



Department of Energy

Brookhaven Site Office

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DEC 30 2008

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Deputy Director for Field Operations
Office of Science
SC-3, FORS

SUBJECT: BROOKHAVEN NATIONAL LABORATORY (BNL) EXECUTABLE PLAN

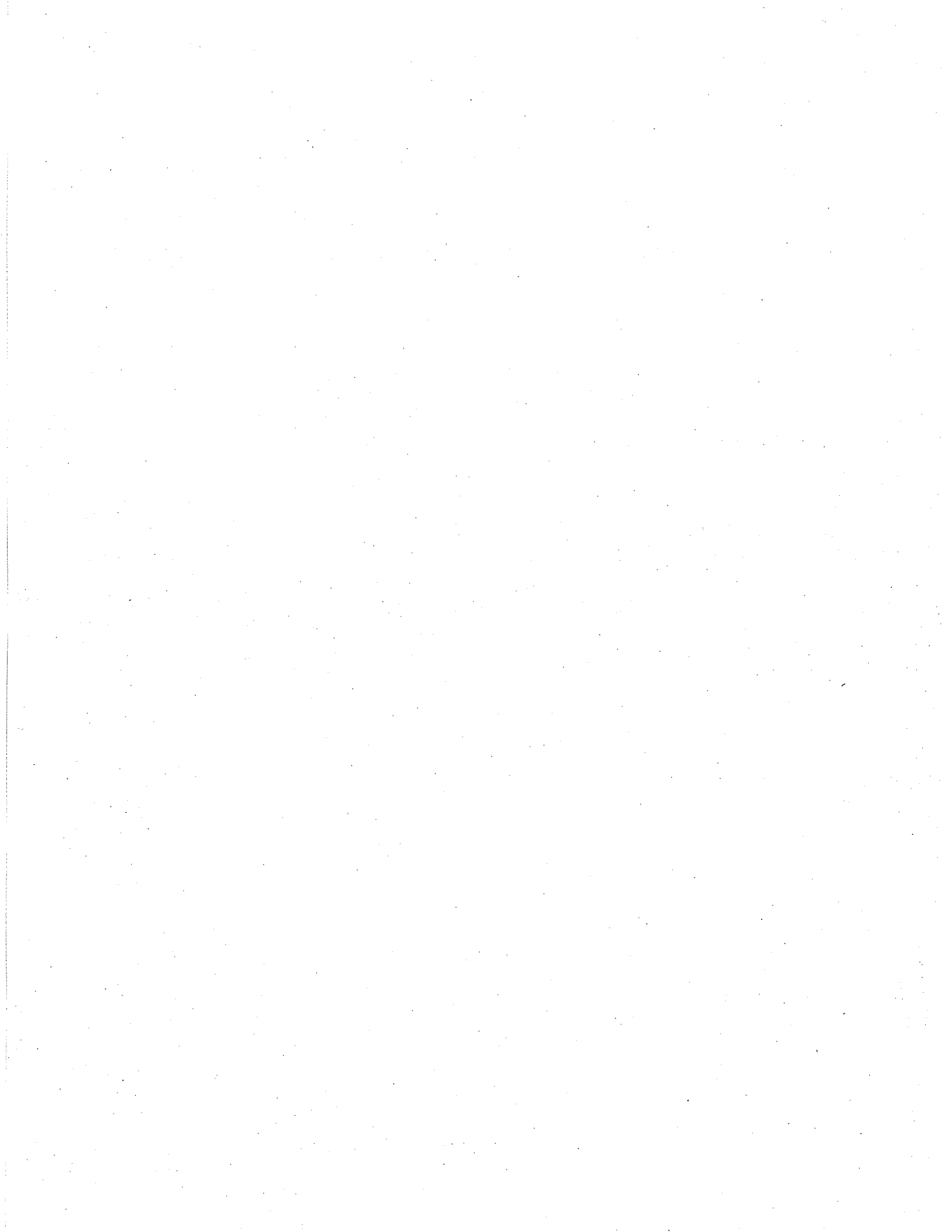
As required by DOE Order 430.2B, "Departmental Energy, Renewable Energy and Transportation Management", enclosed is a copy of the BNL Executable Plan. This plan describes the obligations and commitment by BNL and the Office of Science, Brookhaven Site Office to meet or exceed the goals of Executive Order 13423 and the Transformational Energy Action Management (TEAM) Initiative. If you have any questions, please contact Robert Caradonna of my staff at (631) 344-2945.

A handwritten signature in black ink, appearing to read "Michael D. Holland".

Michael D. Holland
Site Manager

Enclosure:
As Stated


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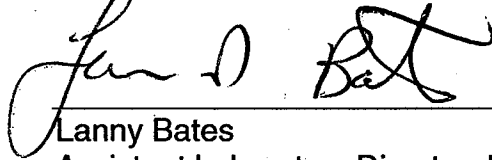
Executable Plan
for
BROOKHAVEN NATIONAL LABORATORY
DOE Order 430.2B
Departmental Energy, Renewable Energy
and Transportation Management

Prepared By:
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Revised December 16, 2008

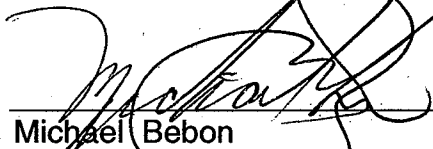
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Edward Murphy Date
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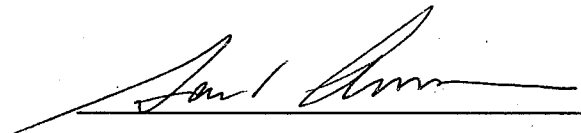
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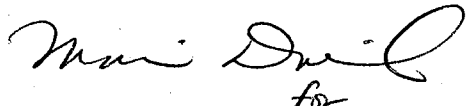
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DOE ORDER 430.2B EXECUTABLE PLAN - BNL

SECTION 1 GOAL SUMMARY

DOE ORDER 430.2B EXECUTABLE PLAN BNL GOAL SUMMARY				
Goal Elements	Plan Meets Goal	Plan Exceeds Goal	Plan Falls Short of Goal	Comments
Energy Efficiency	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Renewable Energy	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Awaiting results of LIPA RFP
Water	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Transportation/Fleet Management	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
High Performance and Sustainable Buildings	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

SECTION 2 OVERVIEW

A. INTRODUCTION and EXECUTIVE SUMMARY

DOE Order 430.2B includes several energy, water, sustainability and transportation related goals and objectives, including the requirement for an “*Executable Plan*” that shows how each organization will address the Order requirements. This document describes Brookhaven National Laboratory’s (BNL’s) commitment to meet or exceed these goals wherever economically viable.

This Executable Plan follows the DOE Office of Science (SC) Guidance, dated July 8, 2008, and identifies the short and long-term initiatives, goals, and required resources, as well as issues and concerns that may affect our ability to reach various goals. It also includes some of BNL’s historical energy management efforts and results, which are necessary to understand the issues and develop and implement the plan forward.

BNL has a long and successful history of identifying and implementing energy conservation projects. BNL began an energy conservation program in the 1970’s to combat high energy costs. Over \$50 million has been invested in a wide range of efforts that has curbed BNL’s energy consumption dramatically. In fact, ***energy intensity (Btu/GSF) has been reduced by over 57% comparing FY2008 to FY1973.***

We are proud to continue our aggressive energy reduction campaign, and are committed to doing as many cost-effective energy, water, and transportation related projects as possible. This plan identifies a number of initiatives that are summarized below, and presented in more detail in the following sections.

- A 32.1% * reduction in energy for buildings and facility space
- Energy Intensity (Btu/GSF) reduction of at least 31.2% *
- A potential large scale solar photovoltaic (PV) project that will exceed the renewable energy goal
- Continued water reduction efforts to meet or surpass the goal
- A comprehensive transportation/fleet management program
- Meeting or exceeding requirements for sustainable buildings

* Compared to a 2003 baseline, as specified in DOE Order 430.2B.

B. BNL ENERGY MANAGEMENT VISION

Our vision is to reduce energy and water usage and costs to the most cost-effective levels while striving to meet Executive Order 13423, Departmental and Transformational Energy Action Management (TEAM) Initiative goals.

C. SITE INFORMATION

BNL is a multi-disciplinary laboratory that carries out basic and applied research in the physical, biomedical and environmental sciences and in selected energy technologies. The Laboratory is managed by Brookhaven Science Associates, under contract to the U.S. Department of Energy (DOE).

Several hundred of Brookhaven's 5,300 acres are developed with over 400 buildings and major research facilities with a total of 4.2 million square feet. More than 2,700 people work at Brookhaven, and several thousand guests, collaborators and students visit each year to use the research facilities. Major research facilities include:

- Alternating Gradient Synchrotron (AGS)
- Relativistic Heavy Ion Collider (RHIC)
- National Synchrotron Light Source (NSLS)
- Tandem Van de Graaff Accelerator
- Accelerator Test Facility (ATF)
- Scanning Transmission Electron Microscope (STEM)
- NASA Space Radiation Laboratory (NSRL)
- Center for Functional Nanomaterials (CFN)

In the conduct of its research, Brookhaven spent \$14.9 million for 233 GWh of electricity and over \$8.7 million for 630 Billion Btu of fuel in FY 2008. To help manage these large expenditures, BNL's Energy Management Program is directed to five major areas, which are described in greater detail in the following sections. They are as follows:

- Meet DOE mandated and other goals, including TEAM.
- Meet operating contract goals.
- Procure energy at the lowest cost for the required reliability.
- Improve efficiency of energy and water consuming systems in the most cost-effective manner.
- Provide comprehensive metering and direct charge of energy data to all BNL energy users.

SECTION 3 GOAL ELEMENTS

A. ENERGY EFFICIENCY

The DOE Order 430.2B energy intensity reduction goal is to reduce energy intensity by no less than 30% by FY 2015 versus a FY 2003 baseline.

1) Current Status

	DOE GOAL FY2015 (BTU/GSF)	FY2003 (BTU/GSF)	FY2008 (BTU/GSF)	ENERGY REDUCTION (%)
ENERGY INTENSITY	227,442	324,917	287,074	-11.6

Brookhaven National Laboratory and the DOE Brookhaven Site Office (BHSO) initiated an ESPC early FY2008 with Constellation Energy. The Initial Proposal (IP) was started on November 5, 2007 and delivered on February 18, 2008. However, there were concerns about the scope of the proposed projects, and other issues that required further analysis. An updated IP was prepared and subsequently delivered on August 21, 2008. BNL and BHSO recently evaluated the IP and have scheduled a date of 12/12/08 for the DOE Review Board. A Notice of Intent to Award is scheduled to be issued by DOE sometime before the end of calendar year 2008.

BNL is in the early phase of implementing a metering and direct charge program for steam. We have found that direct charging for utilities is by far the most cost-effective energy conservation initiative. BNL maintains a comprehensive, automated electric and chilled water metering program, and has been direct charging each department for electricity and chilled water for many years.

Issues and Concerns

Some of the cost estimates included in this document have yet to be fully developed. Further, the required funding sources to implement some of the energy related initiatives identified have yet to be identified. The use of programmatic and/or operational funds is extremely difficult at present due to significant prioritized Environment, Safety and Health (ES&H) demands, a backlog of infrastructure recapitalization requirements, and research mission related needs of each of the research departments. BNL energy projects must compete for funds against these other demands.

Further, while DOE encourages the use of ESPCs to provide third-party funding, construction, and in some cases operation and maintenance, there are limitations with this approach, which are identified in this plan. BNL and BHSO are currently working

with an Energy Service Company (ESCO), Constellation Energy, and expect to begin the Detailed Energy Survey (DES) phase within a month or two. While the Initial Proposal (IP) from Constellation Energy provides very interesting projects, it is apparent that an ESPC alone will not enable BNL to meet the various energy and water reduction goals set forth in DOE Order 430.2B. However, we hope to expand the scope of the ESPC during the DES to find additional savings.

This Executable Plan focuses on energy efficiency and conservation per the guidance. However, by far the most significant energy issue facing BNL is the availability of reliable, low-cost electricity. For over 27 years BNL, has been fortunate to have the New York Power Authority (NYPA) supply power at rates far below the average cost in the region. In fact, BNL's electricity rates were about half of that of the local utility, and lower than virtually any facility in the region. BNL's NYPA contract expires in 2009. BNL and BHSO are currently working to secure a long-term, low cost electricity supply. If we are not successful, there will be a significant increase in electricity rates, on the order of 100% or more. While this may make energy conservation projects more attractive, it will be devastating to the mission of the Laboratory, resulting in over \$15 million/year in increased energy costs. By necessity, electricity rates will continue to be a major focus of BNL's energy management efforts.

2) Site-Specific Goals

BNL's site specific goals have been concurred on by the DOE Brookhaven Site Office in accordance with the DOE SC Guidance.

3) Describe the approach the site will undertake to meet or exceed the goal

BNL's approach for energy efficiency compliance is to maximize the use of third party financing via the ESPC process for energy retrofit projects, to ensure new construction and major renovations achieve the highest cost-effective efficiencies possible, and strive to instill the strongest sense of energy conservation from all personnel on site. Listed below is a summary of BNL's energy efficiency improvement plan:

DOE ORDER 430.2B EXECUTABLE PLAN - BNL

Energy Consumption: Buildings and Facilities (non-process space)

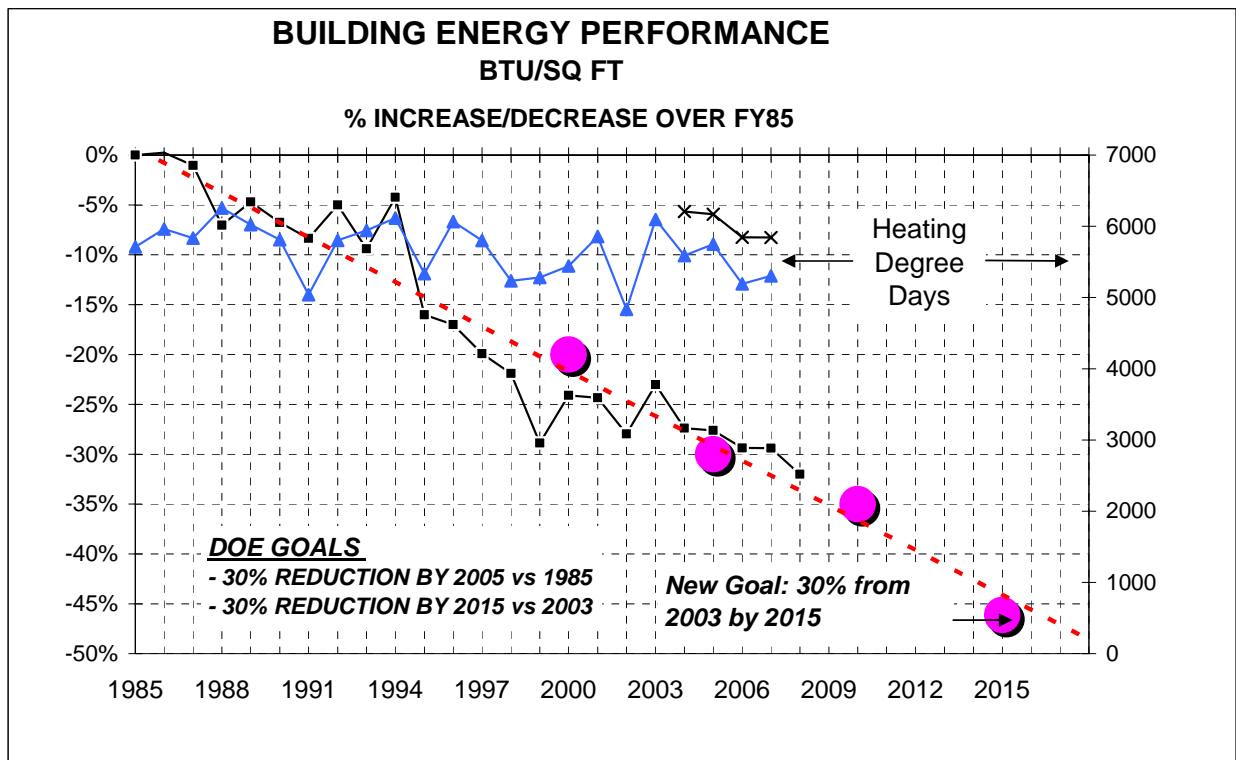
	Area Ft ²	Electricity		Fuel mmBtu	Total Energy mmBtu	Energy Intensity Btu/FT ²
		MWh	mmBtu			
Base Year (2003)	2,915,393	91,930	313,759	633,503	947,262	324,917
FY08	2,979,100	79,930	272,801	582,422	855,223	287,074
Change	63,707	-12,001	-40,958	-51,081	-92,040	-37,843
Change (%)	2.2%	-13.1%	-13.1%	-8.1%	-9.7%	-11.6%
Estimated Changes by 2015						
ESPC	0	-7,111	-24,270	-76,421	-100,691	
Steam Metering/Billing	0	0	0	-58,353	-58,353	
Building Replacement	0	-2,051	-6,999	-14,976	-21,975	
Expand EMCS/Retro Comm.	0	-2,613	-8,918	-19,082	-28,000	
Expand Lighting Upgrades	0	-800	-2,730	0	-2,730	
Total Changes	-102,052	-12,575	-42,917	-168,832	-211,749	
Revised Totals	2,877,048	67,355	229,883	413,590	643,473	223,657
Change from Base Yr	-38,345	-24,575	-83,876	-219,913	-303,789	-101,260
Change (%)	-1.3%	-26.7%	-26.7%	-34.7%	-32.1%	-31.2%
DOE Goal 30%					-284,179	227,442
Variance					-19,610	-1.2%

As can be seen by the above table, with currently identified resources, BNL is expected to reduce its energy use by nearly 32.1%, and surpass the Btu/GSF goal.

If successful, this will be a very impressive accomplishment, as BNL has a long and successful history of energy conservation efforts that have already resulted in completion of many of the economical (quick payback) projects prior to the TEAM Initiative. Further, our energy costs, particularly for electricity, are relatively low, and construction costs in the area are high, making cost-effective projects difficult to find. This has been confirmed not only by the current ESPC effort, but by several ESCo's evaluating BNL for conservation opportunities over the past 10 years.

Another factor affecting BNL's energy reduction effort is the on-going demolition of older space, which are often low energy intensity structures such as warehouses or administrative office space. In cases such as this, it removes low energy consuming space (square feet) from the Btu/square foot calculation, thereby having an increasing effect on BNL's energy intensity.

The chart below shows the impressive reductions already achieved.



While we are extremely proud of our past accomplishments, we will continue to work to identify as many new energy reduction opportunities as possible.

ESPC

As stated previously, Brookhaven National Laboratory and BHSO initiated an ESPC early FY2008 with Constellation Energy. The IP was started on November 5, 2007 and delivered on February 18, 2008. However, there were concerns about the scope of the initially proposed projects, and there were other issues that required further analysis. An updated IP was prepared and subsequently delivered on August 21, 2008. BNL and BHSO recently evaluated the IP and have scheduled a 12/12/08 date for the Review Board. A Notice of Intent to Award is scheduled to be issued by DOE sometime before the end of calendar year 2008.

The August IP identified 6 Energy Conservation Measures (ECM's). Together, these ECM's provide an estimated annual savings of 100,691 mmBtu's, for a reduction of energy of approximately 10.6% compared to 2003. The total cost is \$26 million with a combined simple payback of 10.5 years. The projects are as follows:

1. Ground Source Heat Pumps

DOE ORDER 430.2B EXECUTABLE PLAN - BNL

2. Chilled Water System Improvements
3. Steam System Improvements
4. Lighting Efficiency Improvements
5. Building 555 Laboratory Fume Hood System Improvements
6. Building Energy Management Control System Upgrades

The estimated year one annual cost savings from these projects is \$2.4 million. In addition, over 4 MW of electric demand reduction will result.

BNL hopes to expand some of the scope of the ESPC during the Detailed Energy Survey (DES) phase, or perhaps at a later date. BNL feels strongly there are additional opportunities in the areas of lighting and the energy management control system (EMCS). The additional scope was not pursued during the IP phase due to time constraints and the desire to provide a definitive scope to the ESCO for purposes of evaluating costs and savings. The anticipated additional scope is conservatively estimated as follows:

- | | |
|-----------------------------|---------------------|
| 1. Expanding Lighting: | 2,730 mmBtu |
| 2. Expanding EMCS upgrades: | <u>28,000 mmBtu</u> |
| Total: | 30,730 mmBtu |

In the event the ESPC is not able to accommodate these projects, BNL will strive to dedicate internal resources to implement the projects. Additional information on these efforts is described in the following section on internal resources.

Steam Metering and Direct Charge Plan

As stated earlier, BNL is in the early phases of implementing a metering and direct charge program for steam. BNL has been direct charging each department for electricity and chilled water for many years and has found that direct charging for utilities is by far the most cost-effective energy conservation initiative.

The BNL Energy and Utilities Division recently received approval from Laboratory management to prepare a plan for direct charging for steam, and a 10/01/09 start date for implementation of advisory direct charging, to be followed with actual direct charging beginning 10/01/10. Most of the buildings served by the Central Steam Facility (CSF) have steam and/or condensate meters. Our plan is to repair or replace meters that are not operational, and to install meters as needed. Further, BNL's standard design specification for new buildings includes steam/condensate metering requirements.

BNL has been reading and recording the steam/condensate data from the meters for many years and already has the basic metering and direct charging infrastructure in place. Therefore, the additional requirements are fairly small, with an estimated installed meter cost of \$150,000 and recurring costs of about \$50,000/year. This will be done with internally allocated funds.

We conservatively estimate a 10% savings in fuel usage at the Central Steam Facility (CSF) as a result of direct charging for steam and increased focus on thermal energy savings opportunities. This represents a reduction of 58,353 mmBtu/year.

New Construction/Building Replacement

BNL has incorporated the design standard of Leadership in Energy and Environmental Design (LEED) – Gold for all new construction, into our standard requirements for new buildings. We are also working to ensure this will be applied to all major building renovations over \$5 million, per the DOE Order 430.2B requirement. Our two most recent projects for new facilities are the Research Support Building (RSB) and the Center for Functional Nanomaterials (CFN). Both came on-line in 2007 and achieved a LEED certification of Silver.

Our major new facility, the National Synchrotron Light Source – Phase II (NSLS-II), is in the process of receiving Critical Decision (CD) – 3, and is also expected to receive a LEED certification of Silver. This project received approval prior to the implementation date for the LEED Gold certification requirement in DOE Order 430.2B.

The Interdisciplinary Science Building – Phase I (ISB) Project, which is funded by the SC Science Laboratories Infrastructure (SLI) Modernization Initiative, is currently in design with completion planned for FY 2013. This project also received approval prior to the implementation of the LEED Gold requirement in DOE Order 430.2B. The goal for the ISB Project is to pursue the highest level of LEED certification consistent with the budget and performance goals of the project. All future new buildings and major building renovations, with a value exceeding \$5M will achieve LEED Gold Certification unless waived per DOE O 430.2B.

Based on BNL's Ten Year Site Plan, there are approximately 750,000 gross square feet (GSF) of new facilities that are proposed between FY2008 thru FY2015. However, 457,000 GSF is for a new process facility, the NSLS II, that will not be counted in the energy intensity (Btu/GSF) measure. The table below summarizes the planned building changes:

DOE ORDER 430.2B EXECUTABLE PLAN - BNL

Building Additions and Demolition - Ref. TYSP

Building and Facility Space Only

Year	Add	Remove	Comments
2007			
2008	9,300	38,505	
2009	6,000	1,158	Less CCWF II
2010	0	12,122	Remove 185
2011			
2012	75,000		ISB1
2013		94,240	
2014		15,025	
2015+	40,000	71,302	JPSI but not NSLS II (457k GSF)
Total	130,300	232,352	
GSF Net Change:			-102,052
FY2008 GSF:			2,979,100
FY2015+ GSF:			2,877,048

Note: JPSI – Joint Photon Sciences Institute

Due to DOE’s requirement of demolishing old space before new space can be added, a number of older, obsolete buildings have to be demolished in order to build new space. However, since most of the new space will be classified as process space, there will be a net reduction in the area classified as Buildings and Facility space.

The energy intensity measure, Btu/GSF, uses Buildings and Facility areas in the denominator. If we were demolishing buildings with Btu/GSF values equal to, or higher than the average site value (272,801 Btu-GSF-yr), our energy intensity measure would improve. However, we are in fact demolishing predominately older, low energy intensity (about 120,000 Btu/GSF-yr) space. This will tend to increase our Btu/GSF value to some extent, which offsets our reduction efforts and will therefore require even greater energy savings efforts in order to meet the 30 percent reduction goal.

Regardless, we still estimate some positive effects from the demolition given the overall mix of what is being demolished, and the net effect of the added space. In fact, since the estimated average energy intensity of the new space is 90,000 Btu/GSF and the demolished is 120,000 Btu/GSF, we estimate that we will see a net reduction of 21,975 mmBtu/year.

Expand Energy Management Control System/Retro-Commission

BNL has a site-wide Energy Management Control System (EMCS) in over 100 buildings on site, with over 5,000 control points. As part of the IP, Constellation Energy identified approximately 2,700 additional points that are estimated to save 27,843 mmBtu/year.

BNL believes there is additional potential, and estimates another 28,000 mmBtu is possible. Our plan is to expand the EMCS via the ESPC process during the Detailed Energy Study (DES) phase. However, if this is not possible, BNL will strive to expand the system with internally allocated funds. The cost is estimated to be approximately \$2.2 million, and could be phase funded over a few years. The estimate is based on approximately doubling the scope of the EMCS effort identified in the Constellation IP.

Expand Lighting Efficiency Improvements

Constellation Energy identified approximately 11,000 lighting fixtures to be upgraded or replaced in the IP that are estimated to save 912,000 kWh/year (3,114 mmBtu).

BNL is certain there is additional lighting savings potential, and estimates another 800,000 kWh/year (2,730 mmBtu) is possible. Our plan is to complete additional lighting retrofits via the ESPC process during the DES. However, if this is not possible, BNL will strive to upgrade lighting with internally allocated funds. The cost is estimated to be approximately \$900,000, and would be phase funded over two or three years. The estimate is based on doing an additional scope equal to about 100% of that identified in the Constellation IP.

4) Funding Plan

BNL plans to fund the energy efficiency improvements predominately through the ESPC. However, there are some areas that will/may require other resources. The required areas for funding outside of the actual ESPC are:

- **ESPC: Administration and Management:** \$1.9 million initial and \$150,000/yr
- **Steam Metering and Direct Charging:** \$154,000 initial and \$47,400/yr
- **EMCS Expansion:** \$2.2 million
- **Lighting Efficiency Improvements:** \$900,000

ESPC Administration and Management

BNL conservatively estimates the contract administration cost for the ESPC to be \$2.3 million. This is based on 8% of the \$28 million implementation price of the ESPC. The

estimate was derived based on BNL's contract management experience and conversations with other DOE Laboratories.

There will also be an annual cost associated with contract administration that is currently estimated to be about \$424,900/year. These are staff costs for contract oversight, measurement and verification, additional maintenance, addressing contract deviations, adjustments, and conflict resolution.

BNL will fund these costs through a combination of overhead (e.g. IGPP) funds and surcharges applied to the space rates, and electricity, steam, and chilled water costs.

Steam Metering and Direct Charge

The initial funding required to repair, replace, and install meters will come from internal Laboratory funds. While the final details have to be determined, we anticipate using a surcharge on the utility portion of the space charge to maintain and enhance the steam direct charging/metering program. At present, fuel costs are collected from a surcharge on the space charge that all departments are required to pay. Once the meters are back to 100% operation, and the direct charging system is in place, the annual costs, estimated to be approximately \$47,000, will be collected from a surcharge on the steam bills.

EMCS Expansion

If this effort cannot be completed with the ESPC, BNL will fund these costs through a combination of IGPP funds, a surcharge applied to the space rate charged to users, and on electricity, steam, and chilled water direct charges.

Lighting Efficiency Improvements

If this effort cannot be completed with the ESPC, BNL would fund these costs through a combination of IGPP funds, a surcharge applied to the space rate charged to users, and on energy direct charges.

DOE ORDER 430.2B EXECUTABLE PLAN - BNL

Executable Plan: BNL Resource Requirements

Initiative	BNL Financial Requirements				Year Required
	One-time			Recurring Annual Overhead	
	IGPP	Overhead	Total		
Steam Metering/Billing		\$154,000	\$154,000	\$47,400	2009
Transportation Initiative		\$25,000	\$25,000		2009
ESPC Construction Admin. Year 1 and Leverage Investment	\$1,000,000	\$1,151,135	\$2,151,135		2010
ESPC Construction Admin. Year 2 and Leverage Investment	\$1,000,000	\$1,151,135	\$2,151,135		2011
ESPC Contract Admin. & Ad'l Maint.			\$0	\$424,900	2011
Sub-Total	\$2,000,000	\$2,481,270	\$4,481,270	\$472,300	
Expand EMCS/Retro Comm. - Ph I		\$1,100,000	\$1,100,000		2011
Expand EMCS/Retro Comm. - Ph II		\$1,100,000	\$1,100,000		2012
Expand Lighting Upgrades		\$900,000	\$900,000		2012
Sub-Total	\$0	\$3,100,000	\$3,100,000	\$0	
Total	\$2,000,000	\$5,581,270	\$7,581,270	\$472,300	

Year	Total			
	One-Time			Recurring Annual Overhead
	IGPP	Overhead	Total	
2009	\$0	\$179,000	\$179,000	\$47,400
2010	\$1,000,000	\$1,151,135	\$2,151,135	\$47,400
2011	\$1,000,000	\$2,251,135	\$3,251,135	\$472,300
2012	\$0	\$2,000,000	\$2,000,000	\$472,300
2013	\$0	\$0	\$0	\$472,300
2014	\$0	\$0	\$0	\$472,300
2015	\$0	\$0	\$0	\$472,300
Total	\$2,000,000	\$5,581,270	\$7,581,270	\$2,456,300

Milestones for Reaching the Goals:

		2003		2008	
Building Gross Square Feet		2,915,393		2,979,100	
Total Buildings Energy Use (MBtu)		947,262		855,223	
ESPC Project or Energy Conservation Measure	Actual or Estimated Energy Saved MBTU/yr	Actual or Estimated Project Cost	Expected Year of Implementation	Funding Source (ESPC, UESC, Overhead, IGPP, other)	Estimated Delivery Order Date
ESPC: DO2 *	100,691	\$30,590,877	2011	ESPC	09/15/09
Steam Metering/Direct Charging	58,353	\$154,000	2010	Overhead	N/A
Building Replacement	21,975	\$0	2015	N/A	N/A
Expand EMCS/Retro Commission	28,000	\$2,200,000	2011	ESPC or IGPP	N/A
Expand Lighting Upgrades	2,730	\$900,000	2011	ESPC or Overhead	N/A
Total	211,749	\$33,840,877			

* Full implementation price with \$2 million BNL contribution and proposal development

B. RENEWABLE ENERGY

The EO 13423 renewable energy goal is to have at least 50% of the current renewable energy purchases come from new (after January 1, 1999) renewable sources and to the extent feasible implement on-site renewable energy projects. Executive Order 13423 allows the use of electricity from new renewable energy sources and/or non-electric renewable energy sources to meet the Executive Order goals.

The Energy Policy Act (EPACT) of 2005 renewable energy goal is to have a minimum of renewable energy consumption (% of annual electric consumption) to be 3% for each year from FY 2007 through FY 2009; 5% from FY 2010 through FY 2012; and 7.5% from FY 2013 forward. EPACT 2005 allows only the use of electricity from renewable energy (old and new) to meet the EPACT 2005 requirement. Non-electric renewable energy sources cannot be used to meet the EPACT 2005 requirement. However, DOE Order 430.2B does allow for double credit for in-site sources.

DOE Order 430.2B on-site renewable energy goal is to maximize installation of on-site renewable energy projects to acquire at least 7.5% (3.75% if all is generated on site) of each site's total annual electricity and thermal consumption from on-site renewable sources by FY 2010.

1) Current Status

In May of 2008 a DOE-sponsored consultant, the Antares Group, completed a Renewable Energy Site Assessment for BNL. The report concluded "the potential for installing new and renewable energy generation at BNL is somewhat limited". Photovoltaic (PV), Solar Thermal (Hot water, ventilation pre-heat, etc.), Wind, and Biomass systems were evaluated. The overall recommendations were as follows:

- A small solar hot water project may be economically viable
- A significant biomass energy project may be possible. However, additional resource work is required. In particular, identification of long-term fuel sources is critical. *Note: BNL recently requested additional funds for Technical Assistance from the Federal Energy Management Program (FEMP) to help analyze potential fuel sources. It is our understanding that the request was approved and work should be completed during FY 2009.*

An additional, and very exciting, opportunity emerged during late spring of this year. The local utility, the Long Island Power Authority (LIPA), issued a Request for Proposals (RFP) for up to 50 MW of Photovoltaic (PV) energy. LIPA intends to enter into a 20 year + power purchase agreements (PPA) with prospective developers for the output of the systems. BNL and DOE identified, and subsequently made available to the developers, up to 287 acres for potential projects. If one (or more) of the developers that based their proposal on using BNL/DOE land is selected by LIPA, there may be an opportunity to have one of the largest (up to 50 MW) PV arrays in the country located at BNL, and, at no cost. It is too early to speculate the results. However, BNL and DOE are fully supportive of this LIPA RFP, and will continue to work with the developers to the fullest extent possible.

BNL has long championed renewable energy projects. However, the economics have rarely been favorable. Regardless, we have managed to find opportunities. These include a solar hot water heating system in the Gymnasium building, and solar powered traffic signals in various locations.

2) Description of projects and activities

Renewable Energy Credits (REC's)

BNL's approach for renewable energy compliance for the next few years will require off-site renewable energy purchases in the form of REC's.

Biomass Facility

BNL will work with Antares (or other DOE consultant) to evaluate a long-term fuel source for a biomass facility. If fuel sources are identified, additional evaluation will continue, most likely through the ESPC process.

Small Scale Solar Hot Water Heating

BNL will work with identify potential opportunities for solar hot water heating. This will likely be done through the ESPC.

Solar Demonstration Project

BNL recently received funding to construct a small-scale Solar Combisystem that will integrate flat panel solar collectors and a high efficiency condensing oil-fired boiler. This project is a true partnering effort, and utilizes funding from the New York Energy Research and Developmental Authority (NYSERDA), the Federal Energy Management Program (FEMP) and Laboratory operating funds.

LIPA RFP for Up to 50 MW of Solar PV

BNL will continue to work with LIPA and the developers in order to site a large project on site.

3) Funding Plan

Renewable Energy Credits

At this time the only planned renewable energy efforts are to purchase Renewable Energy Credits (REC's). The estimated cost in the current market is approximately \$40,000 to \$60,000 year. BNL anticipated purchasing the REC's using a small surcharge on the internal electric power cost distribution.

Biomass Facility and Small Scale Solar Hot Water Heating

We anticipate funding these efforts, should they prove viable, through the ESPC process.

LIPA RFP for Up to 50 MW of Solar PV

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Initially there will be no direct cost associated with this effort with the exception of various coordination activities. Should this project be approved at BNL any costs would be picked up by the developer(s). Further, BNL and DOE anticipate a revenue stream from this project.

4) Milestones for reaching the goals

Renewable/ Thermal Energy Projects – including RECs	System Size (capacity)	Total (MWH/yr)	Project Cost (\$)	Funding Source	Expected Year of Implementation
RECs	-	12,000 – 22,000	\$40- 60k/yr	Electric Direct Charging Recharge	FY09 – FY10
Small Scale Hot Water Heating	TBD	N/A	TBD	ESPC or overhead	FY2010
LIPA RFP for PV	10 – 50 MW	TBD	N/A	PPA	FY2011+

5) Waiver Process

At this time, BNL does not plan to request a waiver. If the LIPA RFP ultimately ends up with a large PV project being located at the BNL site, the output should more than meet the DOE Order 430.2B requirements.

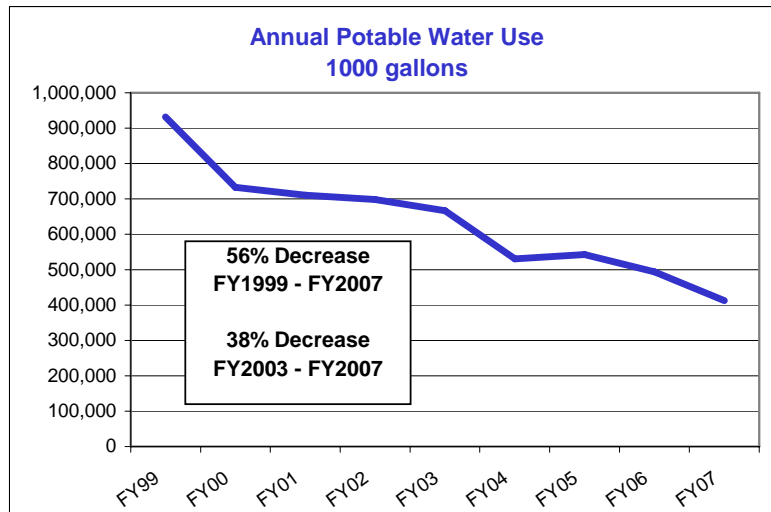
C. WATER

DOE 430.2B water reduction goal is to reduce potable water by no less than 16% by FY 2015 versus a FY 2007 baseline.

1) Current Status and How Water is Measured

BNL has made impressive reductions in water consumption over the last several years, achieving a 56% reduction comparing 2007 to 1999, and a 38% reduction for 2007 compared to 2003. See chart below:

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These reductions have been made through a number of initiatives, including elimination of many once-through cooling systems and the identification and repair of leaks. BNL also undertook a detailed leak detection survey for underground piping which concluded the systems is tight, and there are no major leaks in the distribution system.

BNL Total Water Consumption Intensity

	FY 2007 baseline (gallons/gsf)	DOE FY 2015 GOAL (gallons/gsf)
Water Consumption	143.2	120.3

Groundwater is plentiful on Long Island. BNL pumps and treats its own water through a system of underground wells, elevated storage tanks, a water treatment plant, and a waste water treatment plant. The entire system is owned by DOE and operated by BNL personnel. As a result, the incremental costs are extremely low at approximately \$0.25/kgal for water and \$0.10/kgal for sewage treatment. This makes it extremely difficult to justify large investments aimed at water reduction since the projects are not cost effective.

Most of BNL’s water usage falls into two categories, once-through cooling systems, and evaporative cooling systems for process systems and conventional chiller systems for building cooling. We estimate that well over 50% of the water consumption is associated with evaporative cooling.

BNL is continuing to eliminate once-through cooling systems as the units fail or building renovations are occurring. However, evaporative cooling systems (i.e. cooling towers)

are very efficient. To convert to dry-type cooling systems is extremely costly and increases energy usage.

How Potable Water Usage is Measured

Water usage is measured through a combination of meters and flow calculations based upon pump operation. There are water meters at pump houses, at the water treatment and sewage treatment plants, and nearly all of the cooling towers.

All new buildings are required to have potable water meters installed. Very few of BNL's existing buildings have water meters. It has historically been difficult to economically justify retrofitting existing buildings with water meters.

2) Description of projects and activities

Water Management Plan

BNL is in the process of developing a formal Water Management Plan, with a target date for completion of March 31, 2009.

Current Activities

BNL has been very aggressive in identifying water conservation opportunities and has already implemented nine (9) of the 14 FEMP Best Management Practices (BMPs). They are:

- BMP 2: Information and Education Programs
- BMP 3: Distribution System Audits, Leak Detection and Repair
- BMP 4: Water-Efficient Landscaping
- BMP 5: Water-Efficient Irrigation
- BMP 6: Toilets and Urinals
- BMP 7: Faucets and Showerheads
- BMP 8: Boiler/Steam Systems
- BMP 9: Single-Pass Cooling Equipment
- BMP 10: Cooling Tower Management

In addition, Water Sense products and other low-flow devices are now requirements of BNL's standard design specifications for new facilities, renovations, and equipment upgrades.

Planned Projects and Activities

- Continued replacement of single-pass equipment

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- More aggressive management of cooling tower operation
- Completion of another leak detection survey with focus on single-pass cooling systems
- Replacement of plumbing fixtures with water conserving components

BNL believes we should be able to achieve the 16% water use reduction target. This determination is based on our past experience with water reduction efforts.

3) Funding Plan

The funding source to implement the water conservation measures that are identified and any future water efficiency projects will be from project budgets and BNL's overhead budget. All future facilities will incorporate water saving measures and will be funded thru their respective project budgets.

4) Metering Plan

All of the necessary metering is in place to establish the FY 2007 baseline. All new facilities will require a main building potable water meter. Further, as a BNL design standard for new and renovated spaces, water sub-meters are required at make-up water systems that support mechanical HVAC equipment and laboratory process systems.

5) Milestones for Reaching the Goals

Water Conservation Measure	Actual or Estimated Water Saving (kgal/yr)	Expected Year of Implementation	Actual or Estimated Implementation Cost	Funding Source
Continued replacement of single-pass cooling systems	TBD	FY2009	TBD	Overhead
More aggressive Cooling Tower Management	TBD	FY2009	\$120,000	Overhead
Water Management Plan	TBD	FY2009	TBD	Overhead
Leak Detection Survey Update	TBD	FY2009	\$40,000	Overhead

D. TRANSPORTATION/FLEET MANAGEMENT

EO 13423 transportation/fleet management goals, with the base line as FY 2005, are to reduce the fleet's total consumption of petroleum products by 2% annually or 20% by the end of FY 2015, increases the total fuel consumption that is non-petroleum based by 10% annually and to use plug in hybrid (PIH) vehicles when PIH vehicles are commercially available and life-cycle cost effective.

DOE 430.2B transportation/fleet management goals are to achieve the petroleum reduction goal thru 1) reducing 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) Increase overall fleet fuel economy through acquisition of higher fuel economy vehicles; 3) "right size" its fleet; 4) employ efficiency strategies that reduce energy such as low rolling resistance tires, synthetic oil, and other technologies; and 5) consider use of plug-in hybrid electric vehicles (PHEVs) and the use of electric drive vehicles to the extent feasible and in accordance with applicable statutes, regulations, executive orders and Departmental guidance.

The Energy Policy Act (EPAAct) of 1992 includes the requirements that a minimum of 75% of the acquisitions in covered fleets be alternative fuel vehicles (AFVs). Also, EPAAct of 2005 requires each of the Federal agencies to use alternative fuel in all of its dual fuel vehicles – such as ethanol flex-fuel vehicles (FFV) or bi-fuel gasoline/gaseous fuel vehicles – except where the vehicles have received a waiver from the DOE.

Vehicle Acquisitions

1) Site plan to annually meet the EPACT 1992 AFV acquisition requirement of 75 percent, including biodiesel use.

In the past BNL was able to satisfy the EPACT requirement by purchasing compressed natural gas vehicles. However, Original Equipment Manufacturer (OEM) compressed natural gas vehicles are no longer available, except for the Honda sedan which would not be useful to most BNL vehicle users.

In order to satisfy EPACT acquisition requirements eight flex-fuel vehicles were acquired in FY 2008 and more are expected to be acquired in FY 2009. The plan is to build the flex-fuel vehicle fleet to about forty vehicles, over three years, and then convert one of the two gasoline tanks and dispensers at the fleet fueling station to E85. Converting a gasoline tank now would reduce BNL's ability to reliably fuel about one hundred and fifty gasoline vehicles. This plan may be

accelerated if backup means of gasoline refueling or alternative flexfuel storage and dispensing can be obtained.

BNL started a biodiesel pilot program using B5 in May of 2008 and by CY 2009 most diesels will use B20.

Hybrid vehicles should work very well for BNL's site because most driving is stop and go driving where hybrids excel. When budgets and vehicle availability permit, hybrids will be acquired to reduce petroleum consumption in a cost efficient manner.

2) Evaluation of Fleet Size.

BNL has a fleet of 292 vehicles and evaluating fleet size and composition is a continuous process. Local Use Objectives require periodic review of the fleet and the Brookhaven Site Office and others review the fleet size annually.

3) Fleet Replacement with AFVs/HEVs by 2010.

The cost of replacing all gasoline vehicles is about 2.6 million dollars. BNL has 65 gasoline-fueled medium-duty and heavy-duty vehicles. BNL will replace gasoline vehicles with AFVs/HEVs through its normal funding process. Typically, BNL replaces 10-20 vehicles annually.

4) Obstacles in meeting EPACT 1992 or Order goals.

Obtaining sufficient funding to accomplish the Order's goals will be challenging. GSA vehicle selection and New York State Emission Requirements may impact vehicle acquisitions.

Petroleum Reduction

1) Plans to meet or exceed E.O. 13423 two percent annual petroleum reduction requirements.

- Biodiesel use should result in a 2 % reduction in petroleum use.

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- E85 use will reduce petroleum consumption depending upon the number of E85 vehicles in use, their usage and when refueling infrastructure is in operation.
- Smaller and more fuel efficient vehicles should reduce petroleum consumption by 0.5%. This depends upon what vehicles are available and what is replaced as well as usage.
- Idle reduction technology may reduce petroleum consumption by 0.5%.
- Operator awareness and training will reduce petroleum consumption by an unknown amount.

Table 1 below provides BNL's fuel trends.

	FY 2005	FY 2006	FY 2007
GASOLINE (Gal.)	84,825	78,872	77,414
DIESEL (Gal.)	21,398	19,057	22,894
PETROLEUM (Gal.)	106,223	97,929	100,308
PETROLEUM REDUCTION (%)	NA	7.8	5.6
CNG (GGE)	21,988	25,617	25,169
BIODIESEL (Gal.)	0	0	0
E85 (Gal.)	0	0	0
NON-PETROLEUM TOTAL	21,988	25,617	25,169
NON-PETROLEUM % INCREASE	NA	16.5	-1.7

Note: GGE – Gasoline Gallon Equivalent

2) Reduce vehicle miles through methods such as trip consolidation, web conferencing, videoconferencing, and/or mass transportation.

BNL Management will Issue guidance to employees, stressing the importance of trip consolidation, web conferencing, videoconferencing, and/or mass transportation.

3) Plan to increase overall fleet fuel economy through acquisition of smaller sized, hybrid-electric or other advanced technology vehicles.

Hybrids may be utilized if they are cost effective for the mission. Neighborhood electric vehicles may replace some conventional-fuel vehicles.

4) Efforts to identify the most fuel efficient vehicle for the required task.

In replacement planning the fleet manager will investigate how the vehicle is used to accomplish its missions and will determine the most fuel efficient vehicle. For example a large step van used for mail deliveries might be replaced by a smaller van with pull out shelving or a pull out bed. The vehicle solution must enable the user to accomplish the mission in a safe and efficient manner.

Alternative Fuel Availability and Use

1) Plan to operate all alternative fuel vehicles on alternative fuel.

BNL had seventy seven compressed natural gas vehicles that refueled at an on-site CNG station in 2007. In FY 2008 one compressed natural gas vehicle was retired due to condition. In FY 2009 another compressed natural gas vehicle will be retired when the tanks expire. Two bi-fuel vehicles can not operate on compressed natural gas due to tank failure. BNL applied for exemptions for these vehicles.

BNL has eight flex-fuel vehicles that are fueled solely on gasoline due to lack of fueling infrastructure and fuel cost. BNL applied for exemptions for these vehicles.

BNL plans to convert an existing gasoline tank by the end of CY 2009 provided Underwriters Laboratory or Other Standards Development Organizations approval for E-85 dispenser equipment is granted or waivers are obtained.

2) Plans to operate all diesel vehicles on biodiesel fuel.

Most diesel vehicles will be operating on biodiesel in CY 2009.

3) Plans to meet or exceed E.O. 13423 10 percent annual alternative fuel use increase requirements.

BNL displaced 50% of its road vehicle gasoline use by using compressed natural gas vehicles. Unfortunately, CNG vehicle in the type BNL requires are no longer available through original equipment manufacturers.

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Biodiesel use will displace about 20% of the vehicle diesel consumption by 20% beginning in CY 2009. BNL uses about 23,000 gallons of diesel per year.

BNL will investigate conversion of gasoline vehicles to compressed natural gas. BNL will acquire as many compressed natural gas and E85 vehicles as the budget permits.

BNL will probably not be able to achieve this goal without substantial funding increases.

4) Plans to aggregate demand for alternative fuel by collaborating with other Federal, State or Local governments through the DOE Clean Cities program.

BNL provides compressed natural gas refueling to local governments that partner with DOE Clean Cities. When E85 infrastructure is available it may be shared with local governments.

5) Plans for installing a cost effective on-site alternative fueling infrastructure.

Compressed natural gas fueling infrastructure is already installed and operating on site. E85 refueling infrastructure should be in place in CY 2009. However, U.L. or equivalent approval for the dispensing equipment must be obtained first, and this issue has yet to be resolved.

6) Funding.

Normal funding derived from vehicle rate structure will be used as well as requests to for other operating or overhead funds as necessary.

E. HIGH PERFORMANCE & SUSTAINABLE BUILDINGS

DOE 430.2B high performance and sustainable buildings goals are:

- All new buildings and major building renovations in excess of \$5 million will incorporate the Guiding Principles of Executive Order 13423 and attain LEED Gold certification.

- Existing buildings that are owned or leased real property must develop and implement a plan, to ensure that 15 percent of their enduring buildings are compliant with the guiding principles of Executive Order 13423.
- High performance building plans, that each year on August 1, the contractor must submit a plan to their respective and appropriate Department Field Element Office that addresses how the contractor will ensure that (1) all new construction and renovation projects implement design, construction, and maintenance and operation practices in support of the sustainable design/high-performance building goals of Executive Order 13423 and statutory requirements and (2) existing facilities' maintenance and operation practices in support of the goals of Executive Order 13423. Such plans must also align with Executive Order 13327 and the Department's real property asset management plan.

1) Current Status

BNL's plans to assess its current building inventory with the use of DOE's existing building assessment tool to determine the extent to which the high performance sustainable building guiding principles of Executive Order 13423 are being applied. The initial assessment has already been completed. However, a more formal report will be completed no later than April 2009 and will be included in the BNL's Ten Year Site Plans. The assessment will serve as a baseline for compliance with the 15 percent sustainability target.

Based on our currently authorized new projects starts, as well as two recently completed LEED Silver rated buildings, we believe we will be able to meet, and likely exceed the goal of 15%. See the table included in Section 3, Existing Owned and Leased Space.

BNL's design standard for all new construction and major renovations requirements have been modified to include energy conservation design that had a goal to exceed the base case of ASHRAE 90.1 – 2004 by a minimum of 30% of energy cost, attain a minimum of LEED – Gold certification, all new equipment to be Energy Star where applicable, and provide a Sustainability Design Report, which includes a metering plan for energy inputs.

2) New Buildings and Major Renovations

BNL plans to have all DOE-owned buildings incorporate the guiding principles of EO 13423. BNL's current design standards include this requirement.

Based on BNL's Ten Year Site Plan, there is approximately 457,000 GSF of new facilities that are proposed between FY2008 thru FY2015. The most recent design efforts include the National Synchrotron Light Source – Phase II (NSLS – II) and the Interdisciplinary Science Building – Phase 1 (ISB-1). The NSLS II is predominately a

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process building, and therefore exempt from the LEED requirement, and it was approved before the LEED Gold requirement became effective. However, it is being designed to achieve a LEED Silver rating. The ISB-1 was approved prior to the LEED Gold requirement date in DOE Order 430.2B and is designed to achieve the highest LEED certification possible considering budget and performance goals of the project.

3) Existing Owned and Leased Space

BNL’s plan to ensure that 15 percent of the enduring buildings are compliant with the guiding principles of EO 13423 is to assess the current building inventory and document it in the Ten Year Site Plans.

As indicated above, we recently completed a preliminary assessment of existing space. We believe we will be able to meet or exceed the 15% goal. The baseline for BNL in 2004 was 4,200,000 GSF (this includes process and building space). The Research Support Building (RSB) and Center for Functional Nanomaterials (CFN) have been completed with Silver LEED certification and each had one for one removal of excess space. This maintained the baseline at 4,200,000 GSF. The ISB-I is scheduled for completion in FY 2013 and completion of the ISB-II scheduled for FY 2015, but buildings will also have one for one removal of excess space. Only the NSLS-II and Joint Photon Science Institute (JPSI) facilities will add square footage to the 4,200,000 baseline. Listed below is a table indicating that BNL will meet the requirement of 15% of GSF Laboratory space by 2013 ahead of the required date of 2015.

Recent and Planned Major Buildings (Includes Process Buildings)

Item	Project Title	GSF	Cum. GSF	Cum. GSF Demo	BNL GSF	Completion	LEED	% of BNL GSF
1	Research Support Building (RSB)	64,816	64,816	65,000	4,200,000	2006 (A)	Silver	1.5
2	Center for Functional Nanomaterials (CFN)	95,947	160,763	159,500	4,200,000	2007 (A)	Silver	3.8
3	Interdisciplinary Science Building - I (ISB-I)	75,000	235,763	234,500	4,200,000	2012	Silver/Gold	5.6
4	NSLS-II Ring Building	385,000	620,763	234,500	4,585,000	2012	Silver	13.5
5	Joint Photon Sciences Institute (JPSI)	40,000	660,763	234,500	4,625,000	2012	Silver/Gold	14.3
6	NSLS-II Lab/Office Buildings (LOB)	72,000	732,763	234,500	4,697,000	2013	Silver	15.6
7	Interdisciplinary Science Building - II (ISB-II)	75,000	807,763	309,500	4,697,000	2015	Gold	17.2

Notes

4,200,000 GSF is baseline

All GSF values rounded

BNL does not currently lease building space.

F. AUDITS

As part of the ESPC process, most of the site was surveyed for energy and water conservation opportunities during 2007 and 2008. Additional surveys will take place in early 2009 during the Detailed Energy Survey (DES).

G. METERING

Existing Metering Infrastructure Survey Findings

BNL receives electrical power at one of two substations where the 69 kV transmission voltage is reduced to 13.8 kV. Distribution of the electrical power on site is through two distribution systems, an underground 13.8 kV system and a 2.4 kV system with both underground and some overhead line distribution. All 13.8 kV feeders are metered as well as most transformer points.

Currently there are 282 electric meters metering building and process loads. 248 of these meters are connected to automated data recorders that record power consumption in 15 minute demand intervals which are then automatically interrogated on a daily basis to download load profile data to our database. 19 of the 282 electric meters are manually read meters that will eventually be connected to automated data recorders. The remaining 15 meters are either out of date metering equipment or meters that are not used for direct charging or load information.

A continuing program is in place to install and upgrade electrical metering throughout the site. Data recorders and meters are being replaced with more advanced metering that incorporates both metering and recorder functions as well power quality and real time monitoring of electrical load. This type of meter cuts down on both equipment needed and installation costs. The data obtained by these meters are becoming more in demand by both the user and the engineer as electrical loads become more sophisticated, ie., super computing and electron microscopes.

For the past two decades Brookhaven National Laboratory has been continually upgrading its metering capabilities in all areas of energy consumption which include electric, steam and chilled water.

How metered data will be used

BNL has been metering and direct charging internal Departments for electricity for decades, and has found it to be one of the most effective methods of conservation. As is the case with existing advanced metering, data will be used to establish trends in consumption and provide timely information to reduce demand for selected large electrical loads. Some loads are optional and can be started at later times in the day. Energy metering will provide data for reducing the load and save demand charges from

the utility company. It will also be used to identify when equipment is being run longer than needed; thus allowing energy savings from the reduction of unnecessary demand.

Summary of site-wide building practicability screenings

All main feeders and most buildings already have advanced metering. Most other buildings will have advanced meters installed in the next few years, except for groups of buildings of similar usage, like storage buildings, trailers, and site lighting.

Installation Schedule for new advanced meter applications

The installation schedule will take place over fiscal years 2009 - 2012. All buildings that pass the practicality test will have advanced meters installed.

Site Metering Financing Plan

Designs will continue to be performed utilizing in-house resources. Materials will be procured and installed using a current electrical subcontractor. IGPP funds will be budgeted in the Ten-Year Site Plan to support this Electric Metering Plan.

Site wide metering program support requirements

The site metering program will require 0.25 man-years and \$40,000 for maintenance, repair and calibration of meters annually. The total annual budget requirement is about \$100,000. The total cost for advance meter purchases and installation is approximately \$30,000/year.

List of site staff accountable for metering program activities

All metering program activities will be accomplished by the Facilities and Logistics Management department:

Metering Analysis – Energy Project Engineer – Ed Phillips

Metering Installation – Staff Electrical Engineers and Line Crew - Various

Meter Data Analysis – Energy Project Engineer – Open

BNL Energy Metering Summary

Metering Systems	Quantity	% of Total Energy Read	MWh	mmBtu	Billed
Advanced Electric Meters w/Pulse Output & Recorders	248	82.0%	205,000		Yes
Electric Meters without Recording	34	3.0%	7,500		Yes
Total Electric Meters	282	85.0%	212,500		Yes
Electric Meters with Live Data (Web Based)	69	100.0%	250,000		
Steam Condensate Meters	72	66.0%		290,400	No
Steam Meters	3	15.0%		66,000	No
Total Steam Meters	75	81.0%		356,400	No
Chilled Water Meters	19	99.0%		177,000	Yes

H. EMERGENCY CONSERVATION

BNL's heats the vast majority of the site with steam from the Central Steam Facility (CSF). The CSF has the capability to burn natural gas, no. 2 fuel oil, and no. 6 fuel oil. In addition, we have the capability to store over 2 million gallons of liquid fuel. With an annual fuel consumption equivalent of approximately 4.7 million gallons, BNL has considerable flexibility to deal with a fuel supply disruption.

In the event one of the main fuel supplies is not available, we will switch to another fuel. We strive to maintain a reserve of liquid fuels at all times, especially during the winter months.

Electrically, we have the ability to curtail major usage in response to limits on the electric system. We participate in various load curtailment programs with the local utility.

I. PERSONNEL RESOURCES

The current Energy Management staff authorization is 4 FTE's. All four are degree engineers, two are licensed Professional Engineers, and one is a Certified Energy Manager (CEM).

Our energy management efforts are supplemented by other employees throughout the Laboratory, on an as-needed basis. This includes the Environmental Protection Division, and others.

We anticipate the need for at least one more FTE once a delivery order for the ESPC has been placed.

REFERENCES

1. 2007 Federal Energy Management Program (FEMP) Renewable Energy Requirement Guidance for EPACT 2005 and Executive Order 13423 – January 28, 2008
2. BNL's FY 2007 DOE Annual Energy Report
3. Initial Proposal for BNL – August 21, 2008 by Constellation Energy
4. Office of Science Memo – Guidance for developing the executable plan – July 8, 2008
5. Renewable Energy Site Assessment Final Report – May 15, 2008 by Antares Group, Inc.
6. DOE Order 430.2B Departmental Energy, Renewable Energy, and Transportation Management – 2-27-08
7. Executive Order 13423 Strengthening Federal Environment, Energy, and Transportation Management – 1-26-07
8. BNL 10 Year Site Plan – August 2007
9. BNL 2007 In-House Energy Management Factbook