

West Virginia's Abandoned Well Problems





Ohio River Valley Institute

216 Franklin Street, Suite 400

Johnstown, PA 15901

www.ohiorivervalleyinstitute.org

Author: Ted Boettner

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Overview

For a brief period of time, West Virginia was at the center of an oil and natural gas boom in the early 1900s. While this moment was brief, stretching just a decade or two - it left an indelible mark upon our landscape. It wasn't until the advent of unconventional shale drilling that the state would climb back to being a giant in hydrocarbon production. Along the way, there have been at least 145,000 oil and gas wells drilled in West Virginia. More than a third of these wells were drilled prior to state government oversight, including permitting and proper well plugging. The lack of oversight, standards, and rules has resulted in tens of thousands of unplugged or improperly plugged abandoned wells being unaccounted for in the state.

Unplugged or improperly plugged abandoned wells can pose significant risks to human health, the environment, and coal-mining operations. They can leak harmful chemicals that contaminate the air, water, and soil. Methane, which is a powerful greenhouse gas that contributes to climate change, can also leak from abandoned wells. For landowners, abandoned wells also impede economic development and lower property values.

Over the last several decades, West Virginia's Office of Oil and Gas (OOG) has taken a number of steps to address the state's abandoned well problem. In the 1990s, the OOG worked with the West Virginia Geological and Economic Survey (WVGES) to identify approximately 53,000 abandoned wells in the state. The state also adopted an abandoned well classification system based on their risk to the environment and people to prioritize which wells to plug first. More recently, the state has diverted severance tax revenue to plug more abandoned wells.

Despite these efforts, the number of abandoned wells in the state continues to grow. A 2012 performance audit concluded that OOG is "not forcing operators to comply with statutory requirements regarding abandoned oil and gas wells, which is causing the number of abandoned wells in the state to grow." The audit found that "abandoned wells are typically not inspected" allowing operators to "evade" enforcement. While financial assurance - bonding - is supposed to incentivize operators to plug their abandoned wells, bonding amounts haven't changed in about 40 years and there is little enforcement of the state's abandoned wells laws that require operators to plug wells if they are inactive for more than a year.

The central aim of this report is to examine the state's history of oil and gas development and regulatory enforcement, in order to examine the problems associated with the lack of

enforcement and compliance regarding abandoned wells. This report uses oil and gas well data collected from annual reports stretching back to 1930 when the Office of Oil and Gas Development was created under the Department of Mines. To the author's knowledge, there is not a published history of the state's oil and gas regulations over the last 150 years. This report is a short attempt to stitch together the evolution of oil and gas regulations and laws, especially as they pertain to abandoned wells in the state.

Section One of the report provides a brief history of the state's oil and gas development since the first commercial well was drilled in 1860 to the present development of unconventional shale drilling. While the exact number of abandoned wells in the state is unknown, **Section Two** uses the best available data from well records to estimate the number of unplugged abandoned wells in the state. This helps elucidate the scale of the abandoned wells that needs to be plugged.

Section Three describes how decommissioning West Virginia's backlog of wells can support job and revenue growth throughout the state. New well-plugging jobs can help reverse declining employment trends in the upstream oil and gas industry since the height of the shale gas boom.

Section Four provides a brief overview of state oil and gas regulations from 1891 to the present, with particular emphasis on laws and regulations as they relate to abandoned wells. The last section, **Section Five**, will explore the enforcement problems that inhibit the state from addressing the state's abandoned well problem. The conclusion will make recommendations for how the state can stem the tide of abandoned wells and implement a long-term program that will not only clean up thousands of abandoned wells but also boost the state's economy.

Well Status Definitions in West Virginia

- **Active Well:** Any well producing oil and gas in commercial quantities or being used for underground injection or storage of hydrocarbons
- **Abandoned Well:** Any well completed as a dry hole or not in use for a period of 12 consecutive months that does not have a bona fide future use.
 - **Orphaned Well:** An abandoned well with no known operator or an insolvent operator that is the responsibility of the state to plug.

- **Future Use Well:** Any inactive well that has established a bona fide future use for the well approved by the Office of Oil and Gas.

Key Findings & Recommendations

1. The Office of Oil and Gas lists approximately 16,000 abandoned wells, including about 4,500 orphaned wells (unknown or insolvent operator). However, there are over 50,000 unplugged abandoned wells in the state. This is largely because the state did not require permitting for well drilling and plugging until 1929 and there has been little oversight or enforcement of abandoned wells.
2. Bonding amounts for conventional (vertical) wells have not been increased in over 40 years (1983) and only comprise a fraction of the cost to plug one well. Since bonds are rarely forfeited, usually only when an operator becomes insolvent, bonding does little to incentivize plugging of abandoned wells.
3. The frequency of well inspections, including abandoned well inspections, is lower today than it was in the 1990s. The number of violations issued per inspection is about 1%, compared to 22% in the state of Pennsylvania, reflecting poor enforcement and a lack of inspectors and oversight.
4. The number of abandoned wells has not declined since a 2012 audit revealed that the Office of Oil and Gas was not requiring operators to decommission their abandoned wells. In fact, over the last 10 years, about 6,000 wells have not produced oil and gas or been repurposed since 2022 indicating the lack of enforcement of state regulation requirements.
5. Instead of enforcing the state's requirement that all wells be plugged or reactivated after 12 months of no production, the state has used consent agreements with operators to address their abandoned wells. Between 2013 and 2024, operators agreed to address over 4,500 abandoned wells. While it is unclear how many of these wells have been plugged (or reactivated, as some consent orders allow), only about 3,400 wells were plugged in the state over this time, with 30% being plugged by coal companies and the Office of Oil and Gas.
6. Remaining funding from the Infrastructure Investment and Jobs Act could decommission 1,393 orphaned wells through 2031, supporting an estimated 810 total job-years. If West Virginia pursued a new program to decommission an additional

4,000 orphaned wells from 2032 to 2041, it is estimated that it would create over 2,000 job-years or 207 jobs per year over the ten year period.

7. To address the state's past, present and future abandoned wells, state policy makers will need to ensure operators pre-fund the decommissioning of their wells and there will need to be a production fee to address many of the low-producing and inactive and abandoned wells across the state.



West Virginia & Regional History Center

I. A Brief History of West Virginia Oil and Gas Development

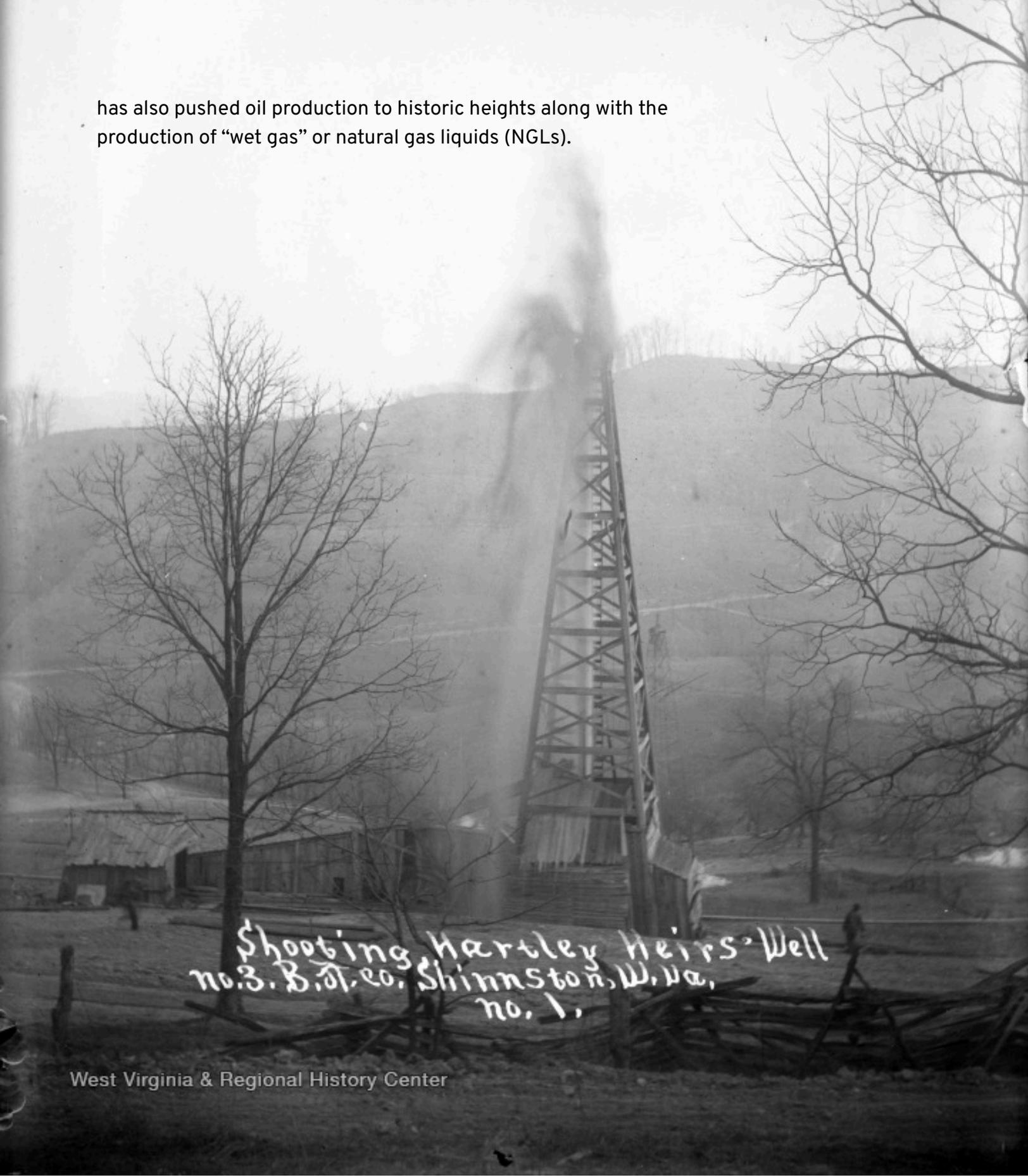
West Virginia has a long history of oil and gas drilling, dating back to 1860 when the first large commercial oil well, the Rathbone Well, was drilled in Burning Springs, West Virginia, in Wirt County.¹ This was less than a year after the Drake Well, the nation's first successful commercial oil well drilled near Titusville, Pennsylvania, in 1859. The oil and gas industry in West Virginia began as an outgrowth of the state's salt industry in the Kanawha Valley, where saltmakers would frequently strike oil and gas deposits while drilling for brine.

The oil and gas fields of West Virginia are primarily located in the northwestern half of the state, stretching along the Ohio River Valley and Allegheny Plateau. While the Volcano oil field in Wood County was the state's first area of active drilling in 1860, producing oil from shallow wells, it wasn't until the 1890s that a short, but intense, oil boom took off in West Virginia.² For example, the town of Sistersville in Tyler County became "the nation's premier oilfield boomtown" growing from 300 inhabitants to 15,000 oil people, including drillers and speculators."³ The oil industry also fueled massive growth in Parkersburg, Mannington, and Clarksburg, with Standard Oil dominating production, as the landscape as farmland and forests were cleared to make way for hundreds of wooden oil derricks.

In 1900, oil production peaked at 16.2 million barrels of oil, surpassing Pennsylvania and making up about 25% of the nation's oil production (Figure 1).⁴ The state's oil boom was short lived, however, as production stagnated and then declined markedly by the 1910s, dropping to less than 1% of total US production by 1925. The state's natural gas industry began to boom as the state's oil production declined amidst a shift of production from the Appalachian Basin to oilfields in the Western US. West Virginia was the nation's largest natural gas producer from the early 1900s to the mid 1920s, but by the 1930s, the state produced less than 5% of the nation's natural gas.

From the early 1930s to the first decade of the 2000s, West Virginia was only a minor player in the oil and gas industry, producing less than 1% of total US natural gas and oil production in 2000. This would change, however, with the advent of unconventional or horizontal drilling and hydraulic fracturing deep into the Marcellus shale formation. The "shale boom" that began in the early 2010s would catapult the state to once again be a national leader in natural gas production, ranking 6th highest in the nation in 2024 (Figure 1). The shale boom

has also pushed oil production to historic heights along with the production of “wet gas” or natural gas liquids (NGLs).

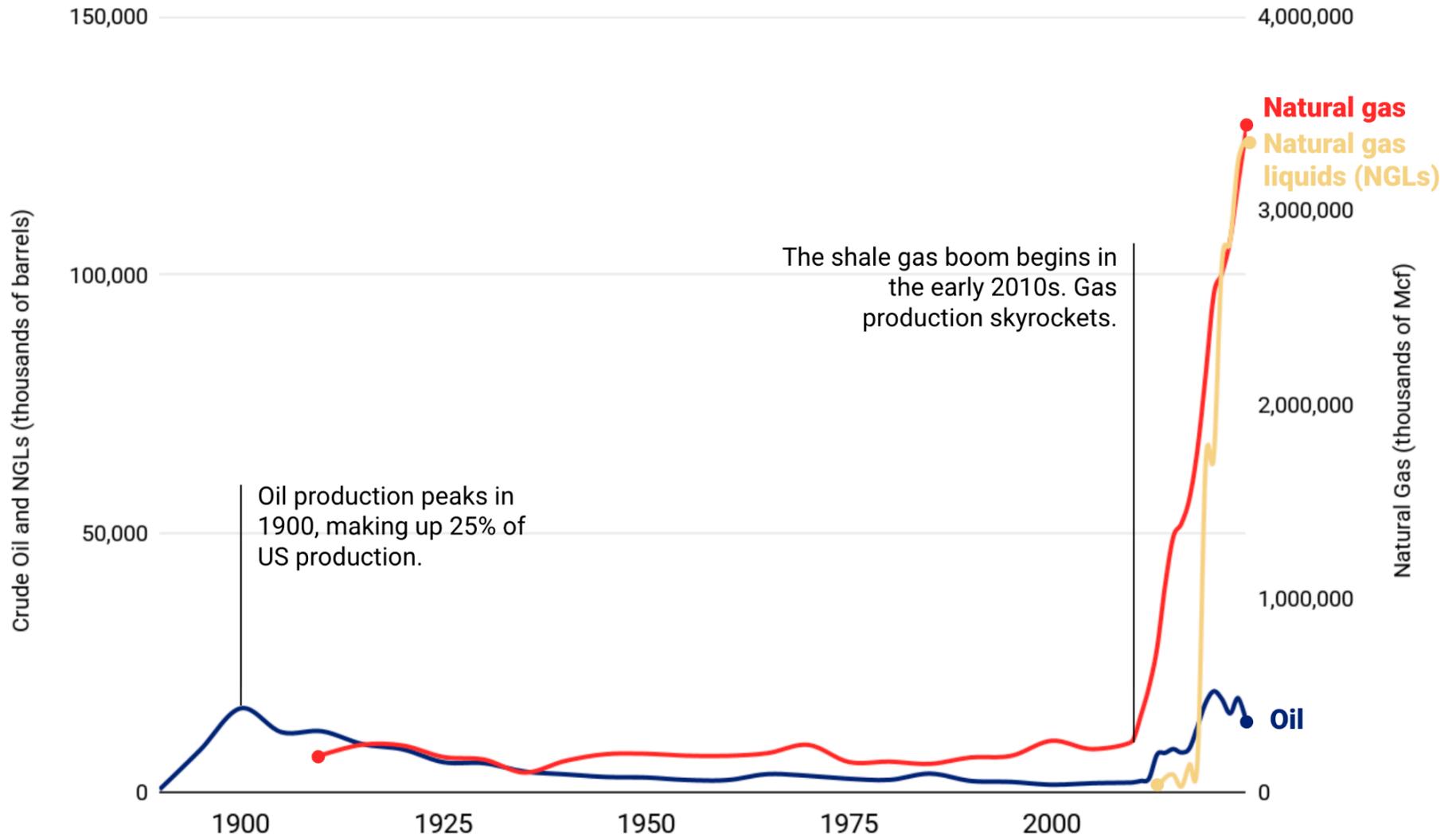


Shooting Hartley Heirs' Well
no. 3. B. & T. Co. Shinnston, W. Va.,
no. 1.

West Virginia & Regional History Center

Figure 1: A history of oil and gas production in West Virginia

Crude oil and natural gas liquids production (Mbbbl) and natural gas production (MMcf), 1890-2024



Source: Arnold and Kemnitzer (1931), West Virginia Blue Books (1930-1981), WV Geological and Economic Survey, and U.S. Energy Information Administration.

According to the West Virginia Geological & Economic Survey (WVGES), there have been “more than 145,000 oil and gas wells drilled in West Virginia over the past 150 years.”⁵ Figure 2 on the following page shows the number of wells drilled from 1876 to 2025 using historical data. Drilling peaked in the state in 1900 at around 3,000 wells per year during the height of the oil boom, increasing again following the 1979 energy crisis that was driven by high oil prices only to crash by the late 1980s. As noted above, the shale boom that began in 2010 precipitated a huge growth in high-volume horizontal hydraulic fracturing shale wells.

The growth in natural gas production from these shale wells has led to massive increases in productivity. In 2001, the industry produced 47 million cubic feet of natural gas per oil and gas worker in West Virginia. Today, one worker produces nearly 693 million cubic feet of natural gas, a 15 fold increase in productivity.⁶ Unlike the previous oil boom in the late 1890s that resulted in over 12,000 new wells being drilled, the shale boom has only resulted in about 4,000 horizontal unconventional wells.⁷

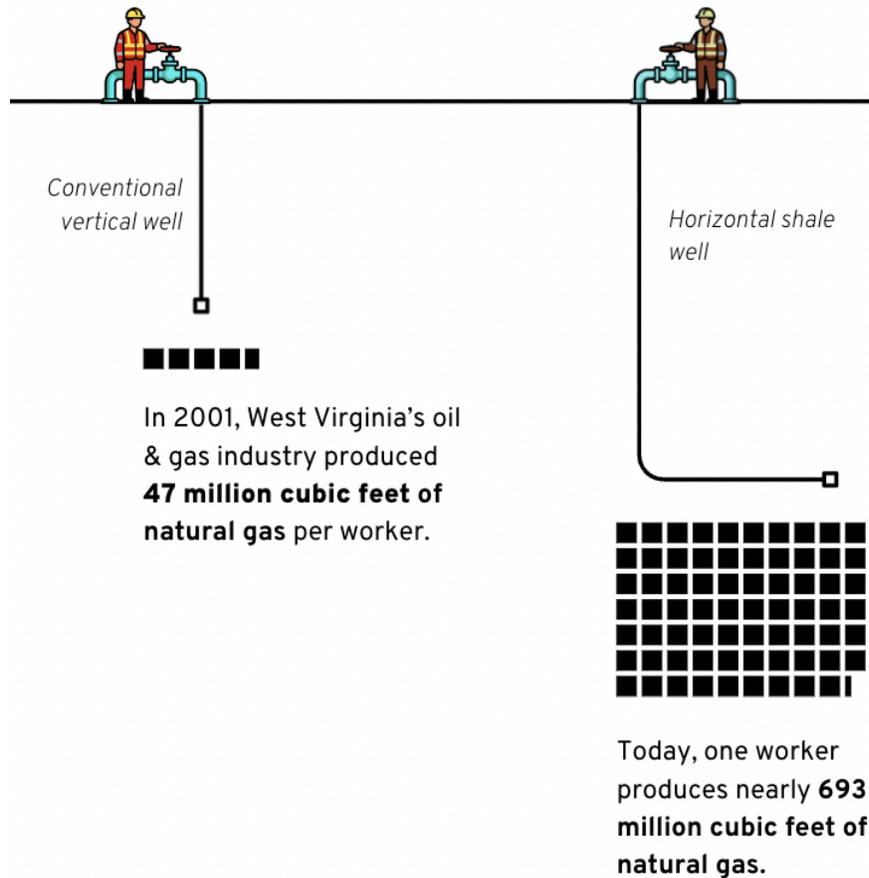
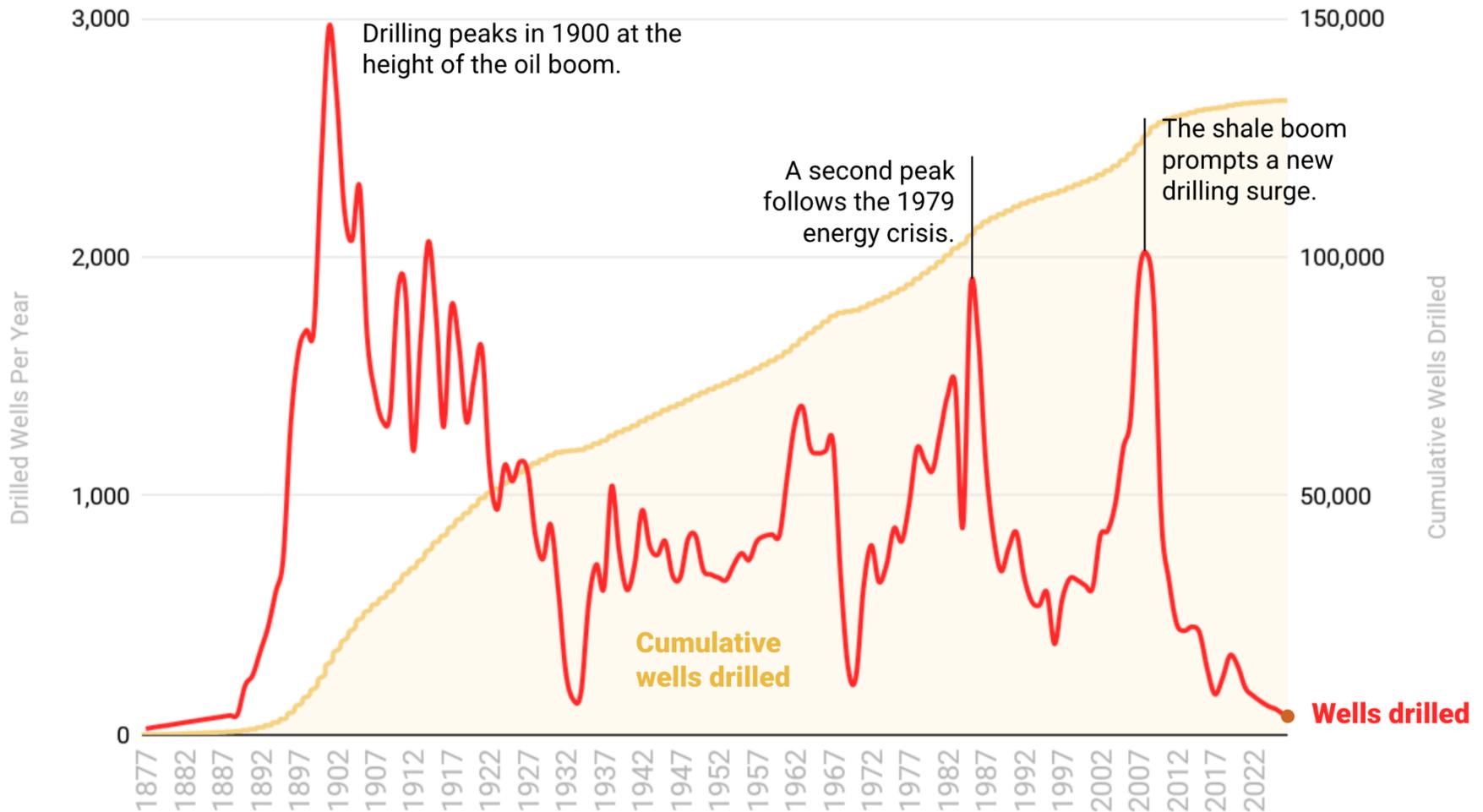


Figure 2: The peaks and valleys of well drilling in West Virginia
Historic Oil and Gas Wells Drilled in West Virginia, 1875-2025



Source: Arnold and Kemnitzer (1931) from 1875 to 1929. Data for wells drilled from 1930 to 1986 are from WV Department of Mines, Office of Oil and Gas, Annual Reports, WV Geological and Economic Survey, The American Institute of Mining, Metallurgical, and Petroleum Engineers, and American Association for Petroleum Geologists. Data from 1987 to 2025 is from the WV Department of Environmental Protection and the Center for Asset Retirement Accountability's Upstream Energy platform.

II. Abandoned Well Regulation in West Virginia

West Virginia's laws on abandoned wells have evolved significantly over the last 130 years. The state has required operators to plug abandoned wells since 1891, but the plugging methods and materials used were largely inadequate and there was little enforcement and no requirements to clean up well sites.⁸ Actions against operators that didn't plug abandoned wells happened at the local level, if at all. It wasn't until 1929 that the state required permits for drilling and plugging wells and established regulatory oversight within the WV Department of Mines. State plugging methods improved in the 1930s but it wasn't until the early 1960s that hydraulic cement plugs were required and the state provided detailed instructions for plugging abandoned wells. Unlike brush or rock, hydraulic cement provides a seal that can stop the flow of hydrocarbons into groundwater aquifers or coal seams.

By the late 1960s, the state established a reclamation fee to fund the plugging of abandoned wells - most of which were abandoned by operators that were insolvent or unknown - and also formalized a more comprehensive approach to well plugging that included multiple cement plugs to seal wells and a "work order" detailing how operators planned to plug wells. The state also more clearly defined an abandoned well at this time, presuming that a well not in use for 12 months is abandoned.

In the 1970s, the state adopted reclamation requirements for well sites and by the end of the decade required operators to submit annual production reports. Bonding amounts increased in 1983, and have largely remained the same. It wasn't until the 1990s that the threat of abandoned wells came in stark relief to policymakers. With passage of the Abandoned Well Act in 1992, the state discovered that there were over 53,000 abandoned wells in the state, thousands of which were contaminating groundwater supplies. The state developed a classification system to prioritize which wells to plug first.

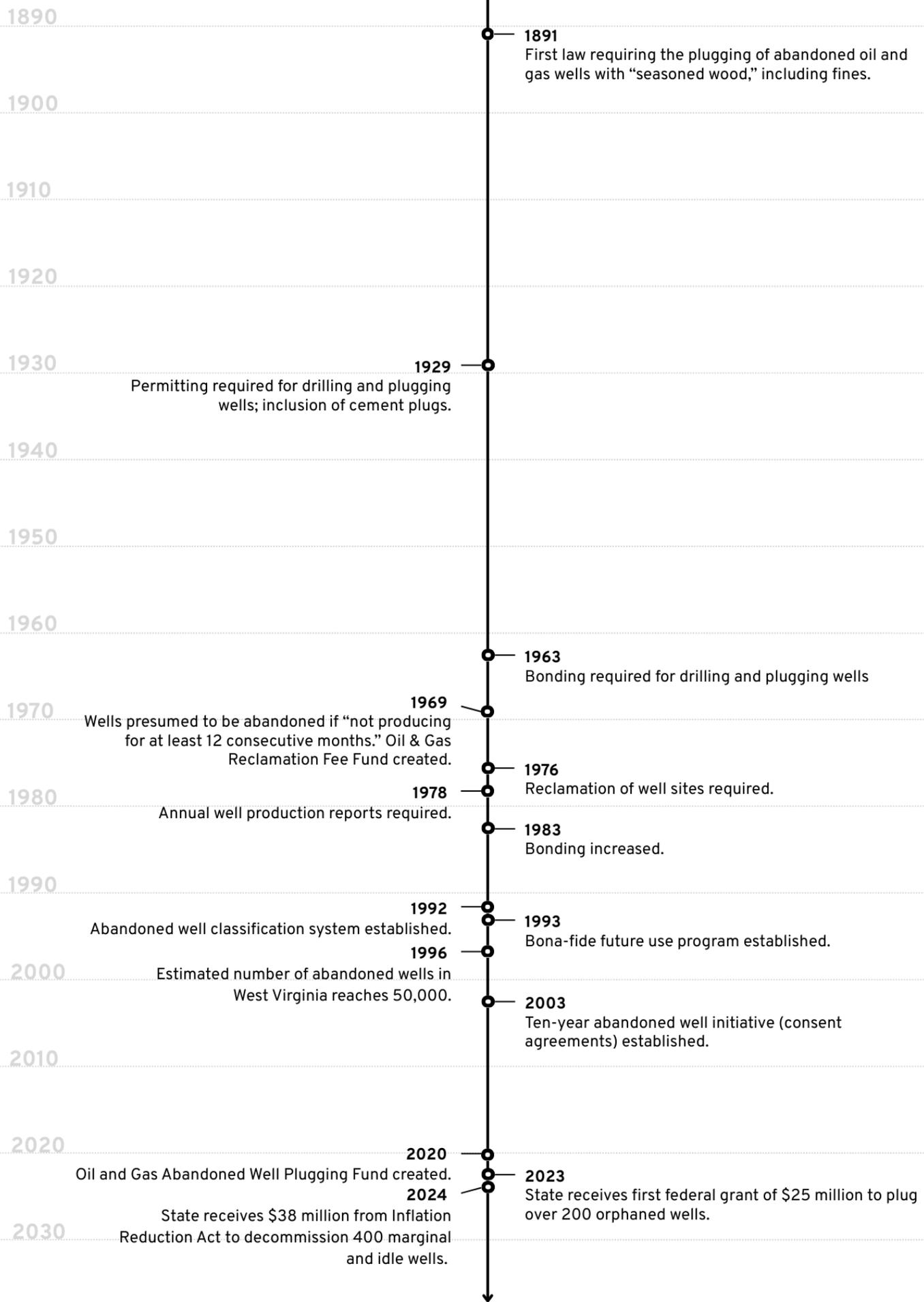
With little funding to plug or inspect abandoned wells, the state began entering into consent agreements with operators to plug their abandoned wells beginning in the early 2000s. A 2012 performance audit found that the state wasn't enforcing its abandoned well laws that require operators to plug abandoned wells or prove there is a bona fide future use for such wells. In response, the Office of Oil and Gas said they needed more funding to hire inspectors and staff to enforce abandoned well laws. Legislation passed in 2023 providing additional

funds for the Office of Oil and Gas to hire more staff and inspectors. There are now about 20 inspectors, compared to just 10 several years prior.

The state has also been able to allocate additional funding for abandoned well cleanup by diverting oil and gas severance taxes to a new abandoned well plugging fund while establishing a new oversight fee on higher producing wells to fund the state Oil and Gas Reclamation Fund. The state is also taking advantage of federal funds to decommission orphaned, low-producing, and idle wells.



See the following page for a timeline of abandoned well regulation in West Virginia.



Early Regulation

The first law regulating the oil and gas industry in West Virginia was enacted in 1891. The 1891 Act was for “Preventing the wasting of natural gas and providing for plugging abandoned gas or oil wells.”² The legislation required operators to plug wells by filling them “with sand and rock sediment” and to “drive a round, seasoned, wooden plug” of three feet into the well. The 1891 Act also made failing to plug an abandoned well a misdemeanor offense that included a \$200 fine (\$7,100 in 2026 dollars), although there was no clear statutory definition of abandoned well.

In 1897, the state amended this act to lessen waste from natural gas and to establish a timeframe for plugging abandoned wells. This included requiring well owners and operators to plug wells within 20 days upon receiving a notice to plug and that other operators of adjacent lands can plug abandoned wells and be paid by the abandoned well owner.¹⁰ While these new regulations required the plugging of abandoned wells, they “were mildly enforced and ineffective.”¹¹ This is because there were no oil and gas inspectors or regulatory enforcement of abandoned wells within the state government. The materials and plugging methods prescribed at this time were also inadequate to properly seal the abandoned wells from leaking. It was not until 30 years later that the state would begin to properly account for wells drilled and establish a regulatory regime to enforce the state’s abandoned well laws.

1929 to late 1970s

In 1929, the state repealed its previous laws on oil and gas and established regulatory oversight within the Department of Mines, which was created in 1905.¹² The laws enacted in 1929 centered on regulating and permitting drilling and plugging of oil and gas wells that penetrated workable coal seams or coal that is commercially viable for mining.¹³ This is because wells drilled into coal seams could jeopardize coal production and threaten the life of coal miners through the release of gas and water into mines. The 1929 legislation was also enacted to address the astonishing amount of natural gas that was being wasted from unplugged abandoned and producing oil wells.¹⁴ The new laws also maintained that all abandoned wells were to be plugged.

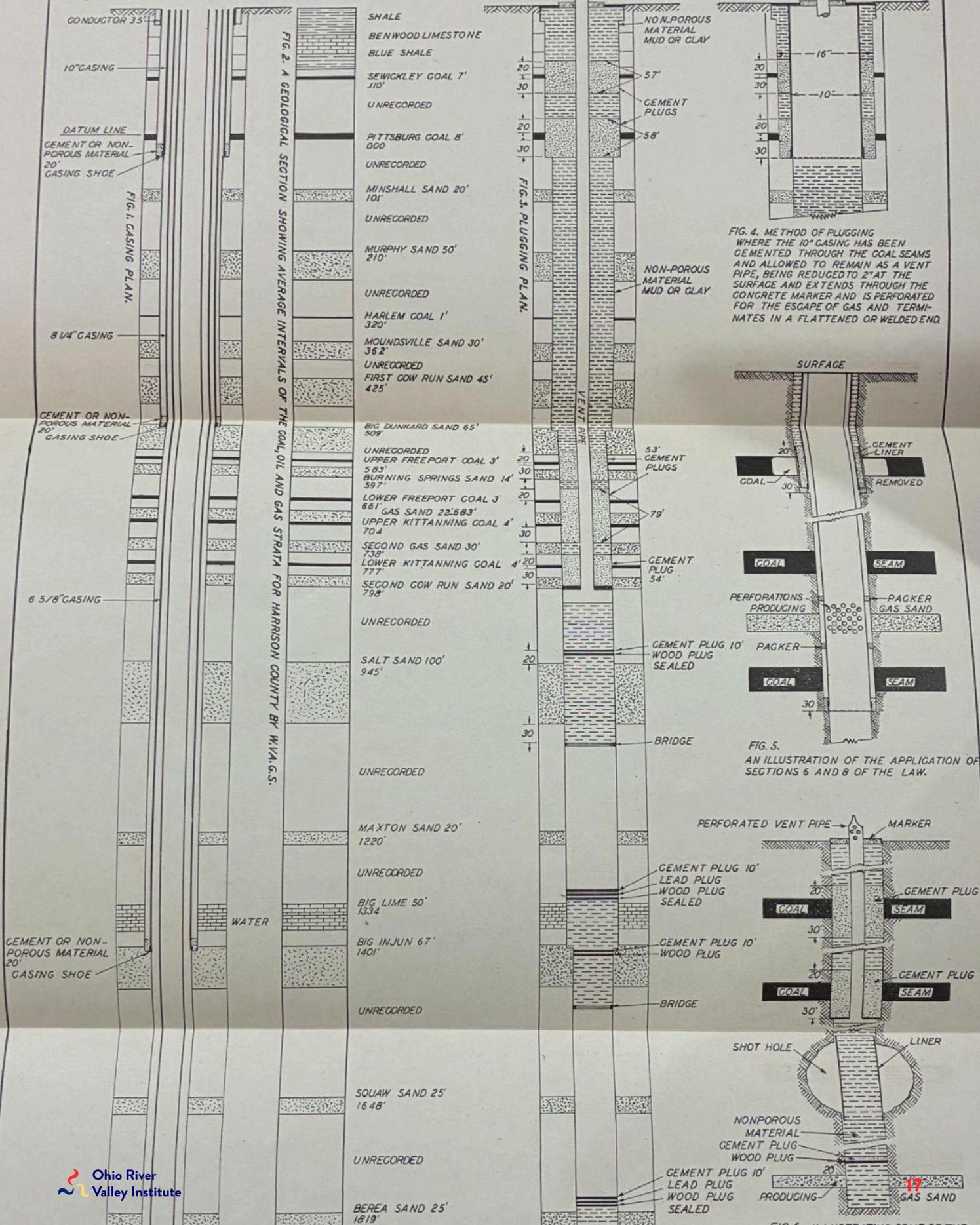
The 1929 legislation required oil and gas operators to provide “plats,” or maps, of drilling locations near coal mines to affected coal operators and to obtain a drilling permit from the West Virginia Department of Mines for all wells. Operators were also required to notify coal operators and the Department of Mines prior to plugging wells and were required to follow specific methods to plug wells using “cement” or “other suitable materials” along specific

intervals of strata, such as reservoir zones, coal seams, and water zones, to seal the well (See the diagram on the following page). It is unclear whether the use of cement plugs were a requirement for plugging wells since the statute left open the door for other materials.

The 1929 law also increased penalties for failing to follow these regulations, from \$200 to \$2,000 and up to 12 months in prison if found guilty for failing to plug an abandoned well. In 1931, the newly created Oil and Gas Division within the Department of Mines issued the first rules and regulations governing the plugging of oil and gas wells.¹⁵ These rules specified that “all dry and abandoned wells shall be plugged” and that all plugging “shall be done in a manner as to prevent any migration of oil, gas or water to any strata than that in which they occur.” Operators were required to submit a plugging permit (notice of intent to plug) and a “work order” that detailed the manner in which the wells were to be plugged and to give notice and copies of the work order to coal and property owners. Upon plugging the wells, a permanent marker or monument had to be erected over the location that included the company and well number. The rules also provided a schematic for plugging abandoned wells.

WEST VIRGINIA DEPARTMENT OF MINES
OIL AND GAS DIVISION.

PLANS ILLUSTRATING THE APPLICATION OF THE OIL AND GAS LAW, RULES AND REGULATIONS TO THE CONDITIONS HERE GIVEN AS TO THE CASING OF OIL OR GAS WELLS AND TO THE PLUGGING AND FILLING OF ABANDONED WELLS.



The new Oil and Gas Division (OGD) within the Department of Mines grew after the 1930s to include oil and gas field inspectors that covered 8 regions of the state and a “deputy director” of the division. From 1931 to 1960 the number of inspectors grew from 2 to 10 and the number of staff within the OGD increased from 3 to 15 over this period.

In 1963, legislation expanded the Oil and Gas Division to include a deputy director, supervising inspectors, and an inspectors’ examining board to oversee inspections, empowered inspectors, and established a process of enforcement and compliance with judicial review.¹⁶ The 1963 legislation also established bonding requirements for operators prior to drilling wells, which included a bond of \$1,000 for a single well or \$10,000 for a blanket bond covering multiple wells.¹⁷ Regulations adopted in 1964 also required notification for the transfer of wells from one operator to another operator.

As mentioned above, the state plugging standards included the option of using cement for plugging wells in 1929, however it wasn’t until 1953 that the American Petroleum Institute began recommending hydraulic-grade Portland cement for well plugs and casing.¹⁸ Prior to the early 1950s, the cement plugs used were often contaminated with mud and failed to harden into effective seals to protect against leaks, and the cement often lacked sufficient additives for proper cement setting. Rules adopted in 1964 required the use of hydraulic cement for well plugs but the first mention of using hydraulic cements “as recognized by the American Petroleum Institute” wasn’t adopted until 1973 in state regulations.

In 1964 state regulations required all “dry and abandoned wells...to be immediately plugged,” but it wasn’t until 1969 that an abandoned well was “presumed to have been abandoned” if it is “not in use for a period of twelve consecutive months” or if it does not have a “bona fide future use.”¹⁹ It was also during this time that the Oil and Gas Reclamation Fund was created, funded by a \$100 fee for each drilling permit issued and with bonds that have been forfeited.²⁰ The funds were dedicated to “plugging of abandoned (orphaned) wells which have not been plugged or which have been improperly plugged” and to “purchase abandoned wells” if necessary and submit an annual report and contract out these plugging projects on a competitive basis.

Since 1978, the state has been responsible for plugging orphaned wells, which are abandoned wells in which no owner can be found.²¹ The reclamation fee was raised in 2005 to \$150 per drilling permit.²² Reclamation requirements of well sites upon plugging a well were first established in 1976 and largely remain the same today.²³ Operators are required within six months of plugging a well to remove all production and storage structures,

equipment, oil, salt water and debris, fill excavations, grade and terrace well site, and to prevent erosion and sedimentation.

Regulations finalized in 1978 require operators to submit an annual report of oil and gas production of their wells.²⁴ This was the beginning of well production records by the state. In 1985, the Oil and Gas Division was moved into the newly created Department of Energy, after passage of the West Virginia Energy Act.²⁵ Prior to this legislation, bonding amounts were increased from \$2,500 to \$10,000 for a single well from \$15,000 to \$50,000 for multiple wells in 1983.²⁶

1990s to 2010s

In 1991, the West Virginia Division of Environmental Protection (later the Department of Environmental Protection, or WVDEP) was created and took over the regulation of the oil and gas industry.²⁷ Significant changes to the regulation of abandoned wells occurred with the passage of the Abandoned Well Act (AWA) in 1992.²⁸ The legislation found that “plugging requirements for certain older oil and gas and other wells may not have been sufficient to protect the underground water supplies” and that “[m]any wells may exist in West Virginia which are abandoned and either not plugged or not properly plugged in a manner to protect underground water supplies.”²⁹

In response to these findings, the AWA included a \$25,000 fine for operators that failed to plug their abandoned wells if ordered by the WVDEP, and allowed other interested parties to plug and reclaim abandoned wells. The AWA also required the Office of Oil and Gas to maintain a census of abandoned wells in the state and publish a list of abandoned wells at least once every five years. The AWA also stipulated that operators must have bonding on *all* of their wells unless it would result in financial hardship, presumably to include wells drilled before bonding requirements.

Arguably, the most significant change to the regulation of abandoned wells in the AWA was the creation of an abandoned well classification system for prioritizing which wells the WVDEP should plug first—which was based on a well’s threat to the environment. The legislation created three priority classes that are scored based on several factors, including groundwater contamination; leakage of oil, gas, and salt water; distance from public waters or dwellings; age; and other conditional factors. Class 1 wells, which must be plugged first, are abandoned wells with an imminent danger to people and resource development.³⁰ Class 2 wells pose no imminent danger (lower score) but must be plugged and may include all

orphaned wells. Class 3 wells contain wells that pose no risk but are abandoned and that can be deferred for an indefinite period.

In 1990, the Office of Oil and Gas contracted with the WV Geological and Economic Survey (WVGES) to identify the threat posed by abandoned wells.³¹ The WVGES was asked to find the number of unplugged wells that have not produced since 1984 or were not used for other purposes (storage, injection, etc.). In 1995, the WVGES released its study, finding that an estimated 51,000 abandoned wells in the state matched the above criteria and had some documentation. WVGES then randomly sampled 150 of the wells and attempted to locate them and classify them based on the abandoned well classification system included in the AWA.

Among the 150 wells sampled, WVGES found that 45% could not be found (no location), 26% were abandoned, 15% were plugged, 15% were producing, and 2% had a status of unknown. Applying these percentages, the WVGES estimated that nearly 22,950 wells could not be found and 13,260 were abandoned, while the remaining wells were plugged or producing. Most of the 51,000 abandoned wells identified by WVGES were drilled prior to 1929, before the advent of permitting and other regulations, and are “orphaned” wells with unknown or insolvent operators. In 2013, the WVGES estimated there were around 55,000 wells drilled prior to 1929.³²

A 1996 audit of the Abandoned Well Plugging and Reclamation Program in the Office of Oil and Gas found that the program plugged 11 wells per year since 1986, estimating it would take 1,205 years to plug the 13,258 estimated documented abandoned wells in the state based on current rates of plugging.³³ The audit found that abandoned wells “can potentially cause a threat to groundwater contamination and be a possible explosive and fire hazard” and a “hindrance to economic development.”

In 2002, the Office of Oil and Gas launched the “Abandoned Well Initiative” (AWI) where participating operators sign a consent agreement to plug or reactivate a portion of their abandoned wells over ten years, resolving at least 10% each year.³⁴ The authority for these consent agreements was established from legislative rules adopted in 1993 and 1998, after the AWA was enacted, to allow operators to request a “schedule for plugging abandoned wells” for good cause over a period of time.³⁵ The aim of the program was to allow operators with multiple abandoned wells a chance to bring their wells into compliance without the threat of violations and fines. While the AWI is not active today, the state continues to use consent agreements with a similar criteria.

Operators are required to provide a list or exhibit of oil and gas wells to be part of a consent agreement but the wells cannot be part of the 'bona fide future use' program. (While state law has allowed abandoned wells with a bona fide future use to remain unplugged since at least the 1960s, the first administrative rules creating the bona fide future use program for inactive wells was not until 1993.³⁶) Operators are also allowed to transfer wells to other operators upon approval of the Office of Oil and Gas.

According to the Office of Oil and Gas, there were 2,614 wells in the abandoned well initiative.³⁷ It is unclear how many wells have been plugged or reactivated through the AWI since 2003, since no reports have been published.

In 2006, the state lowered bonding amounts for single vertical wells from \$10,000 to \$5,000 but the blanket bond amounts remained at \$50,000.³⁸ On the heels of the shale boom, the state passed the Natural Gas Horizontal Well Act in 2011 that established new bonding amounts for horizontal wells, including \$50,000 for each horizontal well (individual bond) or \$250,000 to cover all wells (blanket bond).³⁹ Any bonds forfeited are directed to the Oil and Gas Reclamation Fund.

In 2012, a state performance review audit of the Office of Oil and Gas found, of the state's estimated 13,000 abandoned wells: 19% were in the AWI program; 44% were owner-operated abandoned wells not in a compliance agreement; and 36% were orphaned wells with no known operator. Most strikingly, the audit concluded that the Office of Oil and Gas was "not requiring operators to plug abandoned wells or prove there is a bona fide future use for such wells" and that "the number of abandoned wells is increasing, and some wells remain abandoned for 10 years or more."⁴⁰ The audit also found that inspections of abandoned wells are "typically not conducted."

The Legislative Auditor recommended in 2012 that the Office of Oil & Gas should enforce its abandoned well rules that require operators to plug their abandoned wells, place the well back into production, enter it into the bona fide future use program, or enter into a long-term compliance agreement. The Office and Oil and Gas responded to the audit citing low staffing levels due to a lack of funding, claiming that they planned to update their database to generate automatic letters to operators out of compliance (e.g., wells with no documented production in the last 12 months).

In 2020, the state created a second fund to plug abandoned wells, the Oil and Gas Abandoned Well Plugging Fund that relies on severance tax revenues instead of fees and bond forfeitures.⁴¹ The new fund is funded by a 2.5% severance tax from low-producing

vertical (conventional) oil and gas wells. The fund received \$6.7 million in severance tax revenue in FY 2024 and spent \$2.8 million plugging 15 abandoned wells.⁴²

In 2023, the state passed legislation that dedicated additional funds from the oil and gas severance tax – not to exceed \$1.2 million per year – to increase the number of field inspectors.⁴³ In addition, this legislation created an annual oversight fee for operators of high- and moderate-producing wells to be placed in the Oil and Gas Reclamation Fund. This included a \$350 fee per well for the first 400 wells owned by operators that produce more than 250 Mcf per day, a \$75 fee per well for the first 400 wells that produce less than 250 Mcf per day but more than 60 Mcf per day, and a \$25 fee per well fee for the first 4,000 wells that produce less than 60 Mcf per day but more than 10 Mcf per day. All other wells were exempt.

Over the last several years, the number of field inspectors has grown from 9 in 2022 to about 20 inspectors in 2026.⁴⁴ Permit fees transferred to the Oil and Gas Reclamation Fund grew from \$123,000 in 2020 to \$1.7 million by 2024, reflecting the new fees on high- and moderate-producing wells.

Federal Action on Well Decommissioning

Recent legislation at the federal level has boosted state efforts to decommission oil and gas wells. The Infrastructure Investment and Jobs Act (IIJA) passed in 2021 included \$4.3 billion in funding for states to decommission orphaned wells. The 2022 Inflation Reduction Act's Methane Emission Reduction Program (MERP) included \$350 million in state formula grants to decommission low-producing marginal conventional wells, which are a large source of methane emissions.⁴⁵

West Virginia received an Initial State Grant from the IIJA of \$25 million which was used by the state to decommission 206 orphaned wells.⁴⁶ The state is eligible for a total of \$212 million in IIJA grants to plug orphaned wells. In 2023, West Virginia was awarded \$37.8 million in MERP grants.⁴⁷ The Office of Oil Gas estimates it will decommission about 400 low-producing and idle wells with these funds.

III. Economic Impact of Well Decommissioning

The decommissioning of oil and gas wells in West Virginia can provide jobs, income, and much needed tax revenues for local communities in parts of the state that are under economic distress. Boosting the number of well plugging jobs could also help employ hundreds of the oil and gas workers who have lost their jobs over the last several years as the drilling boom has subsided. IMPLAN’s 2026 Model for West Virginia, along with contractor payments provided by the WV Office of Oil and Gas, shows that \$1 million in spending on orphaned well decommissioning could support approximately 4.3 total jobs per year. The \$189 million in IIJA grant funds left to be disbursed could create 501 direct job-years and 811 total jobs while decommissioning about 1,400 orphaned wells.

Decommissioning the state’s remaining orphaned well inventory could lead to the creation of over 2,000 job-years, or about 207 jobs per year over a ten-year period.

Economic Impact of Orphaned Well Decommissioning

According to the West Virginia Office of Oil and Gas, the state decommissioned 206 orphaned wells in 2023 and 2024.⁴⁸ Total contract payments over this time period were approximately \$24.8 million. Using IMPLAN’s 2026 Industry Output Model, the \$24.8 million in contracts results in an estimated 107 total job-years associated with well plugging between 2023 and 2024. This includes 66 direct well-plugging job-years, 15 indirect job-years in adjacent industries, and 26 induced jobs in the broader economy from the respending of worker incomes. Total labor income generated was approximately \$9 million and the total impact on state and local tax revenues collected was \$1.7 million.

Table 1: Economic Impact from \$25 million IIJA Initial Grant in West Virginia

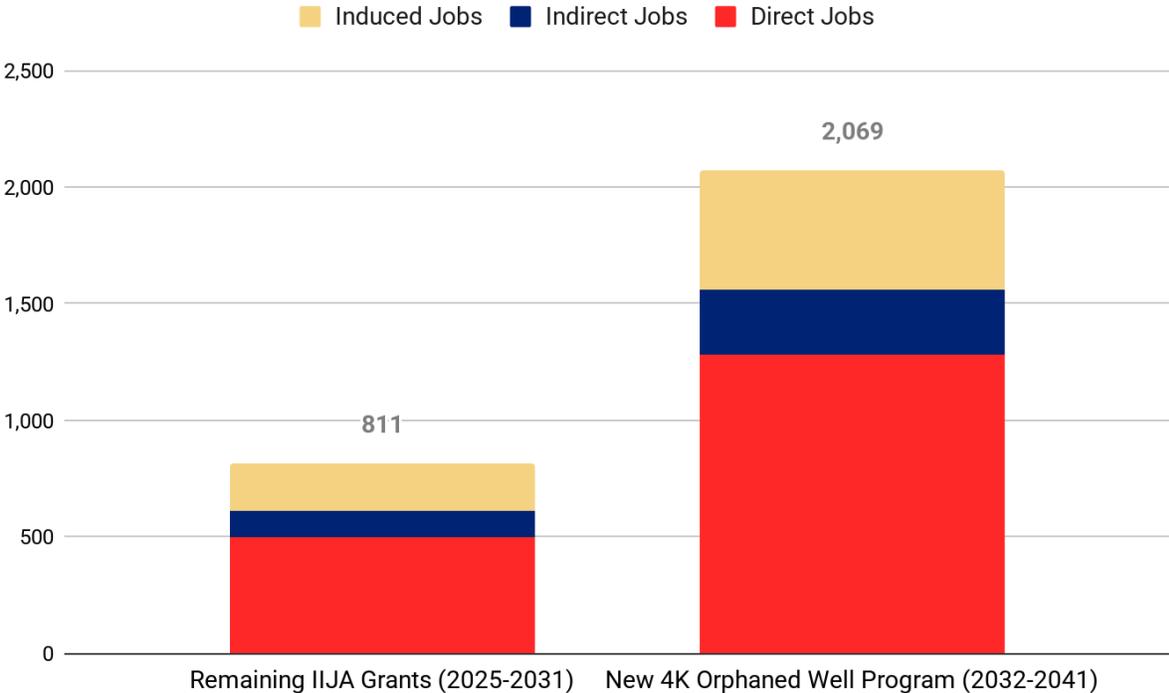
	Contractor Payments (millions)	Wells Plugged	Job-Years				Total Labor Income (millions)	Total State & Local Tax Revenue (millions)
			Direct	Indirect	Induced	Total		
IIJA Initial Grant (\$25 million)	\$24.8	206	66	15	26	107	\$9.0	\$1.7

Source: ORVI analysis of West Virginia Office of Oil and Gas data, IMPLAN Industry Output Model.

Figure 3 below explores the job impact of spending the remaining \$188.6 million in estimated payments to well plugging contractors that could take place between 2025 and 2031. These funds could create an estimated 810 job-years over these seven years, averaging 116 job-years per year. Total direct job-years created are estimated to be 501, or 72 jobs per year. Approximately 1,393 orphaned wells could be decommissioned with the remaining IJJA funds, bringing the total number of orphaned wells decommissioned with federal IJJA funds to nearly 1,600.

Figure 3: Ramping up decommissioning programs could create thousands of additional jobs.

Job-years from orphaned well decommissioning in West Virginia



Source: ORVI analysis of WVDEP Office of Oil and Gas data, IMPLAN.

Note: Job-year multipliers captured for the IJJA Initial Grant analysis were applied to estimate job-years for the above two scenarios. For the \$188.6 million remaining IJJA grants funds, it is assumed that plugging costs increase 3% per year from 2024 to 2031. For the New 4k Orphaned Well Program, the jobs per well decommissioned captured in the IJJA Initial Grant funds expended in 2023 and 2024 were used: 0.32 direct job-years, 0.07 indirect job-years, and 0.13 induced job-years for every orphaned well plugged.

As discussed earlier, the WVDEP Oil and Gas database lists about 4,500 abandoned wells that are orphaned, with no known operator. However, the OOG has also listed that the state has approximately 6,000 orphaned wells, which includes wells with known operators that are likely insolvent.⁴⁹ If West Virginia pursued a new program to decommission an additional 4,000 orphaned wells from 2032 to 2041, it is estimated that it could create over 2,000

direct, indirect, and induced job-years, or 207 total jobs per year, over the ten year period. Total direct job-years are estimated to be 1,279, or about 128 jobs per year.

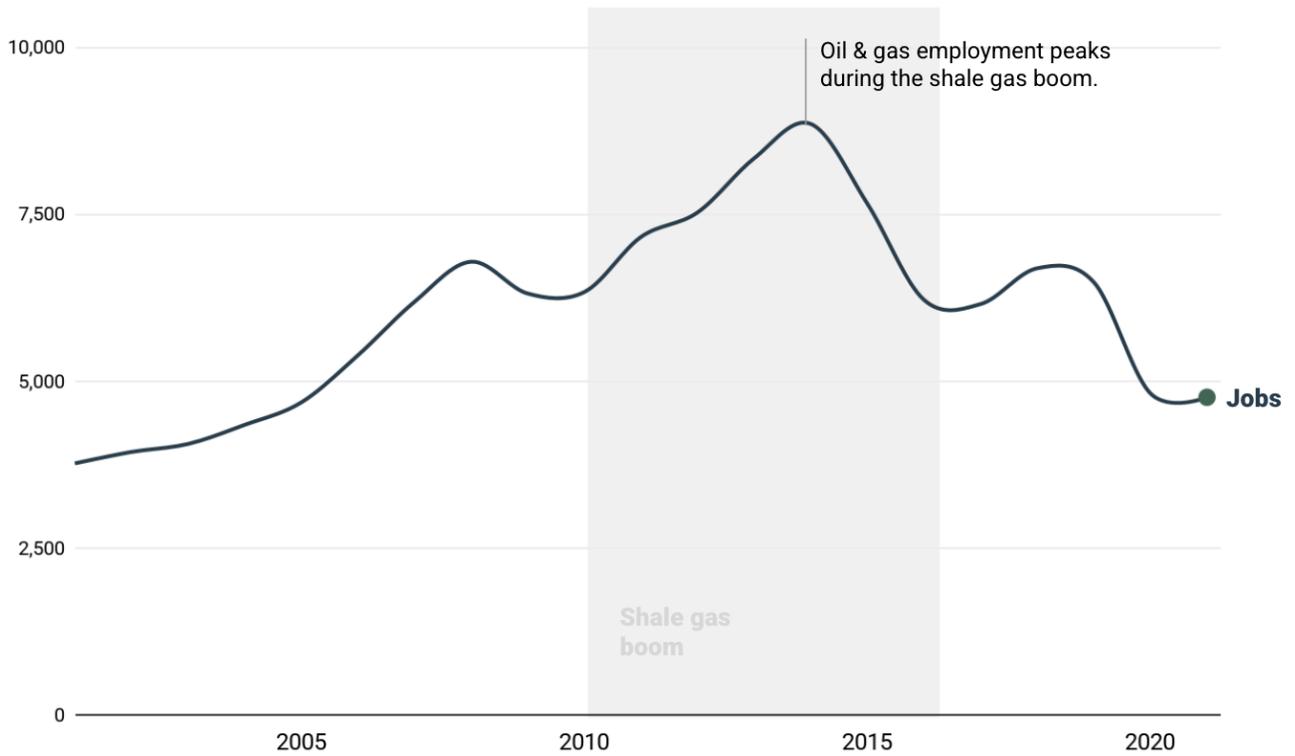
Putting Job Creation into Context with Declining Oil and Gas Jobs

To put the above job creation in context, Figure 4 below shows the levels of employment in the upstream oil and gas sector in West Virginia over the last two decades. Total upstream oil and gas sector employment stood at 4,931 in 2024. The additional jobs from the remaining IIJA funds would boost employment in the upstream oil and gas sector by 2.4%, assuming the funds are expended over the next seven years. Including the new program to decommission 4,000 orphaned wells over ten years, would add 4.2% to 2024 upstream oil and gas sector employment.

This boost in employment is badly needed. As noted previously, the large gains in productivity in the oil and gas industry have led to fewer workers as the industry has shifted from conventional to unconventional production. Employment in the upstream oil and gas industry has declined sharply since the shale drilling boom from 2010 to 2016. In fact, there are fewer workers in the upstream oil and gas industry today than before the shale boom. As Figure 4 shows, total upstream oil and gas employment in the state declined by 44% or 3,950 jobs since its height in 2014. Total upstream oil and gas employment in 2024 was just 4,931, compared to nearly 6,708 in 2008.

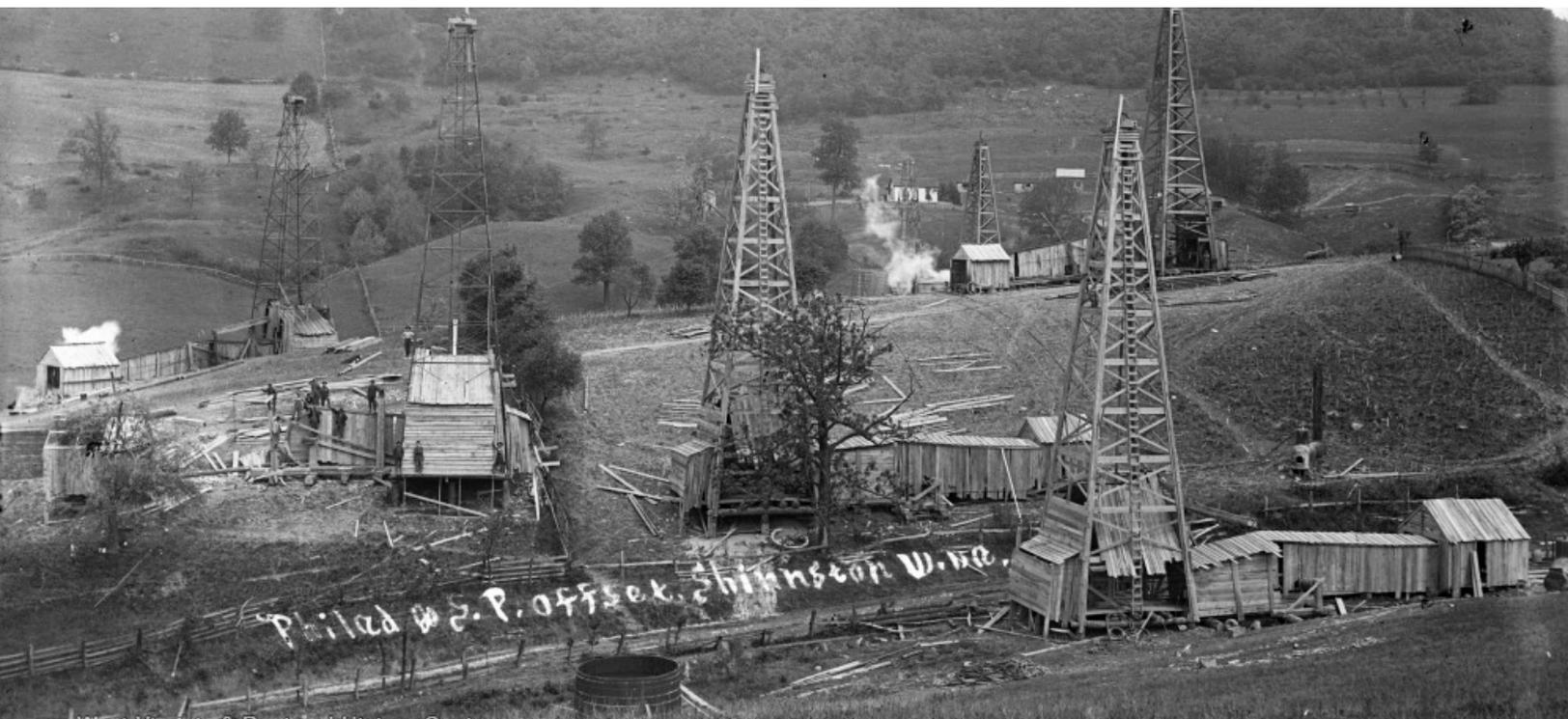
While a portion of the employment growth from 2010 to 2016 was transient workers who moved to the region to complete shale development, there is likely still a sizable portion of workers who are now in other industries or unemployed.⁵⁰ This means there is a pool of workers who could potentially work in well decommissioning.

Figure 4: Upstream oil and gas employment has fallen since the shale gas boom.
Oil and gas extraction, drilling, and support operations employment in West Virginia, 2000-2024



Source: US Bureau of Labor Statistics, Quarterly Census of Wages and Employment.

Note: Upstream oil and gas employment includes NAICS codes 211 (Oil and Gas Extraction), 213111 (Drilling Oil and Gas Wells), and 213112 (Support Activities for Oil and Gas Operations). Between 2003 and 2014, NAICS 213111 employment levels were not disclosed so the author estimated employment from total employment in NAICS 213 (Support Activities for Mining).



IV. Unplugged Abandoned Wells in West Virginia

The number of unplugged abandoned oil and gas wells in West Virginia is not known, but it is likely there are at least between 49,000 and 61,000. The uncertainty is largely because there are not many records for wells drilled or abandoned prior to the advent of permitting in West Virginia, which began in 1929. A 1931 survey by Ralph Arnold and William Kitzmiller found records for 58,478 oil and gas wells drilled in West Virginia between 1860 and 1929, including 19,321 that were abandoned over this time. I.C. White, the state's first geologist, estimated in 1917 that between 60,000 and 70,000 oil and gas wells were drilled in West Virginia between 1860 and 1915.⁵¹

The US Bureau of Mines reported in 1963 that “more than 81,973 wells were drilled” in West Virginia between 1860 and 1960.⁵² A recent study by scholars at Princeton University and McGill University estimated that there were at least 63,000 unplugged abandoned wells in the state in 2016.⁵³ After conducting a five-year study in the 1990s, the WVGES estimated there were about 51,000 abandoned wells in the state in 1996.⁵⁴

Table 2 below shows estimates for the number of unplugged abandoned wells in West Virginia according to four different sources. There are an estimated 133,000 drilled wells with some documentation in the state. Approximately 25,600 wells have been plugged with approximately 4,240 plugged prior to 1952 when API plugging cement standards were issued, according to the OOG. There are approximately 58,200 active wells, according to the OOG. This leaves about 50,000 unplugged abandoned wells in the state. Using the higher figure provided by the WVGES of “at least 145,000 drilled wells” means there could be 62,000 unplugged abandoned wells in the state.

Scholars have noted there may be a large underestimation of wells drilled in Appalachia since drilling records often excluded enhanced recovery (ER) injection wells drilled from 1860 to the late 1940s. These ER wells were used for “waterflooding” to increase the flow of oil to producing wells during that time. The 1963 Bureau of Mines report mentioned above found that waterflooding first began in West Virginia in 1937 while the use of gas injection wells were also prominent in many of the oil fields during this time. A 2016 study in Pennsylvania estimated that at least 2 ER wells were drilled for every oil well in the state.⁵⁵

Table 2: Estimation of the Number of Abandoned Wells in West Virginia

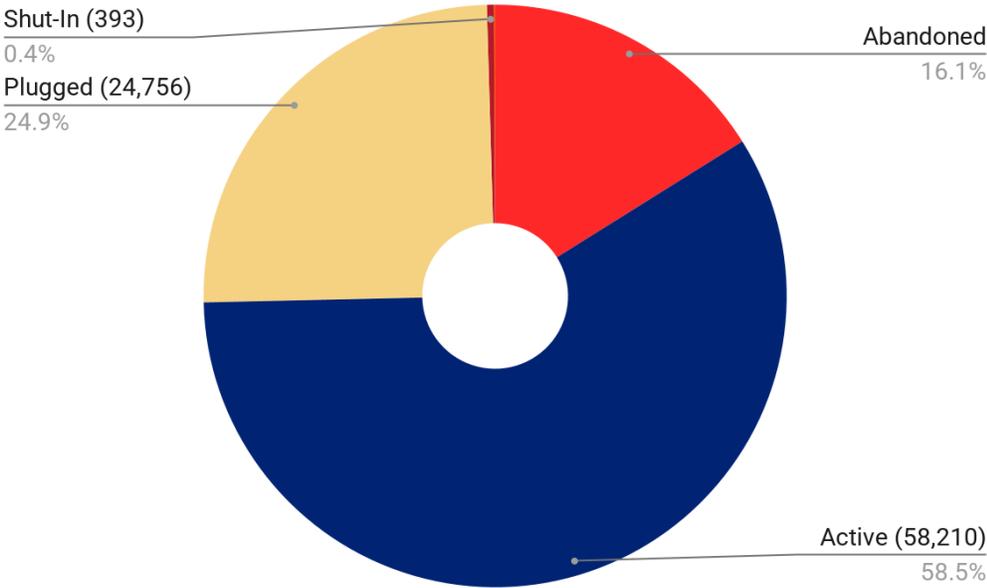
Sources	Years	Documented Drilled Wells
Arnold and Kemnitzer (1931)	1875-1929	58,478
WV Department of Mines/WVGES/AAPG* (1930-1986)	1930-1986	48,948
Upstream Energy Platform (2026)	1987-2021	24,922
WV DEP Oil and Gas Database (2026)	2022-2025	452
Total Drilled Wells		132,800
Plugged Wells		24,756
Active Wells		58,210
Unplugged Abandoned Oil and Gas Wells		49,834

The West Virginia Department of Environmental Protection’s oil and gas well database contains about 16,000 unplugged abandoned wells, including about 4,500 that have an unknown operator that are orphaned (Figure 5). There are approximately 34,000 abandoned wells not included in the WVDEP’s database. Most of these wells are included in the database of the WVGES, but many do not have approximate locations and are missing completion dates. The WVDEP has never attempted to locate the thousands of abandoned wells included in the WVGES database. The Upstream database, which includes well data from the WVGES, lists over 13,500 oil and gas wells that have an “unknown” status but contain well information that suggests they have been drilled and are unplugged.⁵⁶



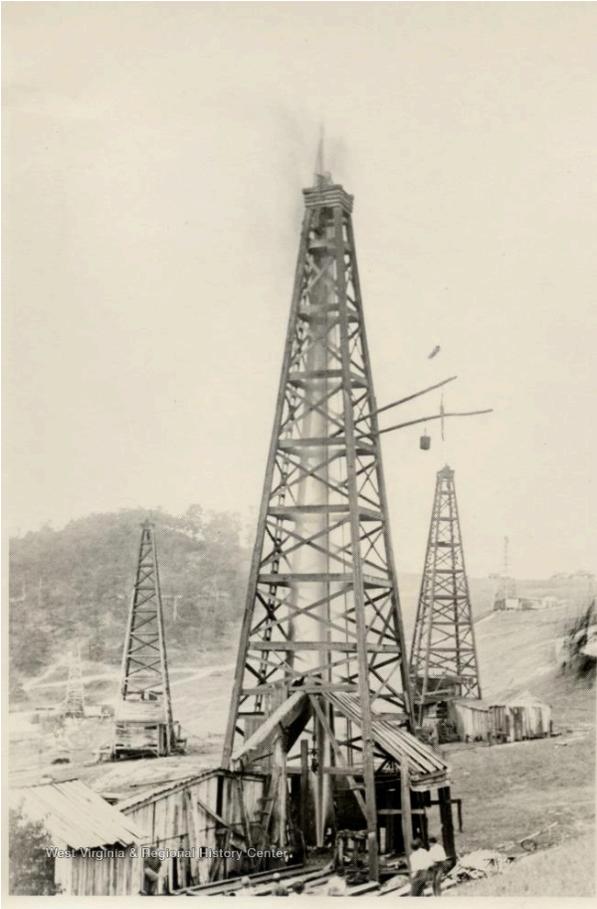
Figure 5: West Virginia’s regulatory database contains about 16,000 unplugged abandoned wells.

Oil and Gas Wells by Well Status in West Virginia



Source: WVDEP TAGIS database.

Note: This data does not include wells with a status of Never Drilled, Never Issued, Permit Application, Permitted Issues, Plugged, Duplicate APIs, and Under Construction



V. Abandoned Well Enforcement Problems

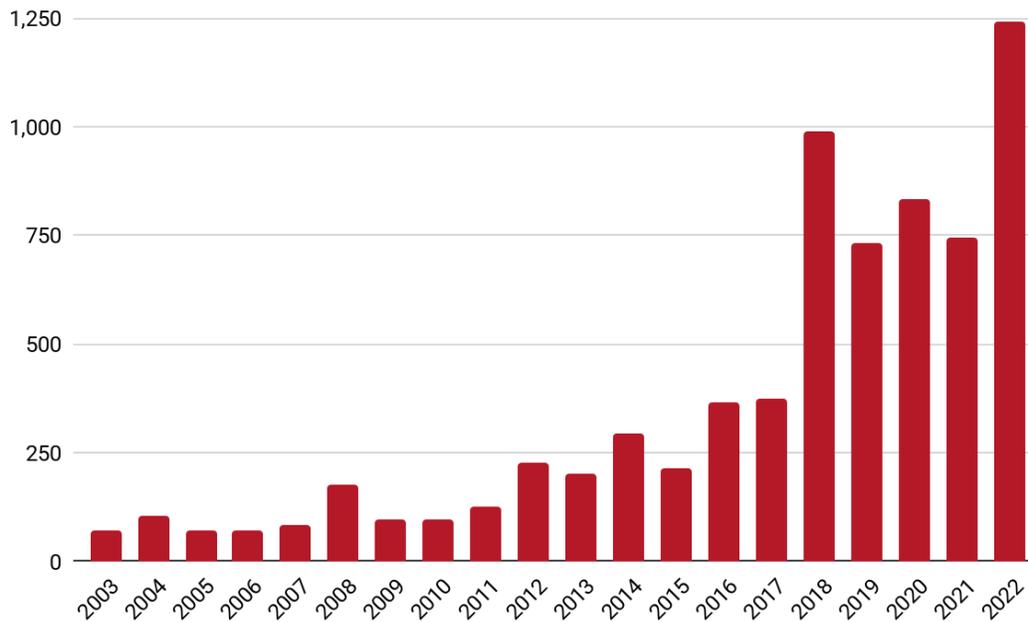
As noted previously, state law requires wells that have not been active – either used for storage, injection, monitoring, disposal, or brine – or producing over the last 12 months, or part of the bona fide future use program, to be immediately decommissioned by operators. The state lists approximately 16,000 wells that meet these criteria and are presumed to be abandoned. Approximately 4,500 of these wells are orphaned, with an unknown or insolvent operator. This leaves 11,400 owner-operated abandoned wells in the state that are likely in violation of the state’s abandoned well laws unless they are part of a long-term consent agreement.

There are several reasons why the Office of Oil and Gas is not enforcing the immediate decommissioning of owner-operator abandoned wells in the state. This includes lax regulatory enforcement, which may be the result of deficient staffing resources such as not enough field inspectors, and an unwillingness to hold operators accountable. The large number of unplugged abandoned wells is also the result of an inadequate financial assurance or bonding system that fails to incentivize well decommissioning. With little enforcement, it is much less expensive for well operators to pay a small bonding premium of a few thousand dollars per year than to spend millions of dollars decommissioning their wells. This is especially true if that state lacks the resources to pursue enforcement action.

Figure 6 below shows the number of unplugged abandoned wells according to the last year of production over a 20-year period. This only includes abandoned wells with production data and with a last year of production between 2003 and 2022. As the data indicates, the number of unplugged abandoned wells has grown significantly over the last two decades. Over the last 10 years, about 6,000 wells that were out of production longer than two years were abandoned. If the OOG was properly enforcing abandoned wells laws, and if the bonding system reflected actual decommissioning costs, the number of unplugged inactive wells should be decreasing. While many of the unplugged abandoned wells are relics of the past, it is clear that current regulators and operators are no more enlightened than their predecessors.

Figure 6: The number of unplugged abandoned wells has grown significantly over the last two decades.

Number of Abandoned Wells by Last Year of Production, 2003-2022



Source: ORVI analysis of Upstream Energy Platform. Note: Of the 14,000 abandoned (including orphaned) wells, 8,311 contain production data while 5,689 do not contain production data.

Inspections and Violations Infrequent

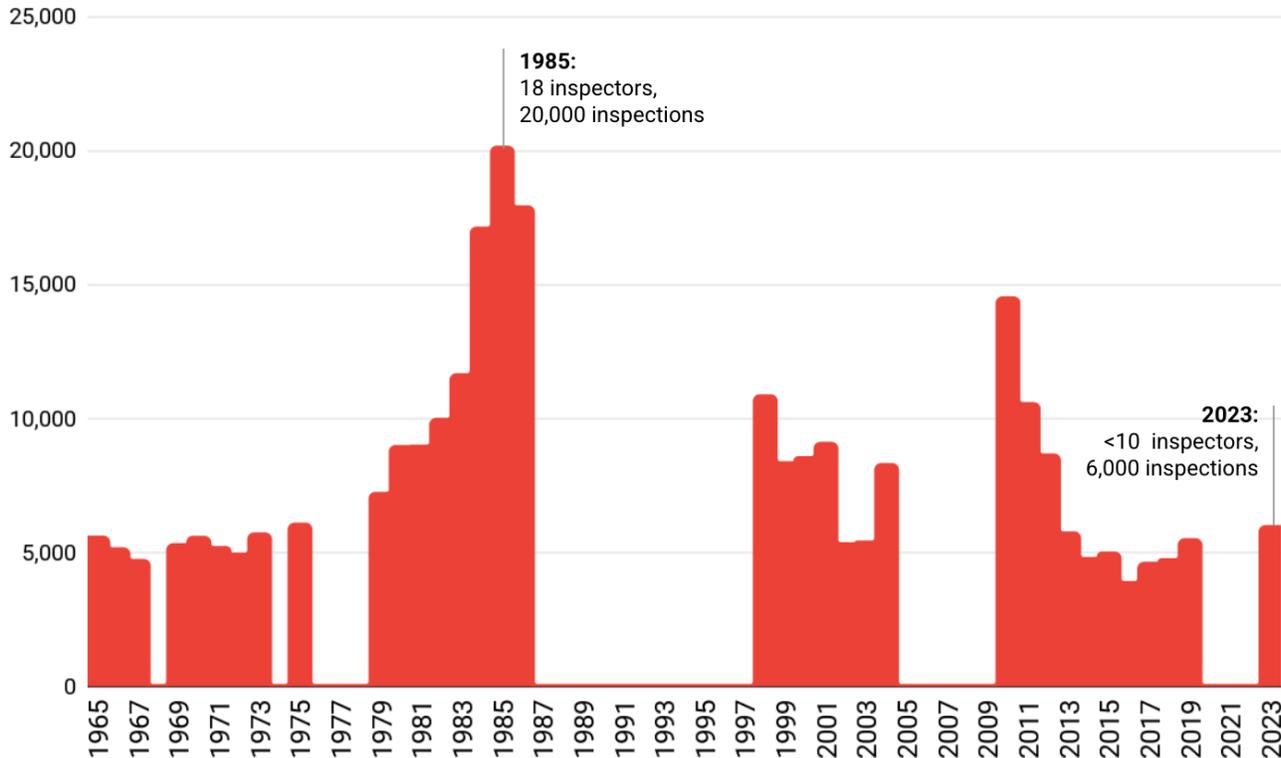
As discussed earlier, the 2012 state performance audit found that the Office of Oil and Gas (OOG) was not enforcing the statutory requirement that operators plug their abandoned wells⁵⁷. One reason highlighted by the audit was that inspections of abandoned wells “are typically not conducted” unless an operator applies for a well-work permit or a citizen files a complaint. The audit further concluded that without inspections, “many potential hazardous abandoned wells go unnoticed and the operator would evade the OOG Enforcement Process Policy.” Operators are required to submit annual inspection reports for their wells and to report any “evidence of significant leakage or other indications of casing integrity failure.” It’s kind of like a city requiring that restaurants submit evidence of rodents and unclean conditions, instead of performing actual inspections. Adding to the magical thinking, it doesn’t appear that the OOG uses fines or penalties to encourage abandoned wells to be decommissioned.

The graphs below show historical data on inspections and notices of violations published in annual reports from the OOG contained at West Virginia Archives & History. Inspections

reached a high of over 20,000 in 1985 compared to about 6,000 in 2023. The number of inspections carried out by the OOG is heavily influenced by the number of field inspectors and to some extent the number of permits to drill or plug wells. In 1985 there were 18 field inspectors compared to fewer than 10 in 2023. Currently, the OOG has 18 oil and gas field inspectors or one inspector for every 8,700 wells in the state.⁵⁸

Figure 7: Total inspections have fallen sharply since their height in the 1980s.

Total Oil and Gas Inspections, FY 1965-2023



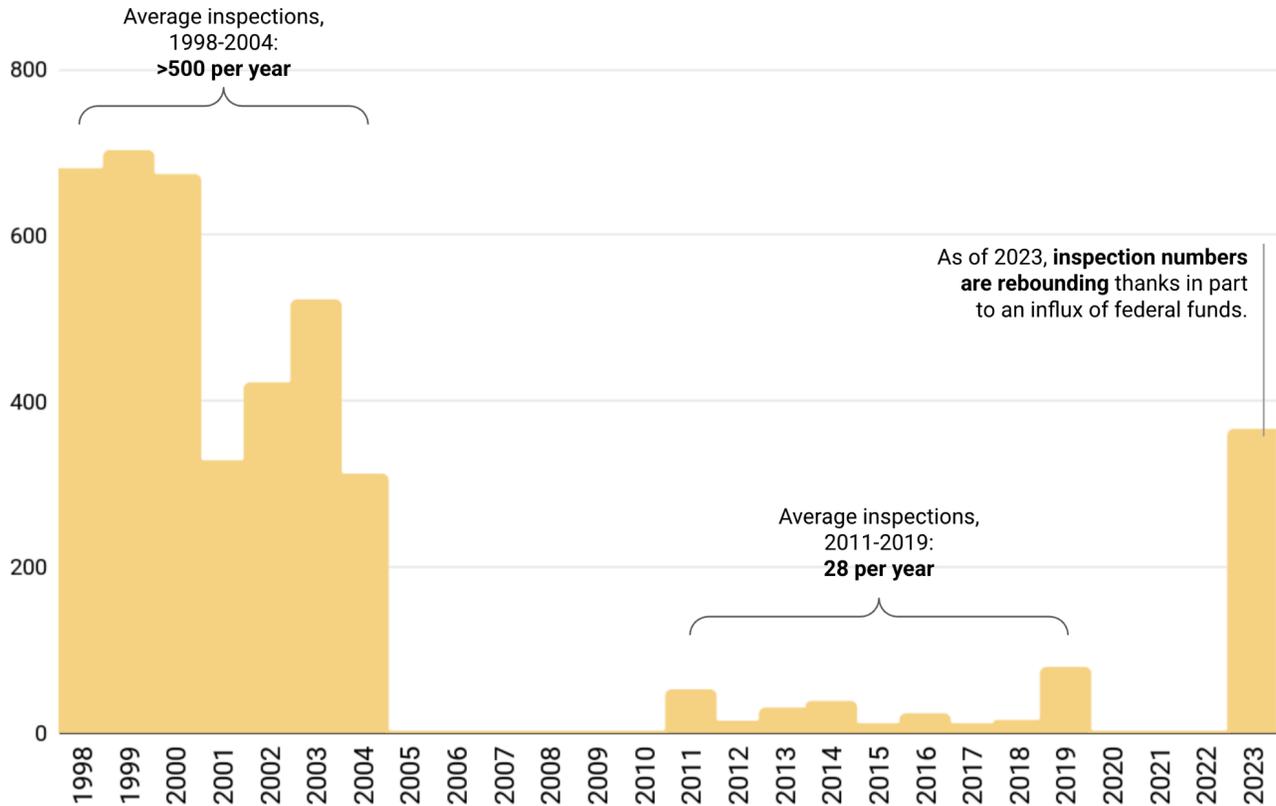
Source: West Virginia Department of Environmental Protection, Annual Reports FY 1965-67, 1969-1973, 1979-1986, 1998-2004, 2010-2019, and 2023.

Note: Years based on availability. Inspections from 1965 to 1985 include drilling and plugging inspections.

Since the late 1990s, the number of abandoned wells inspections has declined. The OOG averaged over 500 abandoned well inspections per year between 1998 and 2004 compared to an average of just 28 per year between 2011 and 2019 (Figure 8). However, in 2023, abandoned well inspections rose to 342, likely due to the influx of federal grants to plug orphaned wells. The number of violations issued has also declined. During the late 1990s, the OOG issued nearly 1,200 violations per year compared to just 141 per year on average between 2010 and 2023. There are simply not enough cops on the beat.

Figure 8: Federal grants are boosting the frequency of abandoned well inspections after a decades-long decline.

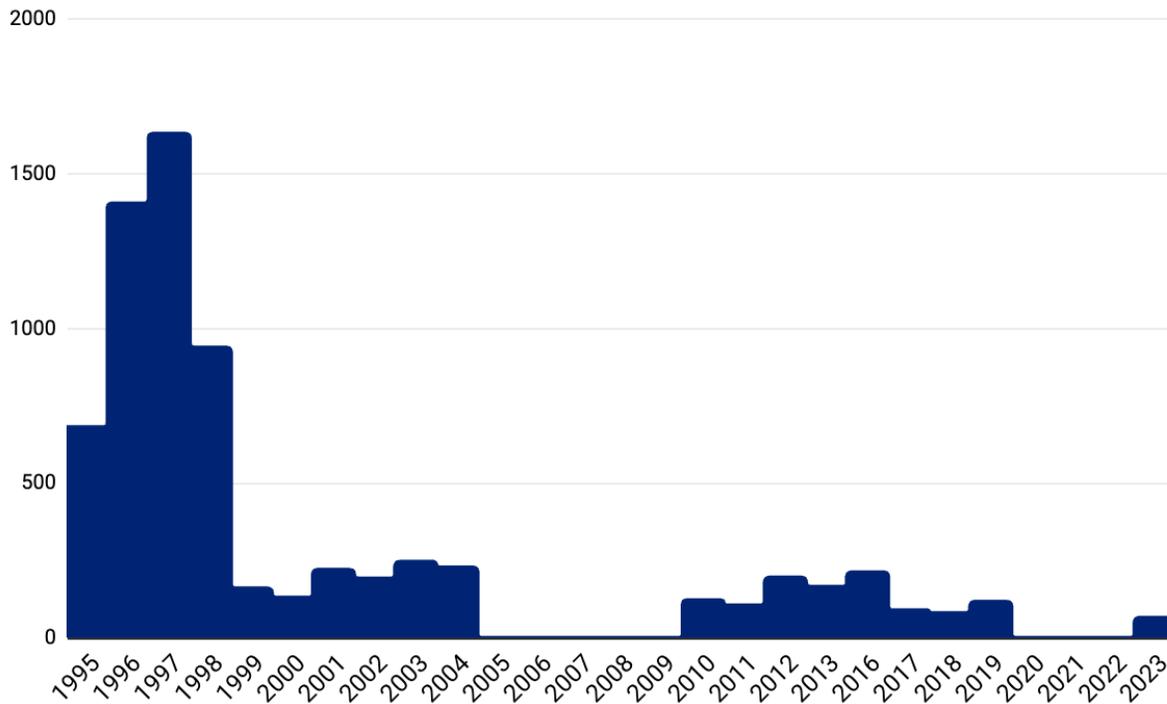
Abandoned Well Inspections, FY 1998-20



Source: West Virginia Department of Environmental Protection, Annual Reports FY 1998-2004 and FY 2011-2019, and FY 2023. Years based on availability.

Figure 9: Inspectors are issuing fewer notices of violation after vigilance peaked in the 1990s.

Oil and Gas Notices of Violation, FY 1995-2023



Source: West Virginia Department of Environmental Protection, Annual Reports FY 1995-2004 and FY 2010-2019, and FY 2023. Years based on availability of data.

Table 3 below compares oil and gas inspections and notices of violations (NOVs) in 2023 between West Virginia and Pennsylvania. On a per well basis, Pennsylvania conducts about 5 times as many inspections and issues 22 times more notices of violations than West Virginia. While Pennsylvania had nearly 10 times as many field inspections than West Virginia in 2023, this doesn't account for the ultra-low number of violations issued per inspection. Pennsylvania issues a violation for nearly a third of all inspections while West Virginia issues a violation only for about 1% of all inspections.

Table 3: West Virginia records far fewer inspections and notices of violation than neighboring Pennsylvania.

West Virginia and Pennsylvania Oil and Gas Inspections and Violations, 2023

State	Inspections	NOVs	Well Count*	Inspections/Well	NOVs/Inspection
Pennsylvania	44,746	10,201	146,600	0.31	22.8
West Virginia	5,929	65	88,600	0.07	1.1

Source: WV DEP FY2023 Annual Report and PA DEP 2023 Annual Report

* Included wells listed as Abandoned, Active, Inactive, Orphan, Permitted, and Shut-in.

The Failure of Bonding

West Virginia, like all oil and gas states, requires operators to buy financial assurance to drill and operate oil and gas wells.⁵⁹ The stated purpose of financial assurance is to ensure regulatory compliance and guarantee that operators properly decommission their well sites at the end of their lives. Financial assurance can include cash, CDs or a letter of credit. In West Virginia, however, it is almost exclusively surety bonds. With a surety bond, the operator pays the insurer (the surety) a percent (or premium) – usually 1 to 5% of the bond amount based on the financial health of the operator – annually and the surety agrees to pay the state if the operator fails to decommission the well.

West Virginia requires a bond of \$5,000 per vertical well drilled and \$50,000 per horizontal well drilled. In lieu of the per-well bond, operators can post a statewide blanket bond of \$50,000 for vertical wells and \$250,000 for horizontal wells to cover all of the operator's wells.⁶⁰ Bonding levels are supposed to incentivize operators to plug their wells, but since the bonding amounts are only a fraction of an operator's decommissioning costs, it is often cheaper to not plug the well since regulators rarely take meaningful action, such as issuing plugging orders for non-compliance.

For most wells, bonding amounts in West Virginia haven't changed in over 40 years. The last time bond amounts were raised for conventional (vertical) wells – which make up 95% of all operated wells in the state – was 1983 (Table 4). In 1985, it cost the state about \$13,000 to decommission one abandoned well, or about 26% of the \$50,000 blanket bond amount for vertical wells).⁶¹ Today, the average cost to decommission one well is \$95,000, nearly twice the blanket bond amount for vertical wells.⁶² In 2025 dollars, the blanket bond amount in 1983 would be nearly \$154,000, if it were updated for inflation. While the blanket bond for horizontal wells is higher, at \$250,000, the average cost to decommission a horizontal shale well is around \$261,000 per well, according to industry filings from two large shale operators

in Appalachia.⁶³ On top of bond amounts, the penalty for failing to plug abandoned wells in the state has been at \$5,000 per offense since the early 1980s. It was \$2,000 in 1931.⁶⁴

Table 4: Bonding amounts haven't changed in over 40 years.

Vertical Well Bonding Amounts in West Virginia

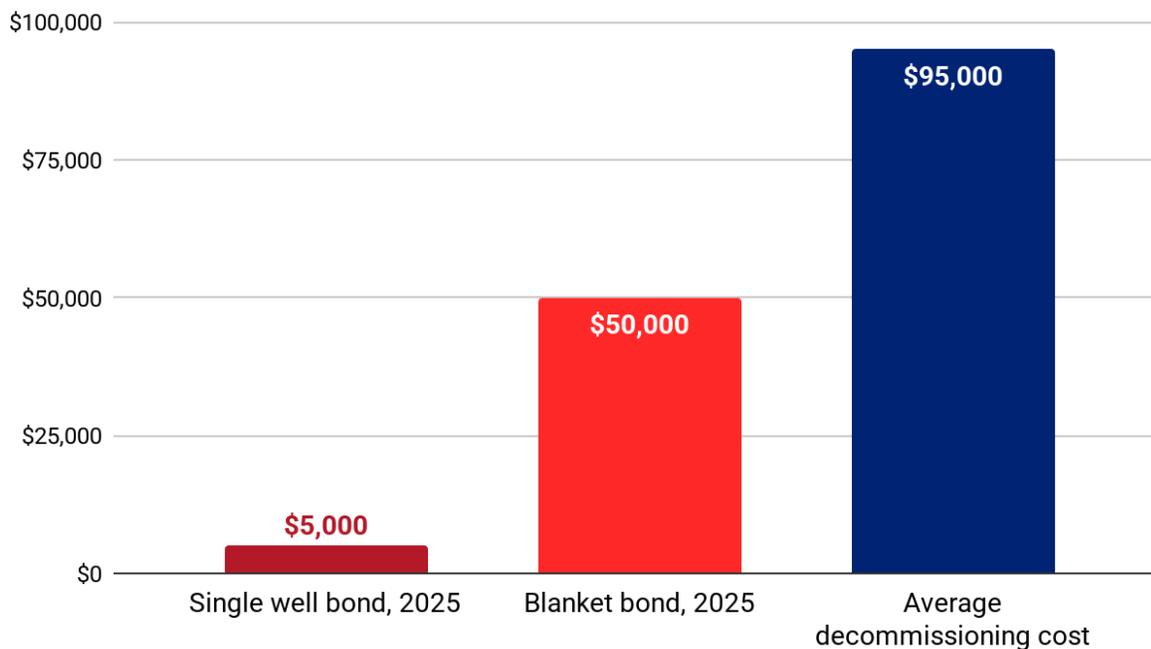
	1963	1973	1983	2006	2025
Single Well	\$1,000 (\$10,700)	\$2,500 (\$19,000)	\$10,000 (\$33,100)	\$5,000 (\$8,200)	\$5,000
Blanket	\$10,000 (\$106,600)	\$15,000 (\$114,100)	\$50,000 (\$153,600)	\$50,000 (\$81,700)	\$50,000

Source: West Virginia State Code, Amendments to Chapter [§22-4-2](#) and [§22-6-26](#), including [SB 219](#) in 1963, [SB 60](#) in 1973, [SB 183](#) in 1983, and [HB 4622](#) in 2006. Inflation adjustments provided by the U.S. Department of Labor Statistics, [CPI Inflation Calculator](#), December 2025.

Note: Parentheticals represent 2025 dollars.

Figure 10: Bonding amounts cover just a fraction of the cost to plug a single well.

Vertical well bonding amounts vs. average decommissioning cost, 2025



The central issue with bonding is not the amount of the bond, but that they are rarely forfeited. The process to recover funds from a surety company or an operator to cover cleanup costs can be a very lengthy legal process that requires investigations, site visits, and a large amount of staff time. Between 2010 and 2024, the total amount of bond forfeitures

was \$210,000, indicating that bonds were forfeited only a few times over 15 years.⁶⁵ Meanwhile, the number of abandoned wells during this time has not declined.

Typically, bonds are only forfeited when an operator becomes insolvent. Even if the OOG decommissions an operator’s well or wells, its bonding can remain intact unless the OOG actively pursues forfeiture. This is largely because if an operator has their bonds forfeited, they can no longer operate in the state. If this happens, the results could be job loss and more orphaned wells for the state to decommission. Justifiably, the OOG does not want to see this happen. Instead of forfeiting bonds or imposing fines, the OOG typically pursues a long-term consent agreement with operators to address abandoned wells.

Long-Term Consent Agreements

For several decades, the OOG has entered into consent orders with operators to address abandoned wells. In 2002, the OOG developed the Abandoned Well Initiative to put operators into long-term agreements to plug or reactivate their abandoned wells over ten years. Operators who participate are shielded from the requirement to immediately plug their wells. While the Abandoned Well Initiative may have ended in 2012, the state continues to use consent agreements in lieu of forfeiting bonds or issuing plugging orders to operators that are out of compliance with state abandoned well laws.

Between 2013 and 2024, the state signed approximately 88 consent agreements with dozens of operators covering about 6,000 wells (Table 5). During this time, about 4,500 wells were ordered to be plugged or reactivated, while an additional 1,450 wells were ordered to be plugged or reactivated between 2025 and 2035.

Table 5: West Virginia continues to rely on consent agreements.

Consent Agreements Addressing Abandoned Wells, 2013 to 2024

Consent Agreements Signed	88
Wells To Be Resolved, 2012-2024	4,501
Wells To Be Resolved, 2025-2035	1,446
Wells To Be Resolved, Total	5,947

Source: WV DEP Office of Oil and Gas

It is unclear how many of the 4,500 abandoned wells have been plugged or reactivated or transferred to other operators. However, data from the WVDEP’s oil and gas database shows

that 3,424 wells were plugged from 2013 to 2024, with 294 plugged by the WVDEP. Table 6 below lists the companies that plugged the most wells from 2013 to 2024 and the number of wells included in their respective consent agreements. Coal companies plugged approximately 22%, or nearly 800, of the plugged wells over this period, despite making up a small percentage of wells included in the consent agreements. Since consent agreements can allow operators to plug or reactivate wells not specified in the consent agreement, and that operators can transfer wells to meet targets, it is difficult to discern how effective the agreements are in plugging and reactivating wells.

Table 6: Top plugging operators.

Top 25 Operators by Wells Plugged, 2013 to 2024

Operator (Parent Company)		Wells Plugged, 2013-2024	Wells to Resolve from Consent Agreements
1	Core Natural Resources	472	176
2	EQT Corp	396	625
3	Diversified Energy	387	870
4	WV DEP	294	-
5	Expand	288	470
6	American Consolidated Natural Resources	228	34
7	CNX Corp	229	262
8	HG Energy	121	0
9	EXCO Resources	65	63
10	Antero Resources	65	0
11	Ross & Wharton Gas	64	0
12	Conterra	56	0
13	TC Energy	50	0
14	NNE Resources	47	68
15	Greylock	38	56
16	Exxon Mobile	36	237
17	Seven Energy	33	0
18	Noumenon Corp	31	33
19	BHE GT&S	25	8
20	Tribune Resources	25	0
21	Enervest	25	44
22	Pillar Energy	21	128
23	BRC Operating Company	17	0
24	Teavee Oil and Gas	16	0
25	Viper Capital Partners	15	44
Total Wells for Top 25		3,044	3,118

Total Wells Plugged, 2013-2024	3,424
% Wells Plugged by Top 25	89%
Total Plugged by Coal Industry	758 (22%)

Source: ORVI analysis of WV DEP Oil and Gas Database.

While consent agreements can be a useful tool to encourage operators to decommission abandoned wells, it doesn't appear that they are stemming the tide of abandoned wells in the state. The 2012 audit of the Office of the Oil and Gas's abandoned wells program estimated that there were approximately 13,000 abandoned wells in the state. Today there are estimated to be between 14,000 and 14,500 wells that the OOG lists as abandoned, while their database shows about 16,000. There are also roughly another 35,000 abandoned wells not included in the OOG's database that have been identified in this report.



West Virginia & Regional History Center

Conclusion

This report has shown the severe and escalating problem of unplugged abandoned oil and gas wells in West Virginia, a legacy of over 150 years of drilling. With more than 145,000 wells drilled since 1860, the lack of early regulations and lax enforcement today has resulted in an estimated 49,000 to 61,000 unplugged abandoned wells.

These wells pose significant environmental threats, including groundwater contamination and fire/explosive hazards, while also hindering economic development. The state has attempted to address this through various regulatory changes, including the Abandoned Well Act of 1992, which created a classification system for prioritizing cleanup, and recent 2020 and 2023 legislation that increased funding for plugging and raised the number of field inspectors to around 20.

West Virginia's efforts have historically been hampered by anemic enforcement. Despite laws requiring operators to immediately decommission wells inactive for 12 months, a 2012 audit found that inspections of abandoned wells were "typically not conducted." This lack of oversight allows thousands of owner-operated abandoned wells to remain unplugged, with compliance programs like the Abandoned Well Initiative (AWI) and other consent agreements failing to keep pace with the problem.

The core problem stems from a combination of deficient staffing and an inadequate financial assurance (bonding) system that fails to incentivize well decommissioning. For operators, paying a small bonding premium is far less expensive than spending millions to plug their wells, especially when the state lacks the resources and willingness to pursue rigorous enforcement.

The estimated liability of the state's abandoned well inventory is between \$4.7 and \$5.8 billion based on plugging costs of \$95,000 per well. Most of these wells are orphaned and do not have a viable operator. There are around 9,000 abandoned wells with viable operators. Some of these wells are included in long-term consent agreements and may be addressed, but it is likely there will be more abandoned wells added over this time.

There are several steps policymakers can take to address these issues. The Orphan Well Prevention Act of 2025, which has bipartisan support, is one approach that would dramatically improve enforcement of the state abandoned wells laws.⁶⁶ The bill would require oil and gas operators to set aside funds to decommission wells as they are completed for

production. It would also require operators to pay a production fee to ensure that active and inactive wells are properly decommissioned. On top of ensuring that thousands of wells are decommissioned, it would also boost the economy of the state by keeping more money in the state's local economy and employing more workers in the oil and gas industry.



Endnotes

1. West Virginia Geological & Economic Survey, "WV History of Minerals: Oil and Gas," July 6, 2004. Accessed from <https://www.wvgs.wvnet.edu/www/geology/geoldvog.htm>
2. See Ralph Arnold and William J. Kemnitzer, "Petroleum in the United States and Possessions," (Harper & Brothers), 1931, p. 154.178.
3. David Matchen and Bernard L. Allen, "Natural Gas and Petroleum," The West Virginia Encyclopedia Online. Accessed from <https://www.wvencyclopedia.org/entries/1547>; John Samsell, "When Oil was Big Business in W. Virginia," The Dominion Post, May 18, 2013. Accessed from http://www.uppermon.org/news/dominion%20post/DP-When_Oil_was_Big-18May13.html#:~:text=Sistersville%2C%20on%20the%20east%20side,home%20were%20struck%20by%20lightning.
4. See Arnold and Kemnitzer, p154.
5. West Virginia Geological and Economic Survey, "Data: Oil and Gas Well Data System Description," June 12, 2009. Accessed from <https://www.wvgs.wvnet.edu/www/services/servogdt.htm#:~:text=The%20West%20Virginia%20Geological%20and%20Economic%20Survey%27s,link%20records%20for%20specific%20episodes%20of%20drilling>
6. United States Energy Information Administration and United States Bureau of Labor Statistics, Quarterly Census of Employment and Wages. In 2005, West Virginia produced 192 billion cubic feet of natural gas compared to 3,418 billion cubic feet of natural gas in 2024. Upstream Oil and gas employment (211,213111, and 213112) was 4,092 in 2011 compared to 4,931 in 2024.
7. Arnold and Kemnitzer, and WVDEP OOG well data for Horizontal (6A) and Horizontal wells drilled from 2008 to 2026.
8. See Arnold and Kemnitzer, p.168
9. Acts of the West Virginia Legislature, 1891, "An Act to prevent the wasting of natural gas and to provide for the plugging of all abandoned gas and oil wells," March 14, 1981, Chapter 106, p.1060-1061. Accessed from https://www.wvlegislature.gov/legisdocs/publications/acts/Acts_1891.pdf
10. Acts of the West Virginia Legislature, 1897, An Act to regulate the drilling, maintenance and operation of wells for the production of oil, gas, salt water or mineral water," February 28,1897 Chapter 58, p.114-116. Accessed from https://www.wvlegislature.gov/legisdocs/publications/acts/Acts_1897.pdf
11. See Arnold and Kemnitzer, p.168
12. Acts of the West Virginia Legislature, 1929, "An Act to provide for the safe development and operation of oil and gas wells through workable coal seams by regulating the location, drilling, casing, plugging and abandonment of natural gas and petroleum wells, and coal mining operations within the vicinity of such wells," March 7, 1929, House Bill 305, p. 311-25, Chapter 86. Accessed from https://www.wvlegislature.gov/legisdocs/publications/acts/Acts_1929.pdf; West Virginia Office of Miners' Health Safety & Training, Mining in West Virginia: A Capsule History. Accessed from <https://minesafety.wv.gov/historical-statistical-data/mining-in-west-virginia-a-capsule-history/>

13. Acts of the West Virginia Legislature, Regular and Extended Sessions, 1929, Chapter 86, House Bill Number 305, March 7, 1929, page 311-325. Accessed from https://www.wvlegislature.gov/legisdocs/publications/acts/Acts_1929.pdf
14. Eugene D. Thoenen, "History of The Oil and Gas Industry in West Virginia," Education Foundation, 1964, p 270.
15. "Rules and Regulation Governing the Drilling, Operations, and Plugging of Oil and Gas Wells," West Virginia State Department of Mines, Oil and Gas Division, R.M. Lambie, Chief, 1931. Accessed from state documents at the West Virginia Archives and History.
16. West Virginia Legislature, Senate Bill 219, 1963. Accessed from https://code.wvlegislature.gov/signed_bills/1963/1963-RS-SB219-ENR_signed.pdf
17. Ibid (1936, SB 219), Sections 2 and 9.
18. The National Petroleum Council, "Plugging and Abandonment of Oil and Gas Wells," Paper #2-25, September 15, 2011. Accessed on December 25, 2024: https://www.npc.org/Prudent_Development-Topic_Papers/2-25_Well_Plugging_and_Abandonment_Paper.pdf
19. West Virginia Administrative Regulations, Department of Mines, Chapter §22-4, 1964, 2.09. Accessed here <https://apps.sos.wv.gov/adlaw/csr/ruleview.aspx?document=5724&Keyword=> and Acts of the West Virginia Legislature, Senate Bill 24, March 8, 1969. See section §22-4-7. Accessed from https://www.wvlegislature.gov/legisdocs/publications/acts/Acts_1969.pdf
20. Ibid, SB24, 1969.
21. Performance Audit of the Division of Environmental Protection, "Orphan Gas and Oil Wells are a Threat to Health, Safety, and Economic Development," January 1996, (PE95-19-40). Accessed from https://www.wvlegislature.gov/legisdocs/reports/perd/PE95_19_40.pdf
22. West Virginia Code, §22-6-29, and House Bill 3354 in 2005. Accessed from <https://code.wvlegislature.gov/22-6-29/> and https://www.wvlegislature.gov/Bill_Text_HTML/2005_SESSIONS/RS/signed_bills/house/HB3354%20ENR_signed.pdf
23. West Virginia Legislature, Senate Bill 157, 1978, §22-4-12b. Accessed from https://code.wvlegislature.gov/signed_bills/1976/1976-RS-SB157-SUB1%20ENR_signed.pdf
24. West Virginia Administrative Regulations, Department of Mines, Chapter §22-4, 1978, Section 21: 01, Accessed from <https://apps.sos.wv.gov/adlaw/csr/readfile.aspx?DocId=16916&Format=PDF>
25. West Virginia Legislature, House Bill 1850, 1985. Accessed from https://code.wvlegislature.gov/signed_bills/1985/1985-RS-HB1850-SUB%20ENR_signed.pdf
26. West Virginia Legislature, Senate Bill 183, 1983. Accessed from https://code.wvlegislature.gov/signed_bills/1983/1983-RS-SB183-ENR_signed.pdf
27. West Virginia Legislature, House Bill 217. Accessed from https://code.wvlegislature.gov/signed_bills/1991/1991-2X-HB217-SUB%20ENR_signed.pdf

28. Acts of the West Virginia Legislature, 1992, House Bill 4476, Abandoned Well Act. Accessed from https://www.wvlegislature.gov/legisdocs/publications/acts/Acts_1992.pdf or https://code.wvlegislature.gov/signed_bills/1992/1992-RS-HB4476-SUB%20ENR_signed.pdf
29. Ibid, HB 4476, 1992
30. West Virginia Administrative Regulations, Oil and Gas Division, 1993, Title 38 Series 22. Accessed from <https://apps.sos.wv.gov/adlaw/csr/readfile.aspx?DocId=7020&Format=PDF>
31. Performance Audit of the Division of Environmental Protection, “Orphan Gas and Oil Wells are a Threat to Health, Safety, and Economic Development,” January 1996, (PE95-19-40). Accessed from https://www.wvlegislature.gov/legisdocs/reports/perd/PE95_19_40.pdf
32. WVDEP, Office of Oil and Gas, Presentation on Abandoned Wells, David Belcher, October 24, 2012. Accessed from <https://dep.wv.gov/oil-and-gas/Resources/Documents/OCT%2024,%202012%20WORKSHOP%20PRESENTATION%20ABANDONED%20WELLS-%20Dave%20Belcher.pdf> See also WVGES, Permit Number Series 30,000 to 90,000 for description of well data. Accessed from <https://www.wvgs.wvnet.edu/www/services/servogdt.htm>
33. Ibid, 1996 Audit PE95-19-40
34. West Virginia Department of Environmental Protection,, Policy Statement, Abandoned Well Initiative, July 16, 2002. Accessed from <https://dep.wv.gov/oil-and-gas/Resources/Policy/Documents/Abandoned%20Well%20Initiative11.pdf>
35. West Virginia Administrative Regulations , Division for Environmental Protection, Abandoned Wells, §38-22-7, May 26, 1993. Accessed from <https://apps.sos.wv.gov/adlaw/csr/readfile.aspx?DocId=16922&Format=PDF> (1998) and <https://apps.sos.wv.gov/adlaw/csr/readfile.aspx?DocId=7023&Format=PDF> (1993)
36. West Virginia Administrative Regulations, Department of Mines, 1993 Notice of Title 38 Series 21, August 22, 1991. Accessed from <https://apps.sos.wv.gov/adlaw/csr/readfile.aspx?DocId=7014&Format=PDF>; also Acts of the 1969 Legislature, Senate Bill 24, March 8, 1969 Legislature p.505, §22-4-7
37. Abandoned Well Compliance: Inspections, Inventory and Enforcement,” WV Office of Oil and Gas, David Belcher, February 6, 2013. Accessed from <https://dep.wv.gov/oil-and-gas/Resources/Documents/Presentations%202013/FEB%206th,%202013%20WORKSHOP%20PRESENTATION%20ABANDONED%20WELLS-%20Dave%20Belcher.pdf>
38. West Virginia Legislature, HB 4622, March 11, 2006. Accessed from https://code.wvlegislature.gov/signed_bills/2006/2006-RS-HB4622-ENR_signed.pdf
39. West Virginia Legislature, House Bill 401, December 14, 2011. Accessed from https://code.wvlegislature.gov/signed_bills/2011/2011-4X-HB401-ENR_signed.pdf
40. West Virginia Legislative Auditor, Office of Oil and Gas, September 2012 (PE 12-10-523). Accessed from http://www.wvlegislature.gov/legisdocs/reports/perd/Oilgas_9_2012.pdf

41. West Virginia Legislature, House Bill 4090, March 3, 2020. Accessed from https://www.wvlegislature.gov/Bill_Text_HTML/2020_SESSIONS/RS/signed_bills/house/HB4090%20SUB%20ENR_signed.pdf
42. West Virginia Legislature, State Agency Report, WVDEP, FY 2024 Oil and Gas Report for Funds 3322 and 3334, July 10, 2024. Accessed from https://www.wvlegislature.gov/legisdocs/reports/agency/E05_FY_2024_26390.pdf
43. West Virginia Legislature, HB 3310, March 11, 2023. Accessed from https://code.wvlegislature.gov/signed_bills/2023/2023-RS-HB3110-SUB%20ENR_signed.pdf
44. Mike Tony, “Justice signs bill into law that’s designed to boost DEP Office of Oil and Gas Funding,” Charleston Gazette, March 30, 2023. Accessed from https://www.wvgazette.com/news/legislative_session/justice-signs-bill-into-law-thats-designed-to-boost-dep-office-of-oil-and-gas/article_2d5c05fc-a641-5c7f-a10f-7b2e5b1b9b17.html See WVDEP Organization Chart, page 61, for number of current inspectors. Accessed from <https://dep.wv.gov/Documents/DEPOrgChart.pdf>
45. See Ted Boettner, “First Tranche of Federal Orphan Well Funds Out the Door,” January 17, 2023. Accessed from <https://ohiorivervalleyinstitute.org/first-tranche-of-federal-orphan-well-funds-out-the-door/> Ted Boettner, “What’s happening with MERP in Ohio River Valley States,” Ohio River Valley Institute, October 2025. Accessed from <https://ohiorivervalleyinstitute.org/whats-happening-with-merp-in-ohio-river-valley-states/>
46. See West Virginia Office of Oil and Gas, Abandoned Well Program, IIJA. Accessed from <https://dep.wv.gov/oil-and-gas/abandoned-well-plugging/infrastructure-investment-jobs-act/Pages/default.aspx> and <https://tagis.dep.wv.gov/wellplugging/> Note: West Virginia plugged 206 wells with the \$25 million in Initial Grant funds from the IIJA. Total paid to contractors was \$24.8 millions or \$120,493 per well.
47. Ibid, Boettner, 2025
48. See West Virginia Office of Oil and Gas, Abandoned Well Program, IIJA. Accessed from <https://dep.wv.gov/oil-and-gas/abandoned-well-plugging/infrastructure-investment-jobs-act/Pages/default.aspx> and <https://tagis.dep.wv.gov/wellplugging/> Note: West Virginia plugged 206 wells with the \$25 million in Initial Grant funds from the IIJA. Total paid to contractors was \$24.8 millions or \$120,493 per well.
49. <https://oklahoma.gov/content/dam/ok/en/ioGCC/documents/publications/Orphan%20Wells%20Revised.pdf> and <https://netl.doe.gov/project-information?p=FE0032425>
50. WorkForce WV, “West Virginia Oil and Gas Study,” <http://lmi.workforcewv.org/LaborMarketStudies/WVOilandGasStudy.html> and Dougherty Leventhal & Price, LLP, “State workers finding future in shale gas industry,” February 2011, <https://www.dlplaw.com/state-workers-finding-future-in-shale-gas-industry/> and Douglas H. Wrenn et. al., Agricultural and Resource Economics Review, Cambridge Core, “Resident vs. Nonresident Employment Associated with Marcellus Shale Development,” September 15, 2016, <https://www.cambridge.org/core/journals/agricultural-and-resource-economics-review/article/abs/resident-vs-no-resident-employment-associated-with-marcellus-shale-development/01028163455FDCEE774C91BFFC06ECD>

51. West Virginia Blue Book, 1916, page 514. Accessed from https://www.wvlegislature.gov/legisdocs/publications/bluebook/WVS_Bluebook_1916.pdf
52. Charles E. Whieldon and William E. Eckard, "West Virginia Oilfields Discovered Before 1940," Bureau of Mines, US Department of the Interior, Bulletin 607, p. 3. Accessed from https://digital.library.unt.edu/ark:/67531/metadc12760/m2/1/high_res_d/Bulletin0607.pdf#:~:text=During%20this%20period%20more%20than,contains%20approximately%2024%2C080%20square%20miles%3B
53. Stuart N. Ridick et al., "Measuring methane emissions from abandoned and active oil and gas wells in West Virginia," *Science of the Total Environment*, Volume 651, pages 1849-1856, February 1, 2019. Accessed from <https://www.sciencedirect.com/science/article/abs/pii/S0048969718339561>
54. Ibid, 1996 Audit PE95-19-40
55. Mary Kang et al., "Identification and characterization of high methane-emitting abandoned oil and gas wells," *Sustainability Science*, Volume 113, pages 13636 to 13641, November 14, 2016. Accessed from <https://www.pnas.org/doi/10.1073/pnas.1605913113> Also see Supporting Information Appendix for further detail. Accessed from https://www.pnas.org/doi/suppl/10.1073/pnas.1605913113/suppl_file/pnas.1605913113.sapp.pdf
56. See CARA's Upstream energy platform. West Virginia wells with a well status of "Inactive." Accessed from <https://upstream.thecara.org/>
57. Ibid, Audit 2012, PE 12-10-523.
58. West Virginia Department of Mines, Oil and Gas Annual Statistical Report of 1985. Report of Oil and Gas Reclamation Fund FY1985-1986. Approximately 20 wells were plugged of OOG at a cost of \$261,425 or \$13,071 per well. Accessed from <https://archive.wvculture.org/history/wvmemory/stdocsdetail.aspx?Id=5369>
59. National Council of State Legislators, "State Oil and Gas Bonding Requirements," January 26, 2022. Accessed from <https://www.ncsl.org/energy/state-oil-and-gas-bonding-requirements>
60. Ibid NCLS
61. West Virginia Department of Mines, Oil and Gas Annual Statistical Report of 1985. Report of Oil and Gas Reclamation Fund FY1985-1986. Approximately 20 wells were plugged by the OOG at a cost of \$261,425 or \$13,071 per well. Accessed from <https://archive.wvculture.org/history/wvmemory/stdocsdetail.aspx?Id=5369>
62. Ibid, Boettner, 2025.
63. Dwayne Purvis and Ted Boettner, "Filing the Hole: A Federal Solution to Cleaning Up America's Orphaned and Abandoned Oil and Gas Wells," Ohio River Valley Institute, May 2025. Accessed from <https://ohiorivervalleyinstitute.org/filling-the-hole-a-federal-solution-to-cleaning-up-americas-orphaned-and-abandoned-oil-and-gas-wells/>
64. West Virginia State Code 1931. §22-4-17, West Virginia State Code §22B-1-34 (1985), and West Virginia State Code §22-6-34 (Current)
65. West Virginia Legislature, State Agency Reports, Department of Environmental Protection, Office of Oil and Gas, Funds 3332 and 3334, FY2011-2024. Accessed from

66. West Virginia Legislature, Senate Bill 11. Accessed from
https://www.wvlegislature.gov/Bill_Status/Bills_history.cfm?input=11&year=2025&sessiontype=RS&btype=bill