

# Pacific Northwest National Laboratory

Advancing scientific discovery and delivering solutions for sustainable energy and national security



PNNL advances the frontiers of knowledge with distinctive strengths in chemistry, Earth sciences, biology, and data science. The Laboratory delivers solutions for sustainable energy, with an emphasis on decarbonization and energy storage; and for national security, especially in nuclear materials and threat analysis. In FY20, PNNL had **\$1.1B in expenditures** supporting DOE's mission and sponsors, notably DoD, DHS, the intelligence community, and NIH.

## CLEAN ENERGY: DEVELOPING AND DEPLOYING NEW TECHNOLOGIES

PNNL is a leader in **chemical catalysis** with an emphasis on understanding and manipulating catalytic processes at the molecular scale. This expertise is applied to develop clean energy alternatives, such as transportation fuels derived from waste carbon, and to deliver **energy storage** solutions for electric vehicles and the power grid. Two new facilities will accelerate progress in these areas: the *Energy Sciences Center* (SC) and the *Grid Storage Launchpad* (OE).

PNNL conducts applied research and development in **energy efficiency** for lighting, appliances, and buildings; and in marine power at PNNL's *Marine and Coastal Research Laboratory*. Additional research advances vehicle technologies, carbon capture, and nuclear power. PNNL is central to DOE's **grid modernization** initiative and Energy Storage Grand Challenge.

## CLIMATE CHANGE: UNDERSTANDING THE PLANET AND INFORMING POLICY

PNNL is DOE's leading **climate science** lab with strengths in atmospheric science, hydrology, subsurface science, and Earth system modeling across scales. PNNL manages **two user facilities** that support this research. The *Environmental Molecular Sciences Laboratory* hosts experts and instruments to explore key environmental and biological processes; and the *Atmospheric Radiation Measurement Climate Research Facility* manages fixed, mobile, and aerial platforms to collect **data on physical processes** that influence the atmosphere and climate. In addition, the *Joint Global Change Research Institute* (JGCRI) focuses on human-Earth system interactions and analyses, including the **socioeconomic impacts** of technologies and policies.

## BIOLOGY: EXPLORING THE MICROBIOME AND COMBATING COVID-19

PNNL's strengths in biology advance our understanding of the environmental **microbiome**, enable development of **bio-energy** products, improve human health, and support the nation's biodefense efforts. PNNL is using these capabilities to fight **COVID-19** via DOE's *National Virtual Biotechnology Laboratory* and to provide testing for its staff and continuity of operations.

## COMPUTING: ADVANCING MACHINE LEARNING AND CYBERSECURITY

PNNL is a recognized leader in data science and **machine learning** for scientific discovery, power grid operations, and national security. PNNL also is developing applications for DOE's Exascale Computing Project, partnering with industry on next-generation architectures, and participating in three quantum computing centers.

As one of the nation's leading labs in **cybersecurity**, PNNL conducts research for a variety of sponsors, including DHS and the intelligence community. PNNL leverages these capabilities to benefit DOE in two areas: the *Cybersecurity Risk and Information Sharing Program* (CRISP) to assist utilities with grid security; and the *Cooperative Protection Program* (CPP) to provide real-time cyber monitoring across the DOE enterprise.

### **NUCLEAR NONPROLIFERATION: SUPPORTING U.S. AND GLOBAL EFFORTS**

PNNL is the flagship lab in nuclear nonproliferation for NNSA and other government agencies. Programs range from research in radiation detection to the development and deployment of sensors to support U.S. and **international treaty monitoring** efforts. PNNL works in over 130 nations to secure nuclear and radiological materials, thwart their trafficking, and interrupt the illicit acquisition of sensitive technologies. PNNL experts also advise the U.S. government about the nuclear capabilities of various nations, including Iran and North Korea.

### **HANFORD CLEAN-UP: REDUCING RISK AND COST**

PNNL's technical expertise and detailed understanding of the Hanford Site has enabled EM and its contractors to reduce risks and **save hundreds of millions of dollars**. Current focus areas include real-time monitoring of vitrification waste flows, cost-effective alternatives to glass encapsulation, and modeling of contaminant fate and transport. The *Radiochemical Processing Laboratory*, a hazard Category II nuclear facility, provides essential support.

### **WORKFORCE: EMBRACING DIVERSITY AND PROMOTING STEM EDUCATION**

PNNL has 5,000 staff with expertise in most scientific and engineering disciplines, as well as in management and operations. They are among the most **highly cited researchers** in a variety of fields, including energy storage and climate science. Women and people of color compose nearly 40% and 25%, respectively, of the total workforce. PNNL has spear-headed several diversity, equity, and inclusion initiatives and is known for its **STEM outreach** and educational programs, including several focused on females and historically underserved populations.

### **ECONOMIC IMPACT: COMMERCIALIZING TECHNOLOGY**

On average, PNNL staff file one invention disclosure every business day and are granted two patents per week. PNNL licenses these **innovations to industry** to maximize the impact of taxpayer-funded research and development. One example is the millimeter-wave holographic technology used in more than 1,000 airport scanning systems around the world. In all, PNNL people or technologies have found their way into more than 150 companies.

### **ABOUT PNNL**

Pacific Northwest National Laboratory advances the frontiers of knowledge, taking on some of the world's greatest science and technology challenges. Distinctive strengths in chemistry, Earth sciences, biology, and data science are central to our scientific discovery mission. PNNL's research lays a foundation for innovations that advance sustainable energy through decarbonization and energy storage and enhance national security through nuclear materials and threat analyses.

### **CONTACT**

**Dr. Steven Ashby**, Laboratory Director  
(509) 375-4550 | [sfashby@pnnl.gov](mailto:sfashby@pnnl.gov) | [www.pnnl.gov](http://www.pnnl.gov)