



**Pacific Northwest**  
NATIONAL LABORATORY

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



# Innovative Solutions for a Sustainable World

## 2015 SUSTAINABILITY REPORT

### EXECUTIVE SUMMARY

ENVIRONMENTAL STEWARDSHIP | SOCIAL RESPONSIBILITY | ECONOMIC PROSPERITY

U.S. DEPARTMENT OF  
**ENERGY**

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## MESSAGE FROM THE DIRECTOR

For more than 50 years, the Department of Energy's (DOE) Pacific Northwest National Laboratory (PNNL) has advanced the frontiers of science and technology through courageous discovery and innovation. Our fundamental scientific endeavors enhance our understanding of the world around us—and our applied research and development activities help to create a safer, more secure, and sustainable future.

With respect to sustainability, PNNL is committed to continuously improving our triple-bottom-line of **environmental**, **social**, and **economic** responsibility. Across all levels of our organization, we strive to be good stewards of our resources and to share our approach with stakeholders through upfront planning and open communication of our goals and performance.

Our multidisciplinary team of more than 4,400 scientists, engineers, and support professionals is tackling global sustainability challenges in our science, energy, environmental, and security missions. For example, our research on how human and natural systems interact is critical to informing sustainable solutions to the nation's energy and environmental challenges.

PNNL is equally committed to sustainability right here at home, and I am pleased to report that we are making excellent progress toward the goals described in this report. We also work on ongoing challenges, such as reducing the energy required to meet our research mission and promoting conservation among our employees.

Among the highlights in FY2015 was the opening of the new Systems Engineering Building. This LEED Gold-certified facility houses power grid control rooms, testing platforms, and a number of laboratories to address a broad range of energy challenges. It also has a building operations control center to monitor and optimize energy usage on PNNL's campus and to test new buildings control strategies that increase energy efficiency while reducing strain on the grid.

Looking forward, we will pursue aggressive goals to ensure the economic, environmental, and social dimensions of our efforts deliver value to our community and the nation. As a leading research institution, we aim to enhance global sustainability through our commitment to sustainable operations and the investment we make in our staff, facilities, and equipment in order to position PNNL and our region for long-term prosperity.

*Steven F. Ashby*

Dr. Steven Ashby  
Laboratory Director

### HIGHLIGHTS

#### ENVIRONMENTAL

*PNNL climate impacts scientists and Facilities & Operations professionals joined forces to put our research and practical experience with climate resilience planning to work on our own campus.*

#### SOCIAL

*Through our more than 1,000 interns, fellows, and research associates, we are fostering the next generation of science, technology, engineering, and math (STEM) problem solvers as well as developing a STEM-literate community for years to come.*

#### ECONOMIC

*Within our operating budget of approximately \$1 billion, we exceeded our goals to support small and socio-economically disadvantaged businesses with our procurement spending.*

# INTRODUCTION

This executive summary of PNNL’s FY2015 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>. The web site also features our annual Site Sustainability Plan, detailed priorities and performance goals, news about PNNL’s sustainability practices, and resources for reducing environmental impacts at work.

PNNL recognizes the value of using an external standard for sustainability reporting to enable a balanced, transparent, and comparable representation of our organizational performance toward the goal of sustainable development. 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/report/gri\\_index.stm](http://sustainable.pnnl.gov/report/gri_index.stm)













*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. We manage a large campus with approximately 80 facilities. At the end of FY2015, PNNL employed approximately 4,400 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.

# 2015 SUSTAINABILITY SCORECARD

		2014	2015	
<b>ENVIRONMENT</b>	 <b>Reducing building energy use and greenhouse gas (GHG) emissions</b>			
	<ul style="list-style-type: none"> <li>Reduce Scope 1 and 2 GHG emissions 50% from 2008-2025<sup>1</sup> (Target: 21,843 MTCO<sub>2</sub>e)</li> </ul>	18,030	10,067	
	<ul style="list-style-type: none"> <li>Reduce energy use intensity in buildings 30% from 2003-2015 (Target: 150 kBtu/ft<sup>2</sup>) and 25% from 2015-2025 (Target: 126 kBtu/ft<sup>2</sup>)</li> </ul>	182	167	
	<ul style="list-style-type: none"> <li>At least 7.5% of electricity use from renewable sources<sup>1</sup></li> </ul>	50%	53%	
	 <b>Traveling smarter</b>			
	<ul style="list-style-type: none"> <li>Reduce petroleum-based fuel use in fleet vehicles 20% from 2005-2015 and maintain thereafter (Target: 31,059 GGE)</li> <li>Reduce fleet-wide per mile GHG emissions 30% from 2014-2025 (Target: 468 gCO<sub>2</sub>e/mile)</li> <li>Reduce Scope 3 GHG emissions from employee transportation 25% from 2008-2025 (Target: 18,091 MTCO<sub>2</sub>e)</li> </ul>	31,836	28,988	
		668	709	
		21,463	21,190	
 <b>Minimizing water use</b>				
<ul style="list-style-type: none"> <li>Reduce potable water use intensity 16% from 2007-2015 and 36% by 2025 (Targets: 59 and 45 gallons/ft<sup>2</sup>)</li> <li>Reduce irrigation water use 30% from 2010-2025 (Target: 123M gallons)</li> </ul>	26	23		
		184M	168M	
 <b>Reducing material purchases and waste</b>				
<ul style="list-style-type: none"> <li>Divert at least 50% of sanitary waste from landfills</li> </ul>	54%	54%		
<b>SOCIAL</b>	 <b>Keeping employees healthy and safe</b>			
	<ul style="list-style-type: none"> <li>Total recordable case rate ≤ .65<sup>2</sup></li> <li>Days away, restricted, or transferred rate ≤ .25<sup>2</sup></li> </ul>	0.87	0.86	
		0.22	0.46	
	 <b>Investing in our employees' professional development</b>			
	<ul style="list-style-type: none"> <li>Average participant satisfaction rating from professional development programs ≥ 4.5/5</li> </ul>	4.7	4.6	
 <b>Creating an inclusive work environment</b>				
<ul style="list-style-type: none"> <li>No goal established</li> </ul>			N/A	
 <b>Fostering the next generation of scientists and engineers</b>				
<ul style="list-style-type: none"> <li>Average participant rating of work-based learning programs ≥ 4.0/5</li> </ul>	4.6	4.7		
<b>ECONOMIC</b>	 <b>Transferring technology that makes a difference</b>			
	<ul style="list-style-type: none"> <li>Economic contribution to global economy from licensed technologies (Target: Minimum=\$50M, Stretch=\$100M)</li> </ul>	\$97.3M	\$108.7M	
	 <b>Maintaining financial viability through research and operational excellence</b>			
	<ul style="list-style-type: none"> <li>Sales targets: &gt;\$812M in 2015 and &gt;\$885M in 2016</li> <li>Operating budget targets: &gt;\$931M in 2015 and &gt;\$934M in 2016</li> </ul>	\$938M	\$918.5M	
		\$1,020M	\$955.1M	
 <b>Supporting small businesses</b>				
<ul style="list-style-type: none"> <li>Award at least 50% of procurement dollars to small businesses</li> </ul>	57%	57%		
 <b>Giving back to our communities</b>				
<ul style="list-style-type: none"> <li>Philanthropic investments (No target)<sup>3</sup></li> </ul>	\$634,383	\$621,740	N/A	

1. Purchased renewable energy certificates are used to reduce our Scope 2 GHG emissions and are applied toward renewable energy goals. This is consistent with federal rules for energy and GHG reporting. Emissions for 2015 were incorrectly reported as zero and updated on 4/11/16.  
 2. Reported per 200,000 employee hours worked.  
 3. Philanthropic investments are distributed by a committee of employees from Battelle's Pacific Northwest Division.

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

## AWARD-WINNING TECHNOLOGIES

In its annual R&D 100 awards, *R&D Magazine* honored five advancements developed by PNNL researchers, including a few that are providing the nation with more sustainable, resilient energy sources.

### Power Model Integrator

Energy forecasters working for utilities and other power organizations currently rely on a combination of personal experience, historical data, and their own preferred forecasting model. Each model tends to excel at capturing certain grid behaviors, but not necessarily the whole picture. The Power Model Integrator is a new forecasting tool that delivers up to a 50% increase in accuracy and the potential to save millions of dollars in wasted energy costs.



*PNNL's Power Grid Integrator has demonstrated up to a 50% improvement in forecasting future electricity needs over several commonly used tools.*

### Hydrothermal Processing

A new chemical processing system can convert natural substances as diverse as waste treatment sludge, food scraps, and algae into a variety of useful fuels. The system is remarkably efficient, in many cases converting 99% of a feedstock like algae into fuels, including biocrude oil, which can then be refined into aviation fuel, gasoline, and diesel fuel.

The process also produces another fuel — methane gas — as well as clean water and useful plant nutrients such as nitrogen, phosphorous, and potassium.



*A new hydrothermal process uses heat and pressure to chemically and physically change algae into biocrude in a matter of minutes.*

## A LIVING LABORATORY

At PNNL, we use our campus as a “living laboratory” by applying our own scientific discoveries and innovations, as well as sustainability best practices, to our own operations. Our multidisciplinary teams tackle complex scientific and technological challenges related to energy, environment, and national security, and transfer that knowledge and technology to industries worldwide.

### Climate Change Resilience Planning

In 2015, PNNL climate impacts scientists and Facilities & Operations professionals joined forces to put our research and practical experience with resilience planning to work right at home. A cross-cutting team of 15 internal stakeholders assessed PNNL’s vulnerability to climate impacts and developed the PNNL Climate Resilience Action Plan. The Plan describes current and planned actions to build PNNL’s resilience to future climate exposures. Learn more at <http://sustainable.pnnl.gov/climate-resilience/>.



The Climate Resilience Action Plan assesses climate exposures with potential to impact PNNL operations.

## The Power Grid of the Future

We are leading a national effort that will transform our nation’s electric grid in support of a cleaner, more energy-efficient economy. The recently opened Systems Engineering Building (SEB) features a suite of capabilities to enable researchers and industry to collaboratively tackle the nation’s top challenges in grid modernization, buildings efficiency, and renewable energy integration. The LEED Gold-certified facility houses power grid and buildings control rooms, testing platforms, and a number of laboratories to address a broad range of energy challenges. The facility also features the latest in industry software and real-time grid data with access to advanced computational capabilities that allow researchers to design, test, and evaluate tools and concepts in a setting that mirrors current industry conditions. This includes PNNL’s own **VOLTRON™** technology, which enables appliances and other devices to communicate among each other to prioritize power needs and deliver electricity accordingly. The technology is open source and publicly available, an approach PNNL pursues whenever possible as a means to speed development and industry adoption. To learn more, visit <http://systemsengineeringbuilding.pnnl.gov/>.



The new SEB provides a state-of-the-art facility for energy research and collaboration with industry and others.

# Challenging ourselves as we look forward

## CONTINUOUS IMPROVEMENT

We challenge ourselves to set priorities and continually improve performance for the benefit of our employees, our organization, and our community. Looking forward, we have several activities planned to continue to improve our sustainability performance across our 12 focus areas.

### Safety

A primary opportunity for operational performance improvement is keeping our employees healthy and safe. We exceeded our minimum targets for the number of incidents and days away from work in FY2015. This was due principally to overexertion, strain, or repetitive trauma associated with low-risk activities. The laboratory continues to emphasize wellness and stretching activities as a preventative measure. In addition, PNNL has subcontracted an ergonomist to evaluate high-risk



work groups to identify opportunities to reduce the risk of musculoskeletal disorders.

### Energy

Our greatest environmental challenge lies in reducing building energy intensity. Our research mission requires unique facilities and operational requirements, and fulfilling these evolving requirements in recent years has led to increases in our overall energy use intensity. For example, in two of our most energy-intensive laboratory facilities we have increased fume hood density, lower chilled water temperatures to de-humidify laboratory air for research needs, and increased fume hood exhaust rates to enable safer handling of acids. We remain committed to constructing and operating buildings that meet the Federal government's Guiding Principles for High Performance and Sustainable Buildings. To improve our building operations, we are fully implementing a continuous commissioning process beginning in FY2016. Continuous commissioning is enabled by our investments in advanced building meters, a cloud-based building data management platform, diagnostic tools, and a more robust preventative maintenance program. With real-time monitoring and analysis of building systems data, we will be able to make better and quicker decisions to reduce energy use and maintenance costs, and extend equipment life in facilities.



*Rendering of PNNL's new 16,000-square-foot general-purpose chemistry facility, which is being constructed to meet federal Guiding Principles for High Performance and Sustainable Buildings.*



## LOOKING FORWARD

### Activities planned for FY2016

- Initiate an assessment of actions to work toward new Executive Order 13693 goals for net zero buildings.
- Update the site Water Management Plan to identify new opportunities for water savings.
- Commission and safely move staff into the new general purpose chemistry laboratory, a building that meets the Guiding Principles for High Performance and Sustainable Buildings.
- Leverage the success of the *Rock the Watt* energy conservation campaign in 2015 to engage building-level advocates in sustainability throughout the year.
- Update the PNNL Sustainability website to provide a central source of information on actions staff members can take to **green** their laboratory operations, workspace, and commute.
- Designate an alternative commute coordinator to educate and promote alternative commute options to PNNL employees, including biking, public transit, and carpooling.



*Looking forward, we will continue to integrate best practices for sustainable buildings into the day-to-day operations of our campus.*

# ENVIRONMENTAL STEWARDSHIP

## Changing Behavior with "Rock the Watt" |

The PNNL Sustainability Program led a successful 3-month campaign to foster energy conservation behavior in offices and laboratories. The campaign was designed with behavioral science principles in mind and served as a useful pilot for our own research on behavior change for sustainability. Key aspects of the campaign were using 14 building-level sustainability champions to engage with occupants and emphasizing personal outreach over electronic communications, when possible. More than 200 actions were reported in those 14 buildings with estimated annualized savings of nearly 120,000 kWh. The success of the campaign has us looking for ways to engage the building sustainability champions year-round.



# At a Glance



## FLEET VEHICLES

Petroleum-based fuel use

**25%**

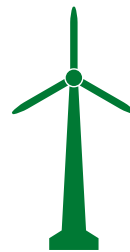
reduction from FY2005 baseline



- ▶ 19% of total fuel purchases are E85
- ▶ 50% of light-duty vehicle acquisitions were alternative fuel vehicles



## ENERGY USE



**22%**

reduction in building energy use intensity since 2003

**53%**

of electricity purchases from renewable sources

## SUSTAINABLE BUILDING DESIGN

**36%**

of portfolio meets the Guiding Principles for High Performance and Sustainable Buildings or equivalent certification methods (Leadership in Energy and Environment Design, or LEED) permitted by the DOE

## WASTE DIVERSION



*nonhazardous solid waste diverted from landfills through recycling and composting*



## WATER

**67%** reduction in building water use intensity from FY2007 baseline



## SCOPE 3 EMISSIONS

**13%**

reduction from the FY2008 baseline

## ALTERNATIVE COMMUTING

**90+**

employees logged **20,160 miles** in May's National Bike to Work Challenge, nearly doubling last year's participation



## PAPER

**97%**

paper purchased with 30% or more recycled content (Target: 100%)



# SOCIAL RESPONSIBILITY

The image shows the exterior of Delta High School. The building features a prominent corner made of grey stone blocks. On this corner, a sign reads "DELTA HIGH SCHOOL" and "5801 BROADMOOR" in white, sans-serif capital letters. To the right of the stone corner is a large glass entrance with multiple panes. The sky is a clear, bright blue. The overall scene is brightly lit, suggesting a sunny day.

DELTA HIGH SCHOOL  
5801 BROADMOOR

Foster the Next Generation of Scientists and Engineers | A bronze plaque greets visitors at the front door of Delta High School's new home in Pasco. The plaque was purchased by Battelle to congratulate the first graduating class in 2013. It has the signatures of the students and the teachers who were part of that effort. The new school opened in 2015 and can accommodate 400 students. Delta High was a community effort that grew from a discussion by founding members Battelle, Washington State University Tri-Cities, and the Kennewick, Pasco, and Richland school districts about the possibility of a STEM high school in the Tri-Cities. The approximately 45,000-square-foot facility was made possible thanks to funding from the Superintendent of Public Instruction, the Washington State Legislature, local school districts, and our community.



# At a Glance

## VOLUNTEER HOURS



for 56 local organizations

**team  
battelle**

## Keeping Employees Healthy & Safe

Annual Summer Roadshows about safety, security, sustainability, and wellness at PNNL for students expanded to a year-round show-and-tell for post-docs and new hires.



## INVESTING IN OUR COMMUNITY

Habitat for Humanity Project

**\$80K**

plus staff labor donated to build a new home for a family of 5

**LOCAL ORGANIZATIONS  
\$621,740**

invested in local philanthropic and civic organizations

- ▶ Heritage University
- ▶ REACH Foundation
- ▶ Washington State STEM Education Foundation
- ▶ United Way

## TELEWORK OPTION FOR STAFF



**5%** participation weekly

**28,185**

telework days recorded by staff

## NEXT GENERATION STEM WORKFORCE

**~1,300**

interns, research associates, post-docs, post-masters, fellows, and educators benefitted from on-campus immersion experiences at PNNL



## BERYLLIUM PROGRAM IMPROVEMENTS

A few of PNNL's facilities have a history of using the metal beryllium. To minimize worker exposure to beryllium, PNNL took several actions in 2015:

- ▶ Worker Safety & Health staff led the development of the Beryllium Explorer tool. Staff planning and performing work in facilities learn about beryllium and its history at PNNL.
- ▶ Staff may participate in a voluntary medical surveillance program for beryllium through the on-site occupational health clinic.
- ▶ A hazard assessment is conducted when work is planned in beryllium-contaminated areas or with beryllium articles and compounds.



# ECONOMIC PROSPERITY

**Supporting Small Businesses |**  
In 2015, PNNL was selected to participate in DOE's new Small Business Vouchers Pilot and work will begin in 2016. The pilot aims to help small businesses bring next-generation clean energy technologies to the market faster by enabling them to access expertise and specialized equipment at DOE's national labs. More than 100 small businesses selected through the pilot's merit review process will receive \$50,000 to \$300,000 vouchers to exchange for national lab technical assistance or initiate collaborative research projects. Three cycles of competitions will be offered to interested small businesses in 2015 and 2016.



# At a Glance

## ECONOMIC DEVELOPMENT

**~170**

businesses have roots to Battelle-PNNL technology or personnel

**~4,672**

jobs (direct and indirect) in Tri-Cities, Washington (based on analysis released in FY2015)

## LOCALLY OWNED

**12.3%**

portion of spending on local suppliers



## EMPLOYEES TAKE ACTION FOR EFFICIENCY

### Paper Purchases

**5%**

reduction in printer and copy paper purchases (from FY2014)

and **64%** from 2010



### Chilling Up

**\$2,700**

saved per year by employees' changing the temperature on ultra-low-temperature freezers



## PROCUREMENT OF GOODS AND SERVICES

**\$319 million**



## R&D 100 AWARDS

**5** of this year's winners are PNNL technologies that enhance cybersecurity, increase our ability to detect trace amounts of chemicals, convert sewage into fuel, view energy processes under real-world conditions, and forecast future electric needs.

## SMALL BUSINESS PROCUREMENT

**9.7%** to Small, Women-Owned Businesses (relative to a 5% goal)

**4.3%** to Veteran-Owned Small Businesses (relative to a 1% goal)



## PUBLICATIONS

**1,048**

peer-reviewed publications sharing our science with the world



Visit us online at  
<http://sustainable.pnnl.gov>  
or  
e-mail [sustainability@pnnl.gov](mailto:sustainability@pnnl.gov)  
for more information.

