UNCONVENTIONAL OIL AND NATURAL GAS RESOURCES RESEARCH PROGRAM
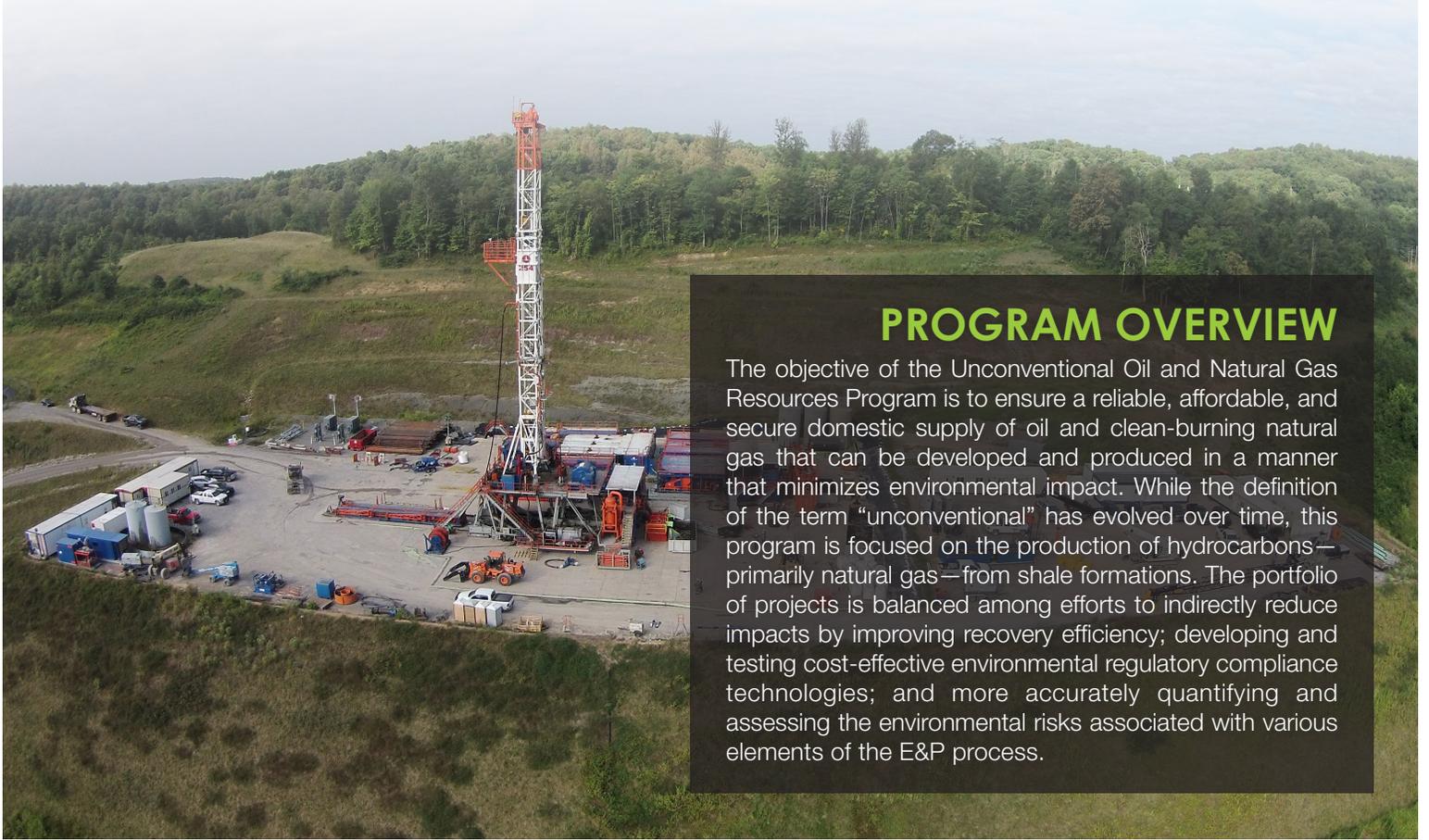
PROGRAM OVERVIEW

The objective of the Unconventional Oil and Natural Gas Resources Program is to ensure a reliable, affordable, and secure domestic supply of oil and clean-burning natural gas that can be developed and produced in a manner that minimizes environmental impact. While the definition of the term "unconventional" has evolved over time, this program is focused on the production of hydrocarbons—primarily natural gas—from shale formations. The portfolio of projects is balanced among efforts to indirectly reduce impacts by improving recovery efficiency; developing and testing cost-effective environmental regulatory compliance technologies; and more accurately quantifying and assessing the environmental risks associated with various elements of the E&P process.

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THE ISSUES

Several trends are currently converging, amplifying the need for continued research into ways to reduce the environmental impact of domestic oil and gas production.

- Energy demand continues to grow, and the need to limit energy imports for economic and energy security reasons remains strong

- Natural gas remains an important element of any strategy to help the U.S. transition to a lower carbon energy footprint

- Conventional domestic natural gas production is declining, and the primary alternative for replacing it (e.g., natural gas from hydraulically fractured shales) involves an increased demand for fresh water, wastewater disposal, incidences of surface disturbances, and methane emissions

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- Stakeholders are increasingly concerned about the environmental impacts of large-scale development of shale plays, and interested in basing decisions on scientifically sound data reflecting the costs and benefits of energy development

These trends have highlighted the need for good scientific data and more rapid technology development to address issues facing all stakeholders, from citizens to policymakers to energy producers.

PROJECT PORTFOLIO

The Unconventional Oil and Natural Gas Resources Program aims to find solutions to these environmental concerns by focusing on: 1) fundamental subsurface science, 2) reservoir characterization, 3) improved hydraulic fracturing, and 4) reducing or mitigating impacts to air, water, or surface.

While many of the projects in the portfolio are set in the laboratory, a portion of the portfolio is specifically focused on research at "field laboratories." These locations function as observatories where scientists can carry out data-gathering and test methods that can only be done on location with actual wells and facilities. The three examples of this approach currently under way have already provided some important findings and an expansion to additional sites is under consideration.

Currently, there are about 30 active or recently completed extramural projects in the Unconventional Oil and Natural Gas Resources Program, for a total value of roughly $127 million (not including participant cost-share of at least 20 percent). The project leads and team members are balanced across producers, universities, state agencies, and technology providers.

ONSITE RESEARCH

In addition to managing these extramural projects, NETL is carrying out on-site research projects designed to complement these efforts. Scientists and engineers at NETL are:

- Determining the physical, geomechanical, and thermodynamic phenomena that govern shale reservoir behavior to develop solutions (models, technology, best practices) that decrease development intensity

- Conducting integrated scientific monitoring of shale gas development impact on subsurface reservoirs, recovery efficiency, air quality, and water use, in concert with the extramural field observatories described above

- Investigating the long-term integrity of casing/cement bonding

- Investigating non-aqueous based (or reduced water) systems for hydraulic fracturing

- Investigating options for improving re-fracking operations applicable to tight oil and gas

- Developing technologies/best practices focused on enhanced recovery from tight oil and natural gas formations using CO_2

- Identifying pathways for converting underutilized U.S. natural gas resources into valuable liquid products along with cogeneration of heat and electric power

These projects, along with the extramural projects described above, form a portfolio that is balanced and responsive to the issues facing stakeholders. The data, technologies, and tools developed through this portfolio help industry and regulators make decisions and optimize operations in ways that will advance the goals of environmentally sustainable development of domestic oil and natural gas resources.

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