

SITE SUSTAINABILITY PLAN



Fiscal Year 2017

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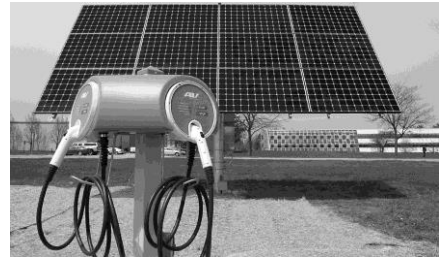
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Acronyms

AFV	alternative fuel vehicle
AHU	air handling unit
APS	Advanced Photon Source
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ATLAS	Argonne Tandem Linac Accelerator System
CHP	combined heat and power
DC	direct current
DOE	U.S. Department of Energy
EDC	Enterprise Data Center
EISA	Energy Independence and Security Act
E.O.	Executive Order
EPEAT	Electronic Product Environmental Assessment Tool
ESPC	energy savings performance contract
FY	fiscal year
GHG	greenhouse gas
GSA	General Services Administration
GSF	gross square foot (feet)
HEMSF	High-Energy Mission-Specific Facility
HPSB	High-Performance Sustainability Building
HVAC	heating, ventilation, and air conditioning
ILA	industrial, landscaping, and agricultural
LED	light-emitting diode
LEED	Leadership in Energy and Environmental Design
MDL	Materials Design Laboratory
MSW	municipal solid waste
PPA	power purchase agreement
PUE	power usage effectiveness
R2	Responsible Recycling
REC	renewable energy credit

SPO	U.S. Department of Energy Sustainability Program Office
T&D	transmission and distribution
TCS	Theory and Computing Science Center
USGS	U.S. Geological Survey
VFD	variable frequency drive
WWT	wastewater treatment

Executive Summary

Argonne’s vision for a more sustainable laboratory is built upon a strong combination of technical expertise, scientific collaboration, management commitment at all levels, and strategic investment of resources. This vision is challenged by the high demand for energy and water in our scientific user facilities and by the need to wisely use a finite amount of available funding. Through the use of alternative financing and innovative, high-return-on-investment projects, Argonne has been extremely successful in reaching sustainability goals.

Argonne’s sustainability plans and progress are driven by Executive Order (E.O.) 13693, “Planning for Federal Sustainability in the Next Decade,” and the flow-down U.S. Department of Energy (DOE) Order 436.1, “Departmental Sustainability.” Progress toward goals is recorded in this annual Site Sustainability Plan and in the site’s International Organization for Standardization (ISO) 14001 certified Environmental Management System.

E.O. 13693 issued a new set of challenges to federal agencies. Over the next 10 years, DOE sites will find new ways to:

- Cut Scope 1 and 2 greenhouse gas (GHG) emissions by 50 percent;
- Commit to 25 percent renewable energy;
- Design and build net-zero energy buildings; and
- Reduce fleet GHG emissions by 30 percent.

Argonne’s sustainability accomplishments during fiscal year (FY) 2016 included the following:

1. Completed a combined heat and power (CHP) plant, which was financed through the laboratory’s fourth Energy Savings Performance Contract.
2. Expanded the employee electric vehicle charging program that was launched in FY 2015.
3. Reduced potable water intensity to 35 percent less than the FY 2007 baseline.
4. Diverted 4,246 metric tons (99 percent) of construction and demolition waste from municipal landfills.
5. Received the Illinois Governor’s Sustainability Award for the third consecutive year.
6. Completed a comprehensive climate resilience planning process including a site stormwater vulnerabilities assessment in partnership with the U.S. Geological Survey.

The Argonne sustainability team continues to partner with the laboratory’s programmatic research divisions to develop forward-thinking sustainable campus solutions that help maximize the laboratory’s ability to deliver world-class science and user facilities.

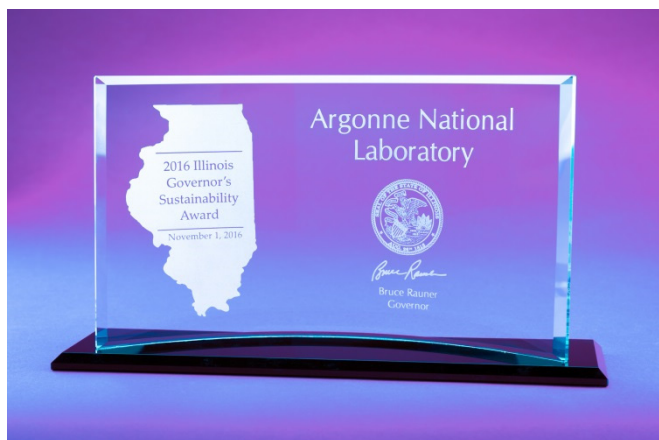


Figure 1: 2016 Illinois Governor’s Sustainability Award

Table 1: Executive Summary Table of DOE Sustainability Goals based on the SSP and Executive Order 13693¹

SSP Goal #	DOE Goal	Performance Status through FY 2016	Planned Actions and Contribution
Goal 1: Greenhouse Gas Reduction			
1.1	50% Scope 1 & 2 GHG reduction by FY 2025 from a FY 2008 baseline (2016 target: -22%).	-23%	Continue to reduce GHG through new CHP plant production, energy efficiency projects, SF ₆ capture projects, and renewable energy credit (REC) purchases
1.2	25% Scope 3 GHG reduction by FY 2025 from a FY 2008 baseline (2016 target: -7%).	-8%	Continue to reduce GHG through increased employee green commute participation, and continue to reduce transmission and distribution loss through increased on-site power generation
Goal 2: Sustainable Buildings			
2.1	25% energy intensity (Btu per gross square foot [GSF]) reduction in goal-subject buildings, achieving 2.5% reductions annually by FY 2025 from a FY 2015 baseline.	-5%	Reduce energy intensity through new CHP plant production, steam loss reductions, and lighting upgrade projects
2.2	Energy Independence and Security Act (EISA) Section 432 energy and water evaluations.	On target	Continue required EISA energy and water evaluations
2.3	Meter all individual buildings for electricity, natural gas, steam, and water, where cost-effective and appropriate.	100% of facilities metered for electricity, steam, natural gas, and chilled water	Continue installing advanced metering and developing analytics for facility utility consumption
2.4	At least 17% (by building count) of existing buildings greater than 5,000 GSF to be compliant with the revised Guiding Principles for High-Performance Sustainability Buildings (HPSBs) by FY 2025, with progress to 100% thereafter.	16%	Continue progress through renovation of existing buildings and new facility design
2.5	Efforts to increase regional and local planning coordination and involvement.	Successful efforts to improve transportation planning, site selection, environmental planning, and community outreach	Continue site planning and coordination with local and regional planning organizations, as well as outreach efforts
2.6a	Net-zero buildings: 1% of the site's existing buildings above 5,000 GSF intended to be energy, waste, or water net-zero buildings by FY 2025.	0%	Continue to investigate energy, waste, and water net-zero building renovation opportunities

¹ See Appendix G—E.O. 13693 Crosswalk for clarification on the relevant regulations that set the targets described in Table 1.

Table 1: Executive Summary Table of DOE Sustainability Goals based on the SSP and Executive Order 13693 (continued)

SSP Goal #	DOE Goal	Performance Status through FY 2016	Planned Actions and Contribution
2.6b	Net-zero buildings: All new buildings (>5,000 GSF) entering the planning process designed to achieve energy net-zero beginning in FY 2020.	0%	Continue to investigate energy, waste, and water net-zero design and construction opportunities
Goal 3: Clean & Renewable Energy			
3.1	Clean energy: 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 FY 2016–2017, working toward 25% by FY 2025.	7%	Continue evaluation of electric and thermal clean energy sources and purchase of RECs
3.2	Renewable electric energy: renewable electric energy shall account for not less than 10% of a total agency electric consumption in FY 2016–2017, working toward 30% of total agency electric consumption by FY 2025.	13%	Continue evaluation of renewable electric and energy sources and purchase of RECs
Goal 4: Water Use Efficiency and Management			
4.1	36% potable water intensity (in gallons per GSF) reduction by FY 2025 from a FY 2007 baseline (2016 target: 18%).	-35%	Continue once-through to closed-loop conversion projects and installation of low-flow fixtures
4.2	30% water consumption (in gallons) reduction of industrial, landscaping, and agricultural (ILA) water by FY 2025 from a FY 2010 baseline (2016 target: 12%).	-6.5%	Continue cooling tower efficiency improvement projects and expansion of drought-tolerant landscaping
Goal 5: Fleet Management			
5.1	30% reduction in fleet-wide per-mile GHG emissions by FY 2025 from a FY 2014 baseline (2016 target: -3%; 2017 target: -4%).	-8%	Continue to seek opportunities to replace traditional vehicles with high-efficiency, hybrid, and plug-in electric vehicles
5.2	20% reduction in annual petroleum consumption by FY 2015 relative to a FY 2005 baseline; maintain 20% reduction thereafter (2016 target: -20%).	-58%	Continue to seek opportunities to use alternative fuel vehicles (AFVs) and improve petroleum use efficiency
5.3	10% increase in annual alternative fuel consumption by FY 2015 relative to a FY 2005 baseline; maintain 10% increase thereafter (2016 target: 10%).	133%	Continue to seek opportunities to use AFVs
5.4	75% of light-duty vehicle acquisitions must consist of AFVs (2016 target: 75%).	100%	Continue to seek opportunities to acquire light-duty AFVs

Table 1: Executive Summary Table of DOE Sustainability Goals based on the SSP and Executive Order 13693 (continued)

SSP Goal #	DOE Goal	Performance Status through FY 2016	Planned Actions and Contribution
5.5	50% of passenger vehicle acquisitions consist of zero-emission or plug-in hybrid electric vehicles by FY 2025 (2016 target: 4%).	0%	Continue to seek opportunities to acquire zero-emission vehicles
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 contracts contain sustainable acquisition clause	Develop sustainable acquisition policy and update contract clauses
Goal 7: Pollution Prevention & Waste Reduction			
7.1	Divert at least 50% of non-hazardous solid waste, excluding construction and demolition debris (2016 target: 50%).	51%	Continue diversion of non-hazardous solid waste from municipal landfills
7.2	Divert at least 50% of construction and demolition materials and debris (2016 target: 50%).	95%	Continue diversion of construction and demolition materials and debris from municipal landfills
Goal 8: Energy Performance Contracts			
8.1	Annual targets for performance contracting to be implemented in FY 2017 and annually thereafter as part of the planning of Section 14 of E.O. 13693.	N/A; annual targets to be implemented in FY 2107	Continue to seek opportunities to use performance contracting for facility efficiency improvements
Goal 9: Electronic Stewardship			
9.1	Purchases: 95% of eligible acquisitions each year are Electronic Product Environmental Assessment Tool (EPEAT) registered products.	94%	Continue purchase of EPEAT-registered products
9.2	Power management: 100% of eligible personal computers (PCs), laptops, and monitors have power management enabled.	54%	Expansion of power management into non-centrally managed systems
9.3	Automatic duplexing: 100% of eligible computers and imaging equipment have automatic duplexing enabled.	100%	Continue deployment of automatic duplexing enabled equipment
9.4	End of life: 100% of used electronics are reused or recycled using environmentally sound disposition options each year.	100%	Continue 100% recycling of e-waste by an R2-certified recycler
9.5	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.	1.4 PUE for new data centers and 1.9 PUE for existing data centers	New enterprise data center will meet PUE goal

Table 1: Executive Summary Table of DOE Sustainability Goals based on the SSP and Executive Order 13693 (continued)

SSP Goal #	DOE Goal	Performance Status through FY 2016	Planned Actions and Contribution
Goal 10: Climate Change Resilience			
10.1	Update policies to incentivize planning for, and addressing of, the impacts of climate change.	Continued vulnerabilities analysis and evaluation of existing policies	Complete vulnerabilities analysis, then initiate resilience planning process
10.2	Update emergency response procedures and protocols to account for projected climate change, including extreme weather events.	Continued vulnerabilities analysis and evaluation of existing policies	Complete vulnerabilities analysis, then initiate changes to emergency response policies
10.3	Ensure workforce protocols and policies reflect projected human health and safety impacts of climate change.	Continued vulnerabilities analysis and evaluation of existing policies	Complete vulnerabilities analysis, then initiate changes to workforce policies
10.4	Ensure site/lab management demonstrates commitment to adaptation efforts through internal communications and policies.	Site and laboratory management continues to fully support adaptation efforts	Stakeholder working group to continue appropriate coordination with management
10.5	Ensure that site/lab climate adaptation and resilience policies and programs reflect best available current climate change science, updated as necessary.	Completed stormwater model report in cooperation with U.S. Geological Survey (USGS) and Argonne scientific research division staff	Improve USGS stormwater model through use of National Oceanic and Atmospheric Administration climate change risk protocols

1 Greenhouse Gas Reduction

1.1 Scope 1 and 2 Greenhouse Gas Inventory and Reduction

GOAL

↓ 50%

from a FY 2008 baseline by FY 2025

↓ 22%

from a FY 2008 baseline by FY 2016

STATUS

↓ 23%

from a FY 2008 baseline in FY 2016

Scope 1 greenhouse gas (GHG) (direct) emissions are a result of on-site combustion and other emission-producing activities on Argonne's campus. Scope 2 (indirect) emissions are produced by off-site power facilities as a result of energy generated for Argonne's campus needs. Argonne carefully managed Scope 1 and 2 GHG emissions in fiscal year (FY)

2016 through energy efficiency retrofits, fleet conversions, and fugitive emission controls. Scope 1 and 2 GHG emissions are down 23 percent from the FY 2008 baseline (Figure 2). However, due to an increase in emissions from industrial processes, meeting additional Scope 1 and 2 GHG emissions reductions will be challenging for Argonne. Argonne will continue to purchase renewable energy credits (RECs) to offset future emissions increases.

Scope 1: Direct GHG Emissions

The FY 2016 Scope 1 fugitive emissions decreased 82.5 percent from the FY 2008 baseline (Table 2). These results exceed the U.S. Department of Energy's (DOE's) 2011 Strategic Sustainability Performance Plan goal to reduce fugitive emissions by 50 percent by FY 2012 and beyond. The most significant contribution to fugitive gas is sulfur hexafluoride (SF₆), which is used in a variety of scientific electrical equipment, including accelerators and electron microscopes. SF₆ emissions decreased 46 percent from FY 2015, primarily due to the complete shutdown of the Argonne Tandem Linac Accelerator System (ATLAS) and decreased emissions from other accelerators.

New SF₆ recovery system expected to reduce 5,000 tons of CO₂ emissions annually

In FY 2016, Argonne acquired a sulfur hexafluoride (SF₆) recovery unit for a linear accelerator located in Building 211. The new system is expected to recover approximately 500 pounds of SF₆—equivalent to more than 5,000 tons of CO₂—annually. This could reduce campus SF₆ emissions by up to 50 percent based on past years' activity.

Portable SF₆ recovery systems are also being used at small source facilities, such as electron microscopy facilities, across Argonne's campus.



Principal Physicist Roman Gromov will use this recovery system to capture and recycle SF₆ from the Building 211 linear accelerator.

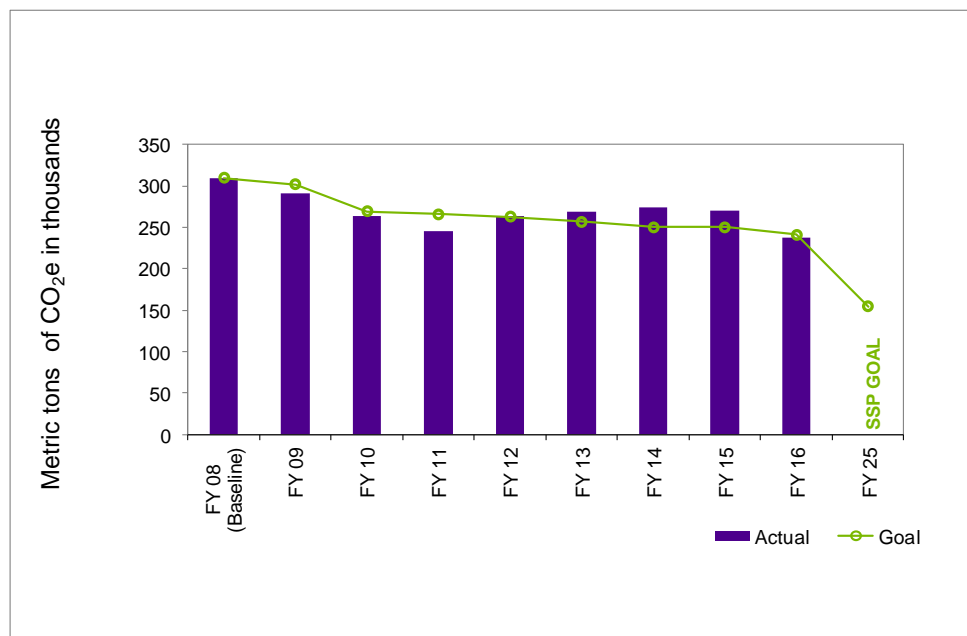


Figure 2: Scope 1 and 2 GHG Emissions Performance and Goal (1,000 metric tons/FY) (CO₂e)

Table 2: Scope 1 and 2 GHG Emissions Breakdown, Metric Tons CO₂e

Categories	Baseline* (2008)	FY 2015	FY 2016
Energy Production	246,731	270,412	244,333
Fugitive Emissions*	60,042	19,586	10,507
On-Site Wastewater Treatment (WWT)	25.3	28	40.8
On-Site Landfill Municipal Solid Waste (MSW)	1,988	2,651	0
Fleet Fuel	492.3	190.3	177
Non-fleet Fuel (Vehicle & Equipment)	203	148	149
Renewables	0	605.7	734
Purchased RECs	NA	-23,884	-18,535**
Total	309,480	269,737	237,406

* Baseline year fugitive emissions included mixed refrigerants, fugitive emissions, and industrial processes.

** Based on 40,000 MWh purchased, at 0.4634 metric tons/MWh emission factor. The whole RECs-related GHG emission credit is attributed to Scope 1 and 2 emissions.

Argonne recaptures, recycles, recharges, and reuses SF₆. In FY 2016, a new SF₆ recovery unit was acquired for the Building 211 linac, a significant emitter. One pound of SF₆ has the global warming equivalent of 11 tons of carbon dioxide. Attachment A shows the actual and projected emissions of SF₆ from FY 2010 to FY 2020.

Scope 2: GHG Emissions from Power Production—Space Management and Alternative Workplace Arrangements

Argonne utilizes space management and alternative workplace arrangements to minimize its on-site built/occupied footprint, and therefore minimizes associated energy loads and GHG emissions. Decommissioning and demolition of surplus and substandard facilities at Argonne is a necessary component to minimizing the on-site covered facility footprint, and it will lead to a reduction in the laboratory's utility and maintenance overhead.

Alternative workplace arrangements are offered to employees whose work and management allow for regular or occasional teleworking. Offering Argonne employees the ability to telework promotes a healthy work-life balance while also reducing the on-site employees' workspace and utility burden.

New facilities at Argonne use designs for reduced laboratory footprints and more flexible office/cubicle arrangements to optimize space for research and allow for future reconfiguration and adaptability. Thus, Argonne is creating offices and laboratories that are not only energy-efficient but also multipurpose.

Scope 2: GHG Emissions from Power Production—HEMSF Reductions and Challenges

High-energy mission-specific facilities (HEMSFs) pose a particular challenge to the laboratory’s reduction of Scope 2 GHG emissions. The Electrical Energy and Cost Projections Including High-Energy Mission-Specific Facilities section of this report compares the energy consumed by HEMSFs to the energy used by other laboratory facilities (see Figure 15). The most prominent HEMSFs at Argonne are its high-performance computing facilities and the Advanced Photon Source (APS). These facilities use more than half of the electricity consumed onsite.

Process loads from HEMSFs are typically difficult to reduce. However, Argonne engineers developed a means to capture waste heat at APS. This heat is then used to heat adjacent office spaces, thereby decreasing the offices’ energy consumption and contributing to the achievement of HPSB goals.

In FY 2015, a feasibility study was commissioned to explore the options for using waste heat that will be produced by a planned high-performance computing facility. The waste heat would be used to heat the new Materials Design Laboratory (MDL), which is to be constructed in FY 2017.

Plans

Fugitive Emissions

Argonne will continue to support fugitive emissions capture and equipment repair projects in FY 2017. Future efforts will examine accelerator systems for new opportunities to reduce fugitive emissions, especially SF₆.

Space Management and Alternative Workplace Arrangements

Argonne will continue to use strategies to minimize its built/occupied footprint on site, which in turn minimizes its energy consumption and associated Scope 1 and 2 emissions. By designing and building laboratory and office facilities using flexible and optimized space configurations and encouraging the use of alternative workplace arrangements such as teleworking, the site will maintain an optimized built/occupied footprint. Decommissioning and demolition of surplus building stock will be key to optimizing space utilization.

HEMSF Reductions and Challenges

Additional waste heat utilization systems are being evaluated for potential use in HEMSFs other than the APS. Process energy lost as heat could be used to condition adjacent spaces. Other improvements to HEMSFs will continue to take the form of traditional facility energy efficiency projects such

as improving lighting and heating, ventilation, and air conditioning (HVAC) systems.

Argonne will also continue to work to identify and implement energy efficiency strategies to the greatest extent feasible. By forming working groups such as the Data Center Consolidation Workgroup, decisions can be made early during projects’ design phases to ensure energy-efficient design and operation of Argonne HEMSFs.

1.2 Scope 3 GHG Reduction

GOAL

↓ 25%

from a FY 2008 baseline by FY 2025

↓ 7%

from a FY 2008 baseline by FY 2016

STATUS

↑ 8%

from a FY 2008 baseline in FY 2016

In FY 2016, Scope 3 GHG emissions were up 8 percent compared to the baseline in FY 2008. The majority of this increase is attributable mainly to increased commuting-related emissions, which were up 33% in FY 2016 compared to baseline. The increase in emissions, quantified in Table 3, is offset to the greatest degree possible by the programs listed in this section.

Table 3: Scope 3 GHG Emissions Breakdown, Metric Tons CO₂e

Categories	Baseline	FY 2015	FY 2016
Electrical T&D Losses	12,286	12,671	11,681
Air Travel	6,535	6,039	5,973
Ground Travel	512	865	528
Commute	11,717	14,090	15,652
Off-Site Landfill MSW	1,224	566	930
Total	32,274	34,231	34,764

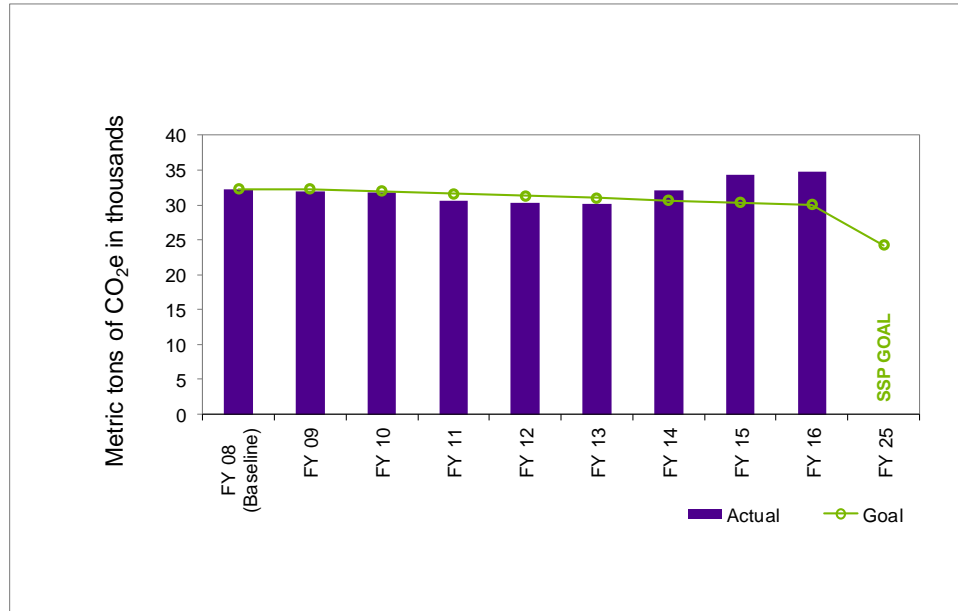


Figure 3: Scope 3 GHG Emissions Performance and Goal (1,000 metric tons/FY) (CO₂e)

Employee Commuting

A recent employee commuting survey showed an increase in the average number of miles traveled to work. This increase offsets an increase in the number of commutes made via low-emission vehicles and a decrease in the average number of driving days.

Scope 3 GHG emissions include indirect emissions from sources not owned or directly controlled by Argonne, but related to the laboratory’s activities. Scope 3 GHG emission sources include transmission and distribution (T&D) losses associated with purchased electricity, employee travel and commuting, contracted solid waste disposal, and wastewater treatment. The major sources of Scope 3 GHG emissions at Argonne are employee commuting, business air travel, and electrical T&D losses.

The laboratory’s strategy for reducing Scope 3 emissions is summarized in Table 3 and includes the promotion of green employee commute options such as on-site mobility, alternative work schedules, teleworking, and videoconferencing.

Argonne employs a dedicated online tool, GreenRide Connect, to help employees find carpool and vanpool matches

in their local areas. In addition, since FY 2014, Argonne has tracked teleworking via employee online timecard entries

A sustainable employee commuting workgroup meets regularly to evaluate commuting strategic goals, such as:

- Increased access to the regional mass transit system;
- Increased on-site campus transportation options (e.g., Bike Share) in support of commuters who choose transit options;
- Tracking telework and alternative work schedule participation; and
- Tracking carpool or vanpool ride sharing.

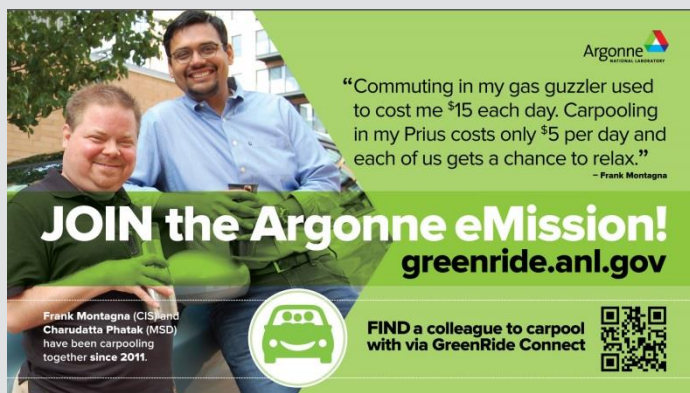
In FY 2016, Argonne continued to offer employees a pre-tax saving option to incentivize mass transit use, such as participation in vanpools. Argonne employees supported two vanpools in FY 2016 (with the assistance of Pace, the Chicago suburban regional transit authority). Argonne’s Bike Share program provides an alternative to automobile use for last-mile site travel (the difference between the transit/charpool drop point and the employee’s final destination). It provides on-site mobility for public transit users and promotes wellness in the workplace. The Bike Share fleet is made up of 120 bicycles placed in populated areas. More than 3,000 employees are registered to participate.

We're on a mission to reduce commuting “eMissions”

In FY 2016, Argonne piloted the “eMission” campaign, which focuses on actions that employees can take to reduce their work-related commuting emissions. Promotional campaign materials featured quotations from employees who have already adopted sustainable commuting practices.

According to an employee survey and feedback from a focus group, it was determined that the eMission campaign increased employees’ interest in ridesharing by 30 percent.

Argonne’s eMission campaign materials will be shared with other DOE laboratories throughout the complex as a resource to assist in advancing other organizations’ commuting programs.



This poster is one in a series within Argonne’s eMission internal communications campaign that focused on employees and their positive commuting habits.

Table 4: Scope 3 GHG Reduction Strategies

Action	FY 2016 Status	FY 2017 Plan
Commuter Program: Use of electric vehicles	Installation of additional charging plan for Argonne employees	Increase number of charging stations for users; incorporate changes to allow DOE employees to participate
Commuter Program: Last Mile Strategies—Bike Share program	Bicycles maintained and new styles tested; additional participants registered in the program	Continue Bike Share program; install odometers to track miles ridden by bike share bicycles
Commuter Program: Last Mile Strategies—Encourage walking and biking	Continued promotion of joint sustainability/employee wellness activities; increase in biking miles noted in 2015 survey	Continue participation in Virgin Pulse healthy living competition and “Bike to Work” weeks
Commuter Program: Last Mile Strategies—Videoconferencing	Installed additional videoconferencing centers	Continue to expand videoconferencing infrastructure, services and promote use
Commuter Program: Use of high-efficiency vehicles and ride sharing	GreenRide Connect ride share tool promoted; continued preferred parking to incentivize ride sharing and high-efficiency vehicle use	Monitor use of high-efficiency vehicles and car- and vanpooling
Commuter Program: Use of mass transit	Continued pre-tax commuter flexible spending account program	Provide additional on-site transportation options and continue pre-tax commuter flexible spending account program
Commuter Program: Teleworking and alternative work schedule	Encouraged teleworking and alternate work schedules	Continue to promote teleworking once a week when practical and promote use of alternative work schedule
Energy Efficiency Improvements	Implemented aggressive set of energy efficiency projects, summarized in Section 2.1	Continue implementing energy-efficiency improvements for site facilities to the greatest extent possible to reduce purchased power and related T&D losses
Site Combined Heat and Power (CHP) Plant	Construction completed in FY 2016	Operational testing and power production will begin in FY 2017; CHP plant will reduce purchased power, which in turn will reduce associated T&D losses

Business Ground and Air Travel

Argonne employees traveled 76,793 more ground miles and 345,537 fewer air miles in FY 2016 compared to FY 2015. To offer an alternative to business travel, Argonne continues to invest in expanding videoconferencing locations across campus.

Transmission and Distribution Losses

Scope 3 T&D losses are directly related to the amount of electricity consumed on site. In FY 2016, T&D losses decreased by 5 percent due to reduced site electric consumption.

Off-site Wastewater Treatment

Argonne's wastewater is processed entirely on site; therefore, no off-site (Scope 3) wastewater treatment emissions are produced.

Off-site Municipal Waste Disposal

In FY 2016 off-site municipal waste disposal increased 64% over FY 2015, leading to an associated 24 percent drop over FY 2008 baseline in off-site Scope 3 waste disposal related emissions.

Plans

Employee Commuting

In FY 2017, Argonne will continue to focus efforts on its four-part commuting strategy by increasing participation in mass transit, increasing options for "last-mile" and on-site mobility, tracking telework and alternative work schedules, and increasing and tracking ride sharing.

The formal electric vehicle charging program for Argonne employees was expanded in FY 2016 to allow DOE employees access to the program. In addition, a new research facility employing direct current (DC) fast charging was constructed and will be put into operation in early FY 2017. This facility will be made available to participants in the electric vehicle charging program.

Laboratory staff will monitor the success of its pre-tax commuter savings program participation and will work with Pace, the Chicago regional bus transit authority, to examine the possibility of new vanpools or links to transit services. In order to improve transit and vanpool users' on-site mobility, Argonne will consider piloting an on-site vehicle sharing program.

Transmission and Distribution Losses

Argonne will continue to reduce overall site base electric load for existing facilities by addressing actual ancillary transmission and distribution losses through FY 2017. Argonne's capacity to generate nearly 6 MW of electricity on site through the CHP plant, which began operations in late FY 2016, will reduce T&D losses.

Off-site Municipal Waste Disposal

Argonne's efforts to improve its recycling, composting, and reuse programs will lead to continued reduction of off-site municipal waste disposal emissions in FY 2017.

Electric vehicles on the rise, Argonne meets charging demand

Argonne expanded its existing employee electric vehicle charging program in FY 2016 with the installation of four additional charging stations, with two charging points per station. A new, more user-friendly reservation system was also introduced, simplifying online charging reservations for all users.

Further development of the laboratory's electric vehicle charging infrastructure was in response to increased employee demand.



Geoff Pierce (left) and Julie Cross (right) were early adopters of Argonne's Employee Electric Vehicle Charging Program.

2 Sustainable Buildings

2.1 Energy Intensity Reduction

GOAL	
↓ 25%	from a FY 2015 baseline by FY 2025
↓ 2.5%	annually from a FY 2015 baseline by FY 2016
STATUS	
↓ 5.3%	from a FY 2015 baseline in FY 2016

Argonne achieved a 5.3 percent reduction in energy intensity over the FY 2015 baseline.

FY 2016 was highlighted by the construction of a new CHP plant on campus, financed through an energy savings performance contract (ESPC). The plant began limited operation in the fourth quarter of FY 2016 and will ramp up to full operation in FY 2017. The plant will supply about 80 percent of the campus total steam consumption and 50,000 MWh of electricity.

Argonne’s Energy and Water Working Group meets monthly to evaluate and implement energy- and water-saving projects. In FY 2016, 11 energy and water conservation measures were completed at a cost of \$320,000. Annual cost savings from these projects yielded a cumulative simple payback period of 5.7 years. Projects included lighting retrofits, replacement of compressed air driers, and industrial water reuse projects.

Argonne teams use the latest tools and best practices to reduce campus energy intensity. These tools include advanced auditing technologies, automated data collection, trend analysis, and benchmarking using Energy Star Portfolio Manager.

Plans

Argonne will continue to pursue proven and novel technologies to further reduce the campus energy intensity. Argonne remains committed to implementing a Smart Campus Initiative that includes upgrading and integrating

facilities and systems to give building managers, operators, and occupants greater knowledge of how their building is performing. In order to ensure that future buildings meet energy intensity reduction goals, Argonne has required, through recently published design guidelines, that all new construction and major renovation projects provide energy models that achieve a 30 percent greater energy efficiency than American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 90.1.

2.2 EISA Evaluations

Argonne annually evaluates energy usage in all buildings to determine its 75 percent highest energy consuming facilities. These facilities are placed on a 4-year evaluation cycle for energy and water usage and efficiency. The audits are performed in accordance with the ASHRAE Level I Audit procedures as required by the Energy Independence and Security Act (EISA) of 2007. FY 2016 was the last year of the current 4-year cycle; a new cycle will begin in FY 2017 with buildings last audited in FY 2013 being re-audited. In addition, Argonne continues to use Energy Star Portfolio Manager to benchmark facilities and identify future opportunities for improvement.

Plans

Energy audits and evaluations are an important step in the retro- and re-commissioning processes. In the past, the results of the EISA audits were used in conjunction with other assessments to find energy savings opportunities as single projects. Going forward, in FY 2017, Argonne plans to create a retrocommissioning team that will use the results of the audits to drive full-scale retro- and recommissioning projects on the site buildings that consume the most energy and water. The retro- and recommissioning projects will give Argonne the opportunity to expand the use of measurement and verification on energy reduction projects. Previously, measurement and verification was done only in cases where existing monitoring was in place.

LED retrofit project saves \$15K annually

Over the last 2 years, Argonne’s custodial and maintenance teams have upgraded older fluorescent light fixtures and bulbs to light-emitting diodes (LEDs) when conducting routine maintenance activities. This continuous project saves Argonne an estimated \$15,000 in energy costs each year.



2.3 Metering

GOAL

100%

of buildings metered at the building level

STATUS

100%

of buildings metered at the building level

As in previous years, Argonne continues to focus on advanced metering of electricity usage. In FY 2016, building-level electricity consumption was monitored by advanced meters in real time. Argonne also upgraded to advanced meters on the largest consumers of non-potable industrial water.

Due to the nature of the Argonne campus electrical and natural gas distribution system, Green Button data is ineffective in tracking building-level usage. Argonne monitors the buildings and distribution systems using its own system

of advanced metering, which provides real-time and 15-minute historical data similar to the data Green Button provides.

Plans

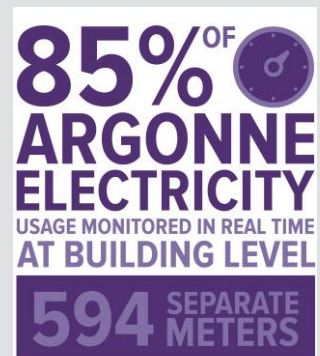
Argonne will continue to install advanced metering on electrical loads where economically feasible. Metering upgrades are prioritized by usage and by building (as determined by campus planners).

Argonne continues to use multiple energy tracking systems to monitor the laboratory’s energy and water usage. The laboratory has future plans to integrate data from these disparate systems into a central energy management system, but the timing is still undetermined.

The largest implementation barrier Argonne faces continues to be the actual installation of advanced meters. Meter installations typically require full or partial building system shutdowns, which can be difficult to schedule due to programmatic needs. To combat this, Argonne personnel work with the building maintenance, utilities infrastructure, and project management groups to coordinate installation schedules with previously planned shutdowns. Short-notice, emergency shutdowns can also be utilized to perform meter installations, so Argonne maintains a small stock of standard meter configurations.

Real-time data enables smart, energy-saving decisions

Advanced electricity metering infrastructure is vital because it gives Argonne a greater understanding, in real time, of how power is distributed and used across campus. This insight allows managers to view time-dependent trends and find energy savings in places we would never notice if we were only looking at monthly usage data.



2.4 High-Performance Sustainability Buildings (HPSBs)

GOAL	
17%	of buildings compliant with HPSB Guiding Principles by FY 2025
15%	of buildings compliant with HPSB Guiding Principles by FY 2016
STATUS	
16%	of buildings compliant with HPSB Guiding Principles in FY 2016

In FY 2016, Argonne certified one additional existing building as being in compliance with the Guiding Principles for HPSB. Reclassification of buildings and other structures in the Facility Information Management System database meant that facilities that had previously been categorized as other structures were subsequently categorized as buildings. This reclassification caused the percentage of HPSB buildings to

remain the same as in FY 2015, even though an additional compliant building was added.

The project completed in FY 2016 was an upgrade to Laboratory Office Module 434 at the APS. The project implemented lighting and lighting control upgrades to achieve compliance.

In FY 2016, the project management group at Argonne rewrote a set of design guidelines intended for architects and engineers who perform construction or major renovation projects on campus. Significant collaboration between the sustainability group and the project management group resulted in a robust sustainability section that mandates that all new buildings and major renovations adhere to the Guiding Principles for HPSB certification.

Plans

In FY 2017, Argonne plans to certify between one and four additional buildings. These buildings include the Enterprise Data Center (EDC), which is currently under construction, and three additional laboratory office modules in the APS. In order to reach the 17 percent threshold in FY 2017, Argonne will need to certify two buildings.

Moving forward, Argonne will continue to evaluate all buildings on campus for HPSB and Leadership in Energy and Environmental Design (LEED) certification feasibility.

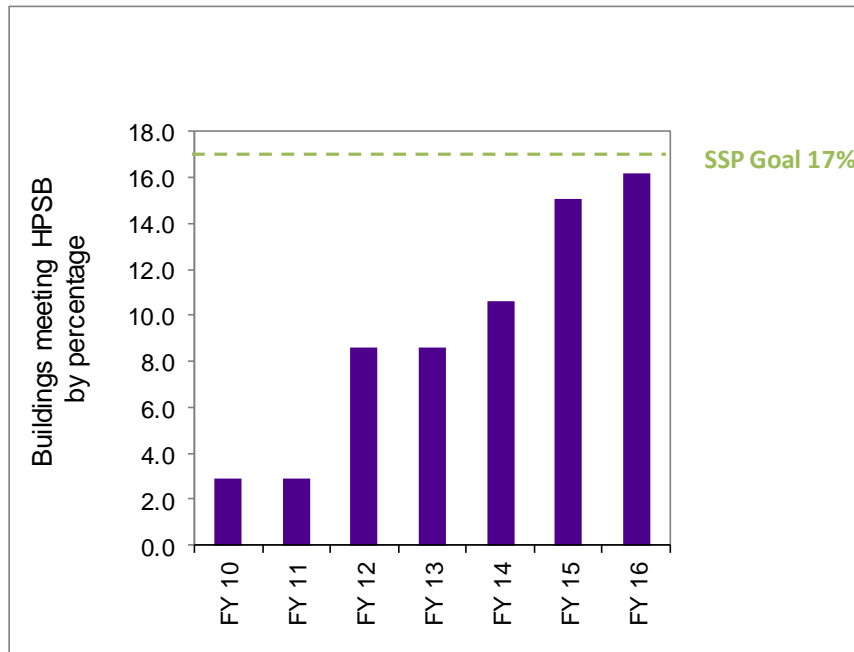


Figure 4: 16 Percent of Argonne Buildings Meet HPSB Criteria

Table 5: High-Performance Sustainable Building Plan

Building Number: Name	Criteria	FY 2011 or prior	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017 or after
046: Shipping and Receiving	LEED Silver	X						
216: Sub-Angstrom Microscopy & Microanalysis	LEED Gold	X						
214: Facilities Management	HPSB		X					
302: Security	HPSB		X					
438: APS Laboratory Office Module	HPSB		X					
440: Center for Nanoscale Materials	LEED Silver		X					
435: APS Laboratory Office Module	HPSB			X				
241: Energy Sciences Building	LEED Gold					X		
446: Advanced Protein Characterization Facility	LEED Gold					X		
436: APS Laboratory Office Module	HPSB					X		
224: Visitor Reception Center	HPSB					X		
434: APS Laboratory Office Module	HPSB						X	
431–433: APS Laboratory Office Modules	HPSB							X
386: Enterprise Data Center	HPSB							X
242: Materials Design Laboratory	LEED Gold							X

Upgrades yield 25 percent higher energy efficiency than traditional buildings

In FY 2016, Argonne exceeded its campus goal of 15 percent HPSBs. This is due in part to energy usage upgrades in Laboratory Office Module (LOM) 434 at the Advanced Photon Source. Waste process heat from scientific equipment is now being captured to augment building heating. LED lighting was also installed, as well as occupancy and light-harvesting sensors. LOM 434 now uses 25 percent less energy than a conventional building of the same size.



Argonne facility engineers and staff implemented energy conservation measures in APS LOM 434 that contributed to a 25 percent decrease in energy consumption. [Left to right: James Podraza, George Doktorczyk, Mary Ann Youell, and Rick Janik]

2.5 Regional and Local Planning

Argonne is a driver in regional planning initiatives. We lead by example on our own site and in collaboration with regional partners. Argonne's internal and cooperative planning efforts advance the laboratory's scientific mission and complement local initiatives, enhancing Chicago as a regional economic and employment center.

Transportation Planning

Argonne is taking a leadership role in transportation planning by assisting the DOE Sustainability Performance Office in looking for ways to improve alternative commuting strategies at federal facilities.

In FY 2016, Argonne used results and recommendations from a FY 2015 commuting survey to create a Sustainable Commuting Toolkit. This toolkit was presented to the DOE Sustainability Program Office (SPO) to be shared with other national laboratories in order to assist in improving their alternative commuting programs.

Site Selection and Planning

Argonne is the nation's oldest national laboratory and has existed as part of the Chicago suburbs since its inception in 1946. All new construction and facility renovations occur within the 1,500-acre laboratory site.

Argonne's development plans incorporate elements of the Council on Environmental Quality's Principles for Sustainable Federal Location Decision. Argonne's site modernization plan calls for development to:

- Promote walking and biking,
- Prioritize brownfields/grayfields and infill development,
- Preserve historic resources,
- Preserve existing ecosystems,
- Avoid sensitive greenspaces, and
- Promote climate change adaptation planning.

Environmental Management and Planning

Argonne's natural resources staff coordinates with ecosystem, watershed, and environmental management efforts outside the laboratory. Argonne maintains a seat on the Chicago Wilderness Executive Council, a local consortium of more than 100 federal, state, and local organizations that promote the welfare of nature and society. Argonne also hosts quarterly Community Leader Roundtable Meetings. Members include local and state elected officials, school district leadership, leaders of environmental boards and other governmental agencies, and officers of labor unions and homeowners associations. These roundtable meetings serve as a way to communicate Argonne's plans and direction to members of local and regional groups who may have an interest in the laboratory's initiatives.

Outreach

To communicate sustainability ideas to community groups and regional partners, Argonne produced a variety of publications and participated in a number of outreach activities in FY 2016. These included the following:

- Presentations and site tours for students from surrounding communities, led by Argonne sustainability program staff, which introduced students to sustainability ideas and science and highlighted Argonne's Sustainability Program progress;
- Argonne sustainability program staff, working side by side with college student interns, giving the next generation of scientists and engineers practical experience with sustainability principles and projects;
- Argonne's GreenLab Initiative website, which featured articles and videos highlighting Argonne's sustainability-related research and development, on-site pollution prevention, energy and water conservation efforts, renewable energy installations, and outreach activities;
- Argonne OutLoud, the laboratory's public lecture series, which highlighted the intersection of cutting-edge research with popular culture;
- Sustainability tours and presentations for community groups, students, teachers, municipalities, government agencies, and educational organizations; and
- Presentations to professional organizations, given by Argonne sustainability staff members.

Plans

Argonne will continue to participate in national, regional, and local planning efforts in order to comprehensively contribute more to the social, environmental, and economic successes of the region and the nation. Sustainability staff will continue to provide and participate in outreach and education with students, teachers, partner organizations, and other groups to develop learning opportunities and strategic planning tactics.

2.6.a Net-Zero Buildings

GOAL	
1%	of existing buildings energy, waste, or water net-zero by FY 2025

STATUS	
0%	of existing buildings energy, waste, or water net-zero by FY 2016

Argonne continues to be in the planning process of determining a path to net-zero energy, water, and waste facilities.

Plans

Renovating existing buildings on Argonne's campus to achieve net-zero energy and water or waste will present significant hurdles, especially for Argonne's aging facility stock. Argonne staff will examine case studies of net-zero renovations and investigate means to accomplish renovation of existing facilities to achieve net-zero for energy and water or waste.

2.6.b Net-Zero Buildings

GOAL	
100%	of all new buildings designed to net-zero energy starting FY 2020

STATUS	
0%	of all new buildings designed to net-zero energy in FY 2016

Argonne continues to plan for a path to net-zero energy, water, and waste facilities

Plans

Although Argonne currently has no new facilities proposed for planning, design, or construction after 2020, sustainability and strategic planning groups will begin the exploratory process to determine available paths to net-zero energy, water, and waste for future constructed facilities.

3 Clean and Renewable Energy

3.1 Clean Energy

GOAL	
25%	renewable energy as a percentage of overall facility electricity use by FY 2025
10%	electric & thermal energy from renewable sources by FY 2016
STATUS	
7%	total electric & thermal energy from renewable sources in FY 2016

Argonne utilizes on-site installations to provide clean energy in partnership with on-site renewable research and operational programs. The campus includes solar photovoltaic, wind, and geothermal renewable energy installations.

Solar Photovoltaic

In FY 2016, Argonne’s 109-kW on-site solar array, consisting of more than 700 photovoltaic panels, provided electricity for the laboratory’s emergency operations center. It generates about 120,000 kilowatt-hours (kWh) of energy, saves about \$6,000, and helps avoid emission of 110 metric tons of CO₂e annually. Argonne researchers use the solar photovoltaic system to study the performance of panel types in a Midwestern environment.

High-resolution sensor monitor components are used to train machine-learned algorithms to forecast the power production of Argonne’s photovoltaic plant. Two additional small solar installations provide power to electric vehicle charging stations and are grid-tied to provide energy to building systems when not charging vehicles. One 3.8-kW photovoltaic array utilizes a powered dual-axis tracker to increase energy yield by keeping the array pointed at the sun. It can produce enough power to charge four electric vehicles simultaneously.

A second, fixed-axis 9-kW photovoltaic array was installed in FY 2016 and is connected to a bank of charging stations used for research and employee electric vehicle charging.

Wind

Argonne’s 10-kW wind turbine provided electricity for the laboratory’s shipping, receiving, and vehicle maintenance facility. It generates about 6,000 kWh annually and helps Argonne avoid producing about 6 metric tons of CO₂e emissions per year. Argonne scientists and engineers are using the wind turbine to study the interactions between wind energy, electric vehicle charging, the electric grid, and energy storage.

Geothermal

The geothermal heat pump system at Argonne’s Visitor Reception Center eliminates approximately 668 million Btu of natural gas per year in on-site fossil fuel combustion.

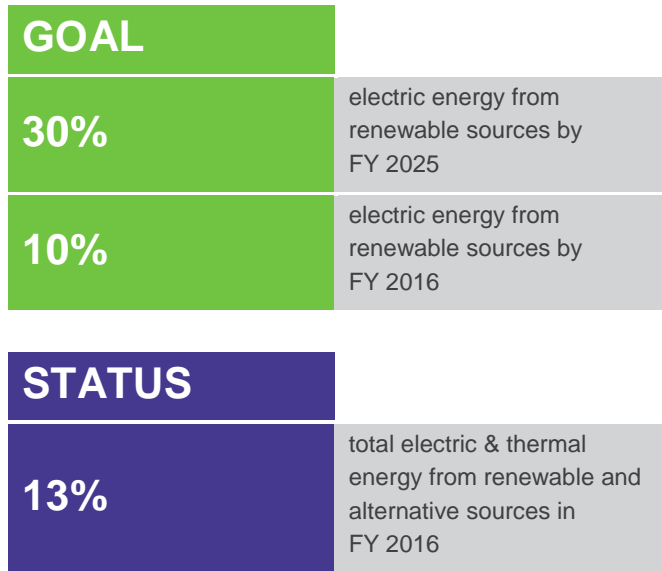
Plans

Argonne will continue to evaluate the feasibility of other and larger renewable and alternative energy generation projects such as fuel cells, solar outdoor lighting, solar carports, and solar thermal or hybrid solar thermal/photovoltaic systems. Argonne will continue to evaluate the feasibility of including renewables and clean energy technology in the design of new construction.

Table 6: Renewable Energy Credit Purchases

FY	Purchased RECs (1,000 MWh)	Unit Cost (\$/MWh)	Total Cost (\$k)
2011 (act.)	21	0.45	10
2012 (act.)	21	0.43	9
2013 (act.)	24	0.44	11
2014 (act.)	26	0.99	26
2015 (act.)	33	0.60	20
2016 (act.)	40	0.43	17
2017 (est.)	47	0.43	20

3.2 Renewable Electric Energy



Renewable Energy Credits

Argonne reached the balance of its 10 percent renewable electric energy commitment through the purchase of Green-e

certified RECs. A summary of REC purchases is included in Table 7. Argonne’s power demands are expected to almost double with the installation of exascale computing facilities. Although the preferred choice would be to offset GHG emissions through on-site production of renewable energy, REC purchases will likely continue to be used to offset GHGs associated with this increased power demand.

Assessments

Two renewable energy assessments were previously conducted for Argonne’s site, both by renewable energy research teams at the National Renewable Energy Laboratory in conjunction with the DOE’s Energy Efficiency and Renewable Energy and by Federal Energy Management Program:

- 2008 Renewable Energy Feasibility Assessment
- 2011 Renewable Energy Screening Report

Plans

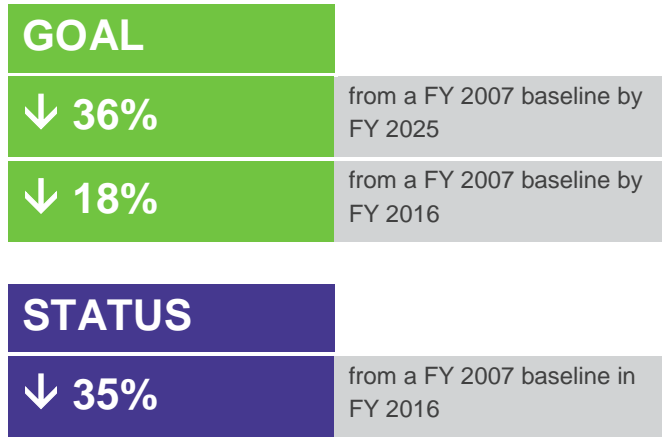
The purchase of RECs will continue as a primary means of meeting the target percentages.

Table 7: Renewable and Clean Energy Projects

Project	FY 2016 Status	FY 2017 Plan
ESPC #4: Natural gas–fired CHP plant	CHP plant became operational	Measure and verify energy savings
Solar photovoltaic array	109-kW solar array operational	Continued use for programmatic weather forecasting projects
Wind turbine	10-kW wind turbine operational	Continued evaluation of on-site wind turbine installations
Purchase RECs	Purchased 40,000 MWh of RECs	Purchase credits to meet balance of goal versus on-site generation
Ground source heat pumps	Building 224’s 23-ton geothermal heat pump system operational	Monitor performance of geothermal system
Large-scale solar photovoltaic array	Explored power purchase agreement financing; current maximum 10-year contract duration not favorable for developers	Evaluate potential for larger-scale solar array to offset programmatic growth

4 Water Use Efficiency and Management

4.1 Potable Water



Argonne obtains treated potable water from Lake Michigan via the City of Chicago and the DuPage County Water Commission distribution system. It is delivered to the site through an underground force main pipeline and distributed to site buildings. Potable water is used for domestic (including sanitary), contact cooling, fire protection, plumbing, and laboratory purposes. Table 8 illustrates the main potable water consumption (excluding losses) at Argonne.

Operational issues related to Argonne’s aging potable water distribution system consumption are primarily related to leaks and water main breaks. In some buildings, water service lines are susceptible to extreme cold temperatures at points of entry or if the service line passes through an unheated space. Water mains deteriorate with age and often develop small leaks due to corrosion and pipe wall thinning from subsurface conditions. In FY 2016, approximately 30,000 gallons of potable water were lost due to water main breaks and ruptures in building service lines.

Argonne has aggressively pursued water efficiency and conservation measures. This yields tremendous success in

Table 8: Potable Water Uses

Use	Activities
Domestic	Steam generation
	Chilled water
	Sanitation (food service)
	Sanitation (general)
	Fire protection
Laboratory	Waste water treatment
	Research (programmatic)
	Waste management
	Sanitation (programmatic)

reducing its water consumption despite a growing population and new water-intensive research processes.

Figure 5 demonstrates the progress that Argonne has achieved in meeting potable water intensity reductions. Overall, Argonne’s potable water usage is already below the FY 2025 goal, reflecting the gradual reduction in use of older, inefficient buildings and the growing prevalence of low-flow fixtures throughout the campus, as well as annual water conservation projects. The slight FY 2015 to FY 2016 increase in water intensity reflects the potable water used in the extensive start-up and testing of Argonne’s new CHP plant.

In FY 2016, one major water conservation project was completed. A review of water usage data for Building 595 (the laboratory wastewater treatment plant), determined that the building, which is lightly populated, is the third-highest potable-water-consuming building on site. Potable water was used to conduct routine flushing of wastewater lines and tanks. In order to use treated wastewater effluent instead of potable water for this routine activity, a line connected to the treated wastewater effluent lines and ancillary pumps and storage tanks were installed in a project that cost about \$46,000. This will result in a savings of about 3 million gallons of potable water and \$16,000 per year.

Plans

In FY 2017, Argonne will continue to seek new opportunities to beneficially reuse process domestic water instead of disposing of it in the wastewater treatment system.

At the Building 583 Canal Water Treatment Plant, industrial, landscaping, and agricultural (ILA) water that is drawn from the nearby Chicago Sanitary and Ship Canal is treated for use in campus cooling-tower systems. Using a portion of the treated canal water to clean the process canal water treatment lines in place of the potable water currently used for this purpose is expected to result in a savings of an additional 3 million gallons of potable water each year.

In order to identify additional potable water savings opportunities across the Argonne campus, a building water use audit will be conducted to identify, on a building-by-building basis, cost-effective projects that could result in significant potable (or ILA) water savings. This audit will be repeated approximately every 5 years.

When constructing a new facility or renovating an existing building, Argonne adheres to federal HPSB guidelines, WaterSense labeling, or LEED standards for water fixture efficiency.

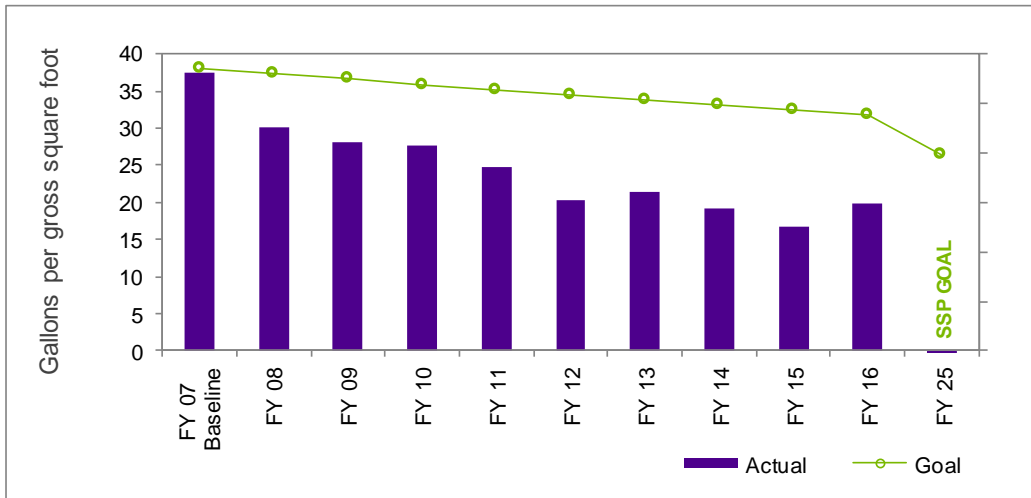


Figure 5: Potable Water Intensity Reduction Actual vs. Target, FY 2016 (gallons/GSF)

Wastewater reuse saves 3M gallons of H₂O and \$16K annually

In FY 2016, Argonne installed a treated wastewater interconnect system that allows treated wastewater to be used—in place of potable water—to clean tanks and pipes at Argonne’s Laboratory Wastewater Treatment Plant. Cleaning ensures that the plant operates efficiently, and the reused water is a sustainable solution that fits a basic campus need.

This process improvement alone will result in savings of about 3 million gallons of water and \$16,000 each year.



The Wastewater Effluent Recovery System team includes (from left to right): Tad Jesionowski, Paul Apple, Brenda Teaster, Kent Oikle, Don Cain, and Alan Moler.

4.2 Industrial, Landscaping, and Agricultural Water

GOAL	
↓ 30%	from a FY 2010 baseline by FY 2025
↓ 12%	from a FY 2010 baseline by FY 2016
STATUS	
↓ 7%	from a FY 2010 baseline in FY 2016

Industrial

Argonne is on track to achieve the FY 2025 goal of 30 percent consumption reduction. However, from FY 2015 to FY 2016, prolonged warm summer temperatures increased demand for cooling at all Argonne chilled water plants, which resulted in a slight increase in ILA water usage at cooling towers.

The largest reduction from 2007 levels has been achieved through continued cooling tower water recycling, which nearly doubles industrial water reuse cycles by using advanced water quality monitoring, careful chemical metering, and conductivity adjustments based on real-time conditions.

Landscaping/Agricultural

Argonne uses no water for landscape maintenance except to establish newly planted areas. Therefore, a majority of site landscape-level water management activities fall into the category of green infrastructure and sustainable landscape and stormwater management practices.

DOE facilities are required to employ design and construction strategies that reduce stormwater runoff and polluted site water runoff. At Argonne, green infrastructure is used in the design of new buildings and, when feasible, in the rehabilitation of existing buildings. Green infrastructure includes the use of rain gardens and bioswales, which are diverse assemblages of plant-based features that promote ground absorption and evaporation of stormwater instead of transporting stormwater to off-site waterways. Draining roof runoff to open areas is another example of green stormwater management.

In FY 2015, bioswales were installed at two locations on the site to better manage stormwater runoff from developed

areas, and in FY 2016 they underwent the first of 2 years of aggressive maintenance. Maintenance of these green infrastructure installations included completion of an ecological assessment, followed by herbiciding of aggressive invasive species and mowing.

Also in FY 2016, Argonne continued landscape management activities by identifying areas in need of natural area enhancement. This included the following activities:

- In the eastern part of campus, Argonne conducted invasive shrub control across 45 acres of forest through clearing, cutting, and herbiciding. Controlled burns were conducted on an additional 25 acres in wetland areas and areas where non-native landscapes have been converted to native prairies.
- Site-wide, Argonne conducted invasive species control. Near the APS, wetland improvements were made through targeted invasive species removal.
- Site-wide, Argonne implements a snow management plan during the winter to reduce salt use by closing lightly traveled roads and parking lots, restricting salt application near environmentally sensitive areas, and mixing organic beet juice derivatives with salt.
- Vegetative cover was maintained on several site soil management stockpiles.

Plans

In FY 2017, an opportunity to reuse domestic chilled water as cooling tower make-up will be evaluated for the APS cooling tower system and is expected to result in a savings of 12 million gallons of ILA water per year.

In conjunction with the building potable water use audit described in Section 4.1, Argonne buildings that use significant amounts of ILA water will be evaluated for potential projects to reduce their use of industrial water.

The first phase of a 3-year turf grass-to-prairie landscape project will begin on three parcels totaling 10 acres. Successful establishment of deep-rooted prairie plants will result in improved infiltration of stormwater management while increasing native plant diversity on site and increasing the variety of pollinating plants across the campus.

In Argonne's 100 Area, a former boiler house "lime sludge" basin, which is currently used for clean clay and topsoil management, will be converted to native prairie. This effort will improve water quality in nearby wetlands and enhance native plant diversity in an industrial part of the Argonne campus.

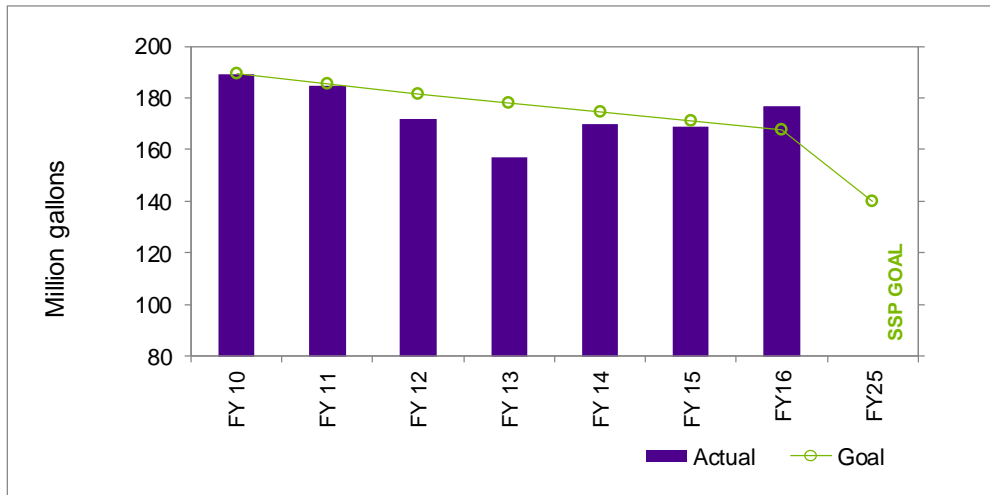


Figure 6: Industrial Water Reduction Actual vs. Target (million gallons)

Green infrastructure reduces stormwater runoff

In FY 2016, Argonne continued with ongoing “green” infrastructure activities at two key locations on campus in order to reduce flooding and restore heavily degraded natural areas. Prairie establishment and wetland rehabilitation efforts help reduce stormwater runoff by promoting infiltration into the ground. This simultaneously filters pollutants out of the water.

Argonne employees and visitors are already enjoying the return of wildlife and native plants to these and other restored areas on campus.



Argonne Environmental Engineer Peter Lynch (right) and Cole Clayton from Applied Ecological Services, Inc. (left) stand in a wetland rehabilitation area on Argonne’s campus. Turf grass has been replaced with deep-rooted prairie plants. Invasive wetland plants such as cattails and fragmites were removed and replaced with a diverse assortment of wetland species native to the Midwest region. These efforts aid stormwater infiltration on Argonne’s campus.

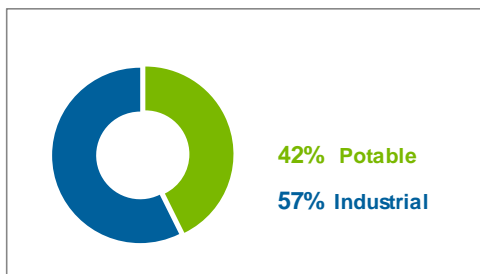


Figure 7: Water Consumption by Source

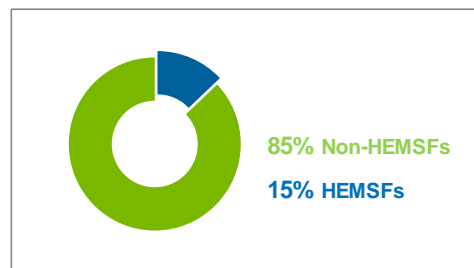


Figure 8: Potable Water, HEMSFs vs. Non-HEMSFs

5 Fleet Management

5.1 Fleet GHG Emissions

GOAL	
↓ 30%	in fleet-wide GHG emissions by FY 2025
↓ 3%	in fleet-wide GHG emissions by FY 2016
STATUS	
↓ 8 %	in fleet-wide GHG emissions by FY 2016

Argonne achieved an 8 percent reduction in fleet-wide GHG emissions during FY 2016 compared to its FY 2014 baseline.

Plans

Argonne will continue to replace older, less-efficient vehicles with low-GHG models through the General Services Administration (GSA) lease program to further reduce fleet-wide GHG emissions while reducing petroleum use and increasing alternative fuel use.

5.2 Petroleum Consumption

GOAL	
↓ 20%	from a FY 2005 baseline by FY 2015, maintain each year thereafter
STATUS	
↓ 58%	from a FY 2005 baseline in FY 2016

Argonne continues to maximize fuel efficiency by ordering replacement vehicles through the GSA lease program. Replacement vehicles selected use alternate fuel and produce low emissions. Utilizing the GSA lease program ensures Argonne’s fleet has the newest, most fuel-efficient vehicles available in each class.

Plans

Replacement vehicles will continue to be ordered with GHG compliance as a guiding principle where available and applicable.

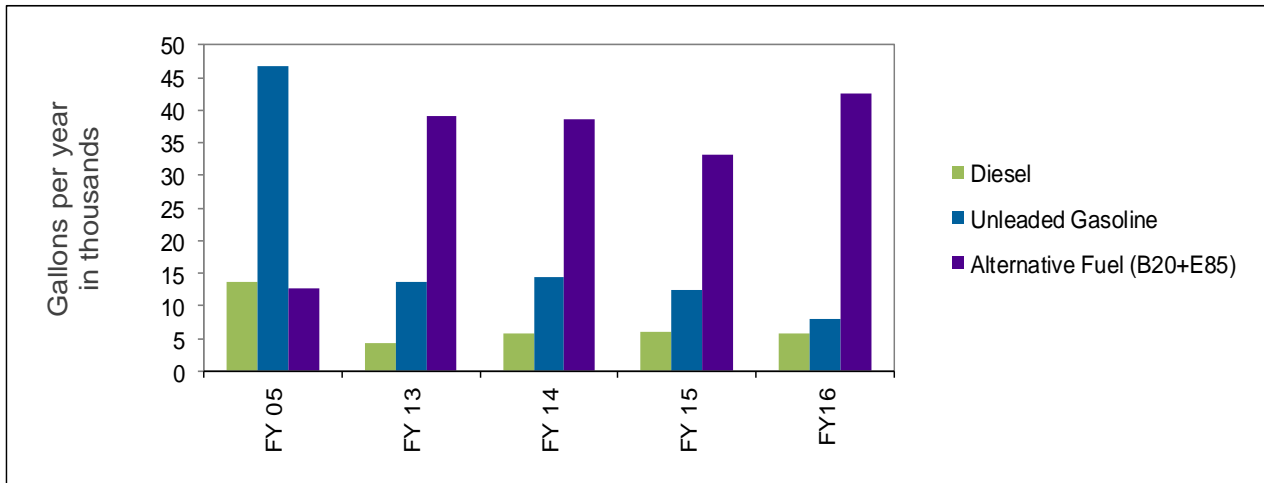
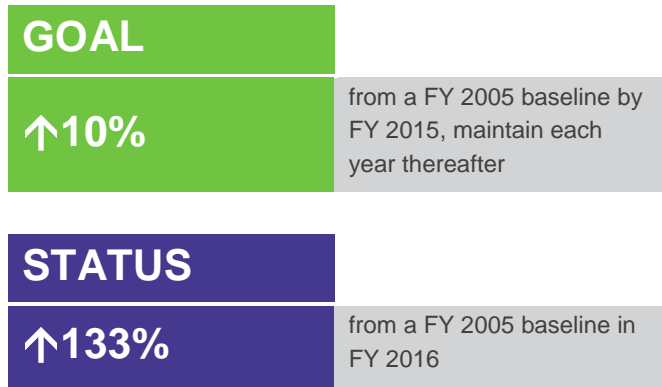


Figure 9: Annual Fuel Consumption (1,000 gallons/year)

5.3 Alternative Fuel Consumption

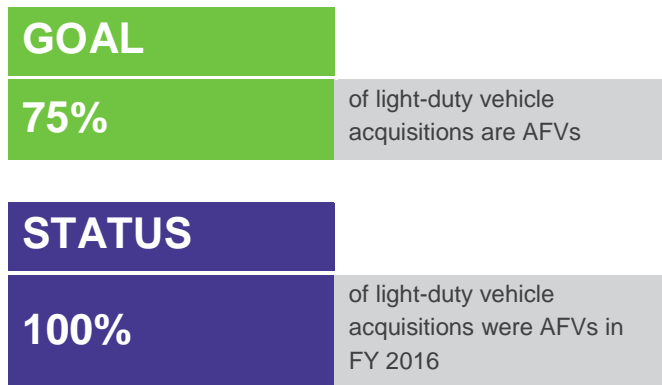


Argonne has increased its alternative fuel usage by 133 percent from its FY 2005 baseline. A policy of ordering only AFVs from the GSA leasing program has resulted in over 90 percent of fleet vehicles operating on ethanol (E85), biodiesel (B20), or electricity. Older, less-efficient unleaded fuel vehicles have been replaced with newer AFVs.

Plans

Argonne will continue to replace aging fleet vehicles with low GHG/gallon gas equivalent models where applicable.

5.4 Light-Duty Vehicle Acquisitions

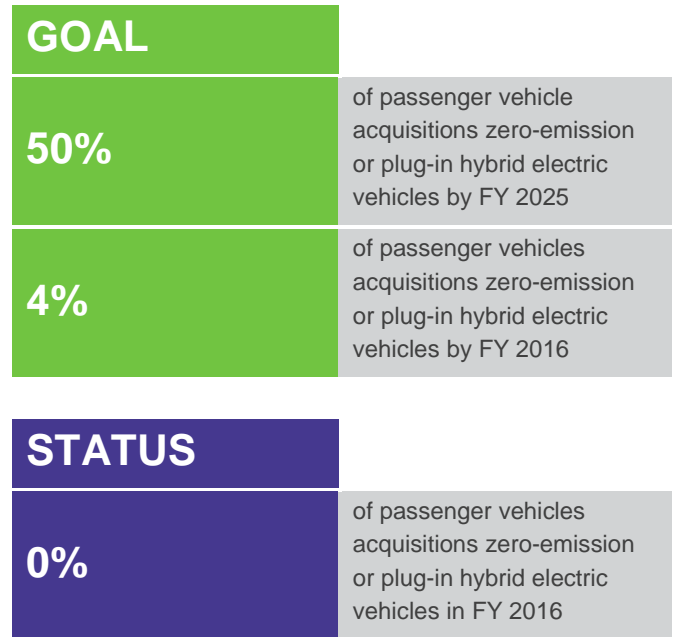


All replacement light-duty vehicles during FY 2016 were AFVs.

Plans

Argonne will continue to order only alternative fuel, light-duty vehicles through the GSA lease program.

5.5 Zero-Emission and Hybrid Electric Vehicles



The GSA lease program did not offer zero-emission or plug-in hybrid models during FY 2016. The Argonne fleet is comprised of 13 percent hybrids, which were obtained in the FY 2015 ordering cycle. The Argonne fleet is small and passenger vehicles are minimal, so this goal will take a number of years to achieve as the fleet ages and zero-emission and hybrid electric vehicle become available.

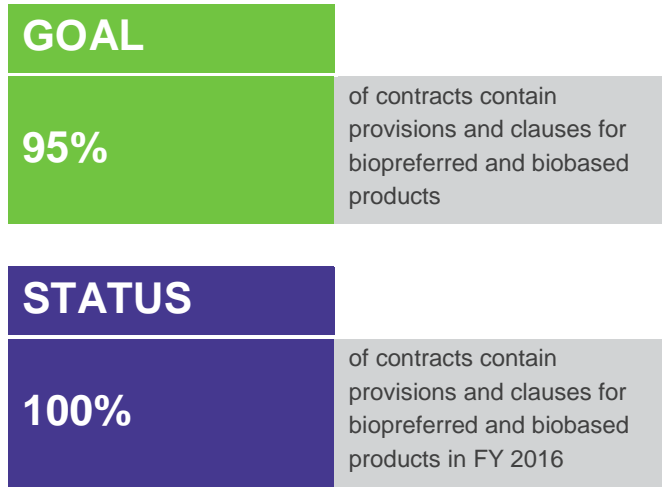
Plans

Argonne has 12 strategically placed vehicle charging stations across the site. Six additional charging stations are planned for installation to meet demand.

Laboratory employees have access to on-site electric charging stations that have been installed as part of an ongoing research program. Fleet vehicles also have access to these stations.

6 Sustainable Acquisition

6.1 Necessary Provisions in Procurement Documents



Argonne’s Prime Contract directs the site’s procurement efforts to maximize acquisition of sustainable products. The Prime Contract includes sustainable acquisition clauses for the procurement of energy-efficient electronics, such as Energy Star certified products. Additional clauses require electronics, imaging equipment, and televisions purchased to be Electronic Product Environmental Assessment Tool (EPEAT) certified, which ensures that these products are designed, manufactured, and packaged, and can be recycled or disposed of, in accordance with stringent environmental standards.

Argonne’s Prime Contract also requires the use of “Bio-Preferred and bio-based” products, which are commercial or industrial goods (other than food or feed) that the U.S. Department of Agriculture Secretary has determined are composed in whole or in significant part of biological products, forestry materials, or renewable domestic agricultural materials, including plant, animal, or marine

materials. The Prime Contract also has sustainable acquisition provisions to protect other natural resources, such as water, which can be conserved through the purchase of WaterSense products, and the Earth’s atmosphere, which is safeguarded through the procurement of non-ozone-depleting chemicals and alternatives to high-global-warming-potential hydrofluorocarbons. The Prime Contract clauses regarding the purchase of recycled-content, non-toxic, and fuel-efficient products are also aimed at protecting natural resources.

Plans

In FY 2016, the Facilities Management and Services Sustainability Group initiated a Sustainable Acquisition Working Group. The goals of this collaboration were to establish a site policy and procedure for sustainable acquisition, to train and engage employees in selecting environmentally responsible products, and to improve tracking of sustainable contracts and procurements. A functional area review highlighted opportunities for the Sustainable Acquisition Working Group to continue working toward achieving these important goals. In FY 2017, the Facilities Management and Services Sustainability Group will continue to work with Procurement to achieve the goals of Sustainable Acquisition Working Group, and will explore opportunities to support Section 15(b) of E.O. 13693—to monitor and improve supply-chain GHG emissions management through procurement mechanisms such as contract selection criteria or the inclusion of specific contract language or requirements for GHG emission disclosure. The group will also review the U.S. Environmental Protection Agency’s recommendations for specifications, labels, and standards that designate environmentally preferable products and services and consider any relevant implementation needs.

7 Pollution Prevention and Waste Reduction

7.1 Municipal Solid Waste Diversion

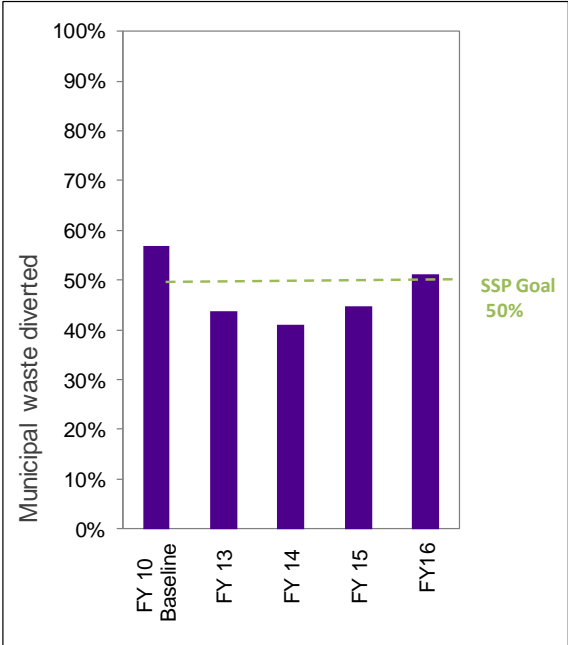


Figure 10: Municipal Solid Waste Diversion Rates

GOAL	
50%	of non-hazardous solid waste diverted from landfills
STATUS	
51%	of non-hazardous solid waste diverted from landfills in FY 2016

In FY 2016, the non-hazardous solid waste diversion rate (excluding construction and demolition debris) was 51 percent. Argonne switched to all-in-one recycling in FY 2015, boosting the annual diversion rate. Argonne’s scrap metal recycling program contributes approximately \$50,000 in revenues to laboratory programs annually. Funds are used for solid waste diversion initiatives and pollution prevention programs such as sustainable employee commuter activities, bikes and helmets for Argonne’s Bike Share Program,

recycling containers, and filtered water bottle filling/drinking stations.

Initiatives in 2016 included the following:

- Argonne completed the first full year of the all-in-one recycling program. Paper, plastic, metal, and glass are now comingled in every recycling bin on site, including individual workspace bins.
- Argonne completed a pilot program to replace existing waste and recycle containers in the lobbies and meeting rooms of multiple buildings with a new aesthetically approved landfill and all-in-one recycle receptacle. The new receptacles have an Argonne-designed container marking and conform to the new all-in-one recycling program.
- The results of a solid waste characterization project completed during 2015 have been reviewed and are currently under consideration for implementation. The characterization study revealed new opportunities for diverting more waste from landfills and increasing Argonne’s overall diversion rate.
- The on-site composting program continued in 2016. Food waste collected from the Bistro and the Guest House is composted instead of being thrown in the trash. As a result of this effort, Argonne’s new municipal waste contract includes the option to expand composting to an off-site industrial-scale composting facility and could include all compostable waste—not just food waste.
- The measurement and tracking of waste and recycling waste weights continued in 2016. Argonne’s waste and recycling contractor weighs and reports the amount of trash and recycled material it receives from Argonne. In addition, obsolete electronics are weighed before they are sent off site for recycling.

Plans

Argonne will continue to improve solid waste diversion by implementing recommendations from the FY 2015 waste characterization project. The recommendations may include the expansion of a pilot composting program to additional facilities on site, or other novel waste diversion programs for Argonne’s campus.

Ramping up recycling and waste reduction for FY 2017

Based on a recent assessment of Argonne's waste material, the laboratory has developed an aggressive set of actions to be implemented in FY 2017:

- 1 Increase collection of recyclable materials through outreach and involvement of building services staff.
- 2 Expand compost collection program.
- 3 Encourage source reduction of paper.

Argonne's goal is to divert 50 percent of municipal waste material from landfills.



Recycling bins are located at convenient locations throughout Argonne's campus.

7.2 Construction and Demolition Materials and Debris Diversion

GOAL

50%

of construction and demolition debris diverted from landfills

STATUS

95%

of construction and demolition debris diverted from landfills in FY 2016

In FY 2016, Argonne diverted 95 percent of its construction and demolition debris. Argonne generated 246 metric tons of debris for off-site landfill disposal and 4,269 metric tons of debris for recycling and reuse facilities.

Argonne diverts construction and demolition debris from three primary sources: maintenance of existing infrastructure (buildings and roads), demolition of existing buildings, and construction of new buildings. Construction and demolition debris recycled from Argonne's construction sites included brick/concrete, ceiling tile, paper, corrugated cardboard, drywall, glass, metal, plastic, and wood.

Argonne initiated a project to replace Building 377A's cooling tower during 2016. The cooling tower was built in the 1960s and was field constructed out of wood and cementitious panels containing asbestos. The demolition of the cooling tower resulted in 192,735 pounds of demolition debris. Of this total, 142,703 pounds were recycled, resulting in 74 percent waste diversion from landfill. The remaining debris was asbestos-containing material that could not be recycled and was compliantly disposed of in a permitted disposal facility.

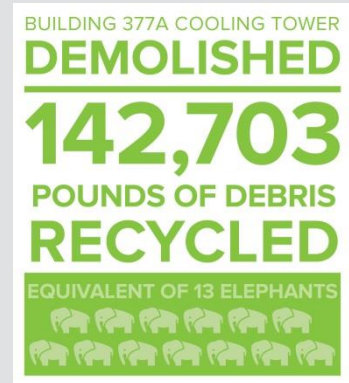
Plans

The laboratory will continue to identify and develop opportunities to improve diversion rates for construction demolition debris from its maintenance, renovation, and new construction activities.

Argonne recycles tons of demolition debris

In FY 2016, Argonne demolished Building 377A's cooling tower in preparation for a newer, more efficient replacement. The old cooling tower was built in the 1960s and was constructed of wood and cement panels that contained asbestos.

Demolition of the tower resulted in more than 192,000 pounds of demolition debris, 74 percent of which was recycled. The recycled debris weighed approximately the same amount as 13 elephants. The remaining demolition debris contained asbestos, so it was disposed of in an approved disposal facility.



8 Energy Performance Contracts

GOAL

Achieve FY 2017 and FY 2018 targets for performance contracting per Section 14 of E.O. 13693.

STATUS

Four active ESPCs implemented in FY 2016

Argonne has completed three ESPCs to date. In FY 2016, \$1.76 million in cost savings was achieved through these existing ESPCs. A fourth ESPC for the construction of a CHP

plant was awarded in 2014. The CHP became operational at the end of FY 2016. Table 9 describes the energy and cost savings from Argonne’s ESPC projects.

Plans

In response to the President’s Performance Contracting Challenge of December 2013, Argonne has sought opportunities to expand its use of performance-based energy contracts. The laboratory continues to evaluate numerous potential applications of alternative financing vehicles (such as Energy Savings Performance Contracts, Utility Energy Service Contracts, and Power Performance Agreements) and found ESPCs to be most appropriate and economical.

Table 9: ESPC Energy Conservation Measures, Energy Savings, and Cost Savings

Energy Conservation Measure	Energy Savings (MBtu/year)	Cost Savings (\$/year)
ESPC 1: Upgrade controls, reduce unoccupied outside air, lighting upgrades, steam pipe insulation, variable frequency drive (VFD) installation	46,306	\$408,208
ESPC 2: Chiller replacement, Metasys upgrade, APS heat recovery; lighting improvements, window replacements, condensate return improvements, APS pumps/VFDs	46,886	\$798,999
ESPC 3: APS improvements—free cooling and Metasys upgrade, air handling unit (AHU) modifications, AHU heat reclamation, lighting upgrades	34,541	\$548,781
ESPC 4: CHP plant (awarded in FY 2014; was fully operational near the end of FY 2016; estimated benefits in FY 2017 and beyond)	342,454	\$2,219,421
Total ESPC annual savings	470,187	\$3,975,409

9 Electronic Stewardship

9.1 EPEAT Purchases

GOAL	
100%	of eligible electronic acquisitions each year must be environmentally sustainable (EPEAT-registered) products

STATUS	
94%	of eligible acquisitions are EPEAT-registered products in FY 2016

EPEAT is a global rating system that certifies environmentally responsible characteristics of electronic devices. The EPEAT system evaluates electronics based on a variety of criteria including design, production, energy use, and recycling.

Per Federal Acquisition Regulations, Argonne’s Prime Contract for site operations contains clauses that require purchases of EPEAT-certified personal computer products, imaging equipment, and televisions. The Prime Contract also includes a clause pertaining to energy efficiency in energy-consuming products

Plans

Argonne will continue to purchase EPEAT-registered eligible products and adhere to the clauses of the Prime Contract.

9.2 Power Management

GOAL	
100%	of eligible equipment has power management enabled

STATUS	
54%	of eligible equipment has power management enabled in FY 2016

Power management has been enabled on 100 percent of Argonne’s non-exempt centrally managed computers.

Argonne implements power management on eligible, centrally managed electronic products. Because there is decentralized computer resource management in the research divisions, the overall number of Argonne computers with active power management enabled is an estimate. Centrally managed computers in the operations divisions utilize advanced power management software to reduce energy consumption and operating costs.

Plans

Argonne will work with research groups to identify means to advance power management into non-centrally managed systems. In addition, the sustainability group will work to draft a process to standardize the power management program. The laboratory plans to achieve full compliance by the end of FY 2018.

9.3 Automatic Duplexing

GOAL	
100%	of eligible imaging equipment have automatic duplexing enabled

STATUS	
100%	of eligible imaging equipment have automatic duplexing enabled in FY 2016

Duplexing is enabled on 100 percent of eligible centrally managed computers and imaging equipment, and on 100 percent of all new eligible imaging equipment. Argonne currently deploys all new computers and imaging equipment with duplexing enabled as a default setting. For centrally managed computers and printers, this setting cannot be changed except on a per-print-job basis.

Plans

Argonne's Computing and Information Services (CIS) Division has contracted with a service provider to manage service desk operations and office computing needs. The service provider conducts a campus-wide printer assessment of all network-managed printers and a survey of all direct-connected (universal serial bus or private network) printers. The assessment documents current conditions and provides recommendations on meeting power and paper management goals.

All of Argonne's e-waste (100 percent) is managed by an R2-certified e-waste recycler. Argonne reuses working electronics through redeployment processes to conserve resources and reduce operational costs. End-of-life and obsolete electronics are collected in bulk, and hard drives are sanitized on site to ensure that confidential information is secure and appropriately managed. Argonne partners with nearby Fermi National Accelerator Laboratory to consolidate both sites' obsolete electronics in shipments to an R2-certified recycler.

9.4 Electronics Disposal

GOAL

100%

of used electronics reused or recycled

STATUS

100%

of used electronics reused or recycled in FY 2106

Plans

Argonne will continue to recycle 100 percent of e-waste through an R2-certified e-waste recycler. In FY 2017, the site will evaluate opportunities to increase recycling rates, expedite property management processes, and gain greater efficiencies in managing electronics.

Longstanding electronics recycling partnership with Fermilab stands the test of time

Argonne has been recycling electronic devices, computers, and monitors in partnership with Fermilab for the past 13 years. On average, Argonne recycles 112 pallet loads of electronics through this program each year.

The collaboration began when Argonne's former pollution prevention program manager, Keith Trychta, arranged for Fermi to include Argonne's "end-of-life electronics" in their electronics recycling program. Fermi was already conducting a weekly mail truck run from Fermilab to the DOE's Chicago Field Office, located on Argonne's campus, so there was no additional shipping cost for Argonne. The electronics were simply placed on the existing truck run.

Fermi no longer makes a weekly mail run to Argonne, but it has continued to support two to three electronics pickups from Argonne each month at no additional cost to Argonne. This arrangement has stood the test of time and is mutually beneficial to both Fermi and Argonne, as Fermi is paid by the electronic recycling company for the increased volume of recycling material that Argonne provides.



9.5 Data Center Efficiency

GOAL

1.2–1.4

Power usage effectiveness (PUE) for new data centers

1.5

PUE for existing data centers

STATUS

1.4

PUE for new data centers

1.9

PUE for existing data centers

In FY 2016, Argonne completed the design and broke ground for the EDC. The EDC will incorporate hot/cold aisle separation and containment along with energy-efficient HVAC and power distribution equipment. The new EDC will comply with the Guiding Principles for HPSBs.

Plans

Argonne’s new EDC is expected to open in FY 2017. Most of the existing enterprise equipment on campus will be decommissioned and replaced with new, more efficient equipment as programmatic users consolidate their data centers into this new energy-efficient facility.

Argonne’s Sustainability Group intends to support this transition by completing energy and risk assessments of existing data centers to provide users with the business cases they need to justify consolidation costs. In addition, Argonne is committed to using virtualization and cloud applications to further reduce the energy footprint of on-site data centers.

Ground broken on Enterprise Data Center

Argonne broke ground on its new Enterprise Data Center (EDC) in FY 2016. The new data center will meet high-performance sustainable building guidelines and is expected to achieve a PUE of 1.4.

The EDC will provide higher energy efficiency, stronger cybersecurity, better infrastructure, and centralized support. The center will have redundant essential utility services, including backup power and cooling, and it will employ “concurrent maintainability” by placing racks and equipment in a hot aisle and cold aisle configuration.



Argonne broke ground on its new Enterprise Data Center in May 2016. [Left to right: Douglas Tinnin, Tracey Rager, Gene Veltri, Fred Bathje, Mike Skwarek, Bob Swale, Dave Salbego, Phil Matton, Jonathan Cisek, Karl Schmidt, and Stuart Hannay]

10 Climate Change Resilience

10.1 Planning for and Addressing Impacts

In FY 2016, Argonne completed a detailed utility-level flood hazard analysis of the site through a partnership with the U.S. Geological Survey (USGS). The analysis identified several areas that have increased risk from flooding under current precipitation scenarios.

A climate change vulnerability assessment working group—consisting of personnel from both programmatic and operations divisions—was convened to define the scope of a climate change vulnerability assessment and to identify potential areas of focus for the assessment team. Argonne’s Global Security Sciences Division began a Climate Change Vulnerability Assessment to identify climate-related impacts and risks to site mission, operations, and personnel. In FY 2016, programmatic division directors and personnel responsible for division environment, safety, and health issues were interviewed to evaluate potential, direct impacts on research programs from projected mid-century climate change.

Plans

In FY 2017, Argonne will complete the Climate Change Vulnerability Assessment by conducting interviews with operations personnel responsible for utility management and distribution, building maintenance, and campus planning. The

hydraulic and hydrologic model will be integrated into Argonne’s Climate Change Vulnerability Assessment to evaluate future risk from predicted climate change precipitation scenarios. The assessment will describe relevant climate change predictions for the Midwest region and predictions downscaled to the Argonne site, and then list and prioritize Argonne assets and programs that are vulnerable to specific climate change impacts. The follow-on Climate Change Adaptation Plan will also begin; it will contain steps needed to create a more resilient and safer campus as climate change impacts unfold in the decades to come.

10.2 Emergency Response Procedures and Protocols

Argonne continually adapts to extreme weather events to ensure staff safety and protection of critical assets. In FY 2017, the Climate Change Vulnerability Assessment will describe climate-related vulnerabilities for site emergency operations activities and will identify where safety procedures and practices could be improved in response to climate change impacts.

Plans

In response to predicted climate change impacts on Argonne, specific revisions to Argonne health and safety policies and emergency response procedures will be incorporated into the Climate Change Adaptation Plan.

Recognizing future risks, climate change

In FY 2016, Argonne continued a multi-phase climate change vulnerability assessment to define risks to Argonne’s research programs and operations as the result of a warming climate.

Argonne operations and programmatic divisions partnered together to begin quantifying climate change threats to the laboratory. Interviews were conducted with programmatic directorates, as well as with site infrastructure managers, to identify vulnerable research and site operations activities.

Potential impacts on the campus from increased heavy storm events—a key climate stressor for the Midwest region—were also quantified in a U.S. Geological Survey stormwater base model. This information will be used for future scenario mapping.



One of the top scientific destinations in the world, Argonne occupies 1,500 wooded acres 25 miles southwest of Chicago in DuPage County, Illinois.

10.3 Workforce Protocols and Policies

Argonne's Environment, Safety, and Quality Assurance Division implements and updates as necessary several safety procedures and protocols for working in extreme weather conditions such as extreme heat and cold. In addition, lab-wide alerts (known as "labcasts") are issued via email and public address systems to alert the broader Argonne population to extreme weather events, including extreme heat, extreme cold, storms, and impending snowstorms.

Plans

The upcoming Argonne Climate Change Vulnerability Assessment, scheduled for completion in FY 2017, will assess and summarize focused impacts on workforce protocols regarding human health and safety from climate change.

10.4 Management Commitment

Argonne's Climate Change Vulnerability Assessment Working Group includes senior division managers and directorate-level environmental, safety, and health staff. In FY 2016, Climate Change Vulnerability Assessment interviews included division-director-level management and senior environmental, safety, and health staff in those divisions.

Plans

The Climate Change Vulnerability Assessment, scheduled for completion in FY 2017, will include a written commitment by senior Argonne management; adaptation efforts are recommended in the assessment and detailed in the Climate Change Adaptation Plan, which is scheduled for completion in FY 2018. If necessary, laboratory policies will be amended and/or created to ensure that climate change adaptation efforts will be implemented across the Argonne site.

10.5 Use of Best Available Current Climate Change Science

In FY 2016, a multidisciplinary team of climate change risk subject matter experts began the Climate Change Vulnerability Assessment effort. In accordance with DOE's Site Sustainability Plan Guidance, Section 2.7 (Regional and Local Planning), Argonne envisions this Climate Change Vulnerability Assessment developing through collaboration with numerous regional and local agencies.

Plans

In FY 2017, Argonne will evaluate climate change risks for the Argonne site by leveraging on-site climate change risk experts and climate change modeling experts, coupled with climate change risk information produced by the National Oceanic and Atmospheric Administration's Climate Toolkit. In addition, the results of a stormwater model effort completed by the USGS will be incorporated into the Climate Change Vulnerability Assessment. Argonne will ensure that the most accurate climate change forecasts available are used in this Climate Change Vulnerability Assessment.

10.6 Dashboard Climate Change Resiliency Survey

Argonne has begun a multifaceted Climate Change Vulnerability Assessment to evaluate climate risks for safety, operations, and programmatic activities at the site. The results of the assessment will be used to guide specific actions Argonne can take to become resilient to climate change; these steps will be documented in a climate change adaptation plan.

In the Dashboard Climate Change Resilience Survey, Argonne identified impacts on the site mission that may occur as a result of the following events:

- Extreme precipitation (snowfall) lasting several days, usually once per year.
- Extreme precipitation (flooding) causing localized road closures and building service floor flooding, usually several days per year.
- Extreme cold weather; these suspensions rarely last more than 1 or 2 days and occur about once per year or once every other year.
- Extreme heat events during heat waves, lasting usually a few hours at a time; these impact both operations activities (outdoor work), and programmatic activities if Argonne is asked by its electricity provider to curtail power usage.

Fleet Management Plan

Organization and Structure

The vehicle fleet at Argonne is comprised predominantly of leased vehicles. The vehicles are supplied under a lease agreement through the GSA. The GSA recovers vehicle expenses by charging the lessee a monthly fee and a per-mile fee for vehicles. The monthly fee is for fixed costs associated with the vehicle and the mileage fee is for maintenance, repair, and fuel. The vehicles offered by GSA meet more than 90 percent of Argonne's vehicle fleet requirements. Other vehicle purchases are generally limited to specialty vehicles, such as emergency response and utility vehicles, which are not acquired through GSA fleet offerings. In recent years, GSA-leased vehicles were approximately 25 percent more fuel efficient on average than the vehicles they replaced. Approximately 50 percent of GSA's offerings are AFVs. The GSA turnover rate on light-duty trucks and passenger vehicles is typically 7 years. Therefore, the use of GSA-supplied vehicles directly translates to lower fuel consumption for Argonne. Ninety-three percent of the vehicles in the Argonne fleet are AFVs. Ten fleet vehicles are used exclusively to support scientific research located in rural areas in the Midwest that do not have reasonable access to alternative fuels. Management of the Argonne fleet is provided by the Facilities Management Services Division. The group also includes a fleet specialist and an on-site vehicle maintenance group.

Fleet Procurement

Vehicles are selected for addition or replacement based on the operational needs of the laboratory. GSA leasing is the preferred option for vehicles when the GSA vehicle offerings meet minimum operational requirements. Federal Management Regulations require GSA to select vehicles that achieve maximum fuel efficiency and limit body size, engine size, and optional equipment to what is essential to meet operational requirements. In addition, low-GHG passenger vehicle and light-duty truck GSA options are considered when available. All additions to the vehicle fleet are authorized by the DOE Argonne Site Office. Details of the fleet procurement process, including required approvals, are specified in Argonne's Vehicle Management Manual.

Fuel Infrastructure

Argonne vehicles are almost exclusively fueled on site. Currently, the site dispenses biodiesel (B20, and B5 during the winter season only), ethanol (E85), and unleaded fuels. The on-site fueling infrastructure allows for maximum alternative fuel use in diesel and flex-fuel fleet vehicles. The

GSA leasing program supplies vehicles that are compatible with the alternative fuels available on site.

Argonne uses a keyed fueling system with an embedded chip to support on-site vehicle fueling operations. The chip keys are programmed so that alternative-fueled passenger and light-duty trucks are authorized to utilize E85 only. The site dispenses only biodiesel for vehicles designed to operate on diesel fuel.

Vehicle Use Policies

Argonne has a documented vehicle use policy. The details of the policy are contained in the Vehicle Management Manual. The work instruction details responsibilities of vehicle custodians, vehicle operators, and supervisors. Topics addressed in the procedure include vehicle idling restrictions, employee check-out standards, safe operations, fueling requirements, limitations on vehicle usage, and preventative maintenance responsibilities. The work instruction is required reading for all vehicle custodians and operators. Recently acquired GSA lease vehicles have telematics that are used to track and manage use and performance.

Additional Fuel Reduction, Alternative Fuel Use, and Vehicle Reduction Activities and Policies

Argonne has reduced its fleet by replacing traditional fleet vehicles with electric and biodiesel vehicles. In response to the U.S. Secretary of Energy's fleet reduction goals, a fleet right-sizing plan was created. The plan established criteria and provided justification for the continued use of each vehicle in the Argonne fleet. The outcome of the plan demonstrated that the remaining vehicles that make up the Argonne fleet are mission critical.

In an effort to further reduce fuel consumption, Argonne is participating in a GSA-sponsored electric vehicle pilot program. An on-site electric vehicle charging infrastructure has been created as part of an ongoing electric vehicle charging research program. The charging stations are accessible for fleet vehicle charging and laboratory employee personal vehicles.

Funding

Argonne’s sustainability program is funded by a variety of sources, which are summarized in Table 10.

Table 10: Summary of Sustainability Project Funding (\$K)

Category	FY 2016 Actual	FY 2017 Planned/ Requested	FY 2018 Projected
Sustainability Projects*	1,439	2,460	2,400
Sustainability Activities Other than Projects**	57	60	60
SPO Funded Projects (SPO funding portion only)	420	100	100
Site Contribution to SPO Funded Project	0	0	0
ESPC/UESC Contract Payments (if applicable)	4,646	5,884	5,828
Renewable Energy Credit (REC) Purchase Costs (if applicable)	17	20	20
Total	6,579	8,524	8,408

*Projects specifically funded to meet sustainability goals. Funding sources include annual sustainability program, in-house energy/water savings program, and pollution prevention/waste minimization recycling program.

** Activities indirectly related to sustainability goals such as annual Site Sustainability Plan preparation and outreach/education.

Electrical Energy and Cost Projections Including High-Energy, Mission-Specific Facilities

The Laboratory Chief Research Officers define HEMSFs as “constructed, mission-specific facilities, such as accelerators (particle and light sources), reactors (fusion and fission), high performance computers, high performance lasers and similar facilities and the closely coupled conventional facilities necessary for their operations which are necessary to achieving the Departments mission goals.” Argonne’s three HEMSFs are described below.

The Advanced Photon Source (APS)

The APS is an accelerator that creates high-energy X-ray beams that allow scientists to pursue new knowledge about the structure and function of materials (Figure 11). The APS is considered an excluded building under Criterion G of the National Energy Conservation Policy Act (“metered intensive load”). Total APS-related electricity consumption was 119,880 MWh in FY 2016.



Figure 11: The Advanced Photon Source

The Argonne Tandem Linear Accelerator System (ATLAS)

The ATLAS is a facility for fundamental nuclear physics research and provides a wide range of beams for nuclear reaction and structure research (Figure 12). Electric power is supplied to ATLAS through six substations, which also supply electric power to the remaining portions of Building 203. Because ATLAS-related electricity consumption does not

comprise an overwhelming portion of Building 203’s electricity consumption, the entirety of Building 203 (including ATLAS) is considered goal subject. FY 2016 ATLAS-related electricity consumption was 12,117 MWh.

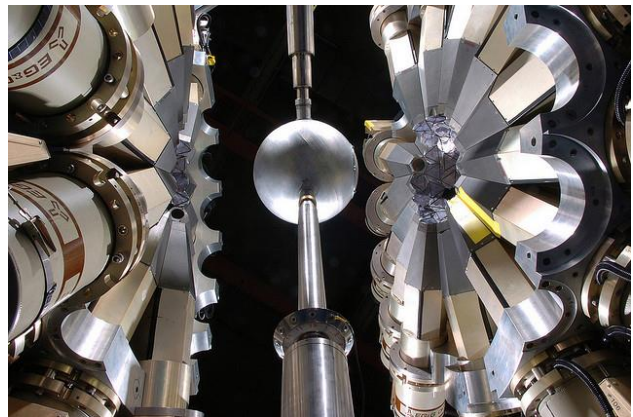


Figure 12: The Gammasphere, the world’s most powerful spectrometer for nuclear structure research, is part of the Argonne Tandem-Linac Accelerator System (ATLAS)

The Argonne Leadership Computing Facility (ALCF)

The ALCF, a high-performance computing facility, is the newest HEMSF at Argonne (Figure 13). It is located in Building 240, the TCS, which provides an infrastructure for world-class, large-scale computers and computational laboratories. This high-performance computing facility is a 25,000-square-foot area that includes an IBM Blue Gene/Q supercomputer (“MIRA”), one of the fastest open-source computers in the world. Total TCS-related electricity consumption was 55,763 MWh in FY 2016.



Figure 13: MIRA, a supercomputer capable of operating at 10.1 petaflops, is part of the ALCF

Cumulative

Cumulatively, the total annual electricity consumption of the three HEMSFs and HEMSf-related consumption was 187,760 MWh, comprising 60 percent of total site electricity consumption. Figures 14 and 15 detail the breakdown of HEMSFs and other newer facilities' electricity consumption.

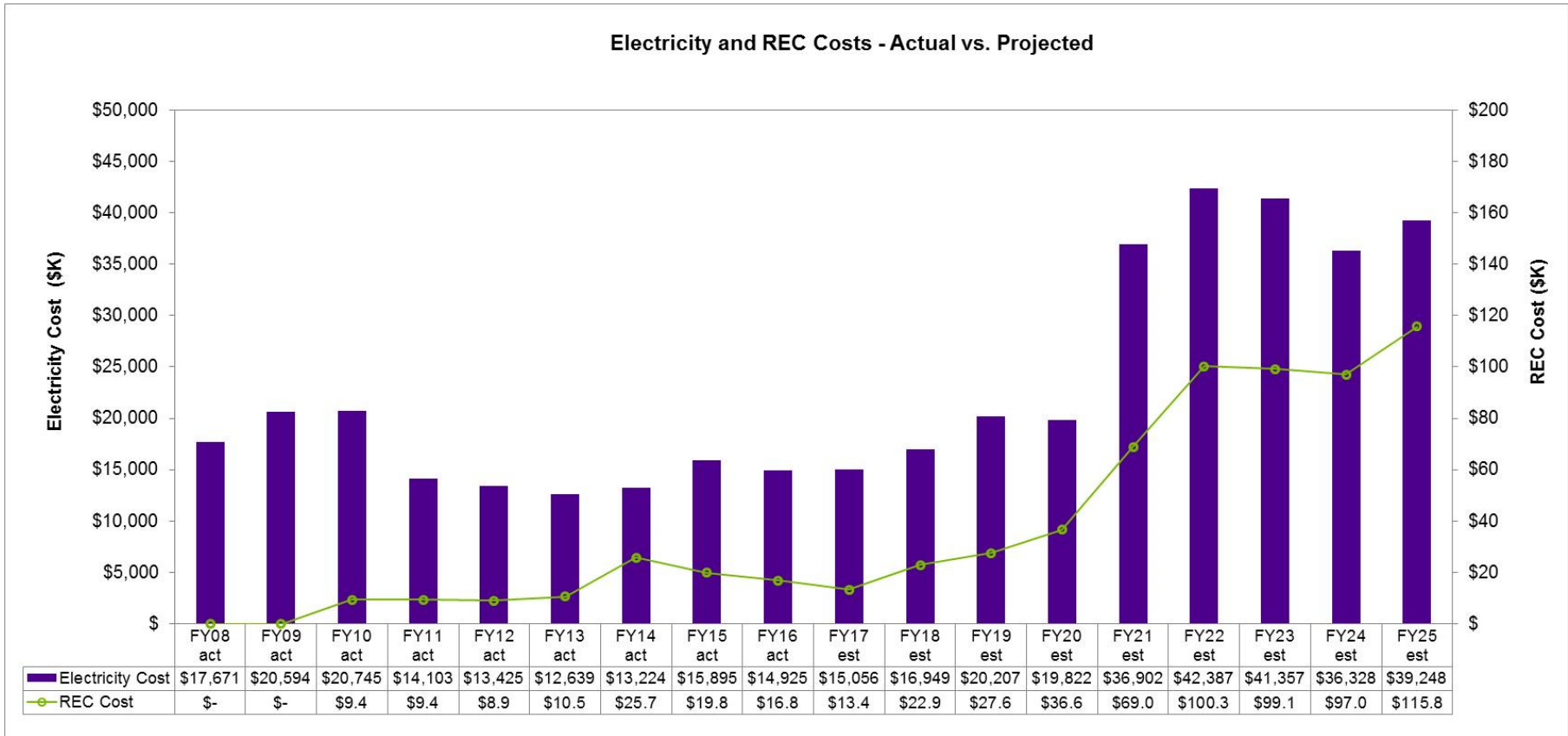


Figure 14: Electricity Costs vs. REC Costs, Actual and Estimated, FY 2008–FY 2025

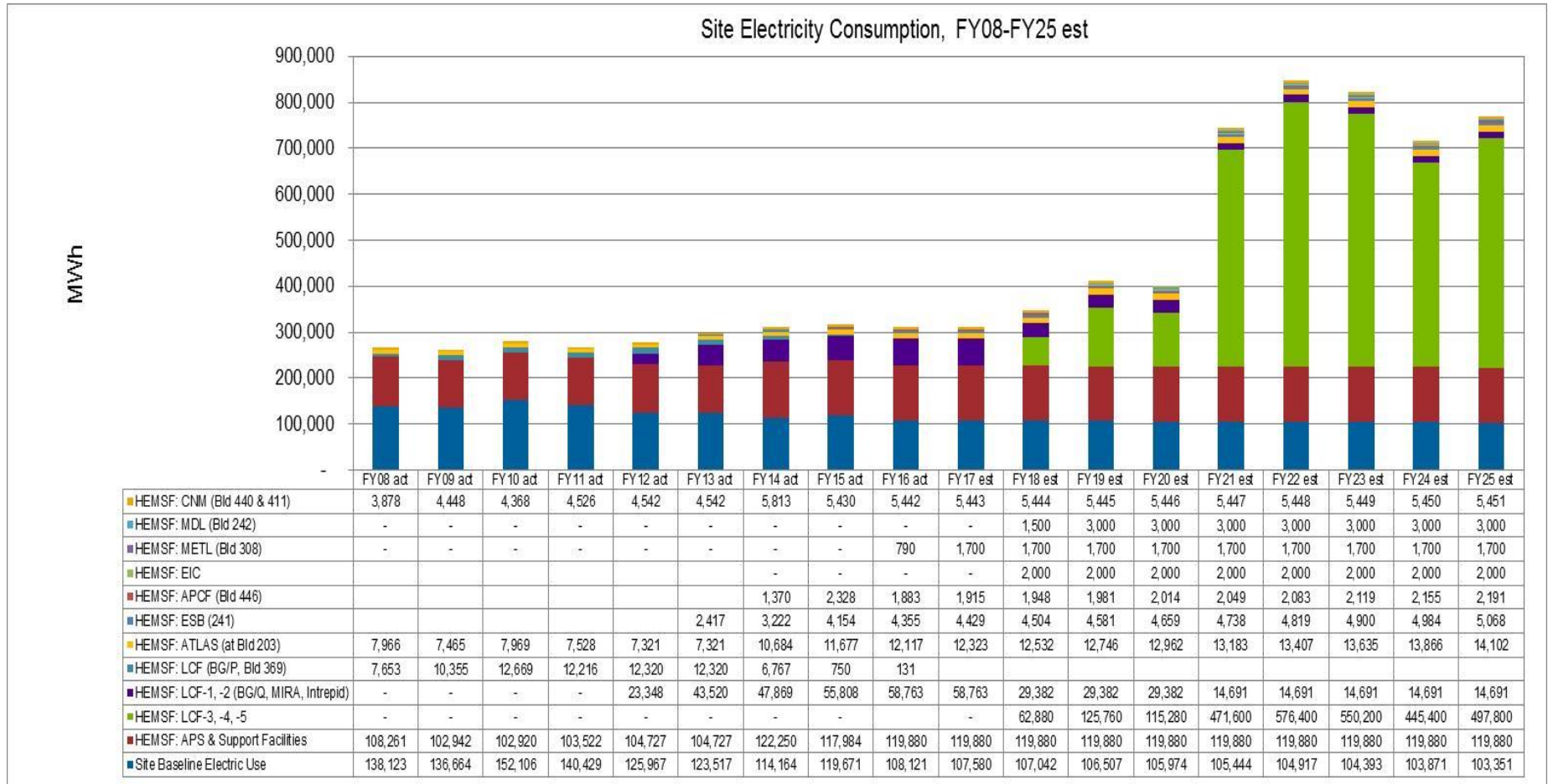


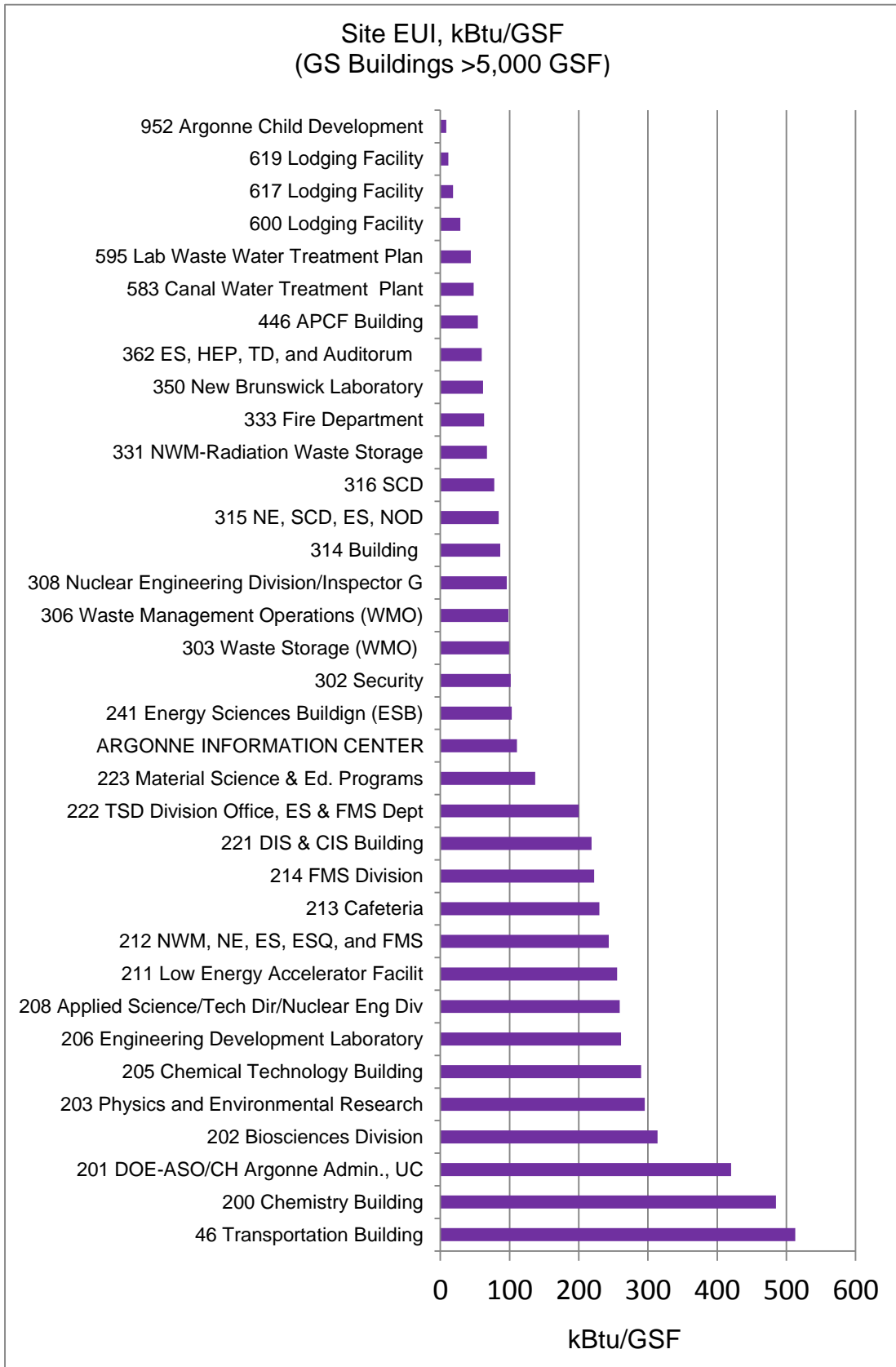
Figure 15: Electric Consumption, Actual and Projected

ATTACHMENT A: Actual and Projection SF₆ Emissions by Device

Application/Processes/ Facilities/Systems/ Using SF ₆ *	Identify Key Facilities by FIMS Asset #	Current SF ₆ Storage Inventory (lb.)	SF ₆ Device Inventory (lb.)	Emissions (lb.)												Total – FY16 to FY20 (Est.)
				FY10	FY11	FY12	FY13	FY14	FY15	Total – FY10 to FY15	FY16 Actual	FY17 (Est.)	FY18 (Est.)	FY19 (Est.)	FY20 (Est.)	
ATLAS Tandem Accelerator	FIMS – OSF 067	1,800	0	115	0	2,795	1,320	10	400	4,640	0	0	0	0	0	
Ion implant Accelerator	FIMS – Bldg. 212	1,015	1,100	490	396	60	88	181	88	1,303	80	80	70	70	70	370
Bldg. 211 Linac	FIMS – OSF 070	700	8	0	0	0	115	532	920	1,567	240	200	200	200	200	1,040
Argonne Wakefield Accelerator	FIMS – Bldg. 366	400	45	700	692	513	340	333	272	2,850	266	205	200	200	200	1,071
Site Utilities (Switchgear)	FIMS – OSF 543, 544, 545, 546, 548, 549, 551	330	1,500	100	86	86	115	178	185	750	199	150	125	125	125	724
Advanced Photon Source – Linac	FIMS – OSF 081	100	--	7	9	70	50	47	27	210	198	75	50	50	50	423
Center for Nanoscale Materials (CNM)	FIMS – Bldg. 440	50	N/A	0	0.4	0.4	Trace	1	2	3.8	6.5	5.0	3.0	3.0	3.0	21
Subangstrom Microscopy & Microanalysis (SAMM)	FIMS – Bldg. 216	40	--	0	23	0	0	0	0	23	0	0	0	0	0	0
Energy Systems (ES)	FIMS – Bldg. 362	1	N/A	0	0	0	182	0	0	182	0	0	0	0	0	0
Balance of Site		130	--	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		4,566	2,653	1,412	1,206	3,524	2,210	1,282	1,894	11,528	989	715	648	648	648	3,648

* Separately identify those major ones that together account for 80% or more of the emissions.

ATTACHMENT B: Buildings with EUI Greater than 150 Btu/GSF



ATTACHMENT C: Dashboard Data Accuracy Self-Certification



Department of Energy

Argonne Site Office
9800 South Cass Avenue
Argonne, Illinois 60439

DEC 02 2016

MEMORANDUM FOR SUSTAINABILITY PERFORMANCE OFFICE

FROM:

JOANNA M. LIVENGOOD
MANAGER

A handwritten signature in black ink that reads "Joanna M. Livengood".

SUBJECT:

SELF-CERTIFICATION FORM FOR DASHBOARD DATA ACCURACY
VERIFICATION

The Department of Energy (DOE) annually reports the agency's greenhouse gas emissions, energy and water use, fleet optimization, green buildings, and renewable energy to comply with the sustainability goals mandated in E.O. 13693 and DOE Order 436.1 Departmental Sustainability Directive.

To fulfill the Department's sustainability reporting requirements, data was previously collected through the Consolidated Energy Data Report (CEDR) and verified by a Site's manager or Program Office through the SSP submission process. The CEDR has been retired and a new system for data collection, the DOE Sustainability Dashboard (Dashboard), has been created as the official DOE sustainability reporting tool.

I certify that the data submitted for FY 2016 through the Dashboard for Argonne National Laboratory has been accurately entered and completed to the best of my knowledge and expertise.

If you have any questions, please contact Jurgis Paliulionis of my staff at (630) 252-2724 or by email at jurgis.paliulionis@science.doe.gov.

A component of the Office of Science

ATTACHMENT D: Excluded Buildings Self-Certification



Department of Energy

Argonne Site Office
9800 South Cass Avenue
Argonne, Illinois 60439

DEC 02 2016

MEMORANDUM FOR SUSTAINABILITY PERFORMANCE OFFICE

FROM: JOANNA M. LIVENGOOD
MANAGER

A handwritten signature in cursive script that reads "Joanna M. Livengood".

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

Each buildings or group of buildings excluded under the criteria for a Part G or Part H exclusion is/are metered for energy consumption and their consumption is reported annually.

If any building has been excluded under the criteria for Part H for impracticability then all practicable energy and water conservation measures with a payback of less than 10 years have been installed. 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 Dashboard Energy Exclusions Report.

I certify that the buildings listed on the Excluded Buildings List produced by the Dashboard as dated November 11, 2016 for Argonne National Laboratory meet the exclusion criteria in *Guidelines Establishing Criteria for Excluding Buildings* published by FEMP on January 27, 2006.

If you have any questions, please contact Jurgis Paliulionis of my staff at (630) 252-2724 or by email at jurgis.paliulionis@science.doe.gov.

A component of the Office of Science

Argonne National Laboratory Buildings Excluded from Energy Intensity Goal Calculation as of November 11, 2016

Site #	Fiscal Year	Building Name	Building Number	Real Property Unique ID	Property Type	Ownership	Goal Subject Facilities SqFt	Excluded Facilities SqFt	Exclusion Part
301	2016	SANITARY LIFT EAST AREA	030	123687	Building	DOE Owned (O)	150	0	
301	2016	#1 Well House (Shallow Well)	031	123660	Building	DOE Owned (O)	300	0	
301	2016	#2 Well House (Shallow Well)	032	123659	Building	DOE Owned (O)	300	0	
301	2016	Transportation Building	046	123713	Building	DOE Owned (O)	49,809	0	
301	2016	Transportation Building	046A	216311	Building	DOE Owned (O)	3,028	0	
301	2016	Guard Post Eastwood Dr	091	123670	Building	DOE Owned (O)	50	0	
301	2016	Storage Building	107	123517	Building	DOE Owned (O)	1,907	0	
301	2016	Central Boiler House Bldg 108A	108A	216323	Building	DOE Owned (O)	0	59,367	G - Metered intensive loads
301	2016	Combined Heat and Power Plant	109	217015	Building	DOE Owned (O)	0	5,500	G - Metered intensive loads
301	2016	Util Systems Offices	114	123535	Building	DOE Owned (O)	1,818	0	
301	2016	Shaker House	115	123671	Building	DOE Owned (O)	0	1,050	H - Impracticability
301	2016	Crusher House	116	123699	Building	DOE Owned (O)	0	980	H - Impracticability
301	2016	FMS LOCKER/WASHROOM	123	133901	Building	DOE Owned (O)	2,617	0	
301	2016	Lake Michigan Flow Control Station	127	135754	Building	DOE Owned (O)	165	0	
301	2016	Waste Water - Domestic Water	128	123617	Building	DOE Owned (O)	0	2,121	H - Impracticability
301	2016	Pumping Station, Office	129	123662	Building	DOE Owned (O)	0	6,050	H - Impracticability
301	2016	Storage Bldg	130	123604	Building	DOE Owned (O)	1,282	0	
301	2016	Storage Building and Shop	145	123534	Building	DOE Owned (O)	3,526	0	
301	2016	Utilities Office Building	146	123582	Building	DOE Owned (O)	1,397	0	
301	2016	#5 Well House (Deep Well)	160	123658	Building	DOE Owned (O)	240	0	
301	2016	#3 Well House (Shallow well)	163	123656	Building	DOE Owned (O)	250	0	
301	2016	Chemistry	200	123515	Building	DOE Owned (O)	356,889	0	
301	2016	DOE-ASO/CH ARGONNE ADMIN., UC	201	123533	Building	DOE Owned (O)	220,099	0	
301	2016	Biosciences Division	202	123564	Building	DOE Owned (O)	203,002	0	
301	2016	Biosciences Division	202X&Y	216309	Building	DOE Owned (O)	5,664	0	
301	2016	Physics and Environmental Research	203	123563	Building	DOE Owned (O)	304,852	0	
301	2016	Chemical Technology Building	205	123562	Building	DOE Owned (O)	262,073	0	
301	2016	Engineering Development Laboratory	206	123583	Building	DOE Owned (O)	24,177	0	
301	2016	Engineering Development Shed 206 A	206A	216322	Building	DOE Owned (O)	120	0	
301	2016	Applied Science/Tech Dir/Nuclear Eng Div	208	123712	Building	DOE Owned (O)	82,666	0	
301	2016	Low Energy Accelerator Facilit	211	123577	Building	DOE Owned (O)	56,118	0	
301	2016	NWM, NE, ES, ESQ, and FMS	212	123519	Building	DOE Owned (O)	304,572	0	
301	2016	Cafeteria	213	123602	Building	DOE Owned (O)	34,492	0	
301	2016	FMS Division	214	123560	Building	DOE Owned (O)	23,664	0	
301	2016	Sub-Angstrom Microscopy & Micro	216	206768	Building	DOE Owned (O)	0	7,289	G - Metered intensive loads
301	2016	DIS & CIS Building	221	123559	Building	DOE Owned (O)	72,356	0	
301	2016	TSD Division Office, ES and FMS Dept	222	123588	Building	DOE Owned (O)	58,737	0	
301	2016	Mat. Science & Educational Programs	223	123520	Building	DOE Owned (O)	110,303	0	
301	2016	ARGONNE INFORMATION CENTER	224	123587	Building	DOE Owned (O)	7,500	0	
301	2016	240 Theory & Computing Science Buld Trus	240	208578	Building	Contractor Leased (C)	0	300,468	G - Metered intensive loads
301	2016	ESB	241	211590	Building	DOE Owned (O)	172,311	0	
301	2016	Guard Post Northgate Rd	291	123669	Building	DOE Owned (O)	50	0	
301	2016	Smart Energy Plaza	300	123706	Building	DOE Owned (O)	2,403	0	
301	2016	Security	302	123707	Building	DOE Owned (O)	19,360	0	

Site #	Fiscal Year	Building Name	Building Number	Real Property Unique ID	Property Type	Ownership	Goal Subject Facilities SqFt	Excluded Facilities SqFt	Exclusion Part
301	2016	WMO Waste Storage	303	123610	Building	DOE Owned (O)	6,257	0	
301	2016	WMO Waste Management Oper	306	123565	Building	DOE Owned (O)	45,639	0	
301	2016	Nuclear Engineering Division/Inspector G	308	123556	Building	DOE Owned (O)	25,606	0	
301	2016	Nuclear Engineering Division	309	123555	Building	DOE Owned (O)	9,453	0	
301	2016	Experimental Building	311	123553	Building	DOE Owned (O)	2,365	0	
301	2016	Building 313	313	123581	Building	DOE Owned (O)	1,771	0	
301	2016	Building 314	314	123527	Building	DOE Owned (O)	16,586	0	
301	2016	NE, SCD, ES, NOD	315	123552	Building	DOE Owned (O)	59,694	0	
301	2016	SCD	316	123551	Building	DOE Owned (O)	17,299	0	
301	2016	NWM-Waste Management Storage	318B	135441	Building	DOE Owned (O)	150	0	
301	2016	USDA Wildlife Services Field Facility	320	123586	Building	DOE Owned (O)	1,561	0	
301	2016	NWM-Rad Waste Storage	331	123548	Building	DOE Owned (O)	32,444	0	
301	2016	FMS Dept - Fire Protection	331A	216310	Building	DOE Owned (O)	6,937	0	
301	2016	Fire Department	333	123603	Building	DOE Owned (O)	11,395	0	
301	2016	Building 335 APS	335	123547	Building	DOE Owned (O)	14,511	0	
301	2016	FMS-BM and FMS-CU	340	123546	Building	DOE Owned (O)	4,339	0	
301	2016	New Brunswick Laboratory	350	123601	Building	DOE Owned (O)	85,372	0	
301	2016	HEP, CEPA Building	360	123579	Building	DOE Owned (O)	0	97,166	G - Metered intensive loads
301	2016	IPNS Linac Injector Building	361	123521	Building	DOE Owned (O)	0	24,899	E - Skewed energy usage
301	2016	ES, HEP, TD, and Auditorium	362	123578	Building	DOE Owned (O)	198,840	0	
301	2016	Central Shops	363	123573	Building	DOE Owned (O)	0	48,195	G - Metered intensive loads
301	2016	Center Bldg	364	123600	Building	DOE Owned (O)	0	33,812	G - Metered intensive loads
301	2016	Ring Building/SNS Development Test Area	365	123522	Building	DOE Owned (O)	0	51,173	E - Skewed energy usage
301	2016	Fabrication Area	366	123544	Building	DOE Owned (O)	0	26,594	G - Metered intensive loads
301	2016	WMO Facility Storage	367	123543	Building	DOE Owned (O)	0	8,240	E - Skewed energy usage
301	2016	Power Distribution and Crafts	368	123542	Building	DOE Owned (O)	0	19,998	G - Metered intensive loads
301	2016	Building 369- ALCF & ES	369	123541	Building	DOE Owned (O)	0	30,771	G - Metered intensive loads
301	2016	Nuclear Eng Alex Facility/ES Facility	370	123572	Building	DOE Owned (O)	0	41,088	G - Metered intensive loads
301	2016	TRANSPORTATION TECHNOLOGY R & D CENTER,	371	123524	Building	DOE Owned (O)	25,884	0	G - Metered intensive loads
301	2016	Transportation Technology Storage	371C	216312	Building	DOE Owned (O)	600	0	
301	2016	Transportation Technology Storage	371D	216314	Building	DOE Owned (O)	196	0	
301	2016	OEM Offices - EOC	372	123571	Building	DOE Owned (O)	0	3,649	G - Metered intensive loads
301	2016	ES Equipment Storage	373	123523	Building	DOE Owned (O)	0	2,489	G - Metered intensive loads
301	2016	IPNS Experimental Area & Neutr	375	123569	Building	DOE Owned (O)	0	24,331	E - Skewed energy usage
301	2016	IPNS Experimental Area Storage 375 A	375A	216315	Building	DOE Owned (O)	0	952	E - Skewed energy usage
301	2016	IPNS Experimental Area Storage 375 D	375D	216316	Building	DOE Owned (O)	0	963	E - Skewed energy usage
301	2016	TRANSPORTATION TECHNOLOGY, R&D CENTER EN	376	123568	Building	DOE Owned (O)	0	22,691	G - Metered intensive loads
301	2016	Cooling Water Tower Fac A	377A	216292	Building	DOE Owned (O)	0	1,998	G - Metered intensive loads
301	2016	Cooling Water Tower Fac B	377B	216293	Building	DOE Owned (O)	0	992	G - Metered intensive loads
301	2016	Cooling Water Tower Fac G	377G	216294	Building	DOE Owned (O)	0	554	G - Metered intensive loads
301	2016	APS Storage	378	123576	Building	DOE Owned (O)	0	9,709	G - Metered intensive loads
301	2016	Building 379	379	123672	Building	DOE Owned (O)	0	4,155	G - Metered intensive loads
301	2016	APS Vacuum Systems	382	123566	Building	DOE Owned (O)	0	18,573	G - Metered intensive loads
301	2016	Storage	384	123590	Building	DOE Owned (O)	768	0	
301	2016	IPNS Survey Calibration Area	385	123589	Building	DOE Owned (O)	0	518	E - Skewed energy usage
301	2016	IPNS RF Power Supply Bldg	389B	123598	Building	DOE Owned (O)	0	640	E - Skewed energy usage

Site #	Fiscal Year	Building Name	Building Number	Real Property Unique ID	Property Type	Ownership	Goal Subject Facilities SqFt	Excluded Facilities SqFt	Exclusion Part
301	2016	IPNS Cryogenic System and Lab	390	123597	Building	DOE Owned (O)	0	1,948	E - Skewed energy usage
301	2016	IPNS Rapid Cycling Synchrotron	391	123596	Building	DOE Owned (O)	0	7,810	E - Skewed energy usage
301	2016	IPNS NGS Control and Computer	399	123595	Building	DOE Owned (O)	0	2,805	E - Skewed energy usage
301	2016	APS Exper Hall/Storage Ring & EAA	400	123720	Building	DOE Owned (O)	0	490,493	G - Metered intensive loads
301	2016	Central Lab & Office Bldg.and Control Ce	401	128755	Building	DOE Owned (O)	0	191,336	G - Metered intensive loads
301	2016	APS Conference Center	402	128756	Building	DOE Owned (O)	0	27,252	G - Metered intensive loads
301	2016	APS Linear Accelerator Facility	411	123728	Building	DOE Owned (O)	0	10,061	G - Metered intensive loads
301	2016	APS Injection Wing	412	123729	Building	DOE Owned (O)	0	26,978	G - Metered intensive loads
301	2016	APS Low Energy Undulator Test Line Bldg.	413	135713	Building	DOE Owned (O)	0	4,477	G - Metered intensive loads
301	2016	APS Booster/ Synchrotron Tunnel	415	123730	Building	DOE Owned (O)	0	19,810	G - Metered intensive loads
301	2016	APS RF Extraction Wing	420	123731	Building	DOE Owned (O)	0	36,444	G - Metered intensive loads
301	2016	APS Lab/Office Module	431	128780	Building	DOE Owned (O)	0	27,989	G - Metered intensive loads
301	2016	APS Lab/Office Module	432	128773	Building	DOE Owned (O)	0	22,894	G - Metered intensive loads
301	2016	APS Lab/Office Module	433	128776	Building	DOE Owned (O)	0	24,430	G - Metered intensive loads
301	2016	APS Lab/Office Module	434	128777	Building	DOE Owned (O)	0	22,679	G - Metered intensive loads
301	2016	APS Lab/Office Module	435	128778	Building	DOE Owned (O)	0	23,831	G - Metered intensive loads
301	2016	APS Lab/Office Module	436	140752	Building	DOE Owned (O)	0	22,619	G - Metered intensive loads
301	2016	APS Lab/Office Module	437	205543	Building	DOE Owned (O)	0	23,637	G - Metered intensive loads
301	2016	APS Lab/Office Module	438	128779	Building	DOE Owned (O)	0	28,921	G - Metered intensive loads
301	2016	Center For Nano Materials -CNM Building	440	204124	Building	DOE Owned (O)	0	88,369	G - Metered intensive loads
301	2016	Scanning Probing Microscope	441	208134	Building	DOE Owned (O)	0	4,682	G - Metered intensive loads
301	2016	APCF Building	446	215882	Building	DOE Owned (O)	66,705	0	
301	2016	APS Utility Building	450	123710	Building	DOE Owned (O)	0	37,340	G - Metered intensive loads
301	2016	Argonne Guest House	460	135146	Building	DOE Owned (O)	0	124,153	G - Metered intensive loads
301	2016	Meteorological Facility	484	125717	Building	DOE Owned (O)	2,003	0	
301	2016	Meteorological Facility	484A	216454	Building	DOE Owned (O)	411	0	
301	2016	Greenhouse	485	123605	Building	DOE Owned (O)	2,122	0	
301	2016	200 Area Chilled Water Building	528A	216295	Building	DOE Owned (O)	0	10,271	G - Metered intensive loads
301	2016	Steam Dist. Building A	531A	216296	Building	DOE Owned (O)	1,035	0	
301	2016	Communications Systems Bldg 541 A	541A	216297	Building	DOE Owned (O)	0	202	H - Impracticability
301	2016	Communications Sytem Bldg 541 B	541B	216298	Building	DOE Owned (O)	0	2,560	H - Impracticability
301	2016	Communications System Building 541 C	541C	216299	Building	DOE Owned (O)	0	672	H - Impracticability
301	2016	Outdoor Load 543 A	543A	216300	Building	DOE Owned (O)	756	0	
301	2016	Outdoor Load 544 A	544A	216301	Building	DOE Owned (O)	269	0	
301	2016	Outdoor Load Building 544 B	544B	216302	Building	DOE Owned (O)	997	0	
301	2016	Outdoor Load 300 & 400 549-4	549-4	216304	Building	DOE Owned (O)	1,643	0	
301	2016	Outdoor Load Center 300 & 400 549-3	549-3	216303	Building	DOE Owned (O)	1,180	0	
301	2016	Outdoor Load Center 300 & 400 Area 549 7	549-7/8	216305	Building	DOE Owned (O)	2,054	0	
301	2016	Outdoor Load Bldg 200 551 A	551A	216306	Building	DOE Owned (O)	2,046	0	
301	2016	Lake Michigan Water Pump Station	567	123732	Building	DOE Owned (O)	683	0	
301	2016	Blower Bldg	572	123626	Building	DOE Owned (O)	0	158	H - Impracticability
301	2016	Sanitary Sampling	573	123627	Building	DOE Owned (O)	0	144	H - Impracticability
301	2016	Sanitary Treatment Laboratory,	574	123628	Building	DOE Owned (O)	0	1,085	H - Impracticability
301	2016	WWTP Maint Bldg, & Storage	576	134636	Building	DOE Owned (O)	3,052	0	
301	2016	CANAL WATER PUMPING STATION	582	123657	Building	DOE Owned (O)	0	1,673	G - Metered intensive loads
301	2016	Canal Treatment (Cooling Water)	583	123661	Building	DOE Owned (O)	6,235	0	

FOR MORE INFORMATION

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