FERMI NATIONAL ACCELERATOR LABORATORY
FY 2019 SITE SUSTAINABILITY PLAN

U.S. Department of Energy
Sustainability Performance Office

Executive Summary

Highlights

Fermi National Accelerator Laboratory is an international hub for particle physics. Fermilab's employees and users drive discovery in particle physics by building and operating world-leading accelerator and detector facilities, performing pioneering research with national and global partners, and developing new technologies for science that support U.S. industrial competitiveness. Fermilab's science strategy for the future delivers on the U.S. particle physics community's goals as outlined in the Particle Physics Project Prioritization Panel's 2014 report. The strategy's primary ten-year focus is a world-leading neutrino science program anchored by the Long Baseline Neutrino Facility (LBNF) and Deep Underground Neutrino Experiment (DUNE).

Fermilab's 6,800 acre site and extensive infrastructure supports the laboratory's current particle physics research program, including the experiments at the Fermilab Accelerator Complex user facility and others located around the world. The laboratory's infrastructure is also evolving to support the significant requirements of the international LBNF/DUNE and PIP-II projects. LBNF and DUNE will be powered by megawatt beams from an upgraded and modernized accelerator complex made possible by the Proton Improvement Plan II (PIP-II). The flagship facility comprised of LBNF, DUNE, and PIP-II will be the first international mega-science project based at a Department of Energy national laboratory.

In FY 2018 Fermilab included a commitment to environmental and sustainability stewardship as a main theme of the Fermilab Campus Master Plan. The Campus Master Plan builds on Fermilab's campus strategy which has four goals:

1. Construct sustainable infrastructure that will attract international investment and the brightest minds to the world's leading laboratory for accelerator-based neutrino science
2. Maximize productivity by establishing an atmosphere of "eat-sleep-work to drive discovery" that efficiently meets the needs of the scientific community
3. Integrate into one geographic area the entire life cycle of research, engineering, fabrication, and operations expertise for accelerators and detectors
4. Consolidate, centralize, and modernize to optimize operational resources, maximize efficiency, enhance communication, and foster succession planning

These goals set the stage for the activities and programs associated with sustainable operations at Fermilab. In FY 2018, Fermilab achieved success in meeting the laboratory's sustainability goals. The following FY 2018 accomplishments are notable examples of sustainability progress which support Fermilab's ability to deliver on its mission:

- Fermilab participated in the DOE Facilities and Infrastructure Restoration and Modernization (FIRM) program to assess the potential for conducting "deep energy efficiency retrofits" at Fermilab and for using financing mechanisms (UESC, ESPC, etc.) to complete the work.
- A bikeshare program was introduced, which gives employees an alternative onsite transportation option.
- Fermilab published the FY 2018 Campus Master Plan, setting the stage for thoughtful, sustainable campus development.
- In cooperation with neighboring communities, Fermilab participated in a review of its village sanitary system which will yield information to feed into strategic utility planning efforts in FY 2019.
- Fermilab achieved CD-4 on its Utilities Upgrade 413 project which completed site improvements to industrial cooling water system efficiency and electric utility reliability/resilience.
- A new waste disposal contract was executed, including provisions for an expanded composting and educational program.
- Plans were developed for future high performance sustainable building – existing building improvements.
- Several site resilience improvements were made, including adding a generator at the Fermilab Village Kuhn Barn, which now can serve as a warming shelter during extreme weather events/outages.
- For the eighth consecutive year, Fermilab's Grid Computing Center was awarded Energy Star status.

Executive Summary Table available on page 26.
Comprehensive Scorecard available on page 28.

Clockwise from top Fermilab's Sustainability Management Team; managing Fermilab's natural areas with controlled burns; new bicycle sharing program in 2018; Fermilab bison, resident symbols of the coexistent scientific and prairie frontiers; modernization of Wilson Hall's 13th floor, the first slab-to-slab renovation of Fermilab's iconic central high-rise building.

Mission Changes

Fermilab has pivoted toward a five-year program that includes current and near-term neutrino experiments, an R&D platform that serves the wider neutrino physics community, and prototype detectors (ProtoDUNEs) at the European laboratory CERN. This program is driving the development of capabilities and infrastructure planning and bringing together the international community needed for the Long-Baseline Neutrino Facility (LBNF) and Deep Underground Neutrino Experiment (DUNE).

This direction will require new and modernized onsite infrastructure to support the significant requirements of hosting an international flagship experiment. Future upgrades of the accelerator complex enabled by the Proton Improvement Plan II (PIP-II) project will provide megawatts of beam power to LBNF/DUNE. These upgrades will yield an increase in the amount of energy consumed as a site. Minimizing energy consumption for conventional facility operations will be important to provide an offset to required science-driven consumption needs.

In addition to modernized facilities and infrastructure at Fermilab to support the fast-approaching LBNF/DUNE/PIP-II era, DOE has a real-property lease with the South Dakota Science and Technology Authority (SDSTA) at the Sanford Underground Research Facility (SURF) in Lead, South Dakota. Real-property improvements will be necessary at SURF in both leased space and non-leased space in support of the DOE science mission.

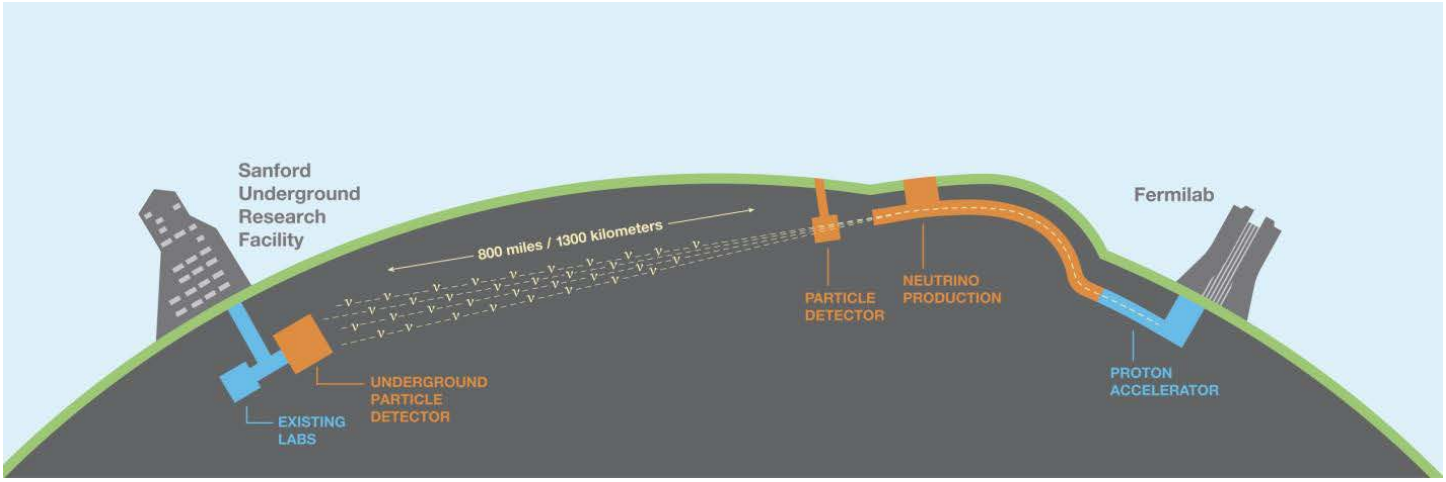


Photo: Artist's rendering of the Long-Baseline Neutrino Facility (LBNF) that will send a very intense beam of neutrinos 1300 km (800 miles) to a massive liquid-argon detector located deep underground in the Sanford Underground Research Facility in South Dakota.

Energy Management

Energy Use and Intensity

Energy Intensity

Goal: The latest energy intensity reduction goal, requires a reduction in energy intensity for goal subject facilities by 25 percent by FY 2025 relative to FY 2015 baseline. The prior goal, required a 30 percent reduction by FY 2015 relative to FY 2003 baseline.
Interim Target (FY 2018): -7.5 %

Current Performance: -11%

	FY 2015	FY 2018	% Change
Purchased Utilities (MMBtu)	95,494.3	84,648.5	-11.4%
Purchased Renewables (MMBtu)	0.0	0.0	N/A
Goal-subject GSF	1,053,588.0	1,043,636.0	-0.9%
Energy Intensity (Btu/GSF)	**90,637.3**	**81,109.2**	**-10.5%**

Photo: One strategy for reduction of site energy intensity is to fully decommission end of life facilities. Fermilab's Central Helium Liquifer facility took several steps toward 'cold and dark' in FY 2018.

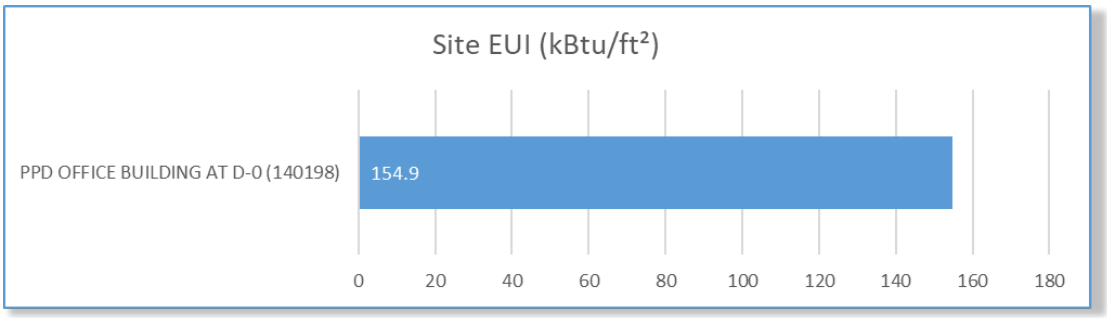
Status

In 2018, Fermilab completed conventional facility energy efficiency improvements which contributed to a reduction in overall facility energy intensity. The improvements included decommissioning pumps, replacing heat exchangers with more efficient and right-sized models, and installation of variable frequency drives to improve efficiency of pumps in our central campus area.

Fermilab also substantially completed a portion of the Wilson Hall 2.0 modernization project to design and construct new, modern, and sustainable spaces within Fermilab's iconic Wilson Hall central high-rise building. The project's Wilson Hall 13th floor renovation included a slab-to-slab renovation which allowed for the deployment of energy efficient daylight sensors, occupancy sensors, greater thermal mechanical controls, heat rejecting window treatments, and LED overhead and task lighting. The renovation also set a new standard for space density and utilization for future space modernization initiatives.

Fermilab participated in an energy curtailment program as negotiated with the laboratory's curtailment service provider in FY 2018. The demand reduction exercise yielded $916K in target reduction accomplishment compensation. Fermilab will continue to participate in curtailment programs in the future.

Fermilab has one non-excluded facility (a Particle Physics Division Office Building) greater than 5,000 gsf with an EUI greater than 150 kBTU/gsf. This building is currently in the process of retro-commissioning and energy modeling.



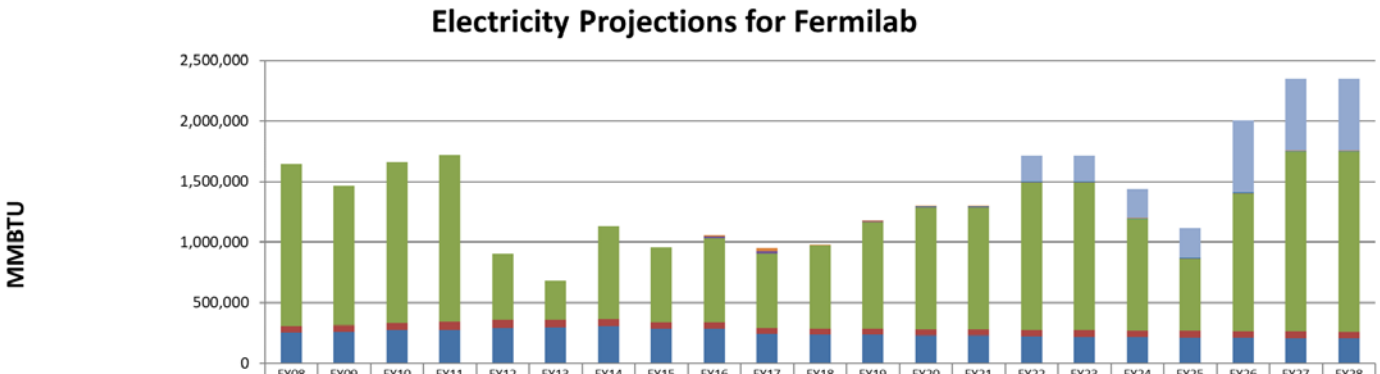
Plans

Fermilab is developing a plan for an in-house energy efficiency reinvestment program. An in-house program would incentivize and fund energy efficiency facility and asset repairs and replacements. The laboratory is also exploring alternate funding mechanisms to support a broader energy efficiency and asset modernization program.

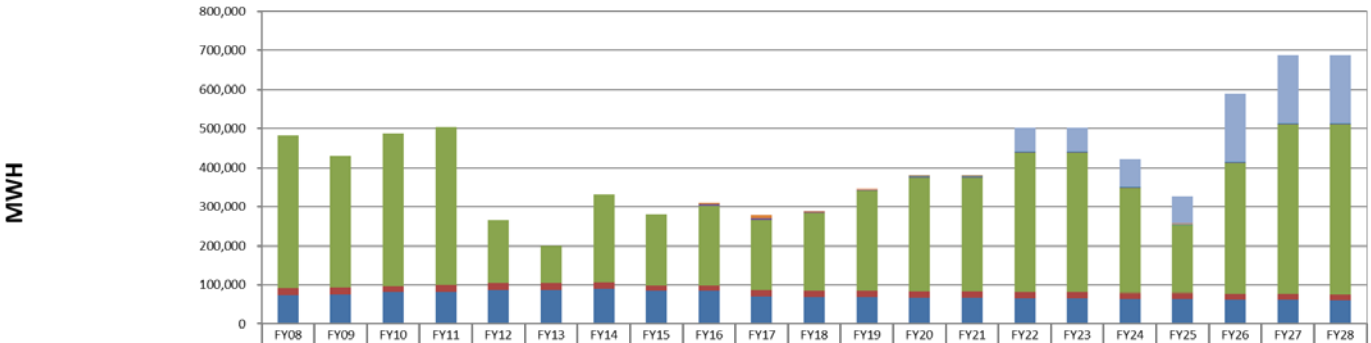
In FY 2019, Fermilab will develop a Strategic Facility Assessment. The Assessment will be the first step to prioritizing facilities ready for decommissioning and demolition. Fermilab's energy intensity performance will improve as legacy facilities are removed from the laboratory's portfolio and their associated utility consumption is eliminated.

Electricity Use Projections

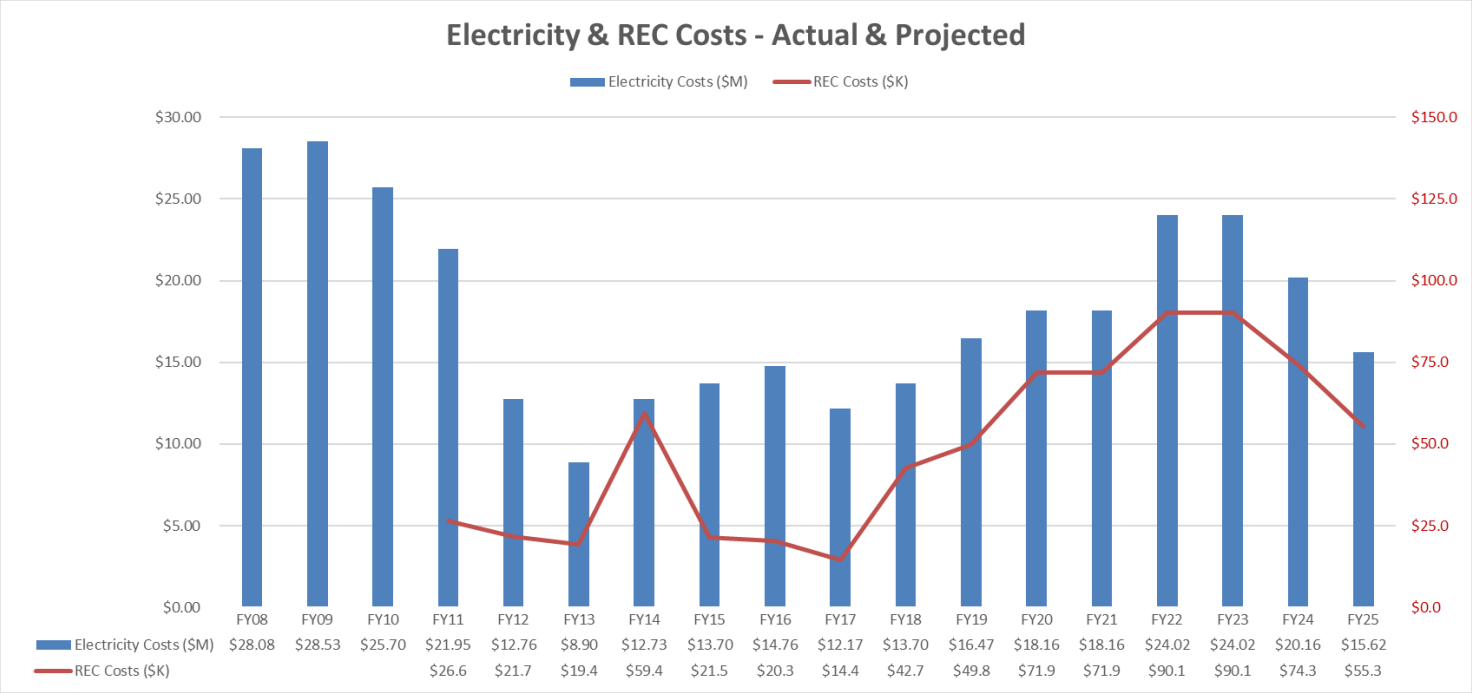
A significant change to Fermilab's projected energy consumption will occur starting in 2024 when a planned 2-year accelerator shutdown begins and will conclude in 2026 when the new PIP-II accelerator complex is brought online. During the shutdown, the LBNF infrastructure will tie into the existing accelerator campus. The PIP-II accelerator operation is expected to increase Fermilab's overall energy consumption significantly, perhaps by 30% over existing levels.



	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
PIP-II															209,224	209,224	242,102	242,102	591,805	591,805	591,805
SBN Near & Far Detectors									13,450	30,263	1,873	2,391	2,391	2,391	2,391	2,391	2,391	2,391	2,391	2,391	2,391
Mu2e (MC-2)											1,108	2,989	5,978	5,978	5,978	5,978	5,978	5,978	5,978	5,978	5,978
Muon G-2 (MC-1)									17,336	17,336	3,183	5,978	5,978	5,978	2,989	2,989	2,989	2,989	2,989	2,989	2,989
Existing Particle Accelerators HEMSF	1,334,80	1,150,35	1,331,66	1,374,70	548,235	323,213	767,143	622,715	693,244	612,375	683,142	879,327	1,000,02	1,003,19	1,218,49	1,221,50	916,114	594,834	1,139,95	1,483,87	1,486,52
Existing High Performance Computing HEMSF	56,463	58,738	58,790	67,281	66,678	62,745	56,551	50,303	50,303	54,264	52,275	52,275	52,275	52,275	52,275	52,275	52,275	52,275	52,275	52,275	52,275
Site Base	254,839	257,931	273,033	274,856	293,362	295,900	308,217	286,122	285,305	239,901	236,486	233,156	229,910	226,744	223,658	220,649	217,715	214,855	212,066	209,347	206,695



	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
PIP-II															61,320	61,320	70,956	70,956	173,448	173,448	173,448
SBN Near & Far Detectors									3,942	8,870	549	701	701	701	701	701	701	701	701	701	701
Mu2e (MC-2)											325	876	1,752	1,752	1,752	1,752	1,752	1,752	1,752	1,752	1,752
Muon G-2 (MC-1)									5,081	5,081	933	1,752	1,752	1,752	876	876	876	876	876	876	876
Existing Particle Accelerators HEMSF	391,208	337,150	390,288	402,903	160,678	94,728	224,837	182,507	203,178	179,477	200,217	257,716	293,092	294,019	357,120	358,002	268,498	174,336	334,101	434,898	435,675
Existing High Performance Computing HEMSF	16,548	17,215	17,230	19,719	19,542	18,389	16,574	14,743	14,743	15,904	15,321	15,321	15,321	15,321	15,321	15,321	15,321	15,321	15,321	15,321	15,321
Site Base	74,689	75,595	80,021	80,556	85,979	86,723	90,333	83,857	83,618	70,311	69,310	68,334	67,383	66,455	65,550	64,669	63,809	62,970	62,153	61,356	60,579



EISA Section 432 Benchmarking and Evaluations

Goal

Evaluate all facilities that constitute at least 75% of Fermilab's total energy use every four years

2018 Actual

In year two out of the four-year Energy Independence and Security Act (EISA) Section 432 schedule, Fermilab has completed energy evaluations on 47% of facilities that consume 75% of Fermilab's total energy use. (1,635,360 gsf complete, 1,794,643 gsf remaining.)

Status

In FY 2018, the State of Illinois discontinued its public-sector retro-commissioning and energy assessment program for electric utility consumers greater than 10MW. However, a natural gas energy efficiency program is now available through the local natural gas utility. In FY 2018 Fermilab began planning for new thermal energy facility assessments. Fermilab's emerging centralized facility management program is also conducting condition assessments of facilities included in the program. The resulting data will enable Fermilab's facilities planning teams to more accurately plan for targeted energy assessments.

Plans

Fermilab will continue to perform energy and water evaluations of goal-subject facilities to complete all facilities every four years. In FY 2019, Fermilab will partner with the local natural gas utility to complete energy efficiency ASHRAE level 2 facility assessments. Fermilab is also in design stage for the upgrade of three facilities to be certified High Performance Sustainability Buildings (HPSB). These buildings will be part of the FY 2019 energy assessment schedule.

Facility Metering

Goal

Meter all individual buildings for electricity, natural gas, steam, and water where cost-effective and appropriate.

2018 Actual

100% of new facilities are metered at the building level.
Of existing buildings,

55% of facilities are individually metered for electricity,
61% of facilities are individually metered for natural gas, and
7% of facilities are individually metered for domestic water.

Status

Fermilab's new buildings utilize the most current smart meters designed to monitor, track, and assess facility performance and energy consumption. The lab's existing facilities are variably metered either at the building level or at the branch level, giving the lab's facilities management staff the ability to monitor energy consumption and identify and mitigate energy consumption issues. The laboratory's industrial cooling water utility is most comprehensively metered which enables the laboratory to manage ICW to sustain programmatic needs. Electric, natural gas, and domestic water meters are deployed less frequently on existing buildings, but issues are identified and consumption is monitored by utilizing branch metering.

Plans

As part of Fermilab's campus modernization efforts, aging and failing utility meters will be replaced with smart meters. In FY 2019, the laboratory's metering infrastructure will be evaluated as part of a Strategic Utilities Assessment. As a result, Fermilab will be able to better plan for metering needs and funding. Fermilab will also conduct an evaluation of meters that will properly interface with the laboratory's supervisory control and data acquisition (SCADA) system.

Non-Fleet Vehicles and Equipment

Status

Fermilab first reported on non-fleet equipment fuel use in FAST in FY 2016.

Plans

As the laboratory continues to build a trend history of non-fleet fuel consumption, Fermilab will begin to develop strategies to monitor and reduce this category of energy consumption.

Water Management

Water Use and Management – Potable

Potable Water Intensity

Goal: Reduce potable water intensity by 36 percent by FY 2025 relative to FY 2007 baseline.
Interim Target (FY 2018): -22.0 %

Current Performance: -48%

	FY 2007	FY 2018	% Change
Water Consumption (million gal)	41.4	22.2	-46.4%
Aquifer Recharge (million gal)	0.0	0.0	N/A
Total GSF	3,398,290.0	3,498,768.0	3.0%
Water Intensity (Gal/GSF)	**12.2**	**6.4**	**-47.5%**

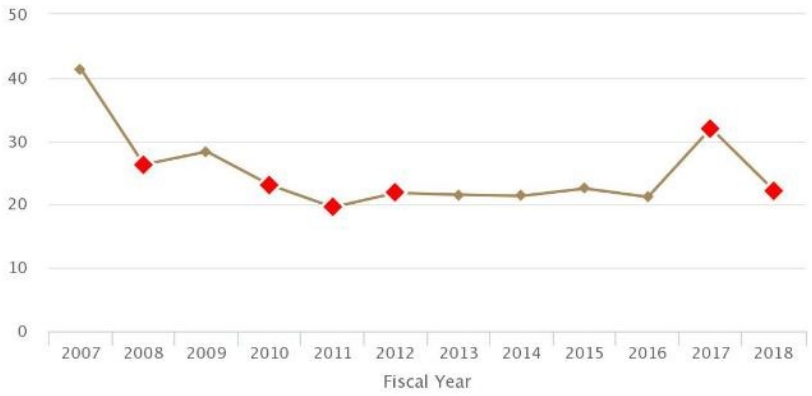


Figure: Potable Water Consumption, MGal, 2007-2018

Photo: A Fermilab general plant project for domestic water infrastructure improvements in FY 2018 will yield increased domestic water efficiency.

Table: Potable Water Use and Intensity, FY 2018

FY 2018 Potable Water Use and Intensity			
Facility	*Use, kGal*	*Size, GSF*	*Intensity, (Gal/gsf)*
CMTF	536	27,204	19.70
HAB	116	41,610	2.79
MC-1	632	14,881	42.48
MC-2/Mu2e	293	8,800	33.26
Wilson Hall	2,997	420,213	7.13
Total	4,574	512,708	8.92

Status

After repairing a large and persistent domestic water leak in late FY 2017, in FY 2018 Fermilab resumed its excellent performance in reduction of domestic water intensity. Fermilab utilizes a continuous domestic water monitoring system to identify water consumption anomalies and excursions. Conventional potable water reduction measures include specifying water efficient fixtures in all new construction and renovation projects.

A general plant project for domestic water line repairs is underway and will yield improvements to site potable water efficiency by reducing leaks and inefficiencies in the potable water distribution system.

Plans

Fermilab remains on track to meet the potable water intensity reduction goal in FY 2019. Plans for FY 2019 include replacement of domestic water mains in areas which are known sources of water breaks and leaks. Conventional potable water reduction measures will continue to be deployed in FY 2019 including specifying water efficient fixtures in all new construction and renovation projects.

Aging site infrastructure, including potable water lines, poses a significant risk to maintaining potable water efficiency. Water main or branch breaks reduce the site's water consumption efficiency and consume staff time to reactively respond to and repair the breaks. In FY 2019, Fermilab will develop a Strategic Site Utility Assessment which will identify and prioritize necessary utility system improvements including potable water.

Water Use and Management – Industrial, Landscape & Agricultural

Industrial, Landscaping, Agricultural Water

Goal: Reduce industrial, landscaping and agricultural water use by 30 percent by FY 2025 relative to FY 2010 baseline.
Interim Target (FY 2018): -16.0 %

Current Performance: 19.4%

	FY 2010	FY 2018	% Change
Industrial	81.3	97.1	19.4%
Landscaping	0.0	0.0	N/A
Agricultural	0.0	0.0	N/A
Total ILA Water (million gal)	**81.3**	**97.1**	**19.4%**

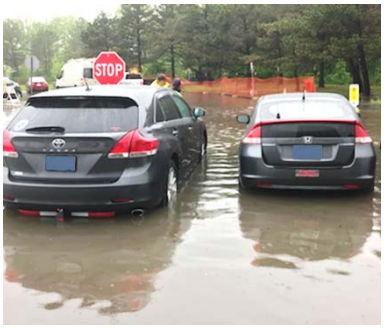


Photo: Flooding of the Wilson Hall Parking Lot triggered an FY 2018 project to improve stormwater management, reducing flooding risk and reliance on pumped stormwater flow.

Status

Virtually all Industrial, Landscaping, and Agricultural (ILA) water used at Fermilab is contained in a semi closed-loop, surface and piped, industrial cooling water (ICW) system to provide cooling for the accelerator complex. Water for the ICW system is supplied principally from precipitation which is considered an alternative water source and therefore not subject to efficiency goals. Precipitation is not accounted for in Fermilab's ILA consumption records. Precipitation is supplemented by ground and surface makeup water which comprise the target for ILA reduction goals. ***Since precipitation is not part of the ILA accounting process, slight increases or decreases to the makeup water sources lead to exaggerated goal impacts.***

Fermilab's Science Laboratories Infrastructure (SLI) ICW improvement project received CD-4 closeout in FY 2018, providing a new piped backbone to reduce leaks and improve transmission efficiency. This $18M investment in Fermilab's underground water

distribution system replaced or installed 4 miles of new pipe to provide significantly more efficient transmission of ICW across the site.

Fermilab has a site-wide strategy of natural landscaping and native grassland management that requires a minimum amount of landscape or agricultural watering. Minor amounts of ICW are used during times of drought to water ornamental trees.

Plans

In FY 2019 Fermilab will continue to take measures to increase the efficiency of the ICW system. ICW system leaks will be identified and repaired in a timely manner to minimize ILA losses. Fermilab's ILA water is used for fire protection and to support High Energy Mission Specific (experimental) operations. The development of a Strategic Utilities Assessment in FY 2019 will provide Fermilab with a better understanding of future capacity needs and the identification and prioritization of needed repairs and replacements to the current system.

Groundwater Infiltration into Wastewater Infrastructure

Groundwater infiltration into the site's sanitary sewer infrastructure has been steadily increasing. Fermilab's wastewater effluent is sent to two neighboring municipalities depending on the origination point within the laboratory. The infiltration into the underground infrastructure causes a significant increase in onsite lift station pump runtimes as well as additional offsite water treatment processing burden. The laboratory is conducting a study of the system's deferred maintenance and replacement needs which, when complete, will provide guidance on where the repairs are most needed. The lab is also performing immediate repairs to especially leaky lift station structures.

Waste Management

Municipal Waste Diversion

Municipal Solid Waste Diversion

Goal: Divert at least 50 percent of non-hazardous solid waste (excluding construction and demolition debris)
Interim Target (FY 2018): 50.0 %

Current Performance: 63%

	FY 2018	%
Off-Site Landfills	229.4	35.8%
On-Site Landfills	0.0	0.0%
Waste to Energy*	6.8	1.1%
Non-diverted Waste	***236.2***	***36.9%***
Diverted Waste	394.8	61.7%
On-Site Composted	0.0	0.0%
Off-Site Composted	2.6	0.4%
Waste to Energy Credit	6.8	1.1%
Total Diverted Waste	***404.1***	***63.1%***
Total Waste (metric tons)	**640.3**	**100.0%**

Photo: Compostable waste generated from Fermilab's kitchen is separated and managed under Fermilab's municipal waste hauler contract.

Status

Fermilab has an established recycling program and actively seeks opportunities to expand the program. More than 445 tons of Fermilab's waste was diverted from landfills in FY 2018. This includes paper, plastic, and aluminum cans as well as scrap metal and other items such as alkaline batteries and polystyrene. Fermilab has an established compost program for kitchen scraps that diverted 2.82 tons of scraps to an offsite composting facility. In FY 2018, Fermilab dropped its use of polystyrene in the cafeteria by deploying disposable food containers made with organic fiberboard material.

The trash and recycling hauling contract for non-hazardous municipal waste was renewed in August 2018. The new contract includes composting hauling services, provisions for additional education of recycling methods, and an expectation for routine meetings between Fermilab staff and the hauling contractor to improve Fermilab's waste diversion rates.

Plans

Fermilab will continue to build aggressive waste minimization programs, including recycling and compost collection in the cafeteria. New signage will be deployed in FY 2019 in the cafeteria to assist in refuse sorting. Fermilab is working with the cafeteria contractor to explore more environmentally-friendly take-out containers. The first meeting between Fermilab and the new waste hauling company included a tour of the waste transfer station Fermilab's waste is taken to before heading to recycling and landfill facilities. New signage and bins and participation in Fermilab's Earth Day Fair were discussed. A small ad hoc group has been meeting to

develop a Waste Management Tracking Database to simplify and standardize data collection for all types of non-hazardous waste; expected to be online mid-2019.

Construction & Demolition Waste Diversion

Construction & Demolition Diversion
Goal: Divert at least 50 percent of construction and demolition materials and debris
Interim Target (FY 2018): 50.0 %
Current Performance: 89%

	FY 2018	%
Landfilled C&D Waste	45.9	11.4%
Diverted C&D Waste	355.9	88.6%
Total C&D Waste (metric tons)	**401.8**	**100.0%**

Photo: Waste generated by the demolition of trailers and other infrastructure was recycled to make way for the construction of the Industrial Center Building Addition project.

Status

Fermilab requires contractors to recycle construction and demolition waste. The volume of waste recycled in any year is dependent on the construction activities occurring onsite. Fermilab is meeting the interim and final construction and demolition waste diversion goal.

Plans

Fermilab will continue to require contractors to recycle construction and demolition debris from both construction and renovation projects.

Fleet Management

Fuel use data/ scorecards not included due to unavailability of DOE Sustainability Dashboard data

Fleet Management Strategies

Status

Fermilab continues to increase the number of vehicles utilizing telematics. In FY 2018 the laboratory increased the number of vehicles equipped with telematics from 13 to 23. The laboratory is able to review data logs to monitor usage and to review mileage, routes, idle time, speed, and other data to support fuel efficiency and utilization analyses. Fermilab proposed a modified method for calculating Local Use Objectives using telematics data (number of trips vs mileage).

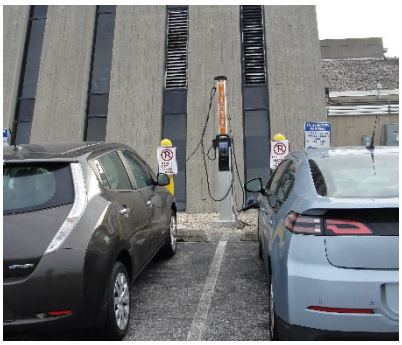


Photo: Fermilab maintains a fleet of low-emission and alternative fueled vehicles including plug-in hybrid vehicles which use onsite charging to minimize fuel use.

Fermilab replaces older, less efficient vehicles with newer, fuel-efficient vehicles. When possible, Fermilab selects alternative fuel or plug-in hybrid vehicles. The Fermilab fleet consists largely of light trucks. Electric and hybrid versions of the light truck category are not yet widely available. However, over half of Fermilab's fleet of 195 vehicles use E85 fuel. Over 40 more vehicles use biodiesel fuel. Fermilab continues to use its electric vehicle charging stations to serve both fleet vehicles and charging for employee vehicles.

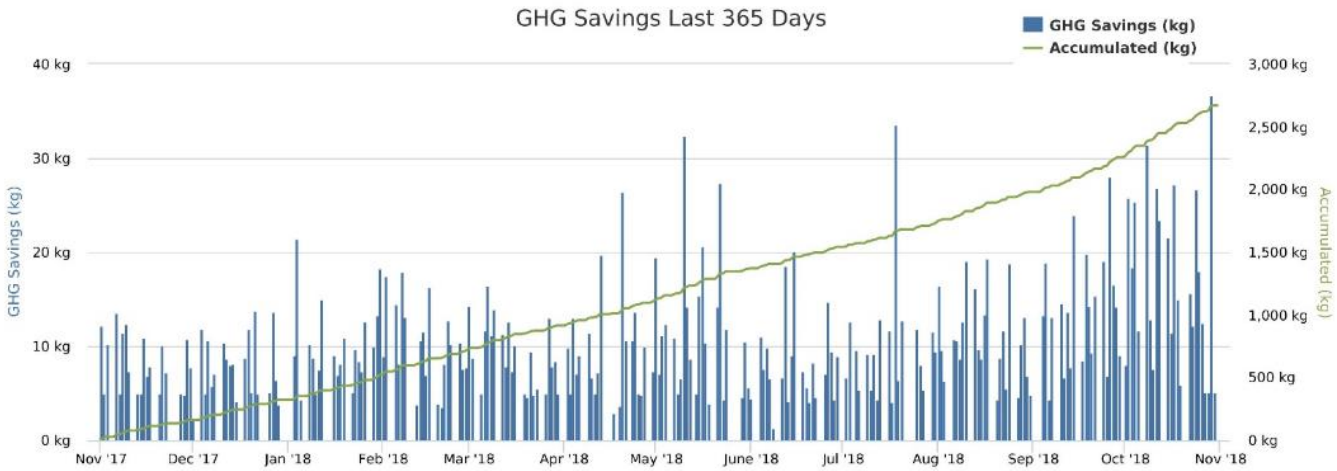


Figure: GHG savings associated with the use of Fermilab's Chargepoint electric vehicle charging stations, FY 2018

The Fermilab fleet was supplemented in FY 2018 with a laboratory bicycle sharing program. Bicycles were purchased by the laboratory and deployed to multiple locations. The bicycles are equipped with location tracking hardware. To access the bicycles, users first download a smartphone app and then select a bicycle and unlock using the app. The bicycle sharing program is in its first year of deployment.

Plans

Fermilab will continue to consider fuel efficient and alternative fuel vehicles including plug-in electric and hybrids when procuring vehicles in FY 2019. If additional plug-in vehicles are procured, the laboratory will consider installing more electric vehicle charging

stations. Electric vehicle charging stations will also be deployed, where possible, in new construction or significant redevelopment projects.

Although the timeline for the procurement of renewable diesel is unknown, Fermilab will continue to pursue a project to first demonstrate then deploy renewable diesel to replace the laboratory's current biodiesel product.

Finally, as Fermilab central campus projects pick up in FY 2019 and beyond, parking in the central campus will become limited for stretches of time when construction projects displace parking. Fermilab launched a parking task force in FY 2018 to address current and anticipated current parking challenges in the central campus. The laboratory is contemplating and planning for the potential to use Fermilab's bus fleet to run fixed route, on-site shuttle service in addition to the current on-demand taxi program.

Clean & Renewable Energy

Renewable Energy

Renewable Electricity

Goal: By FY 2025, use 30 percent renewable energy as a percentage of overall facility electricity use.
Interim Target (FY 2018): 15 %

Current Performance: 19%

	FY 2018 Electricity Consumption	FY 2018 Renewable Electricity w/ Bonuses	% of Total
Grid Electricity	286,655	0.00	N/A
On-Site Renewable Energy	794	1,587	0.6%
Purchased Green Electricity	0	0.00	N/A
Renewable Energy Certificates	N/A	54,000	18.8%
Total (MWh)	**287,449**	**55,587**	**19.3%**

The Village Crier

fermi national accelerator laboratory

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SOLAR HEATING COMES TO FERMILAB

The Fermilab Solar Energy Club christened its first solar energy heating system on Wednesday, January 28 -- a bright, cold, sun-filled day in Illinois. Two-hour operation on the succeeding days successfully demonstrated that the system is ready to convert the energy of the sun to comfort heat for a Fermilab resident.

The Solar Energy Club is a group of Fermilab employees who have worked as a volunteer group since the fall of 1974 in design and construct a solar energy heating system for an existing residence on Sauk Circle in the Fermilab Village. Working evenings and Saturdays to complete the project, the dedicated researchers are now watching their self-made system accumulate data on the use of solar energy in northern Illinois.

Photo: Fermilab has historically been at the forefront of practical, scientific solutions to site needs. Here, in 1976, the first residential solar collector was deployed to heat a home in the Fermilab village.

Status

Fermilab produced the equivalent of approximately 6 MWH/year of clean energy in FY 2018. The Office, Technical, and Education building (FIMS 328) is heated and cooled by a geothermal well network and exceeded its design output of 2,015.5 MMBTU per year with an output of 2,708 MMBTU. Renewable electric energy produced on site amounted to approximately 6 MWH in FY 2018. Fermilab purchased 54,000 MWH of renewable energy credits (RECs) in FY 2018, equivalent to 17% of the site's total annual electric energy consumption.

Plans

Solar photovoltaic, solar hot water heating, and other clean and renewable systems are regularly considered in all construction assessments, but due to Fermilab's very low energy utility rates, are a challenge to justify on cost effectiveness. Fermilab will continue purchasing RECs until cost effective opportunities for renewable power generation are identified.

Fermilab will continue to explore onsite renewable energy development opportunities in FY 2019. The laboratory is collecting industry data including state market environment, financing opportunities, and other regulatory and market-driven factors.

Green Buildings

Guiding Principles

High Performance Sustainable Buildings

Goal: Ensure 17 percent by building count comply with the Guiding Principles for sustainable buildings by FY 2025.
Interim Target (FY 2018): 15.3 %

Current Performance: 6.8%

	Building Count	GSF
Guiding Principles Certified	7	127,621
Total Applicable*	103	2,068,187
Performance (%)	**6.80%**	**6.17%**

* Applicable means buildings and trailers that are DOE owned or DOE leased where the gross/rentable SqFt is greater than 5,000.

Photo: The break room at the Illinois Accelerator Research Center, a LEED Gold (HPSB) facility, with natural area out one window and a green roof out the other.

Status

In FY 2018, Fermilab assessed existing buildings to identify potential candidates for which to pursue high performance sustainable building (HPSB) guiding principle compliance. Fermilab selected three potential candidates by focusing on the energy efficiency goal, considered to be the hardest guiding principle to meet. The first facility, the Training Center (FIMS 522), which has an end-of-life HVAC system, was evaluated first by comparing building energy model results to an ASHRAE 90.1 2016 baseline. The system replacement would use industrial cooling water for heat rejection, resulting in a 30% better than ASHRAE 90.1-2016 baseline.

Fermilab identified 6 buildings which are now considered 'not applicable' under the Federal Real Property Profile (FRPP) sustainability field, in accordance with the new FRPP guidance. These facilities include barns (Sites 49, 70, 52, 3, Magnet Storage, and Anderson Barn) and 1 building that was demolished in FY 2018 (Site 56 Shed). These buildings meet the low energy usage criteria, no occupancy, and low or no water usage. Once the FRPP data are updated, this will reduce the base eligible building list from 103 to 96 and will result in an increase to 7.3% facilities meeting High Performance Sustainable Building guiding principles.

Table: HPSB Compliant Facility List, Including Projections

Facility Name	FIMS Property ID	Sq Ft	Date HPSB GPs Achieved
HDCF – Grid Computing Center – WBL Ctg House	628	16925	2014
Office, Technical and Education (OTE)	328	47300	2014
Site 37 Roads and Grounds Shop	921	17500	2015
MC-1	209	14881	2017
MC-2	270	11000	2017
SBN – Far Detector Bldg	788	14775	2017
SBN – Near Detector Bldg	789	5240	2017
Projected			
ICB-A	802	14000	2020+
Training Center	522	9565	2020+
IB3-A	808	14670	2020+
D0- PPD office	326	10483	2020+
PIP II Cryo Building (new)	TBD	TBD	2020+
IERC (new)	TBD	TBD	2020+

Plans

In FY 2019, the same energy assessment or modeling effort will be performed for two additional facilities, currently chosen as Industrial Building 3-Addition (IB3-A) and The Particle Physics Division's D-Zero office building (D0 PPD). Additionally, in FY 2019, the Industrial Center Building-Addition (ICB-A) (under construction) will be 70% compliant with HPSB guiding principles after the design stage and is expected to be 100% compliant with guiding principles by the end of construction commissioning before the end of FY2019.

The engineering design guide and procedure includes the requirement for providing energy modeling to show 30% better than ASHRAE baseline, for new building over 5,000 gsf. The submittal of the energy model is included as part of the typical 60% design submittal. Fermilab is updating the lab's engineering design guide's sustainability section to incorporate climate-resilient design and management elements into the design of applicable new or retrofitted buildings.

There are no existing buildings or planned new construction identified for Net Zero energy. The Campus Master plan noted that the GAC (Global Accelerator Center), known alternately as the Accelerator Science and Technology Center (ASTC), may be the first non-process building to be designed to Net Zero Energy.

New Building Design

Status

IERC, which achieved CD-1 in FY 2017, is currently at approximately 25% HPSB guiding principle compliance using existing lab policies. The project will track, evaluate, and update the guiding principle list during the project's design stage. The laboratory expects IERC to be at least 70% compliant at the end of final design and at full compliance at the end of construction.

Photo: Plans for the Integrated Engineering Research Center (IERC) include meeting high performance sustainable building guiding principles.

The Cryo building for the PIP-II project, which is slated for preliminary design in FY 2019, is approximately 15% compliant with HPSB guiding principles. The challenge for a process building such as this is meeting the building energy efficiency goal. The project will be exploring whether rejected process heat can be used for outdoor air preheat.

Plans

All new buildings that meet square foot threshold for HPSB eligibility will be designed to meet the HPSB guiding principles and the 30% building energy over ASHRAE 90.1 baseline. Fermilab has a procedure in place, as well as updated design guides, and design reviews to ensure the HPSB guiding principles are met.

Fermilab is working towards consolidating building design documents such as the engineering design procedures and design guide into a Fermilab Facilities Manual. Engineering design guides are continually updated to include sustainability requirements.

Acquisition & Procurement

Sustainable Acquisition

Goal: Ensure 95 percent of new contract actions for products and services meet sustainable acquisition requirements
Interim Target (FY 2018): 95.0 %

Current Performance: 100%

	Contracts Reviewed	Contracts Without Opportunity	Contracts Meeting All Requirements	%
Number of Contracts	337	0	337	100.0%

Status

In FY 2018 Fermilab applied sustainable acquisition requirements to procurement policies and practices. Fermilab continues to expand the use of eMarketplace, an electronic catalog system for procurement of common use items. Use of the system continues to reduce the amount of paper requisitions and allows employees to place orders from the point of need, helping to streamline procurement practices.

Plans

In FY 2019 Fermilab will explore opportunities for sustainable acquisition improvements.

Measurements, Funding & Training

Status

Over the last 17 years, Fermilab has completed 6 utility energy service contracts (UESCs, formerly called UIP) and energy savings performance contracts (ESPCs) valued at nearly $60 million. In 2014, Fermilab conducted an investment grade audit, but a viable ESPC project was not pursued. Measurement and verification (M&V) is performed annually by Ameresco for a 15-year ESPC begun in 2011. The M&V reports verify that the projected energy savings are all being met. The ESPC included a new central plant boiler, various lighting upgrades, and disconnection of unused transformers.

In FY 2018, Fermilab participated in the DOE Facilities and Infrastructure Restoration and Modernization Program (FIRM). The program offers an assessment of the potential for conducting "deep energy efficiency retrofits" on a campus and an analysis of the potential for using financing mechanisms (UESC, ESPC, etc.) to complete the work. The National Renewable Energy Laboratory (NREL) visited Fermilab in first quarter FY 2018. Fermilab is evaluating performance contracting to see if using these contracts will benefit the laboratory.

Finally, in FY 2018 Fermilab funded sustainability initiatives through payments to a UESC contract and renewable energy credit procurements.

Table: Fermilab Sustainability Funding and Projections, FY 2018 – FY 2021

Summary of Sustainability Funding ($K)				
Category	FY18 Actual	FY19 Planned/ Requested	FY20 Projected	FY21 Projected
Sustainability Projects	0.0	0.0	0.0	0.0
Sustainability Activities other than projects	0.0	0.0	0.0	0.0
SPO Funded Projects (SPO funding portion only)	0.0	0.0	0.0	0.0
Site Contribution to SPO Funded Project	0.0	0.0	0.0	0.0
ESPC/UESC Contract Payments	196.6	206.3	216.4	226.2
Renewable Energy Credits (REC) Purchase Costs	42.7	56.9	78.2	78.2
Total	239.3	263.2	294.6	304.4

Plans

Fermilab will continue to assess future opportunities including technology specific measures. Recent state legislation has removed Fermilab and other high energy-consuming customers from its public energy efficiency incentive program. However, Nicor, the local natural gas utility, has recently begun offering rebates and energy audits for its high gas use customers. Fermilab will investigate these program offerings and will participate in them if it will help to achieve its goals.

Fermilab is also investigating the development of an in-house program to reinvest and incentivize energy efficiency projects. The laboratory is benchmarking with other facilities to identify best practices and developing a coordinated approach to enhancing Fermilab's energy management program.

Fermilab conducted a thorough exercise in 2013 to ensure requirements of the 2010 Federal Buildings Personnel Training Act were met. At the time, no gaps in competencies were identified. In FY 2019 Fermilab will review the requirements in light of new staff capabilities and training to identify any additional training or expertise needed to continue to meet FBPTA requirements.

Travel & Commuting

Status

Emissions associated with commuting show an increase in FY 2018. This change can be at least partly attributed to a change in the method used to describe Fermilab's employee population. Beginning this year, employee population count is based on occupant data used in DOE's Facilities Infrastructure Management System (FIMS). FIMS data is now being used to standardize reporting across DOE reporting elements. This number is marginally higher that previous methods used.

Emissions associated with airline travel have increased over the past several years. The increase has been in medium haul flights and can be attributed primarily to the increase in support of the Deep Underground Neutrino Experiment to be located in the Sanford Underground Research Facility in Lead, South Dakota. Fermilab expects this travel to continue for the foreseeable future.

Photo: Two bicycle fix-it stations were procured in FY 2018. These stations will encourage bicycle commuters by offering a method to perform quick fixes on bicycles onsite.

A new bicycle sharing program was initiated in the spring of 2018. The program complements a long-standing bike share program available only to residents of the Fermilab Village. The new program expands bike sharing across the site with the installation of bike stations at seven major hub locations. Bikes are free to use by laboratory personal and can be accessed via a smartphone app.

Plans

The new bike share program has been widely popular with laboratory staff and the Global Services Group anticipates an expansion of the program in the spring of 2019. Evaluations are currently underway to determine where new bike racks will be placed and the number of bicycles to add to best optimize the expansion.

New building design for the Integrated Engineering Research Center (IERC) and the Proton Improvement Plan project (PIP-II) include opportunities to expand Fermilab's electric vehicle charging station infrastructure. New stations would be made available for personal vehicle charging via ChargePoint's fee-based system (third party vendor) similar to existing chargers.

Fugitives & Refrigerants

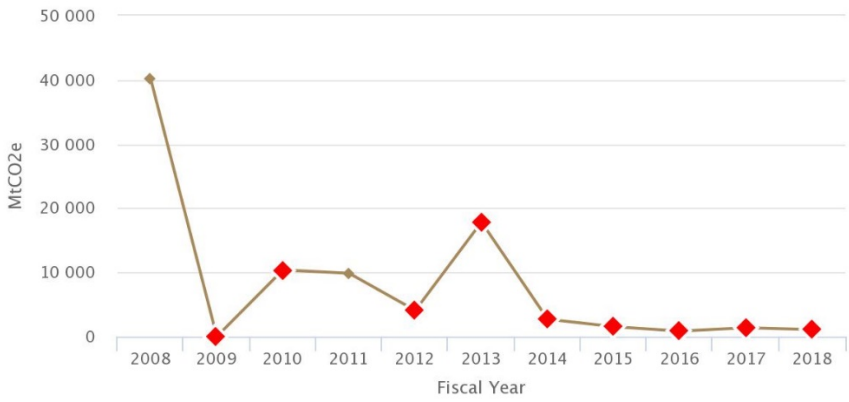

Figure: Fugitives and Refrigerants Emissions, MtCO2e, 2008-2018

Photo: Data center cooling units on the roof of Feynman Commuting Center, part of the inventory of equipment using refrigerants monitored by the site refrigerant management team.

Status

Fugitive emissions continue to trend lower and are well below 2008 baseline releases. Fermilab uses an in-house refrigerant management system based on regulatory refrigerant use protocols to minimize losses. This centralized system uses a database based on refrigerant mass balance accounting to track the use (and release) of refrigerants used across the site. Fermilab uses very little sulfur hexafluoride (SF_6), and inventories are managed by groups who use it.

Plans

In 2019, Fermilab will provide enhanced third-party training to laboratory staff involved with the management of refrigerants. The training will involve a review of relevant regulations, including a focus on recent changes, data management and reporting, guidance on self-assessing the program, and lessons learned from different industries. Members of the Logistics and Property Control Group (LPC) and the Environmental Protection Group will participate to ensure an understanding of the requirements from both a compliance and reporting standpoint as well as from operations. Additionally, two members of LPC will receive Refrigerant Compliance Manager certification. The CRCM designation is a professional credential that recognizes an individual's competence for managing refrigerant compliance within an organization.

Electronic Stewardship

Electronics Acquisition

Goal: 100 percent of eligible electronics procurements must be environmentally sustainable (e.g. EPEAT)
Interim Target (FY 2018): 95.0 %

Current Performance: 99%

	EPEAT Acquired	Total Acquired	%
Monitors	289	290	99.7%
Computers	500	500	100.0%
Imaging Equipment	1	1	100.0%
Televisions	11	11	100.0%
Total Acquired	**867**	**876**	**99.0%**

Electronics Recycling

Goal: Dispose of 100 percent of electronics through government programs and certified recyclers
Interim Target (FY 2018): 100.0 %

Current Performance: 100%

	Amount	%
Transferred or Donated	0.000	0.0%
Recycled by Certified Recycler	23.115	100.0%
Recycled by non-Certified Recycler	0.000	0.0%
Amount disposed (e.g. landfill)	0.000	0.0%
Total Electronics Waste (metric tons)	**23.115**	**100.0%**

Power Management

Goal: Implement and actively use power management features on 100 percent of eligible computers (PCs & laptops) and monitors
Interim Target (FY 2018): 100.0 %

Current Performance: 96%

	Total Owned	PM Enabled	Exempt	%
Monitors	0	0	0	N/A
Computers	5,258	3,822	1,256	95.5%
Total Items	**5,258**	**3,822**	**1,256**	**95.5%**

Duplex Printing

Goal: Implement and actively use duplex printing features of 100 percent of eligible printers
Interim Target (FY 2018): 100.0 %

Current Performance: 100%

	Total Owned	Duplex Enabled	Incapable	%
Total Printers	**281**	**277**	**4**	**100.0%**

Status

Fermilab is committed to meeting the prescribed federal acquisition goals for electronic assets by purchasing qualified computing equipment which meet the Electronic Product Environmental Assessment Tool (EPEAT) registration requirements. Requisitioners must provide justification for any acquisitions that are not EPEAT registered. These justifications must be reviewed and approved by a designated approver. Purchases that may cause the failure to meet these goals may be denied.

Fermilab requires that all eligible desktops and laptops be centrally managed. Central management systems enforce power management settings as defined in the respective operating system baseline.

A user must submit a Power Management Exemption request for any monitor, laptop or desktop that cannot meet the Power Management settings. That request will be reviewed to determine if the provided business case is sufficient. If approved, the device will be added to the appropriate power management exemption group.

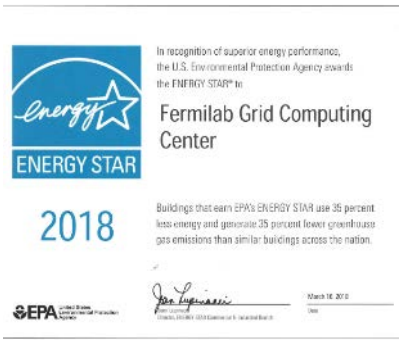

Photo: Fermilab was awarded the Energy Star award for the Grid Computing Center in each of the last eight consecutive years.

For the new Servers reporting category, 20 have Gold status, 4 Silver, 142 are EXEMPT and 6 of the total 30 servers acquired are status unknown, primarily because they were built from components by the vendor and did not have any EPEAT classification.

Fermilab lists all electronics on the federal General Services Administration (GSA) excess system that are condition code 1 (unused), 4 (used, working) or 7 (repairs required). If an asset does not get reused through the GSA excess system, it is disposed of by sending to a R2 recycler.

iCOM and Variable Speed Drive (VSD) Upgrade

The Feynman Computer Center second floor computer room holds eight 30 Ton Computer Room Air Conditioners (CRAC). In the Spring of 2018, smart controllers were configured, including sensors and VSD fans, which bring a projected $14K annual energy savings. This upgrade increases reliability and annual energy savings.

HEPCloud Project

Fermilab's Scientific Computing Division HEPCloud project has demonstrated the ability to burst into commercial cloud and High-Performance Computing (HPC) resources at a level matching the entirety of global resources allocated for the Compact Muon Solenoid (CMS) experiment. This year's effort has focused on using HEPCloud to increase the utilization of HPC facilities at the National Energy Research Scientific Computing Center (NERSC), executing scientific workflows for the Intensity Frontier NOvA experiment at scales orders of magnitude larger than resources available at Fermilab.

Plans

In FY 2019, Fermilab's data center efficiency is expected to improve based on the following projected activities. First, the power usage effectiveness (PUE) of the Feynman Computing Center is expected to continue to improve in the next year resulting from a cooling upgrade and ongoing cold aisle containment improvement. Second, the savings estimate for migrating workloads from the single purpose physical systems to virtual machines is more than $2.4M or about 85% over approximately 7 years.

Organizational Resilience

Status

In 2018 Fermilab integrated climate change resilience into the Campus Master Plan. The plan addresses a vison for Fermilab that will centralize, consolidate and modernize the facilities of the laboratory. The inclusion of a resilience element provides an opportunity for future laboratory planning to address risks associated with a changing climate.

Currently, new construction and major renovation projects are subject to high performance sustainable building (HPSB) review. This review includes a resiliency planning element that must be addressed for each project. A custom checklist ensures ongoing tracking of progress toward Guiding Principles compliance.

Photo: Fermilab's Campus Master Plan (2018) describes climate change resilience as an element of prioritizing and integrating sustainablity into campus planning.

Fermilab continued to improve operational resilience in 2018 through ongoing investments in a utilities upgrade project (UUP). Much of the work has involved upgrades and improvements to infrastructure associated with Fermilab's industrial cooling water system (ICW). Improvements to date are as follows.

- Construction of 4 miles of new ICW backbone piping ranging in size from 6" to 30" diameter pipe. Installed from Casey's Pond to Main Injector and includes new network Loop piping to improve working pressures and fire protection flows.
- A new standalone pump station for the Cryogenic Test Module Facility at Andy's Pond to reduce ICW demands on Casey's Pumphouse.
- Two new strainer vaults at Casey's Pond Pumphouse installed to improve efficiency in ICW flow control and monitoring.
- New Pump station at Swan Lake for more efficient return of water to ICW system.
- New Well 4 Pumphouse piping to improve means for adding makeup water to Swan Lake.
- Installation of Main Ring Pond A-0 makeup water piping. Used to return ICW flows from A-0 Pond back to Swan Lake and the Swan Lake Pump Station.
- Casey's Pond electrical room addition. New space provides for relocated power supplies for four (4) 100 horsepower pumps previously exposed to flooding during heavy rain events.
- Reconstruction of the Kidney Pond parking lot, including a complete reroute of stormwater piping to alleviate chronic flooding problems.

Plans

Fermilab intends to update its Engineering Design Guide to include an element to address climate resilient design. This would be applied to all applicable new or retrofitted buildings.

Executive Summary Table

Prior DOE Goal	Current Performance Status	2 Year Performance & Plans	5 Year Performance & Plans	10 Year Performance & Plans
Multiple Categories				
50% Scope 1 & 2 GHG emissions reduction by FY 2025 from a FY 2008 baseline.	67% reduction	Initiatives including the establishment of a utility reinvestment fund, investigations into onsite renewables (building-level or utility scale), and continued focus on procurement of alternative fueled vehicles will carry Fermilab's Scope 1 & 2 reduction trend in the next 10 years.		
Energy Management				
25% energy intensity (Btu per gross square foot) reduction in goal-subject buildings by FY 2025 from a FY 2015 baseline.	11% reduction	Fermilab will work to reduce energy intensity of goal-subject buildings; Fermilab will continue to work towards previously established DOE targets. The lab will implement measures described in this Site Sustainability Plan.		
EISA Section 432 continuous (4-year cycle) energy and water evaluations.	In compliance	In FY 2019 and beyond Fermilab will continue to work with State of Illinois -funded programs to pursue energy assessments and will		
Meter all individual buildings for electricity, natural gas, steam and water, where cost-effective and appropriate.	100% of new buildings are metered at the building level; Existing Bldgs 55% electricity 61% natural gas 7% water (no steam)	Previously Fermilab counted facilities metered by group feeder lines as 'individually metered.' Current data reflects only those metered at the unique facility location. Metering plan to implement meters at individual existing buildings as resources allow.		
Water Management				
36% potable water intensity (Gal per gross square foot) reduction by FY 2025 from a FY 2007 baseline.	48% reduction	Fermilab will continue to specify low-water use fixtures in new construction or remodeling projects. Ongoing potable water system utility repairs will also help continue the reduction of potable water use onsite.		
30% water consumption (Gal) reduction of industrial, landscaping, and agricultural (ILA) water by FY 2025 from a FY 2010 baseline.	19% increase *(metric is for makeup water only; gross total is unavailable as rainfall totals are not accounted for.)*	The makeup water which supplies Fermilab's site industrial cooling water will continue to fluctuate annually based on precipitation levels. However, Fermilab's overall ILA consumption (including precipitation-fed system) will continue to hold steady as repairs to branch lines continue.		
Waste Management				
Divert at least 50% of non-hazardous solid waste, excluding construction and demolition debris.	63% diversion	Fermilab will continue to meet and exceed the 50% diversion target, and overall totals may increase with continued focus on recyclable material excessing and expanding composting program.		
Divert at least 50% of construction and demolition materials and debris.	89% diversion	Onsite construction will continue to divert construction and demolition debris into reuse or recycling streams, and will yield continued success in meeting and exceeding the 50% diversion rate target.		
Fleet Management				
20% reduction in annual petroleum consumption by FY 2015 relative to a FY 2005 baseline; maintain 20% reduction thereafter.	*DATA NOT YET AVAILABLE IN DASHBOARD*	As electric and hybrid vehicle offerings grow, Fermilab's use of alternative fuels will continue to grow and offset petroleum consumption.		
10% increase in annual alternative fuel consumption by FY 2015 relative to a FY 2005 baseline; maintain 10% increase thereafter.	*DATA NOT YET AVAILABLE IN DASHBOARD*	As electric and hybrid vehicle offerings grow, Fermilab's use of alternative fuels will continue to increase relative to annual acquired vehicles.		
75% of light duty vehicle acquisitions must consist of alternative fuel vehicles (AFV).	*DATA NOT YET AVAILABLE IN DASHBOARD*	As electric and hybrid vehicle offerings grow, Fermilab's acquisition of AFVs will increase.		

Prior DOE Goal	Current Performance Status	2 Year Performance & Plans	5 Year Performance & Plans	10 Year Performance & Plans
Clean & Renewable Energy				
"Renewable Electric Energy" requires that renewable electric energy account for not less than 30% of a total agency electric consumption by FY 2025 and each year thereafter.	19% of consumption is renewables (from Renewable Energy Credits)	Fermilab will continue to purchase Renewable Energy Credits to meet renewable energy targets. The laboratory will also explore opportunities for building-level or utility-scale renewable installations in conjunction with other energy saving projects.		
Green Buildings				
At least 17% (by building count) of existing buildings greater than 5,000 gross square feet to be compliant with the *revised* Guiding Principles for HPSB by FY 2025, with progress to 100% thereafter.	6.8% meet High Performance Sustainable Building Criteria	New facilities in planning and design stages will be designed and constructed to meet HPSB guiding principles. Fermilab will also pursue projects to modify existing buildings to bring additional existing buildings into compliance with HPSB guiding principles.		
Acquisition & Procurement				
Promote sustainable acquisition and procurement to the maximum extent practicable, ensuring BioPreferred and biobased provisions and clauses are included in 95% of applicable contracts.	In Compliance	Fermilab will continue to include requirements for sustainable acquisition and procurement in contract terms, and will seek opportunities to improve opportunities for requisitioners to choose sustainable alternatives.		
Measures, Funding, & Training				
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.	Fermilab continues to consider opportunities for ESPC/UESC and other financing methods	In FY 2019 and beyond, Fermilab will continue to consider opportunities for ESPC/UESC and other financing methods to support sustainability performance in the areas of energy efficiency, high performance sustainable buildings, and renewable energy.		
Electronic Stewardship				
Purchases – 95% of eligible acquisitions each year are EPEAT-registered products.	99% EPEAT-registered	Fermilab will continue to procure only EPEAT-registered products, with granted exceptions only for products with no registered alternative.		
Power management – 100% of eligible PCs, laptops, and monitors have power management enabled.	96% enabled	Fermilab will continue to support labwide computing power management.		
Automatic duplexing – 100% of eligible computers and imaging equipment have automatic duplexing enabled.	100% enabled	Fermilab will continue to support and deploy automatic duplexing of all eligible computers and imaging equipment.		
End of Life – 100% of used electronics are reused or recycled using environmentally sound disposition options each year.	100% recycled or responsibly disposed	Fermilab will continue to dispose of all end of life electronics through certified reuse or recycling programs/facilities.		
Organizational Resilience				
Discuss overall integration of climate resilience in emergency response, workforce, and operations procedures and protocols.	Planning Underway	Fermilab will continue to develop methods for integrating climate resilience techniques into emergency response, site planning, facility development and renovation processes.		