



Innovation in

- ✦ The research Battelle's Jacqueline Gerst conducts to learn more about the potential for carbon capture and geological sequestration includes studying core samples taken thousands of feet below the earth's surface.

Energy Technology

The world's energy future will be characterized by the complex interplay of supply, transport, and end use. From generating power to enabling mobility, many options are available, but not all are commercially viable. To meet the anticipated demand for energy in environmentally responsible ways, new and cost-effective approaches based on innovative and early-stage technology must be developed and made part of a comprehensive, global energy mix.

Carbon Management and Climate Change: Making the Connection

Carbon management is part of our portfolio of solutions for mitigating global climate change. Efforts by Battelle and the national laboratories we manage or co-manage for the U.S. Department of Energy include sequestration, or storing carbon in soils, plants, or geologic formations; developing zero emission fossil energy systems; and capturing carbon from emission streams such as power plants and refineries.

Alternative Energy for Real-World Use

Also crucial to a sustainable energy future is the ability to accelerate alternative energy research from scientific innovations to market-viable solutions. One focus of our alternative energy R&D is low-cost membranes for fuel cells used in stationary, portable, and automotive power applications. Another is a complete fuel cell system capable of providing quiet and efficient power to the U.S. military for combat and communications electronics that can run on military logistics fuel. Battelle and our affiliated national labs also are working to transform the nation's abundant and renewable biomass resources into high-performance and cost-competitive biofuels.

- ➔ At FirstEnergy's R.E. Burger Power Plant in southeastern Ohio, the Midwest Regional Carbon Sequestration Partnership (MRCSP) completed an 8,400-foot-deep test well, an important milestone in its regional field tests on carbon sequestration. Battelle and MRCSP scientists now are beginning a series of analyses in the well to confirm that the geology is suitable for injection of carbon dioxide. Battelle also is conducting similar demonstrations in Kentucky and Michigan through MRCSP and is participating in American Electric Power's (AEP's) larger-scale demonstration at AEP's Mountaineer Plant in West Virginia.

Reconfiguring the Power Grid

Many of us recall North America's largest blackout ever, a power outage in 2003 that impacted 50 million people and 9,300 square miles. Battelle's expertise in electricity infrastructure engineering can help improve reliability and security for large, interconnected power systems through the development, assessment, and deployment of advanced power grid operation and control technologies. An outstanding example is Pacific Northwest National Laboratory's (PNNL's) Wide Area Measurement System used on the eastern and western power grids; another is GridWise™, the PNNL-led, U.S. Department of Energy program to redefine the electrical system of the future.

Spanning the Entire Energy Conversion Supply Chain

Battelle's energy-related R&D activities total nearly \$900 million annually in the United States alone and position us as a premier resource for global energy solutions. From source to distribution, and from supply to application, Battelle's expertise and experience span the entire band of the energy continuum.



Clean Water Sources. Battelle researcher Bruce Monzyk takes a process reading in the Acid Mine Drainage pilot plant located near a Johnston, Pennsylvania mine where exposed coal contaminates water in nearby streams, rendering it unhealthy to drink. Battelle is developing technology to purify water that not only will increase water resources for consumption but also can be used in developing new energy conversion processes. A variation of the technology, also developed by Battelle, was used to clean up chemical weapons sites and has potential environmental applications in dairy farming.




A Working Fuel Cell. Battelle's Multipurpose Electric Power System (MEPS) is one of the first devices to effectively use fuel cell technology with liquid hydrocarbon fuels. The 5kW power generator runs quietly; generates very little heat, toxic emissions, or odor; produces up to 20 liters of usable water per day; and will never run out of power as long as fuel is available. MEPS has been designed and fabricated for a variety of military applications, with potential for industrial and commercial uses as well.




Electricity Infrastructure Operations Center. This new user-based facility brings together experts in grid management and research with cutting-edge tools to create a central resource for improving grid control, operations, and security. Located at Pacific Northwest National Laboratory (PNNL), the center is dedicated to energy and hydro power research, operations training, and backup resources for energy utilities and industry groups. Battelle manages PNNL for the U.S. Department of Energy.






DuPont Biorefinery Project. The National Renewable Energy Laboratory (NREL) is participating in a four-year research project with DuPont, John Deere, and Michigan State University that will provide a technical foundation for DuPont's proposed Integrated Corn-Based Biorefinery. Battelle co-manages NREL for the U.S. Department of Energy (DOE). DOE is cost-sharing the research with DuPont.



Coal Conversion. Battelle is providing support to a number of companies by developing comprehensive business cases for converting coal to liquid fuels and chemicals that combine carbon capture and sequestration with responsible water use.



Olympic Peninsula Project. PNNL teamed with regional utilities and industry partners on the Olympic Peninsula Project, a study in which municipal and residential customers were given access to real-time electricity cost information so they could decide whether they wanted to reduce their electricity consumption during peak demand. Study results revealed that they did—reducing peak load by 15 percent over a one-year period. Battelle manages PNNL for the U.S. Department of Energy.