



Pacific Northwest National Laboratory

2010 Sustainability Report

Innovative Solutions for a Sustainable Future



Pacific Northwest
NATIONAL LABORATORY

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

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor Battelle Memorial Institute, nor any of their employees, makes **any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights.** Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or Battelle Memorial Institute. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

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>



This document was printed on recycled paper.

(9/2003)

MESSAGE FROM THE DIRECTOR

A wise man once advised, “Leave this world a little better than you found it.” It is great counsel that can apply to any person or organization.

At the Pacific Northwest National Laboratory (PNNL), we embrace this philosophy by focusing on our organization’s operational impacts in the areas of environmental stewardship, social responsibility, and economic prosperity—a “triple-bottom-line” approach that helps us think holistically about our contributions to society. By evaluating our sustainability performance, we will be better stewards of the Laboratory.

PNNL is the first of 10 Office of Science laboratories for the U.S. Department of Energy to take this approach, and we are also the first national laboratory that has chosen to use the Global Reporting Initiative (GRI) Sustainability Reporting Framework for the basis of our reporting. In doing so, we are aligning ourselves with many of the world’s business leaders who have embraced GRI as the preferred evaluation method.

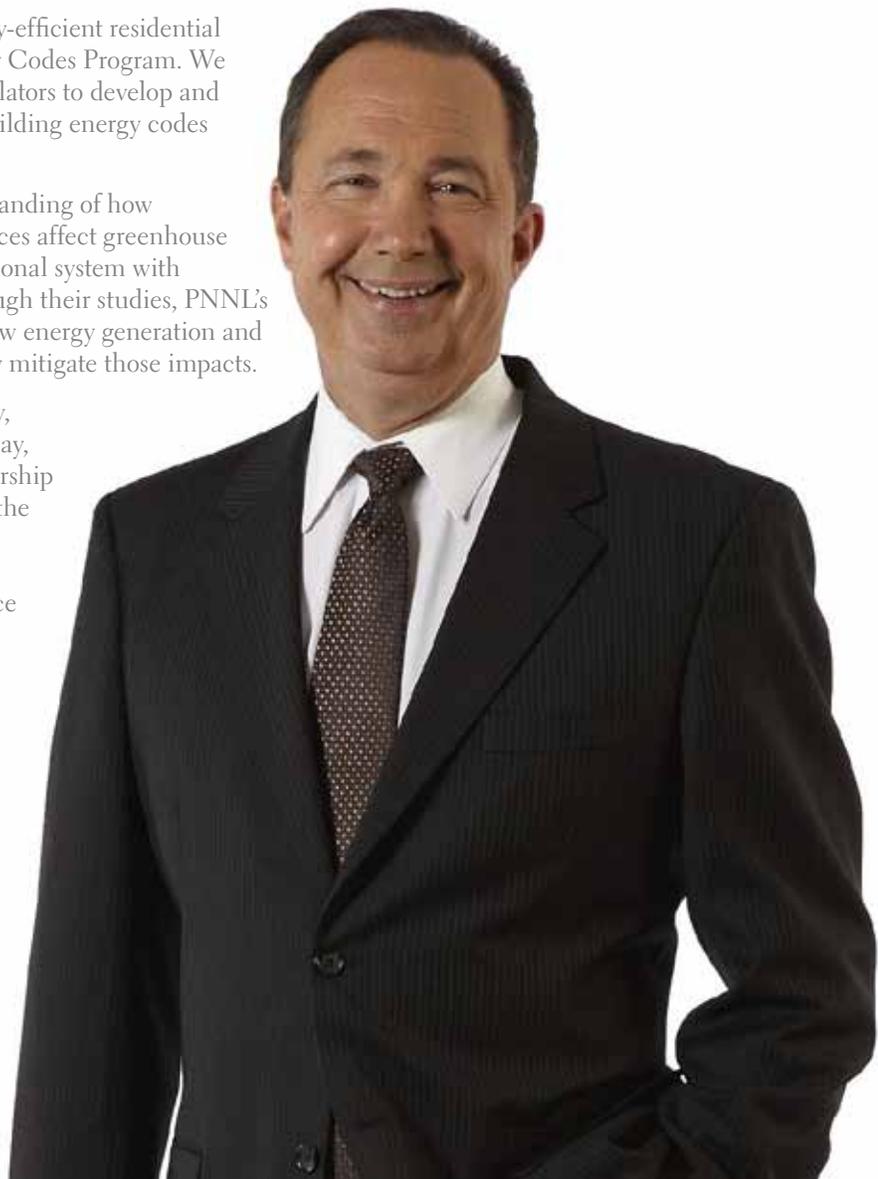
In this report, you will find information about how PNNL’s science and technology are enabling the development of clean, reliable, domestic energy resources while providing important information to help guide decision making by America’s leaders. Building energy codes and more accurate climate modeling are two of the many ways in which we are contributing globally to sustainable solutions.

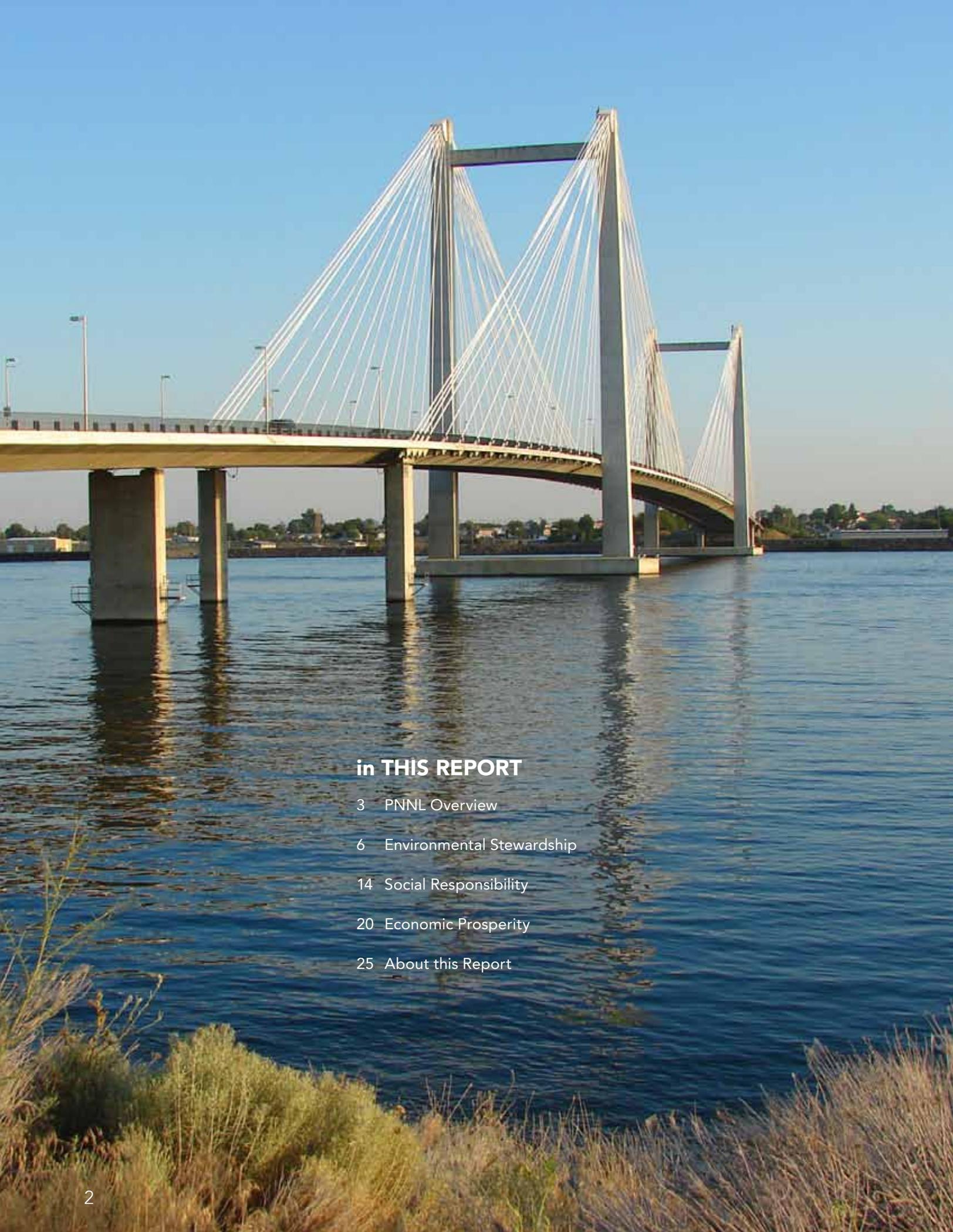
- » PNNL’s scientists are helping to create more energy-efficient residential and commercial buildings via the Building Energy Codes Program. We are partnering with the building industry and regulators to develop and promote more stringent and easy-to-understand building energy codes and to assess potential barriers.
- » Our scientists are also improving scientific understanding of how atmospheric processes and energy technology choices affect greenhouse gas emissions by combining a global field observational system with advanced modeling and laboratory research. Through their studies, PNNL’s researchers are improving our understanding of how energy generation and use distress the environment and how to effectively mitigate those impacts.

At PNNL, we take great pride in operating sustainably, and our passion is evident throughout this report. Today, employees are advancing science and delivering leadership in national security, energy, and the environment for the benefit of the nation. We realize we have many opportunities for further improvement. You have my commitment that we will continue to apply our science and sustainability best practices, not only to our own Laboratory, but to the nation, for a cleaner, safer, and greener tomorrow.



Michael Kluse
Laboratory Director





in THIS REPORT

- 3 PNNL Overview
- 6 Environmental Stewardship
- 14 Social Responsibility
- 20 Economic Prosperity
- 25 About this Report

PNNL OVERVIEW

At Pacific Northwest National Laboratory (PNNL), researchers are improving our understanding of how energy generation and use affect the environment and climate and how to effectively mitigate those impacts through the development of clean, reliable, domestic energy resources.

PNNL is advancing science and technology by combining theory, computation, and experimentation to deliver solutions to the world's most intractable energy and environmental sustainability problems.

Located in Richland, Washington, PNNL is one of the U.S. Department of Energy's (DOE's) 10 national laboratories managed by the Office of Science. PNNL employs more than 4,200 people who conduct approximately \$1.1 billion of contract-based research and development. In addition to the main campus in Richland, the Laboratory has offices in Seattle, Tacoma, and Sequim, Washington; Portland, Oregon; and Washington, D.C.

Ohio-based Battelle has proudly operated PNNL for DOE since its inception in 1965. Organized as a nonprofit corporation for charitable, scientific, and educational purposes, Battelle's pursuit of science in the service of humankind has helped to foster a culture of sustainability at PNNL.



SUSTAINABILITY AT PNNL

This report follows the Global Reporting Initiative (GRI) sustainability reporting framework, which enables organizations of all types to assess their economic, environmental, and social performance and disclose the results in a similar way. It also demonstrates PNNL's commitment to sustainable development, compares our performance over time, and measures performance with respect to laws, norms, standards, and voluntary initiatives.

We believe that our “triple-bottom-line” approach to measuring our sustainability performance—including the environmental, social, and economic pillars—makes us better stewards of the Laboratory and helps us think holistically about the impact of our work, while focusing on what is most important to our organization and stakeholders. PNNL is the first of the 10 national laboratories to take this approach.

Interdisciplinary teams coordinate to make sustainability integral to both our research and our operations. As you will see in this report, we “walk the talk” by applying our own scientific discoveries and innovations, as well as sustainability best practices, to our own research and operations.

This report follows the guidelines of GRI—the world's leading sustainability reporting standard (see sidebar). We believe in transparency around our annual performance; therefore, we produce this report to celebrate where we are doing well, while focusing on opportunities for improvement. This challenges us to accomplish more and drives priority-setting. It also makes PNNL a great place to work.

More detailed information on our performance against GRI indicators can be found in the section, “About this Report (p. 25),” and on our website at http://sustainable.pnnl.gov/kpi_tables.stm, which also shows the ways our researchers are advancing the frontiers of science for a sustainable future.

PNNL's sustainability program achieves strength through its multifaceted “triple-bottom-line” approach. Much like a honeycomb structure, the foundation consists of interlocking pieces that—through the strength gained by mutual support and integration—create a program that is greater than the sum of its parts.



PREPARING FOR CLIMATE CHANGE

Environmental stewardship includes planning for an unpredictable future. Rising to that challenge, a team of PNNL scientists have begun measuring and modeling aerosol interactions in the earth system. Advancing the knowledge of atmospheric processes will help couple climate and energy systems to prepare for what lies ahead in climate change.

Aerosols, or tiny particles in the atmosphere, are among the most important phenomena affecting climate change—and yet the least understood. Science has just begun to uncover the secrets of the complex interactions between aerosols and clouds, such as how the aerosols absorb and reflect sunlight over land and oceans and cause clouds and precipitation to form.

The PNNL team has estimated the impact of small-scale features within a large-scale system for aerosols to bring insights to climate models. Like a wide-angle camera lens, current large-scale climate models miss the fine details in any particular climate picture because of the inability to show details smaller than the selected model grid size. These details are what researchers call the sub-grid variability in climate and atmosphere activity modeling.

Using the macro lens of a modeling toolkit, WRF-Chem, these scientists were able to show the details, better representing aerosol data for climate modeling. Initial experimentation with this method showed better spatial variability of pollutant emissions at higher resolutions and demonstrated that this spatial variability contributes a large share of the sub-grid variability of aerosols in the climate models.

Accounting for the variability of aerosols and trace gases resulting from terrain and local emissions in climate models is an important detail in understanding the transport and mixing of these particles in the atmosphere and their effect on climate change. This concept, called “parameterization,” is a mathematical estimation of a physical process in a model. PNNL research shows, for the first time, the probability density functions of major chemically active trace gases and aerosols that will benefit the development of aerosol parameterization in global climate models.

The new, improved method for studying aerosols will allow researchers to continue to improve their understanding of aerosol parameterization in climate models—leading to a world better prepared for the climate change challenges yet to come.

Reference: Qian Y, WI Gustafson Jr, and JD Fast. 2010. “An Investigation of the Sub-Grid Variability of Trace Gases and Aerosols for Global Climate Modeling.” *Atmospheric Chemistry and Physics* 1: 6917-6946. doi:10.5194/acp-10-6917-2010.





Environmental Stewardship

ENVIRONMENTAL STEWARDSHIP



PNNL has a long history of demonstrated commitment to protecting and using resources wisely. For nearly a decade, we have used the ISO 14001 standard and Environmental Management System to track and improve upon our environmental performance. Last year we began incorporating a broader set of sustainability priorities into our Environmental Management System to better align with the GRI's global standard for sustainability performance. We continue to do so and are leading the way for others.

Our long-term priorities are aggressive reductions in energy use, greenhouse gas emissions, and use of water and materials, and to protect natural resources while fulfilling our science and technology mission for the U.S. Department of Energy.



We strive to achieve zero waste at staff events by incorporating "reduce, reuse, and recycle." At two events 100% of the waste was recycled, reused, or composted. Now employees ask, "Is this a zero waste event?"

SUSTAINABLE DESIGN CUTS BUILDING'S CO₂e EMISSIONS BY 38%

The LEED Gold certified BSF-CSF integrates several principles of sustainable design, as outlined by the LEED U.S. Green Building Rating System, into the facility. Examples of the design principles are shown below.

WATER EFFICIENCY

- » 30% reduction of water use by using low-flow fixtures

ENERGY AND ATMOSPHERE

- » 30% less energy is consumed compared with similar laboratory facilities
 - » Ground source heating and cooling system
 - » Heat recovery chiller system
 - » Optimization of lighting system layout and controls
 - » Indirect evaporative cooling system
 - » Evaporative heat pipe recovery system for "once-through" laboratory air
 - » Exterior LED lighting
 - » Green Power Purchasing for more than 35% of energy consumed
 - » Enhanced commissioning
 - » Enhanced energy metering
 - » Variable air volume fume hoods
- ### MATERIALS AND RESOURCES
- » Diverted 95% of construction waste

In 2010 PNNL saw impressive results from the innovative design and co-location of our Biological Sciences Facility (BSF) and Computational Sciences Facility (CSF), which started operation in 2009. The two buildings were designed to exist in a symbiotic relationship, and PNNL is the first national laboratory to pioneer the use of a geothermal system as a secondary heat source to support the primary strategy of heat recovery from one building to the other.

CSF is home to data-intensive and high-performance computing hardware and software technologies. The computer equipment in CSF generates enough heat for its own facility, as well as enough to provide heat to BSF. In turn, BSF reduces energy consumption by recovering the heating and cooling effect of the building's exhaust air. This exhaust air heats and cools the outside air going into the building by using heat recovery coils.

To supplement this heat exchange method, a geothermal system (often called a water-source heat pump) is used. In the winter heat is extracted from the groundwater, and in the summer heat from the building is added to the groundwater. The water chillers and water-cooled computer room equipment reject heat into the condensing water system, and the heat-recovery chillers extract heat into the condensing water system.

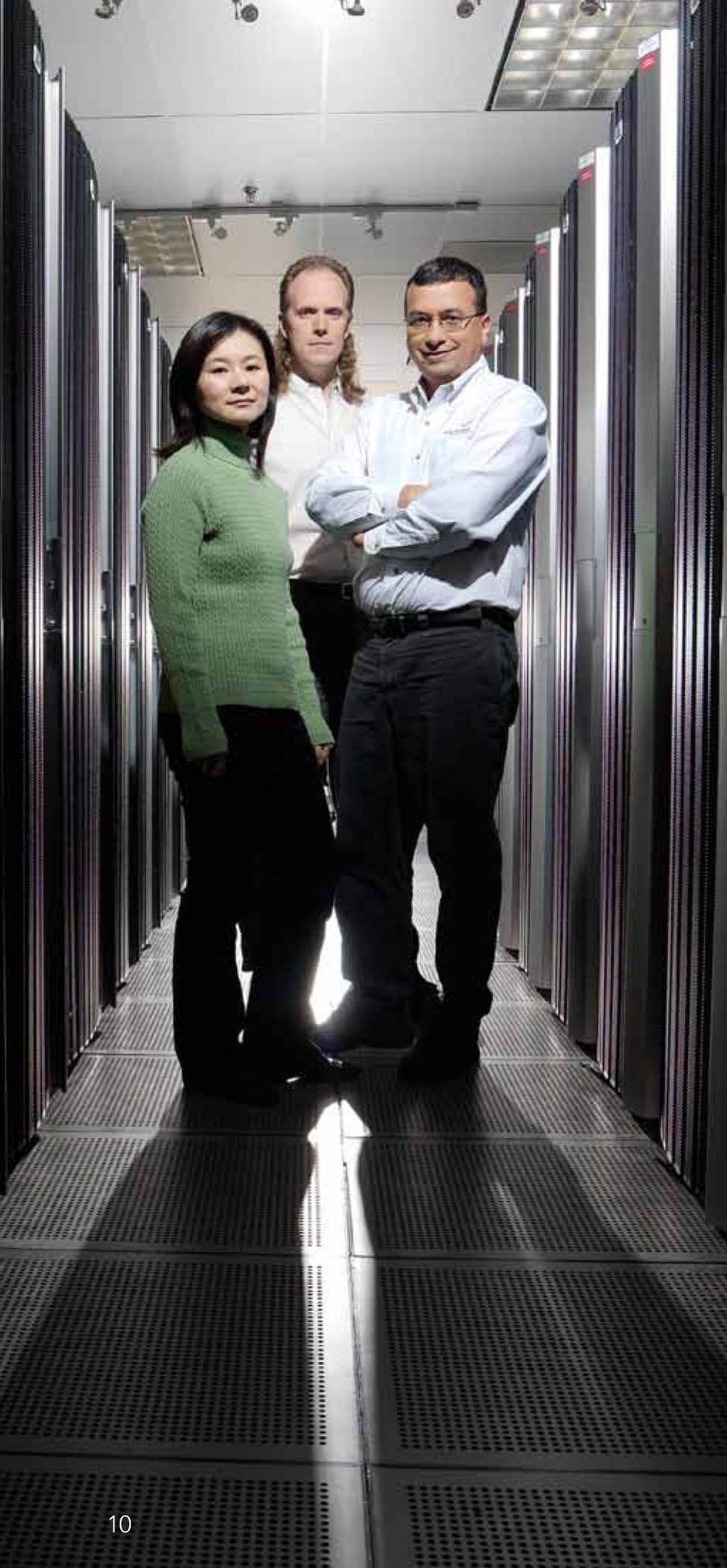
The outcome of this strategy has been an energy use savings of over 30 percent compared to the standard laboratory design, as well as 38 percent less CO₂e (CO₂ equivalent) emissions compared to laboratories designed using standard code-compliant methods.

BSF-CSF houses nearly 300 staff members and is one of only a small handful of laboratories across the nation to receive Leadership in Energy and Environmental Design (LEED) Gold certification. The LEED U.S. Green Building Rating System is the nationally accepted standard for the design, construction, and operation of high-performance green buildings.

"...30% less energy used and the avoidance of approximately \$270,000 a year in utility costs."

PNNL's LEED Gold Biological Sciences
and Computational Sciences Facilities.





EMSL scientists (left to right) Ping Yang, Dave Cowley, and Niri Govind.

EMSL's supercomputer (pictured here), Chinook, will allow scientists to develop a molecular-level understanding of the complex biological, chemical, and physical processes that underlie the environmental and energy challenges facing DOE and the nation.

EMSL supports a wide range of computational activities for addressing critical research in energy production (e.g., bioenergy and artificial solar energy) and bio/environmental remediation for studying surfaces and interfaces on natural heterogeneous materials present in atmospheric or subsurface environments. Large biomolecular simulations, large data bioinformatics computations, aerosol modeling, and reactive chemical transport modeling are also supported.

Managing Our Energy and Greenhouse Gas Emissions

Across the PNNL campus, greenhouse gas emissions from both direct and indirect sources increased by 11 percent in 2010, driven in part by an increase in the size of our workforce and energy use in our research facilities. The new Biological and Computational Science Facilities and the new Physical Sciences Facility complex, which began operation during 2009, were the primary reasons for the increase in our energy use during 2010.

As our employee population grows, we recognize the importance of managing our facility energy use, the impacts of employee transportation, and the use of other resources. While this growth provides economic benefit to the community, fostering a culture of environmental stewardship will be essential to minimizing the impact of our growth on the environment.

Our work requires a substantial and growing demand for energy-intensive laboratories and high-performance computing equipment that ranks among the fastest in the world. For example, EMSL, the Environmental Molecular Sciences Laboratory Chinook supercomputer supports more than 80 research projects from around the world, and logged more than 150 million core hours of use.

A number of efficiency measures were implemented to manage the intensive amounts of energy needed for PNNL's computing equipment. We were able to reduce fossil fuel use in our most energy-intensive facility through the reuse of the facility's "waste" heat. We have also realized efficiency gains from the installation of high-efficiency LED lighting throughout our facilities. As a result, PNNL's electricity consumption only increased by 4 percent. After energy efficiency improvements, we further reduced the impact of our operations by purchasing renewable energy certificates to offset 70 percent of our remaining electricity use.

We continually look for opportunities to integrate advanced efficiency measures into our operations and to use our campus as a test-bed for the innovative technologies that our researchers are developing. Opportunities for improving our energy and greenhouse gas performance in 2011 include expanding night setback hours on heating, ventilation, and air-conditioning systems and implementing IT efficiency improvements, including the further consolidation and virtualization of servers.

Minimizing Our Use of Toxic Chemicals

PNNL's goal for managing chemical use is to reduce toxicity by right-sizing inventories, actively eliminating unneeded materials, redistributing unwanted materials to new users, and identifying substitute materials of lesser toxicity.

- » As part of DOE's Hanford cleanup program, more than 500 PNNL employees vacated several old buildings on the Hanford Site and moved into new, more energy efficient research facilities on the PNNL campus. During this process, more than 2,400 kilograms of chemicals were redistributed outside the Laboratory or safely disposed of, saving almost \$1.4 million.
- » The ChemAgain chemical redistribution program re-deployed 639 chemicals in 2010, eliminating the need for their procurement and disposition.

89% of the paper products consumed contained 30% or more post-consumer recycled content. Our goal is 100%.



BETTER CODES. GREATER BENEFITS.

As the country attempts to reduce energy emissions in the face of global climate change, it is turning to the building sector for viable solutions. Residential and commercial buildings account for 40 percent of all U.S. energy consumption and more than 70 percent of electricity consumed. More efficient energy-saving codes and green building codes are major tools in improving building energy efficiency, reducing a substantial portion of U.S. energy consumption, and provide a strong foundation for sustainability.

With support from PNNL, DOE's Building Energy Codes Program (BECP) has been working for more than 2 decades to improve residential and commercial building energy codes and standards.

Energy Codes: The Foundation for Efficiency and Sustainability

Building energy codes have resulted in transformational changes in building energy performance. The benefits of these changes include reductions in energy consumption, cost, and CO₂ emissions. Not surprisingly, better codes and better enforcement and compliance mean greater benefits. The BECP provides nationwide leadership and collaboration in code development, education, training, and key compliance and enforcement support. The results of these efforts are significant. Estimates show that combined impacts of the program will result in 1.7 quadrillion Btu saved annually by 2030. Cumulative savings from 2009 to 2030 are estimated at over 14 quadrillion Btu. These numbers translate into an estimated cumulative CO₂ savings by 2030 of 800 million metric tons, reducing impacts to the planet. The financial benefits to building owners are equally significant—with an estimated nearly \$2 billion saved annually by 2015, rising to over \$15 billion by 2030.

Beyond Codes for Sustainability: Building on a Strong Foundation

PNNL's support of BECP helps communities, states, and federal agencies that are reaching beyond energy codes to embrace comprehensive sustainable development and construction strategies. From support of Advanced Energy Design Guide development to the Federal Sustainability Rulemaking effort, PNNL is involved. In addition, through the newly funded Green Building Code and Beyond Code support task, the program offers comprehensive support directly to states and jurisdictions seeking adoption or compliance assistance with a variety of green building and sustainability efforts.

Development, Adoption, Implementation, and Enforcement

From development to enforcement, PNNL efforts help to strengthen these building energy codes and sustainability efforts nationwide. Code development is a critical first step, whether it is the International Energy Conservation Code or the American Society of Heating, Refrigerating, and Air-Conditioning Engineers Standard 189.1. PNNL efforts help provide tools and support to make adoption easier for states, ranging from technical analyses of proposed state code amendments to no cost code-compliance software.

Successful implementation of codes by builders and designers and correct enforcement by code officials is necessary to deliver on the promise of more efficient homes and commercial buildings. To enhance understanding and usability of codes for builders, designers, and code officials, PNNL supported DOE in the launch of the largest building energy code compliance study ever in 2010.

In support of DOE's 90 percent compliance effort, a suite of resources, web tools, and recommended procedures was released to assist states in gathering data. Compliance measurement pilot studies were also initiated in nine states. This effort will uncover new information about the real, on-the-ground impact of building energy codes and the vital role they play in efficient and sustainable buildings. Supporting the ongoing development and adoption of green building codes and beyond code programs will continue to strengthen sustainability efforts nationwide.



*Codes = transformational changes
in building energy performance:*

» 1.7 quadrillion Btu saved annually

*» 800 million metric tons of CO₂
emissions eliminated*

*» \$15 billion in energy costs saved
annually*



Social Responsibility

SOCIAL RESPONSIBILITY



Social responsibility at PNNL means fostering the next generation of scientists and engineers, protecting the health and safety of employees, investing in their professional development, and creating an inclusive work environment. We were named one of Washington's top 10 best places to work in 2010 by the Puget Sound Business Journal because we take care of our employees, and, in turn, they are inspired to find solutions to global and national challenges.

Employees are also inspired to give back to the community in myriad ways, such as volunteering for an environmental restoration project, hosting interns, and mentoring high school students at the Delta High School. PNNL leadership catalyzes innovation and improvement in STEM (science, technology, engineering, and math) education at the local, state, and national levels in order to foster the next generation of scientists and engineers.

Delta High School students (left to right) Avika Sharma and Anahi Antonio-Hernandez with mentor Signe White.



“We all want our legacy to be carried on by someone else. Mentoring, internship programs, one-on-one or group meetings, and working on collaborative projects bring students into the pipeline and connect them with scientists and the work environment.”

—PNNL scientist and STEM expert Signe White

Delta High School

PNNL led the community effort to launch Delta High School, located in Richland, Washington, with a STEM focus that features a community partnership among K-12, higher education, business, and community organizations. Delta's founding partners are Battelle, PNNL, Washington State University - Tri-Cities, Columbia Basin College, the Washington State STEM Education Foundation, Kennewick School District, Pasco School District, and Richland School District.

Now in its second year, Delta is home to 10 teachers and 180 students benefitting from an interdisciplinary education that is connected to the world beyond the classroom. Delta efforts focus on individual teachers and students, while STEM business and education professionals collaborate together in full share partnerships to provide content workshops that improve students' learning experiences.

PNNL helped make Delta High, Washington State's only public/private STEM partnership school, a reality and led the effort to establish a STEM Foundation to secure the school's future. Delta offers rigorous and relevant learning experiences while simultaneously allowing students to hone the qualities and skills identified by industry and higher education institutions as critical for success in the 21st century workplace.

More than 100 PNNL staff members have supported Delta High School, either through curriculum development, professional development opportunities, hands-on opportunities like research and experiments, or general building operations.

STEM EDUCATION AT PNNL

Washington State LASER

PNNL co-led the Washington State Leadership and Assistance for Science Education Reform (LASER) Project, a statewide public/private partnership designed to help school districts initiate, implement, and sustain high-quality science education. PNNL partners with school districts in the area of curriculum and instruction, assessment, professional development, equipment and materials, and administrative and community support.

Across the state, nine regional LASER Alliances provide support and resources to local school districts, enabling 1,600 schools and 52,500 teachers to benefit from LASER-sponsored professional development programs.

The strategic use of Battelle corporate funds (\$2 million) and PNNL's human, financial, and technical resources (\$2 million), with commitments from other public/private partners, are having positive, sustainable effects on science education. LASER has garnered a broad base of public and private support that includes \$15 million in state funds, \$15 million in school district commitments, \$7 million of corporate commitments, and \$25 million of in-kind commitments from public and private partners.

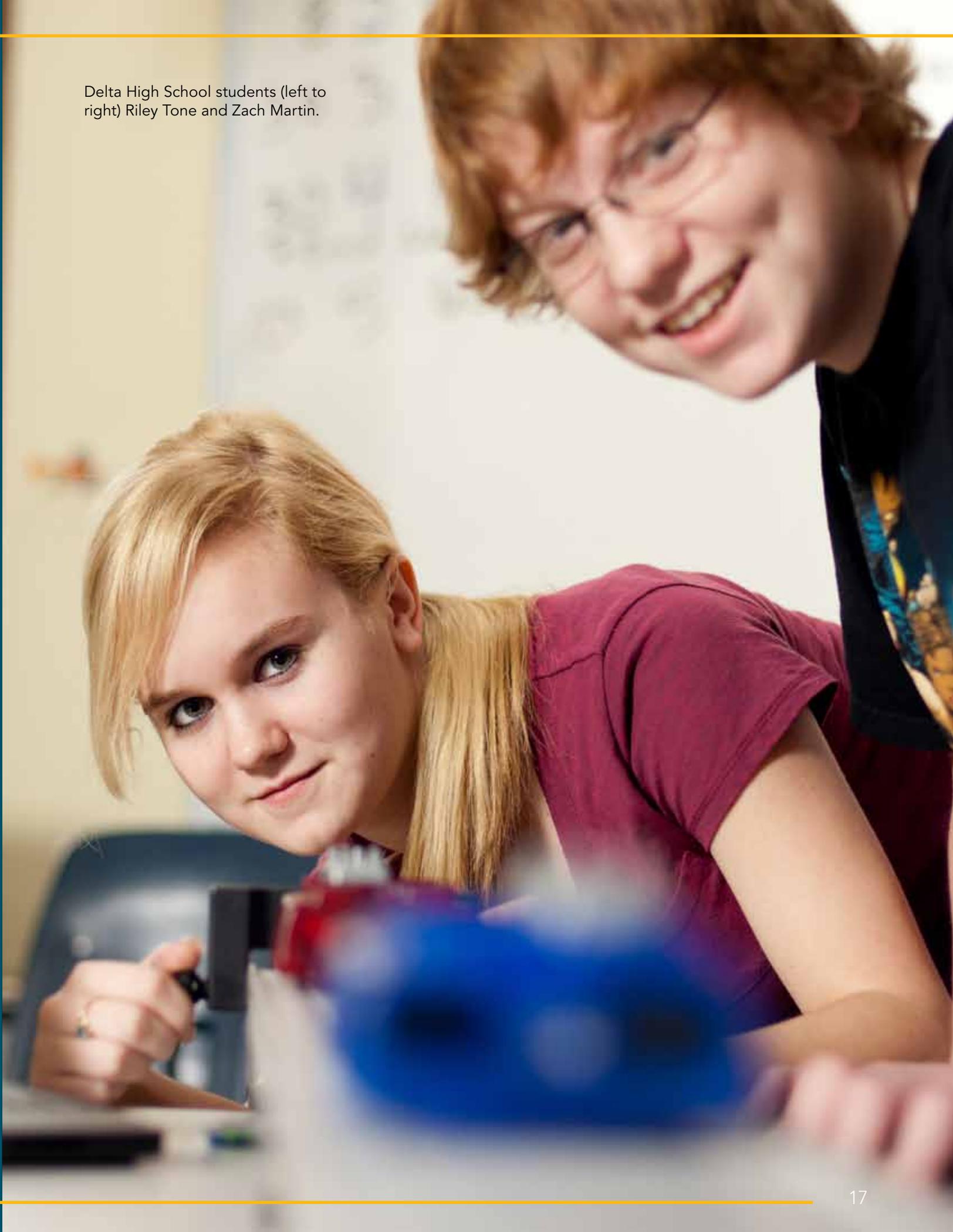
In 2010 the target for the LASER network was exceeded, with 203 school districts representing 91 percent of students involved. As a result, state science education leaders created the Science Partnership Academy to focus on increasing student learning and achievement through teacher professional development.

Fellowships, Internships, and Apprenticeship Programs

Our campus provides opportunities for students and teachers from across the country to participate in fellowships, internships, and apprenticeship programs. Depending on the program, laboratory and research positions connecting academic learning to the world beyond the classroom can be year-round or specific to program needs. In the summer of 2010, PNNL scientists hosted more than 400 students eager to play a part in furthering DOE's scientific mission.

We will continue to partner with national leaders and organizations to address preparing the next generation of scientists and engineers, while promoting diversity in STEM-related careers. By influencing STEM program design, decisions, and policies related to students and teachers, PNNL can prepare a robust group of young researchers and developers to keep the United States at the forefront of innovation.

Delta High School students (left to right) Riley Tone and Zach Martin.



Protecting Worker Safety and Health

PNNL's safety performance, as measured by injury and illness rates, has improved dramatically over the past several years. Our Total Recordable Case Rate (incidence rate for all cases of injuries and illnesses) is 30 percent below the average for "Scientific Research and Development Services" employers with greater than 1,000 employees, according to the North American Industry Classification System. Likewise, the Days Away Restricted or Transferred case rate is 40 percent below the current average for similarly sized employers.



Pacific Northwest National Laboratory safeguards and security staff provide resources to promote the safe, secure and compliant conduct of work across the laboratory campus.

Staff members have a keen awareness of health and safety, both at work and at home, and they are encouraged to identify and correct safety issues before they become problems in the open environment we have created through our Voluntary Protection Program.

In addition, the Directorate Zero Accident Councils provide a forum for staff members and management to exchange ideas, and, as a result, 100 percent of employees are involved. For 2011 and beyond, our safety goal is always zero accidents—we want employees to go home at the end of each day in the same or better condition as when they arrived.

Advancing Employee Skills

PNNL offered a broad set of skills development programs in 2010 for scientists and engineers, managers, and advanced leaders, in which a total of 156 staff members participated. Responding to input from our staff members about other skill development areas that would support their career paths, PNNL plans to add two new programs in 2011. The Emerging Leader Program will develop mid-level managers, and the Project Manager Development Program will have a broad-ranging positive effect on the viability and effectiveness of all Laboratory functions.

Creating an Inclusive Work Environment

Enhancing the lives of our employees—both at work and outside of work—is a central objective of our social responsibility efforts. A key way we do that is through our Life@PNNL program. Life@PNNL provides a centralized resource for information on the benefits of working for PNNL and encourages participation in sponsored events and staff-organized activities. It helps staff members to connect through clubs and professional networks and raises awareness about programs available. It is one-stop shopping for employees to benefit from—and contribute to—creating a positive work environment and local community.

Life@PNNL approaches enhancing the total employee experience through four important elements:

- » Safety and health—taking responsibility for your own safety and health, and that of others
- » Social responsibility—enhancing the welfare of our organization and society at large
- » Quality of culture—valuing the uniqueness of our staff members and the quality of our place
- » Environmental stewardship—contributing positively to the condition of our environment.



More than 500 PNNL staff members, friends, and families participated in one of our athletic leagues or clubs last year. These programs bring together individuals from diverse backgrounds and promote teamwork and healthy lifestyle choices.



\$

Economic
Prosperity

ECONOMIC PROSPERITY



As a national laboratory operated by a nonprofit organization, the Battelle Memorial Institute,¹ economic prosperity is not just about our own bottom line, but the value we bring to a broad set of stakeholders, including our staff members, suppliers, entrepreneurs, and the community as a whole.

Our leadership and business growth have had a positive impact on job creation and the local economy, and our technology transfer successes are leading to innovative solutions for a more sustainable future.

PNNL actively supports regional economic development initiatives. Laboratory staff members provide executive leadership to the Tri-Cities Research District (TCRD) and the Mid-Columbia Energy Initiative (MCEI). Bringing executive leadership to these important groups, PNNL is helping to fuel the region's economic growth, transforming southeastern Washington into a clean energy technology hub for the Pacific Northwest. TCRD and MCEI cultivate an environment of entrepreneurship and business diversification, making the Tri-Cities an ideal location for technology pioneers to turn their ideas into thriving businesses.



¹Battelle is a 501(c)(3) charitable trust headquartered in Columbus, Ohio.

GREEN CHEMISTRY IS GOOD FOR THE ENVIRONMENT—AND THE ECONOMY

Researchers at PNNL invented a way to cost-effectively produce propylene glycol with clean, renewable plant sugars. As a result, a new facility in Decatur, Illinois—built by chemical giant Archer Daniels Midland Company (ADM)—uses the breakthrough process developed at PNNL to manufacture propylene glycol from renewable resources (PGRS), demonstrating that green chemistry can also be good for the economy.

Propylene glycol—found in everyday products like liquid detergents, antifreeze, de-icers, paints, polyesters, cosmetics, personal care products, and pharmaceuticals—has traditionally been produced via petroleum-based methods.

In 2009, after extensive research collaboration with PNNL to validate the process at a pilot plant, ADM licensed the technology. The following year, the company built a full-scale manufacturing facility capable of delivering up to 100,000 metric tons of propylene glycol each year.

Renewable propylene glycol is derived from soybeans or canola. ADM processes soybean or canola seeds through a crushing, dehulling, conditioning, flaking, and extraction operation into a crude vegetable oil. This vegetable oil is further processed into refined oil. The oil is then transformed through a transesterification process into crude biodiesel and crude glycerin. The crude glycerin is processed through several evaporation and distillation steps into a refined, kosher, pharmaceutical-grade glycerin. This glycerin is either sold into the market or processed into propylene glycol. The propylene glycol is distilled into an industrial- or a pharmaceutical-grade propylene glycol.

The environmental benefits of PGRS are clear—petroleum-derived propylene glycol co-produces CO₂ and large amounts of wastewater, and traditional production methods perpetuate the dependence on foreign oil. The water is recovered and recycled in the new process.

Perhaps equally important are the economic and social benefits of PGRS. To ADM, PGRS means profit. To the people of Decatur, PGRS means jobs and an influx of capital to local businesses. By decreasing the nation's reliance on petroleum imports, PGRS moves the United States toward energy independence.

Through its use of clean, renewable resources and its commercialization by a well-established, global leader with the means to transform national and international markets, PGRS proves that helping the planet can also contribute to a healthy bottom line.

Renewable propylene glycol derived from soybeans or canola means jobs and an influx of capital to local businesses.



Funding for Research Continues to Grow

Funding obligated for new research projects increased by more than 8 percent in 2010 to \$1,162,000,000. Total costs expended on current research projects increased by 5 percent in 2010 to \$1,112,400,000. We also distributed more than \$500 million in the form of purchased goods and services; 52 percent went to small and socio-economically disadvantaged businesses, exceeding our goal by 2 percent.

The continued growth in contract-based research for federal agency and private sector customers is a sign that we are maintaining a sharp focus on delivering valued science and technology that addresses national challenges.

Volunteer Efforts Bolster Local Communities

PNNL is the largest employer in the Tri-Cities and well known for the efforts of its employee-led volunteer group, Team Battelle, which logged 18,384 volunteer hours in 2010. Together, PNNL and Battelle invested over \$1 million in 2010 to bolster non-profit organizations in the local community, including contributions to regional STEM education programs and the United Way.²

The Friends of Badger Mountain, an all-volunteer, citizen-based organization begun in 2003, led the effort to preserve 647 acres of Badger Mountain, the most prominent ridge in the Tri-City area. Team Battelle has been active in the efforts that built and continually maintain three trails which saw nearly 120,000 users in 2010. The mountain is host to a wide range of activities and celebrations, including wildflower walks, Ice Age Tours, and ongoing outreach to children and families.



²Battelle makes direct investments in our community that are not distributed by PNNL, but occur because of Battelle's management role of the Laboratory. During 2010, direct capital investments from Battelle totaled \$565,000 to the Kadlec Foundation for the new Pediatric Center.

ABOUT THIS REPORT

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. We use the Global Reporting Initiative (GRI) G3 Sustainability Reporting Guidelines as a framework for measuring and reporting our environmental, social, and economic performance.

The following pages describe how the content of this report meets GRI disclosures and where that information can be found. The external assurance letter offers a third party's opinion of whether we have effectively met these guidelines. Finally, the performance summary table elaborates on our performance against the GRI indicators considered most material to our organization. On our website you will find expanded management disclosures and performance data against all GRI "core" indicators.

GRI Content

Materiality, Scope, and Boundary of Report: This report highlights PNNL's view of sustainability in both the context of the work we do and how we do it. We measured and reported on those aspects of the GRI indicators that were applicable to our business, fell into opportunity areas for improvement, were material to our key stakeholders, and were closely tied to our organizational values. Both the qualitative and quantitative content in the print report were defined to focus on performance areas that are of the highest priority to our primary customer, DOE, and our employees. In many cases these performance measures are codified in our operating contract with DOE and the results will influence decisions it makes about our organization. Performance measures that are less significant to our customers and our employees, and less impactful on our operations, are included in a summary table on our Website for completeness. The scope of topics covered in both the print and Web versions of our report include the majority of core, and some additional, GRI indicators and provide a representative view of our significant economic, environmental, and social impacts.

This report is for Fiscal Year (FY) 2010 and all years are reported as fiscal years, which run from October 1 to September 30. While PNNL is operated by Battelle, the boundary of this report is restricted to the activities that occur by the employees and operations of PNNL. The reporting boundaries include government-owned, contractor-operated facilities, as well as Battelle-owned, and leased facilities that are jointly managed at PNNL as a "consolidated laboratory." It does not include Battelle's corporate headquarters, or other facilities operated by Battelle outside of the consolidated laboratory, unless otherwise noted.

Report Content and Balance: PNNL leveraged existing internal data and input on priorities from ongoing stakeholder engagement with our clients and community to develop the information for this report. We appointed a group to systematically go through all the data and GRI guidelines, identify gaps, and to ensure the report was written in a balanced way by not just highlighting positive aspects and work already done, but also identifying areas that need improvement.

Stakeholder Inclusiveness: Although we did not conduct a formal stakeholder engagement effort for this report, throughout the year we regularly engage with our primary stakeholders, our customers, our employees, and our communities. Every 4 months, our senior management reviews aspects of the Laboratory's performance with our DOE customer. A year-end self-evaluation of our performance across various economic, social, and environmental aspects is shared with DOE and is used to inform decisions that DOE makes around performance grades, contract extensions, and the fee paid for managing the Laboratory.

Input on employee perceptions of safety and health in the workplace was collected through an annual survey of all employees, and through focus groups to understand the barriers to building on our operational excellence. Furthermore, data on employee commuting preferences was collected in 2010 and is being used to shape policies that will improve the environmental impact of and employee satisfaction with commuting to PNNL.

Accuracy and Completeness: PNNL tried to be as complete, accurate, reliable, consistent, and detailed as possible with its information throughout the report. When data were unavailable, or not as complete as we would like, we explain why that is the case. The coverage of material topics in the indicators, and the 4 years of data provided should enable stakeholders to assess the organization's significant economic, environmental, and social performance, both during the reporting period and over time.

Governance and Management Disclosures: The leadership team at PNNL shares responsibility for delivering balanced and sustainable excellence in science and technology mission impact, operations, and community service, which encompass the economic, environmental, and social dimensions of our work.

The Deputy Director for Science and Technology stewards the economic dimension, the Chief Operations Officer stewards the environmental dimension, and the Associate Laboratory Director for Organizational Development stewards the labor and society dimensions. In actual practice, the leadership team—having a collective view across all dimensions—decides institutional priorities, resource allocations, and assesses performance. This includes ensuring compliance with the Laboratory's vision, goals, principles, code of conduct, product responsibility, conflicts of interest policy, and that the precautionary principle is followed. For complete management disclosure, please visit <http://sustainable.pnnl.gov/>.

Membership and Awards: For a complete list of organizational memberships and the various community awards and patents received in 2010, please visit http://www.pnnl.gov/about/awards_achieve.asp.

PNNL Report Contact: For more information about this report and its contents, please contact:

Mike Moran
Facilities & Operations Sustainability Office
mike.moran@pnnl.gov

GRI Index and Report Application Levels

Report Application Level		C	C+	B	B+	A	A+
Standard Disclosures	G3 Profile Disclosures → OUTPUT	Report on: 1.1 2.1-2.10 3.1-3.8, 3.10-3.12 4.1-4.4, 4.14-4.15	Report Externally Assured	Report on all criteria listed for Level C plus: 1.2 3.9, 3.13 3.1-3.8, 3.10-3.12 4.1-4.4, 4.14-4.15	Report Externally Assured	Same as requirement for Level B	Report Externally Assured
	G3 Management Approach Disclosures → OUTPUT	Not Required		Management Approach Disclosures for each Indicator Category		Management Approach Disclosures for each Indicator Category	
	G3 Performance Indicators & Sector Supplement Performance Indicators → OUTPUT	Report on a minimum of 10 Performance Indicators, including at least one from each of: Economic, Social, and Environmental		Report on a minimum of 20 Performance Indicators, at least one from each of: Economic, Environmental, Human rights, Labor Society, Product Responsibility		Report on each G3 and Sector Supplement Indicator with due regard to the Materiality Principal by either: a) reporting on the Indicator or b) explaining the reason for its omission	

The GRI Application Level of PNNL's 2010 Sustainability Report:



The index below provides an overview of our reporting and the location within the report for all G3 Sustainability Reporting Guidelines.

Standard GRI Disclosures	G3 Indicator	Page
Strategy and Analysis	1.1-1.2	Message from the Director, 1, http://sustainable.pnnl.gov/report/kpi_tables.stm
Organizational Profile	2.1-2.7 2.8-2.10	3-4, http://www.pnnl.gov/ 25-26
Governance	4.1-4.10 4.11 4.12-4.13	26 http://sustainable.pnnl.gov/report/kpi_tables.stm (PR1) http://www.pnnl.gov/about/partnerships.asp ; http://www.pnnl.gov/edo/about/collaborators.asp
Stakeholder Engagement	4.14-4.17	26
Disclosures on Management Approach		26
Environmental		7-11
Economic		21-24
Society, Labor and Human Rights		15-19
Product Responsibility		Message from the Director, 1
Performance Indicators		http://sustainable.pnnl.gov/report/kpi_tables.stm
Economic	EC 1-9	29
Environment	EN 1-30	29-31
Society and Labor	LA 1-14, SO 1-8	31-32
Product Responsibility and Human Rights	PR 1-9, HR 1-9	32

External Assurance Letter from Sustainable Business Consulting

Sustainable Business Consulting evaluated Pacific Northwest National Laboratory's (PNNL) sustainability report to establish that the information in the report was a reliable representation of the company's social, environmental, and economic performance in relation to the Global Reporting Initiative (GRI) reporting framework as specified in the GRI G3 Guidelines. Our responsibility was to carry out an assurance engagement, verify data and provide specific suggestions for improvement.

We found that PNNL satisfactorily meets the guidelines and reported the information in the spirit of GRI disclosure. The 2010 Sustainability Report provides a reasonable and balanced perspective concerning report content, quality, boundary setting, and indicators material to PNNL.

Completeness: PNNL reported on all the management approaches and profile disclosures regarding strategy and analysis, organizational profile, report parameters and governance. The organization also reported on all of its activities in the body of the report as well as the core indicators in each of the six performance categories: Economic, Environment, Human Rights, Labor, Society and Product Responsibility. While these are not all detailed in the print version, we have reviewed all source data and are confident in the full indicator disclosure on the organization's website. We are not aware of the exclusion of any material issues or misstatements of information.

After we reviewed the initial draft of the report and highlighted concerns or made suggestions for improvement, PNNL responded to each concern with a thorough explanation and plan for addressing each one. These changes were included for the final version of the report.

Assurance approach: Our activities included a review of the definitions of the reporting metrics, PNNL's sustainability glossary, all source data and multiple readings of the entire report. We performed a site visit to the PNNL's main campus in Richland, WA during their 2010 fiscal year and recently conducted a conference call with senior company representatives responsible for this report to discuss report content, data, methodologies, and strategies for balanced disclosure around their social, environmental, and economic activities. Our assurance team was made up of sustainability experts from our firm, which undertakes engagements similar to this with U.S.-based and multinational businesses. As part of this assurance, we:

- reviewed PNNL's disclosures on all profile disclosures and core indicators, assessing the information based on the GRI Guidelines
- examined PNNL's source data as well as procedures for data collection, tracking and analysis
- analyzed PNNL's stakeholder engagement activities and materiality determination process provided suggestions for meeting the GRI guidelines in initial readings and reviews
- used the test checklists provided by GRI to analyze the report quality and content according to the GRI Principles

Recommendations for improvement

When conducting stakeholder engagement in the future, PNNL should be more intentional with its stakeholders to engage them about their full sustainability efforts and both communicate and seek input on its social, environmental, and economic efforts. Currently this engagement happens around one or two of these issues, but rarely with intention around all three at once. Also, for future reports, the organization should figure out how people with differing abilities (language, technology, etc.) can access the report content.

Opinion: This was PNNL's second GRI-based sustainability report and the company has demonstrated rigorous internal commitment and procedures for data gathering & reporting. It is in our opinion that in the instances where PNNL does not collect data or have a specific policy or procedure, it is because the issue is deemed not applicable at this time or immaterial. Therefore, we support the company's self-assessment that its 2010 report meets the GRI application level of A+.


Kevin Wilhelm, CEO
Sustainable Business Consulting

Seattle, Washington.
April 7, 2011

Key Performance Indicator Summary Table

GRI Indicator	Indicator Title	2007	2008	2009	2010
Economic Performance					
EC1	Sales	\$ 843,017,000	\$ 1,123,136,000	\$ 1,074,450,000	\$1,162,000,000
	Business volume (total operating costs)	\$ 760,661,000	\$ 881,224,000	\$ 1,058,584,000	\$1,112,400,000
	Employee wages and benefits	\$ 454,111,213	\$ 467,328,000	\$ 514,310,000	\$547,935,000
	Report estimated value of defined benefit (pension) plan liabilities	\$ 719,858,828	\$ 764,242,552	\$ 775,117,033	\$805,103,296
Environmental Performance					
Materials					
EN2	Percentage of materials used that are recycled input materials	Being a service-based organization, paper for printing and other uses represents one of the most important material inputs to our business. PNNL currently tracks consumption of uncoated copy and writing papers with recycled content.			
	Percent of paper product purchases with 30% or greater recycled content	73%	80%	94%	89%
Energy					
EN3 ^a	Direct energy consumption by primary energy source (kBtu)	153,485,839	120,900,742	122,893,218	128,066,896
	Natural gas	146,759,300	113,019,364	116,157,500	120,790,500
	Propane	146,453	190,902	69,835	109,336
	Gasoline	5,377,625	5,348,750	4,227,500	4,875,000
	Diesel	1,063,690	1,582,567	1,530,090	1,788,675
	E85	138,771	759,159	908,292	503,385

^aValues reported for EN3 in the 2009 report have been revised. Updates account for the inadvertent omission of gasoline and diesel fuel use in stationary equipment (e.g. generators) and revised high heating values to convert gallons to kBtus.

GRI Indicator	Indicator Title	2007	2008	2009	2010
EN4	Indirect energy consumption by primary source (kBtu)				
	Non-renewable	298,956,147	287,931,494	306,537,605	317,447,198
	Renewable	37,352,150	31,416,993	24,090,631	198,384,216
Water					
EN8 ^a	Total water withdrawal (gallons)	508,429,829	558,938,450	634,529,882	638,262,078
Emissions					
EN16	Total direct (scope 1) ^b and indirect (scope 2) ^c greenhouse gas emissions (metric tons of CO ₂ equivalent)	45,560	43,654	43,688	48,297
EN17	Other relevant indirect greenhouse gas emissions (scope 3) ^d by weight (metric tons of CO ₂ equivalent)	21,645	23,415	26,425	29,631

^aAdditional data for our aquaculture research facility were added to the 2009 and 2010 totals to closer approximate the actual water usage and discharge. Accurate metered data from this facility were not previously available. This is the primary reason for the reported increase in water use.

^bScope 1 “direct emission” sources include fuel combustion in our facilities (e.g., natural gas, propane), fuel combustion in our fleet vehicles, and fugitive emissions (e.g., refrigerants).

^cScope 2 “indirect emission” sources include electricity use in our facilities.

^dScope 3 “other indirect emission” sources include employee business travel (air and ground), employee commuting, and waste disposal.

GRI Indicator	Indicator Title	2007	2008	2009	2010
Waste					
EN22	Total weight of waste by type and disposal method (tons)				
	Recycled	369	494	492	692
	Recycled demolition	26	118	2474	558
	Landfilled	496	575	666	766
	Composted	0.60	0.60	0.64	0.86
	Regulated hazardous waste ^a	15	30	289	138
	Rad-containing waste—landfilled (after stabilization, size reduction, and/or thermo-treatment)	319	75	70	467
Social Responsibility					
Labor Practices & Workforce Performance					
LA1	Total workforce by employment type, employment contract, and region (excludes interns)	3,734	3,850	4,136	4,289
LA2	Total number and rate of employee turnover by age group, gender, and region	7.2%	5.8%	4.5%	5.7%
LA7	Rates of injury, occupational diseases, lost days, absenteeism, and total number of work-related fatalities by region	All numbers reported are per 200,000 employee hours worked.			
	Total Recordable Case Rate (TRCR)	0.68	0.87	0.79	0.77
	Days Away, Restricted, or Transferred	0.31	0.34	0.29	0.24

^a95% estimated to be incinerated, 5% treated and landfilled.

GRI Indicator	Indicator Title	2007	2008	2009	2010
LA11	Programs for skills management and lifelong learning that support the continued employability of employees and assist them in managing career endings	101 participants	170 participants	161 participants	156 participants

Product Responsibility Performance

PR5	Practices related to customer satisfaction, including results of surveys measuring customer satisfaction	Each year DOE evaluates PNNL's performance against established goals. Two of the most important goals relate to the quality of science and technology (S&T) we deliver in support of our mission and the effectiveness with which we manage and operate the Laboratory. We have consistently and notably exceeded DOE's expectations for S&T performance and have met its very high expectations for management and operations (M&O) performance.			
	Mission Accomplishment (S&T performance)	A	A	A	A
	Operating, Maintaining, and Renewing Facility and Infrastructure (M&O performance)	B+	B+	B+	B+

The indicators reported in this table are a representative of our key performance indicators. PNNL has reported on all of its core indicators as required by the GRI and on our performance relative to 2010 goals on the web version of the report at http://sustainable.pnnl.gov/report/kpi_tables.stm.

On the Cover: Rattlesnake Mountain soil sampling, PNNL employees Vanessa Bailey, Ray Wildung, Harvey Bolton, Allan Konopka.

Photography: Kim Fetrow, ImageWorks (15, 17)



Pacific Northwest
NATIONAL LABORATORY

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



U.S. DEPARTMENT OF
ENERGY

