ADDRESSING METHANE EMISSIONS IN APPALACHIA

HOW MANY JOBS WILL IT TAKE?

GREG CUMPTON, PH.D.
TED BOETTNER
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Ohio River Valley Institute

Ohio River Valley Institute
216 Franklin Street, Suite 400
Johnstown, PA 15901
www.ohiorivervalleyinstitute.org

Authors:
Greg Cumpton, Ph.D., Director of the University of Texas at Austin's Ray Marshall Center
Ted Boettner, Senior Researcher, Ohio River Valley Institute

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GLOSSARY

- **Apprenticeship Program** — The process of learning a skilled occupation through paid on-the-job training under a journey-level craftsperson or trade professional with classroom instruction.
- **Associated Gas** — Gas produced with crude oil.
- **Centrifugal Compressors** — Centrifugal compressors move gas by adding kinetic energy to the gas as it moves through an impeller.
- **Compressor Station** — A facility that stabilizes the flow and pressure of natural gas by receiving gas from the pipeline, re-pressurizing it, and sending it back into the pipeline system. There are three types of compressor stations in the crude oil and natural gas category: gathering and boosting stations, transmission stations, and storage stations.
- **Department of Labor (DOL)** — Federal executive agency responsible for administering federal laws concerning occupational safety, wage and hour standards, unemployment benefits, and reemployment services.
- **Environmental Protection Agency (EPA)** — Federal agency tasked with protecting the environment by researching, developing, and implementing regulations.
- **Flaring** — The deliberate burning of excess natural gas, which results in methane and CO_2 emissions.
- **Fugitive Emissions** — Greenhouse gases that are accidentally released during the production and transportation of oil and gas. These fugitive emissions come from industrial plants and pipelines.
- **Gathering and Boosting Compressor Stations** — Infrastructure consisting of multiple pipelines that collect natural gas to a central point.
- **Greenhouse Gas** — A gas that traps heat in the atmosphere and warms the planet.
- **Transmission Compression** — Any compressors that move natural gas from production fields, natural gas processing plants, or other compressors through transmission pipelines to distribution pipelines and storage facilities.
- **Optical Gas Imaging (OGI)** — The method of using thermal infrared cameras to visualize gases such as methane.
- **Orphaned Wells** — Unplugged oil and gas wells with no known operator or insolvent operator.
- **Pneumatic Controllers** — Pneumatic controllers open and close valves to regulate pressure and temperature.
- **Pneumatic Pumps** — These devices use gas pressure to move fluids by increasing and decreasing the pressure of fluids.
- **Prevailing Wage** — The average wage paid to similarly employed workers in a selected area.
- **Project Labor Agreement (PLA)** — A pre-hire collective bargaining agreement between a contractor and a labor organization establishing the terms and conditions for a construction project.
- **Reciprocating Compressors** — Reciprocating compressors move gases at high pressure.
- **Venting** — The deliberate release of natural gas into the atmosphere.
- **Well Liquids Unloading** — A process where liquids accumulated in a gas well are removed to surface equipment. These liquids include oil, water, and condensate. Well liquids are removed by increasing gas velocity, installing a pump, or temporarily diverting the flow from the well to an atmospheric vent.
- **Well Sites** — Locations occupied by the equipment used to drill or produce a well.
- **Workers' Compensation** — Employer-provided insurance that provides wage replacements and medical benefits to injured workers.

OVERVIEW & KEY FINDINGS

Current efforts to target methane emissions in the oil and gas industry for reduction stem from two underlying facts: excess atmospheric methane plays several particularly egregious roles in the Earth's atmosphere, and currently available technology within the oil and gas industry exists to reduce its prevalence. In other words, there's a problem and we can do something about it.

In December 2023, the EPA released new regulations intended to reduce methane emissions. These regulations focus on oil and natural gas operations for both production and processing as well as natural gas transmission and storage. Through the Infrastructure Investment and Jobs Act of 2021 (IIJA), the federal government allotted $4.7 billion for "Methane Reduction Infrastructure" to decommission orphaned oil and gas wells, which includes plugging the well and surface reclamation. Included in the 2022 Inflation Reduction Act (IRA) was $1 billion for reducing methane emissions from marginal (low-producing) conventional oil and gas wells, including $700 million for state grants to decommission wells.

This report estimates the number and types of jobs required to meet new EPA regulations and to decommission oil and gas wells in four Appalachian states: Kentucky, Ohio, Pennsylvania, and West Virginia.

The four-state Appalachian region of Kentucky, Ohio, Pennsylvania, and West Virginia will collectively require between 13,005 and 15,530 direct jobs to deal with additional EPA methane emissions regulations. While a portion of these jobs will focus on replacement and abatement of methane emissions (between 7,793 and 9,714) and thus be temporary, those positions related to maintenance and monitoring (between 5,212 and 5,816) will be permanent.

Decommissioning 64,607 documented orphaned wells in the four states in Appalachia would support roughly 11,600 direct job-years. Decommissioning the total unplugged well inventory in all four states would support up to 157,000 direct job years. Utilizing $1.3 billion from the IIJA and IRA to decommission orphaned and marginal conventional wells would require an estimated 2,400 direct jobs on well sites.

These are only direct jobs. Indirect jobs will also be created from the purchase of goods and services. Additionally, the labor income paid to employees is circulated back into the economy when those employees purchase goods and services, creating the "induced effect," which further stimulates the economy. For example, the U.S. Department of the Interior estimates that one job is supported per $83,670 in IIJA state grants expended. Using this job creation estimate would increase the number of jobs supported above our estimates for on-site workers needed to decommission wells by nearly six-fold, from 2,090 to over 13,400 total jobs (direct, indirect, and induced) decommissioning orphaned wells.

There has been a sharp employment decline in the upstream oil and gas industry in Appalachia since the development of the Utica and Marcellus Shales in the mid 2010s. Altogether, upstream oil and gas employment in Appalachia declined 46 percent, from about 47,600 in 2014 to 25,700 in 2022, which is slightly below employment levels before the shale boom.

While a portion of the employment growth over the last decade includes transient workers who moved to the region to complete the shale development, there is likely still a sizable portion of workers who still live in the Appalachian region now employed in other industries or unemployed.

There are opportunities to ensure that these jobs could meet the needs of industry and support well-paid and high-benefit union employment. There are several procurement policies state oil and gas regulators can implement to ensure that unions have a good opportunity to bid on projects to decommission wells and well sites and to improve the health, safety, and wellbeing of workers. These policies can also help ensure that taxpayers get the biggest bang for their buck with high quality work, and that federal grants funds stay in local communities and help increase the number of skilled workers. To ensure there are qualified workers for quality jobs to meet new EPA methane mitigation standards, states and the federal government could enact tax credits that incentivize skilled worker training and prevailing wages. We can either implement these programs to move money out the

door quickly, or we can be intentional and design these programs to make sure this work is done correctly by trained professionals who can in turn support Appalachian families comfortably.

I. MITIGATING METHANE IN APPALACHIA

Current efforts to target methane emissions in the oil and gas industry for reduction stem from two underlying facts: excess atmospheric methane plays several particularly egregious roles in the Earth's atmosphere and currently available technology within the oil and gas industry exists to reduce its prevalence. In other words, there's a problem, and we can do something about it. Not only will appropriate capital and labor investments that reduce uncaptured methane emissions provide real, immediate, and long-term benefits to people, but keeping the gas underground also allows for future extraction and usage, preserving a high-demand resource for later use.

Though methane represents a small share of our atmosphere's composition, it is the most abundant hydrocarbon.[1] In 1750, the global average distribution of methane was at 722 ppb (parts per billion); by August of 2023, the National Oceanic and Atmospheric Administration measured methane at 1,919 ppb. Methane's average growth rate is approximately 6 parts per billion (ppb) per year, though this growth in 2021 was measured at nearly 18 ppb.[2,3] Increases in methane's prevalence over short-time periods represent the growing contribution of methane through human-based sources, including agricultural production, biomass burning, and fossil fuels.[4]

Methane traps heat within the Earth's atmosphere and is 80 times more potent at trapping heat than carbon dioxide until it breaks down chemically over the course of about 20 years.[5] Immediate reductions in methane emissions could provide relatively short-term relief to climatic temperature increases. However, methane breaks down into carbon dioxide (and water vapor) through oxidation, thus contributing to longer-term increases in atmospheric carbon dioxide. Thus, methane not only contributes significantly to global warming in the short term, but also, after oxidation, contributes over another century of heat-trapping as carbon dioxide.

Methane is also responsible for most ground-level (troposphere) ozone formation.[6] There are known and suspected impacts on the health of individuals exposed to ozone. Longitudinal analyses of ozone exposure and deaths in multiple cities demonstrate a statistically significant increase in deaths (overall, and for cardiovascular and respiratory causes) in cities during days with higher concentrations of ozone.[7] High ozone levels are associated with long-term damage to lungs, leading to research linking childhood asthma and ozone exposure.[8]

Ozone significantly damages crop function, more than any other airborne pollutant.[9] It damages plant growth and seed development, reduces crops' lifespan, makes crops more susceptible to death in cold temperatures or overwintering, inhibits crops' resistance to drought and other stressors, and leads to visible signs of plant injury.[10] Thus, decreasing methane emissions not only supports climate goals, but also reduces ground-level ozone formation, leading to lower rates of death in cities, less childhood asthma, and increased crop yields.

The Appalachian states of Kentucky, Ohio, Pennsylvania, and West Virginia are the primary states in the Appalachian basin, which is composed of three semi-overlapping shales trapping oil and gas reserves: the Marcellus Shale, the Utica Shale, and the Devonian (Ohio) Shale. These states have extensive oil and gas industry histories. The first successful oil well in the United States, the Drake well, was drilled in Pennsylvania in 1859.[11]

However, these states generally lack regulations regarding methane emissions, their monitoring, or reduction, though each state provides some regulations regarding ownership of coalbed methane emissions. Pennsylvania's Department of Environmental Protection, however, has taken steps to reduce methane leaks from oil and gas wells and the infrastructure that transmits them. This includes updated permits and processes that establish thresholds for methane emissions and proposed regulations for existing oil and gas wells and infrastructure.[12]

Methane emissions are the target of the Environmental Protection Agency (EPA) regulations because their detrimental environmental and health impacts may be readily addressed using existing technologies to greatly reduce unwanted emissions from the oil and gas industry and because most states lack the regulatory structures and initiatives to tackle this issue.

In December 2023, the EPA released new regulations intended to reduce methane emissions. These regulations focus on oil and natural gas operations for both production and processing as well as natural gas transmission and storage.[13] Production and processing equipment and processes covered by EPA's new rule include onshore well sites, storage tank batteries, gathering and boosting compressor stations, and natural gas processing plants. Natural gas transmission and storage equipment and processes covered include compressor stations and

storage tank batteries. Notably EPA's rule covers all equipment and processes, making no distinction between existing emission rates and the level of required monitoring.

EPA's rule requires audio, visual, and olfactory (AVO) monitoring for greenhouse gas (i.e., methane), which requires workers to be physically present to test for the sound and smell of leaks and, in some cases, place soapy water around connections to determine whether gas is escaping. Relatively new technologies could allow for both more rigorous and more efficient (e.g., laser detection) monitoring.[14] Detection technologies might also allow for effective remote monitoring, reducing the need for inspection visits and timetables. AVO inspections using human senses are also likely to be less sensitive than other technological methods of detecting methane leaks. However, EPA rule's focus on AVO monitoring provides significant clarity on how often inspections must occur and also emphasizes that detection must involve worker visits rather than remote-site detection.

EPA also estimates the net benefits of these new rules by measuring the benefits to health and climate with reduced levels of ozone.[15] They calculate a present value net benefit of $97 billion, with an equivalent annual value net benefit of $7.6 billion.[16] As part of this net benefit, EPA estimates the present value of expected compliance costs at $31 billion, with some portion of these costs offset by the value of future product recovery ($13 billion). This represents roughly $8 billion worth of work for the Appalachian states in this report.

The release of EPA's rule on methane emissions follows the passage of the Inflation Reduction Act (IRA), which created the Methane Emissions Reduction Program (MERP), allotting more than $1 billion to reduce methane emissions from the oil and gas sector. [17] In 2021, Congress passed the Infrastructure Investment and Jobs Act (IIJA), which included $4.7 billion for "Methane Reduction Infrastructure" to clean up orphaned wells, many of which are leaking methane and other pollutants into the air, water, and soil. As shown in Section 3, Appalachia will receive a disproportionate amount of these funds to lower methane emissions.

This large federal outlay of funding to states, in combination with new EPA rules around orphan wells and methane emissions, provides both structures and supports to meet the needs of methane emissions reductions while helping to offset some of the capital and labor costs associated with performing this work. This provides an opportunity for businesses and labor to meet new EPA standards with reduced initial costs. A clear benefit of these reduced costs and new standards are the number of jobs needed to decommission orphan wells (a process that could take decades) and to monitor and repair oil and gas infrastructure to prevent or limit methane emissions.

II. JOBS CREATED BY METHANE EMISSIONS STANDARDS IN APPALACHIA

This section describes the process for arriving at the total number of workers needed in the four-state Appalachia region of Kentucky, Ohio, Pennsylvania, and West Virginia to address methane emissions under new EPA regulations.[18] This section focuses on methane emissions maintenance, replacement, and abatement for active oil and gas wells. The following section focuses on the need for workers to manage methane emissions remediation and elimination for orphan and abandoned wells, which comprise the larger share of all types of wells in the four-state Appalachian region. This section uses two methods to arrive at the number of workers:

1. In the case of methane leak inspection, detection, and repair, the number of hours of work to complete those tasks is used to derive the number of workers needed to perform that work.

2. In other methane emissions strategies (replacing pneumatic controllers, replacing compressors, adding flare systems to storage tanks, and decommissioning orphaned well sites), the known and cited costs of installation or maintenance are divided by the assumed hourly cost of work, leading to the calculation of the number of worker hours and thus the estimated number of workers. This latter calculation method stems from more abundant information on the costs related to these tasks rather than the time needed to complete them.

Both strategies rely on identifying the number of sites requiring monitoring, repair, maintenance, and replacement. Again, two strategies are employed:

1. Where possible, Appalachia-specific data from each of the four states examined (e.g., on the number of active oil and gas well sites) is used.

2. When not readily available, US data is used to estimate the number of sites in Appalachia based on the share of oil and gas wells in that region in relation to the rest of the country.

Where relevant, two numbers of workers are calculated, with the lower number being tied as specifically as possible to EPA regulations and the larger number related to more fully addressing methane emissions.

This report focuses on direct employment counts. The expected number of workers reflect those directly engaged in the types of work described.[19] Additional employment and economic activities, both indirect (as a result of purchasing equipment from suppliers), as well as induced (the economic benefits of workers spending their earned income), would result from addressing methane emissions.[20] Given the broad scope of the new EPA regulations across all aspects of the oil and gas extraction, processing, and distribution, and known elements in the EPA regulations not included in this report, the totals likely represent an undercount of the total number of jobs needed.

The focus in this report on directly engaged work serves several purposes. First, this allows calculations of workers needed to perform known tasks without relying on often proprietary modeling techniques that may inadvertently confuse the reader. Second, focusing on jobs directly engaged in the work ensures the focus remains not only on the work but the quality of the job itself. For example, nearly all of the work described in this report could be performed by union labor, which provides significant benefits to workers. The benefits of union jobs are many and well-documented, including higher wages, better benefits, and better safety protections.[21]

Estimating the Number and Type of Sites Impacted

Using publicly available data, the report identifies the number of well sites in Appalachia. Outside of well sites, the report uses activity data from the Environmental Protection Agency to estimate compressor stations, pneumatic controllers, compressors, and storage tanks in Appalachia.[22]

Leak Detection

Leak detection and repair under the EPA proposal would impact both well sites and compressor stations for oil and gas production. Compressor stations include gathering and boosting, transmission, and storage sites.

- Oil and Gas Wells:
  In 2022, the four states in the Appalachian basin possessed 191,112 active oil and gas wells (Table 1).[23]

  Table 1: Active Oil and Gas Wells by State

State	Active Wells
Kentucky	16,558
Ohio	33,654
Pennsylvania	83,800
West Virginia	57,100
Total	191,112

  Source: EIA

  Under proposed EPA regulations, wells will be subject to quarterly monitoring. Sites with currently high levels of methane emissions will require additional and more thorough leak monitoring and will also require additional hours when needing repair. Utilizing national shares of emissions from all wells from EPA, we estimate 87,137 well sites in the studied states (46 percent) produce at least three tons of methane per year. 41,997 well sites produce less than three tons of methane per year, and a further 61,998 sites produce either minimal methane emissions or are wellhead-only sites.[24] EPA proposed regulations would include additional monitoring for all 191,112 wells.[25]

- Compressor Stations:
  Appalachia-specific data on the number and type of compressor sites was not consistently reported across states. Active oil and gas wells in the examined four-state Appalachia region represent roughly 21 percent of all active oil and gas wells across the United States (912,962).[26] Thus, the number of compressor stations in Appalachia represent an estimated 21 percent of all compressor stations across the United States. Data from the EPA indicate a total of 10,040 compressor sites in the United States, with most being for gathering and boosting and the rest for supporting transmission and storage.[27] Appalachian region estimates of compressor stations include 1,569 for gathering and boosting, 460 for transmission, and 72 for storage, for a total of 2,102 compressor stations in the four-state Appalachia region.

Pneumatic Controllers[28]

Pneumatic controller regulations would apply at every oil and gas site, as well as at each compressor station in the studied region. Thus, 191,112 oil and gas wells as well as 2,102 compressor stations (of various types) would fall under the EPA proposal for pneumatic controller requirements.

Compressors

Proposed EPA regulations target most reciprocating compressors, including those at gathering and boosting stations, gas processing plants, and those used for transmission and storage, though these would not include well pad compressors. According to the EPA, in 2020, there were 33,039 compressors in the US that would fall under new regulations.[29] Using the same distribution to estimate the number of compressor stations in the Appalachian region based on national figures, the estimated number of compressors subject to EPA regulations is 6,594, with gathering and boosting compressors being the largest share (3,986), followed by transmission compressors (1,351), gas processing plant compressors (949), and storage compressors (308). An additional 6,916 compressors (well pad compressors) in the Appalachian Basin could also be included in expanded monitoring and evaluation.

Some gas processing and storage stations used a specific type of centrifugal compressor (wet seal) known to leak significant amounts of methane.[30] Using national statistics on the number of wet seal centrifugal compressors, the estimated number in Appalachia comes to 72 used in gas processing and another 175 used in gas transmission.

Storage Tanks

EPA's Technical Support Documentation includes national-level counts of storage tanks and their methane emissions.[31] Given the large number of comments which led to modifications to initially proposed regulations, other researchers estimate a relatively small number (~22,000) will likely be subject to EPA's proposed regulations, though the number of storage tanks likely to need monitoring and installation of appropriate flare controls is much higher (~190,000), based on other research.[32] The EPA proposal impacts a small share of the overall number of storage tanks in the region studied, requiring monitoring of crude oil tanks (857) and condensate tanks (3,790) with more than six tons per year of volatile organic compounds. However, addressing methane emissions more thoroughly would require much more effort, including monitoring tanks storing more than two tons per year of volatile organic compounds, impacting many more crude oil tanks (34,009) and condensate tanks (7,290).[33]

Leak Inspection Time

Leak and Detection Inspection times per site vary depending on the type of site.[34] Standard well sites take an average of 3.6 hours to inspect for leaks; low-producing well-sites take less than three hours (2.3); gathering and boosting compressors stations take 10.4 hours; transmission compressor stations take 14.9 hours, and storage compressor stations take 28.9 hours, the most amount of time. Annual inspection time estimates in the table below show the number of hours needed if inspections occurred quarterly for wells and well sites and monthly for compressor stations.

Table 2: Annual Inspection Hours, by Site Type

Type of Site	Inspection Hours	Inspection Timeframe
Standard Well Sites	14.3	Quarterly
Low-Producing Well Sites	9.2	Quarterly
Compressor Stations: Gathering and Boosting	124.4	Monthly
Compressor Stations: Transmission	178.7	Monthly
Compressor Stations: Storage	346.7	Monthly

Source: Authors' analysis

Leak Repair Time

Once detected, the time to completely repair a leak varies considerably based on the type of component and the nature of the repair; estimates range from 0.17 hours and 16 hours depending on circumstances.[35] Part of the reason for this wide range of repair times stems from the number of components needing repair when found. For example, repair time at a low-producing well tends to be lower in part because there are likely fewer broken components or parts needing repair. Based on the likely number of components needing repair from EPA[9] and figures on the time to complete a repair by site from Colorado's Air Pollution Control Division[8] the repair time per component in this report is estimated to be roughly 2 hours (2.07).[36] Thus, estimated repair times reflect the work needed to repair the likely number of components found (Table 3).

Table 3: Repair Time by Number of Components

Type of Site	Number of Components Needing Repair Per Inspection[37]	Repair Time (Hours)	Based on Inspection Schedule
Standard Well Sites	7	14.5	Quarterly
Low-Producing Well Sites	2	4.14	Quarterly
Compressor Stations: Gathering and Boosting	4	8.28	Monthly
Compressor Stations: Transmission	6	12.42	Monthly
Compressor Stations: Storage	18	37.26	Monthly

Source: Authors' analysis

The annual number of repairs needed per site does not increase linearly with the number of inspections. If an inspector visits a site more times, it increases the probability of leak detection, but not necessarily the number of needed repairs. Based on existing evidence of a quarterly inspection identifying a specific number of parts needing repair per type, we estimate that monthly inspection visits will identify fewer needed repairs per visit, but a handful more (roughly 10 percent) over the course of the year (Table 4).

Table 4: Quarterly and Monthly Component Repair Needs

Type of Site	Number of Components Needing Repair Per Inspection[38]	Inspection Regiment (Quarterly or Monthly)
Standard Well Sites	7	Quarterly
Low-Producing Well Sites	2	Quarterly
Compressor Stations: Gathering and Boosting	4	Monthly
Compressor Stations: Transmission	6	Monthly
Compressor Stations: Storage	18	Monthly

Source: Authors' analysis

Using information from Tables 3 and 4, the estimated annual repair time per site in hours varies based on site type and likelihood of identifying a leak based on the inspection schedule (Table 5).

Table 5. Annual Repair Time by Site and Inspection Schedule

Type of Site	Annual Repair Time Per Site (Hours)
Standard Well Sites	57.96
Low-Producing Well Sites	16.56
Compressor Stations: Gathering and Boosting	99.36
Compressor Stations: Transmission	149.04
Compressor Stations: Storage	447.12

Source: Authors' analysis

Leak Detection and Inspection: Workers Needed

To calculate the number of workers needed to perform leak detection and repair work, each inspector is assumed to have a 40-hour work week, with ten holidays, two weeks of vacation, and one week of sick leave, providing

1,880 annual work hours.[39] Multiplying the number of sites by type to the time to inspect (or repair) those sites provides the total number of hours needed to address leaks. Dividing that total figure by the annual available work hours per person reveals the number of workers needed to address leaks.

Based on this process, the total number of hours for leak inspections is estimated at 2,511,607 hours, yielding 1,336 workers needed. Leak repairs require 7,028,971 hours, necessitating 3,739 workers to address. Leak inspection and repair represent ongoing, continuous work.

In order to meet the needs for leak detection and repair, the four-state Appalachian region would need a total of 5,075 workers across the four states and the two types of work (Table 6).

Table 6: Number of Leak Detection and Repair Workers Needed, by State

State	Leak Inspection and Detection Workers	Leak Repair Workers
Kentucky	116	324
Ohio	236	658
Pennsylvania	586	1,640
West Virginia	399	1,117
Total	1,337	3,739

Source: Authors' analysis

Pneumatic Controller Replacement

In addition to leak detection and repair, workers would also be needed to retrofit pneumatic controllers. Carbon Limit's cost effectiveness spreadsheet estimates pneumatic controller installation costs at 21 percent of total installation costs and labor costs of $75 per hour.[40] Utilizing site-level costs accounts for differences in the number of pneumatic controllers per site (Table 7).

Table 7: Pneumatic Controller Replacement Installation Costs and Labor Hours, by Site Type

Site Type	Estimated Labor Installation Costs per Site	Labor Hours per Site
Standard Well Sites	$6,907	92
Low-Producing Well Sites	$6,907	92
Compressor Stations: Gathering and Boosting	$21,544	287
Compressor Stations: Transmission	$15,637	208
Compressor Stations: Storage	$30,371	405

Source: Authors' analysis

Not all well sites require pneumatic replacements as some sites already use non-emitting controllers, but detailed information on the share of sites likely to need replacing vary, and regulatory plans typically focus on the company-level shares of their non-emitting controllers.[41] Not all sites will require pneumatic replacements, though information on whether sites use pneumatic controllers or an alternative is not universally available. Thus, utilizing estimates of the rate of methane emissions from a set of studied sites, the share of well sites likely needing replacement is estimated to be 75 percent for well sites and 90 percent for compressor stations.[42] Accordingly, the total number of workers required to retrofit pneumatic controllers in the four-state Appalachian basin is estimated at 7,290.

Compressors

EPA regulations cover both reciprocating compressors and centrifugal wet seal compressors. A California Air Resources Board study estimated that 57.9 percent of reciprocating compressor cylinders will need to be replaced in order to reach leak compliance.[43] Estimates for the costs of replacing compressors vary, so this report uses costs from a case study where the replacement cost was $11,070.[44] Assuming labor costs make up 21 percent of the total replacement cost, we estimate it will take 129 workers to replace the appropriate estimated share of reciprocating compressors. All reciprocating compressors will require monitoring, which is estimated to run at $629 per year to pay for labor, providing a need for 60 workers.[45] Hence, a total of 189 jobs will be required to meet EPA regulations related to reciprocating compressors.

Wet seal centrifugal compressors may either be abated (installing systems to capture leaked gas) or replaced with less-leaky dry seal centrifugal compressors. Costs for replacement are much higher than abatement ($444,000 vs. $70,000), but the long-term benefits are larger, so we assume that roughly 25 percent of these types of compressors will undergo abatement with the remainder being replaced.[46] Estimates of the number of workers to perform these replacements and abatements total 130. Once replaced or abated, these systems will continue to be monitored via existing leak detection and repair processes.

Storage Tanks

Storage tanks will require flare systems to manage methane emissions under new EPA regulations. The labor for flare installation ($7,393) and maintenance ($2,327) costs are pulled from the Colorado Air Pollution Control Division.[47] Assuming similar labor hour costs, this report estimates the need for 2,846 workers if all storage facilities in the studied region are appropriately retrofitted. A much smaller number (321) will be needed if only those likely to fall directly under new EPA regulations are addressed. EPA's new methane rule focuses on a small subset of all storage tanks, neglecting specific types of storage vessels. Thus, high estimates reflect fully addressing all storage tank emissions, and low estimates focus only on the smaller portion. Most of these jobs will focus solely on replacement, though a small proportion will need to continue to engage in storage tank maintenance.

Total Direct Workers

Thus, estimates for the number of workers to address each of these issues based on new EPA regulations and the need to address methane emissions more fully range from a low of 13,005 to a high of 15,530 (Table 8). Most of these direct jobs stem from the need to replace pneumatic controllers and for additional Leak Detection and Repair work.

Table 8. Direct Jobs, by Job Type

Job Type	Low Estimate	High Estimate
Leak Inspection and Detection	1,336	1,336
Leak Repair	3,739	3,739
Pneumatic Controllers	7,290	7,290
Compressors	319	319
Storage Tanks	321	2,846
Total Workers	13,005	15,530

Source: Authors' analysis

Two types of jobs are included in these totals: those that represent the immediate need to replace and/or install abatement to counter methane leakages, and those that include ongoing maintenance, including leak detection and repair (Table 9). Jobs related to replacement and abatement are expected to fulfill immediate needs, so they reflect short-term employment. Jobs related to maintenance are expected to continue long-term.

Table 9. Direct Jobs, by Maintenance and Replacement/Abatement Category

Category	Low Estimate	High Estimate
Maintenance	5,212	5,816
Leak Inspection and Detection	1,336	1,336
Leak Repair	3,739	3,739
Compressor Monitoring	60	60
Storage Tanks	77	681
Replacement/Abatement	7,793	9,714
Pneumatic Controller Replacement	7,290	7,290
Compressor Replacement/Abatement	259	259
Storage Tanks	244	2,165

Source: Authors' analysis

The distinction between short-term job needs and long-term job opportunities is not representative of actual opportunities, as new construction will require the same skill sets as those engaged in the replacement and abatement process and companies would benefit from previous worker experience.

Conclusion

The four-state Appalachian region of Kentucky, Ohio, Pennsylvania, and West Virginia will collectively require between 13,005 and 15,530 direct jobs to deal with additional EPA methane emissions regulations. While a portion of these jobs will focus on replacement and abatement of methane emissions (between 7,793 and 9,714) and thus be temporary, those positions related to maintenance and monitoring (between 5,212 and 5,816) will be permanent.

Table 10. Methane Abatement Jobs, by State

State	Low Estimate	High Estimate
Kentucky	1,127	1,346
Ohio	2,290	2,735
Pennsylvania	5,703	6,810
West Virginia	3,886	4,640
Total	13,005	15,530

Source: Authors' analysis

III. JOB CREATION FROM DECOMMISSIONING OIL AND GAS WELLS

The Appalachian states of Kentucky, Ohio, Pennsylvania, and West Virginia could receive over $1.3 billion in federal funding over the next several years to decommission an estimated 16,000 orphaned and low-producing oil and gas wells, creating nearly 2,400 direct jobs on well sites. The four states contain an estimated 816,000 unplugged wells that will need to be decommissioned over the next several decades. Decommissioning these wells could create over 157,000 direct jobs on well sites in the four states.

Federal Funding for Decommissioning Oil and Gas Wells in Appalachia: Methane Reduction Infrastructure (IIJA) and Methane Emissions Reduction Program (IRA)

The Infrastructure Investment and Jobs Act of 2021 (IIJA) contains $4.7 billion for "Methane Reduction Infrastructure" to decommission orphaned oil and gas wells, which includes plugging the well and surface reclamation.[48] The U.S. Environmental Protection Agency estimates unplugged abandoned and orphaned oil and gas wells emitted roughly 294,000 metric tons of methane in 2021, equivalent to the greenhouse emissions of 6 coal-fired power plants.[49]

The Appalachian states of Kentucky, Ohio, Pennsylvania, and West Virginia could receive a total $1.1 billion in IIJA grant funds to clean up their orphaned wells. This includes $100 million in initial grants, $773 million in formula grants, and up to $280 million in performance grants. The four states have identified a total of 64,607 documented orphaned wells, a little more than half of the nation's 126,806 documented orphaned wells.

So far, the four states have each received $25 million in initial grants to decommission approximately 1,500 orphaned wells. Preliminary figures from state bid amounts show the average decommissioning cost per well is approximately $34,000 in Kentucky, $102,000 in Ohio, $109,000 in Pennsylvania, and $124,000 in West Virginia. Based on these state average decommissioning costs, the four states could clean up about 13,600 orphaned wells with the $1.1 billion in federal IIJA funding, or 21 percent of their documented orphaned wells. This assumes that the states use these funds in a manner similar to the initial grant funds, which they are not obligated to do. They can also use these funds to locate and characterize undocumented orphaned wells, to measure and track methane emissions and other contamination from well sites, and to administer the program.[50]

Table 11: Estimated Federal Decommissioning Funds for Appalachia (in millions)

State	IIJA Funding	MERP Funding	Total
Kentucky	$174	$26	$200
Ohio	$326	$40	$366
Pennsylvania	$401	$89	$490
West Virginia	$212	$76	$288
Total	$1,113	$230	$1,343

Source: U.S. Department of the Interior and U.S. Department of Environmental Protection Agency

The Inflation Reduction Act (IRA) contains at least $700 million in funding to reduce methane emissions from low-producing (marginal) conventional wells as part of its Methane Emissions Reduction Program (MERP).[51] This funding can be used to provide financial assistance to operators and well owners to voluntarily decommission their marginal conventional wells, measure and monitor methane emissions from marginal wells, and to administer the program. One recent study found that low-producing marginal wells emit about half — or four million metric tons — of all methane emissions from oil and gas well sites, the equivalent of 88 coal-fired power plants every year.[52]

The four-state Appalachian region has about 150,000 marginal conventional wells, or roughly 25 percent of the national total.[53] In the first round of funding of $350 million, the four states have been allocated a total of $115 million. Altogether, the four states could receive a third, or about $230.2 million, based on the first allocation of MERP grant funds. The Pennsylvania Department of Environmental Protection plans to use its first round of

funding ($44.4 million) to “ramp up plugging of oil and gas wells” for marginally producing wells that are typically owned by producers that “may lack the financial resources to properly address leaking wells.”[54]

It is unclear what portion of the state MERP grants funds will go toward decommissioning marginal convention wells. It is also unknown what the decommissioning costs will be for marginal conventional wells, since states have not dispersed MERP grant funds. If we assume 80 percent of MERP funds will be used to decommission marginal conventional wells, and that the decommissioning costs are the same as orphaned wells, an estimated 2,059 marginal conventional wells will be decommissioned in the four states.

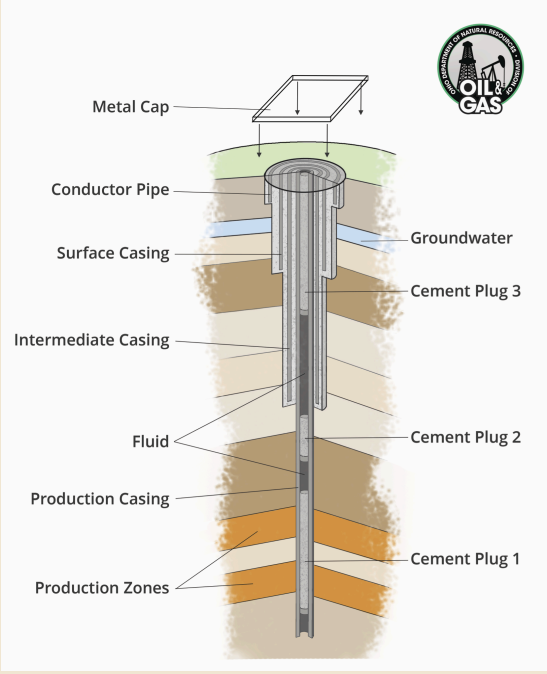
Table 12: Federal Funds for Well Decommissioning

State	Orphaned Wells	Marginal Conventional Wells	Plugging Cost Per Orphaned Well	Orphaned Wells Plugged (IIJA)	Marginal Conventional Wells Plugged (MERP)	Total Plugged Wells
Kentucky	11,728	16,703	$34,435	5,053	604	5,657
Ohio	19,662	25,885	$102,041	3,195	314	3,508
Pennsylvania	26,908	57,908	$109,481	3,663	650	4,313
West Virginia	6,309	49,201	$123,738	1,713	491	2,205
Total	64,607	149,697	$81,695 (avg)	13,624	2,059	15,683

Source: U.S. Department of the Interior, U.S. Environmental Protection Agency, state oil and gas divisions in KY, OH, PA, and WV.

Box 1: Decommissioning Oil and Gas Wells

Figure 1: Well Plugging Schematic



Source: Ohio Department of Natural Resources, Division of Oil and Gas

When oil and gas wells reach the end of their useful life, state law requires operators/well owners to “plug and abandon” (P&A) their wells. This is also called well decommissioning. The primary purpose of well plugging is to stop the vertical flow and migration of fluids and gases within the wellbore to prevent dangerous pollutants from going into the air, water, and soil.

Decommissioning an oil and gas well includes plugging the well, restoring or reclaiming the well site, and remediating contaminated areas. The first step in the decommissioning process is to assess the well’s physical condition, including the underground steel casing and cement, and to identify any subsurface leaks or hazards. Then, the wellbore is cleaned out and workers use cement and other plugging materials to seal the wellbore at specific intervals to prevent fluid flowing to the surface. After placing cement plugs (usually three plugs), pressure testing is performed and each cement plug is tagged to ensure that the plugs are tight. Once this is complete, surface equipment (e.g., tanks) is removed and the surrounding well pad is restored to its previous state (Figure 1).

Workers Needed to Decommission Wells in Appalachia

As shown previously, the cost to plug wells and restore well sites (decommissioning) varies enormously between states depending on several factors.[55] In general, the deeper the well or the older the well, the more it costs to plug. The location, geology, and terrain of the well site, along with the amount of remediation and reclamation needed, can also impact costs. The price of materials (cement), equipment (rigs), and supply of labor also plays a role. The contract size of well plugging packages can also impact cost, with larger contract sizes usually lowering decommissioning costs. Taking these costs into account can help determine the amount of job creation in decommissioning oil and gas wells across Appalachia.

There are two central approaches for estimating the number of jobs or job-years from decommissioning orphaned and abandoned wells. These include using data from contracts on the number of hours it takes to decommission a well, or by using input-out modeling (IMPLAN) that calculates direct, indirect, and induced impacts arising from spending levels that generate economic activity from decommissioning a well. While each of these methods have their advantages, this report uses the number of hours needed to decommission a well, since the focus is on the number of on-site workers needed to carry out this well decommissioning.

To estimate the number of workers needed to decommission wells in Appalachia, this study uses proprietary certified payroll data from two recent (2023) contracts in Pennsylvania for decommissioning a total of 38 wells with federal IIJA initial grant funds. As shown below (Table 3), the average cost per decommissioned well was approximately $70,900 for the two contracts. It took, on average, 266 labor hours of onsite workers per plugged well, or 0.13 direct job-years per well decommissioned.

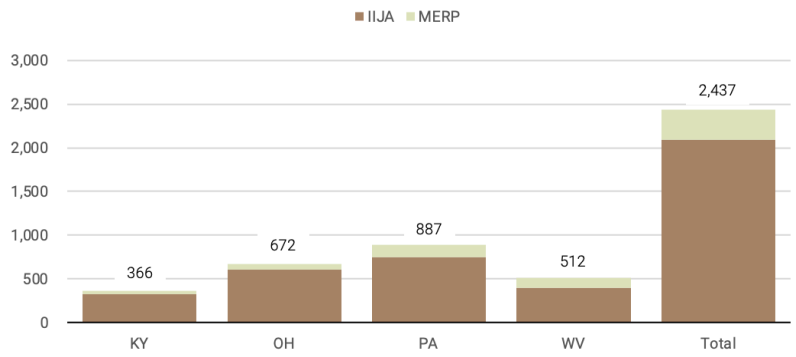
Table 13: Estimated On-Site Workers Needed for Well Decommissioning

Two PA Contracts Awards (2023)	Plugged Orphaned Wells	Cost Per Well	Labor Hours	Hours Per Plugged Orphaned Well	Direct Labor Wages	Job-Years Created	Job-Years Per Plugged Well	Spending Per Job-Year
$2,693,548	38	$70,833	10,114	266	$561,577	5.1	0.13	$532,637

Source: Authors' analysis of certified payroll data submitted to Pennsylvania Department of Environmental Protection

Total spending per job-year was $532,673, with on-site worker costs comprising 21 percent of total project costs. Using the spending per job-year figure to adjust for plugging cost differences between the states, an estimated 2,090 onsite direct workers would be needed to decommission the 13,624 orphaned wells in Appalachia based on $1.1 billion in federal IIJA grant funds. Assuming 80 percent of MERP funds ($184.8 million) are allocated to decommissioning 4,620 marginal conventional wells in Appalachia, an estimated 347 workers would be needed to decommission these wells. In total, over 2,400 jobs would be directly created on well sites to decommission an estimated 15,683 oil and gas wells in Appalachia.

Figure 2: Estimated Job-Years from IIJA/MERP Funding to Decommission Wells



Source: Author's analysis U.S. Department of the Interior, U.S. Environmental Protection Agency, state decommissioning costs from oil and gas divisions in KY, OH, PA, and WV, and two well decommissioning contracts in Pennsylvania.

It's important to recognize that this is only on-site jobs, consisting of mainly truck drivers, heavy machine operators, and laborers. This does not capture all the economic activity generated by the businesses or government that are direct recipients of these funds or secondary effects. For example, these job figures do not include other direct employees of oil and gas service companies contracted to decommission the wells, such as management, engineers, or administrators. Nor does this include subcontractors, purchases of equipment and materials, or jobs at regulatory agencies administering these grant funds. In addition, this does not include indirect jobs or the "induced effect" of these investments.

For example, the U.S. Department of the Interior (DOI) estimates that the $560 million in federal initial grant funds allocated to states to decommission 9,832 orphaned wells created or supported 6,774 job-years, including 2,449 direct and 4,325 secondary jobs. This equates to about 0.69 total jobs per decommissioned well or one job per $82,670 in expenditures.[56] In terms of direct jobs on projects (excluding administration), the DOI estimated $527.4 million in state grants created 2,216 jobs, or about 0.23 job-years per decommissioned well. This is nearly twice the job-years per well that this report uses to estimate the number of workers needed to decommission wells in Appalachia. Using the DOI estimate of $82,670 in spending per job for the $1.1 billion in IIJA grants in the four states would yield a total of 13,463 jobs support. This is 6.4 times the number of job years included in our estimates for the number of well site workers needed. As such, our estimates only include a portion of the likely direct jobs created and should not be understood to capture the total number of direct, indirect, or induced jobs created.

Decommissioning All Unplugged Wells in Appalachia

Documented orphaned wells are not the only wells that will need to be decommissioned. On top of the estimated 65,000 documented orphaned wells in the four states, there are also hundreds of thousands of "undocumented" orphaned wells. According to a 2021 survey conducted by the Interstate Oil and Gas Compact Commission (IOGCC), the four states have somewhere between 148,000 and 638,000 undocumented orphaned wells.[57] Most of these wells were drilled prior to modern plugging regulations before the 1950s. Using mid-point estimates for Ohio and Pennsylvania (the survey includes a low and high estimate), these Appalachian states could have approximately 393,000 undocumented orphaned wells.

The four states also have approximately 387,000 active and inactive oil and gas wells, including 191,000 producing wells (this includes marginal conventional wells) and 196,000 non-producing wells that are either inactive or abandoned.[58] Each state has their own definitions of inactive and abandoned wells, but in general, most of these wells formally produced oil and/or natural gas but haven't for over a year. While states require operators to decommission wells after their useful life, state regulators have not aggressively enforced this requirement. And because the bonding or financial assurance on the wells is a tiny fraction of decommissioning costs, operators have little incentive to decommission their well inventory.[59] Typically, oil and gas operators only decommission wells when they drill.[60] While a fraction of non-producing wells can be lifted back into production or redrilled for other purposes like carbon storage or geothermal, most of them will never be active again and should be decommissioned.

Table 14: Wells to Decommission in Appalachia

State	Documented Orphaned Wells	Undocumented Orphaned Wells*	Abandoned Wells**	Active Wells	Total Wells
KY	11,728	3,000	74,252	16,558	100,225
OH	19,662	51,371	58,842	33,654	159,356
PA	26,908	330,000	29,265	83,800	466,310
WV	6,309	9,000	19,238	57,100	89,934
Total	64,607	393,371	181,597	191,112	815,826

Source: The Capitol Forum Upstream database, Interstate Oil and Gas Compact Commission, and U.S. Department of Interior.

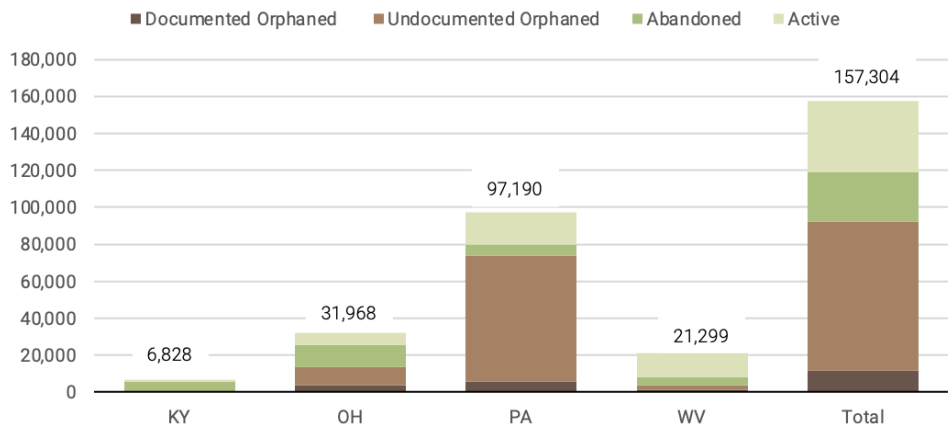
Of the 191,000 active producing wells in the four Appalachian states, approximately 18,600 are high-volume, hydraulic fracturing wells. While few of these unconventional "fracking wells" have been decommissioned in Appalachia, they can be twice as expensive to decommission as conventional wells.[61] Most of the active wells in Appalachia are low-producing stripper or marginal wells, many of which are close to the end of their productive life. About three-quarters of these stripper wells produce less than one barrel of oil equivalent per day (BOED) and by some definitions are considered "uneconomical wells," depending on the price of natural gas.[62] This means most of these low-producing wells will need to be decommissioned in the not-so-distant future.

Altogether, there are between 600,000 and 1.1 million oil and gas wells in the four Appalachian states that will need to be decommissioned over the next several decades. This includes documented and undocumented orphaned wells and producing and non-producing wells. Using a very conservative decommissioning estimate of $50,000 per well, it would cost $42 billion to decommission these wells. Using the average decommissioning cost from the initial grant funding for each state, it would be $82 billion. These figures do not adjust for inflation or increases in productivity that could raise or lower these costs. The amount of bonding or financial assurance that oil and gas operators currently have in the region is less than $150 million, or less than 0.4 percent of decommissioning costs.[63]

Whether the four states or the oil and gas operators pay for the decommissioning of active and inactive wells, it will have to be done one way or another. This means there will be a tremendous amount of work over the next several decades to decommission these wells and well sites. This doesn't include the removal of thousands of miles of buried pipeline, as well as midstream facilities and equipment.

Using estimates of labor hours per well plugged for each state, decommissioning the unplugged well inventory in Appalachia could yield over 157,000 job-years over the next several decades for workers at the well-site. A large portion of this work would be in Pennsylvania, where more than half of the unplugged wells are located. Decommissioning the entire documented orphaned well inventory in the four states could yield nearly 12,000 jobs. Like the above job estimates, these estimates only include workers directly involved in decommissioning at the well site. The total number of jobs could be over six times this amount.

Figure 3: Estimated Job-Years from Decommissioning All Unplugged Wells in Appalachia



Source: Author's analysis of data from TCF Upstream database, state decommissioning costs from oil and gas divisions in KY, OH, PA, and WV, and two well decommissioning contracts in Pennsylvania.

IV: BOOSTING UNION JOBS IN METHANE MITIGATION INFRASTRUCTURE

Union workers are well positioned in Appalachia to benefit from the jobs created from the implementation of strong methane emissions standards and decommissioning unplugged oil and gas wells. Appalachia has above average unionization rates in the industries and occupations that are directly linked to methane mitigation and well decommissioning. These jobs are largely difficult to outsource, since they involve installation of equipment, maintenance and repair, heavy equipment operators, construction laborers, truck drivers, and machinists. Over the last decade, the Appalachian region has lost over 20,000 upstream oil and gas jobs. New jobs in methane mitigation could help reconnect these workers to new careers. For union workers to have the best opportunity at the jobs created by new methane standards and orphaned well decommissioning, state agencies will need to incorporate high-road workforce development and safety standards for federal and state funded projects. Moreover, contractors should be encouraged to become signatories to collective bargaining agreements to expand the most successful model of registered apprenticeship training and gain access to apprentices who meet industry standards.

Importance of Unions to Economic Development & Shared Prosperity

Unions play a pivotal role in lifting wages and benefits for their members while also providing large benefits to communities and the workforce. Unions improve the health and safety of their workers and other workers by setting industry norms around reporting unsafe working conditions and lowering occupational fatalities and injuries. Unions also have indirect effects, such as reducing racial resentment, boosting voter turnout, and championing policies that help all workers, such as increasing the minimum wage and securing paid sick and family leave, flexible work schedules, stronger unemployment insurance systems, better health insurance coverage, and less voter restrictions.[64] Unions help ensure compliance with wage standards, which can reduce employer violations for all workers. Because union members make higher wages, this increases government revenues and decreases the need for government spending since they often use fewer public benefits, such as health insurance, for their employees.

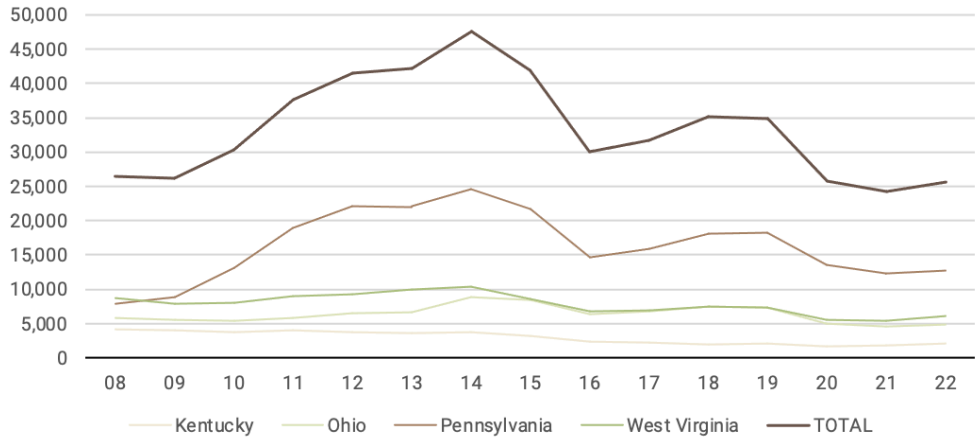
Unions also help foster strong labor-management partnerships and related apprenticeship training programs that offer a key pathway into good middle-class jobs.[65] Many joint-labor apprenticeship programs in construction rival those of colleges, providing commensurate pay and benefits and little debt. Apprenticeship programs can also combat skilled labor shortages by developing workers with in-demand skills.[66] There are currently over 52,000 active apprentices in Appalachia (Kentucky, Ohio, Pennsylvania, and West Virginia) enrolled in federally recognized programs.[67] Approximately 60 percent are enrolled in union (joint-labor management) apprenticeships, while 40 percent are employer-only programs. Of the 33,900 construction apprenticeships in Appalachia, 81 percent, or 27,400, apprenticeships are union-based. Joint Labor-Management apprenticeship programs have several advantages over those run solely by employers, including higher completion rates, higher wages, and more diversity.

Filling the Oil and Gas Employment Gap

There has been a sharp decline in the upstream oil and gas industry in Appalachia since the development of the Utica and Marcellus Shales in the mid 2010s. As Appalachia moved from conventional to unconventional production beginning in 2009, there was a large increase in upstream oil and gas jobs up through 2014, and then a precipitous decline through 2022 as the major development phase of drilling and associated infrastructure reached completion. Altogether, upstream oil and gas employment in Appalachia declined 46 percent, from about 47,600 in 2014 to 25,700 in 2022, which is slightly below employment levels before the shale boom (Figure 4).

While a portion of the employment growth over the last decade is 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.[68] This means there is a pool of workers who could potentially work in the methane mitigation jobs discussed in this report. While natural gas production in the region grew rapidly after 2014 despite declines in upstream employment, production in the region has slowed down over the last couple of years and is expected to remain relatively flat over the next decade.

Figure 4. Upstream Natural Gas and Oil Employment Has Declined by 22,000 (46%) in Appalachia



Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2008-2022. Note: Includes oil and natural gas extraction (211) and support activities for mining (213)

The upstream oil and gas industry has low union density in the United States. In 2022, only 4 percent of oil and gas extraction sector employment in the United States was covered by a union contract, compared to just 6 percent in support activities for mining (mostly oil and gas).[69] The national rate for the private sector was 6.8 percent in 2022. The good news is that the private construction industry has much higher rates of union coverage in Appalachia compared to the nation. More than one in four construction workers in Pennsylvania are covered by a union contract, while one in five are in Ohio and West Virginia. On the manufacturing side, all four Appalachian states have higher rates of union coverage than the nation — especially Kentucky (Figure 5). Higher union coverage in construction, where many of the occupations for methane mitigation are, means more access to highly skilled workers and apprenticeship and training programs.

Figure 5. Most Appalachia States Have Higher Rates of Union Coverage

Union Coverage, 2022	Total Private	Construction	Manufacturing
Kentucky	7.9%	8.4%	15.0%
Ohio	8.2%	20.4%	11.3%
Pennsylvania	7.8%	25.8%	11.2%
West Virginia	7.2%	21.4%	11.9%
United States	6.8%	12.4%	8.6%

Source: Unionstats.com

While there is no specific occupational classification job code for the various jobs in methane mitigation, they fall under a set of skills mostly found in “construction and extraction” and in “installation, maintenance, and repair occupations.” These occupations had national unionization rates of 17.4 percent and 14.2 percent in 2022, respectively.[70] For example, occupations in “construction laborers “and “construction equipment operators,” which would be used in decommissioning orphaned wells, had national union coverage rates of 11.6 percent and 23.1 percent in 2022, respectively.[71] These occupational figures are likely higher in most of the Appalachian states covered in this report.

Importance of Prevailing Wage

The DOI grants for cleaning up orphaned wells and well sites under the IIJA and the EPA grants to states for mitigating emissions from marginal conventional wells under the IRA both require contractors and subcontractors of these grants to pay prevailing wages under the Davis-Bacon Act Related Acts (DBRA). Prevailing wages are local minimum wages for different types of skilled construction work on public construction projects. The purpose of prevailing wage is to create a level playing field for contractors by ensuring that local standards for compensation, craftsmanship, and safety are met with tax-paying funded projects.

Prevailing wage helps protect market-based local wages in the competitive bidding process, so contractors compete on core competence and quality in construction. It helps ensure that there isn't a "race to the bottom" and gives local contractors a fair shot at bidding on public projects while incentivizing contractors not to cut corners on wages, safety, and quality to win bids. Davis-Bacon wage standards are associated with boosting productivity and apprenticeship training for skilled workers, keeping more income circulating in the local economy, making sure projects are completed on time and on budget, and promoting equal pay regardless of race, ethnicity, or gender.

Policies and Practices to Boost Union Jobs on Federally Funded Projects

There are several procurement policies state oil and gas regulators can implement to ensure that not only will unions have a good opportunity to bid on projects to decommission wells and well sites, but that the health, safety, and wellbeing of workers is improved. These policies can also help ensure that taxpayers get the biggest bang for the buck with high-quality work, and that federal grant funds stay in local communities and help increase the number of skilled workers. Below is a list of recommendations that were drafted by unions and other participating organizations in Ohio to ensure that these federal grants support good, family-sustaining jobs in the field of legacy pollution cleanup.

- Registered Apprenticeship Program Participation:
    - Implement a policy stipulating that both the primary bidder and all subcontractors participate in active apprenticeship and training programs approved and registered with the United States Department of Labor's Bureau of Apprenticeship and Training for each of the trades of work contemplated under the awarded contract.
    - Establish a labor hours requirement that provides that a minimum percentage (15 percent) of the total labor hours for a given project must be performed by qualified apprentices. Qualified apprentices are those workers participating in a registered apprenticeship program with the U.S. Department of Labor.

- Responsible Bidder Conditions:
    - Ensure that workers must be classified as employees, not as independent contractors, and that bidders and subcontractors require a health insurance plan and offer a defined-benefit or defined contribution retirement plan for all employees.
    - Require bidders to present certificates of insurance detailing coverage in the following areas: general liability, workers' compensation, unemployment insurance, automobile, and hazardous occupation.
    - Ensure that bidders cannot be rewarded federal grant funds if their companies have outstanding uncorrected or unabated violations or have any labor, safety, or environmental violations.

- Safety and Healthy Workplace:
    - Mandate the use of "toolbox" safety meetings (routine but informal meetings that focus on a specific safety talk) for all employees under supervision and that minutes of Tool-Box Talks are maintained and a copy of each given to all employees on site.
    - Essential Personal Protective Equipment (PPE), such as hardhats, safety glasses and vests, must be provided by managing contractors on project sites and mandatory for all individuals on site.
    - All workers on projects must have successfully completed an OSHA-approved 10-hour construction safety training program and other OSHA-pertinent certifications, such as crane operator and forklift certifications for equipment being used on site.

- Contractor must provide Fall Protection Plans, Fume/Odor Controls plans, and supply documented evidence of their competent person's training and of their "qualified persons," as required by OSHA.
- All on-site workers must be certified by appropriate licensure or accreditation bodies, if applicable, as a competent person in the type of work being performed. Moreover, all appropriate licensures must be issued to workers performing such licensed work when and where applicable.

EPA Methane Standards and Union Jobs

While the jobs associated with methane mitigation emanating from EPA methane standards do not require prevailing wage or other high-road labor standards, unions are still well positioned to ensure that many of these jobs are union jobs. One recent report that examined the employment opportunities from EPA methane emission standards found that "at least 10 percent of the jobs will be union jobs" based on the unionization rates of top job categories.[72] As discussed above, the unionization rates of the occupations created by oil and gas methane standards in Appalachia is likely higher than the national average. Therefore, there should be more opportunities for unions to get a foothold in these industries in Appalachia. To make this happen, states or the federal government could partner with existing pre-apprenticeship and apprenticeship programs to create new training courses and curriculum. This could include grant programs like the one highlighted below in California. In addition, contractors could be encouraged to become signatories to collective bargaining agreements to expand registered apprenticeship programs. States, or the federal government, could also offer a tax credit for companies engaged in methane mitigation projects that pay either prevailing wage rates or utilize active apprenticeship and training program to incentivize unionized workers.

Examples of State Policies to Boost Union Contractors to Decommission Orphaned Wells

The states of Pennsylvania and California are taking steps to build more skilled workers in well decommissioning, including investing in on-the-job training and a pilot initiative for state apprenticeship programs and curricula to upskill journeypersons on well-capping projects.

- Commonwealth Workforce Transformation Program in Pennsylvania:
  In July of 2023, Pennsylvania Governor Josh Shapiro announced an executive order to create an on-the-job (OTJ) training grant program — the Commonwealth Workforce Transformation Program (CWTP) — using 3 percent (estimated around $400 million) of funds from the Infrastructure Investment and Jobs Act of 2021 (IIJA) and the Inflation Reduction Act (IRA).[73] This could mean $9 million alone for training workers to clean up orphaned wells in Pennsylvania.[74] The funding provides a grant of $40,000 per new employee or $400,000 per project to organizations (e.g. private contractors) that receive IIJA or IRA funds and use those funds for job training costs (e.g., wages or apprenticeship costs) and support services (e.g., child care).[75] Other provisions stipulate that new employees must be employed at least six months, contractors must pay prevailing wages and be "responsible contractors," and strict compliance for contractors can be waived for work under project labor agreements (PLAs) or community benefit agreements.

  The CWTP could help incentivize the use of union workers in decommissioning orphaned wells since more than half of all apprenticeships programs in Pennsylvania are union apprenticeship programs. These funds could play a large role in the creation of the state's first union apprenticeship program for well plugging and reclamation if contractors partner with local building trades like the operating engineers, laborers, and teamsters.

- California High Road Training Partnership:
  Last year, the California Workforce Development Board, as part of its High Road Training Partnership, launched an oil and gas well capping pilot initiative in Los Angeles and Kern Counties with $14.3 million in funding.[76] The funds can be for training apprentices and upskilling journeypersons on well plugging projects. Last summer, California Legacy Well Services (a union contractor) received $6.4 million to develop an apprenticeship program.[77] This is the only known state-funded well decommissioning workforce development program in the country.

CONCLUSION

As detailed in this report, reducing methane emissions from oil and gas operations can provide a significant number of jobs in Appalachia. With over $1.3 billion in federal funds and new rules to reduce methane emissions over the next decade, it's imperative that policymakers, workforce development agencies, businesses, and skilled members of the building trades work together to create qualified workers for quality jobs. On top of this federally spurred investment, there are also over 800,000 unplugged wells in the region, representing decades of work in cleaning up well sites and dealing with other dilapidated natural gas infrastructure. To ensure that these jobs are high quality union jobs, high-road employment practices need to be utilized along with policies to support the burgeoning methane mitigation industry.

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