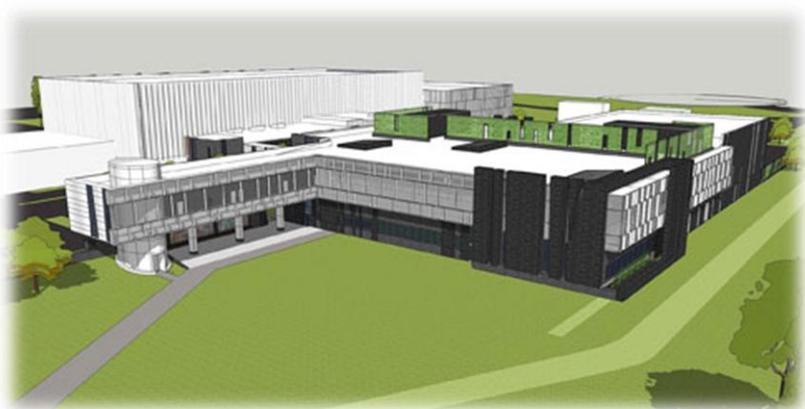


# Jefferson Lab Site Sustainability Plan

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21 December 2010

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## List of Acronyms

AFV – Alternative Fuel Vehicle  
BAS – Building Automation System  
BTUs / GSF – British Thermal Units per Gross Square Foot  
CEDR – Comprehensive Energy Data Report  
ECM – Energy Conservation Measure  
eGRID – “Emissions & Generation Resources Integrated Database” (EPA, EIA, FERC data)  
EUI – Energy Utilization Intensity  
EPACT05 – Energy Policy Act of 2005  
EISA07 – Energy Independence and Security Act of 2007  
EMMS – Energy Metering and Management System  
EMS4 – DOE’s Energy Management System v. 4  
EO13423 – Executive Order 13143, *Strengthening Federal Environmental, Energy and Transportation Management*  
EO13514 – Executive Order 13514, *Federal Leadership in Environmental, Energy and Economic Performance*  
ESPC – Energy Savings Performance Contract  
EUI – Energy Utilization Intensity  
FIMS – DOE’s Facilities Information Management Systems  
GeV – Billion Electron Volts  
GHG – Greenhouse Gas  
GPP – General Plant Projects  
HEMSF – High Energy Mission Specific Facility  
HPSB – High Performance Sustainable Buildings  
HVAC – Heating, Ventilation and Air Conditioning  
Kwh – Kilo Watt Hour  
LEED – Leadership in Energy and Environmental Design  
MGal – Million Gallon  
Mwh – Mega watt hour  
PPA – Power Purchase Agreement  
PPTRS – DOE’s Pollution Prevention Tracking and Reporting Systems  
RPS – Renewable Portfolio Standard  
SF6 – Sulfur Hexafluoride  
STT – Sustainability Transformation Team  
TEDF – technology and Engineering Development Facility

# Site Sustainability Plan

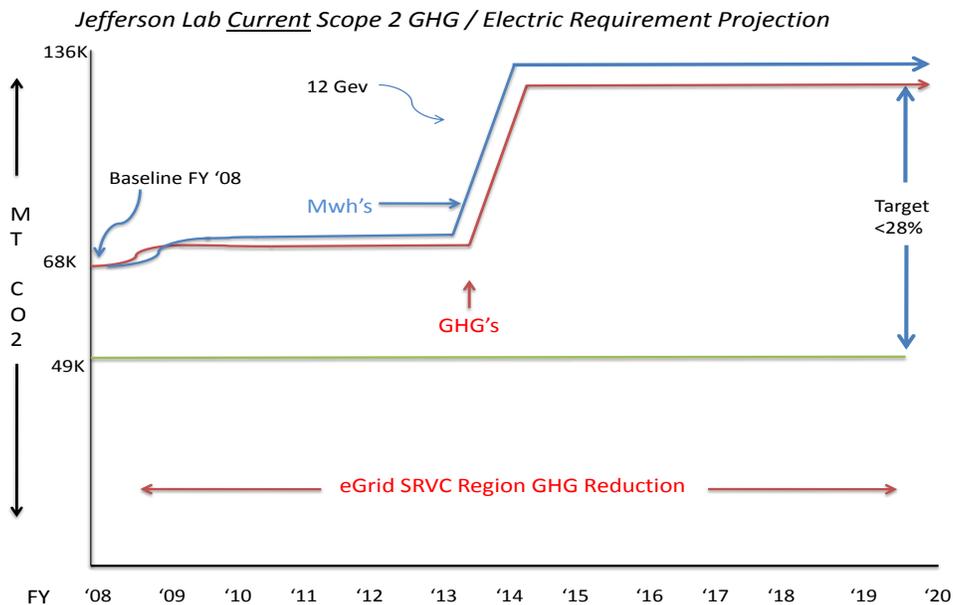
## 1. Executive Summary

The Thomas Jefferson National Accelerator Facility (Jefferson Laboratory), a nuclear physics user facility, provides worldwide unique capabilities for the study of nuclear physics. Jefferson Lab maintains core competencies in Nuclear Physics, Accelerator Science, Applied Nuclear Science and Technology, and Large Scale User Facilities / Advanced Instrumentation to support not only its own research program, but broader Office of Science missions as part of the Department of Energy (DOE) laboratory system, applying these technologies in the national interest.

Jefferson Lab is committed to achieving the diverse set of sustainability goals regarding Energy Utilization Intensity reduction, Renewable Energy applications, Fleet Petroleum management, Advanced Energy Metering, LEED Gold certification compliance in new construction and major renovation projects, High Performance Sustainable Building (HSPB) compliance for existing facilities and both Scope 1 and 3 GreenHouse Gas (GHG) targets defined in Executive Order 13514.

As a High Energy Mission Specific Facility (HEMSF), Jefferson Lab is currently engaged in significant expansion of scientific and support facilities, which will result in significantly increased energy requirements. Consequently, achievement of the Strategic Sustainability Performance Plan Scope 2 emission reduction target (purchased electricity) represents a significant challenge for Jefferson Lab. Figure 1 illustrates the magnitude of anticipated electric energy and subsequent GHG emission increase projection from current electric generation sources.

**Figure 1** GHG Challenges from FY 2008 Scope 2 (Purchased Electricity)



Jefferson Lab is currently upgrading its accelerator from 6 GeV to 12 GeV to realize a significant expansion of its scientific program. Electricity requirements and related power costs for 12 GeV operations starting around 2014 are projected to double from the FY2008 baseline.

Major reduction of Scope 2 GHG emissions from purchased electricity requires implementation of multiple strategies, and relies on availability of lower GHG content purchased electricity by FY 2020:

<b><u>Strategy</u></b>	<b><u>Contribution to Reduction Goal</u></b>
Renewable Energy Certificate (RECs) purchasing	90%
Reduced GHG content of purchased electricity	6% (Utility compliance with RPS)
HEMSF and support facility ECMs	3%
On-site electrical generation	1%

Jefferson Lab’s most significant HEMSF support facility is an existing 95K square foot Test Lab. This facility is undergoing a major renovation and expansion designed to achieve LEED Gold certification. The Test Lab project illustrates the efficiency improvements required to reduce Scope 2 GHG emissions.

Further, as the Jefferson Lab scientific mission continues to expand, thermal energy (cooling tower water) requirements for accelerator operations are projected to significantly increase. Currently, approximately 75% of Jefferson Lab’s annual consumption of 59 MGal of potable water is primarily consumed in cooling tower operations (evaporation/blow down). A water re-use proposal designed to offset all cooling tower consumption of potable water with treated waste water has been prepared (included in CEDR/Tab 5 ECM projects list), and funding approval is pending (approximately \$13 million). Implementing the proposed waste water treatment proposal, or similar waste water use plan (i.e. direct supply of treated waste water from the local sanitation system) will achieve Jefferson Lab’s water intensity reduction goals of 16% by FY 2015, and EO 13514 water consumption goal of 26% by FY 2020.

Jefferson Lab has established a Sustainability Transformation Team (STT) including a cross section of scientific, engineering, environmental safety health & quality, information technology, fleet and facilities managers. The mission of the STT is to identify and develop strategies and implement plans to achieve all goals identified in Table 1, DOE Goal Summary.

**Table 1 - DOE Goal Summary Table**

DOE Goal	FY10 Site Performance Status	Site Planned Actions
28% Scope 1 & 2 GHG reduction by FY 2020 from a FY 2008 baseline (related goals indented below)	16.7% Scope 1&2 GHG emissions increase to-date vs. FY 2008 baseline	Scope 1 – <b>Vehicles &amp; Equipment</b> - meet petroleum reduction and AFV fleet goals <b>Fugitive Emissions</b> – Complete the planned comprehensive GHG inventory by the January 2011 deadline. Determine any opportunities SF6 and other fugitive emission reduction strategies. Scope 2 – <b>Purchased Electricity</b> – Primary strategy – achieves 90% of GHG reduction target through REC purchases. 10% of GHG reduction target from other strategies as described in the Jefferson Lab SSP.
30% energy intensity reduction by FY 2015 from a FY 2003 baseline	19.6% Energy Utilization Intensity (EUI) reduction to-date vs FY 2003 baseline	30% EUI reduction will be achieved through multiple HVAC and lighting reduction Energy Conservation Measures (ECMs) by FY 2015 end. ECMs described in the Consolidated Energy Data Report included with the Jefferson Lab SSP.
7.5% of a site’s annual electricity consumption from renewable sources by FY 2010 (2x credit if the energy is produced on-site)	Purchased Renewable Energy Certificates (RECs) to meet renewable energy goal. Submitted on-site renewable waiver request for the 3.75% on-site option.	Continue to meet the 7.5% renewable energy goal through REC purchasing of 7.5% of annual Mwh electricity consumption.
Every site to have at least one on-site renewable energy generating system by FY 2010	Installed multiple geothermal systems & procured solar powered exterior lighting equipment	Continue implementing geothermal systems, solar exterior lighting, solar thermal, and solar PV applications
10% annual increase in fleet alternative fuel consumption by FY 2015 relative to a FY 2005 baseline	In FY10 Jefferson Lab is exceeding the alternative fuel consumption goal (to date). Alternative fuel consumption increased 57% relative to the FY2005 baseline. FY '10 increase from FY '09 = 775%.	Continue increase Alternative Fuel Vehicle (AFV) fleet by replacing eligible GSA leased vehicles with AFV's to meet the annual 10% increase in alternative fuel consumption by FY 2015.
2% annual reduction in fleet petroleum consumption by FY 2015 relative to a FY 2005 baseline	In FY10 JLab has reduced the fleet petroleum consumption by almost 50% relative to the 2005 baseline.	JLab will continue to decrease its petroleum consumption by replacing petroleum fueled vehicles with hybrid vehicles with low GHG emissions or AFV vehicles as vehicles become eligible for replacement.
75% of light duty vehicle purchases must consist of alternative fuel vehicles (AFV) by FY 2015	In FY10 14 of JLab's 21 vehicles are classified as "Light Duty." Of these 14 vehicles 10 or 72% are AFV.	Replace all light duty vehicles as they become eligible for replacement with AFVs. Achieve 100% AFV's for light duty vehicles by FY2015.
To the maximum extent practicable: advanced metering for electricity (by October 2012), steam, and natural gas (by October 2016); standard meters for water	Jefferson Lab awarded contract in FY'10 for Phase 1 metering plan (install advanced electric, water and gas meters throughout accelerator facilities)	Jefferson Lab will complete Phase 1 installation in FY '11 and award Phase 2 contract of the metering plan (additional site wide water and gas metering) in FY 11. Phase 1 & 2 installation planned to complete by FY '11 end, exceeding the goal deadlines of October 2012 (electric) and October 2016 (natural gas and water) metering

**Table 1 - DOE Goal Summary Table (cont'd)**

DOE Goal	FY10 Site Performance Status	Site Planned Actions
To the maximum extent practicable: advanced metering for electricity (by October 2012), steam, and natural gas (by October 2016); standard meters for water	Jefferson Lab awarded contract in FY'10 for Phase 1 metering plan (install advanced electric, water and gas meters throughout accelerator facilities)	Jefferson Lab will complete Phase 1 installation in FY '11 and award Phase 2 contract of the metering plan (additional site wide water and gas metering) in FY 11. Phase 1 & 2 installation planned to complete by FY '11 end, exceeding the goal deadlines of October 2012 (electric) and October 2016 (natural gas and water) metering
Cool roofs, unless uneconomical, for roof replacements unless project already has CD-2 approval. New roofs must have thermal resistance of at least R-30.	Approximately 25% (193K GSF) of total site roof area (773K GSF) currently comply with cool roof requirements	New construction and major renovation projects currently under construction are designed to meet cool roof requirements. Future roof replacements / upgrades will comply with cool roof requirements as economically feasible.
Training and outreach. DOE facility energy managers to be Certified Energy Managers by September 2012.	Complete, facility Energy Manager CEM & LEED AP certified	Continue to train additional staff and create an organizational structure to improve energy efficiency.
Sulfur hexafluoride (SF6) capture program by September 2012.	Jefferson Lab currently enjoys a successful SF6 capture program that has captured / recycled approximately 862K Mt / CO2 equivalent since 1998.	Jefferson Lab will present our SF6 capture program details at the December Fugitive Emissions Working Group meeting to share our successful capture strategies. Further, in FY '11 Jefferson Lab will continue to conduct SF6 system leak testing utilizing far infrared camera technology.
13% Scope 3 GHG reduction by FY 2020 from a FY 2008 baseline	17.9% Scope 3 emissions increase from additional staff / commuting and Transmission & Distribution (T&D) losses vs. FY 2008 baseline	<u>Develop</u> Scope 3 GHG reduction program in FY 11. <u>Potential</u> reduction strategies : <b>T&amp;D losses</b> – on-site renewable energy generation <b>Business Air / Ground Travel</b> - Increase use of web based meetings <b>Staff Commuting</b> - Promote car pooling, analyze telework and compressed work week programs for applicable support staff.
All new construction and major renovations greater than \$5 million to be LEED® Gold certified. Meet High Performance and Sustainable Building (HPSB) guiding principles if less than or equal to \$5 million	1 new construction and 1 major renovation project under construction. Both designed to meet or exceed LEED Gold requirements	All new buildings and major renovation to meet or exceed LEED Gold requirements
15% of existing buildings larger than 5,000 gross square feet (GSF) to be compliant with the five guiding principles of HPSB by FY 2015	Initial HPSB assessment complete, targeted buildings will achieve compliance. 3 buildings meeting the GP are required to achieve the 15% HPSB goal. 13 existing buildings exceed 15K GSF.	Achieving 15% of existing building compliance requires three (3) Jefferson Lab buildings comply with 100% of the HPSB guiding principles. Two (2) facilities currently under construction, due for completion prior to FY 2015 and one (1) additional building will achieve will comply 100% with the HBSP principles to achieve the 15% goal by FY 2015 end.
16% water intensity reduction by FY 2015 from a FY 2007 baseline, 26% by FY 2020	14.4% increase in potable water consumption vs. FY 2007. Potable water primarily consumed for cooling tower operations	Cooling Tower Water Reduction Strategies: <ul style="list-style-type: none"> <li>• Waste water treatment / reuse project pending funding approval (approx \$13 million).</li> <li>• Evaluate "hybrid" cooling tower systems to capture / recycle evaporation</li> </ul>
20% non potable water consumption reduction of Industrial, Landscaping, and Agricultural (ILA) water by FY 2020 from a FY 2010 baseline	Jefferson Lab does not use non potable water for ILA or any purpose	N/A

## 2.0 Goal Performance Review and Plans

### 2.1 Scope 1 & 2 Greenhouse Gas Reduction Goal Less 28% GHG by FY 2020

By 2020, Jefferson Lab will reduce its GHG Scope 1 and 2 emissions by 28% from the FY 2008 baseline. As indicated in the Executive Summary section, major challenges, especially in Scope 2 (purchased electricity) will require multiple strategies, including on-site renewable energy generation, innovative HEMS operational improvements, reduced electric utility GHG emissions per Mwh, and significant REC purchasing as illustrated in Figure 2 to achieve the 28% GHG emissions reduction goal.

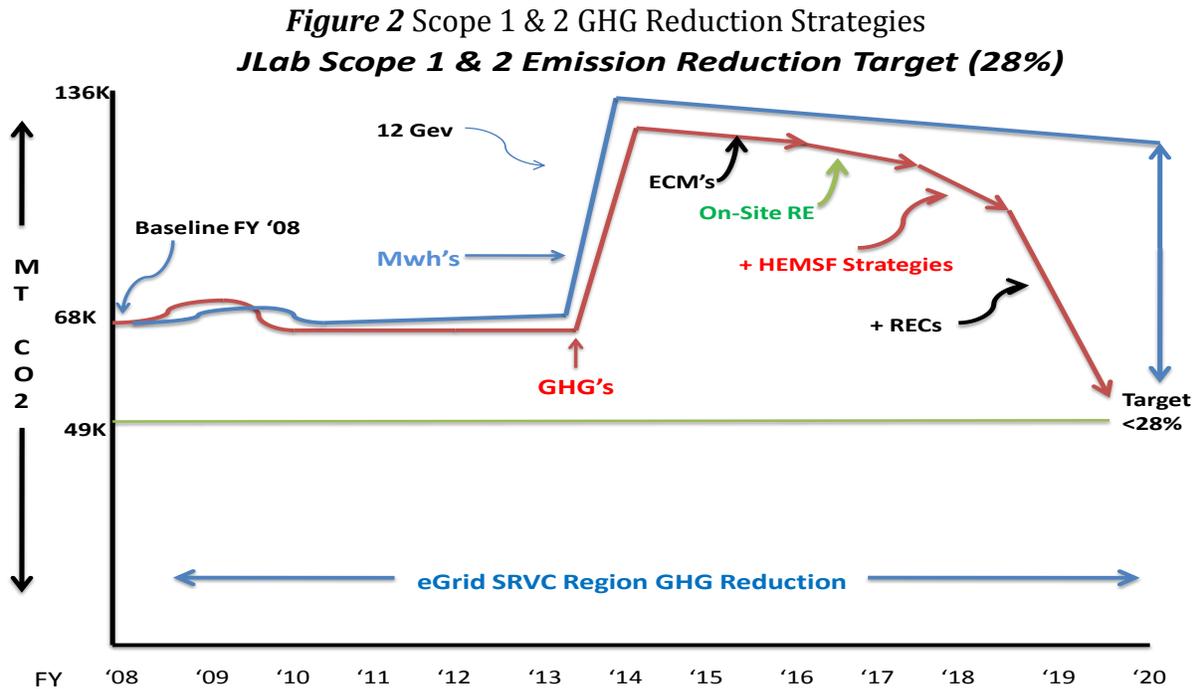
In order to achieve this goal, the Jefferson Lab will aggressively proceed with projects, operational improvements, and additional actions. This will involve obtaining funding from every possible source along with cultural changes and management emphasis.

Daily Energy Reduction Potential:

As a result of Jefferson Lab's participation with the EnergyConnect sponsored demand response program, approximately a 10 MW power reduction (one hour) was achieved in July, 2010 through the following action:

Test Lab operations minimized / LQCD computing de-energized / Beam operations secured / CEBAF Center air conditioning reduced.

A 240 Mwhs (10 MW X 24 hours) reduction per day could be achieved through similar reduced operations. Consequently, GHG emissions could be reduced approximately 120 MtCO<sub>2</sub>e per day.



**Table 2 GHG Reduction Strategies – Mwh / MtCO<sub>2</sub>e Reductions & Investment**

Reduction Strategy	Annual Mwh Reduction	Annual MtCO <sub>2</sub> e Reduction	Capital Investment (\$estimate / FY)	Annual Expense (estimate)
<b>On-Site Renewable Energy</b>				
<b>TEDF / Solar Photo Voltaic</b>	720 Mwhs	360 MtCO <sub>2</sub> e	\$4-\$5 Million FY 12- FY 13	\$30,000 (maintenance)
<b>Large Scale Solar Photo Voltaic</b>	2,000 Mwhs	1,000 MtCO <sub>2</sub> e	Power Purchase Agreement FY 15- FY16	\$120,000 (increase Kwh expense)
<b>Site / ECMs Strategies</b>				
<b>HVAC / Lighting</b>	280Mwhs	140 MtCO <sub>2</sub> e	\$500K -\$750K FY 12 – FY 15	\$50K - \$75K (maintenance)
<b>HEMSF / ECMs Strategies</b>				
<b>Accelerator / Energy Projects</b>	2,000 Mwhs	1,000 MtCO <sub>2</sub> e	\$3 - \$5 Million FY 16 – FY 18	
<b>Accelerator / Thermal Projects</b>	3,000 Mwhs	1,500 MtCO <sub>2</sub> e	\$5 - \$10 Million FY 16 –FY 18	
<b>Renewable Portfolio Standard</b>		5,000 MtCO <sub>2</sub> e	FY 11 – FY 20	
<b>Renewable Energy Certificates</b> \$1.00-\$3.00 / REC	12 Gw / 160,000 Mwhs	78,000 MtCO <sub>2</sub> e	FY 11 – FY 20	\$160K - \$480K
<b>Total GHG Reduction</b>  Target <28%		87,000 MtCO <sub>2</sub> e	\$12 - \$20 Million	\$350K -\$700K

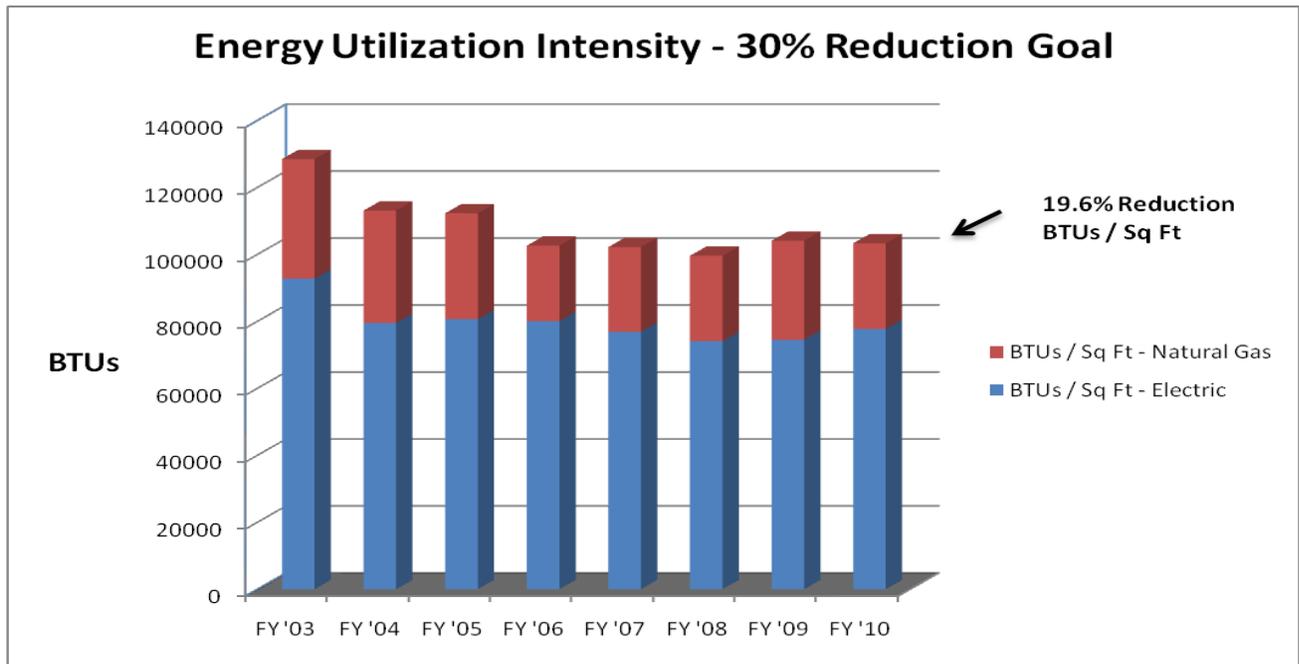
**2.1.1 Energy Intensity Reduction / Goal**

EISA 2007 requires DOE to reduce its Energy Utilization Intensity (EUI) by 30% by FY 2015 from a FY 2003 baseline. Jefferson Lab’s annual EUI reduction exceeds the average overall DOE EUI reduction rate. The lab is also ahead of the annual target reduction rate to achieve a 30% reduction from the FY 2003 baseline by FY 2015 end.

### 2.1.1.1 Performance Status.

Jefferson Lab's current EUI based on its EMS4 FY 2010 data is 103,267 BTUs/GSF which is a 19.6% reduction (*Figure 3*) as compared to the FY 2003 baseline of 128,442 BTUs/GSF. The Site is on schedule to meet the 30% reduction goal by 2015.

**Figure 3 - Energy Utilization Intensity**



### 2.1.1.2 Planned Actions.

Jefferson Lab plans to implement Energy Conservation Measures (ECMs) projects between now and FY 2015 that will significantly reduce energy intensity compared with the FY 2003 baseline. Jefferson Lab selects projects primarily by evaluating life-cycle costs (less than or equal to 25-year simple payback in the initial goal). See Tab 3 of the Consolidated Energy Data Report (CEDR) spreadsheet, which lists projects that, when implemented, have the potential to reduce energy use approximately 30% by the end of FY 2015.

Planned and new facilities currently under construction, along with estimates of their future energy consumption, are listed in the "New Construction" tab of the Consolidated Energy Data Report (CEDR). New facilities that contribute to the FY 2015 existing building inventory will achieve LEED Gold certification and further compliment achievement of the EUI reduction goal.

Additionally, Jefferson Lab also has identified the following activities to further reduce energy intensity and contribute to achievement of the 30% EUI reduction goal:

- HVAC Setbacks—All HVAC systems in facilities with setback capability have "Occupied / Unoccupied" mechanical equipment operation enabled. Further, as described in the CEDR / ECM tab, an optimal / adaptive start / stop strategy, is planned for implementation in Jefferson Lab's largest administrative facility (CEBAF Center).

- New construction and major renovation (>\$5Mil) are designed to achieve LEED® Gold Certification (minimum). A new 70,000 square foot facility (Technology and Engineering Development Center) is targeted to potentially achieve LEED Platinum certification.
- Audits identifying personal appliances in place at Jefferson Lab were conducted. Consequently, in FY 2010, the Jefferson Laboratory “Energy Policy” was implemented to limit staff use of personal heaters, refrigeration units, beverage preparation, ventilation equipment (fans), etc. reducing associated energy plug loads. Further, the new policy establishes consistent / fixed heating and cooling temperature limits throughout all areas controlled through centralized building management systems.
- ASHRAE Level II energy audits will be conducted for approximately 50% of applicable facilities in FY 2011.

### **2.1.2 Increase Departmental Renewable Energy Consumption / Goal**

Jefferson Lab is required to have 7.5% of its electricity consumption from renewable energy sources by FY 2013 per Section 203 of EPACT 2005.

#### *2.1.2.1 Performance Status.*

Jefferson lab has and continues to invest and implement renewable energy technologies. Specifically, several existing administrative and industrial facilities on the Jefferson Lab site utilize thermal renewable energy for building conditioning from geothermal heat pump systems. During FY 2010, Jefferson Lab procured several exterior solar powered parking lot style lights, and purchased Renewable Energy Certificates (RECs) equivalent to 7.5% of the total Mwh consumption of electricity in FY 2010.

#### *2.1.2.2 Planned Actions.*

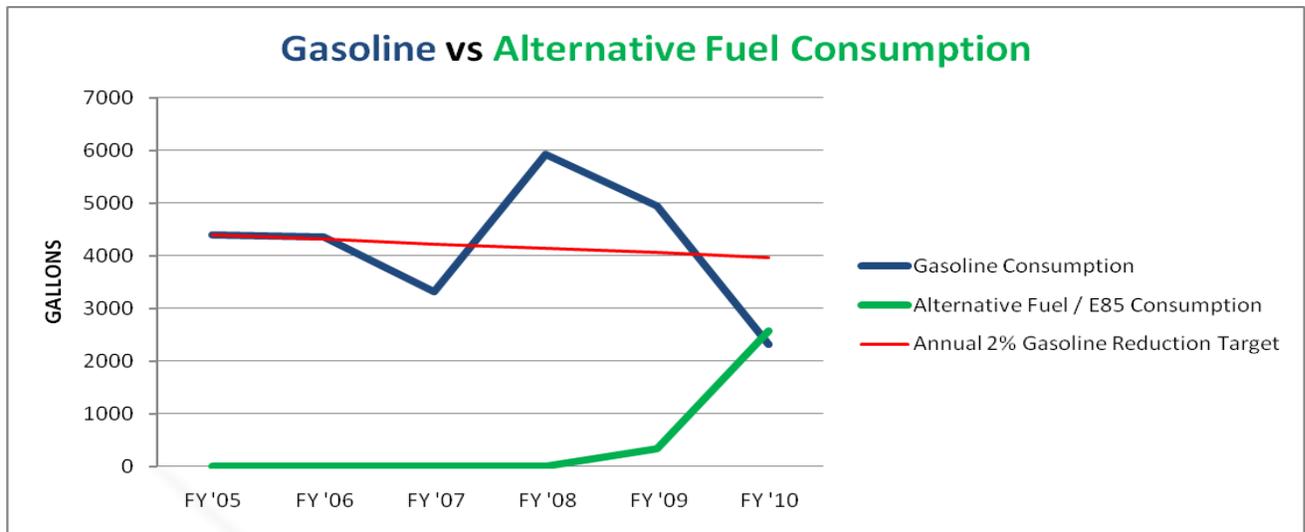
The following renewable energy actions are being planned for the next few years:

- Install a 750Kw solar photo voltaic system in conjunction with the construction of a new Technology and Engineering Development Facility (TEDF). TEDF is designed to achieve LEED Gold certification.
- Continue implementation of exterior solar powered lighting.
- Install a solar thermal system to satisfy domestic water heating requirements for the TEDF project.
- Continue implementation of geothermal heat pump systems.
- Evaluate feasibility of on-site utility scale renewable electric energy generation from solar PV, through a Power Purchase Agreement (PPA) in FY 2011.

### 2.1.3 Reduce Departmental Fleet Petroleum Use by 2 Percent Annual and Increase Alternative Fuel by 10 Percent Year-Over-Year / Goal

Jefferson Lab will decrease fleet petroleum consumption by 2% annually and increase alternative fuel consumption by 10% annually through FY 2015 (*Figure 4*), by replacing petroleum fueled vehicles with hybrid vehicles with low GHG emissions or AFV vehicles as vehicles become eligible for replacement.

**Figure 4** Petroleum vs. AFV Consumption History



Additionally, Jefferson Lab will meet 75% acquisition of alternative fuel vehicle (AFV) for light duty vehicles by FY 2015, if available.

#### 2.1.3.1 Performance Status.

In FY 2010, Jefferson Lab increased alternative fuel consumption by 57% relative to the FY 2005 baseline. Further, also in FY 2010, Jefferson Lab reduced the fleet petroleum consumption approximately 50%, again compared to the FY 2005 baseline. Fourteen (14) of Jefferson Lab's vehicles are classified as "light duty". Ten (10) of these (14) vehicles, or 72% are alternative fuel vehicles.

#### 2.1.3.2 Planned Actions.

The Site has established plans to further reduce petroleum consumption and right size the fleet.

- Continue to utilize AFV's to the greatest extent possible by replacing vehicles with AFV's as vehicles become eligible for replacement.
- Continue to decrease petroleum consumption by replacing petroleum fueled vehicles with hybrid vehicles with low GHG emissions or AFV vehicles as vehicles become eligible for replacement.

- Replace all light duty vehicles with AFV vehicles as available achieving 100% of the light duty vehicle goal by FY 2015.
- Through continued acquisition of additional hybrid electric and flex fuel vehicles, Jefferson Lab will realize further reductions in fleet emissions.

#### **2.1.4 Metering/ Goal**

Install metering devices, advanced or standard, to the maximum extent practicable in each building and other facilities and grounds for electricity by October 2012, and natural gas, steam, and water meters by October 2016.

##### *2.1.4.1 Performance Status.*

Phase 1 of an advanced electric, water and natural gas metering system is currently being installed. Phase 1 consists of a primarily wireless metering system measuring electricity consumption and demand for approximately 95% of the site's current electrical load. Further, critical water and natural gas consumption associated with accelerator operations and support facilities are included in Phase 1 of the metering installation, all due for completion in Qtr 2 / FY 2011. The advanced electric metering system will be completed ahead of the October 2012 deadline.

##### *2.1.4.2 Planned Actions.*

Status of Phase 2 of the Jefferson Lab metering system: awarded contract in Qtr 1/ FY 2011, scheduled to complete Qtr 2 / FY 2011. Phase 2 includes additional potable water (site supply and sub metering) and natural gas metering. All currently metered natural gas and water systems will be included in the site central metering system, and completed in advance of the October 2016 deadline for natural gas and water system metering.

#### **2.1.5 Cool Roofs / Goal**

Jefferson Lab will enhance overall building thermal performance for new roofs and they shall have a thermal resistance of at least R-30. This is consistent with DOE requirements as conveyed in Secretary Chu's memorandum of June 1, 2010.

##### *2.1.5.1 Performance Status.*

Currently, approximately 25% (193K GSF) of total site roof area (773K GSF) currently comply with cool roof requirements. Jefferson Lab is tracking all of its future cool roof activities in the FIMS database.

##### *2.1.5.2 Planned Actions.*

New construction and major renovation projects currently under construction. TEDF and Test Lab renovation are designed to include cool roof technology to comply with R-30 insulation and roof reflectivity requirements. Further, 11 existing facilities have been assessed for roof replacement during the next 5 years. All roof replacements / upgrades in facilities, including mechanical heating and cooling systems, will be evaluated for economic feasibility to comply with cool roof requirements.

## **2.1.6 Training / Goal**

DOE O 430.2B requires that personnel at each site be trained to direct energy and water management programs and dedicate all, or a substantial portion, of their time to the effective implementation of energy and water management plans.

### *2.1.6.1 Performance Status*

Jefferson Lab has a dedicated Energy Manager both certified by the Association of Energy Engineers as a Certified Energy Manager (CEM), and the United States Green Building Counsel as a LEED Accredited Professional (LEED AP). Further, Jefferson Lab has established a Sustainability Transformation Team (STT) including representation from a cross sectional set of organizations including:

- Chief Operating Officer
- ESH&Q Management
- IT / Data Center Management
- Facilities Maintenance / Energy Management & Construction
- Fleet Management
- Accelerator Operations / R&D
- Experimental Nuclear Physics
- Free Electron Laser Management

As indicated previously, the STT's mission is to identify, develop, and implement strategies to achieve the diverse set of goals described in the DOE Strategic Sustainability Performance Plan, including training and educating staff in energy efficiency and managing sustainable practices throughout all Jefferson Lab operations.

### *2.1.6.2 Planned Actions*

The Lab will create an organization that will have the responsibility and authority to improve the energy efficiency of the plant operation.

In addition, outreach and incentive programs will be initiated to motivate employees to minimize waste and become more efficient in their use of energy, water and green products and services.

Staff will be trained and will continue to attend GovEnergy, Labs 21, ASHRAE, Greenbuild and other industry events to enhance their current knowledge base.

## **2.1.7 SF<sub>6</sub> Reduction / Goal**

Jefferson Lab will establish a program to reduce or eliminate non-carbon dioxide (CO<sub>2</sub>) fugitive emissions from sulfur hexafluoride (SF<sub>6</sub>).

### *2.1.7.1 Performance Status.*

Jefferson Lab's utilization of SF<sub>6</sub> is limited to the Free Electron Laser (FEL) facility electron gun operations. The FEL is equipped with a very efficient SF<sub>6</sub> capture / recycle system that

has successfully captured/recycled approximately 72,000 lbs. of SF<sub>6</sub> and subsequent GHG emission avoidance of 782,000 MtCO<sub>2</sub>e during the previous 10-year period. Consequently, Jefferson Lab's SF<sub>6</sub> emissions are highly stabilized at minimal values due to the unique FEL capture system.

### 2.1.7.2 Planned Actions.

Jefferson Lab plans to conduct a complete GHG inventory, in January 2011, including the following SF<sub>6</sub> activities:

- Conduct assessment identifying potential replacement technology for SF<sub>6</sub>, leveraging scientific expertise.
- Continue SF<sub>6</sub> leak detection activities utilizing far infrared camera technology to further identify and correct any / all system leakage.

### 2.1.8 Behavior Change / Goal

Jefferson Lab will establish sustainability awareness communications with staff on a routine and special event basis through various methods:

#### Planned Actions:

- Web based metering system “dashboard” access for all staff will be in place by FY 2011. The energy (electric and natural gas) and water consumption dashboard will provide users with building / system specific information in historic and real time values. Building operation targets (i.e.: BTUs / GSF) will be available for users to view and understand in simplified “Red / Yellow / Green” format.

**Figure 5** Energy Metering and Management System “Dashboard”



- Publication of newsletter articles detailing Lab progress on sustainability related projects and goals.

- Jefferson Lab “Sustainability” website will provide users with both Lab sustainability activities and personal use information regarding various sustainability recommendations.
- Jefferson Lab’s Sustainability Transformation Team and the Public Affairs Office will actively promote both awareness and subsequent behavioral changes throughout all functional areas to help achieve our sustainability goals.
- In FY 2011, Jefferson Lab will establish a sustainability awards program that compensates lab staff for recommending sustainability practices that meet performance criteria. ..

### **2.1.9 Overall Reduction of Scope 1 & 2 GHG Emissions Goal Less 28% by FY 2020 end**

#### *2.1.9.1 Performance Status.*

Scope 1 and 2 GHG emissions have increased approximately 16.7% compared to the FY 2008 baseline, due primarily to increased purchased power consumption in support of the Laboratory’s scientific mission and employee growth. However, reduced emissions were realized in 2010 in our vehicle fleet program, where petroleum based fuel consumption has been reduced approximately 50% from FY 2005. We accomplished this by increasing the number of flex-fuel vehicles and operating them on cleaner burning fuels, like E-85, an ethanol-blended gasoline.

#### *2.1.9.2 Planned Actions.*

Significant reduction of Scope 1 and 2 GHG emissions relies primarily on the implementation of multiple strategies:

- REC purchases (Primary Strategy)
- On-site renewable energy generation
- Improved HEMS operating efficiencies
- Reduced GHG content from purchased electricity (eGrid SRVC region power generation achievement of established Renewable Portfolio Standards)

### **2.2 Scope 3 Greenhouse Gas Emissions Reductions / Goal**

DOE has committed to reducing its Scope 3 GHG emissions by 13%; this section describes Jefferson Lab’s Scope 3 GHG planned emissions reduction activities.

#### **2.2.1 Performance Status.**

Jefferson Lab’s Scope 3 GHG emissions increased approximately 17.9% in FY 2010 from the FY 2008 baseline. This increase was primarily a result of additional staff commuting and Transmission & Distribution (T&D) losses resulting from increased electrical consumption.

## 2.2.2 Planned Actions

Develop Scope 3 GHG reduction program in FY 11. Potential reduction strategies:

- Electricity Transmission & Distribution losses: increase the use of on-site renewable energy generation.
- Business Air / Ground Travel: increase use of web based meetings.
- Staff Commuting: increased Corporate Automobile Fuel Efficiency (CAFE) standards (increasing MPG fuel levels by 2015), promote car pooling, analyze telework and / or compressed work week programs for applicable support staff.

## 2.3 Comprehensive Greenhouse Gas Inventory

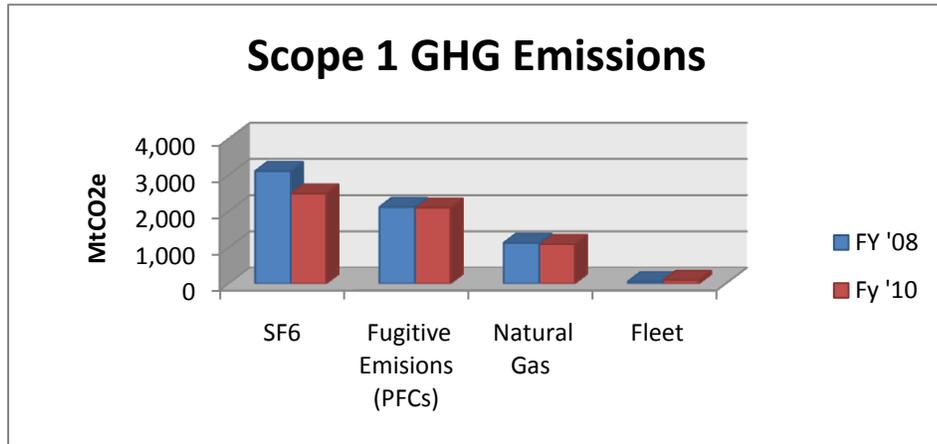
Federal Greenhouse Gas and Accounting Reporting Guidance prepared by FEMP and tools available through the Greenhouse Gas Protocol Initiative website were used to prepare Jefferson Lab's GHG inventory. FY 2008 baseline values prepared by FEMP were used for all Scope 1, 2 & 3 emissions except Scope 1 SF<sub>6</sub> emissions and Scope 3 Business Air Travel / Staff Commuting / Business Ground Travel. Jefferson Lab records indicate the actual FY 2008 SF<sub>6</sub> emission value was 3,107 MtCO<sub>2e</sub> versus 1,821 MtCO<sub>2e</sub> (287.5 Lbs of SF<sub>6</sub> consumed versus FEMP value of 168 lbs of SF<sub>6</sub>). Scope 3 FY 2008 baseline GHG amounts were calculated utilizing the GHG calculation methods provided for determining FY 2010 GHG values. Scope 3 calculations included in this document as Attachment "B".

Total GHG emissions (Scope 1, 2 & 3) for FY 2008 were 84,968.4 MtCO<sub>2e</sub>; energy contributing approximately 84% (71,020.9 MtCO<sub>2e</sub>) of total FY 2008 emissions.

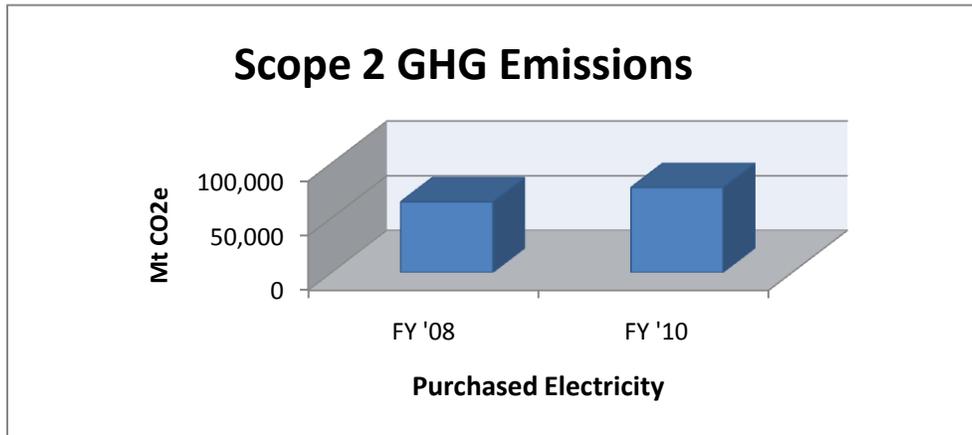
**Table 3 – FY '08 GHG Baseline**

Scope	Group	Source	MtCO <sub>2e</sub>	% of Total MtCO <sub>2e</sub> by Source	% of Total MtCO <sub>2e</sub> by Group
1	<b>Energy</b>	Stationary Combustion	1,126.5	1.3	83.5
2		Electricity	64,633.8	76	
3		Trans. & Dist. Losses-Grid	5,260.6	6.1	
1	<b>Transportation</b>	Fleet	39.5	.04	10.2
3		Staff Commuting	1,374.3	1.6	
		Rental Cars	366	.4	
		Airline Travel	6,939	8.1	
		Personal Auto (Business)	28.1	.03	
<b>1</b>	<b>Fugitives</b>	SF <sub>6</sub>	3,107	3.6	4.6
		Perfluorocarbons (PFC's)	2,095.6	2.4	
<b>Total</b>			<b>84,968.4</b>		

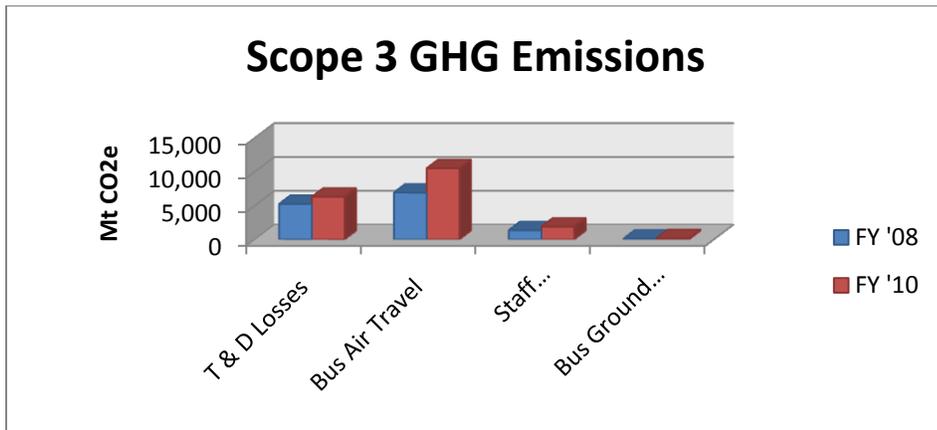
**Figure 6 Scope 1 GHG Emissions FY '08 vs. FY '10**



**Figure 7 Scope 2 GHG Emissions FY '08 vs. F Y '10**



**Figure 8 Scope 3 GHG Emissions FY '08 vs. FY '10**



## **2.4 High Performance Sustainable Design / Goal**

The High Performance Sustainability goal requires that 15% of all site facilities comply 100% with High Performance Sustainability Guiding Principles by FY 2015. Jefferson Lab plans to achieve 100% compliance to high performance sustainable buildings goals, as described in DOE Order 430.2B, 4.1 (1) & (2) and Attachment 1.7.a-c, by completing two new facilities by FY 2015 and completing upgrades to an additional facility.

To address the requirements in DOE Order 430.2B, Jefferson Lab has made a commitment to pursue Green Building Council Leadership in Energy and Environmental Design (LEED® Gold) and incorporate the High-Performance and Sustainable Buildings (HPSB) guiding principles in construction of future buildings, as addressed in the following sections.

### **2.4.1 HPSB New Construction**

Section 4.d of DOE O 430.2B stipulates that all new buildings and major renovations at CD-1 (prior to obtaining CD-2), with a value exceeding \$5 million, must achieve the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®) Gold certification. Any buildings below the \$5 million threshold will be required to meet the Guiding Principles for Federal Leadership in High-Performance and Sustainable Buildings (hereafter, "Guiding Principles") of HPSB design. In addition, per Section 109 of EPACT 2005, all new buildings in design shall be designed such that their energy consumption is 30% below the ASHRAE standard.

#### *2.4.1.1 Performance Status*

Currently two LEED Gold design projects are under construction, scheduled for completion in FY 2013. No other new construction buildings that fit the HPSB criteria are planned prior to FY 2015.

#### *2.4.1.2 Planned Actions*

The new Construction Worksheet of the CEDR captures all planned new construction. No other new construction buildings that fit the criteria of the requirements are planned.

### **2.4.2 HPSB Existing Buildings**

Section 4.d(1) of DOE O 430.2B states "all programs that own, or lease, real property must develop and implement a plan, as part of the executable plan to ensure that at least 15 percent of their enduring buildings are compliant with the Guiding Principles of Executive Order 13423." The Order further states that executable plans shall "establish a time line for execution coupled with specific performance measures and deliverables designed to achieve [the Order's goals]." EO 13514 and the SSPP further clarify the goal to be 15% of the number of buildings – not square footage – and that only a building greater than 5,000 SF are subject to the goal.

#### *2.4.2.1 Performance Status.*

An initial High Performance Sustainable Building assessment for all facilities was completed in FY 2010. CEDR worksheet / Tab 8 "Existing Bldgs HPSB" worksheet indicates the compliance status of applicable facilities (> 5K GSF).

#### *2.4.2.2 Planned Actions.*

Jefferson Lab will include the Guiding Principles in any new lease agreements and continue to evaluate and implement strategies per EO 13423. As illustrated in the CEDR worksheet, “Existing Buildings,” one existing building is planned to meet the Guiding Principles by 2015. Two additional buildings currently under construction and due for completion prior to FY 2015 will meet 100% of the HPSB guiding principles. Subsequently, three facilities (existing as of FY 2015) will meet 100% of the HPSB guiding principles in compliance with the 15% of existing buildings goal.

### **2.5 Regional and Local Planning / Goal**

EO 13514 instructs federal agencies, including DOE, to meet the following regional and local planning goals.

- Participate in regional transportation planning and recognize existing community transportation infrastructure;
- Align federal policies to increase the effectiveness of local planning for energy choices such as locally generated renewable energy;
- Ensure that planning for new federal facilities or new leases includes consideration of sites that are pedestrian friendly, near existing employment centers, and accessible to public transit, and emphasize existing central cities and, in rural communities, existing or planned town centers;
- Identify and analyze impacts from energy usage and alternative energy sources in all Environmental Impact Statements and Environmental Assessments for proposals for new or expanded federal facilities under the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.); and
- Coordinate with regional programs for federal, state, tribal, and local ecosystem, watershed, and environmental management.

#### **2.5.1 Performance Status**

Jefferson Lab’s Environmental, Safety, Health & Quality organization participates with emergency management organizations (Virginia Emergency Management Association and the Local Emergency Planning Committee) that address local transportation issues regarding disaster planning. The Jefferson Lab campus location qualifies for LEED “Development Density & Community Connectivity” credit for previously developed sites requiring pedestrian access to 10 basic services located within a ½ mile radius, and at least one residential zone of 10 units per acre. Although existing public transportation to / from the Jefferson Lab suburban campus is currently limited, the site does qualify for LEED “Public Transportation” credit requiring a minimum of one stop on two bus lines accessible within ¼ mile of a pedestrian route.

#### **2.5.2 Planned Actions**

- Ensure participation in regional transportation planning is incorporated into site policy and guidance documents (by September 2011).

- Identify regional transportation planning, ecosystem, watershed, and environmental management initiatives affecting sites and opportunities to work with local authorities to align energy policies and placement of renewable energy infrastructure (by February 2011).
- Assess state of interaction between sites and their local/regional organizations (by September 2011).

## **2.6 Water Use Efficiency and Management**

### **2.6.1 Water Efficiency / Goal**

The Site will reduce water consumption for the following areas:

- potable water, reducing water intensity by no less than 16% by FY 2015 relative to the established FY 2007 baseline.
- 20% reduction of Industrial/Landscaping/Agriculture (ILA) water consumption is being sought by FY 2020 from a FY 2010 baseline.

#### *2.6.1.1 Performance Status.*

Potable water at Jefferson Lab is primarily (75%) consumed for cooling tower operations and landscape irrigation. Non potable water is not utilized for Industrial Landscaping Agricultural (ILA) use. Potable water consumption has increased approximately 14% compared to the FY 2007 baseline. Further, as indicated in the Executive Summary continued increase in water consumption is expected due to expansion of the scientific mission and related thermal energy (cooling tower) requirements. Jefferson Lab does not currently use non potable water sources for ILA, or any other purpose.

#### *2.6.1.2 Planned Actions.*

Potable Water:

Potable water reduction strategies are primarily focused on reduction in cooling tower consumption. Reductions in potable water consumption can be achieved through implementation of a grey water system. Jefferson Lab has previously proposed a plan (details included in CEDR/Tab 5 / ECMs) to implement a waste water treatment system for use in cooling tower applications. Other potential grey water supply strategies (i.e.: direct grey water supply from the local water authority) are under evaluation. Further, Jefferson Labs Utility Infrastructure Modernization (UIM) program includes plans to evaluate a “hybrid” cooling tower retrofit strategy to capture and reuse cooling tower water evaporation. A combination of the above strategies will be required to achieve the target potable water reduction goals of 16% reduction by FY 2015 and 26% reduction by FY 2020 compared to the FY 2007 baseline.

### **2.6.2 Stormwater Management / Goal**

EISA Section 438 stipulates that, “The sponsor of any development or redevelopment project involving a Federal facility with a footprint that exceeds 5,000 square feet shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow.”

### *2.6.2.1 Performance Status.*

The design and construction of TEDF and Test Lab renovation projects, scheduled for completion in FY 2013, incorporate storm water management that will meet or exceed the requirements of EISA Section 438. See the CEDR spreadsheet for new construction projects.

### *2.6.2.2 Planned Actions.*

Current and future new construction / major renovation projects will comply with LEED Gold certification requirements regarding storm water management. No incremental parking is included in the TEDF and Test Lab projects to mitigate the need for storm water run-off management. Bio-swales will be used adjacent to asphalt roadways and other hard surfaces to facilitate infiltration.

## **2.7 Pollution Prevention (P2) / Goal**

The Site has established the following goals, consistent with the P2 goals outlined in the SSPP and the guidance.

Goal 1: Divert, at a minimum, 50% of non-hazardous solid waste and non-hazardous, non-radioactively contaminated construction and demolition (C&D) materials and debris by FY 2015. Increase the diversion of compostable and organic material from the waste stream.

Goal 2: Develop sustainable pollution prevention practices and to reduce use of toxic, hazardous, and GHG-emissions contributing chemicals.

Goal 3: Reduce printing paper use while purchasing uncoated paper containing at least 30% post-consumer fiber.

### **2.7.1 Performance Status.**

*Goal 1:* Data on sanitary waste including construction, composting, and recycling needs to be analyzed to assess the current performance relative to the goal and data reporting into PPTRS. Recycling contracts are in place for many waste streams (i.e., electronics, scrap metal, wood, paper, plastic, glass, tin, and cardboard). However, vendors recycling from construction and demolition will need to be accessed for frequency and quantities reported.

Goal 2: Specific improvement to the Site's chemical management will be provided in the FY 2010 PPTRS.

Goal 3: Printing continues to be an essential element for conducting mission related work, however, several improvements have been made and the culture is continuing to evolve to the use of more electronic media. Status on the FY 2010 paper usage will be reported through PPTRS.

## 2.7.2 Planned Actions.

### Goal 1:

- Activities Planned:
  - Evaluate existing pollution prevention data reported to PPTRS and establish metrics.
  - Conduct assessment of sanitary dumpsters to assess contents of current waste stream.
  - Assess compliance with reporting recycling activities from contractors.
  - Conduct survey of janitorial staff to assess contents of sanitary waste.
  - Assess feasibility of co-mingled recycling streams.
- Strategies: Develop Solid Waste Strategy that will analyze current sanitary waste generation and disposition options. Analysis will identify improvement opportunities that can be implemented or potential pollution prevention opportunity assessments.

### Goal 2:

- Activities Planned:
  - Maintain and continuously improve chemical inventory system and chemical redistribution program.
  - Evaluate EPCRA reports, Chemical Management System (CMS) and Ozone Depleting Substances (ODS) and GHG inventories to identify chemicals of concern and potential pollution prevention opportunities.
  - Evaluate current pest management activities against Integrated Pest Management guidelines and identify opportunities for improvement.
- Strategies: Develop site-specific chemical reduction objectives and targets based on operating conditions, life cycle costs, mission parameters, GHG emission reductions and other ESH factors.

### Goal 3:

- Activities Planned:
  - Set printers and copiers to duplex print by default
  - Encourage digital storage of records and files wherever the law allows
  - Continue to procure uncoated printing and writing paper containing at least 30% post-consumer content
- Strategies: Continue to utilize technology and encourage behavior to minimize paper use and enable automatic purchasing of 30% post-consumer content paper.

## 2.8 Sustainable Acquisition/Goal

Jefferson Lab has established the following goals to support sustainable acquisition:

Goal 1: Ensure 95% of new contract actions, including task and delivery orders under new contracts and existing contracts, require the supply or use of products and services that are energy efficient (ENERGY STAR® or FEMP-designated), water efficient, bio-based, environmentally preferable (including EPEAT-registered products), non-ozone depleting, contain recycled content, or are non-toxic or less toxic alternatives.

Goal 2: Update the procurement plan, policies and programs to ensure that all federally-mandated designated products and services are included in all relevant acquisitions.

### **2.8.1 Performance Status.**

Currently, all new contracts contain requirements for products and services to be energy efficient (ENERGY STAR® or FEMP-designated), water efficient, bio-based, environmentally preferable (including EPEAT-registered products), non-ozone depleting, contain recycled content, or non-toxic or less toxic alternatives. The purchases of non-compliant energy efficient products under the Purchasing Card (P-Card) program will require written pre-approval from the Subject Matter Expert. Our suppliers under the hosted catalogs are required to provide only compliant energy, water, recycled and bio-based products.

Our acquisition Guideline has been updated to ensure that all Federally-mandated designated products and services are included in all relevant acquisitions.

### **2.8.2 Planned Actions**

Jefferson Lab will enhance the current procurement process by modifying the risk assessment process to allow for review to identify applicable sustainable acquisition requirements. The Site also plans to develop appropriate mechanisms to fulfill PPTRS reporting requirements and track compliance with this goal.

Jefferson Lab will continue to further strengthen requirement for federally-mandated designated products in all purchasing programs as necessary.

## **2.9 Electronic Stewardship and Data Centers**

Jefferson Lab has established the following goals to meet sound electronic stewardship and management of data centers.

Goal 1: Purchase EPEAT silver or better computers, laptops, and monitors to improve power consumption efficiency, reduce hazardous materials (lead) content, and computer vendor recycle programs.

Goal 2: Centrally manage desktop computer and monitor hibernation for reduced overall power consumption.

Goal 3: Deploy virtual machines for IT core computer services in the computer center.

### **2.9.1 Performance Status.**

Goals 1, 2 & 3 achieved.

### **2.9.2 Planned Actions.**

Continue implementation of current equipment purchasing and power reduction practices.

## **2.10 Site Innovation**

- Ganni Cycle

TJNAF engineers revolutionized the operation of helium cryogenic (refrigeration) plants, reducing electricity consumption at Jefferson Lab and other Department of Energy scientific research facilities.

The existing refrigeration system was reconfigured to allow compressors to automatically scale back when full capacity is not needed. The new processes require very few or no new components and nearly double the lifetime of refrigeration equipment, while improving system reliability, availability, stability and efficiency. The engineers also fully automated Jefferson Lab's refrigeration facilities, the first cryogenics plant to do so, using a computer-based control system for round-the-clock load-matching efficient operation without the need for round-the-clock staffing.

This process slashed the power requirements of the refrigeration system from 6 megawatts to 4.2 megawatts, resulting in a savings of \$33,000 each month. The change also increased the time between necessary maintenance periods for the compressors from 45,000 hours to 74,000 hours.

The benefits of the processes have been demonstrated at other DOE facilities, including the Relativistic Heavy Ion Collider at Brookhaven National Laboratory in Upton, NY, and the Spallation Neutron Source at Oak Ridge National Laboratory in Oak Ridge, TN.

- SF6 Recapture

SF6 is used at Jefferson Lab to suppress arcing in the high-voltage DC electron sources at the Free Electron Laser facility. Historically, the SF6 was vented to the atmosphere 3-4 times per week to service or modify the DC photocathode electron gun. In 1998, a recovery system was designed and installed that allows for the capture of the SF6 during these maintenance activities. This system has prevented approximately 1M ton CO2 equivalent from entering the atmosphere.

- 7N supercomputer

The supercomputer, called Hadron, runs on both video game graphics cards and ordinary computer processors. About 90 percent of its computing power comes from

the video game graphics processing units, or GPUs. This application of cutting edge, off-the-shelf components allow for vastly increased computing power with no increase in electricity usage.

- Quad Core Cluster Computer

TJNAF's High Performance Computing Group has redesigned what was a planned dual-core system and replaced it with a quad-core system. This was done with no impact to the project cost, electrical consumption was reduced by 16%, and it is anticipated that the quad-core system will have a longer useful life than the original dual-core.

- Detector Signaling Redesign

TJNAF's Fast Electronics and Data Acquisition Group designed a circuit board that eliminated the need for miles of electronic cabling inside Jefferson Lab's experimental halls. The cables were used to delay the signals from each of the detector devices until a trigger system issued a command to convert these analog signals to digital data. The circuit board and supporting software now complete this action.

- Refurbishment of sodium iodide crystals

A TJNAF experiment needed a detector made with sodium-iodide crystals. As opposed to purchasing a new detector, scientists located a suitable used detector at DOE's Brookhaven Lab. The TJNAF team moved the old detector to Newport News, disassembled it and refurbished each of the 300 plus crystal blocks. After the detector was used for the TJNAF experiment, it was given to Duke University for use in an experiment.

- Upgrade of Continuous Electron Beam Accelerator Facility (CEBAF)

There are opportunities to increase the efficiency of CEBAF components in the range of 10-15% or greater with a capital investment to upgrade the machine. One opportunity is to reduce the generated heat thereby reducing the cryogenics load. This concept is being further evaluated to determine the range of capital investment energy savings.

### **3.0 Return on Investment Evaluation**

#### **3.1 Performance Status**

Return on investment analysis on planned ECM's included in CEDR / Tab 5 worksheet have not been performed since most individual projects are currently "identified" status (estimates for cost and benefit performed).

#### **3.2 Planned Actions**

As projects included in CEDR / Tab 5 worksheet advance to "verified" status (cost and benefits verified), return on investment analysis will be performed.

#### **4.0 Sustainability Transformation Team**

Jefferson Lab has established a Sustainability Transformation Team (STT) including a cross section of organizational disciplines. STT representation includes:

- Chief Operating Officer
- ESH&Q Management
- IT / Data Center Management
- Facilities Maintenance / Energy Management & Construction
- Fleet Management
- Accelerator Operations / R&D
- Experimental Nuclear Physics
- Free Electron Laser Management

The Jefferson Lab STT has conducted two monthly meetings to date to discuss the overall DOE Strategic Sustainability Performance Plan (SSPP), and assignments / contributions to the development of the Site Sustainability Plan. The STT will continue to identify and develop strategies and manage the implementation plan to achieve all goals defined in the DOE SSPP.

#### **5.0 Management and Funding**

##### **5.1 Management**

Jefferson Lab has established a Sustainability Transformation Team (membership described in section 4.0) reporting to the Chief Operating Officer .

##### **5.2 Sustainability Funding in Overhead**

Table 3 categorizes the overhead funding from actual projects completed in FY 2010 and planned projects identified in CEDR Tab 5 for FY 2011, FY 2012 and FY 2013. All out year projects and their costs estimates identified in the CEDR Tab 5 are considered planning information and may change based on emerging requirements and evolving priorities.

**Table 4 –Summary of Overhead Funded Projects**

Summary of Overhead Funded Projects in CEDR Tab 5 (\$000)				
Category:	FY 10 Actual	FY 11 Plan	FY 12 Projected	FY 13 Projected
Water			\$25	\$25
Energy Efficiency (non-data centers)		\$60	\$25	
Energy Efficiency (data centers)				
HPSB*			\$225	\$100
Metering	\$390	\$300		\$50
Cool Roofs				
Behavior Change		\$20	\$20	\$20
Lighting	\$20			
All other				
Total	\$410	\$380	\$275	\$195

\*HPSB – only include in this category projects that are specific to meeting the guiding principles and contain a mix of tasks such as lighting, meters, roofing, HVAC, etc.

### 5.3 ESPC/UESC (Ongoing and Planned Actions)

On-going - In FY 2003, Jefferson Lab began implementing a variety of projects including chiller, boiler and lighting fixture replacement funded through the Bonneville Power Administration (BPA) detailed in Table 4. In addition to the energy intensity reduction in facilities subject to the 30% EUI goal, several projects from the on-going BPA program benefit Jefferson Lab’s goal excluded buildings.

**Table 5: On-Going Energy Saving Projects**

Project	Funding	Cost	Energy Savings	Year Completed
HVAC Replacement	ESPC	\$3,788	998 Mwh/yr 20,400 CCF/yr	2003-2005
HVAC Controls	BPA financed	\$198	145 Mwh/yr	2003
Lighting Upgrades	BPA financed	\$409	1,618 Mwh/yr	2003 - 2004

Planned Actions –The Lab will evaluate a Purchase Power Agreement in FY ’11 focused on implementing a large scale solar PV system, designed to reduce Scope 2 GHG emissions from purchased electricity by approximately 1,000 MtCO<sub>2</sub>e.

**6.0 Supply and Purchasing Renewable Energy Certificates (RECs)** – Jefferson Lab’s GHG reduction goal for Scope 1 and 2 strategy in Section 2.1.8 includes producing electrical energy on-site, purchasing RECs, and evaluation of off-site dedicated renewable or carbon free electrical energy as follows:

### 6.1 On-Site Power

On-Site Power production plans include 720KW solar photo voltaic system included in the new construction TEDF project planning. Further, planning evaluation in FY 2011 of a large scale solar photo voltaic system (approx 2 MW) and procurement through a power purchase agreement.

### 6.2 Off-Site Power Purchasing

Purchasing off-site dedicated renewable or carbon free electrical energy – Jefferson Lab will evaluate this GHG reduction option in FY 2011 verses increased REC purchases. However, purchasing off-site “green” energy is not currently included in the Jefferson Lab overall GHG reduction strategy.

### 6.3 Purchasing RECs

Table 6 includes actual and planned REC purchases in MWH and the estimated cost. Assumptions include gradual REC unit cost increases as general economic conditions improve and REC market demand increases.

**Table 6 – REC Purchase Plan**

	Actual FY10	Planned FY 11	FY 12	FY 13	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20
<b>RECs Purchase Plan (MWHs)*</b>	<b>10,876</b>	<b>10K</b>	<b>10K</b>	<b>80K</b>	<b>160K</b>						
<b>Actual/Planned / Estimated Cost</b>	<b>\$9,896</b>	<b>\$10K</b>	<b>\$10K</b>	<b>\$80K</b>	<b>\$240 K</b>	<b>\$320 K</b>	<b>\$400 K</b>	<b>\$480 K</b>	<b>\$480 K</b>	<b>\$560 K</b>	<b>\$560 K</b>
<b>Unit Costs (\$/MWHs)</b>	<b>\$.909</b>	<b>\$1.00</b>	<b>\$1.00</b>	<b>\$1.00</b>	<b>\$1.50</b>	<b>\$2.00</b>	<b>\$2.50</b>	<b>\$3.00</b>	<b>\$3.00</b>	<b>\$3.50</b>	<b>\$3.50</b>

\*the purchase plan should be based on the strategic plan for meeting GHG reduction goal in Section 2.1.8

## Attachment "A"



TJNAF FY2010 CEDR  
083110 (rev 1).xlsx

## Attachment "B"



Bus Air Travel FY  
2008.xlsx



Bus Ground Travel  
FY 2008.xlsx



Employee Commute  
FY 2008.xlsx