

APPENDIX E: BNL SITE SUSTAINABILITY PLAN:
STATUS SUMMARY FOR FISCAL YEAR 2019

New SSP Category	FY19 Performance Status	FY20 Planned Actions & Contributions
Energy Management This category focuses on all energy-related topics such as energy intensity, metering and benchmarking, Energy Independence & Security Act (EISA) §432 audits, non-fleet fuel use, and greenhouse gas (GHG) emissions.	<p><u>Energy Intensity</u> BNL's energy intensity for FY 2019 was 236,426 British thermal units/gross square foot (Btu/gsf) and was 27.2 percent lower than the base year of 2003. This lower intensity level saved BNL nearly \$2.5 million in FY 2019.</p> <p>FY19 was the fourth full year with the results of the Utility Energy Service Contract (UESC) Phase I project. The energy savings were verified to be within a few percent of the original estimates. The UESC has contributed to lowering BNL's overall energy intensity value. The Temperature Setback Policy is continually communicated to the Laboratory via several methods, including Earth Day events and presentations to facility managers and Laboratory management.</p> <p><u>Metering</u> Three hundred advanced electric meters were installed and capture over 98 percent of consumed electricity. Of the 159 buildings greater than 4,000 square feet, 153 (96 percent) advanced meters were installed.</p> <p><u>EISA Section 432 Evaluations</u> Energy audits of HVAC systems, lighting, and office equipment continue to be used to identify opportunities for energy conservation. The findings help to develop policies on operation and equipment needs. These audits are being performed in conjunction with ongoing Facility Condition Assessment (FCA) surveys in order to reduce additional costs and administrative oversight needs. All information has been placed in EPA's Portfolio Manager Program for benchmarking. Information from the energy and water audits was taken into consideration with the recently completed Investment Grade Audit (IGA) for another potential UESC effort.</p>	<p><u>Energy Intensity</u> Further reductions in energy intensity continue to be the biggest energy-related challenge for BNL. Since the late 1970's, BNL has implemented numerous energy conservation projects, meeting two of the three previous energy intensity reduction goals of 30 percent (1985 vs. 1973), 30 percent (2003 vs. 1985), and 30 percent (2015 vs. 2003).</p> <p>BNL has begun a UESC Phase II effort. If cost-effective projects can be identified for Phase II, BNL will be able to reduce energy intensity. All energy-related projects will be analyzed using Life-Cycle Analyses.</p> <p>BNL will continue all the best practices currently in place, including HVAC setback, steam charge-back, and lighting upgrades.</p> <p><u>Metering</u> Additional meters will be installed as opportunities become available.</p> <p><u>EISA Section 432 Evaluations</u> BNL will continue with the cost-effective Energy Survey/FCA approach in FY 2020 and beyond.</p>
Water Management This category focuses on activities undertaken to reduce potable and non-potable water consumption, comply with stormwater management requirements, and improve water efficiency.	Potable-water usage fell from 931 million gallons/year in FY 1999 (average of 2.55 million gallons per day) to about 368 million gallons/year in FY 2019 (average of one million gallons per day), a reduction of 64.0 percent. BNL's annual water use intensity has decreased from 101 gallons per square foot to 76.5 gallons per square foot, a 24.4 percent water usage reduction since base-year 2007.	<p>BNL will continue to implement BNL's Water Management Plan and reduce water usage by implementing best management practices.</p> <p>BNL will continue to utilize water-efficient processes and plumbing fixtures to conserve water in new construction buildings and renovations.</p>

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Waste Management This category focuses on the site's approach/ vision for addressing waste management, pollution prevention (source reduction) and recycling measures, and construction and demolition (C&D) waste reduction.	<p>During FY 2019, the recycling rate (annual diversion rate for non-hazardous solid waste) was approximately 68 percent.</p> <p>This number does not account for major one-time projects that generate large amounts of debris, such as building demolition or land clearing for construction. Taking the building demolition into account that occurred during FY 2019 (Building 134 and the 528 and 902 modulars), as well as the removal of trees associated with the construction of a traffic circle, the recycling rate jumped to 80 percent as much of the C&D debris was sent to a recycler and the trees were composted on site.</p>	<p>BNL's waste diversion program is expected to remain intact in the future years. BNL will re-evaluate landfilled wastes during 2020 to see if there is opportunity to divert this waste stream back to a waste-to-energy facility.</p> <p>Plans are in place to continue demolition of World War II structures. Apartment number 367 will be demolished during FY 2020. Resulting concrete from the demolition will be crushed on site to convert to Recycled Concrete Aggregate (RCA) for use as a road base on firebreak roads or as underlay in parking areas, saving dollars that would otherwise be used to purchase this type of material. Wood and metal debris will also be segregated and sent for recycling.</p>
Fleet Management This category focuses on the site's approach and vision for addressing fleet optimization, and strategies used to reduce petroleum use and increase alternative fuel use.	<p>Fiscal Year 2019 was the first full year that BNL utilized Telematics to track fleet operations. The fleet management software helps monitor fleet utilization and vehicle idling. In a broader sense, the Lab was able to see how the vehicles travelled in much more detail and obtained more information on the vehicles themselves.</p> <p>BNL replaced some of the older fleet vehicles with newer, more fuel-efficient and alternative fueled vehicles.</p>	<p>Fleet management will continue to work with the General Services Administration (GSA) to order and utilize alternative-fueled and newer, more fuel-efficient vehicles during every replacement cycle.</p> <p>BNL has funded a project in FY 2020 to install the infrastructure needed to support charging stations for three to four electric vehicles. This infrastructure will enable future rollouts of electric vehicles, planned to be ordered in the fall of 2020.</p>
Renewable Energy This category focuses on site efforts towards utilizing renewable energy resources.	<p>BNL purchased 20,000,000 kilowatt hours (kWh) of Renewable Energy Credits (RECs) for 2019 to meet the Renewable Energy requirement of 7.5 percent. BNL's RECs have been and will continue to be purchased through a competitive solicitation process. Each solicitation includes the latest DOE requirements, including the required in-service dates.</p> <p>In 2019, BNL's 816 kW Northeast Solar Energy Research Center (NSERC) facility produced 1,018,429 kWh that were consumed by BNL's facilities. The RECs were retained by BNL and were not sold.</p>	<p>BNL will continue to operate the NSERC facility and provide for further expansion when sufficient funds are identified. REC purchases will continue in order to meet applicable renewable energy and clean energy goals.</p> <p>Renewable energy systems, especially solar hot water, are considered in all new construction and major building renovations. To date, it has been difficult to find cost-effective projects. However, a new office building, the Science and User Support Center (SUSC), will be designed in 2020 and will potentially incorporate a number of concepts, including solar hot water heating and potentially a solar wall for pre-heating.</p> <p>BNL continues to pursue opportunities to implement a true microgrid on site. BNL is continuing discussions with energy storage providers and various governmental agencies to explore options such as hosting large utility-scale battery storage systems on site.</p>

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Sustainable Buildings This category focuses on all aspects pertaining to sustainable building initiatives such as HPSB as well as building inventory changes.	<p>Sustainable Buildings <u>HPSB Guiding Principles</u> Currently, 11 percent of non-excluded buildings have achieved 100 percent of the Guiding Principles and an additional nine percent are at 90 percent or higher. Of the excluded buildings, three percent are at 90 percent or higher. As BNL constructs new buildings and demolishes old non-compliant buildings, this percentage will increase.</p> <p><u>New Building Design</u> All buildings designed from 2007 were designed to meet the New York State Energy Code. The new buildings designed during FY 2018 were Building 742 (HEX Beamline Satellite) and Building 748 (Laboratory for Bio-Molecular Science); construction is expected to be completed in FY 2020. To the extent that is practical and applicable, these new buildings will meet the Guiding Principles. While not a new building, Building 725 is undergoing a major renovation and those areas were designed to meet the Guiding Principles.</p> <p><u>Net Zero Buildings</u> BNL has been discussing the option of applying the output of the NSERC to make one or more of the buildings net-zero. A final selection is anticipated in early FY 2020.</p> <p><u>Regional and Local Planning, Coordination, and Involvement</u> Discussions continue with staff of the Long Island Railroad for a Discovery Park-proposed railroad station. A study has been completed and \$20M approved in the HPSB Guiding Principles budget to construct this new station.</p>	<p>Sustainable Buildings <u>Sustainable Buildings</u> HPSB Guiding Principles/New Building Design Although overall site funding will drive the exact schedule, as new buildings are constructed to be fully compliant with the Guiding Principles and old non-compliant buildings are demolished, the percentage of buildings that are compliant with the Guiding Principles will further increase.</p> <p><u>New Building Design</u> Currently, the only new building in design that will meet the Guiding Principles is the SUSC Building.</p> <p><u>Net Zero Buildings</u> For designs starting in FY 2020, where economically feasible, BNL will ensure net-zero requirements are included in future designs. BNL is continuing to evaluate net-zero concepts in the preliminary design of the SUSC but discussions with staff in the Science Laboratories Infrastructure (SLI) program indicate the current funding constraints will make it difficult to justify additional costs associated with achieving net zero.</p> <p><u>Climate-Resilient Design and Management</u> BNL will continue to incorporate the Climate Resiliency Design Guidelines to all new large construction projects which considers present and future climate conditions in assessing environmental impacts on the project.</p> <p><u>Strategies for Design (42 USC 6834)</u> In lieu of the requirement gap between 42 USC 6834 and 10 CFR Part 433 Subpart B, new building construction and/or modernization will follow the Guiding Principles for Sustainable Federal Buildings to reduce energy consumption.</p>

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Acquisitions and Procurement This category focuses on all relevant sustainable acquisition information efforts to improve supply chain GHG emissions.	<p>BNL has incorporated contract clauses within its vendor contracts that designate environmentally preferred products (EPP), services, and equipment.</p> <p>BNL uses the Vinimaya system ("E-Buy") for most purchases of BioPreferred products. The tabular matrix of commonly purchased items (based on the manufacturer's part number) that are EPP compliant has been updated with additional products.</p> <p>Challenges remain as vendor information regarding recycled content for all categories is lacking, making conformance time-intensive and difficult for purchasers.</p> <p>In 2018, BNL established Environmental Management System (EMS) objectives to improve EPP purchasing performance for a wide range of products. The efforts focused on promoting the requirements with requisitioners. BNL received the Green Electronics Council's 2019 Electronic Product Environmental Assessment Tool (EPEAT) Purchaser Award at the Gold Level; two 2018 DOE Federal Green Challenge awards for waste diversion and electronics reuse and recycle; and the 2018 GreenBuy Prime award for winning GreenBuy Gold Awards three times.</p>	<p>During 2020, BNL will continue to develop the Commonly Ordered Items page, provide E-Buy training specific to EPP purchasing requirements, and provide support to requisitioners with questions. BNL will write new EMS objectives to promote that program and drive improvement.</p> <p>BNL will also audit its EPP program during FY 2020 to identify areas where further purchasing improvements can be made, as well as opportunities to improve data collection to better represent current conformance.</p>
Measures, Funding, and Training This category focuses on efforts to implement identified Efficiency & Conservation Measures (ECM) through appropriations, performance contracts, or other funding mechanisms, and discuss sustainability-related training or education for employees. This section also highlights ECMs and additional funding needed beyond planned activities and typical operation costs for meeting the goal.	<p>Internally funded energy conservation and sustainability related initiatives include a continuation of best practices, with continued emphasis on temperature setback during unoccupied periods.</p> <p>As a result of a budget-constrained environment, BNL, like other DOE sites, has been increasingly using third-party financing options that utilize cost savings to pay for the projects. BNL has low energy rates to operate its research programs, which makes it difficult to find cost-effective projects.</p> <p>BNL completed its first UESC in 2015, which is performing well and meeting the original energy savings estimates. A second UESC project is being planned and will incorporate lessons learned.</p> <p>The manager of Energy Management at BNL is a Certified Energy Manager. All BNL Facility Complex Managers have the Certified Facility Manager recognition from the International Facilities Management Association. Additionally, numerous employees attend training programs to maintain their professional certifications including PE, CEM, Green Professional, LEED, and many others.</p>	<p>BNL is in the process of developing a UESC Phase II project that will include energy conservation measures for lighting, HVAC, controls, and a water side economizer, as well as rebalancing Building 555 (Chemistry), BNL's most energy-intensive building. The recently completed IGA estimates the energy savings at 36,354 mmBtu/year for a reduction of 22 percent from the total affected building baseline.</p> <p>The economics of this potential second UESC II effort are less cost effective than the previous UESC. BNL management is currently evaluating the project and will make a decision regarding whether or not to move forward in early FY 2020.</p>

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Travel and Commute This category focuses on all information pertaining to the site's business travel and commute data, including participation in regional and local planning.	<p>Overall, Scope 3 emissions were up 19.2 percent from FY 2018 (16,106 metric tons carbon dioxide equivalent [MT CO₂e]), and 4.7 percent lower than the FY 2008 baseline value.</p> <p>The increase from FY 2018 is largely due to a 3,975 MT CO₂e jump in air travel GHG emissions and, to a lesser extent, a 380 MT CO₂e rise in commuting GHGs. The increase in commuting GHG emissions from 2018 was due in part to a 4.5 percent increase in the average daily number of commuters, and adjustments to the relative percentages of employee passenger vehicles and light duty vehicles to match those in the Safeguards & Security Division's Vehicle Registration Database.</p>	<p>Combined electricity purchases of conventional power and hydropower are expected to rise 20.6 percent from the FY 2019 total to 338,800 megawatt hours (MWh) in FY 2025. Using eGrid 2016 transmission and distribution (T&D) loss factors, Northeast Power Coordinating Council, Inc. (NPCC) Long Island total output, and NPCC Upstate non-baseload output emission rates, estimated T&D GHG emission will increase to 6,936 MT CO₂e in FY 2025.</p>
Fugitives and Refrigerants This category focuses on all fugitive emissions or refrigerants used at the site and any efforts (current and/or planned) to reduce or minimize GHG emissions (along related challenges or opportunities).	<p>The bulk of BNL's process and fugitive GHG emissions (besides those from insulating gas leaks of SF₆ from the Tandem Van de Graaff accelerator vessels) were due to periodic purging of carrier gases used in STAR detector subsystems during the FY 2019 Relativistic Heavy Ion Collider experimental run. The recirculation system on the STAR multi-gap resistive plate time of flight (TOF) subsystem reduced purged gas releases of HFC-134a by 86.5 percent throughout the experimental run (208.14 MtCO₂e).</p> <p>Environmental Protection Division worked with Facilities & Operations (F&O) Production Division staff to conduct a joint self-audit of their Refrigerant Management Program to identify actions that may be taken to improve the program, and to address any program gaps and deficiencies.</p> <p>Preventative maintenance inspections of four 2.4 kilovolt (kV) and 13 13.8-kV sulfur hexafluoride (SF₆) gas-insulated switches, plus four 69 kV SF₆ gas-insulated circuit breakers, were conducted in FY 2019 as part of BNL's proactive program to identify and mitigate leaks of the Laboratory's SF₆ gas-insulated, high-energy equipment. Recorded equipment temperature readings and pressure gauge readings during the inspection provided no evidence of SF₆ leaks.</p>	<p>Job plans for the next scheduled preventative maintenance inspections of SF₆ gas-insulated switches and circuit breakers will be released on April 1, 2020. Annual preventative maintenance inspections will also be released on April 1, in concurrence with the job plans.</p>

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Electronic Stewardship This category focuses on the acquisition, operations and management, and disposal techniques of all electronics reported, as well as data centers efficiency improvements.	Acquisition/Operations The contract governing the procurement of printers, laptops, and desktop computers ordered through the BNL E-Pro system requires that they have an EPEAT "Gold" certification. During FY 2019, the Laboratory procured printer management software that will help remotely manage printers and will allow the Lab to enforce duplex printing as a default setting when the printer supports it. BNL evaluated the feasibility of extending the desktop computer power management policy to other operating systems. This activity will not be continued. End of Life Approximately 964 desktop computers, 244 laptops, 48 tablets, and 41 servers were reused internally by BNL personnel as well as numerous other small electronics in FY 2019. BNL held two employee household E-Waste collection days during the year. Data Centers BNL completed an evaluation of its existing data centers in response to the Data Center Optimization Initiative (DCOI) from the summer of 2016. The internal assessment identified eight data centers that meet the new DCOI criteria. Additional resources will be needed to meet the goal of power usage effectiveness (PUE) less than 1.5. Four of the eight data centers will require the installation of additional metering in order to determine the actual PUE. The data center associated with the Core Facility Revitalization (CFR) project is currently in the construction phase. Preliminary preparation began in June 2019. The completed CFR is targeting a PUE of less than 1.3 in accordance with the recent DCOI.	Acquisition/Operations The Laboratory will continue to require that all printers, laptops, and desktop computers ordered through the E-Pro system have an EPEAT "Gold" certification. Since procuring the printer management software, going forward in FY20, BNL will utilize this software to help remotely manage printers and enforce duplex printing as a default setting when the printer supports it. This new software will replace the old print servers. ITD is in the process of implementing the software and migrating printers. End of Life BNL will continue to dispose of electronic waste in an environmentally sound manner through a certified R2 recycler. However, electronics collected internally will be tracked separately from home collections in order to clarify internal generation rates and to help monitor the effectiveness of the home collection days. Data Centers Meeting the PUE of 1.5 for the existing data centers will require a significant investment. Further, four of the eight existing data centers will require the installation of new metering, which is partially in progress. BNL will work to identify the actions and resources needed to meet the PUE 1.5 requirement for the eight existing data centers and, if cost effective, begin the process of obtaining potential funding. The data center associated with the CFR project is in the design phase and is targeting a PUE of less than 1.3 in accordance with the recent DCOI. The CFR project received CD-2 approval and started construction in June of 2019, with a projected completion of 2023.

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Resilience This category focuses on resilience-related topics. Organizational resilience is the ability of an agency to adapt to changing conditions and withstand or recover from disruption. Resilience efforts help sites manage risks to DOE assets, infrastructure, and operations.	Resilience Strategies During FY 2019, BNL's Office of Emergency Management (OEM) conducted a Loss of Power exercise specific to F&O to identify gaps or concerns regarding electrical power issues. OEM also performed two accountability exercises for all employees. Accountability exercises are performed on a quarterly basis and are required by the Department of Energy on behalf of the Office of Human Capital. OEM streamlined the exercises and fine-tuned the methodology to account for BNL employees. OEM maintains the Continuity of Operations Plan (COOP) and meets with the Continuity of Emergency Response Group annually to discuss the specific mission-essential functions at BNL. OEM also maintains specific plans such as the Pandemic/Influenza, Power Outage, Severe Weather, Hurricane, and Emergency plans. The Essential Personnel webpage was updated to include a new interface that allows individual employees to view their current status.	Resilience Strategies The All Hazards Survey is scheduled for an update in FY 2020. Accountability exercises will continue to be performed on a quarterly basis, as required by the Department of Energy on behalf of the Office of Human Capital. OEM will continue to maintain the COOP as well as other specific emergency plans (i.e., Pandemic/Influenza Plan, Power Outage Plan, Severe Weather Plan, Hurricane Plan, Emergency Plan).