

FY2016



SITE SUSTAINABILITY PLAN

Mission-Ready for a Sustainable Future



Pacific Northwest
NATIONAL LABORATORY

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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

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(9/2003)

Site Sustainability Plan

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On The Cover: Research engineer Dr. Mariefel Olarte explains how reactors are used for research in converting biomass into liquid transportation fuel during PNNL's 50th Anniversary Family Day, fostering the next generation of scientists and engineers.

Acronyms and Abbreviations

AFV	alternative fuel vehicles	IG	(DOE) Inspector General
BOCC	Building Operations Control Center	ILA	industrial, landscaping, and agricultural (water)
BTu	British Thermal Unit(s)	ISB2	Information Sciences Building 2
CBCP	Certified Building Commissioning Professional	IT	information technology
C&D	construction and demolition	JGCRI	Joint Global Change Research Institute
CEDR	Consolidated Energy Data Report	kBtu	thousands British thermal units
CEM	Certified Energy Manager	kW	kilowatt(s)
CO ₂ e	carbon dioxide equivalent	LDV	light-duty vehicle
COR	City of Richland	LEED®	Leadership in Energy and Environmental Design
CSF	Computational Sciences Facility		
DC Pro	Data Center Profiler Software Tool Suite	MHP	Managed Hardware Program
DOE	U.S. Department of Energy	MOU	Memorandum of Understanding
DOEGRIT	DOE Green IT	MT	metric ton(s)
DOT	U.S. Department of Transportation	MTCO ₂ e	metric tons of carbon dioxide equivalent
DSOM™	Decision Support for Operations and Maintenance Software	NASA	National Aeronautics and Space Administration
ECM	energy conservation measure	PC	personal computer
EISA	Energy Independence and Security Act of 2007	P2	Pollution Prevention
EMSL	Environmental Molecular Sciences Laboratory	PNNL	Pacific Northwest National Laboratory
EPA	U.S. Environmental Protection Agency	PPA	Power Purchase Agreement
EPAct	Energy Policy Act of 2005	PSL	Physical Sciences Laboratory
EPEAT	Electronic Product Environmental Assessment Tool	PUE	power usage effectiveness
ESPC	Energy Savings Performance Contract	PV	photovoltaic
ESS	engineering standards and specifications	REC	Renewable Energy Certificate
EV	electric vehicle	R&D	research and development
F&O	Facilities & Operations	ROB	research and development
FIMS	Facilities Information Management System	SEB	Systems Engineering Building
FY	fiscal year	SF ₆	sulfur hexafluoride
gal	gallon(s)	SPO	DOE's Sustainability Performance Office
gCO ₂ e	grams of carbon dioxide equivalent	SSP	Site Sustainability Plan
GGE	gallons of gasoline equivalent	SSPP	Strategic Sustainability Performance Plan
GHG	greenhouse gas	STEM	science, technology, engineering, and mathematics
GP	Guiding Principles	T&D	transmission and distribution
GRI	Global Reporting Initiative	UESC	utility energy service contract
GSA	General Services Administration	ULT	ultra-low temperature (freezer)
GSF	gross square foot/feet	UPS	uninterruptible power supply
HDI	How Do I?, PNNL's standards-based management system	U.S.	United States
HEMSF	High-Energy Mission-Specific Facility		
HPSB	high performance and sustainable building		
HVAC	heating, ventilation, and air conditioning		

Much like a honeycomb with its interlocking pieces that gain strength through mutual support and integration, our three pillars and twelve focus areas create a Sustainability Program that is greater than the sum of its parts.



PNNL celebrated its 50th anniversary in FY15. Children created images of a future scientific invention. The winning images were placed in the PNNL 50th Anniversary time capsule, along with artifacts selected by staff to represent our 50 years of accomplishments.



As a federal research laboratory of the United States (U.S.) Department of Energy (DOE), Pacific Northwest National Laboratory (PNNL) has both an opportunity and a responsibility to solve complex scientific and technological challenges related to energy, environment, and national security, and we transfer that knowledge and technology to industries worldwide.

We have ambitious long-term environmental goals to reduce water and energy consumption. Investments in water efficiency continued to drive down our potable water use, exceeding our goals. Our greatest challenge lies in reducing building energy intensity and greenhouse gas (GHG) emissions, as fulfilling our research mission drives us to expand into new laboratory- and computing-intensive facilities. To offset these impacts, we incorporated a holistic approach to sustainability into our Campus Master Plan, are committed to constructing facilities that meet the Guiding Principles for High Performance Sustainable Buildings (HPSB), and will continue using our facilities as a living laboratory to explore issues that affect not only our campus but also are challenges throughout DOE.

Our plan includes actions to conserve energy, water, and financial resources and improve the comfort and productivity of our staff members. In FY15, we achieved several sustainability milestones, as highlighted below.

- Changing Behavior with "Rock the Watt":** The Sustainability Program led a successful three-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 behavior-change research. 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.
- Leading the Way with Sustainable Design:** PNNL constructed a new facility in 2015, the Systems Engineering Building (SEB). The SEB was designed to meet the Guiding Principles for HPSB through the Leadership in Energy and Environment Design (LEED) equivalency approach. Currently 36% of our portfolio meets the HPSB criteria, which exceeds the DOE goal of 15% by FY15. Construction is underway for an additional HPSB building which will become operational in FY16.
- Planning for Climate Change:** A cross-cutting team of 15 internal stakeholders took on the task of assessing PNNL's vulnerability to climate impacts and defining actions to improve our resiliency. Key regional impacts of climate change are projected to be drought and streamflow changes, more extreme heat events, more intense precipitation events, and increased wildfires. We defined several new actions to help reduce vulnerabilities. The internal stakeholder team is committed to reviewing these metrics and our climate resiliency plan annually.

For additional information about these projects, please refer to the corresponding sections of this Site Sustainability Plan (SSP).

The following table summarizes each of DOE's Office of Science goals, along with PNNL's performance status, planned actions, and an assessment of the risk of non-attainment as noted below:

<p>Technical Risks: Technology is/is not available in current facilities and systems to attain goal</p> <p>Management Risks: Management systems and/or policies may require changes for which approval authority is outside DOE or requires an internal policy or procedural change</p> <p>Financial Risks: Funds are/are not identified in current or out-year targets to achieve goal</p>	<p>Each risk is assigned a rating of high, medium, or low, defined as follows.</p> <p>High Risk: Risk in one of the three categories is so significant that goal non-attainment is likely or expected</p> <p>Medium Risk: Risk in one of the three categories is significant enough that goal non-attainment is moderate</p> <p>Low Risk: Any risks are satisfactorily mitigated such that goal attainment is likely</p>
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Summary Table of Goals and Targets

SSPP Goal	DOE Goal	Performance Status Through FY15	Planned Actions and Contribution	Risk of Non-attainment
Goal #1: Greenhouse Gas Reduction				
1.1	50% Scope 1 & 2 GHG reduction by FY25 from a FY08 baseline (FY15 target: 19%)	<p>FY08 Baseline: 43,686 metric tons of carbon dioxide equivalent (MTCO₂e)</p> <p>FY15 Actual: 0 MTCO₂e (46,537 MTCO₂e without renewable energy certificates [RECs])</p> <p>FY25 Goal: 21,843 MTCO₂e</p> <p>Status: 100% reduction</p>	Continue REC purchases for near-term GHG reduction goal and implement energy conservation measures (ECMs), where cost-effective.	Low
1.2	25% Scope 3 GHG reduction by FY25 from a FY08 baseline (FY15 target: 6%)	<p>FY08 Baseline: 24,122 MTCO₂e</p> <p>FY15 Actual: 21,190 MTCO₂e (24,277 MTCO₂e without RECs)</p> <p>FY25 Goal: 18,091 MTCO₂e</p> <p>Status: 12% reduction</p>	Continue promoting telework and use of video conferencing to reduce travel; encourage staff through bus and carpool promotions and incentives.	Low
Goal #2: Sustainable Buildings				
2.1	25% energy intensity (British thermal units [Btu] per gross square foot [GSF]) reduction in goal-subject buildings, achieving 2.5% reductions annually, by FY25 from a FY15 baseline.	<p>FY15 Baseline: 167,486 Btu/GSF</p> <p>FY25 Goal: 125,878 Btu/GSF</p>	Continue implementing Consolidated Energy Data Report (CEDR) projects and operational improvements.	High
2.2	Energy Independence and Security Act of 2007 (EISA) Section 432 energy and water evaluations.	Completed third year of the four-year EISA cycle of 10 buildings.	Continue executing EISA evaluations.	Low
2.3	Meter all individual buildings for electricity, natural gas, steam, and water, where cost-effective and appropriate ⁽¹⁾ .	All individual buildings metered for electricity, natural gas, steam, and water, where cost-effective and appropriate.	Improve building performance through data analysis from the meters.	Low

(1) Per NECPA (42 U.S.C Section 8253) the term "buildings" includes industrial, process, or laboratory facilities.

SSPP Goal	DOE Goal	Performance Status Through FY15	Planned Actions and Contribution	Risk of Non-attainment
2.4	At least 15% (by building count or gross square feet) of existing buildings greater than 5,000 GSF to be compliant with the revised Guiding Principles for HPSB by FY25, with progress to 100% thereafter ⁽²⁾ .	36% of PNNL buildings > 5,000 GSF per Facilities Information Management System (FIMS) are HPSB compliant	Continue trending toward 100% of facilities meeting HPSB.	Low
2.5	Efforts to increase regional and local planning coordination and involvement.	Collaborated with City of Richland (COR) Energy Services on contingency planning associated with electrical service outages and catastrophic events.	Continue leveraging partnerships to obtain SSP goals.	Low
2.6a	Net Zero Buildings: Percentage of the site's existing buildings above 5,000 gross square feet intended to be energy, waste, or water net zero buildings by FY25.	No net zero buildings currently on campus.	Perform an assessment in FY16 to gain understanding of this requirement and actions required to meet it.	Low
2.6b	Net Zero Buildings: Percentage of new buildings (>5,000 GSF) entering the planning process designed to achieve energy net zero beginning in FY20.	No net zero buildings currently on campus.	Perform an assessment in FY16 to gain understanding of this requirement and actions required to meet it.	Low
2.7	Data Center Efficiency. Establish a power usage effectiveness (PUE) target in the range of 1.2-1.4 for new data centers and less than 1.5 for existing data centers.	Existing data center weighted PUE is 1.45. Target PUE for new data centers is 1.2-1.4.	Continue performing energy assessments and profiling of data centers using DOE Green IT (DOEGRIT).	Low
Goal #3: Clean & Renewable Energy				
3.1	"Clean Energy" requires that the percentage of an agency's total electric and thermal energy accounted for by renewable and alternative energy shall be not less than: 10% in FY16-17, working towards 25% by FY25.	FY15: 39.4% of annual electric and thermal energy from renewable and alternative energy.	Continue to meet the clean energy goal through onsite generation and RECs.	Low
3.2	"Renewable Electric Energy" requires that renewable electric energy account for not less than 10% of a total agency electric consumption in FY16-17, working towards 30% of total agency electric consumption by FY25.	FY15: 53% of annual electric consumption is renewable electric energy.	Continue to meet the renewable energy goal through onsite generation and RECs.	Low
Goal #4: Water Use Efficiency and Management				
4.1	36% potable water intensity (gallon [gal] per GSF) reduction by FY25 from a FY07 baseline. (FY15 target: 16%)	FY07 Baseline: 70.08 gal/GSF FY15 Actual: 23.33 gal/GSF FY25 Goal: 44.85 gal/GSF Status: Exceeded goal	Update site water management plan in FY16 to identify opportunities for additional reductions.	Low

(2) HPSB targets cited in this SSP Guidance correlate with previous Executive Orders. Revised Guiding Principles will be published in the near future that will amend these targets through 2025. Until those updates are completed and distributed, report progress in this goal area using the previously established targets.

SSPP Goal	DOE Goal	Performance Status Through FY15	Planned Actions and Contribution	Risk of Non-attainment
4.2	30% water consumption (gal) reduction of industrial, landscaping, and agricultural (ILA) water by FY25 from a FY10 baseline. (FY15 target: 10%)	FY11 Baseline: 176,248,000 gal FY15 Actual: 168,235,000 gal FY25 Goal: 123,374 gal Status: 4.6% decrease	Update site water management plan in FY16 to identify opportunities for additional reductions.	Medium
Goal #5: Fleet Management				
5.1	20% reduction in annual petroleum consumption by FY15 relative to a FY05 baseline; maintain 20% reduction thereafter. (FY15 target: 20%)	FY05 Baseline: 38,824 gallons of gasoline equivalent (GGE) FY15 Actual: 28,988 (GGE) FY15 Goal: 31,059 (GGE) Status: 25% reduction	Continue to promote sharing of vehicles, mileage reimbursement plans, and short-term rentals where viable to reduce petroleum consumption.	Low
5.2	10% increase in annual alternative fuel consumption by FY15 relative to a FY05 baseline; maintain 10% increase thereafter. (FY15 target: 10%)	FY06 Baseline: 456 gal of GGE (note: FY05 usage not measured) FY15 Actual: 6,973 (GGE) FY15 Goal: 502 (GGE) Status: Exceeded goal	PNNL periodically checks the availability in the local area for bio-diesel fuel. As older vehicles are replaced, PNNL works with General Services Administration (GSA) to determine if an alternative fuel or fully electric vehicle (EV) is an option for replacement.	Low
5.3	30% reduction in fleet-wide per-mile greenhouse gas emissions reduction by FY25 from a FY14 baseline. (FY15 target: N/A; FY17 target: 4%)	FY14 Baseline: 668 gCO ₂ e/ mile FY15 Actual: 709 gCO ₂ e Status: 6% increase	Continued education to staff members the importance of avoiding extra idling time, speed control, combining trips with other staff members when feasible, proper maintenance to help reduce their GHG impact.	Low
5.4	75% of light duty vehicle (LDV) acquisitions must consist of alternative fuel vehicles (AFV). (FY15 target: 75%)	In FY15, 50% of the new LDV fleet acquisitions consisted of AFV vehicles. Currently, PNNL has a total of 39 LDVs, of which 35 (89%) are AFVs.	PNNL will continue working with GSA to replace vehicles with AFV types whenever available.	Low
5.5	20% of passenger vehicle acquisitions consist of zero emission or plug-in hybrid EVs by FY20, working towards 50% by FY25. (FY15 target: N/A)	In FY15, PNNL evaluated this new goal and is working to determine how best to further integrate zero emission and plug-in hybrid EVs into the existing fleet.	PNNL will work closely with GSA to acquire Zero Emission or Plug-in Hybrid vehicles for all newly acquired passenger vehicles. Consideration for Zero Emission or Plug-in Hybrid will also be taken into account when ordering other vehicle classes.	Low

SSPP Goal	DOE Goal	Performance Status Through FY15	Planned Actions and Contribution	Risk of Non-attainment
Goal #6: Sustainable Acquisition				
6.1	Promote sustainable acquisition and procurement to the maximum extent practicable, ensuring BioPreferred and biobased provisions and clauses are included in 95% of applicable contracts.	100% of acquisition actions contain a clause regarding sustainable acquisitions considerations, which includes reference to BioPreferred and biobased requirements.	Continue being proactive with sustainable item procurement.	Low
Goal #7: Pollution Prevention & Waste Reduction				
7.1	Divert at least 50% of non-hazardous solid waste, excluding construction and demolition debris.	FY15: Diverted 54% of nonhazardous solid waste	Continue conducting assessments for waste reduction opportunities.	Low
7.2	Divert at least 50% of construction and demolition materials and debris.	FY15: Diverted 86% of construction & demolition (C&D) waste.	Continue monitoring C&D recycling performance and raising awareness on waste diversion requirements.	Low
Goal #8: Energy Performance Contracts				
8.1	Annual targets for performance contracting to be implemented in FY17 and annually thereafter as part of the planning of section 14 of Executive Order 13693.	Three Energy Savings Performance Contracts (ESPCs) have been implemented at PNNL.	Evaluate potential candidate projects for opportunities to use alternative financing mechanisms, such as ENABLE, ESPC, UESC, or PPA.	Low
Goal #9: Electronic Stewardship				
9.1	Purchases – 95% of eligible acquisitions each year are Electronic Product Environmental Assessment Tool (EPEAT)-registered products.	In FY15, 99% of eligible acquisitions were EPEAT-registered products.	Continue to purchase EPEAT-registered products when available.	Low
9.2	Power management – 100% of eligible personal computers (PCs), laptops, and monitors have power management enabled.	100% Windows and Mac systems are shipped with power management capabilities enabled.	Continue to implement power management features on initial setup.	Low
9.3	Automatic duplexing – 100% of eligible computers and imaging equipment have automatic duplexing enabled.	The default printer software is configured to use automatic duplex printing.	Continue to use duplex printing as default configuration.	Low
9.4	End of Life – 100% of used electronics are reused or recycled using environmentally sound disposition options each year.	In FY15 all assets identified as electronics to be disposed of as excess were reused or recycled using environmentally sound disposition options.	Continue to reuse and recycle electronics.	Low
Goal #10: Climate Change Resilience				
10.1	Update policies to incentivize planning for and addressing the impacts of climate change.	In FY15 PNNL completed a vulnerability assessment and developed a climate resiliency action plan.	The internal climate resiliency planning stakeholder team established in FY15 will meet annually to determine the need to revise plans and procedures.	Low

SSPP Goal	DOE Goal	Performance Status Through FY15	Planned Actions and Contribution	Risk of Non-attainment
10.2	Update emergency response procedures and protocols to account for projected climate change, including extreme weather events.	The PNNL Sustainability Program met with members of the Emergency Preparedness office during FY13 and 14 to review the status of both emergency preparedness and business continuity plans.	The Sustainability Program will continue to engage Environmental Planning and Emergency Preparedness as part of the annual climate resiliency review.	Low
10.3	Ensure workforce protocols and policies reflect projected human health and safety impacts of climate change.	The FY15 vulnerability assessment identified six potential regional climate exposures that could influence worker health and safety. Existing plans and procedures were determined to address the risk in most cases.	Continue working with Worker Safety and Health professionals to mitigate risks due to climate change.	Low
10.4	Ensure site/lab management demonstrates commitment to adaptation efforts through internal communications and policies.	The climate resiliency planning internal stakeholder team established during FY15 was comprised of senior managers of programs deemed critical to PNNL's climate resiliency.	The climate resiliency planning internal stakeholder team will meet annually to ensure that we have followed through on our commitments to improve PNNL's resiliency, review metrics that could indicate changes in our vulnerability, and determine the need to revise plans and procedures.	Low
10.5	Ensure that site/lab climate adaptation and resilience policies and programs reflect best available current climate change science, updated as necessary.	PNNL's research on atmospheric processes and the interconnections among energy, climate, and other human and natural systems is helping to inform sustainable solutions to the nation's energy and environmental challenges.	The Sustainability Program team members responsible for climate resiliency planning will review updates to national plans as they occur and will continue to consult with internal subject matter experts as warranted to discuss evolving climate change scenarios.	Low



Greenhouse Gas Reduction

PNNL will continue targeting opportunities that have a net positive effect on Scope 1, 2, and 3 GHG emissions.

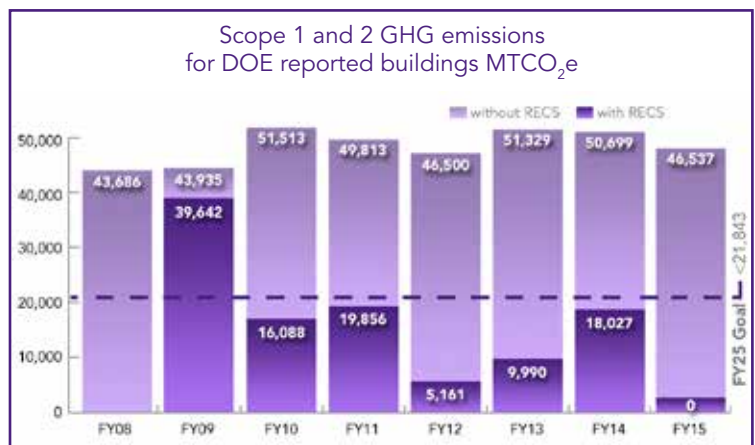
FY15 Performance Status

Scope 1 & 2

The PNNL Scope 1 and 2 greenhouse gas (GHG) emissions FY08 baseline is 43,686 MTCO₂e. Between FY08 and FY15, Scope 1 and 2 GHG emissions increased from 43,686 MTCO₂e to 46,537 MTCO₂e. PNNL executed multiple reduction projects as part of the energy intensity goal that served to offset much of the additional computer load, while also continuing to implement its strategy of procuring Renewable Energy Certificates (RECs). In FY15, RECs offset 46,871 MTCO₂e, resulting in an overall Scope 1 and 2 GHG emissions reduction of 100%, which exceeds the new FY25 goal of 50%. The Campus Master Plan leverages guiding principles to inform decisions for current and future developments fostering a sustainable, collaborative, and flexible PNNL campus. Activities targeted to lower GHG emissions typically benefit both the Scope 1 and 2 goals, like continuous commissioning with support of building dashboards, core business hours, and whole building diagnostics in our Building Operations Control Center (BOCC), for example.

Goals

- 1.1 – 50% Scope 1 & 2 GHG reduction by FY25 from a FY08 baseline
- 1.2 – 25% Scope 3 GHG reduction by FY25 from a FY08 baseline



Scope 1

The largest single source of Scope 1 GHG emissions at PNNL is natural gas that is burned in boilers to heat our facilities. In FY15, the BOCC was relocated to our new SEB and, working with operations staff, implemented strategies to minimize natural gas use across the campus. Areas of focus included maximizing the summer shutdown of boilers, heating water temperature setbacks in the spring and fall, repair and calibration of gas metering, and monitoring of core business

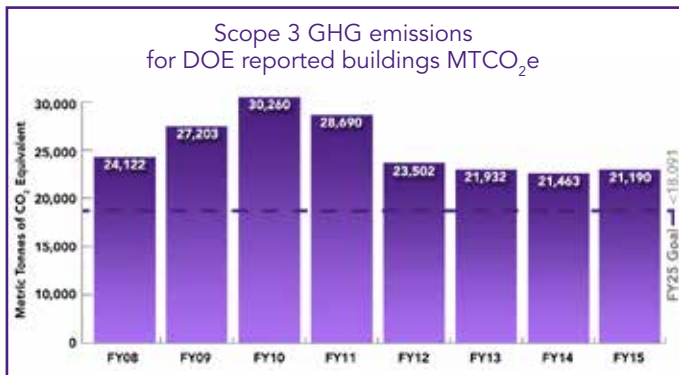
hours. PNNL also uses sulfur hexafluoride (SF₆) for research, which contributes to Scope 1 GHG emissions. PNNL has inventoried existing sources and has a good understanding of its uses (e.g., as an insulator in electron microscopes and as tracer gas). In FY11, PNNL worked with researchers who used SF₆ as a tracer to adopt a substitute gas, nitrous oxide, which has a lower global warming potential. This replacement has continued, and no new project work has included SF₆. For electron microscopes, SF₆ is relatively stable, and year-to-year fluctuations are primarily due to use of a mass balance inventory method.

Scope 2

Scope 2 electricity consumption is our largest source of GHG emissions. The large computational research mission area at the PNNL high-energy mission-specific facilities (HEMSFs) makes reducing Scope 2 challenging; however, the BOCC is continuously monitoring the campus to look for opportunities for improvement. In FY15, PNNL implemented multiple projects to reduce Scope 2 emissions. Examples include the installation of variable speed drives, high-efficiency motors, chiller optimization, intelligent building sensors, LED installations, and the new Lucid dashboard analytics tool. We also continued to operate our 125 kW solar array and procure RECs at competitive rates to offset our GHG emissions.

Scope 3

Scope 3 emissions totaled 21,190 MTCO₂e, representing a 12% reduction from the FY08 baseline after adjusting for transmission and distribution (T&D) loss-related emissions avoided through REC purchases. Business travel was the largest contributor to these emissions (58%), followed by employee commuting (30%) and T&D losses (10%). Emissions from contracted solid waste disposal and wastewater treatment made up just 2%. Reducing Scope 3 emissions continued to be a strategic priority at PNNL in FY15. Specific activities are discussed in more detail below.



Business Air and Ground Travel

In FY15, total emissions from business travel were 13,934 MTCO₂e, an increase of 5% compared with FY14. Air travel totaled 13,111 MTCO₂e and increased 5% compared with FY14. Business ground travel accounted for 823 MTCO₂e, an increase of 9% from the previous year. Emissions from business travel continued to exceed the baseline, at 7% above FY08 levels.

Employee Commuting

PNNL's employee commute emissions in FY15 totaled 7,376 MTCO₂e, an increase of 1% from FY14. The slight growth in employee commute emissions is directly attributable to the increase in PNNL staffing levels over those in FY14. Employee commute emissions are calculated using the results of the GSA Scope 3 Commuter Survey. The survey is conducted bi-annually, and for years in which the survey is not conducted, results from the prior year are extrapolated based on changes in the total employee population at PNNL. Employee commute emissions in FY15 were 13% below the FY08 baseline.

Staff members continued to take advantage of the telework option in 2015. By the end of FY15, approximately 15% of employees had signed telework agreements, with 5% of staff reporting teleworking at least once per week on average. Staff recorded 28,185 telework days through the PNNL electronic time keeping tool and avoided an estimated 223 MTCO₂e.



A Laboratory Telework Advocate and individual Directorate Telework Advocates helped raise staff member awareness of the telework option and commute alternatives through directorate-level and all-staff communications, including articles in PNNL's weekly employee e-newsletter, websites, a quarterly sustainability e-newsletter, a monthly operations newsletter hung in rest rooms, and seasonal challenges like National Bike to Work Month.

PNNL cyclists from Richland, Seattle and Sequim rode 20,160 miles in May's National Bike to Work Month Challenge. Eight teams comprising more than

90 employees participated, almost twice as many as in the previous year. PNNL was deemed a “Bike-Friendly Business” (bronze level) by the League of American Bicyclists in early FY15. This prestigious designation, as well as employee support, demonstrates that PNNL has a robust cycling community.

In addition to the group rides to work that began with a record turnout on Bike to Work Day on May 15, more social rides and other activities are happening among cyclists outside of work. Employees may use the Whiteboard (an electronic bulletin board for staff) to connect with other PNNL riders and to organize events. The Wellness department sponsored an “ask the bike expert” booth at a Mid-Week Music Break, sponsored by Life@PNNL.

A PNNL staff volunteer who is a cycling advocate was recruited to represent PNNL at the Three Rivers Bicycle Club, which works with the Richland City Council to set plans for continued road safety improvements and developing a more bike-friendly community.

Other Scope 3 Emission Sources

All other emission sources comprised 12% of PNNL’s Scope 3 emissions. Specifically, T&D losses attributable to DOE-owned and leased facilities at PNNL totaled 2,404 MTCO₂e using the national loss factor of 6.59%, a 5% decrease from FY14. Contracted wastewater treatment and waste disposal totaled 566 MTCO₂e, an 8% increase from FY14.

PNNL does not actively manage wastewater emissions, as it can be controlled only by reducing staff numbers under the current accounting methodology. T&D losses will be managed as a result of our Scope 2 electricity reduction efforts. Waste management emissions will be actively managed as described in the “Pollution Prevention and Waste Reduction” (P2) section.



Plans, Actions, and Projected Performance

Scope 1 & 2

Beginning in FY16, the new Scope 1 and 2 GHG emissions reduction goal is a 50% reduction by FY25 from a FY08 baseline. The PNNL FY08 baseline is 43,686 MTCO₂e. Targeted areas for reduction of Scope 1 and 2 GHG emissions are described below.

Scope 1

The largest opportunity for reduction of natural gas (Scope 1) GHG emissions at PNNL is to offset the large amount of electricity (Scope 2) that our HEMSFs consume to operate supercomputers by using the considerable amount of low-grade “waste” heat they generate. The Environmental Molecular Sciences Laboratory (EMSL) and Computational Sciences Facility (CSF) have the ability to capture some of this waste heat and utilize it to help heat the buildings during cold weather. Mission strategy projects an increase in computational capacity where the waste heat generated would exceed the heating needs of both EMSL and CSF and could be used to heat other buildings as well. PNNL intends to investigate the possibility of using this heat in other buildings during FY16, and if viable, it would reduce the amount of natural gas needed to heat the buildings.

Scope 2

The projected growth in computational sciences research and equipment makes the reduction of Scope 2 GHG emissions challenging; however, PNNL intends to implement several projects in FY16 that will help offset those increases. Examples include the installation of LED lights, additional intelligent building sensors, and the purchase of high-efficiency equipment. We will also continue to operate our 125 kW solar array and procure RECs at competitive rates to offset our GHG emissions.

Scope 3

To achieve the 25% reduction in Scope 3 emissions by FY25, PNNL will need to reduce annual emissions by another 3,083 MTCO₂e over the next nine years. Most of this decrease will be achieved through a combination of activities aimed at reducing business travel, employee commuting, and T&D losses associated with electricity use. PNNL will continue advancing the programs conducted in FY15 and will pursue additional activities to decrease Scope 3 emissions further.

Employee Commute Emissions

PNNL's commute emissions reduction strategy will continue to emphasize telework in FY16 and beyond. PNNL established a goal of 20% of all employees teleworking one day per week on average by FY20 and 40% by FY25. Additional activities in FY16 to help accomplish PNNL's Scope 3 emission reduction goals include updating the telework training modules to better equip staff members and managers with the knowledge and desire to telework and engaging the staff through communications, special events, seminars, and staff recognition.



Colette Sacksteder, Kristin Victry, and Ron Moore successfully led their peers to set back 29 of PNNL's 65 ULT freezers in Biological Science Facility and EMSL.

Success Story

In FY15, PNNL launched an energy challenge to foster a friendly competition across buildings. The goal of the competition was to raise staff member awareness on how their behavior can impact energy use and to empower staff members to take conservation actions. Staff members were also encouraged to share energy conservation ideas, the majority of which were implemented by the Sustainability Program. Individuals who stood out for their actions were recognized in building email messages and prizes were distributed to occupants of buildings with the greatest number of cumulative actions.

Behavior change in laboratories was also a focus in FY15. High-impact savings opportunities were identified during assessments using PNNL's laboratory sustainability protocol. One such opportunity identified was "chilling up" ultra-low-temperature (ULT) freezers, which are often set at their maximum set point of -80°C even though -70°C will generally meet sample preservation needs. The campaign has been a great success, with the set points being raised on 30 freezers to date, resulting in electricity savings of \$2,700 per year and over \$550k over the life of the freezers. We also negotiated an \$800 utility incentive to encourage the purchase of high-efficiency ULT freezers, which use about half the energy of standard units.

Sustainable Buildings

Advanced metering, HPSB, EISA evaluations, and energy efficiency project implementation continue positive progress toward PNNL's energy goals.

FY15 Performance Status

Energy Intensity

Between FY03 and FY15, PNNL's energy intensity fell from a baseline of 214 kBtu per GSF to 167 kBtu per GSF – a net reduction of 21.5%.

In FY15, PNNL stimulated cultural change to help achieve building energy intensity reductions. An energy challenge was initiated at the beginning of the fiscal year, which brought about friendly competition between building occupants. The objective of the competition was to raise staff's awareness on how their behavior can impact our overall energy usage and to empower them to make positive changes within their building. Prizes for the winning buildings were given out monthly, and the results published in our electronic newsletters. Staff members were also encouraged to submit ideas to further improve building energy intensity, and those who did also received an award. All viable ideas that were submitted have been implemented.

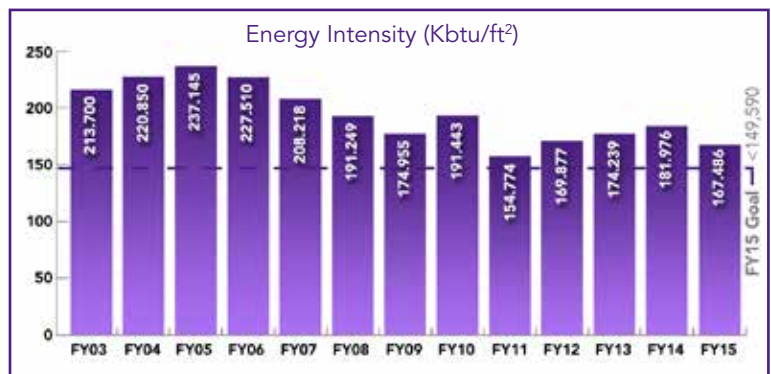
Laboratories were another focus area, specifically those that use ULT freezers. Researchers were challenged to "chill up," which means they raised the temperature of their freezers as much as their research would allow (typically 10-20 degrees). The campaign was a great success, with 30 freezers having their temperatures increased, resulting in a net electricity savings of \$2,700 per year and over \$550K over the life of the freezers. We also were successful in obtaining a utility incentive of \$800 for each new high-efficiency, ULT freezer we procure, helping to offset the higher initial cost.

The successful reduction of energy intensity requires a combination of an engaged staff and the appropriate tools and equipment to execute the work. PNNL's BOCC is vital to our success and is staffed by our sustainability and continuous

PNNL's new Systems Engineering Building completed in FY15

Goals

- 2.1 – 25% energy intensity (Btu per GSF) reduction in goal-subject buildings, achieving 2.5% reductions annually, by FY25 from a FY15 baseline
- 2.2 – EISA Section 432 energy and water evaluations, benchmarking, project implementation, and measures follow up
- 2.3 – Meter all individual buildings for electricity, natural gas, steam, and water, where cost-effective and appropriate
- 2.4 – At least 15% (by building count or GSF) of existing buildings greater than 5,000 GSF to be compliant with the revised Guiding Principles for HPSB by FY25, with progress to 100% thereafter
- 2.5 – Efforts to increase regional and local planning coordination and involvement
- 2.6 – Net Zero Buildings
- 2.7 – Data Center Efficiency



commissioning engineers along with two student interns. Together they analyze data from our advanced meters and building control systems, while also performing functional testing of building systems with our operations staff. Developed at PNNL as an advanced supervision and diagnostic tool, Decision Support for Operations and Maintenance (DSOM™) software has been deployed in select PNNL facilities, helping to reduce energy use, lower operations and maintenance costs, and extend equipment life in facilities.

Adding to our portfolio of analytic tools, we installed Lucid's Building Dashboard, and BuildingOS in FY15. These tools gather real-time data from our whole building advanced meters, receive weather predictions from online sources, and compare these against historical data from our EnergyCap database. Data is then displayed graphically on dashboards and charts, allowing building management to make better informed decisions. The program can also compare buildings against each other for benchmarking purposes and for energy challenge competitions between buildings and their occupants. Staff member skills in energy and water management are kept sharp and refreshed through qualified training programs like the Certified Energy Management (CEM) and Certified Building Commissioning Professional (CBCP) courses.

While we did not achieve our target of a 30% reduction by FY15, PNNL was aggressive about reducing its energy intensity overall. Mission-driven increases in energy use were offset through a combination of energy-saving projects, operational efficiencies, construction of high-performance buildings, improvements to our Engineering Standards and Specifications, and promoting conservation behavior among occupants.

Buildings excluded from the energy intensity goal along with a copy of the exclusion self-certification letter can be found in Appendix A.

EISA Evaluations

PNNL successfully completed retro-commissioning and energy and water audits for two buildings (331 and CSF) that are subject to EISA Section 432 energy and water evaluation requirements. These two buildings represent 21% of the energy used by the ten covered facilities in the four-year goal cycle. ECMs were completed at the 331 Building by PNNL air balance and sheetmetal crafts that reduced airflows and removed abandoned heating coils throughout the building. Physical Sciences Facility 3410 had an ECM implemented that was also performed by PNNL air balance technicians, a controls specialist, and the engineering group that rebalanced the building airflows and reduced fan speeds. Future ECMs will also be implemented in PNNL EISA buildings in FY16 that utilize

information obtained from previous evaluations and expertise from PNNL staff.

Metering

Whole building metering as required by the Energy Policy Act of 2005 (EPA), EISA, and Executive Order 13693 for electricity, natural gas, and water has been completed for all buildings where "appropriate" per the *Federal Building Metering Guidance* (per 42 U.S.C. §8253(e), *Metering of Energy Use* (DOE 2014)). With real-time meter data, our BOCC has all the necessary information to perform system analyses on facilities. The *PNNL Metering Plan* details our successful completion of this goal and outlines future strategies of how we intend to use the data.

High Performance and Sustainable Buildings

Currently, 36% of PNNL buildings meet HPSB requirements. All existing FIMS buildings have been assessed against the HPSB Guiding Principles using the checklist provided in the U.S. Environmental Protection Agency's (EPA's) ENERGY STAR Portfolio Manager.

PNNL began construction of a new laboratory facility in FY15 designed as an HPSB using the Guiding Principles for New Construction criteria. This will be the first new facility at PNNL to use the Guiding Principles as a path toward HPSB status.

Also in 2015, construction on the new SEB was completed. This building has been submitted for LEED Gold certification, furthering progress toward 100% of all buildings meeting the HPSB criteria.

Regional and Local Planning

In FY15, we collaborated with the COR's Energy Services Department regarding the PNNL National Security Directorate's contingency planning associated with electrical service outages and catastrophic events, and on PNNL's Climate Resiliency Action Planning. PNNL signed a memorandum of understanding (MOU) with the COR to establish common goals in the delivery and maintenance of COR-provided utilities to PNNL. The MOU provided the means for the removal of abandoned electrical equipment at facilities in the 300 Area and the installation of COR electrical, water, and sewer to support new facilities.

Data Centers

PNNL performed energy assessments and profiled its data centers during FY15 using DOEGRIT, part of the Data Center Profiler (DC Pro) software tool suite. Assessment results help outline projects that will guide us to better data center efficiencies.

Since FY06, PNNL has aggressively pursued virtualization as the tool to minimize server sprawl, conserve energy, and reduce the equipment footprint of the Information Sciences Building 2 (ISB2) data center. As of fourth quarter FY15, PNNL business virtualization is over 88%, up from last year's 85%. With our virtual desktop early adopters, PNNL continues to pursue increases, in data center energy efficiency.

All three data centers have been profiled using DC Pro by our Certified Data Center Energy Practitioner. The combined weighted existing data center PUE is 1.45. Individual data center PUE results are as follows:

- **CSF:** PUE 1.2 annualized, average IT Load = 571 kW
- **EMSL:** PUE 1.62 annualized, average IT Load = 732 kW
- **ISB2:** PUE 1.58 annualized, average IT Load = 149 kW

Plans, Actions, and Projected Performance

Energy Intensity

Beginning in FY16, PNNL will begin working toward the new goal to reduce energy use intensity 25% by FY25 from a FY15 baseline, and by 2.5% annually. The PNNL FY15 baseline is 168 kBtu per GSF. PNNL intends to work towards goal attainment by establishing annual energy reduction goals within directorate business plans, increasing collaboration with our research scientists, and expanding the tools and equipment available within the BOCC. PNNL will continue making real-time informed decisions through building dashboards and institutionalize real-time commissioning of facility systems to increase attention on daily building operations versus periodic retro commissioning efforts. We have shown with the BOCC that the ability to monitor, perform diagnostics, and make informed decisions enhances the overall performance of PNNL facilities, leading to increased energy savings and greater operational performance.

Maintaining the core competencies of our highly qualified staff is vital to the long-term success of the Sustainability Program and, ultimately, the completion of the goals outlined herein. We will continue to train staff regarding the latest building efficiency technologies and maintain or increase the number of qualified CEMs and CBCPs.

We believe that achieving the 25% energy intensity reduction goal by FY25 will continue to be challenging. Projected business growth in key areas of PNNL's portfolio may result in energy intensity increases, which we will strive

to offset by aggressively managing energy usage in other areas. We will continue to look for additional ways to reduce energy while conducting our world-class research.

EISA Evaluations

PNNL will continue to conduct energy and water evaluations in our EISA-covered facilities. With the 40% increase in FIMS buildings, the number of covered facilities for PNNL has increased from 8 to 10. In FY16, our plan is to evaluate four buildings, as outlined in the CEDR, and implement ECMs outlined in previous evaluations. This will keep us on track to complete approximately 25% of our facilities every year, allowing us to distribute workload and funding. Identified ECMs will be tracked in the CEDR, with funding requests integrated into our planning process.

Metering

With buildings being added to the PNNL campus each year, PNNL will continue to meet metering requirements by installing the most appropriate metering for each asset. As meter installations continue, PNNL will continue to gather and analyze data as we strive to meet the energy and water reduction challenges. Using meter and sensor data, operational improvements or maintenance corrections can be easily identified and corrected in real time. Future strategies for data use will be outlined in the *PNNL Metering Plan*.

High Performance and Sustainable Buildings

An assessment in FY15 detailed the path to 100% conformance with the Guiding Principles. This assessment listed steps necessary and approximate costs to complete the Guiding Principle requirements for each appropriate building. In some buildings, investments needed to achieve HPSB status may not be cost-effective, based on facility age, mechanical equipment design, or specific and specialized research activities.

PNNL intends to build three new facilities over the next several years. We have committed that all new construction, major renovations, and alterations of buildings greater than 5,000 GSF will comply with the Guiding Principles or equivalent certification methods. Planning for future facilities, including line item, general plant project, or leases, will include these requirements.

Regional and Local Planning

PNNL plans to continue conversations with DOE, other Hanford contractors, and the COR that may eventually result in changes to the 300 Area fire, water, and sewer service provider over the next one to three years. There are other planned discussions with the COR to improve the

land-use planning and development process in north Richland adjacent to the PNNL campus. Goals of those conversations include engaging PNNL early to better address potential impacts to current and future PNNL operations from new COR development. An example of effective conversations that occurred this year includes ensuring appropriate deed restrictions and covenants were included in the TRIDEC-DOE land transfer deed issued September 30, 2015.

Net Zero

During FY16, PNNL will initiate an assessment of actions that are required to work toward the new net zero goals for new and existing building. The assessment will leverage a team of domain experts from our Energy and Environment Directorate and our Facilities and Operations (F&O) group. We will begin exploring “high impact” opportunities to transform our campus operations, as well as incremental changes that will continue to drive us toward these goals.

Data Centers

PNNL will continue performing energy assessments and profiling of its data centers using DOEGRIT. Assessment results will be analyzed using the Decision Tool and implemented if cost-effective. Data center metering is now active across all three data centers and reporting PUE. Additional refinements, data collection, and data center infrastructure management software used to monitor and warn of thresholds being exceeded, are being added to make the measurements more useful.

We will continue to expand our automated monitoring of uninterruptible power supplies (UPSs) in laboratory spaces. Programmed power interruption notification, standardized UPS equipment, and automatic UPS maintenance and battery replacement are proving popular with users.



PNNL's Building Operations Control Center in the Systems Engineering Building

Success Story

F&O is always looking for opportunities to use our facilities as a “living laboratory” to test new concepts in energy and environmental science and technology in our own buildings. There is a viewing window in a ceiling tile in the new Systems Engineering Building (3820) where you can see one of the research and development (R&D) controllers that has been installed on the heating, ventilation and air condition (HVAC) system. The devices allow R&D staff, working with BOCC staff, to demonstrate grid integration, energy efficiency routines, and diagnostics for buildings.

Sharing operational experience between R&D and the BOCC helps achieve a more intelligent campus; in turn, R&D has a real test-bed to apply strategies and evaluate the impacts on occupants. VOLTTRON, an open source, distributed sensing and control platform developed by PNNL R&D staff for the DOE Building Technologies Office, is being used to support multi-building load curtailment and other efficiency algorithms. Additionally, the technology will be used in a multi-campus project with the University of Washington and Washington State University next spring for load shedding and transactive control.



Clean and Renewable Energy

Leveraging REC procurements continues to enable purchasing at the lowest cost possible.

FY15 Performance Status

In FY15, PNNL procured enough RECs to offset 53% of its electrical use and is already meeting both the FY20 goal of 20% and the FY25 goal of 30% annual electrical consumption. As noted in this section's "Success Story", we standardized the process for evaluating and procuring RECs, sometimes through a third-party supplier, leveraging multi-agency REC procurements. This competitive bidding process enables us to achieve the best price and was recognized during a DOE IG audit.

Aside from RECs, PNNL has several on-site solar arrays. The solar hot water heater installed at EMSL produces approximately 160,000 Btu/hr of hot water and is dedicated to the lunchroom and associated restrooms, fulfilling the majority of that area's hot water needs. Several solar photovoltaic (PV) arrays also power various air and water monitoring stations throughout the campus. In addition, PNNL operates a 125 kW PV array, which includes charging stations for electric fleet vehicles and is used for several R&D projects.

Goal

- 3.1 – Percentage of total electric and thermal energy accounted for by renewable and alternative energy at least 10% in FY16-17; working towards 25% by FY25
- 3.2 – Renewable electric energy accounts for at least 10% of total electric consumption in FY 16-17; working towards 30% of electric consumption by FY25

Success Story

PNNL has standardized the process for evaluating and procuring RECs annually for the desired number of certificates. Adjustments are made based on growth, LEED renewable energy commitments, and desired GHG Scope 1 and 2 renewable energy reductions. RECs are solicited every one or two years, as needed, to minimize the internal cost and effort needed for the procurement. PNNL has successfully leveraged its procurement through an established competitive bidding process in order to attract the attention of enough REC brokers to achieve the best overall price. This best practice was recognized during a DOE Inspector General (IG) audit.

Plans, Actions, and Projected Performance

PNNL annually assesses the necessary number of RECs based on growth, LEED commitments, and desired GHG Scope 1 and 2 renewable energy reductions. Our strategy of REC procurement will continue to meet (and likely exceed) the renewable energy goal of 30% of annual electrical consumption.

PNNL is committed to finding ways to increase the amount of renewable power generated on site. We will periodically review the addition of new projects where economically feasible. All new building construction will evaluate the cost effectiveness of the use of solar hot water heaters (EISA section 523), in accordance with our ESS.

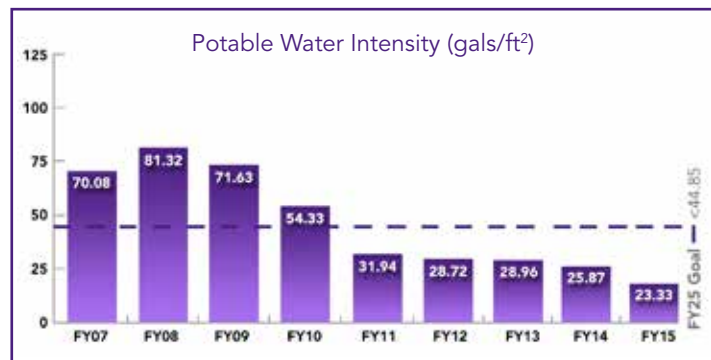
Water Use Efficiency and Management

PNNL will continue balancing water use with enhanced energy efficiency and sustainable landscaping for overall water reduction.

FY15 Performance Status

Water Intensity

PNNL has met the FY25 potable water reduction goal and, as of FY15, has reduced its intensity by 67%. Discharge permit regulatory reviews uncovered several opportunities for non-contact cooling water reductions and, utilizing Sustainability Pays funding, further reducing water intensity in FY15. Energy savings were realized by the installation of a new cooling tower system serving a data center that uses some additional water, highlighting the balance between water use and energy reduction. High Energy Mission Specific Facilities, EMSL and CSF, accounted for 25% of the potable water used at PNNL.



ILA Water

ILA water at PNNL is withdrawn from the Columbia River, is supplied from both the PNNL and COR river irrigation systems, and is used primarily for landscaping, cooling ponds, and aquatics research. PNNL continued to leverage its Landscape Master Plan and implemented opportunities for ILA water savings, effectively reducing consumption by 4.6%. In FY15, four targeted actions were taken to reduce ILA:

- Several landscape areas were targeted in an effort to better understand ILA usage. Sprinkler broadcast patterns along with actual water intensity were measured. The results were mixed, showing many areas being overwatered while a few needed a little more. This led to improvements in sprinkler nozzle sizing and watering times, resulting in an overall reduction of ILA.
- The grounds maintenance department continued managing several large landscaped areas by daily

Cooling Ponds on PNNL campus

Goals

- 4.1 – 36% potable water intensity reduction by FY25 from a FY07 baseline
- 4.2 – 30% water consumption reduction of ILA water by FY25 from FY11 baseline

resetting or even turning off irrigation when possible. This active management of our grounds maintenance team shows how an engaged staff can make a difference.

- Several areas had turf removed and replaced by xeriscaping methods, which reduced irrigation needs.
- Irrigation meters installed in FY13 were used by building management to help make informed decisions on how to use ILA even more effectively.

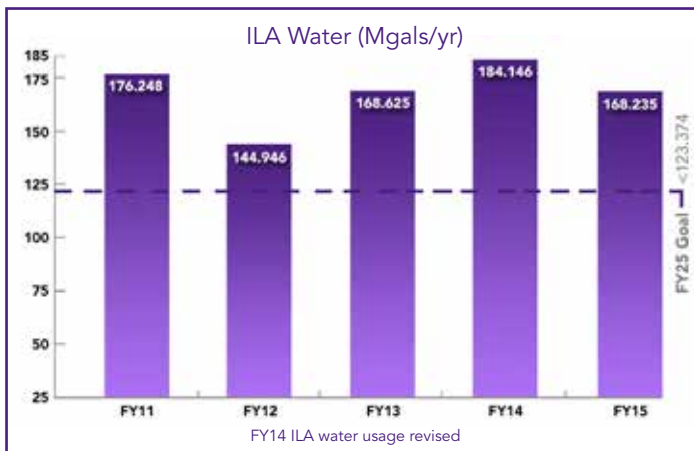
Plans, Actions, and Projected Performance

Water Intensity

In FY16, PNNL will update the site *Water Management Plan* to identify opportunities for both potable and ILA water reductions. PNNL plans to continue performing facility water audits specifically on the EISA-covered facilities. We believe that the trending of water usage through our BOCC will help identify additional savings. Projects that are determined to be cost-effective will be completed.

ILA Water

As PNNL modernizes through new construction or major facility renovation, landscaping remains necessary for fire offsets, dust control, and heat island reduction. In FY16, PNNL will update the *Water Management Plan*, and will continue using the *Landscape Master Plan*. We will also continue installing metering and moisture monitoring, and using our ESS to pursue opportunities for additional ILA reductions. Even with integrated ILA water reduction in our ESS, meeting this goal will be a challenge, especially as new buildings are added to the campus in areas that are currently semi-arid desert.



Success Story

A recent PNNL site improvement project eliminated irrigated lawn landscape at the perimeter of the Research Operations Building (ROB) and Physical Sciences Laboratory (PSL). The two primary goals were to eliminate water consumption and prevent water-related damage to the building exterior wall façades due to irrigation overspray. The project eliminated approximately 13,000 ft². of lawn around ROB and 6,400 ft². of lawn around PSL, capping the irrigation and installing rock landscaping in its place. Minor irrigation was modified to provide water to plants that were added. Water savings are estimated at 750,000 gallons annually.



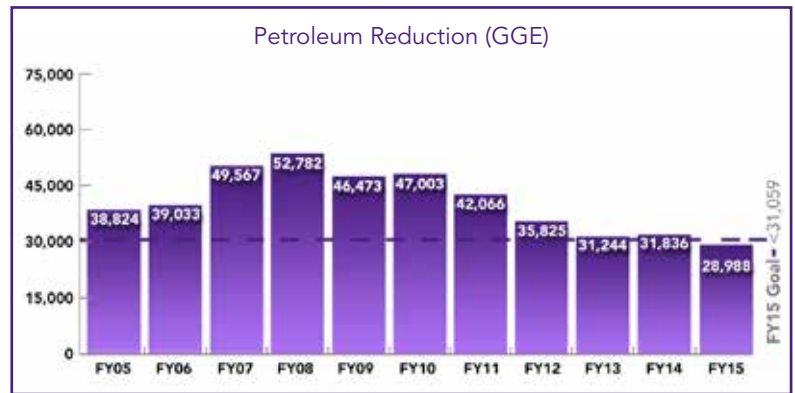
Fleet Management

PNNL will continue working diligently to meet all fleet goals and program requirements by expanding our alternative fuel fleet and integrating additional EVs into service.

FY15 Performance Status

Reduced Petroleum

PNNL has reached the reduction goal of 20% and continues to trend in the right direction through expanded use of AFVs, including EVs. In FY15, PNNL achieved the 20% reduction and overall had cumulative reduction of 25% from the established FY05 baseline.

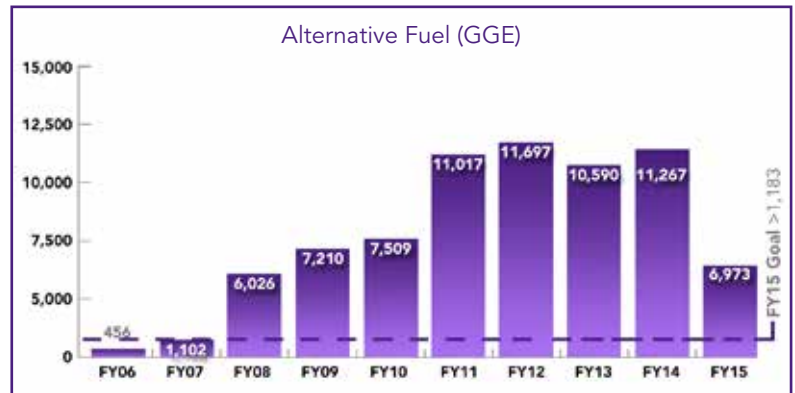


Goals

- 5.1 – 20% reduction in annual petroleum consumption by FY15 relative to an FY05 baseline; maintain 20% reduction thereafter
- 5.2 – 10% increase in annual alternative fuel consumption by FY15 relative to a FY05 baseline; maintain 10% increase thereafter
- 5.3 – 30% reduction in fleet-wide per mile greenhouse gas emissions reduction by FY25 from a FY14 baseline (FY15 target: N/A; FY17 target: 4% reduction)
- 5.4 – 75% of light duty vehicle acquisitions must consist of AFV by FY15 and each year thereafter
- 5.5 – 20% of passenger vehicle acquisitions consist of zero emission or plug-in hybrid EVs by FY20, working towards a goal of 50% by FY25

Alternative Fuel

Through continued training and proactive management, PNNL has far exceeded the goal of increasing alternative fuel use from the original baseline of 456 GGE. PNNL continues to work with local fuel stations to secure a continued supply of E85 fuel.



Vehicle Greenhouse Gas Emission Reduction

PNNL's FY14 GHG emissions baseline is 668 gCO₂e/mile. The FY15 GHG emissions score for PNNL is 708.99 gCO₂e, showing a 6% increase in FY15.

Alternative Fuel Vehicles

PNNL strives to meet the goal of 75% AFV purchases annually by working with vehicle suppliers to acquire AFVs whenever possible. During FY15, 50% of the new LDV fleet acquisitions consisted of AFVs. Currently, PNNL has a total of 39 LDVs, of which 35 (89%) are AFVs.

Zero Emission/Plug-in Hybrid Acquisitions

PNNL will make every effort to meet the new goal of 20% of passenger vehicle acquisitions to consist of Zero-Emission or Plug-in Hybrid vehicles by FY20. PNNL Fleet custodians will work closely with GSA to determine the appropriate vehicle to meet the business needs while working to achieve the goal.

Plans, Actions, and Projected Performance

Reduced Petroleum

Due to the reduction in the number of gas combustible vehicles, PNNL will continue to promote the sharing of vehicles among staff, mileage reimbursement plans, and short-term rentals (where viable) to reduce petroleum consumption. We will continue to educate vehicle custodians about the importance of avoiding extra idling time, speed control, combining trips with other staff members when feasible, and proper maintenance.

Alternative Fuel

PNNL periodically checks the availability in the local area for bio-diesel fuel. As older vehicles are replaced, PNNL works with GSA to determine if an AFV or fully EV is an option for replacement.

Vehicle Greenhouse Gas Emission Reduction

PNNL will look at optimizing routes traveled by vehicles and consolidating deliveries where applicable. We will provide continued education to staff members on the importance of avoiding extra idling time, speed control, combining trips with other staff members when feasible, and proper maintenance to help reduce their GHG impact.

Alternative Fuel Vehicles

PNNL will continue working with GSA to replace vehicles with AFVs whenever available.

Zero-Emission/Plug-in Hybrid Acquisitions

PNNL will work closely with GSA to acquire Zero-Emission or Plug-in Hybrid vehicles for all newly acquired passenger vehicles. Consideration for Zero-Emission or Plug-in Hybrid vehicles will also be taken into account when ordering other vehicle classes.



Success Story

PNNL performed a transportation optimization review to assess the logistical routes used to deliver material from the central shipping and receiving facility to the rest of the campus. The team focused on reductions to both the total miles traveled and the number of trips between buildings to gain efficiency and reduce petroleum consumption.

Implementation of the opportunities identified by the team has had a net positive impact. PNNL continues to review routes as the footprint of the campus changes to optimize use of the vehicles.

Additionally, PNNL has EV charging stations set up with ChargePoint software that can be used by PNNL staff members that use personal EVs to commute to work and/or visitors conducting official business with PNNL. The primary purpose of the EV charge stations on campus is to charge Government EV Fleet vehicles supporting PNNL's mission, and we are able to offer this option for staff and visitors. A ChargePoint account is required in order to use the EV stations.



Sustainable Acquisition

PNNL includes sustainable acquisition provisions in 100% of applicable solicitations and contracts.

FY15 Performance Status

During FY15, PNNL implemented several improvements to its acquisition system for sustainability compliance. We provided continuing education to Contracts Specialists and Technical Oversight Representatives about sustainable requirements and their roles and responsibilities to comply. We provided education to end-users and management via vendor product demonstrations and training, focusing on energy-efficient equipment and laboratory-grade ULTs. We teamed with the P2 Program to evaluate technologies that have the ability to reuse printed paper and toner cartridges (e.g., the pilot of a printer in EMSL with erasable ink). The Contracts Department advertised sustainable ideas to employees via an information booth at several events and remained actively involved with various ongoing internal initiatives to enhance PNNL staff's awareness of and commitment to sustainable purchasing.

Plans, Actions, and Projected Performance

PNNL will continue increasing staff's awareness on available sustainable products, participate in on-campus events, and educate staff about sustainable acquisitions. Benchmarking with other federal agencies on best practices will also occur. Planned activities for FY16 include the following:

- Provide continuing education to Contracts Specialists and Technical Oversight Representatives about sustainable requirements and their roles and responsibilities to comply with the new requirements of Executive Order 13693.
- Provide education to end-users and management via vendor product demonstrations as well as a focused small-order initiative promotion aimed at reducing supplier GHG emissions.
- Participate with the EPA Pilot Program to Assess Standards and Ecolabels, by reviewing and providing comments and feedback on the guidelines. The pilot aims to offer recommendations on EPA's proposed "Draft Guidelines for Product Environmental Performance Standards and Ecolabels for Voluntary Use in Federal Procurement."

Goal

6.1 – Promote sustainable acquisition and procurement, ensuring bio-preferred and bio-based provisions and clauses are included in 95% of applicable contracts

Success Story

In an effort to promote acquisition of energy efficient equipment in laboratories, Sustainability Program staff metered several ULT freezers in our own labs and compared their performance to new higher-efficiency models available on the market. The Business to Business Program negotiated discounts over the supplier list price for several of the higher efficiency models, and educated contracts specialists and researchers on the benefits of purchasing high-efficiency ULT's. We also negotiated a utility incentive to help offset the higher capital cost. PNNL now has several of the highest-efficiency ULTs on our campus.



Pollution Prevention and Waste Reduction

PNNL will continue to focus on waste diversion and minimize its chemical inventory.

FY15 Performance Status

Waste Diversion

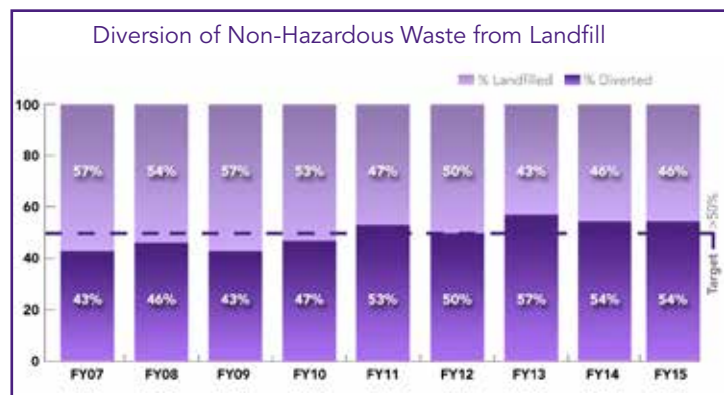
Solid Waste

PNNL has integrated recycling and excessing programs for multiple waste streams, including electronics, batteries, research equipment, furniture, office products, scrap metal, wood, paper, plastic, glass, aluminum, tin, and cardboard. PNNL's excessing process includes verifying that items are free of beryllium or radiological and biological contamination. A procedure in PNNL's online instructional portal, HDI, provides staff with instructions and requirements prior to releasing any materials or equipment from PNNL. HDI also provides instructions on waste minimization through recycling or redistribution. PNNL also hosts "zero waste" all-staff picnics by using mixed recycling and teaming with a local pig farmer to take food waste. As relocations occurred as part of the strategy to move toward a fully integrated campus, PNNL recycled and redistributed as much as possible in FY15, including chemicals, furniture, books, journals, and electronic media.

During FY15, PNNL expanded paper, aluminum, and plastic recycling by placing recycling bins in approximately 40 laboratory spaces. Additionally, recognizing that nitrile gloves create one of the largest waste streams from PNNL's research activities, PNNL participated in Kimberly-Clark's "RightCycle," a nitrile glove recycling program. A pilot to remove nitrile gloves from laboratory waste was conducted in EMSL and PSL. Approximately 2,000 gloves were collected and shipped by the end of the pilot, four months later. PNNL will evaluate options to expand nitrile glove recycling in FY16.

Goals

- 7.1 – Divert at least 50% of non-hazardous solid waste, excluding C&D debris, by FY15
- 7.2 – Divert at least 50% of C&D materials and debris by FY15



To improve P2 Program performance, an assessment was conducted by a PNNL researcher. This assessment consisted of online survey, staff interviews, and walk-downs of recycling stations. Improvement opportunities were identified and documented, and recommendations will be used to build a P2 Program improvement strategy during FY16. PNNL diverted approximately 54% of non-hazardous sanitary waste in FY15.

Construction and Demolition Waste

PNNL has a wide variety of C&D work activities from large construction projects to small scopes of work. Recycling and reuse strategies are integrated with project planning, enabling continuing success in C&D waste diversion. For example, in FY14 PNNL identified the Plant Growth Facilities (one metal building and four greenhouse structures) as excess, and began developing a plan to remove the structures from the PNNL campus. In FY15, an agreement was reached with the local community college (Columbia Basin College) to provide the labor to remove these structures and then reassemble them on its Pasco, WA campus. This allowed PNNL to divert the potential waste that would have resulted from the facility demolition by repurposing the structures as educational facilities. PNNL diverted 86% of C&D waste in FY15.

Composting

Typically, yard waste is collected in a designated yard waste container for off-site composting; however, some green waste has been stock piled on-site due to equipment limitations that prevented access to the yard waste container ramp. In FY15, PNNL's ground maintenance staff sent over 200 tons of the green stock pile to the COR for composting as part of periodic facility clean-up activities.

PNNL also doubled the on-site composting capacity by replacing two existing metal composters that deteriorated due to weathering with four plastic hot composters. The extra capacity will streamline on-site composting of food waste generated by employees and laboratory events.

Toxic Chemical Reduction

Chemical Management

PNNL's ChemAgain chemical redistribution program provides the primary means of collecting and redistributing usable chemicals. This program successfully redirected more than 650 containers of chemicals in FY15 through internal transfer or donation.

The fundamental mechanism for reducing chemicals and waste at PNNL has been through periodic P2 assessments and the Sustainability Pays Program to

encourage the triple-bottom line approach in evaluating P2 and sustainability improvement opportunities.

In FY15, the program funded the purchase of a protein stainer, enabling rapid protein staining and background de-staining. The new system not only cut down the protein staining processing time from one hour per sample to under 10 minutes per sample, it also uses less chemicals and subsequently generated less hazardous waste.

Integrated Pest Management

PNNL has state-licensed commercial pesticide applicators on the grounds crew. These professionals are required to complete continuing education annually to learn about the latest trends in pest control, current chemical and biological control agents, and updated legislative changes. All applicators are committed to integrated pest management principles, where applicable.

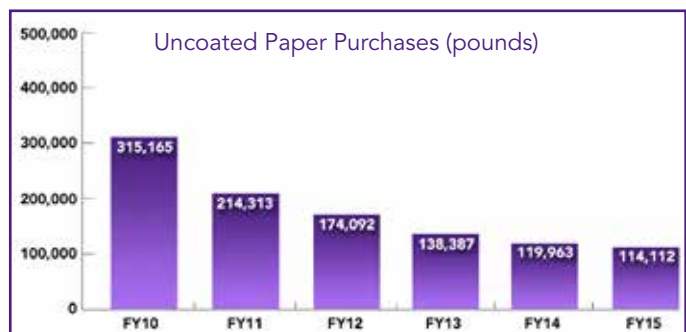
The grounds staff recognizes the responsibility to provide a clean, low-pest environment at PNNL and strives to limit control efforts to those absolutely required for optimal results. Pest control methods begin with the lowest impact, escalating when required, and only to the level necessary for acceptable control.

Best practices are summarized below:

- Using wasp traps in lieu of spraying
- Removing unwanted cardboard and wood pallets
- Using sticky and metal traps for mouse control
- Using netting and spikes to reduce bird issues

Printing Paper Use

Printing continues to be an essential element for conducting PNNL's mission-related work; however, many processes are moving to electronic or paperless systems. For example, records are maintained electronically in the HP Record Management system, required training records are completed electronically, and conference rooms are equipped with audiovisual equipment that enables staff to deliver presentations electronically. All existing network printers were set to duplex, and new printing servers were deployed. PNNL has also reduced printing paper use with the successful implementation of a paperless procurement process.



In FY15, PNNL leased a state-of-the-art copier with erasable, reusable paper for 12 months to determine if this type of copier is a cost-effective option to further reduce printing paper use. Based on initial feedback from participating researchers, the erasable blue ink used is best for proofreading of draft research proposals/reports or computer coding, but not ideal for reviewing journal articles or reports. However, the campaign around the use of the new copier has heightened awareness of PNNL's commitment to reduce printing paper use. As a result, the printing paper use was down by nearly 50%, by weight, compared to the prior year for the participating group in EMSL.

Approximately 97% by weight of the uncoated paper purchased during FY15 contains at least 30% post-consumer content. The overall paper use was reduced by approximately 5% by weight from FY14.

Plans, Actions, and Projected Performance

Waste Diversion

PNNL has achieved both DOE 50% waste diversion goals. The following initiatives have been established to identify and address opportunities in the P2 Programs.

P2 Program

PNNL plans to reduce sanitary waste by:

- Placing recycling bins in additional laboratory spaces enabling paper, plastic, and aluminum recycling.
- Expanding nitrile gloves recycling from pilot to Laboratory-wide, as appropriate.
- Implementing recommended improvement opportunities identified in the FY15 P2 Program assessment report, as appropriate.
- Continue fostering culture and behavior changes in waste reduction by sponsoring "zero waste" at all-staff celebration events.

Toxic Chemical Reduction

PNNL will participate in Washington State Department of Ecology's (Ecology) Hazardous Waste & Toxics Reduction Safer Choice Project. While the majority of PNNL's janitorial products are already considered environmentally friendly, this project will evaluate a handful of "safer choice" janitorial products selected by Ecology to further reduce PNNL's toxic chemical inventory.



Success Story

To ensure that EMSL's research aligns with Biological and Environmental Research and the DOE science mission areas, the last of EMSL's accelerators was retired.

The accelerator's ion/molecular beam spectroscopy helps develop fundamental scientific understanding of ion, electron, and photon interactions with solids. Beam capabilities are applied to analyses of thin films and interfaces, studies of radiation effects in solids, ion beam synthesis of nanostructures, and atmospheric aerosol characterization.

Instead of demolishing the unit for disposal, EMSL donated the accelerator and all the auxiliary equipment to Texas A&M University's Accelerator Laboratory. Texas A&M is well known as one of the largest academic ion irradiation facilities in the country. The EMSL accelerator is now the largest unit added to its inventory of five accelerators, increasing the ion energy capability from 1 MeV to 4 MeV.

The accelerator uses SF₆ as the insulation gas. Approximately 800 pounds of SF₆ gas were recovered for eventual reuse by Texas A&M. Because the on-site storage tanks are not rated for U.S. Department of Transportation (DOT) transportation for compressed gas, the SF₆ gas was first transferred into 10 DOT-rated cylinders by a subcontractor specializing in SF₆ management, then delivered to the university for re-use.



Energy Performance Contracts

Alternative Financing for Energy Conservation

FY15 Performance Status

Energy Performance Contracts

PNNL successfully leveraged alternative financing in 1996, 1997, and 2002 utilizing ESPCs worth several million dollars. The projects targeted the replacement of outdated building infrastructure including boilers, chillers, standby generators, air compressors, lighting, variable air volume units, and building controls. The upgrades eliminated significant amounts of deferred maintenance and improved the overall building efficiency and reliability.

Three additional projects were evaluated for the use of alternative financing in 2005, 2008, and 2011 and were found to not be financially viable. Conservation measures investigated during these evaluations included upgrades to systems such as compressed air, lighting, HVAC and building controls as well as installation of photovoltaics.

Challenges PNNL encountered while investigating the usage of alternative financing included our low utility rates, the stability of federal funding, viability of long-term research missions, and the instability surrounding the length of time PNNL would occupy some of the targeted buildings.

Plans, Actions, and Projected Performance

Energy Performance Contracts

In FY16, PNNL intends to again evaluate potential candidate projects for opportunities to use alternative financing mechanisms, such as ENABLE, ESPC, UESC, or PPA. If they are determined to be viable, PNNL will start the process of obtaining alternative financing for the project; however, our low cost of energy often makes it challenging to provide a reasonable return on investment. This evaluation will be a collaborative effort with the PNNL DOE site office.

Annual targets for performance contracting to be implemented in FY17 and annually thereafter as part of the planning of section 14 of Executive Order 13693



Electronic Stewardship

PNNL makes sustainable decisions when purchasing and disposing of electronic equipment.

FY15 Performance Status

Purchases

In FY15, 99.2% of eligible acquisitions were EPEAT-Registered products. PNNL accomplished this with a policy that requires all PCs, printer, and peripheral device procurements to go through our Managed Hardware Program (MHP). The MHP selects EPEAT-Registered products almost exclusively and staff members make purchase selections within those options.

Power Management

All managed Windows and Mac systems ship with power management capabilities enabled. Staff members are encouraged not to change these settings unless there is a valid business need.

Automatic Duplexing

The default printer software is configured to use the automatic duplex printing setting. Staff members are encouraged not to override this setting and print single-sided jobs unless there is a valid business need.

End of Life

Prior to excess, custodians have the ability to advertise equipment as available for sharing or redeployment within the "Assets" tool. Excess computers and associated electronics are routinely redeployed within the Lab upon request. Excess electronics with remaining life may be advertised for redeployment to other National Laboratories, transferred to schools, or distributed through the Community Re-Use organization. Electronics that are not in working order, or that cannot be sanitized, are recycled with an E-Cycle vendor that has been approved by our Environmental Protection and Regulatory Program.

The PNNL approval process includes:

- Certifications.
- Resource Conservation and Recovery Act, and air and water record with the EPA and the applicable state.
- History of violations.

Goals

- 9.1 – Purchases - 95% of eligible acquisitions each year are EPEAT-registered products
- 9.2 – Power management - 100% of eligible desktops, laptops, and monitors have power management enabled
- 9.3 – Automatic duplexing - 100% of eligible computers and imaging equipment have automatic duplexing enabled
- 9.4 – End of Life - 100% of used electronics are reused or recycled using environmentally sound disposition options each year

- Insurance.
- How long the company has been in business.

Preference is given to EPA, R2 Repair and Recycling, and International Organization for Standardization certifications.

During FY15, the list of electronics accepted by the E-Cycle vendor was expanded to include a number of additional types of equipment.

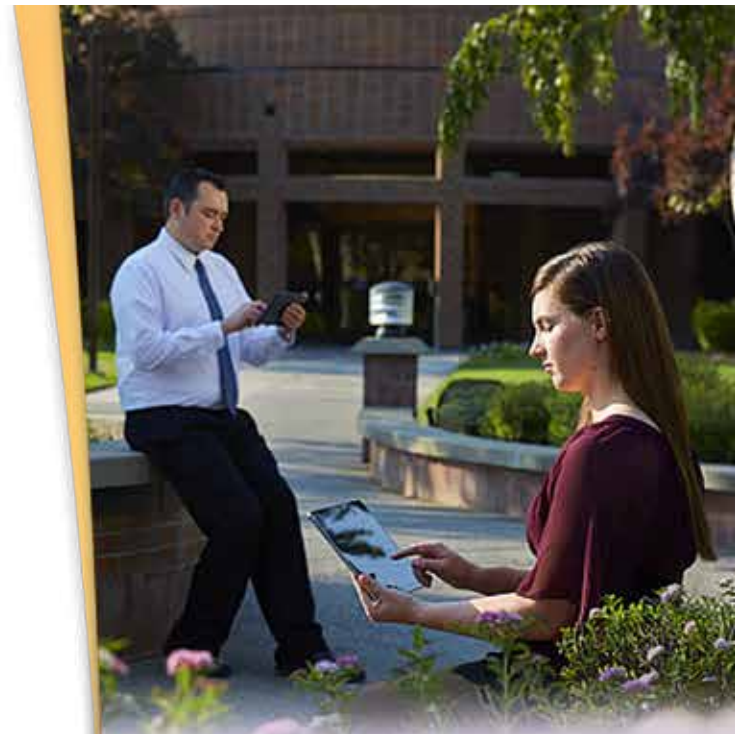
Plans, Actions, and Projected Performance

PNNL will continue to accomplish electronic stewardship goals through a variety of mechanisms, including the use of power management capabilities (part of our current management suite). We continuously look for more energy efficient end-user devices as they appear on the market and work hard to educate users about how they can be more efficient consumers of computational resources.

We are currently making significant investments in migrating staff to a network-based telephone system. This brings further flexibility and untethers them further from their offices, allowing staff members to be productive wherever they need to work. We are confident this will be a key enabler in supporting telework and further encourage the use of virtual collaboration technologies.

PNNL will continue to establish and implement policy and guidance to encourage the use of appropriate power management, duplex printing, and other energy-efficient or environmentally preferred options and features on capable electronic products. Low-energy-intensive laptop computers will become the norm as PNNL works towards its teleworking goal.

The ability for staff to advertise electronic assets for internal sharing or redeployment in the new online tool will remain available moving forward. Enhancements that would allow staff to search on additional attributes are being considered. While staff can perform a wide variety of searches now, plans include the ability to browse the entire list of assets advertised for sharing or redeployment.



Success Story

PNNL continues to make significant progress with our virtual meeting capabilities, and these are becoming more firmly established in our culture and practices. Our staff members are able to easily hold video meetings and share content and desktops in real time with peers throughout PNNL and with many other external organizations with which we collaborate. We host approximately 8,000 meetings per month, including 1,000 shared desktop meetings. These capabilities enable highly productive telework, which affords our staff flexible work arrangements, boosts productivity, and enhances work/life balance, while reducing Scope 3 GHG emissions.



Climate Change Resilience

Preparing Today to Mitigate Potential Climate Change Impacts

Resiliency Planning Updates

Vulnerability Assessment Approach

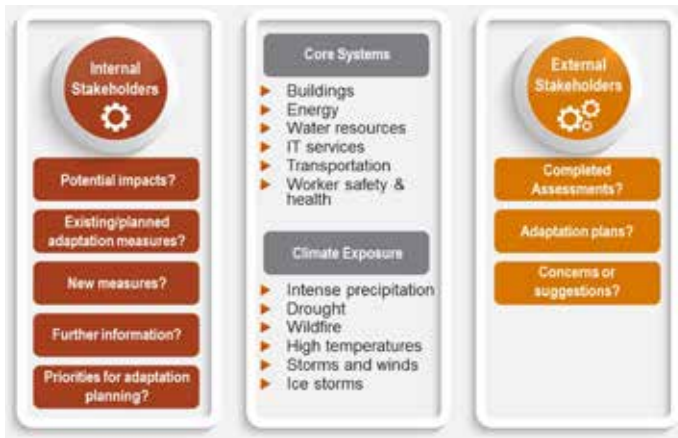
During FY15, PNNL completed a robust vulnerability assessment and developed a *Climate Resiliency Action Plan*, which is available on the PNNL Sustainability website. Our approach drew from established methodologies and our practical experience supporting other agencies in conducting vulnerability assessments. Our approach involved:

1. Creating a core project team and work plan.
2. Securing the commitment of an internal stakeholder team of 10-15 decision-makers.
3. Understanding locally relevant climate exposures and what PNNL “core systems” could be impacted by those exposures.
4. Assessing existing internal and external plans and identifying potential vulnerabilities to highlighted exposures.
5. Prioritizing vulnerabilities during an internal stakeholder workshop and engagement with select external stakeholders.
6. Establishing a resiliency action plan, an approach to integrating actions into PNNL’s ongoing operations, and a limited set of metrics to monitor future changes in resilience.
7. Sharing findings with key external stakeholders.

The climate resiliency planning framework and guiding questions are depicted in the following figure. The initial phase of the project focused on internal stakeholder engagement with outreach to select external groups as needed to fill information gaps. The internal stakeholder team included a cross-cutting group of program managers and technical personnel with responsibility for employee safety, environmental management, energy and water resource management, IT systems, emergency planning, facility engineering and design, and campus master planning. The members of this group have direct responsibility for plans, infrastructure, and systems that are potentially vulnerable to climate impacts. Subject matter experts in climate impacts assessment, risk assessment, and resiliency planning were also engaged as part of the planning team.

Goal

- 10.1 – Update policies to incentivize planning for, and addressing the impacts of, climate change
- 10.2 – Update emergency response procedures and protocols to account for projected climate change, including extreme weather events
- 10.3 – Ensure workforce protocols and policies reflect projected human health and safety impacts of climate change
- 10.4 – Ensure lab management demonstrates commitment to adaptation efforts through internal communications and policies
- 10.5 – Ensure that lab climate adaptation and resilience policies and programs reflect best available current climate change science, updated as necessary



PNNL climate resiliency planning framework

Risks to Mission, Operations, and People

Our assessment of potential climate exposures, impacts on core systems, and current levels of preparedness highlighted both strengths and opportunities in our current plans and procedures. Higher priority areas, shown in the figure below, are the focus of PNNL's near-term climate resiliency planning actions.

Climate Exposure/Core System	High Temperatures	Intense Precipitation	Wildfire	Drought	Storms and Winds	Ice Storms
Buildings	Higher	Higher	Medium	Medium	Medium	Medium
Energy	Higher	Lower	Lower	Medium	Medium	Lower
IT Services	Medium	Medium	Lower	Lower	Medium	Lower
Worker Safety & Health	Lower	Lower	Medium	Lower	Lower	Lower
Water Resources & Infrastructure	Lower	Lower	Lower	Lower	Lower	Lower
Transportation	Lower	Lower	Lower	Lower	Lower	Lower

The two climate exposures of highest concern to our campus operations are the projected increase in the number of high-temperature days and intense precipitation events that we experience each year. Of particular concern are how these climate exposures could impact our building infrastructure and energy systems. For example, an increased number of high-temperature days in the decades ahead could increase costs and reliability as building exteriors and HVAC systems degrade at a faster rate, energy use increases as cooling systems work harder, and facility maintenance costs increase due to the added stress on systems. An increase in the number of intense precipitation events could lead to flood damage to roofs and damage to ground-level and below-grade facilities. Of particular concern is the flood risk to a below-grade data center on our campus.

Building Resilience

The *PNNL Climate Resiliency Action Plan* describes current and planned actions to build PNNL's resiliency to future climate exposures. Actions for our highest priority systems are summarized in the table below.

Most current measures are well-established procedures that are documented in plans and design standards. Implementation of new measures will begin in FY16. Once fully implemented, the new measures should help reduce these vulnerabilities and increase resilience. The vulnerability status of these systems will be re-evaluated annually, with reporting included in and tracked through the Sustainability Program annual project management plan.

Current and Future Actions to Address High Priority Climate Impacts on PNNL Systems

Climate Exposure and System Impacts	High Temperature Impact on Building and Energy Systems	Intense Precipitation Impact on Building Systems
Current measures	<ul style="list-style-type: none"> Preventative maintenance plans are reviewed annually Cool roofs are the design default Maximize use of light-colored materials for roofs and hard-paved areas Use of shade trees Optimize building orientation Plans for a mobile chiller to boost systems stressed by heat Three ESPCs will reduce energy demand Ensure energy escalation rates reflect risk in facility design and operations planning 	<ul style="list-style-type: none"> Preventative maintenance procedures to clean roof drains Current building drain systems are designed for 1" of rain in 24 hours

Climate Exposure and System Impacts	High Temperature Impact on Building and Energy Systems	Intense Precipitation Impact on Building Systems
New measures to build resilience	<ul style="list-style-type: none"> • Add check for remaining life expectancy in the five-year condition assessments • Track equipment life relative to life expectancy assumptions and adjust in LCC analyses if needed • Use building control systems to alternate operating schedules and reduce power load if needed • Model temperature increases in new building designs and consider trade-offs for changes in envelope and HVAC design • Use BOCC to alternate operating schedules to reduce power load • Implement continuous commissioning and facility re-tuning to reduce energy demand 	<ul style="list-style-type: none"> • Revisit preventative maintenance procedure for building drainage systems for adequate frequency • Include drains in five-year facility condition assessments • Consider flood risk changes in building design and leasing decisions • Assess risk of buildings with below-ground access • Assess building and parking lot catch-basins annually to ensure effective infiltration
Responsible offices	<ul style="list-style-type: none"> • Sustainability Program • Facilities Strategic Planning • Facilities Engineering • Facilities & Grounds Maintenance 	<ul style="list-style-type: none"> • Sustainability Program • Facilities Engineering • Facilities & Grounds Maintenance

Building Capacity

As part of the FY15 climate resiliency planning effort, we defined a set of metrics to which could be tracked over time to help gauge changes in climate risk. These metrics will be formally integrated into the Sustainability Management & Operations Program management system during FY16. The internal climate resiliency planning team is committed to meeting annually to review the status of the indicators. For the next few years, we will use this information to better understand baseline conditions. Over time, we will be in a better position to understand whether risk thresholds have been crossed, which may necessitate new policies, procedures, or plans for adoption.

Examples of metrics that will be tracked include:

- Number of consecutive days over 100°F per year
- Premature HVAC equipment failure rates for envelope degradation rate
- Number of rainfall events per year that exceed 1" in 24 hours
- Number of flood incidents per year that affect facilities and infrastructure

See the *Climate Resilience Action Plan* on the PNNL Sustainability website for more information on climate exposures and core system vulnerabilities rated medium or low priority.

Regional and Local Coordination

During FY15, we took our first steps to engage select local and regional stakeholders in a dialogue around

climate impacts and resiliency planning. Our stakeholder engagement efforts informed our assessment of PNNL site vulnerabilities and helped inform the resiliency planning efforts of others by sharing findings from our analysis.

To fulfill our mission, we depend on a number of local and regional organizations to provide us with a reliable and uninterrupted flow of services and products. As part of our vulnerability assessment, we identified services that could be interrupted or diminished by regional climate impacts, and we initiated a dialogue with those key service providers to better understand their current levels of preparedness and plans. For example, we spoke with our local electric utility and internet service providers to better understand the extent to which lines serving our campus were underground (i.e., at lower risk from wildfire or trees falling during more intense precipitation events) and whether existing wood poles had fire retardant pole wraps or plans for replacement with steel poles. This input shaped our prioritization of vulnerabilities.

We also began sharing with select external stakeholders the results of our assessment of regional climate impacts, PNNL campus vulnerabilities, and plans for building resilience. At the end of FY15, we presented our findings to a group of representatives from the DOE-Richland Site Office, the DOE Office of River Protection, lead Hanford contractor Mission Support Alliance, and other organizations responsible for clean-up at the Hanford Site. Based on this dialogue, Sustainability Program personnel from PNNL and Hanford have agreed to collaborate on the development of a similar vulnerability assessment for the Hanford Site during FY16.

Beyond our efforts to make PNNL campus operations more resilient, research staff members in our Atmospheric Science and Global Change Division are helping the Department of Energy and others to advance the fundamental science behind climate change from regional to global scales. We are collaborating with a number of federal entities, including DOE, Department of Homeland Security, EPA, and National Aeronautics and Space Administration (NASA); universities; and industry to better understand how human activities and natural systems interact to affect the earth's climate. In addition, scientists at PNNL's Joint Global Change Research Institute (JGCRI) at the University of Maryland are collaborating with DOE, Department of Defense, NASA, GSA, and other agencies to improve methods and data for conducting vulnerability assessments and using the results to improve design, acquisition, and maintenance of infrastructure and facilities to account for uncertainty in future climate. More information on PNNL's contribution to climate science can be found on PNNL's Atmospheric Sciences and Global Change webpage.

Real Property and Supply Chain Resilience

Plans for the future build-out of the PNNL campus focus primarily on the development of federally owned lands that are currently part of PNNL's core campus (see *Campus Master Plan*). While some existing leases may be renewed, new leases are not currently the focus of our facility acquisition strategy for the PNNL site. Most of PNNL's future real property decisions will involve new construction at the north end of the core campus.

We do not believe that planned development will increase PNNL's exposure to wildfire or flood events. River levels on the Columbia are largely controlled by dams. And fire risk is currently addressed by the requirement of the PNNL fire protection program to maintain defensible space between PNNL-managed facilities and natural cover or wildland areas. Current maintenance and new development practices that support this objective include ensuring that vegetation is kept away from buildings, increasing the use of xeriscaping and rock garden features, and focusing development on the existing core campus rather than in outer wildland areas.

Emergency Response Procedure Updates

The PNNL Sustainability Program staff met with members of the Environmental Planning & Emergency

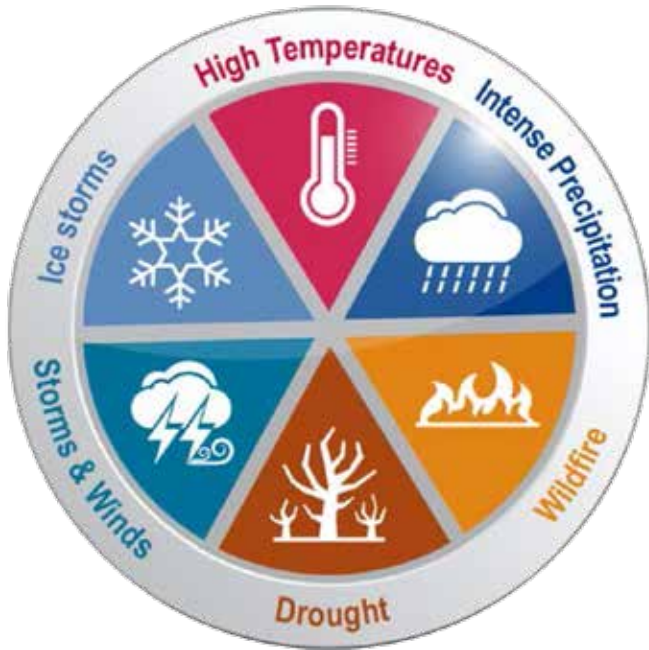
Preparedness office during FY13 and FY14 to review the status of both emergency preparedness and business continuity plans. It was determined at that time that the plans adequately addressed most hazards that could result from long-term climate variability and change. In those initial assessments, we identified the need to strengthen our emergency and continuity of operations plans by including scenarios for longer-term power outages (e.g., from rolling blackouts) and water shortages. After completing a more robust vulnerability assessment during FY15, it was determined that these impacts were not high-risk areas relative to other vulnerabilities identified. Therefore, no changes to emergency response and continuity of operations procedures are currently planned. The Sustainability Program will continue to engage this office as part of our internal stakeholder team that conducts an annual climate resiliency review and adjust accordingly in the future.

Health and Safety Procedures

Worker health and safety represents one of PNNL's "core systems" that we evaluated for potential climate impacts. As part of the FY15 vulnerability assessment, we identified six potential regional climate exposures that could influence worker health and safety as depicted in the following figure. Based on an assessment of the vulnerabilities associated with each exposure and current or planned measures in place to manage those vulnerabilities, we applied a "high, medium, or low" priority rating.

Five of the six exposures were deemed low concern with no additional actions required. For example, "heat stress, heat stroke, and dehydration of outdoor maintenance personnel" was identified as a vulnerability from having an increased number of high-temperature days each year. However, current procedures in place (e.g., educating staff to take breaks, drink fluids, and know symptoms of heat stress and heat stroke, as well as starting shifts of outdoor workers two hours earlier in hot months) were deemed adequate for managing this risk.

Worker health and safety concerns associated with wildfires were assessed to be of medium concern. Specific vulnerabilities identified included potential health effects from smoke pulled into buildings through ventilation systems and driving hazards posed by low visibility on campus roads. Current measures in place will help mitigate this risk to a great extent. For example, our fire response plans already look at air filter loading during fire events, and we maintain a high efficiency particulate air intake filter inventory. For driving hazards, our hazard advisory system and



Climate exposures relevant to worker health & safety at PNNL

Laboratory workday closures/delays encourage staff to stay off roads when unsafe, and our flex time and telework policies help to reduce commuting risks in such circumstances. However, new measures were identified to help manage deficiencies, including adding an assessment of air quality risk to the field work checklist for research staff.

More information on the worker health and safety assessment can be found in the *Climate Resiliency Action Plan* on the PNNL Sustainability website.

Management Commitment

The climate resiliency planning internal stakeholder team established during FY15 was comprised of senior managers of programs deemed critical to PNNL's

climate resiliency, as described above. This team has obligated itself to meet annually to ensure that we have followed through on our commitments to improve PNNL's resiliency, review metrics that could indicate changes in our vulnerability, and determine the need to revise plans and procedures. The climate vulnerability assessment and resiliency planning process helped increase awareness and commitment of staff to this process on an ongoing basis.

Use of Best Available Science

PNNL's research on atmospheric processes and the interconnections among energy, climate, and other human and natural systems is helping to inform sustainable solutions to the nation's energy and environmental challenges. Having subject matter experts on-site puts PNNL in a good position to stay on top of the best available science and to understand how regional climate dynamics could impact our own campus operations.

The *National Climate Assessment*, which includes a series of reports on the Northwest (Dalton 2013)⁽¹⁾ was a key resource consulted during our FY15 vulnerability assessment process. Furthermore, one of PNNL's senior research scientists delivered an assessment of key regional risks and helped the internal stakeholder team understand how those exposures may play out at a local scale during our first stakeholder workshop.

The Sustainability Program team members responsible for climate resiliency planning will review updates to national plans as they occur and will continue to consult with internal subject matter experts as warranted to discuss evolving climate change scenarios.

(1) Dalton, M., P.W. Mote, and A.K. Snover, eds., 2013: *Climate Change in the Northwest: Implications for Our Landscapes, Waters, and Communities*. 224 pp. Island Press.



Fleet Management Plan

PNNL's Fleet Management is aligned within the Asset Management organization, which oversees the efficient lifecycle management of assets and materials at the laboratory. One of Fleet Management's primary responsibilities is to oversee the government-owned vehicles and equipment that support the Laboratory's mission. Fleet Management provides the vehicles that help facilitate research in the field, relocate offices and keep our facilities fully operational. In addition to Fleet Management, the business areas that Asset Management is responsible for taking care of include Property Management, Shipping and Receiving, Excess and Redeployment and Property Accounting.

PNNL's fleet procurement each year is based on replacement needs of the current fleet. GSA leased vehicles are replaced according to the GSA retention schedule depending on the type of vehicle and the vehicles current mileage. DOE owned vehicles are also replaced on a similar schedule as the GSA retention schedule. Each year PNNL holistically reviews the eligible vehicles for replacement and the current business requirements of the fleet and requests replacement vehicles that meet DOE requirements and business needs.

Replacement vehicle orders are reviewed to meet Acquisition & Sustainability goals, by ensuring that all light duty vehicles acquired use alternative fuel, and all medium and heavy duty vehicles are the most fuel efficient possible (EISA Section 142; EO 13693 & EPA Act 1992, Section 303). Vehicle fuel type is also taken into consideration based on location and availability of the fuel types available at the location where the vehicle is utilized.

PNNL vehicles are fueled at local fueling stations that accept either the Wright Express card supplied with GSA vehicles or a Pcard issued to the vehicle driver of a DOE owned vehicle. Access to Unleaded, Diesel, and E85 fuel types are also available in the area. Only vehicles accepting these types of fuels are acquired for the PNNL Fleet. In addition, PNNL is expanding the electrical vehicle charging infrastructure as new facilities are constructed or at existing facilities to accommodate government owned electric vehicles. As PNNL's footprint changes strategies are outlined to ensure electric vehicle infrastructure is adequate. Currently government owned electric vehicles can be charged at a number of locations on the PNNL campus to meet business needs.

Program description and related policies that govern fleet procurement, utilization, and disposition

PNNL's entire fleet is assigned to a permanent custodian/organization to meet the business objectives. Annual justifications are required and reviewed to ensure vehicles are being utilized and properly assigned. At the time the vehicle is assigned to the organization, drivers are instructed on basic policies of operating a vehicle and provided additional HDI policies for detailed instructions of the responsibilities of operating a government vehicle.

In response to the new executive order 13693 requirements, PNNL will work with our DOE Fleet Manager and our GSA Fleet Representative for implementation plans and guidance for acquiring and installing telematics in vehicles to meet the new goals of the executive order as the new vehicles acquired.

Fleet related policies and procedures will be reviewed with an emphasis on sustainability. Education and training for staff on all policy changes will be communicated to appropriate staff.

Each year vehicle custodians are required to submit a justification for the upcoming year vehicle needs. The justification provides the business need and estimated utilization goal. The utilization information is reviewed quarterly to ensure the fleet is meeting business needs and to determine if vehicles need to be redistributed in order to enhance the overall utilization of PNNL's fleet.

At this time PNNL does not have any specific plans for increasing or decreasing the fleet size.

The PNNL Fleet currently has a total of 93 vehicles, 3 of which are DOE owned and funded by their DOE Program in support or research and development activities. We replace 9-10 vehicles per year depending on the age and mileage utilization. Currently we have 39 Light duty vehicles, of which 89% (35) are alternatively fueled vehicles. The average age of the PNNL fleet is 4½ years old. Proper maintenance and replacing vehicles and as soon as they are eligible helps keep repair cost down by using the vehicles warranty coverage on newer vehicles diverting the cost to the manufacturer vs. DOE.

Budget and Funding

The successful implementation of long-term sustainability goals requires a sound budgeting strategy and adequate funding. PNNL uses several methods, as outlined below, to secure the appropriate funding for energy and water efficiencies.

- The most efficient and preferred method is budgeting sustainable components into projects through our ESSs. We recognize that key project energy and water efficiency components (e.g., advanced building electrical meters) are mandatory, and we plan accordingly within project funding requests.
- Projects that result from energy and water evaluations are identified in ECMs and water conservation measures. They are submitted in our annual budgeting process and prioritized along with all other requests using a weighted analysis to incorporate life-cycle cost, deferred maintenance, return on investment, and direct ties to the PNNL mission.
- Direct utility savings identified from implemented energy or water projects are used to fund additional ECMs, as directed by DOE Order 436.1 and encouraged by the EPO Act of 2005, section 102(e).
- Where available, Utility Incentive Programs will be leveraged to the maximum extent practicable to enhance energy and water reductions, as encouraged by EPO Act 1992, section 152, and EISA 2007, section 516.
- If internal funding is not feasible, PNNL will pursue opportunities to use direct project funding through the DOE Sustainability Performance Office, when available, or alternative financing mechanisms, such as ESPCs, although our low cost of energy often makes these challenging to negotiate.

PNNL recognizes that energy and water savings program success requires appropriate funding. Using our ESSs in tandem with our annual prioritized budgeting process will contribute to the completion of all viable energy and water measures. The below table summarizes our budget.

Summary of Sustainability Project Funding (\$K)				
Category	FY15 Actual	FY16 Planned/ Request	FY16 Projected	FY17 Projected
Sustainability Projects	925	900	900	950
Sustainability Activities (other than projects)	2450	2375	2375	2400
Sustainability Performance Office (SPO) Funded Projects (SPO funding portion only)	70	0	0	0
Site Contribution to SPO Funded Project	70	0	0	0
ESPC/UESC Contract Payments (if applicable)	1135	1111	1246	1350
REC Purchase Costs (if applicable)	82	47	47	50
Total	4732	4433	4568	4750

Using our annual prioritized budgeting process, along with institutional Engineering Standards and Specifications, PNNL will complete all viable energy and water measures.



High-Energy Mission-Specific Facilities

High-performance computing is integral to the mission, and PNNL has two FIMs-excluded facilities that meet the definition of HEMSF.

EMSL provides integrated experimental and computational resources for discovery and technological innovation in the environmental molecular sciences to support the needs of DOE and the nation. The Molecular Science Computing capability at EMSL provides users with an integrated production computing environment that includes advanced high-performance computing resources, EMSL-wide data storage, and expert staff critical to support world-class fundamental research with the increasingly predictive, system-level simulation tools required to address complex environmental molecular science challenges. Solving intricate scientific problems requires multidisciplinary science, including close integration of cutting-edge experiments and simulations, instantaneous data access, and essential analysis and visualization capabilities. The integration of EMSL's advanced instrumentation and computational techniques is part of an unparalleled collection of capabilities designed to enable unique cross-discipline research into core science themes—Biological Interactions and Dynamics, Geochemistry/Biogeochemistry and Subsurface Science, and Science of Interfacial Phenomena.

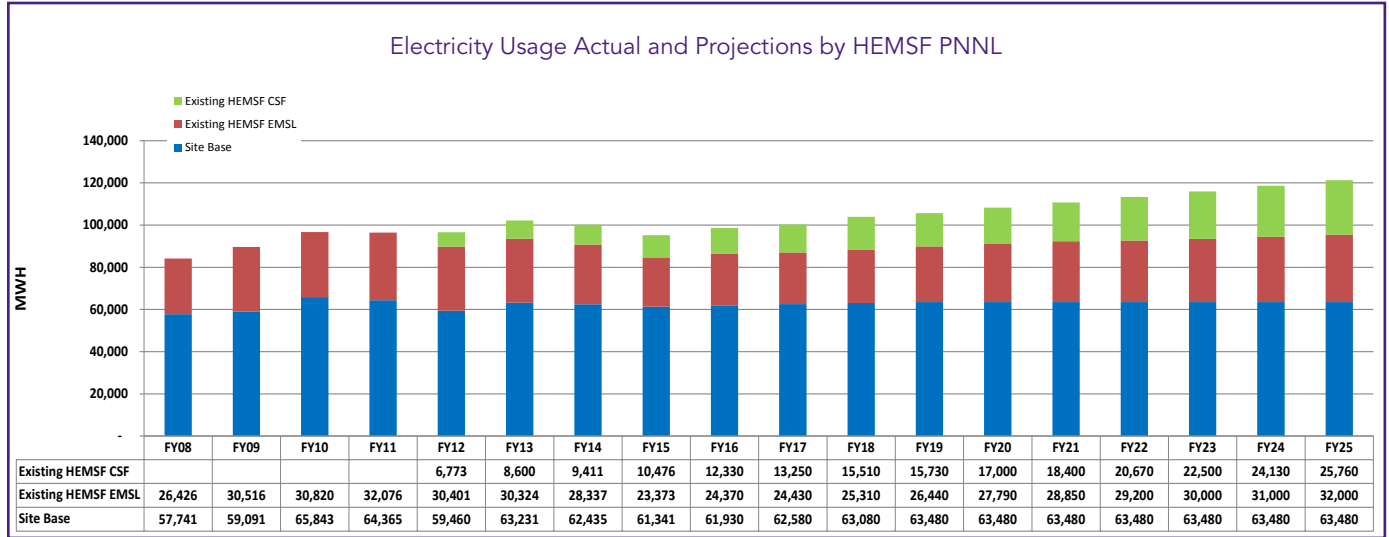
The foundation of EMSL's computational capabilities is the 3.4 petaflop Cascade supercomputer with 23,000 Intel processors that have 184,000 gigabytes of memory available, about four times as much memory per processor as other supercomputers. Testing has shown that it is 14 times more energy efficient per teraflop than its predecessor Chinook by incorporating rear door heat exchangers at every computer cabinet.

CSF is focused on the design and efficient implementation of computational capabilities for analysis of data from high-throughput experimental technologies, the abstraction of models from this data, and the predictive simulation of these models. Multidisciplinary expertise spanning technical pillars of high-performance computing, data science, and computational mathematics work toward building computational capabilities that position PNNL as a computing leader. Continuous focus on enhancing the science of computing to achieve high-performance, power-efficient, and reliable computing at extreme scales for a spectrum of scientific endeavors that address significant problems of national interest, especially among PNNL's core pursuits—energy, the environment,

EMSL employs a forward-looking strategy to maintain leading-edge supercomputing capabilities and encourages users to combine computational and state-of-the-art experimental tools, providing a cross-disciplinary environment to further research.

national security, and fundamental science. CSF's newest computer, Constance, is a 400-node computing cluster featuring dual-socket Intel Haswell E5-2670v3 (12-core-per-socket, running at 2.3 GHz) nodes with 64 GB of memory, an Fourteen Data Rate Infiniband network

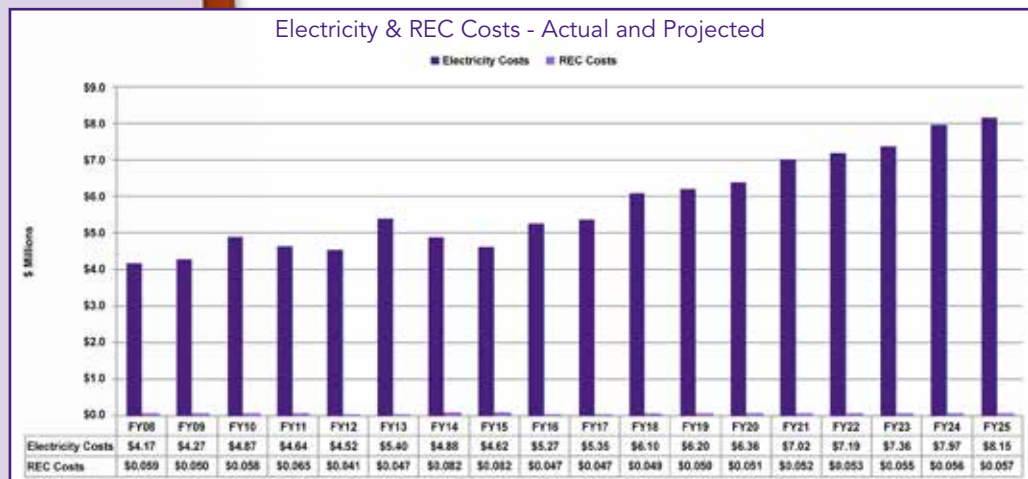
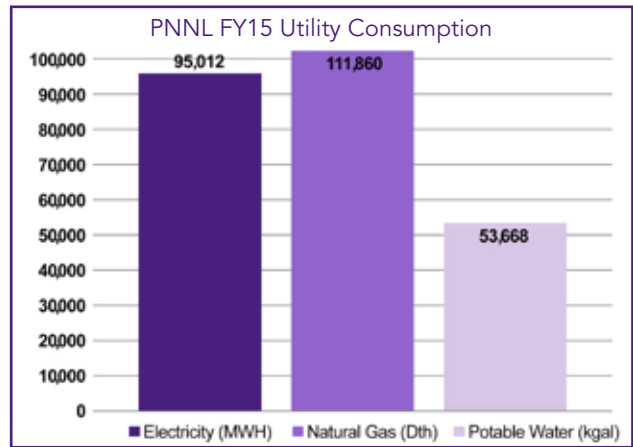
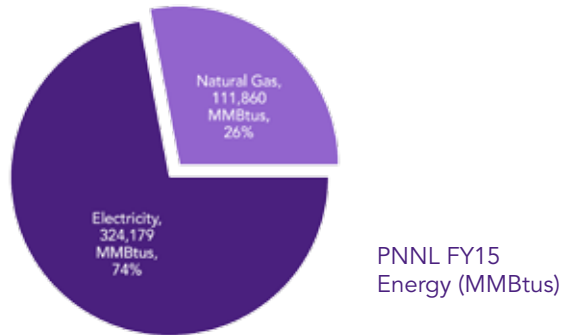
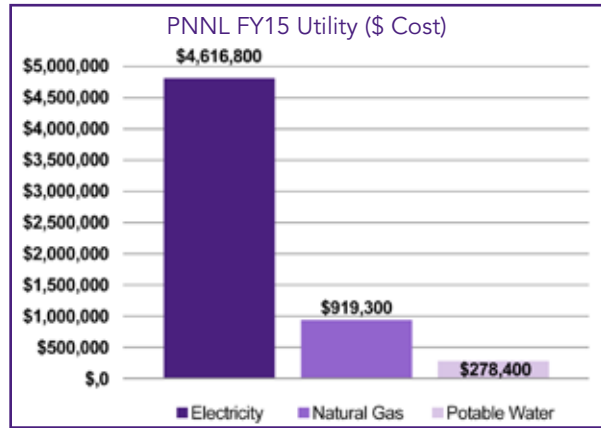
interface card, and 480 GB local disk storage. Incorporating the use of rear door heat exchangers coupled with an innovative ground source cooling system has resulted in the lowest PUE at PNNL.





Utility Usage, Costs, and Projections

Costs and usage of electricity, water, and natural gas with electrical projections through FY25.



Appendix A — Excluded Buildings List and Self-Certification



Department of Energy
Pacific Northwest Site Office
P.O. Box 350, K9-42
Richland, Washington 99352

16-PNSO-0040

MEMORANDUM FOR SUSTAINABILITY PERFORMANCE OFFICE

FROM: DOE PACIFIC NORTHWEST SITE OFFICE (PNSO)
PACIFIC NORTHWEST NATIONAL LABORATORY

SUBJECT: FY 2015 SELF-CERTIFICATION FORM FOR THE ENERGY
INTENSITY GOAL OF EISA 2007

Each Pacific Northwest National Laboratory (PNNL) building excluded under the criteria for a Part G exclusion is metered for energy consumption, and their consumption is reported annually. A justification statement that explains why process-dedicated energy in the facility may impact the ability to meet the goal has been provided in the FIMS Report 063.

No PNNL buildings have been excluded under the criteria for a Part H exclusion.

I certify that the PNNL buildings listed on the Excluded Buildings List, produced by FIMS as Report 063 dated November 12, 2015, meet the exclusion criteria in *Guidelines Establishing Criteria for Excluding Buildings* published by FEMP on January 27, 2006.

A handwritten signature in black ink, appearing to read "R. Snyder", is written over a horizontal line.

Roger E. Snyder
Manager, PNSO

11/17/15
Date

Contact Information:
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PNSO Operations Division
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Facilities Information Management System

11/30/2015

Energy Consuming Excluded Buildings and Trailers List

Property ID	Real Property Unique ID	Property Name	Exclusion Part	Property Type	Gross SQFT	Excluded Facilities (GSF)
3820	216066	3820 Systems Engineering Building	E - Skewed energy usage	Building	24,412	24,412
Added to the PNNL portfolio nominally mid-year during FY15. Per Guidance for the FY15 DOE Site Sustainability Plans (9/16/2014), App B-Definitions of Exclusions Allowed Under the Energy Intensity Reduction Goal: Part E-"Building...buildings entering or leaving the inventory during the year..."; such buildings should be excluded for their (first) partial year.						
EVANSGA	216207	Evans Georgia Office	C - Fully serviced lease	Building	596	596
Fully serviced lease. No utility data is available						
ISB2	139811	Information Sciences Building 2	G - Metered intensive loads	Building	60,080	3,854
Excluding the data center located in this building. 9/18/13 building is separately metered and data center is the predominant load in the building and all LCC ECMs have been implemented.						
3020EMSL	131274	3020 Env Molecular Science Lab	G - Metered intensive loads	Building	234,566	234,566
Excluded starting in FY07 because the supercomputer dominates usage in the building. GSF increased from 224,463 due to 5/12 with Qwing. 9/18/13 building is separately metered and LCC ECMs have either been implemented or are in progress for implementation.						
APEL	142813	Applied Process Engineering Lab	C - Fully serviced lease	Building	54,501	54,501
Fully serviced lease. No utility data is available.						
RSW	204732	Research Support Warehouse	C - Fully serviced lease	Building	8,000	8,000
Fully serviced lease. No utility data is available.						

This report qualifies DOE Owned, DOE Leased, Contractor Leased, Contractor License and Permit buildings and trailers where the Excluded Facilities (GSF) is greater than zero.

U.S. Department of Energy
Facilities Information Management System
Energy Consuming Excluded Buildings and Trailers List

Program Office	SC	Site	10014	Pacific Northwest National Lab	Property ID	Real Property Unique ID	Property Name	Exclusion Part	Property Type	Gross SQFT	Excluded Facilities (GSF)
WSUBSEL		205031		WSU Bioproducts Sci and Engr Lab			C - Fully serviced lease	Building		30,000	30,000
Fully serviced lease. No utility data is available.											
VTARC		214253		Virginia Tech Applied Research Corp			C - Fully serviced lease	Building		1,535	1,535
Fully serviced lease. No utility data is available.											
POS2		207368		Port of Skamania Tietzel Office			C - Fully serviced lease	Building		3,150	3,150
Fully serviced lease. No utility data is available.											
JGCRI		206372		Joint Global Change Research Inst			C - Fully serviced lease	Building		18,043	18,043
Fully serviced lease. No utility data is available.											
BSRC		200709		Battelle Seattle Research Center (ILA)			C - Fully serviced lease	Building		30,925	30,925
Fully serviced lease. No utility data is available.											
PORTLAND		142816		Portland Office			C - Fully serviced lease	Building		7,298	7,298
Fully serviced lease. No utility data is available.											

This report qualifies DOE Owned, DOE Leased, Contractor Leased, Contractor License and Permit buildings and trailers where the Excluded Facilities (GSF) is greater than zero.

Facilities Information Management System
Energy Consuming Excluded Buildings and Trailers List

Program Office	SC	Site	10014	Pacific Northwest National Lab	Property ID	Real Property Unique ID	Property Name	Exclusion Part	Property Type	Gross SQFT	Excluded Facilities (GSF)
ALBUQUERQUE		142911		Albuquerque NM Office			C - Fully serviced lease	Building		3,102	3,102
Fully serviced lease. No utility data is available.											
BWO		142814		Battelle Washington Office (ILA)			C - Fully serviced lease	Building		6,847	6,847
Fully serviced lease. No utility data is available.											
CSF		207161		Computational Sciences Facility			G - Metered intensive loads	Building		74,000	74,000
excluded started in FY12 because the data centers and supercomputers dominate the energy usage in the building. 9/18/13 building is separately metered and was recently constructed as a LEED Gold Facility											

This report qualifies DOE Owned, DOE Leased, Contractor Leased, Contractor License and Permit buildings and trailers where the Excluded Facilities (GSF) is greater than zero.

PNNL-24501




Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

Metering Plan

Enhanced Operations Through
Measuring and Monitoring of
Utility Resource Consumption

July 2015

JE Pope

U.S. DEPARTMENT OF
ENERGY

Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

Appendix C — Integrated Sustainability Performance

Since 2009, PNNL has used the Global Reporting Initiative (GRI) guidelines as a basis for reporting our governance approach and sustainability performance. The GRI report provides an integrated view of the environmental, social, and economic impacts that are important to our stakeholders and PNNL's long-term success. The PNNL FY15 Annual Sustainability Report will be released in early FY16 and available at <http://sustainable.pnnl.gov>.

SUSTAINABILITY PERFORMANCE SCORECARD

		2014	2015	
		did not meet target risk of not meeting target met or on track to meet target		
ENVIRONMENT	Reducing building energy use and GHG emissions			
	<ul style="list-style-type: none"> Reduce Scope 1 and 2 GHG emissions 50% from 2008-2025 after renewable electricity purchases¹ (Target: 21,843 MTCO₂e) 	18,027	0	
	<ul style="list-style-type: none"> Reduce energy use intensity in buildings 30% from 2003-2015 (Target: 150 kBtu/ft²) 	182	168	
	<ul style="list-style-type: none"> At least 7.5% of electricity use from renewable sources 	50%	53%	
	Traveling smarter			
<ul style="list-style-type: none"> Reduce petroleum-based fuel use in fleet vehicles 30% from 2005-2015 (Target: 31,060 GGE) 	31,836	28,988		
<ul style="list-style-type: none"> Reduce Scope 3 GHG emissions from employee transportation 25% from 2008-2025 (Target: 18,092 MTCO₂e) 	21,463	21,192		
Minimizing water use				
<ul style="list-style-type: none"> Reduce potable water use intensity 16% from 2007-2015 and 36% by 2025 (Targets: 59 and 45 GSF) 	26	23		
<ul style="list-style-type: none"> Reduce irrigation water use 30% from 2010-2025 (Target: 123M gallons) 	143M	168M		
Reducing material purchases and waste				
<ul style="list-style-type: none"> Divert at least 50% of sanitary waste from landfill 	53%	50%		
SOCIAL	Keeping employees healthy and safe			
	<ul style="list-style-type: none"> Total recordable case rate ≤ .65² 	0.87	0.86	
	<ul style="list-style-type: none"> Days away, restricted, or transferred rate ≤ .25² 	0.22	0.46	
	Investing in our employees' professional development			
	<ul style="list-style-type: none"> Average participant satisfaction rating from professional development programs ≥ 4.5/5 	4.7	4.6	
Creating an inclusive work environment				
<ul style="list-style-type: none"> No goal established 		N/A		
Fostering the next generation of scientists and engineers				
<ul style="list-style-type: none"> Average participant rating of work-based learning programs ≥ 4.0/5 	4.6	4.7		
Transferring technology that makes a difference				
<ul style="list-style-type: none"> Economic contribution to global economy from licensed technologies (Target: Minimum=\$50M, Stretch=\$100M) 	\$97.3M	\$108.7M		
Maintaining financial viability through research and operational excellence				
<ul style="list-style-type: none"> Sales target: >\$835M in 2014 and >\$812M in 2015 	\$938M	\$918.5M		
<ul style="list-style-type: none"> Business volume/operating budget targets: >\$1,016M in 2014 and >\$931M in 2015 	\$1,020M	\$955.1M		
Supporting small businesses				
<ul style="list-style-type: none"> Award at least 50% procurement dollars to small businesses 	57%	57%		
Giving back to our communities				
<ul style="list-style-type: none"> Philanthropic investments (No target)³ 	\$734,383	\$621,740	N/A	

1. PNNL reduces Scope 2 GHG emissions by the quantity of GHGs avoided from purchasing renewable energy certificates to be consistent with Federal GHG Reporting Guidelines.
 2. Reported per 200,000 employee hours worked.
 3. Philanthropic investments are distributed by a committee of employees from Battelle's Pacific Northwest Division. At least 50% of giving is directed to STEM education.

Social Performance



Beryllium Program Improvements

- ▶ Worker Safety & Health 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 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.



Annual Student Roadshow

- ▶ Show and tell about safety, security, sustainability and wellness at PNNL.

TELEWORK OPTION FOR STAFF



5.0% participation weekly

A dedicated telework advocate, on-demand training and better video-conferencing and mobile technology tools has helped this option become a success. Staff enjoy better work-life balance while helping PNNL maintain operations during inclement weather or crisis.

VOLUNTEER HOURS



for 56 local organizations

**team
battelle**



INVESTING IN OUR COMMUNITY

Habitat for Humanity Project

\$80K

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

NEXT GENERATION STEM WORKFORCE

- ▶ ~1,300 interns, research associates, post-docs, post-masters, fellows, and educators benefitted from on-campus immersion experiences at PNNL



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.



Invested nearly
\$621,740
in area philanthropic and civic organizations

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

Economic Performance



ECONOMIC DEVELOPMENT

~170

businesses have roots to Battelle-PNNL technology or personnel

~4,672

Tri-Cities, Wash. jobs (direct and indirect)

R&D 100 AWARDS

5 of this year's winners are PNNL technologies that impact cyber security, 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.

INVESTED \$106,000

Delta High School which got a new home in Pasco, Wash.



In the former location, the school became inadequate as the student body grew to its full capacity of 400. Delta resulted from 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.

PROCUREMENT OF GOODS AND SERVICES SPENDING

\$319 million



PAPER PURCHASES

Printer and copy paper purchases are down from FY14

5%

(and **64%** from 2010)



PENSION PLAN

Value of pension plan liabilities

\$1.17

billion

PORTION OF SPENDING ON LOCAL SUPPLIERS

12.3%

SMALL BUSINESS PROCUREMENT GOAL

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

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

PEER-REVIEWED PUBLICATIONS



1,048

Sharing our Science with the World!



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