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Current and Future Economic Impacts of the Texas Oil and Gas Pipeline Industry



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Executive Summary

This study provides estimates of the 2013 economic impact of the Texas oil and gas pipeline industry and projections for the year 2024. In addition to the current and future impact studies, a petroleum engineering-based analysis provides further information regarding the pipeline industry, the backbone for economic activity in the oil and gas sector. The focus of this study is on the value creation and the economic sustainability that lies in the economic contributions of Texas pipelines. For purposes of this study, economic output refers to the value of all industrial production in a region (i.e., gross revenues), following the convention used by the U.S. Bureau of Labor Statistics (BLS) and Bureau of Economic Analysis (BEA); jobs are defined as the average annual number of jobs in a sector, industry, or region, while labor income consists of all forms of employment income, including employee compensation (wages and benefits) and proprietor income; and value added indicates the addition to gross state product.

The oil and gas pipeline industry expenditures related to ongoing operations and construction, are an important driver of economic activities in the state of Texas and beyond. The industry's activities generate and sustain jobs, income and output, and contribute to state and local government revenues. The industry also provides substantially to the gross state product of Texas.

In the year 2013, the total economic impact from Texas pipeline operations and construction include:

- Over \$33 billion in economic output
- More than 165,000 jobs
- Over \$18.7 billion in additional gross state product
- Over \$1.6 billion in state and local government revenues

By the year 2024, depending on economic conditions, projections demonstrate that the total economic impact from Texas pipeline operations and construction will generate between:

- \$30-41.4 billion in economic output (in today's dollars)
- 150,000-206,000 jobs
- \$17-23.4 billion in additional gross state product (in today's dollars)
- \$1.5-2.0 billion in state and local government revenues (in today's dollars)

Between the current year and 2024, the Texas pipeline industry will generate cumulative economic impacts (in today's dollars) of around \$374 billion in economic output, \$212 billion in additional gross state product, and contribute \$19.5 billion in state and local government revenues. Additionally, the industry will sustain an average of around 171,000 jobs per year in the state of Texas.

The activities of the Texas pipeline industry, which include the transportation of hydrocarbons from sources of exploration and production to refineries and end-users, are one component of the substantial job creation, investment, and overall economic growth.

Texas plays and reservoirs will help sustain economic activity and growth in the coming years:

- Several potential and confirmed Resource Plays (media terms "shale gas/oil"), which have been identified throughout Texas, cover very large areas (multiple counties) as opposed to conventional, non-Resource Plays, which cover, at best, a few thousand acres
- Wells in a confirmed Resource Play exhibit a repeatable statistical distribution, thus offering predictable performance in a given geological subset
- The above two points result in long-term (i.e., decades of) drilling activity, thus sustaining or increasing production

Drilling activity and production is an important factor in providing current and future economic benefits:

- The State of Texas has the greatest rig count of any U.S. state or world region (48 percent of the total rigs running in the U.S. and 25 percent of the total world rig count)
- A rapidly increasing number of wells in target plays and reservoirs being drilled are horizontal
- Texas' individual well productivity has improved dramatically since 2011 due to improved technology in horizontal drilling and hydraulic fracturing
- Drilling efficiencies are being realized in all U.S. Resource Plays

Texas Projected Production

• Three drilling and production scenarios were assessed for major producing areas/basins in Texas as shown below



Texas Total Oil Production Forecast



Texas Total Gas Production Forecast

Summary of current production and takeaway capacities

	Oil		G	as
Basin	Current Production (Mbbls/d)	Pipeline takeaway capacity (Mbbls/d)	Current Production (Bcf/d)	Pipeline takeaway capacity (Bcf/d)
Anadarko	110	Not available	2.1	2.5 ⁴
East Texas	65	Not available	4.0	3.6 ¹
Texas Gulf Coast	1200	1600 ²	3.7	4.8 ³
Fort Worth	65	24 ⁴	5.3	5.8 ⁴
Permian	1580	1680 ²	3.3	2.8 ⁴
Total	3020	3300	18.4	19.5

¹ Energy Transfer Partners (ETP) and Survey Results

² RBN Energy Data

³ ETP

⁴ Survey Results, less than 100% responding but considered representative of most of the capacity

Other

- Total gas flared in Texas is currently approximately 160 MMcf/d as compared to less than 30 MMcf/d prior to 2010
- This report did not include the effect of an 8-10\$/MMbtu gas price, which would greatly influence substantial increases in drilling and production in the dry gas area of the Eagle Ford, Haynesville and Barnett shale plays.

An Economic Interpretation

The state of Texas competes to attract and retain companies engaged in the exploration, production, processing and refining of oil and natural gas. As shown in this study, Texas has confirmed Resource Plays and Reservoirs that can result in long-term drilling activity and increased production. The pipeline transportation system is a key component in the realization of value and the associated economic benefits that will come from the continued growth and expansion of the oil and gas industry. A pipeline system capable of effectively handling increased levels of oil and gas activity is necessary for companies to economically operate in Texas. From this standpoint, the ability to retain and attract oil and gas investments requires a pipeline system that can manage the flow of hydrocarbons in a timely and cost-effective manner. Accordingly, as shown in this study, the economic benefits attributable to the pipeline system in Texas are substantial. Moreover, the upstream and downstream segments of the energy industry (i.e., exploration, production and refining activities) will generate additional economic benefits for Texas, provided that these companies have an efficient and effective means of transporting their product.

Introduction

This report provides estimates of the positive economic impact of the oil and gas pipeline industry on the state of Texas. The oil and gas industry in Texas is characterized by a highly integrated supply chain centered on pipeline transportation and supporting infrastructure. By connecting upstream to downstream oil and gas activities, pipelines play a significant role in value creation and economic sustainability in the state.

The economic benefits of the pipeline industry result in substantial highly compensated employment, investment and economic growth. The economic impact of the pipeline industry is derived from the transportation of hydrocarbons from sources of exploration and production to refineries and end-users. This core activity, in turn, leads to a number of non-core but very critical supply chain activities such as the construction of pipelines, processing plants, meter stations, compressors, fractionators and equipment manufacturing. The secondary effects of the pipeline industry include the numerous expansions and continuing operations of suppliers to the industry as well as wholesale, retail, real estate and housing, and financial services, etc., which benefit from the increased dollars generated.

A unique feature of this study is the inclusion of the petroleum engineering and geophysical factors analysis that characterize Texas. Well productivity has improved dramatically since 2011 due to improved technology in horizontal drilling and multi-stage hydraulic fracturing. Drilling efficiencies are being realized in all U.S. Resource Plays and Texas is no exception, thus vast improvements in efficiency are not only being realized but expected in and throughout the state. It is these factors that have led current state of production and that have contributed to the many economic benefits to the state. However, the realization of these benefits depends on a pipeline transportation system that will play a vital role in the future development of the Texas economy. The economic benefits arising from the existence and continuing operations of the oil and gas pipeline industry are quantified in terms of employment, labor income (including proprietor's income), value added, and output (i.e., gross revenues). Additionally, this study provides a comprehensive analysis of the tax base associated with the industry. Specifically, this study estimates economic impact for the year ending 2013 and provides projections for the year 2024.

Objectives and Methodological Approach

The major objective of this study is to quantify the economic impact of the Texas oil and gas pipeline industry. Specifically, these impacts are in the form of jobs created and sustained, economic output as measured by the value of all industrial production in an area or region, value added to state gross domestic product, and various forms of state and local government revenues generated from the activities associated with this industry. The methodological approach of this research combines elements from the fields of both energy economics and petroleum engineering.

The research utilizes the IMPLAN economic impact modeling software. To fully capture the underlying factors of economic activity in Texas, historical economic and petroleum engineering data have been collected and analyzed. The study includes analyses of key underlying petroleum engineering aspects of the oil and gas supply chain combined with economic analysis, to estimate the impacts of the industry.

The study is unique in that it blends expertise in energy economics and petroleum engineering to provide an engineering-based economic impact model that takes into account the geological, engineering, and economic nature of the industry.

Overview of Production Forecast and Pipeline Takeaway Capacities

The objective of the engineering assessment was to take the historical activity and production, build a model to project ten years forward, and then compare that with pipeline takeaway capacities. Pipeline takeaway capacities were based on surveys conducted by the Texas Pipeline Association (TPA), and other published studies of which only 2 (Permian and Texas Gulf coast Basins) existed for oil pipeline takeaways. The surveys conducted by the TPA were not completed by all entities; thus resulted in less than 100% of the true takeaway capacity. However, the total capacities summed up for each basin from the surveys, may be representative of the relative take away from each basin. Production profiles were projected as a function of drilling activity and knowledge of the type of play or formation predominantly being drilled. The five major Texas Basins and their respective major plays are as follows:

- Anadarko Basin Granite Wash and the Cleveland Formation
- East Texas Basin Cotton Valley, Haynesville, and Bossier
- Permian Basin Cline, Spraberry, Wolfberry, Wolfcamp, Bone Spring, and Avalon
- Texas Gulf Coast Basin Eagle Ford
- Fort Worth Basin- Barnett

These basins were selected on the basis of having the most drilling, development and production activity. The objective of this study was to access each basin's production, rig activity and pipeline takeaway capacity. The locations of these basins and others are illustrated in Figure 1.1.



Figure 1.1: Descriptive Map of all Basins in Texas (Source: Jackson School of Geosciences)

All of these plays are either considered or may potentially be a Resource Play as defined by the Society of Petroleum Evaluation Engineers (SPEE). The SPEE parameters stated in its book, "Monograph 3; Guidelines for Practical Evaluation of Underdeveloped Reserves in Resource Plays," are as follows:

The following "Tier 1" characteristics are nearly always observed in Resource Plays:

- 1. Wells exhibit a repeatable statistical distribution of estimated ultimate recoveries (EURs).
- 2. Offset well performance is not a reliable predictor of undeveloped location performance.
- 3. A continuous hydrocarbon system exists that is regional in extent.
- 4. Free hydrocarbons (non-sorbed) are not held in place by hydrodynamics.

If the reservoir being evaluated satisfies these four criteria, there is a very good chance the reservoir is a Resource Play. Conversely, if any one of these characteristics is absent, it is quite likely the reservoir is NOT a Resource Play. The Tier 1 criteria are listed in order of significance, and both geological and engineering data must support these criteria.

The Tier 1 criteria possess aspects of engineering and geology, and determining whether a reservoir is a Resource Play requires consideration of both. The geological depositional model needs to describe a reservoir with regional extent, while the engineering data needs to show statistically repeatable EURs over time. Obviously, sufficient time is required to arrive at these conclusions; time for historical data to accumulate, and time to analyze the data. As a practical matter, it is anticipated that Resource Plays will encompass more than 100 completed wells in the reservoir. There are two rationales for this. First, developing a usable statistical model in a Resource Play typically requires about 100 wells. Second, a reservoir that has sufficient areal extent to be considered a Resource Play will likely encompass a minimum of 100 wells.

Although the following "Tier 2" reservoir characteristics are not required, these are commonly observed in Resource Plays:

- 5. Requires extensive stimulation to produce at economic rates.
- 6. Produces little in-situ water (except for Coalbed Methane and Tight Oil Reservoirs).
- 7. Does not exhibit an obvious seal or trap.
- 8. Low permeability (< 0.1 md).

Resource Plays have also been sometimes called "Unconventional Plays" and/or reservoirs. These Resource Plays are important to this study as they result in long term sustained activity.

In accessing the above Basins and Texas total, we made 10 year conservative projections for three different scenarios for hydrocarbon production and rig count. These scenarios are:

• Scenario 1 (High Scenario): Anticipating stable oil prices in excess of \$100/bbl and increasing gas prices resulting in continued or increased drilling activity

- Scenario 2 (Moderate Scenario): Anticipating oil prices in the \$70-\$90 range with some level of instability and gas prices in the current \$4/MMBtu (Million British thermal units) range.
- Scenario 3 (Low Scenario): A collapse in oil & gas prices resulting in minimal activity.

In Scenario 1, we did not include the effect of an 8-10\$/MMBtu gas price which would greatly influence drilling and production in the Dry Gas area of the Eagle Ford, Haynesville and Barnett. The Eagle Ford and Haynesville drilling could be substantial by several orders of magnitude over what we projected in Scenario 1. However, due to data limitations, an assessment of the associated drilling and production impact is not feasible at this time.

Engineering Analysis – The Basis for Economic Activity

The United States has the highest number of rotary rigs with 1757 or 53% of the world's total rigs in operation as of December 2013 (Figure 2.1). The state of Texas has the highest number of rigs with 835 as of December 27, 2013. This represents 48% of total rigs running in the United States, and 25% of total world rig count.

An increasing percentage of the wells in the U.S. are being drilled horizontally as a result of the advancement of hydraulic fracturing and horizontal drilling technology. This is illustrated in the increasing trend of horizontal rig utilization since the 2008 recession, as shown in Figure 2.2. Officially, the National Bureau of Economic research (NBER) dates the beginning of the U.S. recession in 2007Q4 and ending 2009Q2. The effect in the oil and gas industry was generally felt in 2008. Thus, for purposes of this report, we refer to this period as the 2008 recession. In fact, in the last two years, most of the rigs in the U.S. are drilling directional/horizontally versus vertically. Over the last year, the number of horizontal and directional rotary rigs increased by 84 rigs (31%) and the number of rigs drilling vertically decreased by 90 (19%) as shown in Figure 2.3. The historical trend in the U.S. Rig Count (Figure 2.2) is closely mirrored and influenced by the trend in Texas Rig Count (Figure 2.4). Thus, it is fair to conclude that Texas, having the highest number of rigs in operation, as shown in Figure 2.5, has the most drilling activity in the U.S.

The closing gap between total rig count and rigs drilling for oil, as shown in Figures 2.6 and 2.7, indicates operator's preferential drive for hydrocarbon liquid, especially in the post-2008 recessionary period. The reason for this is after 2008, natural gas prices never quite recovered while oil prices quickly recovered back to pre-2008 prices, and then continued to increase thereafter. Oil and gas companies refocused capital budgets to oil (liquids) prone basins. The areas that benefited the most were the Permian Basin, Bakken Play (Williston Basin), and the Eagle Ford (Texas Gulf Coast Basin).



Figure 2.1: Global Land Rig Count, Week Ending December 2013 (Source: Baker Hughes)



Figure 2.2: Historical Rig Count in the US by Drill Type (Source: Baker Hughes)



Figure 2.3: US Rotary Rig by Drill Type (Source: Baker Hughes)



Figure 2.4: Historical Rig Count of Texas (Source: Baker Hughes)



Figure 2.5: US Rig Count (Source: Baker Hughes)



Figure 2.6: US States Land Rig Count Trend Closely Mirrored by Texas Rig Count (Source: Baker Hughes)



Figure 2.7: Historical Offshore Rig Count (Source: Baker Hughes)

Historical production data were sourced from the Railroad Commission of Texas and DrillingInfo[™]. Rig count data was mostly obtained from Baker Hughes[™]. Pipeline takeaway capacities were obtained from published data and collated surveys conducted by the TPA. Detailed explanations of all major five Basins analyzed in this study are discussed in the text.

Anadarko Basin

The Anadarko Basin encompasses both Texas (Texas Panhandle) and Oklahoma with more of the oil and gas production emanating from Oklahoma, as shown in Figure 3.1. Current oil and gas production in the Texas portion is about 110 Mb/d (Thousand barrels per day) and 2.1 Bcf/d (Billion cubic feet per day) respectively. Survey results received from the TPA indicate a pipeline takeaway capacity of about 2.5 Bcf/d for gas. Figure 3.2 shows an increasing oil rig count as operators focused capital expenditure on liquid rich assets due to falling gas prices post 2008 recession. There was no data for oil takeaways from the survey results received. We presume that the current mode of oil transportation is via rail. However, in the third quarter of 2013, Sunoco Logistics completed a successful "open season" for a new proposed pipeline; Granite Wash Extension Pipeline. An open season is a process by which project sponsors propose a package of key terms and design parameters for a potential pipeline project to prospective customers and solicit bids for contracting capacity on that project. The pipeline is expected to move 70Mb/d of crude from the Granite Wash play in the northeastern Texas Panhandle and portions of western Oklahoma. It will originate from Wheeler County, Texas and terminate at Sunoco's

station in Ringgold, Texas. The pipeline is expected to be operational in the third quarter of 2014. Table 3.1 describes current production versus the takeaway capacity from the region.

	Current Production	Takeaway Capacity
Oil	110 Mb/d	Not available
Gas	2.1 Bcf/d	2.5 Bcf/d

Table 3.1: Current Production vs. Pipeline Takeaway Capacities

More pipeline takeaway capacity may be needed to handle the amount of gas vented which has increased exponentially in the period after the 2008 recession, as shown in Figure 3.3. As of March 2012, estimated cumulative production of oil and gas has reached 5.4 billion barrels of oil and 125 Tcf (Trillion cubic feet of gas). These have been forecasted to grow, as shown in Figures 3.4 through 3.6, with increased drilling activity and stable oil and gas prices at/ or above \$100/bbl and \$8/MMBtu respectively.



Figure 3.1: Descriptive Map of the Anadarko Basin (Source: Range Resources)



Figure 3.2: Anadarko Basin (Texas Portion) Rig Count by Drill Type Post 2009-2010 Recession (Source: Baker Hughes)



Figure 3.3: Historical Flared Gas Production of the Anadarko Basin (Source: RRC Texas)



Figure 3.4: Anadarko Total Rig Count Forecast



Figure 3.5: Anadarko Oil Production Forecast



Figure 3.6: Anadarko Gas Production Forecast

East Texas Basin

The East Texas Basin is located in central Gregg, western Rusk, southern Upshur, southeastern Smith, and northeastern Cherokee counties in the east central part of the state of Texas. As of June 2010, cumulative oil production has yielded nearly 5.2 billion barrels of oil from a stratigraphic trap in the Eagle Ford-Woodbine group of the Cretaceous. This basin contains numerous oil and gas producing formations consisting of conventional, unconventional, and tight sand reservoirs. The major formations targeted by producers are: the Cotton Valley, Haynesville Shale, and Bossier Formations. Descriptive maps of the formations are illustrated in Figures 3.7 and 3.8. Daily oil and gas production in this basin is roughly 65Mb/d and 4 Bcf/d respectively as of January 2014. Oil production from this basin is low, as evident in the flat to near zero oil rig count in Figure 3.10. Results from our literature survey indicate a pipeline takeaway capacity of approximately 3.4 Bcf/d for gas, but we were unable to determine takeaway capacity for oil. We presume current mode of oil transportation from this basin is via rail. Table 3.2 shows the current production versus the takeaway capacity from the region.

Table 3.2.	Current Product	tion vs. Pineline	Takeaway	Canacities
1 abic 5.2.	Current i louuc	cion vs. i ipenne	Takeaway	Capacitics

	Current Production	Takeaway Capacity
Oil	65 Mb/d	Yet to be determined
Gas	4.0 Bcf/d	3.4 Bcf/d

More pipeline takeaway capacity may be needed to handle the amount of gas vented which averaged 3.6 MMcf (Million cubic feet) of gas per day as shown in Figure 3.11. Drilling activity and hydrocarbon

production are projected to increase, as shown in Figures 3.12 through 3.14 partly due to immense interest by operators in three emerging unconventional oil plays. These plays are as follows: the Woodbine sands (predominantly sandstone), the Eaglebine (located on the north eastern trend of the Eagle Ford where the Eagle Ford Shale meets the Woodbine Sandstone and consists of laminated shale with a mixture of carbonates and sandstones exceeding 1,000 feet in thickness at depths between 6,500 ft. and 15,000 ft.), and the Buda Rose. The Buda Rose is a combination of formations starting with the Buda Limestone and consists of several other formations below it, including the Georgetown, Glen Rose, and Paluxy among others as described in Figure 3.9. Most of the operators in the area are targeting the Eaglebine, hence, in the second quarter of 2013, Sunoco Logistics completed a successful open season for the Eaglebine Express Pipeline. This pipeline is expected to transport approximately 60Mb/d of crude from Hearne, Texas to Nederland, near Beaumont, Texas and will commence operation in the third quarter of 2014. Stable oil and gas prices are needed to sustain and increase drilling activity in these plays.



Figure 3.7: Descriptive Map of the Cotton Valley Formation in the East Texas Basin (Source : Oil & Gas Journal)



Figure 3.8: Descriptive Map of the Haynesville and Bossier Shale Trend in the East Texas Basin (Source: Chesapeake Energy)



Figure 3.9: Stratigraphic Map of Target Plays in the East Texas Basin (Source: Forestar group)



Figure 3.10: East Texas Basin Rig Count 2011-present (Source: Baker Hughes)



Figure 3.11: Historical Flared Gas Production in the East Texas Basin (Source: Railroad Commission)



Figure 3.12: East Texas Basin Rig Count Forecast



Figure 3.13: East Texas Basin Oil Production Forecast



Figure 3.14: East Texas Basin Oil Production Forecast

Fort Worth Basin

The Fort Worth Basin is a shallow, north-south elongated trough encompassing roughly 15,000 square miles in north central Texas. It is one of several foreland basins associated with the late Paleozoic Ouachita Orogeny, which is a major event of thrust-fold deformation resulting from collisional tectonics during the formation of Pangea. There are other basins in this trend which include: the Black Warrior, Arkoma, Kerr, Val Verde and Marfa Basins. The Mississippian Barnett Shale serves as source, seal, and reservoir to a world class unconventional natural gas accumulation in the basin, and is currently the largest onshore natural gas field in Texas. The most actively drilled area is the Newark East Field. These are illustrated in Figures 3.15 and 3.16.

At the end of 2010, cumulative gas production reached 9 Tcf. The Fort Worth Basin is predominantly a gas producing basin with some condensate production. As can be seen in Figure 3.17, this region has not experienced increased drilling in the years following the recession. Current daily gas production is roughly 5.3 Bcf/d, and average daily oil production is about 65Mb/d. Survey results received indicate takeaway capacity for oil at 24Mb/d and about 5.8 Bcf/d for gas. This is shown in Table 3.3. Some of the produced gas has been flared as shown in Figure 3.18.

Table 3.3: Current Production vs. Pipeline Takeaway Capacities

	Current Production	Takeaway Capacity
Oil	65Mb/d	24Mb/d
Gas	5.3 Bcf/d	5.8 Bcf/d

Most of the forecast shown in Figures 3.19 through 3.21 are quite pessimistic due to declining drilling activity, dictated by falling gas prices in the period since the 2008 recession. This basin would likely experience increased drilling activity and development with increased and stable gas prices at/above \$8/MMBtu, which would necessitate more pipeline construction.



Figure 3.15: Descriptive Structure Map of the Barnett Shale in the Ft. Worth Basin (Source: Fishpetco,





Figure 3.16: Descriptive Cross-section of the Barnett Shale in the Ft. Worth Basin (Source: Grieser et al., 2005)



Figure 3.17: Ft. Worth Basin Rig Count 2011-present (Source: Baker Hughes)



Figure 3.18: Historical Gas Flared Production in the Ft. Worth Basin (Source: Railroad Commission)



Figure 3.19: Ft. Worth Basin Rig Count Forecast



Figure 3.20: Historical Oil Production Forecast in the Ft. Worth Basin



Figure 3.21: Historical Gas Production Forecast in the Ft. Worth Basin

Texas Gulf Coast Basin

The Gulf Coast region can be described as a physiographic province extending from Texas to Florida and encompassing the coastal plain, low hills and deltas of the Gulf of Mexico. The sediments consist of coastal plain deposits and thick land-derived sediments prograding from the Mississippi River Delta system, which ultimately transitions to evaporite and carbonate deposits offshore. The main formation targeted by operators is the Eagle Ford. This is a sedimentary shale rock formation stretching 400 miles from just northwest of Houston to an area south of San Antonio and all the way into Mexico, as shown in Figure 3.22.

Due to falling gas prices, the liquid rich window of the Eagle Ford has seen increased drilling activity and development, with more oil drilling rigs running than gas. This rig count disparity is illustrated in Figure 3.23. As of December 2013, crude oil production was about 1.2MMb/d (Million barrels per day) from the Eagle Ford. Production is expected to exceed 1.5MMb/d by 2015. Several pipeline infrastructures have been constructed and include the following:

• Kinder Morgan Crude/Condensate (KMCC) Pipeline - with a capacity of 300Mb/d, transports crude oil and condensates from the Eagle Ford Formation to Galena Park, Texas on the Houston Ship Channel

- The Enterprise South Texas Crude Oil Pipeline System with a capacity of 350Mb/d, moves products form Karnes County to Sealy which then connects to the Ranch Pipeline into Houston and the Enterprise Houston crude oil (ECHO) terminal
- The Plains-Enterprise joint venture (JV) Pipeline System with a capacity of 350Mb/d, moves crude and condensate from Gardendale in La Salle County to Sealy
- Nustar Energy Pipeline Systems with a total capacity of 428Mb/d, moves crude from Gardendale, Pettus and Pawnee to Corpus Christi marine terminal, Three-Rivers Corpus Christi Crude Pipelines and Corpus Christi Pipelines respectively
- Koch Pipeline Systems with a capacity of 350Mb/d, carries crude from various pipelines into Corpus Christi
- Harvest Pipeline with a capacity of 230Mb/d, moves crude from Gardendale into Corpus Christi
- Double Eagle Pipeline a JV between Kinder Morgan and Magellan Midstream, with a capacity of 150Mb/d, moves condensate from Gardendale and Karnes into Three Rivers.

A description of current production versus pipeline takeaway capacity from the region is found in Table 3.4.

	Current Production	Takeaway Capacity
Oil	1.2 MMb/d	1.6 MMb/d
Gas	3.7 Bcf/d	4.8 Bcf/d

 Table 3.4: Current Production vs. Pipeline Takeaway Capacity

Additional gathering infrastructure may be required as evidenced from the amount of gas being vented or flared.. Figure 3.24 shows an increasing amount of this flared gas volume at an average of 93 MMcf of gas vented per day. Figures 3.25 through 3.27 show forecast for drilling activity, as well as expected production trends. It should be noted that the gas window of this play would see a major increase in drilling activity if gas prices were to increase and stablize in the \$8.00 per MMBtu range. This impact is beyond the scope of this study.



Figure 3.22: Descriptive Map of the Eagle Ford Shale, showing areas prospective for oil, dry gas and wet gas/condensate (Source: Energy Information Administration)



Figure 3.23: Texas Gulf Coast Rig Count (Source: Baker Hughes)



Figure 3.24: Historical Flared Gas Production in the Texas Gulf Basin (Source: Texas RRC)



Figure 3.25: Texas Gulf Coast Basin Rig Count Forecast



Figure 3.26: Texas Gulf Coast Basin Oil Production Forecast



Figure 3.27: Texas Gulf Coast Basin Gas Production Forecast

Permian Basin

The Permian Basin is an oil and gas producing area located in West Texas and the adjoining area of southeastern New Mexico. It covers an area approximately 250 miles wide and 300 miles long. The various producing formations include the following: the Yates, San Andres, Clear Fork, Spraberry, Wolfcamp, Yeso, Bone Spring, Avalon, Canyon, Morrow, Devonian and Ellenburger. As of April 2014, it has produced over 29 Billion barrels of oil and 75 Tcf of gas. The basin currently produces about 1.58 MMb/d of oil and 3.3 Bcf/d of gas. Figure 3.28 describes the three component parts making up the Permian: the Delaware Basin, Central Basin Platform, and the Midland Basin.



Figure 3.28: Descriptive Map of the Permian Basin (Source: Drillinginfo)

The current crude oil pipeline takeaway capacity from the Permian Basin is about 1.19 MMb/d and comprises of the following pipelines in Table 3.5.

Table 3.5: Pipeline Capacities

Pipeline Name	Operator	Capacity (Mb/d)
	Occidental	
Centurion	Petroleum	175
West Texas Gulf		
(WTG)	Sunoco logistics	340
Basin	Plains All-American	450
Longhorn	Magellan Midstream	225
Total		1,190

The Plains All American Basin Pipeline is the largest conduit out of the Permian, carrying 450Mb/d of crude from Colorado City, TX to Cushing, OK. The Centurion Pipeline also carries crude to Cushing. The Magellan Longhorn Pipeline runs from Crane to Houston and Texas City, while the Sunoco WTG Pipeline carries crude to Longview, Houston and Nederland.

In addition to the pipeline capacity, there are four local refineries in West Texas and New Mexico that consume a portion of Permian crude oil production as well as rail takeaway which accounts for about 80Mb/d. The table below lists the four refineries that between them consume close to 450Mb/d of Permian crude production.

Operator	Refinery	Capacity (Mb/d)
Western Refining	El Paso, TX	128
Holly Frontier	Artesia, NM	100
	Big Springs,	
Alon	ТХ	70
Phillips		
66/Cenovus	Borger, TX	146
Total		444

Table 3.6: Refinery Capacities

Combining the pipeline takeaway capacity, rail takeaway capacity, and the current local refining capacity gives approximately 1.68 MMb/d, which is only slightly larger than the current crude oil production in the Permian at 1.58 MMb/d. Gas production is currently at 3.3 Bcf/d. Figure 3.28 describes the current fine balance between Permian crude production and takeaway capacity. The large red arrow on the figure pinpoints the current delicate balance between production and takeaways, which will only be relieved when new/proposed pipelines come online.

These new pipelines consist of the following:

- Bridge Tex Pipeline, a JV between Occidental Petroleum and Magellan Midstream, is expected to come online sometime in the middle of 2014 with a capacity of 300Mb/d of crude from Colorado City to Houston
- Sunoco Logistics' Permian Express II Pipeline is expected to come online mid-2015, with a capacity of 200Mb/d of crude also from Colorado City to Nederland
- The current Longhorn Pipeline operated by Magellan, is expected to expand to 275Mb/d from its current 225Mb/d.



Figure 3.28: Permian Crude Takeaway Capacity (Source: RBN Energy)

Table 3.7 describes the current production versus the takeaway capacity from the region for both oil and gas. The takeaway capacity for oil was obtained from literature surveys while gas takeaways were based on the survey results from the TPA.

Table 3.7: Production vs Takeaway Capacities	Table 3.7	: Production	vs Takeaway	Capacities
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	Current Production	Takeaway Capacity
Oil	1.58 MMb/d	1.68 MMb/d
Gas	3.3 Bcf/d	2.8 Bcf/d

More pipeline takeaway capacity will be needed to handle the flared gas in this basin. Figure 3.29 describes the average amount of gas vented per day since year 2000. In 2013, an average of 62 MMcf/d

was vented. Figures 3.30 through 3.32 show drilling and production forecasts up to 2024. Note that the lack of a significant increase in rigs in the Permian may result from a decline in vertical well drilling which is being offset by relatively more horizontal drilling. It is expected, however, that a significant increase in the number of rigs will occur in the near future.



Figure 3.29: Historical Flared Gas in the Texas Portion of the Permian Basin (Source: Texas RRC)



Figure 3.30: Texas Portion of the Permian Basin Rig Count Forecast



Figure 3.31: Texas Portion of the Permian Basin Oil Production Forecast



Figure 3.32: Texas Portion of the Permian Basin Gas Production Forecast

Texas Total

An increasing number of wells shown in Figures 3.33 and 3.34 were completed in Texas post 2008 recession, with almost 25,000 total completions in 2013 alone. Over 19,000 of these new completions were oil wells. As seen in Figures 3.33 and 3.34, there was a dramatic drop in drilling activity or the number of wells completed during the 2008 recession. However, oil well completions count quickly recovered and surpassed pre-2008 levels by 2011. The reason for this is that after the 2008 recession, natural gas prices never recovered while oil prices quickly recovered back to pre-2008 prices, and then continued to increase. Oil and gas companies in Texas refocused capital budgets to oil (liquid) prone basins. The two areas that benefited the most were the Permian Basin, and the Eagle Ford (Texas Gulf Coast Basin). Thus, while other Texas gas shale plays such as the Barnett and the Haynesville saw a sustained drop in rig count and drilling activity, the Permian Basin and the Eagle Ford more than compensated for that drop.

Also, of the five basins discussed in this study, the Permian and Texas Gulf Coast Basins continue to see increased horizontal drilling and sustained development. This has resulted in increased completion efficiencies following the 2008 recession, represented as BOEPD (barrels of oil equivalent per day) for all basins (see Figures 3.35 and 3.36). BOE is obtained by dividing the gas in Mcf by 6, and then adding that value to the barrels of oil. The increased efficiencies are due to improved development in horizontal drilling and hydraulic fracturing.

The Fort Worth (Barnett Shale) and East Texas (Haynesville Shale) Basins are gas prone and have not experienced much growth in drilling activity. The northwest portion of the Eagle Ford is liquid prone, as is the Permian Basin, thus will continue to see an expanding drilling program, as long as oil prices remain at or above \$80/bbl. Figures 3.37 and 3.38 show production forecasts through the year 2024.





Fig 3.33: Texas Total Historical Completions Count (Source: Texas RRC)

Figure 3.34: Texas Total Historical New Drill Completions Count (Source: Texas RRC)



Figure 3.35: Completions Efficiency for all five Major Basins in Texas



Figure 3.36: Texas Total Completions Efficiency



Figure 3.37: Texas Total Oil Production Forecast



Figure 3.38: Texas Total Gas Production Forecast

Economic Impacts of Texas Oil and Gas Pipeline

The transportation of oil and gas in Texas entails a number of different specialized activities. These activities generate significant economic benefits by creating and sustaining jobs, income, value added and output. In addition, the industry provides important state and local government revenues that benefit the citizens of the state.

A set of economic models, referred to as input-output (I-O) models by economists, was constructed to measure the economic impact of the oil and gas pipeline industry on the Texas economy. The basis of an economic impact model is the spending patterns of individuals and businesses in the region being studied. In particular, expenditures by firms engaged in the ongoing operations and construction of oil and gas pipeline on equipment and supplies occur within the state and elsewhere, while oil and gas pipeline employees tend to spend the majority of their income more locally. Economists generally categorize the economic impacts from these expenditures into two types of effects: direct and secondary. Direct effects represent those expenditures within the region of the industry being studied. Direct effects lead to secondary effects in the form of business-to-business transactions in the region (e.g., to restore inventory) referred to as indirect effects and also to new income in the form of wages and salaries, rent and interest payments, payments to proprietors and stockholders for investment, etc. also known as induced effects. For purposes of this study, economic output (i.e., gross revenues) refers to the value of all industrial production (i.e., mining, services, retail trade, manufacturing, etc.) in the state, following the convention used by the U.S. Bureau of Labor Statistics (BLS) and Bureau of Economic Analysis (BEA), jobs are defined as the average annual number of jobs in a sector, industry, or region, while labor income consists of all forms of employment income, including employee compensation (wages and benefits) and proprietor income, and value added indicates the addition to Gross State Product.

The economic model identifies the "linkages" within the economy that exist between businesses (or enterprises) and other businesses, and businesses (or enterprises) and final consumers. From the economic model, a set of industrial sector "economic multipliers" unique to the state economy are calculated. These multipliers are used to provide a comprehensive assessment of the economic impact of the oil and gas pipeline industry. Specifically, the economic impact analysis provides information as to the number of jobs created and sustained by the ongoing operation of the industry, the income added to the state economy from the industry's operations, which includes household income or earnings, and the total output (in dollars) that industry contributes to the economy. Similarly, economic impacts are generated from the construction of new pipeline and related infrastructure (i.e., plants, meter stations, etc.); however, unlike ongoing operations, construction related impacts are shorter-lived, typically assumed to last one year in an economic impact analysis. An interesting feature of the Texas pipeline industry is that, given the current energy outlook, it is possible that major construction projects will continue to arise throughout the foreseeable future, thus providing economic benefits over a number of years.

For purposes of this report, the economic models were constructed for 2013, the last full year for which all data are available, and for the year 2024, which represents a future reference point 10 years from

now. For the latter, we consider three different scenarios corresponding to various economic environments.

To estimate the economic impact and contribution of the Texas oil and gas pipeline industry in 2013 we follow the convention of first estimating industry sales and using "data internal to the model to identify all backward linkages in the study area related to the subject." (IMPLAN.com) Construction related impacts are derived from estimates of construction expenditures for net new pipeline mileage utilizing data from *Oil and Gas Journal* annual cost survey. Pipeline mileage data (historical, current and net new) come from the Railroad Commission of Texas. The analysis was conducted using the IMPLAN Version 3.0 software package. 2012 values were updated to reflect the information obtained and estimated for 2013. The conversion to 2013 values was accomplished through a set of extrapolations (economic time series analysis) and validated using the engineering-related data. For purposes of this study, and following convention of economic impact research, the core sector was defined as pipeline transportation or new non-residential construction (pipeline other than sewer and water) where, for the latter, local purchase percentage is adjusted to reflect actual expenditure information obtained from the Texas Pipeline Association.

In order to estimate the 2024 projected impacts of the Texas oil and gas pipeline industry it was necessary to first compute the value of oil and gas produced and transported through the system. Commodity price data for West Texas Intermediate crude oil (\$/BBL) and natural gas (Henry Hub, \$/million Btu) are utilized for this purpose and obtained from the Energy Information Agency. Following convention, we assume that typical (average) gas sold in Texas is 1,100 per SCF and the corresponding equivalency conversion factor is thus 1.1 such that, for example, the 2013 annual price of \$3.73/MMBtu corresponds to \$4.103 per MCF. Valuing oil is straightforward using the 2013 annual price of \$97.98. The value of oil and gas produced is utilized in estimating industry sales and entered into the economic contribution impact model. For purposes of this analysis, we also follow the convention of holding technology constant over the projection horizon, which typically has the effect of making the projections quite conservative. Additionally, all future dollar figures are discounted to present value and production changes (i.e., changes in the amounts of oil and gas transported in the system) are in real terms. Further, future construction is assumed to remain in the same proportion (i.e., grows at the same rate) relative to industry sales as historically observed.

Economic Impact: 2013

2013 Economic Impacts from Operations

The following table summarizes the 2013 operations-related impacts of the pipeline industry for the state of Texas. There were 16,000 jobs in the Texas pipeline industry in 2013 and over \$10.8 billion of gross output value generated from ongoing operations. Total impacts (i.e., direct, indirect and induced) from pipeline operations generated and/or sustained 111,000 jobs in Texas. Moreover, the operations-related activities of the industry generated \$24.5 billion in output, and contributed more than \$14.3 billion in total gross state product, i.e., value added. The existence of the pipeline industry generates substantial economic activity and economic benefits to Texas.

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	16,175	\$10,080,027,352	\$6,040,407,712	\$10,836,525,349
Indirect Effect	22,515	\$1,431,902,421	\$2,407,917,696	\$4,295,192,430
Induced Effect	72,267	\$3,252,601,002	\$5,869,364,670	\$9,372,805,965
Total Effect	110,956	\$14,764,530,775	\$14,317,690,078	\$24,504,523,744

Note: Labor income, total value added and output are measured in current dollars (\$).

Pipeline transportation operations-related activity impacts various sectors differently. The following table illustrates the impacts for the top ten sectors in Texas, ranked by employment. The values clearly illustrate the demand for workers in these sectors is quite high and varied. These sectors benefit greatly from the presence of the oil and gas pipeline industry across Texas.

Description	Employment	Labor Income	Value Added	Output
Transport by pipeline	16,175	\$10,080,027,352	\$6,004,407,712	\$10,836,525,349
Food services and drinking places	8,717	\$193,617,996	\$295,152,420	\$505,373,981
Employment services	5,731	\$179,315,284	\$199,863,193	\$234,024,897
Real estate establishments	3,996	\$86,785,897	\$395,811,006	\$500,496,409
Maintenance and repair construction of nonresidential structures	3,803	\$241,772,590	\$271,525,798	\$560,552,259
Offices of physicians, dentists, and other health practitioners	3,748	\$328,789,672	\$335,461,039	\$479,315,144
Private hospitals	3,216	\$252,262,209	\$277,965,650	\$455,136,587

Wholesale trade businesses	2,703	\$247,083,145	\$432,746,250	\$630,022,320
Retail Stores - General merchandise	2,443	\$70,874,412	\$120,361,449	\$147,869,284
Securities, commodity contracts, investments, and related activities	2,356	\$96,010,046	\$83,891,516	\$341,114,982

Note: Labor income, total value added and output are measured in current dollars (\$).

2013 Economic Impacts from Construction

The following table summarizes the 2013 construction-related impacts of the pipeline industry for the state of Texas. The expansion of construction of pipeline in 2013 resulted in 25,500 construction jobs and nearly \$4.2 billion of gross output value generated from construction. Total impacts (i.e., direct, indirect and induced) from construction generated and/or sustained over 54,000 jobs in Texas. Moreover, the construction-related activities of the industry generated \$8.6 billion in output, and contributed more than \$4.4 billion in total gross state product, i.e., value added. The existence of the pipeline industry generates substantial economic activity and economic benefits to Texas.

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	25,504	\$1,622,569,131	\$1,817,113,031	\$4,198,188,575
Indirect Effect	13,108	\$838,495,270	\$1,320,240,067	\$2,348,137,923
Induced Effect	15,711	\$708,768,196	\$1,279,711,116	\$2,043,153,299
Total Effect	54,323	\$3,169,832,597	\$4,417,064,215	\$8,589,479,798

Note: Labor income, total value added and output are measured in current dollars (\$).

Pipeline transportation construction-related activity impacts various sectors differently. The following table illustrates the impacts for the top ten sectors in Texas, ranked by employment. The values clearly illustrate the demand for workers in these sectors is quite high and varied. These sectors benefit greatly from the presence of the oil and gas pipeline industry across Texas.

Description	Employment	Labor Income	Value Added	Output
Construction of other new nonresidential	25,504	\$1,622,569,131	\$1,817,113,031	\$4,198,188,575
structures				
Architectural, engineering, and related services	2,506	\$207,982,745	\$212,268,295	\$315,350,665
Food sorvices and drinking places	2 201	¢10 000 056	674 526 767	\$127 609 267
rood services and drinking places	2,201	\$48,889,050	\$74,520,707	\$127,008,207
Employment services	1,222	\$38,244,458	\$42,626,927	\$49,912,953
structures Architectural, engineering, and related services Food services and drinking places Employment services	2,506 2,201 1,222	\$207,982,745 \$48,889,056 \$38,244,458	\$212,268,295 \$74,526,767 \$42,626,927	\$315,350,66 \$127,608,26 \$49,912,95

Wholesale trade businesses	1,092	\$99,838,798	\$174,859,622	\$254,572,893
Real estate establishments	1,075	\$23,341,091	\$106,453,480	\$134,608,648
Offices of physicians, dentists, and other health practitioners	825	\$72,364,024	\$73,832,339	\$105,493,498
Private hospitals	708	\$55,520,725	\$61,177,829	\$100,171,616
Services to buildings and dwellings	677	\$15,674,733	\$20,006,092	\$35,883,718
Securities, commodity contracts, investments, and related activities	670	\$27,294,819	\$23,849,627	\$96,976,017

Note: Labor income, total value added and output are measured in current dollars (\$).

2013 Total Economic Impacts from Pipeline Operations and Construction Activities

The following table summarizes the 2013 operations- and construction-related impacts of the pipeline industry for the state of Texas. The total pipeline impacts in 2013 resulted in 41,679 direct jobs and \$15.0 billion of gross output. Overall, the total impacts (i.e., direct, indirect and induced) from operations and construction generated and/or sustained over 165,000 jobs in Texas. Moreover, the pipeline-related activities generated \$33.1 billion in output, and contributed more than \$18.7 billion in total gross state product, i.e., value added. The existence of the pipeline industry generates substantial economic activity and economic benefits to Texas.

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	41,679	\$11,702,596,483	\$7,857,520,743	\$15,034,713,924
Indirect Effect	35,623	\$2,270,397,691	\$3,728,157,763	\$6,643,330,353
Induced Effect	87,978	\$3,961,369,198	\$7,149,075,786	\$11,415,959,265
Total Effect	165,280	\$17,934,363,372	\$18,734,754,292	\$33,094,003,542

Note: Labor income, total value added and output are measured in current dollars (\$).

The preceding discussion and tables highlighted the economic benefits created and sustained by the ongoing operations and recent expansions (i.e., construction) associated with the Texas oil and gas pipeline industry. When interpreting impact results it is important to recognize that leakages occur in all economies in that not all monies spent are entirely contained within the study area. Generally speaking, the larger the study area, the more able the model is to capture the spending and consequently reduce leakages. Moreover, standard economic impact analysis follows the convention used by the U.S. Bureau of Labor Statistics (BLS) and Bureau of Economic Analysis (BEA) in which jobs are defined as the average annual number of jobs in a sector, industry, county or region over a period of time such as a month or year. For example, a 40 hour per week job lasting is equivalent to two part-time jobs.

The Texas pipeline industry also generates other economic benefits that are not measured in terms of current jobs, income, value added and output. The IMPLAN economic impact model provides estimates for taxes on production and imports, property, and various other taxes. In 2013, the operations and construction activities of the Texas pipeline industry accounted for \$1,632,713,679 in state and local government revenues.

Economic Impacts: 2024

Future projections of 2024 economic impacts utilize the underlying engineering analysis for the three different scenarios for hydrocarbon production and rig count. These scenarios represent a range of economic environments and are defined as:

- Scenario 1 (High Forecast Scenario): Anticipating stable oil prices in excess of \$100/Bbl and increasing gas prices resulting in continued or increased drilling activity
- Scenario 2 (Moderate Forecast Scenario): Anticipating oil prices in the \$70-\$90 range with some level of instability and gas prices in the current \$4/MMBtu range.
- Scenario 3 (Low Forecast Scenario): A collapse in oil & gas prices resulting in minimal activity.

Additionally, all future dollar figures are discounted to present value (i.e., reported in today's dollars).

2024 Projected Economic Impacts from Operations and Construction

High Forecast Scenario

The following table summarizes the 2024 projected operations-related impacts of the pipeline industry for the state of Texas in the High Forecast Scenario. The Texas pipeline industry will have nearly 20,000 direct jobs in 2024 and over \$13.5 billion of gross output value will be generated from ongoing operations. Total impacts from pipeline operations (i.e., direct, indirect and induced) will generate and/or sustain over 138,000 jobs in Texas. Moreover, the operations-related activities of the industry will generate \$30.6 billion in output, and contribute \$17.9 billion in total gross state product, i.e., value added. The existence of the pipeline industry will generate substantial economic activity and economic benefits to Texas.

Operations

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	19,845	\$12,593,517,132	\$7,546,604,324	\$13,538,650,528
Indirect Effect	28,129	\$1,788,952,256	\$3,008,340,325	\$5,366,213,559
Induced Effect	90,287	\$4,063,648,342	\$7,332,911,107	\$11,709,947,640
Total Effect	138,261	\$18,446,117,731	\$17,887,855,756	\$30,614,811,727

Note: Labor income, total value added and output are in present value (i.e., in today's dollars).

The following table summarizes the corresponding 2024 projected construction-related impacts of the pipeline industry for the state of Texas. The expansion of construction of pipeline in 2024 will result in nearly 32,000 construction direct jobs and \$5.2 billion of gross output value will be generated from construction. Total impacts from construction (i.e., direct, indirect and induced) will generate and/or sustain over 67,000 jobs in Texas. Moreover, the construction-related activities of the industry will generate over \$10.7 billion in output, and contribute more than \$5.5 billion in total gross state product, i.e., value added. The existence of the pipeline industry generates substantial economic activity and economic benefits to Texas.

Construction

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	31,870	\$2,027,586,176	\$2,270,691,086	\$5,246,117,997
Indirect Effect	16,380	\$1,047,795,983	\$1,649,791,344	\$2,934,267,576
Induced Effect	19,633	\$885,687,130	\$1,599,145,774	\$2,553,154,319
Total Effect	67,883	\$3,961,069,288	\$5,519,628,204	\$10,733,539,892

Note: Labor income, total value added and output are in present value (i.e., in today's dollars).

The following table summarizes the projected 2024 operations- and construction-related impacts of the pipeline industry for the state of Texas. The total pipeline projected impacts in 2024 will result in over 51,700 direct jobs and \$18.8 billion of gross output. Overall, total impacts from pipeline operations and construction (i.e., direct, indirect and induced) will generate and/or sustain over 206,000 jobs in Texas. Moreover, the pipeline-related activities will generate \$41.3 billion in output, and contribute more than \$23.4 billion in total gross state product, i.e., value added. The existence of the pipeline industry will generate substantial economic activity and economic benefits to Texas.

Total of Operations & Construction

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	51,716	14,621,103,308	9,817,295,410	18,784,768,524
Indirect Effect	44,509	2,836,748,239	4,658,131,669	8,300,481,136
Induced Effect	109,920	4,949,335,472	8,932,056,880	14,263,101,959
Total Effect	206,145	22,407,187,019	23,407,483,960	41,348,351,619

Note: Labor income, total value added and output are in present value (i.e., in today's dollars).

The Texas pipeline industry also generates other economic benefits that are not measured in terms of current jobs, income, value added and output. The IMPLAN economic impact model provides estimates for taxes on production and imports, property, and various other taxes. In 2024, the operations and construction activities of the Texas pipeline industry will account for \$2,039,549,916 (in today's dollars) in state and local government revenues.

Moderate Forecast Scenario

The following table summarizes the 2024 projected operations-related impacts of the pipeline industry for the state of Texas in the Moderate Forecast Scenario. The Texas pipeline industry will have 17,000 direct jobs in 2024 and almost \$11.7 billion of gross output value will be generated from ongoing operations. Total impacts from operations (i.e., direct, indirect and induced) will generate and/or sustain over 119,000 jobs in Texas. Moreover, the operations-related activities of the industry will generate \$26.4 billion in output, and contribute \$15.4 billion in total gross state product, i.e., value added. The existence of the pipeline industry will generate substantial economic activity and economic benefits to Texas.

Operations

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	17,089	\$10,844,372,803	\$6,498,438,032	\$11,658,234,315
Indirect Effect	24,222	\$1,540,480,311	\$2,590,504,595	\$4,620,887,062
Induced Effect	77,747	\$3,499,238,307	\$6,314,425,187	\$10,083,524,434
Total Effect	119,058	\$15,884,091,421	\$15,403,367,814	\$26,362,645,810

Note: Labor income, total value added and output are in present value (i.e., in today's dollars).

The following table summarizes the corresponding 2024 projected construction-related impacts of the pipeline industry for the state of Texas. The expansion of construction of pipeline in 2024 will result in over 27,000 direct construction jobs and \$4.5 billion of gross output value will be generated from construction. Total impacts from construction (i.e., direct, indirect and induced) will generate and/or sustain over 58,000 jobs in Texas. Moreover, the construction-related activities of the industry will generate over \$9.2 billion in output, and contribute more than \$4.7 billion in total gross state product, i.e., value added. The existence of the pipeline industry generates substantial economic activity and economic benefits to Texas.

Construction				
Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	27,444	\$1,745,987,028	\$1,955,328,571	\$4,517,516,481
Indirect Effect	14,105	\$902,273,953	\$1,420,661,829	\$2,526,744,946
Induced Effect	16,906	\$762,679,415	\$1,377,050,115	\$2,198,562,198
Total Effect	58 <i>,</i> 455	\$3,410,940,396	\$4,753,040,515	\$9,242,823,626

Note: Labor income, total value added and output are in present value (i.e., in today's dollars).

The following table summarizes the projected 2024 operations- and construction-related impacts of the pipeline industry for the state of Texas. The total pipeline projected impacts in 2024 will result in over 44,500 direct jobs and \$16.2 billion of gross output. Overall, total impacts from pipeline operations and construction (i.e., direct, indirect and induced) will generate and/or sustain over 177,500 jobs in Texas. Moreover, the pipeline-related activities will generate \$35.6 billion in output, and contribute more than

\$20.2 billion in total gross state product, i.e., value added. The existence of the pipeline industry will generate substantial economic activity and economic benefits to Texas.

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	44,533	12,590,359,831	8,453,766,603	16,175,750,796
Indirect Effect	38,327	2,442,754,264	4,011,166,424	7,147,632,008
Induced Effect	94,653	4,261,917,722	7,691,475,302	12,282,086,632
Total Effect	177,513	19,295,031,816	20,156,408,329	35,605,469,436

Total of Operations & Construction

Note: Labor income, total value added and output are in present value (i.e., in today's dollars).

The Texas pipeline industry also generates other economic benefits that are not measured in terms of current jobs, income, value added and output. The IMPLAN economic impact model provides estimates for taxes on production and imports, property, and various other taxes. In 2024, the operations and construction activities of the Texas pipeline industry will account for \$1,753,679,037 (in today's dollars) in state and local government revenues.

Low Forecast Scenario

The following table summarizes the 2024 projected operations-related impacts of the pipeline industry for the state of Texas in the Low Forecast Scenario. The Texas pipeline industry will have over 14,400 direct jobs in 2024 and over \$9.8 billion of gross output value will be generated from ongoing operations. Total impacts from operations (i.e., direct, indirect and induced) will generate and/or sustain over 100,000 jobs in Texas. Moreover, the operations-related activities of the industry will generate \$22.3 billion in output, and contribute \$13.0 billion in total gross state product, i.e., value added. The existence of the pipeline industry will generate substantial economic activity and economic benefits to Texas.

Operations				
Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	14,432	\$9,158,092,344	\$5,487,942,610	\$9,845,399,855
Indirect Effect	20,456	\$1,300,938,395	\$2,187,685,792	\$3,902,347,438
Induced Effect	65,657	\$2,955,113,046	\$5,332,543,431	\$8,515,554,527
Total Effect	100,545	\$13,414,143,784	\$13,008,171,834	\$22,263,301,820

Note: Labor income, total value added and output are in present value (i.e., in today's dollars).

The following table summarizes the corresponding 2024 projected construction-related impacts of the pipeline industry for the state of Texas. The expansion of construction of pipeline in 2024 will result in over 23,000 direct construction jobs and \$3.8 billion of gross output value will be generated from

construction. Total impacts from construction (i.e., direct, indirect and induced) will generate and/or sustain over 49,000 jobs in Texas. Moreover, the construction-related activities of the industry will generate over \$7.8 billion in output, and contribute more than \$4.0 billion in total gross state product, i.e., value added. The existence of the pipeline industry generates substantial economic activity and economic benefits to Texas.

Construction Labor Income **Total Value Added** Output Impact Type Employment \$3,815,050,797 23,176 \$1,474,489,186 \$1,651,278,496 **Direct Effect** 11,912 \$761,971,976 \$1,199,751,471 \$2,133,840,654 Indirect Effect 14,277 \$644,084,138 Induced Effect \$1,162,921,300 \$1,856,689,732 49,366 \$2,880,545,301 \$4,013,951,267 \$7,805,581,183 Total Effect

Note: Labor income, total value added and output are in present value (i.e., in today's dollars).

The following table summarizes the projected 2024 operations- and construction-related impacts of the pipeline industry for the state of Texas. The total pipeline projected impacts in 2024 will result in over 37,600 direct jobs and \$13.7 billion of gross output. Overall, the total impacts from pipeline operations and construction (i.e., direct, indirect and induced) will generate and/or sustain over 206,000 jobs in Texas. Moreover, the pipeline-related activities will generate \$30.0 billion in output, and contribute more than \$17.0 billion in total gross state product, i.e., value added. The existence of the pipeline industry will generate substantial economic activity and economic benefits to Texas.

Total of Operations & Construction

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	37,608	10,632,581,530	7,139,221,107	13,660,450,651
Indirect Effect	32,367	2,062,910,371	3,387,437,263	6,036,188,091
Induced Effect	79,935	3,599,197,184	6,495,464,731	10,372,244,259
Total Effect	149,910	16,294,689,086	17,022,123,100	30,068,883,002

Note: Labor income, total value added and output are in present value (i.e., in today's dollars).

The Texas pipeline industry also generates other economic benefits that are not measured in terms of current jobs, income, value added and output. The IMPLAN economic impact model provides estimates for taxes on production and imports, property, and various other taxes. In 2024, the operations and construction activities of the Texas pipeline industry will account for \$1,466,305,514 (in today's dollars) in state and local government revenues.

Summary

The oil and gas pipeline industry is an important driver of economic activities in the state of Texas and beyond. The industry's activities generate and sustain jobs, income, and output and contribute to state and local government revenues. The total effects from construction and operation are estimated to include 165,000 jobs, \$33.1 billion in output, and \$18.7 billion in value added in 2013. The industry also provides substantially to the gross state product of Texas. Recent innovations and discoveries in both plays and technologies have given rise to increased production of oil and gas and have led to additional demands on the pipeline system. Provided that the pipeline industry maintains effective transportation capabilities, it will continue to generate economic benefits that will likely impact Texas for years to come. Conservative projections show that in 2024 the oil and gas pipeline industry in Texas would generate 150,000-206,000 jobs, \$30-41.4 billion in output, and \$17-23.4 billion in value added based on various economic conditions. Moreover, between the current year and 2024, the Texas pipeline industry will generate cumulative economic impacts (in today's dollars) of around \$374 billion in economic output, \$212 billion in additional gross state product, and contribute \$19.5 billion in state and local government revenues. Additionally, the industry will sustain an average of around 171,000 jobs per year in the state of Texas. Overall, the pipeline industry plays a vital and valuable role in both oil and gas activities and broader economies across Texas.

The state of Texas competes to attract and retain companies engaged in the exploration, production, processing and refining of oil and natural gas. As shown in this study, Texas has confirmed Resource Plays and Reservoirs that can result in long term (i.e., decades of) drilling activity, thus sustaining or increasing production. The pipeline transportation system is a key component in the realization of value and the associated economic benefits that will come from the continued growth and expansion of the oil and gas industry. A pipeline system capable of effectively handling increased levels of oil and gas activity is necessary for oil and gas companies to find it economic to operate in Texas. From an economic standpoint, the ability to retain and attract oil and gas investments requires a pipeline system that can manage the flow of hydrocarbons in a timely and cost-effective manner. Accordingly, as shown in this study, the economic benefits attributable to the pipeline system are substantial in the state of Texas. Moreover, the upstream and downstream portions of the energy industry (i.e., exploration and production, refining activities, etc.) will generate even more economic benefits to Texas in the form of additional economic impacts provided that these companies have an efficient and effective way to transport their product.

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