
Alaska	80,225,696	3,803,848,715	3,884,074,411	1,379,589,424	828,065,775	2,207,655,199	6,091,729,609
Arizona	0	0	0	0	0	0	0
Arkansas	27,328,057	206,118,629	233,446,686	177,814,867	49,862,435	227,677,302	461,123,988
California	262,677,621	835,779,037	1,098,456,658	1,183,903,295	215,636,343	1,399,539,637	2,497,996,295
Colorado	701,095,785	3,961,000,310	4,662,096,096	4,153,420,170	910,688,675	5,064,108,845	9,726,204,940
Florida	1,121,473	30,384,448	31,505,920	25,868,920	5,067,462	30,936,381	62,442,302
Idaho	271,129	1,213,437	1,484,567	1,716,850	331,402	2,048,252	3,532,818
Illinois	7,831,975	46,982,275	54,814,251	49,119,457	9,809,243	58,928,700	113,742,950
Indiana	1,297,755	3,838,257	5,136,012	8,414,741	1,542,006	9,956,747	15,092,759
Kansas	60,173,978	573,318,500	633,492,478	511,401,788	78,645,269	590,047,057	1,223,539,535
Kentucky	654,517	3,545,709	4,200,226	3,381,351	1,248,835	4,630,186	8,830,412
Louisiana	212,772,754	2,531,152,577	2,743,925,331	1,747,973,929	503,302,827	2,251,276,755	4,995,202,086
Michigan	13,578,275	94,941,558	108,519,834	93,382,964	20,332,816	113,715,780	222,235,613
Mississippi	19,504,511	176,124,631	195,629,142	129,397,568	25,213,957	154,611,524	350,240,667
Montana	33,978,761	323,669,387	357,648,149	196,414,624	44,097,305	240,511,929	598,160,077
Nebraska	5,288,156	16,721,729	22,009,885	32,125,281	3,862,090	35,987,371	57,997,256
Nevada	49,694	1,348,460	1,398,154	1,013,879	349,858	1,363,738	2,761,891
New Mexico	451,824,694	4,355,071,628	4,806,896,323	3,634,085,706	1,136,840,029	4,770,925,734	9,577,822,057
New York	135,156	219,530	354,686	484,340	35,537	519,877	874,563
North Dakota	424,507,157	5,756,012,488	6,180,519,645	4,705,306,081	1,270,539,690	5,975,845,770	12,156,365,416
Ohio	273,629,090	1,202,537,208	1,476,166,298	1,547,872,077	470,319,021	2,018,191,098	3,494,357,396
Oklahoma	508,539,584	4,506,053,836	5,014,593,419	3,436,941,939	967,844,149	4,404,786,088	9,419,379,508
Pennsylvania	516,013,754	1,794,596,563	2,310,610,317	3,392,564,926	912,201,843	4,304,766,769	6,615,377,087
South Dakota	426,462	9,965,370	10,391,832	8,999,032	2,114,047	11,113,079	21,504,911
Texas	1,636,658,480	25,367,233,748	27,003,892,228	34,670,991,008	9,191,770,291	43,862,761,299	70,866,653,527
Utah	59,325,611	410,437,013	469,762,624	386,090,057	97,311,868	483,401,924	953,164,548
Virginia	3,537,572	18,540,161	22,077,733	23,356,952	4,997,719	28,354,671	50,432,404
West Virginia	101,522,122	785,359,274	886,881,396	610,188,476	188,705,353	798,893,829	1,685,775,225
Wyoming	89,454,247	2,933,859,568	3,023,313,814	1,834,932,197	450,284,486	2,285,216,683	5,308,530,497

* Includes estimate of state severance taxes

Appendix F – Economic contribution analysis methodology

As presented in the main body of this report, the IHS Markit Energy team developed the historical and forecast data for the independents' production, opex and capital expenditures (capex) by state for the years 2016, 2017, 2018, 2020 and 2025. The annual value of the independents' oil, natural gas and NGL production plus the annual capex were used as core inputs to the models that estimated the follow-on economic contributions.

In this study, IHS Markit traced three levels of contribution that accrue from the streams of economic activity initiated by the independent operators in the U.S. The first level, designated as **direct contributions**, encompasses the economic contributions that result from independent operators' production activities and from spending directly with suppliers and service providers on operational and capital projects. The second level, **indirect contributions**, captures the ripple effects through subsequent tiers of the supply chain and purchasing network. Finally, the third level, **induced contributions**, covers the economic contributions that accrue due to the consumer activity of the operators' employees as well as the employees at the companies in the supply chain and purchasing network.

Unless noted otherwise below, the direct, indirect and induced contributions are reported for the following economic indicators.

Employment. To produce their goods and services, companies must hire and retain employees. This indicator measures the number of workers required to support a given level of sales activity within the economy.

Sales activity (output). In the context of an economic contribution analysis, output represents the value of sales (i.e., revenue) that occurs in the U.S. that is ultimately attributable to transactions initiated by independent operators.

Value added contribution to Gross Domestic Product / Gross State Product. Value added is the revenue received for a product or service less its material and services input costs. In this report, Gross Domestic Product (GDP) is the sum of value added across the U.S. economy. Similarly, summing value added across a given state yields Gross State Product (GSP). GDP or GSP are generally used to gauge the overall size and health of the U.S. economy or a state economy, respectively.

Labor income. A subcomponent of value added, labor income captures the compensation and other related income paid to workers. A common measure of the relative contribution of an industry to the overall economy is labor income per worker. The higher the ratio, the greater is each worker's quality and contribution to growth.

The models developed by IHS Markit are based on data from IMPLAN. The IMPLAN data combines classic input/output analysis with regional specific social accounting matrices and multiplier models to trace commodity flows from producers to intermediates and final consumers. The total industry purchases of commodities, services, employment compensation, value added, and imports are equal to the value of the commodities produced.

Purchases for final use (final demand) drive the model. Industries produce goods and services for final demand and purchase goods and services from other producers. These other producers, in turn, purchase goods and services. This buying of goods and services (indirect purchases) continues until leakages from the region (imports and value added) stop the cycle.

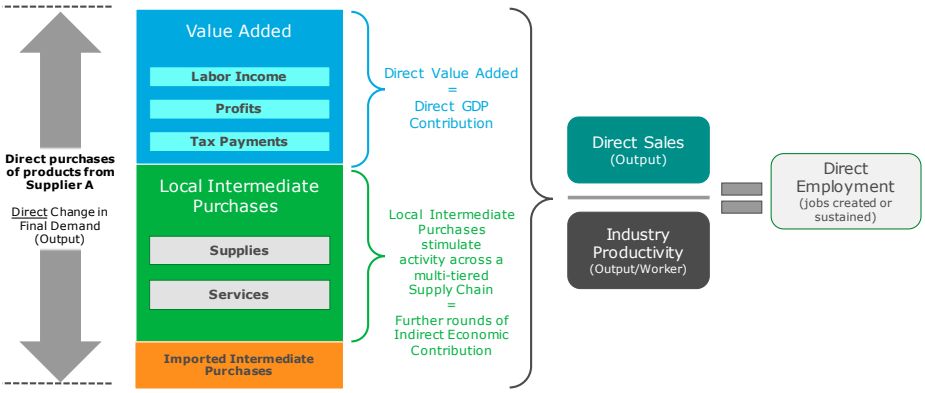
The following graphic decomposes how a direct transaction (e.g., the sale of oil or capital expenditure transactions between the independents and local suppliers) initiates a cycle of economic contribution to a local economy. In this hypothetical example, an independent producer buys products from a local supplier (Supplier A). This sale is represented by the gray arrow on the left side of the graphic.

Supplier A initiates a series of additional sales transactions to source the non-labor components and inputs needed to build the product. Some of this sourcing occurs outside the region ("Imported Intermediate Purchases") and this spending "leaks" out of the local economy. A portion directly enters the local economy ("Local Intermediate Purchases") as Supplier A buys inputs from its local supply network.

Subtracting the local intermediate purchases and the import leakages from the initial sales (the gray arrow) leaves "Value Added." As its name implies, value added measures how much more valuable a final product is relative to its

non-labor inputs. Summing all value added activity across an economy yields its gross domestic product (GDP), which is generally considered the broadest measure of the health of an economy. In this context, GDP measures the ability to convert raw inputs (i.e. intermediate inputs) into higher-value final products.

From value added, Supplier A pays wages to employees ("Labor Income"), draws its profits and pays taxes. IMPLAN provides industry-specific productivity statistics that effectively estimate how many of Supplier A's employees are supported by its transactions with the independent producer. The economic contributions attributable to sales transactions between the independent producers and local firms are classified as "direct effects" or "direct contributions."



The economic contribution cycle initiated by Supplier A buying from its local suppliers repeats as these companies buy from their suppliers and so on. Summing up this supply chain activity yields what is known as "indirect effects" or "indirect contributions."

The direct and indirect companies pay wages to their employees. A significant portion of these wages are spent locally on consumer purchases, housing, education, healthcare, and so on. This spending results in additional rounds of economic activity, which are classified as "induced effects" or "induced contributions."

Tax calculations

IMPLAN also estimates both personal and corporate taxes on the federal, state and local levels. The taxes presented in this report are based on standard IMPLAN results with one enhancement. Specifically, IHS Markit determined the IMPLAN models may underestimate state-level severance tax revenues. Therefore, IHS Markit researched current severance tax rates by state (see table below). Then, using the production value and volumes included in this report, IHS estimated state-level severance taxes. Detailed state-level taxes are included in Appendix E.

	Oil severance taxes		Natural gas severance taxes	
State	Rate	Basis	Rate	Basis
ALABAMA	2.0%	value of output	2.0%	value of output
ALASKA	4.0%	value of output	4.0%	value of output
ARIZONA	3.1%	value of output	3.1%	value of output
ARKANSAS	5.0%	value of output	5.0%	value of output
CALIFORNIA	$0.50	per bbl	$0.05	per mcf
COLORADO	5.0%	value of output	5.0%	value of output
FLORIDA	8.0%	value of output	$0.22	per mcf
IDAHO	2.5%	value of output	2.5%	value of output
ILLINOIS	6.0%	value of output	6.0%	value of output
INDIANA	$0.24	per bbl	$0.03	per mcf
KANSAS	8.0%	value of output	8.0%	value of output
KENTUCKY	4.5%	value of output	4.5%	value of output
LOUISIANA	12.5%	value of output	$0.02	per mcf
MICHIGAN	6.6%	value of output	5.0%	value of output
MISSISSIPPI	6.0%	value of output	4.0%	value of output
MONTANA	9.0%	value of output	9.0%	value of output
NEBRASKA	3.0%	value of output	3.0%	value of output
NEVADA	5.0%	value of output	5.0%	value of output
NEW MEXICO	3.8%	value of output	3.8%	value of output
NEW YORK	None	value of output	None	value of output
NORTH DAKOTA	5.0%	value of output	$0.07	per mcf
OHIO	$0.02	per bbl	1.5%	value of output
OKLAHOMA	7.0%	value of output	7.0%	value of output
PENNSYLVANIA	None	value of output	None	value of output
SOUTH DAKOTA	4.5%	value of output	4.5%	value of output
TEXAS	4.6%	value of output	7.5%	value of output
UTAH	5.0%	value of output	5.0%	value of output
VIRGINIA	1.0%	value of output	1.0%	value of output
WEST VIRGINIA	5.0%	value of output	5.0%	value of output
WYOMING	6.0%	value of output	6.0%	value of output

Sources: The Council of State Governments, National Conference of State Legislatures

Appendix G – Glossary of economic contribution analysis terminology

Capital expenditure (Capex)	This includes the investments made by establishments operating in a particular sector during a certain year, net of fixed assets sold.
Compound Annual Growth Rate (CAGR)	A measure of annual growth rate with the effect of compounding taken into account. The CAGR formula is equal to: [(ending value / beginning value) ^ (1/# of periods)] – 1
Corporate income tax	The tax levied on a corporation's income.
Direct impacts	The first-order responses throughout the economy due to direct sales transactions
Economic impact analysis	A study that examines the direct, indirect and induced impacts of the independent operators' production activities and supply chain spending.
Employment	This includes wages, salaries and self-employment jobs within the economy.
Extended supply chain	The network of suppliers who provide goods and services to the first tier of a supply chain. This is a subset of the indirect economic contributions.
Fiscal analysis	The estimation of the impacts of tax and non-tax contributions of an entity to the government in which it is currently operating.
Government revenues	The streams of revenues paid to a government agency.
Gross domestic product (GDP)	The sum of value added across all products and services produced within a national economy.

Gross state product (GSP)	The sum of value added across all products and services produced within a state economy.
Indirect impacts	The follow-on supply chain or purchasing network activities that are initiated by direct spending.
Induced impacts	The response of the economy to marginal changes in consumer spending from employees of the direct and indirect businesses.
Input-output analysis	The analysis utilizes an input-output table that represents a particular economy and depicts the flows of related economic transactions that take place within the country. It also shows the economic interconnections that exist between different components of the economic system, i.e. production activities, the government and supplier enterprises.
Labor income	This captures all forms of employment income, including employee compensation (wages and benefits, employer-paid payroll taxes, unemployment taxes, etc.) and proprietor income (payments received by self-employed individuals and unincorporated businesses).
Operating expenditures (Opex)	This captures purchases of inputs and suppliers.
Output	The total value of all goods and services produced within an economy.
Personal income tax	The tax levied on an individual's income.
Supply chain	The combination of the direct and indirect suppliers.
Tier-1 suppliers	The suppliers with whom the independent operators directly spend their capital expenditure and operating expenditure funds.
Value added	The difference between the revenue received for a product or service and its non-labor input costs. It is also understood as the difference between the value of sale and the cost of its required non-labor inputs.

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