

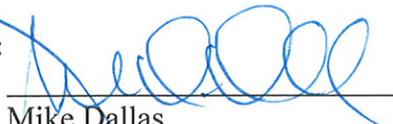
Thomas Jefferson National Accelerator Facility

FY 2009 Executable Plan Update

Energy, Renewable Energy, and Transportation

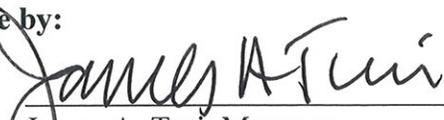


Approved by:


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12/23/09
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1. Executive Summary

The Thomas Jefferson National Accelerator Facility (TJNAF or Jefferson Lab), located in Newport News, Virginia, is a single-program laboratory supporting the Department of Energy's (DOE) Science Strategic Goal and six of seven Strategic Plan goals of the Office of Science. Jefferson Lab, a Nuclear Physics user facility, provides worldwide unique capabilities for the study of hadronic physics, and maintains core competencies in nuclear physics and accelerator technologies to support not only its own research program, but broader Office of Science missions as part of the national DOE laboratory system, applying these technologies in the national interest.

The Jefferson Lab FY 2009 Executable Plan Update (EPU) is prepared as a progress update to the FY 2008 Executable Plan, approved and submitted December 23, 2008. This document and supporting data follows guidance provided by the DOE, Office of Science, FEMP and additional guidance from the DOE – Jefferson Lab Site Office.

a. Site Energy Management Vision.

This FY 2009 EPU demonstrates that Jefferson Lab is committed to achieving an Energy Use Intensity (EUI) reduction goal of 30% by the end of FY 2015, as defined in DOE Order 430.2B, through continued identification and implementation of Energy Conservation Measures (ECM) as outlined in Table C (enclosed), and detailed in the respective Consolidated Energy Data Report. Further, Jefferson Lab plans to implement ECM projects in goal excluded facilities as outlined in Table B (enclosed), to achieve additional energy and associated GreenHouse Gas (GHG) emission savings. Distributed energy generation strategies (Hydrogen Fuel Cell) and on-site renewable energy programs (Solar Powered Exterior Lighting) are currently under evaluation.

Performance measures for FY 2009 and proposed performance measures for FY 2010 are consistent with DOE Order 430.2B goals.

b. Major Planning Assumptions and Energy Issues, Including Funding Strategies.

Significant future EUI reductions are planned to occur from major existing facility renovation projects prior to the end of FY 2015. To date, Energy Service Performance Contract (ESPC) proposals have not identified life cycle cost effective opportunities. Subsequently, major planning assumptions include identification and securing of funding sources to achieve EUI reduction from renovation and retrofit based projects.

Contribution to achieving EUI reduction goals are also planned from two new construction LEED Gold projects scheduled for completion in 2013.

c. FY 2009 vs FY 2008 Performance/Results.

Although 12%+ heating degree days and 16%+ cooling degree days occurred in FY 2009 vs FY2008, an actual EUI (BTU/GSF) reduction of approximately 1.8% was achieved through partial implementation of a building re-commissioning program during the same period. Jefferson Lab expects to complete the re-commissioning program and enjoy the full energy savings benefits of this ECM (and others) in FY 2010.

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d. FY 2009 Comprehensive Energy Data Report.

Specific data addressing Jefferson Lab performance to the goals of DOE Order 430.2B are included in an MS – Excel Spreadsheet transmitted electronically, “under separate cover”.

2. DOE Order 430.2B Goal Summary Table

Goal	Status & Plans
30% energy intensity reduction by FY 2015 from a FY 2003 baseline	Jefferson Lab is on schedule to achieve a 30% EUI reduction by the end of FY 2015. As of FY 2009, Jefferson Lab implemented energy efficient HVAC equipment, lighting and temperature control strategies contributing to a 20% EUI reduction. Jefferson Lab continues to identify new opportunities for additional EUI reduction. A current list of ECM initiatives is described in Table C.
16% water intensity reduction by FY 2015 from a FY 2007 baseline	Jefferson Lab stated in the FY 2008 Executable Plan, achieving the water reduction goal is primarily dependent upon funding and installation of a proposed water reuse program with a local water utility. Approximately 75% of current water consumption is required to support cooling tower operations serving high energy use programmatic processes. The proposed water reuse program replaces potable water for treated wastewater (grey water) for use in cooling tower. Jefferson Lab funding request to the DOE for this project is currently pending approval.
7.5% of a site’s annual electricity consumption from on-site renewable sources by FY 2010	During FY 2009, Jefferson Lab acquired 4.7% of total electric power use via Renewable Energy Credits (RECs) and has arranged to secure at least 7.5% of total electric power use via RECs for FY 2010 and beyond. Achieving 3.75% of annual electric consumption from on-site renewable energy initiatives is not life cycle cost effective at Jefferson Lab. However, on-site renewable projects, as described in Table D are planned for implementation as new construction and facility renovation projects occur.
Every site to have at least one on-site renewable energy generating system	Jefferson Lab has installed geothermal heat pump systems and plans to implement this renewable technology in future projects. Solar powered exterior lighting (parking / roadway applications) are under evaluation.
10% annual increase in fleet alternative fuel consumption relative to a FY 2005 baseline	Alternative fuel consumption equated to approximately 6% of the total amount of fuel used by the Jefferson Lab fleet in FY 2009. This amount is due to increase in FY 2010 if Jefferson Lab acquires an E-85 tank on-site.

Goal	Status & Plans
10% annual increase in fleet alternative fuel consumption relative to a FY 2005 baseline	Alternative fuel consumption equated to approximately 6% of the total amount of fuel used by the Jefferson Lab fleet in FY 2009. This amount is due to increase in FY 2010 if Jefferson Lab acquires an E-85 tank on-site.
2% annual reduction in fleet petroleum consumption relative to a FY 2005 baseline	E-85 use by Jefferson Lab’s fleet has reduced petroleum consumption by 6% in FY 2009. Exclusive use of alternative fuel by designated on-site vehicles is planned to reduce the overall amount of petroleum fuel used by the Jefferson Lab fleet in future years.
75% of light duty vehicle purchases must consist of alternative fuel vehicles	All light duty replacements to the GSA fleet will be alternative fueled if the technology is offered by GSA, fuel is reasonably available, and the vehicle is suitable for use on the Jefferson Lab site. The Jefferson Lab Vehicle Control Officer oversees GSA replacement offerings and assures programmed replacements are consistent with Executable Plan goals and scientific mission objectives.
All new construction and major renovations greater than \$5 million to be LEED® Gold certified	Designing all new construction and major renovations projects to achieve LEED® Gold certification. <ul style="list-style-type: none"> • Technology & Engineering Development Facility / New Construction / FY 2013 • Test Lab / Major Renovation / FY 2013
15% of existing buildings to be compliant with the five guiding principles of (HPSB) design	Jefferson Lab will achieve this goal before the end of FY 2015. Initial HPSB campus assessment completed and target facilities identified in FY 2009. Analysis of requirements to comply with all guiding principles in target existing buildings scheduled to occur in FY 2010/2011. New construction & major renovations projects will comply with all HPSB guiding principles contributing to further achievement of this goal.
Advanced metering to the maximum extent practicable	Jefferson Lab has completed the initial installation of a campus wide (4 phase) advanced metering program. Phase 2 (Web-based communication/energy analysis software) is scheduled in FY 2010. Remaining work (additional electric & gas/water meters) is scheduled for FY 2011/12.

3. Energy Use Intensity

a. Major Energy Conservation Measures.

During FY 2009, Jefferson Lab continued operating facilities efficiently. As stated in the summary table, Jefferson Lab is on schedule to achieve a 30% EUI reduction by the end of FY 2015. ECMs and subsequent energy savings benefit (MWH/Year reduction) completed to date in goal subject buildings are summarized in Table A. ECMs completed and planned in goal exempt facilities are described in Table B. ECMs planned to achieve EUI reduction goals are listed on Table 3 – 2 of the appended FY 2009 Consolidated Energy Data Report (CEDR). Jefferson Lab has committed to implementing all measures “In Development” and anticipates

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implementing all "Identified" measures. Table C (enclosed) summarizes the identified energy conservation measures identified to date including estimated EUI impact in BTU's/Sq Ft.

Jefferson Lab implemented one major ECM (re-commissioning of two significant administration buildings) and several minor initiatives (installed programmable thermostats) during FY 2009. A new energy policy, primarily regarding standard heating/cooling temperature settings, and staff use of personal appliances was prepared in FY 2009, and subsequently implemented at the start of FY 2010.

Additional energy savings are anticipated from improved efficiencies to be realized in current new building construction and major renovations.

Table A: Completed ECM Projects

Project	Description	Funding	Cost	Energy Savings	Year Complete
VARC HVAC Replacement	Replace existing chillers, cooling tower and boilers with new units in "Goal Subject" building	BPA financed	\$757K	181 Mwh/yr 20,400 CCF/yr	2003
VARC & CEBAF Center Lighting Renovation	Replace existing T-12 fixtures with T-8, add occupancy sensors and day lighting controls in "Goal Subject" building	BPA financed	\$76K	380 Mwh/yr	2003
CEBAF Center Upgrade Controls	Upgrade Building HVAC Controls in "Goal Subject" building	BPA financed	\$198K	145 Mwh/yr	2003
EEL & Test Lab Lighting Renovation	Replace existing Mercury Vapor fixtures with Metal Halide fixtures; replace T-12 fixtures with T-8 fixtures In "Goal Excluded" building	BPA financed	\$294K	786 Mwh/yr	2004
Accelerator Service Bldg. Occupancy Sensor Installation	Replace manual lighting control in unoccupied service buildings with multi-zone, occupancy sensors in "Goal Excluded" buildings	BPA financed	\$39K	452 Mwh/yr	2003
Central Chiller Facility	Replace various roof mounted DX units throughout site with a central chilled water facility. Also upgraded chiller used in two large "Goal Excluded" buildings	BPA financed	3,031K	817 Mwh/yr	2005
Trailer City Replacement	Remove existing trailer-based office complex and replace with 60,000 SF addition to CEBAF Center. "Goal Subject" building	Indirect	\$20K	300 Mwh/yr	2006

Table B: ECM Projects - Goal Excluded Facilities

PROJECT	Est. Cost FY2009	Funding Type	Est. Savings	Funding Year	Est. Project Completion
Add building programmable thermostats	\$10,000	Indirect	400 Mwh/yr	2009	Complete
Establish Lab wide heating & cooling temperature standards and use of night setback	\$0	Indirect	28 Mwh/yr	2009	Complete
Replace LCW Controller w/ VFD Bldg. 92	\$50,000	Indirect	242 Mwh/yr	2010	2010
EEL: Correct Leaking Valves	\$45,000	Indirect	60 Mwh/yr	2010	2011
Lighting Renovations	\$225,000	Indirect	60 Mwh/yr	2010	2012
MCC A/C Replacement	\$300,000	Indirect	268 Mwh/yr	2010	2013
N&S Access Economizer	\$40,000	Indirect	42 Mwh/yr	2011	2013
Counting House Rehab	\$1,100,000	GPP	74 Mwh/yr	2013	2014
EEL Building Rehab	\$3,000,000	GPP	277 Mwh/yr	2016	2017
End Station Chilled Water Sys.	\$900,000	GPP	125 Mwh/yr	2017	2018
Total:	\$5,670,000		1,576 Mwh/yr		

Table C: ECM Projects - Goal Subject Buildings

PROJECT	Est. Cost FY2009	Funding Type	Est. Energy Savings	Funding Date	Est. Project Completion
Implement Lab heating & cooling temperature standards and use of night setback	\$5,000	Indirect	1,000 BTU/SF	2009	Complete
Re-commission HVAC Systems in CEBAF Center, VARC, and ARC	\$50,000	Indirect	1,200 BTU/SF	2009	CEBAF / VARC complete ARC / 2010
Temperature setback & lighting controls – Leased Facility / City of Newport News Applied Research Bldg.	\$10,000	City of Newport News	5,000 BTU/SF	2010	2010
VARC Window Replacement	\$225,000	Indirect	110 BTU/SF	2011	2011
CEBAF Center: Replace F-Wing Conf Rm. Heat Pumps	\$92,000	Indirect	250 BTU/SF	2012	2012
Upgrade Mechanical System – Leased City of Newport News Applied Research Bldg.	\$1,200,000	City of Newport News	800 BTU/SF	TBD	TBD

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PROJECT	Est. Cost FY2009	Funding Type	Est. Energy Savings	Funding Date	Est. Project Completion
CEBAF Center Building Rehab	\$18,677,000	SLI	7,500 BTU/SF	Required by 2013	Required by 2015
CEBAF Center Optimal Start / Stop Control	\$50,000	Indirect	500 BTU/SF	2010	2011
Total ECM Projects:	\$20,249,000		16,360 BTU/SF		

b. Data Center Energy Improvements.

Jefferson Lab operates approximately 11K SF of data center located within a 128K SF administration building, and approximately 1K SF of data area located within a 17K process facility. Both the data center areas and facilities including the data center areas are scheduled for modernization activity. Improved data center energy efficiency measures (e.g.: OA economizer control) are under early consideration as an element of the overall facility modernization plans.

Further, a feasibility study regarding installation of a combined heat and power (CHP) hydrogen based fuel cell system is scheduled to occur in FY 2010. Both power and thermal energy from the CHP system would be applied to the 11K SF data center to efficiently provide data center electrical service and satisfy equipment cooling requirements. If life cycle cost effective, the CHP project would significantly improve Jefferson Lab's primary data center energy efficiency.

c. Applications of Best Energy Management Practices.

Jefferson Lab continuously implements best management practices in all occupied facilities including heating setback/cooling setup strategies in all owned and leased facilities, policies and procedures and lease agreements requiring setback programs, building occupants awareness of setback benefits, and continuous maintenance of HVAC systems utilizing setback control.

A new lab wide energy policy was implemented in the first quarter of FY 2010. The policy is designed to maintain consistent, energy efficient heating and cooling temperature set points throughout all building areas, and defines specific building occupancy/setback schedules. Facility Management's action is required to temporarily modify set back schedules for events outside established occupied periods. Further, the policy prohibits individual staff use of energy consuming personal appliances (e.g.: portable heaters) to maintain a safe environment, and reduce plug load consumption.

d. Procurement Procedures.

Procurement systems provide buyers with information concerning the acquisition of energy efficient and sustainable products. Design guidance documentation has been provided to subcontractors responsible for the design and construction of new facilities and both major and smaller renovations. Their subcontract require achievement of LEED® Gold certification from the USGBC for new buildings and major renovations, otherwise following the Guiding Principles of Sustainable Design, exceeding ASHRAE Standard 90.1 – 2004 energy performance by at least 30% and other relevant requirements.

e. Integration into the Environmental Management Systems (EMS).

Jefferson lab's EMS Plan incorporates the Executable Plan in its entirety. All the Executable Plan goals and targets, including energy intensity reduction goals required under DOE Order 430.2B are considered when establishing Jefferson Lab EMS objectives and targets.

4. Water Intensity

a. Water Conservation Measures.

As reported in the FY 2008 Executable Plan, Jefferson Lab continues to pursue a treated wastewater use plan to significantly reduce potable water consumption of cooling tower operations, primarily serving industrial process cooling requirements. Jefferson Lab's funding request to the DOE for this project is currently pending approval.

Jefferson Lab has installed irrigation water conserving equipment, and plans to install water efficient plumbing fixtures to comply with HPSB guiding principle requirements. Further, new construction and major renovation projects will include water efficiency measures to achieve LEED Gold certification.

b. Rationale / Justification - Why Water Savings Goal Cannot be Met.

Unless the above wastewater treatment plan is immediately funded and implemented, or a major water leak is discovered and corrected, Jefferson Lab cannot commit to meeting the end FY 2015 water use intensity savings goal of 16% compared to FY 2007. Cooling tower water consumption contributes to approximately 76% of Jefferson Lab's total water consumption. Subsequently, without major cooling tower water reduction, the balance of Jefferson Lab's water consumption (24%) must be reduced approximately 66% to achieve an overall 16% reduction goal. Water conservation measures identified/planned from above will not achieve a 16% water consumption reduction vs. a FY 2007 baseline. However, Jefferson Lab continues to implement water efficient measures when and where ever feasible.

c. Integration into the Environmental Management Systems (EMS).

Jefferson lab's EMS Plan incorporates the Executable Plan in its entirety. All the Executable Plan goals and targets, including energy intensity reduction goals required under DOE Order 430.2B are considered when establishing Jefferson Lab's EMS objectives and targets.

5. Renewable Energy

a. Renewable Energy (RE) Systems.

Jefferson Lab has implemented geothermal heat pump RE systems and included geothermal heat pump design in both new construction and major/minor renovation projects. Further, Jefferson Lab is currently evaluating and planning to implement a solar-powered lighting system for multiple new parking/roadway area projects. RE systems have not been deployed throughout the Laboratory, due primarily to poor payback economics resulting from Virginia's relatively low electric power rates.

b. On-Site RE Waiver Request.

Jefferson Lab plans to submit an On-Site Renewable Energy Waiver Request. However, per above, Jefferson Lab plans to continue to acquire RECs equivalent to 7.5% of total electric consumption.

c. Integration into the Environmental Management Systems (EMS).

Jefferson lab's EMS Plan incorporates the Executable Plan in its entirety. All the Executable Plan goals and targets, including energy intensity reduction goals required under DOE Order 430.2B are considered when establishing Jefferson Lab's EMS objectives and targets.

Table D: Renewable Energy

PROJECT	FY2009 Est. Cost	Funding Type	Funding Year	Est. Amt of Renewable Energy	Est. Project Completion
TEDF Building (Geothermal Heat Pumps)	\$10,000,000	SLI	FY10-FY12	240 Mwh	2013
CEBAF Center Rehab (Geothermal Heat Pumps)	\$5,000,000	SLI	FY-13	450 Mwh	2015
EEL Rehab (Geothermal Heat Pumps)	\$3,000,000	GPP	FY-14	277 Mwh	2015
Solar Exterior Lighting	\$220,000	Indirect	FY-11	35 Mwh	2014
Total:	\$18,220,000			1,002 Mwh	

6. Fleet

a. Major Fleet Measures Accomplished and Planned.

Since FY 2005, Jefferson Lab has replaced thirteen (13) gasoline vehicles with flex-fuel capability under the GSA lease program. During FY 2009, ten (10) of these vehicles were designated to use E-85 fuel exclusively. The Lab has a number of special use, low-mileage vehicles used primarily on the Lab's small site. Fleet mileage goals have been established and are monitored. Lab activity, as well as vehicle need, is growing therefore overall fleet size may in fact increase over the next few years.

b. Availability & Accessibility of Alternative Fueling Stations.

Additional alternate fuel vehicles will be requested but receipt is dependent on availability through GSA. The Lab has successfully negotiated in principle use of NASA Langley E-85 fuel as no commercial means of refueling is currently available within 5 miles of the Lab. The only remaining item is to work out billing details through GSA. Electric powered industrial vehicles are used extensively for on-site transportation of people and materials to the extent practicable.

7. High Performance Sustainable Buildings

a. New Construction and Major Renovations.

Two new buildings and major renovation projects are listed on CEDR Tab 7 – New Building Construction and on Tab 8 – Existing Bldgs. Both of these projects are designed to achieve LEED® Gold certification.

All projects will meet or exceed the requirement to use 30% less energy than required by ASHRAE Standard 90.1 – 2004.

b. Existing Buildings' 15% High Performance Sustainable Building Goal.

Jefferson Lab plans to exceed this goal, estimating over 20% sustainable existing facilities by the end of FY 2015. This level of sustainable facilities will be achieved primarily through construction of new buildings, and major renovations of existing buildings.

c. Evaluations of Existing Buildings.

Jefferson Lab completed the initial HPSB campus assessment and target facilities identified in FY 2009. Analysis of requirements to comply with all guiding principles in target existing buildings is scheduled to occur in FY 2010/2011.

d. Integration into the Environmental Management Systems (EMS).

An Environmental Management Program (EMP) related to energy consumption is employed to track compliance and with various requirements. The Energy Use EMP includes considerations of building audits and evaluations to achieve compliance with the goals.

8. Metering

a. Metering Plans.

Jefferson Lab is on schedule to complete a campus wide, multi-phase advanced metering program by the end of FY 2012. Schedule summary as follows:

Jefferson Lab Metering Plan Summary

Phase / Description	Status / FY Schedule
Phase I / Advanced Electrical Meters (8 Locations)	Complete
Phase II / Web-based communication / energy analysis software (network above installed meters)	FY 2010
Phase III / Extend network..Add Advanced Electrical Meters (10) / Main Water Meters (3) / Water Sub-Meters (10) / Natural Gas Meters (12)	FY 2011
Phase IV / Extend network...Add Advanced Electrical Meters (5) / Water & Natural Gas Meters (3) / Water Sub-Meters (10)	FY 2012

9. Energy Management

a. Funding Mechanisms.

To date, Energy Service Performance Contract (ESPC) proposals have not identified life cycle cost effective opportunities. Subsequently, ECM investment is primarily funded from internal operating funds.

During FY 2009, Jefferson Lab successfully participated in a local “demand response” program. Jefferson Lab received an award of \$180,000 that is committed to energy efficiency re-investment in compliance with DOE Order 430.2B, Contractor Requirements Document. Jefferson Lab is committed to an increased participation in the demand response program in FY 2010.

b. Status of Energy / Water Audits, Commissioning Re-Commissioning and Retro-Commissioning.

1. Energy and Water Conservation Audits

DOE Order 430.2B and the Energy Independence and Security Act of 2007 require all major site facilities to be audited every (4) four years. Jefferson Lab completed a campus wide energy audit in December 2008, including buildings currently excluded from energy use intensity savings goal performance. Results of these audits contributed to several ECMs currently identified for implementation.

Comprehensive energy and water auditing is scheduled to recommence in FY 2010 with auditing of about 200 K-SF per year, each year, over 25% of the total facility area. These audits will consist primarily of “standard” Facility Condition Assessments (FCAs) conducted by subcontractor VFA. These planned FCAs are enhanced with additional considerations for sustainability, identifying the measures and their costs to align the buildings with the Guiding Principles of High Performance Sustainable Buildings.

Commissioning and Re-Commissioning

Re-commissioning activity in FY 2009 include two administrative facilities (CEBAF Center/127K SF office/data center) and (VARC Bldg./35K SF office). Re-

commissioning additional administrative area (ARC Bldg./75K SF office and laboratories) is scheduled to occur FY 2010.

Additional re/retro-commissioning of facilities included in the HPSB assessment are scheduled to occur in FY 2010/2011.

c. Personnel Management and Resources.

1. Energy and Water Management Staffing and Training.

DOE Order 430.2B requires that Energy Management Program train personnel at the facility/site 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.

Jefferson Lab's Energy Management Program is managed by a dedicated Energy Manager from the Facilities Management & Logistics Division with assistance, as needed, from the Facilities Division mechanical and electrical engineers.

The program is adequately staffed by Full Time Employees (FTEs), including a full-time Sustainability Coordinator/Energy Manager and assistance, as-needed, from Facilities Division mechanical and electrical engineers. Additional assistance is also provided from the Energy and Environmental Technologies Division.

Personnel associated with the Energy Management Program are kept current with developments in the field by attending the annual energy/sustainability events (ie: GovEnergy /ASHRAE / USGBC / AEE), participating in local AEE, USGBC, ASHRAE, BOMA chapter activities, and regularly attend training classes offered by industry associations.

Emergency Energy Supply Conservation.

Jefferson Lab maintains emergency action plans to mitigate the effects of sudden disruptions in electric power and natural gas supplies. These plans are reviewed annually and updated when conditions and/or criteria change.

Enclosed, Consolidated Energy Data Report spreadsheets:

- Performance Summary
- 2009 Data Report / Part 1 and 2
- Conservation and RE Measures/Part 3
- Source Energy savings Credit
- Operating On-Site Renewable Energy Systems
- New Federal Building and Major Renovations
- Existing Buildings to Meet 15% HPSB Goal