

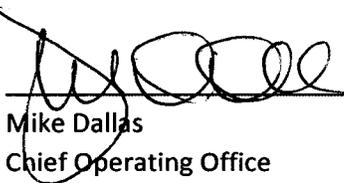
Thomas Jefferson National Accelerator Facility

# Executable Plan

Energy, Renewable Energy, and Transportation



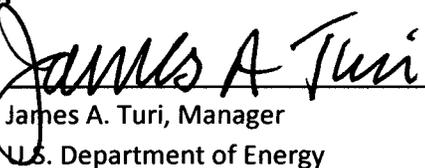
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12/22/08

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12/23/08

Date

## Executive Summary

The Thomas Jefferson National Accelerator Facility (TJNAF or Jefferson Lab), located in Newport News, Virginia, is a single-program laboratory supporting 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 lab system, applying these technologies in the national interest.

Jefferson Lab is operated under a 20 year renewable term Maintenance & Operation contract for DOE by Jefferson Science Associates, LLC (JSA). JSA is a partnership of the previous JLab operator Southeastern Universities Research Association Inc. (SURA) and Computer Sciences Corporation's (CSC) Applied Technology Division. Jefferson Lab consists of 770,751 SF of DOE owned and leased buildings.

This plan outlines how Jefferson Lab will meet at least 12 of the 16 listed elements of DOE O 430.2B, *Departmental Energy, Renewable Energy and Transportation Management*. The Lab has to date, implemented projects that have reduced the energy intensity of non-excluded buildings per DOE Order 430.1B by 25%. This plan identifies additional projects valued at \$20.2M that will reduce energy intensity an additional 8%. Two of the remaining four goals may be possible through a water reuse project with Hampton Roads Sanitation District and a 10 MW distributed electrical generation project through Dominion Virginia Power currently being evaluated by Jefferson Lab. The Lab is not expected to meet the renewable energy or funding of the new projects through an Energy Savings Performance Contract (ESPC). Although geothermal wells have been installed to heat and cool over 50,000 SF of office space with additional geothermal projects planned, the amount provided is only a small portion of the DOE goal. Larger renewable energy projects are not currently feasible at this location. The ESPC contractor was not able to identify any projects with a life cycle payback less than 25 years.

The Lab already has recycling and environmental preferable products selection programs in place that will be strengthened under this Plan.

## DOE Order 430.2B EXECUTABLE PLAN

### TEAM GOAL SUMMARY

Goal Elements	Plan Meets Goal	Plan Exceed Goal	Plan Falls Short of Goal	Comments
<b>Energy Efficiency</b>		<b>X</b>		To date have reduced energy 27%
<b>Renewable Energy</b>			<b>X</b>	Currently utilizes geothermal for HVAC in CEBAF Center Addition and purchasing 3% RECs
<b>Water</b>		<b>X<sup>1</sup></b>	<b>X<sup>2</sup></b>	<ol style="list-style-type: none"> <li>1. Evaluating a water reuse project with local utility. If found to be economically feasible, would reduce potable water use 70%.</li> <li>2. If reuse project not economically feasible, Lab will not meet goal.</li> </ol>
<b>Transportation/Fleet Management</b>	<b>X</b>			About 1/3 of fleet vehicles currently E-85 models
<b>High Performance and Sustainable Design</b>		<b>X</b>		Greater than 15% of existing buildings in 2015 will meet sustainability standards

## Jefferson Lab Executable Plan

Thomas Jefferson National Accelerator Facility (Jefferson Lab) has developed this Executable Plan to meet obligations of the Department of Energy under E.O.13423 dated January 24, 2007, the Instructions for Implementation of such Executive Order dated March 28, 2007 as well as contractual requirements included in DOE O 430.2B, *Departmental Energy, Renewable Energy and Transportation Management*. Under DOE O 430.2B contractors are required to maintain and update, as appropriate, its Ten Year Site Plan/Executable Plan (as required) to include detailed energy management programs and milestones for achieving site-specific energy efficiency, water, and transportation goals and objectives.

The Executable Plan consists of specific goals and implementation plans and current status to meet the specific goals outlined in EO 13423. This Plan will be updated annually. Details of the goals are shown below.

### 1. Use of ESPC to achieve energy/water use reduction goals.

DOE Goal: Whenever life cycle cost-effective, energy savings and other capital improvements can be achieved through the application of private sector financing through contracting vehicles such as Energy Services Performance Contracts (ESPC), such opportunities must receive priority over the application of any appropriated funding.

- a. Lab Goal – Utilize ESPCs to reach goals in lieu of budgeted or appropriated funding if they meet the requirement of a 25 year payback using LCC analysis.
- b. Status – Jefferson Lab financed \$4.7 million in FY 02 through Bonneville Power Administration to fund energy savings projects. Current annual payments are \$572K. In FY08 representative from Trane, Inc. performed energy audits and have suggested potential projects for inclusion in an ESPC. These projects, however, do not meet the 25 year LCC payback and are not eligible for action.
- c. Implementation Plan – Continue the evaluation of reuse water and distributed power projects with the local utility companies.

### 2. Energy Use Reduction Goals

DOE Goal: By 2015, achieve no less than a 30 percent energy intensity reduction across the contractor's facility/site.

- a. Lab Goal – Reduce energy intensity in non-excluded buildings to less than 85,490 BTU/SF, a 33% reduction from the FY 2003 baseline.

- b. Status – The Lab consumed 211,483 BTU/GSF for non exempt buildings in FY 2002. In FY2003 Jefferson Lab began implementing a variety of projects including chiller, boiler and lighting fixture replacement funded through Bonneville Power Administration and are identified in Table 1. The energy intensity baseline for purposes of this Executable Plan is 128,457 BTU/GSF based on consumption for FY 2003. The Bonneville funded energy savings projects were completed in FY2004. As of the end of FY 2008 energy use has been reduced to 93,561 BTU/GSF a 27.2% reduction from the baseline. In addition to the energy intensity reduction in non-excluded buildings several of these projects were also used to reduce energy intensity in excluded buildings.

**Table 1: Completed Energy Saving Projects**

Project	Description	Funding	Cost	Energy Savings	Year Completed
VARC HVAC Replacement	Replace existing chillers, cooling tower and boilers with new units in "Goal" 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" building	BPA financed	\$76K	380 Mwh/yr	2003
CEBAF Center Upgrade Controls	Upgrade Building HVAC Controls	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 Buildings Occupancy Sensor Installation	Replace manual lighting control in unmanned 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. Affected "Goal" building	Indirect	\$20K	300 Mwh/yr	2006

- c. Implementation Plan – Table 2 lists planned projects that will reduce energy use to meet the goal by 2015. The schedule, cost, and estimate of savings from these projects are shown. Completion of these projects is dependent on receipt of the funding requirements indicated.

**Table 2: Energy Savings Projects - Goal Included Buildings**

PROJECT	Est. Cost FY2008	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	2009
Re-commission HVAC Systems in CEBAF Center, VARC, and ARC	\$30,000	Indirect	1,200 BTU/SF	2009	2009
Forestry Heat Pump	\$20,000	Indirect	40 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 - City of Newport News Applied Research Bldg.	\$1,200,000	City of Newport News	800 BTU/SF	TBD	TBD
CEBAF Center Building Rehab	<u>\$18,677,000</u>	<u>SLI</u>	<u>7,500 BTU/SF</u>	Required by 2013	Required by 2015
Total:	\$20,249,000		10,900 BTU/SF		

Total savings from these projects will result in a 33% energy intensity savings from the FY03 baseline

Table 3 lists proposed energy saving projects in Goal Excluded Facilities that were identified in energy audits.

**Table 3: Energy Savings Projects - Goal Excluded Facilities**

PROJECT	FY2008 Est. Cost	Funding Type	Est. Savings	Funding Year	Est. Project Completion
Add building programmable thermostats	\$10,000	Indirect	400 Mwh/yr	2009	2009
Establish Lab wide heating & cooling temperature standards and use of night setback	\$0	Indirect	28 Mwh/yr	2009	2009
Replace LCW Controller w/ VFD Bldg. 92	\$50,000	Indirect	242 Mwh/yr	2009	2009
EEL: Correct Leaking Valves	\$45,000	Indirect	60 Mwh/yr	2009	2009
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.	<u>\$900,000</u>	GPP	<u>125 Mwh/yr</u>	2017	2018
<b>Total:</b>	<b>\$5,670,000</b>		<b>1,576 Mwh/yr</b>		

### 3. Water Use Reduction Goals

DOE Goal: Reduce potable water consumption at least 16 percent relative to the baseline of the facility/site's potable water consumption in FY 2007. Contractor facilities/sites must meet the water reduction goal or have Executable Plans in place to meet this goal no later than December 31, 2008.

- a. Lab Goal – Substitute “Reuse” for potable water where possible thereby reducing potable water consumption 70% from the 2007 baseline.
- b. Status – In FY 07, Jefferson Lab used a total of 49.9 million gallons of water. Of this total, 38.0 million gallons or 76% was consumed in process cooling (cooling towers). There have been preliminary discussions with the HRSD to use treated wastewater to replace the water consumed by process cooling. A feasibility study is underway with HRSD for the delivery of “Reuse” water to the Lab. Two options are being evaluated; 1) treatment facility adjacent to the Lab serving only one customer and 2) a regional plant serving multiple customers. Under both models the Lab would be responsible for onsite

distribution piping. Capital costs of \$10M is required to implement Option 1. Either option, if financially feasible, could reduce Lab potable water use by ~ 70%. The Lab is separately evaluating the treatment and use of both existing groundwater pumped from our experimental halls as well as existing cooling tower blow down as process cooling makeup water and local wells for irrigation. Estimated water reduction from these alternate solutions is less than 5%. Table 4 lists these projects.

**Table 4: Water Reduction Projects**

PROJECT	FY2008 Est. Cost	Funding Type	Est. Savings	Funding Year	Est. Project Completion
Reuse Water for Cooling Towers and Landscape Irrigation	Option 1 \$10,000,000	Option 1: DOE	70% of current use	TBD	TBD
	Option 2 TBD	Option 2 TBD			
<b>Alternate Projects</b>					
Use treated groundwater for cooling towers and/or irrigation	\$100,000	Indirect	TBD		
Drill wells for irrigation	\$20,000	Indirect	TBD		

- c. Implementation Plan – Complete the study with Hampton Roads Sanitation District to determine the if using “Reuse” water for process cooling and landscape irrigation is feasible. Submit a request for capital funding to DOE for this project. Determination on the feasibility of this option will be made on this option by June 2009. Evaluate additional options for reducing water use in FY09 and begin implementation in FY 10.

**4. Metering**

DOE Goal: To the maximum extent practicable, the contractor must install advanced metering that measures consumption of potable water, electricity, steam, and natural gas in each building and other facilities and grounds and participation in the centralized data collection, reporting and management system.

- a. Lab Goal – Install advanced metering where practicable by the end of FY 2012.
- b. Status – A Lab metering plan to install advanced type electrical meters on all of our permanent facilities was developed in FY 07. In FY 08, we completed the first phase of the metering project. The Plan has been updated to include natural gas and potable water meters. See Attached detailed plan and schedule (Attachment 1).
- c. Implementation Plan – Complete design documents and award a contract to install real time web-based meter data collection software for use with existing modified meters in

FY 09. Additional metering will be installed as outlined in the plan in FY 10, and FY 11 . Estimated cost to implement the remaining metering is \$814K and is planned to be funded as GPP. Implementation is contingent upon receipt of agency funding for all remaining metering phases.

## 5. Renewable Energy

DOE Goal: Maximize installation of on-site renewable energy projects at the contractor's facility/site where technically and economically feasible to acquire at least 7.5 percent of each site's annual electricity and thermal consumption from on-site renewable sources by FY 2010. Each facility/site must install a renewable energy project or show that renewable energy is not feasible at the site because of economic or renewable resource barriers. If meeting the renewable energy requirement through on-site renewable generation is not feasible, the contractor must request a waiver. If on-site projects are inadequate to meet the renewable energy goal, sites are allowed to increase the use of electricity from renewable energy to meet the renewable energy goal by purchasing renewable energy credits (RECs) or electricity from renewable energy generators.

- a. Lab Goal – Increase the use of geothermal heat pump systems in existing and new buildings and utilize solar where economically feasible for site lighting and hot water. Use funding identified to purchase Renewable Energy Credits (RECs) of 3% to invest in on site renewable energy sources.
- b. Status – Currently, the only renewable energy project completed is the geothermal heat pump system which was installed with the Phase 1 Addition to CEBAF Center. Installed in FY06, it provided 333 MWH of renewable energy compared to the 125,248.5 MWH consumed in FY 07. 4,000 MWH of renewable energy credits were purchased for FY07 and FY08.
- c. Implementation Plan – Beginning in FY 2011 we plan to replace existing exterior lighting with solar-powered lighting by using the funds each year that would have gone towards purchasing RECs to install new light fixtures. We will continue to purchase RECs in FY 2009 and FY 2010. In addition, geothermal is being considered for new construction and renovation projects. Table 5 lists renewable energy projects.

**Table 5: Renewable Energy**

PROJECT	FY2008 Est. Cost	Funding Type	Funding Year	Est. Amt of Renewable Energy	Est. Project Completion
TEDF Building (Geothermal Heat Pumps)		SLI	FY10-FY12	240 Mwh	2012
CEBAF Center Rehab (Geothermal Heat Pumps)	*	SLI		450 Mwh	2015
EEL Rehab (Geothermal Heat Pumps)	\$3,000,000	GPP		390 Mwh	2015
Solar Exterior Lighting	<u>\$400,000</u>	Indirect		35 Mwh	2014
Total:					

\*Cost included in projects defined elsewhere in the plan.

## 6. Acquisitions of Goods and Services

DOE Goals:

1. Reduce or eliminate the acquisition, use, and release of toxic and hazardous chemicals and materials.
2. Maximize the acquisition and use of environmentally preferable products in the conduct of operations.
  - a. Lab Goals –
    - 1) Reduce the overall quantity of toxic and hazardous materials on site.
    - 2) Substitute environmentally preferable to the maximum extent possible.
  - b. Status – Currently Lab Industrial Hygiene reviews all requests for hazardous materials purchased by the Lab under a “commodity manager” program established under the Personal Property Policies and Procedures. Copy paper with 30% post-consumer content is already at the Lab.
  - c. Implementation Plan – During FY 09 expand the Lab “commodity manager” program to include additional environmentally preferable products and establish a baseline and goals. Develop informational material on environmentally preferable products and present to the Lab staff.

## **7. Waste Reduction and Recycling**

DOE Goal: Reduce degradation and depletion of environmental resources through post consumer material recycling.

- a. Lab Goal – Continuous improvement in conservation in the use and disposal of toxic and hazardous chemicals and materials, diversion of solid waste, and waste prevention and recycling.

Recycle a minimum of 35% of all waste disposed of off site (excluding activated and moratorium metals). Specific information is included in the Annual Progress Report on Disposition of Unneeded Materials and Chemicals.

- b. Status – The Lab currently has a good recycling program for cardboard, paper, metals, wood, and plastics. In addition, recycling is required in all construction projects. Subcontractors are given the option of recycling using the on-site dumpsters or recycling off site if they provide receipts of the materials and weights.
- c. Implementation Plan – Strengthen the documentation of the recycling program during FY 09 and increase staff awareness. Track and share recycling results on a quarterly basis.

## **8. Sustainable Practices in Guiding Principles for Existing Building Inventory**

DOE Goal: All contractors that own or lease real property must develop and implement a plan, as part of the Executable Plan, to ensure that 15 percent of their enduring buildings are compliant with the guiding principles of Executive Order 13423.

- a. Lab Goal – Our goal is to implement sustainable practices in the Guiding Principles in 15% of existing building inventory.
- b. Status – The existing enduring building inventory is equal to 751,568 SF (37 buildings). The total enduring building SF in 2015 is expected to be about 985,000. None of the existing buildings were built using the Sustainable Practices in Guiding Principles.
- c. Implementation Plan – Complete a sustainability survey of all buildings greater than 1,000 SF in FY 09. The TEDF building and Test Lab rehab/addition consisting of ~ 188,000 SF are being constructed under LEED guidelines. Construction is estimated to be complete in FY 14 contingent upon appropriation of required funding. These projects, when complete, will exceed the 15% goal.

## 9. Vehicle Fleet Goals

### DOE Goals:

1. Reduce vehicle miles traveled through such methods as trip consolidation practices, increased use of videoconferencing and web conferencing, and the use of mass transportation/agency shuttles.
2. Overall fleet fuel economy through acquisition of higher fuel economy vehicles.
3. "Right-size" its fleet, employing the most fuel-efficient vehicle for the required task and having the appropriate number of vehicles relative to need.
4. All alternative fuel vehicles shall operate on alternative fuel to the maximum extent possible.

#### a. Lab Goals –

- 1) Convert all GSA fleet vehicles to alternate fuel or hybrid technology by the end of 2010.
- 2) Ensure availability of alternate fuel from nearby commercial or federal sources by the end of 2010.

b. Status – Vehicles are assigned to both groups and pooled. 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. Lab has replaced (through GSA) 6 of the 21 fleet vehicles to date with alternate fuel (E-85) vehicles. 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.

#### c. Implementation Plan

- 1) Submit annual request to GSA for replacement of remaining 15 GSA vehicles with alternate fuel/hybrid technology vehicles; roughly half per year (FY 2009 and FY 2010).
- 2) Complete negotiations with NASA Langley and GSA to provide E-85 and biodiesel fuel.

## 10. Electronic Equipment Procurement, Use and Disposition

DOE Goal: Reduce or Eliminate the Environmental Impact of Electronic Assets.

### a. Lab Goals

- 1) Specify environmentally preferable electronics qualified through the Electronic Procurement Environmental Assessment Tool (EPEAT) for electronic products for which there are EPEAT standards.
- 2) Enable Energy Star® features (power management capabilities) on all computers, monitors, printers, copiers, and other electronic equipment, or to the maximum degree based on mission needs.
- 3) Extend the useful lifespan of computer systems and other electronic products through software upgrades and use of EPA's Guidance to Improve the Operation of Electronic Products provided at [www.federalelectronicschallenge.net/docs/oamdm.pdf](http://www.federalelectronicschallenge.net/docs/oamdm.pdf). Strive to extend the useful life of electronic equipment to four (4) or more years.
- 4) Continue to reuse surplus and recycle end-of-life electronics.

b. Status – Energy Star features have been enabled on computing equipment. In addition, the Computer Center staff is examining additional measures that can be implemented to further reduce energy consumption of computers during building non-occupied hours. The current lab policy is to purchase electronic equipment with a 3-year warranty and then allow it to be used as long as possible. Disposal of electronic equipment is currently recycled.

c. Implementation Plan – During FY 09 select preferable electronics using EPEAT. Expand implementation of power management capabilities beyond personal computers where the capability exists. Update Lab policies as required to address electronic assets.

## 11. Energy Manager

DOE Goal: The contractor must 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.

- a. Lab Goal – The goal is to hire an Energy Engineer to be responsible for managing energy efficiency in Jefferson Lab buildings. This person would conduct audits and manage improvement projects at Jefferson Lab.
- b. Status – Currently management of energy is a collateral duty within the Electrical Department of Facilities Management & Logistics.

- c. Implementation Plan – An Energy Engineer position is in the process of being developed and it is expected that the hiring action will be completed in FY 09. Existing staff will attend LEED and energy management training.

## 12. Energy Audits

DOE Goal: By 6 months after the addition of this CRD to the contract, all major site facilities should have been audited over the last 5 years. After December 31, 2008, facilities should continue to be audited every 4 years.

- a. Goal – Complete all energy audits before December 31, 2008. After that, conduct audits on all buildings, every 4 years.
- b. Status – Energy audit field work is complete for all buildings. Final reports will be completed by December 2008. Proposed projects and policies that will use energy more efficiently were identified as part of this Plan.
- c. Implementation Plan – We are on schedule to complete the audits before the beginning of December.

## 13. Database

The contractor is responsible for collecting data and providing the information for inputting into the web-based Departmental High Performance Federal Buildings Database.

- a. Lab Goal: Collect data as required for submission to DOE.
- b. Status – Jefferson Lab is currently collecting the energy use data from a Cutler Hammer Power Net system and utility bills for existing reporting to DOE. Data is real time.
- c. Implementation Plan – Await specific direction from DOE on implementation.

## 14. Reporting

DOE Goals:

1. Contractor shall provide compliance data to its appropriate Department office no later than November 23 of each year, or as otherwise required by the appropriate Departmental office.
2. Any contractor seeking to use the Excluded Building category must submit annual Exclusion Self-Certification in electronic spreadsheet format to the DOE Program/Site Office by November 1 of each year.
3. Upon the monthly receipt from the Department of the facility/site's vehicle tag numbers, fuel use data (by fuel type for all petroleum and alternative fuels) for covered GSA-leased vehicles, the contractor must track these data to ensure its accuracy and also track comparable data for all covered Department-owned and commercially leased vehicles.

- a. Lab Goal: Submit all reports on time.
- b. Status – Jefferson Lab has timely submitted all past reports. Currently there is no fuel use data available to the Lab for its GSA vehicles.
- c. Implementation Plan – Prepare reports in accordance with current guidance. Modify reporting as guidance is revised.

## **15. Environmental Management System (EMS)**

DOE Goal: Develop and implement an environmental management system by June 30, 2009.

- a. Lab Goal – Updated program will be implemented and ready for a DOE validation by June 30, 2009.
- b. Status – Jefferson Lab has a functioning Environmental Management System but needs to be updated to meet the additional requirements of DOE O 450.1A. Plans and procedures are in the process of being updated to include the new requirements.
- c. Implementation Plan – DOE O 450.1 implementation plan was submitted to the Site Office on September 29, 2008.

## **16. Distributed Generation**

DOE Goal: Where life-cycle cost effective, the contractor must implement distributed generation systems in new construction or retrofit projects, including renewable systems such as solar electric, solar lighting, geo (or ground coupled) thermal, small wind turbines, as well as other generation systems such as fuel cell, cogeneration, or highly efficient alternatives. In addition, the contractor must use distributed generation systems when a substantial contribution is made toward enhancing energy reliability or security.

- a. Lab Goals
  - 1) Install emergency generators as part of new construction projects to enhance energy reliability for emergency and core systems.
  - 2) Obtain 10 MW of emergency electrical power to allow restarting the Central Helium Liquefier compressors during local utility power outages if found to be economically feasible.
- b. Status – Currently Jefferson Lab has 9 emergency generators installed for the purpose of enhancing energy reliability for emergency and core systems. A 200 ton geothermal system currently serves 46,000 SF of CEBAF Center. Currently Jefferson Lab is working with Dominion Power on a 10 MW distributed electrical generation plan. Up-front funding requirements from DOE are about \$4.5M.

- c. Implementation Plan – Complete evaluation of electrical distribution plan with the local utility and seek up-front funding from DOE if the project proves to be feasible. Geothermal heat pumps are planned for use in the new SLI funded TEDF Building as well as proposed SLI-funded CEBAF Center and GPP-funded EEL Rehab projects. Solar hot water is also planned for the TEDF Building.

### **Emergency Energy Conservation**

Jefferson Lab, like other Office of Science facilities, does not have a national security or critical system function that would be affected by a disruption of energy supplies. However, the Lab does have several operating systems associated with the accelerator that more than short term utility disruptions could have extended impacts. These systems are limited to control and communication circuits for safety and cryogenics. In the event of a sudden disruption in the supply of critical energy supplies, the Lab will mitigate the effects on the lab as follows:

Electrical – The site uses about 20 MW of electricity for normal operations when the accelerator is running and is cooled to 2°K. The largest single use is for the operation of the accelerator including the Central Helium Liquefier. During a sudden shortage the accelerator would be placed in a maintenance mode. As long as 10 MW of power is maintained, operation of the Central Helium Liquefier can be maintained and the accelerator maintained at 4°K. As long as the natural gas supply remains stable, loss of all power for periods less than 36 hours, would have minimal impact since emergency generators could be used to maintain critical control systems. An outage beyond 36 hours will result in a warming of the accelerator's cryomodules with the potential for component damage.

Natural Gas is used to power 6 emergency generators, heat 2 storage buildings, and fuel boilers to heat 3 major buildings. Loss of natural gas supplies would only become critical during periods when there is also a loss of power.

Fuel oil is used as the energy source for the accelerator emergency Loop generator. A 5-day supply is kept in the generator fuel tank.

Attachment 1: Jefferson Lab Metering Plan (2008 Update)

**Jefferson Lab Metering Plan  
FY08 Update**

**Overview**

This report outlines the steps to be taken to achieve the metering program in accordance to the Energy Policy Act of 2005, E.O 13423 and DOE Order 230.B. The overall project will be split into four phases (one phase per year) so that it can be accomplished with planned staffing.

Each building that is to be metered will have a Translating Module to change the information from the different meters to a form that can be reported to a central, web-based reporting software tool.

**Metering Plan-Phase I**

For Phase I of the metering project (fiscal year 2007), it was decided to establish meters in all non-accelerator buildings except Building 58, the Test Lab. The Test Lab is presently going through some modifications of its electrical panel boards and will be metered in Phase II. Therefore, by the end of Phase I, Buildings: 19, 28, 34, 34A, 34B, 52, 52A, 52B, 52C and 60 should have the appropriate meters installed. There will be also additions to the CEBAF Center, (#12) as well as the EEL (#90). In addition, Jefferson Lab will also meter Buildings 1 & 2 (North and South Linacs), to round out Phase I. That means accelerator Buildings: 4, 7, 8A, 10, 21, 82, 87, 89 will all be metered as well. A summarization is as follows:

**NON-ACCELERATOR BUILDINGS**

**VARC 28**

(1) Receptacle	\$	400
IMPCABLE communications wire.	\$	1,089
<b>TOTAL COST FOR BLDG.</b>	\$	<b>1,489</b>

**Forestry 19\***

(1) EMINT	\$	1,903
(2) Power Sentinel w/ Inter. CTs	\$	2,575
(1) Receptacle	\$	400
IMPCABLE communications wire.	\$	1,289
<b>TOTAL COST FOR BLDG.</b>	\$	<b>6,167</b>

\*Will also meter Buildings: 19, 13, as well as emergency panel boards.

**CEBAF Center 12**

(1) EMINT	\$	1,903
(3) Power Sentinel w/ Inter. CTs	\$	3,863
(1) Receptacle	\$	400
IMPCABLE communications wire.	\$	1,289
<b>TOTAL COST FOR BLDG.</b>	\$	<b>7,455</b>

**EEL 90**

(1) IQDP4000 to replace an existing meter.	\$	2,810
<b>TOTAL COST FOR BLDG.</b>	\$	<b>2,810</b>

**Splice feed outside of building 34\***

(1) EMINT	\$	1,903
(4) Power Sentinel w/ Inter. CTs	\$	5,150
(1) Receptacle	\$	400
IMPCABLE communications wire.	\$	1,289
<b>TOTAL COST FOR BLDG.</b>	\$	<b>8,742</b>

\* Will also meter Buildings: 34, 34A, 34B, 60, as well as emergency panel boards.

**Jefferson Lab Metering Plan  
FY08 Update**

Attachment 1

**Switchboard #4 (located outside building 52)\***

(1) EMINT	
(2) IQ Energy Sentinel w/ Exter. CTs	\$ 1,903
(1) 600A CT	\$ 2,086
(1) 1200A CT	\$ 310
(2) Power Sentinel w/ Inter. CTs	\$ 310
(1) Receptacle	\$ 2,575
IMPCABLE communications wire.	\$ 400
<b>TOTAL COST FOR BLDG.</b>	<b>\$ 1,289</b>
	<b>\$ 8,873</b>

\* Will also meter Buildings/stations: 57, Panel P-4, MCC/CTF, ECB400/ECB200, as well as emergency panel boards.

**Building 52\***

(1) EMINT	
(4) Power Sentinel w/ Inter. CTs	\$ 1,903
(1) Receptacle	\$ 5,150
IMPCABLE communications wires.	\$ 400
<b>TOTAL COST FOR BLDG.</b>	<b>\$ 1,289</b>
	<b>\$ 8,742</b>

\* Will also meter Buildings: 52, 52A, 52B, 52C, as well as emergency panel boards.

**ACCELERATOR BUILDINGS**

**1 North LINAC\***

(1) EMINT	
(1) IQ Energy Sentinel w/ Exter. CTs	\$ 1,903
(6) Power Sentinel w/ Inter. CTs	\$ 1,043
(1) 600 CT	\$ 7,726
(3) DP 4000	\$ 310
IMPCABLE communications wire	\$ 8,730
<b>TOTAL COST FOR BLDG.</b>	<b>\$ 1,289</b>
	<b>\$ 21,000</b>

\* Will also meter Buildings: 1, 7, 21, 87, 89, as well as emergency panel boards.

**2 South LINAC\***

(1) EMINT	
(2) IQ Energy Sentinel w/ Exter. CTs	\$ 1,903
(6) Power Sentinel w/ Inter. CTs	\$ 2,086
(2) 800 CT	\$ 7,726
IMPCABE communications wire	\$ 620
<b>TOTAL COST FOR BLDG.</b>	<b>\$ 1,289</b>
	<b>\$ 13,623</b>

\* Will also meter Buildings: 2, 4, 8A, 10, 82, as well as emergency panel boards.

GRAND TOTAL MATERIALS COST	\$ 78,902
ESTIMATED INSTALLATION LABOR COST	\$ 18,000
Lab G&A	\$ 26,000
<b>GRAND TOTAL FOR PHASE I METERING</b>	<b>\$ 122,902</b>

**STATUS: Complete**

Actual Costs

**Jefferson Lab Metering Plan  
FY08 Update**

**Metering Plan-Phase II**

Phase II of the Metering Plan (fiscal year 2009) will be to install a web-based program and communication hardware to pull information from our existing metering equipment for presentation on the web. In preliminary discussions with potential vendors, we have described our products, Cutler-Hammer IQ components, and they feel that we will be able to use that equipment with the new interface hardware. In conjunction with this effort, we will change the old systems over and verify that they are communicating properly.

Metering Software (300 Metering Points):	\$	150,000
Translating Modules (20):	\$	40,000
Jlab G&A	\$	38,000
<b><u>Phase II Total:</u></b>	<b>\$</b>	<b>228,000</b>

**Completion of this phase is contingent on funding. In addition, funding must be provided no later than Jan 1, 2009 or completion of this phase will not be done before the end of FY 09.**

**Metering Plan-Phase III**

Phase III of the metering project (fiscal year 2010) will include the last of the non-accelerator buildings, namely, the Test Lab (Building #58). It will also include Buildings: 31, 33, 35, and 59. For the accelerator site, Phase II will meter the essential buildings such as the Injector, Halls A, B, and C, and the Counting House among others. Therefore, phase II will include Buildings: 8, 18, 53, 94, 96, 96B, 97, 101, 101A, and 102. The summarization is as follows:

**NON ACCELERATOR BUILDINGS**

**Test Lab 58\***

(2) Translating Module	\$	4,000
(1) IQDP4000	\$	3,000
(3) Power Sentinel w/ Inter. CTs	\$	4,000
(1) Receptacle	\$	400
IMPCABLE communications wire.	\$	1,300
<b>TOTAL COST FOR BLDG.</b>	<b>\$</b>	<b>12,700</b>

\* Will also meter Buildings: 31, 33, 35, 59, as well as emergency panel boards.

**ACCELERATOR BUILDINGS**

**96 Hall C**

(2) Translating Module	\$	4,000
(2) IQ Energy Sentinel w/ Exter. CTs	\$	2,000
(1) Power Sentinel w/ Inter. CTs	\$	1,300
(3) 2000 CT	\$	1,000
(3) 1200 CT	\$	1,000
IMPCABLE communications wire	\$	1,300
<b>TOTAL COST FOR BLDG.</b>	<b>\$</b>	<b>10,600</b>

**Jefferson Lab Metering Plan  
FY08 Update**

Attachment 1

**94 Hall A**

(2) Translating Module		
(2) IQ Energy Sentinel w/ Exter. CTs	\$	4,000
(1) Power Sentinel w/ Inter. CTs	\$	2,000
(3) 2000 CT	\$	1,300
(1) 1200 CT	\$	1,000
IMPCABLE communications wire	\$	1,000
<b>TOTAL COST FOR BLDG.</b>	\$	<u>1,300</u>
	\$	<b>10,600</b>

**97 Counting House\***

(1) Translating Module	\$	2,000
(4) IQ Energy Sentinel w/ Exter. CTs	\$	5,000
(4) Power Sentinel w/ Inter. CTs	\$	5,200
(3) 800 CT	\$	1,000
(9) 2000 CT	\$	3,000
IMPCABLE communications wire	\$	1,300
<b>TOTAL COST FOR BLDG.</b>	\$	<u>1,300</u>
	\$	<b>17,500</b>

\* Will also meter Buildings: 96B, as well as emergency panel boards.

**96B Gas Shed**

(1) Translating Module	\$	2,000
(1) Power Sentinel w/ Inter. CTs	\$	1,300
<b>TOTAL COST FOR BLDG.</b>	\$	<u>3,300</u>

**53 Injector**

(1) Translating Module	\$	2,000
(1) IQ Energy Sentinel w/ Exter. CTs	\$	1,000
(1) Power Sentinel w/ Inter. CTs	\$	1,300
(3) 1200 CT	\$	1,000
IMPCABLE communications wire	\$	1,300
<b>TOTAL COST FOR BLDG.</b>	\$	<u>6,600</u>

**18 FEL (Unit Sub FEL)**

(1) Translating Module	\$	2,000
(2) IQ Energy Sentinel w/ Exter. CTs	\$	2,000
<b>TOTAL COST FOR BLDG.</b>	\$	<u>4,000</u>

**8 CHL**

(1) Translating Module	\$	2,000
(2) IQ Energy Sentinel w/ Exter. CTs	\$	2,000
(1) Power Sentinel w/ Inter. CTs	\$	1,300
(3) 1200 CT	\$	1,000
(3) 2000 CT	\$	1,000
IMPCABLE communications wire	\$	1,300
<b>TOTAL COST FOR BLDG.</b>	\$	<u>8,600</u>

**Jefferson Lab Metering Plan  
FY08 Update**

Attachment 1

**102 ESR\***

(1) Translating Module	\$	2,000
(3) IQ Energy Sentinel w/ Exter. CTs	\$	3,300
(2) Power Sentinel w/ Inter. CTs	\$	2,600
(3) 2000 CT	\$	1,000
(3) 1200 CT	\$	1,000
(3) 800 CT	\$	1,000
MV Metering	\$	5,000
<b>TOTAL COST FOR BLDG.</b>	\$	<b>15,900</b>

\* Will also meter Buildings: 101 and 101A, as well as emergency panel boards.

**MDP-EM\***

(1) Translating Module	\$	2,000
(1) IQ Energy Sentinel w/ Exter. CTs	\$	1,000
(7) Power Sentinel w/ Inter. CTs	\$	9,000
(3) 800 CT	\$	1,000
<b>TOTAL COST FOR BLDG.</b>	\$	<b>13,000</b>

\*This distribution panel contains circuit breakers for emergency panel boards for various buildings (e.g. Halls A, B, C) on the accelerator

Water & Gas Meters (10)	\$	50,000
Main Water Meters (3):	\$	60,000
Gas Meters (12):	\$	36,000
<b>TOTAL MATERIALS COST</b>	\$	<b>248,800</b>
<b>ESTIMATED LABOR COST FOR INSTALLATION</b>	\$	<b>25,000</b>
Lab G&A	\$	38,000
<b>GRAND TOTAL FOR PHASE III METERING</b>	\$	<b>311,800</b>

**Completion of this phase is contingent on funding. In addition, funding must be provided no later than Jan 1, 2010 or completion of this phase will not be done before the end of FY 10.**

Jefferson Lab Metering Plan  
FY08 Update

Metering Plan-Phase IV

The final phase of the metering project (fiscal year 2011) focuses on the support buildings on the accelerator site. These include the Access and Service buildings, as well as the Extraction buildings. In addition, Phase IV will also meter the majority of the office trailers, storage sheds, and site lighting. It should be noted, however, that the trailers and sheds on the Accelerator site may increase or decrease as time goes progresses, therefore increasing or decreasing budget costs respectively. That being said, Phase III will include Buildings: 15A, 21, 34(C&G), 40, 42, 50, 53(A, B, &C), 56, 62, 63, 67, 68, 70, 72, 85, 98, 101B, and the FEL trailers (numbers are not known). The summarization is as follows:

**ACCELERATOR BUILDINGS**

**67 North Access\***

(1) Translating Module	\$	2,000
(2) IQ Energy Sentinel w/ Exter. CTs	\$	2,000
(3) Power Sentinel w/ Inter. CTs	\$	4,000
(6) 2000 CT	\$	2,000
<b>TOTAL COST FOR BLDG.</b>	<b>\$</b>	<b>10,000</b>

\* Will also meter Buildings: 40, 53(A,B,C), 85, as well as emergency panel boards.

**21 North Extraction Spreader Ser.**

(1) Translating Module	\$	2,000
(1) Power Sentinel w/ Inter. CTs	\$	1,300
IMPCABLE communications wire	\$	1,300
<b>TOTAL COST FOR BLDG.</b>	<b>\$</b>	<b>4,600</b>

**39 East Arc Ser Bldg.**

(1) Translating Module	\$	2,000
(1) Power Sentinel w/ Inter. CTs	\$	1,300
<b>TOTAL COST FOR BLDG.</b>	<b>\$</b>	<b>3,300</b>

**49 East Arc Ser Bldg.\***

(1) Translating Module	\$	2,000
(1) IQ Energy Sentinel w/ Exter. CTs	\$	1,000
(4) Power Sentinel w/ Inter. CTs	\$	5,300
(3) 1600 CT	\$	1,000
IMPCABLE communications wire	\$	1,300
<b>TOTAL COST FOR BLDG.</b>	<b>\$</b>	<b>10,600</b>

\* Will also meter Buildings: 39, 63, FEL trailers, as well as emergency panel boards.

**63 East Arc Ser Bldg.\***

(1) Translating Module	\$	2,000
(3) Power Sentinel w/ Inter. CTs	\$	4,000
<b>TOTAL COST FOR BLDG.</b>	<b>\$</b>	<b>6,000</b>

\* Will also meter Buildings: 62 as well as emergency panel boards.

**Jefferson Lab Metering Plan  
FY08 Update**

**50 East Arc Ser Bldg.\***

(1) Translating Module	\$ 2,000
(2) Power Sentinel w/ Inter. CTs	\$ 2,600
<b>TOTAL COST FOR BLDG.</b>	<b>\$ 4,600</b>

\* Will also meter Buildings: 34(C & G), as well as emergency panel boards.

**38 South Access Bldg.\***

(1) Translating Module	\$ 2,000
(3) IQ Energy Sentinel w/ Exter. CTs	\$ 3,300
(1) Power Sentinel w/ Inter. CTs	\$ 1,300
(3) 1200 CT	\$ 1,000
(3) 1600 CT	\$ 1,000
(3) 800 CT	\$ 1,000
IMPCABLE communications wire	\$ 1,300
<b>TOTAL COST FOR BLDG.</b>	<b>\$ 10,900</b>

\* Will also meter Building: 50, as well as emergency panel boards.

**82 South Extraction\***

(1) Translating Module	\$ 2,000
(1) IQ Energy Sentinel w/ Exter. CTs	\$ 1,000
(2) Power Sentinel w/ Inter. CTs	\$ 2,600
(3) 800 CT	\$ 1,000
<b>TOTAL COST FOR BLDG.</b>	<b>\$ 6,600</b>

\* Will also meter Buildings: 68, as well as emergency panel boards.

**68 West Arc Ser Bldg.\***

(1) Translating Module	\$ 2,000
(1) IQ Energy Sentinel w/ Exter. CTs	\$ 1,000
(7) Power Sentinel w/ Inter. CTs	\$ 9,000
(3) 800 CT	\$ 1,000
IMPCABLE communications wire	\$ 1,300
<b>TOTAL COST FOR BLDG.</b>	<b>\$ 14,300</b>

\* Will also meter Buildings: 56, 70, 72, as well as emergency panel boards.

**56 West Arc Ser Bldg.\***

(1) Translating Module	\$ 2,000
(3) Power Sentinel w/ Inter. CTs	\$ 4,000
<b>TOTAL COST FOR BLDG.</b>	<b>\$ 6,000</b>

\* Will also meter Buildings: 15A, as well as emergency panel boards.

**40 West Arc Ser. Bldg.**

(1) Translating Module	\$ 2,000
(3) Power Sentinel w/ Inter. CTs	\$ 4,000
IMPCABLE communications wire	\$ 1,300
<b>TOTAL COST FOR BLDG.</b>	<b>\$ 7,300</b>

**Jefferson Lab Metering Plan  
FY08 Update**

Attachment 1

**45 West Arc Ser Bldg.\***

(1) Translating Module	\$ 2,000
(3) Power Sentinel w/ Inter. CTs	\$ 4,000
<b>TOTAL COST FOR BLDG.</b>	<b>\$ 6,000</b>

\* Will also meter Buildings: 40, as well as emergency panel boards.

**98 Service Bldg.\***

(1) Translating Module	\$ 2,000
(1) IQ Energy Sentinel w/ Exter. CTs	\$ 2,000
(3) Power Sentinel w/ Inter. CTs	\$ 4,000
(3) 2000 CT	\$ 1,000
IMPCABLE communications wire	\$ 1,300
<b>TOTAL COST FOR BLDG.</b>	<b>\$ 10,300</b>

\* Will also meter Buildings: 98, 101B, as well as emergency panel boards.

<b>Water &amp; Nat Gas Metering (3):</b>	<b>\$ 15,000</b>
<b>Sub-Meters, Water (30):</b>	<b>\$ 90,000</b>
 GRAND TOTAL MATERIALS COST	 \$ 205,500
ESTIMATED INSTALLATION LABOR COST	\$ 30,000
Jlab G&A	\$ 38,000
<b>GRAND TOTAL FOR PHASE IV METERING</b>	<b>\$ 273,500</b>

**Completion of this phase is contingent on funding. In addition, funding must be provided no later than Jan 1, 2011 or completion of this phase will not be done before the end of FY 11.**

**Totals (All Phases):**

		Actual	
Phase I (complete):	\$ 122,902	\$	116,000
Phase II: 2009	\$ 228,000		
Phase III: 2010	\$ 311,800		
Phase IV: 2011	\$ 273,500		
<b>Total Project Cost Estimate: \$ 936,200</b>	<b>\$ 936,202</b>		