



the **ENERGY** lab

R&D FACTS

Geological and Environmental Sciences

Geological and Environmental Sciences Onsite Research

As the lead field center for the DOE Office of Fossil Energy's research and development program, the National Energy Technology Laboratory has established a strong onsite research program conducted by Federal scientists and engineers who work closely with employees of contractor organizations and researchers from universities. Onsite R&D—managed by NETL's Office of Research and Development—makes important contributions to NETL's mission of implementing a research, development, and demonstration program to resolve the environmental, supply, and reliability constraints of producing and using fossil resources.

Researchers in NETL's Office of Research and Development perform onsite R&D in support of NETL's technology lines and for external government and industry customers. In addition, NETL's onsite research pursues knowledge, science, and technology with broad societal and industrial interest. NETL onsite R&D helps industrial and academic partners solve problems that would otherwise become barriers to commercializing power systems, fuels, and environmental and waste management technologies. NETL uses a variety of partnership mechanisms to conduct R&D of mutual interest with academic and private-sector organizations. The Office of Research and Development provides DOE's Fossil Energy program an onsite "corporate laboratory" at NETL. The onsite R&D efforts utilize state-of-the-art capabilities and facilities in Morgantown, West Virginia; Pittsburgh, Pennsylvania; and Albany, Oregon. About one-fourth of NETL's approximately 1,100 Federal and contractor employees are involved with onsite research activity. NETL is DOE's only government-owned, government-operated national laboratory; the onsite research program has a core group of about 150 Federal scientists and engineers. Supplemental site support comes from contractors who are selected through a competitive process, as well as research fellows and associates at the faculty, postdoctoral, graduate, and undergraduate levels.

Onsite research is conducted in four primary focus areas: Computational and Basic Sciences, Energy System Dynamics, Geological and Environmental Sciences, and Materials Science and Engineering.



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U.S. DEPARTMENT OF
ENERGY

Geological and Environmental Sciences Focus Area

The Geological and Environmental Sciences Focus Area conducts research into minimization and abatement of environmental problems associated with the development and use of fossil fuels. Research concentrates on geological sequestration of carbon dioxide, oil and gas exploration and production, and removal of toxins from emissions from coal utilization systems. The focus area performs research to assess the capacity, suitability, and permanence of potential carbon sequestration reservoirs, to assess the ability of unconventional reservoirs to produce gas and oil and assist in that production, to improve environmental performance of existing power plants, and to be recognized for performing sound science, achieving excellence, and meeting goals.

Focus Area Research

The scope of the focus area research includes geological sequestration; ensure permanent carbon sequestering; resources assessment; production modeling; development of unconventional gas and oil resources; fate of air toxics such as mercury; byproduct utilization; and water issues related to existing coal-fueled electric power plants. Sequestration simulation and field work expertise provides a valuable internal capability for NETL in assessing external activities. The focus area is working closely with sequestration field-testing activities and plans to develop a range of collaborative activities with the regional sequestration partnerships being developed by DOE. The focus area directly supports the President's Global Climate Change Initiative, carbon sequestration technologies, natural gas and oil technologies, and clean power generation. NETL researchers in this focus area have achieved significant R&D successes and are widely recognized for their expertise and quality research.

The long-range objective of the focus area is to conduct research in carbon sequestration, natural gas and oil, and environmental research. Specific objectives include:

- Develop underpinning science to ensure safe, essentially permanent carbon sequestration; develop reliable measurement, monitoring and verification technologies acceptable to permitting agencies; and develop sequestration site selection criteria acceptable to external organizations (e.g., regional partnerships).

- Develop and validate mathematical models that correctly predict field results for reservoir flows and leaks (e.g., coal seams), resulting in models that are “transparent,” and that represent significant improvement over current codes.
- Participate with regional partnerships in field activities to test and evaluate technologies; validate and couple geomechanical and flow reservoir models to provide accurate and reliable simulations in fractured reservoirs based on an explicit fracture simulator.
- Improve drilling rates in the field by 20 percent through a state-of-the-art advanced drilling research laboratory.
- Identify opportunities for the natural gas and oil program to expand gas resource base by better resource characterization.
- Develop technology to reduce cost of mercury control while achieving at least 90 percent capture; characterize potential environmental impacts of byproducts of advanced fossil energy coal technologies; improve management of produced waters from coal-bed methane production; and develop cost effective power plant water management technology.

