LEGISLATIVE BUDGET AND FINANCE COMMITTEE

A JOINT COMMITTEE OF THE PENNSYLVANIA GENERAL ASSEMBLY

A Study Pursuant to House Resolution 2023 - 131: An Examination of Natural Gas Tax Structures

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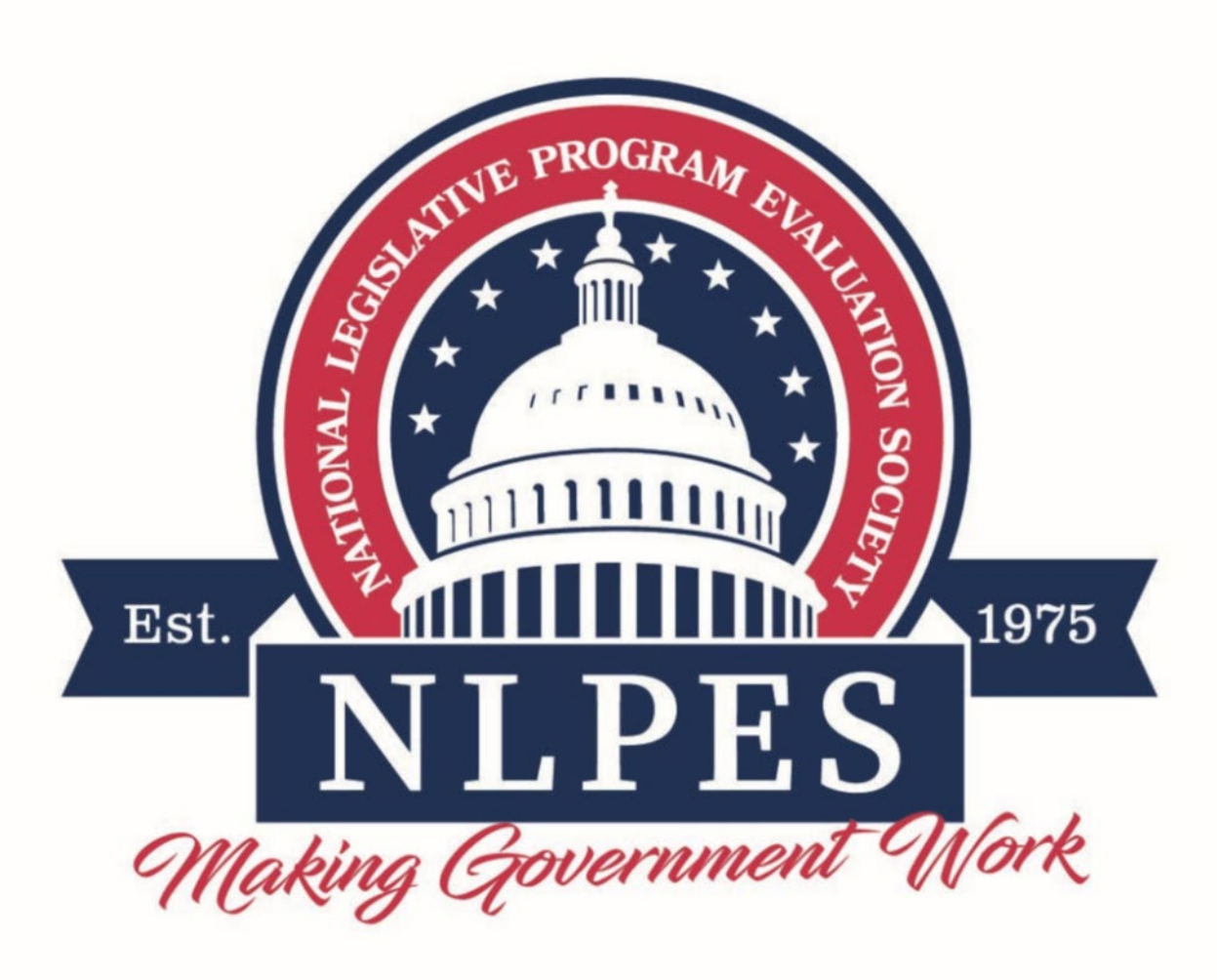

For the ninth straight year, the National Legislative Performance Evaluation Society (NLPES) awarded the Legislative Budget and Finance Committee with a Certificate of Impact. NLPES presents the Certificate of Impact to legislative offices that produce evaluations or audit reports that result in documented public policy changes, program improvements, dollar savings, or other public impacts.

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REPORT SUMMARY

Study Objectives

Our objectives for this study were as follows:

1. *Examine and compare the structure of any impact fee or severance tax within each of the top five natural gas producing states and study the factors that impact the calculation of the fee or tax.*

2. *Examine any unique factors within each of the top five natural gas producing states that impact the competitive business climate associated with natural gas drilling, including permitting requirements and costs; geological, geographical, and climatological conditions; and access to processing and transportation infrastructure.*

3. *Study the historical natural gas market price differences within the states and compare each state's natural gas prices to New York Mercantile Exchange index prices.*

Overview

House Resolution (HR) 131 directed the Legislative Budget and Finance Committee (LBFC) to compare the natural gas severance tax structures used among the top five producing states. As part of that review, HR 131 also sought information on each state's competitive business environment, including factors such as permit requirements, geographic conditions, climate, etc.

By way of background information, Pennsylvania has had a major presence in the coal and petroleum refining industries for decades. More recently, as technological advancements dramatically increased unconventional drilling in the Marcellus Shale formation, the state became a major natural gas producer. As of June 2023, the top five natural gas-producing states, which we refer to as the "top states" in this report, are in descending order:

1. Texas,
2. Pennsylvania,
3. Louisiana,
4. West Virginia, and
5. New Mexico

The objectives for this study were derived from the resolution (and are summarized in the left-facing text box). On December 12, 2023, the LBFC officers adopted HR 131 as a staff project.

This report is organized into three sections as follows:

- Section I: Objectives, Scope, and Methodology
- Section II: Comparison of Natural Gas Impact Fees and Severance Tax Structures
- Section III: Selected Factors Surrounding Natural Gas Development

Section II
Comparison of Natural Gas Impact Fees and Severance Tax Structures

Section II provides detailed discussions of our research comparing the fees and taxes assessed on natural gas drilling in the top five gas-producing states. It is organized by Issue Areas (A-D).

Type of Natural Gas Tax Structure

Pennsylvania imposes an impact fee on each gas well drilled, a unique practice among states. While this fee varies depending on the national natural gas price, the amount paid does not fluctuate based on the volume of gas produced. The other top gas-producing states assess severance taxes on the amount or market value of the extracted natural gas (see Figure 1).

Figure 1

State	Revenue Basis	Revenue Event	How the fee/tax works...
Pennsylvania	Impact fee	Drilling of well	Producers pay an annual fee during the well's first 15 years of operation. This fee varies based on the nationwide price of natural gas and generally decreases over time.
Louisiana	Severance tax	Extraction & sale of gas	Producers pay a tax which varies based on the volume of gas extracted. The tax rate is adjusted annually to reflect changes in the national market price of gas.
New Mexico	Severance tax	Extraction & sale of gas	Producers pay 3.5 percent of the market value of gas when it is extracted and sold.
Texas	Severance tax	Extraction & sale of gas	Producers pay 7.5 percent of the market value of gas when it is extracted and sold.
West Virginia	Severance tax	Extraction & sale of gas	Producers pay 5 percent of the market value of gas when it is extracted and sold.

Pennsylvania's per-well fee is relatively "new" compared to the other leading states. Texas instituted a severance tax in 1931 and has not revised it since 1969. Louisiana began taxing natural gas in 1910. West Virginia imposed its tax in 1921, and New Mexico, which uses several severance/extraction taxes, first instituted its taxes in the 1930s.

In addition to severance taxes, per-well impact fees, and restoration and clean-up fees, natural gas property owners must also pay property taxes on the value of the land and its wellhead equipment in most jurisdictions. The tax rates, exclusions, deductions, and calculation methods for such taxes differ in every jurisdiction.

Natural Gas Impact Fee/Severance Tax Administration

In Pennsylvania, Act 13 of 2012 specifies the fee amount for each well based on the average annual price of natural gas in the year the well is drilled. This fee continues until the 14th year after the well is drilled and increases annually if the Consumer Price Index in the Mid-Atlantic region increases.

The law has specific provisions for computing the impact fee for wells taken out of service or that have significantly decreased production. In 2018, the Pennsylvania Supreme Court ruled that if a well produces the minimum amount of gas in one month of a year, drillers must pay the full fee for that well.

Three states assess severance taxes on the market value of extracted natural gas, which must be remitted monthly. Producers in Texas pay 7.5 percent, West Virginia drillers pay five percent, and New Mexico assesses three separate taxes totaling 7.69 percent. In all three states, gas extracted from low-producing wells pays a lower rate or is exempt from tax, sometimes depending on the recent natural gas price.

Louisiana's natural gas producers pay a severance tax based on the volume of gas extracted. While the tax is based on the volume of gas produced rather than its market value, the tax rate is adjusted annually based on the national gas price in the futures market. While natural gas extracted from conventional vertical wells is taxed at the full rate, drillers of horizontal wells receive an exemption from paying up to 100 percent of the severance tax due, depending on the average annual price of natural gas.

In summary, each state uses different means of "assessing" drillers for the natural gas extracted within its borders. As each state is different, so too are the parameters of how these taxes/fees work. While state-to-state comparisons provide an operational context for how severance taxes work, we caution that because of the complexities and needs of each state, it is difficult to make "apples-to-apples" comparisons.

Amount of Revenue Collected from Natural Gas Impact Fees/Severance Taxes

Since 2012, Pennsylvania's Act 13 impact fee has generated more than $2.5 billion in revenue. The collected impact fees ranged from $146 million in 2021 to $279 million in 2023, averaging about $212 million per year. Although this is assessed per well, the fee amount changes if the national market price of natural gas changes significantly.

We analyzed the revenue each state received from its fee/tax from 2013 to 2023, as well as the number of active gas wells in each state during that time. Focusing more directly on just the past five years, Texas collected $12 billion in severance tax revenue, which is the most of any state by a significant margin. The other four top gas-producing states collected the following amounts during this period:

- Pennsylvania: $1.10 billion.

- Louisiana: $1.15 billion.
- West Virginia: $1.36 billion.
- New Mexico: $1.32 billion.

How Natural Gas Impact Fee/Severance Tax Revenue is Distributed

Each state distributes natural gas tax/fee revenue uniquely based on various financial and statutory requirements. Pennsylvania initially distributes about 10 percent of impact fee revenue to state agencies for conservation or to oversee natural gas drilling and the implementation of Act 13 itself. Pennsylvania distributes 60 percent of impact fee funds to local governments based, in part, on the number or percentage of wells located in each county or municipality. The remaining money is allocated to programs that fund environmental, transportation, and infrastructure projects through the Marcellus Legacy Fund.

Louisiana and West Virginia distribute a much smaller percentage of severance tax revenue than Pennsylvania to local governments. Both states allocate those funds in a way that gives most or all of it to areas where natural gas is extracted. Most of those states' severance tax revenue goes to the state's general fund. Texas and New Mexico allocate severance tax revenue to specific state budget categories and do not distribute specific amounts to local governments.

Section III
Selected Factors Related to Natural Gas Development

HR 131 directed us to explore unique factors relevant to natural gas production within the leading gas-producing states. We gathered data and information from state, federal, and non-governmental entities to conduct a comparative analysis of regulatory provisions and environmental conditions.

- Permitting Procedures: Generally, each state requires operators to submit applications for permits to drill and meet bonding requirements to drill in the state. Operators may also need to obtain other permits before commencing drilling operations. For example, Pennsylvania requires that an operator obtain a sediment control plan/general permit and a water obstruction and encroachment permit if the operation is deemed to impact the state's waterways. Each state requires operators to submit a permit fee as part of the drilling permit application process. In Pennsylvania, operators seeking to operate an unconventional

well must pay a permit application fee of $12,500, which is higher than in peer states.

- Geological Conditions: We examined major shales and basins contributing to a significant portion of natural gas production. Specifically, these shales and basins include the Eagle Ford Shale, Permian Basin, Haynesville Shale, San Juan Basin, Point Pleasant-Utica Shale, and Marcellus Shale. These shale areas may cover multiple states. The Marcellus Shale, Pennsylvania's primary natural gas source, is one of the largest natural gas plays in the United States.

- Geographical Conditions: Of the top gas-producing states, Texas is the largest by area, with a land area spanning 261,194 square miles and a water area measuring 7,331 square miles. It also has the longest gas distribution pipeline system, totaling 169,237 miles. West Virginia has the smallest land area and the shortest gas distribution pipeline system. Federal and state-owned lands within each state have different leasing and permitting processes. Federal lands follow policies regarding natural gas drilling that the Bureau of Land Management sets forth. While Texas has the largest total land acreage, it also has the smallest federal land acreage in proportion to its total land acreage. New Mexico had the most federal land acreage in proportion to its total land acreage.

- Climate Conditions: We explored each peer state's seasonal temperatures and weather conditions. Of the selected states we examined, we found that, from 2012 to 2023, Louisiana had the highest mean temperature of 67.8 degrees Fahrenheit, while Pennsylvania had the lowest mean temperature of 50.2 degrees Fahrenheit. Variance in temperatures can affect the natural gas development and production process. For example, freezing weather conditions can lead to freeze-offs in the flow of natural gas. Conversely, hot weather conditions can increase pressure on the pipeline system, raising the risk of explosion.

Natural Gas Market Price Differences

Figure 2

As highlighted in Figure 2, significant differences exist between the national natural gas price determined on the New York Mercantile Exchange and state-specific prices. When we computed the averages of monthly state-specific prices from 2012 to 2023, Pennsylvania had the highest average of $5.48 per thousand cubic feet. New Mexico and Louisiana nearly tied for the lowest average of $3.94 per thousand cubic feet. Texas and West Virginia averaged $4.78 per thousand cubic feet and $4.97 per thousand cubic feet, respectively. All these prices were higher than the average natural gas price set at the Henry Hub delivery point near the Gulf of Mexico.[1]

The proceeds that natural gas drillers receive for extracted natural gas are determined by individual natural gas purchases and sales using prices driven by the market conditions at each delivery location. These prices are influenced by weather, economic activity, demographics, storage or transportation capacity, and demand for natural gas in that specific state or city. These prices fluctuate dramatically and sometimes move in the opposite direction of national prices due to localized effects.

[1] Henry Hub is the interconnection of seven interstate pipelines and three intrastate pipelines in Erath, Louisiana. It is typically used as a delivery point for pricing natural gas.

SECTION I
OBJECTIVES, SCOPE, AND METHODOLOGY

Why we conducted this study…

House Resolution 131 called for a review of applicable natural gas extraction tax structures, including severance taxes and impact fees, among the top-producing states.

The scope of this resolution was significantly amended from its initial intent. The House of Representatives adopted the resolution on June 29, 2023.

By extension, the LBFC officers adopted HR 131 as a staff project on December 12, 2023.

Objectives

House Resolution (HR) 131 directed the Legislative Budget and Finance Committee (LBFC) to examine and compare natural gas extraction tax structures among the top five natural gas-producing states (hereafter referred to as the "top five states"). HR 131 further required the LBFC to compare the "competitive business climates" of the natural gas industry within those respective states.

As a matter of practice, when the House or Senate adopts a resolution directing the LBFC to conduct a study, the officers meet to discuss the resolution and vote to adopt the resolution as a staff project. On December 12, 2023, the officers adopted HR 131 as a staff project.

Following adoption of the resolution as a staff project, LBFC staff develops objectives to answer the resolution's intent and guide future planning efforts. For this study, HR 131 enumerated broad research-oriented objectives as follows:

1. Examine and compare the structure of any impact fee, severance tax, or other taxes within each of the top five states, including the factors that impact the calculation of the fee or tax in each state.

2. Identify and examine unique factors within each of the top five states that impact the competitive business climate within the states, including the following factors:

    a. Permitting requirements, timelines, and associated costs in preparing and obtaining necessary operating permits.
    b. Geological conditions, including depth, thickness, and formation irregularities that may impact resource access.
    c. Geographical conditions that impact operational costs, including terrain, miles of waterways, and the amount of federal and state lands excluded from development.

d. Climate conditions impacting operations including seasonal temperature factors and other weather conditions.
e. Availability and access to sufficient gathering, processing, and transportation infrastructure (pipelines and roadways) within the states to access markets.
f. Historical natural gas market price differences within the states and how each state's prices have compared to the New York Mercantile Exchange (NYMEX) index price for natural gas over the last decade.

Scope

Our study primarily covered fiscal year (FY) 2012-13 through FY 2022-23. In some areas, our scope may have preceded or extended beyond this timeframe because it was necessary to provide a historical context of relevant issues confronting the natural gas market in Pennsylvania or designated peer states.

Methodology

We used open data published by the United States Energy Information Administration (USEIA) to identify the top five natural gas-producing states. The USEIA is an agency within the United States Department of Energy that promotes, collects, analyzes, and disseminates independent and impartial energy information to promote sound policymaking. We did not independently audit USEIA data; however, we believe it to be a sufficiently reliable source for the purposes of this report.

To examine the fees and tax structures for natural gas among the top five states, we analyzed relevant state constitutions and statutes that detail the fees and taxes imposed on natural gas drilling and the calculation methods. We also obtained and analyzed federal and state data identifying the number of active natural gas wells, the amount of gas extracted, and the revenue each state collected from gas drilling. We reviewed and examined state government budgets, financial reports, tax summaries, natural resources department briefings, revenue disbursement reports, and other data to determine the amount of money each state collected from gas extraction and how those funds were distributed.

Regarding permitting procedures, including permit requirements, fees, and timeframes, we examined agency guidelines and reports and state

laws and regulations from respective states. We gathered data and information related to unconventional wells and drilling where possible. We used the following method of data collection for the number of permits issued in each state:

1. Pennsylvania: The data was obtained from the Pennsylvania Department of Environmental Protection's (DEP) website. Only numbers related to unconventional well permits in Pennsylvania have been recorded. The data for 2012 through 2022 was gathered via DEP's Oil and Gas Annual Reports from 2016 and 2022. Data for 2023 was found via the agency's Permits Issued Detailed Report. To gather the 2023 data, we used various data filters. We changed "Permit Issued Start Date" and "Permit Issued End Date" to January 1, 2023, and December 31, 2023, respectively. We also selected "Unconventional" under "Well Configuration" and only "Gas" and "Oil" under "Well Type," which is consistent with DEP's earlier reporting. Other filters in the data were left as "All."

2. Texas: The data was gathered by examining the oil and gas figures for "Permitted Well Types" in the Railroad Commission's Monthly Drilling, Completion, and Plugging Summaries. For 2012 to 2022, we reviewed the agency's annual reports, which compile all monthly data within each year. For example, our analysis of the number of permits issued in 2012 is based on the 2012 annual report. However, as of June 3rd, 2024, the annual report for 2023 was unavailable; therefore, for the number of permits issued in 2023, we used the agency's monthly summary from April 2024, which lists cumulative data for 2023. The numbers presented for Texas in our analysis may include data on permits issued in the state for unconventional and conventional wells.

3. Louisiana: The data was captured by reviewing the Louisiana Department of Energy and Natural Resources' newsletter, Louisiana Energy Facts, from December 2015, December 2019, and May 2024. We summed the monthly data to determine the total number of permits issued each year from 2012 to 2023. The data captures the entirety of oil and gas permits in Louisiana. Permit data is not separated by unconventional and conventional well/drilling permits.

4. West Virginia: The data was collected through the annual compilation of 22-6A Permit Issuance Monthly Reports by the West Virginia Department of Environmental Protection's Office of Oil and Gas. The data reflects the number of Horizontal 6A permits issued in the state each year.

5. New Mexico: The data was gathered by reviewing the New Mexico Energy, Minerals, and Natural Resources Department's statistics published in a spreadsheet titled "APD Permits Issued By Type By

Year." The computation of the total number of oil and gas permits for each year is presented in the exhibit/analysis.

For geological conditions, we reviewed USEIA's profile analyses (from each of the state's *State Profile and Energy Estimates*) to identify which basin(s) or shale(s) produce significant natural gas for each of the selected states. From there, we explored studies and reports produced by government agencies (e.g., United States Geological Society) and non-governmental entities to analyze the geological conditions of each basin and shale.

We reviewed each state's transportation and environmental protection agencies for comparative geographical conditions, which we supplemented with data from the United States Department of Transportation. We also relied upon federal land management information from the United States Bureau of Land Management. We relied on the United States Department of Transportation's Pipeline and Hazardous Materials and Safety Administration (PHMSA) for state data on pipeline miles and facilities. We extracted data from PHMSA's *Pipeline Miles and Facilities 2010+* for each state's pipeline infrastructure.

Our analysis primarily relied on the data and reports produced by the National Oceanic and Atmospheric Administration's National Centers for Environment Information (NCEI) for climate considerations. For natural gas pricing information, we examined USEIA's data on Henry Hub natural gas spot prices and state citygate prices.

Frequently Used Abbreviations and Definitions

This report uses several abbreviations for government-related agencies, terms, and functions. These abbreviations are defined as follows:

Abbreviation	Name	Definition
BLM	United States Department of Interior's Bureau of Land Management	The federal agency administers federal lands for various activities, such as energy production and mineral development.
CNG	Compressed Natural Gas	A type of natural gas that is compressed to less than one percent of its volume at standard atmospheric pressure.
DCNR	Pennsylvania Department of Conservation and Natural Resources	A state agency tasked with overseeing Pennsylvania's public lands and outdoor recreation, including maintaining and protecting state parks and managing state forest land.

DENR	Louisiana Department of Energy and Natural Resources	A state agency that oversees activities involving Louisiana's natural resources and energy.
DEP	Pennsylvania Department of Environmental Protection	A state agency responsible for protecting and preserving the land, air, water, and public health through enforcing Pennsylvania's environmental laws.
EMNRD	New Mexico Energy, Minerals and Natural Resources Department	A state agency that manages and protects New Mexico's energy, minerals, and natural resources.
FERC	Federal Energy Regulatory Commission	An independent federal agency that regulates the interstate transmission of natural gas, oil, and electricity, as well as natural gas and hydropower projects.
GLO	Texas General Land Office	A state agency that oversees Texas' public lands and mineral rights properties.
GPD	Gallons per day	Unit of measurement.
LDTD	Louisiana Department of Transportation and Development	A state agency responsible for maintaining and managing Louisiana's public transportation and infrastructure system.
LNG	Liquefied Natural Gas	A type of natural gas that must be cooled and stored in liquid form at -260 degrees Fahrenheit prior to being converted into gas.
MCF	Thousand Cubic Feet	One thousand cubic feet is a common unit of volume of natural gas used in financial and government reporting.
NCEI	National Oceanic and Atmospheric Administration's National Centers for Environment Information	A federal agency under the National Oceanic and Atmospheric Administration that focuses on providing environmental data, products, and services covering the ocean's depths to the sun's surface.
NMDOT	New Mexico Department of Transportation	A state agency responsible for managing and overseeing New Mexico's public transportation system, including transit, rail, aviation, and highways.
NMSLO	New Mexico State Land Office	A state agency that is responsible for overseeing New Mexico's public land and mineral resources.
NYMEX	New York Mercantile Exchange	A commodity futures exchange that is part of the Chicago Mercantile Exchange Group.
PADOT	Pennsylvania Department of Transportation	A state agency that oversees Pennsylvania's public transportation and infrastructure system.
PHMSA	United States Department of Transportation's Pipeline and Hazardous Materials and Safety Administration	A federal agency under the United States Department of Transportation that oversees and enforces federal law and regulations related to pipeline safety and transportation of hazardous materials (that operate via land, air, or sea).

PUC	Pennsylvania Public Utility Commission	A state agency that oversees all public utility services in the state, including natural gas utilities and natural gas pipelines.
RRC	Railroad Commission of Texas	A state agency that holds primary regulatory jurisdiction over Texas' oil and natural gas industry, pipelines, natural gas utilities, liquefied petroleum gas industry, natural gas infrastructure, and coal and uranium surface mining operations.
SMEB	Louisiana State Mineral and Energy Board	A state board under the Louisiana Department of Energy and Natural Resources that administers the state's proprietary interest in minerals and oversees leasing processes for the development and production of minerals, oil, and gas on the state's public land.
SWR	Statewide Rule (Texas)	A set of rules from the Texas Administrative Code. This report primarily relates this terminology to Title 16, Part 1, Chapter 3, Rules §3.37 and §3.38 of the Texas Administrative Code. SWR 37 relates to the statewide spacing rule for wells, and SWR 38 relates to well densities.
TCEQ	Texas Commission on Environmental Quality	A state agency responsible for protecting Texas' public health, natural resources, and environment.
TXDOT	Texas Department of Transportation	A state agency that oversees the maintenance and management of Texas' roadways, aviation, maritime, and public transportation system.
USCB	United States Census Bureau	A federal agency that gathers and analyzes demographic data.
USDOT	United States Department of Transportation	A federal agency that oversees the nation's transportation system.
USEIA	United States Energy Information Administration	A federal agency that collects, analyzes, and disseminates energy data and information.
USGS	United States Geological Survey	A federal agency that monitors and analyzes information related to natural resource conditions, issues, and problems.
WVDEP	West Virginia Department of Environmental Protection	A state agency that enforces state and federal environmental laws related to protecting West Virginia's air, water, and land.
WVDOC	West Virginia Department of Commerce	A state agency that oversees West Virginia's economy and tourism, use of natural resources, and safety and productivity of the state's workforce.
WVDOT	West Virginia Department of Transportation	A state agency that oversees West Virginia's public roadway and transportation system.

Acknowledgments

We acknowledge and thank the cooperation we received from the Pennsylvania Public Utility Commission, the United States Energy Information Administration, and numerous state and agency resources and personnel from the selected states. We also thank the Marcellus Shale Coalition for providing insight into the natural gas industry in Pennsylvania.

Important Note

This report was developed by the Legislative Budget and Finance Committee staff, including Deputy Executive Director Stephen Fickes, who served as project manager, and David Beaudoin and Anthony Choi, who were analysts assigned to the project. The release of this report should not be construed as an indication that the LBFC as a whole, or its individual members, necessarily concur with the report's findings, conclusions, or recommendations.

Any questions or comments regarding the contents of this report should be directed to the following:

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SECTION II
COMPARISON OF NATURAL GAS IMPACT FEES AND TAX STRUCTURES

Fast Facts...

- *The top five natural gas-producing states are Texas, Pennsylvania, Louisiana, West Virginia, and New Mexico (in decreasing order of natural gas produced).*
- *All states impose an extraction tax or fee on natural gas extracted from within its borders. Pennsylvania is unique in requiring natural gas well operators to pay an "impact fee," created by Act 13 of 2012.*
- *Of these states, Pennsylvania distributes up to 90 percent of its extraction fee revenue either directly to county and municipal governments or to programs that fund environmental, transportation, and infrastructure projects. Sixty percent of these funds are distributed to local governments based, at least in part, on the number or percentage of wells located in each county or municipality.*

Overview

Government terminology is complex and may have different connotations. For example, is a government fee a tax, or is it some other revenue source? According to the nonpartisan Tax Foundation, taxes, fees, and penalties are all imposed by the government, all raise revenue, and all impose economic costs, but there are definitional differences between the two terms.

These terminology distinctions are significant to this report because Pennsylvania imposes an "impact fee" on natural gas exploration, whereas other states typically impose "severance taxes." House Resolution (HR) 131 directed us to study and compare impact fees and severance taxes among the top five natural gas-producing states, including how such fees or taxes are structured and calculated.[2]

Texas leads among the top five states, with Pennsylvania a distant second. Louisiana, West Virginia, and New Mexico are the third, fourth, and fifth top-producing states. This report section compares the impact fee/severance tax used in those states. Specifically, we address the following:

- **Issue Area A: Natural Gas Tax Structures in the Top-Producing States.** We reviewed relevant legislation governing the fees or taxes the top states apply to natural gas drillers and discussed the taxes' origin, history, and any unique aspects of these assessments. For example, Pennsylvania is unique in its use of an impact fee, but it is also a relatively "new" producer compared to other states. Texas instituted a severance tax in 1931 and has not revised it since 1969, although it also imposes an Oil-Field Cleanup Regulatory Fee on Natural Gas." Louisiana began taxing natural gas in 1910. West Virginia imposed its tax in 1921, and New Mexico, which has several severance/extraction taxes it uses, instituted its taxes in the 1930s. Comparatively, high-volume natural gas drilling in Pennsylvania's gas-rich Marcellus Shale region began around 2008.

[2] In this report, we frequently refer to the top five natural gas-producing states as "top states," "cohort of states," or "peer states."

- **Issue Area B: Natural Gas Tax Administration.** We analyzed how natural gas drillers or owners/operators calculate the relevant fee or tax. We explained any special provisions that apply to specific drilling situations, such as different rates for certain low-producing well types or the applicability of any tax or fee exemptions. Pennsylvania's impact fee is unlike the revenue-generating mechanisms found in other states. This conclusion should not be construed as an evaluative judgment regarding its suitability; rather, it is meant to highlight its unique applicability compared to peer states.

  Other states assess a severance tax based on the volume of material extracted, its market value, or both. For example, among the top five natural gas-producing states, New Mexico, Texas, and West Virginia assess a severance tax based on the market value of the gas extracted. Louisiana's severance tax is on the gross volume of gas produced.

- **Issue Area C: Historical Revenue Collection from Natural Gas Impact Fees/Severance Taxes.** We analyzed the amount of revenue each state received from its fee or tax from 2013 to 2023, as well as the number of active gas wells in each state during that time. Since 2012, Pennsylvania's Act 13 impact fee has generated more than $2.5 billion in revenue. Focusing more directly on just the past five years, Texas collected $12 billion in severance tax revenue, which is the most of any state by a significant margin. The other four top gas-producing states collected revenue as follows:

  - Pennsylvania: $1.10 billion.
  - Louisiana: $1.15 billion.
  - West Virginia: $1.36 billion.
  - New Mexico: $1.32 billion

- **Issue Area D: State-defined Uses of Natural Gas Tax Revenue.** We reviewed state budgets and legislation to determine how each top gas-producing state used the revenue collected from taxes and fees assessed on natural gas drilling. As expected, each state distributes revenue uniquely based on various financial and statutory requirements. Of these states, Pennsylvania distributes up to 90 percent of its extraction fee revenue either directly to county and municipal governments or to pro-

grams that fund environmental, transportation, and infrastructure projects. Sixty percent of these funds are distributed to local governments based, at least in part, on the number or percentage of wells located in each county or municipality. Louisiana and West Virginia distribute a much smaller percentage of severance tax revenue than Pennsylvania to local governments. Both states allocate those funds in a way that gives most or all of it to areas where natural gas is extracted. Most of those states' severance tax revenue goes to the state's general fund. Texas and New Mexico allocate severance tax revenue to specific state budget categories and do not distribute specific amounts to local governments.

Issue Areas

A. Natural Gas Tax Structures in the Top-Five Producing States

Natural gas has been an energy source for homes and businesses in the United States since the early 1800s. Companies started building long-distance pipelines in the early 20th century, which made gas use efficient and economical. Due to increased discoveries of reserves and improved technologies for extracting those reserves, natural gas is now the country's largest source of electricity production.

According to data compiled by the United States Energy Information Administration (USEIA), in 2023, the United States produced over 41 million cubic feet of natural gas. This production occurred in 34 states, with the 10 largest states responsible for 94 percent of that amount.

HR 131 asked us to compare the fee and tax structures for extracting natural gas among the top five gas-producing states, including Pennsylvania. To show the comparative natural gas production of the major gas-producing states, Exhibit 1 lists the states.

Exhibit 1

Top-10 Natural Gas Producing States
(2023)

State	Marketable Natural Gas Production (mm cu. ft)
Texas	11,539,966
Pennsylvania	7,619,721
Louisiana	4,305,988
West Virginia	3,239,174
New Mexico	3,164,408
Oklahoma	2,817,297
Ohio	2,263,473
Colorado	1,824,228
North Dakota	1,120,237
Wyoming	951,046

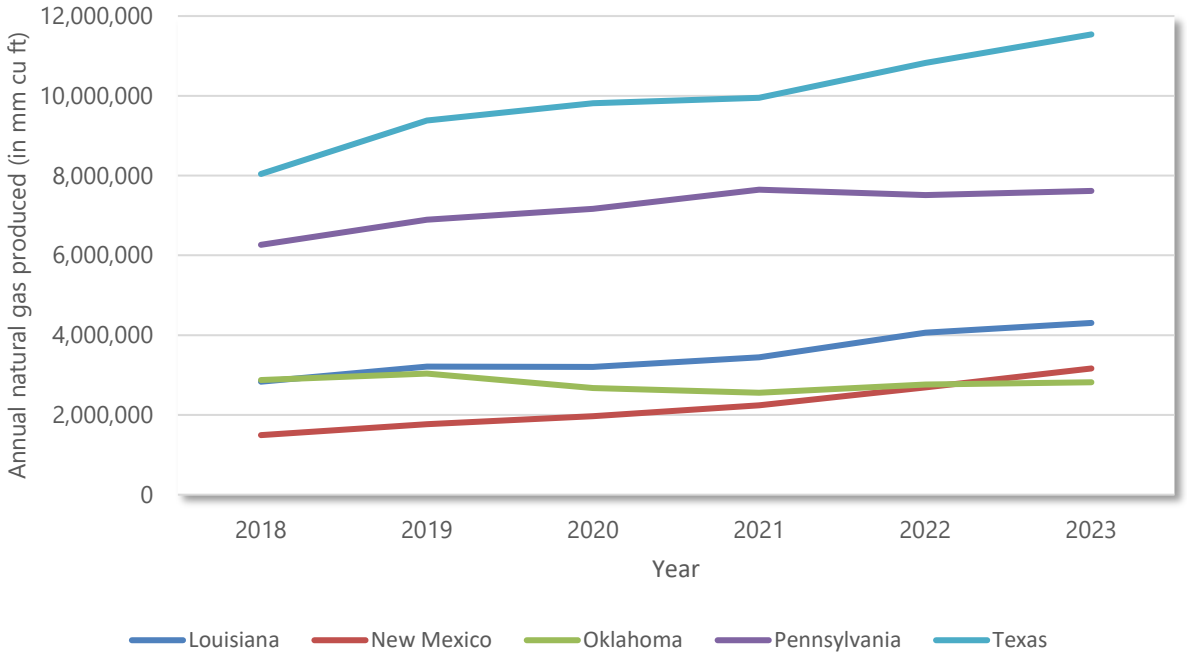
Source: Developed by LBFC staff from data collected by the United States Energy Information Administration (USEIA).

In terms of state production, Texas leads all states with 29.7 percent of marketed natural gas in the country in 2023. Pennsylvania produced 19.6 percent of the United States' natural gas, which has increased by an average of about 4 percent annually since 2018.

Exhibit 2 displays the annual natural gas production of the five top-producing states since 2018, showing Pennsylvania's production increasing slightly compared to more dramatic growth in Texas, Louisiana, and New Mexico.

Exhibit 2

Natural Gas Production in the Top Five Producing States (2018 – 2023)



Source: Developed by LBFC staff from data obtained from the United States Energy Information Administration.

Having identified the top five natural gas-producing states (top states), we next compiled the fee/tax structures for natural gas exploration that were used as the revenue basis in those states. Exhibit 3 summarizes the primary fee or tax that exists in Pennsylvania, Texas, Louisiana, West Virginia, and New Mexico.

Exhibit 3

Revenue Basis Used Among the Top Five Producing States

State	Revenue Basis	Revenue Event	How the fee/tax works...
Pennsylvania	Impact fee	Drilling of well	Producers pay an annual fee during the well's first 15 years of operation. This fee varies based on the nation-wide price of natural gas and generally decreases over time.
Louisiana	Severance tax	Extraction & sale of gas	Producers pay a tax which varies based on the volume of gas extracted. The tax rate is adjusted annually to reflect changes in the national market price of gas.
New Mexico	Severance tax	Extraction & sale of gas	Producers pay 3.5 percent of the market value of gas when it is extracted and sold.
Texas	Severance tax	Extraction & sale of gas	Producers pay 7.5 percent of the market value of gas when it is extracted and sold.
West Virginia	Severance tax	Extraction & sale of gas	Producers pay 5 percent of the market value of gas when it is extracted and sold.

Source: Developed by LBFC staff from information obtained from each state's statutes or other respective state-specific information.

It is important to note the difference between taxes and fees. Although definitions can vary, the nonpartisan Tax Foundation presents a reasonable distinction between the two. Specifically, they noted the following:[3]

> **Taxes** are imposed to raise revenue, resulting in funds spent on general government services. **Fees** are imposed to cover the cost of providing a service, with the funds raised directly from those benefiting from a particular provided service. Revenues from some taxes, known as *user taxes*, are deposited in a special dedicated fund and not the general fund. If their purpose is revenue generation for general government functions, these are still taxes, although they can be mischaracterized as fees.

Pennsylvania is unique in its use of an impact fee. Whether the fee is really a tax or a user tax is beyond the scope of this report and is immaterial to the information requested in HR 131. For the purposes of this report, we use the terms impact fee and severance tax to mean the same thing: revenue collected by the state for extracting natural gas within that state's borders.

[3] Bishop-Henchman, Joseph, *How is Money Used? Federal and State Cases Distinguishing Taxes and Fees,* Tax Foundation, March 27, 2013.

We also note Pennsylvania's impact fee is different in that while the per-well fee varies depending on the national natural gas price, the amount paid does not fluctuate based on the volume of gas produced. According to the National Conference of State Legislators, in other states where natural resources are mined or extracted, those states assess either a market-value or volume-based charge for "severing" materials from the ground (known as a severance tax). In the subsections below, we further highlight the historical perspective of each state's tax. In Issue Area B, which follows, we discuss the specifics of how the tax is calculated.

Pennsylvania

In 2012, Pennsylvania enacted Act 13, which amended the state's oil and gas production statutes and established an "impact fee" to assess unconventional natural gas wells drilled in the commonwealth.

The law distinguishes between conventional and unconventional gas wells. An "unconventional gas well" is "a bore hole drilled or being drilled for the purpose of, or to be used for the production of natural gas from an unconventional formation."[4] Correspondingly, the law sets impact fees for wells based on age and the average annual price of natural gas.

Producers are not required to pay the fee for wells that have stopped producing natural gas and have been plugged in accordance with Department of Environmental Protection (DEP) regulations.

The impact fee is paid on April 1 of each year. The law also authorizes the Public Utility Commission (PUC) to refrain from issuing permits for new wells to any driller with unpaid impact fees from previous years.

Texas

Texas imposes a 7.5 percent severance tax on natural gas extraction based on natural gas market value. While this rate has varied since the tax was first assessed in 1931, the current severance tax rate has remained unchanged since 1969.[5]

Texas also assesses an Oil-Field Cleanup Regulatory Fee on Natural Gas, which is paid monthly along with the severance tax. This fee is one-fifteenth of one cent ($.000667) per 1,000 cubic feet (mcf) of gas.

[4] Pennsylvania Act 13 of 2012, § 2301.
[5] Texas Comptroller of Public Accounts, *Sources of Revenue: A History of State Taxes and Fees, 1972-2022*, January 2023.

Louisiana

Louisiana assesses a severance tax on the extraction of oil and natural gas. While the tax is based on the volume of gas produced rather than its market value, the tax rate is adjusted annually based on the national gas price in the futures market. This means that the tax operates like a market-value-based tax in that the state receives more revenue when natural gas prices are high and less revenue when prices are low.

Louisiana first began taxing natural gas extraction in 1910. In 1921, the state strengthened its authority to assess such a tax by amending its constitution to adopt a severance tax expressly. Originally, the tax was assessed on gas extracted (by volume). From 1912 through 1927, the state changed it to a market-value-based tax. In 1928, Louisiana switched back to applying the tax based on the volume of gas.

In 1990, the legislature changed the severance tax so that is adjusted annually based on futures market prices. As such, the severance tax is like the different impact fee prices specified in Pennsylvania's Act 13. The law authorizing Louisiana's severance tax adjustment specifies the tax rate can never be less than seven cents ($0.07) per million cubic feet (mcf). Since 2013, the severance tax rate has ranged from 9.1 cents per mcf to 25.1 cents per mcf.

Additionally, drill operators in Louisiana must pay an oilfield site restoration fee based on the volume of natural gas extracted. This fee is three-tenths of $.01 ($.003) per 1,000 cubic feet (mcf) of gas.[6] Producers must file a separate return to the Louisiana Department of Revenue for this fee. These funds are deposited in the Oilfield Site Restoration Fund and used to assess and restore gas and oilfield sites as directed by the Oilfield Site Restoration Commission within the Louisiana Department of Natural Resources.

Louisiana's Constitution prohibits other taxes on drilling and extracting natural resources. It also prohibits adding the value of a property's mineral reserves to determine its assessed value, stating, "no further or additional tax or license shall be levied or imposed upon oil, gas, or sulphur leases or rights. No additional value shall be added to the assessment of land because of the presence of oil, gas, or sulphur therein or their production therefrom."[7]

[6] Louisiana Revised Statutes § 30:87.
[7] Louisiana Constitution, Article 7, §4 (B) (1)

West Virginia

West Virginia imposes a five percent severance tax on the gross receipts from the sale of natural gas extracted in the state. The state first instituted a tax on the proceeds from mining natural resources such as coal, oil, gas, and timber in 1921, and the rate that specifically applied to natural gas extraction ranged from 1.85 percent to 8.63 percent from 1925 to 1975.[8] The current gas severance tax rate has remained unchanged since 1989.

From 2005 to 2016, West Virginia enacted a temporary additional severance tax of 4.7 cents per 1,000 cubic feet (mcf) of gas.[9] The revenue from this temporary tax was used to pay down debts from the previous state-administered workers' compensation system. This additional tax was also assessed on coal mining and timber extraction.

Additionally, the net proceeds from natural gas sales must be reflected in the property values of properties with oil and gas wells, which affects those properties' county tax assessments.[10]

New Mexico

New Mexico gas producers pay five specific taxes or fees for extracting natural gas in the state. Three of these taxes are assessed on the taxable value of natural gas, which is the value of the sold gas, excluding any royalties paid to federal or tribal governments and reasonable transportation expenses to the first place the gas is sold.

These three taxes are as follows:

- A 3.5 percent Oil and Gas Severance tax.[11] Gas extracted from low-producing wells is taxed lower if the average annual taxable value of gas sold in the state the previous year is below specific levels.
- A 0.19 percent Oil and Gas Conservation tax.[12]
- A 4 percent Oil and Gas Emergency School Tax.[13]

[8] *See* the West Virginia Department of Revenue's September 14, 2015, presentation to the state legislature's Joint Select Committee on Tax Reform.
[9] W. Va. Code §11-13V-4.
[10] W. Va. Code §11-1C-10.
[11] NM Statutes § 7-29-4.1.
[12] NM Statutes § 7-30-4.
[13] NM Statutes § 7-31-4.

Natural gas drillers also pay an Ad Valorem Production tax and an Ad Valorem Production Equipment tax. The Production tax is based on the assessed value of natural gas extracted,[14] and the Production Equipment tax is based on the equipment located at each site.[15] The tax rates for both are set annually by local taxing authorities (counties and school districts) for each site. These taxes are paid to the state Taxation and Revenue Department, although much of the funds are distributed to local governments. They function like local property taxes.

Additionally, operators of natural gas processing plants in New Mexico pay a Natural Gas Processors Tax based on the volume of gas delivered to each plant.[16] The New Mexico Taxation and Revenue Department calculates the tax rate annually based on the average annual taxable value of natural gas during the previous fiscal year. The rate for the year ending June 30, 2024, was .0282 per million BTU.

According to the New Mexico State Investment Council, the state has collected severance taxes on natural resource extraction since the 1930s.

Property Taxes

In addition to severance taxes, per-well impact fees, and restoration and clean-up fees, natural gas property owners must also pay property taxes on the value of the land and its wellhead equipment in most jurisdictions. The tax rates, exclusions, deductions, and calculation methods for such taxes differ in every jurisdiction. A national comparison of average state property tax rates published by Bankrate.com found the following 2023 effective property tax rates for the five states we studied:

- West Virginia: 0.49%
- Louisiana: 0.62%
- New Mexico: 0.62%
- Texas: 1.20%
- Pennsylvania: 1.33%

[14] NM Statutes § 7-32-4.
[15] Ibid.
[16] Ibid.

B. Natural Gas Tax Administration

As discussed in the last issue area, Pennsylvania is unique in its use of an impact fee. Other states assess a severance tax based on either the volume of material extracted, its market value, or both. For example, among the top five natural gas-producing states, New Mexico, Texas, and West Virginia assess a severance tax based on the market value of the gas extracted. Louisiana's severance tax is on the gross volume of gas produced. In this issue area, we provide further context on how each state administers or applies its respective fee/tax on natural gas extraction.

Pennsylvania

Act 13 specifies the fee amount on each well depending on the average annual price of natural gas each year. The fee continues until the 14th year after the well is spud.[17] The law also requires that the base fee increase annually for "upward changes in the Consumer Price Index for all Urban Consumers for the Pennsylvania, New Jersey, Delaware, and Maryland area in the preceding 12 months" if the "total number of unconventional gas wells spud…exceeds the total number of unconventional gas wells spud in the prior year."[18]

The law has specific provisions for computing the impact fee for wells taken out of service or that have significantly decreased production. These wells are commonly referred to as "stripper wells." Similarly, vertical unconventional gas wells, which are defined as those that use "hydraulic fracture treatment through a single vertical well bore and produce[s] natural gas in quantities greater than that of a stripper well," are assessed 20 percent of the regular impact fee. Additionally, these wells are only assessed for the first 10 years of production.

The starting impact fee assessed per well is based on the average annual price of natural gas in the well's first year. Exhibit 4 details the exact fee that drillers must pay, depending on that price.

[17] Spud is an industry term that generally refers to the point in the drilling process when the ground is broken.
[18] Pennsylvania Act 13 of 2012, § 2302 (c).

Exhibit 4

Pennsylvania's Unconventional Natural Gas Well Impact Fee (Year to Year Calculations)

(1) Year One: If the annual average price of natural gas is...

- not more than $2.25, the fee shall be $40,000 for the calendar year in which the unconventional gas well is spud.
- greater than $2.25 and less than $3.00, the fee shall be $45,000 for the calendar year in which the unconventional gas well is spud.
- greater than $2.99 and less than $5.00, the fee shall be $50,000 for the calendar year in which the unconventional gas well is spud.
- greater than $4.99 and less than $6.00, the fee shall be $55,000 for the calendar year in which the unconventional gas well is spud.
- more than $5.99, the fee shall be $60,000 for the calendar year in which the unconventional gas well is spud.

(2) Year Two: If the annual average price of natural gas is...{the same natural gas price criteria as Year One}

- the fee shall be $30,000 for the calendar year following the year in which the unconventional gas well is spud.
- the fee shall be $35,000... "".
- the fee shall be $40,000... "".
- the fee shall be $45,000... "".
- the fee shall be $55,000... "".

(3) Year Three: If the annual average price of natural gas is...{the same natural gas price criteria as Year One)

- the fee shall be $25,000 for the second calendar year following the year in which the unconventional gas well is spud.
- the fee shall be $30,000..."".
- the fee shall be $30,000..."".
- the fee shall be $40,000..."".
- the fee shall be $50,000..."".

(4) Years Four Through Ten: If the annual average price of natural gas is...

- not more than $2.25, the fee shall be $10,000 for the third through ninth calendar years following the year in which the unconventional gas well is spud.
- greater than $2.25 and less than $3.00, the fee shall be $15,000.."".
- greater than $2.99, the fee shall be $20,000..."".

(5) Years 11 - 15: **If the annual average price of natural gas is...**

- less than $3.00, the fee shall be $5,000 for the 10th through 14th calendar years following the year in which the unconventional well is spud.
- greater than $2.99, the fee shall be $10,000..."".

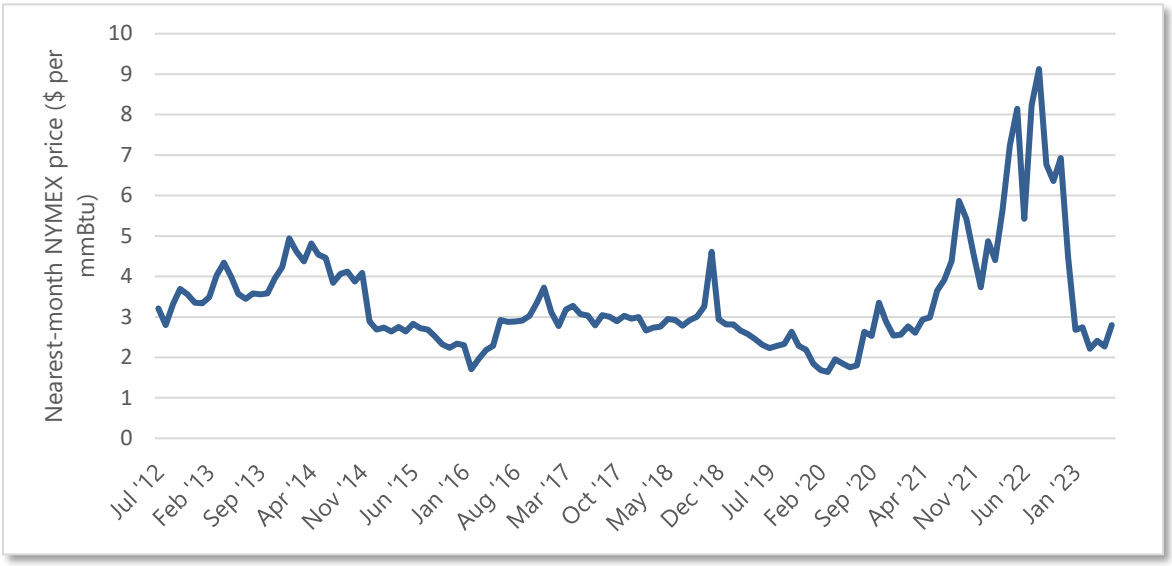
Source: Developed by LBFC staff from Pennsylvania Act 13 of 2012, § 2302 (b).

As shown above, Pennsylvania's impact fee is significantly driven by the price of natural gas (see Section III, Issue Area E that follows). The average annual price of natural gas, as used in the fee calculation, is determined by calculating the "arithmetic mean of the New York Mercantile Exchange (NYMEX) settled price for the near-month contract...for the last trading day of each month" of the calendar year.[19] Exhibit 5 below shows those month-end prices from July 1, 2012, through June 30, 2023.

[19] Pennsylvania Act 13 of 2012, § 2301.

Exhibit 5

Monthly Natural Gas Futures Prices (2012-2023)



Source: Developed by LBFC staff from the United States Energy Information Administration (USEIA) data.

By way of an example, using historical pricing data, a well spud in 2012 would have had an impact fee imposed as follows:

- The average annual natural gas price for 2012, as determined by the Public Utility Commission, was $2.78. The PUC calculated and published this amount, along with certain other statistics specified in the statute, annually as a Commission order on its website and in the *Pennsylvania Bulletin*.

- Based on this price, and according to the language of §2302 (b)(1)(ii), the year one fee would have been $45,000 since the average annual price of natural gas in the year the well was drilled was between $2.25 and $3.00.

State Supreme Court decision regarding implementation of Act 13 for low gas-producing wells. The complexity of Pennsylvania's impact fee, how it is applied, and to which wells have been at issue. In particular, the law's applicability to low-producing wells was at the root of ongoing litigation almost from its initial passage. As mentioned earlier, Act 13's impact fee provides special treatment for

"stripper wells" that produce lower amounts of natural gas.[20] Unconventional gas wells that become stripper wells within two years after drilling are no longer assessed an impact fee. However, if such a well produces natural gas greater than 90,000 cubic feet per day, the gas well (impact) fee is reinstated.[21]

In 2014, the PUC's Bureau of Investigation and Enforcement (I&E) filed a complaint against a driller, Snyder Brothers, Inc. (SBI), stating that SBI had failed to report and pay impact fees on 45 wells. The complaint sought payment of those previous years' fees, penalties, and interest. SBI denied its liability for those fees and contended that the wells produced insufficient quantities of gas and were, thus, stripper wells and exempt from the impact fee.

The central issue in the case was the law's precise definition of a stripper well, specifically the definition that such a well was one "incapable of producing more than 90,000 cubic feet of gas per day during any calendar month."[22]

SBI's position was that such language "was unambiguous, and that, under its plain language, if an unconventional well produced 90,000 cubic feet per day of gas, or less, for even a single month in the annual reporting period, then the well was classified as a stripper well and exempt from the impact fee (emphasis added)."[23]

The I&E position was that the definition of a stripper well in the law "was ambiguous in that 'any' can mean either 'one or another taken at random,' or 'every.'"[24] Because of the ambiguity of this term, the I&E argued that courts needed to apply the principles of statutory construction to interpret this provision of the law. In the I&E's opinion, such analysis concludes that "the objective of the impact fee provisions of Act 13 was 'to provide relief to municipalities affected by unconventional gas wells,' and that 'this objective would be frustrated by exempting active producing wells from paying fees under Act 13 because their production falls below 90,000 [cubic feet] of gas per day for one month out of twelve.'"[25]

In 2015, a PUC Administrative Law Judge (ALJ) upheld the I&E's determination and agreed that the wells under dispute were subject to the Act 13 impact fee. The ALJ agreed with the PUC that the statutory language

[20] Specifically, "an unconventional gas well incapable of producing more than 90,000 cubic feet of gas per day during any calendar month, including production from all zones and multilateral wellbores at a single well, without regard to whether the production is separately metered." *See* Act 13 of 2012, § 2301.
[21] Pennsylvania Act 13 of 2012, § 2302 (d) (3).
[22] Pennsylvania Act 13 of 2012, §2301.
[23] Pennsylvania Supreme Court, *Snyder Brothers, Inc. et al. v. Pennsylvania Public Utility Commission*, J-23A-2018 and J-23B-2018, page 7.
[24] Ibid, pp. 7-8.
[25] Ibid, page 8.

was ambiguous and gave deference to the PUC's interpretation since it is the administrative agency charged by Act 13 with administering the law.

SBI subsequently appealed this decision to the full PUC, which also upheld the ALJ's decision in 2015. In 2017, SBI then appealed the PUC's ruling to the Commonwealth Court, which heard the case *en banc* and overturned the PUC's ruling in a split decision. The majority in that opinion determined that "the term 'any' as used in the phrase 'any month' in the definition of stripper well"[26] was unambiguous. Therefore, "the court ruled that, whenever a gas well cannot produce more than 90,000 cubic feet per day in any one month of a calendar year, it must be classified as a stripper well for that year, and therefore is not subject to annual impact fees."[27] The PUC then appealed this ruling to the state Supreme Court in 2017.

In December 2018, the Pennsylvania Supreme Court ruled 6-1 to overturn the Commonwealth Court's ruling and reinstated the unconventional gas well fees for the 45 wells under dispute. The majority opinion of the state's highest court stated the following:

> The pivotal question presented by this appeal remains whether the 45 unconventional vertical wells at issue meet Section 301's definition of "vertical gas well," as alleged by the PUC, and are subject to the assessment of an impact fee; thus, it is the definition of "stripper well,"
>
> …In making the determination of whether the wells in question exceeded this production level, we are required to interpret the word "any" as used in the relevant production time frame — namely, "any calendar month…"any" could mean "'all' or 'every,' as well as 'one.'"…
>
> Thus, an interpretation of "any calendar month" in the definition of a stripper well, as incorporated into the definition of "vertical gas well," to mean "each and every" calendar month during the reporting year is most consonant with this purpose, as it relieves producers of the obligation to pay the fee only if their well or wells produce 90,000 cubic feet per day or less of natural gas for each and every calendar month of the year. As the PUC argues, this will result in more producers paying the impact fee — exactly what the General Assembly intended....In conclusion, for all of the aforementioned rea-

[26] Ibid, page 12.
[27] Ibid, page 13.

> sons, we hold that, under Act 13, an unconventional vertical well is a "vertical gas well" subject to assessment of an impact fee for a calendar year whenever that well's natural gas production exceeds 90,000 cubic feet per day in at least one calendar month of that year."[28]

In the end, the state supreme court's decision in *Snyder Brothers Inc.* resolved the issue for drillers regarding the applicability of the impact fee if a well produces over 90,000 cu ft. of gas per day in at least one calendar month. In 2019, Snyder Brothers paid the PUC $8.9 million for these wells, which covered the accumulated impact fees during the period the case was litigated.

Texas

Gas producers (drillers) generally pay Texas' 7.5 percent severance tax, although some sale agreements include provisions that split the tax between the producer and subsequent gas purchasers. Both drillers and purchasers file monthly reports summarizing the amount of gas produced and sold in the prior month, and the tax is paid to the state within two months of producing the gas.

Producers or purchasers who fail to pay the tax on time are subject to a five percent penalty, and if the taxes are unpaid for another 30 days after that, the penalty is an additional five percent. Texas law reduces or suspends the severance tax on inactive wells and provides credits for taxes paid on low-producing gas wells, depending on the current market price of natural gas.

Severance taxes on oil and natural gas are paid to the Texas Railroad Commission, which is the state agency that administers and regulates oil and gas drilling in the state.

Louisiana

Gas producers (drillers) generally pay Louisiana's severance tax. However, some sale agreements include provisions that split the tax between the producer (who charges it back to the gas's rights owners) and subsequent gas purchasers. Both drillers and purchasers file monthly reports summarizing the amount of gas produced and sold in the prior month, and the tax is paid to the state within two months of producing the gas.

[28] *See* Pennsylvania Supreme Court, *Snyder Brothers, Inc. et al. v. Pennsylvania Public Utility Commission*, J-23A-2018 and J-23B-2018, pp 26-28, 40.

Louisiana enacted a severance tax exemption in 1994 to incentivize drilling horizontal wells like those used in fracking. While natural gas extracted from conventional vertical wells is taxed at the full rate, drillers of horizontal wells receive an exemption from paying up to 100 percent of the severance tax due, depending on the average annual price of natural gas. The exemption lasts for 24 months or until the cost of the well is paid off, whichever comes first. Drillers also receive a similar exemption from paying on very deep wells (those drilled to a depth of 15,000 feet or greater).

Like Pennsylvania, gas producers pay a lower severance tax rate on natural gas extracted from oil wells and wells incapable of producing an average of 250,000 cubic feet of gas per day.

Producers are not required to pay severance tax on natural gas injected underground to facilitate further drilling, gas flared or vented from the well itself, or gas used as fuel to power the drilling or production of oil and gas at the well site.

West Virginia

Gas producers (drillers) pay West Virginia's severance tax, which is five percent of the market value of the natural gas extracted. The law assessing the tax identifies some instances where gas producers don't have to pay the tax, including:[29]

- "Free natural gas provided to any surface owner,"
- Gas from any well that produced less than 5,000 cu. ft. per day during the preceding calendar year, and
- Gas from a well that hadn't produced marketable quantities of product for five consecutive years before it is placed back in production.

The severance tax rate is halved to 2.5 percent on natural gas extracted from vertical gas wells with an average daily production of between 5,000 and 60,000 cubic feet per day.[30] However, gas from horizontal wells (generally used when drilling in shale formations) with that production level must still pay the full rate. Gas from any well with an average daily production of less than 5,000 cubic feet per day is exempt from the tax.

Land with natural gas reserves and the equipment needed for extraction that has been built on that property are included in the property's valuation and assessment for local property taxes.[31]

[29] W. Va. Code §11-13A-3a (a).
[30] W. Va. Code §11-13A-3a.
[31] W. Va. Legislative Rules §110-1J-1. and §110-1P-1.

Producers must file severance tax returns annually one month after the entity's tax year ends. However, the Tax Commissioner may grant an extension for filing the return if requested. Drillers must make periodic payments monthly if their tax liability is greater than $1,000 per year. All filers automatically receive a $500 nonrefundable credit that can be applied against each year's tax liability.[32]

New Mexico

New Mexico assesses three separate taxes: an Oil and Gas Severance tax, an Oil and Gas Conservation tax, and an Oil and Gas Emergency School Tax. These three taxes total 7.69 percent of the taxable value of oil and gas severed from the ground. Although three separate laws authorize the taxes, the taxes are all calculated similarly.

In New Mexico, the entity that extracts the natural gas pays the tax, which should be shared proportionally among all resource owners. The law defines taxable value as the amount the producer receives for selling the gas, less the transportation and "processing costs" needed for the gas to be ready for market use. Processing costs include dehydration, purification, and compression of the gas.

Gas extracted from low-producing wells for two of the taxes--the Severance Tax and the Emergency School Tax--is taxed lower if the average annual taxable value of gas sold in the state the previous year is below $1.35 per mcf. As of May 2024, the monthly futures price for natural gas has not been at or below that price since at least July 2012. All three taxes are paid in advance to the New Mexico Taxation and Revenue Department monthly, meaning that producers must prepay an amount equal to their average monthly tax liability.

C. Historical Revenue Collection from Natural Gas Impact Fees/Severance Taxes.

We analyzed each state's revenue from its fee or tax from 2013 to 2023 and the number of active gas wells in each state during that time.

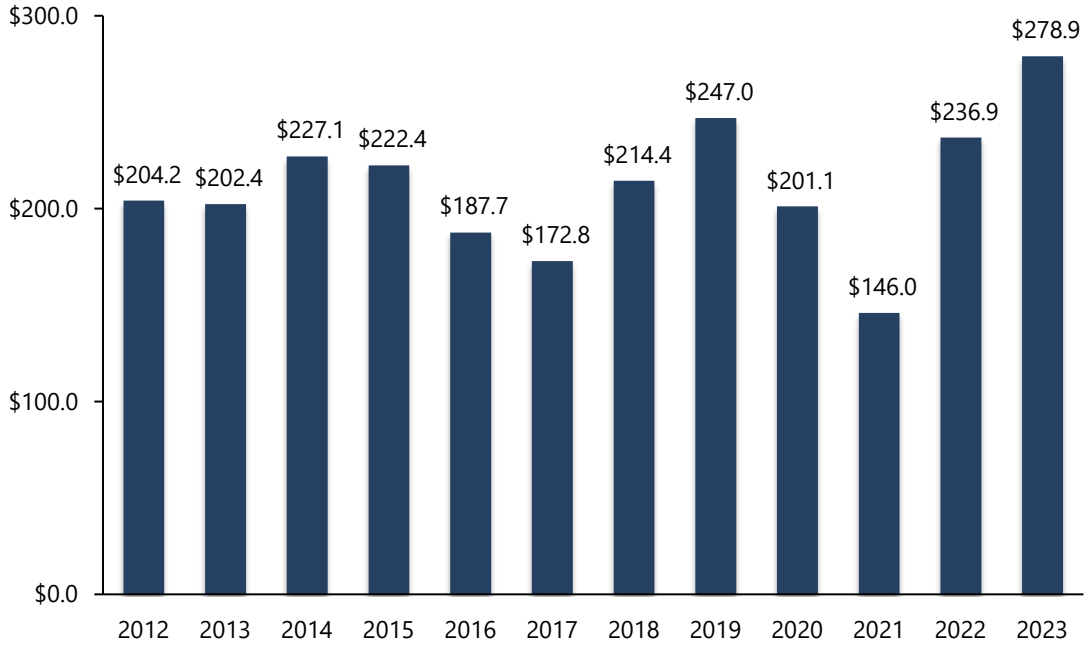
[32] *See* West Virginia Annual Severance Tax Return Filing Instructions (Form SEV-401).

Pennsylvania

Since 2012, Pennsylvania's Act 13 impact fee has generated more than $2.5 billion in revenue. Exhibit 6 shows the amount of fees collected each year through 2023.

Exhibit 6

Pennsylvania Impact Fee Revenue By Year ($Millions)



Source: Developed by LBFC staff from information obtained from the PUC's website.

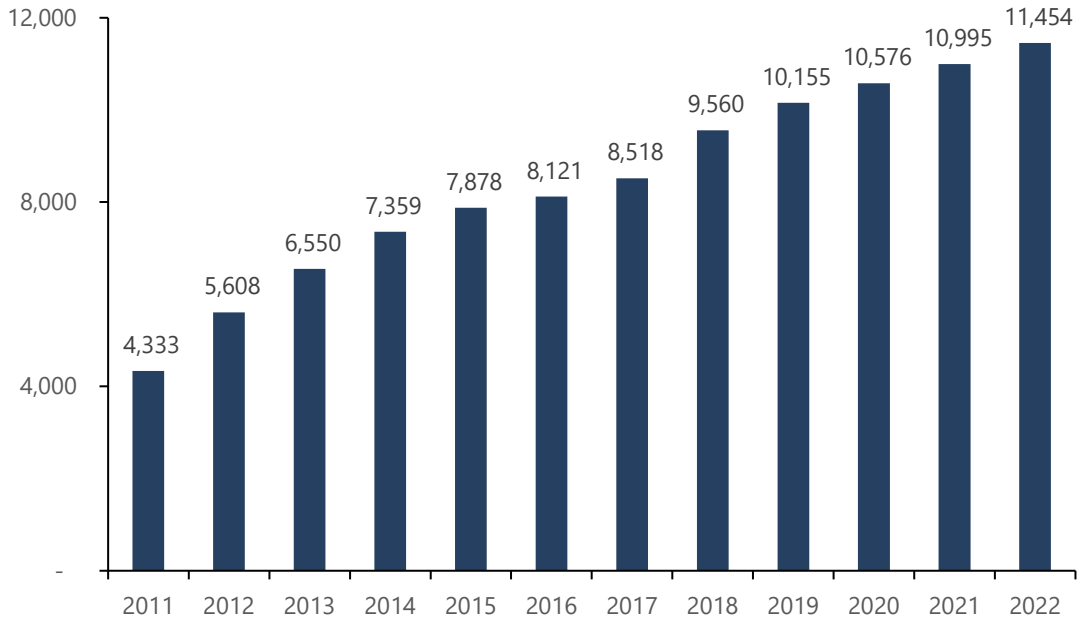
The amount of impact fees collected has ranged from $146 million in 2021 to $279 million in 2023, an average of about $212 million per year. Although the impact fee is assessed per well, the fee amount changes if there is a large change in the national market price of natural gas, as described in Section III, Issue Area E. Impact fee revenue collected in 2021, which reflects fees assessed on 2020 wells, was the lowest of any year because the national price of natural gas was at its lowest point during this period, averaging less than $2.00 per mcf for the first seven months of 2020. Gas prices then increased dramatically, reaching over $9.00 per mcf in August 2022, subsequently leading to 2023 being the highest year for impact fee revenue.[33]

[33] On June 18, 2024 the PUC reported that the distribution of 2024 Act 13 impact fees would be $179.6 million, or about $100 million less than last year, driven primarily by the decreased average price of natural gas in 2023, which generated a lesser impact fee payment for each well in 2023, along with the addition of only 423 new wells during 2023.

Number of unconventional gas wells in Pennsylvania. Exhibit 7 shows the number of active unconventional gas wells in Pennsylvania for which impact fees were assessed by year.

Exhibit 7

Number of Natural Gas Wells Paying Pennsylvania's Impact Fee
(By Year)



Source: Developed by LBFC staff from information obtained from the PUC's website.

Since Act 13's passage, the number of gas wells for which producers pay the impact fee has steadily increased. The initial number of wells (4,333) was obviously not all drilled in one year — this number reflects the active wells in service as of the fee's implementation. Since then, the number of new wells on which the fee is assessed has increased by an average of about 650 per year, with larger increases occurring from 2012 through 2014, which was less than eight years from when production in the Marcellus Shale region began in 2008. Since 2015, the average increase in the number of active wells on which the fee is paid has been under 6 percent.

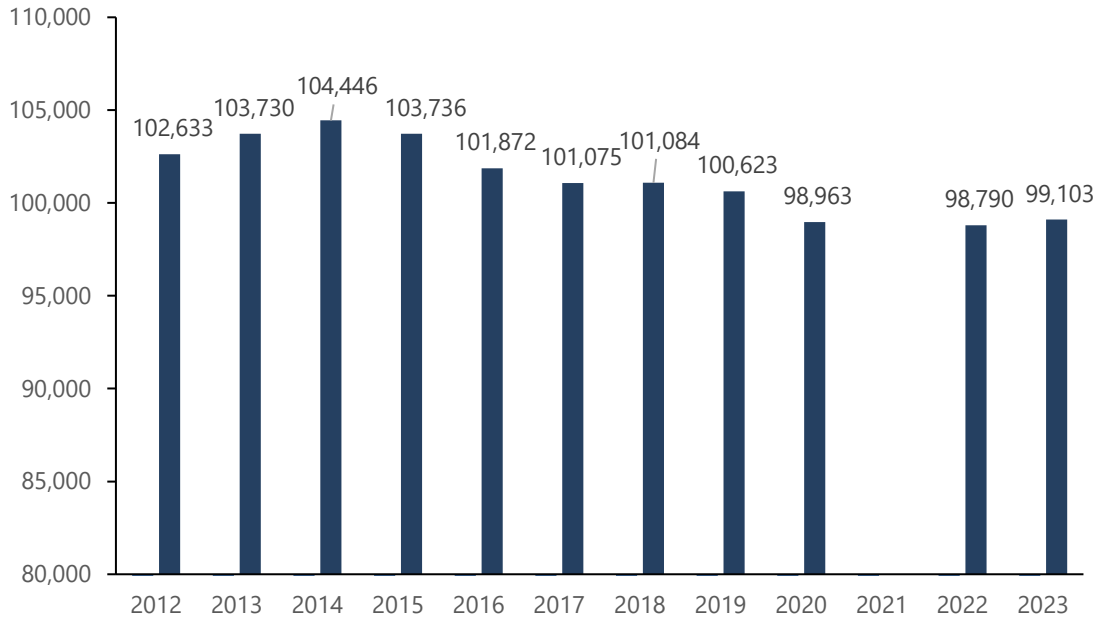
Texas

Drilling for oil and natural gas has been synonymous with Texas' culture and economy throughout the 20th century, and it continues to be a prominent oil and natural gas producer in the United States.

Number of Active Gas Wells. Oil and gas drilling occurs throughout Texas, with the latest report of regular producing gas wells showing wells in 178 of the state's 254 counties. The county with the most wells — Webb, with 6,496 — is less than seven percent of the statewide total. Exhibit 8 shows the state's approximate number of active wells from 2012-2023.

Exhibit 8

Approximate Number of Active Natural Gas Wells in Texas*



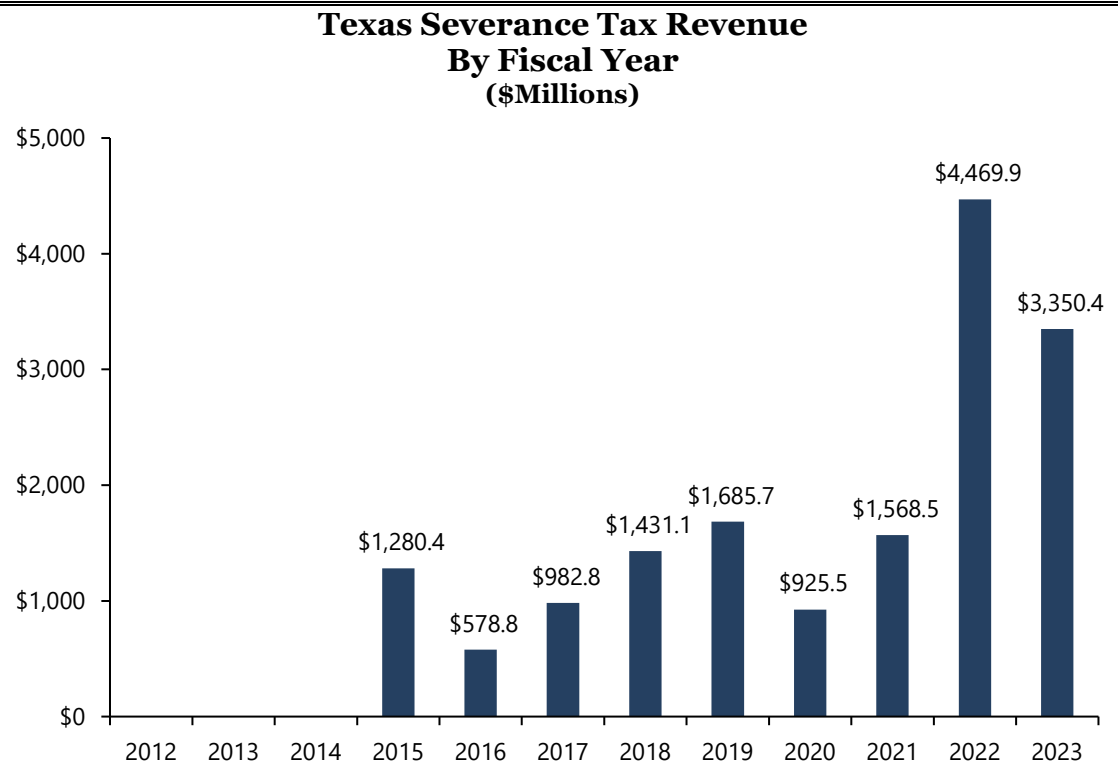
Note: */ 2021 gas well data is unavailable.
Source: Developed by LBFC staff from information on the Texas Railroad Commission's website.

The number of regularly producing natural gas wells increased from about 60,000 in 2001 to its highest level of almost 104,500 in 2014. Since 2020, the number has fluctuated narrowly, with the state now having approximately 99,000 active gas wells.

Severance Tax Revenue Collected. Texas first instituted an oil production tax in 1905, which was replaced with the state's current severance tax later in the century. Exhibit 9 shows the amount of severance tax Texas collected during the past nine fiscal years, from 2015 through 2023.[34]

[34] Fiscal years in Texas begin on September 1 of the previous year and run through August 31.

Exhibit 9



Note: */ Severance tax revenue amounts are unavailable for the fiscal years 2012, 2013, and 2014.
Source: Developed by LBFC staff from information obtained from Texas' comptroller website.

Although total natural gas production in Texas increased eight percent in 2022 and six percent in 2023, severance tax revenue dramatically increased in fiscal years 2022 and 2023 due to higher natural gas prices.[35] The national average annual price of natural gas per million BTU, as reported by Pennsylvania's PUC over the last four calendar years, was as follows:[36]

2020: $2.08
2021: $3.84
2022: $6.64
2023: $2.74

[35] Percentage change in annual natural gas production calculated from Monthly Oil & Gas Production data compiled by the Texas Railroad Commission.
[36] *See* each year's annual Pennsylvania Public Utility Commission order summarizing specific Act 13 data as published in the *Pennsylvania Bulletin*.

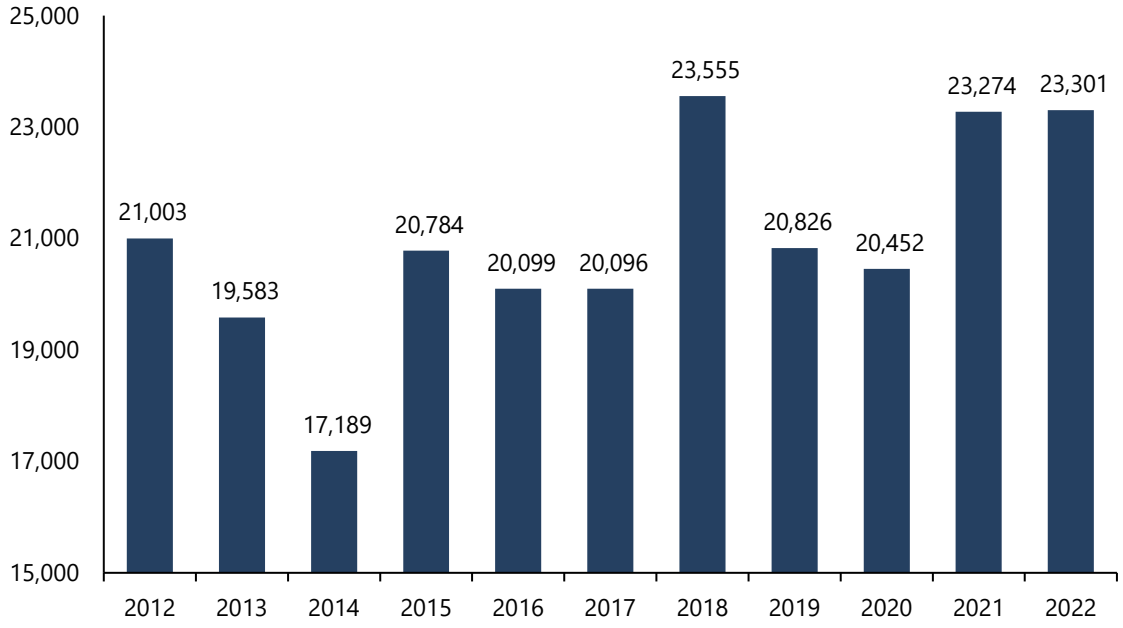
Louisiana

Louisiana's oil and gas industry began in earnest in the early 1900s, shortly after the first high-volume oil wells were drilled in Texas. Both Texas and Louisiana are situated in the Haynesville Shale region, one of the country's largest natural gas-producing regions (see Section III that follows).

Number of Active Gas Wells. The number of active gas wells in the state increased from just over 17,000 in 2000 to about 23,000 in 2022, which averages to under two percent annually. Exhibit 10 shows the state's approximate number of active wells from 2012-2023.

Exhibit 10

Estimated Number of Active Natural Gas Wells in Louisiana



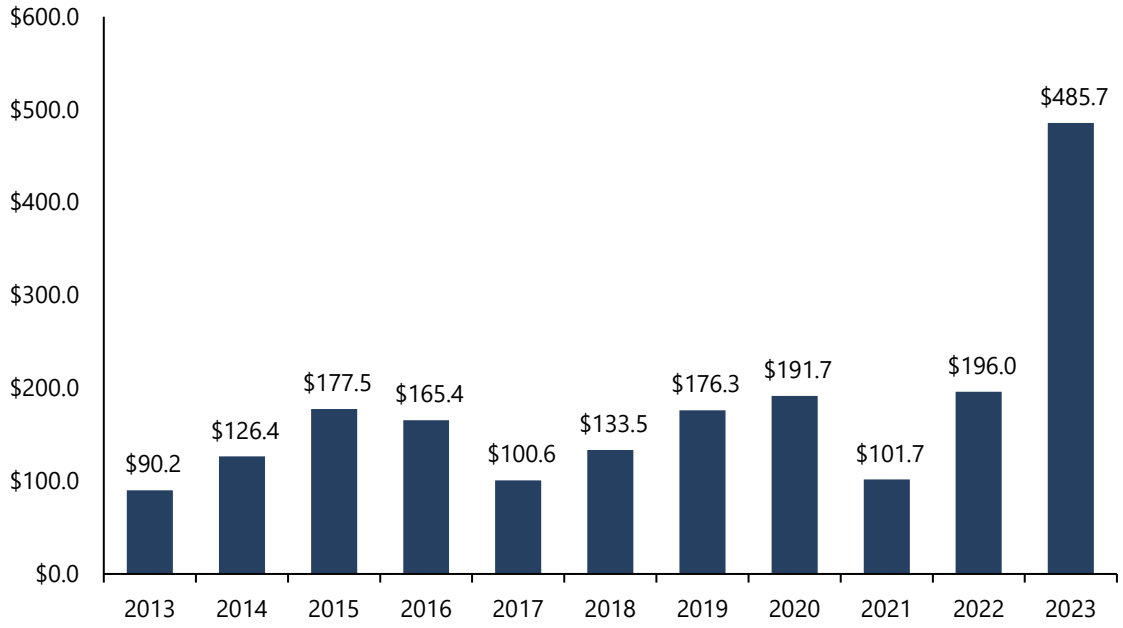
Source: Developed by LBFC staff from information published by the Louisiana Department of Natural Resources.

The number of natural gas wells in Louisiana fluctuated significantly over the past five years, primarily in response to spikes in natural gas prices in 2018 and 2022, which also affected the state's severance tax collections, as discussed later. More than 80 percent of Louisiana's gas wells are in the Haynesville Shale region in the northern part of the state (note: Exhibit 10 above does not include natural gas wells in the outer continental shelf in federal waterways in the Gulf of Mexico).

Severance Tax Revenue Collected. Louisiana assesses a severance tax on the volume of natural gas extracted, although the tax rate is adjusted annually to reflect changes in the national gas price. Exhibit 11 shows the amount of severance tax collected during the past 11 fiscal years since July 1, 2012.[37]

Exhibit 11

Louisiana Severance Tax Revenue from Natural Gas Drilling By Fiscal Year ($Millions)



Source: Developed by LBFC staff from information published by the Louisiana Department of Revenue.

Louisiana received an average of $146 million in severance tax revenue from July 2012 to June 2022 before collecting over three times that amount, $486 million, in 2023. Through the end of March 2024, the state had already collected $417 million in fiscal year (FY) 2024, putting it on pace to collect almost $550 million in severance tax revenue from natural gas in the current fiscal year.

The reasons for this increase are two-fold. First, as noted earlier, although Louisiana's severance tax is based on the volume of gas extracted, the tax rate is adjusted annually to reflect the current national futures market price for natural gas. Because natural gas prices were higher throughout FY 2022, the state's severance tax rate in FY 2023 was almost

[37] Louisiana fiscal years are July 1 through June 30.

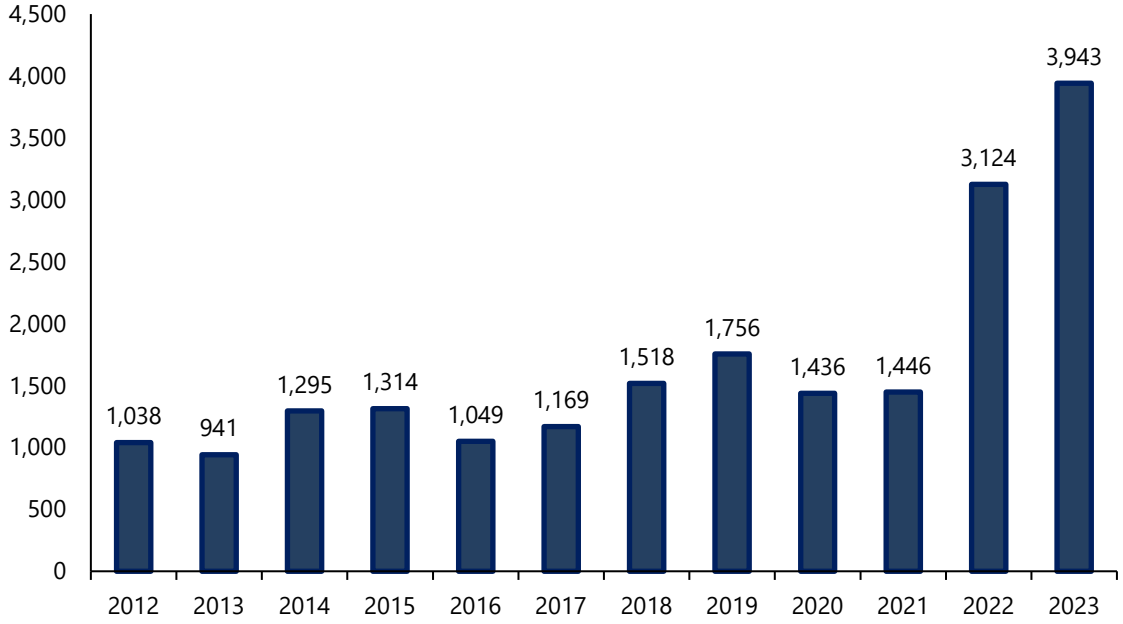
double that of the preceding year, and the rate for FY 2024 is nearly 50 percent higher than the FY 2023 rate:

- FY 2019: 12.2 cents per mcf.
- FY 2020: 12.5 cents per mcf.
- FY 2021: 9.3 cents per mcf.
- FY 2022: 9.1 cents per mcf.
- FY 2023: 17.7 cents per mcf.
- FY 2024: 25.1 cents per mcf.

Secondly, natural gas production in the state increased dramatically in 2022 and 2023, driven by increased market prices. This increase can be seen in Exhibit 12, which shows the yearly volume of natural gas extracted since 2012.

Exhibit 12

Louisiana Natural Gas Production By Year
(in billion cu ft)



Source: Developed by LBFC staff from information published by the Louisiana Department of Energy and Natural Resources.

In June 2023, the United States Energy Information Administration (USEIA) wrote in its energy profile of the state that "In the first half of 2023, monthly natural gas production from the Haynesville Shale region reached a record high of more than 16 billion cubic feet per day." The

Haynesville Shale region comprises about 9,000 square miles underneath large parts of southwestern Arkansas, northwest Louisiana, and eastern Texas. The USEIA characterized it as one of seven key natural gas-producing regions in the United States. Because natural gas in the Haynesville formation (10,500 to 13,500 feet below the surface) is much deeper than in the Marcellus Shale region (4,000 to 8,500 feet), drilling is more expensive and more responsive to increases in natural gas prices (see Section III that follows).

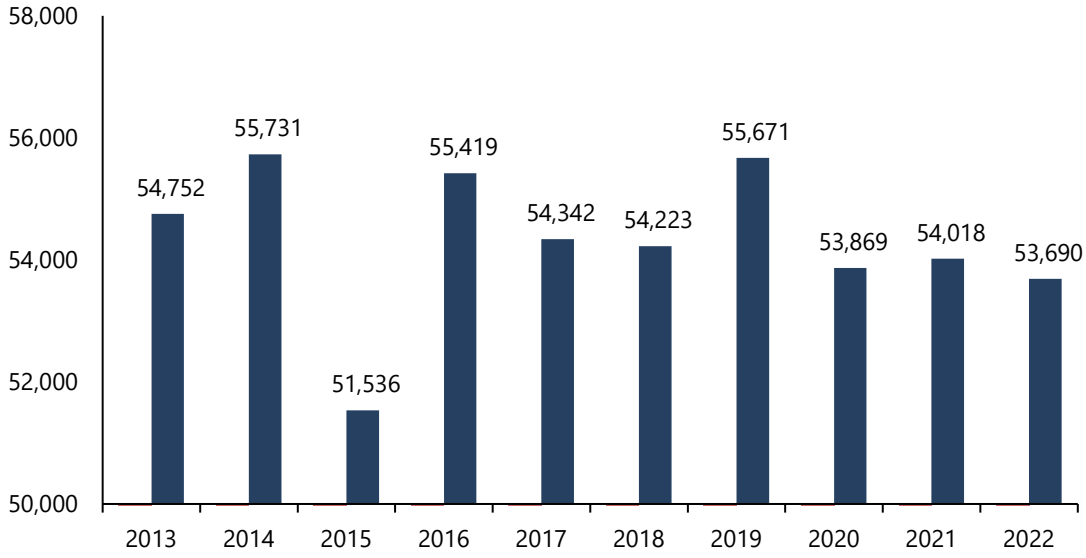
West Virginia

The oil industry in West Virginia predated that of Texas, with significant production occurring in the latter half of the 1800s. Although oil drilling declined after 1900, the state led the nation in natural gas production from 1906 through 1924.[38]

Number of Active Gas Wells. Active natural gas wells increased by about three percent annually from 2000 to 2012 before flattening out to current levels. Active gas wells are found in all but nine of the state's 55 counties. Exhibit 13 shows the number of active wells in the state from 2013 through 2022.

Exhibit 13

Number of Active Natural Gas Wells in West Virginia



Source: Developed by LBFC staff from information from the West Virginia Geological and Economic Survey website.

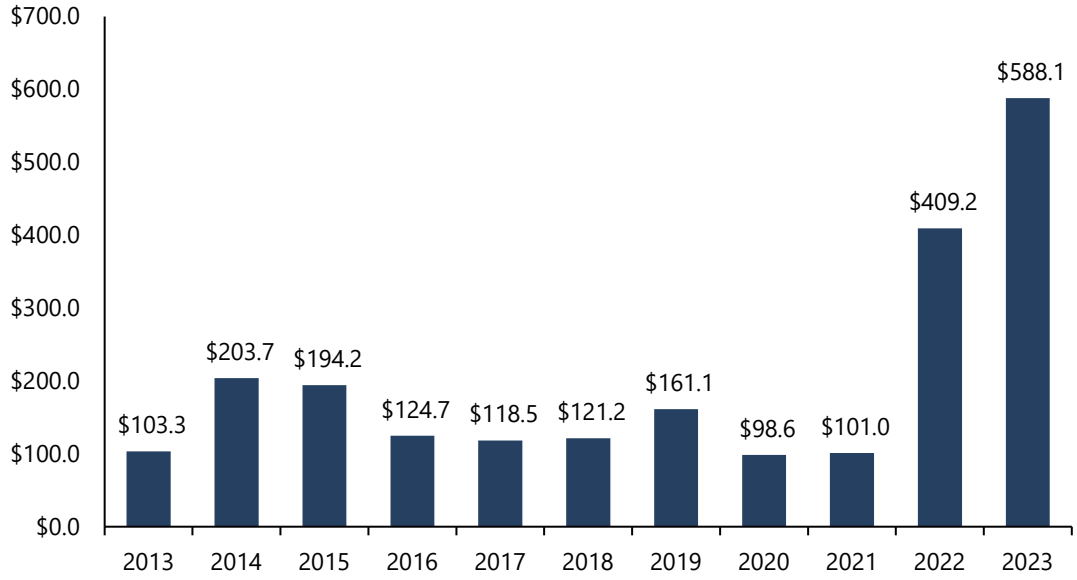
[38] *See* "Natural Gas and Petroleum," e-WV: The West Virginia Encyclopedia, 28 July 2023.

Since 2013, the number of active natural gas wells in West Virginia has stayed between 51,500 and about 55,500. Like Pennsylvania, West Virginia's natural gas production is largely in the Marcellus Shale region. The state continues to extract record amounts of natural gas each year, and according to the EIA, since 2019, the energy value of its natural gas production has exceeded that of its coal industry.

Severance Tax Revenue Collected. As mentioned earlier, West Virginia's severance tax is based on the natural gas market value. As a result, the increase in severance tax revenue since FY 2013 is attributed to higher gas production and prices (see Exhibit 14).[39]

Exhibit 14

West Virginia Severance Tax Revenue from Natural Gas Drilling By Fiscal Year
($Millions)



Source: Developed by LBFC staff from information published by the West Virginia Department of Revenue.

Similar to figures from Louisiana and Texas, the severance tax revenue that West Virginia collected over the past two fiscal years when natural gas prices spiked to over $9 per million BTU, is double or triple the revenue the state collected during the preceding years.

Additionally, the severance tax West Virginia collected before FY 2017 includes revenue from the "temporary additional severance tax." This tax was assessed until March 2016 to pay down debts from the previous state-administered workers' compensation system.

[39] West Virginia fiscal years are July 1 through June 30.

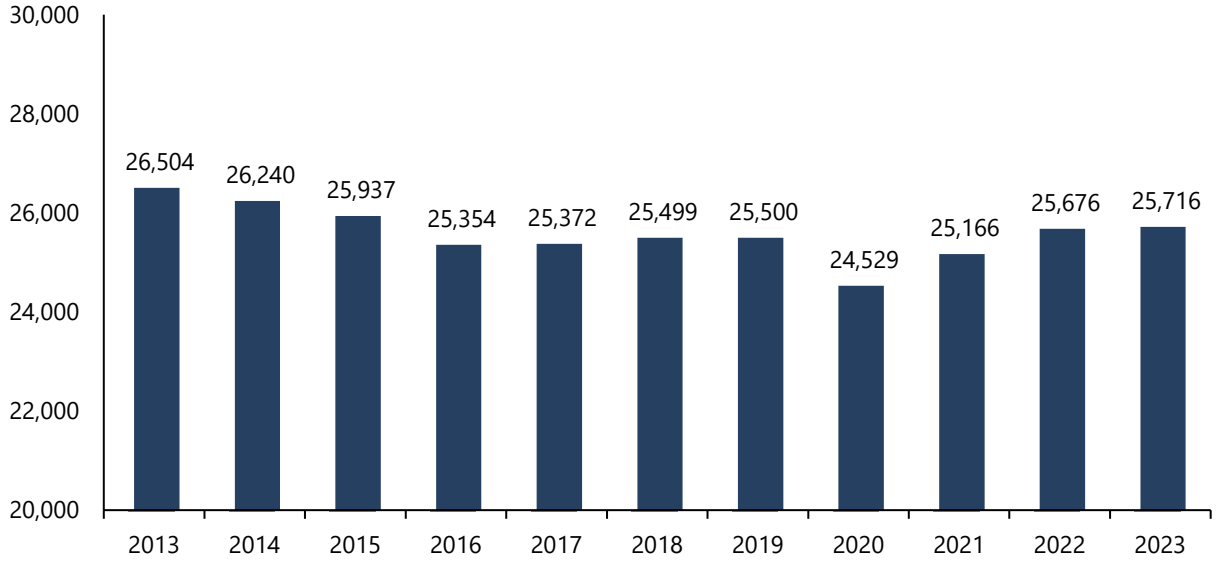
New Mexico

According to the New Mexico Bureau of Geology and Mineral Resources, oil and gas were first produced in the state in the 1920s. Although oil production peaked in the 1960s, natural gas production has increased since the early 1990s due to drilling in the San Juan Basin in the state's northeastern portion (see Section III). New Mexico is one of only 15 states that produce natural gas from coalbeds.[40]

Number of Active Gas Wells. Exhibit 15 shows the number of active wells in the state from 2013 through 2022.

Exhibit 15

Number of Active Natural Gas Wells in New Mexico



Source: Developed by LBFC staff from information obtained from the New Mexico Energy, Minerals and Natural Resources Department.

Since 2013, the number of active natural gas wells in New Mexico has generally been stable, ranging from a low of 24,529 active wells in 2020 to a high of 26,504 at the end of 2013.

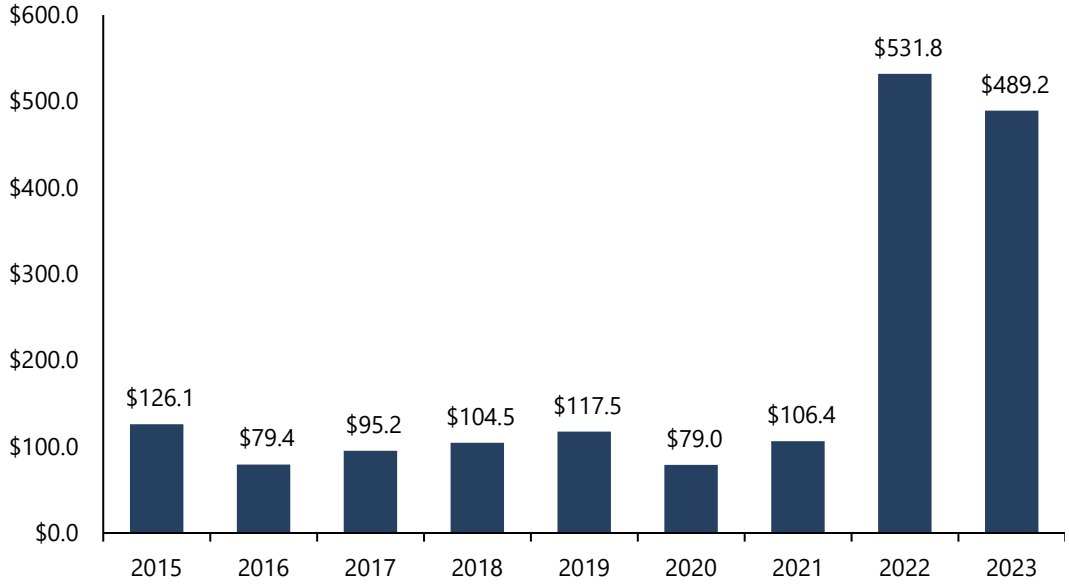
Severance Tax Revenue Collected. Like Texas and West Virginia, New Mexico's severance tax is based on the market value of ex-

[40] *See* "New Mexico State Energy Profile," United States Energy Information Administration.

tracted gas. The significant increase in natural gas prices in 2022 contributed to an almost five-fold increase in severance tax revenue over the past two fiscal years (see Exhibit 16).[41]

Exhibit 16

New Mexico Severance Tax Revenue from Natural Gas Drilling By Fiscal Year ($Millions)



Source: Developed by LBFC staff from information published by the New Mexico Legislative Finance Committee.

The chart above shows the significant increase in severance tax revenue from natural gas drilling in FY 2022 and 2023, driven not only by increased prices but also by an almost doubling in production from FY 2020 to FY 2023. With production expected to level off, the New Mexico Legislative Finance Committee projects that the state will collect just under $300 million from gas drilling in the current fiscal year.[42]

D. State-defined Uses of Natural Gas Tax Revenue

We reviewed state budgets and legislation to determine how each top gas-producing state used the revenue collected from taxes and fees assessed on natural gas drilling. As expected, each state distributes revenue uniquely based on various financial and statutory requirements.

[41] New Mexico fiscal years are July 1 through June 30.
[42] *See* New Mexico Legislative Finance Committee, FY 2025 Budget Recommendations.

Pennsylvania

Impact fees are deposited into the Unconventional Gas Well Fund. Distributions from the Unconventional Gas Well Fund are complex and involve several state and local agencies. Exhibit 17 is an excerpt from the PUC's annual gas well impact fee report detailing where these funds go and how they are distributed.

Exhibit 17

Pennsylvania Act 13 Impact Fee Distribution in 2020

		Year Nine	Distribution by July 1, 2020	
		2019 Paying Wells		Formulas/Notes
Impact Fee Payments		**$ 200,349,200**		**(Deposited in the Unconventional Gas Well Fund)**
		$ 15,300		(Including $ in prior year well adjustments & payments)
	TOTAL	**$ 200,364,500**		
County Conservation Districts & Conservation Commission (50 / 50 Split)		7,897,250		
Fish and Boat Commission		1,000,000		
PA Public Utility Commission		1,000,000		
Department of Environmental Protection		6,000,000		
PA Emergency Management Agency		750,000		These funds will be an interagency transfer
Office of State Fire Commissioner		750,000		
Department of Transportation (Rail Freight Assistance)		1,000,000		
	Sub-Total	$ 18,397,250		
	Balance	$ 181,967,250		
60% - Local Governments		**$ 109,180,350**		(Amount for distribution to counties / muni's)
Housing Affordability and Rehabilitation Enhancement Fund		5,000,000		
36% to Counties with producing Unconventional well		37,504,926		County amount = # of county wells/# of total wells subject to the fee
37% to Municipalities with producing unconventional wells		38,546,730		Municipalities Amt = # of Mun. wells/# of total wells subject to the fee
27% to Munis that are contiguous or 5 linear miles of municipalities with wells		28,128,695		Amt = # county wells/# of wells subject to the fee
50% to Munis that are contiguous, or within 5 miles of well			$ 14,064,348	
50% to each Municipality			7,032,174	Based on Population of eligible Municipality/Total
50% to each Municipality			7,032,174	Based on Highway Miles of eligible Municipality/total
50% to all Municipalities located in the County			$ 14,064,348	
50% to each Municipality			7,032,174	Based on Population of eligible Municipality
50% to each Municipality			7,032,174	Based on Highway Miles of eligible Municipality
(Restriction: On Municipalities - cannot exceed the greater of $500,000 or 50% of its FY 2010 budget, out years adjusted for inflation)				
Excess from restriction - Housing Affordability & Rehabilitation Enhancement Fund			$ 941,854	
40% - Marcellus Legacy Fund		**$ 72,786,900**		
20% to Commonwealth Financing Authority (DEP/DCED review of applications)		14,557,380		
10% Environmental Stewardship Fund (DCNR)		7,278,690		
25% to Highway Bridge Improvement Restricted Account (PennDOT)		18,196,725		
Minimum amount per county is $40,000				County Population/Commonwealth Population
25% for Water and Sewer Projects		18,196,725		
50% to PA infrastructure Investment Authority			9,098,363	
50% to H2O PA Progam (within Commonwealth Financing Authority)			9,098,363	
15% for Rehabilitation of Greenways, Recreation Trails, open Space, Nature Areas		10,918,035		
Each county to receive minium of $25,000				County Population/Commonwealth Population
5% for Hazardous Site Clean-up		3,639,345		

Source: PUC's 2020 Unconventional Gas Well Impact Fee Annual Report of Fund Revenue and Disbursements.

As shown in the exhibit above, the first distributions include "top-level" allocations made to specific state agencies, as follows: [43]

- A base amount of $7.5 million to county conservation districts. The law further stipulates that these funds should be split with "one-half…distributed by dividing

[43] Pennsylvania Act 13 of 2012, §2314

the amount equally among conservation districts for any use consistent with…the Conservation District Law" and "one-half…distributed by the State Conservation Commission in a manner consistent with the Conservation District Law and the provisions of the State Conservation Commission's Conservation District Fund Allocation Program-Statement of Policy under 25 Pa. Code Ch. 83 Subch. B."

- $1 million to the Pennsylvania Fish and Boat Commission "for costs relating to the review of applications for permits to drill unconventional gas wells."
- $1 million to the PUC to administer Act 13 of 2012.
- $6 million to the Pennsylvania Department of Environmental Protection for the administration and enforcement of acts relating to clean air and clean water.
- $750,000 to the Pennsylvania Emergency Management Agency "for emergency response planning, training and coordination related to natural gas production from unconventional gas wells."
- $750,000 to the State Fire Commissioner's Office "for the development, delivery, and sustainment of training and grant programs for first responders and the acquisition of specialized equipment for response to emergencies relating to natural gas production from unconventional gas wells."
- $1 million to the state Department of Transportation "for rail freight assistance."

All the above funding levels are fixed dollar amounts except those allocated to conservation districts. Act 13 specifies this amount as $2.5 million in the first year that fees are collected (2012), increasing to $5.0 million in the second year. The base amount of $7.5 million will be distributed for conservation in the third year (fees collected in 2014), and the percentage increase in the Consumer Price Index increases this base figure.

Exhibit 18 shows unconventional well impact fees distributed to county conservation districts from 2012 to 2023.

Exhibit 18

Act 13 Impact Fees Distributed to Conservation Districts* ($Millions)

Year	Amount
2012	$2.5
2013	5.0
2014	7.5
2015	7.5
2016	7.5
2017	7.6
2018	7.8
2019	7.9
2020	7.9
2021	8.2
2022	8.9
2023	9.3
Total	**$87.6**

Note: */ Fee distribution amounts are listed for the year the money was distributed.
Source: Developed by LBFC staff from information obtained from PUC reports.

After disbursements to conservation districts, the law requires that the PUC distribute $20 million over the first three years' fees to fund the Natural Gas Energy Development Program, which was used to fund grants to purchase or convert eligible vehicles to natural gas. Funding includes the following:

- From 2011 well fees (Year 1): $10,000,000
- From 2012 well fees (Year 2): $7,500,000
- From 2013 well fees (Year 3): $2,500,000

After those specific disbursements, the remaining impact fee revenue is split: **60 percent** is appropriated directly to various counties and municipalities throughout the commonwealth, and **40 percent** is distributed to projects throughout the state and local governments through the Marcellus Legacy Fund (created by Act 13).

Act 13 requires the PUC to distribute $5.0 million yearly from these funds to the Pennsylvania Housing Affordability and Rehabilitation Enhancement Fund (PHARE).[44] PHARE was created in

[44] Regarding these funds, the law called for an initial $2.5 million to the Housing Affordability and Rehabilitation Enhancement Fund and $5 million yearly thereafter.

2010 "to provide the mechanism by which certain allocated state or federal funds, as well as funds from other outside sources, would be used to assist with creating, rehabilitating, and supporting affordable housing throughout the commonwealth. The PHARE Act did not allocate any funding. Still, it did outline specific requirements that include preferences, considerations, match funding options, and obligations to utilize a percentage of the funds to assist households below 50 percent of the median area income."[45,46]

After the initial allocation to PHARE, the law further specifies that 60 percent of remaining well fee revenues should be distributed to local governments as follows:

- 36 percent to the counties in which unconventional gas wells are located, based on the ratio of unconventional gas wells in each county to the overall total in the state.

- 37 percent to the municipalities in which unconventional gas wells are located, based on the ratio of unconventional gas wells in each municipality to the overall total in the state.

- 27 percent to the municipalities in the counties where gas wells are located.

Of the 27 percent to municipalities, the funds in this "bucket" are further divided as follows:

- Half of the funds are to be distributed to municipalities where such wells are located, are contiguous with a municipality with an unconventional gas well, or are located within five linear miles of an unconventional gas well.

- The other half of these funds are allocated to all municipalities in counties with gas wells, regardless of whether the municipality contains or is close to an unconventional gas well.

- In both cases, these funds are allocated to each municipality using two formulas — half is distributed using the ratio of the municipality's

[45] *See* the PA Housing Finance Agency's website about the PHARE Act at https://www.phfa.org/legislation/act105.aspx.
[46] PHARE also receives funds from money collected under Pennsylvania's Realty Transfer Tax.

population to that of the overall county, and half is split using the ratio of the highway miles within each municipality to that of the overall county.

A total of $1.3 billion has been distributed to county and municipal governments in Pennsylvania in this manner. Exhibit 19 displays the counties that have received the most impact fee revenue from 2012 through 2023 under this section of Act 13.

Exhibit 19

Pennsylvania Counties Receiving the Most Act 13 §2314 (d) Disbursements 2012-2023
($Millions)

County	Amount
Washington	$204.8
Bradford	$191.5
Susquehanna	$182.8
Greene	$141.1
Lycoming	$118.7
Tioga	$109.7
Butler	$60.8
Wyoming	$36.2
Westmoreland	$34.9
Fayette	$34.4

Note/* Includes both amounts distributed to municipalities within these counties and amounts allocated directly to county governments under § 2314 (d) (1).
Source: Developed by LBFC staff from information published by the PUC.

As shown above, the counties receiving the most impact fee revenue are those with the most wells (i.e., "impacted" by natural gas activity). Specifically, the §2314 (d) funds distributed to the counties shown in Exhibit 19, make up 86 percent ($1.1 billion) of the $1.3 billion total distributed directly to counties and municipalities.

As noted earlier, more than half of the money that Act 13 allocates to local governments in counties with wells is distributed directly to municipalities, based on the complex allocation formulas specified in § 2314 (d) (e.g., population, number of wells, proximity to wells, etc.). Exhibit 20 shows the municipalities that have received the most impact fee revenue from 2012 through 2023 under this section of Act 13.

Exhibit 20

Municipalities Receiving the Most Act 13 §2314 (d) Disbursements 2012-2023 ($Millions)

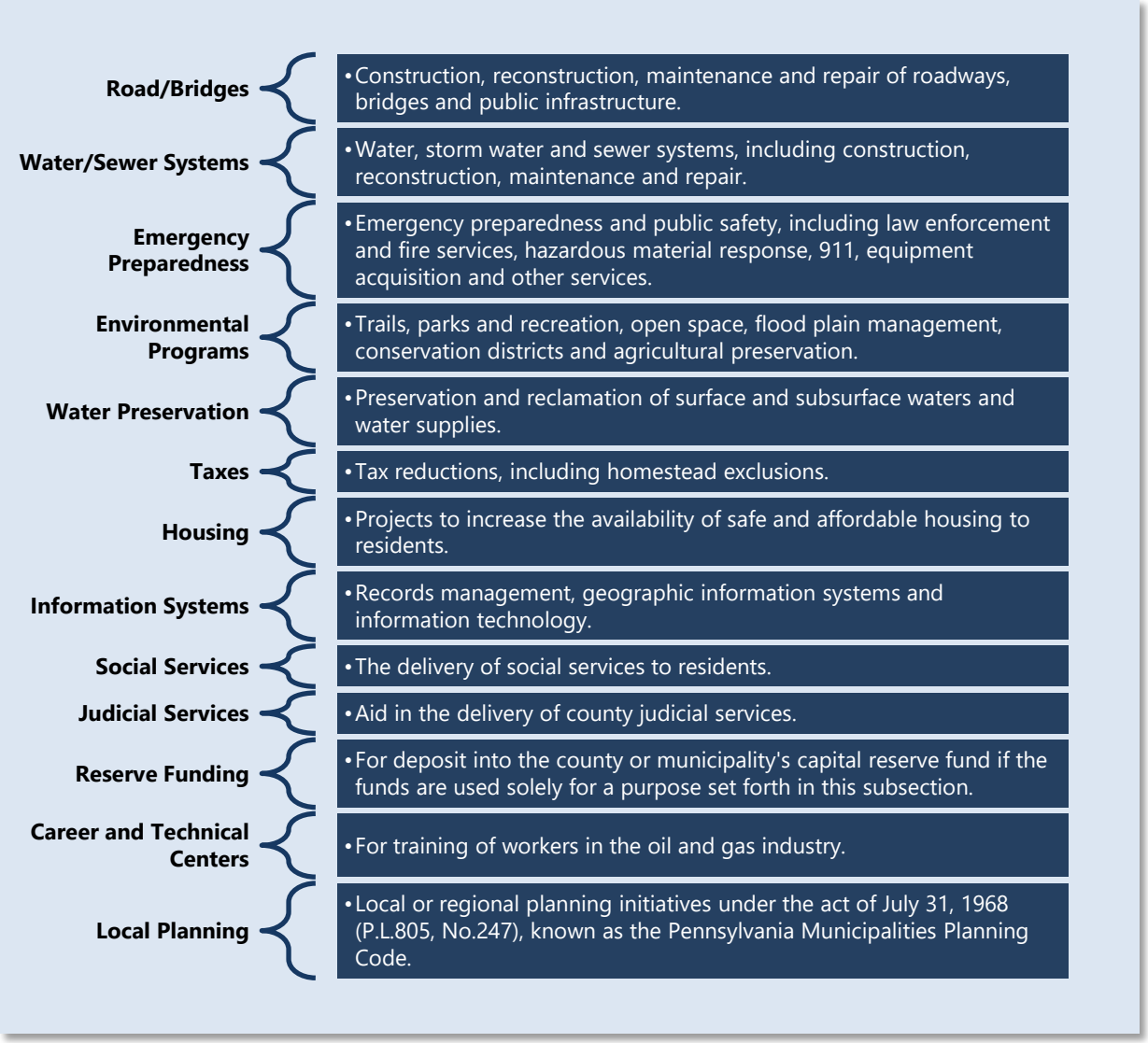
Municipality	County	Amount
Center Township	Greene	$10.5
Cumberland Township	Greene	$9.7
Auburn Township	Susquehanna	$9.6
Morris Township	Greene	$9.0
Amwell Township	Washington	$9.0
Franklin Township	Greene	$8.6
Springville Township	Susquehanna	$8.4
New Milford Township	Susquehanna	$8.0
Morgan Township	Greene	$7.6
Cogan House Township	Lycoming	$7.2

Source: Developed by LBFC staff from information published by the PUC.

Through 2023, over $800 million of § 2314 (d) distributions went to more than 1,300 municipalities in counties where natural gas wells are located. Although these funds are distributed directly to county commissions and local governments, the law restricts how these funds can be spent. For example, under §2314(g), thirteen broadly defined areas are outlined. These areas include roadway maintenance and construction, emergency preparedness, and other social services to name a few. The complete list of permissible areas is listed in Exhibit 21.

Exhibit 21

Act 13 Permissible Uses (County and Municipal)



Source: Developed by LBFC staff from Pennsylvania Act 13 of 2012, §2314(g).

The law also limits the funding each municipality may receive. Specifically, §2314(e) states the following:

> The amount allocated to each municipality…shall not exceed the greater of $500,000 or 50 percent of the total budget for the prior fiscal year beginning with the 2010 budget year and continuing every year thereafter, adjusted to reflect

> any upward changes in the Consumer Price Index for all Urban Consumers for the Pennsylvania, New Jersey, Delaware, and Maryland area in the preceding 12 months. Any remaining money shall be retained by the [PUC] and deposited in the Housing Affordability and Rehabilitation Enhancement Fund.

Consequently, because of the Act's limiting language, municipalities (even those with many unconventional gas wells) cannot rely entirely on impact fees to fund operations since they can only receive impact fee monies up to $500,000 or half of their 2010 annual budget.

Finally, §2315 established the Marcellus Legacy Fund, which receives 40 percent of the remaining revenues from unconventional gas well fees. Act 13 further specifies the distribution of these funds as follows:

- 20 percent to the Commonwealth Financing Authority (CFA) for grants for projects that:
  - Clean or reclaim acid mines,
  - Plug orphaned and abandoned oil and gas wells,
  - Comply with the Pennsylvania Sewage Facilities Act,
  - Acquire, develop, or repair open space, trails, parks, and other beautification projects,
  - Establish baseline water quality data on private water supplies,
  - Watershed programs, and
  - Flood control (up to 25 percent of CFA funds).

- 10 percent to the Environmental Stewardship Fund.

- 25 percent to the Highway Bridge Improvement Restricted Account of the Motor License Fund to replace or repair at-risk bridges. These funds are distributed to counties based on the population ratio in each county to the state's overall population, with each county receiving a minimum of $40,000. The state Department of Transportation must approve all such repair plans that the counties submit.

- 25 percent for water and sewer projects, with half of this money administered under the Pennsylvania Infrastructure Investment Authority Act and the other half distributed to the H2O PA program and administered by the CFA.

- 15 percent for the "planning, acquisition, development, rehabilitation and repair of greenways, recreational trails, open space, natural areas, community conservation and beautification projects, community and heritage parks and water resource management. Funds may be used to acquire lands for recreational or conservation purposes and land damaged or prone to drainage by storms or flooding."[47] These funds are also distributed to counties based on their population ratio to the state's overall population, with each county receiving a minimum of $25,000.

- Five percent to the Hazardous Sites Cleanup Fund in the fourth year that impact fee revenue is received. For the first three years, these monies were distributed "to the Department of Community and Economic Development for projects to provide for the planning, development, remodeling, remediation, and construction of projects relating to oil, natural gas or other chemical substances."[48] This included facilities to liquefy or refine natural gas or to convert natural gas into other substances.

Act 13 states explicitly that Marcellus Legacy Fund revenue should not be used for outreach, public relations, lobbying or litigation, or for land acquisition unless the county or municipality in which the land is located approves. The Department of Environmental Protection and Department of Conservation and Natural Resources are responsible for reviewing grant applications to the Marcellus Legacy Fund and providing recommendations regarding which projects should be prioritized.

Exhibit 22 shows the impact fee revenue distributed to the Marcellus Legacy Fund each year from 2012 through 2023.

[47] Pennsylvania Act 13 of 2012, § 2315 (a.1) (5)
[48] Pennsylvania Act 13 of 2012, § 2315 (a.1) (6)

Exhibit 22

Act 13 Impact Fees Distributed to the Marcellus Legacy Fund

Year	Amount (in millions)
2012	$72.5
2013	71.8
2014	82.1
2015	82.2
2016	67.9
2017	62.0
2018	76.5
2019	93.4
2020	72.8
2021	51.0
2022	86.0
2023	103.6
Total	**$921.9**

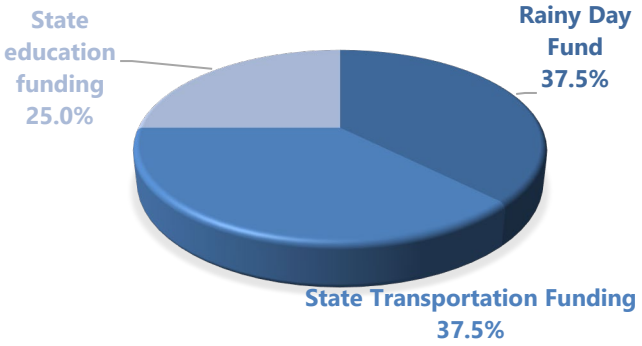
Source: Developed by LBFC staff from information obtained from PUC reports.

Texas

Texas' constitution specifies how revenue from the state's oil and natural gas production taxes must be distributed. As shown in Exhibit 23, this allocation includes three areas: 1) the "Rainy Day" fund, 2) state transportation funding, and 3) education funding.

Exhibit 23

Distribution of Texas' Oil and Gas Severance Tax Revenue



Source: Developed by LBFC staff from information obtained from Texas' Constitution and statutes.

Currently, 37.5 percent of severance tax revenues are dedicated to the economic stabilization fund, also known as the Rainy Day Fund. Voters created the Rainy Day Fund in 1988 with a state constitutional amendment. Initially, 75 percent of the collected severance tax revenue went to the Rainy Day Fund. However, in 2014, voters approved another constitutional amendment (Texas Proposition 1 – Transportation Funding Amendment), which split the 75 percent in half, with 37.5 percent going to the Rainy Day Fund and 37.5 percent for transportation funding. The remaining 25 percent is allocated to the Foundation School Fund, which the Texas Education Agency uses to distribute money to the state's public schools.

Louisiana

Louisiana's Constitution specifies that parishes (similar to counties in other states) may retain up to 20 percent of the severance tax revenues assessed within their boundaries, up to a statutorily defined amount. This limit was set at $850,000 in 2007 and increases by an amount equal to the average annual increase in the Consumer Price Index for all urban consumers, as published by the United States Department of Labor.[49] As of 2024, the maximum amount of severance taxes each parish can retain from drilling that takes place within its boundaries is approximately $1,150,000.[50]

The state constitution defines "excess severance tax" as tax revenue that each parish retains which exceeds the amount kept in the 2011-12 fiscal year.[51] Parishes must spend at least half of this excess severance tax on constructing or repairing roads, highways, levees, or public transit.[52] All other Louisiana severance tax revenue goes to the state's general fund.

West Virginia

State law governs severance tax revenue distributions in West Virginia. Almost all severance tax revenue goes to the state's general fund. Three-quarters of one percent (not to exceed $1,200,000) is dedicated to regulating the oil and gas industry. These funds are appropriated to the Office of Oil and Gas in the West Virginia Department of Environmental Protection.[53]

[49] Louisiana Constitution, Article 7, §4 (D) (3).
[50] "Proposal would let parishes keep more oil and gas taxes," *Louisiana Illuminator*, April 4, 2023.
[51] Louisiana Constitution, Article 7, §4 (D) (4) (a) (iii).
[52] Louisiana Constitution, Article 7, §4 (D) (4) (a) (iii).
[53] W. Va. Code §11-13A-5a (a).

Ten percent of the total severance tax revenue collected is allocated via a complex formula that requires further distributions of 75 percent to counties and 25 percent to municipalities. For example, West Virginia law states the following:[54]

- 75 percent is distributed to "oil and gas producing counties" (i.e., the counties where the gas originated).[55] This allocation is based on the county's share of the total gas extracted statewide.[56] For example, if a county produced 10 percent of the total gas produced in West Virginia, that county would receive 10 percent of this "75 percent" allocation.

- State law also requires that counties with a population greater than 200,000 spend 75 percent of this money directly in the portion of the county where the gas originated.[57] However, as of the 2020 census, none of West Virginia's 55 counties have a population exceeding 200,000; thus, this provision has not been applicable.

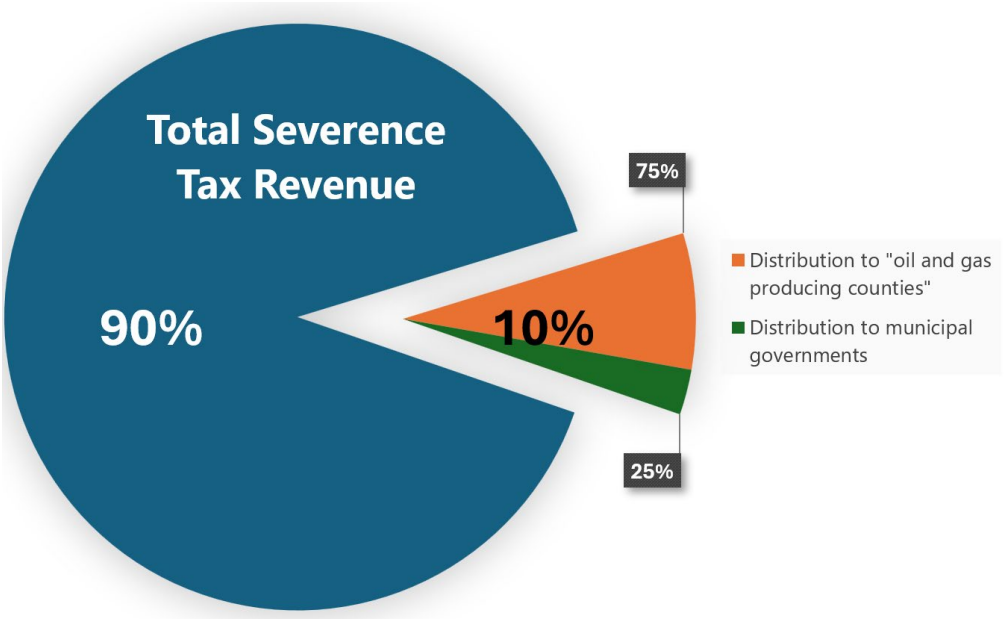
- The remaining 25 percent is distributed primarily to municipal governments.[58] These funds are first allocated to each county based on its share of the state's population, as determined by the most recent national census. Within each county, funds are then distributed to each municipality based on its share of the county's population. For the proportion of the population that lives in unincorporated areas, which are not part of any municipality, those funds are distributed to those county governments.[59]

Exhibit 24 highlights West Virginia's severance tax distributions. Additionally, the law specifies that $35,000 of severance tax revenue is allocated to the State Tax Commissioner for the administrative costs related to these distributions to local governments.[60] County and municipal governments may use severance tax revenue for any purpose, but they must submit a budget outlining the intended use of the funds to the Tax Commissioner for approval.[61]

[54] W. Va. Code §11-13A-5a (a).
[55] W. Va. Code §11-13A-5a (b).
[56] W. Va. Code §11-13A-5a (f).
[57] W. Va. Code §11-13A-5a (h).
[58] W. Va. Code §11-13A-5a (b).
[59] W. Va. Code §11-13A-5a (g).
[60] W. Va. Code §11-13A-5a (a).
[61] W. Va. Code §11-13A-5a (i) & (j).

Exhibit 24

Distribution of West Virginia's Oil and Gas Severance Tax Revenue [a/]



Note:
[a/] Two specific distributions are not shown above due to their immaterial effect. Three-quarters of one percent (i.e., 0.75 percent) of the total severance tax revenue is allocated to the state's Department of Environmental Protection. Additionally, $35,000 is dedicated to the State Tax Commissioner. These figures are not reflected in the exhibit.
Source: Developed by LBFC staff from information obtained from state statutes.

New Mexico

New Mexico's three taxes on natural gas extraction are distributed differently. All revenue collected from the Oil and Gas Severance tax goes to the severance tax bonding fund. The state then issues bonds (known as "severance tax bonds") against this money. The state annually projects the fund's capacity to issue debt based on its forecast of severance tax revenues for the year. Debt instruments are issued to fund state projects, which can be either long- or short-term.

New Mexico uses the severance tax bond fund for four different types of debt:

- long-term senior bonds,
- short-term senior notes,
- Long- and short-term supplemental bonds, and
- notes used for public school projects authorized by the Public School Capital Outlay Council.

Any excess revenue is transferred to the Severance Tax Permanent Fund (STPF), which saves and invests such monies.[62] Annually, the STPF distributes 4.7 percent of the average of its year-end market value over the preceding five years to the state's general fund, which was approximately $246 million in fiscal year 2022.[63]

Revenue from the Oil and Gas Conservation Tax, the Oil and Gas Emergency School Tax, and the Natural Gas Processors Tax generally goes to the state's general fund.[64] [65]

[62] *See* the State Board of Finance's August 10, 2021, presentation to the New Mexico Revenue Stabilization & Tax Policy Committee.
[63] NM Statutes § 7-27.
[64] If the amount of Oil and Gas Emergency School Tax revenue exceeds the five-year average of such revenue and the amount of general fund reserves is more than 25 percent of recurring appropriations, a portion of the Oil & Gas Emergency School Tax is deposited into the New Mexico Early Childhood Education and Care Fund. The New Mexico State Investment Council manages this fund and distributes annual amounts to the state Early Childhood Education and Care Department to fund programs and scholarships for early childhood education.
[65] Two-nineteenths (approx. 10.5 percent) of the Oil and Gas Conservation Tax goes to the Oil and Gas Reclamation Fund, which is used to plug wells and reclaim drilling sites that have been abandoned. The remainder of this money goes to the general fund.

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SECTION III
SELECTED FACTORS RELATED TO NATURAL GAS DEVELOPMENT

Fast Facts...

- *Drilling permits vary significantly among peer states. Fees range from a low of $126 (Louisiana) to $12,500 (Pennsylvania), and issuing dates vary from two days to more than a month.*
- *Shales and basins included in our review: the Eagle Ford Shale, Permian Basin, Haynesville Shale, San Juan Basin, Point Pleasant-Utica Shale, and Marcellus Shale. Each shale area may cover multiple states, presenting different challenges when drilling into the formation.*
- *Freezing weather conditions can lead to freeze-offs in natural gas flow, an issue in Pennsylvania, which has the lowest mean temperatures.*
- *Natural gas prices are influenced by economic conditions. From 2012 to 2023, Pennsylvania prices averaged $5.48 per thousand cubic feet, while Henry Hub spot prices averaged $3.30 per million btu.*

Overview

As directed by HR 131, we explored unique factors relevant to the production and management of natural gas (within the largest gas producing states). We gathered data and information from state and federal agencies and non-governmental entities to conduct a comparative analysis of regulatory provisions and influencing environmental conditions. In this section, we covered the following:

1. **Permitting Procedures.** Our review focused on drilling permits. We identified regulatory agencies responsible for overseeing entities producing natural gas. We also examined the associated costs of obtaining drilling permits and the approximate time agencies spend processing drilling permit applications.

   Generally, each state requires operators to submit permit applications and meet bonding requirements to drill. Operators may also need to obtain additional permits before commencing drilling operations. For example, Pennsylvania requires an operator to obtain a sediment control plan/general permit and a water obstruction and encroachment permit if the operation is deemed to impact the state's waterways.

   Each state requires operators to submit a permit fee as part of the drilling permit application process. In Pennsylvania, operators seeking to drill an unconventional well must pay a permit application fee of $12,500, which is higher than peer states. West Virginia had the second-highest permit fee behind Pennsylvania, requiring a "well work fee" of $10,000.

2. **Geological Conditions.** We examined major shales and basins contributing to a significant portion of natural gas production. Specifically, these shales and basins include the Eagle Ford Shale, Permian Basin, Haynesville Shale, San Juan Basin, Point Pleasant-Utica Shale, and Marcellus Shale. These shale areas may cover multiple states.

   The Marcellus Shale, Pennsylvania's major natural gas source, is one of the largest natural gas plays in the United States. By 2015, it had 77.2 trillion cubic feet of proven natural gas reserves. We also found that Texas' Eagle Ford Shale has been a fast-growing source of natural gas over the last decade. The Eagle

Ford Shale also accounted for 8.8 percent of the nation's oil production in December 2022, while it only accounted for one percent in January 2010.

3. **Geographical Conditions.** We examined roadways/terrains, pipeline and transportation infrastructures, and federal and state lands excluded from natural gas development. Of the selected states, Texas is the largest, with a land area spanning 261,194 square miles and a water area measuring 7,331 square miles. West Virginia has the smallest land area, with a land area of 24,035 square miles and a water area of 189 square miles. Concurrently, Texas also has the longest gas distribution pipeline system out of the selected states, totaling 169,237 miles. West Virginia had the shortest gas distribution pipeline system, totaling 14,444 miles.

   Public land areas in each state are separated into two categories: (1) federal and (2) state-owned lands. Federal lands follow federal land policies (e.g. BLM's rules and procedures), while state-owned lands follow land policies at the state level. Moreover, federal and state-owned lands have different leasing and permitting processes. While Texas has the largest total land acreage, it also has the smallest federal land acreage in proportion to its total land acreage. New Mexico had the most federal land acreage in proportion to its total land acreage.

4. **Climate Conditions.** We explored each peer state's seasonal temperatures and weather conditions. Of the selected states we examined, we found that, from 2012 to 2023, Louisiana had the highest mean temperature of 67.8 degrees Fahrenheit, while Pennsylvania had the lowest of 50.2 degrees Fahrenheit. Variance in temperatures can affect the natural gas development and production process. For example, freezing weather conditions can lead to freeze-offs in the flow of natural gas. Conversely, hot weather conditions can increase pressure on the pipeline system, raising the risk of explosion.

5. **Natural Gas Prices.** We compared the Henry Hub natural gas spot price to citygate prices from each of the selected states. In general, while NYMEX natural gas prices reflect transactions in the futures market, spot prices and futures prices converge as futures contracts approach their delivery date.

   We found the average monthly Henry Hub natural gas spot price from 2012 to 2023 was $3.30 per million Btu, with the price hitting its lowest ($1.63 per million Btu) in June 2020 and highest at $8.81 per million Btu in August 2022. At the state level, we found that Pennsylvania had the highest average of monthly citygate

prices from 2012 to 2023 at $5.48 per thousand cubic feet, while New Mexico and Louisiana had the lowest average at $3.94 per thousand cubic feet.

Issue Areas

A. Permitting Procedures

HR 131 directed us to examine the permitting requirements, timelines, and associated costs of preparing and obtaining operating permits for developing natural gas wells in the top five natural gas-producing states: Pennsylvania, Texas, Louisiana, West Virginia, and New Mexico.[66]

As expected, permitting processes are complex and differ by each state's regulatory requirements. Moreover, an operator may have to undergo different permitting processes depending on the well's expected output. Similarly, each state may have additional requirements for well operators (e.g., erosion and sediment control permits). As such, no two states have identical permitting requirements; however, all states have a regulatory process that a state-level agency administers. An overview of the applicable regulatory authority in each state is presented in Exhibit 25.

Exhibit 25

State Regulatory Agencies Within Top Five Producing States

Source: Developed by LBFC staff from the respective state agencies.

[66] As discussed in Section I, these states were selected based on total marketable natural gas production reported as of June 30, 2023.

Issuing Authority and Permit Requirements

Pennsylvania. The Department of Environmental Protection's (DEP) Office of Oil and Gas Management oversees drilling permit applications. This regulatory oversight includes operators seeking to drill unconventional and conventional wells.[67] For the purposes of this review, our analysis is focused on unconventional well permit requirements as that is the primary source of natural gas in Pennsylvania.

These requirements are found in statutes and DEP's regulations for unconventional well permits. Title 58 Pa C.S.A Section 3211 requires operators to obtain a well permit before drilling a well. The requirements for a well permit are further prescribed in regulation in Title 25, Chapter 78a, Subchapter B of the Pennsylvania Code. Generally, to obtain a well permit, the applicant must submit a plat prepared by a qualified engineer (or surveyor) and identify the well's specific location and other significant information related to individuals or entities who will be affected by the well's location, such as water purveyors, surface landowners, and coal seams owners/operators.[68] Importantly, the well application must include proof of notification to nearby landowners.

Title 25, Chapter 78a.15, Subchapter B of the Pennsylvania Code also requires that if the "proposed limit of disturbance of the well site is within 100 feet measured horizontally from any watercourse or any high quality or exceptional value body of water or any wetland one acre or greater in size," the operator must demonstrate that the well site location will protect these areas.[69] Permit applicants may comply with this provision by adopting plans approved by DEP or developed under the Pennsylvania Code, such as submitting an erosion and sediment control plan/general permit pursuant to Chapter 102 and a water obstruction and encroachment permit issued under Chapter 105.[70]

New drilling permit applicants may also need to file air quality permits and waste permits. Exhibit 26 provides a comprehensive overview of the forms DEP requires as part of its drilling permit process.

[67] In Pennsylvania wells are generally distinguished as conventional and unconventional. This definition excludes potable water wells, which are not regulated in Pennsylvania. Title 58 (which Act 13 of 2012 amended) §3203 defines an unconventional well as "a bore hole drilled or being drilled for the purpose of or to be used to produce natural gas from an unconventional formation. An unconventional formation is defined in Title 58 §2301 as "a geological shale formation existing below the base of the Elk Sandstone or its geologic equivalent stratigraphic interval where natural gas generally cannot be produced at economic flow rates or in economic volumes except by vertical or horizontal well bores stimulated by hydraulic fracture treatments or by using multilateral well bores or other techniques to expose more of the formation to the well bore."
[68] Title 58 PA C.S.A, Section 3211(b).
[69] Title 25, Chapter 78a, Subchapter B, Section 78a.15.
[70] In June 2019, the LBFC conducted a performance evaluation of DEP's oversight of Chapter 102 and Chapter 105 permits.

Exhibit 26

DEP's Drilling Permit Application Checklist

REQUIREMENT	Conventional		Unconventional	
	Included	N/A	Included	N/A
a. Page 1 with all spaces filled in where applicable.	☐		☐	
b. Page 2, with names, addresses, and signatures (surface owner, water supplies purveyors, coal mines, and gas storage operator municipality and adjacent municipalities).	☐		☐	
c. Location plat, form 8000-PM-OOGM0002, Original and one copy	☐		☐	
d. Application fee based on permit fee calculator, check or money order payable to "Commonwealth of Pennsylvania."	☐	☐	☐	☐
e. Proof and record of notifications and/or written consent, as applicable: 1. Attach copies of signed and dated certified mail receipt cards or a completed "Affidavit of Non-Delivery of Certified Mail" as proof that you notified the parties listed on page 2. Note that you are required to send a copy of the whole application (pages 1 and 2 of form 8000-PM-OOGM0001 as well as the plat, form 8000-PM-OOGM0002 and attachments). Also, to parties with water supplies within 1,000 or 3,000 feet of the well location as applicable, include "Landowner Notification of Well Drilling or Alterations," form (8000-FM-OOGM0052).	☐		☐	
2. For required or optional written consent from a notified party -- is the party's signature in ink on the appropriate blank on Page 2, or on a separate document.	☐	☐	☐	☐
f. Bond instrument, if not already in effect	☐		☐	
g. Bond Agreement Id # provided on Page 1 if bond is in effect	☐		☐	
h. For a "Phased Deposit" bond -- additional collateral, if required.	☐	☐	☐	☐
i. "Coal well" -- spacing exception request or well cluster spacing.	☐	☐	☐	☐
j. Request for Waiver for Distance Requirements from Springs, Stream, Body of Water, or Wetland, form 8000-FM-OOGM0057.	☐	☐	☐	☐
k. Request For Variance From Distance Restriction From Existing Building Or Water Supply, form 8000-FM-OOGM0058.	☐	☐	☐	☐
l. Request For Approval of Alternate Waste Management Practices (form 5500-PM-OG0071), if needed.	☐	☐	☐	☐
m. Proposed Alternate Method of Casing, Plugging, Venting or Equipping (form 8000-PM-OOGM0024), if needed.	☐	☐	☐	☐
n. Coordination of a Well Location with Public Resources (form 8000-PM-OOGM0076), if needed.	☐	☐	☐	☐
o. For a disposal well or an enhanced recovery well, include the additional information required by regulations §78.18 (EPA UIC permit; control and disposal plan; erosion and sedimentation control plan).	☐	☐	☐	☐
p. Attach a copy of your PNDI check for the proposed well location shown on your plat.	☐	☐	☐	☐
q. Earth Disturbance Permit: Attached on prior ESCGP approval.	☐	☐	☐	☐
r. WMP for Unconventional Well: Attached prior approval.	☐	☐	☐	☐
Signature of Applicant				
s. On page 1 of the application -- the signature, and printed name and title of the person authorized to submit the application, and date. See instructions, **SIGNATURE OF APPLICANT.**	☐		☐	

Source: DEP, *Checklist for Completing An Application For A Permit To Drill, Operate or Alter An Oil Or Gas Well.*

Pennsylvania also requires specific bonding requirements for operators. These requirements are contained within Pennsylvania Code §78a.15, which requires the operator to verify its compliance with bonding provisions, and Title 58 Pa. C.S.A. Section 3225. As shown in Exhibit 27, the bond amounts vary depending on the depths of the wells and the number of wells. Under Title 58 Pa. C.S.A. Section 3225(d), there are alternative forms of payment in lieu of traditional bonds for operators "of not more than 200 wells who cannot obtain a bond for a well drilled prior to April 18, 1985… due to inability to demonstrate sufficient financial resources," such as a $50 annual fee per well, a $500 blanket fee for ten to 20 wells, or a $1,000 blanket fee for more than 20 wells that an operator may pay for each year a bond is not filed. The bond is set at a maximum

of $250,000 for wells with depths of under 6,000 feet and $600,000 for wells with over 6,000 feet.

Exhibit 27

Pennsylvania Well Drilling Bond Requirements

Unconventional wells with a total well bore length of less than 6,000 feet

Number of Wells Operated by the Owner/Operator	Bond
Up to 50 wells	$4,000 per well
51 to 150 wells	$35,000 plus $4,000 per well for each well over 50 wells
151 to 250 wells	$60,000 plus $4,000 per well for each well over 150 wells
250 wells or more	$100,000 plus $4,000 per well for each well over 250 wells

Unconventional wells with a total well bore length of at least 6,000 feet

Number of Wells Operated by the Owner/Operator	Bond
Up to 25 wells	$10,000 per well
26 to 50 wells	$140,000 plus $10,000 per well for each well over 25 wells
51 to 150 wells	$290,000 plus $10,000 per well for each well over 50 wells
150 wells or more	$430,000 plus $10,000 per well for each well over 150 wells

Source: Developed by LBFC staff from Title 58 Pa. C.S.A. Section 3225(a).

Texas. In Texas, the Railroad Commission (RRC) provides regulatory oversight of the state's oil and gas activities. RRC was established in 1891 following the passage of a mandate to oversee issues related to railroad charges and tariffs; however, by 2005, its oversight of rail functions in the state had been delegated to other Texas state agencies.[71]

For natural gas well permits, operators must submit a drilling permit application to RRC and (similar to Pennsylvania) comply with the state's bonding requirement identified in Title 16, Part 1, Chapter 3, Rule §3.78 of the Texas Administrative Code. The bond for a single well is $2 per foot of depth of the well. A blanket bonding requirement is also based on the number of wells. The blanket bond is $25,000 for 10 wells or less, $50,000 for 11 to 99 wells, and $250,000 for 100 wells or more.

Notably, in Texas, the process for drilling permit applications depends on whether an application is exempt from the Statewide Rule (SWR). Specifically, applications with SWR 37 or 38 exceptions may be placed in a queue for further review by the agency. SWR 37 (also referred to as

[71] RRC, *About Us.*

"Statewide Spacing Rule") governs how close a well can be to a property, lease, or subdivision line, while SWR 38 relates to well densities.[72] If the application does not require a manual review or holds SWR exceptions, it may proceed directly to the Public Sales Queue before final approval.[73]

Different permit applications and forms are available for operators who perform duties on the well site in addition to drilling. Environmental permits and/or injection-storage permits may be applicable for operators depending on the intended use of their well site.

Louisiana. Louisiana's oil and gas activities are regulated by the state's Department of Energy and Natural Resources (DENR) Office of Conservation. Operators must submit a drilling permit to the district office where the well will be located. Once the district office completes its application review, it receives a second review at the DENR headquarters. As in other states, all well operators in Louisiana are subject to the state's bonding rules under Title 43, Part XIX, §104 of the Louisiana Administrative Code. The bond amount is factored by the location of the well (land, coastal waters, or offshore waters), the depths of the wells, and the number of wells. For a single land-based well, the bond is $2 per foot if the well's depth is equal to or under 3,000 feet, $5 per foot if the well's depth is between 3,001 and 10,000 feet, and $4 per foot if the well's depth is equal to or over 10,001 feet. Blanket bond measures are also based on the number of wells. There is a blanket bond for land-based wells of $50,000 for up to 10 wells on a given land, $250,000 for 11 to 99 wells, and $500,000 for 100 wells or more.

As part of the application process, applicants are required to submit a pre-entry notice affidavit under Title 43, Part XIX, §103 of the Louisiana Administrative Code, which is used to verify that the surface owner of the well has been notified of the intent to drill at least 30 days before beginning any well work. Operators must comply with the state's guidelines on well plats and regulations relating to off-site storage, treatment, and/or disposal of exploration and production waste generated from drilling.

West Virginia. The Department of Environmental Protection's (WVDEP) Office of Oil and Gas oversees the oil and gas activities in West Virginia. Like Pennsylvania, drilling within the Marcellus Shale formation constitutes a significant portion of new well activity in West Virginia. As such, the permitting process varies depending on whether the operator is drilling a horizontal or vertical well. Unconventional wells, which are typically handled using a horizontal drilling process, require operators to ob-

[72] SWR 37 and 38 follows Title 16, Part 1, Chapter 3, Rules §3.37 and §3.38 of the Texas Administrative Code.
[73] This analysis is based on the flowchart published by RRC on the drilling permit approval process. To view the flowchart, *see* RRC, *Drilling Permit Approval Process for a problem-free application*.

tain Horizontal 6A Permits. As part of the permitting process for Horizontal 6A wells, the operator must submit a series of plans, which includes a water management plan and site safety plan, along with a bond of $250,000.[74]

New Mexico. In New Mexico, the state's Energy, Minerals and Natural Resources Department's (EMNRD) Oil Conservation Division processes drilling permits in the state. Under Title 19, Chapter 15, Part 14 of the New Mexico Administrative Code, an operator must submit a drilling permit application and a form to indicate the well location and acreage dedication plat. Like other states, New Mexico requires that proposed wells comply with the state's bonding rules. Specifically, the state requires bonds to be set forth via (1) an irrevocable letter of credit, (2) a plugging insurance policy, or (3) a cash or surety bond. Under Section C of the New Mexico Administrative Code R. § 19.15.8.9, a single well comes with a bonding requirement of $25,000 plus $2 per foot of the projected depth of a proposed or existing well, but it may instead be subject to securing a blanket plugging financial insurance that ranges from $50,000 to $250,000 depending on the number of wells that the operator is responsible for.

Other permitting requirements, such as General Construction Permits overseen by the New Mexico Environment Department's Air Quality Bureau and oil and gas leasing rules governed by the New Mexico State Land Office's Oil, Gas, and Minerals Division, may apply.

Well Permit Fees

Exhibit 28 provides Texas, Louisiana, and West Virginia permit fee schedules.[75] In Pennsylvania, under the Pennsylvania Code §78a.19, applicants subject to filing a permit application for an unconventional well are required to pay a permit application fee of $12,500; however, this number may change at least every three years depending on the outcome of the evaluation of the fees. In New Mexico, under Chapter 70 of the New Mexico statutes, an operator must submit a fee of $500 to the Division for each application for a non-federal permit to drill, deepen, plug back, or reenter the well.

[74] WVDEP, *Checklist for Filing a Permit - Horizontal 6A Well*.
[75] Texas permit fee schedule follows Title 16, Part 1, Chapter 3, Rule §3.78 of the Texas Administrative Code. Louisiana's permit fee schedule follows Title 43, Part XIX, §703 of the Louisiana Administrative Code. For West Virginia's permit fee schedule, *see* WVDEP, *Fee Schedule*.

Exhibit 28

Texas Permit Fee Schedule

Type	Fee	Surcharge (150% of fee)	Total Assessment
Drilling permits less than 2,000 feet	$200	$300	$500
Drilling permits 2,001 to 4,000 feet	$225	$337.50	$562.50
Drilling permits 4,001 to 9,000 feet	$250	$375	$625
Drilling permits greater than 9,000 feet	$300	$450	$750
Expedite Fee	$150	$225	$375
Statewide Rule 37 and 38 Exception Fee	$200	$300	$500

Louisiana Permit Fee Schedule

Type	Fee
Application for Permit to Drill - Minerals: 0' - 3,000' (6 months)	$126
Application for Permit to Drill - Minerals: 0' - 3,000' (1 year)	$252
Application for Permit to Drill - Minerals: 3,001' - 10,000' (6 months)	$631
Application for Permit to Drill - Minerals: 3,001' - 10,000' (1 year)	$1,262
Application for Permit to Drill - Minerals: 10,001' + (6 months)	$1,264
Application for Permit to Drill - Minerals: 10,001' + (1 year)	$2,528

West Virginia Permit Fee Schedule

Type	Fee
Well work fee for initial H6A horizontal well on a pad.	$10,000
Expedited review fee for initial H6A horizontal well on a pad (additional fee)	$20,000
Well work fee for additional H6A horizontal well(s) on a pad.	$5,000
Expedited review fee for additional H6A horizontal well(s) on a pad (additional fee)	$10,000
Expedited review of modification request for H6A permit for horizontal well	$5,000
Well work fee for deep well work except plugging.	$650
Well work fee for CBM well work except plugging.	$650
Well work fee for shallow well work except plugging.	$400
Fee for permit to dispose of well work fluids.	$100
Fee for land application disposal of pit fluids	$100
Well fee to go into the reclamation fund for each permit except pluggings.	$150
Well work fee to convert an existing shallow well to an injection well without land application.	$550
Well work fee to convert an existing deep well to an injection well without land application.	$800
Annual Fee for Oil and Gas Well	$0
Groundwater Fee for Oil and Gas Well	$3
Annual Fee for Gas Storage Well	$0
Groundwater Fee for Gas Storage Well	$3

Source: Developed by LBFC staff from respective state permit fee schedules.

Permit fees vary widely across the states. For example, Pennsylvania charges a permit fee of $12,500 for unconventional wells, which is one of the highest among the selected states in this study. West Virginia ranked closely behind Pennsylvania, with the state requiring a well work fee of $10,000 for the initial horizontal 6A well. In Louisiana, the fee for drilling permit applications depends on the well's depth and the permit's length, but the most expensive permit is $2,528. In Texas, drilling permit costs are based on a fee and a surcharge. The surcharge is calculated by multiplying the drilling permit fee by 1.5. Texas also has SWR exceptions that may apply to applicants seeking to drill in the state, which may come with additional costs as listed under the state's fee schedule in Exhibit 28.

Permit Timeframes

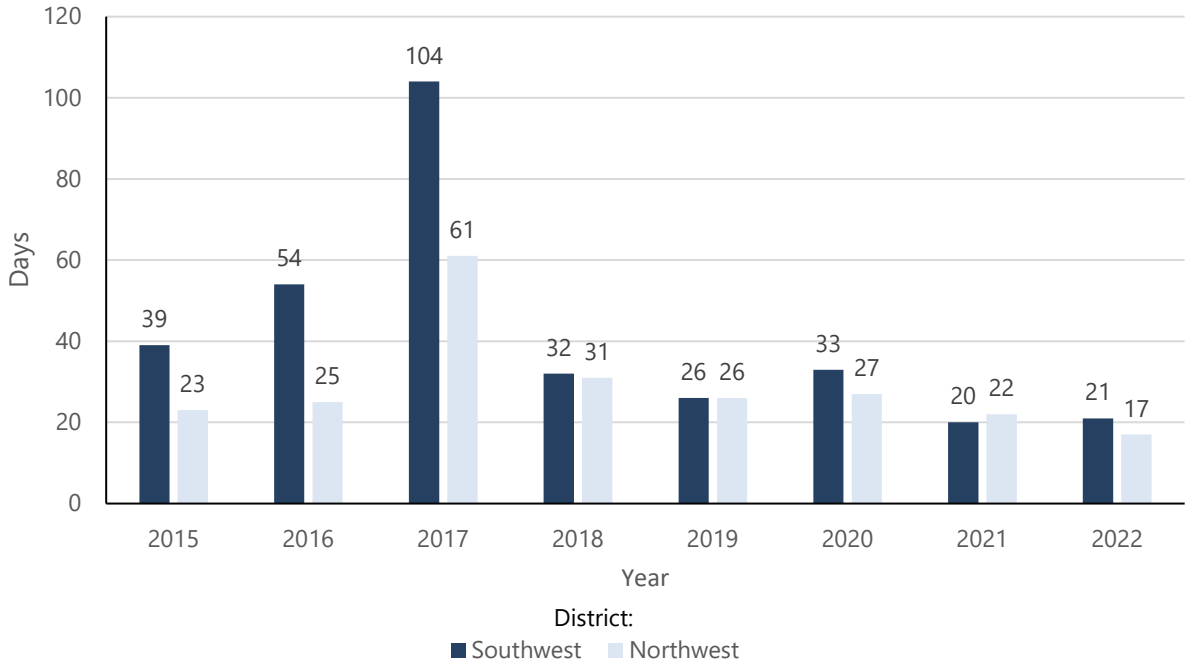
In Pennsylvania, Title 58 Pa. C.S.A. Section 3211(e) requires DEP to issue a permit within 45 days of submission of a permit application unless the department decides to deny the permit application for one or more of the reasons listed in Title 58 Pa. C.S.A. Section 3211(e.1), "except that the department shall have the right to extend the period for 15 days for cause shown upon notification to the applicant of the reasons for the extension."[76] Under Act 13, DEP may extend this review period by a maximum of an additional 15 days if the applicant seeks a variance or waiver request of the well location restrictions.[77]

Pennsylvania previously instituted a policy regarding permit timeframes. In July 2012, then-Governor Tom Corbett signed Executive Order 2012-11, establishing the so-called "Permit Decision Guarantee" for DEP. Specifically, the Executive Order directs DEP to develop a permit decision guarantee policy that includes a "predictable processing time for each permit application covered by the permit decision guarantee."[78] The policy must also aim to process permit applications as "expeditiously as possible."[79] Other measures in the Executive Order establish additional responsibilities for DEP, including developing, implementing, and enhancing information technology tools for permitting processes. Exhibit 29 provides the average number of days it takes for DEP to issue oil and gas drilling permits.

[76] Act 13 of 2012, Section 3211.
[77] DEP, *Act 13 Frequently Asked Questions*.
[78] Commonwealth of Pennsylvania, *Executive Order 2012-11*, July 24, 2012.
[79] Ibid.

Exhibit 29

Average Number of Business Days to Issue Oil and Gas Drilling Permits



Source: Developed by LBFC staff from the DEP's *Oil and Gas Annual Reports* from 2019 and 2022. 2023 data, as well as data preceding 2015, were unavailable. The Eastern Oil and Gas District does not issue oil and gas drilling permits.

Except for 2016 and 2017, DEP has issued drilling permits under 40 days. The average number of days DEP took to issue drilling permits in the southwest district was reduced from 39 days in 2015 to 21 days in 2022, indicating a decline of 46.2 percent. Similarly, the average number of days DEP took to issue drilling permits in the southwest district was reduced from 23 days in 2015 to 17 days in 2022, marking a decline of 26.1 percent.

In Texas, RRC's required turnaround timeframe for processing drilling permits is three days.[80] However, a press release from RRC in 2020 identified that from 2018 to 2020, RRC staff had set a record of taking two days on average to process standard drilling permits.[81] As of April 16th, 2024, the drilling permit processing time for standard permits is approximately four business days, while it takes approximately two business days for expedited permits.[82]

[80] This information is based on a phone call with a staff member from RRC.
[81] RRC, *RRC Staff Processing Standard Drilling Permits in Two Days*, January 17, 2020.
[82] RRC, *Oil & Gas*. This information is based on what was shown under the section titled "Drilling Permit Processing Time as of April 16th, 2024" on RRC's Oil and Gas page.

In Louisiana, representatives from DENR stated they do not track permit application approval times. It does have such information in individual records, but its database only tracks the permit issuance date. However, the agency anecdotally indicated that the timeframe is usually about two days to a week, depending on whether the permit is related to something simple like a shallow vertical or something more complex, like a horizontal well with multiple fracture stages. Further, representatives noted that timelines are not specified in law or regulation.[83]

In West Virginia, the state's Horizontal Well Act provides that no permit may be issued less than 30 days after the application's filing date for any well work except plugging or replugging processes. In 2012, it took an average of 95 days from when the Office of Oil and Gas received the permit application to when the permit was issued to the operator.[84] In 2023, that number was shortened to 35 days.[85]

We contacted representatives from the New Mexico EMNRD's Oil Conservation Division but could not identify permit timeliness information. However, at least anecdotally, according to an article from *Farmington Daily Times*, an application to drill on state-managed land in New Mexico typically takes less than 10 days to process.[86]

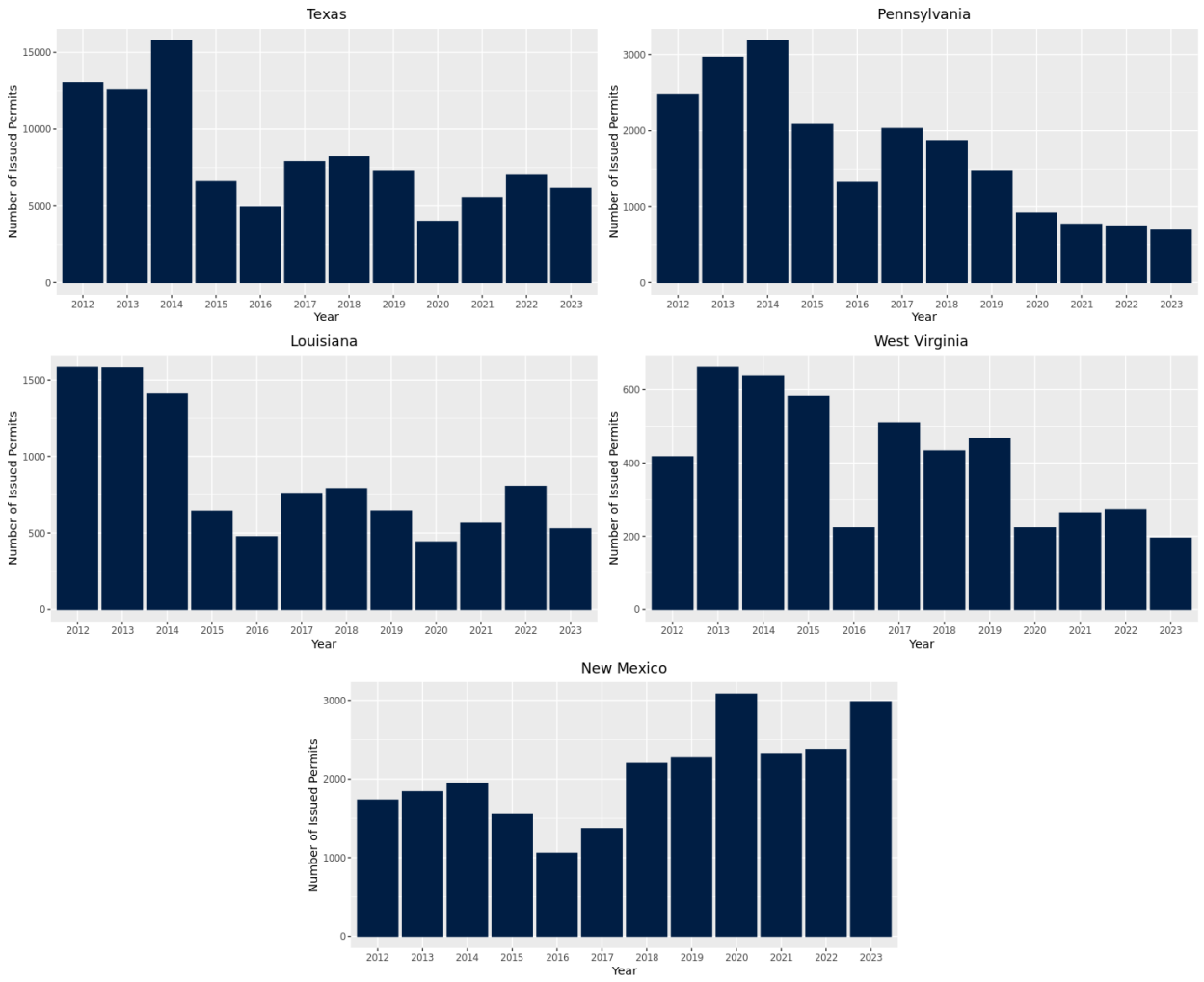
Number of Permits Issued

Exhibit 30 lists the number of drilling-related permits issued by each of the top five natural gas-producing states from 2012 to 2023. Where possible, our analysis focuses on unconventional well permits for natural gas instead of conventional well permits, which may target other resources (e.g., oil).

[83] An email from DENR on May 31, 2024.
[84] WVDEP's Office of Oil and Gas, *22-6A Permit Issuance Monthly Report - 2012*. We obtained this information via an email from WVDEP's Office of Oil and Gas on May 30, 2024.
[85] WVDEP's Office of Oil and Gas, *22-6A Permit Issuance Monthly Report - 2023*.
[86] Irvin, Leigh Black, *BLM outlines drilling permit process on federal lands*, Farmington Daily Times, May 27, 2017.

Exhibit 30

Number of Issued Permits in the Top Five States from 2012 to 2023[a/]



Note:
[a/] Section I discusses the methodology for this exhibit. Data is for unconventional/horizontal drilling permits where possible.
Source: Developed by LBFC staff from data published by the respective states.

As shown in Exhibit 30, the number of drilling permits has decreased overall from 2012 to 2023 for most states, except New Mexico, which has issued more permits in recent years than in 2012. The number of unconventional well permits in Pennsylvania has decreased in recent years. For example, the state issued 2,648 unconventional well permits in 2012, but that number declined by 73.9 percent to 692 unconventional well permits in 2023. Similarly, in West Virginia, the state issued 417 Horizontal 6A permits in 2013; however, that number declined by 53.2 percent to 195 permits in 2023.

Despite a decrease in the number of drilling permits issued in these states, overall natural gas production has increased. In 2023, the natural gas marketed production in the United States was 41,296,088 million cubic feet or a 63.3 percent increase from the 2012 production data (25,283,278 million cubic feet).[87] In the same year, there were 7,619,721 million cubic feet of natural gas marketed production in Pennsylvania or a 237.6 percent increase from the 2012 production data (2,256,696 million cubic feet).[88]

B. Geological Conditions

HR 131 directed us to identify "the unique geological conditions among the top five natural gas-producing states." We relied upon information from *State Profiles and Energy Estimates* published by the United States Energy Information Administration (USEIA) to answer this objective.[89] Our analysis focused on the following basins and shales:

1. **Eagle Ford Shale**. The Eagle Ford Shale notably contributed to Texas' increasing productivity in natural gas over the last decade. By 2014, the Eagle Ford Shale play surpassed the Barnett Shale play in gas production rate, becoming the top gas play in the state.[90]

2. **Permian Basin**. According to USEIA, most of the past decade's increase in Texas natural gas production came from the Eagle Ford Shale and the Permian Basin. Horizontal drilling and hydraulic fracturing technologies contributed to improved production from shales and other low-permeability[91] formations.[92] New Mexico also produces large amounts of natural gas through conventional oil and gas wells and shale gas wells in the Permian Basin.

3. **Haynesville Shale**. The Haynesville Shale is one of the key natural gas-producing regions in the United States, and it is located mainly in northwestern Louisiana and northeastern Texas. With productive formations like

[87] USEIA, *Natural Gas Gross Withdrawals and Production*.
[88] Ibid.
[89] USEIA, *State Profiles and Energy Estimates*.
[90] This information is based on the data on top gas plays in Texas from 2010 to 2018. For more information on this data, *see* University of Texas at Austin's Bureau of Economic Geology, *Oil and Gas Map of Texas - 2018*.
[91] Permeability relates to the capacity of a material, such as porous, sediment, soil, or rock, to transmit a fluid.
[92] USEIA, *Texas - State Profile and Energy Estimates - Profile Analysis*.

Haynesville Shale, Louisiana accounts for about ten percent of the nation's marketed natural gas production and seven percent of the nation's natural gas proved reserves.[93]

4. **San Juan Basin**. Natural gas in New Mexico is produced via low permeability sands, most notably from shale-gas wells in the San Juan Basin in the state's northwestern region.

5. **Point Pleasant-Utica Shale**. The Point Pleasant-Utica Shale ranked closely to the Marcellus Shale in the Appalachian Basin. It is one of the primary formations responsible for producing natural gas for West Virginia.

6. **Marcellus Shale**. The Marcellus Shale and the Point-Pleasant Utica Shale comprise about 95 percent of West Virginia's natural gas production.[94] A significant portion of Pennsylvania's natural gas production comes from the Marcellus Shale, with proven reserves in the state more than quadrupling from 2011 to 2021 as natural gas development has increased.[95]

Natural Gas and Drilling Concepts

Fundamentals of Natural Gas. Natural gas is a gaseous mixture that is primarily composed of methane (CH_4) and smaller quantities of other hydrocarbons. Natural gas was formed under the Earth's crust millions of years ago as layers of decaying organisms that have been exposed to extreme heat and pressure.

There are two kinds of natural gas: (1) dry gas and (2) wet gas. *Dry gas* primarily comprises methane, while *wet gas* is a mixture of methane and other chemical compounds, such as butane and ethane. *Wet gas* typically contains more ethane and other complex hydrocarbons and less methane than dry gas.

Natural gas can be extracted using either conventional or unconventional drilling processes. *Conventional gas* is typically extracted by drilling vertically under the ground. On the other hand, *unconventional gas* is often extracted via different extraction methods, most notably by drilling horizontally under the ground via hydraulic fracturing ('fracking'). Shale gas,

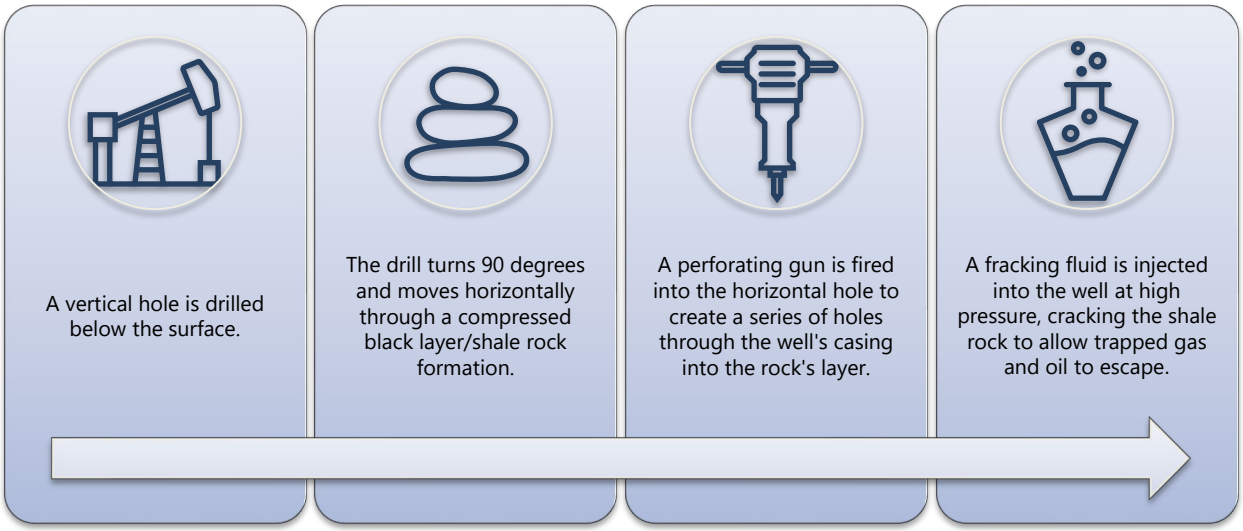
[93] USEIA, *Louisiana - State Profile and Energy Estimates - Profile Analysis*. Natural gas proved reserves refer to the amount of natural gas that can be recovered from a deposit with a reasonable degree of certainty.
[94] USEIA, *West Virginia - State Profile and Energy Estimates - Profile Analysis*.
[95] USEIA, *Pennsylvania - State Profile and Energy Estimates - Profile Analysis*.

coalbed methane, tight gas, and sour gas are some of the examples of unconventional gas.

Hydraulic Fracturing. Hydraulic fracturing, or "fracking," is a drilling method used to extract unconventional energy resources. Exhibit 31 illustrates the fracking process.

Exhibit 31

Horizontal Drilling and Fracking Process



Source: Developed by LBFC staff from Mia Nacamulli, *How does fracking work?*, TED-Ed, July 13, 2017.

The process begins with drilling a long vertical wellbore through sediment layers, reaching 2,500 to 3,000 meters below the surface, before initiating horizontal drilling and fracking. As the drill reaches the targeted depth, it slowly turns 90 degrees and extends horizontally for approximately 1.5 kilometers through a compressed black layer/shale rock formation. From here, a perforating gun is fired into the horizontal hole, resulting in a series of small holes that burst through the well's casing into the rock's layer. The fracking process usually begins 3-4 months after the initial drilling process. During the process, a fluid is injected into the well at a pressure great enough to crack the shale rock, releasing the trapped gas and oil. The fracking fluid is mostly made up of water, with

the rest comprising concentrated chemical additives, such as acid, slickwater[96], and disinfectant. It may also include sand and clay.[97]

Key Geological Concepts and Terminologies

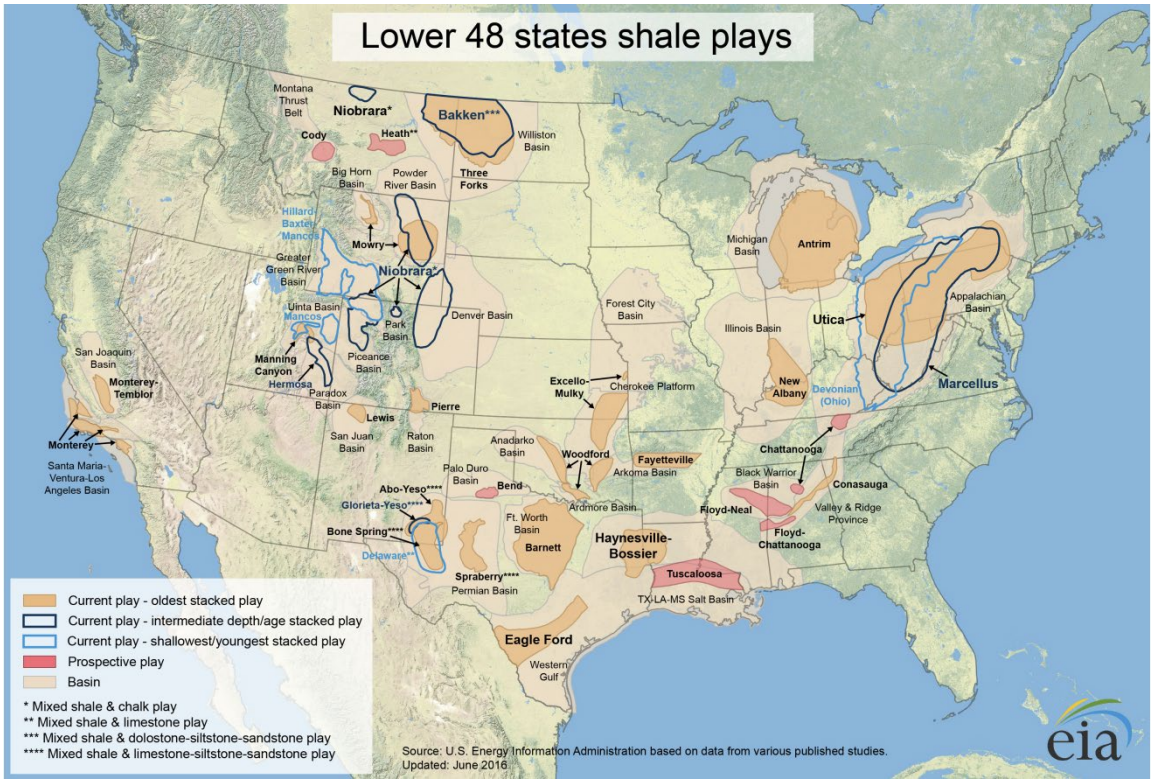
A clear understanding of geologic terminology is essential for comprehending natural gas production. Differentiating between basin and shale, understanding the difference between thickness and depth, comprehending the type of rock, and recognizing geologic time periods all play important roles in influencing natural gas recovery.

Basin vs. Shale. The USEIA's glossary defines a shale as a "very fine-grained, classic sedimentary rock that forms when mud, silt, and clay-size mineral particles are consolidated and compacted into relatively impermeable layers."[98] Conversely, a basin is a depression or a dip in the Earth's surface. Activities that occur above the ground, such as erosion, or below the ground, such as earthquakes, can contribute to the formation of a basin. Shale plays are situated within basins, which may contain other oil and natural gas resources. Exhibit 32 visualizes different shale plays and basins across the lower 48 states in the United States.

[96] Slickwater is a shale fracture fluid that is primarily composed of water. Other additives may be added to slickwater to enhance the effectiveness of the fracturing operation, though these additives may vary depending on the well and the preferences of the operator. For more information on fracture fluids, *see* United States Department of Energy's Office of Fossil Energy, Natural Gas From Shale: *Questions and Answers*, April 2013.
[97] The information on hydraulic fracking in this paragraph was adapted from Mia Nacamulli, *How does fracking work?*, TED-Ed, July 13, 2017.
[98] USEIA, *Glossary - Shale*.

Exhibit 32

Shale Plays and Basins in Lower 48 States in the United States



Source: USEIA.

Thickness and Depth. The measurement of *thickness* and *depth* is one of many variables in evaluating the geology of a given shale or basin. Thickness (also known as "true thickness") generally refers to a perpendicular distance between two parallel planes, surfaces, or beds, while depth can be found by measuring the vertical distance from one level, such as the earth's surface, to a point, plane, or line.[99]

Rock Composition. There are three different types of rocks: (1) sedimentary, (2) igneous, and (3) metamorphic rocks. According to *National Geographic*, "the most important geographical processes that lead to the creation of sedimentary rocks are erosion, weathering, dissolution, precipitation, and lithification."[100] Specifically, sedimentary rocks are formed by accumulating deposits and sediments on the Earth's surface. Coal, limestones, oil shale, and sandstones are resource examples found within sedimentary rock. Igneous rocks are formed via the cooling and

[99] Donal M. Ragan, *Structural Geology: An Introduction to Geometrical Techniques - 4th edition*, Cambridge University Press, 2009.
[100] National Geographic, *Sedimentary Rocks*.

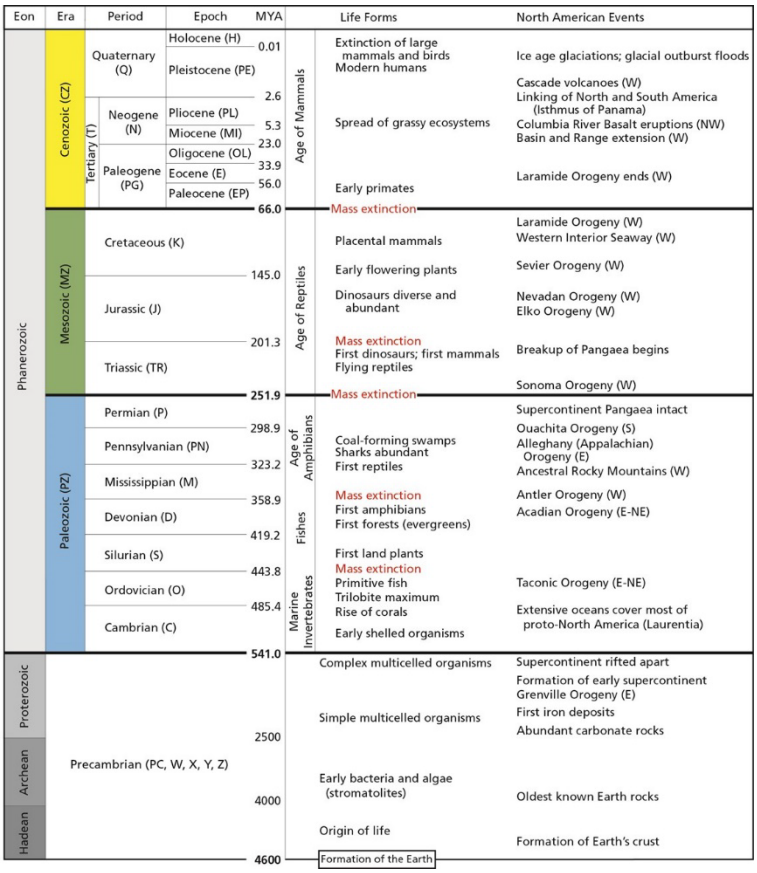
solidification of molten rocks (magma).[101] Examples of igneous rocks include basalt and granite. Metamorphic rocks, such as slate and marble, are formed when existing rocks are modified via heat, pressure, and/or chemically reactive fluids.[102]

Geologic Time. The geologic time scale identifies and organizes geological history, which provides an approximate age of a given basin or shale.

[101] National Park Service, *Igneous Rocks*.
[102] American Museum of Natural History, *Metamorphic Rocks*.

Exhibit 33

Geologic Time Scale



Source: National Park Service.

As presented in Exhibit 33, the geologic time scale summarizes geologic time from ice age glaciations, glacial outbursts, and other mountain-building processes (orogeny). More importantly, geologic time helps to determine the age of a shale since its composition and formation may change over time in response to changes in geological conditions.

Formation Descriptions

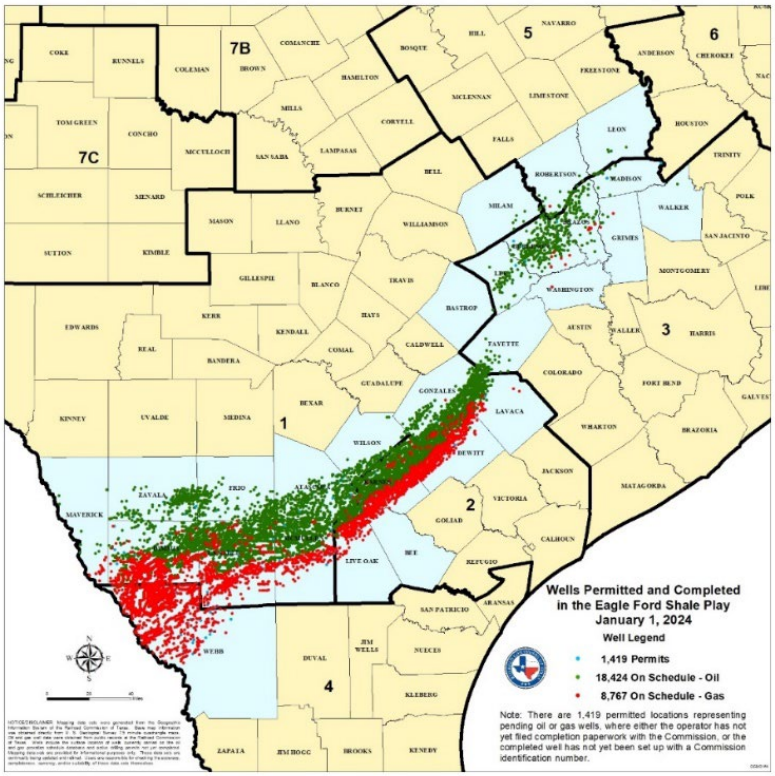
Eagle Ford Shale. The Eagle Ford Shale is a hydrocarbon-bearing, Late Cretaceous formation. According to the Texas Commission on Environmental Quality (TCEQ), the shale extends over 26 counties across Texas, stretching from the Mexican border between Laredo and Eagle Pass up through counties east of Temple and Waco.[103] The play (i.e., the

[103] TCEQ, *Eagle Ford Shale Geological Area*.

recoverable natural gas resource) measures approximately 50 miles wide and 400 miles long.[104] Exhibit 34 presents and labels the RRC's districts and the Eagle Ford Shale play.

Exhibit 34

Eagle Ford Shale



Source: RRC.

Embedded between 4,000 and 12,000 feet below the Earth's surface, the shale holds an average thickness of 250 feet within RRC Districts one (San Antonio region) through six (Kilgore region).[105] with the formation being thickest in the Maverick Basin area and thinnest in the San Marcos Arch region.[106]

[104] RRC, *Eagle Ford Shale*.
[105] Ibid.
[106] USEIA, *Updates to the EIA Eagle Ford Play Maps*, December 2014.

The shale holds both wet and dry gas.[107] The USEIA estimated that the shale comprises organic-rich calcareous mudrock, with carbonate minerals making up 40 to 90 percent of its mineralogy. Other shale mineralogy components include between 15 and 30 percent clay and 15 to 20 percent silica/quartz.[108] The shale is stratigraphically above the Buda Limestone and below the Austin Chalk.[109]

The shale's high percentage of carbonate makes the rock more brittle, creating a desirable condition for extracting oil and gas via hydraulic fracturing. According to the Federal Reserve Bank of Dallas, the northernmost part of the Eagle Ford Shale primarily holds oil, and the southernmost window mostly contains natural gas, while the central window of the shale holds natural gas liquids (e.g., propane).[110]

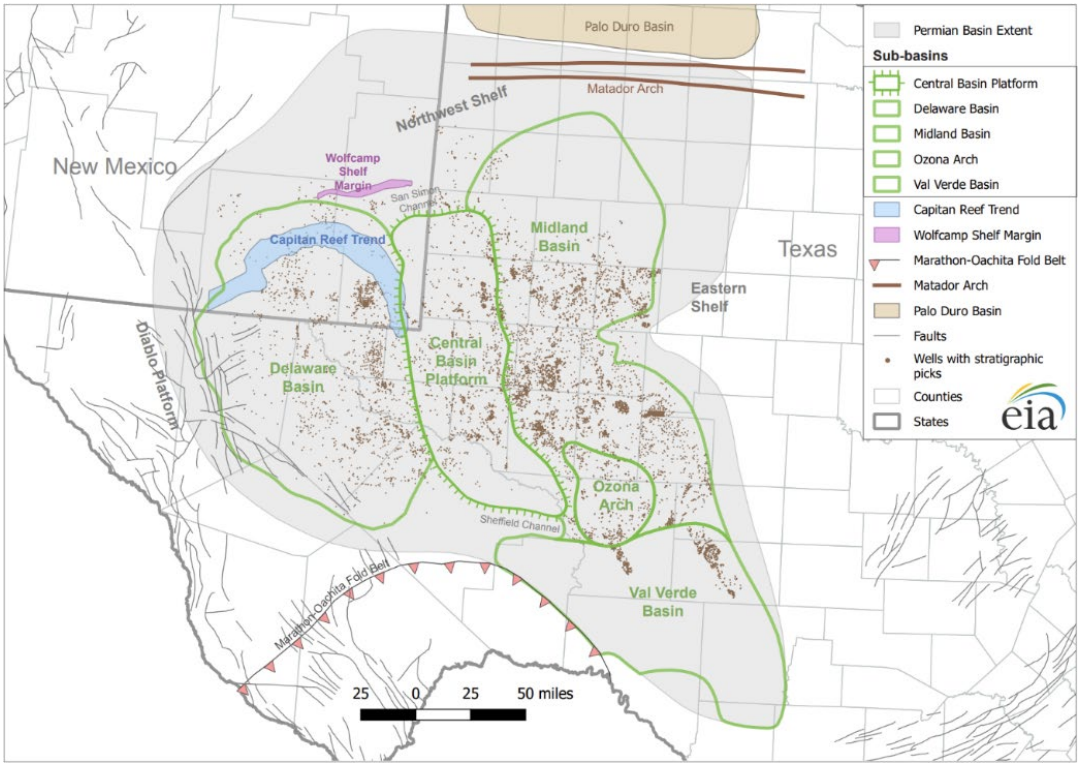
In January 2010, the Eagle Ford Shale accounted for one percent of the United States' oil production, but it reached 8.8 percent in December 2022.[111]

Permian Basin. The Permian Basin, which is shown in Exhibit 35, is a sedimentary system located in West Texas and southeastern New Mexico. According to the USEIA, the Permian Basin developed in the open marine area known as the Tobosa Basin in the middle Carboniferous period approximately 325 million to 320 million years ago, and it covers more than 75,000 square miles and extends across 52 counties in West Texas and Southeast New Mexico.[112]

[107] NPR State Impact, *What is the Eagle Ford Shale?*.
[108] Ibid.
[109] Stratigraphy is an area of geology that focuses on the study of rock layers.
[110] Federal Reserve Bank of Dallas, *Eagle Ford Shale*.
[111] Ibid.
[112] USEIA, *Permian Basin Part 1: Wolfcamp, Bone Spring, Delaware Shale Plays of the Delaware Basin – Geology review*, February 2020.

Exhibit 35

Permian Basin



Source: USEIA, *Permian Basin - Part 1: Wolfcamp, Bone Spring, Delaware Shale Plays of the Delaware Basin - Geology review*, February 2020.

Three sub-basins are included in the Permian Basin: (1) Central Basin Platform, (2) Delaware Basin, and (3) Midland Basin. While these sub-basins are located inside the Permian Basin borders, the Midland Basin and Delaware Basin tectonics were primarily influenced by the uplift of the Central Basin Platform. Most notably, the Delaware Basin and Midland Basin were rapidly sinking (also known as "subsidence") simultaneously with the uplift of the Central Basin Platform.[113]

Since 2007, the Wolfcamp play, which is found within all three sub-basins contributed to the growth in crude oil and natural gas production in the Permian Basin. The Wolfcamp play accounts for more than one-third of the total Permian Basin's natural gas production, and as of September 2018, the play produced gas at approximately four billion cubic feet per

[113] Ibid.

day. In recent years, horizontal drilling within the Wolfcamp play has increased from approximately 2,500 linear feet in 2005 to over 8,500 linear feet in 2018, increasing the play's productivity.[114]

The Wolfcamp play extends across the three subbasins of the Permian Basin. The play's depths below sea level range from 0 to 9,500 feet in the Delaware Basin and between 2,000 to 7,000 feet in the Midland Basin. The thickness of the play in the Permian Basin also ranges from approximately 800 feet to over 7,000 feet in the Delaware Basin, 400 feet to over 1,600 feet in the Midland Basin, and 200 to 400 feet in the Central Basin Platform.[115]

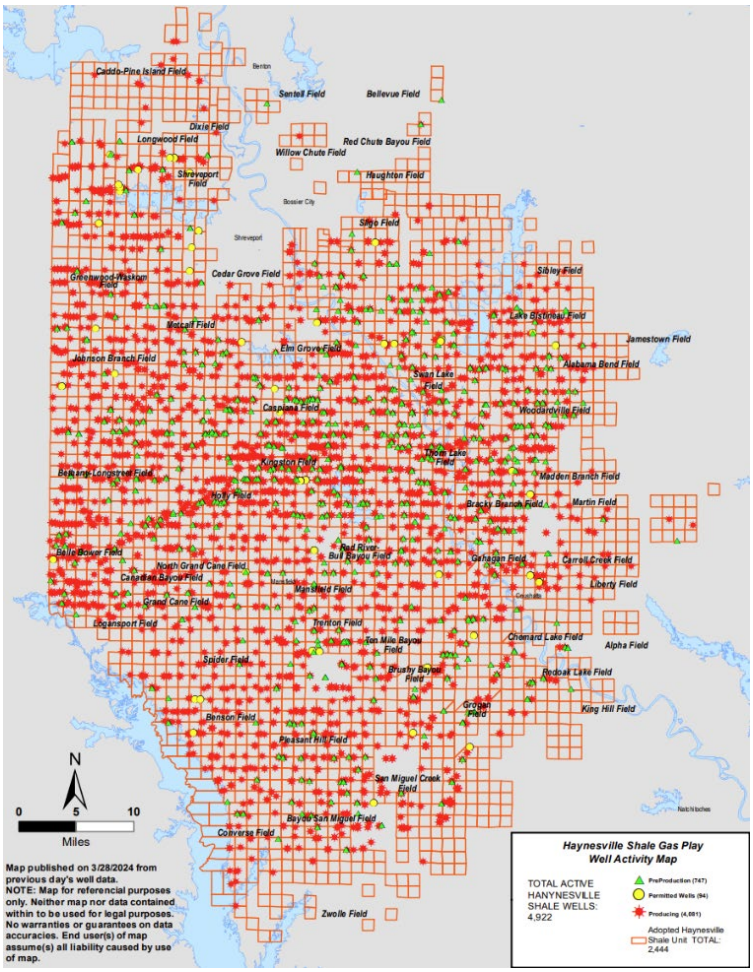
The Permian Basin has increased natural gas production over the last decade. For example, in 2021, marketed natural gas production reached a new annual high of 16.7 billion cubic feet daily.[116] Advancements in horizontal drilling and hydraulic fracturing have contributed to the Permian Basin's production growth over the last decade.

Haynesville Shale. The Haynesville Shale is a hydrocarbon-producing geological formation shown in Exhibit 36. It is organic-rich and began to form and develop during the Late Jurassic period in a marine environment. According to DENR, the shale sits in "the area of northwestern Louisiana, southwestern Arkansas, eastern Texas, with some of the formation stretching well across the northern central portion of Louisiana."[117]

[114] USEIA, *The Wolfcamp play has been key to Permian Basin oil and natural gas production growth*, November 16, 2018.
[115] Ibid.
[116] USEIA, *Natural gas production in the Permian Basin reached an annual high in 2021*, June 2, 2022.
[117] DENR, *Haynesville Shale*.

Exhibit 36

Haynesville Shale



Source: DENR.

The shale's thickness ranges from 200 to 350 feet, with producing depths ranging from 10,000 feet to more than 14,000 feet.[118] Haynesville wells are typically deeper, and as a result, the drilling costs in the shale tend to be higher than other shale plays.[119] The Haynesville Shale primarily comprises quartz, calcite, clay, relatively small amounts of pyrite, and organic matter (kerogen).[120] It also has a naturally lower methane intensity than other gas basins in the United States.[121] The shale is stratigraphically located above the Smackover Formation and below the Cotton Valley

[118] University of Texas at Austin's Bureau of Economic Geology, *Haynesville Shale-gas Study*.
[119] USEIA, *Haynesville natural gas production reached a record high in late 2021*, April 13, 2022.
[120] Jiang, Meijuan and Spikes, Kyle T, *Rock-physics and seismic-inversion based reservoir characterization of the Haynesville Shale*, Journal of Geophysics and Engineering, June 2016.
[121] Hallahan, Kelsey and Corral, Emmanuel, *Right time, right place for Haynesville Shale to meet global call for cleaner natural gas*, S&P Global, May 9, 2022.

Group and has an extremely low permeability of less than 0.001 mD (average).[122] The Smackover Formation and Cotton Valley Group fall within the Upper Jurassic period.

According to a DENR publication, the Haynesville Shale requires horizontal drilling and fracturing of large formation areas to release gas in economical quantities. Therefore, the gas produced from the formation is relatively expensive, at $5 to $6 million per well.[123]

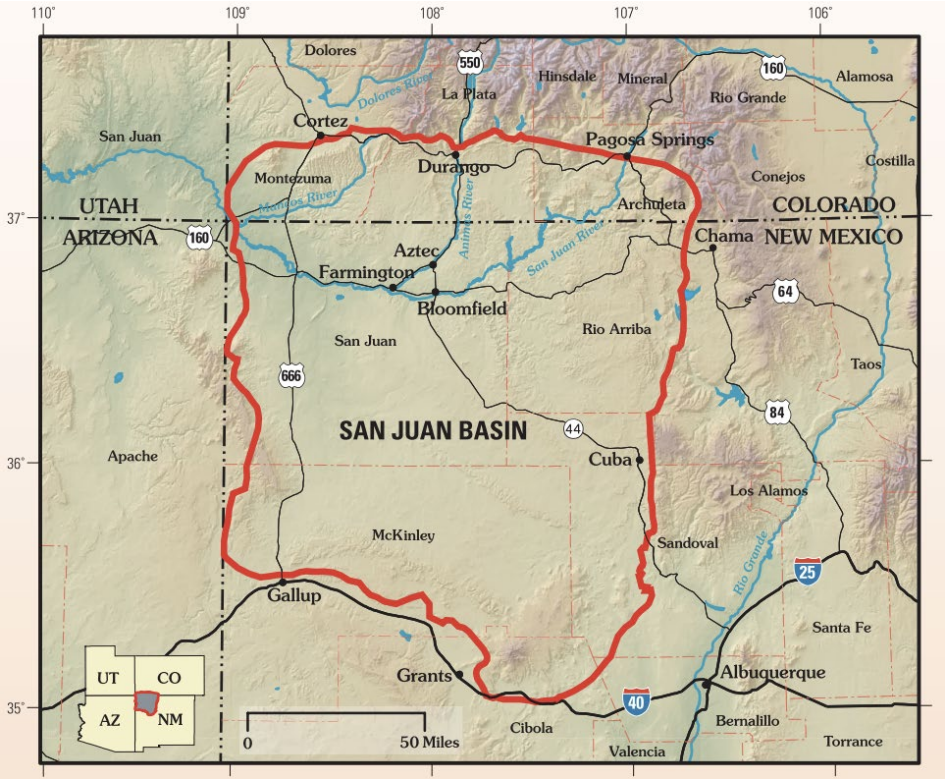
Natural gas production in the Haynesville Shale has been on the rise. For example, dry natural gas production in the Haynesville Shale increased from about 7.4 billion cubic feet per day in January 2012 to about 14.3 billion cubic feet per day in December 2023, representing a 93 percent increase.[124]

San Juan Basin. The San Juan Basin developed as a large structural basin during the late Cretaceous-Paleogene Laramide orogeny. Most of the sedimentary rocks in the basin were deposited during the Pennsylvanian period through the Tertiary period. The San Juan Basin is situated in the four corners region of northwestern New Mexico and southwestern Colorado, with a smaller part in northeastern Arizona and southeastern Utah, covering an area of approximately 21,600 square miles.[125] The maximum structural relief of the San Juan Basin is approximately 10,000 feet.[126] The central part of the basin is a circular, bowl-shaped depression that holds sedimentary rocks over two and a half miles thick (up to 14,400 feet).[127] An outline of the San Juan Basin is depicted on Exhibit 37.

[122] mD refers to millidarcy, which is a unit of permeability. Jiang, Meijuan and Spikes, Kyle T., *Estimation of reservoir properties of the Haynesville Shale by using rock-physics modelling and grid searching*, Geophysical Journal International, October 2013.
[123] Loren C. Scott and Associates, *The Economic Impact of the Haynesville Shale on the Louisiana Economy in 2008*, DENR, April 2009.
[124] Information based on the dataset published by the United States Energy Information Administration. For data, see USEIA, *Dry shale gas production estimates by play*, May 2, 2024.
[125] Craigg, Steven D., *Geologic Framework of the San Juan Structural Basin of New Mexico, Colorado, Arizona, and Utah, with Emphasis on Triassic Through Tertiary Rocks,* USGS, 2001.
[126] Ibid.
[127] Brister, Brian S. and Hoffman, Gretchen K., *Fundamental Geology of San Juan Basin Energy Resources*, New Mexico Bureau of Geology and Mineral Resources, 2002.

Exhibit 37

San Juan Basin



Source: USGS, *Assessment of Undiscovered Oil and Gas Resources of the San Juan Basin Province of New Mexico and Colorado*, 2002.

There are a few notable shale formations within the San Juan Basin. The United States Geological Survey (USGS) previously conducted oil and gas assessments of three specific formations/shales in the San Juan Basin: (1) Lewis Shale, (2) Fruitland Formation, and (3) Mancos-Menefee Composite.[128]

According to the USGS, the Lewis Shale has a maximum thickness of approximately 2,400 feet, containing "offshore marine shales, mudstones, siltstones, and sandstones, and interfingers with shoreface sandstones of the Cliff House Sandstone to the southwest of the central San Juan Basin."[129]

[128] The USGS published assessments of these three shales in November 2020. For more information on the assessments, *see* United States Geological Survey, *San Juan Basin Oil and Gas Assessments*, November 19, 2018.
[129] USGS, *Assessment of Undiscovered Gas Resources in the Lewis Shale Total Petroleum System of the San Juan Basin Province, New Mexico and Colorado*, 2020.

The Fruitland Formation is another natural gas producer in the San Juan Basin. The Fruitland Formation contains coal, shale, siltstone, and sandstone layers. A New Mexico Bureau of Geology and Mineral Resources report estimated that the Fruitland Formation has an average thickness of between 300 and 350 feet. However, the formation thins out in its eastern counterpart "partly due to erosion" and "a stratigraphic rise of the underlying Pictured Cliffs Sandstone."[130]

The USGS' assessment of the Mancos-Menefee Composite indicated that it contains reservoir rocks from the (1) Dakota Sandstone, (2) Gallup Sandstone, (3) Mancos Shale and associated sandstones of the Tocito Sandstone Lentil and El Vado Sandstone Member, and (4) Mesaverde Group.[131] Oil and gas from these units have primarily been extracted via vertical drilling, though horizontal drilling has occurred in recent years, mostly in the Mancos Shale. According to a report published by the New Mexico Bureau of Geology and Mineral Resources, the Mancos Shale contains carbonaceous marine shales, and its thickness ranges from 400 feet to 2,000 feet.[132]

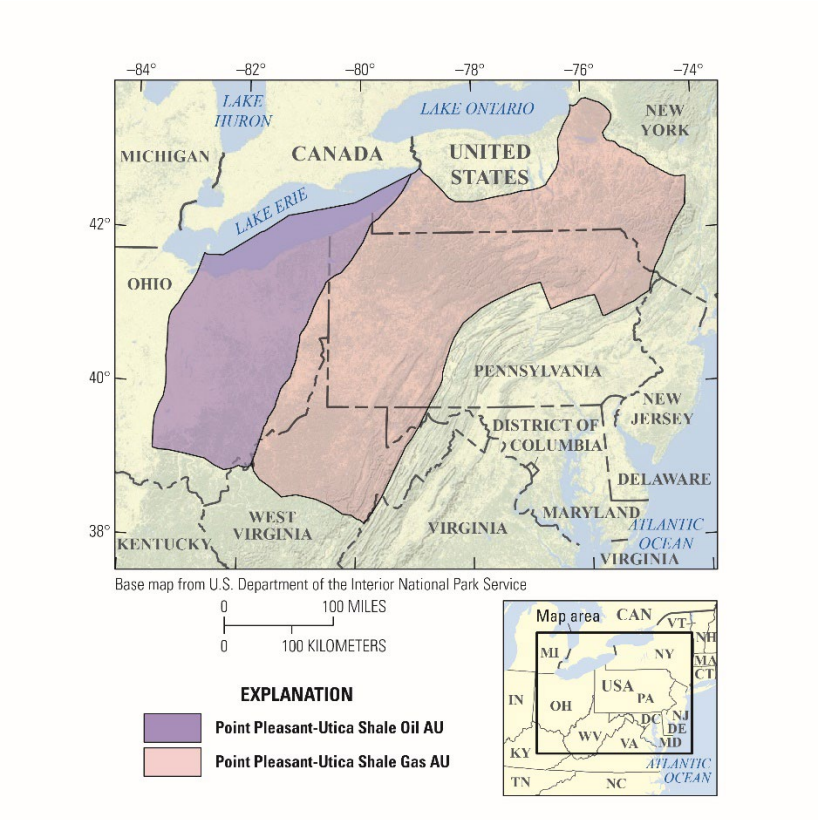
The San Juan Basin and the Permian Basin are major oil and gas resources for New Mexico, although the former produces more gas, and the latter produces more oil. Specifically, the San Juan Basin produces about 67 percent of the state's gas in New Mexico, while the rest (33 percent) is generated from the Permian Basin. On the other hand, the San Juan Basin only makes up about 5 percent of the state's oil production, while the Permian Basin produces about 95 percent of the state's oil.[133]

Point Pleasant-Utica Shale. The Point Pleasant-Utica Shale is shown in Exhibit 38. According to the USEIA, the shale is made up of the Utica Formation and Point Pleasant Formation of the Late Ordovician age, which are both organic-rich formations that extend in the subsurface across the Appalachian basin from New York state in the north to northeastern Kentucky and Tennessee in the south.[134] The Utica Formation covers approximately 115,000 square miles, while the Point Pleasant Formation covers approximately 108,000 square miles.[135]

[130] Wolberg, Donald L., *Data Base and Review of Paleofaunas and Floras of the Fruitland Formation, Late Cretaceous, San Juan Basin, New Mexico, with Interpretive Observations and Age Relationships*, New Mexico Bureau of Geology and Mineral Resources, 1981.
[131] USGS, *Assessment of Undiscovered Oil and Gas Resources in the Mancos-Menefee Composite and Underlying Todilto Total Petroleum Systems of the San Juan Basin Province, New Mexico and Colorado,* 2020.
[132] Shomaker, John and Whyte, Michael*, Geologic Appraisal of Deep Coals, San Juan Basin, New Mexico*, New Mexico Bureau of Geology and Mineral Resources, 1977.
[133] Broadhead, Ron and Kelley, Shari, *Frequently Asked Questions About Oil and Gas*, New Mexico Bureau of Geology and Mineral Resources.
[134] USEIA, *Utica Shale Play*, April 2017.
[135] Ibid.

Exhibit 38

Point Pleasant-Utica Shale



Source: USGS.

The Utica Formation is thickest in western Ohio and the northwest corner of Pennsylvania at 200 to 300 feet and thins out to 50 feet or less in southern Ohio and northern Kentucky. Conversely, the Point Pleasant Formation reaches a thickness of more than 200 feet in the central part of Pennsylvania and thins out to less than 20 feet in the eastern part of Kentucky. The combined thickness of both formations exceeds 300 feet in northwest and central Pennsylvania and northeast central Ohio, but it thins out to 100 feet or less where Ohio, West Virginia, and Kentucky meet.[136]

In terms of deepness, the Point Pleasant Formation is deepest in southwestern Pennsylvania, with depths exceeding 13,000 feet. The Utica Formation's depths reach 12,500 feet in a northeast arc through Pennsylvania, though the most productive wells in the formation exist within depths between 5,000 feet and 11,000 feet.[137]

[136] Ibid.
[137] USEIA, *EIA Produces New Maps of Utica Shale Play*, May 2, 2016.

The USEIA identifies the Point Pleasant-Utica interval as carbonaceous grey to black shale that encloses scattered carbonate concretions and locally abundant fossils. However, both the Point Pleasant Formation and Utica Formation have slightly different material compositions. The Utica Formation contains gray to black and brown calcareous shale that is composed of 10 to 60 percent calcite. The Point Pleasant Formation is an organic-rich calcareous shale with some limestone beds and composed of fossiliferous limestone, shale, and minor siltstone. The Point Pleasant Formation extends beneath the Utica Formation. The upper interval is typically known as a non-reservoir within the Point Pleasant Formation partly because it is an organic-poor gray shale containing thin carbonate beds. In contrast, the lower interval of the formation is an organic-rich calcareous shale with approximately 40 to 60 percent carbonate content.[138]

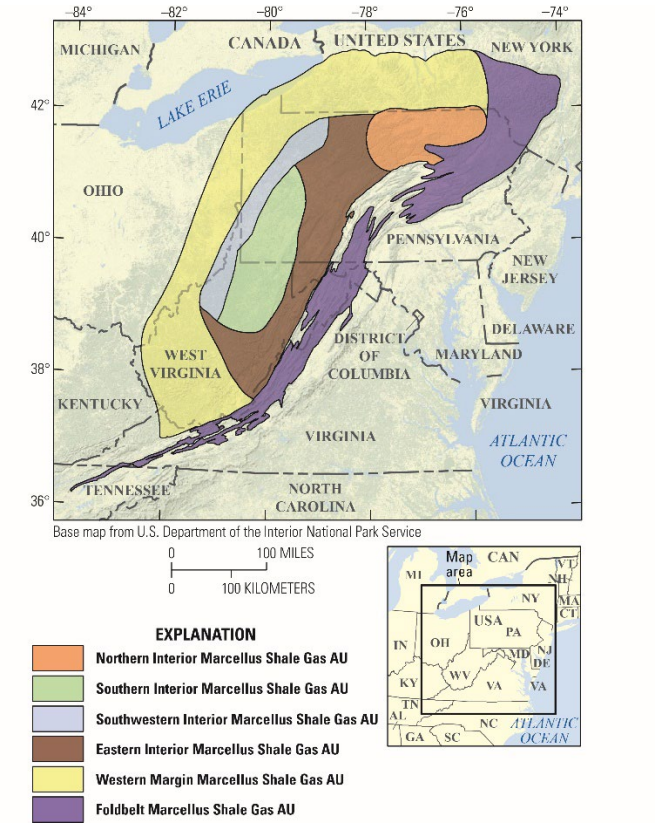
In 2021, the Point Pleasant-Utica Shale produced 162.6 billion cubic feet of natural gas, an increase of 8.5 percent from 2020, when the shale produced 149.9 billion cubic feet of natural gas.[139]

Marcellus Shale. According to the USEIA, the Marcellus Shale (shown in Exhibit 39) is a Middle Devonian-age organic-rich formation that extends in the subsurface from New York State in the north to northeastern Kentucky and Tennessee in the south, covering about 95,000 square miles.[140] The shale encompasses New York, Pennsylvania, Ohio, West Virginia, and Kentucky. It is one of the largest natural gas plays in the nation and a major play in the Appalachian basin, with proven reserves reaching 77.2 trillion cubic feet by 2015.[141]

[138] USEIA, *Utica Shale Play*, April 2017.
[139] Vance, Timothy, *2021 Marcellus Shale and Utica-Point Pleasant Production Summary*, West Virginia Geological and Economic Survey, November 4, 2022.
[140] USEIA, *Marcellus Shale Play*, 2017.
[141] Ibid.

Exhibit 39

Marcellus Shale



Source: USGS.

The Marcellus Shale is especially productive between the depths of 2,000 feet to 6,000, which is the interval that houses most of the producing wells. The Marcellus Shale's thickness ranges from 1 to 950 feet, though it tends to get thinner in the westward direction from the central part of the Appalachian basin. The Marcellus Shale is characterized as carbonaceous silty black shale that is primarily composed of nine to 35 percent mixed-layer clays, 10 to 60 percent quartz, up to 10 percent feldspar, five to 13 percent pyrite, three to 48 percent calcite, up to percent dolomite, and up to 6 percent gypsum.[142]

According to the USGS, directional drilling, which allowed wells to be drilled in non-vertical directions, was one of the factors that spurred interest in the development of the Marcellus Shale.[143] Thus, gas from the

[142] USEIA, *Marcellus Shale Play - Geology Review*, 2017.
[143] Soeder, Daniel J. and Kappel, William M., *Water Resources and Natural Gas Production from the Marcellus Shale,* USGS, May 2009.

Marcellus Shale is extracted via horizontal drilling and hydraulic fracturing as it is embedded deep under the ground within a shale formation.

Upwards of five million gallons of flowback water, which is used to remove chemicals and minerals from the well, are necessary for hydraulic fracturing.[144] Compared to conventional wells, hydraulic fracturing for shale gas wells requires more water because of the extended reach of horizontal wells and the significant amount of fracturing that is required to extract gas from rocks with low permeability.[145] Therefore, access to water (of which Pennsylvania and West Virginia are generally abundant compared to western states) is a significant benefit. The Appalachian basin, which contains both the Marcellus Shale and the Point Pleasant-Utica Shale, is one of the major natural gas producers in the United States. In the first half of 2021, it accounted for approximately 34 percent of dry natural gas production in the United States.[146]

C. Geographical Considerations

The preceding section examined the top five natural gas-producing states' geological conditions (i.e., conditions below the surface impacting natural gas production). This section provides an overview of the conditions and factors on the surface which may also affect natural gas production. We also review state-specific regulatory and/or public policy measures for natural gas management and transportation.

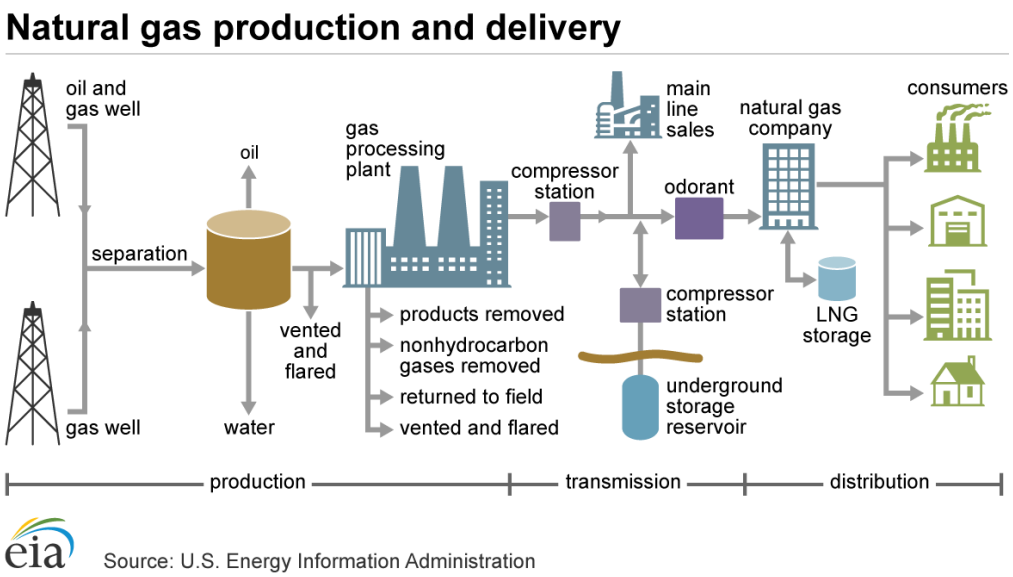
Natural Gas Processing

For natural gas to be viable for consumers, it must be processed before reaching the distribution market. According to the USEIA, three components make up the natural gas delivery infrastructure: (1) processing, (2) transportation, and (3) storage.[147] Exhibit 40 illustrates this delivery infrastructure.

[144] United States Environmental Protection Agency, *Natural Gas Drilling in the Marcellus Shale - NPDES Program Frequently Asked Questions*, March 16, 2011.
[145] Ibid.
[146] USEIA, *Shale natural gas production in the Appalachian Basin sets records in first half of 2021*, September 1, 2021.
[147] USEIA, *Natural Gas Explained - Delivery and Storage*.

Exhibit 40

Natural Gas Delivery Infrastructure



Source: USEIA, *Natural Gas Explained - Delivery and Storage*.

Natural gas is typically transported via pipelines to gas distribution companies or underground storage fields before being delivered to consumers.[148] However, before that stage, natural gas must be sent to gas processing plants to remove contaminants, hydrocarbon gas liquids, oil, water, and other impurities before reaching the pipelines. Other impurities include sulfur, helium, nitrogen, hydrogen sulfide, and carbon dioxide, which determine the number of stages and the processes required to produce pipeline-quality, dry natural gas. As part of the processing stage, odorants are added to natural gas. Odorants give the gas its distinctive smell, which helps to detect leaks.[149] Exhibit 41 provides the basic stages of natural gas processing and treatment.

[148] USEIA, *Natural Gas Explained.*
[149] USEIA, *Natural Gas Explained - Delivery and Storage.*

Exhibit 41

Natural Gas Processing and Treatment

Gas-oil-water separators	• Pressure relief in a single-stage separator causes a natural separation of the liquids from the gases in the natural gas. In some cases, a multi-stage separation process is required to separate the different fluid streams.
Condensate separator	• Condensates are most often removed from the natural gas stream at the wellhead with separators, much like gas-oil-water separators. The natural gas flows into the separator directly from the wellhead. The condensate extracted there is sent to storage tanks.
Dehydration	• This process removes water that may condense in pipelines and cause undesirable hydrates to form.
Contaminant removal	• Nonhydrocarbon gases—such as hydrogen sulfide, carbon dioxide, water vapor, helium, nitrogen, and oxygen—must also be removed from the natural gas stream. The most common removal technique is to direct the natural gas though a vessel containing an amine solution. Amines absorb hydrogen sulfide and carbon dioxide from natural gas and can be recycled and regenerated for repeated use.
Nitrogen extraction	• Once the hydrogen sulfide and carbon dioxide are reduced to acceptable levels, the natural gas stream is routed to a Nitrogen Rejection Unit (NRU), where it is further dehydrated using molecular sieve beds.
Methane separation	• This process can occur as a separate operation in a natural gas processing plant or as part of the NRU operation. Cryogenic processing and absorption methods are some of the ways used to separate methane from HGLs.
Fractionation	• HGLs are separated into component liquids using the varying boiling points of the individual HGLs. HGLs from the processing plant may be sent to petrochemical plants, oil refineries, and other HGLs consumers.

Source: Developed by LBFC staff from information obtained from the USEIA, *Natural Gas Explained – Delivery and Storage*.

Different forms of natural gas flow in the pipeline system. Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) are two examples. CNG refers to natural gas that has been compressed to less than one percent of its volume at standard atmospheric pressure, and it can be found in most natural gas fueling stations and is typically used in light-, medium-, and heavy-duty vehicles. LNG must be super-cooled and

stored in liquid form at -260 degrees Fahrenheit before converting into a gas. LNG must be in its gaseous form before entering the pipeline distribution system.[150] LNG serves a wide range of infrastructures and customers, including but not limited to homes, businesses, power plants, and LNG-powered marine vessels.[151]

Pipelines are not the only method of transporting natural gas. According to the United States Government Accountability Office, multiple modes of transportation, including pipelines, rail, highways, and waterways, connect oil and gas production to infrastructure (such as wells and processing plants) to customers.[152]

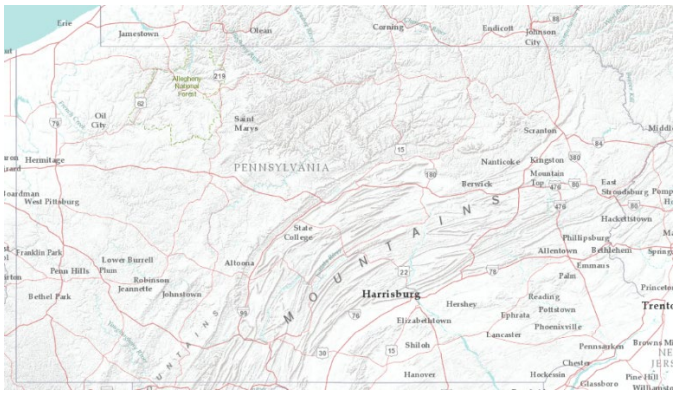
Roadway Miles and Transportation Sources

Pennsylvania. According to the United States Census Bureau (USCB), Pennsylvania is the 33rd largest state by area in the United States[153], with a land area of 44,730 square miles and a water area of 1,312 square miles.[154] The Pennsylvania Department of Transportation's (PADOT) Bureau of Planning and Research reported in the 2022 *Highway Data* that there are about 121,891 linear miles of highways in the state, with about 274 million miles of daily vehicle miles of travel.[155] There are 23 interstate highways in Pennsylvania, which include 12 primary routes and 11 auxiliary routes.[156] Exhibit 42 presents Pennsylvania's terrain, highway system, and unconventional oil and gas well locations.

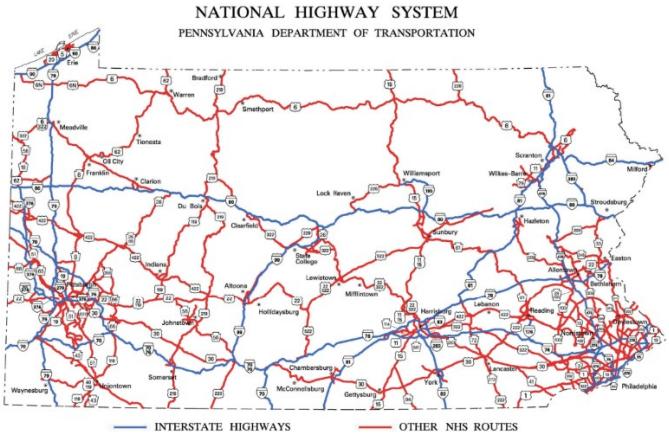
[150] United States Department of Energy's Alternative Fuels Data Center, *Natural Gas Distribution*.
[151] United States Department of Energy's Office of Fossil Energy, *Liquefied Natural Gas (LNG) - A Bright Present and a Bright Future*, June 2020.
[152] United States Government Accountability Office, *Department of Transportation Is Taking Actions to Address Rail Safety, but Additional Actions Are Needed to Improve Pipeline Safety*, August 2014.
[153] USCB, *State Area Measurements and Internal Point Coordinates*, 2010.
[154] USCB, *Pennsylvania - Census Bureau Profile*.
[155] PADOT, *2022 Highway Data (Revised Edition)*. PADOT's Bureau of Planning and Research defines linear miles as the length measured along the roadway centerline. "Daily vehicle miles of travel" refers to a measure of total travel by all vehicles.
[156] Wesser, James, *How many interstate highways pass through Pennsylvania,* abc27, September 21, 2022.

Exhibit 42

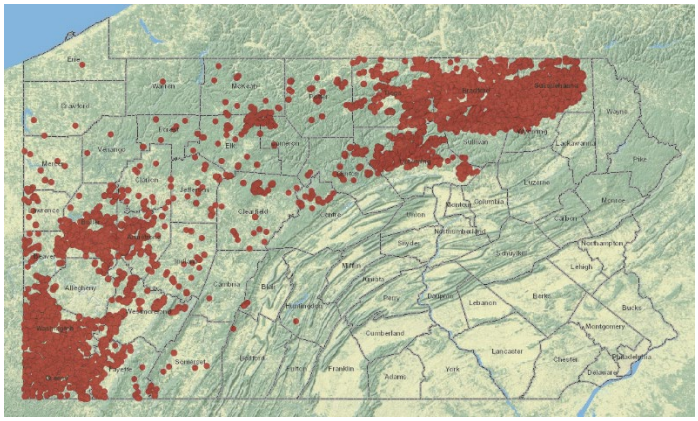
Pennsylvania Terrain Map



Pennsylvania National Highway System Map



Pennsylvania Unconventional Oil and Gas Well Locations



Source: (Top) DCNR; (Middle) PADOT; (Bottom) DEP.

According to PADOT's *2022 Highway Data*, Allegheny, Montgomery, Bucks, Philadelphia, and Westmoreland counties had the most linear highway miles.[157] The following list identifies linear miles of highway and daily vehicle miles of travel for each of these counties:

1. Allegheny: 521.3 linear highway miles and 13,611,557 daily vehicle miles of travel.
2. Montgomery: 363.5 linear highway miles and 10,969,212 daily vehicle miles of travel.
3. Bucks: 306.4 linear highway miles and 7,500,650 daily vehicle miles of travel.
4. Philadelphia: 276.8 linear highway miles and 10,931,732 daily vehicle miles of travel.
5. Westmoreland: 220.4 linear highway miles and 5,114,763 daily vehicle miles of travel.

Except for Allegheny County, there are few unconventional oil and gas wells in or surrounding the other four counties listed above. As of July 31, 2023, there were 12,571 active unconventional wells in Pennsylvania, scattered across 36 of the state's 67 counties, mostly located in the northeast and southwest regions.[158]

The following counties hold most of the state's unconventional wells: Susquehanna (16 percent of the state's active unconventional wells), Washington (16 percent), Bradford (13 percent), Greene (12 percent), and Lycoming (8 percent).[159] According to PADOT's *2022 Highway Data*, those same counties have the following highway miles and daily vehicle miles:

1. Susquehanna: 27.2 linear highway miles and 511,259 daily vehicle miles of travel.
2. Washington: 190 linear highway miles and 3,651,227 daily vehicle miles of travel.
3. Bradford: 65.3 linear highway miles and 461,712 daily vehicle miles of travel.
4. Greene: 39.3 linear highway miles and 632,372 daily vehicle miles of travel.
5. Lycoming: 83 linear highway miles and 1,350,377 daily vehicle miles of travel.

Other transportation sources in the state include 65 railroads covering 5,600 miles and six international airports handling over 600,000 tons of material each year. Three major ports, Philadelphia, Pittsburgh, and Erie,

[157] PADOT, *2022 Highway Data (Revised Edition)*.
[158] Pennsylvania Department of Health, *ONGP – Frequently Asked Questions*.
[159] Ibid.

provide access to the Atlantic Ocean, the Gulf of Mexico, and the Great Lakes, respectively. As of 2023, the state had 23,257 bridges.[160]

Despite Pennsylvania being one of the main natural gas-producing states, its motor fuel taxes are higher than other states. As of July 2023, at 62.2 cents per gallon, Pennsylvania had the third-highest gas tax in the nation.[161] Pennsylvania had the highest gas tax rate out of the five states examined in this study.

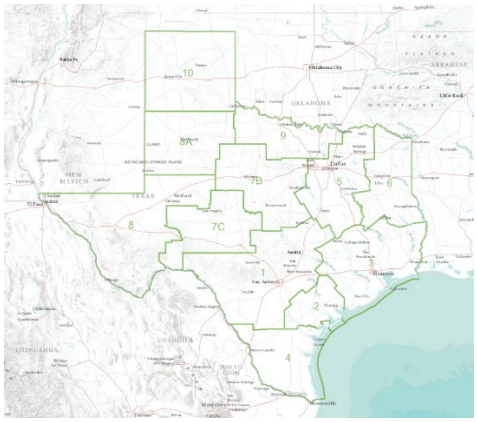
Another factor that may affect natural gas distribution is the Alternative Fuels Corridor program. Established via the Federal Highway Administration in July 2019, the Alternative Fuels Corridor was intended to assist transportation agencies "with planning for the deployment of alternative vehicle fueling and charging facilities along Interstate corridors."[162] Specifically, under the program, the Federal Highway Administration "designates national plug-in electric vehicle charging and hydrogen, propane, and natural-gas-fueling corridors in strategic locations along major highways to improve the mobility of alternative fuel vehicles."[163] Over 1,800 miles of Pennsylvania's roadways have been designated alternative fuel corridors for at least one fuel type.[164]

Texas. According to the USCB, Texas is the second-largest state by area, with a land area of 261,194 square miles and a water area of 7,331 square miles.[165] Texas's land area is 5.8 times larger than Pennsylvania's. Despite being larger, Texas has 16 interstate highways, seven fewer than Pennsylvania.[166] Exhibit 43 presents Texas' terrain, highway system, and locations of the state's oil and gas wells.

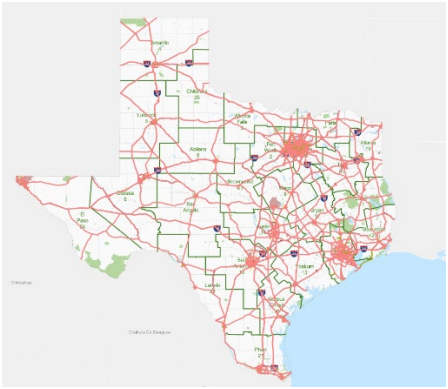
[160] USDOT's Bureau of Transportation Statistics, *State Transportation by the Numbers – Pennsylvania.*
[161] Hoffer, Adam and Dobrinsky-Harris, Jessica, *How High are Gas Taxes in Your State?*, Tax Foundation, August 15, 2023.
[162] PennDOT, *Alternative Fuel Corridors*.
[163] Ibid.
[164] Ibid.
[165] USCB, *Texas - Census Bureau Profile*.
[166] TXDOT, *Interstate and U.S. Highway Facts*.

Exhibit 43

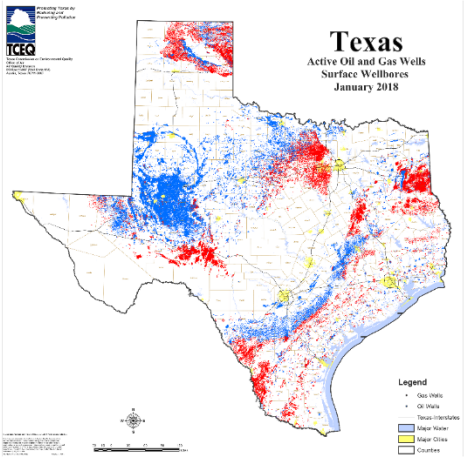
Texas Terrain Map



Texas National Highway System



Texas Active Oil and Gas Wells



Source: (Top) RRC; (Middle) TXDOT; (Bottom) TCEQ.

According to the Texas Department of Transportation's (TXDOT) *2022 Roadway Inventory Annual Report*, the state has 701,967 lane miles of public roadways.[167] In 2022, 796,961,605 daily vehicle miles of travel and 94,083,507 truck daily miles of travel were recorded across the state's public roadways.[168]

The top five natural gas-producing counties in Texas, according to RRC's monthly production data from January 2024, are as follows:[169]

- Webb (81,961,927 thousand cubic feet)
- Reeves (77,092,605 thousand cubic feet)
- Midland (65,488,730 thousand cubic feet)
- Panola (49,626,433 thousand cubic feet)
- Martin (43,131,969 thousand cubic feet).

For comparative purposes, the total lane mileage, daily vehicle miles of travel, and truck daily vehicle miles of travel for public roadways in these counties is as follows:[170]

1. Webb: 3,726 lane miles, 5,701,723 daily vehicle miles of travel, and 1,216,948 truck daily vehicle miles of travel.
2. Reeves: 2,458 lane miles, 1,931,705 daily vehicle miles of travel, and 766,592 truck daily vehicle miles of travel.
3. Midland: 3,568 lane miles, 5,920,433 daily vehicle miles of travel, and 998,352 truck daily vehicle miles of travel.
4. Panola: 2,114 lane miles, 1,108,573 daily vehicle miles of travel, and 263,116 truck daily miles of travel.
5. Martin: 1,625 lane miles, 1,227,508 daily vehicle miles of travel, and 355,846 truck daily vehicle miles of travel.

Among the counties listed above, Webb County, which is also a leading natural gas-producing county in Texas, had the highest lane miles, daily vehicle miles of travel, and truck daily vehicle miles of travel. However, this does not imply that natural gas-producing counties necessarily have larger roadway or highway infrastructures.

Along with its roadway system, Texas' transportation and port network includes 26 commercial airports scattered throughout the state and 19

[167] TXDOT, *Roadway Inventory Annual Reports - 2022*. Lane mileage, according to the report, is defined as "mileage of all through lanes of a segment of roadway." 701,967 lane miles of public roadways include total mileages for the following: (1) interstate highways; (2) United States highways; (3) state highways, spurs, loops, and business routes; (4) farm or ranch to market roads and spurs; (5) pass, park and recreation roads; (6) frontage roads; (7) city streets; (8) certified county roads; (9) toll road authority roads; and (10) federal roads. Each of the county-level data presented in the following paragraphs relating to Texas may or may not include all of these roadway types, depending on the county.

[168] Ibid. TXDOT defines truck daily vehicle miles of travel as the "daily number of miles traveled by trucks only."

[169] RRC, *Texas Oil and Gas Production Statistics for January 2024*, April 1, 2024.

[170] TXDOT, *Roadway Inventory Annual Reports - 2022*.

seaports for global trade. Overall, the state has approximately 31 ports of entry.[171] Texas also has 56,313 bridges (as of 2023) and 10,370 miles of freight railroad (as of 2021).[172]

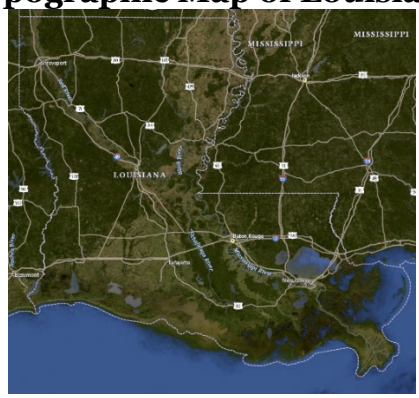
Texas also had a lower gas tax rate (20 cents per gallon as of July 2023) than Pennsylvania.[173] Specifically, Texas' gas tax rate was about three times lower than Pennsylvania's.

Louisiana. According to the USCB, Louisiana ranks right after Pennsylvania as the 31st largest state by area in the United States[174], with a land area of 43,193.1 square miles and a water area of 9,168.3 square miles.[175] Exhibit 44 presents Louisiana's geography, including its highway system and oil and gas well locations. According to the Louisiana Department of Transportation and Development (LDTD), the state has 39,326 miles of highway system.[176]

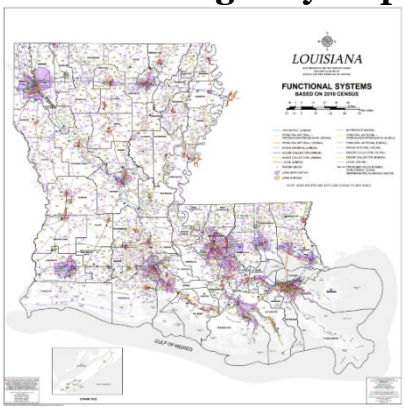
[171] Texas Economic Development and Tourism (Office of the Governor of Texas), *Infrastructure*.
[172] USDOT's Bureau of Transportation Statistics, *State Transportation by the Numbers - Texas*.
[173] Hoffer, Adam and Dobrinsky-Harris, Jessica, *How High are Gas Taxes in Your State?*, Tax Foundation, August 15, 2023.
[174] USCB, *State Area Measurements and Internal Point Coordinates,* 2010.
[175] USCB, *Louisiana*.
[176] LDTD, *State Highway Inventory Reporting System - Lane Miles for 2019*, June 2, 2020.

Exhibit 44

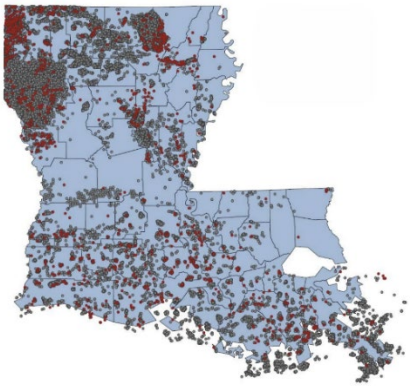
Topographic Map of Louisiana



Louisiana Highway Map



Louisiana Oil and Gas Wells Map [a/]



Note:
[a/] This exhibit is from an audit of the Office of Conservation's regulation of oil and gas wells and management of orphaned wells from May 28, 2014. Therefore, this exhibit may not fully reflect the current locations of Louisiana's oil and gas wells. "Current" oil and gas wells are colored in grey, and orphaned wells are colored in red.
Source: (Top) USGS; (Middle) LDTD; (Bottom) LLA, *Department of Natural Resources - Office of Conservation - Regulation of Oil and Gas Wells and Management of Orphaned Wells*, May 28, 2014.

Data from the LDTD showed that Rapides Parish had one of the highest lane mileages in the state's highway system, measuring 1,434.7 lane miles.[177] In 2019, Rapides Parish had 3,583,402 daily vehicle miles and 1,307,941,763 annual vehicle miles.[178]

We used data on the active natural gas-producing parishes within the Haynesville Shale, Louisiana's significant natural gas source. According to DENR, the most active areas [within the Haynesville Formation in Louisiana] have been Caddo, Bienville, Bossier, DeSoto, and Red River.[179] Below is the 2019 data on daily vehicle miles traveled and lane miles of the state's highway system for these respective counties:[180]

1. Caddo: 1,303 lane miles, 5,518,989 daily vehicle miles traveled, and 2,014,431,315 annual vehicle miles traveled.
2. Bienville: 717 lane miles, 1,013,873 daily vehicle miles traveled, and 370,063,822 annual vehicle miles traveled.
3. Bossier: 734 lane miles, 3,049,401 daily vehicle miles traveled, and 1,113,031,475 annual vehicle miles traveled.
4. DeSoto: 798 lane miles, 1,472,168 daily vehicle miles traveled, and 537,341,434 annual vehicle miles traveled.
5. Red River: 354 lane miles, 294,935 daily vehicle miles traveled, and 107,651,410 annual vehicle miles traveled.

Of the parishes listed above, Caddo Parish had the highest lane mileage and daily and annual vehicle miles of travel in 2019. While Caddo Parish had a lower lane mileage than Rapides Parish, it had higher daily and annual vehicle miles of travel, which exceeded Rapides Parish's figure by 1,935,587.8 miles and 706,489,552 miles, respectively.

Along with Louisiana's roadway infrastructure, the state has six deepwater ports and four of the nation's top 15 ports by tonnage. These ports are responsible for 25 percent of all United States waterborne commerce, 60 percent of the nation's grain, and 20 percent of the nation's coal.[181] The state's railroad infrastructure includes six Class I railroads that extend over 3,000 miles and converge with a deepwater seaport.[182] There are also seven primary airports[183] and 12,717 bridges (as of 2023).[184]

[177] LDTD, *State Highway Inventory Reporting System - Lane Miles for 2019*, June 2, 2020.
[178] LDTD, *State Highway Inventory Reporting System - Daily Vehicle Miles Traveled (DVMT) for 2019*, June 2, 2020.
[179] DENR, *Haynesville Shale*.
[180] The data on lane mileages was retrieved from LDTD's *State Highway Inventory Reporting System - Lane Miles for 2019*. The data on daily vehicle miles traveled was retrieved from LDTD's *State Highway Inventory Reporting System – Daily Vehicle Miles Traveled (DVMT) for 2019*.
[181] Louisiana Economic Development, *Transportation Infrastructure*.
[182] Ibid.
[183] Ibid.
[184] USDOT's Bureau of Transportation Statistics, *State Transportation by the Numbers – Louisiana*.

As of July 2023, Louisiana's gas tax rate is 20.93 cents per gallon, which is approximately three times lower than that of Pennsylvania's gas tax.[185]

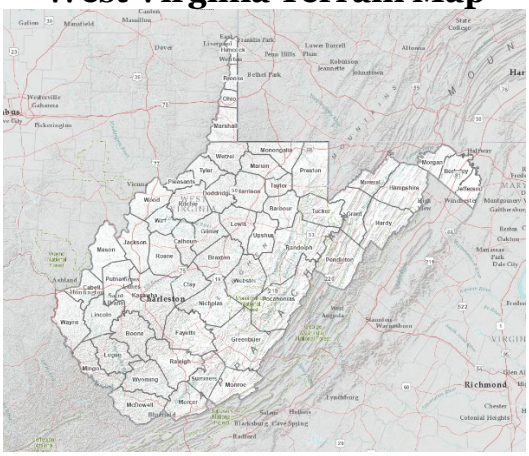
West Virginia. According to the USCB, West Virginia is the 41st largest state by area in the United States, with a land area of 24,035 square miles and a water area of 189 square miles.[186] Exhibit 45 illustrates the state's terrain, highway/roadway system, and oil and gas well locations. Roadways maintained by the West Virginia Department of Transportation's (WVDOT) Division of Highways include but are not limited to the following:[187]

- 38,770 miles of public roads.
- 34,691 miles of state-owned highways, 835 miles of federally owned roads, and 3,244 miles of municipally owned roads.
- 555 miles of state-owned interstate highway.
- 87 miles of West Virginia Turnpike.
- 1,988 miles of the National Highway System.

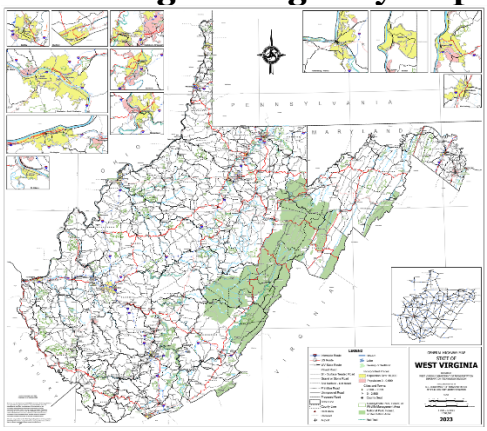
[185] Hoffer, Adam and Dobrinsky-Harris, Jessica, *How High are Gas Taxes in Your State?*, Tax Foundation, August 15, 2023.
[186] USCB, *West Virginia*.
[187] WVDOT, *Division of Highways*.

Exhibit 45

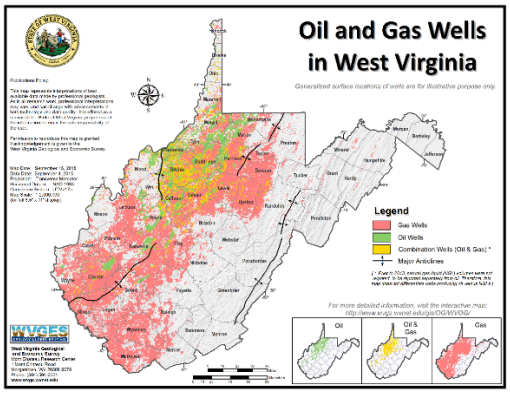
West Virginia Terrain Map



West Virginia Highway Map



West Virginia Oil and Gas Wells Map



Source: (Top and Bottom) West Virginia Geological and Economic Survey; (Middle) WVDOT.

We examined highway data of the top five natural-producing counties in West Virginia. According to an article published by *The Dominion Post* in

October 2021, the top 10 gas-producing counties, in order, are Tyler, Marshall, Doddridge, Ritchie, Wetzel, Harrison, Monongalia, Ohio, Brooke, and Marion, with Tyler County producing 597.3 billion cubic feet of natural gas.[188] To keep the methodology consistent with other states, we only examined the roadway/highway data of the first five of these 10 counties in West Virginia. According to WVDOT's *2014 Annual Roadway Statistics*, below is the length of the National Highway System routes (excluding intermodal mileage) in each of the top five natural gas-producing counties:[189]

1. Tyler: 13.9 miles.
2. Marshall: 59.8 miles.
3. Doddridge: 18.9 miles.
4. Ritchie: 21 miles.
5. Wetzel: 24.2 miles.

Among all West Virginia counties, Kanawha County had the longest National Highway System routes, at 159.08 miles.[190] However, Marshall had the longest National Highway System routes within the top five natural gas-producing counties. While Tyler County is more productive than Marshall County, its National Highway System routes were 4.3 times smaller than those of Marshall County. From a larger perspective, the National Highway System routes in Marshall and Tyler Counties were less than half those of Kanawha County.

As of January 2020, West Virginia had 2,214 miles of freight railroad, seven major airports, one major water port, and 7,269 bridges in addition to the roadway system.[191]

West Virginia instituted a policy on oil and gas drilling operations in January 2012 to better track these operations and potential road impacts. According to the state's "Oil and Gas Road Policy," gas and oil well operators must provide a written notice to their district engineer or manager to include the proposed project's exact location and the routes they intend to use.[192] The policy also identifies single and blanket bonding requirements that apply to operators whose oil and gas operations may impact the roads in the state. As of July 2023, West Virginia's gas tax rate was 37.2 cents per gallon, or 1.7 times less than Pennsylvania's tax.[193]

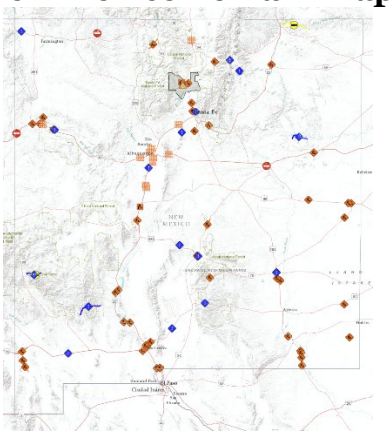
[188] Beard, David, *GO-WV's Gas Facts report describes thriving West Virginia natural gas industry*, The Dominion Post, October 21, 2021.
[189] WVDOT's Division of Highways, *2014 Annual Roadway Statistics*, December 31, 2014. According to the report, the National Highway System "includes the Interstate Highway System as well as other roads important to the nation's economy, defense, and mobility."
[190] Ibid.
[191] USDOT's Bureau of Transportation Statistics, *West Virginia - Transportation by the Numbers*, January 2020.
[192] WVDOT, *Oil and Gas Road Policy*, January 3, 2012.
[193] Hoffer, Adam and Dobrinsky-Harris, Jessica, *How High are Gas Taxes in Your State?*, Tax Foundation, August 15, 2023.

New Mexico. According to the USCB, New Mexico ranks 5th largest state by area in the United States, with a land area of 121,280 square miles and a water area of 281 square miles.[194] The state's roadway includes "27,853 lane miles in the New Mexico State Highway System, including all paved Interstate, US, and NM designated routes and off-Interstate Business Loops."[195] Exhibit 46 presents New Mexico's terrain, highway system, and oil and gas well locations.

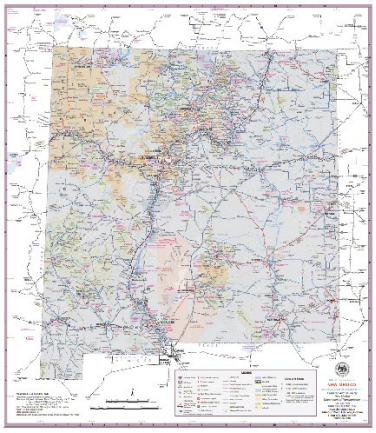
[194] USCB, *New Mexico - Census Bureau Profile*.
[195] American Society of Civil Engineers (New Mexico section), *Report Card for New Mexico's Infrastructures - Roads*, September 21, 2012.

Exhibit 46

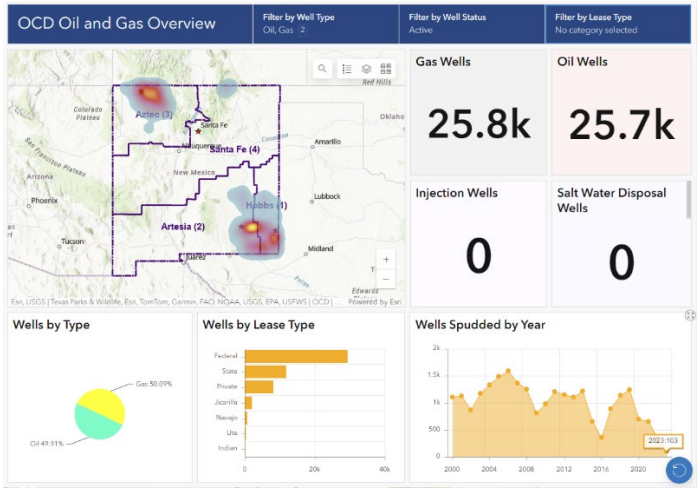
New Mexico Terrain Map



New Mexico Highway Map



New Mexico Oil and Gas Wells Data and Heat Map



Source: (Top and Middle) NMDOT; (Bottom) EMNRD.

According to data from the New Mexico Department of Transportation's (NMDOT) website, the longest roads/highways in New Mexico are as follows:[196]

- US64P is the longest United States route in New Mexico, with a length of 425 miles and locations in San Juan, Rio Arriba, Taos, Colfax, and Union counties.
- I25P is the longest interstate route in New Mexico, with a length of approximately 461.7 miles and crossing Dona Ana, Sierra, Socorro, Valencia, Bernalillo, Sandoval, Santa Fe, San Miguel, Mora, and Colfax counties.
- NM120P is the longest state route in New Mexico, with a route length of approximately 118.8 miles, and it can be found in Colfax, Mora, Harding, and Union counties.
- BL36P is the longest business loop in New Mexico. Its route length is approximately 6.8 miles, and it is situated in Quay County.

The top five counties with the highest gas production in 2023 (mcf), are as follows:[197]

1. Eddy: 1,411,993,855
2. Lea: 1,182,912,332
3. San Juan: 277,989,572
4. Rio Arriba: 212,903,883
5. Colfax: 13,241,397

Using the data above, San Juan, Rio Arriba, and Colfax counties were present in one or more of the routes identified above, although Colfax County was mentioned more frequently in those routes than the other four counties.

Along with the roadway system in New Mexico, other transportation infrastructure in the state includes 1,859 miles of freight railroad (as of 2021), 10 public-use airports (as of 2024), 4,037 bridges (as of 2023), and two border ports of entry (as of 2022).[198]

As of July 2023, New Mexico's gas tax rate was 19 cents per gallon, 3.3 times lower than that of Pennsylvania's gas tax.[199]

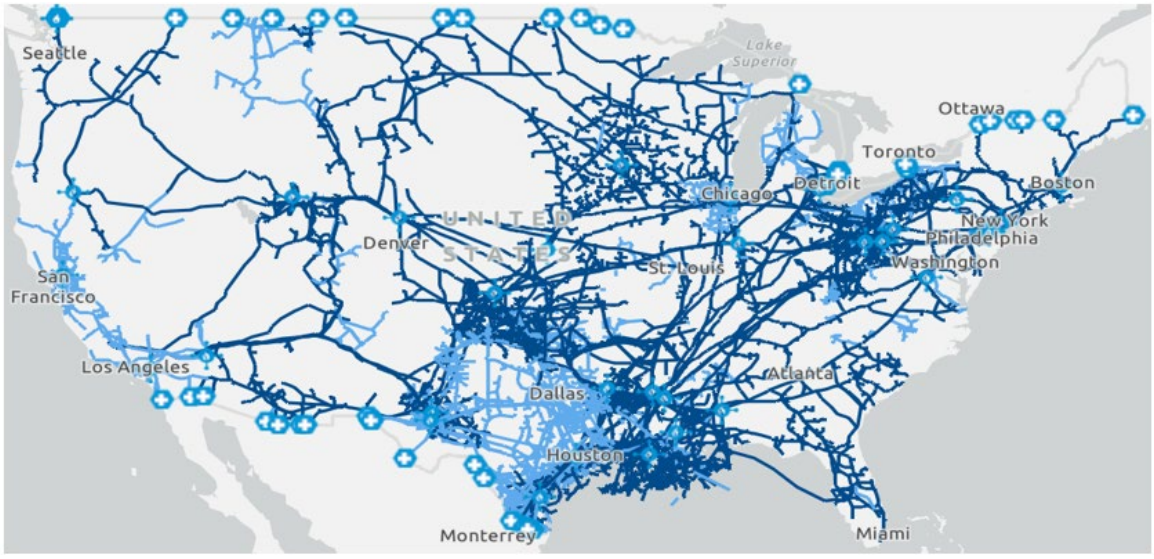
[196] NMDOT, *Roadway Inventory Program*. We gathered the data from the Roadway Inventory Program's *Legal Route Descriptions* (from 2020) of business loops and interstate, New Mexico, and United States routes.
[197] EMNRD, *County Production and Injection by Month*. We utilized the county production and injection data from the production year 2023, based on what was available on June 3, 2024. We calculated the annual production figures by adding up each of the county's monthly gas production (from January 2023 through December 2023).
[198] USDOT's Bureau of Transportation Statistics, *State Transportation by the Numbers - New Mexico*.
[199] Hoffer, Adam and Dobrinsky-Harris, Jessica, *How High are Gas Taxes in Your State?*, Tax Foundation, August 15, 2023.

Pipelines

The United States has a pipeline network measuring about three million miles of mainline and other pipelines that link natural gas production areas and storage facilities with consumers. This network delivered 29.2 trillion cubic feet of natural gas to 78.3 million consumers nationwide (see Exhibit 47).[200]

Exhibit 47

Natural Gas Pipelines in the United States



Source: USEIA, *Natural gas explained - Natural gas pipelines*.

Pipelines exist in every state, and approximately 3,000 companies maintain their functionality. Consumers rely on pipeline networks for natural gas delivery.

We examined gas pipeline infrastructures and systems in each of the top five natural gas-producing states using the information and data published by the United States Department of Transportation's (USDOT) Pipeline and Hazardous Materials and Safety Administration (PHMSA) on *Pipeline Miles and Facilities 2010+*.[201] In accordance with HR 131, we ex-

[200] USEIA, *Natural gas explained - Natural gas pipelines*.
[201] PHMSA, *Pipeline Miles and Facilities 2010+*. Note that our analyses of pipelines in each of the selected states are based on the numbers that were shown on PHMSA's data on June 3, 2024.

plored the data from the years 2012 through 2023 (where data was available). Our analysis includes data on interstate pipelines governed by the federal government and intrastate pipelines governed by state governments.[202] Additionally, as discussed later, each of the state's gas-gathering pipeline data in 2022 and 2023 was significantly higher than in the preceding years due to the addition of Type C[203] lines to the data.

We explored pipeline data on gas distribution, gathering, and transmission in each of the five natural gas-producing states. Pipelines responsible for gas transmission move natural gas from "compressor stations and storage facilities to regulators," while pipelines responsible for gas distribution operate the smaller lines that deliver gas to businesses and homes.[204] Gas-gathering pipelines typically collect/retrieve raw natural gas from wells, resources, platforms, or facilities that produce natural gas.

Pennsylvania. There are 99,136 miles of gas pipelines in Pennsylvania as of 2023. These pipelines are categorized as follows:

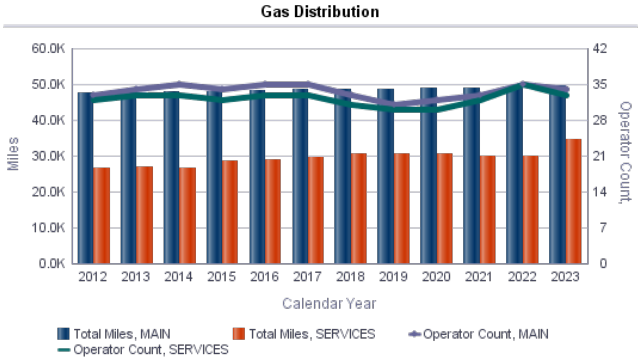
- Gas Distribution: 83,958 miles (49,542 main miles + 34,416 service miles).[205]
- Gas Gathering: 4,744 miles.
- Gas Transmission: 10,434 miles.

Exhibit 48 presents data on Pennsylvania's pipeline infrastructure from 2012 to 2023.

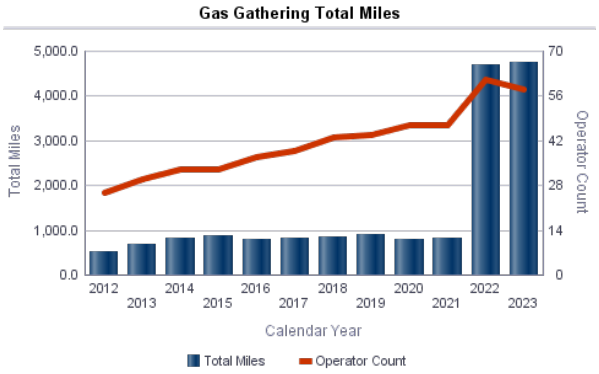
[202] PHMSA, *Federal/State Legislative Authorities*.
[203] There are also data on Type A and Type B lines that are included in the data. Type A, B, and C lines are categorized depending on their regulatory standards. For information on Types A, B, and C designations for gas gathering lines, *see* PHMSA, *Gas Gathering Regulatory Overview*. For the summary of Type C requirements, *see* PHMSA, *Gas Gathering Fact Sheet*.
[204] Pacific Gas and Electric Company, *What is the difference between a transmission pipeline and a distribution pipeline?*
[205] Main miles refer to the length of the distribution main lines, and service miles refer to the length of the distribution service lines. According to the Pipeline and Hazardous Materials Safety Administration, distribution main lines "are generally installed in underground utility easements alongside streets and highways," while distribution service lines "run from the distribution main line into homes or businesses." For more information, *see* PHMSA, *Pipeline Basics*.

Exhibit 48

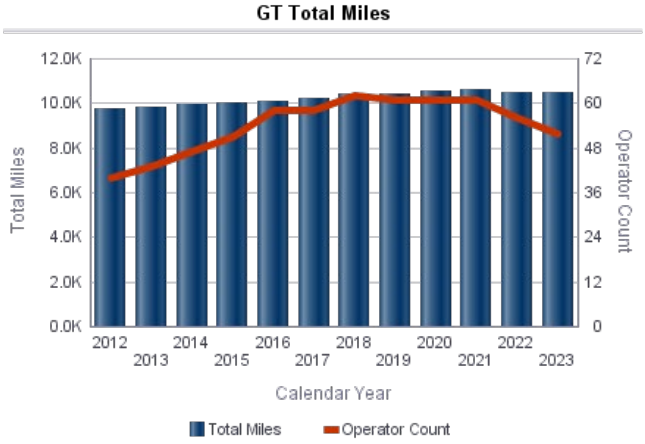
Pennsylvania Gas Distribution Pipeline Miles



Pennsylvania Gas Gathering Pipeline Miles [a/]



Pennsylvania Gas Transmission Pipeline Miles [b/]



Note:
[a/] Total miles include miles of Types A, B, and C lines and offshore lines.
[b/] Total miles include miles of both onshore and offshore lines.
Source: PHMSA, *Pipeline Miles and Facilities 2010+*.

From 2012 to 2023, the total mileage of Pennsylvania's gas distribution pipelines increased from 74,153.1 miles to 83,958 miles, representing a

13.2 percent increase. The operator count in 2023 increased to 36 from 34 in 2012, although it varied between those years. The total mileage within the state's gas transmission pipelines increased by seven percent from 2012 to 2023. Most notably, the total mileage within the state's gas-gathering pipelines increased by 814.8 percent from 2012 to 2023, due to the inclusion of Type C lines in Pennsylvania's data in 2022 and 2023.

Some changes to Pennsylvania's pipeline infrastructure may affect the state's natural gas production and transportation. Among the list of major pipeline projects[206] The Ohio Valley Connector Expansion Project, approved by the Federal Energy Regulatory Commission (FERC), plans to add transportation capacity to allow natural gas to move from the central Appalachian region into the interstate pipeline grid.[207] An energy company operates the current natural gas pipeline system in the central Appalachian region, which covers northern West Virginia and southwestern Pennsylvania. The proposed project extends the pipeline into Ohio.[208]

Other projects that may affect the natural gas operation in Pennsylvania are the Appalachia to Market II and Armagh and Entriken HP Replacement Project. According to DEP, these projects will provide natural gas transportation service from the Appalachia supply basin in Southwest Pennsylvania to existing local distribution company customers in New Jersey. The project will occur in Huntingdon, Indiana, Lebanon, Cambria, and Fayette Counties.[209]

The third FERC-approved project is the Regional Energy Access Expansion Project, which includes Maryland and New Jersey.[210] The project is anticipated to extend across Luzerne, Monroe, Northampton, Bucks, Chester, Delaware, and York County.[211]

Texas. As of 2023, Texas had 263,138 miles of gas pipelines, which are divided as follows:

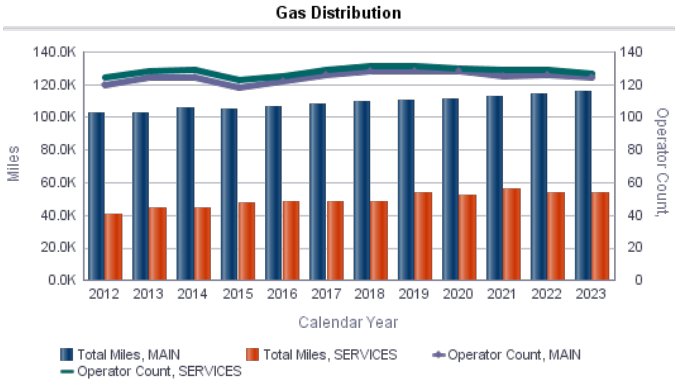
- Gas Distribution: 169,237 miles (115,502 main miles + 53,735 service miles).
- Gas Gathering: 46,523 miles.
- Gas Transmission: 47,379 miles.

Exhibit 49 presents a graphical representation of Texas' gas distribution, gathering, and transmission data for the period 2012-2023.

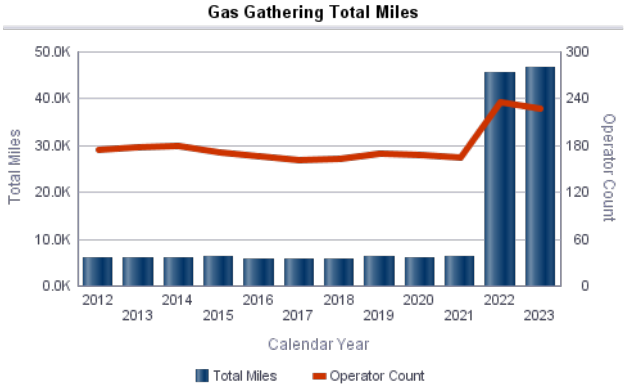
[206] FERC, *Approved Major Pipeline Projects, (*1997-Present).
[207] Equitrans Midstream, *Ohio Valley Connector Expansion Project.*
[208] Ibid.
[209] DEP, *Appalachia to Market II Project.*
[210] FERC, *Approved Major Pipeline Projects (1997-Present)*.
[211] DEP, *Regional Energy Access Expansion Project*.

Exhibit 49

Texas Gas Distribution Pipeline Miles



Texas Gas Gathering Pipeline Miles [a/]



Texas Gas Transmission Pipeline Miles [b/]

Note:
[a/] Total miles include mileages of Types A, B, and C lines and offshore lines.
[b/] Total miles include mileages of both onshore and offshore lines.
Source: PHMSA, *Pipeline Miles and Facilities 2010+*.

As might be expected given its historical oil and gas development, Texas has one of the largest pipeline systems in the United States. The total mileage of Texas' gas distribution pipelines increased from 143,020.2 miles in 2012 to 169,236.8 miles in 2023, an increase of 18.3 percent. This change was about five percent greater than Pennsylvania's and benefits the state's natural gas industry.

The total mileage of the state's gas-gathering pipelines increased by 659.6 percent from 2012 to 2023, primarily due to the inclusion of Type C lines in the state's data in 2022 and 2023. The operator count for the state's gas-gathering pipelines also increased between 2012 and 2023, though it was at its highest in 2022, with 235 operators operating the state's gas-gathering pipelines. The state's gas transmission pipelines increased from a total of 46,432.1 miles in 2012 to 47,378.5 miles in 2023, an increase of two percent.

Texas' pipeline system is noticeably larger than Pennsylvania's. For example, Texas' gas distribution pipelines measured 169,236.8 miles in 2023, approximately twice the size of Pennsylvania's. The number of operators operating gas distribution pipelines in Texas was 3.5 times greater than that of Pennsylvania in 2023.

Some pipeline projects that expanded Texas' intrastate pipeline capacity in 2023 include the Eagle Ford Project and the Spears Expansion Project, designed to deliver natural gas from the Eagle Ford-producing region to the Gulf Coast markets.[212]

Louisiana. As of 2023, there are a total of 74,826 miles of gas pipelines, which are divided into the following pipeline systems:

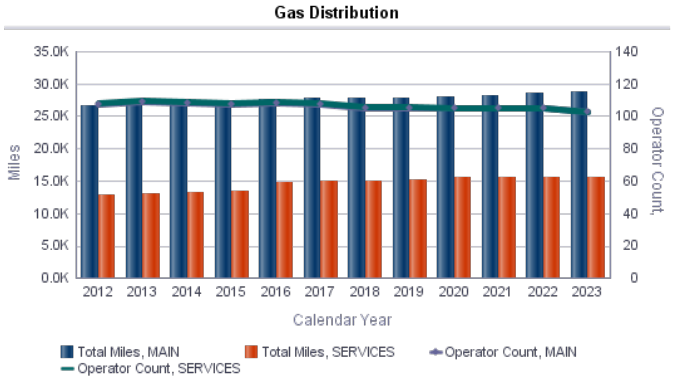
- Gas Distribution: 44,164 miles (28,594 main miles + 15,570 service miles).
- Gas Gathering: 6,483 miles.
- Gas Transmission: 24,180 miles.

Exhibit 50 presents Louisiana's pipeline infrastructure from 2012 through 2023.

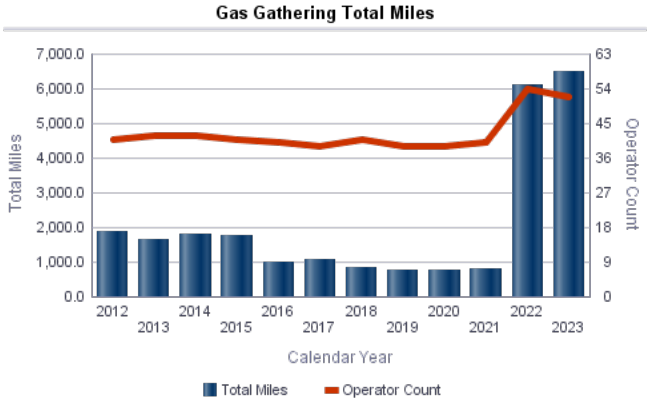
[212] USEIA, *Natural gas intrastate pipeline capacity additions outpaced interstate additions in 2023*, March 20, 2024.

Exhibit 50

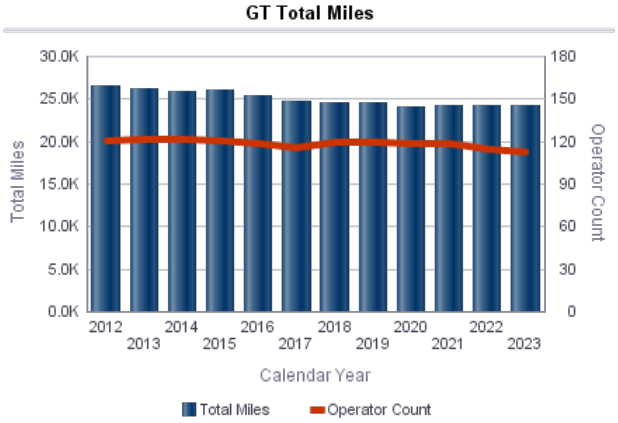
Louisiana Gas Distribution Pipeline Miles



Louisiana Gas Gathering Pipeline Miles [a/]



Louisiana Gas Transmission Pipeline Miles [b/]



Note:
[a/] Total miles include mileages of Types A, B, and C lines and offshore lines.
[b/] Total miles include mileages of both onshore and offshore lines.
Source: PHMSA, *Pipeline Miles and Facilities 2010+*.

From 2012 through 2023, the total mileage of Louisiana's gas distribution pipelines increased by 11.7 percent. The total mileage of Louisiana's gas-gathering pipeline increased from 1,867.6 miles in 2012 to 6,483.4 miles in 2023. Like other states explored in this section, Type C lines were added to Louisiana's gas-gathering pipeline data in 2022 and 2023, resulting in a spike in total miles in 2022. Also, unlike Pennsylvania and Texas, gas transmission pipeline mileage in Louisiana has declined over the years, from 26,366.6 miles in 2012 to 24,179,7 miles in 2023, indicating a decline of 8.3 percent.

There have been efforts to expand the pipeline system in Louisiana. One proposed pipeline project in the state is the Gator Express Pipeline, which is estimated to deliver natural gas from pipeline interconnections to the Plaquemines LNG export terminal located about 20 miles south of New Orleans, Louisiana.[213] Other proposed projects include the Evangeline Pass Expansion Project and Venice Extension Projects, both of which aim to provide natural gas delivery services to the Plaquemines LNG export terminals.[214]

West Virginia. As of 2023**,** West Virginia has 20,953 miles of gas pipelines, which are divided as follows:

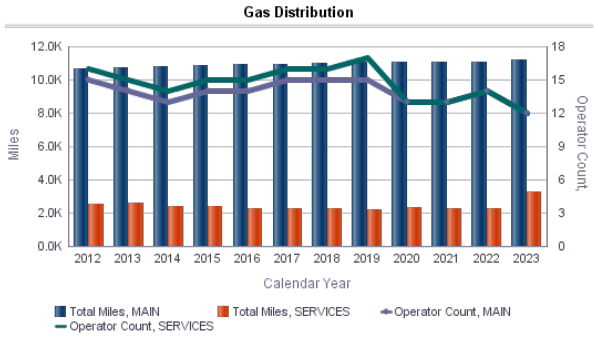
- Gas Distribution: 14,444 miles (11,146 main miles + 3,298 service miles).
- Gas Gathering: 2,739 miles.
- Gas Transmission: 3,770 miles.

Exhibit 51 presents West Virginia's pipeline infrastructure from 2012 through 2023.

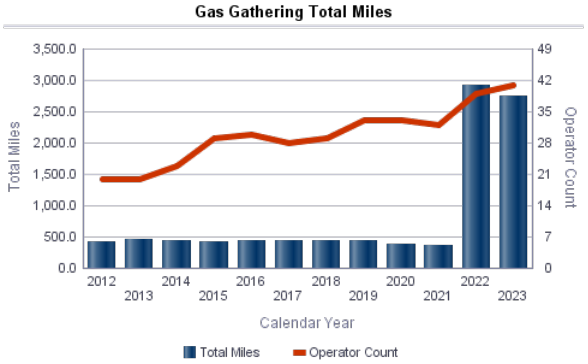
[213] USEIA, *New pipelines will bring significant volumes of natural gas to new LNG export terminals*, December 12, 2023.
[214] Ibid.

Exhibit 51

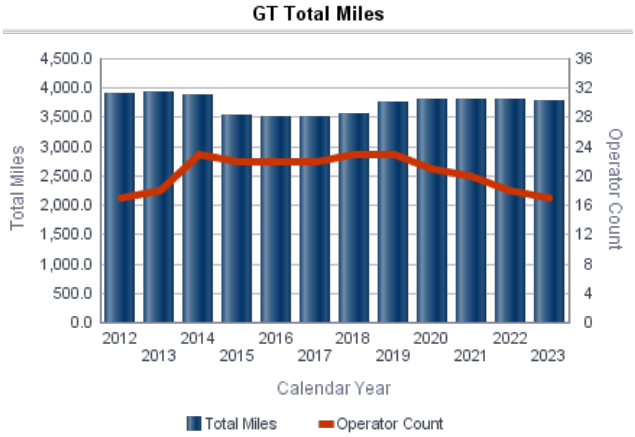
West Virginia Gas Distribution Pipeline Miles



West Virginia Gas Gathering Pipeline Miles [a/]



West Virginia Gas Transmission Pipeline Miles [b/]



Note:
[a/] Total miles include miles of Types A, B, and C lines and offshore lines.
[b/] Total miles include miles of both onshore and offshore lines.
Source: PHMSA, *Pipeline Miles and Facilities 2010+*.

From 2012 to 2023, the total mileage of West Virginia's gas distribution pipelines increased from 13,188.9 miles in 2012 to 14,444.4 miles in 2023,

an increase of 9.5 percent. The total mileage of the state's gas-gathering pipeline increased by 555.5 percent from 2012 to 2023, which is largely due to Type C lines being added to the data. The total mileage of West Virginia's gas transmission pipeline declined by 3.4 percent from 2012 to 2023.

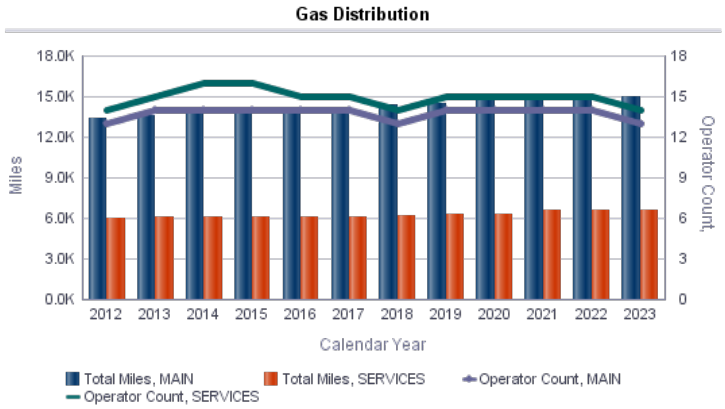
New Mexico. As of 2023, New Mexico had 36,055 miles of gas pipelines, which are divided into the following pipeline systems:

- Gas Distribution: 21,536 miles (14,913 main miles + 6,623 service miles).
- Gas Gathering: 8,141 miles.
- Gas Transmission: 6,378 miles.

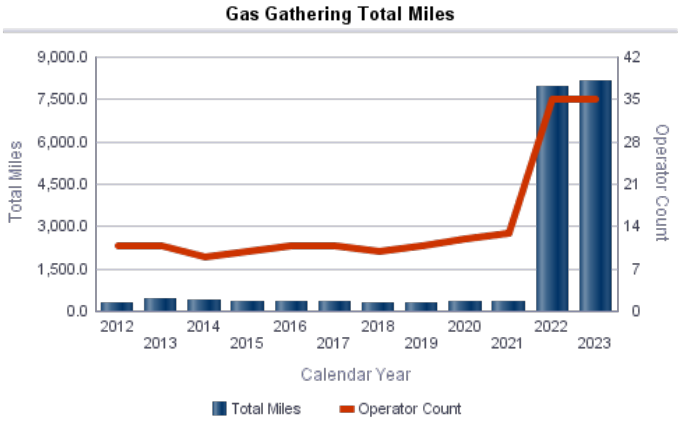
Exhibit 52 presents New Mexico's pipeline infrastructure from 2012 through 2023.

Exhibit 52

New Mexico Gas Distribution Pipeline Miles



New Mexico Gas Gathering Pipeline Miles [a/]



New Mexico Gas Transmission Pipeline Miles [b/]

Note:
[a/] Total miles include miles of Types A, B, and C lines and offshore lines.
[b/] Total miles include miles of both onshore and offshore lines.
Source: PHMSA, *Pipeline Miles and Facilities 2010+*.

The total mileage of New Mexico's gas distribution pipelines increased from 19,376.8 miles in 2012 to 21,536.1 miles in 2023, an increase of 11.1 percent. Like other states, adding Type C line data to New Mexico's pipeline data significantly increased the gas-gathering pipeline mileage. Specifically, the total mileage of the state's gas-gathering pipelines increased from 298.9 miles in 2012 to 8,141.1 miles in 2023, a substantial increase of 2,624 percent. New Mexico's gas transmission pipeline mileage had generally declined over the years, with its total mileage declining from 6,516.6 miles in 2012 to 6,377.7 miles in 2023, a decrease of 2.1 percent.

There have been efforts to expand the pipeline infrastructure in New Mexico. Notably, in September 2019, the FERC approved the request to start the application process for the proposed Permian Global Access Pipeline, a project designed to build a 625-mile pipeline connecting an oil field in New Mexico and Texas to markets in the Gulf Coast.

Waterways

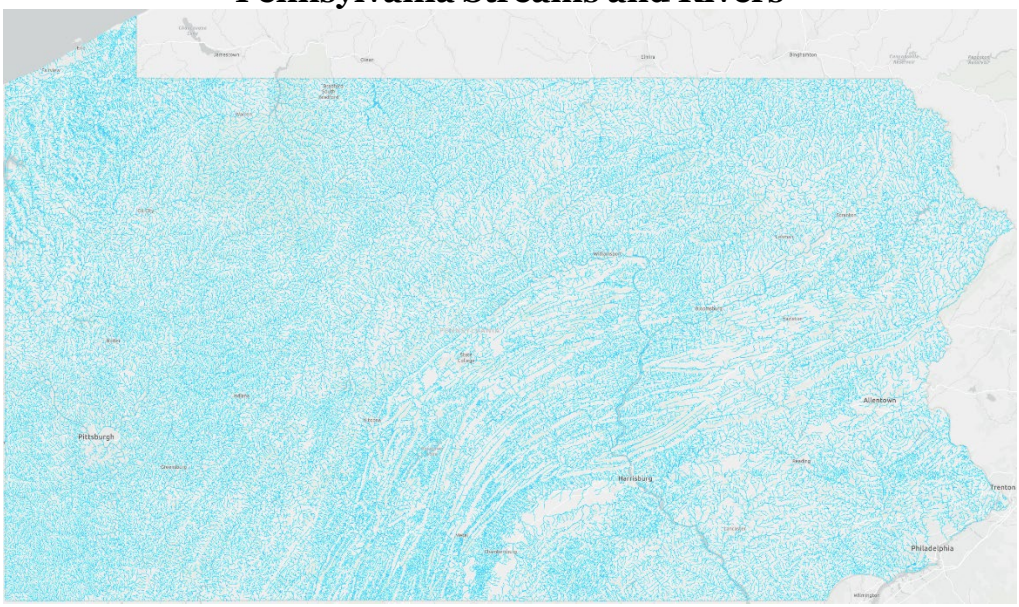
HR 131 also sought information on waterways within the top five natural gas-producing states. As mentioned earlier, hydraulic fracturing is a water-intensive drilling process. Specifically, fluids used for hydraulic fracturing are developed using groundwater or surface water, and the wastewater resulting from hydraulic fracturing is either disposed or reused.[215]

Pennsylvania. Pennsylvania has 260 miles of inland waterway (as of 2018) and two principal water ports (as of 2021).[216] The state has 85,568 miles of rivers and streams, 310 publicly-owned lakes (totaling 105,135 acres), 1,591,012 acres of freshwater wetlands, and 1,377 acres of tidal wetlands.[217] The longest rivers include the Ohio River (981 miles), the Susquehanna River (444 miles), the Delaware River (330 miles), and the Allegheny River (325 miles).[218] Some of the largest lakes include Lake Erie (greater than 6 million acres), Pymatuning Lake (17,088 acres), and Allegheny Reservoir (12,080 acres).[219] Exhibit 53 depicts the waterways in Pennsylvania.

[215] United States Environmental Protection Agency, *The Hydraulic Fracturing Water Cycle*.
[216] USDOT's Bureau of Transportation Statistics, *State Transportation by the Numbers*.
[217] DEP, *2024 Pennsylvania Integrated Water Quality Report*, 2024.
[218] Wesser, James, *Longest rivers that flow through Pennsylvania*, abc27, August 29, 2023.
[219] Schneck, Marcus, *Where are the largest lakes in Pennsylvania*, PennLive, May 17, 2018.

Exhibit 53

Pennsylvania Streams and Rivers



Pennsylvania Lakes, Bays, and Wetlands

Source: DEP, *2024 Pennsylvania Integrated Water Quality Report.*

In 2022, Pennsylvania withdrew 5,221,913,968 gallons of water per day (GPD) from 6,207 sources, which includes 4,679,304,998 GPD of surface water withdrawals and 542,608,970 GPD of groundwater withdrawals.[220]

[220] DEP, *Pennsylvania Water Use Data - Annual Reported Water Use Summary Visuals*, 2022.

In 2022, the top five counties with the highest total water withdrawals were as follows:

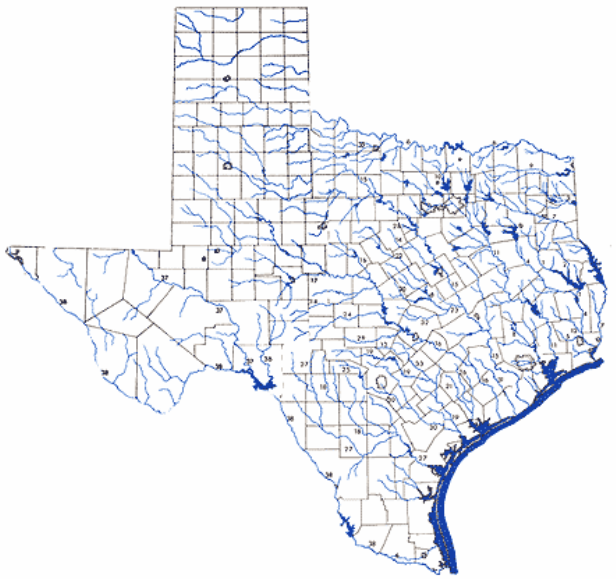
- York County: 2,530,592,703 GPD,
- Allegheny County: 454,369,501 GPD,
- Philadelphia County: 322,782,128 GPD,
- Lawrence County: 307,456,280 GPD, and
- Delaware County: 134,217,805 GPD.

A daily withdrawal of 9,780,687 gallons of water was dedicated to oil and gas uses, or 0.19 percent of the total withdrawals in 2022.[221]

Texas. Texas has 830 miles of inland waterway (as of 2018) and 12 principal water ports (as of 2021).[222] According to the Texas Water Development Board, Texas has 191,000 miles of streams, 15 major river basins, eight coastal basins, and 196 major reservoirs.[223] Exhibit 54 illustrates the waterway system in Texas.

Exhibit 54

Texas Waterway Map



Source: Texas Parks and Wildlife Department (TPWD)

Major river basins in Texas include Rio Grande (49,387 square miles in Texas), Brazos (42,865 square miles in Texas), Colorado (39,428 square

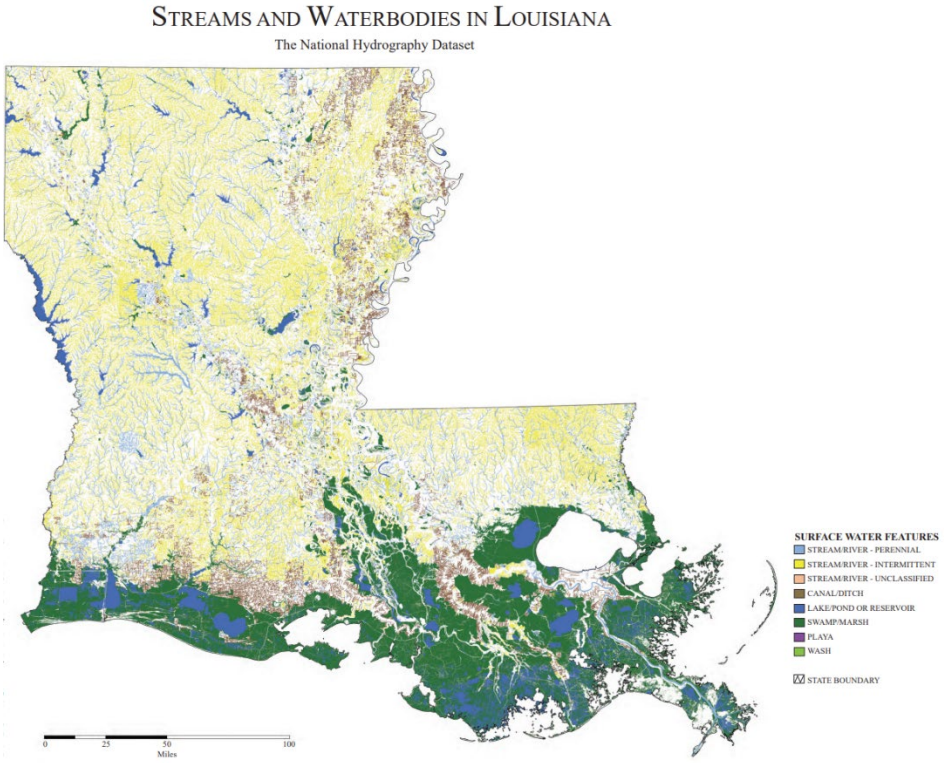
[221] Ibid.
[222] USDOT's Bureau of Transportation Statistics, *State Transportation by the Numbers*.
[223] Texas Water Development Board, *River Basins & Reservoirs*.

miles in Texas), Red (24,297 square miles in Texas), and Trinity (17,913 miles in Texas).[224] The largest reservoirs/lakes in Texas include Toledo Bend Reservoir (182,490 acres), Sam Rayburn Reservoir (112,590 acres), Falcon Reservoir (85,195 acres), Lake Texoma (78,420 acres), and Amistad Reservoir (66,465 acres).[225]

Louisiana. As depicted in Exhibit 55, Louisiana has 2,820 miles of inland waterway (as of 2018) and 10 principal water ports (as of 2021).[226] According to the Louisiana Watershed Initiative, the state has mostly flat terrain with abundant waterbodies, including 900 named bayous, 110 named rivers, and 242 named lakes.[227]

Exhibit 55

Louisiana Streams and Waterbodies



Source: United States Environmental Protection Agency.

The Mississippi River and its tributaries are the core of Louisiana's marine transportation system, which winds 2,552 miles as it travels from the headwaters in northern Minnesota down through Louisiana and into the

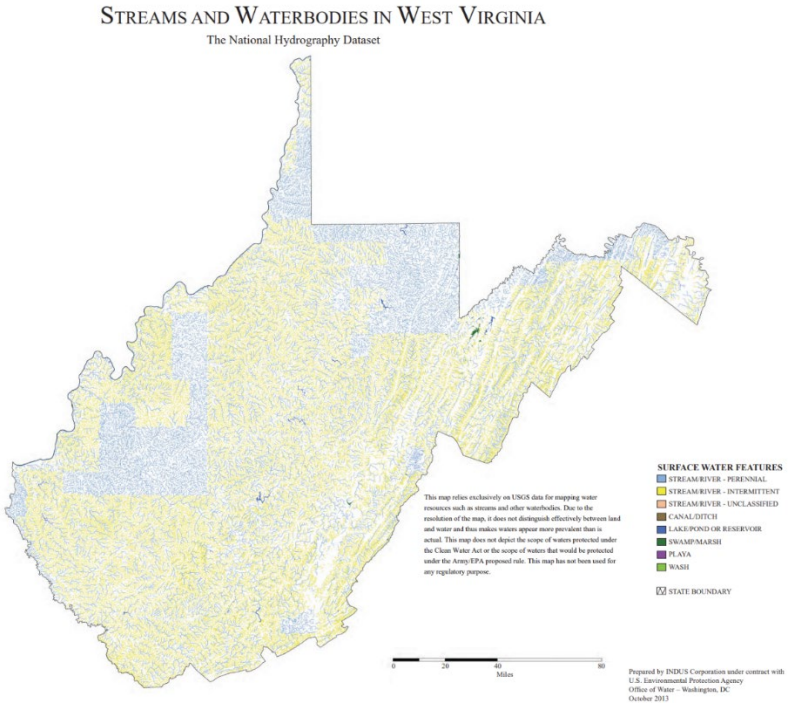
[224] Texas Water Development Board, *River Basins*.
[225] Texas Almanac, *Lakes and Reservoirs*.
[226] USDOT's Bureau of Transportation Statistics, *State Transportation by the Numbers*.
[227] Louisiana Watershed Initiative, *FAQ*.

Gulf of Mexico.[228] The Mississippi River is one of the most expansive deepwater terminals in the United States. It handles exports of various goods and resources, including coal and lumber.[229]

West Virginia. West Virginia has 680 miles of waterway and one major water port as of January 2020.[230] The state has 32,260 miles of river and 32 watersheds.[231,232] According to the West Virginia Division of Natural Resources, the state has over 40,000 miles of streams and over 100 public lakes.[233] Exhibit 56 illustrates streams and waterbodies in West Virginia.

Exhibit 56

West Virginia Streams and Waterbodies



Source: United States Environmental Protection Agency.

The Ohio River, which is one of the largest rivers in the United States, flows through West Virginia's border. Specifically, the Ohio River forms most of the western edge of West Virginia, which spans nearly 300 miles

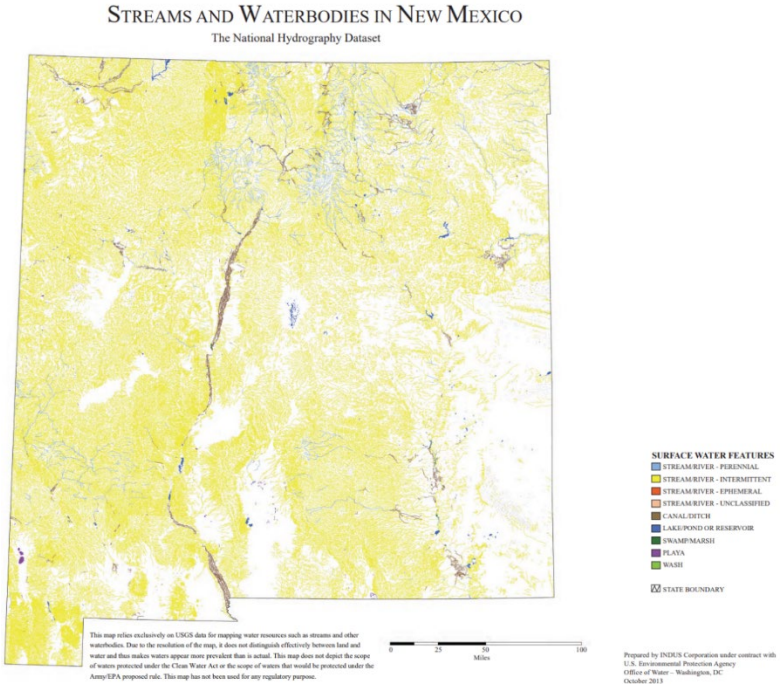
[228] LDTD, *2016 Marine Transportation System Booklet*.
[229] Ibid.
[230] USDOT's Bureau of Transportation Statistics, *West Virginia - Transportation by the Numbers*, January 2020.
[231] National Wild and Scenic Rivers System, *West Virginia*.
[232] WVDEP, *West Virginia watersheds*.
[233] West Virginia Division of Natural Resources, *Your Spring Fishing Guide to West Virginia*, May 3, 2023.

and forms the border between West Virginia and Ohio.[234] Among the list of lakes, Summersville Lake is the largest lake in the state, carrying over 2,800 acres of water and 60 miles of shoreline.[235]

New Mexico. There are no inland waterways and principal water ports in New Mexico.[236] There are 108,014 miles of river,[237] and there are 19 lakes in the state.[238] Exhibit 57 depicts streams and waterbodies in the state.

Exhibit 57

New Mexico Streams and Waterbodies



Source: United States Environmental Protection Agency.

The largest lake in New Mexico is Elephant Butte Lake/Reservoir, which measures 40 miles long[239] and has a surface area of 36,600 acres.[240] The Rio Grande, the second-longest river in North America, is in the state. It has a length of more than 1,800 miles.[241]

[234] West Virginia Rivers, *The Ohio River Watershed*.
[235] City of Summersville, *Summersville Lake*.
[236] USDOT's Bureau of Transportation Statistics, *State Transportation by the Numbers*.
[237] National Wild and Scenic Rivers System, *New Mexico*.
[238] Smith, Mike, *Want to beat the summer heat? These 10 lakes in New Mexico offer cool water experiences*, Carlsbad Current Argus, June 2, 2023.
[239] New Mexico Tourism Department, *Elephant Butte*.
[240] American Society of Civil Engineers, *Elephant Butte Dam*.
[241] New Mexico Office of the State Engineer, *Rio Grande Basin*.

Federal and State Lands "Unavailable" for Drilling

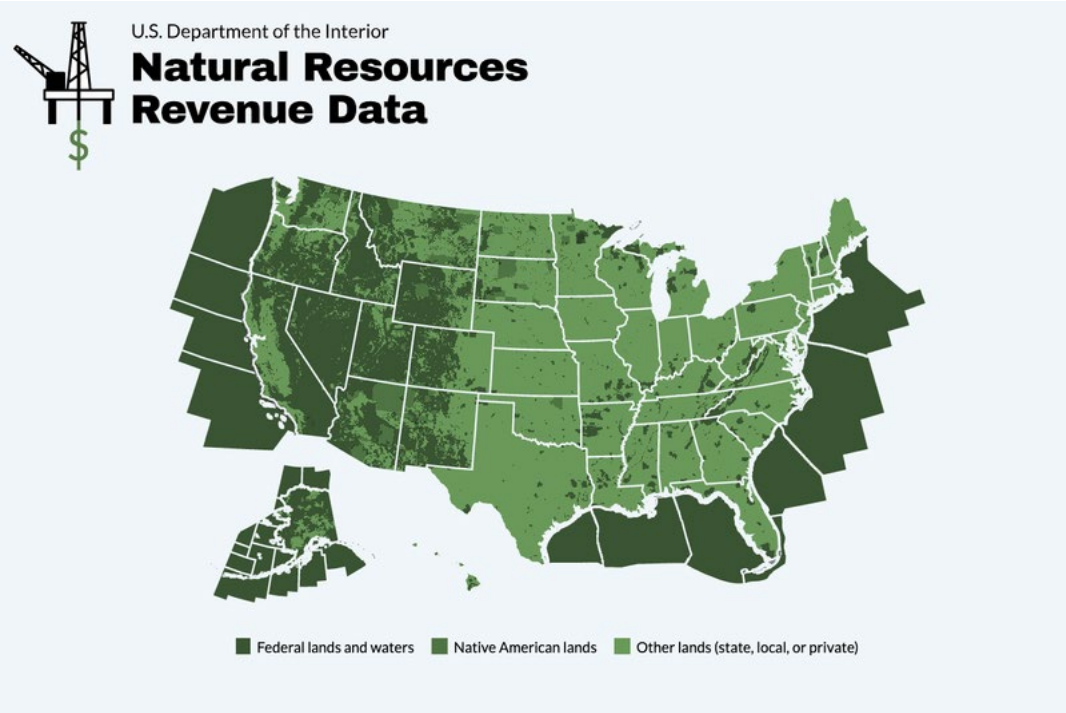
HR 131 directed us to evaluate the amount of federal and state lands excluded from [natural gas] development. Unfortunately, precise data does not exist on undeveloped acres of federal and state lands because the plays are still being tested and explored in many states. We analyzed data on federal and state public acreage and the acres of federal land under oil and gas leases managed by the Bureau of Land Management (BLM) within the United States Department of the Interior. Where possible, we included information on existing data on state lands available for oil and gas development or under oil and gas leases as part of our analysis.

According to the Congressional Research Service, the federal government owns roughly 640 million acres or about 28 percent of the 2.27 billion acres of land in the United States. BLM, Fish and Wildlife Service, National Park Service, Forest Service, and Department of Defense administer approximately 615.3 million acres.[242] BLM is the primary agency responsible for managing the federal government's onshore subsurface mineral estate.[243] Exhibit 58 displays a map of federal lands and waters, non-federal lands, and data on federal and state-owned lands.

[242] Vincent, Carol Hardy, and Hanson, Laura A., *Federal Land Ownership: Overview and Data*, Congressional Research Service, February 21, 2020.
[243] BLM, *About the BLM Oil and Gas Program*.

Exhibit 58

Federal and Non-Federal Lands and Waters



Federal and State Acres

State	Total acreage (as of 2018)	Federal land acreage (as of 2018)	State-owned land acreage	Federal land acreage under BLM-administered oil/gas lease (as of FY 2023)
Pennsylvania	28,804,480	622,160	3,975,000	9,164
Texas	168,217,600	3,231,198	2,055,000	277,033
Louisiana	28,867,840	1,353,291	1,038,000	157,148
West Virginia	15,410,560	1,134,138	288,000	64,736
New Mexico	77,755,400	24,665,774	9,323,000	4,185,578

Source: (Top) Santana, Stephanie, *Deep Dive into the UX Field*, United States General Services Administration, February 11, 2020. (Bottom) Developed by LBFC staff from information obtained via (1) BLM, *Oil and Gas Statistics - Fiscal Year 2023 Statistics*; (2) Vincent, Carol Hardy, and Hanson, Laura A., *Federal Land Ownership: Overview and Data*, Congressional Research Service, February 21, 2020; (3) Nelson, Robert H., *State-Owned Lands in the Eastern United States: Lessons from State Land Management in Practice*, Property and Environment Research Center, March 2018.

As of 2018, BLM, Fish and Wildlife Service, National Park Service, Forest Service, and Department of Defense manage 2.2 percent of Pennsylvania's total acreage, 1.9 percent of Texas' total acreage, 4.7 percent of

Louisiana's total acreage, 7.4 percent of West Virginia's total acreage, and 31.7 percent of New Mexico's total acreage.[244]

Only a small portion of federal lands in each state had oil and gas leases among our group of states. In Pennsylvania, 1.5 percent of its federal lands hold oil and gas leases that are administered by BLM. Compared to other top-producing states, this percentage was the lowest of the states examined. New Mexico had the highest percentage, with approximately 17 percent of its federal lands holding oil and gas leases that are administered by the Bureau of Land Management.

Federal legal guidance. The Mineral Leasing Act of 1920 and the Mineral Leasing for Acquired Lands Act of 1947 grant BLM's ability to manage oil and gas resources on public lands.[245] Specifically, the Mineral Leasing Act of 1920 governs leasing oil, gas, coal, and non-energy minerals (e.g. phosphates and sodium) from public lands and requires individuals/entities under such a lease to pay royalty on amounts mined and sold.[246]

Other relevant laws relating to federal oil and gas leases (and mineral mining) include the General Mining Law of 1872, which permits individuals and corporations to prospect on public lands and stake claims on mineral discoveries, and the Federal Land Policy and Management Act of 1976, which mandates that public lands remain under federal control.[247] The leasing provisions of the Mineral Leasing Act of 1920 exclude the following federal land areas: National parks and monuments, lands in incorporated cities, towns or villages, and areas within the National Wilderness Preservation System.[248]

A few significant updates have been made to federal rules on public lands that may affect federal oil and gas leasing procedures.[249] These include BLM's Onshore Oil and Gas Leasing Rule and Public Lands Rule. The Onshore Oil and Gas Leasing Rule updates the agency's governance of its oil and gas program in accordance with the Inflation Reduction Act of 2022. Among other provisions, the rule raises royalty rates, rentals,

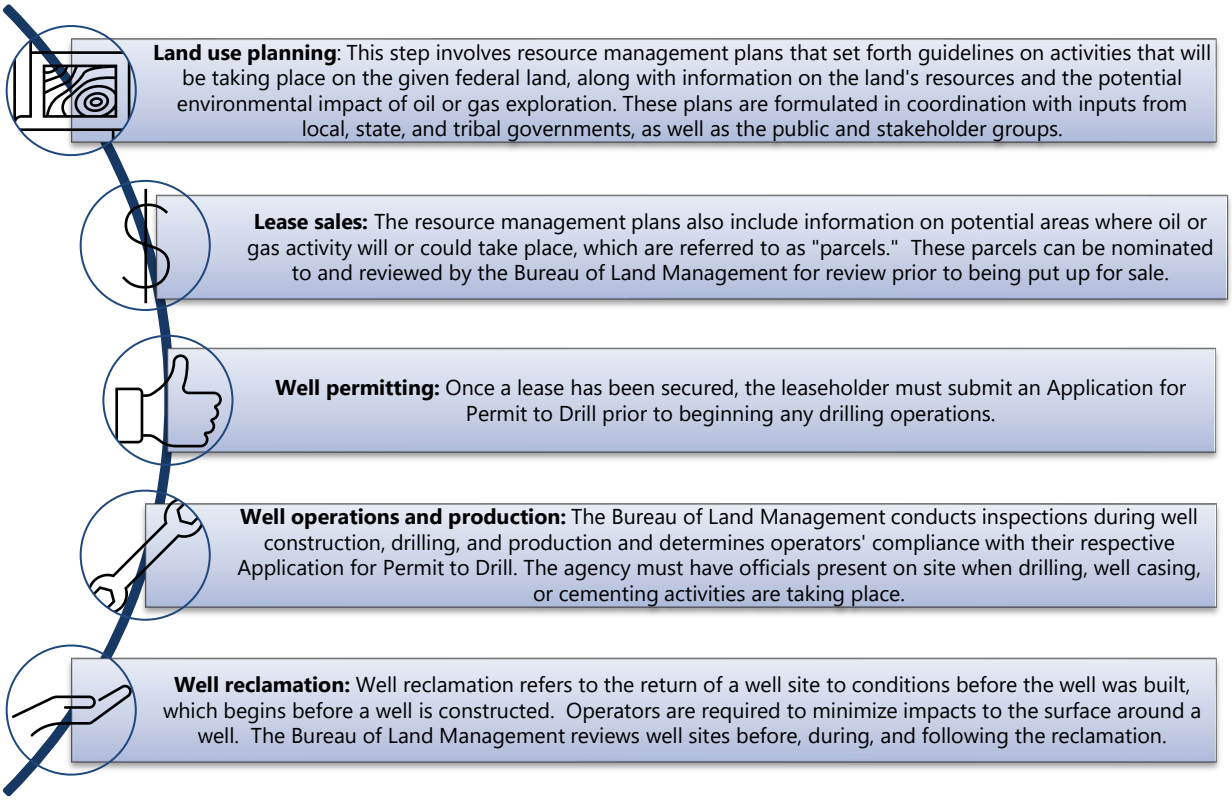
[244] Vincent, Carol Hardy, and Hanson, Laura A., *Federal Land Ownership: Overview and Data*, Congressional Research Service, February 21, 2020.
[245] BLM, *About the BLM Oil and Gas Program*.
[246] BLM, *About Mining and Minerals*.
[247] Ballotpedia, *Oil and natural gas extraction on federal land*.
[248] Ibid.
[249] While this paragraph focuses on BLM's updates to its rules/policies, an Executive Order signed on January 27, 2021, included updates to federal policies relating to natural gas development on public lands. Enacted as Executive Order 14008 (titled "Tackling the Climate Crisis at Home and Abroad"), part of Section 208 reads, "to the extent consistent with applicable law, the Secretary of the Interior shall pause new oil and natural gas leases on public lands or in offshore waters pending completion of a comprehensive review and reconsideration of Federal oil and gas permitting and leasing practices in light of the Secretary of the Interior's broad stewardship responsibilities over the public lands and in offshore waters, including potential climate and other impacts associated with oil and gas activities on public lands or in offshore waters." Executive Order No. 14008, 86 FR 7619 (January 27, 2021).

and minimum bids for oil and gas leases issued by BLM. The rule imposes a fee when an individual/entity submits an expression of interest for leasing oil and gas. It also updates bonding requirements for leasing, development, and production. The rule is scheduled to go into effect on June 22, 2024.[250] The Public Lands Rule relates to BLM's effort in restoring and protecting public lands and waters.

Federal and State Permit Procedures for Oil and Gas Drilling on Public Land. Developing oil and/or natural gas on federal lands involves five steps, shown in Exhibit 59. BLM's drilling permit applications are separate from state-level drilling permit applications. The agency approved 3,769 applications for Permit to Drill in 2014, with its review process taking an average of 94 days.[251] In fiscal year 2023, a total of 3,519 federal land drilling permits were issued by the agency.[252]

Exhibit 59

Process to Develop Oil and Gas on Federal Lands



Source: Developed by LBFC staff from Ballotpedia, *Oil and natural gas extraction federal lands*.

[250] *Fluid Mineral Leases and Leasing Process*, 89 FR 30916 (April 23, 2024).
[251] Ballotpedia, *Oil and natural gas extraction on federal land*.
[252] BLM, *Oil and Gas Statistics - Fiscal Year 2023 Statistics*.

With respect to state policy, each state has its own regulations that govern state-owned or managed lands. In Pennsylvania, the Department of Conservation and Natural Resources' (DCNR) Bureau of Forestry manages the 2.2-million-acre state forest system and oversees the development and storage of oil and natural gas resources on state forest land via lease agreements. Additionally, 934,000 acres of the 1.5 million acres of game lands that the Game Commission manages are situated within the Marcellus Shale region.[253]

DCNR also reviews the "siting of individual infrastructure components," with objectives aimed at "minimizing potential adverse impacts; balancing competing and sometimes conflicting state forest resources, use, and values; confirming that well sites are geologically sound and in compliance with lease terms; and assuring the efficient extraction of gas resources."[254] Relevant Pennsylvania regulations pertaining to natural gas development on state forest lands include the State Forest Resource Management Plan. Additionally, Act 18 (Conservation and Natural Resources Act) functions as DCNR's outline for managing the state forest system and ensuring its sustainability.[255]

In 2015, Pennsylvania's policy on leasing state-managed land for natural gas development was amended by *Executive Order 2015-3*, which continues to be in effect today. This policy change ordered that "no State Park and State Forest lands owned and/or managed by DCNR shall be leased for oil and gas development."[256] The initial moratorium was established under Governor Rendell's administration but briefly lifted under Governor Corbett's administration. However, the moratorium did not necessarily halt all leases on public lands, as the state "has continued to lease out thousands of acres of publicly-owned streambeds" because DCNR "determined the moratorium did not apply to streambeds."[257]

Outside of Pennsylvania, we found the following:

- In Texas, the General Land Office (GLO) manages 13 million acres of state lands and mineral rights.[258] Title 31, Part 1, Chapter 9 of the Texas Administrative Code provides provisions relating to GLO's management and oversight of exploration and leasing of oil and gas

[253] Whipkey, Brian, *Game Commission's windfall from natural gas, oil leases brief. How will money be used?*, GoErie, March 14, 2024.
[254] DCNR's Bureau of Forestry, *Guidelines for Administering Oil and Gas Activity on State Forest Lands – 4th Edition, Revised 2016*.
[255] Ibid. Act 18 is the law that established the DCNR in 1995. It allows the agency to manage contracts or leases related to mining or removal of minerals that are embedded in the state forest system.
[256] Commonwealth of Pennsylvania - Governor's Office, *Executive Order 2015-03*, January 29, 2015.
[257] Hennen, Anthony, *Pennsylvania moratorium loophole nets $45M in oil and gas revenue*, The Center Square, May 4, 2022.
[258] GLO, *Land Management - Overview*.

on state lands. This rule also provides leasing procedures for leasing land for oil and gas exploration and development. Under this rule, the School Land Board, GLO's staff, or persons interested in leasing state land in Texas may nominate a tract for lease, and the nominated tracts are then reviewed by geologists at the GLO.

- In Louisiana, the State Mineral and Energy Board (SMEB) administers the state's interest in minerals, with the authority to lease any lands in the state for the development and production of minerals, oil, and gas.[259] The DENR's Office of Mineral Resources' *Leasing Manual* from 2007 outlines the process of acquiring a mineral lease on state agency lands and water bottoms in Louisiana.[260] The manual outlines nine general steps in the state mineral lease acquisition process. The first step is to register applicants and prospective leaseholders seeking state mineral leases, and the last step covers the issuance and execution of state and state agency mineral lease contracts after the state mineral lease sale.[261] According to a Louisiana Legislative Auditor's (LLA) report on the State Mineral and Energy Board's mineral lease royalty rates, DENR's Office of Mineral Resources was overseeing 1,888 active mineral leases on over 840,000 acres of state-owned land or water bottoms as of November 2012.[262] According to the SMEB's Lease Review Report from May 8, 2024, "there are 967 active State Leases containing approximately 410,681 acres," and DENR's Geological and Engineering Division "reviewed 176 leases covering approximately 95,014 acres for lease maintenance and development" since the Board's report from March 13, 2024.[263]

- In West Virginia, under Chapter 20, Article 1, Section 7 of the West Virginia Code, the West Virginia Department of Commerce's (WVDOC) Division of Natural Resources oversees the state's mineral leasing process for lease minerals subject to the agency's control and jurisdiction.[264] A bidder seeking a mineral lease for a parcel of land or waterway under the Division of Natural Resources jurisdiction notifies the agency by submitting a mineral lease nomination form. Following this step, the agency must obtain written approval from the Office of the Governor, allowing the agency to undergo a competitive bidding process for the property where mineral development will occur.[265] In 2023, the Office of the Governor approved three requests to begin competitive bidding processes for some of the land in West Virginia, which included 177.241 acres of land in Brooke County, 25.178 acres of land in Marshall County, and 193.33 acres of

[259] DENR's Office of Mineral Resources, *State Mineral and Energy Board*.
[260] DENR's Office of Mineral Resources, *Leasing Manual*, 2007.
[261] Ibid.
[262] LLA, *State Mineral and Energy Board - Mineral Lease Royalty Rate*, April 2013.
[263] DENR's Office of Mineral Resources - State Mineral and Energy Board, *Lease Review Report*, May 8, 2024.
[264] WVDOC's Division of Natural Resources, *West Virginia Mineral Development - About the Process*.
[265] Ibid.

land in Ohio County and Marshall County, respectively.[266] In January 2015, WVDOC opened the bidding process for "several tracts of land" in the Marcellus Shale region.[267]

- In New Mexico, the State Land Office's (NMSLO) Oil, Gas, and Minerals Division oversees nine million surface acres and 13 million mineral acres in the state[268] and manages the oil and gas leasing process. Title 19, Chapter 2 of the New Mexico Administrative Codes governs the oversight of state trust lands in New Mexico. Specifically, Title 19, Chapter 2, Part 100 of the Code relates to oil and gas leases for public lands in the state. NMSLO holds the sales of oil and gas leases on the third Tuesday of every month via its auction contractor.[269] NMSLO's Oil and Gas Manual from July 2023 noted that, unlike some other states, New Mexico requires that both annual rentals and royalties be paid on oil gas leases, regardless of the production status, and production must continue on leases.[270] In December 2023, the State Land Office announced a lease sale notice for tracts of land totaling 1834.68 acres in Chaves County, Eddy County, and Lea County.[271]

D. Climate Considerations

HR 131 directed us to examine the climate conditions (of the top five natural gas-producing states), including seasonal temperatures and precipitation.

Seasonal Temperatures and Precipitation

To keep our analyses consistent, we considered the following months for each season when computing average temperatures:

- Winter: December, January, and February
- Spring: March, April, and May
- Summer: June, July, and August
- Fall/Autumn: September, October, and November

Our data is from the *Statewide Time Series*, published by the National Oceanic and Atmospheric Administration's National Centers for Environment Information (NCEI). Using county-level temperature data published

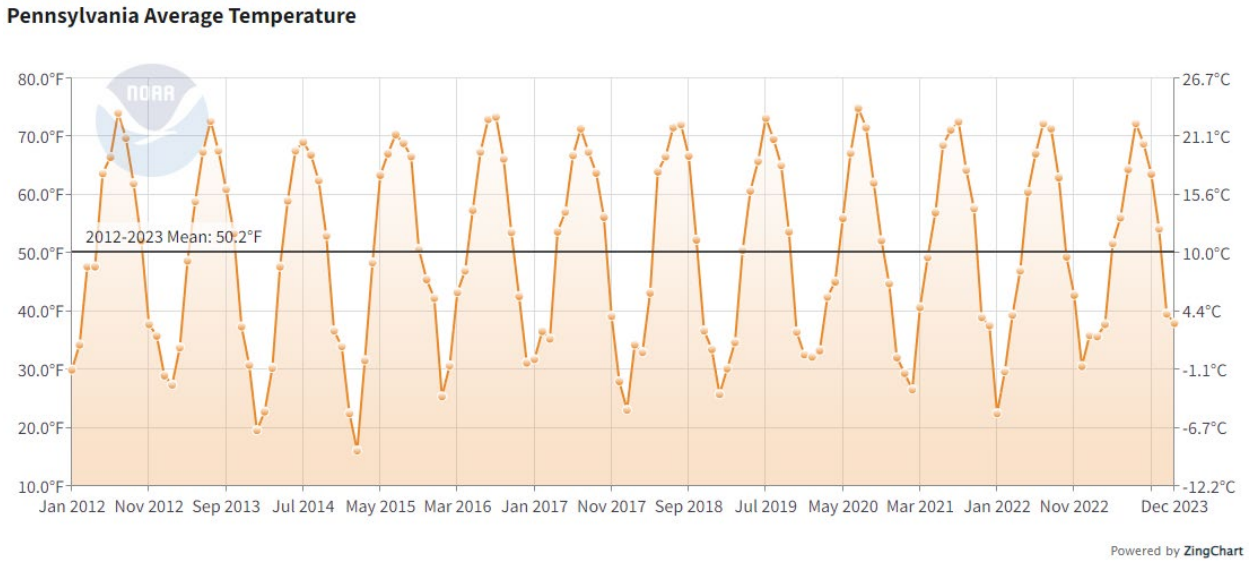
[266] WVDOC's Division of Natural Resources, *West Virginia Mineral Development – Mineral Development Properties*.
[267] Associated Press, *Companies Bid Millions to Drill Under State Lands in W.Va.*, West Virginia Public Broadcasting, January 26, 2015.
[268] NMSLO, *About*.
[269] NMSLO, *FAQs-Oil, Gas & Minerals*.
[270] NMSLO, *Oil and Gas Manual*, July 27, 2023.
[271] NMSLO, *Lease Sale Process - 2023 Lease Sale Notices - December 2023*.

by NCEI, we identified the top five counties in each state with the lowest and highest average temperatures from January to December 2023.[272]

Pennsylvania. From 2012 to 2023, Pennsylvania's mean temperature was 50.2 degrees Fahrenheit. According to the USEIA, "The state's temperate climate varies from the southeast, where it is influenced by the Atlantic Ocean, to cooler areas near the Great Lakes in the northwest, where weather fronts with frigid temperatures that trigger heavy Lake effect snowfalls often from Canada."[273] The state's annual precipitation has ranged from a low of 28.9 inches in 1930 to a high of 64.0 inches in 2018, with the wettest consecutive five-year interval taking place from 2016 to 2020.[274] Exhibit 60 plots the state's monthly average temperatures for those years.

Exhibit 60

Pennsylvania Monthly Average Temperature from 2012 to 2023



Source: NCEI.

The top five Pennsylvania counties with the highest average temperature from January to December of 2023 were Philadelphia County (57.2 degrees Fahrenheit), Delaware County (56.8 degrees Fahrenheit), Montgomery County (55.6 degrees Fahrenheit), York County (55.3 degrees Fahrenheit), and Lancaster County (55.1 degrees Fahrenheit). The top five counties with the lowest average temperature from January to December of 2023 were Sullivan County (47.6 degrees Fahrenheit), Potter

[272] NCEI, *County Mapping.*
[273] USEIA, *Pennsylvania - State Profile and Energy Estimates - Profile Analysis.*
[274] Frankson, Rebekah, et al., *State Climate Summaries 2022 - Pennsylvania,* NCEI (published via North Carolina Institute for Climate Studies).

County (48.3 degrees Fahrenheit), Tioga County (48.5 degrees Fahrenheit), McKean County (48.9 degrees Fahrenheit), and Wayne County (49 degrees Fahrenheit).

The following are Pennsylvania's average seasonal temperatures from 2012 to 2023 (in degrees Fahrenheit):

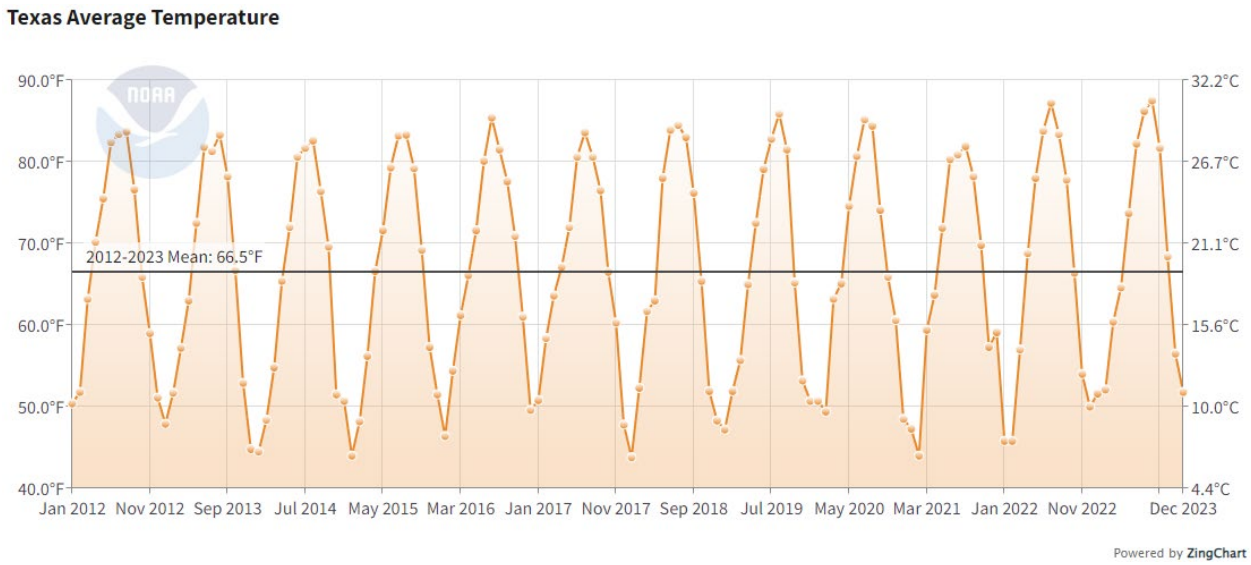
- Winter: 30.3
- Spring: 48.4
- Summer: 69.7
- Fall/Autumn: 52.3

Texas. From 2012 to 2023, Texas' mean temperature was 66.5 degrees Fahrenheit. According to the USEIA, the climate "ranges from humid and subtropical along the coast, where much of the state's population resides, to semi-arid on the high plains of central and western Texas and arid in the state's mountainous west."[275] The state's lightly populated high plains tend to experience freezing temperatures during winter, while heavily populated areas of Texas can reach above 90 degrees Fahrenheit during summer.[276] In general, the state's precipitation ranges from less than 10 inches in the far west to more than 60 inches in the extreme southeast, with the wettest consecutive five-year interval taking place from 2015 to 2019.[277] Exhibit 61 plots the state's monthly average temperatures for those years.

[275] USEIA, *Texas - State Profile and Energy Estimates - Profile Analysis*.
[276] Ibid.
[277] Runkle, Jennifer, et al., *State Climate Summaries 2022 - Texas,* NCEI (published via North Carolina Institute for Climate Studies).

Exhibit 61

Texas Monthly Average Temperature from 2012 to 2023



Source: NCEI.

The top five Texas counties with the highest average temperature from January to December of 2023 were Hidalgo County (77.2 degrees Fahrenheit), Starr County (77.1 degrees Fahrenheit), Cameron County (77 degrees Fahrenheit), Willacy County (76.7 degrees Fahrenheit), and Zapata County (76.7 degrees Fahrenheit). The top five counties with the lowest average temperature from January to December of 2023 were Dallam County (56.3 degrees Fahrenheit), Hartley County (57.6 degrees Fahrenheit), Sherman County (58.5 degrees Fahrenheit), Oldman County (59.1 degrees Fahrenheit), and Lipscomb County (59.3 degrees Fahrenheit).

The following are Texas' average seasonal temperatures from 2012 to 2023 (in degrees Fahrenheit):

- Winter: 49.5
- Spring: 66.3
- Summer: 82.8
- Fall/Autumn: 67.2

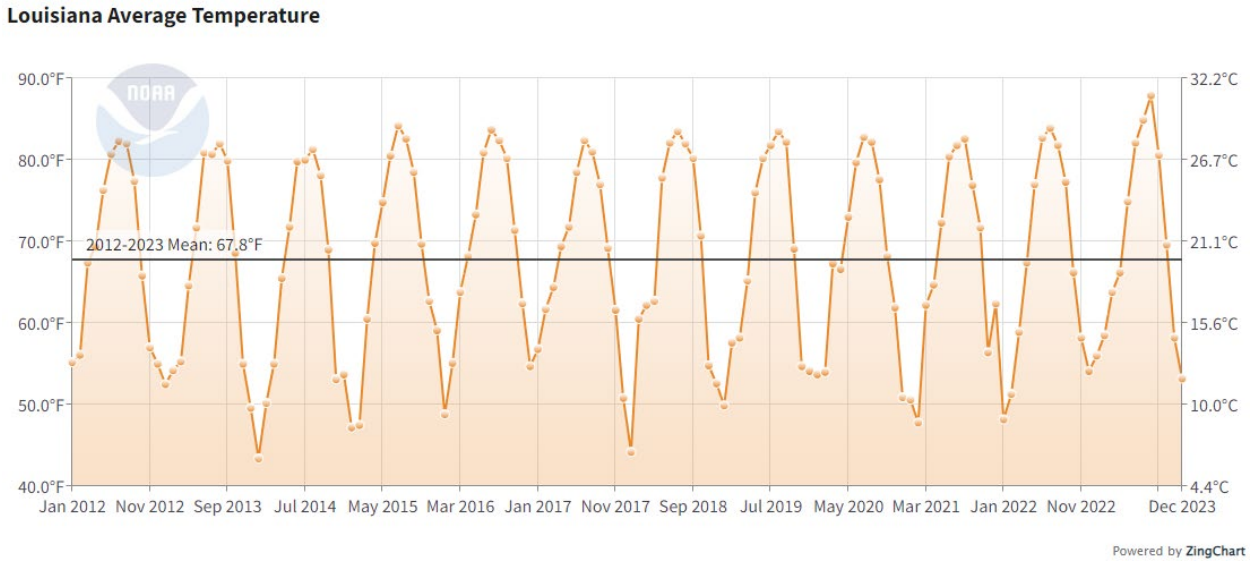
Louisiana. From 2012 to 2023, Louisiana's mean temperature was 67.8 degrees Fahrenheit. Louisiana tends to have "relatively short and mild winters, hot summers, and year-round precipitation," with annual precipitation ranging from approximately 50 inches in the northern part of the state to approximately 70 inches at some locations in the southeastern part of the state.[278] The state's annual precipitation "has ranged

[278] Frankson, Rebekah, et al., *State Climate Summaries 2022 - Louisiana,* NCEI (published via North Carolina Institute for Climate Studies).

from a low of 36.6 inches in 1924 to a high of 79.5 inches in 1991, with the wettest consecutive five-year interval taking place from 1989 to 1993.[279] Exhibit 62 plots the state's monthly average temperatures for those years.

Exhibit 62

Louisiana Monthly Average Temperature from 2012 to 2023



Source: NCEI.

The top five Louisiana counties with the highest average temperature from January to December of 2023 were Plaquemines Parish (72.4 degrees Fahrenheit), Terrebonne Parish (72.3 degrees Fahrenheit), Jefferson Parish (72.2 degrees Fahrenheit), Lafourche Parish (72.2 degrees Fahrenheit), and Orleans Parish (71.9 degrees Fahrenheit). The top five counties with the lowest average temperature from January to December of 2023 were Claiborne Parish (66.2 degrees Fahrenheit), Union Parish (66.5 degrees Fahrenheit), Lincoln Parish (66.7 degrees Fahrenheit), Morehouse Parish (66.9 degrees Fahrenheit), and Webster Parish (66.9 degrees Fahrenheit).

The following are Louisiana's average seasonal temperatures from 2012 to 2023 (in degrees Fahrenheit):

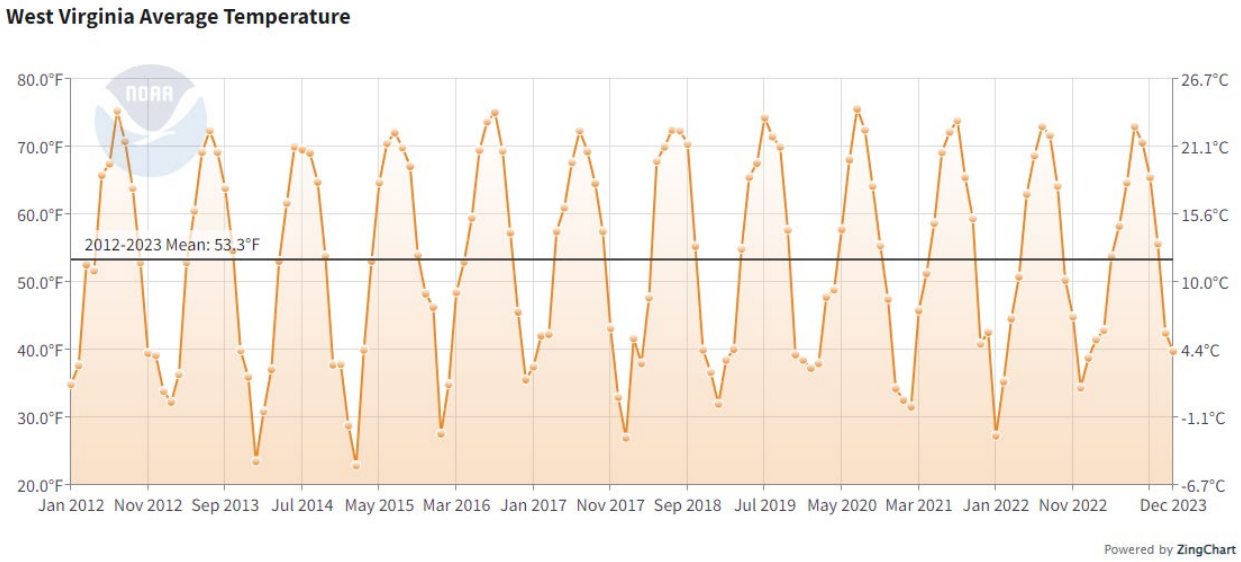
- Winter: 53.1
- Spring: 67.5
- Summer: 82
- Fall/Autumn: 68.6

[279] Ibid.

West Virginia. From 2012 to 2023, West Virginia's mean temperature was 53.3 degrees Fahrenheit. West Virginia has "moderately cold winters and warm, humid summers."[280] The state's annual precipitation has varied over the years, with the wettest consecutive five-year interval occurring from 2016 to 2020, with an average of 51.9 inches of precipitation.[281] Exhibit 63 plots the state's monthly average temperatures for those years.

Exhibit 63

West Virginia Monthly Average Temperature from 2012 to 2023



Source: NCEI.

The top five West Virginia counties with the highest average temperature from January to December of 2023 were Wayne County (57.5 degrees Fahrenheit), Lincoln County (57.4 degrees Fahrenheit), Mingo County (57.3 degrees Fahrenheit), Cabell County (57.2 degrees Fahrenheit), and Logan County (56.8 degrees Fahrenheit). The top five counties with the lowest average temperature from January to December of 2023 were Pocahontas County (48.8 degrees Fahrenheit), Randolph County (49.8 degrees Fahrenheit), Tucker County (49.9 degrees Fahrenheit), Webster County (51.1 degrees Fahrenheit), and Pendleton County (51.5 degrees Fahrenheit).

[280] Runkle, Jennifer, et al., *State Climate Summaries 2022 - West Virginia,* NCEI (published via North Carolina Institute for Climate Studies).
[281] Ibid.

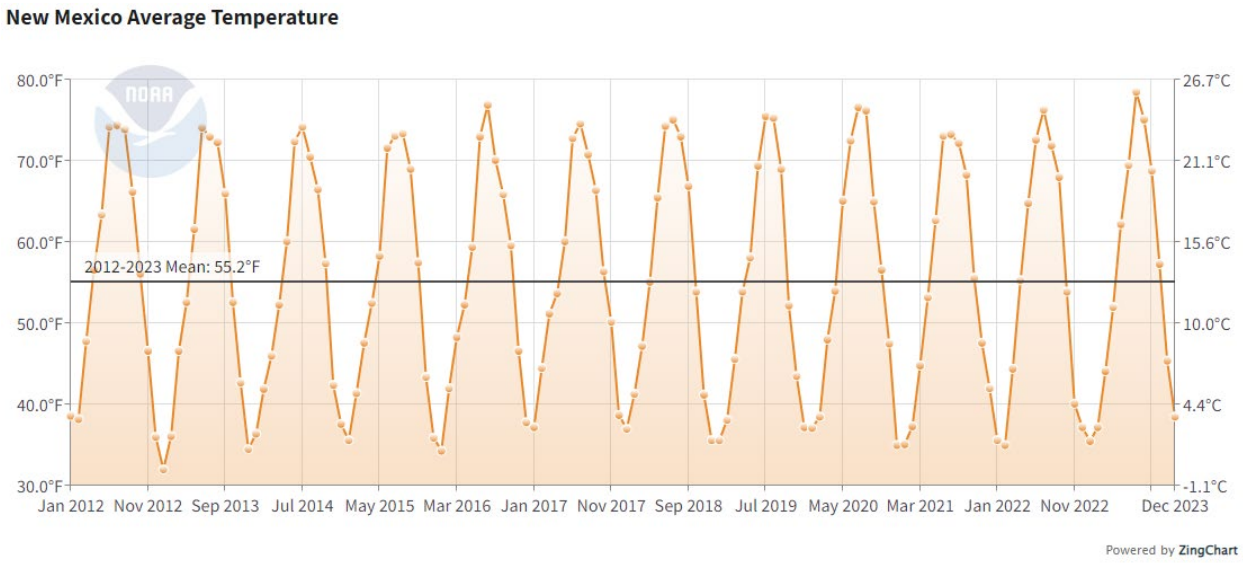
The following are West Virginia's average seasonal temperatures from 2012 to 2023 (in degrees Fahrenheit):

- Winter: 35.1
- Spring: 52.5
- Summer: 71.0
- Fall/Autumn: 54.6

New Mexico. From 2012 to 2023, New Mexico's mean temperature was 55.2 degrees Fahrenheit. While temperatures vary across the state, "much of the state is characterized as arid to semiarid."[282] The state's annual precipitation ranged from a high of 26.6 inches in 1941 to a low of 6.6 inches in 1956, with the wettest consecutive five-year interval occurring from 1984 to 1988.[283] Exhibit 64 plots the state's monthly average temperatures for those years.

Exhibit 64

New Mexico Monthly Average Temperature from 2012 to 2023



Source: NCEI.

The top five counties in New Mexico with the highest average temperature from January to December of 2023 were Eddy County (64.2 degrees Fahrenheit), Dona Ana County (63.4 degrees Fahrenheit), Lea County (62.8 degrees Fahrenheit), Chaves County (62.4 degrees Fahrenheit), and Luna County (62.3 degrees Fahrenheit). The top five counties with the

[282] Frankson, Rebekah, et al., *State Climate Summaries 2022 - New Mexico,* NCEI (published via North Carolina Institute for Climate Studies).
[283] Ibid.

lowest average temperature from January to December of 2023 were Taos County (44 degrees Fahrenheit), Rio Arriba County (46.2 degrees Fahrenheit), Colfax County (47.9 degrees Fahrenheit), Los Alamos County (48.1 degrees Fahrenheit), and Catron County (49.1 degrees Fahrenheit).

The following are New Mexico's average seasonal temperatures from 2012 to 2023 (in degrees Fahrenheit):

- Winter: 37.4
- Spring: 54.1
- Summer: 73.5
- Fall/Autumn: 55.9

Impacts of Weather on Natural Gas Production. Extreme weather conditions, such as winter storms, interrupt the supply chain and natural gas production. Most notably, in February 2021, winter storm Uri reduced the natural gas production rate of the Permian region by nearly 5 billion cubic feet per day, with Texas experiencing a decline of almost 45 percent in its natural gas production during the storm.[284] Low temperatures/cold weather can lead to freeze-offs that are inflicted upon water or hydrates in the natural gas stream freezing at a lower temperature or pressure, which creates blockages and disrupts the flow of natural gas from a well or through a natural gas transportation system.[285]

On the other hand, hot weather can also influence natural gas production and supply. Specifically, hot weather can increase electric power demand for natural gas, partly due to increased demand for air conditioning.[286] From a production standpoint, gas in natural gas pipeline systems expands under warmer temperatures (e.g., heat waves), and the pipeline systems face a risk of explosion because they operate under higher pressure than usual.[287]

E. Natural Gas Pricing Information

Finally, HR 131 asked us to examine the historical differences between state natural gas prices and how those prices have compared to the New York Mercantile Exchange Index Price (NYMEX) over the past decade. This analysis begins with a brief overview of natural gas pricing.

[284] USEIA, *Winter storms have disrupted U.S. natural gas production*, March 13, 2024.
[285] Ibid.
[286] USEIA, *Natural gas explained - Factors affecting natural gas prices*.
[287] Baddour, Dylan, *Texas Pipeline Operators Released or Flared Tons of Gas to Avert Explosions During Heatwave*, Inside Climate News, June 30, 2023.

Natural Gas Pricing

Natural gas producers can arrange to sell the gas they extract to a marketer, pipeline company, or end user through the existing network of pipelines. Generally, the gas driller prices the gas at the wellhead, meaning where it comes from the ground. The gas transportation to the pipeline access point is then determined separately from the gas price.

Individual natural gas purchases and sales occur throughout the country and are usually delivered the next business day. Transaction prices are based on or determined by the market conditions at each delivery location. These prices include influences such as weather, economic activity, demographics, storage or transportation capacity, and demand for natural gas in that specific state or city.

The natural gas price at the pipeline distribution points where utility companies and other major end users take delivery is called the "citygate price." Based on nationwide surveys of marketers and pipeline operators, the USEIA and other organizations compile and record this price daily.[288]

The New York Mercantile Exchange (NYMEX) also hosts the sale of natural gas contracts for future delivery (known as futures contracts), which call for the delivery of a specific quantity of gas at an exact date at the "Henry Hub," an interconnection of seven interstate and three intrastate pipelines in Erath, Louisiana. A futures contract is a financial tool industry participants use to hedge the price risk of owning or using a physical commodity, in this case, natural gas. These contracts trade around the clock, five days a week, on the NYMEX and in less regulated, over-the-counter markets with similar terms. Few natural gas transactions on the futures market result in the actual physical delivery of gas; most participants close out their obligation by purchasing or selling an offsetting futures position.

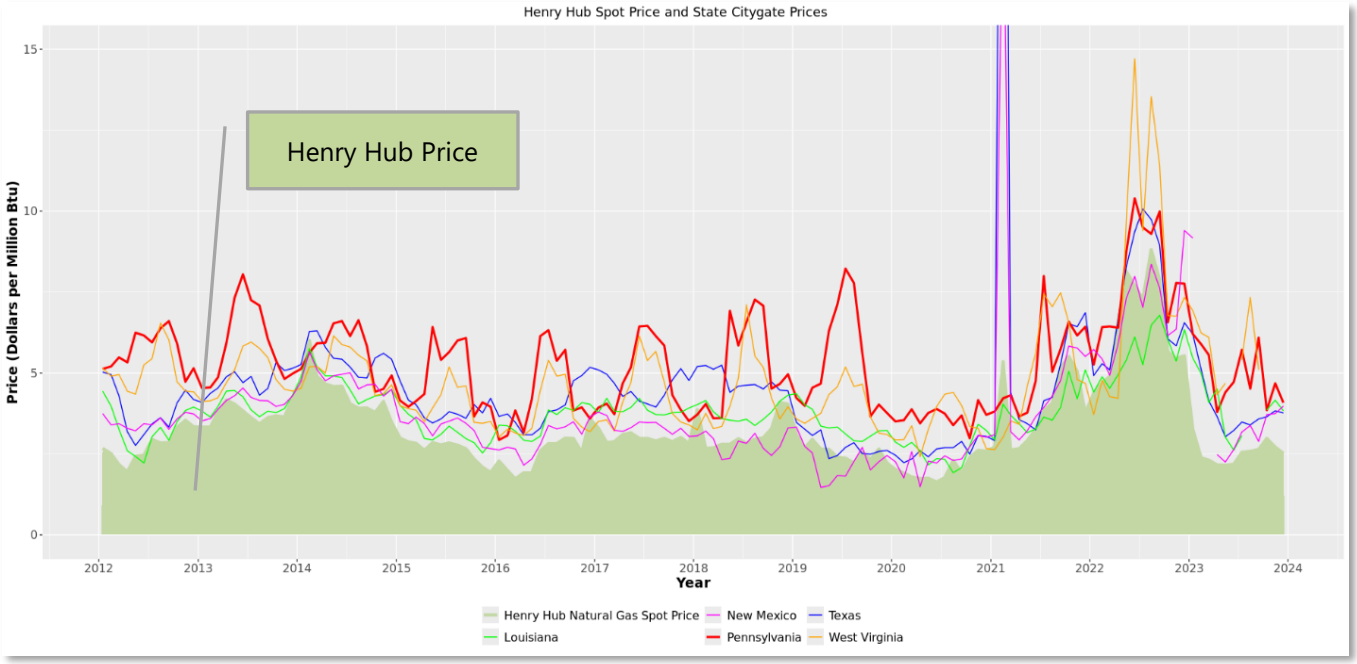
Because the prices for contracts traded on the NYMEX are for a standardized amount of gas delivered to a prominent pipeline interconnection point, many industry participants consider them a "national price." The prices in this market fluctuate based on global or national meteorological, economic, and geopolitical conditions and overall natural gas supply and demand. Although this price is useful as an index, gas producers, pipeline operators, and customers do not buy and sell gas based on this national price. Drillers and utilities buy and sell gas in their local markets at prices that more closely reflect citygate prices, which, in addition to global and national factors, are also affected by regional weather, business, and infrastructure considerations.

[288] American Gas Association, www.aga.org/research-policy/resource-library/natural-gas-prices, accessed May 29, 2024.

Comparison of Henry Hub (NYMEX) and citygate prices. To show how the national prices have compared to the citygate prices in the leading gas-producing states, Exhibit 65 graphs the spot price of natural gas at Henry Hub versus citygate prices tracked by the USEIA from each of our selected states from 2012 to 2023.

Exhibit 65

Henry Hub Natural Gas Spot Price and State Citygate Prices from 2012 to 2023 [a/]



Note:
[a/] Citygate prices have been converted to the unit for Henry Hub spot prices (dollars per million Btu) from dollars per thousand cubic feet. This was done by dividing the dollar amount per thousand cubic feet by 1.036 million Btu per thousand cubic feet. For example (according to USEIA), $13.86 per thousand cubic feet divided by 1.036 million Btu per thousand cubic feet would be $13.38 per million Btu. The 1.036 million Btu per thousand cubic feet is based on USEIA's preliminary estimate for 2022. For more information on unit conversion, see USEIA, which explains units and calculators. August and September 2023 data for Louisiana; June, October, November, and December 2023 data for West Virginia; and February and March 2023 data for New Mexico were unavailable.
Source: Developed by LBFC staff from information provided by the USEIA.

As detailed in Exhibit 65, there can be a significant difference between the national Henry Hub price (solid shading) and the state-specific prices denoted by the colored lines. The solid red line depicts citygate prices for Pennsylvania and has generally trended above the NYMEX price.

To better visualize the data, we contained the y-axis (i.e., price) within the scale of 0 to 15 dollars per million Btu. This range limiter was necessary because capturing the entirety of the 2021 price spike in Texas and New Mexico distorted the graph of the price differences in each of the selected states. For example, New Mexico experienced a significant one-week spike in its natural gas prices in February 2021 due to frigid weather across the Southwest region.[289] In the same month, a winter storm limited the operation of natural gas and electricity markets in Texas and Oklahoma.[290]

Using the USEIA's data, our calculation found that Henry Hub natural gas spot prices average from 2012 to 2023 was $3.30 per million Btu. We also found that, between those years, the Henry Hub natural gas spot price was lowest at $1.63 per million Btu in June 2020 and highest at $8.81 per million Btu in August 2022. When we computed the averages of monthly citygate prices[291] for each of the selected states from 2012 to 2023, Pennsylvania had the highest average of $5.48 per thousand cubic feet. New Mexico and Louisiana nearly tied for the lowest average of $3.94 per thousand cubic feet. Texas and West Virginia averaged $4.78 per thousand cubic feet and $4.97 per thousand cubic feet, respectively.

As discussed in Section II, Pennsylvania's impact fee depends on the average NYMEX gas price rather than the city gate price during the preceding year. If that national price in the previous year increases, the per-well impact fee is higher, especially during a well's first three years of operation. The effect of prices on the Act 13 impact fee rate is also capped; the highest fee assessed on a well in any year is when the NYMEX price is over $6.00. If the price were to be significantly higher than that, there would be no further effect on the per-well rate.

Producers in Louisiana pay severance tax based on the volume of extracted gas. However, the state adjusts the severance tax rate each year based on the average national (NYMEX) price in the previous year, similar to Pennsylvania. Louisiana's rate does not have a maximum level and is set by the state's revenue department annually.

Drillers in New Mexico, Texas, and West Virginia pay severance taxes based on the value of the extracted gas's actual sales transactions. As such, a direct correlation exists between the local prices a producer receives for gas and the amount of severance tax paid to those states.

Nationwide, natural gas index prices fluctuated significantly from multi-year lows in 2020 to multi-year highs in 2022. According to the USEIA, 2020 natural gas spot prices reached a multi-year low due to the United

[289] New Mexico Gas Company, *A Word About Natural Gas Prices*.
[290] USEIA, *U.S. natural gas prices spiked in February 2021*, then generally increased through October, January 6, 2022.
[291] The following data was not available: August and September 2023 data for Louisiana; June, October, November, and December 2023 data for West Virginia; and February and March 2023 data for New Mexico.

States' mild winter and spring weather and decreased natural gas consumption during the COVID-19 pandemic. However, prices rebounded in 2021 and increased significantly in 2022 for two reasons. First, Russia decreased sales of natural gas to Europe after those countries imposed economic sanctions on Russia for invading Ukraine. Second, 2022 was a very hot summer in the United States, which drove increased electricity demand for cooling. Prices declined from those higher levels in 2023 because many European countries switched to other fuel sources, a mild winter in the northern hemisphere, and increased natural gas production in many states.[292]

[292] "Why Natural-Gas Prices Have crashed," *International Banker*, June 22, 2023.

APPENDICES

Appendix A – House Resolution 131 of 2023

PRIOR PRINTER'S NO. 1402 PRINTER'S NO. 1791

THE GENERAL ASSEMBLY OF PENNSYLVANIA

HOUSE RESOLUTION

No. 131 Session of 2023

INTRODUCED BY STEELE, HILL-EVANS, MADDEN, KHAN, WARREN, SANCHEZ, PROBST, FRIEL, MALAGARI, BOROWSKI, PIELLI, SCOTT, VITALI, KENYATTA, HOHENSTEIN, SHUSTERMAN, TAKAC, D. WILLIAMS, SALISBURY, DONAHUE, SAPPEY, CEPEDA-FREYTIZ, KRAJEWSKI, CIRESI, MAYES, GREEN AND WEBSTER, MAY 31, 2023

AS AMENDED, HOUSE OF REPRESENTATIVES, JUNE 29, 2023

A RESOLUTION

~~Directing the Legislative Budget and Finance Committee to conduct a study to determine the amount of revenue that Pennsylvania may have collected since the enactment of Act 13 of 2012 if the Commonwealth implemented a severance tax.~~ <--

DIRECTING THE LEGISLATIVE BUDGET AND FINANCE COMMITTEE TO CONDUCT A STUDY TO COMPARE IMPACT FEES AND SEVERANCE TAXES IN THE LARGEST NATURAL GAS PRODUCING STATES AND EXAMINE THE COMPETITIVE BUSINESS CLIMATE FOR THE INDUSTRY IN THOSE STATES. <--

WHEREAS, A large portion of the Marcellus Shale Basin, a stretch of sedimentary rock several thousand feet underground, over 400 million years old and containing a huge source of natural gas and oil, sits within Pennsylvania's borders; and

WHEREAS, The Marcellus Shale is stretched amongst several states, including New York, the western region of Maryland and West Virginia, as well as the far eastern regions of Ohio, Kentucky and Tennessee; and

~~WHEREAS, Since the early 1800s, Pennsylvania has been home to nearly 40,000 active natural gas wells while approximately 4,000 new wells are drilled each year; and~~ <--

WHEREAS, On February 14, 2012, the Pennsylvania Legislature passed Act 13 of 2012 to establish impact fees for oil and gas drilling in the State; and

~~WHEREAS, Impact fees are collected from oil and gas drilling companies based on the number of new wells drilled, whereas severance taxes are based on the amount of natural gas extracted from wells; and~~ <--

WHEREAS, IMPACT FEES ARE COLLECTED FROM OIL AND GAS DRILLING COMPANIES BASED ON THE TOTAL NUMBER OF NEW WELLS A PRODUCER OWNS, THE AGE OF THE WELL AND THE AVERAGE PRICE OF NATURAL GAS FOR THE PRECEDING YEAR, AS CALCULATED BY THE PENNSYLVANIA PUBLIC UTILITY COMMISSION UTILIZING THE SETTLED NATURAL GAS PRICE OF THE NEW YORK MERCANTILE EXCHANGE (NYMEX), WHEREAS SEVERANCE TAXES ARE BASED ON THE PRICE OF NATURAL GAS AND THE AMOUNT OF NATURAL GAS PRODUCED FROM WELLS; AND <--

WHEREAS, Second only to Texas in production, Pennsylvania is the largest natural-gas-producing State in the United States that ~~does not impose a severance tax on new or current unconventional gas wells~~ IMPOSES AN IMPACT FEE ON PRODUCERS; and <--

WHEREAS, In 2022, Pennsylvania accounted for 19% of marketed natural gas production in the United States; and

WHEREAS, Pennsylvania's marketed natural gas production was at an annual high of 20.9 billion cubic feet per day (Bcf/d) in 2021 and averaged 20.5 Bcf/d in 2022; and

WHEREAS, Although the number of horizontal wells increased from 4,022 in 2011 to 11,164 in 2022, and the amount of gas produced increased from 1,066 billion cubic feet in 2011 to an estimated 7,600 in 2022, the revenue income ~~to the State did not increase; and~~ REMAINED RELATIVELY STABLE, FLUCTUATING BETWEEN $146 MILLION AND $279 MILLION; THEREFORE BE IT <--

~~WHEREAS, Impact fee revenue has hovered between $146 million and $274 million per year and has not steadily increased in the same way gas production has increased since 2011; therefore be it~~ <--

~~RESOLVED, That the House of Representatives direct the Legislative Budget and Finance Committee to conduct a study to determine the amount of revenue Pennsylvania may have collected since the enactment of Act 13 of 2012 if the Commonwealth implemented a severance tax and submit a report with its findings to the General Assembly within one year of the adoption of this resolution; and be it further~~

~~RESOLVED, That, at a minimum, the report include all of the following information:~~

~~(1) The severance tax rates imposed and the years imposed in other states.~~

~~(2) The amount of natural gas and derivatives of natural gas extracted from Pennsylvania since the enactment of Act 13 of 2012.~~

~~(3) The amount of revenue generated by the impact fee, per year, and the total, since the enactment of Act 13 of 2012.~~

~~(4) An estimate, with the calculation method, of the amount of revenue Pennsylvania may have generated if the Commonwealth had implemented a severance tax in 2012.~~

RESOLVED, THAT THE HOUSE OF REPRESENTATIVES DIRECT THE <--
LEGISLATIVE BUDGET AND FINANCE COMMITTEE TO CONDUCT A STUDY TO EXAMINE TAX STRUCTURES THAT EXIST AS OF JUNE 30, 2023, WITHIN THE TOP FIVE NATURAL GAS PRODUCING STATES IN THE UNITED STATES AND SUBMIT A REPORT WITH ITS FINDINGS TO THE GENERAL ASSEMBLY WITHIN ONE YEAR OF THE ADOPTION OF THIS RESOLUTION; AND BE IT

FURTHER
RESOLVED, THAT, AT A MINIMUM, THE REPORT INCLUDE ALL OF THE FOLLOWING INFORMATION:
(1) THE STRUCTURE OF ANY SEVERANCE TAX OR IMPACT FEE IMPOSED WITHIN EACH OF THE TOP FIVE STATES.
(2) THE FACTORS THAT IMPACT THE CALCULATION OF THE TAX OR FEE IN EACH STATE UNDER PARAGRAPH (1), INCLUDING ANY REDUCED INTRODUCTORY TAX RATE, CAPITAL INVESTMENT RECOVERY OR OFFSETS OF THE TAX OR FEE AGAINST OTHER TAXES OR COSTS BORNE BY THE PRODUCER.
(3) OTHER TAXES IMPOSED BY EACH STATE UNDER PARAGRAPH (1) UPON NATURAL GAS PRODUCERS AND HOW THEY ARE SHARED WITH ROYALTY OWNERS;
AND BE IT FURTHER
RESOLVED, THAT THE REPORT ALSO EXAMINE AND SEEK TO IDENTIFY UNIQUE FACTORS WITHIN EACH OF THE TOP FIVE STATES THAT IMPACT THE COMPETITIVE BUSINESS CLIMATE WITHIN EACH STATE, INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING FACTORS:
(1) PERMITTING REQUIREMENTS, TIMELINES AND ASSOCIATED COSTS IN PREPARING AND OBTAINING NECESSARY OPERATING PERMITS.
(2) GEOLOGICAL CONDITIONS, INCLUDING DEPTH, THICKNESS, IRREGULARITIES IN FORMATION AND OTHER FACTORS THAT MAY IMPACT ACCESS TO THE RESOURCE.
(3) GEOGRAPHIC CONDITIONS THAT IMPACT OPERATIONAL COSTS, INCLUDING TERRAIN, MILES OF WATERWAYS AND THE AMOUNT OF FEDERAL AND STATE LANDS EXCLUDED FROM DEVELOPMENT.
(4) CLIMATE CONDITIONS THAT IMPACT OPERATIONS, INCLUDING SEASONAL TEMPERATURE FACTORS, OTHER WEATHER CONDITIONS AND RELATED REGULATORY OPERATIONAL RESTRICTIONS.
(5) AVAILABILITY AND ACCESS TO SUFFICIENT GATHERING,

PROCESSING AND TRANSPORTATION INFRASTRUCTURE WITHIN THE STATE TO ACCESS MARKETS.

(6) HISTORICAL NATURAL GAS MARKET PRICE DIFFERENCES WITHIN THE STATES AND HOW EACH STATE'S PRICES HAVE COMPARED TO THE NEW YORK MERCANTILE EXCHANGE (NYMEX) INDEX PRICE FOR NATURAL GAS OVER THE LAST DECADE.