THE SUPER COMPUTING SCIENCE CONSORTIUM

PENNSYLVANIA-WEST VIRGINIA PARTNERS IN DEVELOPMENT OF CLEAN POWER TECHNOLOGIES

(SC)² co-chairs Lynn Layman, PSC (left) & Bob Romanowsky, NETL.

Formed in 1999 and supported by the U.S. Department of Energy, the Super Computing Science Consortium is a regional partnership of research and educational institutions in Pennsylvania and West Virginia. (SC)² provides intellectual leadership and advanced computing and communications resources to solve problems in energy and the environment and to stimulate regional high-technology development and education.

Through (SC)², Evergreene Technology Park in Greene County provides a resource that supports and encourages companies to collaborate with local universities in southwest Pennsylvania and West Virginia and to have access to PSC.

Since the spring of 2000, a high-speed network — the first fiber-optic service to Morgantown, West Virginia — has linked the National Energy Technology Laboratory (NETL) campuses in Morgantown and Pittsburgh with PSC, facilitating NETL collaborations. Researchers at NETL and WVU have actively used this link to tap PSC computational resources.

In August, PSC scientists provided a series of presentations to NETL scientific staff on PSC resources and capabilities in visualization, data analysis, parallel performance optimization, emerging software and trends in high-performance computing.

(SC)² Partners

National Energy Technology Laboratory
Pittsburgh Supercomputing Center
Carnegie Mellon University
Duquesne University
University of Pittsburgh
Waynesburg University
West Virginia University
NASA Independent Verification & Validation Facility
The West Virginia Governor's Office of Technology

MORE INFORMATION
www.sc-2.psc.edu

(SC)² Super Computing Science Consortium

PSC & (SC)²: RESEARCH FOR CLEAN ENERGY

Since the 1999 founding of (SC)², 51 (SC)² researchers have used PSC systems for a range of clean-energy related projects, using more than 5.7-million hours of computing time, over 330,000 hours within the past year.

This work includes:

High-Fidelity Simulation of Turbulent Combustion
www.psc.edu/science/2008/sc2/

Clean Liquid Fuel from "Syngas"
www.psc.edu/science/2006/sc2/

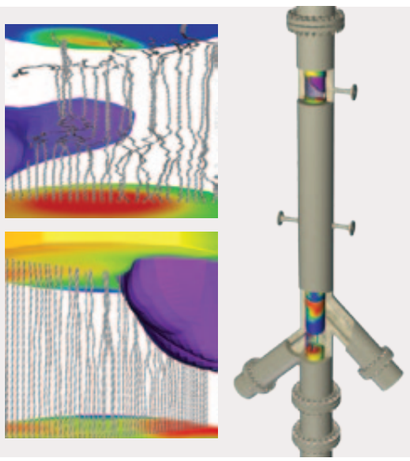
Fuel-Quality Hydrogen from Fossil Fuels
www.psc.edu/science/2005/sc2

Gas from Black Liquor
www.psc.edu/science/2004/sc2/

Fluidized-Bed Combustion of Silane
www.psc.edu/publicinfo/netl/

Lean-Fuel Mixes in Next-Generation Power-Generating Turbines
www.psc.edu/science/Richards/clean_power.html

A New Design for a Power-Generating Turbine
www.psc.edu/science/cizmas2002.html



Modeling an Operational Clean-Coal Power Plant

This graphic represents results from 2007 NETL research that used PSC resources to model coal gasification for a power plant in Florida, anticipated to be the world's cleanest coal-fired plant when it comes online in 2010. See: www.psc.edu/science/2007/coal

The top image shows coal as it enters the upper region of the gasifier (purple). Minimal impact on the vertical flow pattern of the gas (grey streamlines) implies poor coal penetration into the gasifier, which can lead to lower conversion of coal to gas and elevated discharge of soot and carbon-dioxide. The lower graphic represents burner air entering the gasifier (purple) and the complex flow pattern (grey streamlines) it creates. Complex flow in this region is critical for sufficient mixing and to maximize contact between the gas and solid particles.

EDUCATION, OUTREACH & TRAINING

ENERGIZING SCIENCE LEARNING

WITH A QUARTET OF PROGRAMS IN SCIENCE EDUCATION, PSC GIVES THE PITTSBURGH REGION A JUMPSTART TOWARD A CYBER-SAVVY WORKFORCE

"It's one thing to read about it, and another thing entirely to see it happening," says Marian Opest, a biology teacher at Penn Hills High School, a suburb of Pittsburgh. What stirs her enthusiasm is CMIST (Computational Modules in Science Teaching), one of four programs in secondary science education that PSC has introduced to teachers and to science classrooms in the Pittsburgh region and beyond over the past four years.

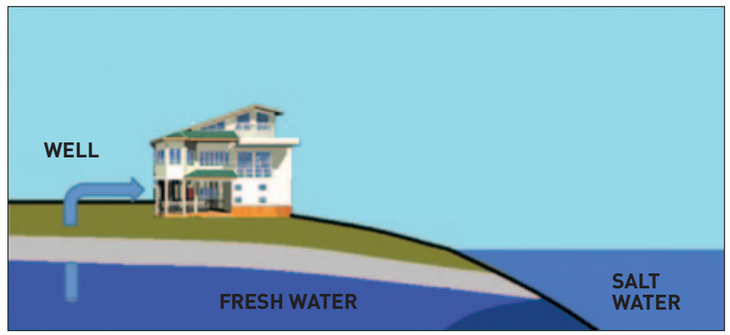
"It's the difference between reading a textbook and visually experiencing a topic such as diffusion or osmosis," says Pallavi Ishwad, education outreach specialist for the National Resource for Biomedical Supercomputing (NRBSC), PSC's biomedical program. A former high-school biology teacher herself, Ishwad has seen first-hand the difference that computational tools, such as vivid 3D animations produced by supercomputer simulations, can make in science learning.

"Introducing 'cool' technology into the classroom engages students," says PSC's director of outreach and education, Cheryl Begandy, "and increases their willingness to stay with subjects they may otherwise find too complicated or just uninteresting." For Begandy and Ishwad along with other PSC staff the goal is to help in re-imagining high-school science instruction so that it better attracts future scientists, engineers and educators. Ultimately the goal is to create the cyber-savvy workforce demanded by the 21st-century marketplace.

CAST

PSC's first venture into science education, Computation and Science for Teachers (CAST) has over the past three years introduced teachers to easy-to-use modeling and simulation tools. Based on ideas pioneered in the Maryland Virtual High School Project, the CAST approach to "computational thinking" can be incorporated in classroom use across the math science curriculum.

Over 40 teachers from southwestern Pennsylvania have participated in CAST's weeklong summer workshop followed by quarterly sessions throughout the school year. "We actually built the model of the water cycle," says CAST participant Jim Lear, physics teacher at Pittsburgh's Oakland Catholic High School. "It was really neat to see the variables change and the effect on the amount of water as vapor, liquid, and vapor precipitating back to liquid in our model."



SITUATION

Before you buy a home, you should always consider the location, drainage, and water resources. Consider the situation above. This is a beautiful house, near the beach in Louisiana. The property includes the well and an in-ground septic system. The closest property is a mile away and is an old gas station that closed in 1989. What are some of the concerns that you should investigate before you purchase?