



The U.S. Department of Energy, Office of Oil and Natural Gas' Division of Supply and Delivery identifies and operates in areas where there is an appropriate government role for the development of technologies that can increase energy and economic security.

The Division provides early-stage research in natural gas infrastructure, gas hydrates and crude by rail:

- Develop technologies to reduce methane losses and increase the operational efficiency of the natural gas infrastructure.
- Analyzes key infrastructure issues concerning the safe delivery of oil and gas.
- Develop technologies to safely and efficiently find, characterize, and recover methane from gas hydrate formations.
- Conduct U.S. Department of Energy (DOE) research studies.

Major R&D Program Component

The goals of the Division of Supply & Delivery are to ensure energy security and reliability through the ongoing modernization of oil and natural gas infrastructure; determine the potential for gas hydrates as an energy resource of the future, and further enhance the cost-competitiveness and efficiency of oil and natural gas fuels and products in support of a low-carbon energy economy.

Natural gas is a critical fuel source for the U.S. economy. Pipelines are the primary mode of transportation for delivering natural gas to the domestic market and require an extended and interconnected network of pipelines comprising more than 1.3 million miles of distribution mains, nearly 300 thousand miles of transmission pipelines, and almost 12 thousand miles of gathering lines. A leak or rupture in the pipeline system can release methane and cause a significant disruption in transmission service. As the system expands and increases in complexity, natural gas infrastructure must continue to efficiently and cost-effectively support the production and delivery without impacting safety, reliability, and security.

Evaluating the production of methane from hydrates poses several challenges included confirming the existence and occurrence of quality reservoirs, demonstrating the ability to reliably locate such occurrences, and developing the techniques and technologies required to enable such production. These challenges are being addressed through DOE and internationally supported research efforts.

DOE directed research studies cover a variety of areas. Research dynamically responds to various energy policy needs through subject area special studies including: crude by rail research; natural gas demand response analysis; beneficial reuse options for used oil; and stranded gas issues.

Natural Gas Technologies (NGT) R&D

The Natural Gas Technologies R&D program's goal is to support pipeline networks of tomorrow and move toward more intelligent pipeline systems that enable continuous monitoring of the system's status for improved reliability and safety. Advanced analytics have the potential to proactively identify early sources of pipeline failure, as well as enabling an understanding of real-time operational parameters that can be used to maximize efficiency and ensure cyber-physical security of the natural gas pipeline infrastructure.

To address the challenge of expanding pipeline delivery system, the Program aims to enhance natural gas pipeline reliability, integrity, operational flexibility and ensure infrastructure security by:

1. Quantifying infrastructure emissions to contextualize mitigation technology development.
2. Focusing on early-stage research on advanced materials and sensor technology to address the reliability, public safety, operational efficiency, and resiliency of the Nation's legacy natural gas pipeline delivery and underground natural gas storage infrastructure.

The NGT R&D portfolio consists of research to:

- Develop technologies to detect, measure, and mitigate methane emissions and increase the efficiency of the natural gas pipelines and underground natural gas storage facilities.
- Support process-intensified technologies for the upcycling of flare gas into transportable, value-added products; and
- Advance methane detection and measurement technology validations.

Gas Hydrates R&D

The goal of the Gas Hydrates R&D program is to advance scientific understanding of gas hydrates through research and develop the production feasibility to assess the commercial viability of the potentially enormous naturally-occurring gas hydrates resource within the U.S. and internationally. The program also works to confirm the scale and nature of this potentially recoverable resource through complex drilling and coring programs and by developing the technologies needed to safely and efficiently find, characterize, and recover methane from hydrates through field testing, numerical simulation, and laboratory experimentation.

Gas hydrates consist of molecules of natural gas enclosed within a solid lattice of water molecules. Gas hydrate deposits are found wherever methane occurs in the presence of water under elevated pressures and at relatively low temperatures beneath permafrost or marine environment. Gas hydrates are thought to occur in vast volumes; 250,000–700,000 trillion cubic feet (Tcf) of natural gas with formation thickness up to several hundred meters thick compared to 2,829 Tcf of technically recoverable resources of dry natural gas in the U.S (EIA AEO 2020).

The primary R&D challenge in gas hydrate research is assessing the location and amount of the hydrate resource and determining the best way to extract the gas hydrate.

The program will continue to focus on:

- Pursuing long-term reservoir response experiments to evaluate the potential for economic recovery.
- Obtaining more accurate characterizations of marine hydrate sediments.
- Collaborating with other international programs.

DOE Research Studies

DOE directed research studies either by the Secretary of Energy and/or Congressionally directed cover a variety of areas: Crude Oil Characterization Research Study; Used Oil Management and Beneficial Reuse Options; Natural Gas Demand Response; Natural Gas Flaring and Venting: State and Federal Regulatory Overview, Trends, and Impacts; and R&D to support a Hydrogen Economy.

Major Accomplishments

The Division of Supply & Delivery programs have had several important accomplishments in collaboration with its partners.

NGT R&D: The National Petroleum Council (NPC) Dynamic Delivery Study articulated the challenges of delivering oil and natural gas via existing transportation infrastructure. DOE leveraged the NPC Dynamic Delivery Study recommendations to develop a Strategic Roadmap to chart a path forward for program priorities and R&D activities, including: steps to ensure sufficient natural gas transportation infrastructure is in place, especially in growth basins; and supporting R&D on pipeline inspection technologies, to include developing an artificial intelligence (AI) physics-informed, data-driven, machine learning (ML) pipeline diagnostic analytics software tool, as well as new pipeline and repair coating systems.

Gas Hydrates: DOE, in collaboration with Japan, USGS, and others, plans to establish a world-class gas hydrate field test facility with an instrumented science well and production test well to gather insights into the general viability of gas hydrate recoverability. A long-term production feasibility field test in the Alaska North Slope is the next critical step in advancing the production technology to a point where industry could further develop this potential resource.

Research for a Hydrogen Economy: DOE is focused on technological advancements to enable and expand a decarbonized, domestic hydrogen economy and [strategy](#). The Hydrogen Program Plan reinforces DOE's commitment to develop the technologies that can enable hydrogen expansion in the United States and highlights the importance of collaboration both within DOE and with stakeholders in industry, academia, and the states to achieve that goal.

For additional information about Supply & Delivery, please click [here](#) or contact the following DOE personnel:

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