

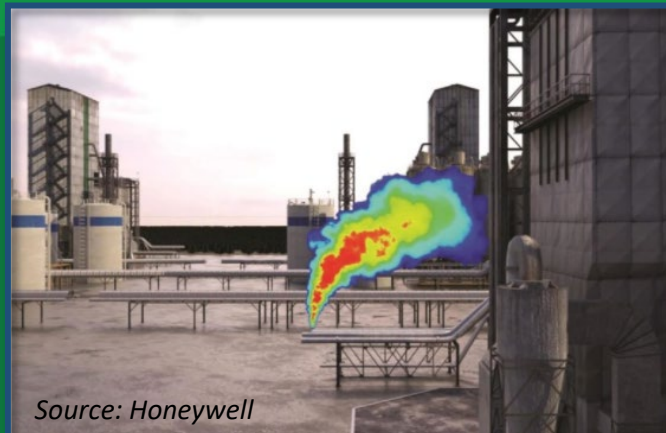


U.S. DEPARTMENT OF
ENERGY

Fossil Energy and
Carbon Management

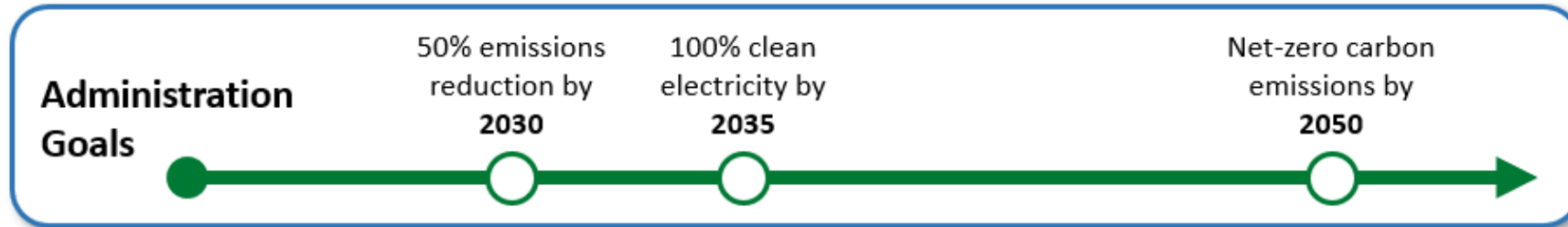
Methane Mitigation Technology Program Overview

Annual Meeting
Tim Reinhardt
April 3, 2024



Program Mission

Administration's Goals



Accelerate the development and deployment of ***technology solutions*** to increase the efficiency, reliability, resiliency, and ***elimination of methane emissions*** across the oil and natural gas infrastructure—from oil and natural gas production, through processing, transportation, and storage, to end-use utilization.



Dynamic Factors Shape R&D Portfolio

Administration's Goals



Administration Goals

50% emissions reduction by 2030

100% clean electricity by 2035

Net-zero carbon emissions by 2050



Shifting Priorities of Industry Research Partners



International Considerations



Rapidly Changing Technology



National Laboratory and Academic Research Partners Capabilities



Methane Mitigation Technologies Division

Methane Emissions Mitigation

Advanced materials, data management tools, inspection and repair technologies, and dynamic compressor R&D for eliminating fugitive methane emissions across the natural gas value chain

Methane Emissions Quantification

Direct and remote measurement sensor technologies and collection of data, research, and analytics that quantify methane emissions from point sources along the upstream and midstream portion of the natural gas value chain

Natural Gas Decarbonization and Hydrogen Technologies

Technologies for clean hydrogen production, safe and efficient distribution, and geologic storage technologies supported by analytical tools and models

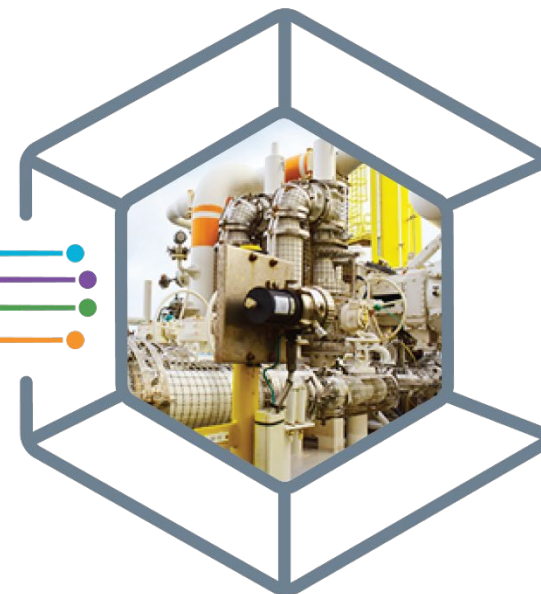
Undocumented Orphaned Wells Research

Developing tools, technologies, and processes to efficiently identify and characterize undocumented orphaned wells in order to prioritize them for plugging and abandonment.



Methane Emissions Reduction Program (MERP)

Under the IRA, MERP will help oil and natural gas sector operators cut methane emissions and transition to innovative methane emissions reduction technologies.

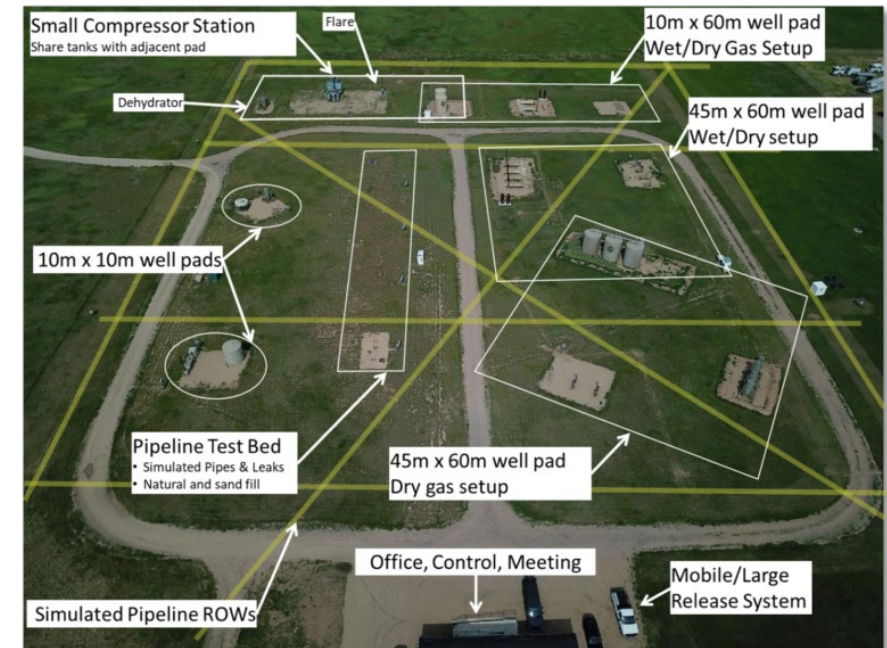




Methane Emissions Quantification Research

Developing and validating the performance of new technologies that are intended to more accurately and precisely measure emissions occurring across the natural gas supply chain.

- Develop innovative methane sensor technologies (e.g. fiberoptic, electrochemical) to enable low-cost, accurate, continuous CH₄ monitoring and risk assessment
- Validate the performance of existing and new technologies that are intended to more accurately and precisely measure emissions occurring within the natural gas supply chain (METEC)
- Improve and accelerate adoption of **methane emission detection and measurement technology on a wide scale** by supporting large-scale field demonstrations (CH₄ Sensor Networks example and Integrated Methane Monitoring Platforms)
- Engaging in field efforts to **characterize emissions** from a variety of sources related to natural gas production, transport, and storage to better inform industry and regulators:
 - Basin-scale Assessments
 - Orphaned wells
 - Marginal wells
 - Gathering pipelines
 - Compressor stations
 - Tanks



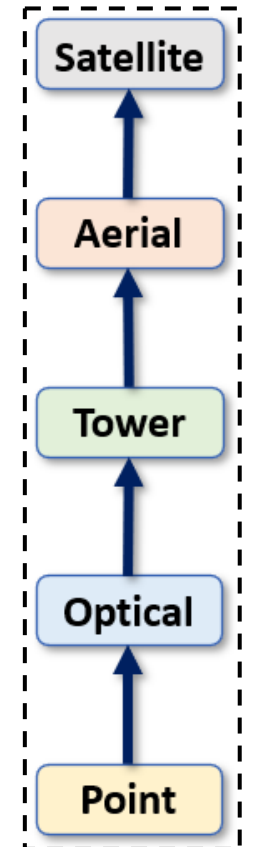
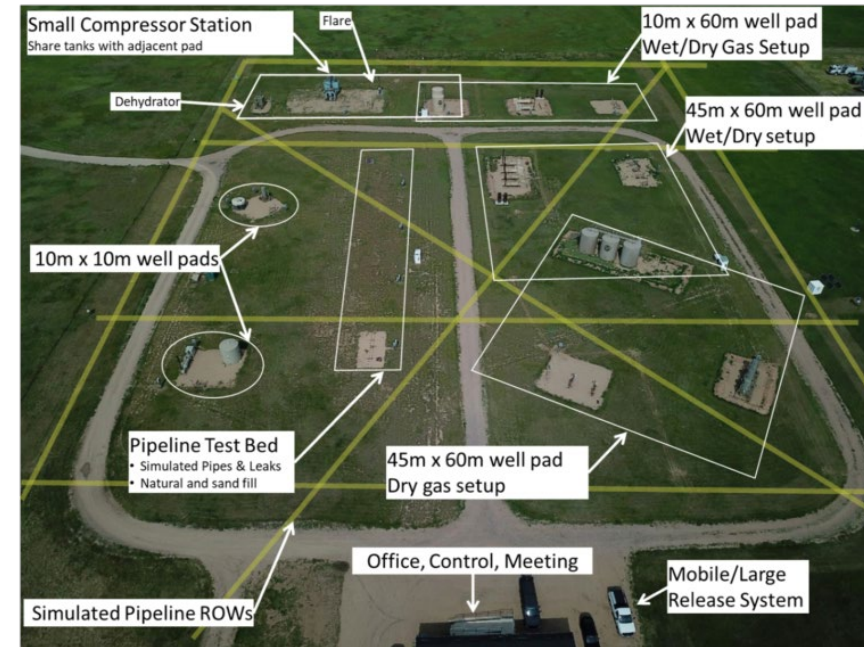
METEC - Advancing Development of Emissions Detection

Comprehensive process of protocol development and testing to accelerate the adoption of natural gas leak detection and quantification (LDAQ) solutions by natural gas operators, and their approval by cognizant regulatory authorities.

- Develop test protocols for LDAQ methods through controlled testing performed at CSU's Methane Emissions Technology Evaluation Center
- Comprehensive field testing of LDAQ solutions on a variety of oil and natural gas emulated facilities (e.g. equipment); and
- Demonstrate methods to evaluate the control efficacy of LDAQ solutions using simulation software developed in parallel projects.



Colorado State University Methane Emissions Technology Evaluation Center



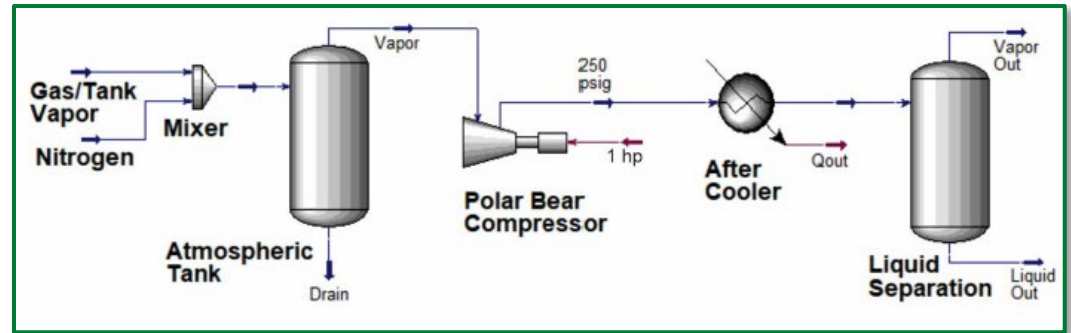
Methane Mitigation Research



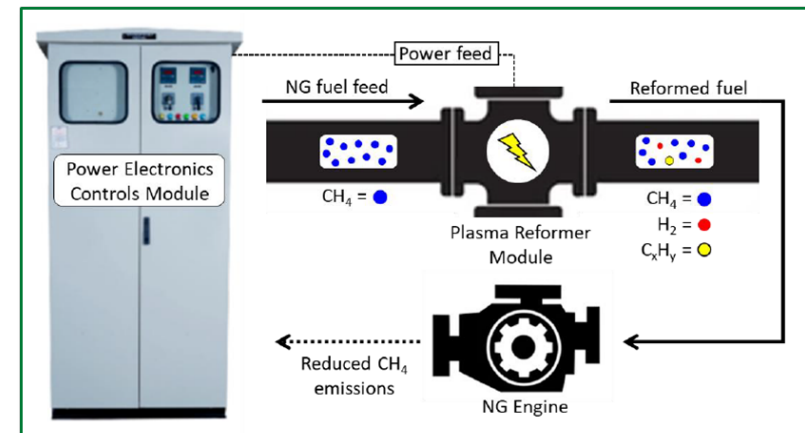
Develop and validate cost-effective and state-of-the-art tools, technologies and materials to mitigate methane emissions and improve the resiliency and efficiency of natural gas transportation and storage infrastructure.

- Development and validation of retrofit technologies for compressors and natural gas fired engines.
- Developing advanced sensors, equipment, and materials for improved resiliency of the natural gas supply chain.
 - Real-time monitoring and risk assessment
 - Pipeline coatings
 - Improved components
- Supporting State's in reducing methane emissions from Marginal Conventional Wells (MCWs) throughout the US.

Polar Bear, Innovative Capture of Storage Tank Vapors



Engine Fuel Reformer



Natural Gas Decarbonization and Hydrogen Technologies (NGDHT)



Supporting the transition towards a clean hydrogen-enabled economy

Focused on finding technology-based solutions to reduce associated natural gas flaring and to convert a potentially wasted resource into beneficial products with high economic value.

Production, Conversion, and Utilization

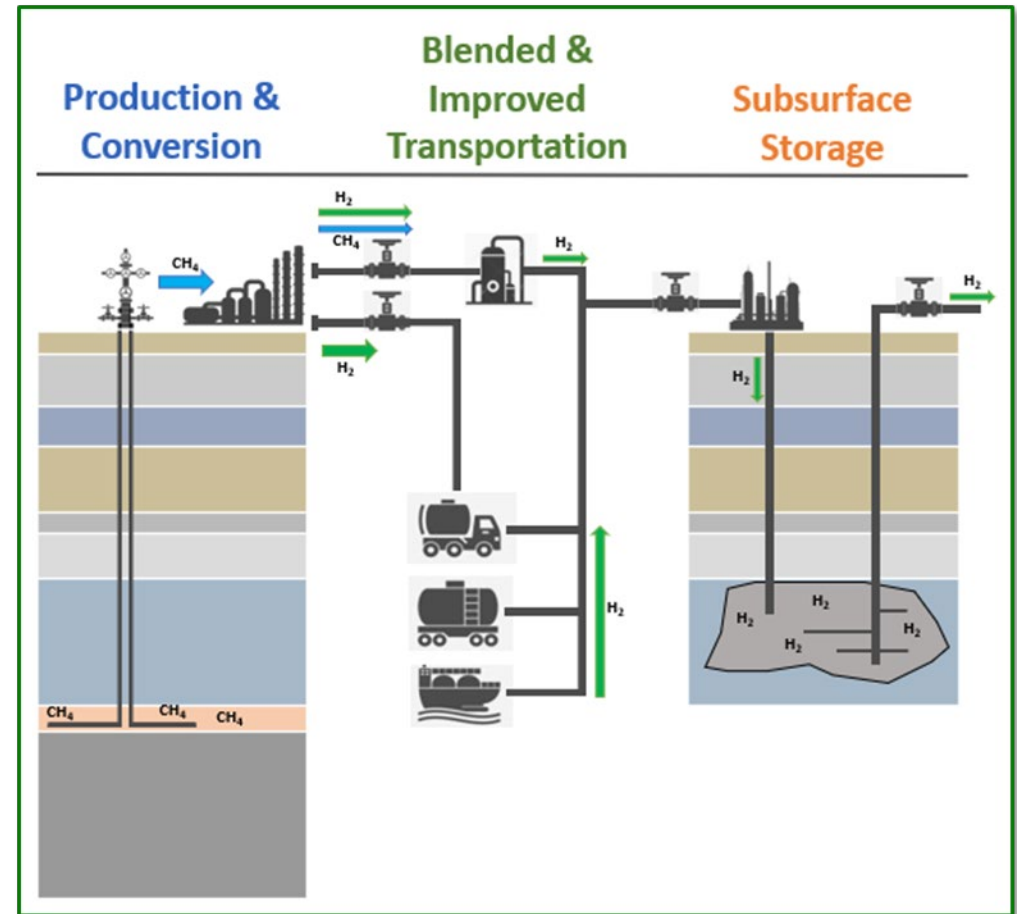
- Transformational concepts for clean hydrogen production from domestic natural gas resources
- Improved catalysis and advanced natural gas to hydrogen conversion solutions

Transportation

- Technologies that improve the cost and performance of hydrogen transportation infrastructure
- Support the use of existing natural gas infrastructure to effectively transport a blended gas stream

Storage

- Improve the cost and performance (efficiency, safety, integrity) of subsurface hydrogen storage



Undocumented Orphaned Wells (UOW)

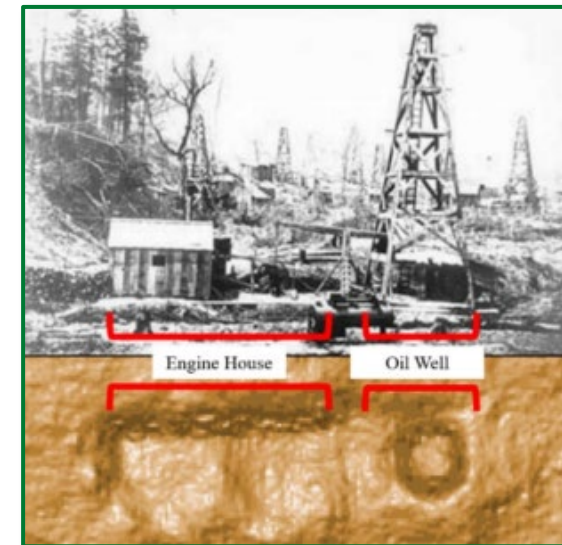
Identify and characterize undocumented orphaned wells and determine the physical locations, methane emissions, wellbore integrity, and other environmental impacts of those wells

The Bipartisan Infrastructure Law (BIL) that was signed in late 2021 directs DOE to implement a *research program* focused on assisting the Federal land management agencies, States, and Indian Tribes in identifying and characterizing undocumented orphaned wells.

- To develop this program, DOE, in collaboration with Interstate Oil and Gas Compact Commission (IOGCC), has created a research consortium with LANL, LLNL, NETL, SNL, and LBNL.

Program Objectives

- Well Identification
- Methane Detection and Quantification
- Well Characterization
- Sensor Fusion and Data Integration with Machine Learning
- Integration and Best Practices



LiDAR Data



Federal Methane Reduction Programs

DOI Orphaned Wells Program

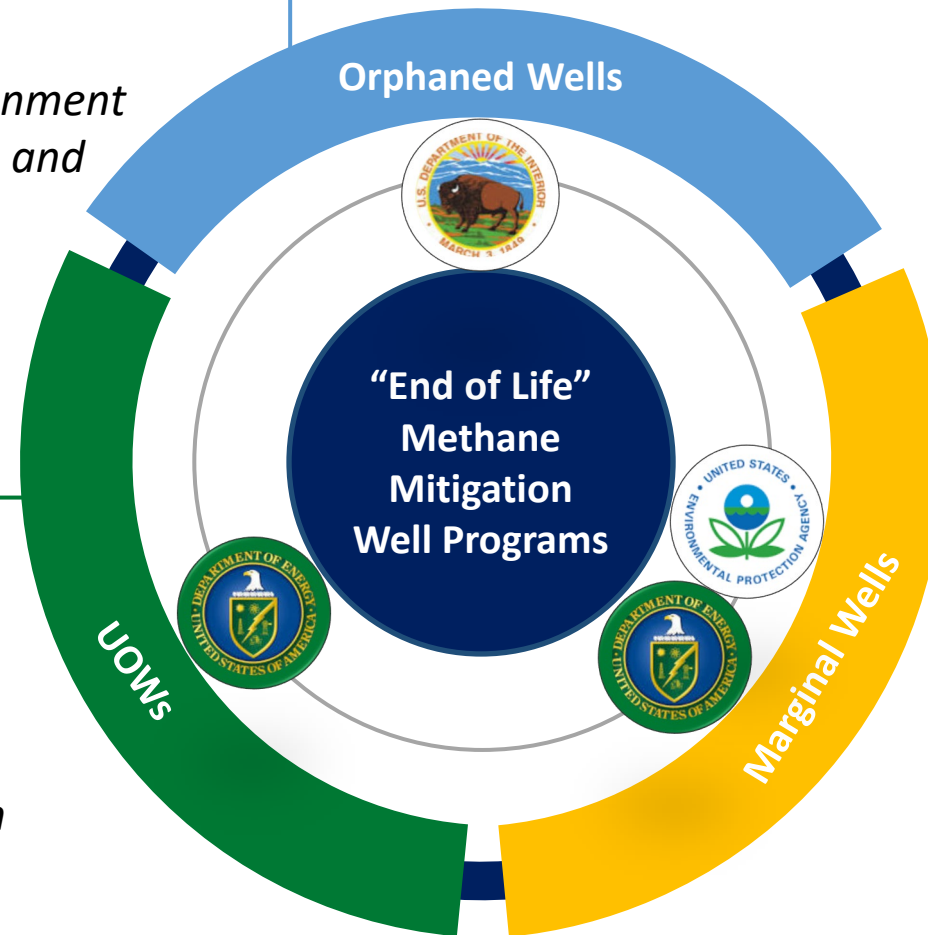
Purpose: Support plugging and abandonment operations across Federal, Tribal, State, and private lands.

Budget: \$4.7 billion for 9 years

DOE Undocumented Orphaned Well (UOW) Program

Purpose: Develop technologies and techniques to identify and characterize orphaned wells that are not currently in the regulatory inventory

Budget: \$30 million for 5 years



* A marginal well is defined as a well producing less than 15 barrels of oil or 90,000 cubic feet of natural gas per day.

DOE/EPA Methane Emissions Reduction Program (MERP)

Purpose: Assess marginal well* methane emissions, prioritize methane mitigation opportunities, plugging wells and surface reclamation

Budget: \$1.5 billion

Background Overview- MERP

- In August 2022, the Inflation Reduction Act (Section 60113) provided new authorities under Clean Air Act Section 136 to reduce methane emissions from oil and gas operations.
- \$1.55 billion was made available to EPA to reduce methane emissions across from oil and natural gas operations through financial and technical assistance efforts.
- EPA and DOE are collaborating to leverage our shared commitment and joint expertise in advancing methane monitoring and reduction technologies and also tap into DOE's expertise on planning and implementing financial and technical assistance efforts.
 - \$1.25 Billion Financial assistance for monitoring and reducing methane emissions from the oil and gas sector (**\$700 Million directed towards marginal conventional wells (MCW*)**)
 - \$50 Million Technical assistance to help states, industry, and other partners implement cost-effective solutions for monitoring and reducing methane emissions



Questions?



Timothy Reinhardt

Director, Methane Mitigation Technologies

Office of Fossil Energy and Carbon Management | Office of Resource Sustainability

Thank You!

Teams at all participating research partners, NETL, DOE, and associated stakeholders

