Progress Report: Oilfield Site Restoration using IIJA Funds

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Project Overview

In November 2021, President Joe Biden signed into law the Infrastructure Investment and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law. Section 40601 of the IIJA included $4.6 billion for orphan well site plugging, remediation, and restoration. Louisiana has already received a $25 million initial grant but is slated to receive significantly more. At the time of the IIJA passage, Louisiana had approximately 4,600 "orphan" oil and gas wells.

Researchers at LSU, led by the LSU Center for Energy Studies (CES), were requested by the Louisiana Department of Energy & Natural Resources (DENR) to estimate the costs of plugging wells and compare with the methane emitted. Two progress reports have been submitted, the first in March 2023 ahead of the Louisiana Legislature's 2023 Regular Legislative Session, and another in late September 2023, coinciding with the conclusion of the initial grant.[6] This is the third progress report and is timed in conjunction with the 2024 Regular Legislative Session of the Louisiana Legislature.

Two contractors were involved in plugging and abandoning (P&A) wells and conducting site restoration: Dynamic Group, LLC, and Lemoine. Both contractors have hired subcontractors to conduct a pre-plug environmental assessment of each site, which includes an estimate of methane leaking, if any. EisnerAmper[7] is the professional services firm hired to support DENR's management of the program. Data presented in this short summary report was provided by a combination of DENR, EisnerAmper, the contractors, and environmental subcontractors. Data has been analyzed by CES and summarized. Unless specified otherwise, the data presented reflects information accessible as of approximately the end of February 2024.

Progress

Table 1 shows the status of orphan and idle wells in Louisiana. At the beginning of 2023, there were 4,610 orphan wells in Louisiana. As of the end of February 2024, approximately 770 wells had been P&Aed.[8] From January 2023 to February 2024, though, an additional 970 wells in net entered the orphan well program.[9] Thus, today there are approximately 4,800 orphan wells that have not been permanently P&Aed.[10]

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[6] Note that an extension has been granted.
[7] Formerly Postlethwaite & Netterville (P&N).
[8] This includes approximately 130 orphan wells plugged in wildlife refuge areas owned by the U.S. Fish and Wildlife Service at a cost of approximately $6 million.
[9] Wells can enter or exit the program for various reasons such as OSR abandonment, EPA abandonment, operators using a cooperative agreement to abandon wells, operators/landowners taking over wells to restore production, etc. Approximately 1,030 wells entered the program, and 60 wells exited the program.
[10] Note there is not perfect consistency over the time period, but this provides sufficient perspective.

Table 1: Orphan & Idle Well Status	
Orphan Well Counts in January 2023 (A)	4,610
Orphan Wells Plugged through February 2024 (B)	770
Net Change in Orphan Well Counts Since January 2023 (other factors) (C)	970
Current Orphan Well Count (A) + (C) - (B)	4,800
Total Idle Wells in Louisiana	18,200

Note: All numbers rounded to nearest 10 wells based on current estimates.

Table 2 shows a more detailed breakdown of well counts by the three DENR conservation districts, Monroe, Shreveport, and Lafayette. The northwest portion of the state is within the Shreveport District, the northeast within the Monroe, and everything south of approximately Rapides Parish in the Lafayette district. Note that all wells plugged with the IIJA funds have been in northern Louisiana (the Monroe and Shreveport Districts). Thus, no cost data (and very limited methane emissions data) is available in the southern part of the state.

Table 2: Orphan and Idle Well Counts by Conservation Districts.

	Monroe District	Shreveport District	Lafayette District	Total
Panel A: Plugging Activity				
P&Aed	180	356	-	536
In Progress	25	2	-	27
Panel B: Current Well Counts by Category				
Orphan	1,580	1,630	1,590	4,800
Idle	2,680	7,150	8,370	18,200
Total	4,260	8,780	9,960	23,000

Note: Numbers in Panel B rounded to nearest 10 wells based on current estimates.

As of the end of February 2024, 536 wells had been P&Aed under this program with 27 wells for which work has been done, but the P&A is not yet completed (i.e. in progress).[11] There are still approximately 3,210 orphan wells that remain to be plugged in these two districts, and an additional 1,590 wells in the Lafayette district. Statewide, we estimate there are approximately 18,200 "idle" wells in Louisiana that have not been designated as orphans. These are wells that are either designated by the operator as idle or have not produced hydrocarbons in five years, but also have not been P&Aed. Approximately 54 percent of these "idle" wells are located in the Monroe and Shreveport districts (northern Louisiana), with the residual in the Lafayette district (southern Louisiana).

Table 3 shows expenditures that have been incurred to date alongside an estimate of the cost to P&A all orphan and idle wells in the Monroe and Shreveport districts. Note that because no wells have been P&Aed in the Lafayette district, we do not present cost estimates, as costs could be systematically different in the northern and southern part of the state. Also note that all wells in the Monroe district have been P&Aed by Dynamic, and all in Shreveport by Lemoine (the two prior-mentioned contractors). Estimates are generated using a linear regression that predicts cost to P&A based on observable well characteristics. Results of this regression model alongside well characteristics for all unplugged wells are used to estimate the cost to P&A unplugged orphan and idle wells. To date, the total amount spent on the program associated with the 536 wells with reported cost data is $22.5

[11] Only plugging activity using IIJA funds under DENR ownership are included in these counts. Site inspection and some preconstruction activities are completed for in-progress wells.

million, implying costs of approximately $42,000 per well.[12] Although not shown in the table, the average cost of a well in the Monroe district is approximately $54,500 per well and the average cost in the Shreveport district approximately $35,800 per well.

We estimate the cost to plug all *orphan* wells in the Shreveport and Monroe districts is approximately $196.7 million. The estimated cost to plug all *idle* wells is $658.4 million, with a total estimated cost to plug all orphan and idle wells as $855.1 million. Please note that these cost estimates continue to change as more wells are plugged and more data becomes available.

Table 3: Estimating P&A Costs

	Total Cost (million $)					
	Costs Incurred			Predicted Future Costs		
	Monroe	Shreveport	Total	Monroe	Shreveport	Total
Orphan						
P&Aed	$ 9.8	$ 12.7	$ 22.5			
In Progress	$ 0.1	$ -	$ 0.1	$ 1.2	$ 0.1	$ 1.3
Not P&Aed				$ 100.6	$ 72.3	$ 172.9
Total (A)	$ 9.9	$ 12.7	$ 22.7	$ 111.6	$ 85.1	$ 196.7
Estimated Cost to P&A All Idle Wells (B)				$ 171.8	$ 486.6	$ 658.4
Orphans and Idle (A + B)				$ 283.4	$ 571.7	$ 855.1

Note: Costs as of the end of January 2024.

Table 4 summarizes methane emissions measurements. The first set of measurements were made by environmental contractors using a two-step process. For each measured well, the contractors performed an initial survey of the site using an optical gas imaging (OGI) camera to identify specific leaks. Then, they measured the concentration of methane at identified leaks using a SEMTECH HI-FLOW device. The second set of measurements was conducted by researchers at LSU using a more sensitive chamber method. For each measurement, the researchers enclosed the wellhead within an acrylic chamber and then recorded how the concentration of methane in the chamber changed over time using either a Cavity Ringdown Spectroscopy CH_4 analyzer for low concentrations or Bascom-Turner Gas Rover for high concentrations. Finally, they calculated emission rates from the concentration data. LSU researchers also collected gas samples at discrete time intervals from the chamber and analyzed them in the laboratory. Note that LSU researchers measured some wells on multiple dates. A simple average of the two measurements was taken and used to compile the summary statistics in Table 3.

To date, environmental contractors have conducted a methane measurement on 853 wells and have detected methane emissions from 194 of these wells. Assuming the leak rates are relatively constant over the course of the day of measurement, this sums to 28.5 thousand standard cubic feet (mscf) of leaked gas per day. For perspective, using these measurements, the combined leaks from all wells measured are equivalent to approximately the energy content of 246 gallons of gasoline per day. Although not shown here, over 50 percent of the methane leakages detected come from just ten of the 853 wells measured. Thus, there are many wells with very small leaks, but a handful of wells with much larger leaks.

[12] These costs are based on Construction Management at Risk (CMAR) contractor submitted costs. These costs are subject to change as reports (PayApps) from contractors are finalized. These costs include CMAR General Conditions costs spread across completed wells. Costs do not include other costs such as EisnerAmper, LSU, and internal DENR costs.

Next, Table 3 shows the measurements taken by researchers at LSU. To date, 78 wells have been measured, with methane being detected in 68 (or 87%) of the wells measured. Thus, the more detailed chamber-based measurements are finding a higher share of wells with leaks. From these 68 wells with detected emissions, a total of 5.09 mscf/day of methane is detected, or approximately 0.07 mscf/day per well. Thus, the average emissions are higher from the wells measured by LSU. We caution against drawing firm conclusions from comparisons between the contractor and LSU measurements at this point because the measurements largely come from different wells. However, we do note that the LSU measurements find a larger proportion of leakers and larger leaks (on average) relative to the contractors. The LSU team is actively engaged in research to estimate aggregate emissions from all Louisiana orphan wells utilizing both contractor and LSU measurements.

Table 3: Methane Measurement

	Contractors	LSU
Wells Measured	853	78
Methane Detected	194	68
Share with Methane Detected	23%	87%
Methane Detected (mscf/day)		
Total Methane	28.5	5.09
Average Methane per Well	0.03	0.07

Note: Methane measurements as of approximately the end of February 2024.

About the LSU Center for Energy Studies

The Louisiana State University Center for Energy Studies (LSU-CES) was created by the Louisiana Legislature in 1982 with the stated mission of conducting, encouraging, and facilitating research and analysis to address energy-related problems or issues affecting Louisiana's economy, environment, and citizenry. The Center's goal is to provide a balanced, objective, and timely treatment of issues with potentially important consequences for Louisiana. More information on LSU-CES can be found on our webpage here.

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