

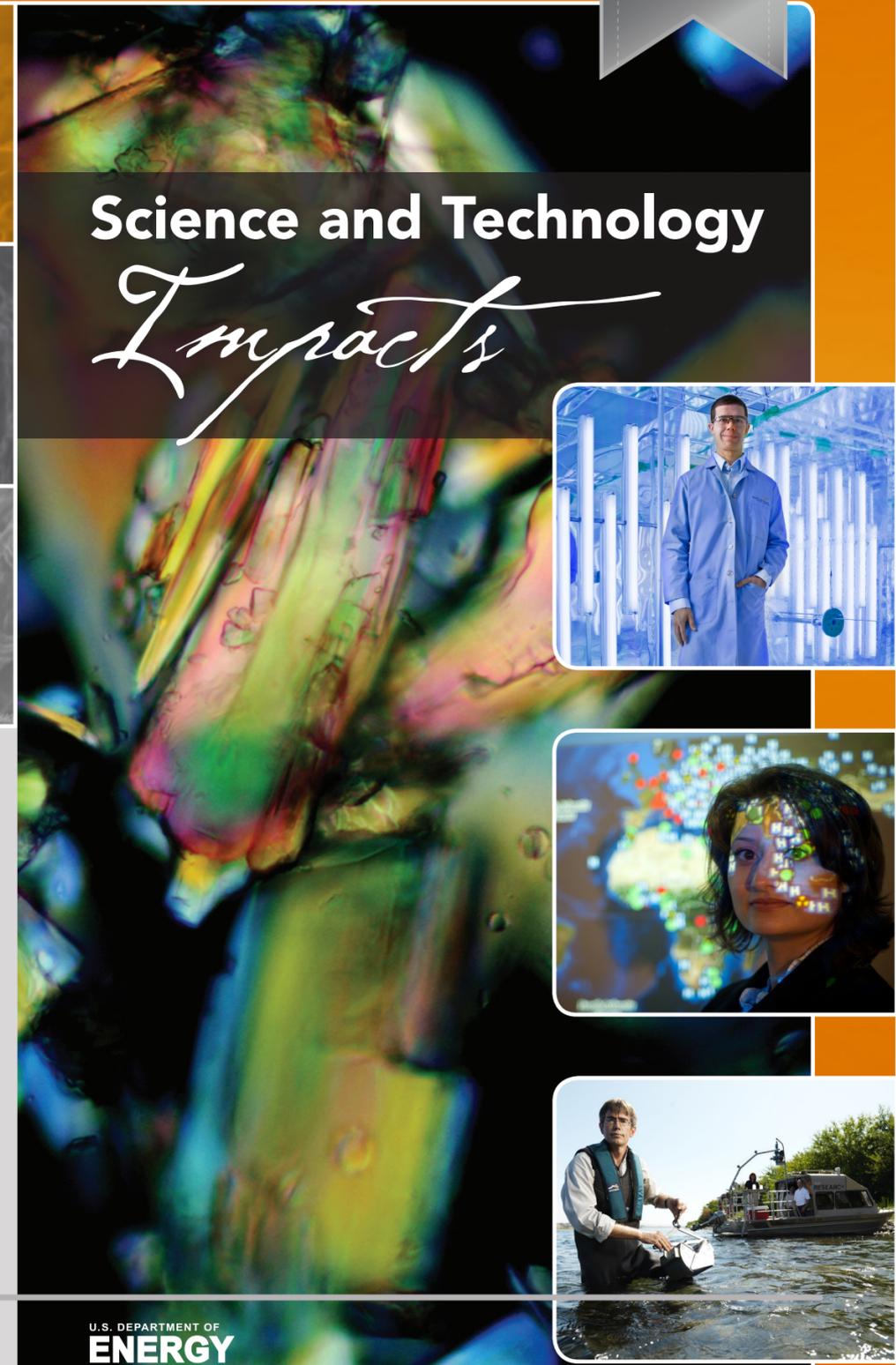
BY THE NUMBERS

FAST FACTS

- » **A national laboratory.** PNNL is a U.S. Department of Energy Office of Science laboratory. We are DOE's premier chemistry, environmental science, and data analytics national laboratory. We are home to EMSL, the Environmental Molecular Sciences Laboratory, and leader of ARM, the Atmospheric Radiation Measurement Climate Research Facility—two DOE facilities that are accessed annually by more than 1,900 scientists worldwide.
- » **Mission-focused leadership.** We support the national missions of DOE and other government sponsors. In particular, we provide national leadership in four areas: deepening the understanding of climate science, inventing the future power grid, preventing nuclear proliferation, and speeding environmental remediation.
- » **Innovations with impact.** Decades ago, our researchers pioneered the CD and DVD technology that revolutionized data storage. This legacy of invention continues. Our science and technology have led to the lean-burn diesel engine for the Dodge Ram truck, an isotope that targets cancer cells while sparing healthy tissue, and scanning systems used to identify threats at security checkpoints.



4,300 SCIENTISTS, ENGINEERS AND OTHER EXPERTS IN FY14	23 LICENSES OF INTELLECTUAL PROPERTY IN FY14	100+ R&D COLLABORATIONS WITH COMMERCIAL PARTNERS IN FY14
\$1.02B R&D EXPENDITURES IN FY 2014	~5,000 VISITORS TO PNNL IN FY14	170+ BUSINESSES WITH ROOTS IN PNNL AS OF FY14
1,900+ RESEARCHERS WORLDWIDE EVERY YEAR WHO USE DOE SCIENTIFIC FACILITIES MANAGED BY PNNL	93 R&D 100 AWARDS FOR INNOVATION SINCE 1969	1,150 TECH ASSISTANCE PROJECTS NATIONWIDE AS OF FY14



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Cover images: Identifying tiny amounts of nuclear materials in crystal forms can provide evidence in support of international nonproliferation treaties. • PNNL's atmospheric chamber simulates conditions that help researchers understand climate impacts. • Radiation detection systems worldwide are reducing the risk of threats across borders. • Science results help decisionmakers protect natural resources and accelerate environmental remediation.



PNNL's catalyst technology is the basis for Archer Daniels Midland's bio-based propylene glycol, which is used in many everyday products like de-icers.

Energy and Environment

Cleaner energy alternatives and advanced technologies are needed to reduce the nation's dependence on fossil fuels, expand the use of renewable resources, and increase energy efficiency. We're focused on improving end-use efficiency in transportation, buildings, and manufacturing; increasing the use of renewable fuels; and modernizing the power grid.

A greener, more reliable power grid. Renewable energy sources such as wind and solar are intermittent—generating power only when the wind blows and the sun shines. PNNL innovations in battery chemistry technology, sponsored by the DOE and industry, led to the first commercially viable redox flow battery for efficiently capturing, storing, and distributing this clean energy for a more reliable power grid. In 2014, Seattle-area UniEnergy Technologies launched its business based on this technology.

Plants instead of petroleum. The additive called propylene glycol is used in everything from de-icers to pharmaceuticals to cosmetics, but it is typically made with petroleum. Sponsored by the DOE and industry, PNNL scientists created the first-ever chemical catalyst that makes propylene glycol from renewable sources like plants. Archer Daniels Midland Company licensed the catalytic process from PNNL, and then built a production facility in Illinois that can produce 200 million pounds annually of this bio-based additive, creating 140 jobs in the process.



PNNL has played a key role in testing and deploying radiation portal monitors that help keep illicit nuclear materials from entering the United States.

Science

The more we understand how nature's most foundational processes work, the better we can use that knowledge to benefit people. Making new discoveries about the world around us, through fields like chemistry, physics, biology, computational science, and earth systems, is the starting point for technological progress that makes our lives better and keeps our nation economically vibrant.

Better information about our climate. Climate science is crucial for understanding how our planet is evolving, affecting conditions from snowpack levels to droughts. Pacific Northwest National Laboratory researchers lead in developing some of the world's most sophisticated climate models, funded by the U.S. Department of Energy and others. Combining these models with actual air and ground measurements, PNNL scientists are helping researchers worldwide to better understand and predict conditions that shape climate. The result: Leaders are making more informed decisions about water resources, agriculture, coastal communities, and city infrastructure protection.

More affordable biofuels. Developing affordable biofuels requires more cost-effective ways to extract sugars, a key ingredient in alternative fuels, from common plants like switchgrass. Working with partners at other DOE laboratories, PNNL researchers have created new techniques that put specialized microbes to work to boost sugar yields for fuel production. The microbes live in extreme heat environments that help to break down plant matter and make sugar extraction easier and cheaper.

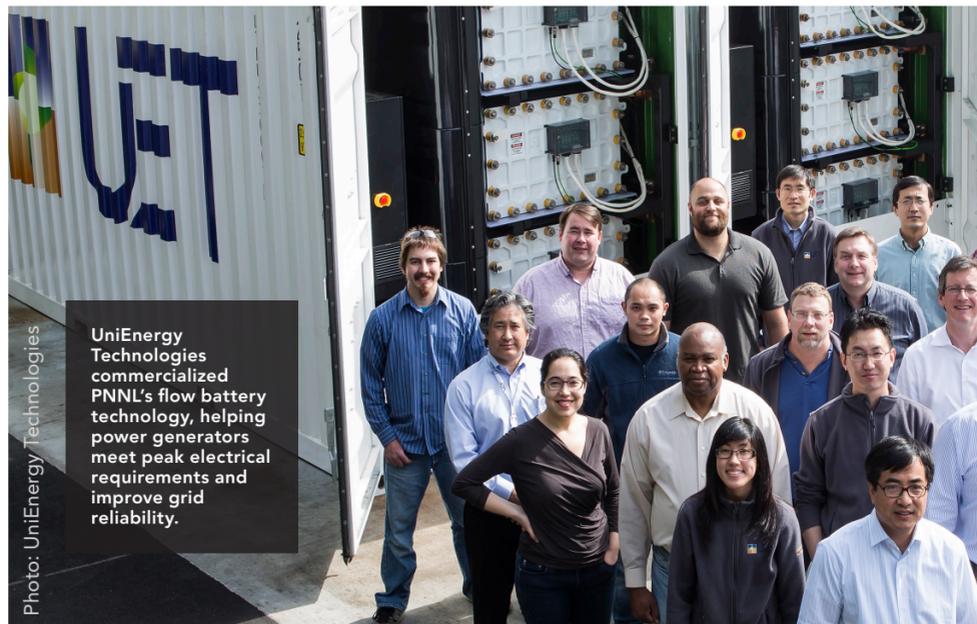


Photo: UniEnergy Technologies

UniEnergy Technologies commercialized PNNL's flow battery technology, helping power generators meet peak electrical requirements and improve grid reliability.

National Security

As security threats become more complex, technology must stay a leap ahead. Our ultra-sensitive nuclear detection instruments give international treaty verification authorities "eyes and ears" in 80 countries around the globe, as well as directly affecting U.S. policy on international treaties. Our staff also directly support international security programs in more than 100 countries, helping reduce threats across borders.

Safer borders. Since the terror attacks on 9/11, the U.S. Department of Homeland Security has been installing systems at U.S. borders that can detect radiation emanating from incoming threats such as nuclear devices and dirty bombs. PNNL has been helping DHS test and deploy these radiation detection systems for more than ten years.

Today, nearly 1,400 radiation portal monitors scan 100 percent of privately owned vehicles and cargo at U.S. land border crossings and 99 percent of all containerized cargo arriving in the U.S. by sea.

Defending against computer attacks. Computer networks are constantly under attack, but organizations may not know they've been compromised until it's too late. A software tool called CLIQUE is helping government and commercial analysts defend networks faster and more efficiently.

CLIQUE learns the normal traffic patterns on a particular network, then shows color-coded deviations that could indicate a threat. Analysts can drill down to see potential problems in specific machines, buildings, or sites.



With colored areas showing abnormal computer traffic, organizations can more quickly find potential threats hidden in millions of network transactions.

MEETING NATIONAL NEEDS FOR FIVE DECADES AND BEYOND



Carried out plutonium production and separation in support of World War II

1940s



Developed peaceful uses of nuclear fuels and materials

1950s



Invented optical digital recording, the basis for CDs and DVDs

1960s



Advanced the new science of holography, the foundation for today's passenger scanning in airports

1970s



Invented the first portable device for blood irradiation, to suppress transplant rejection

1980s



Became recognized for leadership in understanding climate change impacts

1990s



Deployed systems worldwide to detect illicit nuclear materials

2000s



Invented safer, higher-performing batteries for grid energy storage

2010s and beyond