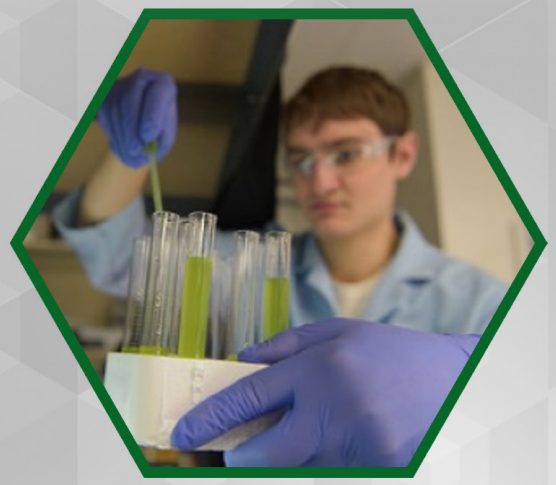
Pacific Northwest
NATIONAL LABORATORY

Proudly Operated by **Battelle** *Since 1965*

Innovative Solutions for a Sustainable World

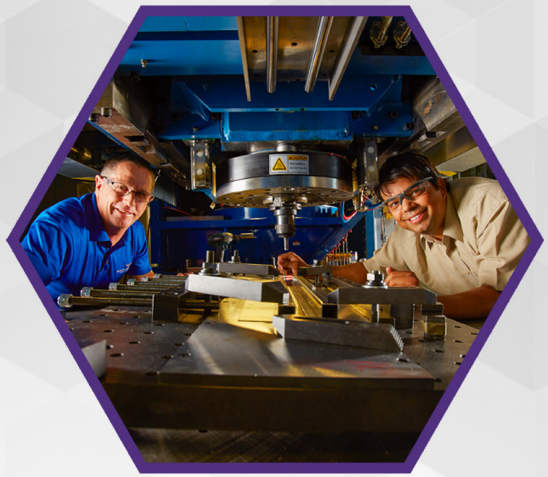
2017 SUSTAINABILITY REPORT

EXECUTIVE SUMMARY



ENVIRONMENTAL STEWARDSHIP

SOCIAL RESPONSIBILITY



ECONOMIC PROSPERITY

U.S. DEPARTMENT OF
ENERGY

PACIFIC NORTHWEST NATIONAL LABORATORY
operated by
BATTELLE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC05-76RL01830

Printed in the United States of America

Available to DOE and DOE contractors from the
Office of Scientific and Technical Information,
P.O. Box 62, Oak Ridge, TN 37831-0062;
ph: (865) 576-8401
fax: (865) 576-5728
email: reports@adonis.osti.gov

Available to the public from the National Technical Information Service
U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161
ph: (800) 553-6847
fax: (703) 605-6900
email: orders@ntis.fedworld.gov
online ordering: http://www.ntis.gov/ordering.htm

MESSAGE FROM THE DIRECTOR

For more than 50 years, the talented staff at the U.S. Department of Energy's (DOE) Pacific Northwest National Laboratory (PNNL) have advanced the frontiers of science, delivered technological innovation, and driven solutions to the marketplace. As the nation's premier chemistry, earth sciences, and data analytics Laboratory, PNNL is tackling some of our nation's most complex challenges in energy, the environment, and national security.

Fundamental to the science and technology outcomes that we deliver every day is our commitment to sustainability—a responsibility that we take seriously. Sustainability at PNNL encompasses environmental stewardship in our operations, as well as how the Laboratory demonstrates social responsibility and advances economic prosperity—all in a manner that delivers lasting benefit to our sponsors, community, and nation.

In fiscal year 2017 (FY17), PNNL's 4,400 scientists, engineers, and support professionals exemplified this commitment, garnering many awards across our sustainability focus areas, including:

- The 2017 DOE Sustainability Award for "Grassroots Outreach Drives Sustainable Culture," recognizing our multi-prong, staff-led approach to raising awareness and engagement in our sustainability efforts
- Seven prestigious R&D 100 Awards for leading-edge technology and innovation, including three with an environmental focus
- The Achieve Award from the Association of Washington Business for our work to advance STEM (science, technology, engineering, and math) education and a STEM-focused workforce

From innovative best practices in sustainable operations to environmentally focused scientific breakthroughs, PNNL is committed to making our world a better place to live for many generations to come. I invite you to read through this report to learn more about our accomplishments in FY17 that demonstrate PNNL's commitment to environmental, social, and economic responsibility.

Steven F. Ashby

Dr. Steven Ashby
Laboratory Director

INTRODUCTION

This executive summary of PNNL's FY17 Sustainability Report provides performance highlights across the environmental, social, and economic dimensions of our operations. The full report is available online at the website **http://sustainable.pnnl.gov**. PNNL uses an external standard for sustainability reporting to enable a balanced, transparent, and comparable representation of our organizational performance. Our performance assessment and reporting approach aligns with the Global Reporting Initiative (GRI) guidelines, which enable organizations of all types to disclose results in a similar way. The GRI provides an integrated view of the environmental, social, and economic impacts that are important to our stakeholders and PNNL's long-term success.

SUSTAINABILITY REPORT

See the full contents of our sustainability report at
http://sustainable.pnnl.gov

Much like a honeycomb with its interlocking pieces that gain strength through mutual support and integration—our three pillars and 12 focus areas create a sustainability program that is greater than the sum of its parts. This is ***our triple bottom line****.*

ABOUT PNNL

Located in Richland, Washington, PNNL is one of 17 DOE national laboratories and one of 10 overseen by DOE's Office of Science. Interdisciplinary teams at PNNL address many of America's most pressing issues in energy, the environment, and national security through advances in basic and applied science. In addition to work for DOE, PNNL conducts research for other government agencies including the U.S. Department of Defense and the National Institutes of Health, as well as private industry. At the end of FY17, PNNL had a team of approximately 4,490 people and had an annual budget of nearly $1 billion. PNNL has been managed for DOE by Ohio-based Battelle since the Laboratory's inception in 1965.

2017 SUSTAINABILITY SCORECARD

		FY16	FY17	
ENVIRONMENT	**Reducing building energy use and greenhouse gas (GHG) emissions**			
	• Reduce Scope 1 and 2 GHG emissions 50% from 2008-2025 after renewable electricity purchases (FY25 Target: 21,843 $MTCO_2e$)	12,609	35,764	
	• Reduce energy use intensity in buildings 25% from 2015-2025 (FY25 Target: 126 kBtu/ft^2)	2233	182	
	• At least 10% of electricity use from renewable sources	53%	30%	
	Traveling smarter			
	• Reduce petroleum-based fuel use in fleet vehicles 20% from 2005-2015 and maintain thereafter (FY17 Target: 31,060 GGE)	31,053	34,077	
	• Reduce fleet-wide per mile GHG emissions 30% from 2014-2025 (FY16 Target: 744 gCO_2e/mile)	738	778	
	• Reduce Scope 3 GHG emissions from employee transportation 25% from 2008-2025 (FY25 Target: 18,091 $MTCO_2e$)	22,804	23,215	
	Minimizing water use			
	• Reduce potable water use intensity 36% from 2007-2025 (FY25 Target: 45 gallons/ft^2)	24	16	
	• Reduce irrigation water use 30% from 2010-2025 (FY25 Target: 123M gallons)	167M	173M	
	Reducing material purchases and waste			
	• Divert at least 50% of sanitary waste from landfills	54%	60%	
SOCIAL	**Keeping employees healthy and safe**			
	• Total recordable case rate (TRCR) ≤ .65[1]	0.86	0.70	
	• Days away, restricted, or transferred target (DART)	0.42	0.33	
	Investing in our employees' professional development			
	• Average participant satisfaction rating from professional development programs ≥ 4.5/5	4.6	4.7	
	Creating an inclusive work environment			
	• No goal established			N/A
	Fostering the next generation of scientists and engineers			
	• Average participant rating of work-based learning programs ≥ 4.0/5	4.6	4.6	
ECONOMIC	**Transferring technology that makes a difference**			
	• Economic contribution to global economy from licensed technologies[2] (Target: $3,725K)	$130.0M	$3822K	
	Maintaining financial viability through research and operational excellence			
	• Sales targets: >$885M in 2016 and >$855.1M in 2017	$1,082.9M	$972.2M	
	• Business volume Operating budget targets: >$934M in 2016 and >$932.4M in 2017	$920.4M	$987.3M	
	Supporting small businesses			
	• Award at least 40% of procurement dollars to small businesses[3]	49.3%	43.7%	
	Giving back to our communities			
	• Philanthropic investments (No target)	$625,114	$643,677	N/A

1. PNNL evaluates safety culture behaviors and Laboratory-level initiatives in combination with TRCR/DART.
2. PNNL re-defined this metric to include the value of intellectual property revenue received during the fiscal reporting period without any developed for internal or external revenue sharing or expenses.
3. Target for supporting small businesses was adjusted from 50% to 40% in 2017.

did not meet target | risk of not meeting target | met or on track to meet target

FOSTERING GRASSROOTS SUSTAINABILITY CULTURE

At PNNL, we execute a multi-prong approach to promote our journey to excellence in environmental, social, and economic performance. FY17 was a landmark year in this effort: we received the **DOE Sustainability Award for "Grassroots Outreach Drives Sustainable Culture."** The award recognized that our staff-led outreach approach has driven noticeable culture change on our campus and contributed to the achievement of our water, energy, and waste diversion goals.

How do we do it? Our sustainability program has evolved over the years to comprise a diverse set of tools and tactics:

- **Campus planning**. We operate as a "living laboratory" with sustainable building construction, a comprehensive water management plan, effective use of our Building Operations Control Center to monitor energy usage, and numerous electrical vehicle charging stations.
- **Best practices**. We implemented single-stream recycling campus-wide, achieving an important step in sustaining and exceeding our waste diversion goal. This approach eliminates the need for users to sort their recyclables and optimizes bin placement.
- **Building Sustainability Champions**. In this peer-to-peer approach, staff volunteer to identify sustainability opportunities by engaging in conversations about conservation and recycling with their colleagues.
- **Sustainability Pay$**. We fund staff-generated projects with direct and measurable impact on PNNL's sustainability performance, particularly in energy and water conservation and waste minimization. Since 2013, the program has awarded more than $200,000 to staff-generated sustainability initiatives.
- **Sustainability reporting**. We communicate our success and opportunities through our annual report and external website, an annual site sustainability plan, and consistent communications with our employees, including our quarterly newsletter: "Second Nature."

LOOKING FORWARD

In FY18, we look forward to continuing to raise the visibility of our sustainability practices, improving our capabilities as a national laboratory, and expanding our partnerships. Planned activities include:

- Complete construction of Discovery Hall, a collaboration center on the PNNL campus designed to meet the High-Performance Sustainable Building Guiding Principles
- Complete High-Performance Sustainable Building certification on the 3860 Engineering Analysis Building
- Launch three joint institutes: with Washington State University (WSU) on nuclear science and engineering, with University of Washington (UW) on materials science, and with Oregon Health and Science University on precision medicine
- Continue to implement site water management plan opportunities for additional reductions
- Pursue funding for large, high-impact projects through the utility energy services contract with Bonneville Power Administration

ENVIRONMENTAL STEWARDSHIP

ENVIRONMENTAL STEWARDSHIP

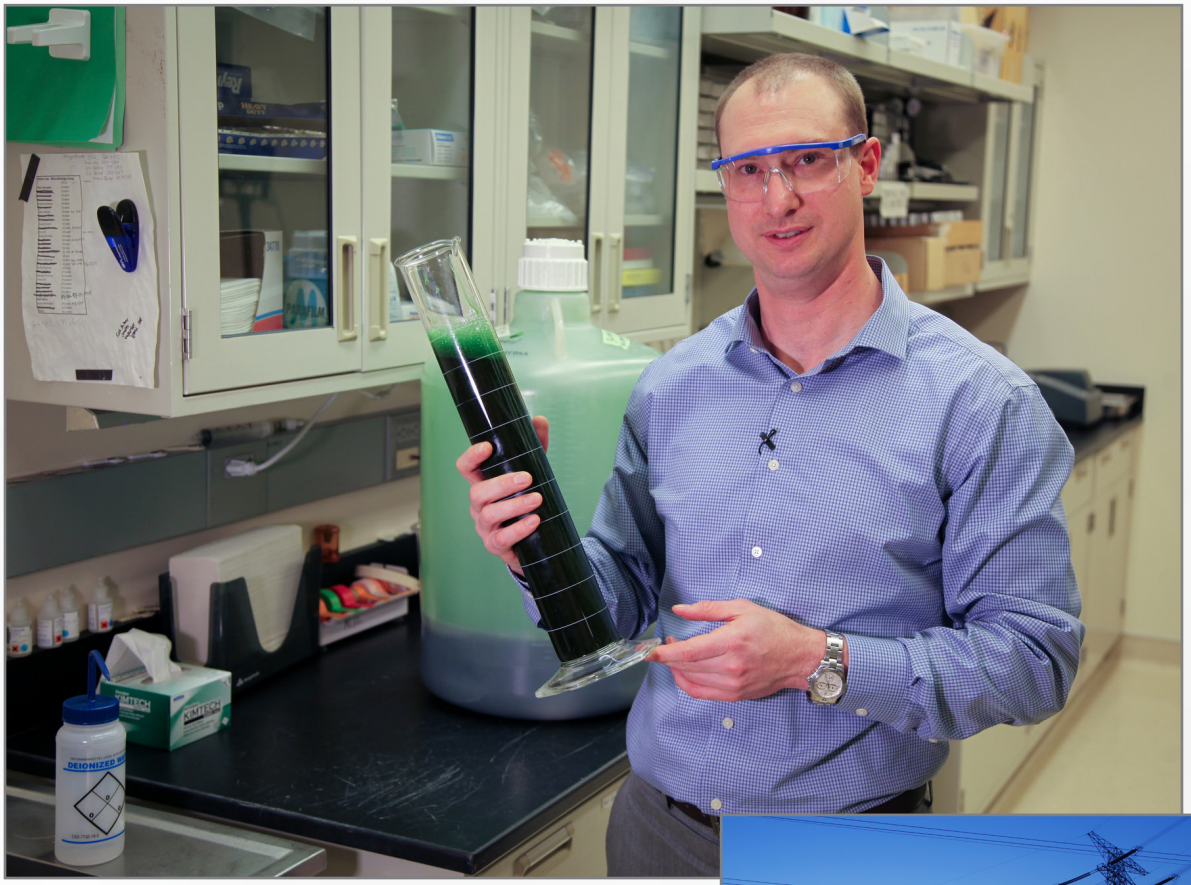
Don't waste waste. PNNL researchers created a continuous thermo-chemical process that produces useful biocrude from algae that can be upgraded to produce fuels such as gasoline, diesel, and jet fuel; however, it also produced a byproduct wastewater stream that included carbon and nutrients from the algae. A partnership with WSU established a means to convert that wastewater stream to a bio-based natural gas, ultimately enhancing the commercial viability of the process.

We are committed to protecting and using natural resources in wise and innovative ways to achieve aggressive reductions in building energy use, water, waste, and greenhouse gas emissions.

Photo credit: WSU Tri-Cities

Designing Sustainable Buildings. Our 3850 General Purpose Chemistry Laboratory received High Performance and Sustainable Building certification, using the Guiding Principles for Sustainable Construction. With the addition of this building, PNNL has over 60% of applicable buildings compliant with the Guiding Principles, far exceeding the 17% goal by 2025.

From moo to goo. PNNL researchers developed a new system to convert methane—an almost unavoidable byproduct of our lifestyle—into a deep green, energy-rich, gelatin-like substance that can be used as the basis for biofuels and other bioproducts, specialty chemicals—and even feed for cows that create the gas in the first place.



Enhancing grid resiliency. In FY17 DOE announced that up to $32 million dollars will go to seven projects—including five involving PNNL—aimed at creating more resilient distribution systems as part of the Department's Grid Modernization Initiative. PNNL will lead a team to demonstrate resilient and secure power distribution strategies that allow for more flexible distribution, as well as the integration of more distributed energy resources such as customer-owned solar production.

At a Glance

FLEET VEHICLE

Alternative fuel use

77%

of PNNL acquisitions during FY17 were alternative fuel vehicles

- 10.1% reduction in petroleum-based fuel consumption from FY05 baseline
- 1.4% increase in fleet-wide per-mile greenhouse gas emissions from FY14 baseline

ENERGY USE

8.5%

increase in building energy use intensity from FY15 baseline

30%

of annual electric consumption is renewable electric energy

SUSTAINABLE BUILDING DESIGN

64%

of existing buildings greater than 5,000 gross square feet are High Performance and Sustainable Buildings.

Scope 3 GHG emissions

3.8%

reduction in greenhouse gas (GHG) emissions related to building electricity usage, employee commute, and business travel from FY08 baseline.

WATER USE

77%

reduction in potable water use intensity from FY07 baseline

21%

increase in irrigation water use from FY10 baseline

WASTE DIVERSION

60%

nonhazardous solid waste diverted from landfills through recycling and composting

88%

construction and demolition material and debris diverted from landfills through recycling

Scope 1 & 2 GHG emissions

18%

reduction in GHG emission related to campus operations, including renewable energy credits from FY08 baseline

PAPER

95%

of uncoated paper purchased contains at least 30% post-consumer content

AWARD

PNNL received DOE's Sustainability Award for SustainABLE Culture.

ELECTRONIC STEWARDSHIP

93%

of eligible acquisition were Electronic Product Environmental Assessment Tool registered products

100%

of eligible PCs, laptops, and monitors have power management enabled

SOCIAL RESPONSIBILITY

SOCIAL RESPONSIBILITY

Engaging events. We hosted our traditional Computing Day and Take Our Kids to Work Day, as well as other events such as hackathons to raise awareness of data science and cybersecurity, SciTech Northwest to share our S&T with industry partners and academic institutions, and Curiosity Day to engage today's youth visiting Seattle's Pacific Science Center.

Our employees have a passion for service and recognize the need to train the next generation of scientists and engineers.

Award-winning STEM Outreach

PNNL received the 2017 Achieve Award from the Association of Washington Business for our work in STEM education. The award recognizes businesses who have excelled in creating, implementing, or supporting high-caliber education and/or workforce development systems aligned with closing the employment gap.

We are fostering a regional alliance to accelerate innovation and commercialization of Northwest R&D, spanning from PNNL to the universities and national laboratories with which we partner.

Diversity and inclusion. At PNNL, we want to be a reflection of the world around us. We take deliberate and purposeful steps to incorporate diversity and inclusion into our current and future workforce planning. We strive to attract, hire, and retain more diverse talent into our workforce. In FY17, our outreach spanned our organization and our campuses. Several of our teams hosted internal roundtables and other forums to invite staff member feedback and foster open conversation. We also announced the launch of Laboratory-level employee resource groups, which are employee-led, lab-supported resources for fostering inclusive work environments. Additionally, Prism, PNNL's network for LGBTQ staff and allies, hosted a number of events for Pride Month and throughout the year to support diversity and inclusion.

Thriving collaborations. Our academic collaborations flourished with 68 joint appointments with 21 universities. We also selected our first cohort of 12 doctoral candidates to participate in the PNNL-WSU Distinguished Graduate Research Program. The program will put the students to work in the lab to gain valuable and relevant research experience.

At a Glance

VOLUNTEER HOURS

> 42,170 hours

for 52 local organizations

team battelle

AWARDS

PNNL received **DOE's Sustainability Award** for SustainABLE Culture

AWARD OF SustainABLE Culture AWARD OF

STEM EDUCATION

2017 Achieve Award from the Association of Washington Business for our work in STEM education

TELEWORKING

7.9%
average teleworkers weekly

86,785
total days teleworked

BIKE ANYWHERE

67 PNNL staff members participated in the 5th Annual Federal Bike Challenge during May 2017

14,581
miles logged

Earned **fifth place** among other participating federal agencies

EMPLOYEE SATISFACTION

4.7/5

average participant satisfaction rating from professional development program

OUTREACH

550
kids learned about the amazing science during the lab's annual Take Our Kids to Work Day

70
students from the Pasco School District and **60 PNNL volunteers** participated in Computer Science Education Week

2017 SUMMER WELLNESS CHALLENGE

8.5M total exercise points logged

814 participants and **74** teams

307 participants received the challenge prize

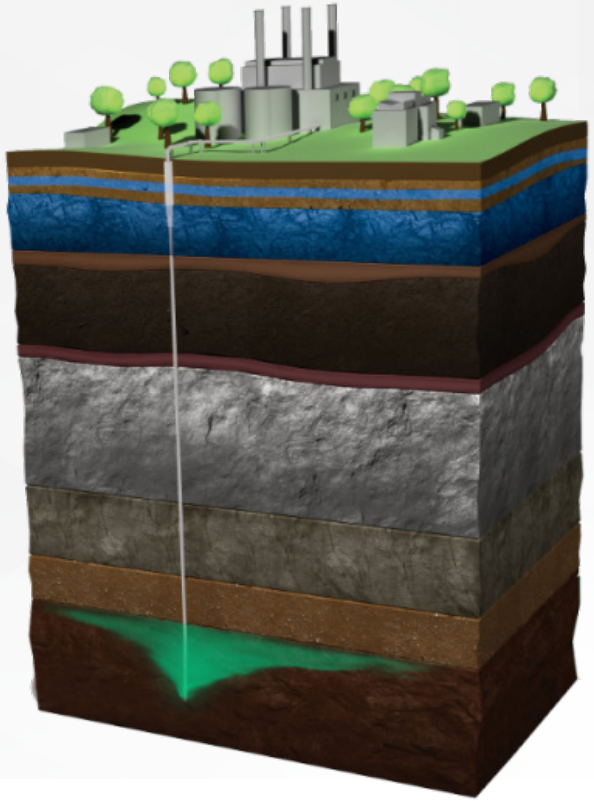
ECONOMIC PROSPERITY

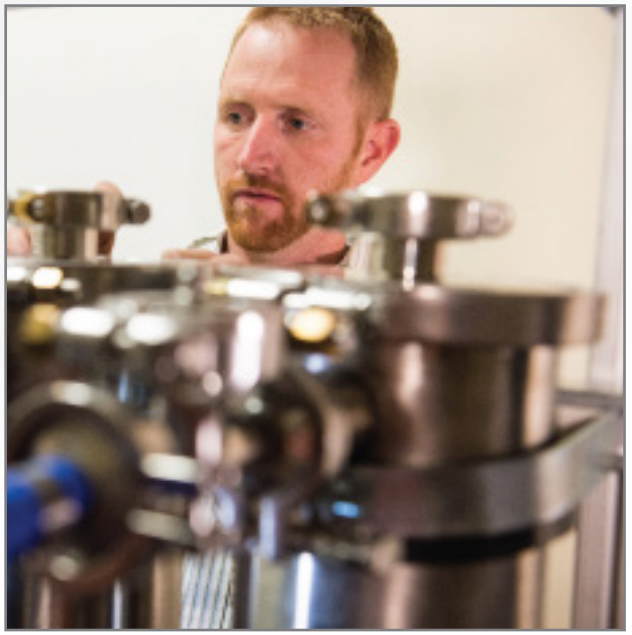
ECONOMIC PROSPERITY

Award-winning S&T. Three of seven PNNL projects that R&D Magazine recognized among this year's top 100 innovative scientific breakthroughs highlight environmentally and cost-effective solutions:

- MARCool, which stands for Multibed Adsorption Recuperative Cooling, offers a new class of solid-state cooling technology that operates on wasted heat from power sources. It could lead to significant energy and cost savings in homes, buildings, cars, trucks, and industrial processes.
- The Friction Stir Scribe Process makes it possible to join materials with drastically different melting points in a continuous, linear, or curved manner, allowing manufacturers to incorporate new and different materials into a variety of strong, lightweight parts.
- The National Risk Assessment Partnership (or NRAP) Toolset is the first complete suite of computer software that models possible environmental risks from potential storage sites, such as fluid leakage and earthquakes.

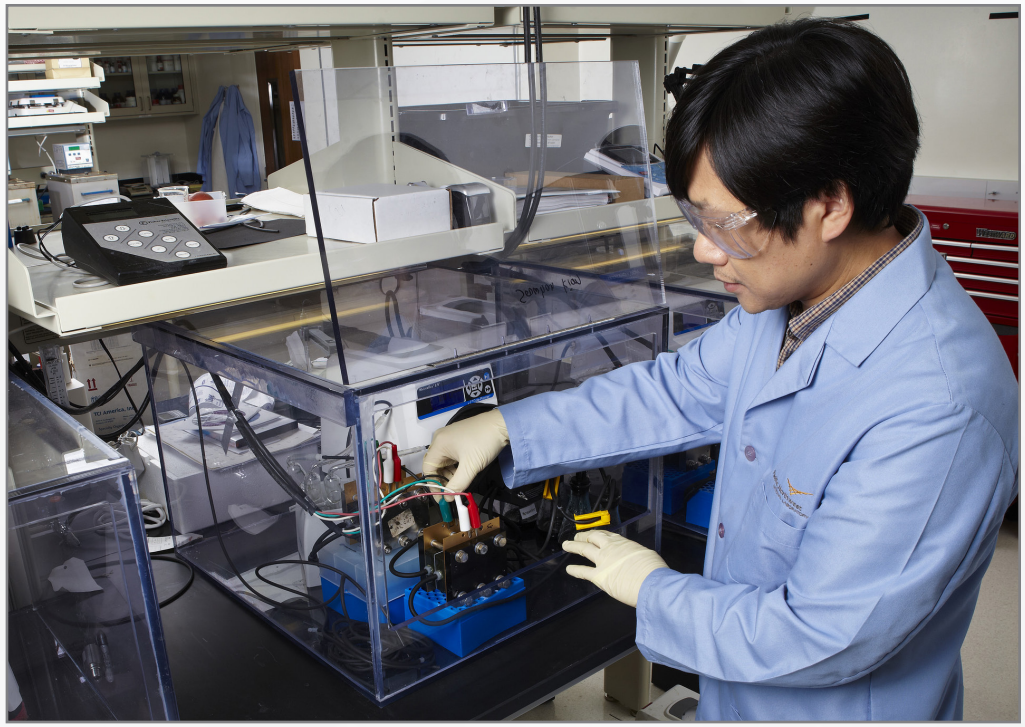
We recognize that sustainable solutions rely on sustainable investments, partnerships, and opportunities.





Enabling small businesses. Through DOE's Small Business Vouchers Program three small businesses were selected to collaborate with our researchers to address technical challenges concerning bio-coal, hydrogen for fuel cell cars, and nanomaterial manufacturing.

Commercializing technology. DOE awarded PNNL nearly $1.5 million to bring six technologies—that do everything from protect fish to monitor the health of flow batteries—closer to commercial use. The projects will receive funding from DOE's Office of Technology Transitions Technology Commercialization Fund to further develop and improve their potential use in commercial products or services.



Finding efficiencies at PNNL. The DOE Pacific Northwest Site Office solicited Bonneville Power Administration (BPA) to provide a customized Utility Services Contract program. BPA will provide outside energy management services to perform energy and water evaluations, recommend energy/water conservation measures, and BPA will also provide funding by way of low-interest loans and incentives for these projects within PNNL buildings.

Award-winning supply chain. PNNL received Bechtel's Nuclear, Security & Environmental Large Business Subcontractor 2016 Supply Chain Recognition Program Award, highlighting our 16-year collaboration and support to Hanford's Vit Plant.

At a Glance

ECONOMIC DEVELOPMENT

$987M R&D expenditures

4,490 scientists, engineers and non-technical staff

STAFF-GENERATED IDEAS

$200K

awarded to staff-generated ideas since 2013

PROCUREMENT OF GOODS AND SERVICES

$313 million

COMMUNITY INVESTMENTS

$27M since 1965

$400,000 philanthropic for FY17

PENSION PLAN

$1.2B value of pension plan liabilities

LOCALLY OWNED

13.4% portion of spending on local suppliers

SMALL BUSINESS PROCUREMENT

43.7% to Small Businesses

Goals is **40%**

R&D 100 AWARDS

7 in FY17 **107** since 1969

TECHNOLOGY TRANSFER

Federal Laboratory Consortium Awards

2 in FY17 **85** since 1984

PUBLISHING SCIENCE FOR THE PUBLIC GOOD

1,127 peer-reviewed published articles

Visit us online at
http://sustainable.pnnl.gov
or
e-mail sustainability@pnnl.gov
for more information.

PNNL-27305