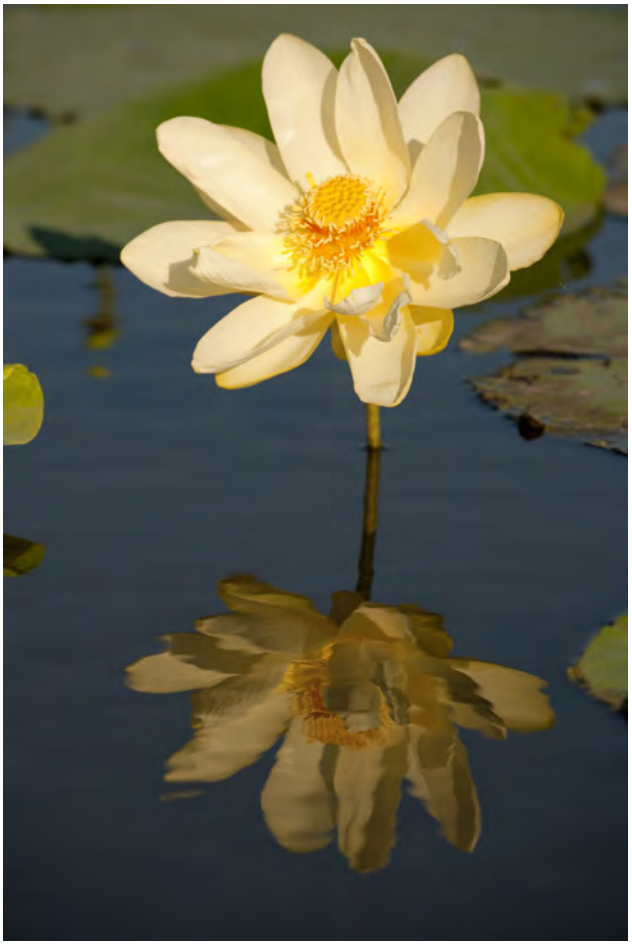
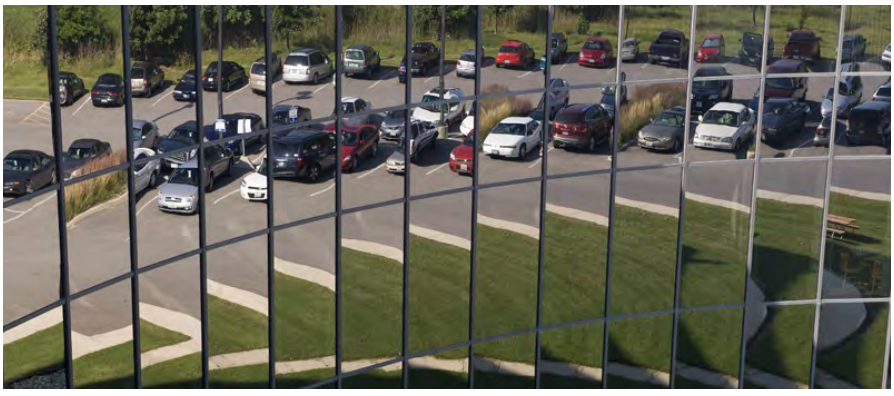
2013 Fermi National Accelerator Laboratory Site Sustainability Plan





Fermilab

U.S. DEPARTMENT OF ENERGY | Office of Science

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LIST OF ACRONYMS USED

AEE	Association of Electrical Engineers
AFV	Alternative Fuel Vehicle
ASHRAE	American Society of Heating, Refrigerating and Air-conditioning Engineers
BTU	British thermal Units
CEDR	Comprehensive Energy Data Report
CEM	Certified Energy Manager
CMS	Compact Muon Solenoid
CO2e	CO2 equivalent
ECM	Energy Conservation Measure
eGRID	Emissions & Generation Resource Integrated Database
EISA	Energy Independence and Security Act
ELM	Ecological Land Management
EPACT2005	Energy Policy Act of 2005
EPEAT	Electronic Product Environmental Assessment Tool
ESCo	Energy Savings Company
ESPC	Energy Savings Performance Contract
FESHM	Fermilab Environment, Safety and Health Manual
FIMS	Facility Information Management System
FSO	Fermi Site Office
GeV	Giga electron volt; Billion electron volts
GHG	Greenhouse gas
GSA/CFL	General Services Administration/Computers for Learning
HEMSF	High Energy Mission Specific Facility
HPSB	High Performance Sustainable Building
ICW	Industrial Cooling Water
IGA	Inter-governmental Agreement
ILA	Industrial, Landscaping and Agricultural (water)
IT	Information Technology
LBNE	Long Baseline Neutrino Experiment
LEED-NC	Leadership in Energy and Environmental Design – New Construction
LHC	Large Hadron Collider
M&V	Measurement and Verification
MINOS	Main Injector Neutrino Oscillation Search
NREL	National Renewable Energy Laboratory
NuMI	Neutrinos at the Main Injector
OSF	Other Sites and Facilities
OTE	Office, Technology and Education
PA	Preliminary Assessment
PM	Portfolio Manager
PUE	Power Usage Effectiveness
REC	renewable Energy Certificate
SA	Sustainable Acquisition
SCRF/CMTF	Super conducting Radio Frequency/Cryo Module Test Facility

SRI	Solar Reflectance Index
SSP	Site Sustainability Plan
SSPP	Strategic Sustainability Performance Plan
T&D	Transmission and Distribution
TeV	Tera electron volt; Trillion electron volts
UESC	Utility Energy Service Contract
UIP	Utility Improvement Project
UPS	Uninterruptable Power Supply
VM	Virtual Machine
WAMUS	Wide Angle Muon System
WUI	Water Use Intensity

I. Executive Summary

Fermi remains committed to our tradition of excellent environmental stewardship. The site is home to more than 1000 acres of restored tall grass prairie. Conservation of the site's forests, wetlands and surface water features is institutionalized in the Fermilab Ecological Land Management (ELM) Plan. Fermilab's land and water management practices minimize contamination of the environment, ensure the efficient use of resources to complete our science mission, and conserve biodiversity. By its very existence, Fermilab stands as a "green island" of open and natural land in a region dominated by industrial, commercial and residential development.

The surrounding communities recognize the Laboratory as a good neighbor, in part for this attitude toward the environment that we share with them. Because of the nature of Fermilab, our neighbors are afforded the opportunity to share the natural environment as well as other amenities like cultural events, lectures and learning opportunities. In this way, Fermilab is a leader and model in demonstrating sustainable practices and policies.

Fermilab's scientific community is naturally attracted to the challenge of carrying out the mission with less energy. However, since much of the technology used in the accelerator complex is unique, it is difficult to identify a benchmark against which to compare our efficiency data. Comparisons to historic power consumption data can be misleading, owing to changes in the science mission and the resulting volatility of electrical and thermal loads. Figure 10 in this report shows that Fermilab decreased our electrical energy use by over 47% in FY2012. However, that is due to a prolonged shutdown of the accelerator complex, demonstrated by the fact that energy use by the accelerator alone decreased by over 60%. That decrease is expected to continue into FY2013, but by FY2014, when full operation of the complex returns and as new High Energy, Mission Specific Facilities (HEMSFs) are introduced, we project even higher use of electrical energy to enable us to fulfill our high energy physics mission. Fermilab's strategic plan for research dictates that electrical energy usage is expected to increase by almost 17% over the next eight years when compared to the baseline year of 2008. In addition, single facilities may house equipment with dramatically different energy requirements from year to year as they are modified and re-purposed to meet scientific goals.

Nevertheless, over the course of Fermilab's history, we have consistently developed new technology to become more efficient. The Main Ring proton accelerator at Fermilab was replaced by the super-conducting Tevatron in 1983, which raised the beam energy available for physics from 400 GeV to 1 TeV using 50% less electrical energy. In 1999, the "recycler" anti-proton storage ring was constructed using permanent magnet technology to dramatically increase the availability of anti-protons at lower cost. Past experiments have been constructed using salvaged items from across the DOE complex. Current plans for the G minus 2 experiment include re-using a detector salvaged from Brookhaven National Laboratory instead of building a new one.

Planning and funding assumptions

As stated above, the mission of Fermilab is characterized by change. As new discoveries are made and understood by the scientific community, new questions emerge and new experiments are proposed, designed and built to provide answers to them. The current plan for the future at Fermilab is articulated in the publication titled "Fermilab: A Plan for Discovery 2011-2030" (Plan for Discovery). Since the transfer of most research at the "Energy Frontier" from Fermilab to the Large Hadron Collider at the European Organization for Nuclear Research (CERN), the emphasis of research has shifted to the Intensity and Cosmic Frontiers and to new projects in the coming decades that depend on much higher beam intensities.

Additional funding that may become available for projects specifically designed to meet the sustainability goals of DOE is less certain. Fermilab has had some success in the past using third-party financing (i.e., UIP, ESPC) to fund energy efficiency retrofits and utility upgrades. During FY2012, we initiated another comprehensive ESPC study to explore where retrofits could contribute to bringing existing buildings into compliance with the High Performance Sustainable Building (HPSB) Guiding Principles.

Fermilab is scheduled to begin receiving Science Laboratory Infrastructure funding in FY2013 to fund infrastructure upgrades that will have positive impacts on water and electrical energy efficiencies. Operating or general plant project funds may be used to improve operating efficiencies in existing buildings based on building assessments.

Successes and Challenges

Fermilab has always embraced the concept of stewardship of our resources, including the environmental resources. From the beginning, Fermilab has held to a philosophy of simplicity and economy of design for buildings and projects, using minimalist strategies to conserve all our resources.

Land and water management strategies and practice are models. Management of land includes restoring some portions to native ecosystems that were destroyed nearly 200 years ago, restoring the health of the land and increasing biodiversity dramatically. We have developed numerous land management strategies, utilizing agriculture, composting, and prescribed burning, to manage the site efficiently, safely and economically. Fermilab's Ecological Land Management Committee regularly advises Laboratory management on impacts of programmatic decisions on the natural landscape.

In Section 1.3, we discuss the dramatic reduction in fugitive emissions, notably SF_6. During the period from 2008 to 2012, Fermilab decreased total fugitive emissions of greenhouse gasses by over 81%. The reduction during FY2012 alone was over 54%. This is primarily the result of ending several experiments that were dependent on the Tevatron. A single piece of equipment, the Pelletron, accounted for 7800 pounds of SF_6 out of the total inventory of 9000 pounds. The challenge now will be finding a place to become the ultimate home for this gas.

Although northern Illinois has an abundance of fresh water available, water management, especially Industrial Cooling Water (ICW) is an important factor in managing the Laboratory. Experimental equipment demands large volumes of cooling water to dissipate high thermal loads. At Fermilab, we rely heavily on capturing and retaining rainwater in surface water features to provide adequate ICW. Water is retained and recycled many times before returning naturally through evaporation to the natural cycle. This practice minimizes the amount of water we are required to extract from external sources. We also supplement the ICW system by capturing and utilizing water from the underground MINOS (Main Injector Neutrino Oscillation Serch) facility that would otherwise run off the site. As a matter of policy, no treated potable water is used for agricultural or landscape uses at Fermilab.

Waste minimization and pollution prevention have been areas of active improvement at the Laboratory for more than two decades. We currently have developed a sitewide recycling program administered by our custodial sub-contractors, and as of FY2012, we are diverting over 63% of institutional waste from the landfill. Recycling of construction and demolition waste on the site is extremely successful. During FY2012, over 90% of this waste stream was diverted. We have operated a very successful scrap metal program for decades, which has recouped significant savings for the Laboratory over the years, and conserved tons of virgin metals.

In pursuit of energy efficiency, Fermilab has successfully utilized third party financing to leverage operating dollars. Between 1998 and 2001 five UESC (UIP) projects totaling $58M were completed, which resulted in significant improvements to Laboratory infrastructure and energy and water savings. During FY2011 a $3M ESPC project also funded a new high efficiency boiler in the Central Utility Building and numerous lighting retrofits, which are expected to result in significant energy savings in the future. The ongoing ESPC Preliminary Assessments will be evaluated during FY2013 to determine if there are additional measures that would result in efficiency gains for Fermilab.

These successes notwithstanding, many of the goals of Executive Orders 13423 and 13514 and the 2011 DOE Strategic Sustainability Performance Plan are problematic for a site whose mission dictates the use of large amounts of energy. The Fermilab SSP for FY2013 illustrates that more than 87% of our GHG emissions in FY2012 were due to electrical power purchases, and more than 60% of that power was used to operate High Energy Mission Specific Facilities that are necessary to produce scientific results (see Figure 1), even in a year in which many of the HEMSF facilities were in shutdown mode. Clearly, Fermilab cannot substantially reduce our emissions of greenhouse gasses (GHG) without incurring severe adverse impacts on our planned scientific mission for FY2020 and beyond.

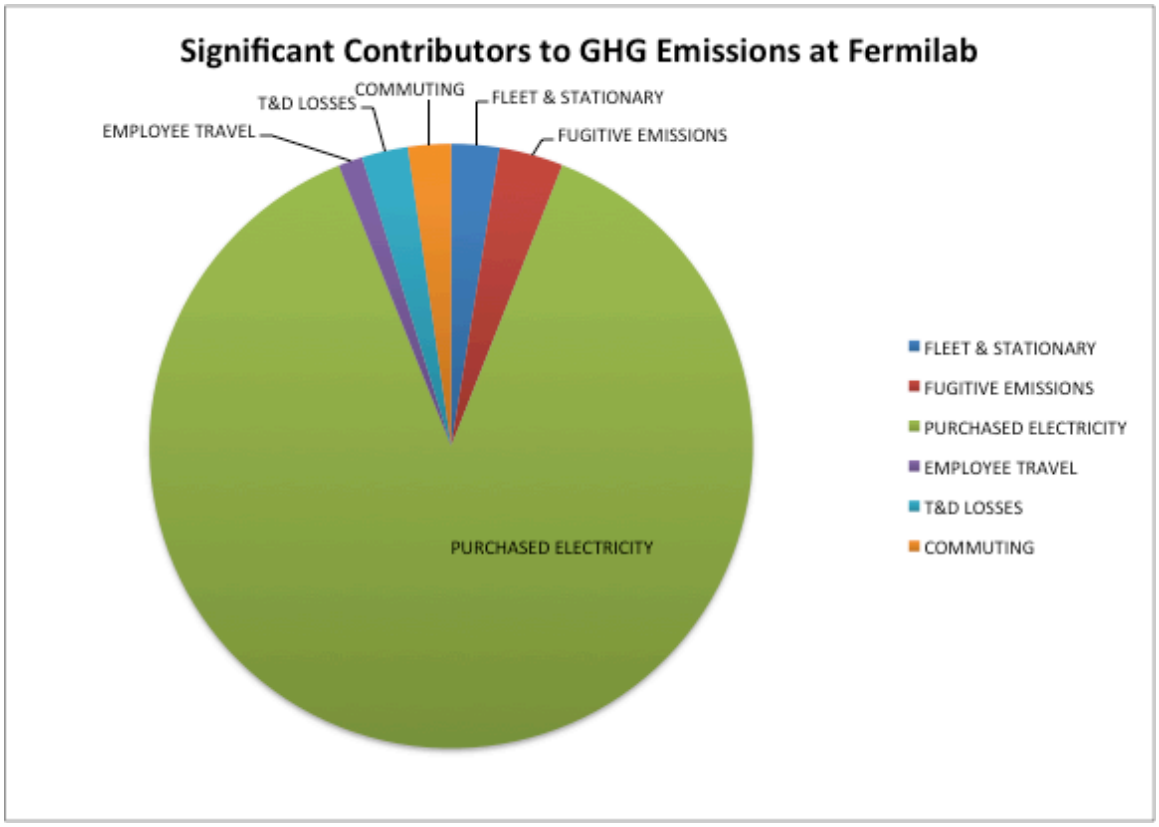


Figure 1. The majority of GHG emissions for which Fermilab is responsible are due to purchased electricity. Most of that is used in the accelerator complex and other HEMSFs to fulfill the high energy physics mission of the Laboratory.

Fermilab is currently dependent upon purchasing Renewable Energy Certificates (RECs) to offset our GHG emissions to meet the goal of a 28% reduction by FY2020 relative to FY2008. The purchase of RECs implies an actual reduction of GHG emissions nationwide, under the assumption that REC purchases have the effect of lowering the cost of producing renewable energy, toward the end of making it competitive with conventional energy generation. We are proposing to allow this method of mitigation for Scope 3 Transmission and Distribution (T&D) losses as well, as discussed in Section 1.9 of this plan. The current method of calculating these losses severely penalizes sites such as Fermilab by using national average T&D loss rates, which are nearly three times the actual rates as provided by our energy providers.

Fermilab supports the goal of making buildings energy efficient, comfortable, and safe as well as minimizing the use of non-renewable materials in their construction and maintenance. We are striving to find ways to upgrade 15% of our existing buildings with more than 5000 sq.ft. floor area as required by the Department of Energy (DOE) Strategic Sustainability Performance Plan (SSPP), using the Guiding Principles as a guideline. Achieving this goal by FY2015 will be a severe challenge, on both budget and other resources. As stated in Section 2.1a, we expect to be able to use the ESPC vehicle to finance some of the necessary modifications to existing buildings on the site if they are cost-effective.

We are currently planning the construction of the Office Technical and Education (OTE) facility as a LEED-NC Gold building, following previous DOE guidance on new buildings. For other projects planned for construction in the future, we intend to utilize the "Guiding Principles for High Performance and Sustainable Buildings" as the standard. While there are characteristics of our site and facilities that present difficult challenges, we believe that our proposals fulfill the spirit of the program to reach sustainability for DOE and the federal government as a whole.

II. Performance Review and Plan Narrative

GOAL 1: Greenhouse Gas Reduction and Comprehensive Greenhouse Gas Inventory

1.1 30% energy intensity (Btu per gross square foot) reduction by FY 2015 from a FY 2003 baseline

Performance Status
Fermilab's current energy intensity of 88,048 BTU/gsf is a 31.5% reduction from the corrected 2003 baseline of 128,599 BTU/gsf as shown on Tab 1.2 of the Comprehensive Energy Data Report (CEDR). This exceeds the entire 2015 goal of 30% outlined in the guidance for FY 2013 DOE Site Sustainability Plans. The baseline energy intensity for FY 2003 was corrected to 128,599 BTU/gsf by prior agreement with DOE to transfer electrical loads from the Excluded category to the Buildings category for facilities that were metered for the first time last year. This had a negative effect on Fermilab's energy intensity reduction reported last year, reducing it from 19.6% to 18.2%. However, in spite of this, a mild winter combined with attrition of Laboratory personnel and diminished activities with the shutdown of the Tevatron accelerator contributed to the large reduction seen this year.

Plans, Actions, and Projected Performance
Fermilab has worked with DOE to select an ESCo for its new ESPC initiative and has initiated Preliminary Assessments (PAs) of all its facilities looking for energy and water conservation measures (ECMs), including retro-commissioning opportunities. This includes a review of controls set points, setbacks, lighting, and metering. Opportunities to capture Operations & Maintenance savings and reduce deferred maintenance while increasing energy efficiency are also being evaluated to help amortize the ESPC contract debt.

Fermilab optimizes reduced fossil fuel usage in its new building designs, per the Energy Independence and Security Act (EISA) Section 433, through assessing fuel substitution, renewable energy opportunities, greater equipment efficiencies, and controls strategies.

Fermilab's site specific measurable goal for FY 2013 is to complete the review of the ESPC PAs and make recommendations to DOE regarding the initiation of Investment Grade Audits (IGAs) toward implementation of an ESPC contract.

Barriers
Current uncertainty over future Laboratory programs limits the investment potential of the ESPC ECMs identified.

1.2 7.5% of annual electricity consumption from renewable sources by FY 2013 and thereafter (5% FY 2010 – 2012)

Performance Status
Renewable energy produced on site currently amounts to less than 5 MWH/year as listed in Tab 3.2a of the CEDR. At this time no further economically viable renewable energy production opportunities on site have been identified.

Fermilab's new ESPC initiative has initiated PAs of all its facilities looking for cost effective renewable energy opportunities. This will also fulfill the DOE 4-Year Cycle requirement to perform site wide renewable energy evaluations, replacing a 2008 study of renewable energy opportunities at Fermilab carried out by DOE's National Renewable Energy Laboratory (NREL).

In lieu of onsite renewable energy generation, Fermilab purchased RECs in FY 2012 equivalent to 12.1% of the site's total annual electric and thermal energy consumption this year, as documented in Tab 3.2b of the CEDR. The goal requirement was exceeded due to operational uncertainties during the year impacting GHG goals.

Plans, Actions, and Projected Performance
Fermilab will continue purchasing RECs to meet the DOE goals each year, until cost effective opportunities for renewable power generation are identified as new technologies develop. Planned future procurement of RECs to cover each year's GHG requirement will concurrently cover the percentages required under this goal.

The application of renewable energy systems is considered in all new construction, and opportunities to augment this through an ESPC are being developed under the PAs currently being carried out on site. Solar hot water heating is regularly evaluated, but is difficult to implement cost effectively due to the potential for freezing in the site's climate zone.

Fermilab's site specific measurable goal for FY2013 will be the purchase of RECs equivalent to a 17% reduction of Scope 1 and 2 GHG emissions from a FY2008 baseline, and to complete the review of the ESPC PAs and make recommendations to DOE regarding the initiation of IGAs toward implementation of an ESPC contract.

Barriers
There are currently no barriers to using RECs to achieve Fermilab's renewable energy goals, in the absence of cost effective renewable energy opportunities.

1.3 SF_6 Reduction

Performance Status

The current inventory of sulfur hexafluoride (SF_6) in the accelerator complex is approximately 9,000 pounds, distributed among 10 locations. This is a more accurate inventory than in the past. But the most significant volume of SF_6 continues to be the 6 MV Pelletron electrostatic accelerator, associated with the Main Injector/Recycler and the study of high-energy physics at the Tevatron. The Pelletron accounts for approximately 7800 lbs of SF_6.

The Pelletron run ended with the Tevatron's and was shut down on September 30, 2011. The SF_6 was transferred to the storage tank (see Figure 2) on December 6, 2011, and remained there throughout the year. Approximately 100 lbs. of SF_6 was inadvertently released during the transfer. No other leaks occurred during the year.

Figure 2. The SF_6 Storage Tank located at MI-31 Service building. The tank holds the entire 7800 pound inventory of SF_6 that was previously contained in the Pelletron.

The balance of SF_6 at Fermilab is located in various, relatively small applications. Some accelerator components and test equipment contain SF_6, such as power supplies, radio frequency equipment, and the Cockroft-Walton pre-accelerators. The majority of this equipment does not leak SF_6. However, test equipment for research and development at the A-Zero PhotoInjector and the New Muon Lab RF Test Window released some SF_6 throughout the year. A total of 184 pounds of SF_6 was released from these two apparatus.

A relatively minor amount of SF_6 at Fermilab is located in various pieces of high voltage electrical distribution equipment. There have been no losses of SF_6 from these sources.

Procurement documents indicate the purchase of 345 lb. of SF_6 during FY2012. GHG emissions due to SF_6 are reported at Tab 6.2 of the CEDR. Calculations were made using the simplified material balance approach resulting in a loss of 184 lb. The remaining gas is in storage or remains in equipment. Added to the Pelletron releases, the total SF_6 emission at Fermilab was 284 lb., which is somewhat less than last year's emissions, but considerably less than the baseline emissions of over 1,100 lbs.

Fugitive GHG emissions other than SF_6 in FY2012 were much less than those reported in FY2011. The dramatic reductions in emissions were primarily due to the decommissioning of two sources in December 2011, the Wide Angle Muon System (WAMUS) and Muon Drift Tube projects. These two projects accounted for large emissions of CH_4 and CF_4 in previous years because the gas systems were "once through" without any type of capturing system.

Plans, Actions, and Projected Performance

Since the shutdown of the Tevatron in 2011, the Pelletron is no longer needed, and is being decommissioned. As stated previously, the SF_6 from the Pelletron has been contained in the storage tank throughout the year. Fermilab's procurement staff is currently searching for a party to take possession of the SF_6, and we expect to be able to ship it off site in FY2013.

After 40 years of operation, the Cockroft-Walton Pre-Accelerators (called I^- and H^-) were shut down. The I^- source was decommissioned in FY2012. The H^- source will be decommissioned in FY2013. During FY2012, the Accelerator Division purchased a Dilo SF_6 Gas Recovery System (see Figures 3 & 4). The recovery system will be used to recover SF_6 from equipment for maintenance, repair and decommissioning. Approximately ten pounds of SF_6 were recovered from the I- source in August 2012. Other small sources will be decommissioned in the near future including thirty power supplies associated with the operation of the Tevatron, which hold approximately eight pounds of SF_6 each. The Dilo system will be used to recover the gas from those power supplies as well as other specialized Tevatron power supply systems. All of the recovered gas will be sent to a vendor for reclamation or disposal.

Figure 3. Dilo SF_6 Recovery Cart purchased to recycle SF6 and minimize releases.

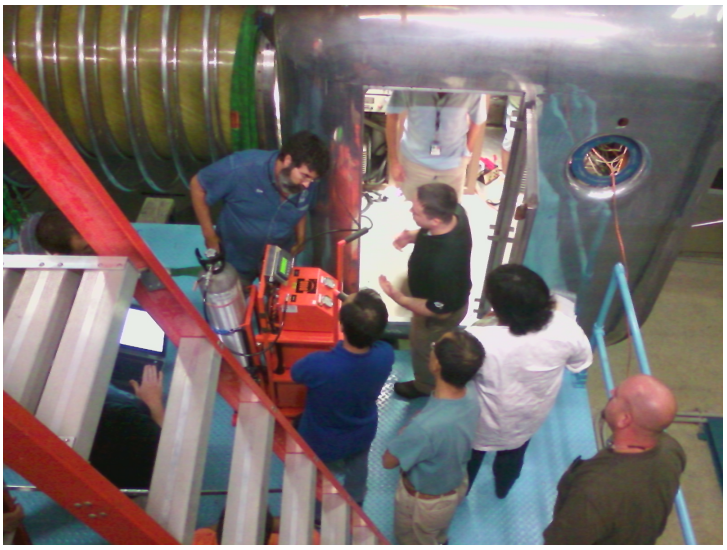


Figure 4. Fermilab's Accelerator Division employees recovering SF_6 from the Cockroft-Walton Ι Pre-Accelerator (August 2012)

After the decommissioning and recovery of SF_6 from equipment associated with the Tevatron, Fermilab's SF_6 inventory will be relatively small, about 1,200 lbs. Management of the remaining SF_6 on site for these projects will consist of tracking purchases needed to make-up losses. Any losses will be investigated and leaks repaired. In addition, applications in which SF_6 is used will be monitored to ensure that any leaks will be detected in a timely manner.

Barriers

The main barrier encountered for SF_6 inventory reduction in FY2012 was procedural. Fermilab's property manager posted the gas on DOE's excess list to receive a release for local disbursement from GSA. No inquiries were made, and GSA released the SF_6 to Fermilab for sale in March 2012. Accelerator Division personnel worked with a number of vendors to sell the Pelletron gas. Only Polar Technologies could offer money for the gas after considerations of shipping and purification. In May 2012 Polar Technologies offered to take ~7,800 lbs. of SF6 for $2,710. This arrangement is expected to be finalized in FY 2013.

An additional barrier to Fermilab's SF_6 inventory reduction effort is lack of personnel to recover the gas from decommissioned systems. The AD Mechanical Support Group will make every effort to remove gas from decommissioned equipment as resources and time allow.

1.4 Individual buildings metered for 90% of electricity (by October 1, 2012; for 90% of steam and natural gas by October 1, 2015 and for chilled water (recommended - not required) by October 1, 2015.

Performance Status

Fermilab has completed the metering of 100% of all electric power and natural gas at the individual building or process level where cost effective, as required under the Energy Policy Act of 2005 (EPACT), thus completing the implementation of the site's Metering Plan by the October 1, 2012 target date. As outlined in the site plan, these meters are used for energy diagnostics, emergency response, and planning and reporting. They have also been used each year to allow the site to participate effectively in power curtailment programs that have reduced electric costs by significant amounts.

Fermilab's electricity metering at the building/process level dropped to 82.8% of total site power usage, as shown on Tab 1.2 of the CEDR, due to a combination of the Tevatron accelerator being terminated, unexpected redirection of Fermilab's energy intense Super-conducting Radio Frequency/ Cryomodule Test Facility (SCRF/CMTF) program, and recent delays or phasing of other new HEMSF initiatives, such as the Long Baseline Neutrino Experiment (LBNE), g minus 2, and Mu2e. The percentages given in the CEDR are based upon normalized power usage when all facilities are operating at design loads, so as to preclude erratic annual fluctuations due simply to temporary operational considerations. Fermilab power usage this year was abnormal as the Laboratory discontinued its Tevatron accelerator and transitioned in shutdown mode toward more energy intense operations at its Main Injector facilities after the year.

Natural gas metering at the building level increased to 53.8% of total site usage in FY 2012, while building level domestic water metering was 12.8% of total site usage and building level ICW metering was at 100%.

Plans, Actions, and Projected Performance

The construction of new HEMSF facilities including Fermilab's new Illinois Accelerator Research Center, Muon Campus, Cloud Computing Center, and LBNE Phase 1 will increase the percentage of electricity metered at the building/process level on site. Fermilab's new ESPC initiative has initiated PAs of all its facilities looking to implement addition metering, including chilled water. Fermilab does not use steam.

Fermilab will continue to use metered data for benchmarking in Portfolio Manager, verification of utility bills, energy system diagnostics and verification, as well as for participation in power curtailment agreements. Readings from the site's advanced meters provide trending and historical information used to analyze progress on the DOE goals.

Fermilab's site specific measurable goal for FY 2013 is to complete the review of the ESPC PAs and make recommendations to DOE regarding the initiation of IGAs toward implementation of an ESPC contract.

Barriers
There are currently no barriers as Fermilab has successfully completed the full execution of its site Metering Plan this year.

1.5 Cool roofs, unless uneconomical, for roof replacements unless projects already have CD-2 approval. New roofs must have thermal resistance of at least R-30.

Performance Status
Fermilab has not historically invested in cool roofs. Because of the normally high process-related thermal loads encountered in the many of our buildings, the cost of heating is low and cooling in process spaces is typically achieved through ventilation. The advantages of cool roofs in our climate are marginal, and given the low cost for electrical energy, life cycle cost analyses are typically not favorable.

During FY2012, the Housing Department installed 6076 sq. ft. of composite shingles with a Solar Reflective Index (SRI) of 31, on residences within the Fermilab Village. This product was identified in the FY2010 SSP. One programmatic building (PS-3) had a new cool roof installed. The area of this roof is 3913 sq. ft.

Plans, Actions, and Projected Performance
We will continue to evaluate replacing roofs with cool roof technology. For all new construction in the future, cool roofs, including R30 insulation will be specified unless it is demonstrated to be infeasible or not life cycle cost effective. The OTE Building, which will be completed in FY2014 will be certified as LEED-NC Gold and will have a cool roof.

The Fermilab Housing Department will continue to employ the reflective shingles for roof replacements, which is expected to result in replacing from 1 to 4 roofs in the Village annually until all of the approximately 80 roofs are compliant. This product will also be evaluated for use on other high slope shingle roofs on site.

Barriers
There are no barriers to the implementation of cool roof technology, assuming cost effectiveness. Currently, the initial cost of the high SRI shingles is roughly twice conventional materials.

1.6 Training

Performance Status
Fermilab's facility energy manager holds the Certified Energy Manager (CEM) certification through the Association of Energy Engineers (AEE) as required by DOE, participates in sustainability webinars and conferences throughout the year, and regularly receives needed safety training. Also, with respect to core competencies identified by GSA in June 2012, the site energy manager has held this position since 1990 and has over 25 years of experience at Fermilab alone that includes lead engineering design, project management, troubleshooting, field measurements, estimating, scheduling, alternative financing, and technical innovation. The site has received numerous energy awards

during this time. Innovative software for cooling pond design was developed by the energy manager that has been used and distributed by the Laboratory under its technology transfer initiative.

Other key individuals on site also receive training on energy and sustainability as needed for their job responsibilities and as appropriate for their personal development.

Plans, Actions, and Projected Performance
Fermilab will continue to ensure that its energy manager keeps training and certification up to date, and will take advantage of teleconferencing and webinars to help reduce costs.

Fermilab's site specific measurable goal for FY 2013 is to maintain the energy manager CEM status through AEE and to continue to take advantage of teleconferencing and webinars for networking on energy and sustainability issues, as well as training.

Barriers
There are currently no barriers to key personnel receiving required training, however, funding constraints limit additional training for personal development.

1.7 Net Zero energy in new or major renovation facilities

Performance Status
Actual implementation of this goal does not appear until FY2020. However, the availability of relatively inexpensive energy and high initial cost of renewable technologies make designing zero energy buildings unrealistic without resorting to offsetting GHG production with REC purchases.

Plans, Actions, and Projected Performance
Current thinking is that for buildings designed after FY2020, sufficient RECs will be purchased to offset annual GHG emissions.

Barriers
Fermilab does not foresee any serious barriers to implementing the strategy.

1.8 Evaluate 25% of 75% of Facility Energy Use over 4-Year Cycle (a new 4-year cycle began June 2012)

Performance Status
This year Fermilab evaluated an additional 128,418 gsf of facilities bringing its total for the last 4-Year Cycle to 3,088,525 gsf. This represents 91% of the total 3,382,240gsf of facilities reported at the end of this cycle, which exceeds the 75% goal of DOE.

Plans, Actions, and Projected Performance
Fermilab's new ESPC initiative has initiated PAs of all its facilities looking for energy and water conservation opportunities, which exceeds DOE goals under EISA. The PAs will also evaluate retro-commissioning opportunities at appropriate facilities that have been identified using DOE guidance.

Fermilab currently intends to repeat this process every 4 years to meet EISA cycle requirements. All of the facilities on site are considered covered facilities under the EISA Section 432 requirements.

Fermilab exceeded its commitment in its FY 2012 SSP to track all metered buildings this year using the EPA Energy Star Portfolio Manager (PM) software. Fermilab now tracks 97 of its 102 facilities over 5000 gsf in size in PM, with DOE SPO access granted. Buildings not tracked are buildings that are either not energy consuming, or not yet reporting energy consumption data. Of these facilities, 11 fall under standard PM categories and are automatically benchmarked against comparable building performance nationally. One of these buildings, the Grid Computing Center (628), has qualified for the Energy Star certification in each of the last two years.

Fermilab's primary intent is to fund new ECMs under ESPC contracts, since funding is readily available for timely implementation. Fermilab will also automatically benefit from annual third-party Measurement and Verification (M&V) of its ECMs as part of the ESPC process.

Fermilab's site specific measurable goal for FY 2013 is to complete the review of the ESPC PAs and make recommendations to DOE regarding the initiation of IGAs toward implementation of an ESPC contract.

Barriers
There are currently no barriers to using ESPC PAs to achieve Fermilab's facility energy and water audit goals.

1.9 13% Scope 3 GHG reduction by FY 2020 from a FY 2008

Performance Status
The most significant source of Scope 3 emissions at Fermilab during FY2012 continues as in past years to be T&D losses. Other significant sources were employee commuting and employee air travel as illustrated in Figure 5 below.

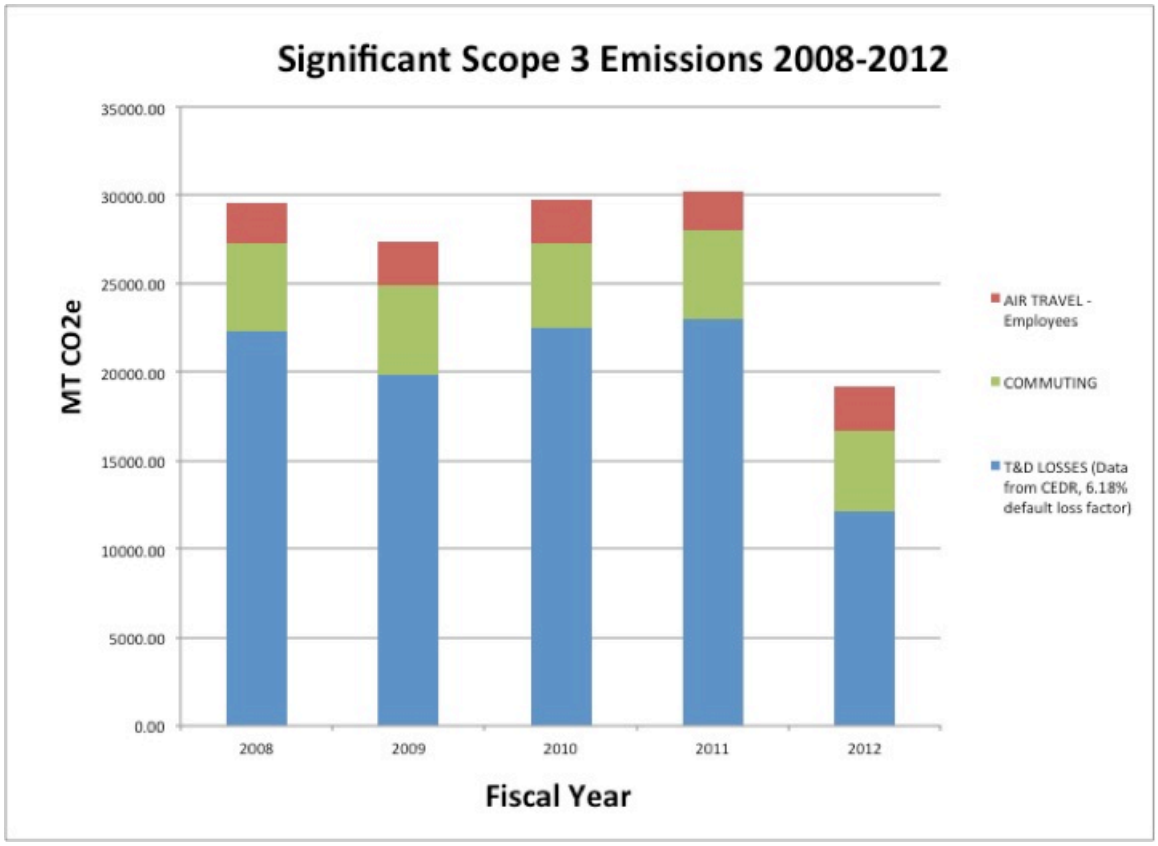


Figure 5. The significant reduction in Scope 3 GHG is due almost entirely to T&D losses, which is a temporary effect for 2012 – 2013 due to the extended shutdown of HEMSF at Fermilab.

Transmission & Distribution Losses

Transmission and distribution (T&D) losses associated with purchased electric power are Fermilab's most significant source of Scope 3 emissions. T&D losses reported in the CEDR are automatically calculated from the MWH of electricity purchased, using a loss factor of (1/(1-6.18%))-1, taken from the Emissions & Generation Resource Integrated Database (eGRID). However, actual T&D losses for baseline 2008 and subsequent years are (1/(1-2.22%))-1 using figures supplied by the site's electrical energy providers, Commonwealth Edison and PJM. In 2012, this amounted to reporting 7,922 metric tons of CO_2 equivalents (CO_2e) above actual generated emissions (12,089 metric tons of CO_2e instead of 4,167).

The fact that Fermilab receives power from the grid at the 345kV level accounts for the disparity from the eGRID data, which is based primarily on low voltage supply to customers with step-down transformer losses occurring before their electricity meters. This results in double counting the emissions from transformer losses to reduce voltages to useable levels at Fermilab. Using the eGRID factor presumes that these losses occur before the Fermilab electricity revenue meter, as is true in the vast majority of cases across the nation. However, at Fermilab these transformer losses occur after the site electricity revenue meter and are included in the MWH of electricity purchased. So when the eGRID factor is applied, transformer losses end up being accounted for as if they

occur both before the Fermilab electricity revenue meter (as part of Scope 3 emissions) and again after the Fermilab electricity revenue meter (as part of Scope 2 emissions).

Employee Commuting

The majority of the 1,744 Fermilab employees and 15 Fermi Site Office (FSO) employees commute to work by automobile from an average distance of 14 miles. Public transportation to the Laboratory is limited and rarely used. No bus routes serve Fermilab and the nearest train station is four miles from Wilson Hall, the main administrative building. As a result, Fermilab's GHG emissions due to employee commuting remain relatively constant (around 5,000 MT CO_2e/year). However, a small emissions savings (~350 MT) was seen in FY2012 due to a nearly 10% reduction in the size of the workforce compared to 2008.

Fermilab has an active commuter bicycling group, some of whom track their mileage to and from work. Riders maintain an interactive website and in 2012 they logged 35,600 person-miles commuting to and from work. The Fermilab campus supports a network of bike trails and bike lanes that encourage this mode of alternative transport.

Business Ground and Air Travel

Fermilab's place in the high energy physics community dictates that employees and visitors travel, much of which is international. In 2012, employee airline trips totaled over 12.5 million miles and accounted for 2,395 MT CO_2e. This represents an increase of close to 8% over FY2011. Fermilab employees accumulated 1,945 total automobile trips using rental (77.5%) and personal (22.5%) car use and the weighted average of 229 miles per trip resulted in the emission of 180 MT CO_2e.

Fermilab continues to utilize its eight fully equipped conference rooms to accommodate video-conferencing and a significant number of meetings, seminars and training sessions are conducted via web-based meeting software and/or tele- and video-conferencing means. The Compact Muon Solenoid (CMS) control room continues to remotely and successfully operate the CMS experiment at the Large Hadron Collider in Geneva, Switzerland. This capability makes many trips to Geneva unnecessary and thereby avoids significant GHG emissions from air travel.

Contracted (off-site) Waste Water Treatment

Fermilab sanitary wastewater is treated off site at two Publicly Owned Treatment Works located in the cities of Batavia and Naperville, which are located to the west and east of the Laboratory respectively. There is no on site wastewater treatment at Fermilab. During 2012, wastewater treated off site resulted in GHG emissions of approximately 4.4 MT CO_2e.

Contracted (off-site) Municipal Waste Disposal

In 2012 Fermilab generated 239 metric tons of landfilled, non-hazardous waste. Fermilab has an established recycling program for a variety of materials and actively seeks out opportunities to expand the program where it is feasible (see Section 5 for details).There is no treatment of solid waste on site at Fermilab.

Plans, Actions, and Projected Performance

T&D Losses

Fermilab purchased RECs this year to offset its T&D loss emissions as calculated using the higher eGRID data under Scope 3, just as they are used to cover the emissions for all of the usable power delivered to the site under Scope 2. Otherwise T&D loss emissions would exercise a disproportionate effect on attaining DOE Scope 3 goals at all sites that use large amounts of purchased electrical power taken from the grid at high voltages.

Current plans call for Fermilab to use even more power than in the past from FY 2014 onward, so barring a way to implement cost effective renewable energy of the scale needed to cover these losses, this is currently the only viable alternative identified. Fermilab's new ESPC initiative has initiated PAs of all its facilities looking for cost effective renewable energy opportunities.

Fermilab's site specific measurable goal for 2013 will be the purchase of RECs to cover T&D loss GHG emissions calculated using the eGRID factors under Scope 3 from a 2008 baseline, and to complete the review of the ESPC PAs and make recommendations to DOE regarding the initiation of IGAs toward implementation of an ESPC contract.

Employee Commuting

Attempts in the past to encourage carpooling and vanpooling have been unsuccessful. Various options for alternative work schedules continue to be evaluated, but for a significant majority of employees, the necessity of access to tools, information and collaborators are prohibitive. Alternative scheduling for non-exempt employees is often prohibited by overtime rules. Fermilab will continue to explore the feasibility of alternate work arrangements for some employees. Fermilab plans to utilize "GreenRide Connect", an online application hosted by Argonne National Laboratory to help employees connect with others for carpooling and GHG accounting for individual commutes.

Business Ground and Air Travel

Fermilab's place in the High Energy Physics community dictates that employees and visitors travel, much of which is international. Fermilab will continue to investigate ways to minimize travel and utilize remote meeting technology.

Contracted (off-site) Wastewater Treatment

Fermilab continues to implement various upgrades to the sanitary sewer system designed to reduce the volume of wastewater treated off site by minimizing the infiltration of groundwater into the sanitary sewers.

Contracted (off-site) Municipal Waste Disposal

Fermilab has an established recycling program for a variety of materials and actively seeks out opportunities to expand the program where it is feasible.

Barriers
There are no barriers to meeting the GHG goal for T&D losses as long as RECs can be used to achieve DOE goals for this portion of its Scope 3 emissions, in the absence of cost effective renewable energy alternatives.

1.10 28% Scope 1 & 2 GHG reduction by FY 2020 from a FY 2008 baseline

Performance Status
This year Fermilab exceeded the 2020 goal for Scope 1 and 2 reduction, being 50% lower than the baseline of FY 2008, as reported in Tab 1.2 of the CEDR (see Figure 6.). This was primarily due to the shutdown of the Tevatron plus the shutdown of other accelerators on site for part of the year. Scope 2 emissions are an order of magnitude greater than Scope 1 and are due exclusively to purchased electrical power, most of which is used to operate the HEMSF particle accelerator complex and high performance computing facilities. Of the total GHG emissions in FY 2012 at Fermilab, 90.2% resulted directly from the purchase of electrical power or indirectly from offsite transmission and distribution (T&D) losses calculated using the eGRID data as reported in Scope 3, after credit for RECs.

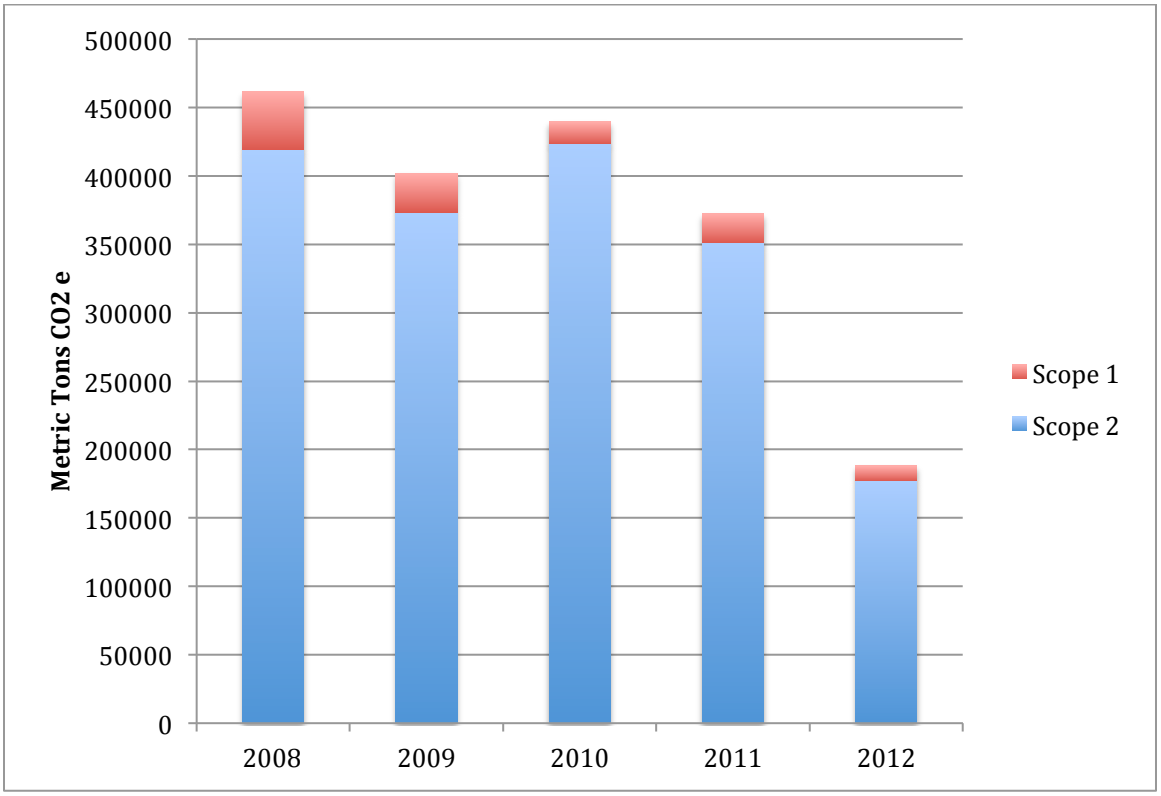


Figure 6. Scope 1 and 2 GHG emissions from 2008 (baseline) to 2012. Reduction from 2008 is approximately 59%.

Plans, Actions, and Projected Performance
Although energy use during 2012 decreased significantly due to the cessation of Tevatron operations and a shutdown of the remaining accelerator complex for part of the year, by

2015 anticipated new projects will increase Scope 2 GHG by roughly 21% above the 2008 baseline. The NOvA, MicroBooNE, Minos+, and SeaQuest experiments are scheduled to begin operation in 2013-14, along with test beam facilities and a new Cloud Computing Center. The chart of "Electricity Projections for Fermilab" (Figure 10 in Section IV) shows that overall Scope 2 emissions in 2020 are expected to exceed the 2008 baseline, as NOvA, MicroBooNE, Minos+, and SeaQuest terminate operations but are replaced by the new Mu2e and LBNE Phase 1. The new g minus 2 project is to begin operation in 2016 and end in 2019, so it will have no net impact on the 2020 goal, although it will impact interim goals for those years. The initiation and cessation of projects in the period from 2013 to 2020 will have an obvious impact on the level of GHG emissions unrelated to efforts to improve energy efficiency. Fermilab's projected energy use for 2020 has been substantially modified from the projection in last year's SSP, due to its original projections for SCRF/CMTF program being modified and the introduction of a phased implementation of LBNE due to funding constraints. These actions resulted in pushing the projections of increased energy use beyond 2020.

Given the energy intensive nature of Fermilab's mission, it is not feasible to reduce the purchase of electrical power to the level required by the SSP goal without compromising the science mission. Fermilab plans to purchase sufficient RECs to offset Scope 1, 2, and Scope 3 T&D loss GHG emissions to meet the 2015 and 2020 goals. Following the schedule in the Appendix J of the SSP guidance, the GHG reduction goal is 19% for 2014-15, with an ultimate goal of 28% in 2020. Additional RECs will be purchased accordingly. Figure 7 illustrates the strategy for REC purchases through FY2020.

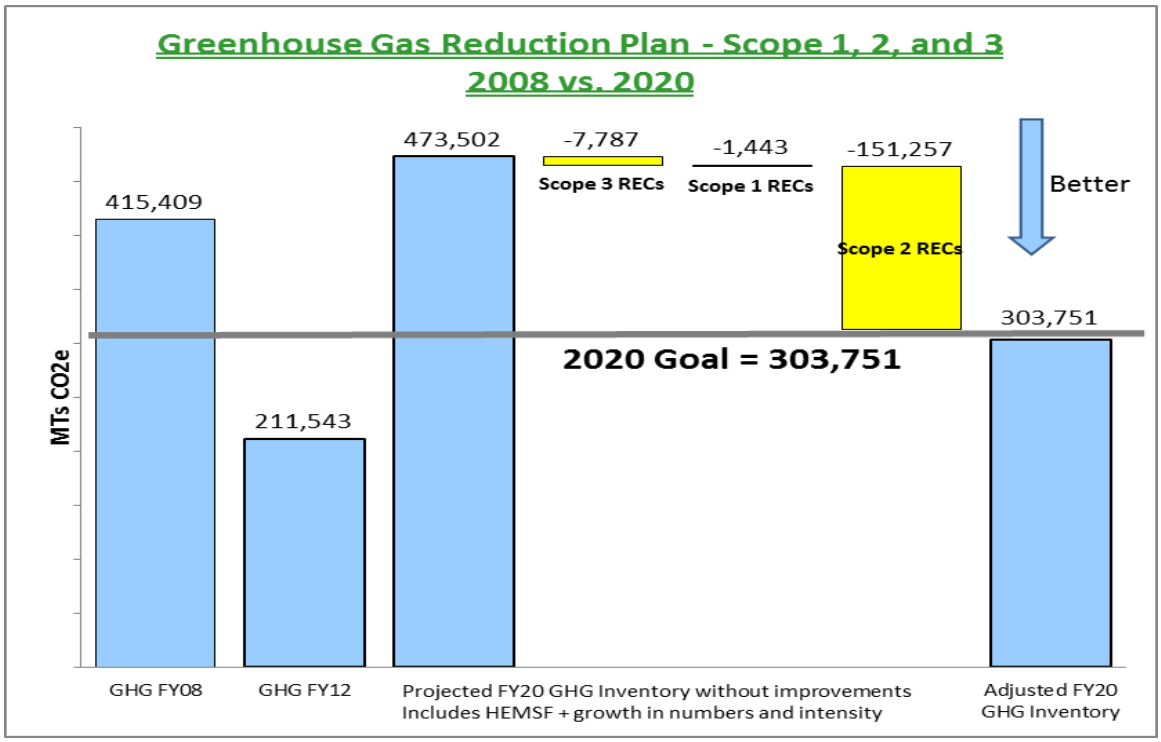


Figure 7. Fermilab actions to mitigate GHG emissions by 2020 consist of REC purchases. This plan is consistent with allowing REC purchases to offset Scope 3 T&D emissions. Over 90% of Fermilab's total emissions are normally from purchased electricity in Scope 2.

The 2013 DOE SSP Guidance indicates a goal of 15% reduction in GHG emissions for 2012. Due to site operations being uncertain during FY 2012 REC purchases amply covered the GHG goals. Anticipated energy use will require REC purchases of 233 GWH by 2020. At FY 2012 costs, that would equate to $158K. The current plan for future REC purchases, barring the implementation of sufficient cost effective renewable energy on site, is shown in Table 1.

	Actual FY 11	Actual FY 12	Planned FY 13	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20
Renewable Energy(MWHs) Plan	5	5	5	5	5	5	5	5	5	5
Renewable Energy Credits (MWHs)* Plan	40,000	32,000	28,170	185,488	209,790	217,339	227,872	232,650	228,155	233,368
Actual/Planned/ Estimated Cost	$26,560	$21,725	$19,125	$125,929	$142,427	$147,553	$154,704	$157,947	$154,896	$158,435
Unit Costs ($MWHs)**	$0.66	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68

*Table 1.Planned REC purchases *Purchase plan is based on the strategic plan for meeting GHG reduction goal 1 and the T&D losses accounted for in goal 1.9 ** REC unit cost is based upon current unit cost*

Barriers
There are currently no barriers to using RECs to achieve Fermilab's energy emissions goals.

GOAL 2: Buildings, ESPC Initiative Schedule, and Regional & Local Planning

2.1.a 15% of the number of existing buildings greater than 5,000 gross square feet (GSF) to be compliant with the five guiding principles (GP) of HPSB by FY 2015, with progress to 100% thereafter

Performance Status
Two buildings, the CDF and D-Zero office buildings, have undergone a retro-commissioning study. Preliminary assessments have been made for them and the appropriate fields have been updated in the Facility Information Management System (FIMS) database. Evaluation of existing buildings toward meeting the 15% goal is formally incorporated into the Fermilab EMS as an Environmental Management Plan with specific milestones and goals. The Grid Computing Center received the U.S. EPA Energy Star certification in FY2012 for the second straight year.

We have identified 14 existing buildings that are the most likely viable candidates, based on function, size, cost to retrofit, and anticipated status after 2015. Due to existing policies, over 40% of the Guiding Principles are already met for each of these buildings. All of the 14 candidate buildings have had electric, natural gas, and water meters installed during FY2012, and are being tracked in Portfolio Manager.

The OTE building is under construction and scheduled to be completed in time to qualify as an existing building in 2015 and is planned to be certified as a LEED-NC Gold project.

These existing buildings and the planned new building are listed in Tab 3.4 of the 2012 CEDR.

Plans, Actions, and Projected Performance
The total building area at Fermilab is 2,383,427sf, which excludes the FIMS "Other Structures and Facilities" (OSF) Research Accelerator Ring/Tunnel and the NuMI Tunnel. The cumulative square footage of the candidate buildings is greater than 375,000 g.s.f., exceeding 15% of the total gross floor area.

For existing candidate buildings, an extensive ESPC Preliminary Assessment is being employed in early FY2013 to further characterize and evaluate these for Guiding Principle compliance. We plan to complete the documentation for Guiding Principle compliance for three buildings during FY2013, including the Grid Computing Center, CDF Office Building, and the D0 Office Building.

We will continue to incorporate sustainable practices into site policy and planning. New building design and construction has been modified to include building commissioning, electric, water and natural gas metering, and sustainable acquisition for materials and items in projects where feasible and practical. Fermilab will continue our past sustainable practices, such as a formal Integrated Pest Management Plan, zero potable water for landscaping policy, no smoking policy, and prohibition of Ozone Depleting Substances in new projects.

Barriers
It is unrealistic in the current budget climate to expect that sufficient funds will be found to design and implement measures to bring additional existing buildings into compliance with the Guiding Principles beyond the three that we have committed to this year, and the OTE building, which will attain LEED status.

Wilson Hall accounts for more than 15% of the total gross square foot area for the Laboratory. The previous strategy was to concentrate on meeting the requirements in this single building. However, new guidance in 2010 changed the goal to 15% of the number of buildings. Fermilab has 102 buildings over 5000 gsf, and revising the strategy to require meeting the Guiding Principles in 15 buildings by 2015 places a severe burden on the Laboratory.

Among the challenges to meeting the Guiding Principles is establishing relevant benchmark data for energy and water usage against which to evaluate compliance. Most of the over 300 buildings at Fermilab have never been individually metered for electricity or natural gas. Many process-related buildings are fed by multiple electrical feeders, so economical metering is a challenge. Until this and other issues are resolved, uncertainties will remain as to whether/how the goals will be met.

2.1.b All new construction, major renovations, and alterations of buildings greater than 5,000 GSF must comply with the GPs

Performance Status
Fermilab currently lists 5 projects in Tab 3.4 "Bldg Inventory Changes" of the CEDR. The Office, Technical and Education Building (OTE) at the Illinois Accelerator Research Center (IARC) will be designed to achieve LEED-NC Gold certification, and will therefore automatically attain Guiding Principle status. As previously noted in the 2009 Executable Plan, the remaining projects are heavily process-oriented, so applying the ASHRAE energy efficiency criteria is problematic. However, all will achieve some portion of the Guiding Principles.

All construction designs are analyzed at the Conceptual Design Review stage for conformance to the Guiding Principles. Results of these analyses are included as a part of respective Project Plans. Incorporation of sustainable building/design practices into the Fermilab EMS is included in the policies of the Facilities Engineering Services Section's Engineering Department.

Plans, Actions, and Projected Performance
Fermilab has elected to demonstrate its compliance with the guiding principles of Executive Order 13423 by preparing and maintaining a "DOE High Performance and Sustainable Buildings Assessment and Compliance Tool for New Construction" spreadsheet for each of the projects listed in Tab 3.4 of the CEDR. The projects are expected to meet at least 90% of the 34 measures required by the tool. Fermilab is committed to implement as nearly as possible all the measures necessary to demonstrate its adherence to the guiding principles. The tool will be used as a roadmap for attaining documented compliance with the guiding principles for these and future projects.

Barriers
Applying many of the sustainable measures to new construction entails a higher than normal initial cost in all phases of the project. This is the case during design, construction and facility operation. Given the current status of the budget, it is exceedingly difficult to justify sustainable design/construction elements unless they can be shown to be life cycle cost effective.

The American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) standard 90.1 states that it should not be applied to "…portions of building systems that use energy primarily to provide for industrial manufacturing, or commercial processes." (ASHRAE 90.1 – 2007, Section 2.3.c.). Many new projects at Fermilab fall within this category. Fermilab is working with its Architectural and Engineering contractors to provide rational estimates of building energy usage for these projects.

2.2 ESPC Initiative, i.e., third party

Performance Status
Fermilab has worked with DOE in completing the first 3 OMB/CEQ tracking milestones to select an ESCo for its new ESPC initiative on site. PAs of all of the site's facilities are

currently being conducted by the ESCo, looking for energy and water conservation opportunities. This site initiative is being tracked as part of the President's $2 billion performance contracting challenge, with monthly reporting updates being provided to DOE though the FSO. This follows the implementation of a prior ESPC that was initiated in FY 2008.

Plans, Actions, and Projected Performance
Fermilab currently favors use of the ESPC contracting vehicle to help in meeting its site sustainability goals, and plans to continue this process on a 4-Year Cycle to parallel EISA requirements. On this cycle ESPCs can provide timely periodic completion of energy and water audits for covered facilities, site wide reassessment of cost effective renewable energy applications, and evaluation of retro-commissioning potential for major facilities.

ESPCs can also provide needed funding to ensure that ECMs are implemented in a timely manner, and automatically provide annual M&V throughout the life of the contract. They allow the site to leverage its potential to achieve savings in both energy and operations while helping the environment.

ESPCs align with the four recommendations applicable to SC sites in the Inspector General Report, "*Opportunities for Energy Savings at Department of Energy Facilities*" dated July 17, 2012. Specifically, they effectively utilize facility evaluations and electricity metering to help decrease energy costs and improve operations, they prioritize the most cost-effective projects identified and implement them in a timely manner, they streamline the performance and reporting of required facility evaluations in order to conserve scarce resources, and they help implement best practices at sites that are economically viable and life cycle cost effective.

ESPCs can also help integrate long-term sustainability goals into the budget process by utilizing return on investment analysis funding strategies, and prioritization to help assess the potential to reduce deferred maintenance. In accord with EPAct 2005 Section 102.(e), Fermilab reinvests all savings to help pay off the debt incurred under ESPC contracting in the shortest time possible, so as to help minimize financing costs and increase project scope.

Fermilab's site specific measurable goal for FY 2013 is to complete the review of the ESPC PAs and make recommendations to DOE regarding the initiation of IGAs toward implementation of an ESPC contract.

Barriers
Current uncertainty over future Laboratory programs limits the investment potential of the ESPC ECMs identified.

2.3 Regional and local planning

Performance Status
Current Fermilab practice includes participation in regional transportation and related sustainability planning. As an integral partner in regional and local planning activities, Laboratory personnel meet with community leaders, public transit leaders, working groups, and regional planning groups, to ensure that Fermilab's mission is aligned with local and regional goals. For larger projects, Fermilab convenes a formal Community Advisory Board to ensure that community and Laboratory goals are consistent.

Fermilab maintains an excellent cooperative relationship with our neighboring communities. We operate a program to assist local communities dispose of leaf litter on our site where it is composted (see this plan, goal 5.1). This provides a way for communities to avoid the cost of hundreds of miles of transportation that they would otherwise have to bear to dispose of leaves.

In 2008, we cooperated with a neighboring community to significantly upgrade the reliability of their electrical distribution system by routing redundant high voltage lines on Fermilab property.

Plans, Actions, and Projected Performance
Fermilab will continue to work closely with local communities.

Barriers
None.

GOAL 3: Fleet Management

3.1 *10% annual increase in fleet alternative fuel consumption by FY 2015 relative to a FY2005 baseline*

Performance Status
Fermilab continues to utilize alternative fuels in effort to meet the EPACT and Department of Energy's (DOE) SSPP goal of increasing the use of alternative fuels. Fermilab currently has a fleet of 194 vehicles, of which, 149 (77%) are Alternative Fuel Vehicles (AFV). Prior to the implementation of the mandated goals, the Laboratory developed the infrastructure necessary to utilize alternative fuels. The Laboratory has increased the use of alternative fuels by 49% since the baseline year of 2005 (see Figure 8, below).

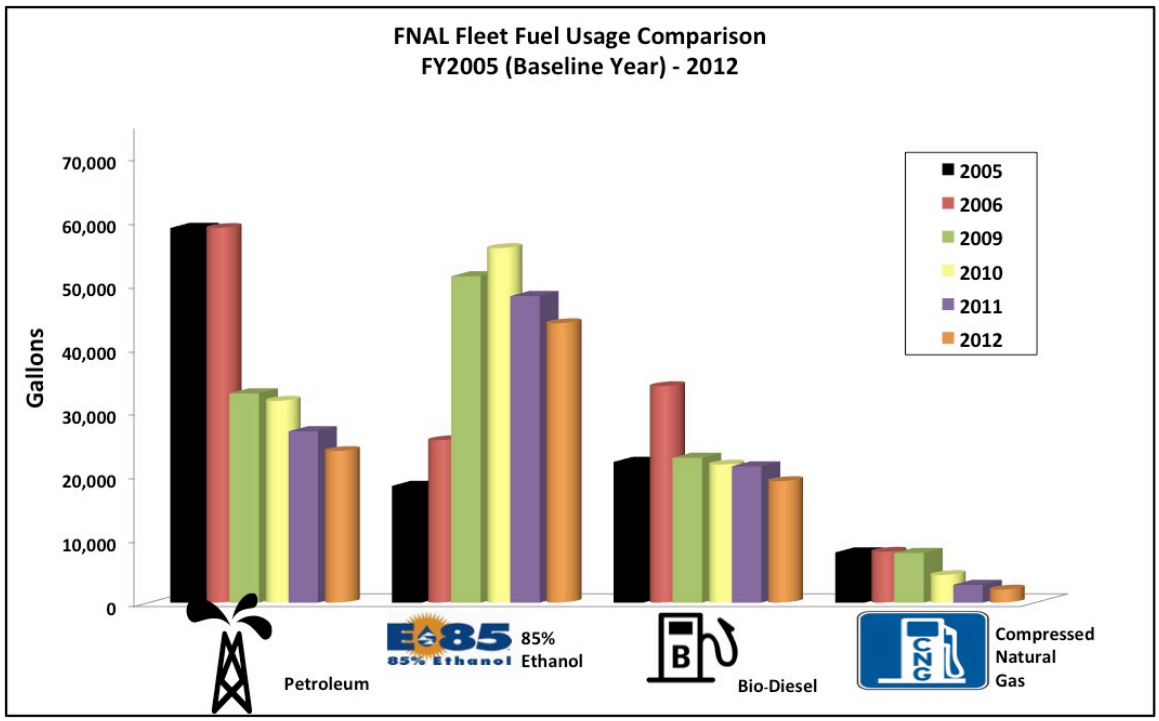


Figure 8. This chart demonstrates the progress in utilizing alternative fuels that Fermilab has made since 2005. Declines in the last 3 years are primarily attributable to decreases in the overall number of vehicles and the increased reliance on hybrids.

Plans, Actions, and Projected Performance

The Laboratory plans to continue giving priority to acquiring AFVs as the fleet is reduced and as budgets allow. We will place an emphasis on right sizing our fleet in effort to meet the requirement of Office of Science Right Sizing Fleet Plan. Our goal is to increase the percentage of AFVs from the current 77% to 100%. There are several medium and heavy-duty vehicles operating on biodiesel fuels (included in the 77%).

Barriers

Per the mandated fleet reduction for CY 2012, we reduced our fleet by 24 vehicles in CY 2012. The reduction included 12 AFVs. An unintended consequence of the loss of these vehicles was failure to meet the 10% increase in alternative fuel use for FY2012. However, there was an overall reduction in the volume of all fuels because of the reduction in the number of vehicles in the fleet.

A recurring consideration is the availability of compatible alternative fueled vehicles. There are economic concerns regarding the high initial cost of electric and hybrid vehicles, including the infrastructure and maintenance costs for compressed natural gas systems. The Laboratory will continue to work to meet the increasingly difficult and economically challenging task of finding suitable alternatively fueled replacement vehicles.

3.2 2% annual reduction in fleet petroleum consumption by FY 2020 relative to a FY 2005 baseline

Performance Status
Fermilab has reduced petroleum usage by 52% since FY2005 and reduced petroleum usage by 10% in FY2012 from FY2011. The Laboratory has been very successful in surpassing the requirements for the petroleum reduction. Fermilab has never requested or needed a Section 701 AFV waiver since it is in full compliance with EPACT 2005.

Plans, Actions, and Projected Performance
Fermilab will continue to be diligent in replacing petroleum-fueled vehicles with alternatively fueled vehicles. The Laboratory has acquired hybrid vehicles with plans to purchase more hybrids and E85 vehicles while maintaining the use of biofuels where practical. Purchasing hybrids will lead to an increase in petroleum fuel use over E85 vehicles.

Barriers
Budgets and funding will play a major role in our ability to be proactive in the procurement of AFVs going forward. As purchasing restrictions continue to make funding more difficult to access, purchasing new vehicles of any type will become more difficult.

Since many of the light duty acquisitions may replace E85 vehicles with hybrids, which could result in an increase in petroleum use. We could lose the volume of the alternative fuel used in the E85 vehicles, while increasing the use of petroleum because the replacement vehicles, albeit hybrid vehicles, burn gasoline.

3.3 75% of light duty vehicle purchases must consist of alternative fuel vehicles (AFV) by FY 2000 and thereafter

Performance Status
Fermilab has always met or exceeded the requirement to specify alternative fueled light duty vehicles for 75% of our purchases. The Laboratory has been very aggressive in past years and now has a fleet of predominantly alternative fueled vehicles. In FY2012, 100% of our light duty purchases were alternatively fueled vehicles**.**

Plans, Actions, and Projected Performance
It is unclear at this time what FY2013 budgets will allow due to continuing funding uncertainties. The right-sizing initiative may have a major impact on the fleet and future vehicle replacement orders. When possible, future purchases of light duty vehicles will be either hybrid or E85. Fermilab continues to support the utilization of alternative fuels by requiring the sub-contracted guard service to use alternatively fueled vehicles in their fleet.

Barriers
The only barriers that will affect our ability to procure AFV's are budgeting and funding issues.

3.4 Reduce fleet inventory of non-mission critical vehicles by 35% by FY 2013 relative to a FY 2005 baseline

Performance Status
As cited in the Fermilab "Right-sizing the Fleet" report, in FY2005 there were 59 non-mission critical vehicles in the fleet, using the Office of Science definition of mission critical. The Laboratory has reduced the number of non-mission critical vehicles by 34 vehicles, or 42%, since then, which exceeds the 35% reduction goal.

Plans, Actions, and Projected Performance
Since the baseline year of 2005, Fermilab has reduced the total vehicle fleet from 229 to 195, a reduction of nearly 15%. Fermilab has reduced the non-mission critical fleet by nearly 58%. The Laboratory expects to reduce the fleet by an additional 5 vehicles based on Right Sizing Principles for a remaining fleet of 21 non-mission critical. Fermilab's Vehicle Utilization Committee will continue to assess all vehicle usage at the Laboratory, on the basis of applicable lease arrangements, replacement strategies, greenhouse gas advantages, vehicle age and mileage comparisons, and future mission demands.

Barriers
No current barriers to the fleet reduction goal exist since the Laboratory has exceeded the requirement. Vehicles are needed to conduct a reasonable level of business on a site this large.

GOAL 4: Water Use Efficiency and Management

4.1 26% potable water intensity (Gal per gross square foot) reduction by FY 2020 from a FY 2007 baseline

Performance Status
As reported on Tab 1.2 of the CEDR, the 26% goal for potable water reduction relative to a 2007 baseline was significantly exceeded in FY 2012. Fermilab reduced domestic water use by 48.0% primarily through monitoring and management of leak detection in its large network of onsite water mains. The water management plan to monitor and appraise potable water consumption was updated again for this year's analysis.

Plans, Actions, and Projected Performance
Fermilab plans to maintain Water Use Intensity (WUI) at the level necessary to exceed the goal (see Figure 9, below). The site-specific measurable goal for 2012 will be to maintain the usage of potable water at a level that exceeds the reduction goal compared to the 2007 baseline.

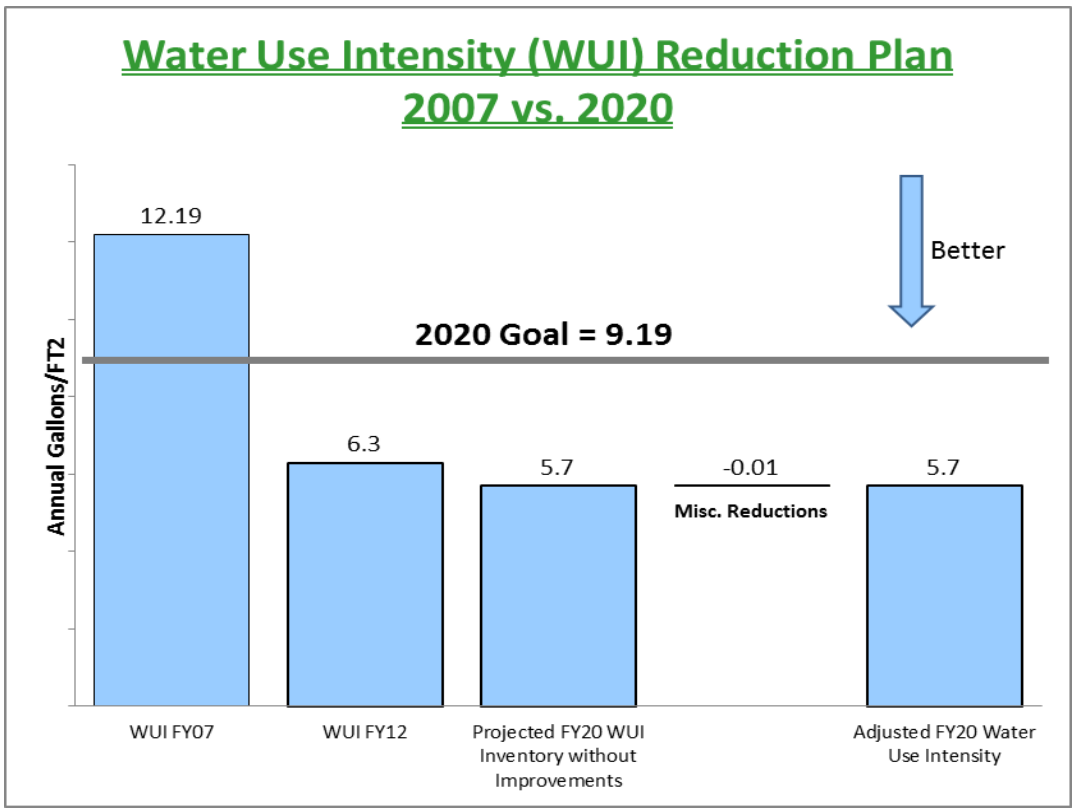


Figure 9. Fermilab Water Use Intensity status and goals Note: Since the goal has already been met, no table of strategies to meet the goal is included for this chart.

Barriers

Currently, the only barrier is the increasing number of leaks needing repair in the aging underground domestic water distribution mains on site, pending their replacement. Also, a broken PRV delayed site leak assessments this year but is being replaced.

4.2 *20% consumption reduction of industrial, landscaping, and agricultural (ILA) water by FY 2020 from a FY 2010 baseline*

Performance Status

As reported on Tab 1.2 of the CEDR, Industrial, Landscaping and Agricultural (ILA) water use during FY2012 was 13.5% higher than in baseline year FY 2010, although it was 19% lower than last year, due principally to the shutdown of the Tevatron. The demand for ILA was primarily due to a drought this year, necessitating the refilling of ponds to offset evaporation. ILA water is obtained principally from storm water capture and reused on site as Industrial Cooling Water (ICW). Approximately 74 Mgal of additional water was captured from the bedrock formation in the tunnel associated with the MINOS facility and injected into the ICW system this year. During 2012, 16.0 Mgal was also pumped from the Fox River and 2.1 Mgal from an onsite deep well to help make up for surface water losses. The surface water management plan was updated again this year in an effort to help minimize surface water runoff losses by lowering the makeup level of the site's main reservoir.

Fermilab has adopted a site-wide strategy of natural landscaping and native grassland management that requires a minimum amount of landscape watering. Minor amounts of non-potable ICW are used during times of drought to water ornamental trees. There is no use of potable or non-potable water for landscaping or the irrigation of crops at Fermilab. This practice is formalized by a memorandum from the Head of the Facilities Engineering Services Section, which includes the Roads and Grounds Department.

Plans, Actions, and Projected Performance
Fermilab exceeded its goal in last year's SSP to reduce the ILA increases above the baseline by at least 50% this year, with an actual reduction of 66%. Increased loads at the Main Injector, beginning in FY 2013 and increasing in FY 2014, will place more demand on ILA make up water use for evaporation from site cooling ponds.

Fermilab's new ESPC initiative has initiated PAs of all its facilities looking for energy and water conservation opportunities. This includes looking at greater utilization of storm water on site, while saving pumping energy, with a new pump station at Eola Road.

Fermilab's site specific measurable goal for FY 2013 is to complete the review of the ESPC PAs and make recommendations to DOE regarding the initiation of IGAs toward implementation of an ESPC contract.

Barriers
The risk of not attaining the DOE 20% ILA reduction goal by 2020 currently seems high, due to the difficulty of capturing and coordinating the use of sufficient amounts of storm water retained on site for ILA make up water usage as accelerator loads increase. However, the ESPC evaluations could help to better define these limitations.

GOAL 5: Pollution Prevention and Waste Reduction

5.1 Divert at least 50% of non-hazardous solid waste, excluding construction and demolition debris, by FY 2015

Performance Status
As reported in PPTRS, Fermilab generated 653 metric tons of non-hazardous waste and recycled materials in 2012. Fermilab has an established recycling program for a variety of materials and actively seeks out opportunities to expand the program where it is feasible. Over 413 of the 653 metric tons (63.3%) were diverted from waste in 2012. This includes a paper, plastic, aluminum can recycling, as well as specific items recycled through our Business Services Section. In addition the Laboratory continues to maintain established programs to recycle other high volume materials when possible such as disposable batteries and polystyrene packaging. Modular office walls and work surfaces are also reused through a centralized program. All electronics are either recycled or donated. See Section 7.3 for more information.

Fermilab has a mature scrap metal recycling program. In 2012, 252 metric tons of metal were sent off site for recycling. Since the July 2000 suspension on recycling metal from

radiological control areas, Fermilab has accumulated over 2722 metric tons of various metals that would otherwise be available for recycling as scrap. Approximately 10,000 square feet of extra space is required to store this scrap metal and the quantity of material and space required to store it continues to increase. Following recommendations resulting from a review done by the Office of Science of our materials and radiological clearance operations, Fermilab adjusted its clearance criteria for certain materials to align with the strict federal definition of a Radiological Area. This adjustment is expected to allow for the additional release of materials formerly held under the suspension.

Some of the surrounding municipalities dispose of their fall leaf refuse on Fermilab's agricultural fields. In 2012, 15,000 cubic yards (roughly 680 metric tons) were spread on the fields as a soil amendment after composting.

Many project engineers, technicians, and physicists reuse or reconfigure old equipment for new experiments. In 2012, Accelerator Division reused 193 metric tons of steel, copper, iron, aluminum, concrete, and wood for new purposes. The Superconducting Radiofrequency Test Facility contains about 75% reused equipment (estimated $28 million value). Fermilab also works with other Laboratories and agencies to obtain or release items.

All computers that are connected to the Fermilab network have been set to default duplex printing. In addition, the Laboratory has undertaken a comprehensive review of all networked printing devices with an aim towards consolidation of the number of units being used. All copy paper purchased through Fermilab's stock room contains at least 30% post-consumer fiber.

Procurement processes in individual Division/Section/Centers, require that environmental officers review purchase orders to determine whether a less toxic alternative would be applicable. Fermilab has also completed a goal two years ahead of schedule, to convert chillers on site from ethylene glycol to propylene glycol. We have initiated a pilot program using near zero waste generating machined parts washing systems. The innovative technology is based on bioremediation principles that digest waste oils and eliminate the need to dispose of solvents.

Fermilab adheres to integrated pest management to minimize pollution and adverse environmental impacts. Fermilab has a prairie restoration program. Native plants are used in landscaping.

Plans, Actions, and Projected Performance
Fermilab intends to continue aggressive waste minimization programs, including recycling.

Barriers
The recycling programs at Fermilab are mature and effective. We anticipate no significant barriers to continuing them.

5.2 Divert at least 50% of construction and demolition materials and debris by FY 2015

Performance Status
Construction projects generate construction and demolition (C&D) waste, much of which is available for recycling. Fermilab continues to maintain a series of dumpsters that sub-contractors can utilize to dispose of small amounts of C&D wastes. During 2012, 201 metric tons of C&D waste was removed from the site and 91% of that total was ultimately recycled.

Plans, Actions, and Projected Performance
Fermilab is in the process of revising procedures, sub-contracting documents and design specifications to ensure effective recycling and reuse of materials during all design and construction activities.

Barriers
The recycling programs at Fermilab are mature and effective. We anticipate no significant barriers to continuing them.

GOAL 6: Sustainable Acquisition

6.1 Procurements meet requirements by including necessary provisions and clauses (Sustainable Procurements / Biobased Procurements)

Performance Status
Fermilab maintains an internal website to educate and provide resources to employees on Sustainable Acquisition (SA). The website is regularly updated with new information about SA and links to outside resources such as the GSA Green Facilities Tool. The Fermilab stock room also provides many SA products and continues to look for SA options to include in their catalog. A new stock catalog has also been developed that allows employees to identify "green" products in the catalog. Products with SA qualities are labeled "environmentally friendly."

All employees also undergo SA training, which is supported by the Fermilab Environment, Safety and Helth Manual (FESHM) chapter 5011 and requires employees to indicate a preference for SA items.

We are drafting updated contractor requirement language to align with current sustainable acquisition requirements. New design guides construction specifications have been adopted that include applicable SA requirements.

Plans, Actions and Projected Performance
Fermilab will adopt updated contract language as appropriate, and continue to apply SA requirements to our procurement policies and practices as appropriate.

Barriers
Product level purchasing data is difficult to track and manage, and is currently limited to purchases made directly by the Lab. The decentralized procurement system used at Fermilab requires that individual purchasers, spread throughout the Lab, must become aware of the purchasing requirements and spend extra time to seek sustainable alternatives to materials or items that have historically been purchased.

GOAL 7: Electronic Stewardship and Data Centers

7.1 All data centers are metered to measure a monthly PUE (100% by FY 2015)

Performance Status
The Lattice Computing Center, Grid Computing Center and Feynman Computing Center are 100% metered and the PUE can be calculated. In the past year, the existing power meters for the 480V electrical services at the Grid Computing Center and Lattice Computing Center were configured to be readable on the network. Several new power sub-meters were added to better monitor power usage in individual rooms.

Plans, Actions, and Projected Performance
Although all computing centers are already metered to measure a monthly PUE, related improvements are being considered. A plan is being developed to create a real time dashboard for power usage and energy efficiency metrics that will utilize data from the existing power meters. There will some power monitoring added at key points within the sub-panel electrical power distribution system.

Barriers
No significant barriers are foreseen.

7.2 Maximum annual weighted average Power Utilization Effectiveness (PUE) of 1.4 by FY2015

Performance Status
Energy efficiency improvement is a key goal in upgrading Fermilab's existing data centers and in building new centers. Efficiency measures employed include hot and cold aisles, cold aisle containment on row ends, blanking and threshold panels, higher cold aisle temperatures, no cabling under raised floors, air conditioner ducting to hot air layer, matching air conditioning to temperature sensors in front of computer racks and use of UPS units with greater than 90% efficiency.

The Power Utilization Effectiveness ratings (PUE) for the three data centers are currently in the range of 1.4 to 1.7. The data is tracked and improvements are implemented and the PUE is monitored. During FY2010, 2011 and 2012, the Fermilab Grid Computing Center was submitted for an Energy Star status, which was received each year.

Fermilab has virtualized approximately 290 servers in the last 18 months. Of these, 200 are associated with scientific computing services and 90 are associated with core

Information Technology (IT) services. There are approximately 58 servers in our Virtual Machine (VM) environment. Of these, 40 are associated with the scientific computing services and 18 are associated with core IT services. It is estimated that the Laboratory has saved approximately $400K in hardware costs through virtualization.

Plans, Actions, and Projected Performance
Fermilab expects to improve the PUE during the next year with several improvements and by operating the rooms at a higher power capacity. There is a plan to deploy cold aisle containment in two computer rooms at GCC, which is expected to decrease PUE. There are also two upgrade projects that are being considered that will improve the efficiency at GCC. The projects are the GCC Cooling Upgrade and the GCC Computer Room A upgrade. The Retro-Commissioning of the Grid Computing Center will yield low cost, energy efficiency improvements that can be implemented this year. Electrical efficiency will be improved by transitioning more 120V electrical load to 208V distribution. The Laboratory will continue its stringent maintenance program for peak efficiency of electrical and mechanical systems.

Engineering plans are being developed to retire two older Uninterrupted Power Supplies (UPSs) in the Feynman Computing Computer. The electrical load is being transferred to a new UPS, which will improve the overall efficiency.

The Laboratory plans to virtualize approximately 110 servers in the next 18 months. With additions and replacements, there is an expected net increase of 12 new physical servers in our VM environment. Fermilab expects project procurement cost savings of $310K over the next 18 months due to additional virtualization. Cost savings have clearly been achieved by the combined effects of more efficient power and space use through virtualization and lower support costs due to server virtualization.

The Laboratory is pursuing several potential upgrade projects to improve the energy efficiency through the DOE Energy Savings Performance Contracts (ESPCs). This may yield projects that improve the PUE for data centers in calendar year 2013. The engineering and facility operations team will investigate potential energy efficiency improvements and emerging technologies for future computer rooms.

Barriers
No significant barriers are foreseen.

7.3 Electronic Stewardship - 100% of eligible PCs, laptops, and monitors with Power Management actively implemented and in use by FY 2012 and continually thereafter

Performance Status
Fermilab is committed to managing computers in accordance with environmentally sustainable practices. To support this effort, all Fermilab employees, visitors and contractors are required to adhere to the Personal Computing Environmental Policy. Fermilab has been a member of the Federal Electronics Challenge since 2007, and as of June 2008, all purchased computing equipment must meet the Electronic Product

Environmental Assessment Tool (EPEAT) registration requirements. Since this requirement was implemented, 99% of PCs/monitors purchased were EPEAT registered. Requisitioners must provide justification for all requisitioned equipment that is not EPEAT registered. Justifications must be reviewed and approved by a designated approver and purchases that jeopardize these goals may be denied. Specifications on energy efficiency for scientific computer purchases are included in solicitations and the bid award process.

The policy requires that computing assets be operated in an energy efficient manner. Procedures define standards for power management of monitors, laptop displays, processing units, and resource utilization standards for printers. Energy saver recommendations for desktop operating systems can be found in the respective baseline documentation and printers are purchased and installed with power saving features enabled.

Electronic equipment at end of life is either donated or recycled. Laptops, desktops, monitors, printers, multi-function devices, televisions, servers, personal digital assistants, and cellular phones are all managed responsibly at the end of their life at Fermilab through the Property Office. During FY2012, 445 units of electronics were donated or transferred for reuse, and 1298 units of electronics were recycled.

Fermilab lists all desktop and laptop computers that are in working condition on the GSA Computers for Learning (GSA/CFL) Excess System. After the computers go through the GSA/CFL system, they are sent to an electronics recycling company. The recycler has completed the "Federal Electronics Challenge Work Sheet for On-Site Review of Electronics Recycling Facility".

Plans, Actions, and Projected Performance
Eighty percent of the Window's systems have been replaced or upgraded from Windows XP operating system to Windows 7 to support centralized power management features. All computers in the Fermilab domain will have these standards automatically applied. New equipment is replacing older equipment and has power management features enabled. Software has been installed that monitors progress on energy settings and usage. A PC refresh plan is being developed that aligns with the fiscal responsibilities of the Laboratory.

Barriers
There are no significant barriers to implementing these plans.

Goal 8 Agency Innovation and Government-Wide Support

8.1 Site Innovation and Government-Wide Support

Performance Status
There is no currently funded sustainability-related research being conducted at the site for demonstration or implementation purposes. Fermilab is a single purpose high-energy physics Laboratory. However, within these constraints, Sustainability continues to be an

important consideration in Laboratory operations. During FY 2012, a Sustainability Committee was formed to investigate potential approaches to making Fermilab more sustainable. The committee meets monthly and is chaired by the Chief Operating Officer.

Plans, Actions, and Projected Performance
There are no official plans to address sustainability issues at Fermilab. Nevertheless, we are constantly looking for ways to increase the effectiveness and energy efficiency of our operations. There are currently significant plans underway in the areas of sustainable acquisition, and design standards for new construction and major renovation.

Barriers
The chief barrier is our status as a single purpose Laboratory, which means that many of our efforts are peripheral to our overall mission in high energy physics research. A related barrier is the nature of the research itself. As stated elsewhere in this report (see especially Section IV on HEMSFs), the research requires the use of large amounts of energy to obtain experimental results.

Section III. Climate Change Adaptation

Goal 1: Improve Understanding of Climate Change Effects and Impacts

1.1: Work with other agencies to improve our understanding of climate change.

Fermilab has no input for this goal.

1.2: Work with other Federal agencies and local jurisdictions (as appropriate) to develop regional partnerships for climate change information sharing and collaboration.

-and-

4.2: Identify or establish and participate in regional climate change adaptation partnerships, as appropriate, for all DOE facilities.

Fermilab has no input for this goal.

Goal 2: Improve Understanding of Climate Change Vulnerabilities and Risk

2.2: Conduct detailed risk or vulnerability assessments, as appropriate,for specific DOE programs or facilities.

Fermilab reviewed the April 2012 DOE publication titled "*High Level Analysis of Vulnerability to Climate Change*", and is currently considering a plan to conducted a preliminary high-level assessment/analysis of potentially major site-specific/local vulnerabilities to climate change by 2015. Site reviewed DOE's climate change

vulnerability/risk assessment to understand possible local climate change effects. Near term challenges could include exposure to the following climate change effects:

- During the summer the site may be negatively affected by increasing heat waves, reduced air quality, and increasing insect and waterborne diseases.

- An increase in precipitation in winter and spring with more heavy downpours, and greater evaporation in summer, may lead to more periods of both floods and water deficits possibly affecting electric power generation, as was the case in 1988 when over 90 reactor-days of power output at several Illinois reactors were either limited to no more than 30% capacity or entirely eliminated to avoid thermal pollution of rivers.

Longer term challenges could include exposure to water shortages, increased water and energy costs, and chronic exposure to flooding events. These could reduce annual accelerator run time and science output, damage the pump house at the main site reservoir, and disrupt operations in other ways. Fermilab is currently planning to undertake specific efforts by 2020 to better understand these issues and begin preparing for local climate change effects at its facilities.

Goal 4: Improve the Climate Resiliency of all DOE Sites

Objective 4.1: Update all appropriate DOE site plans to address climate change resiliency.

In addition to this SSP, the Site also plans to update by 2020 its other climate adaptation related strategies to address climate change adaptation considerations such as continuity of operations, fire management, infrastructure, and construction specifications.

Section IV. Projected Electrical Energy Use & High Energy Mission Specific Facilities (HEMSF)

The Office of Science has identified 3 HEMSF initiatives at Fermilab representing world-leading, core-mission relevant capabilities funded by DOE and used by scientists and engineers across the globe to conduct research and development, as follows:

Particle Accelerators

These include accelerators, detectors and support facilities (including power and cooling) for the Laboratory's multi-stage accelerator complex consisting of the Radio-Frequency Quadrupole (replacing the Cockcroft-Walton Unit), Linac, Booster, Recycler and PBar Accumulator/Debuncher (being recommissioned for other use), Main Injector, and Tevatron. The Tevatron completed its mission and was permanently shut down last September, but ongoing research and other activities will continue in many of its facilities for the foreseeable future.

In FY 2012, the following facilities were included under this HEMSF, all of which are designated as Excluded facilities under FIMS. FIMS designations are given in

parentheses after the facility names. Anti-Proton facilities (201, 202, 203 & 204), Booster Gallery (206), MuCool facility (210), Linac, Cross-Gallery, Transfer Gallery (212), Central Utility Building (214), A0 facilities (216, 217 & 218), Accelerator Service Buildings (220, 221, 222, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 267 & 283), Refrigeration facilities (299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322 & 324), Collider Detector Facility (323), D-0 Assembly Building (325), Meson facilities (402, 404, 406, 408, 410, 412, 414, 418, 426, 428, 430 & 434), KTeV/NM4 facility (630), Main Injector facilities (708, 710, 712, 713, 715, 720, 730, 731, 739, 740, 750, 752, 760 & 762), SciBooNE facility (714), NuMI (765) facility, MiniBooNE facility (780), MINOS facility (785), CHL facility (851), Master Substation (854), Kautz Road Substation (860), Research Accelerator Ring/Tunnel, NML Tunnel, and NuMI Tunnel (OSF).

High Performance Computing

These include 3 HPC clusters consisting of 1358 individual HPC servers housed primarily in two existing buildings designated as Excluded facilities under the FIMS identifiers in parentheses: the Grid Computing Center (628) and the Lattice Computing Center at Muon Laboratory (700).

The Lattice Computing Center uses High Performance parallel computing to calculate Lattice Quantum Chromodynamics in the study of how quarks and gluons interact through the strong force. Physicists compare the calculations to measurements from experiments to seek hints of new physics beyond the Standard Model.

At one time this facility housed all of the Lattice computing, however, it is now approximately 50% Lattice and 50% enterprise computing. Lattice now also has HPC computing at the Grid Computing Center, which also has HPC computing so that about 90% of this facility fits the HPC designation. The new Cloud Computing Center, which is scheduled to come online in FY 2014, is expected to be upwards of 80% High Performance Computing.

Experiments like those at the Large Hadron Collider (LHC) collect more data than any computing center in existence could process, so Fermilab initiated the FermiGrid to take part in a large consortium grid called Open Science Grid. Grid computing is essential to experiments at the LHC, and Fermilab is responsible for storing, processing, and redistributing a significant portion of the data from the CMS experiment there.

Future Accelerators

New experiments and facilities are anticipated to come online through FY2020 as Fermilab pursues the Intensity Frontier of High Energy Physics and the study of neutrinos. However, as outlined in Fermilab's LBNE Reconfiguration plan, funding constraints have pushed back the schedule for new HEMSF facilities. The Long Baseline Neutrino Experiment has now been planned for phased implementation with only Phase 1 to begin operations within the 2020 horizon.

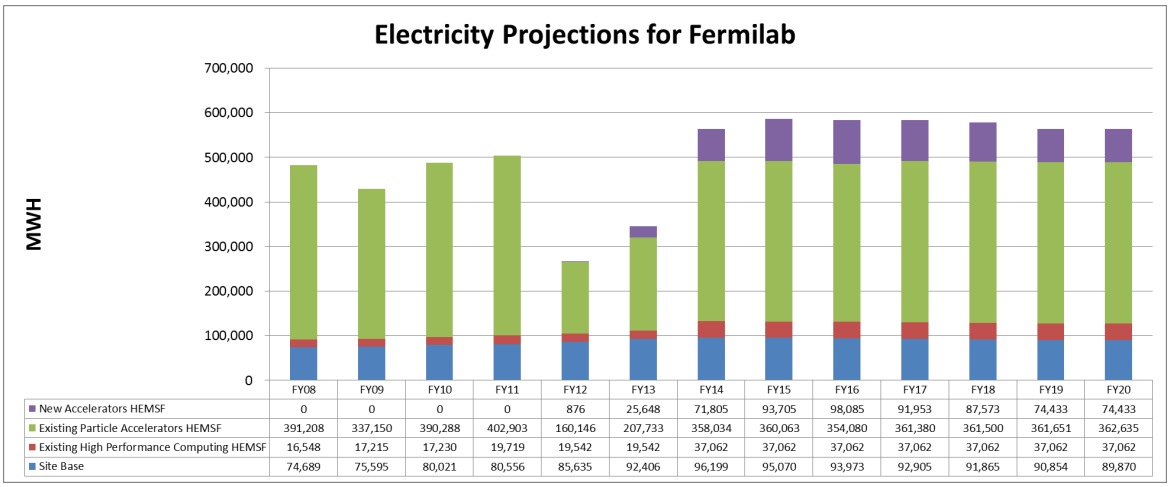
Also, the original program for SCRF/NML and CMTF was modified. Other new facilities such as NOvA and MicroBooNE will expand neutrino studies through intensity upgrades to the existing Main Injector that will help prepare the way for LBNE.

In the mid-term, the new g minus 2 facility will reuse accelerator equipment from Brookhaven to expand testing of the Standard Model by measuring the anomalous magnetic moment of the muon.

Toward the end of the 2020 horizon, Mu2e will look for dramatic new evidence of physical processes beyond our current understanding of particle physics by searching for the coherent, neutrino-less conversion of a muon to an electron in the coulomb field of a nucleus. LBNE will explore interactions and transformations of neutrinos by sending them more than 1000 km through the earth to the largest particle detectors ever built, to answer some of the most fundamental questions about the nature of our universe.

Figure 10 represents the anticipated effects on Fermilab electricity usage through FY 2020 from the following HEMSF activities:

- FY 2013 - Restarting the Main Injector at higher intensity and new test beam facilities
- FY 2014 – Startup of the new NOvA, SeaQuest, MicroBooNE, Holometer and Cloud Computing Center
- FY 2015 – Startup of the new LBNE Phase 1and discontinuation of the existing NuMI
- FY 2016 – Discontinuation of the existing PBar and the new SeaQuest, and startup of the new g minus 2 experiment
- FY 2017 – Discontinuation of MiniBooNE, MINOS, and MINERvA, and the new Holometer
- FY 2018 – Discontinuation of the new MicroBooNE
- FY 2019 – Startup of the new Mu2e, and discontinuation of the new g-2 experiment



	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
New Accelerators HEMSF	0	0	0	0	876	25,648	71,805	93,705	98,085	91,953	87,573	74,433	74,433
Existing Particle Accelerators HEMSF	391,208	337,150	390,288	402,903	160,146	207,733	358,034	360,063	354,080	361,380	361,500	361,651	362,635
Existing High Performance Computing HEMSF	16,548	17,215	17,230	19,719	19,542	19,542	37,062	37,062	37,062	37,062	37,062	37,062	37,062
Site Base	74,689	75,595	80,021	80,556	85,635	92,406	96,199	95,070	93,973	92,905	91,865	90,854	89,870

Figure 10. Site Base loads include goal subject building loads, metered process building and OSF enclosure loads calculated on a square foot basis based upon goal subject building loads per sf, and estimated percentages of metered process loads not specifically identified as HEMSF or applicable support system facilities, such as enterprise computing facilities.

Miscellaneous

Appendix A Self Certification submittal – Note OSF underground enclosures in attached FIMS Report 047 are to be included with buildings and trailers in attached FIMS Report 063 as part of Fermilab's Excluded facilities.

Appendix B Sustainability Highlights

Appendix C Goal Summary Table, attached