TRUE TRANSITION

ADDRESSING METHANE EMISSIONS IN LOUISIANA: HOW MANY JOBS WILL IT TAKE?

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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 CO2 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.

FORWARD

LOUIS REINE,
President of The Louisiana AFL-CIO

Louisiana is one of the top three natural gas-producing states[1] and first in the nation for poverty.[2] Louisiana's 16 oil refineries account for nearly one-fifth of the nation's refining capacity and Louisiana is 47th for median household income.[3] Louisiana's ports handled 35% of the nation's total natural gas exports in 2022 and Louisiana has the fourth lowest overall life expectancy nationally.[4] While there are 29 petrochemical plants and 12 LNG export facilities in various stages of planning in Louisiana, Louisiana is losing more of its residents than any other state in the nation.[5] Louisiana is home to two of the four storage sites that make up the U.S. Strategic Petroleum Reserve and has lost nearly 2,000 square miles of land since the 1930s.[6] Despite record oil and gas production in federal waters of the Gulf of Mexico, over 20 thousand Louisiana oil and gas workers have been "let go" since 2013.[7] It is not enough to encourage commercial investment into our state or host strategic industries. We must also invest in our people.

This report, which is the result of efforts from researchers at True Transition and the University of Texas's Ray Marshall Center, shows clearly that there is no shortage of work in the coming years. What is needed at this moment is the political courage to chart a new course and commit to making these high quality jobs that can support Louisiana families in dignity. Mitigating methane emissions will create high quality union jobs here in Louisiana, raise labor standards in our communities and at the same time, decrease pollution right here in our state.

Methane is a greenhouse gas that contributes to the pollution and warming of our planet's atmosphere, increases ground-level ozone formation, leading to higher rates of death, more childhood asthma, and reduced crop yields. To protect the people of Louisiana and ensure a better future for our children, it is crucial that we decrease our methane emissions. Federal action, such as the Infrastructure Investment and Jobs Act and the newly enacted EPA methane rule provide us an opportunity to make investments into the workers to do this critically important work.

Overall, this report finds that implementing the new EPA methane rules in Louisiana could create approximately 2,609 new jobs in the state and utilizing $197 million from the IIJA and IRA to decommission only orphaned and marginal (2,261) conventional wells that have dedicated funding would require between 394 and 1,243 job years. Decommissioning all of Louisiana's 4,605 documented orphaned wells in Louisiana will support between 803 and 1,607 direct job-years. Meanwhile, plugging all of Louisiana's unplugged oil and gas wells, removing no longer in use platforms, and restoring Louisiana's critical habitat could potentially create 49,138 new job years. It took decades to install that iron, and it will demand no less to remove it.

This report calls on local leaders and policymakers to ensure that the jobs created from the methane mitigation industry are family-sustaining jobs filled with highly trained workers. Achieving this will require enforcing Davis-Bacon, implementing Project Labor Agreements, Labor Peace Agreements, boosting apprenticeship and pre-apprenticeship programs, and collaborating with Louisiana's Workforce Development Boards. Methane mitigation has the potential to address a myriad of economic and environmental challenges and Louisiana has the opportunity to be a leader in creating high-quality union jobs. It's time to get to work.

Louis Reine, President of the Louisiana AFL-CIO

EXECUTIVE SUMMARY

Since the first oil well was drilled in an unassuming rice field in 1901, companies have drilled a known 228,189 oil and gas wells throughout Louisiana. From shallow legacy wells drilled a century ago to active shale wells with laterals that can extend a mile or more, Louisiana's well population is a diverse array representing the arc of technological advancement which has characterized the oil and gas industry.

These wells are situated in forests and prairies, woodlands and swamps, bayous and tidal marshes, and offshore in the 3 nautical mile Louisiana state boundary of the Gulf of Mexico. Connecting these wells to refineries and petrochemical plants, companies have cut through marsh and wetland to build a highway system of pipelines, in total 50 thousand miles of pipelines traverse the state. These pipelines bring oil and gas both from Louisiana wells and the Federal Outer Continental Shelf to Louisiana's 300 process manufacturing facilities, two of the nation's four Strategic Petroleum Reserve (SPR) underground salt caverns, over 150 petrochemical plants, and 16 refineries that process 1/6th of the nation's refining needs.

Despite the age of the industry, the ubiquity of its footprint, and its national strategic importance, efforts to curb waste throughout the oil and gas supply chain have been meek and half-hearted. Recent federal laws to invest public dollars and lower emissions, however, present an opportunity to address this waste once and for all.

Oil well and workers in the Richland Gas Field in Richland Parish Louisiana in 1928 Source: State Library of Louisiana Historic Photograph Collection

EPA METHANE RULE

In March 2024, 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.[8] EPA applies its regulatory authority through the Clean Air Act[9] to revise new source performance standards, and to regulate greenhouse gasses, volatile organic compounds (VOCs), and oil and gas emissions "to mitigate climate-destabilizing pollution and protect human health by reducing greenhouse gas and VOC emissions from the oil and natural gas industry." EPA's new rules reduce methane through improved efforts at monitoring and requiring the replacement or abatement of known high-leak components.

Louisiana will require 2,609 direct jobs to successfully meet EPA methane emissions regulations. While a portion of these jobs will focus on replacement and abatement of methane emissions (1,557) and thus be temporary, those positions related to maintenance and monitoring (1,053) will be permanent.

FEDERAL ORPHAN WELL GRANT PROGRAM

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) is $1 billion for reducing methane emissions from marginal (low-producing) conventional oil and gas wells, including $700 million for state grants to decommission wells. Louisiana could receive a total $181 million in IIJA funds to clean up its orphaned wells. This includes $25 million in initial grants, $111.5 million in formula grants and up to $70 million in performance grants. Louisiana is also eligible for $15.7 million to plug marginal wells to reduce methane emissions.

Decommissioning all of Louisiana's 4,605 documented orphaned wells in Louisiana will support **between 803 and 1,607 direct job-years.** Utilizing **$197 million** from the IIJA and IRA to decommission only orphaned and marginal (2,261) conventional wells that have dedicated funding would require between **394 and 1,243 job years.** 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 (DOI) estimates that one job is supported per $83,670 in IIJA state grants. Using Interior's job creation multiplier would increase the number of jobs supported above the report authors' estimates for on-site workers needed to decommission 2,261 wells. Indeed, DOI the multiplier places the total jobs created at roughly one job per well.

But these are not the only unplugged wells that will require decommissioning in the near future. **Decommissioning the total unplugged well inventory in Louisiana (including offshore wells) will support between 20,429 and 49,138 direct job-years.** Yes, you can park a truck with a boat hitched between these two estimates, but read on for a detailed methodology and explanation. The Louisiana Department of Energy and Natural Resources (LDENR) estimates that decommissioning a well in Northern Louisiana typically require 1-2 days +/-24 hours of work, while Southern Louisiana/Offshore/Deep/Complex wells can take anywhere from 2-4 days to a month or more (depending on downhole issues).[10] We utilized two different job estimation methods in the report to create a range that could appropriately capture this ambiguity.

ABANDONED WORKERS

In its Notice of Intent to the Department of Interiors stating its intent to apply for IIJA well plugging funds, the State of Louisiana reported that between March 1, 2020 and November 15, 2021, employers had fired 12,256 oil and gas workers in the state. Even before the Covid-19 shutdowns, employment in the oil and gas sector was in

sharp decline. Following the national overturn of the crude oil export ban and subsequent crash in 2015, upstream oil and gas employment in Louisiana declined by 41 percent, from just over 50,242 jobs in 2014 to 29,443 jobs in 2023.[11] **Over 20 thousand Louisianans in oil and gas production were handed the pink slip in the last ten years.** True Transition carried out a national survey of oil and gas workers in 2022 and found that almost half (44%) of Louisiana-based survey respondents had been let go at least once prior to 2020 and 15% reported having been let go more than once.[12]

GOOD JOBS RESULT IN BETTER WORK

Unlike the boom and bust of oil and gas production, plugging of wells and monitoring and methane abatement will provide steady demand and require a stable, well-trained workforce. As one is a publicly funded program, there should be a clear public benefit. There is a sizable portion of displaced oil and gas workers who still live in Louisiana who are now employed in other industries, underemployed, or unemployed. These individuals possess skills and experience that Louisiana needs to meet this mandate.

There are opportunities to ensure that these jobs meet Louisiana's various obligations to the public and support well-paid and high-benefit 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 the American public gets the biggest bang for their buck with high quality work, and that federal grant 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 fair wages.

LOUISIANA WORKFORCE DEVELOPMENT BOARDS:

> Workforce Development Boards could play a powerful role to prepare individuals living in Louisiana communities for careers in the budding methane mitigation industry. If a training program is not explicitly linked to jobs then it runs the risk of being nothing more than a "train and pray" scheme. There is an opportunity to increase coordination between the Louisiana Department of Energy and Natural Resources and the Louisiana Workforce Commission and participating union apprenticeships. There will be no shortage of wells to plug and infrastructure to dismantle.

OILFIELD REMEDIATION SHOULD STRENGTHEN LOUISIANA'S COASTAL MASTER PLAN:

> Have you ever waited for a road to be repaired for months to fix an electric line, only to have that same road ripped up again at a later date to repair a water pipe? Infrastructure projects should be planned and implemented in coordination. The orphan well plugging and remediation program should work in concert with Louisiana's Coastal Master Plan, and indeed, those wells should be prioritized in support of the State Master Plan.[13] To the fullest extent possible, oil and gas infrastructure remediation efforts should be carried out to support coastal restoration projects. As such, labor recommendations below apply to both CPRA contracts and DENR contracts.

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 which 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.

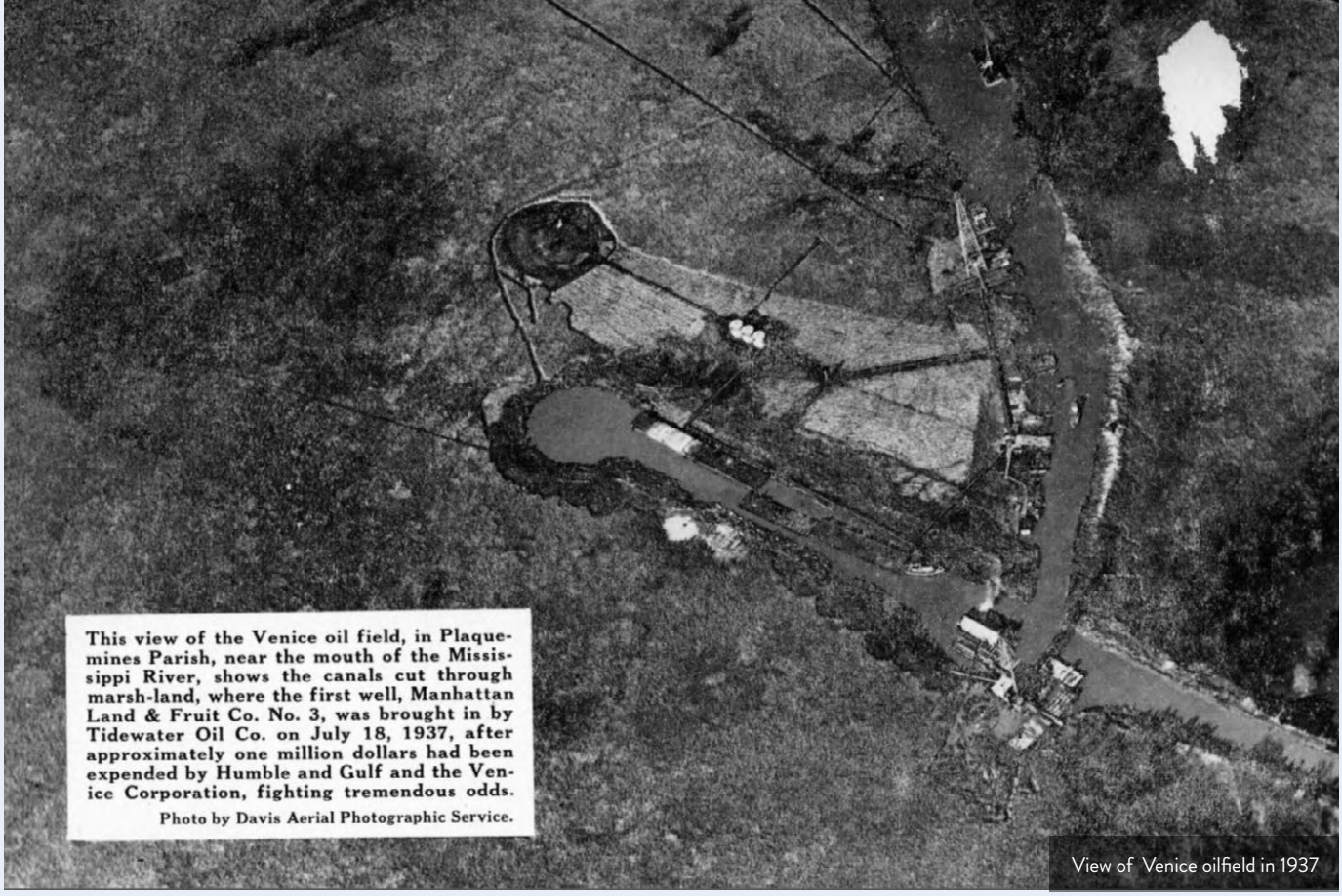
RESPONSIBLE BIDDER CONDITIONS:

- 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 licenses must be issued to workers performing such licensed work when and where applicable.

By providing a careful analysis of the total number of needed workers across the state, this report is intended to help prompt industry and state and federal regulatory agencies in thinking clearly about the scale of need for qualified workers and to consider best practices to ensure high quality employment for them. 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 their own Louisiana families in dignity.



View of Venice oilfield in 1937

BACKGROUND ON THE ECONOMIC AND ENVIRONMENTAL STAKES

This report estimates the number and types of jobs required to meet new EPA regulations and to decommission oil and gas wells in Louisiana. This task is not as simple as counting up the number of wells or compressor stations. First, the data is incomplete.[14] Second, Louisiana is made up of distinct habitat zones which necessarily increase the number of workers and costs to monitor and repair infrastructure located in more challenging geographic areas. It will simply require more people, more equipment, and time to monitor or plug a well in a marsh or the Gulf of Mexico accessible only by boat or helicopter than one in the middle of a pasture accessible by a road.

Finally, reduction of methane is not the State of Louisiana's only goal when addressing this infrastructure. The Louisiana Coastal Protection and Restoration Authority (CPRA) currently administers a statewide $50 billion Coastal Master Plan to restore Louisiana's collapsing coastal habitats and bolster storm protection for inland communities. Most of the land that comprises coastal Louisiana is the spongy Mississippi river delta: ancient bald cypress forests with knotted root systems that can withstand hurricane force winds, wide open brackish marsh and saltwater estuaries that provide nursery habitat for the countless fish species that call the Gulf of Mexico home, and sandy beaches constantly shifting and providing critical storm buffers. But Louisiana's iconic coastal boot is sliding into the Gulf of Mexico, not in small part, because of oil and gas production.

Between 1937 and 1977, more than 6,300 exploratory wells and more than 21,000 developmental wells were drilled in Louisiana's eight southernmost parishes.[15] Multiple studies have confirmed that hydrocarbon production has induced land-surface subsidence and downlift exposing regional zones to relative sea level inundation.[16,17] Additionally, prior to the legal requirement to dispose of produced waters into subsurface injection wells, for decades companies stored briney and radioactive produced waters into unlined pits. In the 1970s, "the flow of brine into pits and surface waters across Louisiana simulated a BP-type event every four days."[18] Only later

View of Venice oilfield in 2013 Photo by Healthy Gulf

did regulators understand that the highly concentrated salt interrupted the natural life cycle of marsh grasses, killing their complex root systems; and without the roots to bind the marsh soil together, land converted to open water.

Saltwater intrusion also came by way of navigation and pipeline canals. In less than a few decades the industry cut into the marsh access canals, both for navigation purposes and over 50,000 miles of pipelines.[19] Louisiana has lost nearly 2,000 square miles of land since the 1930s.[20] Wells that may have been originally drilled on land, may now be in open water.

Louisiana's coastal restoration activities are not separate from addressing aging or obsolete oil and gas infrastructure. Indeed, in more than three decades, the state has dedicated 84 percent of its coastal restoration funds to remedying damages caused by oil and gas operations.[21] In 2020, the CPRA spent more than $20 million attempting to restore and save East Timbalier Island which protected more than 700-plus oil wells in Terrebonne and Timbalier bays from waves and storms, but a tangle of pipelines undermined that work.[22] For coastal restoration to be successful, this infrastructure must be addressed properly.

Then there are new industrial uses. A recent study evaluating the proximity of unplugged wells to Class VI carbon capture and storage projects, identified at least 1,200 abandoned wells with potential to penetrate CO2 storage areas, creating a direct pathway for leakage.[23] For "permanent" storage to approach a state resembling "permanence", this infrastructure must be addressed properly.

The stakes to plug oil and gas wells correctly and isolate and protect freshwater sources are also increasing. Prolonged droughts are imposing demand upon Louisiana surface waters[24] and saltwater intrusion due to port deepening[25] at the mouth of the Mississippi River demonstrates starkly that Louisiana's abundant freshwater resources are not so inexhaustible. Addressing leaks within the oil and gas supply chain and properly plugging oil and gas wells is a critical and important task. At the heart of this report is a simple premise:

We need quality workers to do a quality job.

I. MITIGATING METHANE IN LOUISIANA

1.1 WHAT IS METHANE? WHY DOES IT MATTER?

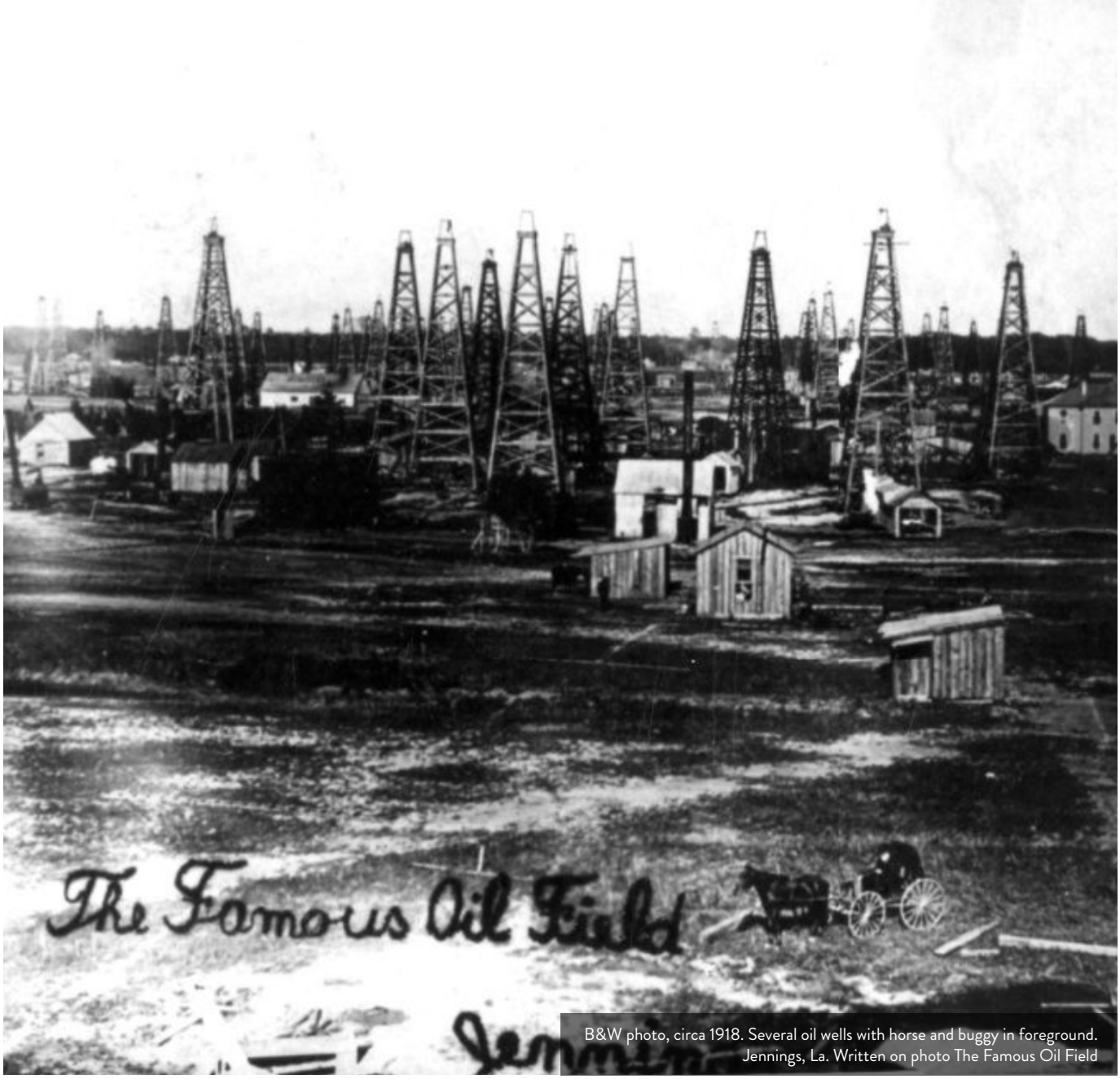
Current efforts to target methane emissions in the oil and gas industry for reduction stem from two underlying facts: Excess atmospheric methane plays several particularly egregious roles in the Earth's atmosphere, and currently available technology within the oil and gas industry exists to reduce its 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.[26] 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.[27,28] 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.[29]

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.[30] 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.[31] 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.[32] High ozone levels are associated with long-term damage to lungs, leading to research linking childhood asthma and ozone exposure.[33] Caddo Parish, for instance, is home to the Haynesville Shale production boom, which has led to the highest concentration of ozone in the state, and the highest age-adjusted rate of emergency room visits for childhood asthma of the 64 parishes in the state.[34]

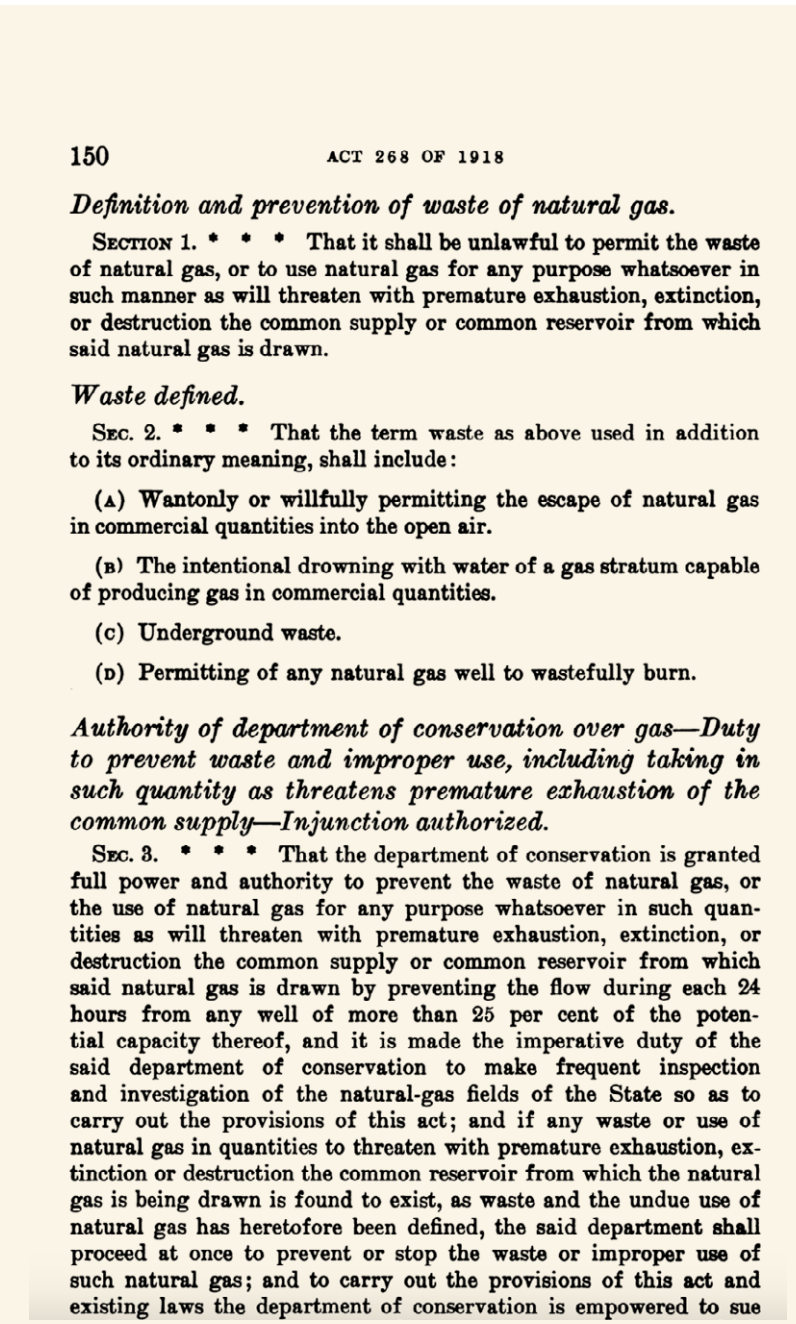
Ozone significantly damages crop function, more than any other airborne pollutant.[35] It damages plant growth and seed development, reduces crops' lifespan, makes crops more susceptible to death in cold temperatures or overwintering, inhibits crops' resistance to drought and other stressors, and leads to visible signs of plant injury.[36] Thus, decreasing methane emissions not only supports climate goals, but also reduces ground-level ozone formation, leading to lower rates of death, less childhood asthma, and increased crop yields. From any vantage, reducing these emissions is a win for the people of Louisiana.



B&W photo, circa 1918. Several oil wells with horse and buggy in foreground. Jennings, La. Written on photo The Famous Oil Field

1.2 METHANE EMISSIONS IN LOUISIANA

The first successful oil well in Louisiana, the Heywood #1 Jules Clement well was drilled in 1901 in Jennings, Louisiana.[37] In 1913, the Conservation Commission established its first standards for drilling, surface casing, construction, plugging of wells, prevention of leaks, inspections, and minimization of waste.[38] As adopted in 1943, and most recently amended in May 1997, Louisiana prohibits natural gas flaring and venting in the state, unless the DENR approves an operator's application for exemption due to economic hardship. Oil and gas production facilities must also obtain an air permit from the LDEQ before beginning construction.[39] Even with rules on the books, funding, staffing and a lack of formal enforcement procedures have hindered Louisiana's state agencies from the beginning and this persists to this day.[40] [41] DENR employs 177 full-time-equivalent employees to oversee oil and gas permitting and oversight. This includes only 52 inspectors (a ratio of 1 inspector to 3,700 wells for the entire well population). Louisiana's Department of Energy and Natural Resources have recently taken steps to reduce methane leaks from oil and gas wells and the infrastructure that transmits them.[42] This includes a proposed rule to prohibit venting and flaring of methane from wells and transmission facilities.[43] It has an "earliest effective date" of January 20, 2024. Whether these



150 ACT 268 OF 1918

Definition and prevention of waste of natural gas.

SECTION 1. * * * That it shall be unlawful to permit the waste of natural gas, or to use natural gas for any purpose whatsoever in such manner as will threaten with premature exhaustion, extinction, or destruction the common supply or common reservoir from which said natural gas is drawn.

Waste defined.

SEC. 2. * * * That the term waste as above used in addition to its ordinary meaning, shall include:

(A) Wantonly or willfully permitting the escape of natural gas in commercial quantities into the open air.

(B) The intentional drowning with water of a gas stratum capable of producing gas in commercial quantities.

(C) Underground waste.

(D) Permitting of any natural gas well to wastefully burn.

Authority of department of conservation over gas—Duty to prevent waste and improper use, including taking in such quantity as threatens premature exhaustion of the common supply—Injunction authorized.

SEC. 3. * * * That the department of conservation is granted full power and authority to prevent the waste of natural gas, or the use of natural gas for any purpose whatsoever in such quantities as will threaten with premature exhaustion, extinction, or destruction the common supply or common reservoir from which said natural gas is drawn by preventing the flow during each 24 hours from any well of more than 25 per cent of the potential capacity thereof, and it is made the imperative duty of the said department of conservation to make frequent inspection and investigation of the natural-gas fields of the State so as to carry out the provisions of this act; and if any waste or use of natural gas in quantities to threaten with premature exhaustion, extinction or destruction the common reservoir from which the natural gas is being drawn is found to exist, as waste and the undue use of natural gas has heretofore been defined, the said department shall proceed at once to prevent or stop the waste or improper use of such natural gas; and to carry out the provisions of this act and existing laws the department of conservation is empowered to sue

Louisiana's Act 268 of 1918 shows that there have been good rules to prevent waste and emissions on the books from the beginning. But without adequate enforcement staff and meaningful consequences, rules are nothing more than a pretty piece of fiction.

new rules will include a corresponding increase of staff to enforce them is unknown.

In 2023, environmental contractors conducted a methane measurement on 549 orphaned wells and detected methane leakage from 148 of these wells.[44] Assuming leak rates are relatively constant over time, just these 148 wells have leaked 131 metric tons in a single year, which could power over 470 Louisiana homes for one year.[45] In 2021, the Global Airborne Observatory platform, which is an aircraft equipped with a visible shortwave infrared imaging spectrometer, surveyed over 150 offshore platforms and surrounding infrastructure (tanks, satellite wells, pipelines, and vents) in US federal and Louisiana state waters in the Gulf of Mexico representing 8% of active shallow water infrastructure.[46] The researchers found that older platforms in state waters were responsible for the highest emissions and that Gulf of Mexico leaks could account for 589 million metric tons in a single year. This wasted gas could power an astonishing 2.6 million homes a year.[47] In 2022, the Sentinel-5P satellite detected a methane plume that stretched 56 miles across multiple Louisiana parishes.[48] Bloomberg News alerted the US Pipeline & Hazardous Material Safety Administration (PHMSA) regarding the event and the investigation is ongoing. From offshore to onshore, from wellhead to pipeline, there are many opportunities to prevent leaks and waste within Louisiana's borders.[49]

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 workers and technologies to greatly reduce unwanted emissions from the oil and gas industry and because most states, including Louisiana, lack the regulatory structures and, particularly, staff to tackle this issue.

In March 2024, the EPA released finalized 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.[50] Production and processing equipment and

processes covered by the EPA's new rule include 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, the EPA's rule covers all equipment and processes, making no distinction between existing emission rates and the level of required monitoring.

The 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, but repairing leaks will still require worker visits and using remote leak sensing technologies also creates an unfortunate lag between leak detection and repair.[51] The EPA's new rules 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.

The EPA also estimates the net benefits of these new rules by measuring the benefits to health and climate with reduced levels of ozone.[52] They calculate a present value net benefit of $97 billion, with an equivalent annual value net benefit of $7.6 billion.[53] As part of this net benefit, the 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).

The release of the 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.[54] 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.

A derelict platform in Louisiana state waters. Source: Scott Eustis with Healthy Gulf.

This large federal outlay of funding to states, in combination with new EPA rules around orphaned 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 orphaned wells (a process that could take decades) and to monitor and repair oil and gas infrastructure to prevent or limit methane emissions. There is a good deal of work to do, and for that we will need to train and pay a lot of good people.

II. LOUISIANA BACKGROUND
CHARACTERISTICS OF LOUISIANA'S WELL INVENTORY

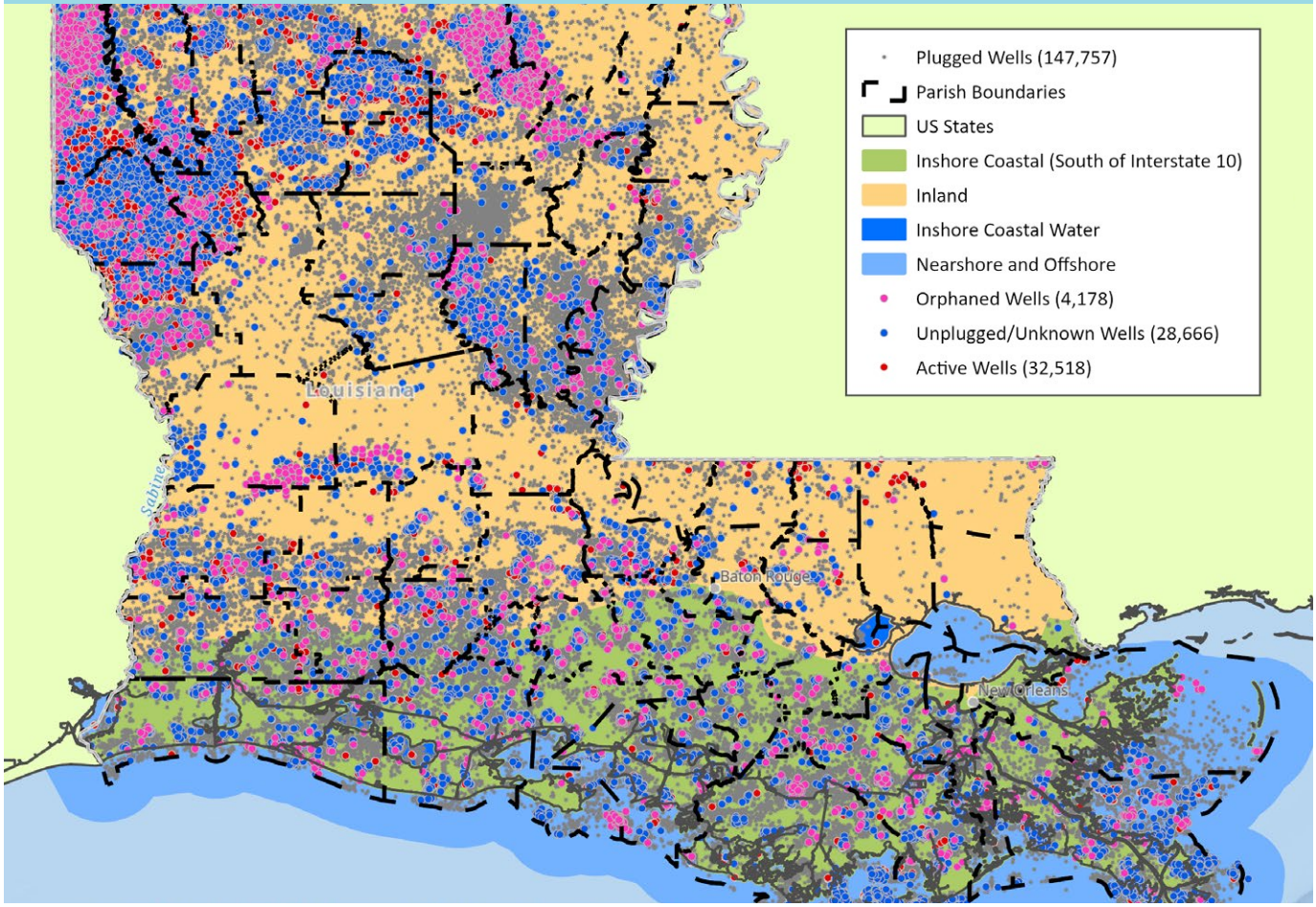
2.1 AGE OF WELL INVENTORY

Louisiana's DENR currently lists 4,533 orphaned wells, but those are not the only wells that will need to be decommissioned over the next several decades. Below is a description of the various well types in Louisiana.

According to Louisiana law, each and every one of those wells will need to be decommissioned[55] and the oilfield site remediated to its original condition. It is important to recognize that oil and gas well categories are not static. A well will naturally move from active production to marginal production. A well that produced considerable amounts of commercial product and profit for its owners can move either to plugged or orphaned depending upon the scruples of its owners and diligence of the relevant regulators.

FIGURE 1

MAP OF LOUISIANA'S UNPLUGGED WELLS



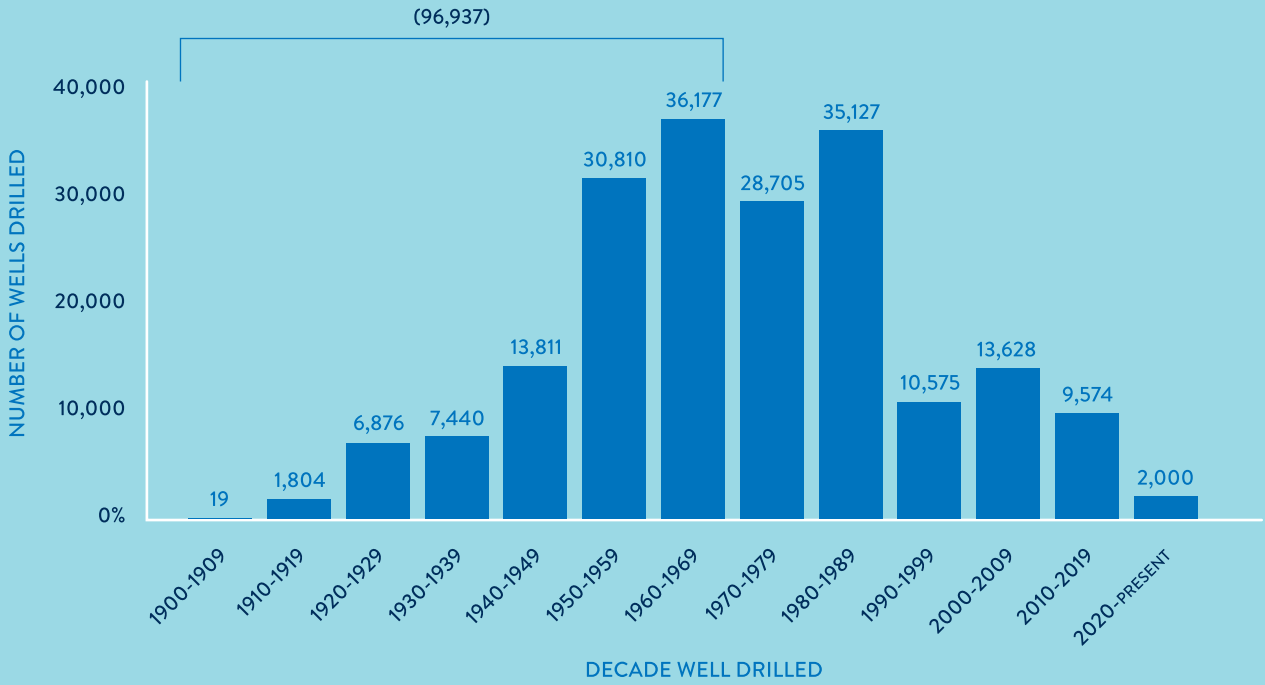
2.2 AGE OF WELL INVENTORY

Data from The Capitol Forum Upstream data platform of real-time production and well reporting for Louisiana shows that in total, 228,189 wells have been drilled between 1900 and 2023. It's a general rule that the older the well, the more unforeseen the complications, and the higher the costs to plug the well. A 2021 study found that wells that were more than 60 years old (anything drilled before 1964) could increase costs by as much as 30%.[56] Steel degrades. Cement (if there is any) cracks. **Figure 1**. (below) shows that over 60,000 wells were drilled before 1970 and over half of the state's well inventory is over 40-years-old.

FIGURE 2

LOUISIANA WELLS DRILLED BY DECADE

truetransition.org



Data Source:The Capitol Forum Upstream database, Louisiana Department of Energy & Natural Resources SONRIS database

INACTIVE WELLS

While states require operators to decommission wells after their useful life, many state regulators have not aggressively enforced this requirement - Louisiana included. 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 inventories.[57] Why pay to plug today when you can pay to delay for a fraction of the cost? Typically, oil and gas operators only decommission wells when they drill and an unplugged well poses a risk to a nearby production well.[58] While a tiny percentage of non-producing wells could potentially be lifted back into production or redrilled for other purposes like carbon storage or geothermal, most of them will never be reactivated again and should be decommissioned.[59]

Louisiana's DENR currently lists over 25,000 non-producing, unplugged wells[60] that are materially no different from orphaned wells.[61] Louisiana defines inactive wells as those having no reported production or other permitted activity for six months. According to Louisiana law,

operators must plug inactive wells within five years after they become inactive.[62] Most operators opt to pay an annual inactive well fee instead.

Louisiana has just passed a Future Utility Rule, that imposes escalating fines for inactive wells, ranging between $125 to $750 depending upon length of inactivity and depth of the well.[63] As of November 2023, over 12,000 of Louisiana's inactive wells have not produced any oil or gas in over ten years.

TABLE 1

INACTIVE WELLS AND YEARS SINCE LAST PRODUCTION

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YEARS SINCE LAST PRODUCTION	NUMBER OF UNPLUGGED WELLS
1	2,410
2-3	3,614
4-5	3,466
6-10	4,808
10-20	4,866
21-30	3,687
31-50	3,895
TOTAL UNPLUGGED WELLS	**26,746**

Data Source:The Capitol Forum Upstream database, Louisiana Department of Energy & Natural Resources SONRIS database

AN AVOIDABLE TRAGEDY

Unplugged wells are far from harmless. In 2020, a tank battery for a shut-in inactive well exploded and killed a child, 14-year-old Zalee Day-Smith.[64] The child's family had rented a home from the surface right owners and were told that the shut-in well and tank battery were secured and safe enough that the children could have full access to the site. This was not the case, and Zalee died a painful and avoidable death. The operator had been allowed to pay a marginal yearly fee instead of an estimated $50,000 to plug the well. In 2021, Louisiana DENR implemented a new rule to restrict the general public's access to tank batteries and embark upon an inventory of all tank batteries in the state.[65]

2.3 MARGINAL WELLS

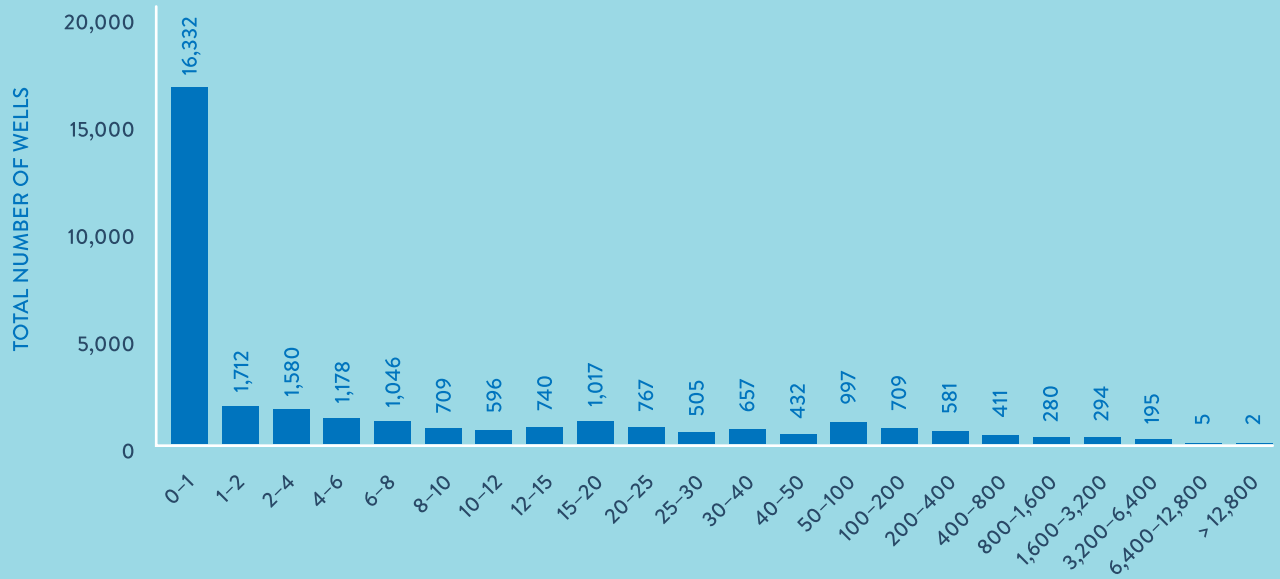
Most of the 30,745 active producing wells[66] in Louisiana are low producing stripper wells, many of which are close to the end of their productive life. A stripper well is typically defined as an unplugged well with an average daily oil and gas production of less than 15 barrels of oil or 90 Mcf[67] of natural gas. Louisiana law defines a stripper well as a well incapable of producing more than 10 barrels of oil a day. These wells are also eligible for a reduced severance tax rate of 3.125%.[68] Almost 80% (approximately 23,893 wells) of the state's total "active" well inventory produces less than 15 barrels of oil or 90 Mcf of natural gas per day and are considered marginal wells. Approximately half or 16,332 of Louisiana's 30,745 active producing 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. This means most of these low-producing wells will need to be plugged in the not-so-distant future.

Current research has found that, "some stripper wells are venting or leaking 100 percent of the gas they produce," and that idle and marginal wells could be responsible for as much as "between 5 and 11 percent of methane emissions in the oil and gas production sector."[69] Marginally producing wells may be responsible for up to 4 Tg[70] per year of methane emissions nationally.[71] One recent study found that stripper wells emit about half of all methane emissions from oil and gas well sites, the equivalent of 88 coal-fired power plants every year.[72] Measurements from Dr. Amy Townsend-Small and her research team have shown that shutting in marginally producing wells from the lowest production category (0 to 1 barrels of oil equivalent per day) will reduce methane emissions from these wells by 10 to 100 times.[73]

FIGURE 3

LOUISIANA ACTIVE OIL AND GAS WELLS AND DAILY PRODUCTION

truetransition.org



DATA: U.S. ENERGY INFORMATION ADMINISTRATION

The Inflation Reduction Act (IRA) contains at least $700 million in funding to reduce methane emissions from conventional stripper wells.[74] This funding can be used to decommission stripper wells, measure methane emissions from stripper wells, and to administer the program. In the first round of funding of $350 million, Louisiana has been allocated just over $15.6 million. Using the state's Notice of Intent to the Department of Interior figure of $87,000 per well, **it would cost $2 billion to decommission Louisiana's 23 thousand marginally producing wells.**[75] Based on the current funding level, Louisiana will be able to plug 180 low-producing wells. These figures do not adjust for inflation or increases in productivity that could raise or lower these costs. Currently oil and gas operators currently hold financial assurance for only 6% of total liability in Louisiana.[76] Even when there are bonds for an orphaned well, the Louisiana Auditor has found cases where DENR was unable to call the bonds from financial institutions.[77]

TABLE 2

INFLATION REDUCTION ACT FUNDING TO REDUCE EMISSIONS FROM STRIPPER WELLS

truetransition.org

	LOUISIANA
# OF WELLS PRODUCING LESS THAN 11 BARRELS OF OIL PER DAY	20,000
PROJECTED COST TO PLUG ALL STRIPPER WELS	$1,700,000,000
$/WELL BASED ON PROJECTED COST	$87,232
PROJECTED WELLS PLUGGED WITH IRA FUNDS	180

Data Source Louisiana's Notice of Intent to the Department of Interior

2.4 IMPROPERLY PLUGGED WELLS

The typical lifespan of a plugged well is unknown. However, it is generally understood that wells plugged before 1950 are considered unplugged or not plugged to modern cementing standards.[78] Just over 25,000 of Louisiana's plugged and abandoned wells were plugged prior to 1953. In some instances, wells were plugged with wood, brush, rocks, or paper and linen sacks. In Pennsylvania, a regulation passed in 1921 stipulated that abandoned wells be plugged with "'well-seasoned', round wooden plugs."[79]

Oil and gas wells plugged before 1953 (when the American Petroleum Institute first published plugging standards) were unlikely to be properly plugged because of inadequate cementing standards.[80]After 1952, when the American

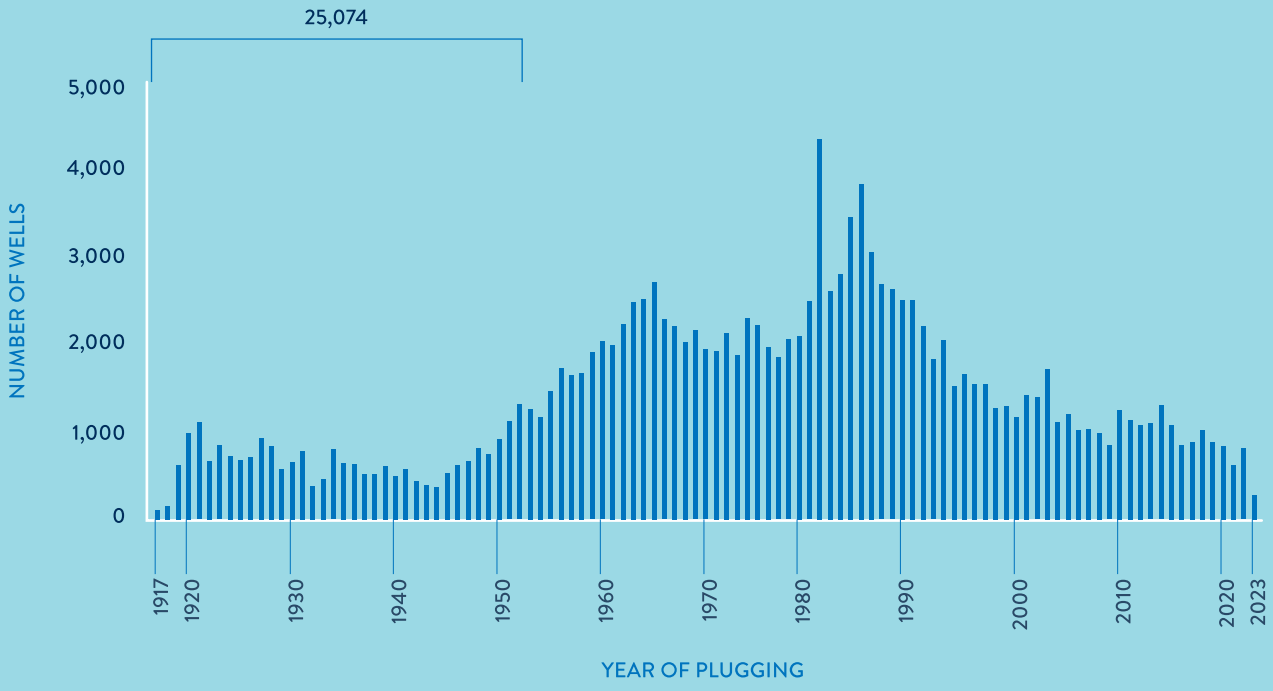
Petroleum Institute standardized plugging procedures and cement composition for wells, the cement plugs were more commonly adopted. Before 1952, the cement plugs used were often contaminated with mud and failed to harden into effective seals to protect against leaks. As Rossi & DiGiulo (2024) point out, even recently plugged wells may not be plugged properly either, as "bankrupt owners may have used substandard materials" while others could still contain "annular spaces that could facilitate fluid movement."[81]

Indeed, multiple studies demonstrate that a bad plug begins when a well is first drilled and that poor well construction or exposed (or uncemented) casing can lead to plugging failures.[82] Some researchers have found that sustained casing pressure may be due to tubing and casing leaks, poor mud displacement during cementing, improper cement slurry design, and damage to primary cement after setting.[83] They state that tubing and casing leaks can result from poor thread connection, corrosion, thermal-stress cracking, and mechanical rupture of the inner string or from a packer leak. Inadequate mud removal prior to cementing is a major contributing factor to gas migration.

FIGURE 4

LOUISIANA WELLS PLUGGED BY YEAR

truetransition.org



Data Source: The Capitol Forum Upstream database, Louisiana Department of Energy & Natural Resources SONRIS database

It is unknown how many wells are plugged properly in the United States. A 1989 report by the Government Accountability Office (GAO) estimated that out of the 1.2 million abandoned wells in the United States estimated (at that time) "about 200,000 may not be properly plugged."[84] Engineer and former US Environmental Protection Agency employee Daniel Arthur has estimated that as many as 500,000 plugged and abandoned oil and

gas wells may be leaking.[85] As already mentioned, just over 25,000 of Louisiana's plugged and abandoned wells were plugged prior to 1953. Conservatively assuming a similar projected well plugging failure rate for only wells plugged prior to 1953, this could add another 4,011 improperly plugged wells to Louisiana's orphaned wells.

2.5 INLAND WELLS

Between 1937 and 1977, more than 6,300 exploratory wells and more than 21,000 development wells were drilled in Louisiana's eight southernmost parishes.[86] A 2023 study estimated that just under 5,000 of Louisiana's unplugged wells are currently situated in Louisiana's wetlands and inland waterways.[87] Multiple studies have confirmed that hydrocarbon production has induced land-surface subsidence and downlift exposing regional zones to relative sea level inundation.[88] Louisiana has lost nearly 2,000 square miles of land since the 1930s.[89] Wells that may have been originally drilled on land, may now be in open water.

2.6 OFFSHORE WELLS

The global offshore oil and gas industry first cut its teeth in Louisiana's coastal waters. Extending three nautical miles into the Gulf of Mexico, Louisiana's state waters boast a concentration of platforms, wells, pipelines, and other associated infrastructure that speaks directly to this heritage. In the last two decades, however, oil and gas production within Louisiana's territorial waters has been in steady decline.[90] Agerton et al. estimate that there are 2,612 unplugged wells in Louisiana state waters.[91] Louisiana's Department of Energy and Natural Resources lists a total of 4,745 wells in coastal waters (including wells plugged in previous decades).

In 2021, a research team piloting the Global Airborne Observatory platform, an aircraft equipped with a visible shortwave infrared imaging spectrometer, surveyed over 150 offshore platforms and surrounding infrastructure in US federal and state waters in the Gulf of Mexico.[92] The team found that methane loss rates were above 23 percent in the shallow waters of the Gulf.

TABLE 3

LOUISIANA OFFSHORE AND INLAND WELLS

truetransition.org

WELL TYPE	INLAND WATER	OFFSHORE (COASTLINE TO 3 NAUTICAL MILES)
Inactive wells	4,131	2,198
Temporary P&A	56	166
Active/recently active	840	405
TOTAL	**5,027**	**2,769**

Data Source: Mark Agerton & Siddhartha Narra & Brian Snyder & Gregory B. Upton, 2023. "Financial liabilities and environmental implications of unplugged wells for the Gulf of Mexico and coastal waters," Nature Energy, Nature, vol. 8(5), pages 536-547, May. https://www.nature.com/articles/s41560-023-01248-1"

Xmas tree equipment ready to move to well, Vermilion Bay, 6:30am, June 11, 1938 Source: State Library of Louisiana Historic Photograph Collection

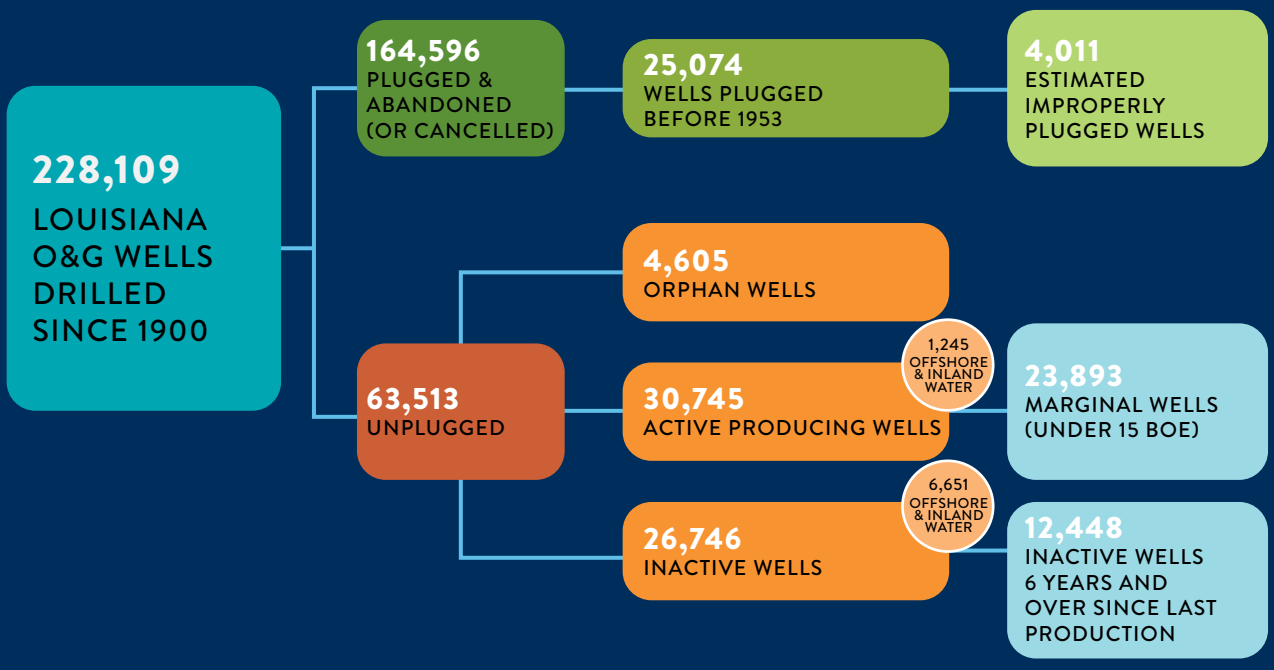
2.7 LOUISIANA'S UNPLUGGED WELLS

In total, there are approximately 63,513 confirmed, unplugged oil and gas wells in Louisiana not producing commercial products and serving no purpose to the public good that will require plugging and remediation in the near future. Whether Louisiana 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 well sites. This doesn't include the removal of thousands of miles of buried pipeline, offshore platforms, midstream facilities, and equipment.

FIGURE 5

LOUISIANA OIL & GAS WELL INVENTORY

truetransition.org



Author's analysis of data from TCF Upstream database, Louisiana's Department of Energy & Natural Resources SONRIS, & Agerton et. Al.

III. JOBS CREATED BY METHANE EMISSIONS STANDARDS IN LOUISIANA

This section describes the process for arriving at the total number of workers needed in Louisiana to address methane emissions under new EPA regulations.[93]

This section focuses on methane emissions maintenance, replacement and abatement for active oil and gas wells and related equipment including compressors, compressor stations, and tanks. The following section focuses on the need for workers to manage methane emissions remediation and elimination for orphaned and abandoned wells, which take up the larger share of all types of wells in Louisiana. This section uses two methods to arrive at the number of workers.

- 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.
- In other methane emissions strategies (replacing pneumatic controllers, replacing compressors, and adding flare systems to storage tanks) 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.

- Where possible, Louisiana-specific data (e.g., on the number of active oil and gas well sites) is used.
- When not readily available, U.S. data is used to estimate the number of sites in Louisiana based on the share of oil and gas wells in Louisiana in relation to the rest of the country.

Active oil and gas infrastructure exists in three different settings in Louisiana which impact the costs and hours of work. *Onshore* represents wholly land-based operations. *Inland waterways* represent a vast network of facilities in the Mississippi delta that are near the water's surface. *Offshore* includes facilities within Louisiana's Gulf Coast waterways. Known distributions and cost differentials for working in these environments must be accounted for when estimating the number of jobs needed to perform this work.

- The majority of Louisiana's oil and gas infrastructure is onshore (91%), with a smaller share being in the inland waterways (6%), and a still smaller share being offshore (3%).
- Whereas the cost of onshore work has been documented and utilized for other similar reports, this report estimates that inland waterway costs and labor are 302% greater than onshore and that offshore costs and labor are 328% greater than onshore.[94]

This report focuses on direct employment counts. The expected number of workers reflect those *directly engaged* in the types of work described.[95] 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.[96] Given the broad scope of the new EPA regulations across all aspects of the oil and gas extraction, processing, distribution, and known elements included in

the regulations but not included in this report, the totals included in this section and this report 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.[97] Finally, knowing the number of jobs needed to directly perform this work should aid state agencies and industry in coordinated planning for appropriate job training and certification development opportunities.

3.1 ESTIMATING THE NUMBER AND TYPE OF SITES IMPACTED

Using publicly available data, the report identifies the number of well sites in Louisiana. Outside of well sites, the report uses activity data from the Environmental Protection Agency to estimate Louisiana-level compressor stations, pneumatic controllers, compressors, and storage tanks.[98]

3.2 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, Louisiana possessed 32,163 active oil and gas wells.[99] Under the EPA's new rule, wells will be subject to quarterly monitoring. Sites with currently high levels of methane emission 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 the EPA, we estimate 14,665 well sites in Louisiana (46%) produce at least three tons of methane per year, 7,065 produce less than three tons, and a further 10,434 with either minimal methane emissions or being wellhead-only sites.[100] EPA proposed regulations would include additional monitoring for all 32,163 wells.[101]

Compressor Stations: Louisiana-specific data on the number and type of compressor sites proved spotty.[102] Active oil and gas wells in Louisiana represent roughly 4% of all active oil and gas wells across the United States (912,962).[103] Thus, the share of compressor stations in Louisiana are estimated to represent 4% of the number of 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*.[104] Louisiana estimates of compressor stations include 264 for gathering and boosting, 77 for transmission, and 12 for storage, for a total of 354 compressor stations in Louisiana. Under the EPA's new rule, compressor stations will be subject to monthly monitoring.

PNEUMATIC CONTROLLERS[105]

Pneumatic controller regulations would apply at every oil and gas site, as well as at each compressor station. Thus, 32,163 oil and gas wells as well as 354 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 U.S. that would fall under new regulations.[106] Using the same distribution to estimate, the number of reciprocating compressors in Louisiana based on national figures subject to EPA regulations is 1,110, with gathering and boosting compressors being the largest share (617), followed by transmission compressors (227), gas processing plant compressors (160), and storage compressors (52). An additional 1,164 compressors (well pad compressors) in Louisiana are also 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.[107] Using national statistics on the number of wet seal centrifugal compressors, the estimated number in Louisiana comes to 12 used in gas processing and another 30 used in gas transmission.

STORAGE TANKS

The EPA's Technical Support Documentation includes national-level counts of storage tanks and their methane emissions.[108] The new EPA rule focuses on storage tanks with potential emissions of six or more tons per year of any volatile organic compounds (VOC) and 20 or more tons per year of methane.[109] This represents a relatively small share of the total number of storage tanks in the United States.[110] The EPA proposal impacts a small share of the overall number of storage tanks in Louisiana, requiring monitoring of crude oil tanks (144) and condensate tanks (638).

3.3 LEAK INSPECTION TIME

Leak Inspection times per site vary depending on the type of site.[111] Standard well sites take an average of 3.6 hours to inspect for leaks; low-producing well-sites take just under 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 the most amount of time, 28.9 hours. Annual inspection time estimates in the **Table 4** below show the number of hours needed if inspections occurred quarterly for wells and well sites and monthly for compressor stations (as required by the EPA rule) in the three ecological zones in Louisiana.

3.4 LEAK REPAIR TIME

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%) over the course of the year **(Table 5)**.

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.[113] 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 the EPA[9] (indicated as Repair Needs in the table) 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).[114] Thus, estimated repair times per visit **(Table 6)** reflect the time per component times the likely number of components needing repair.

Using information from **Tables 5** and **6**, and whether the site requires quarterly (for wells) or monthly (for compressor stations) inspections, the estimated annual repair time per site in hours varies based on site type **(Table 7)**.

TABLE 4

ANNUAL INSPECTION HOURS, BY SITE TYPE

truetransition.org

TYPE OF SITE	ONSHORE	INLAND WATERWAY	OFFSHORE	INSPECTION TIMEFRAME
Standard Well Sites	14.3	48.0	52.3	Quarterly
Low-Producing Well Sites	9.2	31.0	33.7	Quarterly
Compressor Stations: Gathering and Boosting	124.4	416.9	453.9	Monthly
Compressor Stations: Transmission	178.7	599.0	652.1	Monthly
Compressor Stations: Storage	346.7	1161.8	1,264.8	Monthly

Data Source: Author's analysis

TABLE 5

COMPONENT REPAIR NEEDS PER INSPECTION

truetransition.org

TYPE OF SITE	NUMBER OF COMPONENTS NEEDING REPAIR PER INSPECTION[112]
Standard Well Sites	7
Low-Producing Well Sites	2
Compressor Stations: Gathering and Boosting	4
Compressor Stations: Transmission	6
Compressor Stations: Storage	18

Data Source: EPA & Author's analysis

TABLE 6

REPAIR NEEDS AND TIME (HOURS), BY SITE TYPE

truetransition.org

	REPAIR TIME PER VISIT (HRS)		
TYPE OF SITE	ONSHORE	INLAND WATER	OFFSHORE
Standard Well Sites	14.49	43.70	47.58
Low-Producing Well Sites	4.14	12.49	13.59
Compressor Stations: Gathering and Boosting	8.28	24.97	27.19
Compressor Stations: Transmission	12.42	37.46	40.78
Compressor Stations: Storage	37.26	112.38	122.34

Data Source: Author's analysis

TABLE 7

ANNUAL REPAIR TIME BY SITE AND INSPECTION SCHEDULE

truetransition.org

	REPAIR TIME PER VISIT (HRS)		
TYPE OF SITE	ONSHORE	INLAND WATER	OFFSHORE
Standard Well Sites	57.96	174.81	190.31
Low-Producing Well Sites	16.56	49.95	54.37
Compressor Stations: Gathering and Boosting	99.36	299.67	326.24
Compressor Stations: Transmission	149.04	449.51	489.36
Compressor Stations: Storage	447.12	1,348.53	1,468.09

Data Source: Author's analysis

3.5 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.[115] 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 in Louisiana is estimated at 520,308 hours yielding 277 workers needed. Leak repairs in Louisiana are estimated at 1,414,840 hours requiring 752 workers. Leak inspection and repair represent ongoing continuous work.

In order to meet the needs for leak detection and repair, Louisiana would need a total of 1,029 workers.

PNEUMATIC CONTROLLER REPLACEMENT

In addition to leak detection and repair, workers would also be needed to retrofit pneumatic controllers. Site-level installation costs (21% of total costs)[116] vary depending on the number of components needing to be replaced and estimated cost differentials in labor needs by ecological region **(Table 8)**. Carbon Limit's cost effectiveness spreadsheet estimates pneumatic controller installation labor costs of $75 per hour.[117] Using the installation cost per site provides estimates of the labor hours per site **(Table 9).**

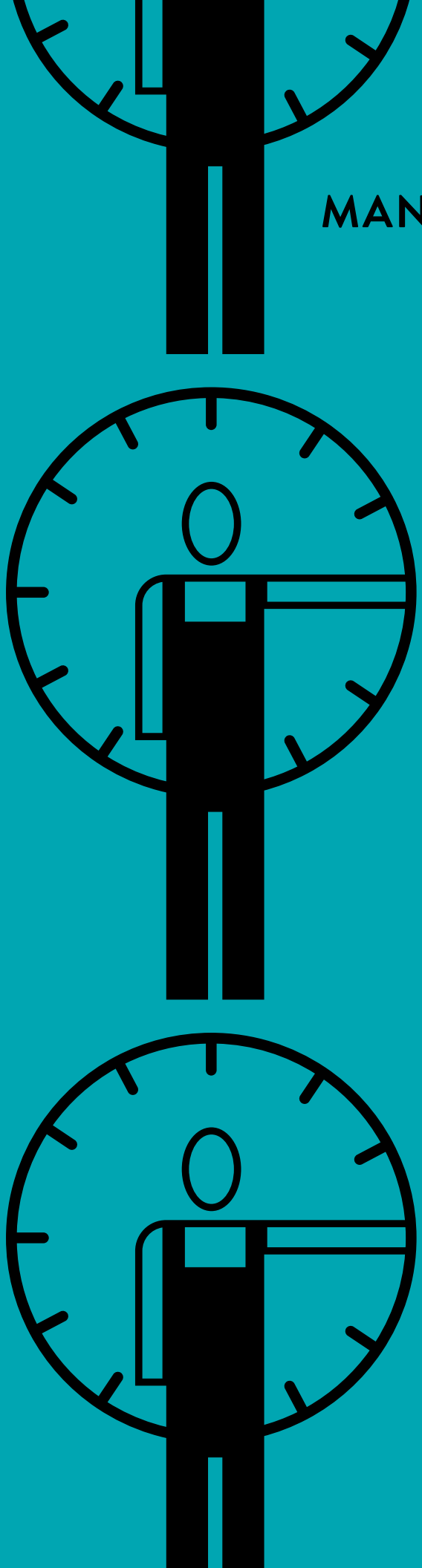
TABLE 8

PNEUMATIC CONTROLLER REPLACEMENT INSTALLATION COSTS, BY SITE TYPE

truetransition.org

	LABOR INSTALLATION COSTS		
TYPE OF SITE	ONSHORE	INLAND WATER	OFFSHORE
Standard Well Sites	$ 6,907	$20,831	$ 22,678
Compressor Stations: Gathering and Boosting	$ 21,544	$ 64,978	$ 70,738
Compressor Stations: Transmission	$ 15,637	$ 47,161	$ 51,342
Compressor Stations: Storage	$ 30,371	$ 91,599	$ 99,720

Data Source: Author's analysis



MAN HOURS DIRECT

520,308
HOURS
LEAK INSPECTIONS TOTAL MAN HOURS

277
WORKERS
LEAK INSPECTIONS TOTAL WORKERS

1,414,840
HOURS
LEAK REPAIRS TOTAL MAN HOURS

752
WORKERS
LEAK REPAIRS TOTAL WORKERS

TABLE 9

PNEUMATIC CONTROLLER REPLACEMENT LABOR HOURS, BY SITE TYPE

truetransition.org

	LABOR HOURS PER SITE		
TYPE OF SITE	ONSHORE	INLAND WATER	OFFSHORE
Standard Well Sites	92	278	302
Compressor Stations: Gathering and Boosting	287	866	943
Compressor Stations: Transmission	208	629	685
Compressor Stations: Storage	405	1,221	1,330

Data Source: Author's Analysis

Not all well sites require pneumatic replacements as some sites already use non-emitting controllers, but detailed information on the share likely to need replacing varies and regulatory plans typically focus on the company-level shares of their non-emitting controllers.[118] Not all sites will require pneumatic replacements, though knowing whether sites use pneumatic controllers or an alternative is not universally available to researchers. 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% for well-sites and 90% for compressor stations.[119] Accordingly, the estimated total number of workers required to address retrofit of pneumatic controllers in Louisiana is estimated at 1,457.

COMPRESSORS

EPA regulations cover both reciprocating compressors and centrifugal wet seal compressors. Based on a California Air Resources Board study, an estimated 57.9 percent of *reciprocating compressor* cylinders will need to be replaced in order to reach leak compliance.[120] Estimates for the costs for replacing compressors vary, so this report uses costs from a case-study where replacement costs totalled $11,070 per compressor.[121] Assuming labor costs make up 21% of the total replacement cost, we estimate it will take 28 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 12 workers.[122] Hence, a total of 40 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 in methane reductions are larger so we assume that roughly 25% of these types of compressors will undergo abatement

with the remainder being replaced.[123] Estimates of the number of workers to perform these replacements (29) and abatements (2) total 31. Hence, a total of 59 workers will be needed for replacement/abatement of all types of compressors, and a further 12 will be needed for monitoring on an ongoing basis.

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 costs ($2,327) are pulled from the Colorado Air Pollution Control Division.[124] Assuming similar labor hour costs, this report estimates the need for 40 workers for replacement of all EPA rule-eligible storage facilities. Maintenance labor for storage tanks totals 12 workers.

3.6 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 total 2,609. Most of these direct jobs stem from the need to replace pneumatic controllers and for additional Leak Detection and Repair work **(Table 10)**.

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 11)**. Jobs related to replacement and abatement are expected to fulfill immediate needs, so reflect short-term employment. Jobs related to maintenance are expected to continue long-term.

TABLE 10

DIRECT JOBS, BY JOB TYPE

truetransition.org

	NUMBER OF JOBS
Leak Inspection and Detection	277
Leak Repair	752
Pneumatic Controllers	1,457
Compressors	71
Storage Tanks	52
TOTAL WORKERS	**2,609**

Data Source: Author's 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.

3.7 METHANE MEASUREMENT CONCLUSION

Louisiana will require 2,609 jobs to deal with additional EPA methane emissions regulations. While a portion of these jobs will focus on replacement and abatement of methane emissions (1,556) and thus be temporary, those positions related to maintenance and monitoring (1,053) will be permanent.

TABLE 11

DIRECT JOBS, BY MAINTENANCE AND REPLACEMENT/ ABATEMENT CATEGORY

truetransition.org

	WORKERS
MAINTENANCE	**1,053**
Leak Inspection and Detection	277
Leak Repair	752
Compressor Monitoring	12
Storage Tanks Maintenance	12
REPLACEMENT/ABATEMENT	**1,556**
Pneumatic Controller Replacement	1,457
Compressor Replacement/Abatement	59
STORAGE TANKS	**40**

Data Source: Author's analysis

IV. JOB CREATION FROM DECOMMISSIONING OIL & GAS WELLS

4.1 HISTORY OF THE LOUISIANA ORPHANED SITE RESTORATION PROGRAM

The Louisiana Oilfield (or Orphaned) Site Restoration Program (OSR),[125] established in 1993 by R.S. 30:80, was one of the first programs in the nation to address the cleanup of derelict wells and improperly abandoned oilfield sites.[126] An oilfield site is orphaned when the Commissioner of Conservation (the head of Louisiana's oil & gas regulatory agency) finds that: 1. No responsible party can be located or such party has failed or is financially unable to undertake actions ordered by the Commissioner; 2. and/or the oilfield site has either not been properly maintained or poses a threat to the public health, the environment, or an oil or gas strata.[127] In a survey administered by the Interstate Oil and Gas Compact Commission on state regulatory programs, Louisiana described orphaning as part of its enforcement process, "When an operator fails to provide financial security, we begin our compliance process which consists of sending an order, followed by a civil penalty, followed by the escrow of money from selling oil, followed by removing the ability to move oil with transporters, and finally orphaning the operator."[128]

The Secretary of the Department of Energy and Natural Resources is empowered by law to recover all costs incurred by the program resulting from orphaned site restoration operations. For a site without a site specific trust account, the Secretary is authorized to collect from the responsible party (i.e., the last operator of record and his working interest owners). In cases where the DENR spends public funds on site restoration and those costs exceed $250,000, DENR can recoup those costs of all former operators and working interest owners in inverse chronological order.. However, there is evidence to support DENR's authority to order all former operators and former working interest holders to perform plug and abandonment and site restoration prior to any public funds being expended. In other words, Louisiana law treats wells differently depending on whether public funds have been spent. Before a public cent is spent, DENR has a good deal of discretion and tools to ensure those companies that profited from Louisiana's shared resources shoulder the costs of cleanup. But once a single public cent is spent, DENR's hands are tied. It is certainly in the interest of the Louisiana public to plug and abandon wells and remediate oilfield sites as soon as possible, but with the current law, DENR does so at the expense of the public purse.[129]

The OSR operates on an annual $4.5 million trust fund collected as a special restoration fee on oil and gas production: $.015 per barrel of oil and $.003 per thousand cubic feet of natural gas, over and above the normal severance tax due the state. The fee is dedicated specifically to the orphaned well program and is capped at $4.5 million. Once the cap is reached, the fees are no longer collected.

A Governor-appointed Commission oversees the management of the program.[130] The commission has statutory authority to approve and evaluate the annual priority site restoration list,[131] choose plugging and abandoning contractors, and review administration of site restoration activities. Between 1999 and 2022, Louisiana's OSR program plugged 1,758 orphaned wells.[132] In that same time period, companies orphaned an additional 5,629 oil and gas wells. Louisiana's DENR currently lists 4,533 orphaned wells.

In some regions, orphaned well inventories are the relics of industry from over a century ago. But Louisiana's ever ballooning orphaned well inventories are the discards of modern oil and gas producers. While Louisiana's OSR program successfully plugged 120 wells between January and March 2023, in the same period, an additional 150 wells were orphaned.[133] The State of Louisiana publishes newly orphaned wells on a monthly basis in the Louisiana Register.[134] The Sisyphean orphaned well program is but one, final piece of a regulatory framework. To prevent the orphaning of future wells, it will require reforms beyond the scope of the OSR program.[135] The Infrastructure Investment and Jobs Act of 2021 (IIJA)'s Performance Improvement Grants and Regulatory Improvement Grants will provide an incentive to states like Louisiana to do just that and make future federal funding contingent on regulatory improvements that reduce future orphaned well burdens.[136]

As of December 2022, the OSR approved contractor list included 68 contractors.[137] Contractors are required to request a work permit for the abandonment process, and abandon the wellbore per 29-B standards.[138] This includes, but is not limited to: isolating productive intervals, isolating usable drinking water interfaces/freshwater horizons, and installing a cement plug. State well inspectors witness plugging operations.[139] The Louisiana Orphaned Well Program has a prioritization scoring system based on factors such as wellhead damage, leaks and leakage volume, hazards to navigation, and so on, to rank which wells to plug.[140]

On average, the OSR has paid private contractors to decommission 161 wells per year since 1999.[141] The state auditor found that for the 145 wells plugged in the fiscal year 2019, the average cost for land wells under 3,000 feet was approximately $4.76 per foot, and the average cost for land wells between 3,000 and 10,000 feet was $35.84 per foot.[142] Since 1999, the state of Louisiana has spent just under $76 million to plug 1,758 orphaned wells ($81,361/well).[143]

Fohs Oil Co., State #4, Lake Long, Lafourche Parish on May 18, 1938
Source: State Library of Louisiana Historic Photograph Collection

Oil and gas production on Louisiana barrier island next to the historic Pass a Loutre Lighthouse
Source: Scott Eustis, Healthy Gulf

In recent years, a significant portion of the OSR's budget has been diverted to "urgent and high priority orphaned well sites."[144] These "monster orphans" have siphoned as much as 89% of the total OSR budget with a median $211,000 price tag for each well.[145] Because a percentage of Louisiana's wells are located in Louisiana's 2.5 million acres of coastal marshes and wetlands, as well as within the three nautical miles of submerged state lands and navigable water bodies, these increased costs are not without context. These wells are located in delicate habitat, navigation canals, and commercial fisheries which necessitate trained professionals and specialized equipment which increase costs.

As an example, in 2020, a barge collided with a submerged, unmarked orphaned well causing an oil spill in the Barataria Bay.[146] The well spewed a 100-foot-high geyser of natural gas and light crude oil for weeks. OSR reported that because of the accident, "the program would [only] plug and abandon urgent and high priority scored orphan wells in marine environments that are potential hazards to navigation instead of plugging urgent, high, moderate and low priority orphan wells statewide."[147] The program office acknowledged that the program realignment would result in a significant decrease of total number of orphaned wells plugged and abandoned by the program per fiscal year due to the increased costs associated with this work (from $26,000 to $163,000 per well average).

4.2 FEDERAL WELL PLUGGING GRANTS IN LOUISIANA

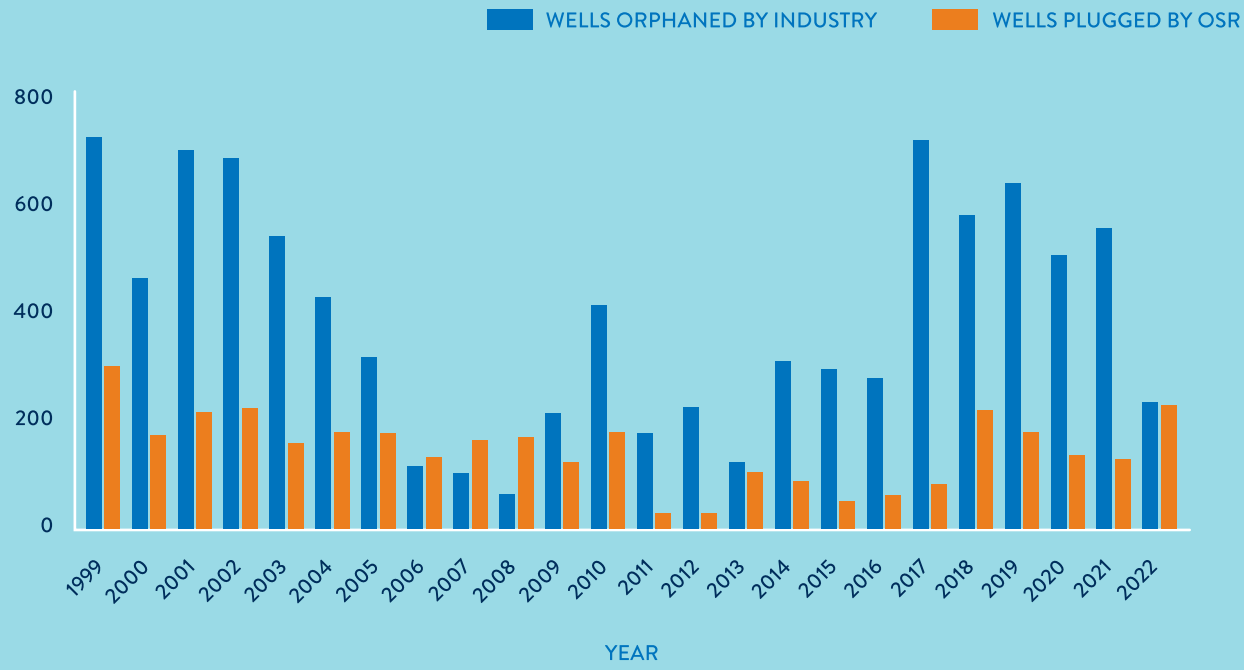
The Infrastructure Investment and Jobs Act of 2021 (IIJA) contains $4.7 billion for "Methane Reduction Infrastructure" to decommission orphaned oil and gas wells, which includes plugging the well and surface reclamation.[148] Louisiana could receive a total of $181.5 million in IIJA funds to clean up its orphaned wells. This includes $25 million in initial grants, $111.5 million in formula grants and up to $70 million in performance grants. Louisiana has identified a total of 4,605 documented orphaned wells. Louisiana reported that the total projected cost to clean up these wells would amount to $401,704,649 or $87,232 per well. Louisiana is also eligible for $15.7 million to plug marginal wells to reduce methane emissions.

In its application for infrastructure law funding from the Interior, Louisiana estimated it would cost more than $401 million to plug 4,605 orphaned wells in the state. That is nearly quadruple the $111.4 million the state has been awarded through the initial and phase one grants provided by the infrastructure law, although Louisiana could be eligible for millions more, depending on its success plugging wells in the next couple of years.

FIGURE 6

WELLS PLUGGED BY THE STATES VS. NEW WELLS ORPHANED BY OPERATORS 1999-2022 BY YEAR

truetransition.org

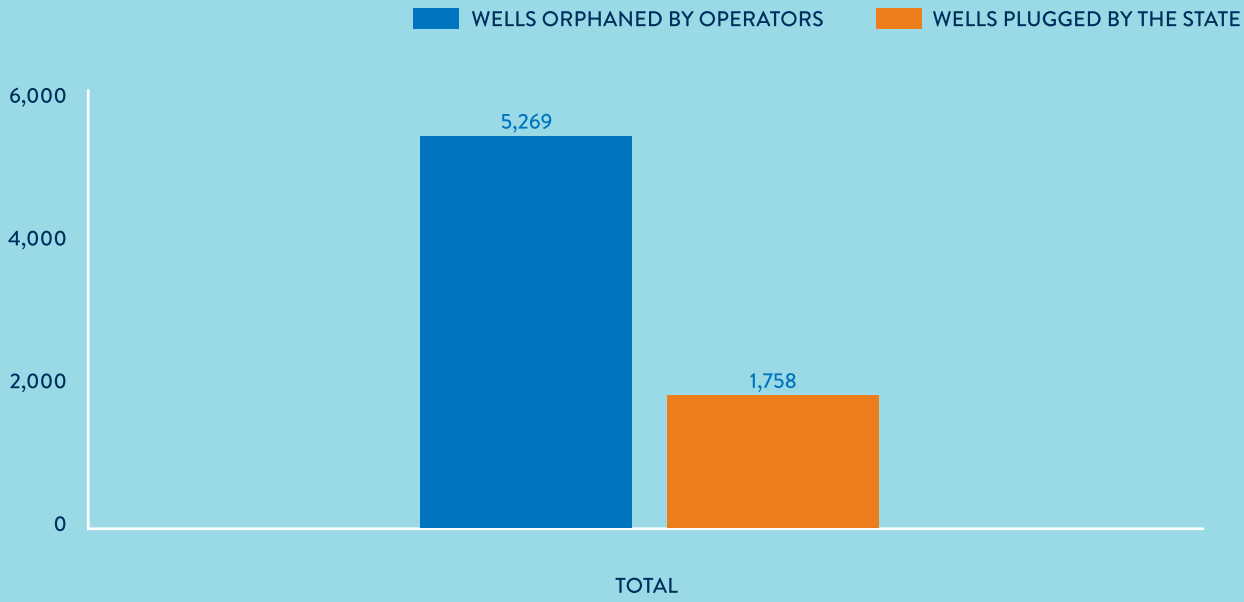


Data Source: Louisiana Department of Energy and Natural Resources Oilfield Site Restoration program

FIGURE 7

WELLS PLUGGED BY THE STATES VS. NEW WELLS ORPHANED BY OPERATORS 1999-2022 TOTAL

truetransition.org



Data Source: Louisiana Department of Energy and Natural Resources Oilfield Site Restoration program

TABLE 12

TOTAL FEDERAL ORPHANED WELL CLEAN-UP FUNDS IN LOUISIANA

truetransition.org

	LOUISIANA
Initial Grants (IIJA)	$25,000,000
Phase 1 Formula Grants IIJA	$25,000,000
Total Formula Grants	$86,559,520
Performance Grants	$70,000,000
Marginal Wells (MERP)	$15,661,335
TOTAL	$197,220,855

Source: U.S. Department of Interior, Section 40601 (Public Law 117-58) : www.doi.gov/sites/doi.gov/files/state-formula-grant-guidance-07.07.2023.pdf
U.S. Department of Energy : www.energy.gov/fecm/funding-notice-ira-mitigating-emissions-marginal-conventional-wells

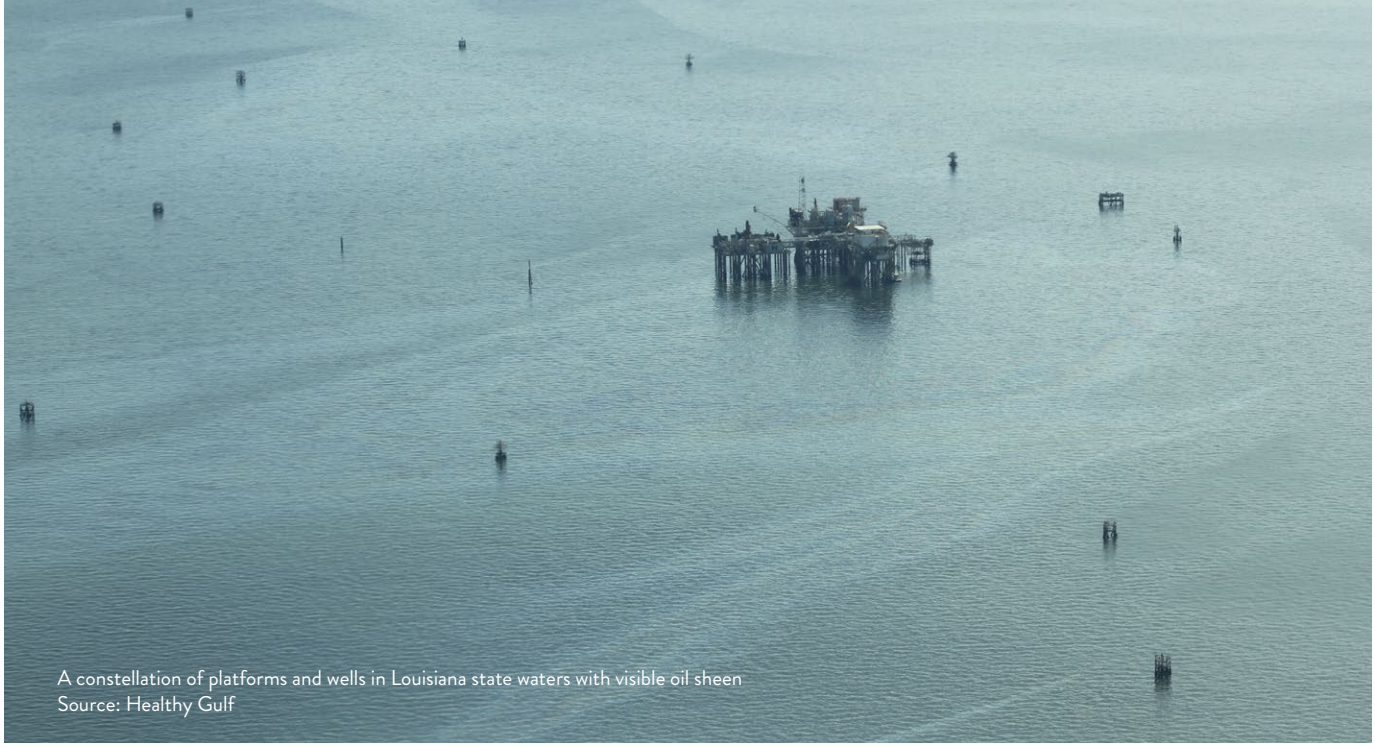
TABLE 13

LOUISIANA NOTICE OF INTENT

truetransition.org

	LOUISIANA
# of Orphaned Wells Reported in Notice of Intent	4,605
State Reported Projected Cost	$401,704,649
$/Well based on Projected Cost	$87,232
Number of Louisiana O&G jobs lost between March 1, 2020 and November 15, 2021	12,256

Source: U.S. Department of Interior, Section 40601 (Public Law 117-58)



A constellation of platforms and wells in Louisiana state waters with visible oil sheen
Source: Healthy Gulf

LOUISIANA IMPLEMENTATION

In its first Request for Qualifications (RFQ) to implement the IIJA orphaned well program, the Louisiana Department of Energy and Natural Resources (LDENR)[149] recommended "partnerships between larger contractors and smaller and local contractors to cover the entirety of operations included in the RFQs."[150] LDENR has selected two primary contractors to carry out Northern Louisiana projects where a high density of orphaned wells are clustered and contractors can batch wellsites:

1. Dynamic Group, LLC[151] for LDNR Project No. 431-PA23-001, focused primarily in Monroe Conservation District
2. Lemoine Disaster Recovery,[152] LLC for LDNR Project No. 431-PA23-002, focused primarily in Shreveport Conservation District

These two firms have no prior downhole experience, but instead manage and oversee "Key Subcontractors." LDENR is using the Construction Management at Risk (CMAR) procurement method, which will require a contractor to oversee subcontractors for the orphaned site restoration work, including well plugging, environmental measurements and sampling, and related services.[153] In essence, this structure privatizes Louisiana's Oilfield Site Restoration Program, outsourcing their traditional well plugging program design and management work to the two contractors.

Orphaned well sites initially planned to be addressed in this program are located in Northern Louisiana (LDENR's Shreveport and Monroe districts) with a smaller number of well sites located in Southern Louisiana. The two northern districts are home to a total of approximately 3,134 orphaned well sites.

Louisiana has received $25 million in initial grant funds. As of November 2023, Louisiana has spent $9,475,141 to plug and abandon 297 wells primarily in the north of the state (Union, Caddo, Claiborne and LaSalle Parishes).[154] Just under a quarter of the state's orphaned well inventory (905 wells) is located in Caddo Parish and just under half of the wells plugged so far with the federal money are in Caddo Parish. The Caddo oil fields were the birthplace of the Louisiana oil and gas industry, and because of the Haynesville Shale that it sits atop, it is experiencing a second production boom leading the state in new wells drilled and shale gas production.[155]

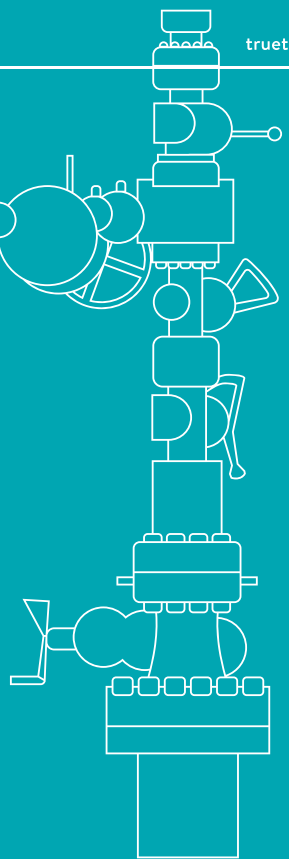
Preliminary figures from state bid amounts show the average decommissioning cost per well is $38,139 per well. Only one contractor reported the number of acres restored (0.25 acres per well). According to the spreadsheet provided by LDENR, the program has restored 40.25 acres adjacent to 161 wells. LDENR states that site restoration operations for these particular well sites were ongoing and would continue through 2023.

TABLE 14

LOUISIANA OSR COSTS AS OF NOVEMBER 2023

truetransition.org

TOTAL ORPHANED WELLS PLUGGED AS OF NOV. 2023	297
TOTAL COSTS AS OF NOV. 2023	$9,475,141
COSTS PER WELL AS OF NOV. 2023	$38,139



Source: Louisiana Department of Energy and Natural Resources Oilfield Site Restoration program data

4.3 DECOMMISSIONING COSTS

The time and cost to plug wells and restore well sites (decommissioning) varies enormously between states depending on several factors.[156] 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 number of available, trained, and qualified workers also plays a role. The contract size of well plugging packages can also impact cost, with larger contract sizes usually lowering per well decommissioning costs. Louisiana's varied geography will also add complexity. Whether a well is onshore or in open water will greatly impact the cost to plug and abandon a well, decommission supporting infrastructure, and restore affected habitat.

The Oilfield Site Restoration program comprises only a subset of the total wells in the state, but can provide a baseline understanding of the time and resources necessary to address each well. For instance, in conversation with LDENR staff we learned that wells in Northern Louisiana typically require 1-2 days +/-24 hours of work, while Southern Louisiana/Offshore/Deep/Complex wells can take anywhere from 2-4 days to a month (depending on downhole issues).[157] Since 1999, the state of Louisiana has spent just under $76 million to plug 1,758 orphaned wells ($81,361/well).[158] While these do not comprise the total inventory of wells, they provide a reasonable range to project future time, workforce, and costs.

4.3a ONSHORE WELL COSTS

For onshore inactive wells, we use the per well decommissioning cost provided by the State of Louisiana in their Notice of Intent to apply for IIJA federal funds of $87,232. We do know so far that LDENR's cost to plug and abandon the 298 wells in Caddo Parish have averaged $38,139 per well. For half of the wells, these costs include the added cost to remediate a quarter of an acre of affected habitat. We also reviewed cost data from the OSR program from the last 10 years which we were able to obtain through the Louisiana Performance Accountability System.[159] It cost an average of $81,361 per well to plug 1,758 wells in that time period. There were several "urgent and high priority wells" that skewed the total costs. In conversations with the LDENR staff, the $87,232 figure reflected those problem wells, and indeed is likely an underestimate since the state has never attempted to plug so many wells at once. In other words, the more you do, the more problems you encounter. Since we do not know the exact location of the 4,011 legacy wells (plugged before 1953) which could be improperly plugged we conservatively do not assume that those wells are located in state waters (although there are likely some that are).

4.3b OFFSHORE WELL COSTS

Wells located in the coastal zone or offshore in open Gulf of Mexico waters will increase the costs of plugging and abandoning a well. There are 2,769 unplugged wells in Louisiana state waters in depths less than 30 meters with an estimated 2,000 fixed platforms.[160] These oilfield sites are only accessible via workboats with day rates that are in the hundreds of thousands of dollars. Common elements for decommissioning of offshore platforms include: engineering and planning, inspections and permits, well P&A, platform preparation, pipeline and subsea umbilical removal, conductor removal, topsides removal and transportation to shore disposal and recycling, substructure removal and disposal, and site clearance and remediation.[161]

The longer a structure is present in the Gulf, the greater the likelihood it will be damaged by a storm. Storm-damaged or toppled structures present a greater risk to safety and require difficult and time-consuming salvage work.[162] Decommissioning a storm-damaged structure may cost 15 times or more the cost of decommissioning an undamaged structure.[163] We do not have an inventory of idle iron in state waters nor do we have a count of storm-damaged structures.[164] The Louisiana Department of Energy and Natural Resources reported that it does not specifically track platforms in state waters.[165] Well depths also increase plugging and abandonment costs which require "more cement and time...reservoir temperature and pressures generally rise with depth, necessitating more powerful equipment to pump thicker and more expensive cement."[166] Successful plugging often requires multiple attempts. A recent study of cementing operations on five deepwater rigs showed a failure rate of 30% which bumps up the cost of materials, equipment, and staff.[167] The additional cost for an extra attempt to set a cement plug can surpass $100,000 on an offshore rig.[168]

There are several available methods to decommission and abandon offshore infrastructure in the Gulf of Mexico.[169] The Rigs-to-Reef program encourages platforms to be left in place (or toppled or removed and moved to a predetermined reefing location) and placed in a state[170] rigs-to-reefs area, as an alternative option to the requirement of removal. Naturally this option has become attractive to oil and gas operators because it is less expensive to "reef" a structure compared to full removal. Today there are more than 515 "reefed" rigs on the seafloor in federal waters. There are currently 33 inshore reefs dispersed throughout Louisiana's coastal basins, including several in Lake Pontchartrain and at Independence Island, a few miles north of Grand Isle. There are eighteen nearshore artificial reef areas in either state or federal waters between the coastline of Louisiana and the 100-foot depth contour. A discussion of the relative merits of full removal and recycling versus abandonment in place is beyond the bounds of this particular report.[171] We assume full removal in our analysis.

The U.S. Department of the Interior's Bureau of Safety and Environmental Enforcement's (BSEE) "Decommissioning Cost Rule" requires that lease holders in federal waters report expenditures for plugging wells, removing platforms and other facilities, and clearing obstructions from sites.[172] In addition, the rule authorizes BSEE to require additional supporting information regarding specific decommissioning costs on a case-by-case basis. This wealth of data has informed recent analysis, which extrapolates federal shallow water costs into state waters and develops projected decommissioning costs to plug wells,[173] decommission platforms, and remove pipeline segments in shallow state waters. We incorporate these estimates for well plugging and abandonment, platform removal,[174] and pipeline removal.[175] We do not have an exact mileage of pipeline segments due for removal to provide cost and jobs estimates.

True Transition has requested cost, days and labor data from the Bureau of Safety Environmental Enforcement for 9 wells in the Matagorda Island lease area currently being decommissioned with IIJA funds as a possible proxy for wells in state waters. That request is still pending.[176] Public records show that BSEE has chosen two firms (Nash Holdings Inc. and Promethean Operating LLC) to perform decommissioning and well plugging services.[177] UK-based wells consultancy Elemental Energies recently secured a master services contract with Promethean Energy to perform well management services for the orphaned wells.[178] As the agency is still in the planning phase of this project this data will be provided at a later date.

4.3b COASTAL INLAND WELL COSTS

Just under a quarter (1,123) of Louisiana's reported 4,605 orphaned wells are located in coastal zone parishes. According to recent analysis, there are 5,027 unplugged wells in Louisiana's inland waterways, swamps, and wetlands.[179]

Louisiana law defines an oilfield site to include the well and associated facilities, equipment, and infrastructure, and Statewide Order No. 29-B requires the removal of associated tanks, pipelines, equipment, and other related infrastructure and the restoration of the site.[180] The Infrastructure Investment and Jobs Act of 2021 (IIJA) allocated federal funds to states to plug orphaned oil and gas wells, but also:

vi To remediate soil and restore native species habitat that has been degraded due to the presence of orphaned wells and associated pipelines, facilities, and infrastructure.

vii To remediate land adjacent to orphaned wells and decommission or remove associated pipelines, facilities, and infrastructure."

As described earlier, Louisiana's coastal land loss crisis is significant. Following Hurricanes Katrina and Rita, the Louisiana Legislature created the Louisiana Coastal Protection and Restoration Authority (CPRA) to administer a statewide $50 billion Coastal Master Plan to restore the coast. But many of those funds have been allocated towards oil and gas industry cleanup. In more than three decades, the state has dedicated 84 percent of its restoration monies to remedying damages caused by oil and gas operations. For instance, Louisiana's Coastal Protection and Restoration Authority spent more than $20 million attempting to restore and save East Timbalier Island which protected more than 700-plus oil wells in Terrebonne and Timbalier bays from waves and storms.[181] In 2020, the state agency's attempts were foiled by a nest of pipelines and oil and gas wells. As a consequence, the state agency cut its losses and abandoned the restoration project. Addressing Louisiana's coastal crisis and remediation of retired oil and gas liabilities are not mutually exclusive activities.[182] The orphaned well plugging and remediation program should work in concert with Louisiana's Coastal Master Plan, and indeed, those wells should be prioritized in support of the State Master Plan.[183] Remediation in Louisiana will have a much larger meaning than filling a hole in the ground with cement and replacing a few inches of topsoil.

We have two sources of potential costs for well sites in coastal wetlands. First, the U.S. Fish and Wildlife Service (FWS) shared contract bid data with True Transition. The FWS was allocated $12.7 million in IIJA Funds to plug and remediate 151 orphaned wells on five national wildlife refuges in Louisiana.[184] The shared contract data is for 6 wells bundled into one contract located in the Atchafalaya National Wildlife Refuge in St. Martin Parish.[185] In total, the remediation of the wellsites is projected to cost a little over $1,465,000 or $209,000 per well. This price tag is split evenly between the physical plug & abandonment and the removal of associated infrastructure (tank battery, drill pads) and remediation. The remediation will require mobilizing heavy machinery operated by skilled workers navigating through sensitive habitat, and transporting contaminated soil to a disposal landfill, and bringing fresh borrow to restore the affected site. If NORM (naturally occurring radioactive materials) are present, then this will increase costs by 15 to 20%. The full project is expected to be carried out by three separate contractors (the Construction Management at Risk (CMAR) consultant, downhole contractor, and habitat remediation contractor). While these wells are within a wetland area, they are accessible by roads[186] and on dry land and would not necessarily be indicative of inland wells in open bodies of water.

The second source is from Agerton et al. (2023), who extrapolate shallow water estimates of state waters P&A costs developed using BSEE decommissioning cost data for federal shallow water decommissioning costs.[187] The authors explain that their "definition of inland waters includes areas in open water but also includes areas such as wetlands." They go on to clarify that, "there is little practical difference in P&Aing wells on the margins of inland waters and in state inshore waters, so we group these two categories together for purposes of cost modeling."[188] It should be noted that these cost estimates are for only the plugging and abandonment of wells and not the topside removal of platforms or subsea pipelines. Please note in **Table 15** we adjust total inactive and active well counts for onshore based on the Agerton counts.

U.S. Fish and Wildlife Service staff visit an orphan oil well in the Lacassine National Wildlife Refuge. The service plans to plug 11 wells in the refuge near Lake Charles. Source: U.S. Fish & Wildlife Service

TABLE 15

LOUISIANA'S WELL PROJECTED COSTS

truetransition.org

Well Type	Estimated Per Well Decommissioning Cost*	Estimated Number of Wells	Total Estimated Decommissioning Cost **
Inland Water Inactive Wells***	$262,890	4,131	$1,086,000,000
Inland Water Temporary P&A	$321,429	56	$18,000,000
Inland Water Active/recently active	$263,095	840	$221,000,000
Offshore Water Inactive wells	$289,353	2,198	$636,000,000
Offshore Water Temporary P&A	$301,205	166	$50,000,000
Offshore Water Active/ recently active	$286,420	405	$116,000,000
Documented Orphan Wells Total**	$87,232**	4,605	$401,704,649
Marginal Wells with production below 15 barrel of oil equivalent per day (Assumed onshore)	$87,232	23,893	$2,084,234,176
Onshore Active Wells	$87,232	12,190	$1,063,358,080
Legacy Wells Improperly Plugged	$87,232	11,000	$959,552,000
Inactive Wells	$87,232	20,417	$1,781,015,744
TOTAL		79,901	$8,416,864,649

* Estimated per well costs from Mark Agerton & Siddhartha Narra & Brian Snyder & Gregory B. Upton, 2023. "Financial liabilities and environmental implications of unplugged wells for the Gulf of Mexico and coastal waters," Nature Energy, Nature, vol. 8(5), pages 536-547, May 2023 https://www.nature.com/articles/s41560-023-01248-1

**Total estimated cost are per well figure multiplied by total well counts

*** We use the nomenclature from Agerton (2023), but these wells may also be referred to as "coastal wetlands," "coastal," or "wetland" throughout the report.

TABLE 16

ADDITIONAL OFFSHORE DECOMMISSIONING COSTS

truetransition.org

ASSOCIATED INFRASTRUCTURE	ESTIMATED PER PLATFORM DECOMMISSIONING COST	ESTIMATED NUMBER OF PLATFORMS	TOTAL ESTIMATED PLATFORM DECOMMISSIONING COST
Fixed Platforms in Louisiana state waters less than 30 meters	$977,000	2,000	$1,954,000,000
Pipeline Removal in water depths less than 30 meters	$321,000 per segment (about a mile) or $29/ft to $68/ft	26,000 miles of OCS related pipelines & 50,000 miles onshore	$3,200,000,000 *assuming 10,000 coastal zone miles

**** Platform Removal Estimates from Mark J. Kaiser. (2022) BSEE decommissioning cost estimates in the deepwater US Gulf of Mexico. Ships and Offshore Structures 0:0, pages 1-22.

***** Pipeline Removal Estimates from Mark J. Kaiser (2023) New statistical data can help pinpoint pipeline decommissioning costs. Offshore Magazine. https://www.offshore-mag.com/decommissioning/article/14291023/center-for-energy-studies-louisiana-state-university-new-st atistical-data-can-help-pinpoint-pipeline-decommissioning-costs

4.3d LABOR AS PERCENTAGE OF COST

There are many factors that can increase the cost of decommissioning abandoned and orphaned wells. These include the depth of the well, its age, the amount of remediation necessary to reclaim a wellsite, the terrain of the well site, the integrity of the well casings, the contract size and scope, state regulations for plugging and abandonment methods and procedures, and the cost and availability of equipment (rigs) and material (cement). When oil and gas prices are high, companies tend to drill more wells, which can cause increases in labor and equipment costs that drive up decommissioning costs. Many of these factors help explain the large variations in decommissioning costs in various states.

Taking these costs into account can help determine the amount of job creation in decommissioning oil and gas wells across Louisiana. Louisiana's various well categories (on land, inland in water bodies, and offshore), impose huge cost and labor variations. When applying the two methods, we determined that it was appropriate when applying a method to showcase the different multipliers for different categories of wells to provide a range. There is not a one-size-fits-all approach to the task. It will simply require more people, more equipment, and time to plug a well in open water than one in the middle of a pasture.

Historically, information on the number of workers required to "get the job done" has been hidden behind a veil of corporate bureaucracy. Companies may not want to reveal this information for competitive or even labor relation related reasons, and regulators have been reluctant to require its disclosure. It is also a fact that plugging and abandonment does not generate profit for operators. While we may now know that for previous projects smaller

Active P&A work at an orphaned well on the Atchafalaya Wildlife Refuge
Source: Dr. Michael Levien

crew may have been all that was "necessary," we can't know whether this was an artificial constraint because of costs, and whether safer and better quality plugging and abandonment projects could be achieved with more trained staff on the job.[189] As a consequence, researchers and policymakers are left with tools of estimation to anticipate the job creation impacts of a given activity and to appropriately prepare that there will be enough trained people to do the work.

There are two central approaches for estimating the number of jobs or job-years from decommissioning orphaned and abandoned wells. The first includes using data from contracts on the number of hours it takes to decommission a well. It's pretty straight forward - look at the actual number of people required to physically plug and abandon a well and multiply by the number of wells. This approach is limited by the data available, which is why the second approach is a much more common choice. The spending method uses input-out modeling (IMPLAN) software to calculate direct, indirect, and induced impacts arising from spending levels that result in economic activity from decommissioning a well. The spending method just uses a level of spending to determine the number of jobs created. To calculate the number of workers needed to perform well plugging and remediation, each worker 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.[190]

We do however have a minimum count of workers for wells plugged through the state's Oilfield Restoration Program. The Louisiana Department of Energy and Natural Resources Oilfield Site Restoration Bid Proposals state that all rig packages shall include a "minimum of (4) man crew plus tool pusher."[191] The U.S. Fish and Wildlife Service (FWS) also shared bid data for 6 wells bundled into one contract located in the Atchafalaya National Wildlife Refuge in St. Martin Parish.[192] Preliminary bid data from the U.S. Fish and Wildlife Service anticipates 16 workers over a week just to carry out post P&A remediation for each well. True Transition's Organizing Fellow, Justin Solet, also visited one of the wells during the well plugging portion of the project.[193] The P&A will require three separate crews: the wireline crew of 5 workers, the cement crew of 3 workers, and the rig with another 3 workers. (This does not include truck drivers/water haulers). In total, 10 workers will be needed to P&A the well over the course of a week if no problems arise.

True Transition has requested payroll and job hour data for the 297 wells the Louisiana Department of Natural Resources already plugged with IIJA funds. Those requests are still pending. However, the LDENR did provide the typical hours worked for wells plugged through the Oilfield Site Restoration Program: "Generally North Louisiana wells take 1-2 days of daylight hours only, +/-24 hours, while South Louisiana/Offshore/Deep/Complex wells can take anywhere from 2-4 days to a month (depending on downhole issues)."[194]

FIGURE 8

ATCHAFALAYA WILDLIFE REFUGE WORKERS FOR ONE WELL

4.4 METHODOLOGY: ESTIMATED JOB CREATION FROM DECOMMISSIONING UNPLUGGED WELLS

4.4a METHOD ONE: JOB-YEARS PER DECOMMISSIONED WELL

A 2020 report by Columbia University and Resources for the Future using estimates provided by state regulators found that decommissioning one orphaned well created **0.24 job-years per well**, or 13,445 job-years decommissioning 56,600 orphaned wells.[195] If this estimate is based on 2,000 hours work per year per worker, this amounts to 480 hours of labor needed to decommission one well. This study also estimated that spending $101,112 (low estimate) to $202,224 (high estimate) created one job-year based on decommissioning costs of $24,735 and $47,703 per well. A job creation calculator from the Pennsylvania Department of Environmental Protection estimates that 302 jobs are created from plugging 1,471 wells or about **0.21 job-years per well** decommissioned.[196] An invoice provided by the West Virginia Department of Environmental Protection for plugging one orphaned well for $182,983 yielded similar results, showing that decommissioning the well required **0.22 job-years** or 465 hours of work based on 1,930 annual work hours.[197]

ONSHORE: The Ohio River Valley Institute (ORVI) obtained certified payroll reports for two contracts to decommission a total of 38 orphaned wells in Pennsylvania in 2023.[198] These contracts were funded by the initial grant ($25 million) Pennsylvania received to decommission 227 orphaned wells and were required to pay Davis-Bacon Wage (DBW) rates. These contracts show that for shallow depth, land-based wells, a crew of three and a small rotary rig can plug and abandon a well in 266 hours or 0.13 direct onsite job-years per well decommissioned.[199] It's important to keep in mind this is only on-site jobs, consisting of 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. For example, this does not include subcontractors or general and administrative jobs, or jobs at regulatory agencies. In addition, this does not include many of the indirect jobs or the "induced effect" of these investments. For example, the DOI estimates that $560 million in federal initial grant funds to decommission 9,832 orphaned wells will create or support 6,774 job-years or about 0.69 total jobs per decommissioned well.[200] In terms of direct jobs on projects (excluding administration), the DOI estimated about 0.23 job-years per decommissioned well. We determined that, absent precise payroll data for Louisiana, it was more appropriate to use the **DOI estimated .23 job-years per decommissioned well for Louisiana's onshore wells.**

Using this figure as our benchmark, decommissioning the state's remaining documented orphaned wells (4,605) would create 1,013 direct job-years. Including Louisiana's inactive wells (26,746) would create another 5,884 direct job-years, and including Louisiana's marginal wells below 15 BOE per day (25,893) would require another 5,495 job-years.

TABLE 17

LOUISIANA'S ONSHORE WELLS PROJECTED COSTS AND JOB-YEARS PER DECOMMISSIONED WELL METHODS

truetransition.org

Well Type	Estimated Per Well Decommissioning Cost*	Estimated Number of Wells	Total Estimated Decommissioning Cost **	Job-Years Per Decommissioned Well Method (.23 per well multiplier)
Documented Orphan Wells Total	$87,232*	4,605	$401,704,649	1,059
Marginal Wells with production below 15 barrel of oil equivalent per day (Assumed onshore)	$87,232	23,893	$2,084,234,176	5,495
Onshore Active Wells	$87,232	12,190	$1,063,358,080	2,804
Legacy Wells Improperly Plugged	$87,232	11,000	$959,552,000	2,530
Inactive Wells	$87,232	20,417	$1,781,015,744	4,696
TOTAL		72,105	$6,289,864,649	16,584

* Figure from State Notice of Intent to Department of Interior
** Multiplied $/well figure by estimated number of wells

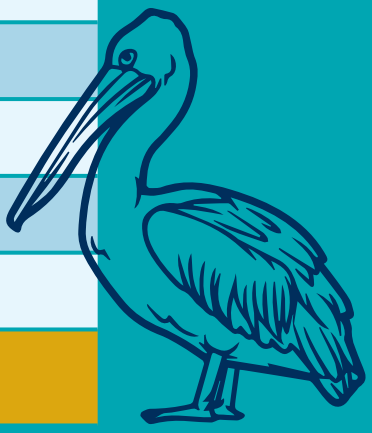
INLAND WATERWAYS: The U.S. Fish and Wildlife Service (FWS) shared bid data for 6 wells bundled into one contract located in the Atchafalaya National Wildlife Refuge in St. Martin Parish.[201] In total, the remediation of the wellsites is projected to cost a little over $1,465,000 or $209,000 per well. True Transition's Organizing Fellow, Justin Solet, visited one of the wells during the well plugging portion of the project and spoke with a site manager about details of the work.[202] The P&A will require three separate crews: the wireline crew of 5 workers, the cement crew of 3 workers, and the rig with another 3. (This does not include truck drivers/water haulers). In total, 10 workers will plug the well over a course of a week if no problems arise. This works out to 400 man hours or .20 job years per well for just the well plugging portion (very close to the DOI figure). Preliminary bid data from the U.S. Fish and Wildlife Service anticipates 16 workers over a week just to carry out post P&A remediation for each well. The remediation work is expected to require a total of 4,608 man hours. This works out to 658 hours or 0.34 direct onsite job-years per well site remediation. Both P&A and remediation will require 26 workers over 1,058 hours per well. This works out to .56 job years per well.

TABLE 18

ATCHAFALAYA NATIONAL WILDLIFE REFUGE WELLSITE BIDS

truetransition.org

BID AMOUNT	$1,191,375
WELLSITES	7
$/WELLSITE	$170,196
TOTAL HOURS	7,408
WORKERS PER WELL (P&A AND REMEDIATION)	26
HOURS PER WELL	1,058
JOB-YEARS PER WELL	0.56
$ SPENDING PER 1 JOB YEAR	**$302,428**



Data Source: Bids provided by the US Fish & Wildlife Service

Using **.56 job** years per well as our benchmark, decommissioning the state's remaining inland wells would require a total of **2,765 job-years**. It's important to keep in mind that these particular wells, while remote, are accessible by road and automobile.

A study conducted by the Center on Global Energy Policy at Columbia University SIPA estimated the annual economic activity associated with $830 million of annual P&A work in inland and state waters (Alabama, California, Louisiana, Mississippi, and Texas) amounted to a total of 10,500 jobs per year.[203] The authors explain that their "definition of inland waters includes areas in open water but also includes areas such as wetlands. There is little practical difference in P&A-ing wells on the margins of inland waters and in state inshore waters, so we group these two categories together for purposes of cost modeling."[204] Using their data, 2.4 direct job-years are created per decommissioned well in inland waters, which would increase the number of job years required to 12,064 job years.

Using these two figures as our bounds, to plug and abandon and remediate the 5,027 inland wells will require between 2,765 and 12,065 job-years. Keeping in mind the time range provided by LDENR (2 days to 1 month) — the figures provide a reasonable range for program administrators, companies, and workforce training programs to anticipate future workforce needs.

TABLE 19

LOUISIANA'S INLAND WELLS PROJECTED COSTS AND JOB-YEARS PER DECOMMISSIONED WELL METHODS

truetransition.org

Well Type	Estimated Per Well Decommissioning Cost*	Estimated Number of Wells	Total Estimated Decommissioning Cost **	Job-Years Per Decommissioned Well Method (.55 multiplier)	Job-Years Per Decommissioned Well Method (2.4 multiplier)
Inland Water Inactive Wells	$262,890	4,131	$1,086,000,000	2,272	9,914
Inland Water Temporary P&A	$321,429	56	$18,000,000	31	134
Inland Water Active/recently active	$263,095	840	$221,000,000	462	2,016
TOTAL		5,027	$1,325,000,000	2,765	12,065

*Estimated per well costs from Mark Agerton & Siddhartha Narra & Brian Snyder & Gregory B. Upton, 2023. "Financial liabilities and environmental implications of unplugged wells for the Gulf of Mexico and coastal waters," Nature Energy, Nature, vol. 8(5), pages 536-547, May 2023 https://www.nature.com/articles/s41560-023-01248-1

** Multiplied $/well figure by estimated number of wells

STATE OFFSHORE: Thanks to the U.S. Department of the Interior's Bureau of Safety and Environmental Enforcement's (BSEE) "Decommissioning Cost Rule" the general public has a good idea on the costs of these Herculean endeavors. Lesser known however, is the time and manpower required to undertake these feats. A 2021 National Ocean Industry Association (NOIA) study estimated over 200 job categories to carry out the decommissioning phase of an offshore structure and associated wells.

A 2004 Marine Minerals Management[205] study estimating the socioeconomic impacts of nonexplosive methods for offshore structure removal provided various ranges for personnel needs. A small decommissioning project on a single platform in shallow water may require 14-20 personnel and 3-7 days to operate the marine equipment spread. A moderately sized project with multiple platforms in shallow to medium water depth may require 50 to 100 personnel spread out over 30 to 45 days. A deepwater decommissioning project with large equipment may require in excess of 100 to 200 personnel over a number of months.[206] There are an estimated 2,000 remaining platforms in Louisiana waters. We do not know the exact state of these platforms but using these figures, we can anticipate Louisiana will need anywhere between 348 to 37,306 job years removing them.

We also applied the aforementioned Center on Global Energy Policy at Columbia University SIPA study and found that 2.4 direct job-years are created for each well plugged and abandoned in Louisiana state waters. This amounts to a total of 6,645 job years to only plug and abandon Louisiana's 2,769 wells located in state waters.

TABLE 20

LABOR HOUR RANGES FOR DECOMMISSIONING PLATFORMS IN THE SHALLOW GULF OF MEXICO

truetransition.org

Crew and Day estimates	Labor Hours Per Platform Decommissioning Estimates	Job-Years Per Platform Decommissioning	Total job years for decommissioning remaining 2,000 Louisiana Platforms
14 crew and 3 days	336	0.17	348
20 crew and 7 days	1,120	0.58	1,161
50 crew and 30 days	12,000	6.22	12,435
100 crew and 45 days	36,000	18.65	37,306

* Twachtman Snyder & Byrd, Inc. and Center for Energy Studies, Louisiana State University. 2004. Operational and Socioeconomic Impact of Nonexplosive Removal of Offshore Structures. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2004-074. 50 pp.

Some wells may require the removal of supporting pipelines and topside platforms. We do not know the exact mileage of no longer in use pipelines and cannot project the number of job years necessary to address those pipeline segments. Kaiser (2023) estimates that pipeline removal in water depths less than 30 meters will cost $321,000 per segment (about a mile) or $29/foot to $68/foot.[207]

True Transition's Organizing Fellow, Justin Solet, has direct experience as a snubbing hand on decommissioning projects in Louisiana state waters. He also interviewed several workers currently engaged in decommissioning work and explained that it was fairly common for a mix of firms comprising 50 + workers to tackle a shallow water P&A (not including platform removal) over the course of 5 days in 12 hour shifts. This would equate to a total of 14,400 labor hours or 7.4 job years per shallow well.

Absent payroll data, we are left with approximations based on available data. In total, it will require between 6,645 and 20,490 job years to plug and abandon Louisiana's offshore wells, and add an additional 12,115 job years to remove associated infrastructure.

TABLE 21

LOUISIANA'S OFFSHORE WELLS PROJECTED COSTS AND JOB-YEARS PER DECOMMISSIONED WELL METHOD

truetransition.org

Well Type	Estimated Per Well Decommissioning Cost	Estimated Number of Wells	Total Estimated Decommissioning Cost	Job-Years Per Decommissioned Well Method (2.4 Multiplier)	Job-Years Per Decommissioned Well Method (7.4 Multiplier)
Offshore Water Inactive wells	$289,353	2,198	$636,000,000	5,275	16,265
Offshore Water Temporary P&A	$301,205	166	$50,000,000	398	1,228
Offshore Water Active/recently active	$286,420	405	$116,000,000	972	2,997
TOTAL		2,769	$802,000,000	6,645	20,490
Associated Infrastructure	Estimated Per Platform Decommissioning Cost	Estimated number of Platforms	Total Estimated Platform Decommissioning Cost	Job-Years Per Removed Platform (6.22 multiplier)	Job-Years Per Removed Platform (6.22 multiplier)
Fixed Platforms in Louisiana state waters less than 30 meters	$977,000	2,000	$1,954,000,000	12,115	12,115
Pipeline Removal in water depths less than 30 meters	$321,000 per segment (about a mile) or $29/ft to $68/ft	50,000 miles of pipeline throughout the state. Miles of pipelines in State Waters unknown			
TOTAL				24,405	32,930

Source: Author's Analysis of Table 16 data

In total, the per job year method provides a reasonable bound to estimate the total trained workers that will be needed to address this inventory of unplugged oil and gas wells. While efficiency gains from bundling wells into one contract can save on equipment and transport mobilization and demobilization costs, hours in the day and trained professionals needed to operate the equipment remain inflexible limits.

TABLE 22

LOUISIANA'S TOTAL WELLS AND DECOMMISSIONED WELL METHOD

truetransition.org

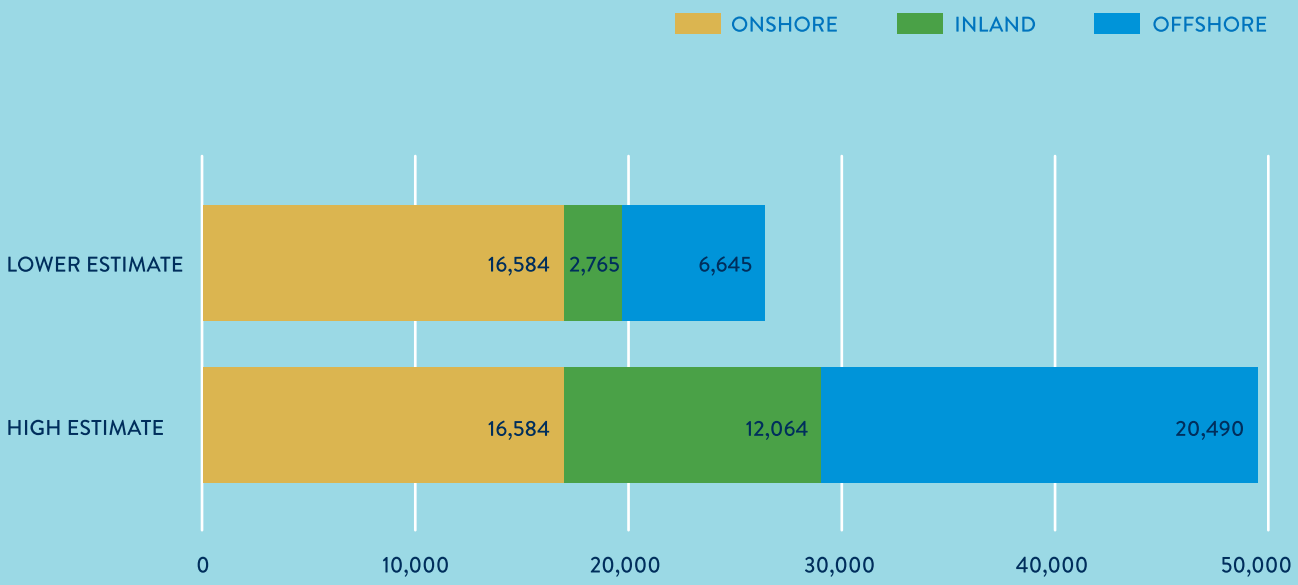
Well Type	Estimated Number of Wells	Total Job Years Low Estimate	Total Job Years High Estimate
Onshore Wells (ALL)	72,105	16,584 (.23 Multiplier)	16,584 (.23 Multiplier)
Inland Wells (ALL)	5,027	2,765 (.55 Multiplier)	12,064 (2.4 Multiplier)
Offshore Wells (ALL)	2,769	6,645 (2.4 Multiplier)	20,490 (7.4 Multiplier)
TOTAL	79,901	25,994	49,138

Source - Author's Analysis

FIGURE 9

JOB YEARS PER WELL METHOD

truetransition.org



Source - Author's Analysis

4.4b METHOD TWO: JOBS CREATED BY SPENDING ON DECOMMISSIONING WELLS

A 2020 report from the Political Economy Research Institute (PERI) estimates that 15.9 jobs are created per $1 million in spending on "closing orphaned wells," including 7.1 direct jobs, 3.4 indirect jobs, and 5.6 induced jobs.[208] This amounts to approximately one direct job supported per $140,845 in spending on decommissioning an orphaned well. Conversely, three reports by PERI commissioned by Reimagine Appalachia in 2021 estimated much smaller job multipliers in Ohio, Pennsylvania, and West Virginia.[209] The reports found that for every $1 million in spending for "plugging orphaned oil and gas wells" it created 1.1 direct jobs in Ohio, 0.9 direct jobs in Pennsylvania, and 1.9 direct jobs in West Virginia. Using the average direct jobs per $1 million across the three states – 1.3 jobs per $1 million – would be roughly $769,000 per job.

A study conducted by O'Donnell Economics and Strategy in 2021 on the economic impact of oil field remediation in New Mexico using IMPLAN found that decommissioning (including removing pipeline and other surface infrastructure) on 28,257 well sites would create 39,211 direct job-years based on spending $8.2 billion.[210]

ONSHORE: The U.S. Department of the Interior (DOI) estimated using input-output analysis (IMPLAN) found that $601.1 million of FY 2022 spending from Section 40601 of the Infrastructure Investment and Jobs Act (IIJA) for "directing the creation of programs to plug, remediate, and reclaim oil and gas "orphaned wells" on Federal, State, Tribal, and private lands" supported 7,250 jobs based on plugging 9,832 wells.[211] This included 2,615

TABLE 23

LOUISIANA'S ONSHORE WELLS JOB-YEARS USING SPENDING METHOD truetransition.org

Well Type	Estimated Per Well Decommissioning Cost	Estimated Number of Wells	Total Estimated Decommissioning Cost	Job-Years Based on Spending Method (2 Job years per $ 1 million)	Job-Years Based on Spending Method (4 Job years per $ 1 million)
Documented Orphan Wells Total	$87,232	4,605	$401,704,649	803	1,607
Marginal Wells with production below 15 barrel of oil equivalent per day (Assumed onshore)	$87,232	25,359	$2,212,116,288	4,424	8,848
Onshore Active Wells	$87,232	12,190	$1,063,358,080	2,127	4,253
Legacy Wells Improperly Plugged	$87,232	11,000	$959,552,000	1,919	3,838
Inactive Wells	$87,232	20,417	$1,781,015,744	3,562	7,124
TOTAL		73,571	$6,417,746,761	12,835	25,670

Source - Author's Analysis

direct jobs, and 4,635 secondary or indirect or induced jobs supported. Using just the direct jobs figure, this equates to roughly one supported job per $229,900 in expenditures, or 4 jobs per $1 million in spending.

INLAND WATERWAYS: Once again we compare preliminary bid data from the U.S. Fish and Wildlife Service (FWS) and the Columbia SIPA study which used real BSEE cost data. In total, the remediation of the 7 wellsites in the U.S FWS is projected to cost a little over $1,465,000. Based on the provided bid data, $1 million in spending is expected to create 3.2 jobs. The Columbia study does not consider there to be a meaningful cost difference between inland waterway and offshore wells. They found that 6 direct jobs are created for every $1 million spent decommissioning Louisiana's offshore and inland water wells. Using these two figures as our bounds, plugging all of Louisiana's 5,027 inland waterway wells will require between 4,240 and 7,950 job years.

STATE OFFSHORE: Two recent studies estimate the number of jobs needed to decommission wells in shallow waters based on the spending method. First, the Center on Global Energy Policy at Columbia University SIPA using BSEE decommissioning cost data and Regional Input-Output Modeling System (RIMS II) estimated the annual economy activity associated with $830 million of annual P&A work in inland and state waters (Alabama, California, Louisiana, Mississippi, and Texas) amounted to a total of 10,500 jobs per year.[212] This included 5,265 direct jobs, and 5,235 secondary or indirect or induced jobs supported. Using just the direct jobs figure, this equates to roughly one supported job per $157,644 in expenditures, or 6 direct jobs per $1 million spent. Using this figure as our benchmark, decommissioning Louisiana's offshore well inventory (2,769) would require 5,614 direct job-years.

A 2021 National Ocean Industry Association (NOIA) study estimates the various jobs created and job categories required throughout an assumed 30-year life cycle of a shallow oil and gas project. The industry trade group estimates that in the final year of a shallow water oil and gas project, employment peaks to its highest at 1,670 jobs during the decommissioning and abandonment phase (at a cost of $370 million).[213] This equates to roughly one job per $221,556 spent, or 4.5 direct jobs per $1 million spent. This estimate assumes full well plugging, subsea equipment removal, pipelines and facilities dismantling and transportation to shore for disposal and recycling. With these two estimates as our bounds, it will require between 3,609 and 4,812 job years to plug Louisiana's 2,769 offshore wells and will require between 16,536 and 14,756 job years to remove supporting infrastructure.

In total, the spending method provides a reasonable bound to estimate the total trained workers that will be needed to address this inventory of unplugged oil and gas wells especially for offshore wells where data is less available.

Orphaned wells in Lacassine National Wildlife Refuge that will be remediated through funding from the Bipartisan Infrastructure Law Source: U.S. Fish & Wildlife Service

TABLE 24

LOUISIANA'S OFFSHORE WELLS PROJECTED COSTS AND JOB-YEARS BASED ON SPENDING

truetransition.org

Well Type	Estimated Per Well Decommissioning Cost	Estimated Number of Wells	Total Estimated Decommissioning Cost	Job-Years Per Based on Spending (6 jobs per $1 million)	Job-Years Per Based on Spending (4.5 jobs per $1 million)
Offshore Water Inactive wells	$289,353	2,198	$636,000,000	3,816	2,862
Offshore Water Temporary P&A	$301,205	166	$50,000,000	300	225
Offshore Water Active/recently active	$286,420	405	$116,000,000	696	522
TOTAL		2,769	$802,000,000	4,812	3,609
Associated Infrastructure	Estimated Per Platform Decommissioning Cost	Estimated number of Platforms	Total Estimated Platform Decommissioning Cost	Job-Years Per Based on Spending (6 jobs per $1 million)	Job-Years Per Based on Spending (4.5 jobs per $1 million)
Fixed Platforms in Louisiana state waters less than 30 meters	$977,000	2,000	$1,954,000,000	11,724	8,793
Pipeline Removal in water depths less than 30 meters	$321,000 per segment (about a mile) or $29/ft to $68/ft	50,000 miles of pipeline throughout the state State Waters unknown			
TOTAL				16,536	14,756

Source - Author's Analysis

TABLE 25

LOUISIANA'S ESTIMATED JOB YEARS USING SPENDING METHOD

truetransition.org

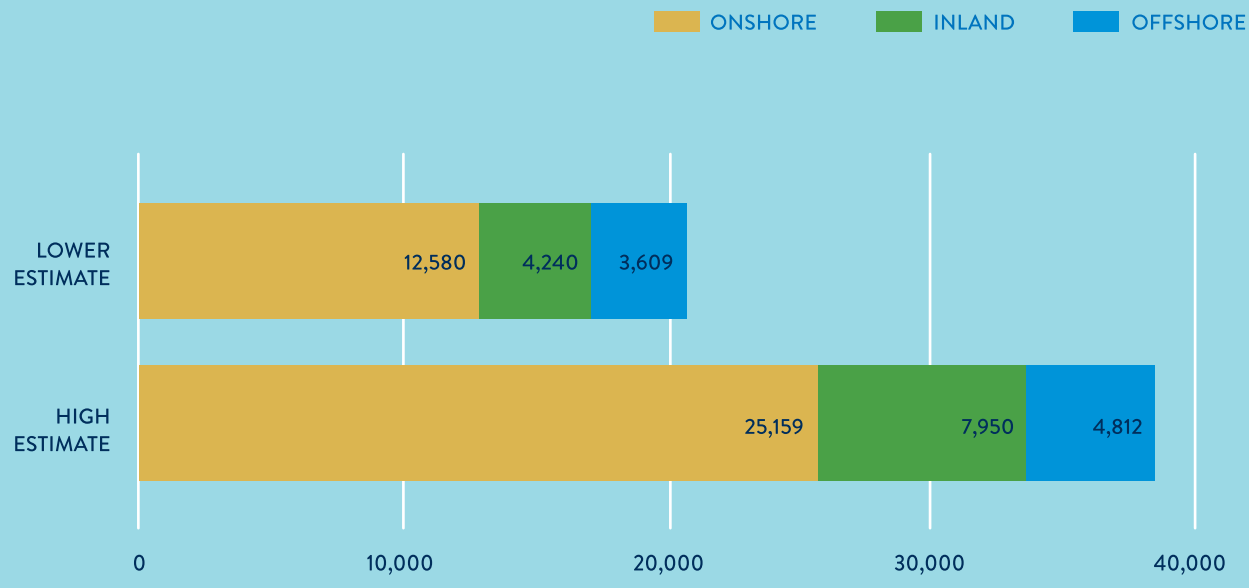
Well Type	Total Job Years Low Estimate	Total Job Years High Estimate
Onshore Wells (ALL)	12,580 (2 job years per $1 million)	25,159 (4 job years per $1 million)
Inland Wells (ALL)	4,240 (3.2 job years per $1 million)	7,950 (6 job years per $1 million)
Offshore Wells (ALL)	3,609 (4.5 job years per $ 1 million)	4,812 (6 job years per $1 million)
TOTAL	20,429	37,921

Source - Author's Analysis

FIGURE 10

JOB YEARS PER SPENDING METHOD

truetransition.org

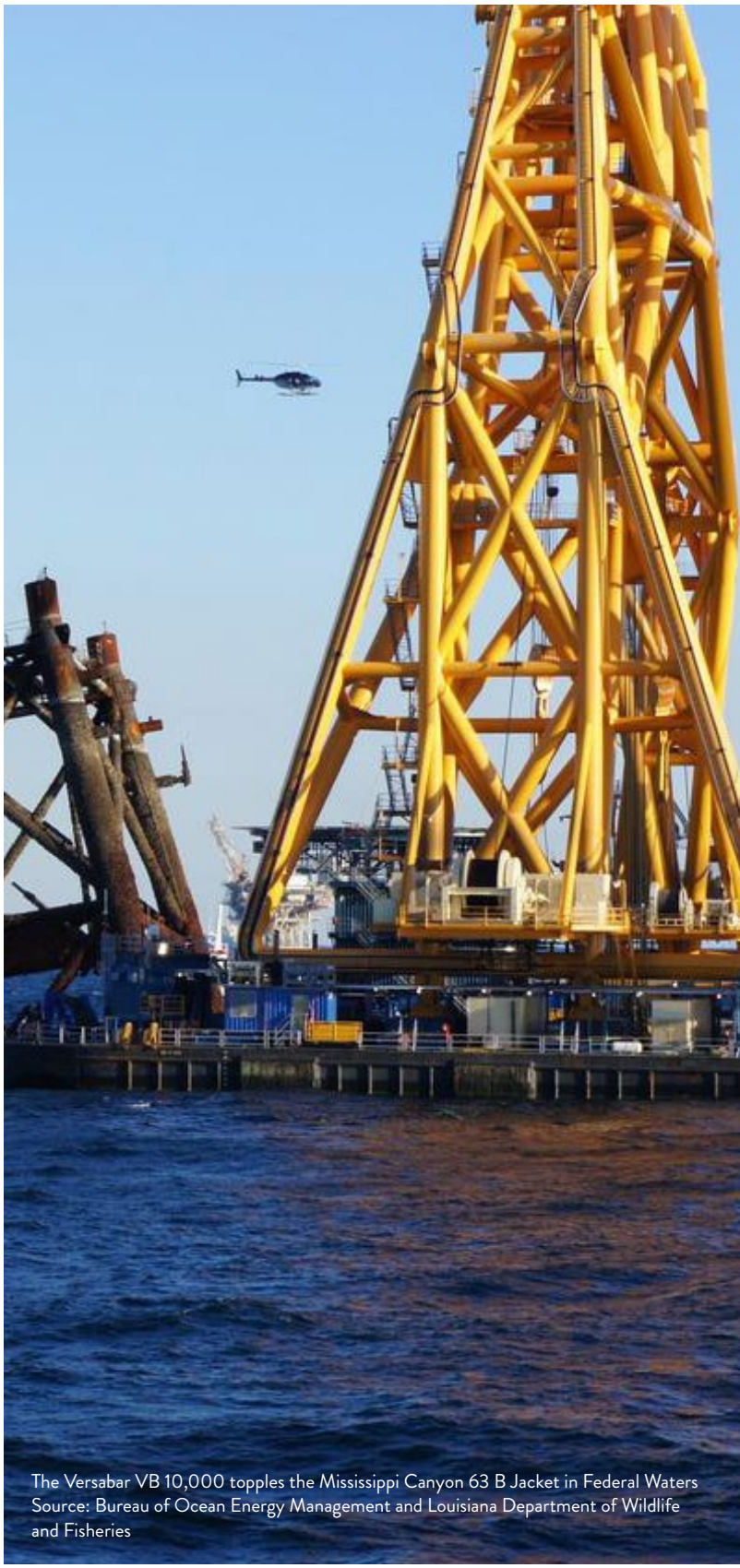


Source - Author's Analysis

4.5 APPLICATION OF JOB CREATION METHODS

This report has been principally concerned with the direct labor needed (number of workers) to decommission orphaned and unplugged wells and remediation of oilfield sites. An invaluable benefit of the IIJA program is that it will bring a once obscure activity into the light and provide the American public a clearer understanding of the task that awaits us. While we are left with historic projects and tools of estimation as our guide, there are benefits to using each of these methods. Because of the huge labor and cost variation between Louisiana wellsites, we determined that using both the job years per well and jobs per spending methods to create ranges was the most useful. Especially when a single well plugging can swing between 2 days to a month or more.[214]

Well plugging and remediation are the lowest value phase of an oil or gas well's life. Cleaning up doesn't turn a profit for the owner of the well. Because state oil and gas regulators, and even federal regulators, have very light touch oversight of the decommissioning process (indeed, few physically witness or inspect a plug and abandonment and none monitor long terms), the public is left with "take our word for it" baselines on everything from costs, best practices, and workers needed. Through the oilfield site restoration program, state regulators have acquired direct oversight experience of decommissioning projects, but because the work is carried out through contractors, regulators are still reliant on external expertise. When we look at previous projects as benchmarks, we can't know whether costs or labor needs are artificial constraints imposed by a desire to "save a buck" at the end of a well's life. Therefore, the Louisiana public is not required to accept past assumptions as self-evident givens. In other words, just because this was the way things were done, this should not dictate how things should be done.



The Versabar VB 10,000 topples the Mississippi Canyon 63 B Jacket in Federal Waters
Source: Bureau of Ocean Energy Management and Louisiana Department of Wildlife and Fisheries

TABLE 26

JOB CREATION POTENTIAL OF CURRENT FEDERAL EXPENDITURES

truetransition.org

Louisiana	Initial Grants (IIJA)	Total Formula Grants	Performance Grants	Marinal Wells Plugged (MERP)	Total
	$25,000,000	$86,559,520	$70,000,000	$15,661,335	$197,220,855
Number of Wells Plugged assuming onshore $87,232 per well cost	287	992	802	180	2,261
JOB ESTIMATION METHOD	JOB YEARS PER CATEGORY OF GRANT FUNDING				
Job-Years Per Decommissioned Well Method (0.23 Direct Job-Years Per Well)	66	228	185	41	520
Job-Years Per Decommissioned Well Method (0.55 Direct Job-Years Per Well)	158	546	441	99	1243
Job-Years Based on Spending Method (2 Direct Job-Years Per $1 Million)	50	173	140	31	394
Job-Years Based on Spending Method (4 Direct Job-Years Per $1 Million)	100	346	280	63	789

Source - Author's Analysis

V. QUALITY WORK & QUALITY JOBS

The implementation of strong methane emissions standards, decommissioning unplugged oil and gas wells, and restoring Louisiana's coast will require a steady supply of well-trained workers. It took decades and tens of thousands of workers to install this metal, and it will take no less to remove it. These jobs are difficult to outsource, since they involve installation of equipment, specialized oilfield services, maintenance and repair, heavy equipment operators, construction laborers, truck drivers, and machinists. These jobs require experience and expertise not only at the well itself, but the background knowledge to work in Louisiana's unique terrains.

What matters to the Louisiana public is that this work is carried out in such a way to protect Louisiana's other natural resources, economic uses, and general welfare of the state. What matters to the workers who will directly perform this work is if they have the appropriate training, safe working conditions, reasonable schedules, and are compensated enough to support their families in dignity and comfort. What matters for the administrators of this program and local unions in the process of developing training and apprenticeship programs is - how many people will it take?

Oil and gas firms have repeatedly complained that "finding and keeping qualified workers [is] the greatest challenge for companies.[215] [216] Dr. Michael Levien, Associate Professor of Sociology with Johns Hopkins University visited the Atchafalaya National Wildlife Refuge with True Transition Fellow Justin Solet, and together, they interviewed some of the crew plugging one of the orphaned wells. Dr. Levien reported that the non-salaried, contracted cement crew made "in the $20s per hour," and that while the plugging jobs paid less, there were regular hours (no overtime, no nights). The salaried staff on the site reported a preference for the reduced, predictable work hours. Contract workers, those men responsible for the direct physical labor, accounted for between 10% and 13% of the total cost to plug a single well (this does not account for remediation costs and those workers).[217]

At the time of writing this report, the United States was the largest producer of crude oil in the world, ever.[218] And while it takes considerably less workers to produce more oil and gas than it took ten years ago,[219] a boom in production implies that well plugging operations are vulnerable to high turnover and "job hopping" to firms engaged in production who can offer a few more dollars an hour. The lure from other orphaned well plugging programs in states with higher prevailing wages, fringe benefits, and union contract agreements also puts Louisiana's well plugging program at a disadvantage. Louisiana has spent decades cultivating a workforce with expertise, but it risks a brain drain if it treats the people who do this physical work as expendable or an afterthought.

In True Transition's national survey of oil and gas workers, workers expressed a preference for stable positions with benefits like health insurance and retirement plans.[220] If well plugging firms and programs are sincere in their desire to address the "qualified worker" quandary, there might be an obvious solution.

The scale of the work ahead of us demands a different approach.

Men on Rig, Gulf Lake Borgne, Vermillion Parish, 1930s Source: State Library of Louisiana Historic Photograph Collection

5.1 A HIGH ROAD APPROACH

In its FY 2022 state initial grant guidance to state programs,[221] the Department of Interior directed states to disclose and describe which of the federal recommended elements of an effective orphaned well plugging program the state implemented, which includes:

- Training programs, registered apprenticeships, and local and economic hire agreements for workers the State intends to conduct or fund in well plugging or site remediation;
- Plans the State has to support opportunities for all workers, including workers underrepresented in well plugging or site remediation, to be trained and placed in good-paying jobs directly related to the project;
- Plans the state has to incorporate equity for underserved communities into their planning, including supporting the expansion of high-quality, good paying jobs through workforce development programs and incorporating workforce strategy into project development.

The Federal government has signaled very directly a commitment to federal dollars being used in such a way to not only plug wells, but to also create middle class jobs in the process. As this report has demonstrated, the current federal outlay will only cover a fraction of Louisiana's and the nation's inventory of unplugged wells. It is reasonable to assume that any future federal commitments for additional well plugging funds will be predicated on the success of this current implementation, which includes evidence of the creation of strong middle class jobs.

Several states are developing high road policies to make sure their orphaned well programs are built for the long haul. 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). This could mean $9 million

alone for training workers to clean up orphaned wells in Pennsylvania.[222] 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).[223] 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.

- **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.[224] 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 in partnership with LiUNA Local 220 and the Operating Engineers Training Trust.[225] There are three training tracks: experienced oil and gas workers, union journeyman and apprentices, and new workers from local communities.[226] This is the only known state-funded well decommissioning workforce development program in the country.

- **Louisiana Lagniappe:** In a Quarterly Report describing activities between 2022–2023 submitted to the Department of Interior, LDENR explained that it is "working to increase worker training opportunities for Louisiana's citizens and to continue to refine and expand benefits for disadvantaged communities" and to that end Lemoine Disaster Recovery partnered with the Louisiana Chamber of Commerce Foundation to develop worker and company outreach in order to advance its Disadvantaged Business Enterprise (DBE) efforts.[227]

Louisiana can and should build upon this initial effort.

5.2 THE BUSINESS CASE FOR THE HIGH ROAD

There are currently 5,383 active apprentices in Louisiana enrolled in federally recognized programs.[228] Approximately 48 percent are enrolled in union (joint-labor management) apprenticeships, while 49 percent are employer-only programs. Of Louisiana's registered apprenticeships, only .11% are in the oil and gas extraction sector. Unions have deep expertise in developing state of the art curriculum and experience overseeing apprentices and supporting members across heavy industrial sectors and large scale government initiatives. Unions help foster strong labor-management partnerships and related apprenticeship training programs that offer a key pathway into good middle-class jobs.[229]

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.[230] Joint Labor-Management apprenticeship programs have several advantages over those run solely by employers, including higher completion rates, higher wages, and more diversity. Union apprentices also report a median hourly wage well above their non-union peers and the state's median per capita income.[231] In addition to apprenticeship training, union workers also go through routine training, both of which raise the skill levels for the craft and foremen. Union standards create a positive feedback loop that elevates the overall quality of a jobsite and outcome of the job.[232]

As states compete between each other for skilled workers to remediate their orphaned wells inventories,[233] attracting and retaining these workers within state borders will be key. A 2022 study found that projects are 40 percent less likely to experience a shortage of skilled labor when union labor is sourced versus open shop labor. Turnover of labor on projects is one-third less likely when union labor is employed versus open shop labor. Job hopping is linked to worse project cost and schedule outcomes.[234] The 2022 study found that union contractors have access

to local union referral systems and, especially on large projects (like tens of thousands of wells), contractors or government programs can access additional support from neighboring local unions facilitating more effective deployment of labor. This suggests that union halls are more effective at meeting project requirements for sufficient skilled labor than when labor comes from open shop sources.

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.[235] 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. Since Louisiana relies heavily upon sales and individual income taxes[236] to repair its crumbling infrastructure[237] and other necessary public services and goods, it is in the public interest to leverage every opportunity to elevate the wage floor for Louisiana residents.

5.3 FILLING THE OIL AND GAS EMPLOYMENT GAP

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).[238] There has been a sharp decline in upstream oil and gas employment in Louisiana. Altogether, upstream oil and gas employment in Louisiana fell by 41 percent, from about 50,241 in 2013 to 29,443 in 2022, which is the lowest level on record. Over 20 thousand Louisianans in oil and gas production were handed the pink slip in the last ten years **(Figure 11**).

Despite record job purges, offshore production in federal waters off of Louisiana's coast have increased markedly.[239] The oil and gas extraction and production industry is trending towards leaner operations.

There is nothing particularly new about a boom and bust employment cycle in the Louisiana oil and gas industry. In the 1990s, Louisiana State University researchers conducted a series of interviews of Gulf of Mexico based firms assessing industry labor demand compared to Louisiana labor supply "suitability."[240] Firms reported to interviewers trouble finding "quality" Louisiana residents to fill positions. Of course, these same firms had also just cut staff by 75% when oil and gas prices dropped, and then found it difficult to scale back up when prices rebounded. While several decades in the past, the themes and conclusions are familiar. Firms are quick to cut workers as an unnecessary cost, and then quicker to complain when trained workers don't want to return to unstable employment.

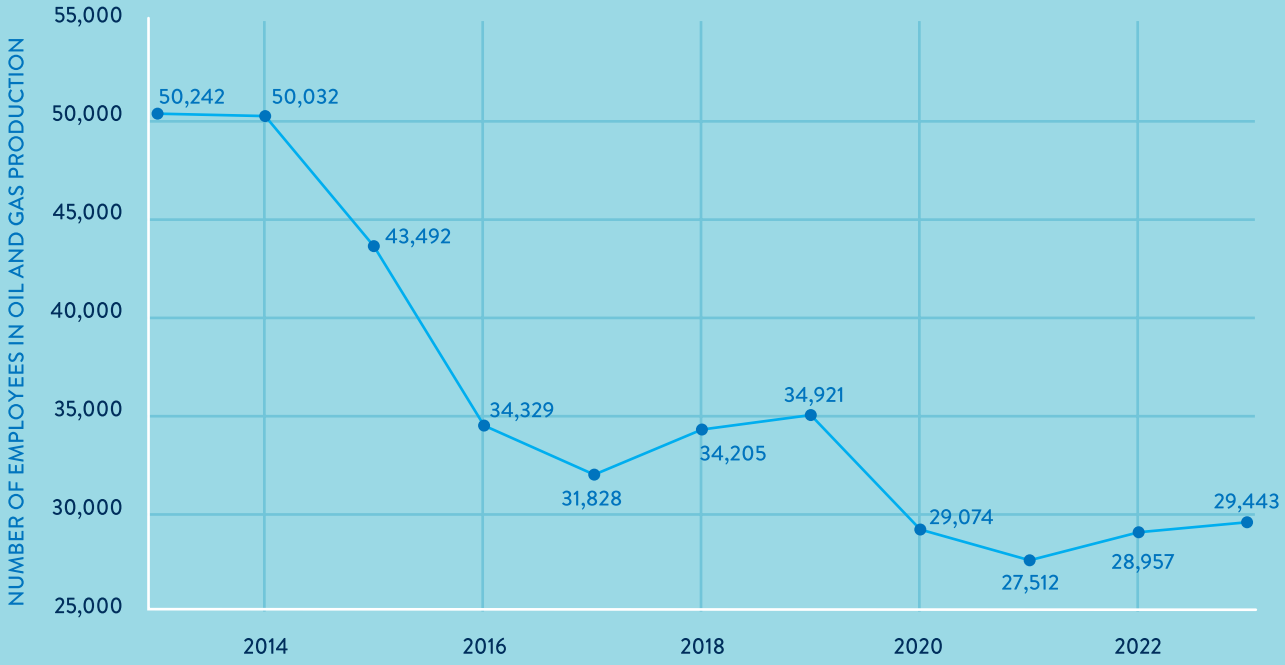
The American Petroleum Institute also carried out a survey in 2022 administered to oil and gas companies. Those firms reported, "finding and keeping qualified workers was the greatest challenge for companies."[241] Indeed, there has been a similar complaint regarding the orphaned well plugging program.[242] Mark Twain famously quipped that "history never repeats itself, but it does often rhyme."

While firms engaged in exploration and production may have less need for these workers, this pool of workers could certainly work in the methane mitigation jobs discussed in this report. In addition to creating tens of thousands of jobs, the methane mitigation industry has the potential to raise standards in the construction and oil and gas industries in Louisiana. Unlike the boom and bust of oil and gas production, plugging of wells and monitoring and methane abatement will provide steady

FIGURE 11

LOUISIANA OIL AND GAS PRODUCTION EMPLOYMENT 2013-2023

truetransition.org



demand and require a stable, well-trained workforce. As one is a publicly funded program, there should be a clear public benefit. There is a sizable portion of displaced oil and gas workers who still live in Louisiana now employed in other industries, underemployed, or unemployed. These individuals possess skills and experience that Louisiana needs to meet this mandate.

5.4 POLICIES AND PRACTICES TO BOOST UNION JOBS ON FEDERALLY FUNDED PROJECTS

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.

There are several procurement policies Louisiana 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 the Louisiana public gets 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.

LOUISIANA WORKFORCE DEVELOPMENT BOARDS:

- Workforce development Boards could play a powerful role to prepare individuals living in Louisiana communities for careers in the budding methane mitigation industry. A Workforce Development Board ("WDB") is an entity of appointed community leaders appointed by elected officials, such as Parish judges and city mayors, who are responsible for developing and overseeing local workforce services and programs for their respective areas.[243] There are fifteen local boards in Louisiana operating over fifty local Louisiana Workforce Commission offices.[244]

Workforce Development Boards are in part funded by grants from the U.S. Department of Labor Employment & Training Administration (DOLETA). In 2014, Congress passed the Workforce Innovation and Opportunity Act (WIOA) to connect job seekers to employment, education, training, and support services.[245] In 2023, WIOA contributed $60 million to fund workforce development in Louisiana.[246] WIOA requires each WDB to include two or more representatives of labor and one or more representatives of a joint labor-management or union-affiliated, registered apprenticeship program.[247] If no union-affiliated registered apprenticeship exists in the local area, the board must appoint a non-union-affiliated registered apprenticeship representative.

If a training program is not explicitly linked to jobs then it runs the risk of being nothing more than a "train and pray" scheme. There is an opportunity to increase coordination between the Louisiana Department of Energy and Natural Resources and the Louisiana Workforce Commission and participating union apprenticeships. There will be no shortage of wells to plug and infrastructure to dismantle.

OILFIELD REMEDIATION SHOULD STRENGTHEN LOUISIANA'S COASTAL MASTER PLAN

- Have you ever waited for a road to be repaired for months to fix an electric line, only to have that same road ripped up again to fix a water pipe? Infrastructure projects should be planned and implemented in coordination. The orphaned well plugging and remediation program should work in concert with Louisiana's Coastal Master Plan, and indeed, those wells should be prioritized in support of the State Master Plan.[248] Remediation in Louisiana will have a much larger meaning than filling a hole in the ground with cement and replacing a few inches of topsoil. Therefore, all labor recommendations made apply to both CPRA contracts and DENR contracts.

5.5 BEST PRACTICES

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 is 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 licenses must be issued to workers performing such licensed work when and where applicable.

CONCLUSION

Reducing methane emissions from oil and gas operations can provide a significant number of jobs in Louisiana. The decisions made today, however, will determine whether those are good jobs.

With just under $200 million 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 prepare quality workers for quality jobs.

On top of this federally spurred investment, there are also over 60,000 unplugged wells in Louisiana, thousands of offshore platforms, and no longer in use pipelines representing decades of work in cleaning up well sites and dealing with other dilapidated natural gas infrastructure. It took decades to install this iron, and it will require no less to remove it.

To ensure that these jobs are high quality jobs, high-road employment practices need to be utilized along with policies to support the burgeoning methane mitigation industry. With Louisiana sinking into the Gulf, its leaders can no longer afford to take the low road.

Plugging and abandoning of an orphaned well at the Lacassine National Wildlife Refuge. The project appears to have utilized a lift boat, a spud barge, and a push boat.
Photo Source: Leslie Hull-Ride, United State Fish and Wildlife Service, Public Domain.

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59 For instance, the authors found that in the state of Texas, only 2% of wells in the state's inactive 100,000 + well inventory have ever been reactivated. Biven, M.M. and Virginia Palacios. (2022, January) Commission Shift: Eliminating Orphan Wells and Sites in Texas: A Toolkit for Redesigning the Railroad Commission's Oilfield Cleanup Program commissionshift.org/wp-content/uploads/2022/01/Eliminating-Orphan-Wells-and-Sites-in-Texas_CommissionShift.pdf

60 Unplugged inactive well count from Louisiana SONRIS database. This list includes "Temporary inactive" for over ten years; "No future utility" "shut-in" wells; "waiting" for over one year; "future utility" for over ten years "active wells" that are actually inactive (37% of status codes 9, 10. https://sonlite.dnr.state.la.us/pls/apex/f?p=108:2700:15123095540600::NO:2700

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64 Dermansky, Julie. Father of Teen Killed in Oil Tank Explosion Pushing for New Louisiana Safety Measures https://www.desmog.com/2021/04/02/zalee-day-smith-teen-death-oil-explosion-louisiana-safety/

65 New oilfield tank battery safety rule goes into effect Office of Conservation requires additional precautions and warnings in higher-risk areas https://www.dnr.louisiana.gov/index.cfm/newsroom/detail/1199

66 Wells showing active production for 2022 according to EIA production data. https://www.eia.gov/petroleum/wells/

67 Mcf stands for 1,000 cubic feet, so this means 90 thousand cubic feet.

68 Louisiana Department of Revenue. https://revenue.louisiana.gov/Faq/QuestionsAndAnswers/76

69 Conversation with Dr. Amy Townsend-Small, University of Cincinnati, December 2020

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71 Omara M, Zavala-Araiza D, Lyon DR, Hmiel B, Roberts KA, Hamburg SP. Methane emissions from US low production oil and natural gas well sites. Nat Commun. 2022 Apr 19;13(1):2085. pmid:35440563

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73 Amy Townsend-Small. An immediate, very low-cost method for reducing methane emissions from the US oil and gas supply chain PLOS Climate, March 2023 10.1371/journal.pclm.0000151

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75 Note: 5,436 of Louisiana's wells are horizontal, and of those 1,050 are marginally producing wells. The Inflation Reduction Act (IRA) – Mitigating Emissions from Marginal Conventional Wells Administrative and Legal Requirements Document (ALRD) Number: DE-FOA-0003109 lists 20,294 eligible marginal wells in Louisiana.

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79 Robert M. Dilmore, James I. Sams III, Deborah Glosser, Kristin M. Carter, and Daniel J. Bain. Spatial and Temporal Characteristics of Historical Oil and Gas Wells in Pennsylvania: Implications for New Shale Gas Resources Environmental Science & Technology 2015 49 (20), 12015-12023 DOI: 10.1021/acs.est.5b00820 https://pubs.acs.org/doi/10.1021/acs.est.5b00820

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90 Oil and gas production in Louisiana State waters has decreased since 2013 to a level of 4.24 million barrels of oil in 2019, with 2.17 million barrels of oil in 2020 year-to-date, and 15.3 million cubic feet of gas in 2019, with 6.81 million cubic feet of gas in 2020 year-to-date (Louisiana Department of Natural Resources 2020a; 2020b).

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93 The author utilized similar methods in two other reports: one for Texas Climate Jobs (https://static1.squarespace.com/static/60e76bd34e5317302f87f357/t/645d1db64453b27b47622494/1683824055315/TCJP+M ethane+Report+2023.pdf) and one for the Appalachian region for the Ohio River Valley Institute (https://ohiorivervalleyinstitute.org/addressing-methane-emissions-in-appalachia/).

94 This section both estimates the share of sites subject to new EPA regulations based on their location (onshore, inland waterways, and offshore) and relative cost differences. Both elements derive from: Agerton, Estimating Future Oilfield Site Restoration Costs and Methane Emissions from Orphaned and Idle Wells in Louisiana. With Kanchan Maiti (PI), Mark Agerton (Co-PI), Ipsita Gupta (Co-PI), and Brian Snyder (Co-PI). $3.2 million. (2023-2027). To estimate relative changes in costs and time to meet new EPA regulations between onshore sites and inland waterways or offshore locations, differentials in known cost differences for plugging orphan wells between these locations serve as a proxy. Essentially, the difference in costs across sites at the types of locations for plugging wells in relation to onshore plugging reflect the set of complexities inherent in the locations and so cost differences between onshore and other locations for meeting EPA regulations are likely to be similar. Cost information by location derived from:

95 This focus on direct employment reflects both an interest in focusing on quality jobs and the difficulty of effectively measuring multi-state indirect and induced employment, as some companies may choose to buy supplies from outside the states studied.

96 An example of nationally calculated indirect and induced jobs related to meeting new EPA regulations can be found here: https://cdn.catf.us/wp-content/uploads/2022/10/04105136/CATF_OilGasJobsReport-1.pdf

97 For more information on the benefits of union jobs go to the following page: https://www.dol.gov/general/workcenter/union-advantage

98 U.S. Department of the Interior, Environmental Protection Agency, Natural Gas and Petroleum Systems in the GHG Inventory: Additional Information on the 1990-2021 GHG Inventory. April 2022. Online access: https://www.epa.gov/ghgemissions/natural-gas-and-petroleum-systems-ghg-inventory-additional-information-1990-2020-ghg. Information in this report refers to Table 3.6-7.

99 U.S. Energy Information Administration. The Distribution of U.S. Oil and Natural Gas Wells by Production Rate with data through 2022 December 2023 https://www.eia.gov/petroleum/wells/pdf/Well_Distributions_report_2023_full_report.pdf.

100 Methane leakage by well-site within Appalachia could not be obtained for this report, hence the application of national rates to Appalachia well sites.

101 Calculations related to worker time for leak detection and repair consider these EPA 'not monitored' sites as future monitored sites with methane emissions of less than three tons per year.

102 Online listings of compressor station permits for Louisiana's Department of Environmental Quality totaled 135, but only provided information on permits starting in 2017. Thus, this report uses the distribution method described in this section.

103 U.S. Energy Information Administration. The Distribution of U.S. Oil and Natural Gas Wells by Production Rate with data through 2022 December 2023 https://www.eia.gov/petroleum/wells/pdf/Well_Distributions_report_2023_full_report.pdf.

104 U.S. Department of the Interior, Environmental Protection Agency, Natural Gas and Petroleum Systems in the GHG Inventory: Additional Information on the 1990-2021 GHG Inventory. April 2022. Online access: https://www.epa.gov/ghgemissions/natural-gas-and-petroleum-systems-ghg-inventory-additional-information-1990-2020-ghg. Information in this report refers to Table 3.6-7.

105 EPA regulations referred to these as one type of 'process controller.'

106 U.S. Department of the Interior, Environmental Protection Agency, Natural Gas and Petroleum Systems in the GHG Inventory: Additional Information on the 1990-2021 GHG Inventory. April 2022. Online access: https://www.epa.gov/ghgemissions/natural-gas-and-petroleum-systems-ghg-inventory-additional-information-1990-2020-ghg. Information in this report refers to Table 3.6-7.

107 ICF. International. Economic Analysis of Methane Emission Reduction Potential from Natural Gas Systems. May 2016. https://onefuture.us/wp-content/uploads/2018/05/ONE-Future-MAC-Final-6-1.pdf

108 U.S. Department of the Interior, U.S. Environmental Protection Agency. Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review: Background Technical Support Document for the Proposed New Source Performance Standards (NSPS) and Emissions Guidelines (EG) 40 CFR Part 60, subpart OOOOb (NSPS) 40 CFR Part 60, subpart OOOOc (EG)." October 2021. Tables 6-6, 6-7, 6-16, and 6-18. Quoted in the following report: Industrial Economics, Incorporated. Employment effects of oil and gas sector emissions controls. October, 2022. Pg. 4. Online Access: https://cdn.catf.us/wp-content/uploads/2022/10/04101855/oil-gas-methane-control-report.pdf.

109 Final EPA rule can be found here: https://www.govinfo.gov/content/pkg/FR-2024-03-08/pdf/2024-00366.pdf. A third-party summary related to storage tanks may be found here: https://cimarron.com/oooob-explained-navigating-the-maze-of-the-epas-methane-rule-with-solutions/.

110 Industrial Economics, Incorporated. Employment effects of oil and gas sector emissions controls. October, 2022. Pg. 7. Online Access: https://cdn.catf.us/wp-content/uploads/2022/10/04101855/oil-gas-methane-control-report.pdf

111 Colorado Department of Public Health and Environment Air Pollution Control Division, Economic Impact Analysis for Proposed Revisions to Colorado AQCC Regulation Number 7, November 5, 2019. Online Access: https://www.edf.org/sites/default/files/content/Attachment%20J%20CDPHE%20EIA%202019.pdf

112 U.S. Department of the Interior, Environmental Protection Agency. Methodology for Conducting Fugitive Emissions Leak Survey Time and Leak Counts from NSPS OOOOa Compliance Reports, Docket ID No EPA-HQ-OAR-2017-0483," 2017. as quoted in the following report: Industrial Economics, Incorporated. Employment effects of oil and gas sector emissions controls. October, 2022. Pg. 4. Online Access: https://cdn.catf.us/wp-content/uploads/2022/10/04101855/oil-gas-methane-control-report.pdf.

113 Colorado Department of Public Health and Environment Air Pollution Control Division, Economic Impact Analysis for Proposed Revisions to Colorado AQCC Regulation Number 7, November 5, 2019. Online Access: https://www.edf.org/sites/default/files/content/Attachment%20J%20CDPHE%20EIA%202019.pdf

114 Component repair time calculated by taking the calculated repair time per hours from the CAPC Division report and dividing it by the number of components needing repair per site type provided by the EPA. For example, the CAPC Division calculates that it takes 32.6 hours to repair a transmission compressor station leak, which, assuming a total of 16 components (as indicated by the EPA), translates to a repair time per component of roughly 2.04 hours. Using all available repair time and component number information available in both reports yields an average of 2.07 hours per component regardless of type of site undergoing repair.

115 Similar assumptions have been made in other reports, for example: From: https://www.edf.org/sites/default/files/content/Attachment%20J%20CDPHE%20EIA%202019.pdf.

116 Installation costs reported through the cost-effectiveness spreadsheet represent 50% of the capital costs of compressors, solar panels, and batteries, making up roughly 21% of the total project budget. This spreadsheet can be found here: https://www.catf.us/resource/zero-emission-technologies-for-pneumatic-controllers-in-the-usa/

117 Installation costs reported through the cost-effectiveness spreadsheet represent 50% of the capital costs of compressors, solar panels, and batteries, making up roughly 21% of the total project budget. This spreadsheet can be found here: https://www.catf.us/resource/zero-emission-technologies-for-pneumatic-controllers-in-the-usa/ 118 "Benchmarking Methane and Other GHG Emissions Of Oil & Natural Gas Production in the United States June 2021 Clean Air Task Force. Online Access: https://www.catf.us/wp-content/uploads/2021/06/OilandGas_BenchmarkingReport_FINAL.pdf

119 Low methane producing studied sites are assumed to be using non-pneumatic controllers; from Omara, et. al., 2022. **Figure 5a** (insert) indicates than 25% of a random sample of sites produce less than .1 kg/hr of methane, thus the 75% remainder are assumed to require replacement. https://www.nature.com/articles/s41467-022-29709-3

120 State of California. Air Resources Board. Proposed Regulation for Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities. Air Resources Public Hearing to Consider the Proposed Regulation for Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities. Staff Report: Initial Statement of Reasons. Based on Appendix B. Economic Analysis. May 31, 2016. pg. 99, as quoted in the following report: Industrial Economics, Incorporated. Employment effects of oil and gas sector emissions controls. October, 2022. Pg. 4. Online Access: https://cdn.catf.us/wp-content/uploads/2022/10/04101855/oil-gas-methane-control-report.pdf.

121 U.S. Department of the Interior, Environmental Protection Agency. Installing Vapor Recovery Units to Reduce Methane Losses. July, 2008. Online Access: https://www.epa.gov/sites/default/files/2017-07/documents/midland5_2008.pdf

122 U.S. Department of the Interior, U.S. Environmental Protection Agency. Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review: Background Technical Support Document for the Proposed New Source Performance Standards (NSPS) and Emissions Guidelines (EG) 40 CFR Part 60, subpart OOOOb (NSPS) 40 CFR Part 60, subpart OOOOc (EG)." October 2021. Tables 6-6, 6-7, 6-16, and 6-18. Quoted in the following report: Industrial Economics, Incorporated. Employment effects of oil and gas sector emissions controls. October, 2022. Pg. 4. Online Access: https://cdn.catf.us/wp-content/uploads/2022/10/04101855/oil-gas-methane-control-report.pdf.

123 Costs for replacement: U.S. Department of the Interior, Environmental Protection Agency. Methane savings from compressors. May, 2009. From slide 10. Online Access: https://www.epa.gov/sites/default/files/2017-07/documents/icf_compressors_okcity_2009.pdf. Costs for abatement: ICF International. Economic analysis of methane emission reduction potential from natural gas systems. May 2016. From Table A-3 from pg. A-2. Online Access: https://onefuture.us/wp-content/uploads/2018/05/ONE-Future-MAC-Final-6-1.pdf

124 Colorado Department of Public Health and Environment Air Pollution Control Division, Economic Impact Analysis for Proposed Revisions to Colorado AQCC Regulation Number 7, November 5, 2019. Online Access: https://www.edf.org/sites/default/files/content/Attachment%20J%20CDPHE%20EIA%202019.pdf

125 Originally named "Oilfield", the program is now titled the Orphaned Site Restoration Program. However, the program might be referred to either of the terms in the literature. Also, please note that Louisiana's Governor Jeff Landry has issued an Executive Order stating his intent to reorganize, consolidate, or eliminate several commissions, including the Orphaned Site Restoration Program. At the time of writing, the future of the Commission is yet to be determined.

126 R.S. 30:80 https://wwwcfprd.doa.louisiana.gov/boardsandcommissions/StatutoryCitations/503_OSR%20Revised%20Statutes%2030_80%20et%20al.pdf

127 "Orphaned oilfield site" means an oilfield site which has no continued useful purpose for the exploration, production, or development of oil or gas and which has been declared to be an orphaned oilfield site by the assistant secretary under R.S. 30:91. We assume that a "threat to an oil or gas strata" implies a FRAC hit, where a production "communicates" with a nearby well. Unplugged wells present a risk of a Frac hit for nearby drilling operations which could drastically reduce total production.

128 IOGCC Survey of state oil and gas regulatory programs courtesy of Documented. https://documented.net/

128A State of Louisiana, Department of Energy and Natural Resources, Oilfield Site Restoration Program. https://www.dnr.louisiana.gov/index.cfm/page/155

129 State of Louisiana, Department of Energy and Natural Resources, Oilfield Site Restoration Program. https://www.dnr.louisiana.gov/index.cfm/page/155

130 Oilfield Site Restoration Commission https://www.legis.la.gov/legis/BoardMembers.aspx?boardId=459 The appointed ten members are primarily representatives from oil and gas industry advocacy organizations including: the Louisiana Oil & Gas Association, the Louisiana Mid-Continent Oil and Gas Association, and the Louisiana Landowner's Association (a group primarily representing subsurface mineral rights owners). National environmental organizations (Sierra Club, Wildlife Federation, Audubon Society and the Nature Conservancy) are allocated two nominations and sitting members.

131 Orphaned Well Prioritzation System for 2022 found on page 27 https://www.dnr.louisiana.gov/assets/OC/IIJA/InitialGrantApplicationLDNR.pdf

132 All new orphaned well counts and OSR P&A counts come from the Louisiana Performance Accountability System. https://www.doa.la.gov/doa/opb/performance/lapas/

133 Upton, Greg. Progress Report: Oilfield Site Restoration using IIJA Funds. March 31, 2023 https://www.lsu.edu/ces/publications/2023/osrprogressreport.pdf

134 https://www.doa.la.gov/doa/osr/louisiana-register/ The Louisiana Register is a monthly publication which provides access to the certified regulations and legal notices issued by the executive branch of the state government.

135 For a more in depth discussion of the types of reforms available to Louisiana and why they would prevent future orphaning, please see the author's previous report on Texas. While terminology may vary, the recommendations hold for both states. https://commissionshift.org/wp-content/uploads/2022/01/Eliminating-Orphan-Wells-and-Sites-in-Texas_CommissionShift.pdf

136 True Transition and the Ohio River Valley Institute submitted recommendations on what state regulatory reforms should qualify a state to receive these funds. https://www.regulations.gov/comment/DOI-2023-0014-0009

137 State of Louisiana Department of Natural Resources. Office of Conservation. Approved Contractors. https://www.dnr.louisiana.gov/index.cfm/page/155

138 Title 43 Natural Resources, Part XIX, Subpart1, Statewide Order No. 29. https://www.doa.la.gov/media/t3qldhn5/43v19.pdf

139 LAC 43:XIX.137.F

140 Interstate Oil and Gas Compact Commission. Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies. 2021. https://iogcc.ok.gov/sites/g/files/gmc836/f/iogcc_idle_and_orphan_wells_2021_final_web.pdf

141 A 2020 Louisiana Legislative Auditor report found that DENR had "difficulty finding licensed contractors to plug orphaned wells. Contractors are required by state law to be licensed, furnish a $1 million liability insurance policy for land projects and a $5 million liability insurance policy for water projects, and obtain a performance bond worth 100% of the amount of the bid package. According to OC, these requirements make it difficult to find contractors who meet these qualifications to plug wells. In addition, the cost to plug wells through the OSR program is significantly

greater than if operators plugged the well themselves because of these requirements. According to OC, operators estimated that the cost to plug wells through the OSR program was three to four times greater than if an operator plugged the well themselves." There was no discussion on what the costs would be if the agency brought the program "in-house" and completed the work itself. https://app.lla.state.la.us/PublicReports.nsf/0/C9D7297FEA93568D86258528006BA4F8/$FILE/0001FA2E.pdf

142 Louisiana Legislative Auditor. Progress Report: Regulation of Oil & Gas Wells and Management of Orphaned Wells. Office of Conversation - Department of Natural Resources. March 11, 2020. https://app.lla.state.la.us/PublicReports.nsf/0/C9D7297FEA93568D86258528006BA4F8/$FILE/0001FA2E.pdf

143 Adjusted for 2024 dollars https://data.bls.gov/cgi-bin/cpicalc.pl

144 Louisiana Performance Accountability System 2010-2011 https://wwwcfprd.doa.louisiana.gov/lapas/public/index.cfm?action=browse&fy=2011&dept=11&agy=432&pgm=A&obj=3&pi= 1

145 Adjusted for 2024 dollars https://data.bls.gov/cgi-bin/cpicalc.pl

146 SkyTruth https://skytruth.org/2010/08/barataria-bay-louisiana-abandoned-well/

147 Infrastructure Investment and Jobs Act [Public Law 117–58] https://wwwcfprd.doa.louisiana.gov/lapas/public/index.cfm?action=browse&fy=2011&dept=11&agy=432&pgm=A&obj=3&pi= 1

148 H.R.3684 - Infrastructure Investment and Jobs Act, 117th Congress (2021-2022) https://www.congress.gov/bill/117th-congress/house-bill/3684/text

149 In January 2024, the Louisiana Department of Natural Resources changed its name to Louisiana Department of Energy and Natural Resources. We use the previous agency name when referring to specific documents and contracts that use its previous agency name.

150 LDNR "LDNR Seeks Site Restoration Contractors to Restore Orphaned Well Sites with Federal Funds" August 11, 2022. https://www.dnr.louisiana.gov/assets/OC/IIJA/2022.08.11News.pdf

151 https://www.dynamicgrp.com/

152 https://disaster.1lemoine.com/

153 LDNR Request for Qualifications: https://www.dnr.louisiana.gov/assets/OC/IIJA/CMARPA23-002.pdf

154 Louisiana Department of Natural Resources. List of wells plugged through end of most recent quarter. Retrieved on November 9, 2023. https://www.dnr.louisiana.gov/assets/OC/IIJA/LDNR2023Q2DOIFullReportJuly2023.pdf

155 Caddo Parish followed DeSoto Parish in terms of total gas production in 2023. US SONRIS. https://sonlite.dnr.state.la.us/sundown/cart_prod/cart_con_yearprod2

156 Daniel Raimi, Alan J. Krupnick, Jhih-Shyang Shah, and Alexandra Thompson Environmental Science & Technology 2021 55 (15), 10224-10230 DOI: 10.1021/acs.est.1c02234 https://pubs.acs.org/doi/full/10.1021/acs.est.1c02234

157 Email correspondence with Patrick Courreges, Communications Director, La. Dept. of Energy and Natural Resources, 11 March, 2024.

158 Adjusted for 2024 dollars https://data.bls.gov/cgi-bin/cpicalc.pl

159 https://wwwcfprd.doa.louisiana.gov/

160 Mark Agerton & Siddhartha Narra & Brian Snyder & Gregory B. Upton, 2023. "Financial liabilities and environmental implications of unplugged wells for the Gulf of Mexico and coastal waters," Nature Energy, Nature, vol. 8(5), pages 536-547, May. https://www.nature.com/articles/s41560-023-01248-1

161 Bryd, Robert C. Cost Estimating for Offshore Oil & Gas Facility Decommissioning http://www.era-tos-thenes.com/wp-content/uploads/2016/09/Cost-Estimating-for-Offshore-Oil-Gas-Facility-Decommissioning. pdf

162 Offshore Oil and Gas Resources: Actions Needed to Better Protect Against Billions of Dollars in Federal Exposure to Decommissioning Liabilities Report to Congressional Requesters December 2015 GAO-16-40 U

163 Mark J. Kaiser & Mingming Liu (2015) Quantifying Decommissioning Risk in the Deepwater Gulf of Mexico, The Engineering Economist: A Journal Devoted to the Problems of Capital Investment, 60:1, 40-74, DOI: 10.1080/0013791X.2014.932036

164 U.S. Department of Energy Office of Fossil Energy – Office of Oil and Natural Gas. Basin Oriented Strategies for CO2 Enhanced Oil Recovery. https://www.netl.doe.gov/sites/default/files/2021-03/OffLou.pdf

165 Email correspondence with Patrick Courreges, Communications Director, La. Dept. of Energy and Natural Resources, 11 March, 2024. True Transition also submitted inquiries to the Louisiana Oil Spill Coordinator's Office, United States Army Corps of Engineers, the National Oceanic and Atmospheric Administration, and the U.S. Coast Guard regarding platforms that may constitute a navigation obstruction and derelict structures. It is unknown whether any government, federal or state, oversees, regulates or monitors structures in Louisiana state waters.

166 Agerton, Estimating Future Oilfield Site Restoration Costs and Methane Emissions from Orphaned and Idle Wells in Louisiana. With Kanchan Maiti (PI), Mark Agerton (Co-PI), Ipsita Gupta (Co-PI), and Brian Snyder (Co-PI). $3.2 million. (2023-2027)

167 Michael Trogus, Shell Exploration and Production, and Douglas Farley and Gregory Gaspard, Weatherford

168 Harestad, Magnus. Setting Off-Bottom Cement Plugs: What is your success rate? https://www.perigon.no/blog/setting-off-bottom-cement-plugs-what-is-your-success-rate#:~:text=Historically%2C%20the%20failure%20rate%20when,cement%20plugs%20is%2050%20percent

169 Louisiana Wildlife and Fisheries. Artificial Reefs. https://www.wlf.louisiana.gov/page/artificial-reefs

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At Marsh Island and Avery Island, altered hydrology and saltwater intrusion from exploration and production activities have required hydrologic restoration including closure of oil and gas canals and stabilization of spoil banks.

In addition, with thousands of miles of abandoned flow lines and puppies scattered across coastal Louisiana, state and federally funded projects spend millions of dollars locating these hazards prior to construction. For example, in 2014 the Bayou Sale Ridge Restoration project was deauthorized due to "numerous abandoned pipelines in the area that presented site access and project construction problems." With an estimated shoreline erosion rate of 13.5 per year, the cancellation of this $2 million project has meant less protection for coastal residents in those low-lying areas. At East Timbalier Island, a tangle of oil pipelines jacked up restoration costs an extra $2.2 million dollars. The "spiderweb of lines" jeopardized the restoration project protecting fragile wetlands, hundreds of oil wells in Terrebonne and Timbalier bays, and Port Fourchon--a key jumping off point for many offshore oil and gas facilities. The abandoned and unmarked lines prevent dredging, a fundamental component of restoring the island. Dredges cutting a line could cause an oil spill, like the accident at Chenier Ronquille Island, where a contractor accidentally cut a pipeline that released 5,250 gallons of crude oil while trying to restore the island. In more than three decades, the state has dedicated 84 percent of its restoration monies to remedying damages caused by oil and gas operations."

183 Email correspondence with Patrick Courreges, Communications Director, La. Dept. of Energy and Natural Resources, 11 March, 2024. " At present the CPRA does not have a direct role in the plugging of orphaned wells in either the state-funded or federal programs. When a contractor plugging wells in the Coastal Zone submits a Coastal Use Permit, one of the steps in the process is a review of the application by CPRA for consistency with the Coastal Master Plan. Essentially, CPRA has a veto on CUP applications – if their analysts find that an application doesn't fit with the Master Plan, then that application goes no further until/unless it is modified to satisfy CPRA's standards."

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188 Note that their analysis only includes well plugging costs and not associated infrastructure removal or remediation whereas the bid data from USFWS is for both P&A and remediation.

189 Public managers of oil well plugging programs are not required to accept these as self-evident givens. Indeed this flurry of funding is an opportunity to really study and assess what works and what doesn't. It might be true that a few workers is indeed best, and it might also be true that more trained workers would achieve better results.

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Well in Louisiana coastal waters.
Source: Healthy Gulf