



the **ENERGY** lab

PROGRAM FACTS

Strategic Center for
Natural Gas & Oil

Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research Program

The Department of Energy's (DOE) Office of Fossil Energy supports research and policy options to ensure clean, reliable, and affordable supplies of oil and natural gas for American consumers. The National Energy Technology Laboratory's (NETL) Strategic Center for Natural Gas and Oil (SCNGO) implements a portfolio of Fossil Energy research & development (R&D) programs aimed at protecting the environment while enhancing domestic oil and gas exploration and production.

Natural gas and crude oil provide two-thirds of our Nation's primary energy supply and will continue to do so for at least the next several decades, as the Nation transitions to a more sustainable energy future. The natural gas resource estimated to exist within the United States has expanded significantly, but because this resource is increasingly harder to locate and produce, new technologies are required to extract it. This is

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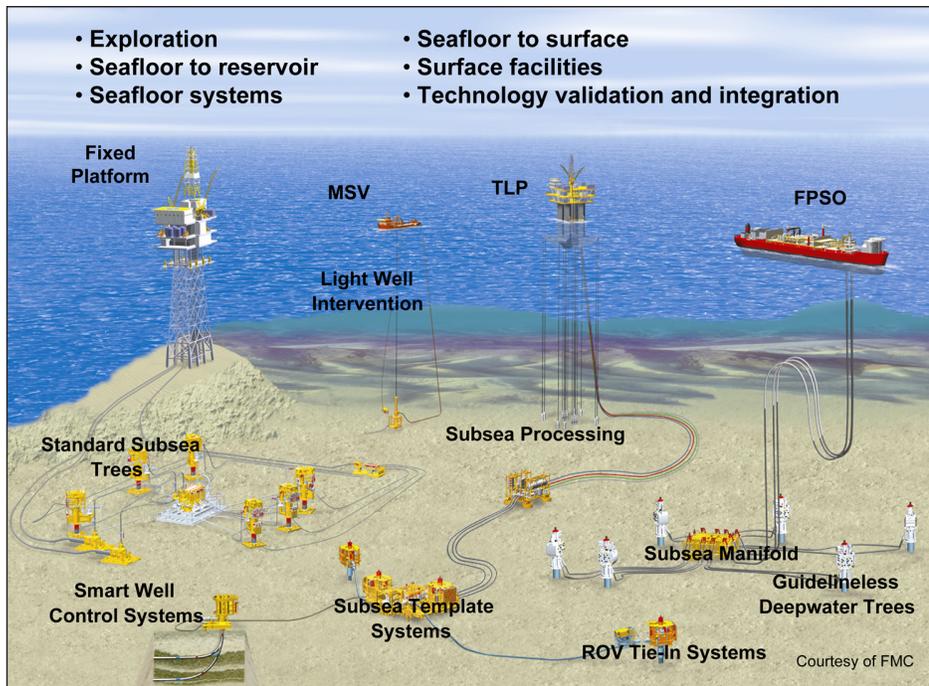
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Ultra-deepwater architecture and technology.

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also true for the domestic oil resource, much of which will need to be produced from very deep water, forced from residual pockets left in older reservoirs, or extracted from unconventional deposits, all of which are difficult to develop with existing technology, even at current prices.

In August 2005, the Energy Policy Act of 2005 (EPAAct) was signed into law. Title IX, Subtitle J, Section 999 of EPAAct adds another dimension to the overall NETL/SCNGO oil and gas R&D effort, enhancing opportunities to demonstrate technologies in the field and accelerate their implementation in the marketplace. The *Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research Program* launched by EPAAct is a public/private partnership valued at \$400 million over eight years that is designed to benefit consumers by developing technologies to increase America's domestic oil and gas production and reduce the Nation's dependency on foreign imports. A portion of the funding is directed towards cost-shared research, while another portion is used by NETL to carry out complementary R&D.

Funding for the program is prescribed by EPAAct as follows:

- Ultra-deepwater architecture and technology (35% of funds).
- Unconventional natural gas and other petroleum resource exploration and production technology (32.5%).
- The technology challenges of small producers (7.5%).
- Research complementary to the above conducted by NETL (25%).



Shale gas drilling at McAlister, Oklahoma.
(Photo courtesy Chesapeake Energy)

Cost-Shared Research

EPAAct required the DOE to competitively select and award a contract to a consortium to administer the cost-shared portion of the program comprised of three elements: Ultra-Deepwater, Unconventional Resources, and Small Producers. The Research Partnership to Secure Energy for America (RPSEA), a 501(c)(3) not-for-profit corporation consisting of over 170 member organizations, was the industry consortium selected to administer these three elements. NETL, on behalf of the Secretary of Energy, maintains oversight and review of the contract with RPSEA and the entire R&D program. The companies, universities, and other organizations that receive funds through this program provide cost-share contributions of 20 to 50 percent or more.

The RPSEA contract was initiated in January 2007 and together with NETL/SCNGO produced the first annual plan for the cost-shared portion of the program. A total of 42 projects were awarded under the 15 solicitations for 2007. Sixteen projects were awarded under the Ultra-Deepwater program element, nineteen projects under the Unconventional Resources element, and seven projects under the Small Producers element.

Solicitations based on Annual Plans for 2008, 2009 and 2010 have resulted in the selection of 68 additional projects as shown in the table below. Solicitations for the 2010 Ultra-Deepwater Program element were released in March–May 2011 and selections are anticipated in late summer/early fall 2011.

	Ultra-Deepwater	Unconventional Resources	Small Producers	Total
2007	16	19	7	42
2008	14	9	6	29
2009	11	11	6	28
2010	TBD	8	3	11
Total	41	47	22	110

The current status of the Section 999 portfolio is 76 active projects with 28 in Ultra-Deepwater, 31 Unconventional Resources, and 17 in Small Producers. A total of 20 projects have been completed to date and 14 projects remain to be awarded. For a complete list and overview of the Section 999 cost shared projects, please see NETL's recently developed Knowledge Management Database (KMD) website at <http://www.netl.doe.gov/kmd>.

The KMD was developed as part of the Complementary Program, discussed below, and is the cornerstone of NETL's Integrated Technology Transfer Program. The KMD provides access to content from dozens of CDs and DVDs related to oil and natural gas research that NETL has published over the years. It also provides links to reports, data sets, and project summaries from ongoing research supported by the Office of Fossil Energy's Oil and Natural Gas Program. Most recently the 9,000 DOE documents in the KMD have been made available through the Society of Petroleum Engineers (SPE) OnePetro

online document repository on the OnePetro website (www.onepetro.org), together with documents from SPE, the Society of Exploration Geophysicists, the American Association of Petroleum Geologists, the Society of Petrophysicists and Well Log Analysts, the Offshore Technology Conference, and eight additional professional societies.

The Annual Plan for 2010 has been completed and sent to Congress; and solicitations for the Unconventional Resources Program and the Small Producers Program elements have closed. These proposals are currently in the review and selection process. The solicitations for the Ultra-Deepwater Program element are in review at DOE/HQ. As a result of the Macondo incident, an increased emphasis on environmental and safety themes will be reflected in these solicitations.

Copies of all annual plans and other reports from the Federal Advisory Committees are available on the Department of Energy website at http://fossil.energy.gov/programs/oilgas/ultra_and_unconventional.

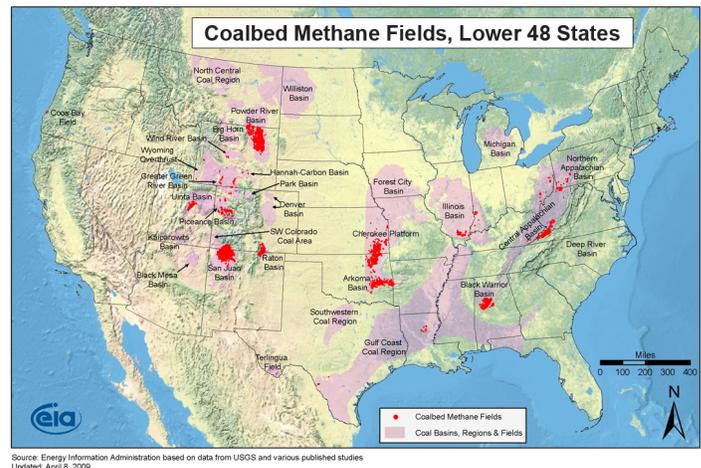
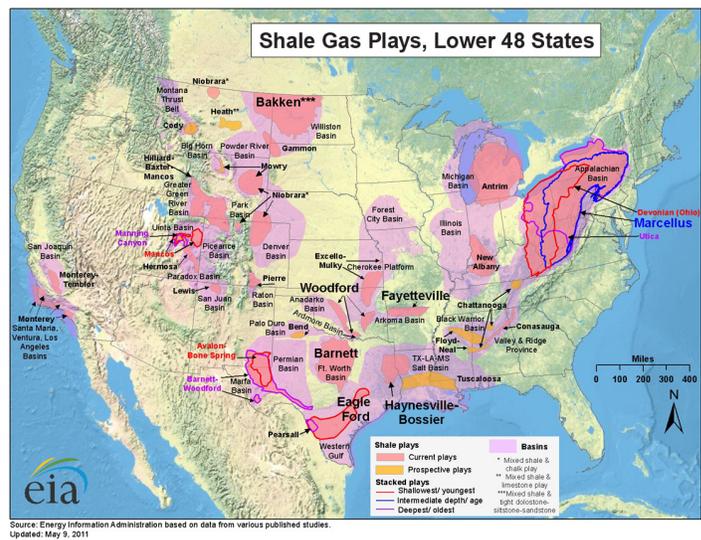
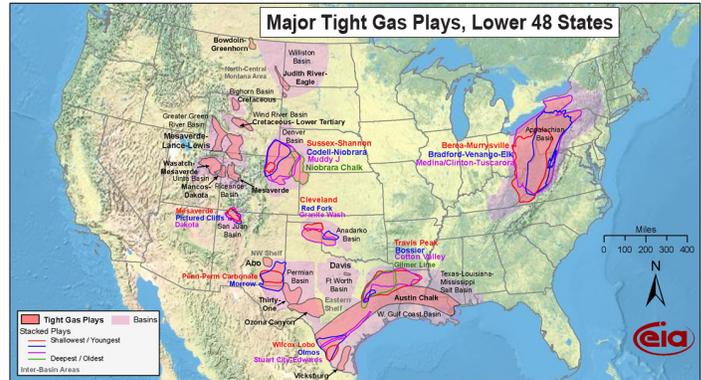
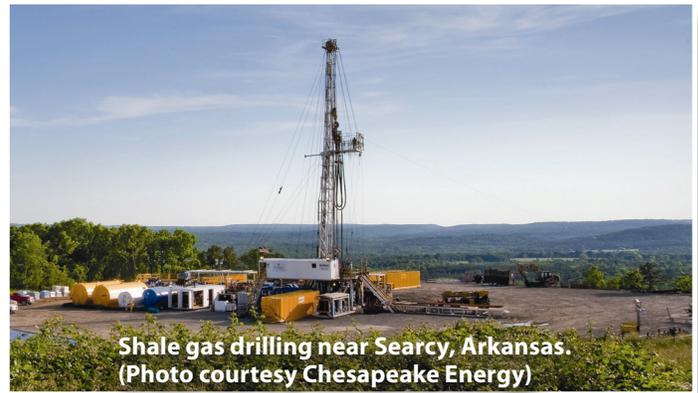
The 2011 Annual Plan is in the process of being reviewed by two Federal Advisory Committees and is expected to be sent to Congress in June of 2011.

Complementary Research

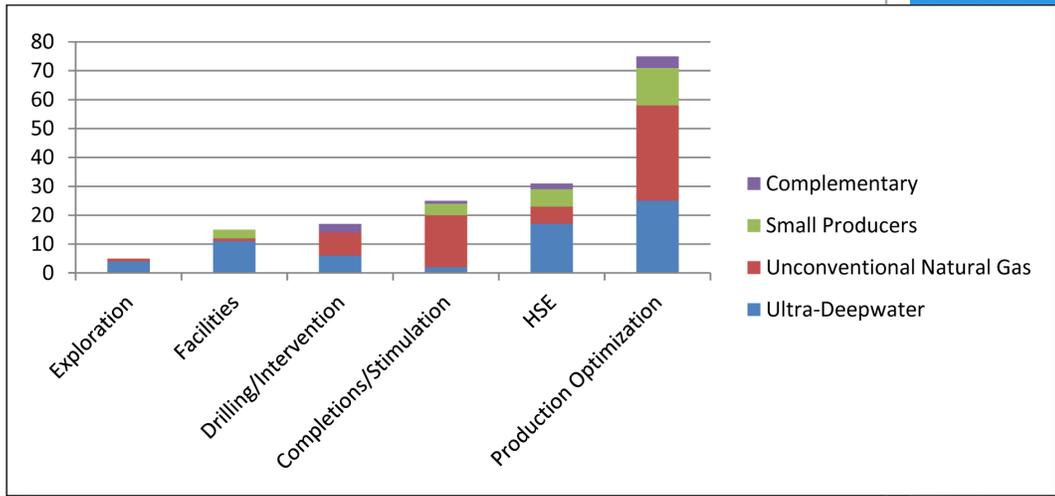
The Complementary R&D Program is being carried out by NETL's Office of Research and Development. The four principal areas of focus are:

- Drilling Under Extreme Conditions
- Environmental Impacts of Oil and Natural Gas Development
- Enhanced and Unconventional Oil Recovery
- Resource Assessment.

Another activity is identifying and quantifying the benefits that are expected to accrue as a result of the entire Section 999 program and performing analyses in support of the requirement in EAct 2005 to estimate potential cumulative increase in Federal royalty receipts as a result of the Section 999 Program. The Drilling Under Extreme Conditions project area focuses on activities related to the Ultra-deep Single Cutter Drilling Simulator (UDS) with the goal of improving the economic viability of drilling for and producing from domestic deep (greater than 15,000 ft true vertical depth [TVD]) and ultra-deep (greater than 25,000 ft TVD) natural gas resources. The Environmental Impacts project area includes research that inventories airshed profiles using sensors mounted on unmanned aircraft to monitor emissions plumes from oil and gas operations. This permits 3-D measurement of constituents within the dispersion plume and will provide a basis for air quality models that better represent the effect of constituents from widely dispersed oil and gas sources. Activities in the Enhanced and Unconventional Oil Recovery area include the development



of new technologies that improve upon current oil extraction processes, while the Resource Assessment area includes activities to perform a detailed assessment of the Marcellus Shale in the Appalachian Basin utilizing high resolution analytical reservoir characterization techniques. The project is integrating higher resolution instrumentation to evaluate the molecular distribution of components in the shale. The results will be used to help determine the mechanisms of gas storage and movement through the matrix and fractures of the shale to the well bore which will lead to more accurate reservoir modeling.



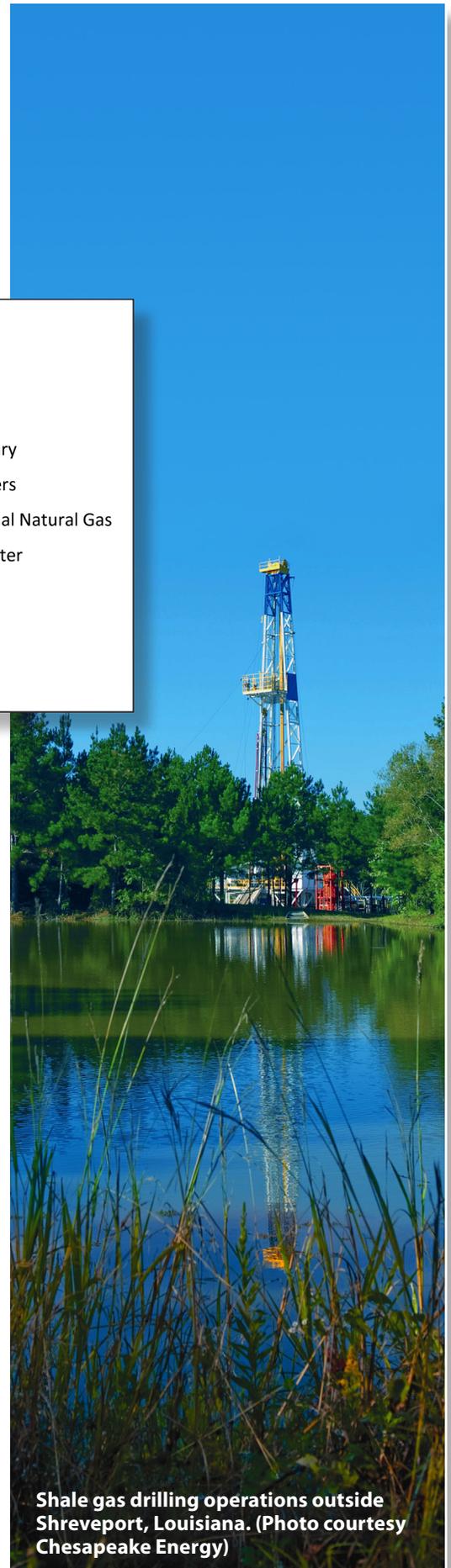
Concentration of impact of Section 999 projects on various program focus areas.

Measuring Performance

When reviewing the directions of the research being undertaken against the goals of the Section 999 program, the 99 projects awarded in the 2007, 2008 and 2009 solicitations, in addition to the complementary research projects undertaken during the same period, are well focused. The two primary aims of the program are to increase indigenous production of oil and gas and to do so in a safe and environmentally responsible manner. Many of the project studies address more than one research area. Research in produced and flowback water clean-up and reuse, for example, has components that apply to the completions, health, safety and environment (HSE) and production optimization foci within the program. When evaluating the Section 999 program, it is therefore possible to assess the application of each project to the various program foci. Doing so yields the chart above showing the number of projects that touch each focus area. This clearly illustrates that the program has the greatest potential impact within the two most important goals of the program, production optimization and HSE.

Looking Ahead

The Section 999 program has reached its midpoint. The first year saw the award of projects in a broad range of topics and sectors. Subsequent project selections have narrowed the focus of the projects based on the relative success of the initial awards. In response to the 2010 Macondo oil spill, DOE began refocusing the Section 999 Program on Safety and Environmental Sustainability (S&ES). The 2010 Ultra-Deepwater solicitations allocated 50% of the funding on this focus area. Planning for subsequent years is for a complete transition to the S&ES focus for the entire program.



Shale gas drilling operations outside Shreveport, Louisiana. (Photo courtesy Chesapeake Energy)