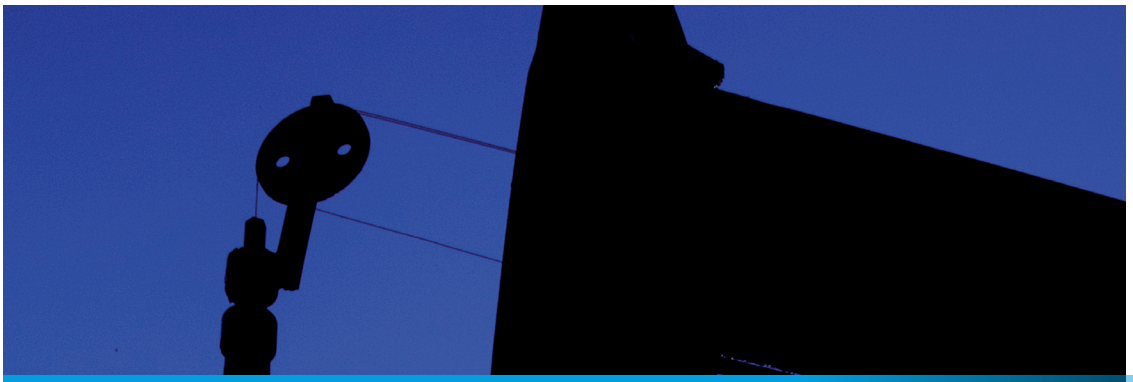

An IHS Report

December 2012

America's New Energy Future:

The Unconventional Oil and Gas Revolution and the US Economy

Volume 2: State Economic Contributions

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We would also like to thank the additional subject matter experts, technical experts, industry experts and analysts who have contributed to this study: Stephen Adams, Dan Bendig, Jerry Eumont, Yanni He, Daniel Lichtenstein, Maria Kulikova, Walter Moody, Rajeevee Panditharatna, Elizabeth Redman, and Pete Stark.

This report offers an independent assessment of the importance of unconventional oil and gas to the US economy. This research was supported by the American Petroleum Institute, the Institute for 21st Century Energy, the American Chemistry Council, America's Natural Gas Alliance, and the Natural Gas Supply Association. IHS is exclusively responsible for this report and all of the analysis and content contained herein. The analysis and metrics developed during the course of this research represent the independent views of IHS and are intended to contribute to the state-level dialogue on the role of unconventional oil and gas production in promoting employment, economic growth, and energy security.

Executive Summary

IHS's October 2012 report, *America's New Energy Future: The Unconventional Oil and Gas Revolution and the US Economy*, highlighted the significant economic contributions that unconventional oil and gas are making today and will continue to make well into the future. More than $5.1 trillion in capital expenditures made between 2012 and 2035 for unconventional oil and natural gas activity will drive state economies. The study's findings demonstrate that:

- In 2012, capital expenditures will surpass $87 billion. These expenditures supporting the growth of unconventional oil and gas activity will reach $172.5 billion in 2020 and more than $353 billion in 2035.
- Over 1.7 million jobs are attributable to unconventional oil and gas development today. These employment contributions are expected to rise to 3 million by the end of the decade and to 3.5 million jobs by 2035. On average, direct employment will represent about 20% of all the jobs resulting from unconventional oil and natural gas activity, with the balance contributed by indirect and induced employment.
- In 2012, unconventional oil and natural gas activity will contribute over $63 billion in federal, state and local tax receipts. In 2020, total government revenues will grow to nearly $113 billion. On a cumulative basis, unconventional oil and natural gas activity between 2012 and 2035 will generate more than $2.5 trillion in tax revenues.[1]
- In 2012, unconventional oil and gas will contribute almost $238 billion in value added to the US economy. This contribution to gross domestic product (GDP) will increase more than 75% by 2020 to over $416 billion. By the final year of the forecast period, 2035, this will increase to nearly $475 billion.

The IHS study of state economic contributions focuses on 20 identified unconventional oil and gas plays, plus emerging plays, across the lower 48 US states and assesses the economic contributions for each individual state. Other petroleum and natural gas formations exist; however, they were not evaluated in this report. If other formations are identified and developed in the future, employment, value added, and government revenue may be higher, especially in the latter years of the forecast.

Two types of plays are considered in this report: unconventional natural gas extracted from shale formations and from tight sands and unconventional oil extracted from shale and other dense rocks. These are referred to collectively throughout this report as "unconventional oil and gas."

Our analysis indicates that both oil and gas producing and non-producing states alike are reaping the benefits of the unconventional oil and gas revolution. Some states benefit through firms that participate in upstream exploration and production, while other states benefit through firms that comprise the vast supply chain supporting unconventional oil and gas development, or both. States also benefit from the interstate trade that occurs as the unconventional oil and gas income effect flows through the economy.

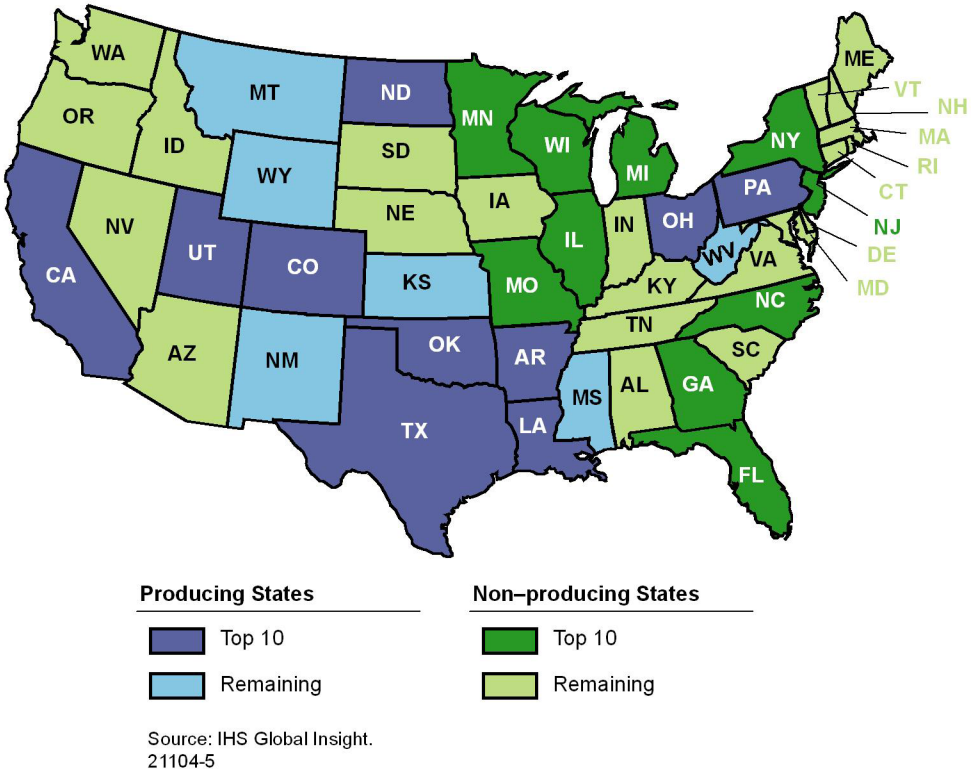
Many of the state-level impacts are clear among the producing states, which currently generate over 1.2 million jobs. Texas and Oklahoma, with a combined total of over 650,000 jobs in 2012 linked to unconventional activity, have long histories of oil and gas production and are home to many firms whose expertise and technology are helping lead this new era of oil and gas development. States such as Pennsylvania, North Dakota and Ohio, with a combined 180,000 jobs linked to unconventional oil and gas activity, have entered the unconventional arena. In North Dakota and Pennsylvania, this activity has become a major force in their economies, and Ohio is on the brink of such development. Additionally,

[1] Government revenue estimates differ from Volume 1: National Economic Contributions report due to the addition of federal bonus, state royalty, and state bonus payments.

many other producing states possess unconventional oil and gas resources that have supported regional economic expansions over the past five years even as the national economy overall was struggling.

Less well-known are the economic benefits that accrue to non-producing states that lack oil and gas resources but nonetheless host firms that sell goods and services that are critical to the lengthy supply chain supporting unconventional oil and gas development. Among non-producing states, fabricated metal manufacturing in Illinois, software and information technology in Massachusetts, and financial services and insurance in Connecticut are examples of central players in the US unconventional oil and gas supply chain.

Employment Contribution of Unconventional Oil and Gas Is Far Reaching
(Based on 2012 employment)



Source: IHS Global Insight.
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Unconventional Oil and Gas *Producing* States: Top 10 Employment Contributions*

(Number of workers)

	2012	2020	2035
Texas	576,084	929,482	733,179
Pennsylvania	102,668	220,635	387,360
California	96,553	153,658	187,270
Louisiana	78,968	97,418	150,903
Colorado	77,622	121,398	175,363
North Dakota	71,824	114,240	57,267
Oklahoma	65,325	149,617	225,387
Utah	54,421	51,859	67,052
Ohio	38,830	143,595	266,624
Arkansas	33,100	52,539	56,418
Top 10 Total	**1,195,396**	**2,034,442**	**2,306,822**
Producing Total	**1,274,486**	**2,168,612**	**2,543,203**
US Total	**1,748,630**	**2,985,176**	**3,498,694**

NOTES: *The rank for all years is based on the 2012 ranking.

Source: IHS Global Insight

Unconventional Oil and Gas *Non-Producing* States: Top 10 Employment Contributions*

(Number of workers)

	2012	2020	2035
New York	44,429	74,007	78,645
Illinois	38,652	66,604	82,817
Michigan	37,848	64,551	78,632
Missouri	37,716	64,228	70,794
Florida	36,532	65,063	79,499
Wisconsin	19,760	33,112	35,976
New Jersey	19,753	34,455	40,537
Minnesota	19,103	34,815	42,691
North Carolina	18,665	32,477	37,439
Georgia	18,505	32,458	38,771
Top 10 Total	**290,963**	**501,771**	**585,801**
Non-Producing Total	**474,144**	**816,563**	**955,491**
US Total	**1,748,630**	**2,985,176**	**3,498,694**

NOTES: *The rank for all years is based on the 2012 ranking.

Source: IHS Global Insight

The following are highlights of this study's findings. The findings detail the economic contributions to individual states in terms of jobs, their contributions to gross state product (GSP), also known as value-added, and the tax revenues paid to federal, state and local governments as a result of unconventional oil and gas activity:

- Among the producing states in 2012, the 10 states with the largest employment gains from unconventional oil and natural gas activity contributed a combined total of nearly 1.2 million jobs, a figure that is projected to exceed 2.3 million in 2035. Among the non-producing states, those with the top 10 employment gains contributed a total of over 290,000 jobs in 2012, and that is expected to increase to over 585,000 by 2035.
- Cumulative government revenues from unconventional oil and natural gas activity will exceed $2.5 trillion between 2012 and 2035. Approximately 82% of these revenues are generated from activities in producing states, with the remaining 18% coming from non-producing states. Within producing states, 75% of all tax revenues, or $1.9 trillion, is contributed by the 10 largest revenue-contributing states.
- Over $188 billion was added to the GSP of producing states from unconventional oil and gas activity in 2012, while non-producing states added more than $49 billion. By 2035, unconventional oil and gas will add almost $475 billion dollars to the economies of the lower 48 US states.

These findings demonstrate the extensive national effects of unconventional oil and gas development, which extend to nearly every lower 48 state economy. Many producing and non-producing states alike are organizing their economic development and infrastructure-investment strategies to further capitalize on the economic benefits they derive from the unconventional oil and gas revolution. The economic activity that begins in the upstream sector is also creating new opportunities downstream, such as in the petrochemical industry.

In summary, the economic gains from the development of unconventional oil and natural gas are felt not only in the states in which these resources are produced but also in other states that benefit from

the oil and gas supply chains that extends across the lower 48 states. This supply chain provides critical products and services and accounts for a substantial share of jobs, economic growth and tax receipts resulting from unconventional oil and gas activity. Firms in this supply chain include suppliers of construction materials, fabricated metals, off-highway machinery, financial, administrative, and professional services.

Key Definitions

Producing vs. Non-producing Definitions

Producing states are defined as those that are part of the 20 largest unconventional oil and natural gas producing plays in the US Lower 48, such as the Bakken and Marcellus Shale plays. Producing states also include those states that are part of an emerging oil or natural gas play that is expected to have sizeable unconventional oil and/or natural gas production in the forecast horizon. The 16 producing states are Arkansas, California, Colorado, Kansas, Louisiana, Mississippi, Montana, New Mexico, North Dakota, Ohio, Oklahoma, Pennsylvania, Texas, Utah, West Virginia, and Wyoming.

Non-producing states are not part of the 20 largest unconventional oil and natural gas producing plays in the US Lower 48 and are not part of an emerging oil or natural gas play in the 2012 to 2035 forecast horizon. These states may be part of plays that are currently producing oil and/or natural gas, but nevertheless are classified as non-producing states because current production is relatively small and the prospect for future unconventional production is unknown. The 32 non-producing states are Alabama, Arizona, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, Nevada, New Hampshire, New Jersey, New York, North Carolina, Oregon, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, Washington and Wisconsin. Some of these may over time move into the producing states category.

It is also important to note that the current policies of state governments toward unconventional oil and natural gas production are assumed to continue through the forecast horizon. For example, the current policy against unconventional oil and natural gas production in the state of New York is assumed to continue; as a consequence New York is considered a non-producing state in this study. It is recognized, however, that this could change at some point.

Finally, states like California, which is anticipated to have unconventional oil production from the emerging Monterey Formation but has no current production, may make major economic contributions. While significant unconventional oil production in California is not expected to begin until late in the forecast period, the large volume of its goods and services that feed into the unconventional oil and natural gas supply chain make California one of the largest producing states in terms of employment, government revenues and value-added.

Activity Type Definitions

Unconventional natural gas activity represents the production of gas and liquids recovered from shale gas and tight gas plays.

Unconventional oil activity represents the production of oil and associated gas recovered from tight oil plays.

Total Unconventional activity represents the sum of unconventional gas activity and unconventional oil activity.

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Introduction

The second phase of IHS's three-volume examination of the role of unconventional oil and gas in the US economy focuses on the contributions by the lower 48 states. The first volume detailed the effects of unconventional oil and gas development on the national economy, and the third volume will focus on how abundant domestic energy supplies could contribute to a US manufacturing rebound and even a renaissance. As new energy resources transform America's energy economy, this study provides a state-by-state breakdown of the economic contributions of unconventional oil and gas. This study illustrates not only the jobs and revenues associated with upstream development but also provides a view of how state policies and priorities are being shaped to optimize the economic opportunity associated with unconventional oil and gas.

Much like the national economy, most state economies have registered only tepid economic growth in the most recent phase of the recovery. Unemployment remains high in many states, and government revenues continue a languid return to pre-Great Recession levels. However, unlike the federal government, most states are bound by balanced budget requirements and cannot deficit spend their way out of a poor economy. More than three years into the economic recovery, 25 states are still forecasting fiscal year 2013 general fund spending below pre-recession levels in fiscal year 2008. In other words, half of all the states have not yet restored their fiscal spending levels of half a decade ago.

Yet, in many unconventional oil and gas producing states, strong employment and revenues are creating more demand for workers and goods and services in the local communities where exploration and production firms operate, and are generating new government revenues for the states. Study findings indicate that Texas and Pennsylvania are the leaders in employment linked to unconventional oil and natural gas activity, followed by California, Louisiana, Colorado and North Dakota.

This report identifies the direct, indirect and induced economic contributions of unconventional oil and gas activity. Direct contributions result from production in the unconventional oil and gas sector itself. Indirect contributions result from the direct sector's effect on demand within the broader supply chain of firms supporting that unconventional activity. Induced effects result when employees in the unconventional oil and gas sector and supply chain spend their incomes on consumer goods, ranging from food and clothing to medical services.

Direct industries include drilling, extraction, equipment and services utilized on the production site. In this study, we have employed an enhanced definition of direct economic contribution, because the oil and gas industry is extremely capital intensive and requires ongoing spending on capital goods and construction. This translates to gains in the manufacturing and construction industries. Since portions of the selected manufacturing sectors are solely related to unconventional oil and gas development, they are also regarded as direct, making them part of a more comprehensive definition of direct economic contribution. Our methodology also captures the flow of capital goods from non-producing states; therefore, the direct contributions are recognized in those states.

The following table lists industries that benefit from the direct, indirect, or induced effects of unconventional oil and gas activity in the 16 producing states. Producing states are defined as those that contain one of the 20 identified unconventional oil and gas producing plays or have an emerging oil or natural gas play that is expected to have sizeable oil and/or natural gas production at some point during the 2012 through 2035 forecast period. The industries that benefit from unconventional oil and gas development also vary by type of impact—direct, indirect or induced.

Selected Major Industries Benefiting from Unconventional Oil and Gas Activity in Producing States		
Direct	**Indirect**	**Induced**
Construction	Administrative & Support Services	Administrative & Support Services
Fabricated Metal Product Manufacturing	Construction	Amusement, Gambling, & Recreation Industries
Machinery Manufacturing	Fabricated Metal Product Manufacturing	Educational Services
Mining (except Oil & Gas)	Financial and Insurance Services	Food & Beverage Stores
Oil and Gas Extraction	Management of Companies & Enterprises	Food Services & Drinking Places
Primary Metal Manufacturing	Monetary Authorities, Central Bank	General Merchandise Stores
Professional, Scientific, & Technical Services	Professional, Scientific, & Technical Services	Hospitals
Support Activities for Mining	Real Estate	Professional, Scientific, & Technical Services
Truck Transportation	Truck Transportation	Real Estate
Utilities	Wholesalers	Wholesalers

For non-producing states, the significant capital expenditures required for upstream oil and gas development are having an appreciable effect on the demand for capital goods, such as construction machinery typically manufactured in the upper Midwest states, such as Illinois and Michigan, and non-capital goods, such as financial and insurance services from New York. These effects make these states the leaders among all non-producing states for job growth and value-added economic contributions.

The following table lists the industries that benefit from the direct, indirect and induced effects of unconventional oil and gas activity in the 32 non-producing states, which do not have one of the 20 largest plays or an emerging play during the 2012 to 2035 forecast horizon. These states may be part of plays that are currently producing oil and/or natural gas, but nevertheless are defined as a non-producing state because their current production is relatively small and the prospect for future production is unknown.

Selected Major Industries Benefiting from Unconventional Oil and Gas Activity in Non-Producing States		
Direct	**Indirect**	**Induced**
Chemical Manufacturing	Administrative & Support Services	Accommodation
Computer & Electronic Product Manufacturing	Construction	Administrative & Support Services
Fabricated Metal Product Manufacturing	Fabricated Metal Product Manufacturing	Educational Services
Machinery Manufacturing	Financial and Insurance Services	Food Services & Drinking Places
Mining (except Oil & Gas)	Machinery Manufacturing	General Merchandise Stores
Nonmetallic Mineral Product Manufacturing	Management of Companies & Enterprises	Hospitals
Primary Metal Manufacturing	Primary Metal Manufacturing	Nursing & Residential Care Facilities
	Professional, Scientific, & Technical Services	Professional, Scientific, & Technical Services
	Real Estate	Real Estate
	Wholesalers	Wholesalers

In some states, the enhanced economic activity resulting from unconventional oil and gas development is helping to ease the budget constraints that have been a harsh fiscal reality in recent years. By the end of 2012, New York and Oklahoma will join four other states—North Dakota, Alaska, Texas, and Louisiana—that have already returned to their pre-recession employment levels, and this is attributable in part to unconventional oil and gas activity. IHS forecasts that another seven states will move from recovery to expansion in 2013. However, most states will be unable to close these employment gaps until 2014, a testament to the depth of the recession and the sluggish pace of recovery. Expanding revenues related to unconventional oil and gas activity in producing states such as North Dakota and Pennsylvania are, among other uses, being allocated to address community impacts in public safety, public education and to underwrite critical infrastructure requirements, such as the roads and water treatment that will support future upstream activity.

In addition to physical infrastructure such as roads, state investments in soft infrastructure such as workforce development and training are needed to support communities experiencing a surge of unconventional oil and gas activity. Unconventional activity is occurring in more remote areas of the country, such as the Appalachian region, that often lack the resident skilled labor pool to fully support unconventional oil and gas development. To overcome skilled-worker shortages, states like Pennsylvania and Ohio are leveraging their publicly funded community college systems to promote training and skills development for high demand occupations on the well pad, such as advanced welding.

Key State Level Findings

- In 2012 in the producing states, the 10 states that generated the most employment through unconventional oil and natural gas activity contributed a combined total of nearly 1.2 million jobs, and that figure is projected to exceed 2.3 million in 2035. In the non-producing states, the top 10, again ranked by employment, contribute over 290,000 jobs currently and are expected to increase to over 585,000 jobs by 2035.
- Cumulative government revenues from unconventional oil and natural gas activity will exceed $2.5 trillion during the period from 2012 through 2035. Among the producing states, the 10 that provide the most tax revenues will contribute about 75% of that total, or nearly $1.9 trillion. Roughly 18% of all tax revenues will be generated from activities in all of non-producing states.
- Over $188 billion was added to the GSP of producing states from unconventional oil and gas activity in 2012, while non-producing states added more than $49 billion. By 2035, unconventional oil and gas will add almost $475 billion to the economies of the lower 48 states.

National Economic Contributions

To further explain the considerable economic impacts of unconventional oil and gas activity on the lower 48 states, it is important to place state-level results in the context of the national-level findings estimated in Volume 1 of this series.

The exploration and production industry is driving the significant investment that is enabling the unconventional revolution. Since the majority of the technology, tools, and know-how are homegrown, an overwhelming majority of every dollar spent throughout the supply chain remains in the United States. Enhanced domestic production requires extensive supply chains spread across many states, including states that do not directly produce unconventional oil and gas.

Below, we present the contribution from the unconventional revolution in terms of jobs, economic value added, and government revenues in the lower 48 states.

- In 2012, the employment contributed by unconventional oil and gas activity is estimated to surpass 1.7 million US jobs and is on a path to nearly 3.5 million jobs by 2035.
- In 2012, the annual contribution to GDP of unconventional oil and gas activity is estimated to reach nearly $238 billion and, by 2035, is expected to nearly double to $475 billion.
- In 2012, government revenues provided by unconventional oil and gas activity are projected to reach over $63 billion and will continue to increase, registering $125 billion in 2035. During the entire 23-year projected horizon of this study, this activity is expected to generate over $2.5 trillion in total government revenues.

Report Structure

This state-level report, Volume 2 in this series, has three sections.

- **Methodology and Approach** contains an overview of the methodology and modeling approach related to the assumed future production profile and capital expenditure outlook for unconventional oil and natural gas. The production profile and capital expenditure outlook are the foundation for the economic contribution analysis. A more detailed description of the methodology is presented in Appendix A of this report.
- The **Lower 48 State Economic Contribution Assessment** provides details for the key producing and non-producing states within the context of state economic conditions, including a detailed rank ordering, by state, for key indicators of their economic contributions.
- The **Conclusion** provides the key conclusions of the state analysis.

There are two types of appendices. First, we include an appendix that provides readers with a deeper understanding of the methodologies, research and data utilized in our analysis. Second, we present several appendices with more detailed results of our analysis, such as state-by-state breakdowns of economic contributions. The appendices are available at www.ihs.com/unconventionalsandthestateeconomies.

Key Definitions

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Vermont, Virginia, Washington and Wisconsin. Some of these may over time move into the producing states category.

It is also important to note that the current policies of state governments toward unconventional oil and natural gas production are assumed to continue through the forecast horizon. For example, the current policy against unconventional oil and natural gas production in the state of New York is assumed to continue; as a consequence New York is considered a non-producing state in this study. It is recognized, however, that this could change at some point.

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Methodology and Approach

Energy

IHS CERA's outlook for unconventional oil and gas in the lower 48 states includes production from 20 established unconventional oil and gas plays and from additional emerging unconventional oil and gas plays nationwide: 10 shale plays, 5 tight sands gas plays and 8 tight oil plays. These are listed below:

Unconventional Plays	Play Type	Geographic Extent of the Play*
Eagle Ford Shale Wet Gas	Shale Gas	Texas
Marcellus Shale	Shale Gas	Ohio, Pennsylvania, West Virginia
Haynesville Shale	Shale Gas	Texas, Louisiana
Fayetteville Shale	Shale Gas	Arkansas
Barnett Shale	Shale Gas	Texas
Eagle Ford Shale Dry Gas	Shale Gas	Texas
Utica Shale (Gas)	Shale Gas	Ohio, Pennsylvania, West Virginia
Niobrara	Shale Gas	Colorado, Wyoming
Woodford Shale	Shale Gas	Oklahoma
Emerging Gas Plays	Shale Gas	Texas, Oklahoma, Louisiana, New Mexico, Arkansas, Utah, Colorado, Wyoming, Ohio, Pennsylvania, West Virginia, Mississippi
Emerging Gas Plays	Tight Gas	Texas, Oklahoma, Louisiana, New Mexico, Arkansas, Utah, Colorado, Wyoming, Ohio, Pennsylvania, West Virginia, Mississippi
Cotton Valley	Tight Gas	Texas, Louisiana
Granite Wash-Colony Wash	Tight Gas	Texas, Oklahoma
Jonah-Pinedale	Tight Gas	Wyoming
Uinta-Piceance	Tight Gas	Utah, Colorado
Bakken	Tight Oil	North Dakota, Montana
Delaware Basin - Bone Spring	Tight Oil	Texas, New Mexico
Midland Basin - Spraberry-Wolfcamp	Tight Oil	Texas
Mississippian	Tight Oil	Oklahoma, Kansas
Cleveland-Tonkawa-Marmaton	Tight Oil	Texas, Oklahoma
Emerging Oil Plays	Tight Oil	Texas, Oklahoma, Louisiana, New Mexico, Arkansas, Utah, Colorado, Wyoming, Ohio, Mississippi, California
Eagle Ford Oil and Volatile Oil	Tight Oil	Texas
Utica (Oil)	Tight Oil	Ohio

*The list of unconventional plays provides the state location or locations of the play production considered for this study. States containing part of a play but no ongoing extraction takes place in those states at present are not included in this table. This study also assumes that no production is forthcoming from New York.

Source: IHS CERA

The assessments of geological potential take into consideration both oil and gas reserves and development activity. Projections of geological potential are based on trends in initial production rates, decline rates, and reserve amounts associated with new completions. Other petroleum and natural gas formations exist; however, they were not evaluated in this report. If other formations are identified and developed in the future, employment, value added and government revenue may be higher, especially in

the later years of the forecast. Finally, this forecast also assumes current technology. Future advances in drilling/completion technologies and down-spacing could extend or increase production and investment in the latter part of the forecast, further increasing their economic contributions.

Estimates generated by IHS CERA on each state's capital expenditures and production provide the foundation for the economic contribution assessment developed by IHS Global Insight. We have aggregated the underlying capital expenditures and production data to the Census divisions for display in this report.[2]

US Census Division Annual Capital Expenditures: Unconventional Oil and Gas Activity

(Current $M)

	2012	2015	2020	2025	2030	2035
New England	11	25	46	75	133	217
Middle Atlantic	4,115	7,205	11,010	16,394	25,426	38,263
East North Central	4,908	9,677	16,411	24,269	35,376	48,879
West North Central	8,630	13,880	18,400	23,843	26,396	27,982
South Atlantic	975	1,779	2,852	4,362	6,925	10,519
East South Central	65	103	160	497	1,280	2,556
West South Central	54,312	74,405	102,126	131,339	148,994	168,144
Mountain	11,314	15,209	16,902	20,876	31,586	45,940
Pacific	2,971	4,006	4,634	6,012	8,037	10,577
US Total	**87,301**	**126,288**	**172,542**	**227,667**	**284,154**	**353,076**

Source: IHS Global Insight

US Census Division Annual Production: Unconventional Oil

(mbd)

	2012	2015	2020	2025	2030	2035
New England	0.00	0.00	0.00	0.00	0.00	0.00
Middle Atlantic	0.00	0.01	0.02	0.03	0.04	0.07
East North Central	0.01	0.10	0.25	0.35	0.45	0.54
West North Central	0.62	1.04	1.23	1.23	1.03	0.80
South Atlantic	0.00	0.00	0.01	0.01	0.02	0.03
East South Central	0.00	0.00	0.00	0.01	0.03	0.05
West South Central	1.06	1.84	2.33	2.23	2.06	1.93
Mountain	0.37	0.51	0.60	0.67	0.83	1.02
Pacific	0.00	0.00	0.00	0.01	0.04	0.06
US Total	**2.07**	**3.50**	**4.43**	**4.53**	**4.49**	**4.50**

NOTE: Numbers may not sum due to rounding.

Source: IHS Global Insight

[2] https://www.census.gov/geo/www/us_regdiv.pdf

US Census Division Annual Production: Unconventional Gas (bcf per day)	2012	2015	2020	2025	2030	2035
New England	0.00	0.00	0.00	0.00	0.00	0.00
Middle Atlantic	3.82	5.95	9.01	11.76	14.87	18.70
East North Central	0.08	0.52	1.97	3.38	5.13	6.81
West North Central	0.46	0.92	1.28	1.40	1.34	1.20
South Atlantic	1.05	1.65	2.58	3.43	4.42	5.64
East South Central	0.00	0.00	0.00	0.01	0.08	0.28
West South Central	25.20	29.56	38.94	45.69	43.46	41.68
Mountain	5.51	5.66	5.76	3.93	3.70	5.69
Pacific	0.00	0.00	0.00	0.01	0.04	0.08
US Total	**36.12**	**44.27**	**59.53**	**69.61**	**73.06**	**80.05**

Source: IHS Global Insight

Economic Contribution Assessment

The model framework used here was established as a system of linked state economies. As a result, the sourcing of inputs for the development of unconventional oil and gas activity will impact states that do not have an unconventional oil or gas play within their borders. For example, the development of unconventional gas wells in Arkansas relies on bank, financial and insurance services in New York and professional services primarily in Texas. Capturing these connections highlights the indirect economic contribution even in states that lack unconventional oil and gas plays. The leakages out from the originating states will also refine the size of GDP and employment multipliers, making them more accurate for states that do have unconventional oil or gas plays.

In addition, while the value created by oil and gas production is attributed only to states with unconventional oil and/or gas plays, the allocation of capital expenditures among the 48 producing and non-producing states is more involved. Capital expenditures act as direct impacts at both the state and industry levels. This requires a complex analysis because a portion of that spending may be allocated to states—including non-producing states—that do not have unconventional oil or gas plays. This spending will trigger direct, indirect and induced impacts in states that provide goods and services for capital expenditure purposes. To ensure that these effects are included in the economic analysis, IHS Global Insight used industry input, IHS Global Insight's own expertise and proprietary databases, and extensive additional research to arrive at the best possible methodology for allocating capital expenditures among different states.

The research, expertise and input from industry sources were integrated with IHS's interstate trade-flow data set and with IHS Global Insight's Business Market Insight databases to determine the sources of various products and services by state. For example, it is evident that unconventional gas extraction using hydraulic fracturing requires special sand produced primarily in Wisconsin, Minnesota, Ohio, and Arkansas. Since not all states with unconventional oil or gas plays produce these unusual sands, they must import them from the other states and are assumed to do so in the model. IHS's trade-flow database was one of many sources used to determine the origin and destination of the various materials and equipment on a state level basis.

This process was undertaken for all the detailed capital expenditure categories (defined as various products and services) in the 16 states with current and future drilling in unconventional oil and gas plays. We identified 27 non-producing states that will be directly impacted because they are the source

of capital goods purchases. The set of products and services, and—in a producing state—the value of production, were input into 43 (27 non-producing and 16 producing) of the lower 48 states, with each relevant IMPLAN state model applied in assessing the contribution to an individual state's economy. The remaining five states experience only indirect, supply chain effects and corresponding induced effects as determined by the multi-regional analysis capability of the IMPLAN model. The net result is an assessment of the economic contributions accruing to the 16 producing and 32 non-producing states.

Lower 48 State Economic Contribution Assessment

The analysis of unconventional oil and gas development and its contribution to the US regional economies was conducted using a top-down/bottom-up approach. The contribution was assessed separately for direct, indirect, and induced contributions defined as follow:

- **Direct** contributions of unconventional oil and gas are those activities required to explore, produce, transport, and deliver products to downstream elements or activities that provide critical on-site equipment and services.
- **Indirect** contributions are activities in outside industries that supply materials and services to the developers of unconventional oil and gas and to their tier of suppliers.
- **Induced** contributions are the economic effects from workers spending their wages and salaries on consumer goods and household items.

Although this IHS study was performed on a state-by-state basis, we had to account for labor migration across states. It is widely acknowledged that the existing labor pool in states such as North Dakota and Pennsylvania do not have enough individuals with the skills and occupational expertise required for unconventional oil and gas development. In fact, these emerging states have seen considerable labor migration from Texas, Oklahoma, Louisiana, and other states. Our methodology and model have accounted for this in-migration through a framework that has unconventional activity in emerging states initially relying heavily on the in-migration of labor, which eventually subsides over the forecast period as the states develop the resident expertise to support the industry.

Unconventional Oil and Gas Producing and Non-Producing States

Producing States	Non-Producing States
Arkansas	Alabama
California	Arizona
Colorado	Connecticut
Kansas	Delaware
Louisiana	Florida
Mississippi	Georgia
Montana	Idaho
New Mexico	Illinois
North Dakota	Indiana
Ohio	Iowa
Oklahoma	Kentucky
Pennsylvania	Maine
Texas	Maryland
Utah	Massachusetts
West Virginia	Michigan
Wyoming	Minnesota
	Missouri
	Nebraska
	Nevada
	New Hampshire
	New Jersey
	New York
	North Carolina
	Oregon
	Rhode Island
	South Carolina
	South Dakota
	Tennessee
	Vermont
	Virginia
	Washington
	Wisconsin

Source: IHS Global Insight

To summarize the findings across the lower 48 states, the results are presented in two distinct groups. First are the 16 so-called producing states. Second are the non-producing states, of which there are 32 in the lower 48 states.

Employment Contribution of Unconventional Oil and Gas in Producing vs. Non-Producing States: 2020

(Number of workers)

	Producing States	Non-Producing States	All States
Direct	547,508	52,912	600,419
Indirect	662,399	253,405	915,804
Induced	958,706	510,246	1,468,953
Total	**2,168,612**	**816,563**	**2,985,176**

Source: IHS Global Insight

Producing vs. Non-Producing States

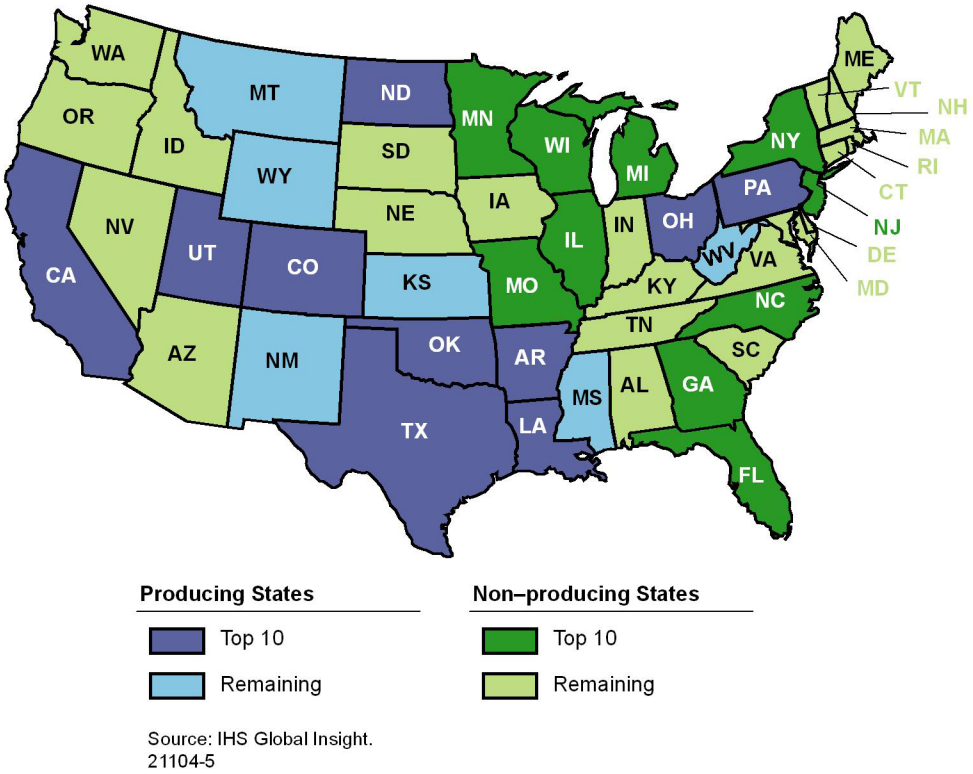
This study was performed on a state-by-state basis, and the results are presented in their entirety in the appendices. However, to summarize the findings across the lower 48 states, the results are presented in two distinct groups. First are the top 10 in terms of economic contributions for the producing states, where unconventional oil and gas activity is occurring in active and emerging plays. Second are the top 10 in terms of economic contributions for the non-producing states.

The common characteristic of non-producing states is that they are not part of the 20 largest unconventional oil and natural gas producing plays and are not part of emerging oil or natural gas plays in the 2012 through 2035 forecast horizon. These states may be part of plays that are currently producing oil and/or natural gas, but nevertheless are included as a non-producing state because current production is relatively small and the prospect for future unconventional production is unknown. It is important to note that this does not mean these states lack the potential for resource development. Rather, based on currently available information, we assume there will be no significant unconventional oil and/or gas production occurring within these states during the forecast horizon. (We recognize that policy changes could occur in some states that would move them over into the producing category.) However, these non-producing states are expected to greatly benefit from unconventional oil and/or gas development in the future through a complex network of supply chains, trade flows among producing states, and the income effects of earnings spent by workers benefitting directly or indirectly from unconventional oil and/or gas production.

Direct activity in the producing states includes new well drilling and completion, unconventional oil and gas production, and spending on capital equipment and commodities. Many of these states have built strong support industries that participate in the unconventional oil and gas supply chain. The economic contribution from direct and indirect activity associated with unconventional oil and gas production is further amplified through incomes that will fuel consumer expenditures—the induced impact.

Non-producing states will contribute in two ways: 1) through their contributions in the lengthy supply chain that supports unconventional oil and gas activity; and 2) through their direct contributions to well-site capital expenditures within unconventional oil and gas activity. While most of the capital spending is undertaken in the producing states, some capital spending will be accounted for in non-producing states as a result of competitive cost advantages. This will cause spending to leak out to the non-producing states (this concept is further presented in the appendices).

Employment Contribution of Unconventional Oil and Gas Is Far Reaching
(Based on 2012 employment)



Source: IHS Global Insight.
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The following findings for the economic gains generated by increased unconventional oil and gas production in the United States will be presented in terms of their contributions to employment, gross state product (value added), and federal, state and local government revenues (including royalties, bonuses and lease payments). For each category of economic contribution, the report will break out and compare gains between the producing and non-producing states. State-by-state details supporting these aggregate data can be found in the appendices.

Employment Composition Varies in Producing and Non-Producing States

In the producing states, a greater proportion of the total jobs generated are found in direct production or key industries that support unconventional oil and gas activity. In Pennsylvania, for instance, direct unconventional gas employment represents about 25% of all state employment associated with unconventional gas activity. In non-producing states, more employment is generated in supplier networks that support the unconventional activity. In New York, for example, 68% of employment related to unconventional oil and gas activity is in the service sector, including financial, health, and other related services.

Jobs: Over 816,000 by 2020 in Non-Producing States Alone

The majority of US economic activity generated by the unconventional oil and gas industry will take place in the 16 states directly involved in production. In 2012, the 10 producing states that generate the most jobs from unconventional activity are responsible for creating nearly 1.2 million jobs. We forecast these top 10 adding nearly 900,000 additional jobs between 2012 and 2020, growing to over 2 million total jobs. The producing states of Texas, Pennsylvania and California will lead the top 10 in job creation through 2020. By 2035, Ohio and Oklahoma will join the top five states, ranked by employment, behind

Texas and Pennsylvania and will move ahead of California. Total employment gains in all of the non-producing states will also be significant, reaching more than 816,000 jobs in 2020. New York and Illinois will lead the top 10 in job creation among non-producing states throughout the forecast horizon.

There are two avenues for job creation in non-producing states. First, purchases of capital goods for use in producing states are made in the other states. Second, expenditures made in producing states will result in cross-state contributions (leakages) from direct and supply chain industries, which require inputs from other states. These cross-state contributions will include purchases of services, such as the financial and insurance service sectors which propell New York to the top of the list of non-producing states. For example, in 2012 and 2020, respectively, more than 17,000 and 28,000 jobs are contributed by the financial, insurance and other related services sectors as a result of unconventional oil and gas activity, representing 40% of New York's total employment contributions in each of the two years. However, it is possible to isolate the contribution within a state. Appendix C presents state results netting out these cross-state contributions.

Employment Contribution of Unconventional Oil and Gas in Producing vs. Non-Producing States

(Number of Workers)

	2012	2020	2035
Producing States	1,274,486	2,168,612	2,543,203
Non-Producing States	474,144	816,563	955,491
US Total	**1,748,630**	**2,985,176**	**3,498,694**

Source: IHS Global Insight

Unconventional Oil and Gas Producing States: Top 10 Employment Contributions*

(Number of workers)

	2012	2020	2035
Texas	576,084	929,482	733,179
Pennsylvania	102,668	220,635	387,360
California	96,553	153,658	187,270
Louisiana	78,968	97,418	150,903
Colorado	77,622	121,398	175,363
North Dakota	71,824	114,240	57,267
Oklahoma	65,325	149,617	225,387
Utah	54,421	51,859	67,052
Ohio	38,830	143,595	266,624
Arkansas	33,100	52,539	56,418
Top 10 Total	**1,195,396**	**2,034,442**	**2,306,822**
Producing Total	**1,274,486**	**2,168,612**	**2,543,203**
US Total	**1,748,630**	**2,985,176**	**3,498,694**

NOTES: *The rank for all years is based on the 2012 ranking.

Source: IHS Global Insight

Unconventional Oil and Gas *Non-Producing* States: Top 10 Employment Contributions*

(Number of workers)

	2012	2020	2035
New York	44,429	74,007	78,645
Illinois	38,652	66,604	82,817
Michigan	37,848	64,551	78,632
Missouri	37,716	64,228	70,794
Florida	36,532	65,063	79,499
Wisconsin	19,760	33,112	35,976
New Jersey	19,753	34,455	40,537
Minnesota	19,103	34,815	42,691
North Carolina	18,665	32,477	37,439
Georgia	18,505	32,458	38,771
Top 10 Total	**290,963**	**501,771**	**585,801**
Non-Producing Total	**474,144**	**816,563**	**955,491**
US Total	**1,748,630**	**2,985,176**	**3,498,694**

NOTES: *The rank for all years are based on the 2012 ranking.

Source: IHS Global Insight

Unconventional Oil and Gas Activity Contributes To Lower Unemployment Rates in Producing States

According to IHS Global Insight's US Economic Outlook, the national unemployment rate for 2012 is estimated at 8.1%. The 10 producing states that generate the most jobs have unemployment rates ranging from 0.2 to 5.1 percentage points below the national average.

Government Revenues: Nearly $113 Billion Nationwide by 2020

In 2012, our study estimates $63 billion in annual federal, state and local government tax receipts was derived from unconventional oil and gas activity.[3] Total annual receipts will approach $113 billion by 2020 and exceed $125 billion by 2035—double 2012 levels. On a cumulative basis, between 2012 and 2035 unconventional oil and gas activity is projected to contribute over $2.5 trillion in total revenues.

The state tax revenues presented include a respective state's federal contributions through corporate and personal income taxes, as well as any federal bonuses and royalties—where activity is taking place on federal lands in any given state. Additional tax revenues include the respective state and local government's corporate and personal income taxes, royalties, bonuses, severance taxes, and ad valorem levies. Royalty and bonus payments will only be observed as revenue for states where unconventional oil and gas production activity is taking place on state-owned lands. Severance taxes and ad valorem levies are collected by state governments based on total state production, regardless of land ownership. Where private lands are in use, royalty payments are reflected through reported individual income taxes. Finally, it is important to reiterate that these taxes will vary between producing and non-producing states. In particular, non-producing states will not collect tax revenues associated

[3] Government revenue estimates differ from Volume 1: National Economic Contribution report due to the addition of federal bonus, state royalty, and state bonus payments. Tax projections were based on current tax structures and did not consider the impact in the tax structure.

with production activity—royalty payments, bonuses, severance taxes, and ad valorem levies—nor will income taxes in those states reflect the royalty and bonus payments from production on private lands.

In 2012 in the producing states, the 10 states generating the most government revenues provide 75% of total revenues from unconventional oil and gas activity.[4] These revenues derive not only from personal, corporate, federal, state, and local taxes but also from severance, ad valorem, and bonus and royalty payments, which are specific to the unconventional oil and gas industry. By 2020, these top 10 states, led by Texas, North Dakota and Oklahoma, will generate over $85 billion in revenues—or 76% of total tax receipts. By 2035, they will generate over $92 billion in taxes—or 73% of total government revenues.

While traditional energy-producing states will lead the way, the non-producing states will contribute a total of over $12 billion in 2012 tax revenues associated with unconventional oil and gas activity; that is projected to exceed $20 billion by 2020. By 2035, receipts from all of the non-producing states will reach nearly $23 billion. Among the non-producing states, the top 10 in terms of government revenues account for a significant share of the total coming from all of the non-producing states. In 2012, these 10 states contribute more than $7 billion—or over 62%—of all government revenues generated by the non-producing states. By 2020, that will increase to nearly $13 billion, or about 63% of the non-producing state total. This large increase will be due to more supply chain activities in the producing states. It must be noted that government revenues in non-producing states are comprised of personal and corporate taxes paid to federal, state and local governments. To reiterate, since there is no exploration or extraction in the non-producing states, the associated taxes exclude all oil and gas related taxes and payments by the industry.

Contribution to Government Revenue of Unconventional Oil and Gas in Producing vs. Non-Producing States

(2012 $M)

	2012	2020	2035	2012-2035*
Producing States	50,776	92,539	102,513	2,094,083
Non-Producing States	12,239	20,404	23,142	460,834
US Total	**63,015**	**112,943**	**125,655**	**2,554,917**

NOTES: *2012-2035 represents the total for all years including those years not reported.

Source: IHS Global Insight

In addition to the federal government revenues that flow from each state economy, state governments are also positioned to benefit through their own statewide tax collections. Within the producing states, $1.8 billion derives from state personal income taxes and $13.8 billion derives from state corporate taxes generated by the 10 states that bring in the most federal, state, and local government revenues from unconventional activity. For the non-producing states, the top 10 tax-revenue-generating states provide $1 billion in state personal income taxes and $2.7 billion in state corporate taxes.

[4] On February 14, 2012, the Commonwealth of Pennsylvania passed and enacted Act 13 (House Bill 1950) to enable local governments to levy an impact fee for wells drilled in the state and to strengthen environmental standards related to unconventional drilling. The fee is based on natural gas prices and the CPI, and as a result, may fluctuate from year to year. The total amount of fees collected since Act 13 became effective through October 17th, 2012 totaled $204.2 million. Since this fee is not technically regarded as a 'tax' and adoption is determined at the county or local level, it was not incorporated into our state tax calculations.

Unconventional Oil and Gas Activity: A Major Contributor to State Budgets

In 2012, Texas's education budget is projected to reach $72 billion, while healthcare spending will be approximately $55 billion. Unconventional oil and gas activity is estimated to generate state and local revenues of $10.3 billion. To put this in perspective, it is the equivalent of 14% of the education budget or about 19% of the healthcare budget.

The revenue contribution in Texas is further highlighted by the lease payments the University of Texas System receives annually. The University of Texas System's Permanent University Fund (PUF) owns oil and gas rights to approximately 2.1 million acres in the Permian Basin of West Texas—part of an original endowment when UT was founded in 1883. In the most recent PUF financial statement, contributions of PUF Lands mineral income increased by 6.6% from $895.6 million in FY2011 to $954.5 million in FY2012.

In Utah, $2.7 billion was allocated to education in 2012. In comparison, the unconventional oil and gas industry generated $1.1 billion in state and local revenues—the equivalent or 41% of its education budget.

Unconventional Oil and Gas *Producing* States: Top 10 Contributions to Government Revenue*

(2012 $M)

	2012	2020	2035	2012-2035
Texas	22,168	38,538	28,656	790,984
North Dakota	5,758	10,159	5,363	202,392
California	2,987	4,615	5,773	108,383
Pennsylvania	2,980	5,623	9,869	146,689
Colorado	2,935	4,748	7,147	121,542
Louisiana	2,553	3,070	5,181	82,685
Oklahoma	2,432	7,016	11,123	178,512
Utah	2,401	2,989	2,636	60,650
New Mexico	1,473	1,931	3,597	53,299
Ohio	1,448	6,744	12,672	177,956
Top 10 Total	**47,135**	**85,433**	**92,016**	**1,923,092**
Producing Total	**50,776**	**92,539**	**102,513**	**2,094,083**
US Total	**63,015**	**112,943**	**125,655**	**2,554,917**

NOTES: *The rank for all years is based on the 2012 ranking.

Source: IHS Global Insight

Unconventional Oil and Gas *Non-Producing* States: Top 10 Contributions to Government Revenue*

(2012 $M)

	2012	2020	2035	2012-2035
New York	1,648	2,573	2,598	56,274
Illinois	1,012	1,710	2,099	39,332
Michigan	919	1,612	1,948	37,244
Missouri	740	1,316	1,437	29,495
Florida	651	1,112	1,337	25,536
Wisconsin	590	993	1,028	22,018
New Jersey	561	975	1,196	22,443
Minnesota	526	956	1,133	21,870
Georgia	520	867	985	19,577
North Carolina	486	792	860	17,655
Top 10 Total	**7,654**	**12,906**	**14,621**	**291,444**
Non-Producing Total	**12,239**	**20,404**	**23,142**	**460,834**
US Total	**63,015**	**112,943**	**125,655**	**2,554,917**

NOTES: *The rank for all years is based on the 2012 ranking.

Source: IHS Global Insight

Unconventional Economic Development in Ohio

About a year and a half ago, many of Ohio's business and economic-development groups realized that unconventional oil and gas resources would alter the energy infrastructure in their state. Governor John Kasich and JobsOhio, an economic development organization, assembled key stakeholders to determine the best approach for linking unconventional oil and gas development to economic growth initiatives. After a series of strategy planning meetings, JobsOhio, Team NEO, NorTech, the Ohio Shale Coalition (an initiative led by the Ohio Chamber of Commerce), the Ohio Oil & Gas Association and other partners have undertaken initiatives in three major areas: 1) workforce 2) supply chain and 3) innovation.

While Ohio is still in the early stages of understanding how the Utica and Marcellus Shale plays will translate into new jobs and industry diversification opportunities there, initiatives are already under way in each of these three areas.

Workforce: Community colleges and career centers are collaborating to train Ohio's labor force to participate in the unconventional oil and gas industry and its supply chain. Through new approaches and curriculum design, educational institutions are focused on training local residents to work in oil and gas field operations so that operators do not have to hire from out of state. Additional training is being developed for truckers (commercial driver's license certification), welding, mechanical engineering, and oil field safety and orientation.

Supply Chain: Numerous workshops, hosted by chambers of commerce and economic development groups, with support from the Ohio Oil & Gas Association and the Ohio Shale Coalition, are held regularly to introduce potential suppliers to the standards, culture and operating practices of the unconventional oil and natural gas industry. These workshops detail strategies companies can use to win contracts and what developers seek in their potential suppliers, from work crews and capital equipment suppliers to security, professional and catering services. Other organizations such as NorTech and the Ohio Shale Coalition are leading efforts to equip and connect Ohio businesses with oil and gas operators and their engineering procurement construction firms. Dave Karpinski, NorTech's Vice President and Director of Energy Enterprise, says, "Whether it be equipment for pumping, filtration stations, collection systems, or separating liquids from gas, we are trying to find supply chain pressures where existing suppliers largely in and around Texas have excess demand so Ohio companies can become a part of the value chain."

Innovation: Ohio universities are working with the unconventional oil and gas industry to research relevant topics, such as new materials technologies and effective ways to ensure environmental protections and the health and safety of oil and gas workers.

Ohio's unconventional industry is still in its early days. Many firms have only recently completed land leases and now are waiting for price fluctuations to settle. Yet the industry's presence is already being felt in rural and metropolitan areas around the state. Struggling rural areas have been transformed by the lucrative land leases that many residents have obtained from oil and gas operators, and professional services firms in cities like Canton, Cleveland, and Columbus have seen a flood of new business as the oil and gas companies seek legal and accounting services.

Value Added: Over $416 Billion in US GDP by 2020

The commonly used measure of GDP, which is simply the sum of the value added across all products and services produced in the United States, is the broadest measure of the health of the US economy. Value added is the total value of workers' incomes, corporate profits, indirect business taxes paid, and depreciation. Annual value added from unconventional oil and gas activities was more than $237 billion in 2012 and, by 2020, is projected to surpass $416 billion.

In 2012, the 10 producing states providing the greatest value added contribution to GDP—nearly $178 billion—account for 75% of the total US value added from unconventional oil and gas activity nationwide. By 2020, we project these top 10 states will add another $134 billion to GDP, increasing their combined contribution to over $312 billion. By 2035, unconventional oil and gas activity nationwide will add almost $475 billion to US GDP, with 71% of that coming from the 10 producing states that generate the most economic activity.

The non-producing states account for about 21%, on average, of the total value added contribution to US GDP during the entire forecast season. While the share of labor income from the non-producing states is in line with their employment share, their contribution to GDP is smaller than that of the producing states. This is because producing states are heavily influenced by the oil and gas sector, which has high value added (mostly dedicated to non-labor income).

US Value Added Contribution of Unconventional Oil and Gas in Producing vs. Non-Producing States

(2012 $M)

	2012	2020	2035
Producing States	188,391	331,963	373,457
Non-Producing States	49,293	84,588	101,527
US Total	**237,684**	**416,551**	**474,985**

Source: IHS Global Insight

An Economic Growth Engine in Producing States

IHS Global Insight's outlook for economic growth in the producing states of Texas, North Dakota, and Utah indicates that they will outperform all other states. Between 2012 and 2015, each state's economy is expected to grow more than 3.6% annually.

In Texas and North Dakota, unconventional oil and gas activities in 2012 will represent approximately 7.4% and 15%, respectively, of the states' total economic activities. In 2012, the 10 producing states with the most economic activity from unconventional oil and gas accounted for 75% of the total value added to US GDP by the industry.

Unconventional Oil and Gas *Producing* States: Top 10 Value Added Contributions*

(2012 $M)

	2012	2020	2035
Texas	101,633	168,558	125,701
Pennsylvania	14,113	26,714	49,022
Colorado	11,647	17,605	26,675
Louisiana	10,727	12,829	19,718
California	10,455	16,647	21,631
Oklahoma	8,911	24,454	38,061
North Dakota	6,808	13,046	6,630
Utah	5,618	8,195	9,430
Ohio	4,103	17,960	35,292
Arkansas	3,818	6,409	6,876
Top 10 Total	**177,832**	**312,418**	**339,038**
Producing Total	**188,391**	**331,963**	**373,457**
US Total	**237,684**	**416,551**	**474,985**

NOTES: *The rank for all years is based on the 2012 ranking.

Source: IHS Global Insight

Unconventional Oil and Gas *Non-Producing* States: Top 10 Value Added Contributions*

(2012 $M)

	2012	2020	2035
New York	5,033	8,171	8,836
Illinois	4,228	7,315	9,434
Florida	3,669	6,346	7,814
Michigan	3,658	6,570	8,363
Missouri	3,322	6,035	6,886
New Jersey	2,353	4,184	5,430
Georgia	2,037	3,494	4,202
North Carolina	2,010	3,360	3,855
Minnesota	1,996	3,743	4,717
Virginia	1,991	3,426	4,298
Top 10 Total	**30,298**	**52,643**	**63,834**
Non-Producing Total	**50,382**	**86,974**	**105,687**
US Total	**237,684**	**416,551**	**474,985**

NOTES: *The rank for all years is based on the 2012 ranking.

Source: IHS Global Insight

Colorado: Unconventional Oil and Gas and Economic and Energy Diversification

Colorado has pursued a portfolio approach to energy strategy and has diversified by adding renewables through an aggressive renewable energy standard dating back to 2004 and recently through passage of the Clean Air, Clean Jobs Act in 2010. As a result, the state's two investor-owned utilities are in the process of converting 900 megawatts from coal-fired to gas-fired electricity over the next several years. More recently, the ability to extract tight gas and oil has opened up plays in new areas, increasing the number of oil and gas jobs statewide.

The Office of Policy and Research under Governor John Hickenlooper, a trained geologist with professional experience with hydraulic fracturing, cites the state's proximity to natural gas basins throughout the central United States, as well as low state taxes, the satellite US patent office in Denver, workforce talent, and transportation infrastructure as advantages that have attracted unconventional oil and gas operators. This is buttressed by a long history of conventional oil and gas development in the state, combined with a strong culture of environmental protection. In addition to being centrally located and supported by top-level policymakers, the state's unconventional industry benefits from partnerships with local universities and colleges engaged in scientific research and workforce training. Exxon Mobil and General Electric have worked with the Colorado School of Mines to develop a program on unconventional oil and gas regulatory practices, and the Engines and Energy Conversion Laboratory at Colorado State University is designing and testing natural gas engines.

The Colorado Energy Office seeks to drive increased demand for natural gas by increasing the use of compressed natural gas (CNG) in the state's transportation fleet. Colorado, in partnership with Oklahoma, leads a joint initiative with 21 other states to solicit bids from auto manufacturers for affordable natural gas vehicles that can be purchased for state and local fleets. Colorado also has an agreement with the Colorado Municipal League to support CNG vehicle purchases.

Further indications of the CNG industry's development include Colorado's Roaring Forks Transit Authority, which is launching the largest rural bus rapid transit system in the United States and will utilize CNG in its fleet. Additionally, Republic Services, a waste-services company, also plans to convert its truck fleet to natural gas. Subsequently, retailers have announced plans to open several new natural gas fueling stations in the Front Range in partnership with producers, local governments, and the Regional Air Quality Council.

According to the Governor's Office of Policy and Research, the state views unconventional resources as a growing industry, and one that will support the technological advancements that will expand and diversify the Colorado economy.

Overall Lower 48 State Economic Contribution Results

The tables on the following pages show the state-by-state results for employment, value added contribution to GSP and government revenues for the lower 48 states in the primary forecast years, namely 2012, 2020, and 2035.

US State-Level Employment Contribution of Unconventional Oil and Gas Summary

(Number of workers)

	2012	2020	2035
Alabama	9,064	15,512	18,615
Arizona	11,698	20,924	26,340
Arkansas	33,100	52,539	56,418
California	96,553	153,658	187,270
Colorado	77,622	121,398	175,363
Connecticut	8,262	13,392	14,119
Delaware	2,195	3,841	4,907
Florida	36,532	65,063	79,499
Georgia	18,505	32,458	38,771
Idaho	3,052	5,344	6,327
Illinois	38,652	66,604	82,817
Indiana	15,973	27,303	33,366
Iowa	8,751	14,631	18,320
Kansas	11,032	25,340	43,959
Kentucky	9,614	16,595	20,243
Louisiana	78,968	97,418	150,903
Maine	2,769	4,571	5,007
Maryland	11,749	20,059	22,241
Massachusetts	15,896	26,446	28,090
Michigan	37,848	64,551	78,632
Minnesota	19,103	34,815	42,691
Mississippi	5,082	8,887	22,441
Missouri	37,716	64,228	70,794
Montana	9,634	16,799	18,811
Nebraska	6,261	10,483	11,287
Nevada	6,295	11,270	13,867
New Hampshire	3,070	5,138	5,693
New Jersey	19,753	34,455	40,537
New Mexico	23,625	29,849	58,466
New York	44,429	74,007	78,645
North Carolina	18,665	32,477	37,439
North Dakota	71,824	114,240	57,267
Ohio	38,830	143,595	266,624
Oklahoma	65,325	149,617	225,387
Oregon	8,912	15,620	18,472
Pennsylvania	102,668	220,635	387,360
Rhode Island	2,257	3,708	3,804
South Carolina	9,131	15,905	19,032
South Dakota	2,013	3,477	3,937
Tennessee	13,516	23,310	27,702
Texas	576,084	929,482	733,179
Utah	54,421	51,859	67,052
Vermont	1,458	2,456	2,583
Virginia	18,028	31,806	38,961
Washington	13,217	23,000	26,775
West Virginia	11,884	29,656	58,244
Wisconsin	19,760	33,112	35,976
Wyoming	17,834	23,639	34,459
US Total	**1,748,630**	**2,985,176**	**3,498,694**

Source: IHS Global Insight

US State-Level Total Government Revenue Contribution of Unconventional Oil and Gas Summary

(2012 $M)

	2012	2020	2035
Alabama	279	456	540
Arizona	327	549	669
Arkansas	1,003	1,689	1,681
California	2,987	4,615	5,773
Colorado	2,935	4,748	7,147
Connecticut	246	376	375
Delaware	71	117	144
Florida	651	1,112	1,337
Georgia	520	867	985
Idaho	91	151	177
Illinois	1,012	1,710	2,099
Indiana	377	613	721
Iowa	161	264	325
Kansas	251	731	1,471
Kentucky	283	457	530
Louisiana	2,553	3,070	5,181
Maine	68	105	110
Maryland	401	641	667
Massachusetts	417	666	685
Michigan	919	1,612	1,948
Minnesota	526	956	1,133
Mississippi	167	269	1,016
Missouri	740	1,316	1,437
Montana	511	991	1,015
Nebraska	118	198	213
Nevada	139	237	281
New Hampshire	56	91	100
New Jersey	561	975	1,196
New Mexico	1,473	1,931	3,597
New York	1,648	2,573	2,598
North Carolina	486	792	860
North Dakota	5,758	10,159	5,363
Ohio	1,448	6,744	12,672
Oklahoma	2,432	7,016	11,123
Oregon	282	467	527
Pennsylvania	2,980	5,623	9,869
Rhode Island	56	87	86
South Carolina	251	410	474
South Dakota	47	75	83
Tennessee	223	372	439
Texas	22,168	38,538	28,656
Utah	2,401	2,989	2,636
Vermont	32	51	52
Virginia	446	754	898
Washington	213	361	425
West Virginia	483	1,435	3,085
Wisconsin	590	993	1,028
Wyoming	1,226	1,990	2,229
US Total	**63,015**	**112,943**	**125,655**

Source: IHS Global Insight

US State-Level Value Added Contribution of Unconventional Oil and Gas Summary (2012 $M)			
	2012	**2020**	**2035**
Alabama	950	1,610	2,017
Arizona	1,219	2,123	2,731
Arkansas	3,818	6,409	6,876
California	10,455	16,647	21,631
Colorado	11,647	17,605	26,675
Connecticut	917	1,444	1,529
Delaware	244	415	545
Florida	3,669	6,346	7,814
Georgia	2,037	3,494	4,202
Idaho	296	511	632
Illinois	4,228	7,315	9,434
Indiana	1,667	2,768	3,414
Iowa	853	1,412	1,798
Kansas	1,183	3,150	5,853
Kentucky	1,028	1,717	2,111
Louisiana	10,727	12,829	19,718
Maine	261	417	462
Maryland	1,228	2,042	2,269
Massachusetts	1,723	2,818	3,075
Michigan	3,658	6,570	8,363
Minnesota	1,996	3,743	4,717
Mississippi	510	860	2,811
Missouri	3,322	6,035	6,886
Montana	1,260	2,539	2,728
Nebraska	619	1,056	1,175
Nevada	674	1,170	1,442
New Hampshire	302	494	554
New Jersey	2,353	4,184	5,430
New Mexico	2,719	3,547	6,835
New York	5,033	8,171	8,836
North Carolina	2,010	3,360	3,855
North Dakota	6,808	13,046	6,630
Ohio	4,103	17,960	35,292
Oklahoma	8,911	24,454	38,061
Oregon	891	1,533	1,846
Pennsylvania	14,113	26,714	49,022
Rhode Island	227	362	375
South Carolina	927	1,567	1,915
South Dakota	197	327	373
Tennessee	1,351	2,266	2,722
Texas	101,633	168,558	125,701
Utah	5,618	8,195	9,430
Vermont	144	238	253
Virginia	1,991	3,426	4,298
Washington	1,319	2,245	2,689
West Virginia	1,618	4,479	9,394
Wisconsin	1,960	3,410	3,766
Wyoming	3,268	4,968	6,799
US Total	**237,684**	**416,551**	**474,985**

Souce: IHS Global Insight

US State-Level Labor Income Contribution of Unconventional Oil and Gas Summary

(2012 $M)

	2012	2020	2035
Alabama	566	986	1,222
Arizona	699	1,268	1,628
Arkansas	2,010	3,335	3,674
California	6,265	10,085	12,686
Colorado	5,901	9,054	13,622
Connecticut	554	903	950
Delaware	148	265	347
Florida	2,124	3,830	4,677
Georgia	1,161	2,054	2,477
Idaho	178	316	382
Illinois	2,623	4,632	6,018
Indiana	1,010	1,734	2,140
Iowa	511	865	1,112
Kansas	659	1,589	2,911
Kentucky	598	1,035	1,275
Louisiana	5,627	6,335	9,553
Maine	158	265	297
Maryland	743	1,279	1,393
Massachusetts	1,068	1,794	1,930
Michigan	2,365	4,220	5,393
Minnesota	1,220	2,307	2,946
Mississippi	300	527	1,424
Missouri	2,219	3,988	4,588
Montana	586	1,085	1,237
Nebraska	366	637	721
Nevada	351	627	771
New Hampshire	187	315	351
New Jersey	1,344	2,388	2,925
New Mexico	1,423	1,743	3,369
New York	3,049	5,128	5,465
North Carolina	1,155	2,024	2,325
North Dakota	3,609	9,586	4,896
Ohio	2,478	9,162	17,862
Oklahoma	4,447	11,030	17,245
Oregon	520	924	1,096
Pennsylvania	7,330	13,966	24,741
Rhode Island	140	232	238
South Carolina	546	962	1,177
South Dakota	113	195	222
Tennessee	818	1,428	1,720
Texas	48,883	77,181	61,291
Utah	2,994	3,910	4,604
Vermont	89	155	163
Virginia	1,169	2,095	2,635
Washington	789	1,395	1,656
West Virginia	794	2,087	4,307
Wisconsin	1,215	2,115	2,352
Wyoming	1,440	2,098	2,943
US Total	**124,541**	**215,132**	**248,957**

Source: IHS Global Insight

Conclusion

The revolution now under way in unconventional oil and gas activity is transforming parts of the US economy and will generate significant economic benefits in the decades ahead. The revolution is spreading its economic gains both to the 16 states directly involved in unconventional oil and gas activity and to the 32 states along the supply chain that provide heavy machinery, fabricated metals, construction materials, professional services, and other inputs required by an expanding industry. Significantly, this revolution is offering growth opportunities to many regional economies at a time the national unemployment rate remains stubbornly high and overall economic growth is sluggish.

The economic gains to producing and non-producing states come in three primary forms: increased employment, increased economic output, and rising tax revenues paid to federal, state and local governments. While the scope of these economic contributions is significant, what is also striking is that their contribution will grow steadily in both the producing and non-producing states throughout the entire forecast period of this analysis, 2012 through 2035:

- Current employment—direct, indirect and induced—associated with unconventional oil and gas activity nationwide is 1.7 million and will increase 70% by 2020, to nearly 3 million jobs. By 2035, total employment associated with unconventional oil and gas activity will be nearly 3.5 million—double current levels.
- Total tax payments related to unconventional oil and gas activity—personal, corporate, federal, state, and local taxes, as well as ad valorem, severance and royalty payments—are currently $63 billion. These tax payments will rise to nearly $113 billion in 2020 and will surpass $125 billion in 2035. Over the entire 2012-2035 forecast period, total taxes paid as a result of unconventional oil and gas activity will exceed $2.5 trillion.
- The value added to US GDP as a result of unconventional oil and gas activity will also grow steadily in the future. This year, the producing and non-producing states together are contributing nearly $238 billion to GDP. This economic contribution will rise 75%, to $416 billion, by 2020 and will increase again, to nearly $475 billion by 2035.

The largest economic gains will go to states directly involved in the production of unconventional oil and gas. However, the non-producing states in the supply chain will also see considerable benefits.

Focusing on the producing states, the 10 states that generate the most employment associated with unconventional oil and gas activity in 2012 have together created close to 1.2 million jobs. During the next eight years, their employment will increase by 70%, to over 2 million and will continue to increase to over 2.3 million jobs by 2035. These 10 states—led by Texas, Pennsylvania, California, Louisiana, Colorado, and North Dakota—currently account for 68% of all of the jobs generated by the unconventional oil and gas industry. Employment in the other top 10 states such as Pennsylvania, Oklahoma and Ohio is also forecast to increase sharply by 2035. The non-producing states will also see their employment double during this forecast period, from 474,000 in 2012 to nearly 1 million in 2035.

Unconventional oil and gas activity is becoming a substantial source of tax revenues for states, which, in contrast to the federal government, are often bound by balanced budget laws. The tax payments to federal, state and local governments generated by the producing states will double, from nearly $51 billion in 2012 to over $102 billion in 2035, contributing about 82% of the tax revenues generated by all unconventional oil and gas activity nationwide. The top 10 non-producing states, ranked by the government revenues they generate, will contribute over $14 billion in annual tax revenues in 2035, double their estimates for 2012 revenues.

The contribution to economic growth from the unconventional oil and gas industry will roughly double during the forecast horizon in both the producing and non-producing states. Fueled by unconventional development, the economies of Texas and Pennsylvania will outperform the economies of all other states in the forecast period. Significantly, the technologies fueling the industry's expansion are also responsible for creating a new group of significant producing states, such as Ohio and North Dakota.

Unconventional oil and gas activity in 2012 adds almost $238 billion in value added to the US economy, and that will rise more than 75%, to over $416 billion in 2020, and will further increase to $475 billion in 2035. The GDP contribution in non-producing states in the supply chain will be substantial. Examples include New York, which furnishes non-capital goods such as financial and professional services to the unconventional oil and gas industry, and Illinois, which is the source of significant capital equipment manufacturing.

While some regional economies in the United States with geologic advantages are disproportionally benefitting, the economic contributions spawned by the unconventional oil and gas revolution is reaching across the country. America's new energy future portends an economy strengthened by abundant energy, supported by an expansive domestic supply chain and an economy that is increasingly competitive in traded goods. To that end, states across the nation—producers and non-producers—will realize economic gains from the unconventional oil and gas activity that is now unfolding.