

# Pacific Northwest National Laboratory

Operated by Battelle for the  
U.S. Department of Energy

## Building Pacific Northwest National Laboratory's Capability Replacement Laboratory



# World-Class National Laboratory for the 21st Century



Mike Kluse, Interim Laboratory Director of Pacific Northwest National Laboratory

Over the course of the past four decades, the campus of Pacific Northwest National Laboratory (PNNL) has expanded to reflect its broadening role in solving some of the nation's toughest challenges. What began as a single-program national laboratory serving the needs of the Hanford Site has now grown into a multi-program national laboratory serving the Department of Energy's missions in fundamental science, energy, national security and the environment.

The significant investments made by DOE and Battelle in PNNL have enabled the Laboratory to deliver truly outstanding science and technology, while earning a solid reputation for management and operations, and excellence in community stewardship.

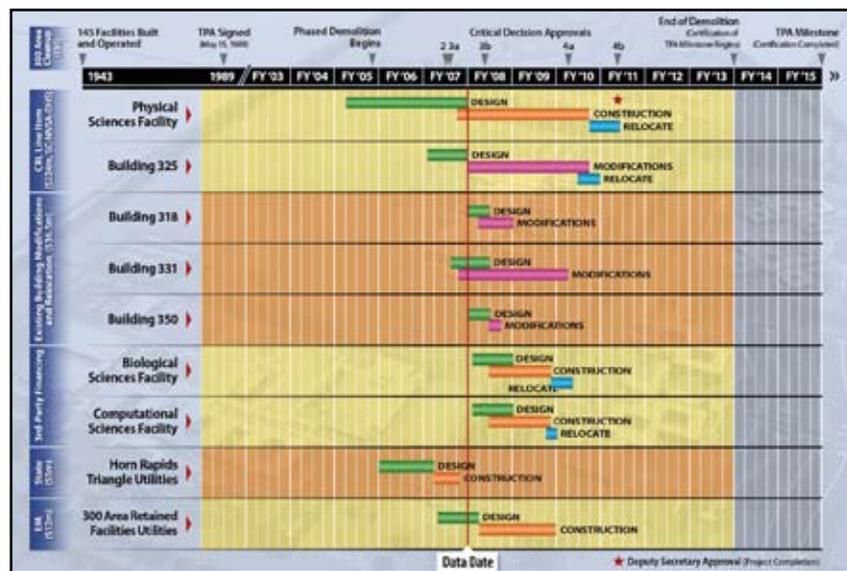
Looking to the future, PNNL is transforming its campus to accommodate a bold vision of becoming a world-leading national laboratory. Over the next six years, new facilities and equipment will make PNNL among the most modern laboratories in DOE's national laboratory system. The updated campus also will inspire innovative public and private research enterprises to locate in the science and technology park adjacent to us.

Sherwood Fawcett, PNNL's first director, said shortly after PNNL opened its doors, "We are moving into exciting and challenging times." Those same words ring true today.

Mike Kluse  
Interim Laboratory Director



"PNNL, as a key Department of Energy national laboratory, produces outstanding science and technology, and its contributions are vital to maintaining U.S. preeminence in science, technology and innovation, which depends on the continued availability of the most advanced scientific research facilities for our researchers." Mike Weis, Manager, Pacific Northwest Site Office, U.S. Department of Energy



PNNL's schedule for building the Capability Replacement Laboratory project.

## A Critical First Step

We plan to build our future campus in phases, beginning with the most critical step of replacing scientific capabilities housed in the 300 Area of DOE's nearby Hanford Site. These critical capabilities include most of the Laboratory's biology research; a significant portion of its chemistry; all its radiochemistry research; and unique capabilities in detection technology, radiation dose certification, environmental research and advanced energy materials. These capabilities support national and homeland security missions by detecting and preventing the proliferation of weapons of mass destruction, and detecting and assessing threats. They also are key to solving some of the nation's most pressing problems in energy production and the environment.

About one-third of PNNL's total campus footprint and nearly 50 percent of its experimental laboratory space are located in 300 Area facilities. The Laboratory has until 2011 to transition from some of the facilities it occupies. The entire 300 Area is slated to be cleaned to industrial use standards by 2012.

Nearly 1,000 employees out of PNNL's 4,100 workforce support work in the 300 Area and about a third, or \$200 million, of PNNL's \$765 million R&D activities are based in these buildings. The research includes programs for the DOE's Office Science (SC), which owns the Laboratory. Others who benefit from PNNL research include the National Nuclear Security Administration (NNSA), the Department of Homeland (DHS), and the intelligence community.



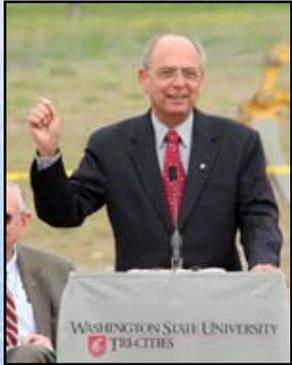
"The Capability Replacement Laboratory project will strengthen the Office of Science's capabilities at PNNL to deliver results from research programs in basic energy sciences, biological and environmental sciences, and computational science and contribute to the nation's research needs in energy security, national security, and environmental restoration." Dr. Raymond L. Orbach, Under Secretary of Energy for Science.



"Pacific Northwest National Laboratory does nonproliferation work for NNSA, and is 'quite important' to NNSA. I think that I am now the largest single customer of the lab..." Ambassador Linton Brooks, formerly with the National Nuclear Security Administration, House Armed Services Committee, Subcommittee on Strategic Forces, Hearing on the DOE FY 2005 Budget



World-renowned PNNL research capabilities located in the 300 Area of the Hanford Site support the U.S. government's missions in homeland and national security, energy, environment and basic research.



“The Lab is a valuable national asset and a foundation for the future of the Tri-Cities. Providing for a workable transition into new lab space will help ensure that PNNL is well positioned to be a growing force as we work to prepare our community for life after Hanford.”  
U.S. Rep. Doc Hastings

These programs range from national security to environmental research. To enhance national and global security, for example, PNNL scientists have developed two devices used to verify compliance with the Comprehensive Nuclear Test Ban Treaty by detecting the presence of radioactive materials from nuclear weapons testing. These monitoring devices are being stationed around the globe.

Researchers in the 300 Area also have designed an automated instrument for clients that allows fast and safe measurement of radioactive materials in aged nuclear waste stored in single- and double-shell underground storage tanks at Hanford.

Maintaining these capabilities is necessary to ensure that research critical to our nation continues. Building replacement facilities and extending the life of four facilities in the 300 Area require a multimillion-dollar investment by the government that will consolidate laboratories, reduce the overall campus footprint, and modernize laboratories and offices. The proposed funding profile for PNNL's new campus includes SC, NNSA, DHS and private developers.

## Joint Acquisition Strategy—Government and Private Industry

With the commitment and vision of SC and its partners in the project, NNSA and DHS, PNNL's funding is on target:

- In fiscal year 2004, \$1.6 million was made available to fund conceptual designs for PNNL facilities.
- In fiscal year 2005
  - \$10 million was made available to fund design activities for 300 Area replacement facilities. PNNL selected CUH2A, an architecture engineering and planning firm headquartered in Princeton, N.J., to develop conceptual designs.
  - \$2 million was allocated by DHS to assist with transition planning.



PNNL's Capability Replacement Laboratory project includes building three new facilities and retaining four facilities in the 300 Area of the Hanford Site.

- \$5 million was provided by the Washington State Legislature to the city of Richland to bring infrastructure improvements—water, sewer and power—to the Research Park at the north end of Richland, which includes PNNL and one of its proposed new facilities.
- In 2006, \$18 million was allocated to fund definitive designs for PNNL replacement facilities.
- In 2007, \$19.9 million was provided to continue work.

## Three New Facilities at PNNL by 2011

PNNL's Capability Replacement Laboratory project includes building three new facilities by 2011 to house staff, equipment and capabilities displaced from the 300 Area. The buildings include the Physical Sciences, Biological Sciences and Computational Sciences facilities. The future campus also includes building the joint Washington State University and PNNL Bioproducts, Sciences, and Engineering Laboratory. These facilities will be built using a mix of both public and private financing, an approach supported by DOE.

### Physical Sciences Facility

Some of PNNL's capabilities will be relocated to the 200,000-square-foot federally sponsored Physical Sciences Facility (PSF). The PSF will be located just north of PNNL's current campus. This state-of-the-art facility will house PNNL's radiological capabilities, which are important to the government's future missions in countering terrorism, and in addressing other national and homeland security challenges. The PSF will consist of three separate buildings—materials science and technology, radiation detection, and ultra-trace—as well as a large detector laboratory, a radiation portal monitoring test track, and a proposed conference center. The scientific research to be conducted in the PSF includes:

- Ultra-trace and low-level detection and characterization of radionuclides for detecting the proliferation of weapons of mass destruction.
- Materials science and technology for development of unique materials for advanced energy systems.
- Chemistry and processing for fundamental and interfacial radiochemistry, closing nuclear fuel cycles, and for programs in signatures and observables of nuclear proliferation.
- Radiation detection for uncovering weapons of mass destruction and



terrorist activities as well as for attribution in support of treaties and agreements.

The Physical Sciences Facility is a federally funded facility that will house PNNL's radiological capabilities.



"Investing in PNNL pays dividends for our state in jobs and economic development, and it pays dividends for our country in science and solutions. That's why I've been proud to fight for the funding we need to move forward." U.S. Senator Patty Murray during a visit to the Lab, December 2005



"The lab (PNNL) is going to continue to play a key role in federal research missions, and it is a key asset in the Tri-Cities innovation economy that will be the hallmark of this region for generations to come. It is a jewel for this community, this state and the Pacific Northwest." U.S. Senator Maria Cantwell, Fifth Annual IT Day, May 4, 2005



“Oregon’s collaboration with PNNL will prove a powerful asset in helping position the Pacific Northwest to compete successfully in markets worldwide, including emerging markets in new energy.” Oregon Gov. Ted Kulongoski, Bi-State Metropolitan Forum (Portland, Ore.), March 3, 2006



“PNNL performs important research for the Department of Homeland Security, including programs in nuclear detection, standards development and certification for radiological detection technologies, and information analytics. We recognize the unique and world-class research staff and facility capabilities at PNNL and appreciate the work performed for us.” James Johnson, Director, Office of National Laboratories, Science and Technology Directorate, Department of Homeland Security

## Biological Sciences Facility

The Biological Sciences Facility (BSF) will house some of PNNL’s replacement capabilities in system biology, microbial and cellular biology, soil remediation and analytical interfacial chemistry. These capabilities are crucial for research in bioenergy, environmental remediation and soil remediation. To be built by



Biological Sciences Facility

private developers, the 73,100-square-foot BSF will include biological laboratories and nuclear magnetic resonance laboratories for advanced genomic (genomes-to-life) research. Research in the BSF will focus on the discovery of biomarkers using advanced analytic technologies for environmental and human health applications. It also will include offices and conference rooms.

## Computational Sciences Facility

Once built, the 75,600-square-foot Computational Sciences Facility (CSF) will house replacement computing capabilities in information and visual analytics as well as high-performance computing for extracting knowledge from massive amounts of heterogeneous data. These world-renowned capabilities are critical for future DHS and other government missions, such as detecting terrorist activities, cyber security, critical infrastructure protection, high-performance computing and sensor analytics. The CSF, to be built by private developers, also will include computer labs, electronic and instrumentation labs, conferencing and symposium areas, and office space.



Computational Sciences Facility

## Bioproducts, Sciences, and Engineering Laboratory

PNNL’s future campus also will include the Bioproducts, Sciences, and Engineering Laboratory (BSEL). The national laboratory is teaming with Washington State University (WSU) on BSEL, which will be located south of PNNL on the WSU Tri-Cities campus. At BSEL, researchers will develop basic process technologies for cost-effective conversion of biomass into chemicals and fuels. These chemicals are used as components of industrial and consumer products, including biofuel, plastics, paints, non-toxic solvents, textile fibers, antifreeze, toothpaste and foods.

The \$24-million laboratory will provide badly needed educational space for WSU students and an opportunity for PNNL researchers and WSU faculty to collaborate on research projects. BSEL will house research and teaching labs, and a development laboratory in its 2,500-square-foot high-bay facility. Washington Governor Chris Gregoire added \$13.1 million in her capital budget to fund construction of BSEL, calling it one of the drivers in her plans for economic recovery in Washington state. The DOE's Office of Biomass Programs has invested significant capital at PNNL for equipment in bioresearch. This equipment will be transferred to BSEL once the facility is completed in 2008. The Office of Biomass Programs is part of DOE's Office of Energy Efficiency and Renewable Energy.



Bioproducts, Sciences, and Engineering Laboratory (third building from the left)

### 300 Area Facilities to be Maintained

Four of the facilities PNNL occupies in the 300 Area will be modified and retained for up to 20 years—Buildings 325, 331, 318 and 350. The Radiochemical Processing Laboratory (RPL), or Building 325, is a Category 2 non-reactor nuclear facility that will house shielded operations, radiation detection, materials science and technology, as well as radiochemistry and processing capabilities. The mission of the RPL is to create and implement innovative processes for environmental cleanup and the beneficial use of radioactive materials. This includes processes to advance the cleanup of radiological and hazardous wastes, the processing and disposal of nuclear fuels, and the production and delivery of medical isotopes. The federal government will fund upgrading this facility.



Researchers at PNNL conduct analytical research on nuclear materials using hot cells that shield the researcher from the radiation.

Building 331, the Life Sciences Laboratory Complex, will contain subsurface science and environmental biomarkers capabilities, which are key to understanding human health and microbial community ecology and metabolism. These capabilities further understanding of the impact of toxic metals and other compounds that have contaminated soil and groundwater as a result of legacy nuclear and enrichment activities. Within Building 318 will be PNNL's core capabilities in certification and dosimetry. The support services shop will continue to be housed in Building 350. The life extension of these facilities will be funded by PNNL.



"BSEL is one of the wisest investments we can make for the future of the Tri-Cities and for the entire state." Washington Gov. Chris Gregoire, Tri-City Herald



PNNL's former Laboratory Director Len Peters along with Washington Gov. Chris Gregoire (left) and Senator Maria Cantwell (right) at the groundbreaking for the Bioproducts, Sciences, and Engineering Laboratory.

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