



▲ Jim Kasdorf, PSC director of special projects. "NETL is a national laboratory in our backyard, and the (SC)² partnership catalyzes high-tech development in this region."

Tools of Discovery

The Super Computing Science Consortium

On April 28, by plugging two cables together in the PSC network room, Undersecretary Ernest J. Moniz of the U.S. Department of Energy inaugurated a high-speed network that will play a vital role in development of technologies for clean, efficient fossil-fuel combustion. "With this link," said Moniz, "we connect DOE's newest national laboratory with new tools of discovery that are transforming science."

Moniz's PSC visit highlighted a new fiber-optic network connecting West Virginia University and the National Energy Technology Laboratory with PSC's Internet hub. As Moniz plugged the cables together, instantaneously a video screen lit up showing Dr. David Hardesty, president of West Virginia University, at the WVU Virtual

Environmental Lab in Morgantown. "This brings greater capability for scientific work," said Hardesty, speaking over the network in real time to an audience at PSC, as he noted that the link will foster collaboration among WVU, NETL and PSC.

In December 1999, NETL—formerly the Federal Energy Technology Center—became DOE's newest national laboratory. Moniz noted that NETL research is directed toward a critical environmental challenge: innovative technologies for fossil-fuel combustion. "Developing technologies to use fossil-fuel more efficiently and cleanly is NETL's key mission," said Moniz. "With the combined brainpower of West Virginia University and Pittsburgh Supercomputing Center, we will press forward to solve these problems."

With offices in Pittsburgh and Morgantown, NETL solves national energy and environmental problems with emphasis on developing cleaner, more efficient technologies for fossil-fuel

combustion. With DOE sponsorship, NETL, PSC, CMU, Pitt, WVU and the West Virginia Governor's Office of Technology formed a regional partnership, the Super Computing Science Consortium, to foster research and economic development in the southwest Pennsylvania-West Virginia region. (SC)² paved the way for research collaboration between PSC and NETL (see p.18) and for the new network link.

More information: <http://www.sc-2.psc.edu>

Bubble Transport in Fluidized-Bed Combustion

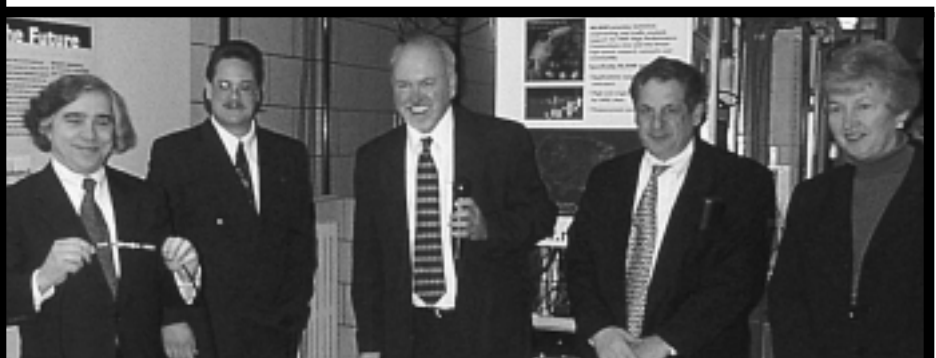
One of the technologies in development at NETL is fluidized-bed combustion, an environmentally friendly system to burn biomass in a powdered bed by heating it from the bottom in a cylinder. This combustion process can use virtually any fuel and burn it efficiently.

"New advances in computer simulation technologies, in revolutionary new concepts for coal and natural gas fueled power plants, in carbon sequestration technologies, and in the production of ultra-clean transportation fuels and chemicals now allow us to envision a future in which the economic advantages of fossil fuel can continue to be enjoyed without environmental concerns."

Bill Richardson
U.S. Secretary of Energy

(from his Dec. 10, 1999 statement, designating the National Energy Technology Laboratory as DOE's 15th national laboratory)

["With this link, we connect DOE's newest national laboratory with new tools of discovery that are transforming science."]



DOE Undersecretary Ernest J. Moniz (left) plugs cables together to officially inaugurate the network linking West Virginia University and the National Energy Technology Laboratory with the Pittsburgh gigaPoP. Looking on are PSC network engineer Steve Cunningham; Lynn Layman, Westinghouse Electric Company; Ralph Roskies, PSC scientific director; and Rita Bajura, director, National Energy Technology Laboratory.

PSC and NETL scientists collaborated to simulate this process using sophisticated software called MFIX. In one animation from these computations (right), color corresponds to the percentage of gas versus solid as the powdered fuel (red) in the bottom of the cylinder heats and forms bubbles that rise into the upper-half (blue) of the cylinder.

An important objective of fluidized-bed combustion is minimizing ozone emissions, and the simulation tracks ozone as it rises—to see if it escapes the cylinder. In another animation (below), color represents relative ozone concentration. This is the first 3D simulation of this process, and it shows asymmetries in the gas plume rising from the bed, which couldn't be detected in earlier 2D simulations.

