



the **ENERGY** lab

R&D FACTS

Office of Research and Development

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The National Energy Technology Laboratory (NETL), one of the Department of Energy's 17 national laboratories, is leading research, development, and demonstration programs to resolve the environmental, supply, and reliability constraints of using fossil fuels, including coal. In support of this mission, NETL's Office of Research and Development (ORD) provides the DOE Fossil Energy R&D Program an onsite "corporate laboratory," where researchers perform fundamental and applied fossil energy R&D.



Through ORD's research, NETL is—

- Advancing scientific understanding of key fossil energy technologies
- Generating new ideas and directions for future programs
- Collaborating with regional and national universities
- Helping to develop our nation's future scientific and energy engineering experts

NETL attracts world-class researchers who are addressing diverse energy and environmental needs including—



- Secure and reliable energy supplies
- Future roles for hydrogen
- Clean power generation from coal,
- Global climate change research
- Critical infrastructure assurance

While pursuing knowledge, science, and technology, NETL also has received numerous licensable patents.

NETL's researchers use state-of-the-art capabilities and unique facilities in Albany, OR; Morgantown, WV; and Pittsburgh, PA. A core group of approximately 150 Federal scientists and engineers conduct the R&D program with support contractors and academic partners. NETL provides an impartial evaluation of new concepts and materials, along with expert, authoritative reviews of external R&D proposals. NETL also provides a venue for other Federal agencies (e.g., DOD, NASA) and research organizations to collaborate.

NATIONAL ENERGY TECHNOLOGY LABORATORY

Albany, OR • Anchorage, AK • Morgantown, WV • Pittsburgh, PA • Sugar Land, TX

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In addition, NETL conducts R&D with external academic and industry partners—efforts designed to help overcome barriers to the commercialization of advanced power system, fuels, and environmental and waste management technologies. NETL's onsite research facilities are an important benefit of this collaboration, eliminating the need for outside groups to build separate test platforms for each research concept.

To maintain a high level of quality and relevance, ORD annually conducts a comprehensive peer review of its research projects. Teams of external science and technology experts review research projects to provide a broad, comprehensive assessment of the current and planned R&D portfolio.

Four Focus Areas

Research is conducted in four primary focus areas that build upon R&D strengths at NETL, and that address long-range issues central to continuing fossil fuel use in an environmentally and cost-effective manner.

Computational Science and Engineering integrates physical and chemical experimental research with computational sciences as the preferred method for understanding and developing technologies, advanced materials, and multi-scale energy systems ranging from the molecular-scale to device-scale to plant-scale. Onsite computational and basic science research includes: computational chemistry, device simulations, advanced fuel systems including hydrogen, and gas hydrates.

Energy System Dynamics conceives, analyzes, and develops pre-commercial energy technology that minimizes the environmental impact of fossil fuel use, and maximizes reliable use of domestic energy sources and infrastructure. Some examples include research on: fuel cells/hybrids, gas turbine combustion, carbon capture, and new zero-emission technologies (e.g., FutureGen).

Geological and Environmental Sciences 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, air pollution/ particulate matter issues, removal of toxins from coal utilization system emissions, as well as water and coal utilization by-products.

Materials Science and Engineering specializes in formulating, characterizing, and/or melting of most metals, alloys, and ceramics; casting, fabrication, and prototype development; and the recycle and remediation of waste streams associated with these processes. Research includes alloy development, materials production, physical and chemical analysis, and performance testing. NETL is one of the few places in the world where alloy development, melting, casting, fabrication, physical and chemical analyses and performance testing (wear, erosion, and various forms of corrosion) can be performed in one place,

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.
- 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.

NETL-Regional University Alliance

The NETL-Regional University Alliance (NETL-RUA) is an applied research collaboration that combines NETL's energy research expertise with the broad capabilities of five nationally recognized, regional universities: Carnegie Mellon University (CMU), The Pennsylvania State University (PSU), the University of Pittsburgh (Pitt), Virginia Tech (VT), and West Virginia University (WVU), and the engineering and construction expertise of an industry partner (URS). The NETL-RUA leverages its expertise with current fossil energy sources to discover and develop sustainable energy systems of the future, introduce new technology, and boost economic development and national security.

