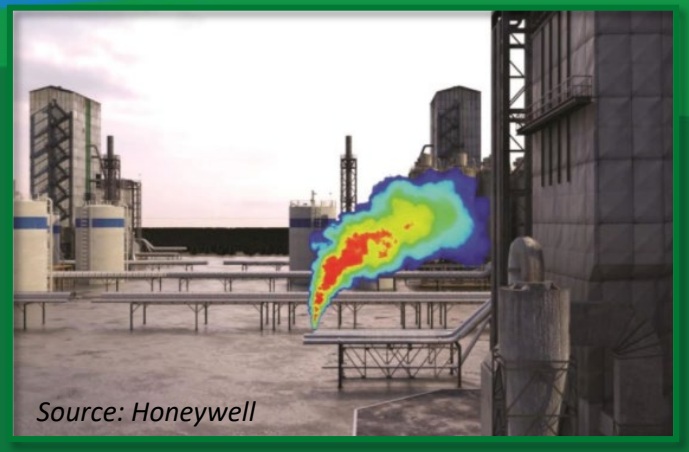
U.S. DEPARTMENT OF ENERGY
Fossil Energy and Carbon Management

FECM Methane Mitigation

Alaska Critical Minerals workshop

David Alleman

2024


Source: Honeywell


Source: NETL


Source: Konica Minolta

Methane Mitigation Technologies Division

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

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 Reduction Program

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

Undocumented Orphaned Wells

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

Waste and Underutilized Natural Gas Conversion

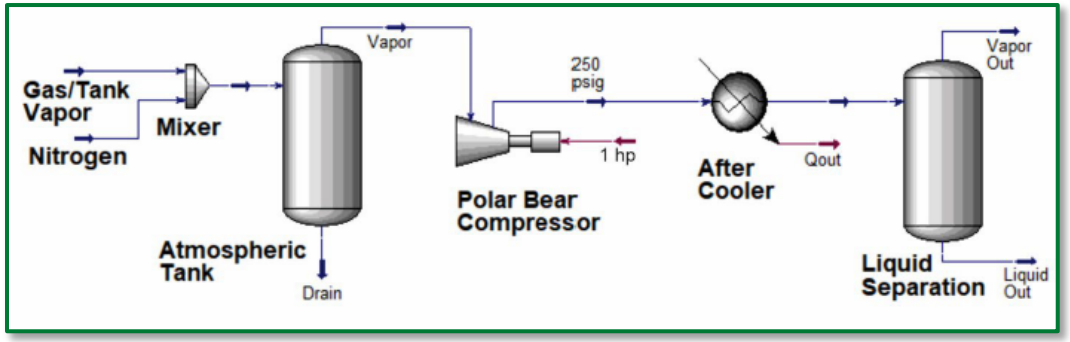
Technologies for conversion and utilization of natural gas to reduce venting and flaring of the resource

Methane Mitigation Research

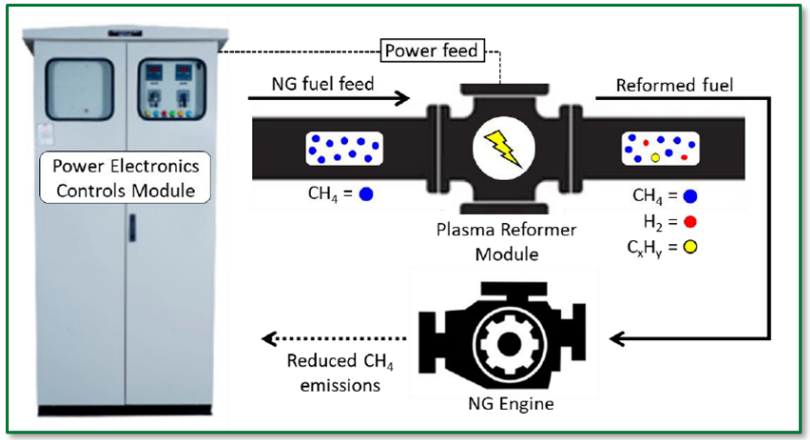
Develop and validate cost-effective and state-of-the-art tools, technologies and materials to mitigate methane emissions and improve the resiliency and efficiency of natural gas transportation and storage infrastructure.

- 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 States in reducing methane emissions from Marginal Conventional Wells (MCWs) throughout the US.

Polar Bear, Innovative Capture of Storage Tank Vapors



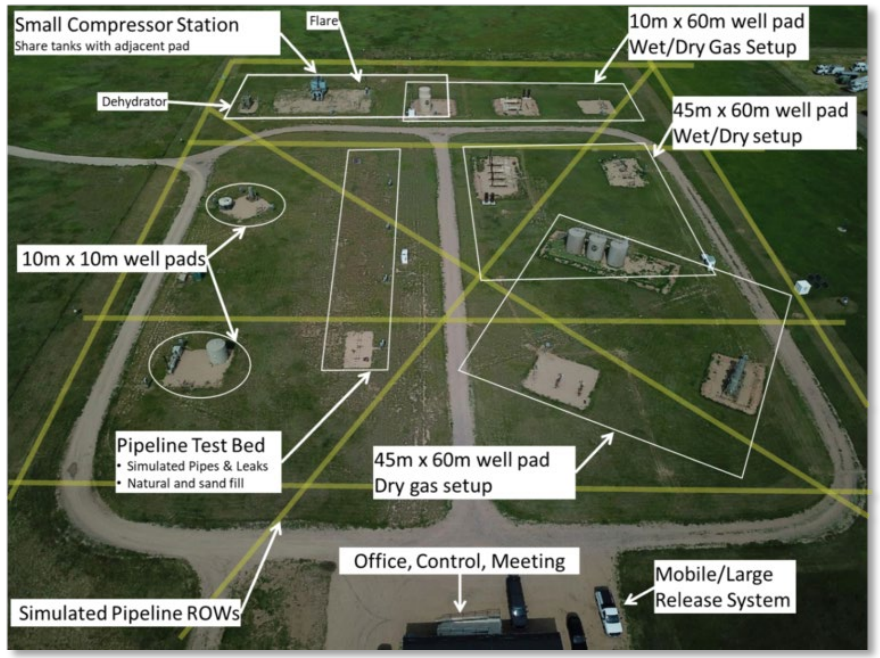
Engine Fuel Reformer



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 CH_4 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 (CH_4 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



Waste and Underutilized Natural Gas Conversion

+ HOW DO WE DEFINE **SUSTAINABLE?**

The design and production of chemicals in a manner that reduces GHG emissions by using less energy, reducing process emissions, reducing feedstock-related emissions, and supports the circular economy by using waste gas streams

Stranded and Underutilized Natural Gas Conversion to More Sustainable Chemicals

+ **KEY RESEARCH AREAS**

1. Waste Feedstock Utilization
2. Innovative, Carbon-Efficient Chemical Conversion Processes
3. Demonstrate Advanced Conversion Processes and Scalability
4. Understand Sustainability Implications (*crosscutting*)

+ HOW DO WE DEFINE **CHEMICALS?**

Low-Emission Chemicals for Consumer & Industrial Products

Undocumented Orphaned Wells (UOW)

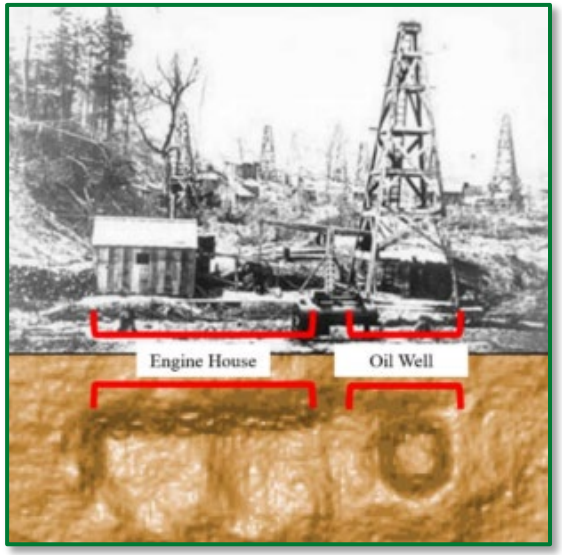
Identify and characterize undocumented orphaned wells and determine the physical locations, methane emissions, wellbore integrity, and other environmental impacts of those wells

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

Methane Emissions Reduction Program (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.
- **Non-Competitive** – In 2023, provided $350 Million to state agencies for the permanent plugging and abandonment of marginal conventional wells (MCWs)* on non-Federal lands (voluntary basis).
- **Competitive** – In 2024, provide up to $1 billion under a competitive solicitation to pursue broad scale methane emissions monitoring and mitigation across oil and gas sector, including tribal lands

* A MCW produces <15 BOED or <90 MCFD

Phase 2 Competitive Funding Opportunity Overview

Methane Emissions Reduction from Existing Wells and Infrastructure

a. Assist **smaller operators** in mitigating emissions from MCWs* through equipment repairs
b. Assist **upstream and midstream operators/service companies** in mitigating emissions from production facilities and associated infrastructure
c. Assist **tribes** in mitigating emissions from MCWs and associated infrastructure

Accelerating Deployment of Methane Emissions Reduction Solutions

a. Technology validation and implementation of compressor and engine technologies
b. Technology validation and implementation of flare gas reduction technologies
c. Innovative "disruptive" technology development for advanced methane mitigation

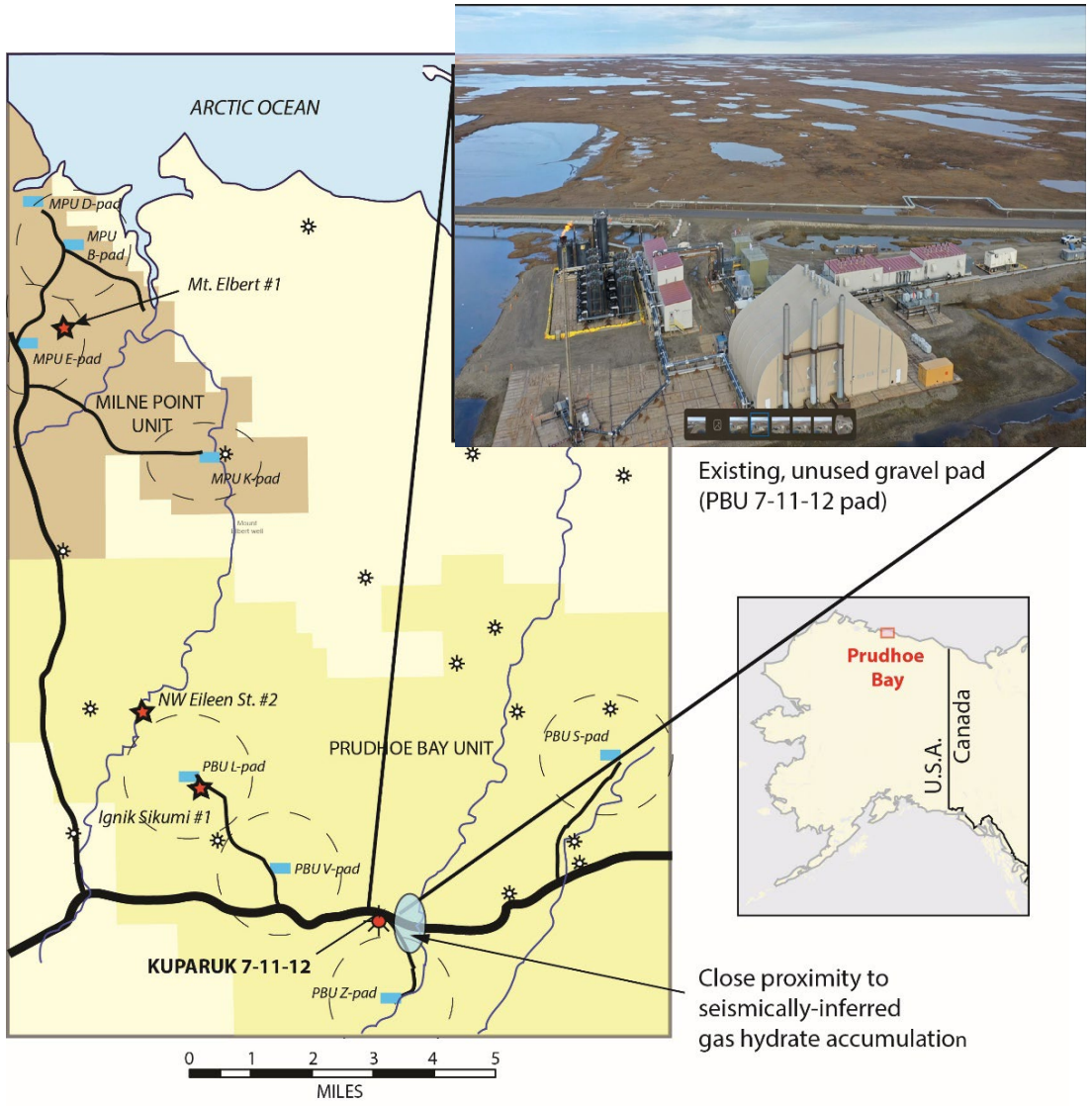
Accelerating Deployment of Methane Emissions Monitoring Solutions

a. Drive emissions reduction through multi-scale, region-specific, and measurement-informed methane emissions data collection from oil and natural gas operations
b. Quantify emissions reduction by validating new monitoring technologies, processing algorithms, and data collection methodologies

* A MCW produces <15 BOED or <90 MCFD

Project Context

- The potential resource of methane hydrates in the North Slope is almost 54 trillion cubic feet, equivalent to about 8.6% of total U.S. proven natural gas reserves. However, methane hydrates are not commercially viable, as producing gas from these systems is not fully understood.
- The objective is to conduct a long-term gas hydrate production test to improve our fundamental understanding of the behavior of this potentially very large gas hydrate deposit.
- In partnership with the government of Japan, private industry, the U.S. Geological Survey, and the Alaska Department of Natural Resources.



Alaska Production Testing Program

What it can tell us:

Insight into the scale and recoverability of gas hydrate for Alaska

- Key interest point for AK state government and AK congressional delegation

Insight into the general viability of gas hydrate recoverability

- At a very small fraction of the cost of offshore tests
- At reduced operational risk and longer project timelines than offshore tests
- With substantial additional operational flexibility as compared to offshore tests
- Any opportunity to enable calibration/validation of numerical models is valuable

Science is technically-relevant to Marine GH evaluation

- Will address first-order issues common to any GH reservoir… endothermy, heat transfer, post-dissociation consolidation
- AK and GOM reservoirs are both fine-grained sands, poorly consolidated, with Sgh 80%+ and likely similar free and bound water saturations
- Japan fully recognizes the relevance as evidenced by large expenditures for projects in Alaska and Canada

energy.gov/fecm
10

U.S. DEPARTMENT OF ENERGY

Fossil Energy and Carbon Management

Questions?