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Institute**

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

ILLINOIS STATE GEOLOGICAL SURVEY
ENERGY & MINERALS | SUBSURFACE ENERGY RESOURCES

Mitigating Emissions from Marginal Conventional Wells in Illinois

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Head – Subsurface Energy Resources Section**

**Illinois Oil and Gas Association
Annual Convention and Trade Show
March 5, 2024**



Outline

- What is this project?
- How did this project come to be?
- Background – Methane emissions from marginal wells
- How is this project organized?
- How will the prioritization method be developed?
- What can we learn about the basin?
- What is the purpose of the website?
- What are community benefits?
- How do I participate?



What is this project?

US Dept of Energy / EPA – Mitigating Emissions from Marginal (<15 BOPD) Conventional Wells

INFLATION REDUCTION ACT SECTION 60113

- **This Administrative and Legal Requirements Document (ALRD) makes \$350 million available for financial assistance in the form of non-competitive grants to States via a formula.**
- Financial assistance to operators/well owners to
 - **voluntarily and permanently plug and abandon MCWs** (including elements of environmental restoration required to comply with applicable State or Federal plugging and abandonment standards and regulations)
 - monitor methane emissions from MCWs to **verify that plugged wells are no longer emitting methane**



US Dept of Interior – Orphaned Wells Program

BIPARTISAN INFRASTRUCTURE LAW SECTION 40601

- Orphaned Well Site Plugging, Remediation, And Restoration Program
 - Initial Grants (2022): Either \$5 million or \$25 million to each qualifying State that applies before May 14, 2022. Funding unobligated after 1 year must be returned.
 - Formula Grants (2024): \$2 billion in total funding available to States that submitted a Notice of Intent to the Department of the Interior by December 30, 2021. The amount each State is eligible for under this program is determined by formula. Funding unobligated after 5 years must be returned.
 - Performance Grants (future): \$1.5 billion in discretionary grants to States that increase their own spending on well plugging, remediation, and reclamation, or improve the regulation of oil and gas wells within the State.



What is this project?

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Awardees

The following state agencies received conditional funding commitments based on a participating state's proportion of the total number of low-producing conventional wells in participating states on nonfederal lands:

- Texas Commission on Environmental Quality: \$134,151,343
- Pennsylvania Department of Environmental Protection: \$44,457,220
- West Virginia Department of Environmental Protection: \$37,791,464
- California State Lands Commission: \$21,913,688
- Ohio Department of Natural Resources: \$19,941,597
- **Illinois Department of Natural Resources: \$17,367,009**
- Louisiana Department of Natural Resources: \$15,661,335
- New Mexico Department of Energy, Minerals, and Natural Resources: \$14,656,151
- Kentucky Energy and Environment Cabinet: \$12,912,198
- Colorado Department of Natural Resources: \$12,608,270
- New York State Department of Environmental Conservation: \$8,123,602
- Michigan Department of Environment, Great Lakes, and Energy: \$5,022,306
- State of Utah Department of Environmental Quality: \$2,750,115
- State of Virginia Department of Energy: \$2,643,702



How did this project come to be?

- Summer 2023: ISGS and IDNR met to discuss data sharing to improve orphaned well database
- August 2023: DOE released ALRD, ISGS shared opportunity with IDNR
- September 2023: ISGS and IDNR collaborated on application following DOE's provided Statement of Project Objectives
- October 2023: IDNR submitted application
- December 2023: DOE announced awards, increased Illinois' award amount, and issued conditional grant to IDNR (pending final budgets, etc.)
- March 2024: DOE negotiating with IDNR and ISGS to finalize grant

APPENDIX B – FEDERAL GOVERNMENT GENERATED STATEMENT OF PROJECT OBJECTIVES (SOPO)

STATEMENT OF PROJECT OBJECTIVES

Methane Emissions Reduction Program for Marginal Conventional Wells - *[Insert State]*

A. Objectives

The objective of this project is to mitigate methane emissions from marginal conventional wells (MCWs) by assisting operators/well owners to voluntarily and permanently plug and abandon MCWs on non-Federal lands and measure methane emissions from MCWs both pre- and post-plugging operations. This project may also support elements of environmental restoration required for full compliance with applicable State or Federal well plugging and abandonment standards and regulations. The project is expected to result in methane and other greenhouse gas emission reductions and provide environmental benefits through the restoration of MCW pads. These activities are expected to mitigate legacy air pollution from MCWs in low-income and disadvantaged communities and provide potential benefits to such communities, including improved ambient air quality, surface and groundwater quality, climate resilience, and human health as well as creation of high-quality jobs.

B. Scope of Project

The project will develop a process and methodology to identify and prioritize MCWs for permanent plugging and abandonment, monitor (via discrete measurements) methane emissions from MCWs, and support elements of environmental restoration required for full compliance with applicable State or Federal well plugging and abandonment standards and regulations. Monitoring can include detection and measurement of methane emissions used to provide a preliminary screening of emissions from MCWs as a mechanism to inform plugging prioritization. Monitoring must include measurement of methane emissions (in accordance with the DOE methane measurement guidelines for MCWs) prior to and following the plugging and abandonment of any MCW, quantification of the methane emissions mitigated for plugged wells, and verification that plugged wells are no longer emitting methane emissions as required for full compliance with applicable State or Federal well plugging and abandonment standards and regulations. Stakeholder engagement and outreach are key to this project, and it is anticipated that the outcomes of the project will result in substantial benefits with specific impact on disadvantaged communities.



FINAL PROJECT REPORT

US DOE NETL Award Number DE-FE0031702

Quantification of Methane Emissions from Marginal (Low Production Rate)
Oil and Natural Gas Wells



<https://netl.doe.gov/node/9373>

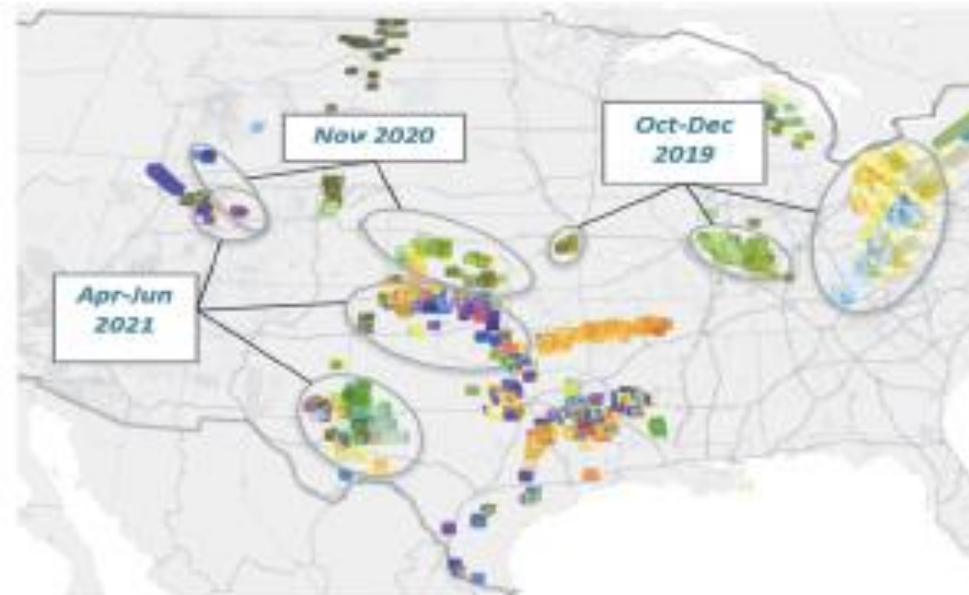
Issued: 28 April 2022

Prepared for: U.S. Department of Energy
National Energy Technology Laboratory

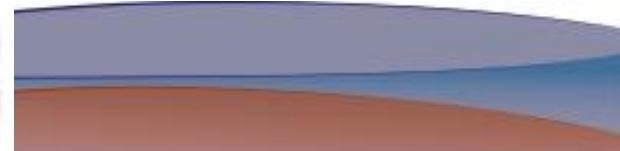


Background

- Previous project funded by US DOE with supplemental funding from IOGA, among other contributors
- 589 oil and gas production sites were studied across US
- No emissions were detected at ~55% of natural gas production sites and ~60% of oil production sites
- Separators, wellheads, and tanks were the largest source of emissions



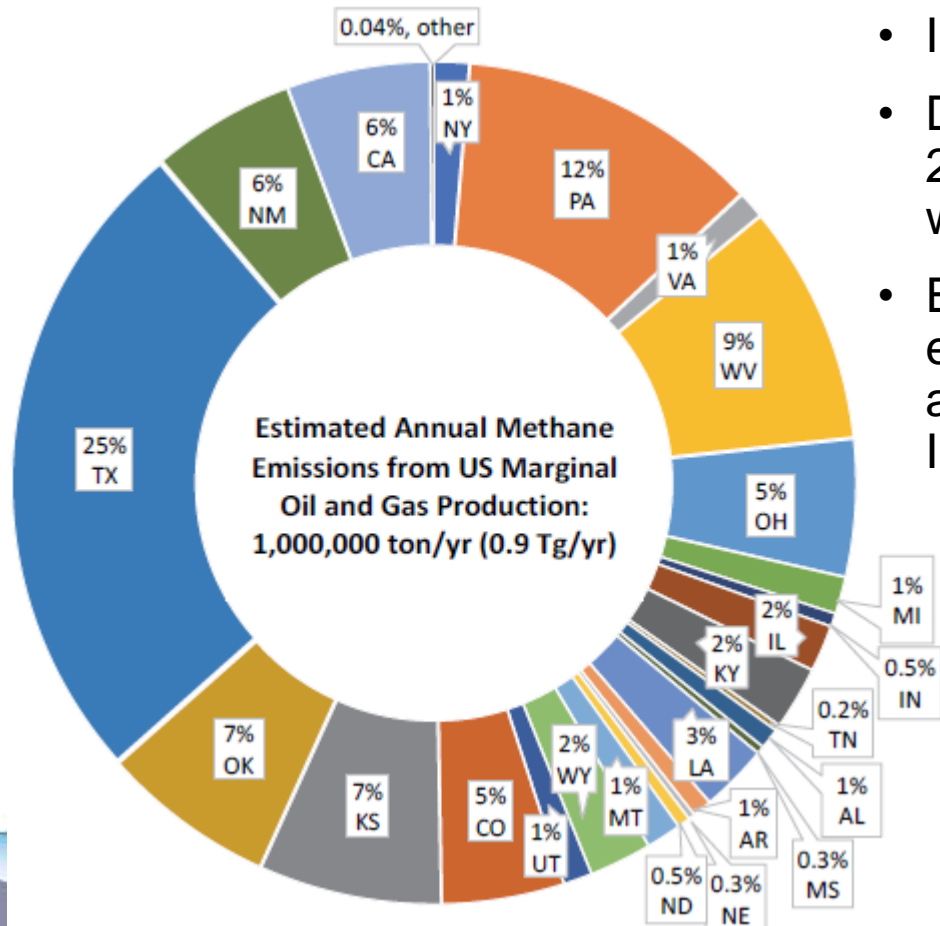
NOTE:
Our project will focus on taking measurements at the wellhead and collecting a gas sample





Illinois in context

- Marginal oil and gas production in the US ~1 million ($\pm 140,000$) ton/yr of “every day” methane emissions



- IL = 20,000 ton/yr
- DOE estimates 22,522 marginal wells
- Expectation: emissions for average well in Illinois is <1 ton/yr

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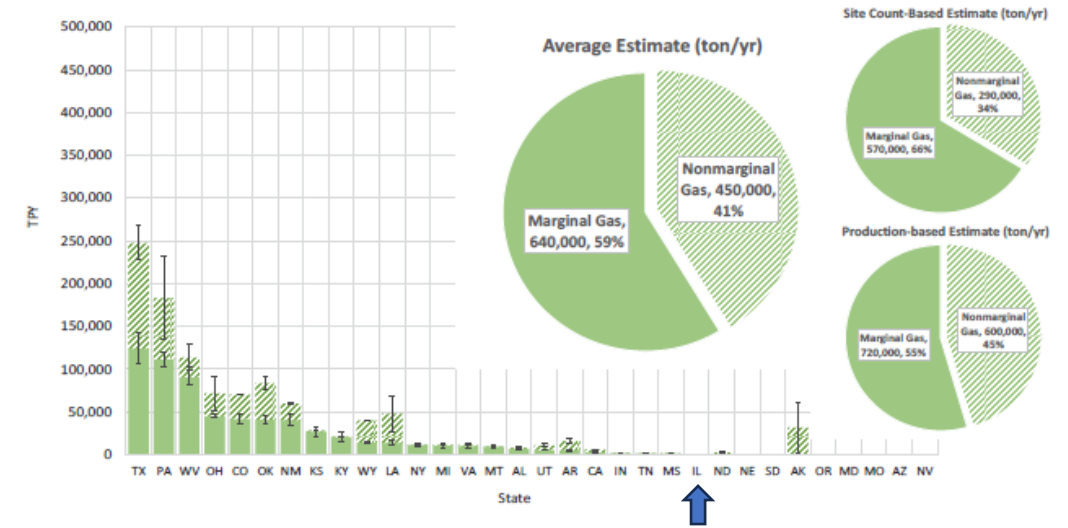


Figure 11. Estimated overall methane emissions from marginal and nonmarginal gas production.

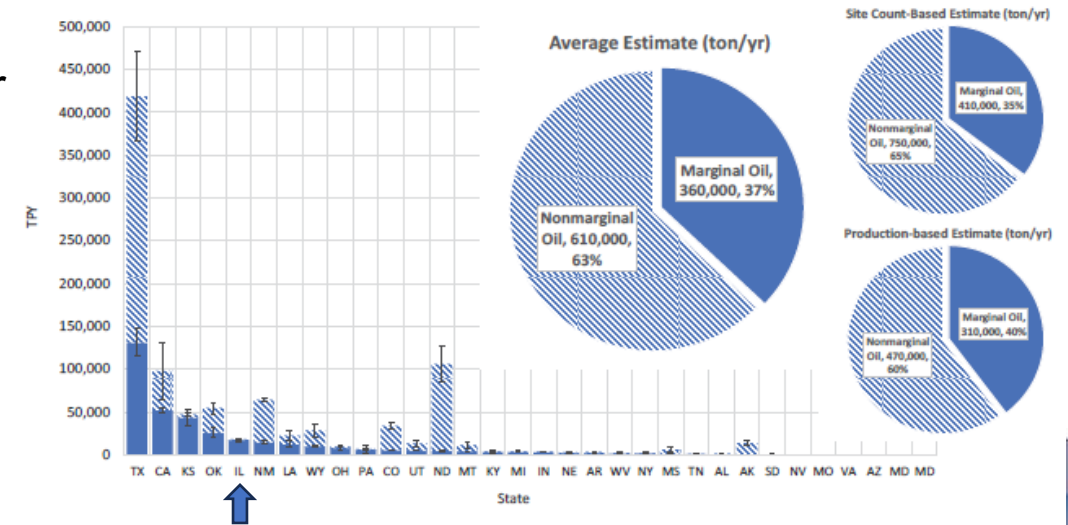
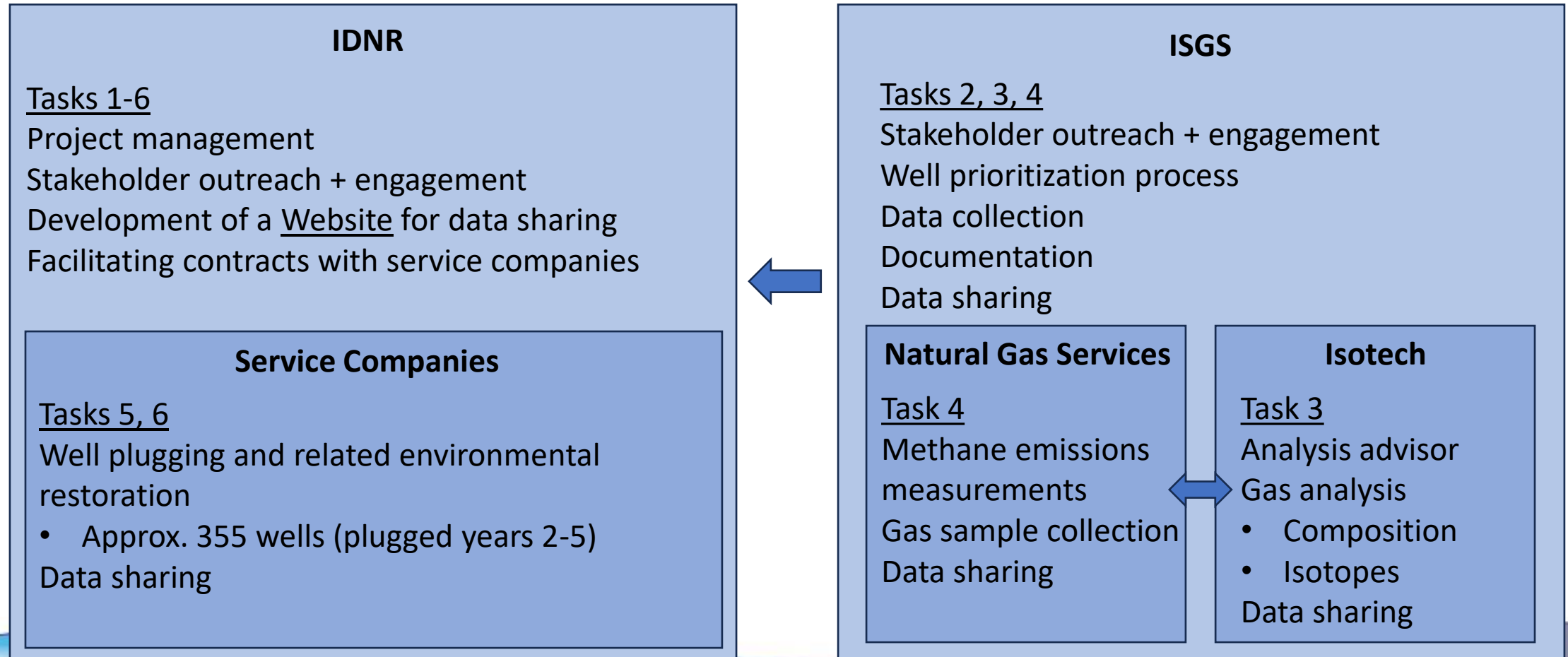


Figure 12. Estimated overall methane emissions from marginal and nonmarginal oil production.



How is this project organized? (5-year project; \$17.4M; 6 project tasks)





Task 1 – Project Management and Planning

**Task 2
Stakeholder Engagement and Community Benefits**

- Community engagement meetings
 - MCWs volunteered for plugging
- Website development
- Data sharing
 - Process information
 - Methane emissions

**Task 3
Prioritization of MCWs**

- Screening Criteria**
- **Geologic setting:** Depth, geologic formation, OOIP, cumulative field / lease production, HCP-ft, well age, reservoir drive.
 - **Development:** well density, waterflood, operator.
 - **Well:** Well age, surface pressure, gas head volume, gas rate, oil rate average past 3 yrs. (before TA), TA status duration.

- Screening Data Sources**
- Operators
 - Existing ISGS data / publications
 - Targeted data collection from diverse geologic settings in Illinois

- Prioritization criteria**
- Hypothesis: Methane emissions governed by:
- Equipment/operations
 - Well age (casing/cement bond issues)
 - Surface equipment on location
 - Well production rate
 - Geologic setting
 - Well completion interval
 - Thermal/burial history
 - Infiltration of drift gas
 - Proximity to basement faults

- Develop Prioritization**
- Prioritization criteria
 - Risk of methane emissions to communities
 - Risk of contamination of sensitive aquifers or wetlands

Share data on website

**Task 4
Measuring Methane Emissions**

- Measure emissions at MCWs**
- Detect (solid state detector)
 - Quantify (rate; Hi-Flow Sampler)
 - Collect sample (Isobags)
 - Characterize
 - Composition (to determine methane concentration)
 - Isotopes (to differentiate thermogenic vs. biogenic origin)

- Data analysis outcomes**
- Improved understanding of:
- Variation in gas composition / origin and relationship to geology
 - Emissions based on geologic setting
 - Composition relative to completion interval
 - Spatial variations

Share data on website

**Task 5
Plugging MCWs**

- Plug MCWs

**Task 6
Well Abandonment and Environmental Restoration**

- Restore MCW well pads

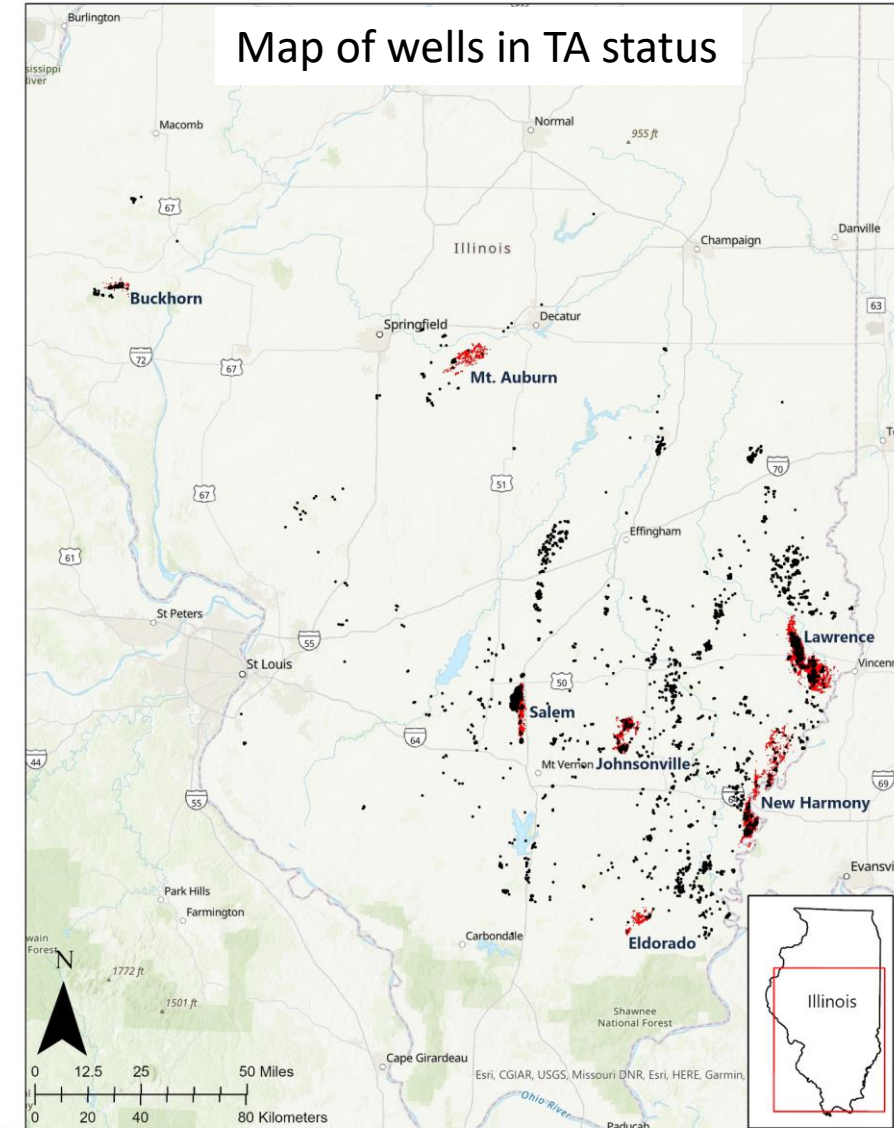
Share plugging and restoration data on website

revise prioritization methodology



How will the prioritization method be developed?

- Year 1: Collect data from 25 wells to establish baseline
- Sample selectively for wells that represent a range of well ages, formations, traps, reservoir drives, proximity to hydrocarbon kitchen



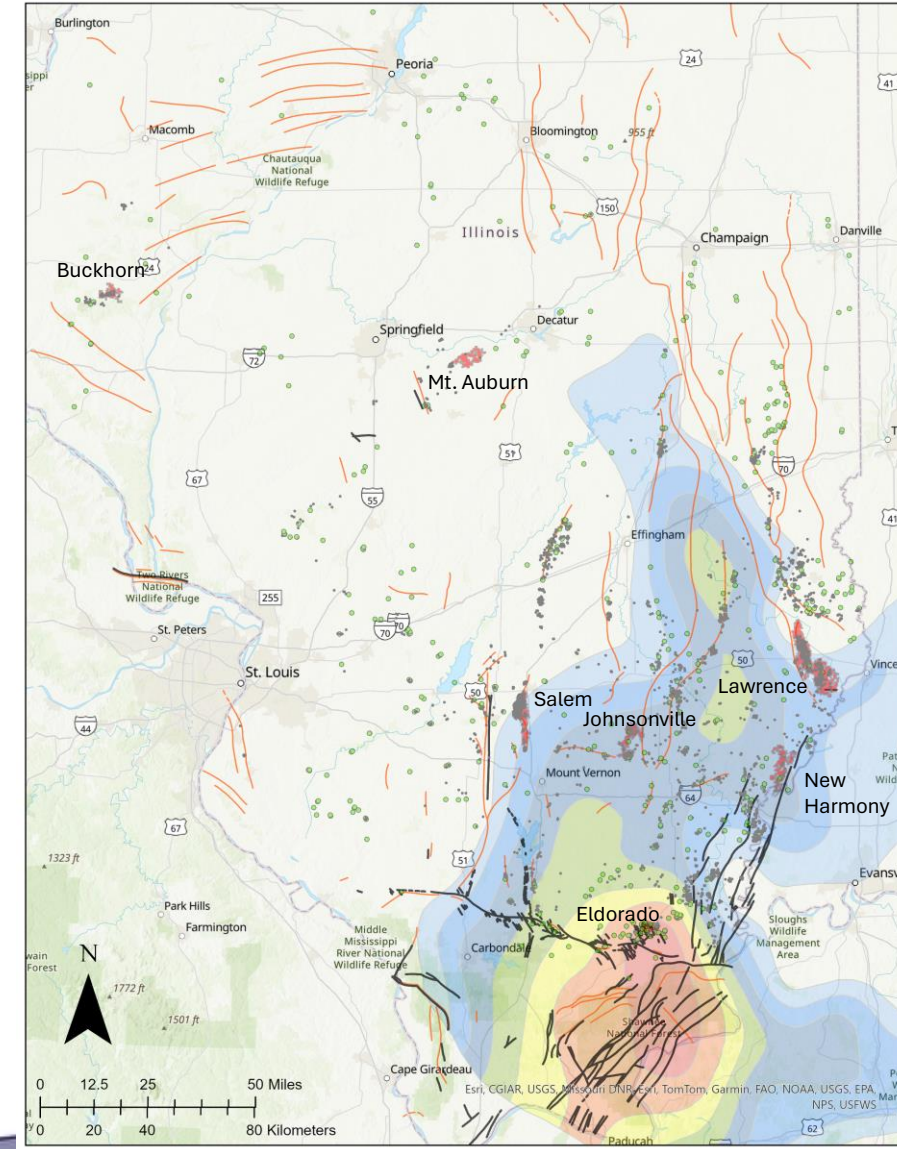
Oilfield Name	Screening criteria					
	Operational factors		Geological factors			
	Well Depth (ft)	Well Age (yr)	Geologic formation	Trap type	Reservoir Drive	Proximity to HC kitchen
Buckhorn	600	40	Silurian-Ordovician	Stratigraphic	Solution gas, Bottom water	Not
Eldorado	2500	70	Mississippian	Structural	Solution gas	High
Johnsonville	3000, 4000	75, 50	Mississippian	Structural	Solution gas, Bottom water	Medium
Lawrence	1000-2000	75-40	Pennsylvanian-Mississippian	Structural	Solution gas, Bottom water	Low
Mt. Auburn	1900	40	Silurian	Stratigraphic	Solution gas	Not
New Harmony	2800-3900	80-40	Mississippian-Devonian	Fault	Solution gas, Bottom water	Medium
Salem	1900, 3500	85	Mississippian-Devonian	Structural	Solution gas	Low



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What can we learn about the basin?

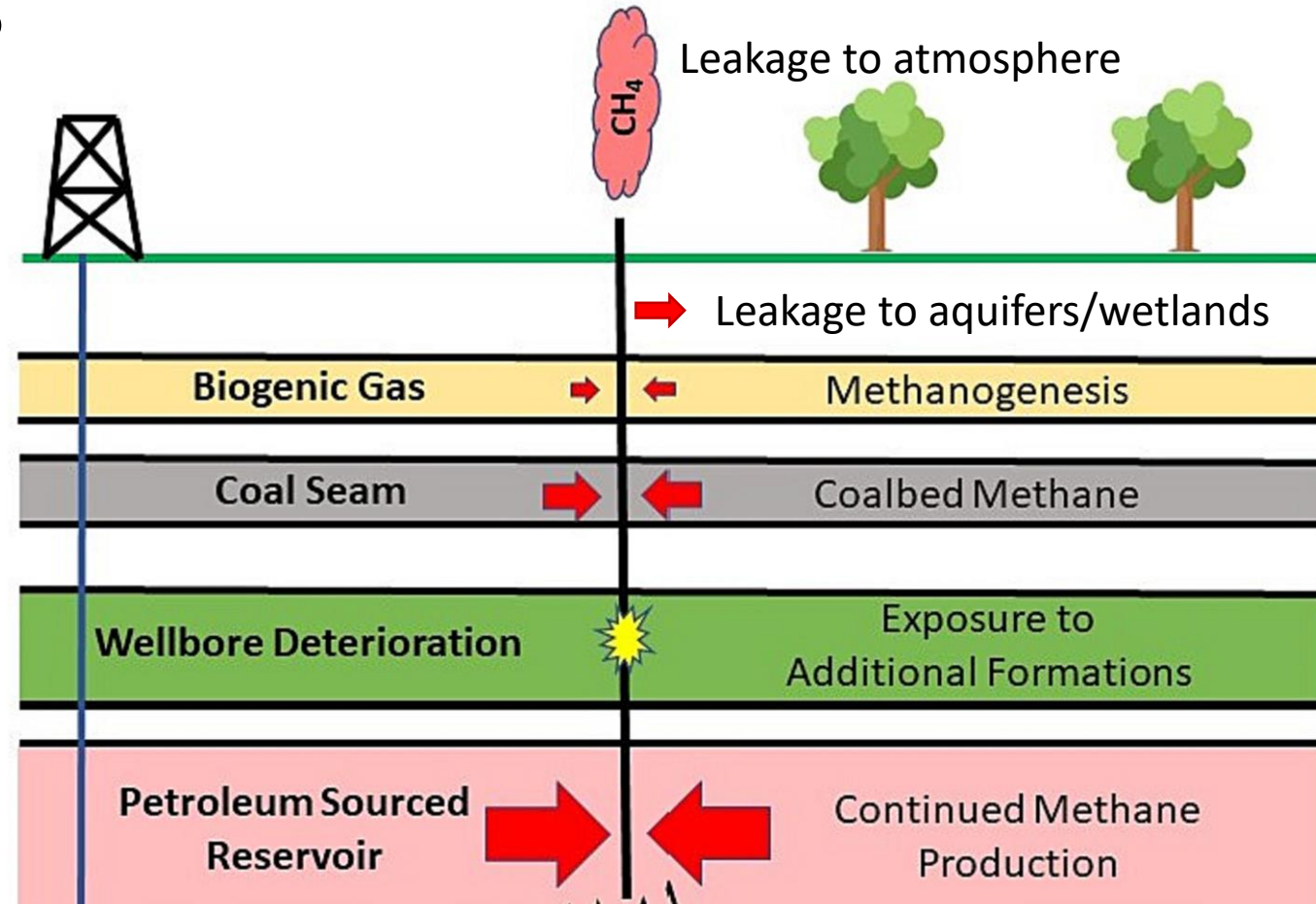
- Wells represent pathways to the surface for methane from multiple sources
 - Gas composition and isotopic analysis allow us to differentiate these sources
- Does IL natural gas have resource potential (other than methane)?
 - Modern, high-precision analysis may allow us to discover the presence of constituents (H, He) that were previously assumed absent

Geochemistry, Geophysics,
Geosystems*

Research Article | [Free Access](#)

Natural H₂ in Kansas: Deep or shallow origin?

J. Guélard ✉, V. Beaumont, V. Rouchon, F. Guyot, D. Pillot, D. Jézéquel, M. Ader, K. D. Newell, E. Deville



Modified from Gianoutsos et al., 2024



What is the purpose of the website?

- Share data about each project task (updated monthly)
- Part of required reporting for use of IRA funds
 - Similar to IJA/BIL reporting required for plugging of orphaned wells



IJA Plugged Wells to Date

IJA Illinois Federal Projects

Plugged wells

Search

[Export To CSV](#)

Filters

COUNTY NAME

STATUS

All

All

[Filter Table](#)

[Clear Filters](#)

REF #	API #	OPER #	WELL NAME	LOCATION	SEC	TWN SHP	TYPE	STATUS	COUNTY NAME	
121572	1200100044	1,260.00	BARKER #1/PRFIJA-23-032-Z-01	0330S 0330W NEc SE NE	36	03S	O	WSR	ADAMS	
121615	1200100049	1,260.00	OMER MOWEN FARM #1/PRFIJA-23-032-Z-01	0330S 0330W NEc NW	36	03S	O	WSR	ADAMS	
121600	1200100050	1,260.00	MANARD #1/PRFIJA-23-032-Z-01	0330N 0330W SEc NW NE	25	03S	O	WSR	ADAMS	



What is the purpose of the website?

Share data about each project task (updated monthly)

Community Benefits

- Engagement with community partners (e.g., local governments, labor unions, and community-based organizations that support or work with underserved communities)
- Creation of high-quality jobs, including workers from underserved populations
- Advancement of diversity, equity, inclusion, and accessibility (DEIA)
- Contributions to the Justice40 Initiative

Prioritization of MCWs

- Process and status of identifying and prioritizing MCWs to be permanently plugged

Measuring Methane Emissions at MCWs

- Well locations
- Estimated annual reduction of methane emissions from each plugged well
- Total estimated annual reduction of methane emissions from all plugged wells



What is the purpose of the website?

Share data about each project task (updated monthly)

Plugging MCWs on Non-Federal Land

- Operator/well owner
- Well type (e.g., oil, gas)
- Production rate prior to plugging
- Total cost of well plugging
- Whether the plugged well is in a DAC
- Aggregate data, including totals of the above.

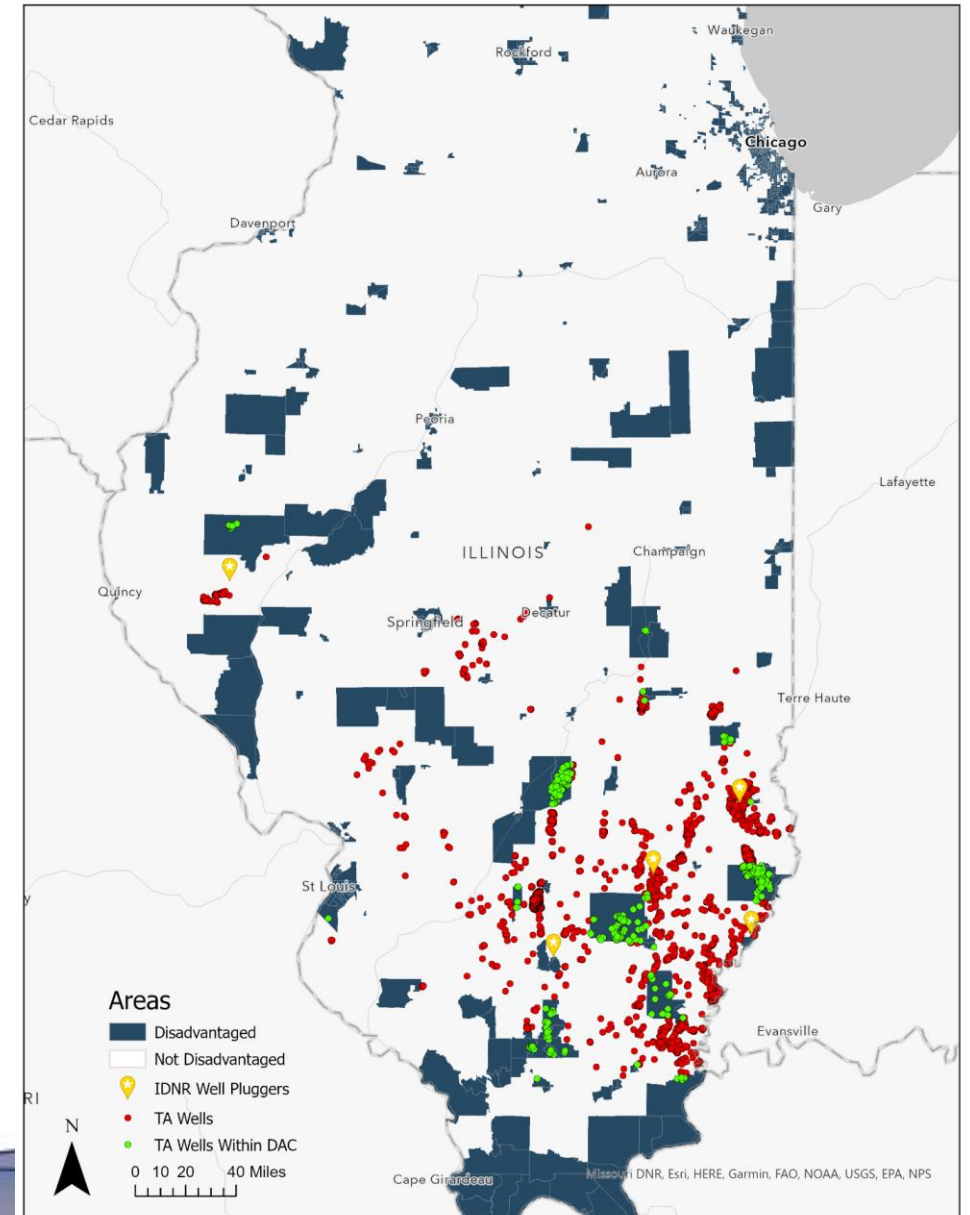
Well Abandonment and Environmental Restoration of Well Pads

- Environmental restoration activities performed at each well pad
- Acreage of reclaimed and restored land
- Cost of environmental restoration activities
- Aggregate data, including totals of the above



What are community benefits?

- New component of all federally funded projects
- Prevailing wage requirement for all laborers and mechanics employed in the performance of well plugging
- Emissions reductions, environmental restoration, and quality jobs to positively impact underserved and disadvantaged communities
 - Visit screeningtool.geoplatform.gov for maps and definitions





How do I participate?

- You are participating now by being part of the conversation!
 - Participation \neq having your well plugged
 - We estimate funding may plug up to 355 wells (for reference, this is ~10% of wells currently in TA status)
 - The purpose of this presentation today is to **solicit input and share process information**
- **To have wells plugged, you must volunteer!**
- ISGS developing an application form
 - Information to provide (required for website):
 - Operator/well owner
 - Well location
 - Well type (e.g., oil, gas)
 - Well completion (e.g., perf intervals)
 - Well history (e.g., primary production, waterflooding)
 - Production rate prior to plugging
- Well plugging is not expected to begin until 2025



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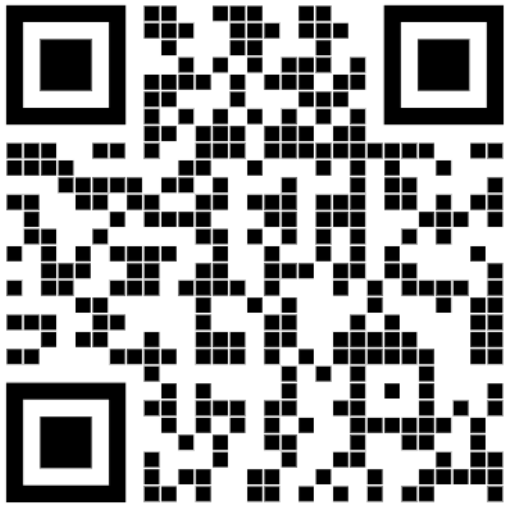
<https://publish.illinois.edu/methane-wells-project/>

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Marginal Conventional Wells

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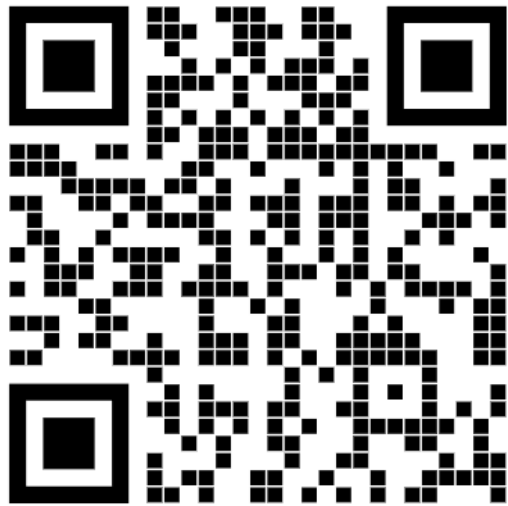
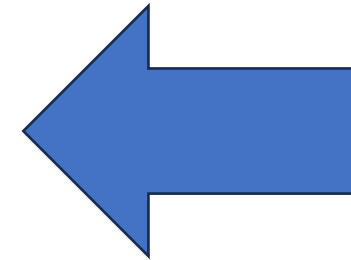


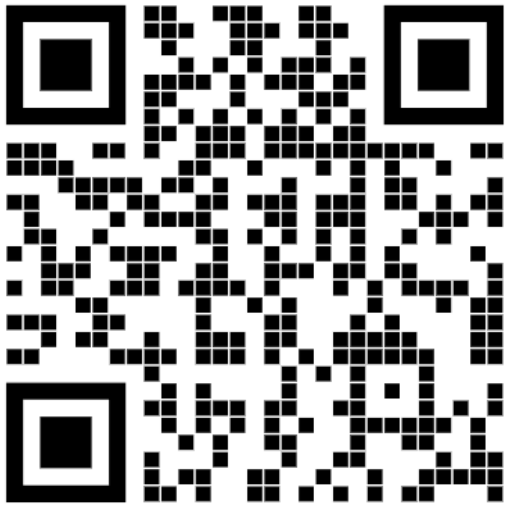
Home

Project Documents

Volunteer Your Well

Mitigating
Emissions from Marginal
Conventional Wells
in Illinois





This program will incorporate wells that are volunteered by their owners to be measured as part of our study. If you'd like to volunteer your well to be included in the study, please fill out this form:

[Authorization for the ISGS to Sample Gas for Regional Illinois Basin Study](#)

Plugging Your Well – Gauging Interest

If you might be interested in having your well(s) plugged at the end of this study, please fill out this form:

[Potential Interest in Volunteering Well\(s\) to be Plugged](#)

Company Approval

Note: Eventually, we may also collect forms for submitting company approval for volunteering marginal conventional wells to be plugged, but submissions for this will open later in 2024.