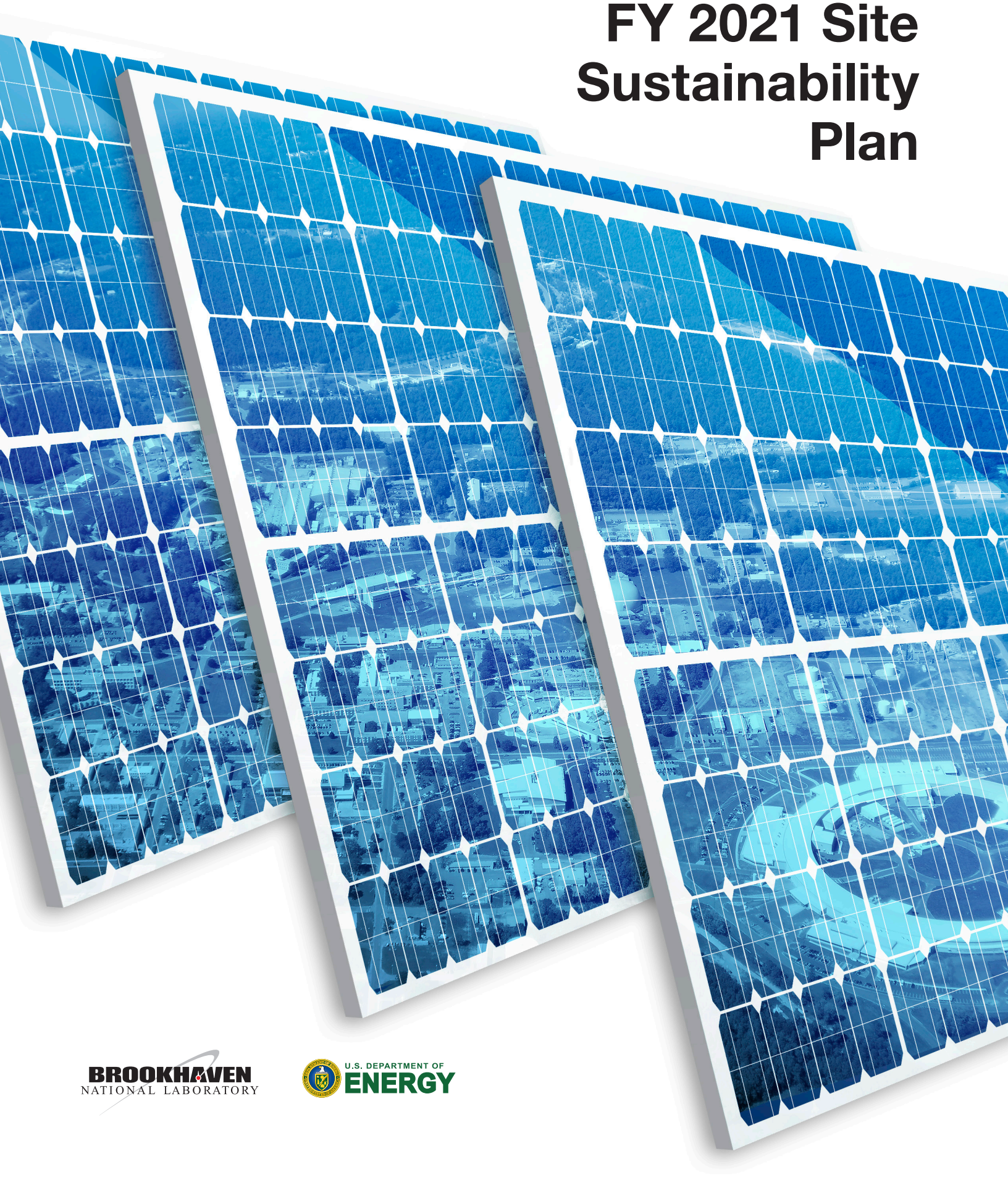
BROOKHAVEN NATIONAL LABORATORY

FY 2021 Site Sustainability Plan



BROOKHAVEN NATIONAL LABORATORY

U.S. DEPARTMENT OF ENERGY

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I. Executive Summary and Executive Summary Table

Brookhaven Science Associates (BSA) is pleased to submit this annual Site Sustainability Plan for Brookhaven National Laboratory (BNL). Effectively managing such a large, diverse portfolio of programs takes many committed individuals working towards a common goal. This document is the work of a large cross-functional team of BSA employees both within the science directorates as well as the support or operations directorates.

BNL is operated and managed for the Department of Energy Office of Science (DOE-SC) by BSA, a partnership formed by Stony Brook University (SBU) and Battelle Memorial Institute. BNL is staffed by over 2,600 research and support employees and hosts an even greater number of facility users, guest researchers, and scientists annually. The Laboratory operates from an extensive campus located in Upton, New York, on 5,320 acres with approximately 4.9 million gross square feet (gsf) of space in over 300 buildings.

BNL conceptualizes, designs, builds, and operates major scientific facilities and makes them available to university, industry, and government researchers in support of the SC mission. The sustainability vision for BNL leverages this unique combination of access to diverse research talent, stewardship for a significant national research infrastructure, and a location in the energy intensive northeastern United States.

As a result, BNL is well established as a northeastern regional resource for sustainability expertise and is effectively utilizing its physical infrastructure to demonstrate sustainability technology. This approach to development and deployment of technology, combining the unique resources of both research and operations, is the vision of the BNL Site Sustainability Plan (SSP) to help ensure a successful future for our nation.

The Laboratory's efforts in sustainability have been consistent over the last several years and they focus on four broad principles:

1. Striving to be climate neutral through reducing energy use and effective energy management;
2. Lowering the environmental impact of the campus through sustainable infrastructure;
3. Leveraging research in conjunction with our operations and in support of the northeastern region; and
4. Fostering a culture of sustainability with our employees and our community.

Fiscal Year 2020 presented unique challenges as we faced the global COVID-19 pandemic, which caused BNL to declare a Continuity of Operations Plan (COOP) Event. We successfully transitioned into Minimum Safe (Min-Safe) operations, diligently planned recovery operations, maintained critical infrastructure throughout, and implemented the Resumption of Operations Plan (ROOP). Throughout the COVID-19 pandemic, all facilities remained operational and we were able to successfully support all essential operations.

Despite the global challenge, the Laboratory remains strongly committed to supporting and achieving the targets in the DOE Strategic Sustainability Performance Plan (SSPP). Leadership in sustainability is demonstrated through the Laboratory's management practices, stewardship of the BNL campus, as well

as our research and education programs. The efforts in sustainability are communicated widely across the Laboratory, and the Senior Leadership team remains actively engaged.
BNL's energy management program continues to be the centerpiece of our Sustainability program. We continue to maintain solid relationships with local utility providers ensuring cost effective power rates for operating the energy intensive user facilities and general infrastructure. BNL collaborates with the local utilities to leverage purchasing power and assist in renewable energy production to jointly support the goals of BNL and the New York region.

BNL continues to host the Long Island Solar Farm (LISF), a solar photovoltaic (PV) power plant, developed through a collaboration that included BP Solar, the Long Island Power Authority (LIPA), and DOE. The LISF, located on the BNL site, began delivering power to the LIPA grid in November 2011. The LISF is made up of 164,312 PV panels and can produce up to 32 MW of electricity.

Additionally, the Laboratory has developed the Northeast Solar Energy Research Center (NSERC) on its campus that serves as a solar energy research and test facility for the solar industry. The mission of the NSERC is to support the expansion of solar power by providing high-quality data, field-testing, analyses, and solar energy expertise to address technical, economic, environmental, and policy issues facing solar power deployment in northeastern climates. The NSERC will be a proving ground for BNL and our industrial partners to test new solar technologies, including electrical inverters, storage devices, and solar modules, which effectively adds solar energy research to the user facility portfolio of BNL.

These projects demonstrate how BNL is continuing to collaborate with many organizations both internally and externally to enhance research at the Laboratory with the sustainability goals in mind. Staff members from the BNL Environment, Biology, Nuclear Science, and Nonproliferation (EBNN) Directorate, Facilities & Operations (F&O) Directorate, Information Technology Division (ITD), and the DOE Brookhaven Site Office (BHSO) have been instrumental in preparing our research agenda and developing a plan to bring it to fruition.

The Comprehensive Scorecard illustrates the areas we've been extremely successful, and they include compliance with the Guiding Principles (GPs) of High Performance Sustainable Buildings (HPSB), construction and demolition recycling, fleet management, and sustainable purchasing.

The Laboratory has made significant progress this year in meeting the goals of the SSPP. We have challenges that we are working on creative solutions to overcome. This coming year we will be maintaining focus on those areas that are preforming well and will be concentrating on making improvements in those areas that are not on track to meeting the requirements, including evaluating zero emission buildings, GHG emissions, as well as data center efficiencies.

Sustainability remains an important focus for BNL. BSA and BHSO work collaboratively on these efforts. We continue with our quarterly meetings to ensure that we are on track to meet the goals as well as to discuss challenges in meeting these goals. This is a marathon, not a sprint and requires a strong team effort to ensure that we continue to press forward in doing our part to protect the environment. We are on a very good path.

A copy of the Executive Summary Table is provided below, highlighting plans for anticipated performance towards DOE targets as a guide.

Prior DOE Goal	Current Performance Status	Planned Actions & Contributions	Overall Risk of Non-Attainment
Energy Management			
30% energy intensity (Btu per gross square foot) reduction in goal-subject buildings by FY 2015 from a FY 2003 baseline and 1.0% Year-over-year (YOY) thereafter.	FY20 energy intensity was 28.1% below FY03, 3% below 2015.	A second Utility Energy Service Contract (UESC) II (or self-funded effort) effort focusing on Building HVAC controls, temperature set-back, re-heat minimization and lighting is planned. Continue emphasis on Temperature Set-back policy.	**Medium**
Energy Independence and Security Act (EISA) Section 432 continuous (4-year cycle) energy and water evaluations.	83 Buildings covering 706,859 sq. ft. were audited in FY20.	Continue audits meeting the 4-year cycle.	**Low**
Meter all individual buildings for electricity, natural gas, steam, and water, where cost-effective and appropriate.	Eight new smart meters were added in FY20. Current status is 99% of electricity, 100% of natural gas, +90% of steam are metered. Most potable water is used for cooling tower make-up. We are currently metering ~25% of cooling tower make-up and adding meters regularly.	Continue maintaining and expanding metering installations, with an emphasis on potable water make-up for cooling towers. This process has already started.	**Low**
Water Management			
20% potable water intensity (Gal per gross square foot) reduction by FY 2015 from a FY 2007 baseline and 0.5% YOY thereafter.	Potable-water usage fell from 931 million gallons/year in FY 1999 (average of 2.55 million gallons per day) to about 389 million gallons/year in FY 2020 (average of 1.07 million gallons per day), a reduction of 62.0%. BNL's annual water use intensity has decreased from 101 gallons per square foot to 80.9 gallons per square foot, a 20.1% water usage reduction since base-year 2007.	Completion of Well No. 12 in FY21. BNL will continue to implement BNL's Water Management Plan and reduce water usage by implementing best-management practices. BNL will continue to utilize water-efficient processes and plumbing fixtures to conserve water in new construction buildings and renovations.	**Low to Medium**

Prior DOE Goal	Current Performance Status	Planned Actions & Contributions	Overall Risk of Non-Attainment
Non-potable freshwater consumption (Gal) reduction of industrial, landscaping, and agricultural (ILA). YOY reduction; no set target.	N/A	N/A	N/A
Waste Management			
Reduce at least 50% of non- hazardous solid waste, excluding construction and demolition debris, sent to treatment and disposal facilities.	BNL's recycling rate counting only day-to-day activities is 53% and jumps to 83.9% if composting of site trees and brush for landscaping needs is included.	• Continue to recycle >50% • Fund Pollution Prevention Opportunities • Determine relationship between working-at-home and recycling rates.	**Low**
Reduce construction and demolition materials and debris sent to treatment and disposal facilities. YOY reduction; no set target.	Construction & Demolition Debris (C&D) generation rates have been increasing over the last several years because of site improvement activities. As site development progresses, that trend can be expected to continue making it impossible to set reduction goals.	Use FY21 to collect all C&D data in order to establish a baseline for YOY reduction goals in future years.	**Low**
Fleet Management			
20% reduction in annual petroleum consumption by FY 2015 relative to a FY 2005 baseline and 2.0 % YOY thereafter.		41 new Telematics have been received and will be installed by the end of February in the remaining vehicles that currently do not have units. Full scope of usage on the entire Fleet can be determined including idling time. Quarterly spot checks will be implemented to ensure vehicles are not running unattended, operating efficiently and are properly maintained.	**Low**

Prior DOE Goal	Current Performance Status	Planned Actions & Contributions	Overall Risk of Non-Attainment
10% increase in annual alternative fuel consumption by FY 2015 relative to a FY 2005 baseline; maintain 10% increase thereafter.		E-85 fuel usage is expected to increase with the new vehicle acquisitions due for 2021.	Medium
75% of light duty vehicle acquisitions must consist of alternative fuel vehicles (AFV).		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.	Medium
Clean & Renewable Energy			
"Renewable Electric Energy" requires that renewable electric energy account for not less than 7.5% of a total agency electric consumption by FY 2013 and each year thereafter.	BNL purchased 22,000,000 kilowatt hours (kWh) of RECs for 2020 to meet the "Renewable Energy" requirement of 7.5%. BNL's RECs have been and will continue to be purchased through a competitive solicitation process. In 2020 BNL's 816 kW Northeast Solar Energy Research Center (NSERC) facility produced 977,967 kWh that were consumed by BNL's facilities. The RECs are retained by BNL and are not sold. The total of the REC's and the NSERC output was 8.2% of BNL's electric consumption.	BNL will continue to operate the NSERC facility and provide for further expansion when sufficient funds are identified. Renewable energy credit (REC) purchases will continue in order to meet applicable renewable energy and clean energy goals. 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. BNL continues to pursue opportunities to implement a microgrid on site and are continuing discussions with energy storage providers and various governmental agencies to explore options such as hosting large utility scale battery storage systems on site.	Low

Prior DOE Goal	Current Performance Status	Planned Actions & Contributions	Overall Risk of Non-Attainment
Continue to increase non-electric thermal usage. YOY increase; no set target but an indicator in the OMB scorecard.	A small residential solar thermal space heating system was installed in Building 30 as part of a research demonstration project. The system has fallen into disrepair but there are plans to bring it back into service.	New facilities such as the SUSC are evaluated for solar thermal opportunities. To-date the economics have not supported new installations. BNL will continue to evaluate various options such as solar domestic hot water heating and pre-heating, solar wall make-up air pre-heating, and other options.	**Low**
Green Buildings			
At least 15% (by count) of owned existing buildings to be compliant with the *revised* Guiding Principles (GP's) for Sustainable Buildings by FY 2021, with annual progress thereafter.	Currently 8 buildings have achieved 100% of the 2008 GP's and an additional 7 buildings are considered meeting them as they have achieved Leadership in Energy & Environmental Design (LEED) Gold or higher status. This represents 20% of non-excluded buildings.	Review underway to ensure compliance with 2016 GO+P's	**High**
Acquisition & Procurement			
Promote sustainable acquisition and procurement to the maximum extent practicable, ensuring BioPreferred and biobased provisions and clauses are included in all applicable contracts.	• BNL has incorporated contract clauses within its vendor contracts that designate environmentally preferred products (EPP), services, and equipment. • BNL continued to provide requisitioners EPP purchasing training. • BNL successfully funded two Pollution Prevention projects that involved replacement of products with bio-preferred alternatives.	• BNL will perform an assessment of their sustainability program in order to identify conformance status and areas for improvement. • BNL will continue to establish Environmental Management System (EMS) objectives to improve EPP purchasing performance for a wide-range of products including bio-preferred. • BNL will enact their Pollution Prevention Opportunity Program with a focus on EPP conforming product replacements.	**Medium**

Prior DOE Goal	Current Performance Status	Planned Actions & Contributions	Overall Risk of Non-Attainment
	• BNL received the "Green Electronics Council's 2020 Electronic Product Environmental Assessment Tool (EPEAT) Purchaser Award" at the Gold Level; and the "2020 GreenBuy Prime" award for winning the GreenBuy Gold Award three times. • BNL's weakness is the ability to collect data for reporting purposes.		
Measures, Funding, & Training			
Site set annual targets for sustainability investment with appropriated funds and/or financed contracts for implementation.	Internally funded energy conservation and sustainability related initiatives include a continuation of best practices, with continued emphasis on temperature setback during unoccupied periods. Due to the impact of COVID-19, little resources were able to be directed to internal energy conservation efforts.	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. Due to marginal economics the 2nd UESC effort was put on hold while BNL evaluates options, including self-funding or a partnership with the New York Power Authority (NYPA). We expect to make a decision in early FY21. Training continues for various staff members to maintain their respective certifications for energy, engineering, environmental and other related capabilities.	**Low to Medium**

Prior DOE Goal	Current Performance Status	Planned Actions & Contributions	Overall Risk of Non-Attainment
Electronic Stewardship			
End of Life: 100% of used electronics are reused or recycled using environmentally sound disposition options each year.	• BNL's equipment tracking system allows 100% collection of tagged electronics for recycling through an R2 Certified recycler. • BNL held one home electronics pick-up day. • BNL received the "Green Electronics Council's 2020 EPEAT Purchaser Award" at the Gold Level.	Continue the current high level of performance.	**Low**
Data Center Efficiency: Establish a power usage effectiveness target for new and existing data centers; discuss efforts to meet targets.	Additional metering is in progress for 4 of the existing 8 data centers. The new data center in Building 725 is estimated to be in operation in June of 2021 with a PUE of <1.3.	Meeting the PUE of 1.5 for the existing data centers will require a significant investment. 4 of the 8 existing data centers 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.	**Low for the new data center.** **Medium for the existing data centers.**
Organizational Resilience			
Discuss overall integration of climate resilience in emergency response, workforce, and operations procedures and protocols.	• Emergency Response Organization (ERO) is fully staffed and ready to respond to an Operational	Conduct drills, exercises & annual refresher training. LSPT's demonstrate proficiency.	**Low**
		Prepare EOC for daily operations including testing communication and response equipment.	**Low**

Prior DOE Goal	Current Performance Status	Planned Actions & Contributions	Overall Risk of Non-Attainment
	Emergency at BNL if necessary. • Emergency Operations Center (EOC) is fully operational and kept in "warm mode" during normal business hours" to respond to an operational emergency within thirty minutes of declaration. • All joint and partial assessments were completed in compliance with DOE O 151.D. • Continuity of Operations Plan (COOP) Continuity of Emergency Response Group (CERG) is fully staffed. Ensuring all mission essential functions are operating without interruption. • Required building evacuations were completed and local emergency plans updated. • Supported COVID-19 response activities for BNL. • Supported Safeguards and Security with Hazardous materials analysis with respect to the Design Based Threat (DBT)	Complete five joint self-assessments with BHSO and ten partial self-assessments with Office of Emergency Management (OEM).	Low
		Conduct beyond design basis full scale exercise. Exercise will simulate a catastrophic emergency involving multiple facilities onsite without any outside assistance.	Medium
		Complete the All Hazard Survey triennial review and updates	Low
		Complete the Triennial review required for Building 735 Emergency Preparedness Hazard Assessment (EPHA).	Low
		Perform quarterly DOE accountability drills on behalf of the U.S. Office of Human Capital.	Low
		Perform semi-annual CERG & DERG trainings and meetings.	Low
		Perform annual COOP awareness briefing for BNL employees.	Low
		Continue to support COVID-19 response activities for BNL.	Low
		Continue to support Safeguards and Security with Hazardous materials analysis with respect to the DBT.	Low

Prior DOE Goal	Current Performance Status	Planned Actions & Contributions	Overall Risk of Non-Attainment
Multiple Categories			
YOY scope 1 & 2 Greenhouse Gas (GHG) emissions reduction from a FY 2008 baseline.	34% reduction comparing FY20 to FY08 baseline.	Continued efforts for Energy Intensity Reductions through UESC's, Energy Savings Performance Contracts (ESPC's) and other methods including self-funding. Continued hydropower allocation, REC purchases and operation of the NSERC Solar photovoltaic (PV) array. Meeting the goal will be difficult beyond 2030 due to increased electrical load associated with EIC and the new data center.	**Medium**
YOY scope 3 GHG emissions reduction from a FY 2008 baseline.	Currently 33% lower than the FY08 baseline value. Large reduction over past year primarily due to decline in air travel and commuting GHG emissions as a result of the COVID-19 pandemic.	Build and continue to learn from experiences using virtual meeting platforms (e.g. Microsoft Teams and Zoom) due to COVID-19 to encourage and improve teleworking and other collaborations that will likely reduce commuting GHG emissions and influence future decisions on domestic and foreign air travel. Potential Yaphank/BNL commuter rail station could significantly reduce the number of vehicles coming to BNL from current values.	**Medium**

II. Mission Change

This category discusses mission changes and program direction over the next five to ten years. It includes potential impact on sustainability goals and provide projections. For major initiatives, it discusses the site strategic vision and how sustainability goals will be influenced.

BNL has identified seven scientific initiatives that, when achieved, will help realize the vision for the Lab. The major initiative areas for BNL are:

1) **Nuclear Physics: RHIC, EIC**—Exploit RHIC's unique capabilities to learn about the matter that makes up nearly all the visible universe and set the foundation to transition to an Electron-Ion Collider (EIC).

    - The BNL EIC complex will likely add additional buildings and increase energy use.

2) **Materials and Chemical Sciences**—Integrate BNL's expertise, ideas, and facilities to focus on select timely goals in Materials and Chemical Sciences.

    - The anticipated construction of additional beamlines will increase the utilization of the National Synchrotron Light Source (NSLS)-II, Building 740, and increase its energy consumption.

    - The construction for the NSLS-II laboratory office buildings (LOBs) applied the Guiding Principles in their design to the extent possible based on the nature of the facilities.

3) **Making Sense of Data at Exabyte-scale and Beyond**—Create solutions for experiment-related computing to enable near-real-time data analysis and experimental steering.

    - New computing facilities are under construction in the existing Building 725. It is anticipated that the new computing facilities will have a power utilization effectiveness (PUE) of 1.3 which is within DOE guidelines.

4) **High Energy Physics: Building for Discovery**—Steward the participation of U.S. high energy physicists in global particle physics experiments that explore the Standard Model and search for phenomena that signal physics beyond the Standard Model.

    - There are no foreseeable sustainability impacts anticipated by this research and its required facilities.

5) **Accelerator Science and Advanced Technology: From Innovations to Applications**—Build on the Lab's unique combination of accelerator-based facilities and broad technical expertise to support efforts in accelerator science and technology that range from innovations to applications.

    - Support for the EIC upgrade could have sustainability impacts on the research and its required facilities.

6) **Quantitative Plant Science Initiative**—Accelerate genome-to-function understanding to advance fundamental discoveries in plant science relevant to the DOE mission in energy security.

- A current capitol project will eliminate once-through waters systems previously used for cold boxes.

7) **Quantum Information Science and Technology Cross-cut**—Leverage BNL's expertise in materials, instrumentation and networking, codes and algorithms to develop infrastructure that will enable scalable, large, and effective quantum systems in partnership with leading quantum experts.

    - There are no foreseeable sustainability impacts anticipated by this research and its required facilities.

BNL's scientific vision is structured around the achievement of these science initiatives, while additional operational initiatives enable and ensure the delivery of the research mission.

1) **Renewed Research Campus**—The Lab's strategy for mission readiness will provide a revitalized physical plant to improve scientific productivity, promote the attraction and retention of the scientific workforce, including the significant BNL user population, and assure the safe, reliable functioning of BNL's major scientific facilities. The resulting strategy consists of five major elements:

    - Focus limited DOE investment in critical core buildings and infrastructure to enable the scientific agenda. An example of this is the Core Facility Revitalization (CFR) Science Laboratories Infrastructure (SLI) Line Item Project.

    - Make research safe and cost effective by downsizing the campus and demolishing old buildings. This is evidenced by BNL's consolidation planning and right-sizing of its campus footprint.

    - Ensure scientific reliability through targeted investments in buildings and utility infrastructure. The Critical Utility Rehabilitation Project (CURP) SLI line item project will start to address this and is followed by a proposed SLI utility line item referred to as CURE. In addition, the redesign of the current Well 11 and the future new Well 12 will be water saving in that less water will be lost going through the water treatment plant.

    - Support the growing population of scientific users through an innovative concept called "Discovery Park".

    - Ensure renewed critical infrastructure and buildings are resilient against severe climate and weather. Climate resiliency is being factored into all projects.

II. Performance Review and Plan Narrative

Energy Management

This category focuses on all energy-related topics such as energy intensity, metering and benchmarking, Energy Independence & Security Act (EISA) §432 evaluations, non-fleet fuel use, and associated greenhouse gas (GHG) emissions.

Performance Status

Energy Intensity

In FY20 BNL and BHSO worked diligently to develop a second Utility Energy Service Contract (UESC) project. The effort culminated in the preparation of nearly all required documents to issue a Task Order. However, as has been the case with past energy conservation efforts BNL's relatively low-cost of energy combined with the high construction costs make it difficult to find cost-effective projects. The economics of the 2nd UESC effort is marginal and will be re-evaluated in FY21.

Energy intensity for FY20 was 235,750 Btu/gsf which is 3% lower than the current base year of 2015. This lower intensity level saved BNL nearly $181,000 in FY20 as compared to 2015. The previous reduction goals of 30% (2015 vs. 2003) and the 30% reduction by 2003 as compared to 1985 make it increasingly difficult to achieve the goals. However, BNL met those goals resulting in an estimated annual savings of $4.6 million comparing 2020 and 1985 energy intensity.

Energy intensity is greatly affected by many factors, including several beyond a site's ability to control. The most significant factor at BNL is weather. The site is located in the Northeast and fuel for heating is the most dominate energy source for buildings. Other factors affecting energy intensity include changing outdoor air code requirements, increased density/occupancy of new facilities, and constantly changing technologies including computers and related IT systems, lighting, and for FY20, the impact of COVID-19. Best practices continue to be temperature set-back during unoccupied periods and appropriate building maintenance.

Interestingly, BNL's energy intensity for FY20 was only slightly lower (~0.3%) than FY19. The heating degree-days were ~5% lower, but the cooling degree-days were ~18% higher. Given the limited building occupancy resulting from the minimum-safe (Min-Safe) operating mode due to COVID-19, it was expected that there would be a greater drop in energy intensity. To date, although a formal analysis has not been conducted, it's anticipated the fact that building spaces still needed to be maintained (in most cases with additional outside air ventilation requirements from COVID-19 protocols), most or all of the energy savings will likely be negated.

Figure 1 (below) depicts the energy use intensity (EUI) for non-excluded buildings (i.e., goal subject ones) at BNL greater than 5,000 gsf with an EUI of 150 kBTU/GSF or above:

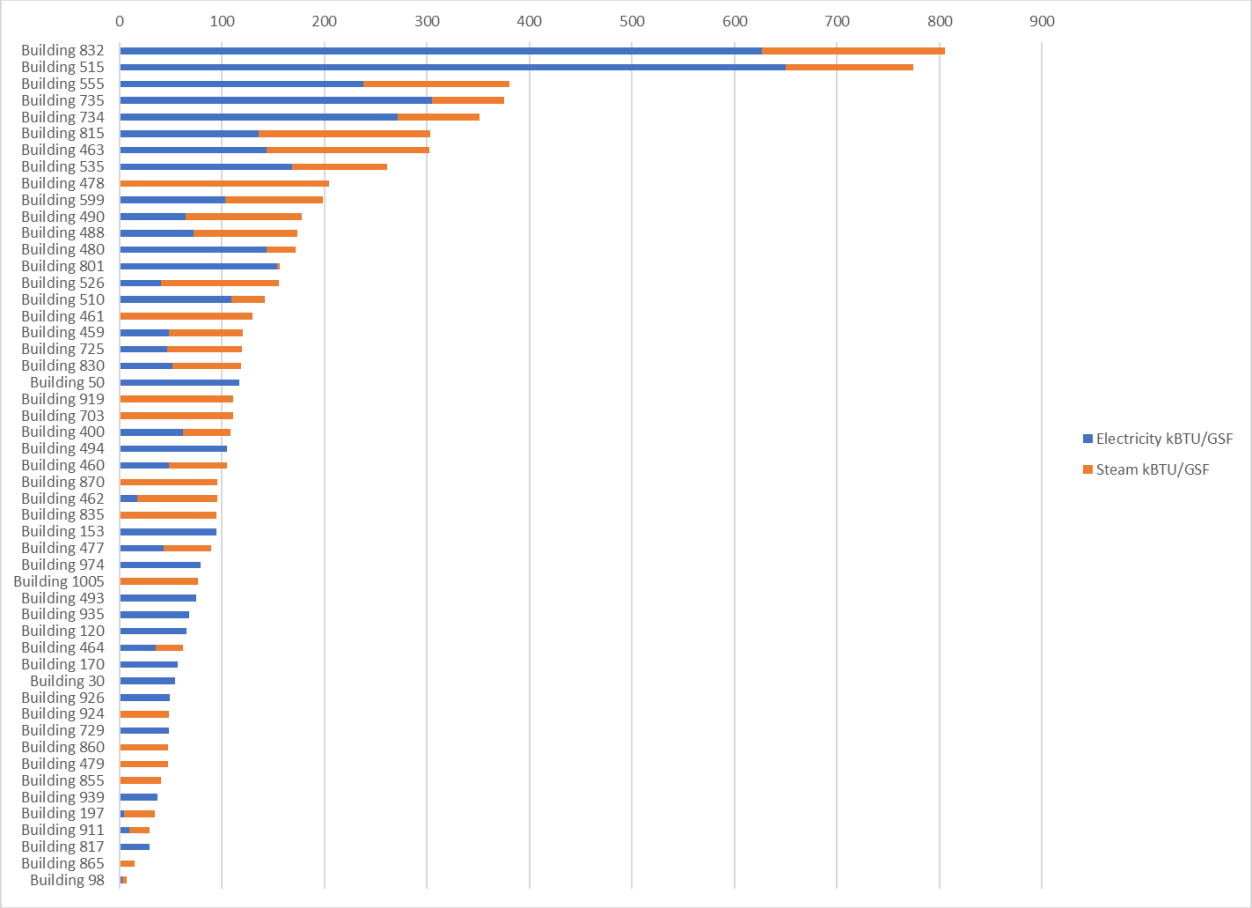


Figure 1: EUI for Non-Excluded Buildings

FY20 was the fifth full year with the results of the Utility Energy Service Contract (UESC) Phase I project. The energy savings were once again verified to be within a few percent of the original estimates. The UESC has contributed to lowering BNL's overall energy intensity value. A robust Measurement and Verification (M&V) process is in place for the UESC.

As regularly discussed, the biggest factor affecting BNL's ability to continue to reduce energy intensity is the lower electricity rates and current low fuel prices. While the low rates/prices are excellent for continuing research programs, they make it extremely difficult to find cost-effect projects, especially when paired with high construction costs. Further, most of the most attractive projects have already been completed. Regardless, BNL will continue to strive to reduce energy intensity.

EISA Section 432 Evaluations and Benchmarking

83 Buildings covering 706,859 sq. ft. were audited in FY20. Energy audits of heating, ventilation, and air-conditioning systems (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 Environmental Protection Agency's (EPA's) Portfolio Manager Program for benchmarking.

Information from the energy and water audits was taken into consideration with the 2019 Investment Grade Audit (IGA) being used to develop another potential UESC effort, or self-funded project.

To date, BNL has not capitalized on the capability of benchmarking with Portfolio Manager due to limited resources.

Measurement and Verification (M&V)

Measurement and Verification (M&V) continues to be an important process to ensure performance of energy and water conservation projects. BNL's existing comprehensive metering and building automation systems are a tremendous resource for our M&V efforts. The UESC Phase I projects Performance Assurance Plan (PAP) continues to be used to verify project performance. For the five years that the project has been in operation, energy savings have been within a few percent of the original projections. The PAP includes all of the fundamental elements of a full M&V program.

Facility Metering

BNL continued its decades-long tradition of advanced metering efforts in FY20 and is meeting the metering goals for electricity, natural gas, and chilled water. During FY20 six additional advanced electric meters were installed.

There are nearly 280 advanced electric meters are currently installed and they capture over 99% of consumed electricity. Of the 158 buildings greater than 4,000 square feet, 153 (97%) advanced meters are installed.

Chilled water is metered at 100% with 43 advanced chilled water meters installed in 34 buildings or loads with chilled water, and all three of BNL's natural gas-supplied facilities have advanced meters installed. Approximately 90% of the steam consumption is metered with advanced steam/condensate metering in 45 of the largest buildings. However, 23 buildings still have conventional steam meters that will be upgraded as appropriate.

Due to BNL's low cost of water (less than $0.43 per 1,000 gallons), the installation of water meters is not economically justifiable. However, BNL's major facilities with cooling towers, as well as new buildings and major renovations include water metering. A substantial amount of the water used at BNL is utilized by cooling towers, most of which are currently metered. BNL installed one new cooling tower meter in 2020 and plans to meter all cooling towers within the next few years. Currently approximately 25% of BNL's potable water consumption is metered at the main cooling towers and new buildings.

BNL has a long history of advanced metering dating back nearly 40 years. Energy data is utilized for numerous purposes including the following:

- Verification of utility bills: Over the years there have been several occasions where utility billing errors were captured, saving literally hundreds of thousands of dollars in cost.
- Internal utility cost re-distribution of all energy streams (electric, chilled water, steam) to various departments and organizations.
- M&V for both third party and internal energy and water conservation projects: currently used for the UESC effort.

- Participation in electric load curtailment programs that allows BNL to reward individual departments and organizations in direct relation to their contribution to the curtailment.
- Live monitoring of energy usage.
- Troubleshooting and evaluation of unusual loads and disturbances.
- Sizing of energy distribution systems.
- Energy use optimization when combined with the site-wide energy management control system.
- Detailed measurement of BNL's ~1 MW Solar photovoltaic (PV) system.
- Assisting the BNL scientists and researchers in developing new projects and endeavors such as Connected Communities, microgrid proposals, and more.

Plans and Projected Performance

Energy Intensity

Continued reductions in Energy Intensity had been and will 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% (1985 vs. 1973), 30% (2003 vs. 1985), and 30% (2015 vs. 2003). BNL is currently at a 28% reduction vs. 2003 and 65% vs. 1973.

The previous efforts naturally targeted the most financially attractive projects first. Further, while BNL's construction costs continue to escalate, the energy rates and electricity, have not. In fact, BNL's FY20 electric rate is lower than the rates of nearly four decades ago. This makes it very difficult to identify new cost-effective projects.

As previously discussed BNL has begun a UESC Phase II effort in FY19. The effort was further developed in FY20. Virtually all the documentation necessary to issue a task order was completed. Less than optimal economics, however, put the project on hold. BNL may decide to move forward with some other method such as self-funding in order to reduce the cost.

Heating, Ventilation, and Air Conditioning (HVAC) Setback

Temperature setback during unoccupied periods for HVAC systems continues to be implemented throughout the BNL campus. The Facility Complex Managers (FCMs) and their staff regularly evaluate systems to ensure that this function is operating as intended. Setback impact is captured by using the Building Automation System. FCMs will communicate with building occupants about energy usage and the benefits of HVAC setback and energy conservation.

The HVAC setback initiative will continue to be emphasized as part of BNL's educational effort for the facility managers. This is part of a larger site-wide effort to encourage active employee participation in various conservation efforts.

Steam Charge-back

A steam cost charge-back program was developed for implementation several years ago. BNL has long used direct charges to building occupants and departments for electricity and chilled water, which is one

of the most effective methods to increase energy conservation. Unfortunately, there continued to be concern from at least one department regarding a major financial disproportionate impact that would result from direct billing of steam/fuel. BNL continues to work to develop a program that will minimize the financial impacts to this Department occupants. It is estimated that this should provide energy savings of approximately 62,000 mmBtu/year.

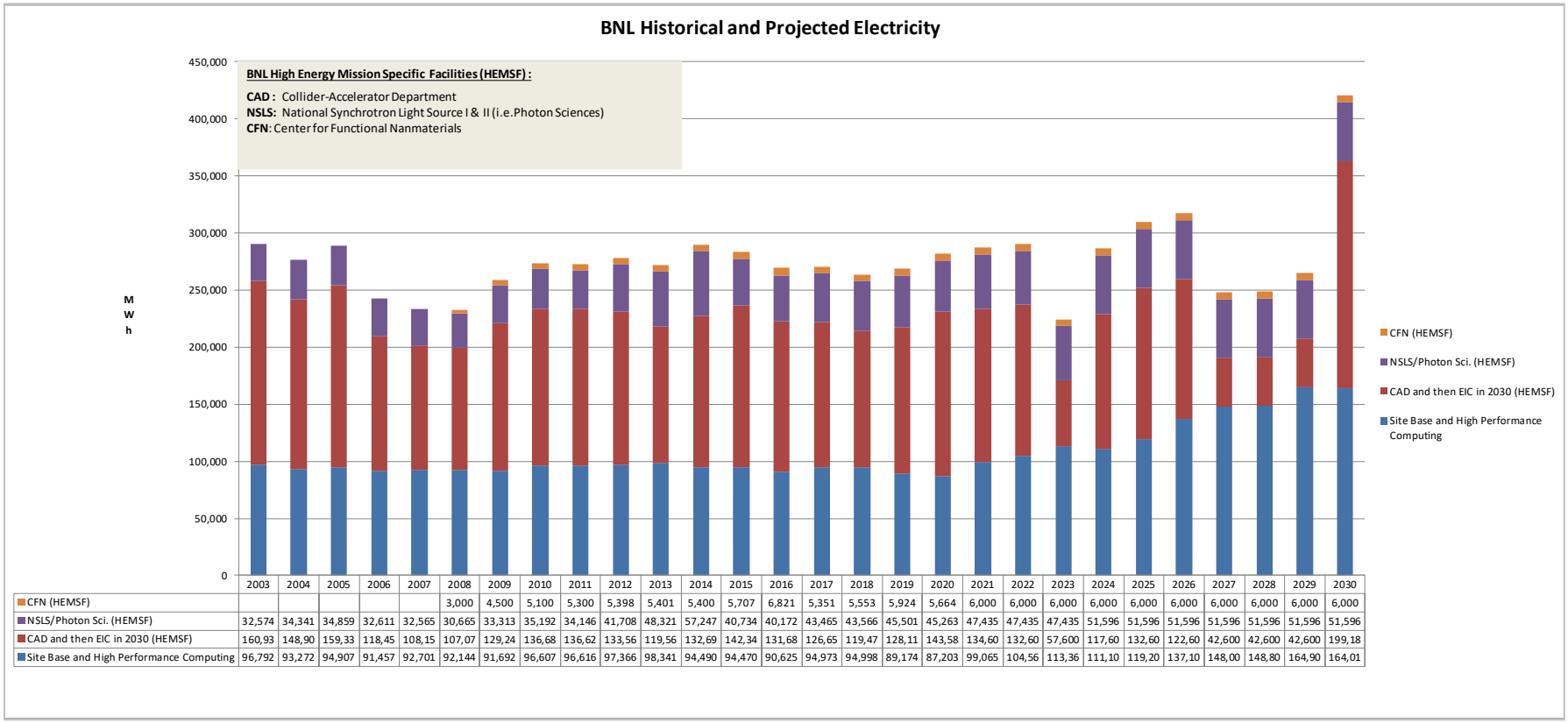
Lighting Upgrades

The natural migration to LED lighting from older technologies continues making BNL's lighting more efficient. Over time this natural cycle will eliminate more of the older, less efficient technologies. Further, all new facilities include the most efficient lighting and automated controls where appropriate.

Metering

Additional meters will be installed as opportunities become available. Electric and steam meter installations often require extensive coordination and shutdown of operations. BNL typically strives to install at least five electric meters and at least one steam/condensate meter annually. The biggest issue is limited funds and coordination of building operations if shutdowns are required. In FY20 the Lab was able to meet the goal of installing the goal of eight advanced electric meters, four of which installed on some major transformers are full power quality analyzers/meters.

Electric Usage Projections



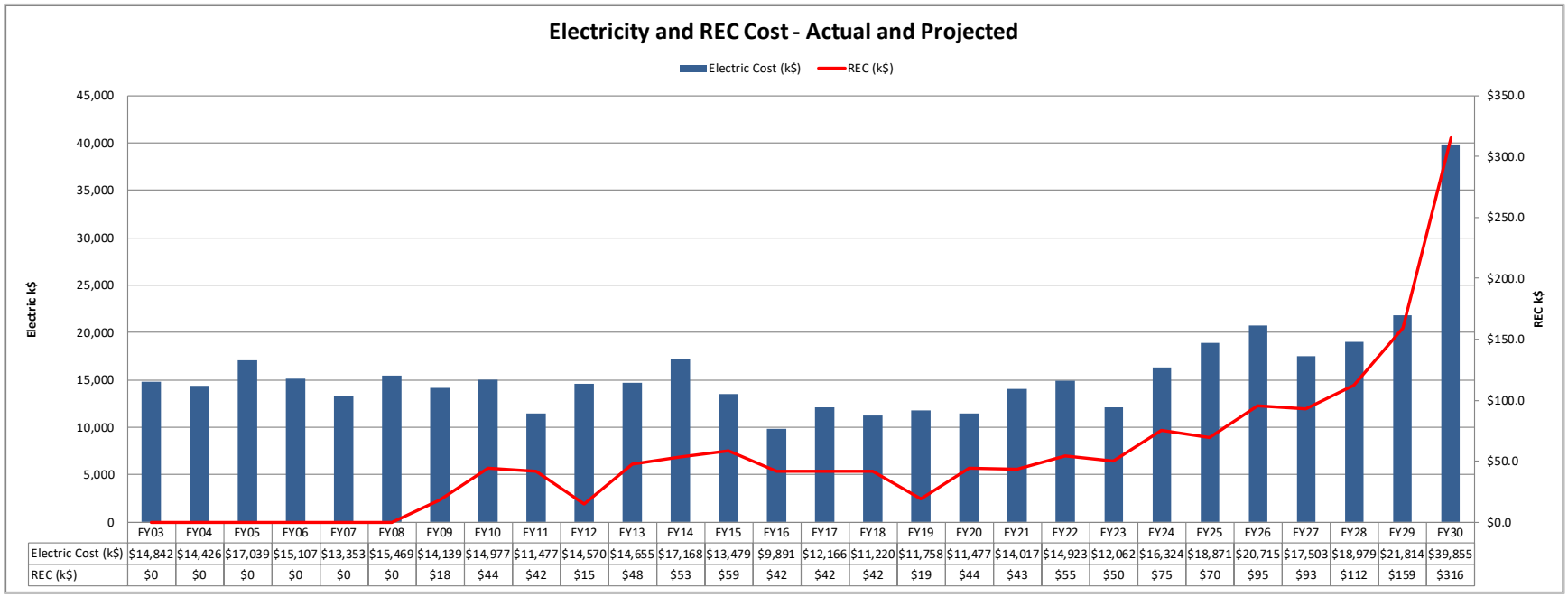
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
CFN (HEMSF)						3,000	4,500	5,100	5,300	5,398	5,401	5,400	5,707	6,821	5,351	5,553	5,924	5,664	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
NSLS/Photon Sci. (HEMSF)	32,574	34,341	34,859	32,611	32,565	30,665	33,313	35,192	34,146	41,708	48,321	57,247	40,734	40,172	43,465	43,566	45,501	45,263	47,435	47,435	47,435	51,596	51,596	51,596	51,596	51,596	51,596	51,596
CAD and then EIC in 2030 (HEMSF)	160,93	148,90	159,33	118,45	108,15	107,07	129,24	136,68	136,62	133,56	119,56	132,69	142,34	131,68	126,65	119,47	128,11	143,58	134,60	132,60	57,600	117,60	132,60	122,60	42,600	42,600	42,600	199,18
Site Base and High Performance Computing	96,792	93,272	94,907	91,457	92,701	92,144	91,692	96,607	96,616	97,366	98,341	94,490	94,470	90,625	94,973	94,998	89,174	87,203	99,065	104,56	113,36	111,10	119,20	137,10	148,00	148,80	164,90	164,01

Figure 2: BNL Historical and Projected Electricity

Electricity and REC Cost Projections

The chart below shows electricity and Renewable Energy Credit (REC) cost history and projections. BNL's REC purchases to-date have been relatively inexpensive, under $1/MWh for the last few years. However, in FY20 the rate went to $2/MWh. Given the increasing renewable and clean energy requirements from New York State's new Climate Leadership and Community Projection Act (CLCPA), BNL anticipates substantial increases in REC and energy pricing as the years progress. The CLCPA requires 100% of all electricity generation to be renewable by 2040.

The table assumes that rates will increase to ~$5/MWh by 2027 and to ~$10/MWh by 2030. These assumptions are based on discussions with a few REC providers as well as anticipation of the impact of the CLCPA. They will be updated in future Site Sustainability Plans (SSPs).

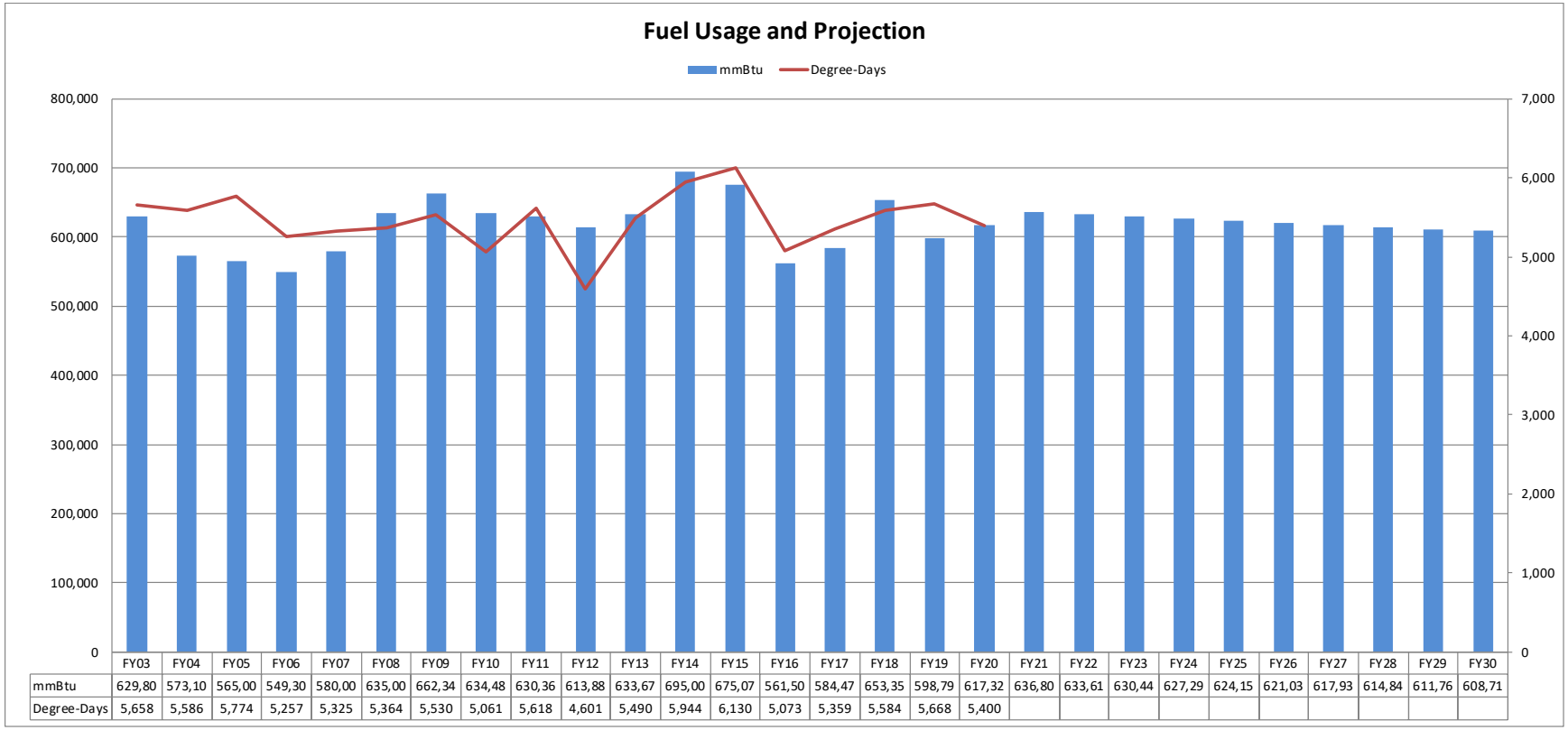


	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30
Electric Cost (k$)	$14,842	$14,426	$17,039	$15,107	$13,353	$15,469	$14,139	$14,977	$11,477	$14,570	$14,655	$17,168	$13,479	$9,891	$12,166	$11,220	$11,758	$11,477	$14,017	$14,923	$12,062	$16,324	$18,871	$20,715	$17,503	$18,979	$21,814	$39,855
REC (k$)	$0	$0	$0	$0	$0	$0	$18	$44	$42	$15	$48	$53	$59	$42	$42	$42	$19	$44	$43	$55	$50	$75	$70	$95	$93	$112	$159	$316

Figure 3: Electricity and REC Cost – Actual and Projected

Fuel

Over 95% of the fuel use at BNL is for the Central Steam Facility. Estimated fuel use going forward is estimated to slightly decline by ~0.5%/year, mainly due to continued efficiency improvement projects and a reduction of older underutilized facilities. As previously discussed BNL is concerned about our ability to meet the continued energy intensity reduction requirements.



	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30
mmBtu	629,80	573,10	565,00	549,30	580,00	635,00	662,34	634,48	630,36	613,88	633,67	695,00	675,07	561,50	584,47	653,35	598,79	617,32	636,80	633,61	630,44	627,29	624,15	621,03	617,93	614,84	611,76	608,71
Degree-Days	5,658	5,586	5,774	5,257	5,325	5,364	5,530	5,061	5,618	4,601	5,490	5,944	6,130	5,073	5,359	5,584	5,668	5,400										

Figure 4: Fuel Usage – Actual and Projected

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, as well as summarizes any issues or obstacles related to the implementation of reduction strategies or the collection of water consumption data.

Performance Status

BNL obtains its potable, process cooling, and fire protection water from Long Island's underground aquifer. BNL runs its own NYS-regulated "community water system" which consists of five water wells, a Water Treatment (Iron Removal/Filter) Plant, two elevated water storage tanks with a capacity of 1.3 million gallons, and an underground distribution system with about 45 miles of piping, valves, and hydrants.

BNL has a long history of reducing water consumption – even though water on Long Island is plentiful and inexpensive. BNL has conducted an effective water-reduction and conservation program for more than 20 years, illustrated in the figure below by the trend in annual potable (includes process) water usage.

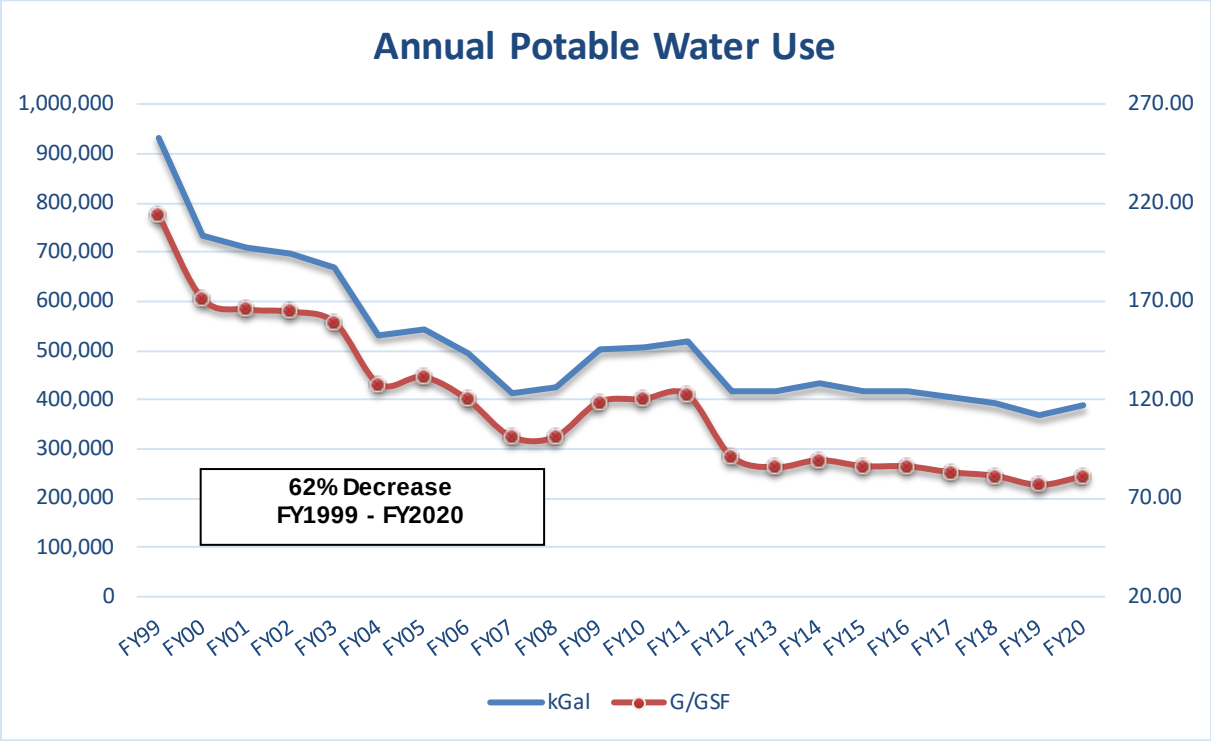


Figure 5: Annual Potable Water Use (1999-2020)

Potable-water usage fell from 931 million gallons/year in FY99 (average of 2.55 million gallons per day) to about 389 million gallons/year in FY20 (just over 1 million gallons per day), a reduction of 62.0%. When normalized by site growth (building area in gross square feet), BNL's annual water use intensity has

decreased from 101 gallons per square foot to 8039 gallons per square foot, a 20.1% water usage reduction since base-year 2007. The table below illustrates the change in site gross square footage.

Table 1: Annual Change Gal/GSF Water Use (1999-2020)

FY	kGal	GSF	G/GSF
FY99	931,452	4,363,224	213.48
FY00	732,408	4,281,455	171.07
FY01	710,583	4,286,993	165.75
FY02	698,340	4,241,450	164.65
FY03	666,916	4,191,562	159.11
FY04	530,414	4,148,593	127.85
FY05	542,568	4,128,355	131.42
FY06	493,641	4,105,635	120.23
FY07	412,935	4,081,900	101.16
FY08	427,400	4,237,100	100.87
FY09	504,500	4,252,200	118.64
FY10	505,075	4,203,457	120.16
FY11	520,308	4,249,150	122.45
FY12	418,153	4,586,455	91.17
FY13	419,372	4,906,797	85.47
FY14	433,718	4,865,753	89.14
FY15	416,904	4,843,649	86.07
FY16	417,364	4,854,679	85.97
FY17	406,876	4,905,386	82.94
FY18	393,096	4,845,380	81.13
FY19	368,520	4,815,914	76.52
FY20	389,437	4,815,914	80.86

Water usage increased slightly from FY19 to FY20, even with the reduced site activity associated with COVID-19 and Min-Safe. While BNL has not had time to fully analyze the data, there where several issues that likely contributed to the increase usage, ironically due to COVID-19 response. These include increased water main/service flushing and the delayed Collider-Accelerator Department (C-AD) run that caused the machines to run during the summer with the resulting increase in cooling tower operation, blow-down, evaporation, and cleaning.

Further, this summer was warmer and drier than last year, resulting in additional evaporation and blow-down cycles.

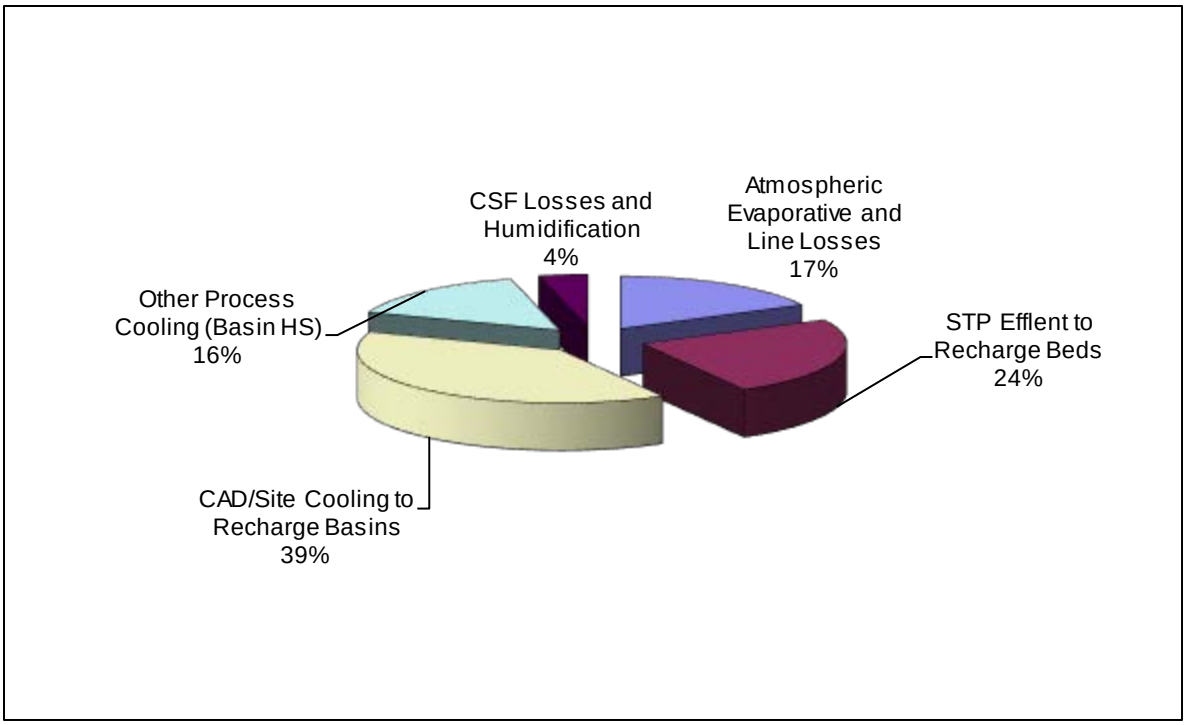


Figure 6: 2020 Potable Water Utilization

In October 2014, BNL implemented groundwater recharge of treated wastewater at its Sewage Treatment Plant. Currently, about 82% of water used at BNL is recharged (recycled) to groundwater via groundwater recharge basins. The water recharged is near potable water quality.

We estimate that over two-thirds of BNL's water production is attributable to High Energy Missions Specific Facilities.

Plans and Projected Performance

Water Management Plan

BNL's Water Management Plan describes how BNL designs and operates the Laboratory's buildings and facilities to be sustainable and water efficient. It outlines our efforts to continue to reduce water usage by implementing best-management practices. The E.O. 13834 goals require that BNL reduce potable water intensity (Gal per gross square foot) by 20% relative to FY07 by FY15 and 0.6% year after year thereafter.

Presently, we are implementing best-management practices (BMPs) as detailed in Section 2.2 of our Water Management Plan. Implementing water conservation is a significant economic challenge. Water is plentiful and inexpensive at BNL. The variable cost of producing water currently is about $0.45 per thousand gallons. Most water conservation measures are capital- and labor-intensive. We are always evaluating the return on investment of implementing additional BMPs. These BMPs have the potential to lower water consumption by more than 40 million gal/yr. Our ability to implement these capital-intensive measures depends upon obtaining additional benefits (such as replacing obsolete equipment, extending

equipment's end-of-life, reduced maintenance costs, reducing waste water discharges to the sewage treatment plant, and increasing energy savings) and upon obtaining capital funding to install them (aligned with other priorities).

A carbon filtration system was renovated and returned to service for per- and polyfluoroalkyl substances (PFAS) removal Well House No. 11 on site will reduce the need to use older wells therefore reducing the Water Treatment Plant filter back-wash cycles by restoring the carbon filtration system.

Finally, we emphasize that over 80% of BNL's water consumption is returned and recharged to groundwater at potable water quality. We believe that BNL's groundwater recharge fully meets the DOE's water management "recycling" or "non-consumptive" criteria (except for insignificant temperature changes). To increase the rate of on-site recharge, BNL completed a project in 2014 to re-route the treated effluent from the sewage treatment plant from a surface water discharge to a groundwater recharge system. This project eliminates a potential source of trace metals contamination to the Peconic River and improves the quality of the river down-stream of BNL. Review of analytical data for the Sewage Treatment Plant effluent shows that the water quality meets all Federal and state groundwater quality standards. This change resulted in an increase of over 100 million gallons per year recharged locally versus off-site flow via the Peconic River.

The following paragraphs summarize BNL's past and present (ongoing) efforts in water conservation (best management practices); more details are available in BNL's Water Management Plan.

- Public Information and Education Programs: BNL's water-related public information and education programs emphasize the excellent quality of BNL's potable water supply and seek to minimize employee's use of expensive, environmentally unfriendly bottled water.

- Distribution System Audits/Metering: BNL periodically audits its water distribution system as part of infrastructure planning and utility reviews (e.g., 10-year Master Plans). BNL's utility engineers understand BNL's water system to be "tight" and relatively leak-free. Because of the plentiful supply and low cost of water at BNL, water meters are not available at most buildings or major process users. We bill one major process user for water.

- Water-efficient Landscaping: BNL's minimal formal landscaping is compatible with the local climate and rainfall. BNL does not routinely irrigate lawns and landscape.

- Toilets and Urinals: BNL currently specifies low consumption toilets and flushometers (1.6 gallons per flush (gpf) for toilets, 1.0 gpf for urinals) for new constructions, renovations, and maintenance.

- Faucets and Showerheads: BNL specifies low-flow, WaterSense faucets and showerheads for new constructions, renovations, and maintenance.

- Boiler/Steam Systems: BNL has a district steam-system and Central Steam Facility. Depending on the season, 75-85% of the steam exported from the facility returns as condensate. (This is excellent return for a large district steam-system and the condensate return conserves water and energy).

- Single-Pass Cooling Systems: BNL has reduced water flow through single-pass cooling systems that discharge to the sanitary sewer system. The marked success of these efforts is reflected in the 55% water use intensity reduction.

- Cooling-tower Systems: To reduce water use in once-through cooling systems, BNL has 32 cooling towers with a flow rate of over 300 gpm. To maximize cooling efficiency and minimize water use, BNL controls the blowdown rates on the large towers to maintain the "cycles of concentration" between 4 and 6.

- Water Reuse and Recycling: Over 80% of BNL's water consumption (except evaporation and drift at cooling towers) is recharged back to the ground (where the well water came from). All of BNL's process water (e.g., make-up and cooling) currently is obtained from the Laboratory's potable-water system and is accounted for in accordance with Executive Order 13834 "Efficient Federal Operations".

- Sewage Treatment Plant Effluent Recharge: A modification to convert BNL Sewage Treatment Plant from surface water discharge (Peconic River) to groundwater recharge / recycling was completed in September 2014. Purified wastewater (effluent) from BNL operations is currently being recharged and recycled to groundwater.

All new construction and renovation at BNL will continue to utilize water-efficient processes and plumbing fixtures to conserve water.

In FY16, the Laboratory funded engineering and design of a new Well House No. 12. Start of construction of the new well house has begun and is expected to be completed in FY21. Total estimated cost (TEC) for the project will be about $2.3 million. The new well house will replace the well house structure destroyed in a propane explosion in October 2008.

Well No. 12 is located in an area of the BNL site with low-iron groundwater. Return of Well No. 12 to operation will reduce the need operate BNL's high-iron wells – Well Nos. 4, 6, and 7. This in turn will reduce the duty on BNL 's Water Treatment (i.e., Iron Removal / Filter) Plant, and reduce the number of backwash cycles and backwash wastewater.

We continue to expect that increased, "main-mission" science program activities, with their need for accelerator cooling will tend to increase water consumption, due to cooling tower evaporation. This is not as significant an issue at BNL as it is at DOE facilities located in arid locales. Groundwater recharge from annual precipitation (almost all storm water is recharged on site) is orders of magnitude greater BNL's water usage that is "lost" due to evaporation (in evaporative cooling towers).

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.

Performance Status

BNL has a mature established waste reduction and diversion program that recycles the following components:

- Mixed paper
- Cardboard
- Bottles and cans
- Tires
- Construction & demolition debris (C&D)
- Used motor oil
- Metals
- Concrete/asphalt,
- Lead acid (automotive/UPS) batteries
- Garnet
- Fluorescent bulbs
- Blasocut (cutting oil coolant)
- Scrap electronics
- Trees/brush (composted)

As evidenced by the graph below, BNL's annual diversion rate for non-hazardous solid waste has been above the Department's 50% goal for the past 19 years. During FY20, the recycling rate, including municipal solid waste and C&D waste generated from normal daily activities, was approximately 53%.

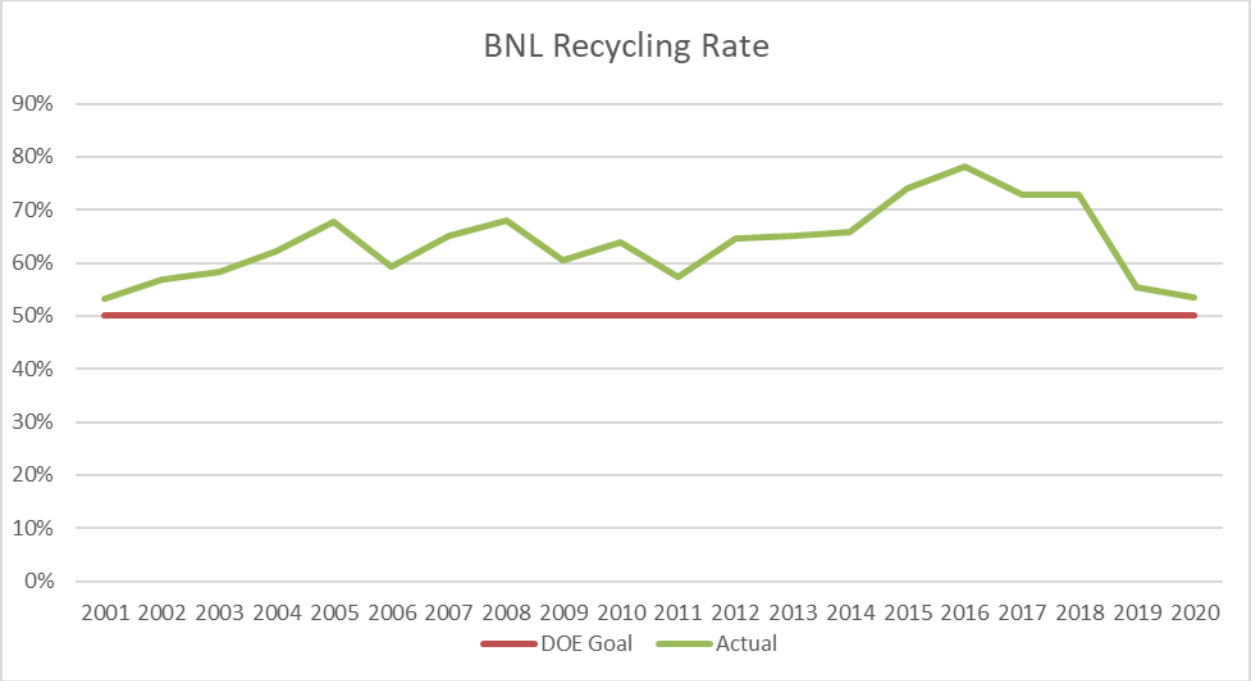


Figure 7: BNL's Recycling Rate

This number does not account for major one-time projects that generate large amounts of debris, such as building demolition or landscape maintenance. Much of the building demolition is sent to facilities that sort out recyclable material, thereby reducing the amount of C&D debris ultimately sent to a C&D landfill. However, information about the amount ultimately recycled versus landfilled is difficult to obtain. This report makes the conservative assumption that all C&D debris collected by Facilities and Operations as part of everyday activities is being landfilled and therefore counts it as part of BNL's overall Municipal Solid Waste (MSW) stream. However, the C&D material collected from FY20 demolitions (Apartments B366 and B367) is counted as recycled because that work occurred under separate contracts making recycling information more transparent. The change in assumptions regarding disposal of C&D debris has played a significant role in why the Lab's recycling rate dropped from 78% in 2016 to 53% in 2020. BNL is working on getting improved information regarding the actual percentage of C&D waste recycled in order to reflect true performance.

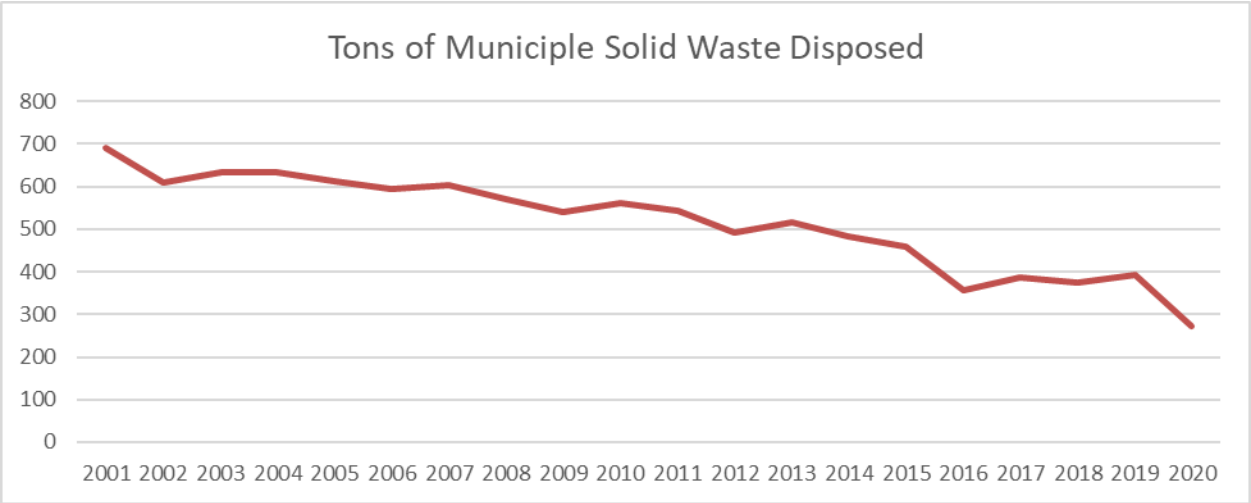


Figure 8: Tons of Municipal Solid Waste Disposed

BNL's municipal solid waste stream (not counting C&D waste) has been on a downward trend for many years decreasing 61% from 2001. However, Laboratory Min-Safe operating conditions in response to COVID-19 contributed to a 30% drop in putrescible waste generation from FY19 to FY20. The impact was the same for most recycling streams, with most seeing significant reductions this year solely based on the reduced operating capacity of the Laboratory. What can't be tracked is how much of the recycling stream moved to staff member's private residences while working from home.

One waste stream that was not reduced was the compostable waste stream resulting from grounds maintenance. A large amount of hurricane damage-related tree and brush debris was collected site-wide during FY20. Consideration of this waste steam causes BNL's recycling rate to jump to 83.9%. The compost created is used by the grounds crew for site landscaping needs.

Plans and Projected Performance

BNL will continue its successful waste diversion program, exceeding the DOE goal by continuing to divert > 50% of material from the municipal solid waste stream for recycling or reuse during FY21.

BNL will once again fund the successful Pollution Prevention Opportunity Program for FY21 in order to identify and promote new ideas for waste reduction, recycling and reuse. Five- and ten-year goals would include using success stories with verified payback information to justify and obtain increases in funding levels to expand this program.

BNL will start developing statistical measures to track recyclable generation against on-site population over time to better understand the ongoing impact of work-at-home employees on recyclable and MSW generation rates.

BNL will collect all C&D data generated during FY21 in order to establish a baseline for future YOY C&D reduction goals.

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.

Performance Status

41 Telematics were ordered for the remaining fleet vehicles, so a full scope of usage on all BNL's vehicles can be determined for FY21. Four new infrastructures have been installed to support charging stations for electric vehicles. BNL's Fleet Management continued to work with the General Services Administration (GSA) to order and utilize alternative-fuel and newer, more fuel-efficient vehicles. One Hybrid Electric replacement arrived in July and one Hybrid Midsize Sports Utility Vehicle (SUV) arrived in August. The FAST report as of 2019 shows a steady decline in fuel consumption since 2015. COVID-19 impacted fuel usage with a significant drop in April and May, due to the Laboratory entering into a Min-Safe operating status, which ceased most operations on campus. Per the FleetDash report for FY20: petroleum, E85, biodiesel and diesel greenhouse emission totals in April and May are almost half as much as any other month. Vehicle utilization also decreased in FY20 due to Min-Safe and continued minimal operations onsite.

The tables below contain data from FY20 that has been exported from the FleetDash database:

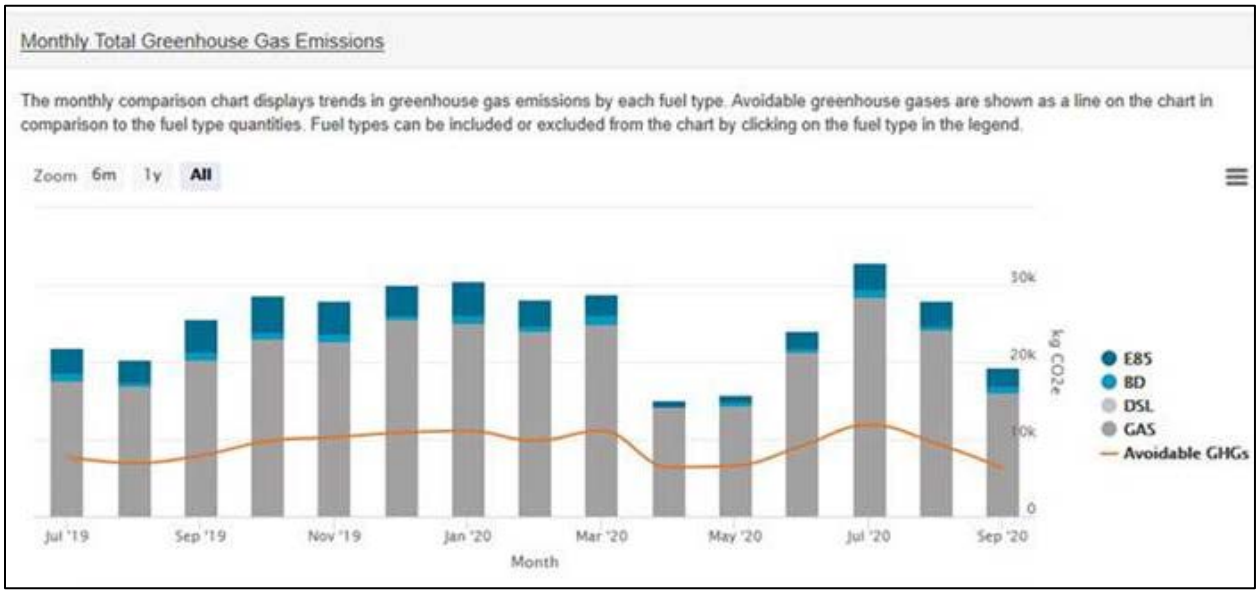


Figure 9: Total Greenhouse Gas Emissions

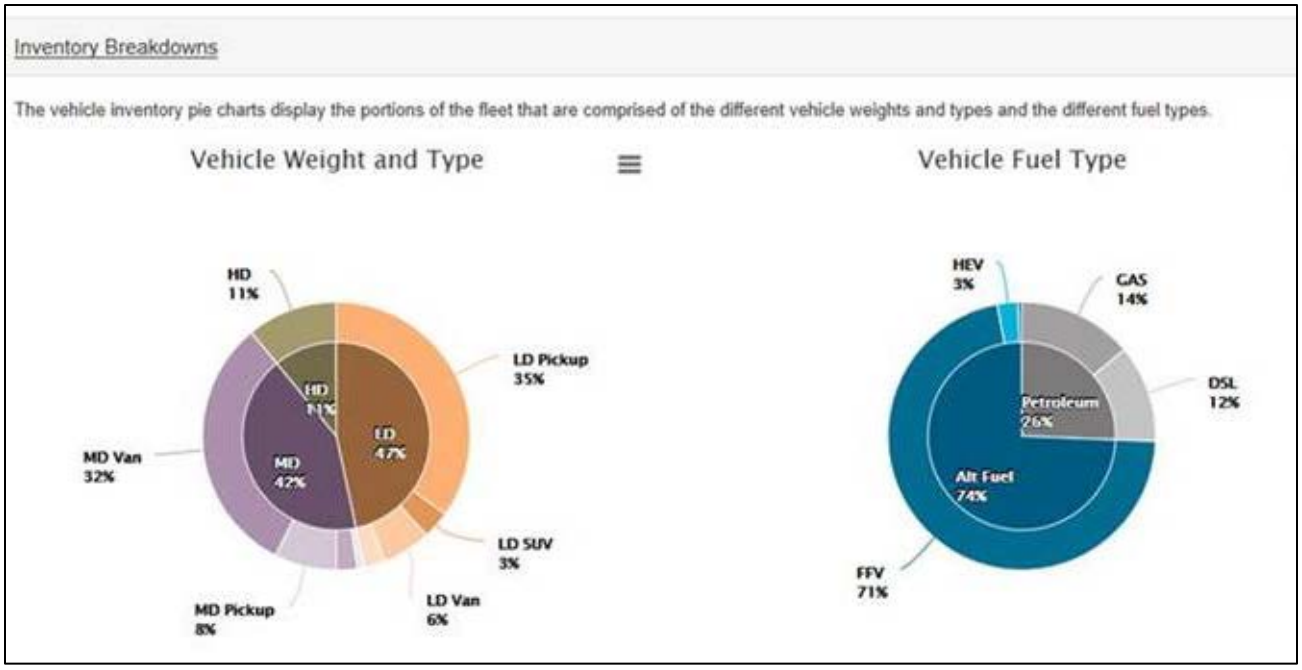


Figure 10: Vehicle Inventory Breakdown

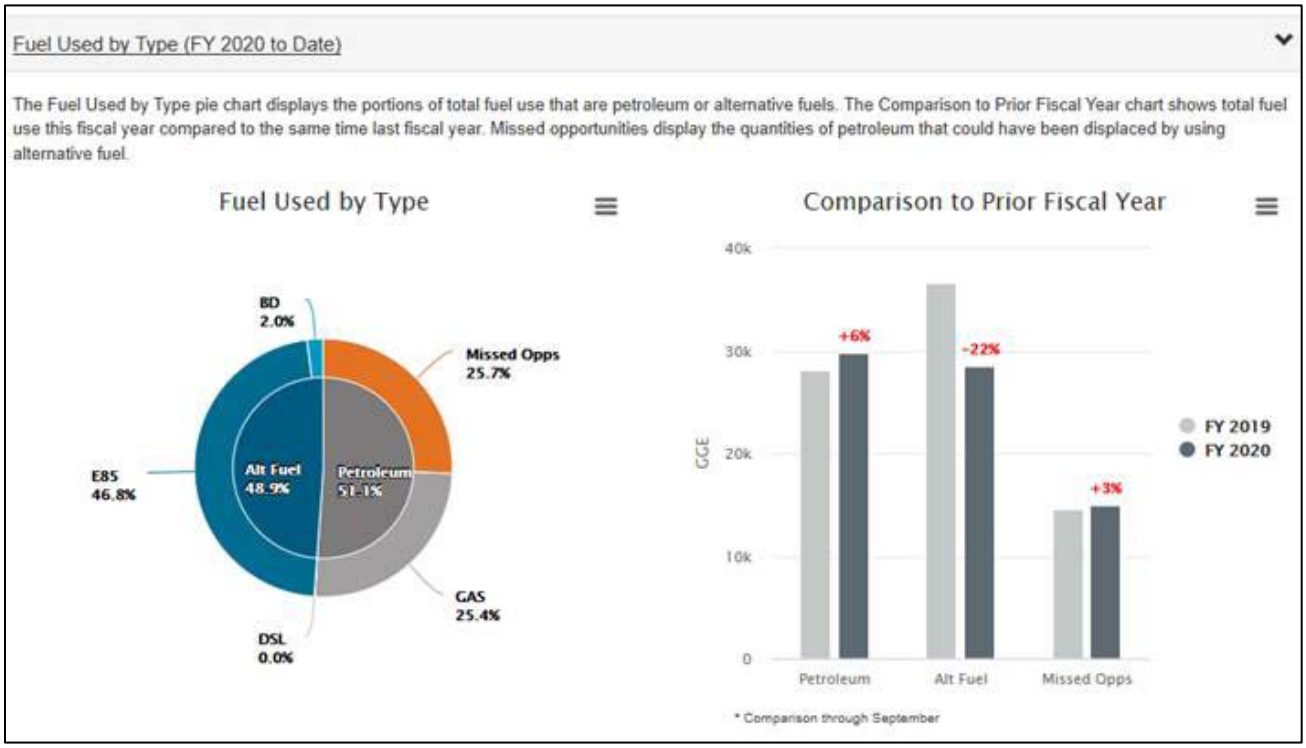


Figure 11: Fleet Fuel Usage

Plans and Projected Performance

BNL's Fleet Management will continue to replace vehicles through the GSA Lease Plan for FY21. The number of alternative fuel acquisitions will depend on the GSA inventory available. In reference to the FleetDash Report for FY20: 71% of the Fleet is Flex Fuel Vehicles, with 74% of the overall Fleet using alternative Fuel. While the FAST report data for 2020 was not available at the time of submission, FAST data through 2019 shows a steady decline in petroleum use, which is expected to continue in FY21. Fleet Management is implementing quarterly spot checks for FY21 to monitor overall condition of vehicles, including tire assessments to ensure optimal performance. Accountability for unattended idling vehicles is also included as part of the spot checks. Installation of the final 41 Telematics will be completed by the end of February 2021 and will provide comprehensive information on usage and fuel consumption for the entire Fleet.

Renewable Energy

This category focuses on site efforts towards utilizing renewable energy resources.

Performance Status

BNL purchased 22,000,000 kilowatt hours (kWh) of RECs for 2020 to meet the "Renewable Energy" requirement of 7.5%. 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. It is important to note the price of REC's more than doubled compared to last year. By most accounts the price of REC's will continue to increase in the future.

BNL's 816 kW Northeast Solar Energy Research Center (NSERC) facility produced 977,967 kWh in FY20 that were consumed by BNL's facilities. The RECs are retained by BNL and are not sold.

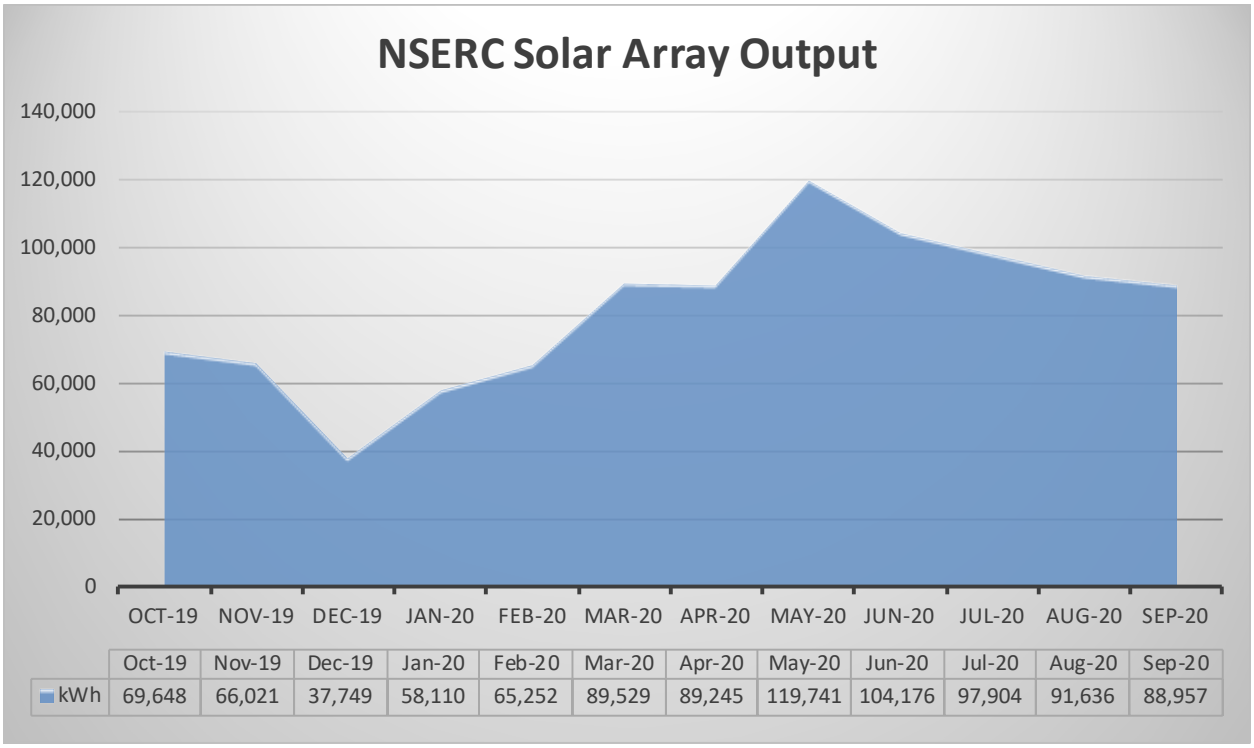


Figure 12: NSERC Solar Array Output

FY20 is the 8th year of BNL's hosting the Long Island Solar Farm (LISF), a 32 MW Solar PV generation system that provides power to the Long Island Power Authority (LIPA). Even though BNL does not receive any of the power generated from the LISF, it provides clean, renewable energy to the local area and region. The LISF produced 48,024,000 kWh in FY20.

As discussed in previous SSP's an evaluation of combined heat and power (CHP) was completed in 2016. The report highlighted the potential to reduce GHGs by approximately 50,000 MtCO2e per year and act as an on-site source of "clean energy." There are a number of other benefits associated with CHP including providing increased resilience in the event of impacts from weather or other events that could affect the electric grid. However, current and estimated low energy costs in the future continue to prevent CHP from being economically viable at this time.

Plans and Projected Performance

BNL will continue to operate the NSERC facility and provide for further expansion when sufficient funds are identified. Renewable energy credit (REC) purchases will continue in order to meet applicable renewable energy and clean energy goals.

BNL continues to regularly evaluate alternative energy opportunities. The Long Island Power Authority (LIPA) recently indicated a plan to issue a Request for Proposal (RFP) for utility scale battery storage on Long Island. BNL will continue to monitor this area to identify potential opportunities.

The most recent renewable energy assessment that included the BNL site was completed by National Renewable Energy Laboratory (NREL) in 2016. The report concluded that even though the site is over 5,000 acres, given the existence of the 32-MW Long Island Solar Farm (LISF) on the BNL site and that much of the land is forested and in environmentally sensitive areas (core Pine Barrens), BNL is concerned about clearing additional land for another renewable energy (RE) project.

The NREL report also states: "PV, biomass, LFG, and SHW do not appear economically viable at this time. Should the cost of electricity increase or escalate at a rate higher than what is assumed in the model or should the price of RE decreases or new incentives become available, then it is possible additional RE projects could become cost-effective." NREL did suggest consideration of small wind turbines given the Federal Aviation Administration's (FAA's) determination that large (300 ft. high) ones would pose an aviation problem in the area.

BNL's low energy rates and high construction costs have thus far precluded renewable energy projects from being economically viable. 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, even with the new office building, the Science and User Support Center, (SUSC). During the design several renewable concepts were evaluated including solar hot water heating and a solar wall for pre-heating. Unfortunately, they proved too expensive and were not included.

BNL continues to pursue opportunities to implement a true microgrid on site. The ~1 MW NSERC facility is intended as one of the first segments that will we ultimately plan to be combined with energy storage. 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 as mentioned.

Sustainable Buildings

This category focuses on all aspects pertaining to sustainable building initiatives such as Sustainable Buildings, formerly referred to as High Performance Sustainable Buildings, as well as building inventory changes.

Performance Status

Guiding Principle (GP) Compliant List

Table 2: Guiding Principle Compliant Buildings and GSF

Property ID	Size s.f.	Compliant Year
0438	5,082	2015
0510	202,654	2015
0515	77,503	2015
0599	12,148	2015
0734	89,733	2014
0740	408,311	2017
0741	42,370	2017
0742	42,365	2017
0743	47,825	2017
0744	42,445	2018
0745	42,966	2018
0817	16,827	2015
0935	5,850	2015
0938	5,316	2015

Barriers and Most Difficult- GP's

The most significant barriers to meeting the Guiding Principles are the costs associated with meeting the Energy Efficiency, Water Use, and Commissioning. Of these three, meeting the Energy Efficiency requirements is by far the most expensive. BNL's relatively low energy rates and high construction costs make is extremely difficult to find cost-effective projects.

Guiding Principles

Currently 8 buildings have achieved 100% of the 2008 GP's and an additional 7 buildings are considered meeting them, as they have achieved LEED Gold or higher status. This represents 20% of non-excluded buildings. As BNL constructs new buildings and demolishes old non-compliant buildings, this percentage will increase.

New Building Design

All buildings designed from 2007 were designed to meet the NYS Energy Code. In addition, BNL incorporates these principles into major renovations. As such, these buildings, some of which also obtained LEED certification, meet or exceed the Guiding Principles. BNL does not have any leased facilities. The Modernization Project Office's Design Standards (Modernization Project Office [MPO] Procedure 100E) include requirements to ensure that all new construction is at least 30% more efficient than the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 90.1-2013. The current EISA Section 433 is not applicable, as BNL does not have any planned commercial or multi-family high-rise residential buildings.

No new buildings were designed in FY20. The design for the new Science and User Support Center (SUSC) will be completed in FY21.

Net Zero Buildings

Where economically feasible, BNL will ensure net-zero requirements are included in future designs.

Strategies for Design (42 USC 6834)

In lieu of the requirement gap between 42 United States Code (USC) 6834 and 10 Code of Federal Regulations (CFR) Part 433 Subpart B, new building construction and/or modernization will follow the Guiding Principles for Sustainable Federal Buildings to reduce energy consumption.

COVID-19 Impacts

There have been no impacts on performance and goals for Sustainable Buildings from COVID-19.

Plans and Projected Performance

Guiding Principles

Although overall site funding will drive the exact schedule, as new buildings are constructed to be fully compliant with the Guiding Principles (GPs) and old non-compliant buildings are demolished, the percentage of buildings that are compliant with the GPs will further increase.

New Building Design

Currently the only new building in design that will meet the Guiding Principles is the SUSC Building.

Preliminary Design Rendering of the Science and User Support Center (SUSC)

Net Zero Buildings

Although not an issue at this point, BNL has not made specific progress on the net-zero energy building goals, but there is continued discussion with BHSO and DOE-HQ. BNL will continue to engage the national laboratory community on techniques to economically meet the net-zero requirements.

For designs starting in FY21, where economically feasible, BNL will ensure that net-zero requirements are included in future designs. BNL will consider net-zero concepts in the preliminary design of the SUSC; however, 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.

Climate-Resilient Design and Management

The Modernization Project Office's Design Standards (MPO Procedure 100L) requires that all new large construction projects (new building, building addition, or Level 3 alteration) consider present and future climate conditions in assessing environmental impacts on the project. The design criteria adopts the latest version of the "Climate Resiliency Design Guidelines" prepared by the New York City Mayor's Office of Recovery and Resiliency with respect to increasing temperatures, frequency of heat waves, and precipitation. The Climate Resiliency Evaluation has been incorporated into the design for the SUSC project.

Strategies for Design (42 USC 6834)

As mentioned previously, 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.

Acquisitions & Procurement

This category focuses on all relevant sustainable acquisition information as well as efforts to improve your supply chain GHG emissions.

Performance Status

During FY20, BNL maintained and added to the "Commonly Ordered Items" page and provided training specific to requisitioners on EPP requirements and available assistance.

The major initiative for FY20 was to assess BNL's sustainability program, with a focus on EPP purchasing contract conformance. However, the assessment has been delayed to FY21 due to COVID-19-related work restrictions. The assessment will look at the reporting metrics in the SSP for improvement opportunities.

The Lab's Environmental Protection Division suggests EMS objectives that will support the institutional program to line organizations. For FY20, the focus was on identification of products for replacement with bio-preferred alternatives, enforcement of Federal Energy Management Program (FEMP) requirements, and Energy Star requirements in purchases in scientific organizations. These objectives are tied to BNL's Pollution Prevention Proposal Program offering funding for sustainability-related projects. Even with the impact on normal operations resulting form COVID-19, all projects identified for FY20 were implemented as planned and all available funding was spent. Two of the 18 proposals funded involved bio-based replacements for existing items. One proposal funded biodegradable nitrile gloves for testing in laboratories. If successful, the plan is to replace all stocked nitrile gloves with the biodegradable alternative.

BNL continues to be recognized for its EPP Program as can be demonstrated by receipt of the Green Electronics Council's annual EPEAT Gold award, the annual DOE Green Buy Award as well as the Green Buy Prime Award, which is a new category recognizing organizations who have won Green Buy Awards three times.

Green Electronics Council: 2020 EPEAT Gold Purchaser Award

Plans and Projected Performance

BNL cannot currently make measurable targets for improvement due to the lack of measurable data. Current data collection for reporting purposes is done manually due to the fact that BNL's purchasing system does not accurately track the EPP conformance status of purchased items, nor does the reporting capture all conforming purchases. Based on field observations, BNL may perform better than what is reported. Programming improvements to enhance data collection are cost prohibitive.

In addition, EPP conformance purchasing remains a challenge primarily for administrative staff acting as requisitioners for staff ordering office supplies, electronics and occasionally furniture, as it is difficult to identify conforming items through BNL's EPro (Vinimaya) System.

The "medium" risk rank for the Sustainable Acquisition goal (see Executive Summary table) is based on the reporting limitations of BNL's EPP purchasing program. Based on observation and awards received, BNL has demonstrated a successful EPP program, but has weaknesses in the area of being able to set numerical goals against which the Lab can measure performance as evidence of conformance.

The planned Sustainability Assessment will be used to verify that contracts are conforming with sustainable acquisition BSA contract clauses and will be useful for identifying areas for improvement.

Measures, Funding, & Training

This category focuses on efforts to implement identified Efficiency & Conservation Measures (ECM) through appropriations, performance contracts, or other funding mechanisms, and discuss provided 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.

Performance Status

Efficiency & Conservation Measures

Internally funded energy conservation and sustainability related initiatives include a continuation of best practices, with continued emphasis on temperature setback during unoccupied periods. As mentioned previously, we were surprised at the minimal (~0.3%) reduction in energy intensity between FY19 and FY20 given the minimal building occupancy starting in March that in response to the COVID-19. We have not had time to evaluate the reasons why, but suspect the impact of additional cooling degree-days along with the increased ventilation requirements negated a meaningful reduction in energy intensity.

Consistent with past efforts BNL continues to implement small lighting and water conservation projects by using the latest, most efficient equipment as part of on-going maintenance efforts.

Energy and water evaluations are completed annually per EISA 432 requirements. The information is placed into a database for BNL's use as well as into EPA's Portfolio Manager program. Potential projects are reviewed to determine if they are cost-effective. Small cost-effective projects are sometimes implemented with operating funds. Unfortunately, due to the limited site presence during the COVID / Min-Safe mode little to no progress in the area occurred in FY20. When larger cost-effective projects are identified they have been and will be directed to areas that may have funding available, or to a UESC or ESPC effort.

Energy Performance Contracts

As indicated in previously BNL completed its first UESC in 2015. The project continues to perform well, meeting the original energy savings estimates within a few percent each year. As a result of the success of this project a second UESC was developed in FY20. An Investment Grade Audit (IGA) was complete at the end of FY19. Lessons learned from the first project, UESC Phase I, were included with the UESC Phase II effort. Virtually all the necessary documentation for a Task Order was developed by August. Unfortunately, the economics of this project are marginal and BNL decided to put the effort on hold while other options are evaluated, including a potential internally phase funded effort for the most cost-effective portions of the project.

Funding

Funding continues to be difficult for energy conservation and sustainability related projects in the current 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. However, while BNL is extremely

fortunate to have low energy rates to operate its' research programs, it makes it difficult to find cost-effective projects.

Table 3: Sustainability Funding

Category	FY20 Actual	FY21 Planned/ Request	FY22 Projected
Sustainability Projects*	0	100	200
Sustainability Activities other than projects	37.5	38.25	39.01
SPO Funded Projects (SPO funding portion only)	0	0	0
Site Contribution to SPO Funded Project	0	0	0
ESPC/UESC Contract Payments (if applicable)	1,597	1,645	1,695
Renewable Energy Credits (REC) Purchase Costs (if applicable)	51.7	60	70
Total	1,687	1,844	2,004

Training

The manager of Energy Management at BNL and the Data Center manager are Certified Energy Managers (CEM's). There is a least one other CEM on site, although not currently directly involved in site energy initiatives. Further, all of the Facility Complex Managers throughout the BNL campus have the Certified Facility Manager (CFM) recognition from the International Facilities Management Association. All of the Facility Complex Managers and Facility Complex Engineers participate in various training programs throughout the year to ensure core competencies are maintained.

Additionally, numerous employees attend training programs to maintain their professional certifications including PE, CEM, Green Professional, LEED, and others.

Plans and Projected Performance

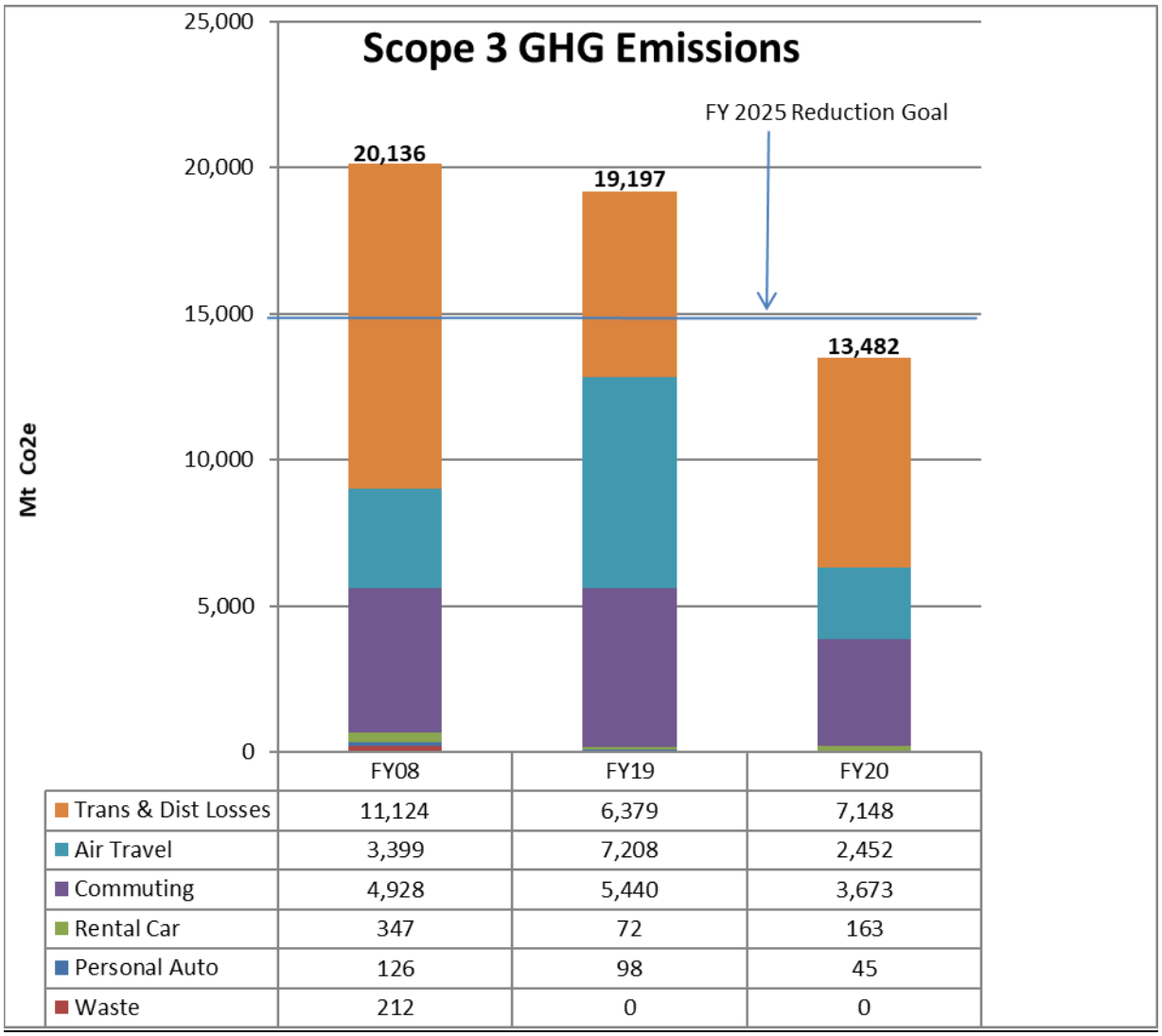
As indicated, the economics of the potential second UESC II effort are less cost-effective than the previous UESC. BNL is currently evaluating the project and available funding options, including a phased self-funded effort or a partnership with the New York Power Authority (NYPA). A decision regarding how best to move forward will be made in early FY21.

Travel & Commute

This category focuses on all information pertaining to the site's business travel and commute data, including participation in regional and local planning.

Performance Status

BNL continues to track its Scope 3 Greenhouse Gas (GHG) Emission in relation to the previously established Scope 3 greenhouse gas reduction goal established under Executive Order 13514. The figure below illustrates that, overall Scope 3 emissions are down 29.8% from FY 2019 (19,197 metric tons of carbon dioxide equivalent [MtCO2e]), and 33% lower than the FY 2008 baseline value.



	FY08	FY19	FY20
Trans & Dist Losses	11,124	6,379	7,148
Air Travel	3,399	7,208	2,452
Commuting	4,928	5,440	3,673
Rental Car	347	72	163
Personal Auto	126	98	45
Waste	212	0	0

Figure 13: Scope 3 GHG Emissions

The decrease from FY19 is primarily due to a 66% decline in air travel GHG emissions and a 33% drop in commuting GHGs. The COVID-19 pandemic had significant impacts on FY20 air travel and commuting GHGs. For the period from March 23 to September 30 when the Laboratory followed its limited operations plan consistent with New York State and DOE guidelines, air travel GHG emissions accounted for just 2.5% of FY 2020 total air travel emissions. During this period commuting GHG emissions were just 30% of the annual total, since the 64% of employees were working at home.

FY20 commuting GHG emissions for the period from October 1 to March 22 were estimated using employee residency zip code records to determine the average employee round trip commute distance and past results from an April 2016 gate survey that employed a combination of automatic traffic counters and personnel to record the numbers and types of single occupant vehicles and carpools entering the site during the morning commute hours. During BNL Min-Safe operations, it was assumed that all employees commuted alone and that 907 vehicles per day were driven based on Safeguard & Security main gate records.

The 12% increase in transmission and distribution loss GHGs, was due in part to a 10% increase in purchased electricity from the Long Island grid and higher local grid methane and nitrous oxide emission factors.

In September 2020, three Leviton Evr-Green 4000 Level Two charging stations were installed in the parking lots adjacent to Buildings 464, 734 and 744. The charging stations are intended to meet the current charging needs for one plug-in hybrid electric vehicle purchased in 2020, and future charging of the one to two additional plug-in hybrid vehicles BNL's Fleet Management anticipates purchasing each year over the two to three years. Each of the charging stations is equipped with two charging ports. The station charging ports will be accessible to employees who currently own plug-in hybrid or all electric vehicles, so long as the charging port are not being used or are otherwise reserved for recharging fleet vehicles. Employees using the charging stations, will be assessed fees to cover the cost of purchased electricity.

BNL's Information Technology Division (ITD) offers a variety of video and audio-conferencing services that enable personnel to communicate and collaborate with off-site personnel remotely thereby reducing business travel for offsite meetings. Video conferencing options include video collaboration utilizing Microsoft Teams and Zoom streaming platforms.

Regional and Local Planning

BNL continues to maintain close interaction with NY State, the Metropolitan Transportation Authority (MTA), Long Island Railroad (LIRR) and Suffolk County/Brookhaven Town officials regarding plans for the relocation of the Yaphank rail station. The plan is for the station to become a Yaphank/BNL rail station that is more proximate to BNL and public transportation arteries. New York State budgeted $20M for the relocation of the Yaphank rail station. A planning study for the relocated station has recently been completed.

The scope of the study includes planning for a station that would be more easily accessible for the general public, BNL, and potential public bus routes/vehicle access along the William Floyd Parkway corridor. The scope includes provisions for potential electrification of the rail line and capability for up to 3 platforms of 12 cars each. This potential electrification would make the Yaphank/BNL station the Eastern terminus

of the LIRR Ronkonkoma electrified line and relieve some of the congestion at the Ronkonkoma station. A station with more frequent electrified service within a mile of BNL (in conjunction with public bus routes or shuttle service) would make commuting by public transportation a viable option for BNL employees and make work at BNL attractive for New York City residents. The relocated station would also make travel to/from regional airports (John F. Kennedy International Airport [JFK], Laguardia, Islip) much more convenient for the thousands of researchers visiting BNL annually from all over the US and the World.

Plans and Projected Performance

Combined electricity purchases of conventional power and hydropower are projected to rise 9.8% from the FY20 total to 309,400 megawatt hours (MWh) in FY25 and by more than 49% to 420,800 MWh in FY30 when testing of the Electron Ion Collider is expected to begin. Using eGrid 2018 transmission and distribution (T&D) loss factors and 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 7,896 MtCO2e in FY25 and to 10,989 MtCO2e in FY30.

The surge in COVID 19 cases in the US and globally and strict NYS travel restrictions will most certainly contribute to reduced air travel in FY21. This surge will likely cause more exempt employees to seek their supervisor's approval of the to work from home on a limited basis in FY21.

Positive experiences using the Microsoft Team and Zoom platforms to collaborate remotely with colleagues during the pandemic will likely influence future decisions on domestic and foreign air travel. Post pandemic, it wouldn't be surprising to see more exempt employees who were able to productively work from home to make some arrangements with their supervisors to telework from home.

Regional and Local Planning

The Discovery Park development continues to make excellent progress. The Science and User Support Center is the Federally funded anchor for the Discovery Park development and received first year funding in FY19. Design of the facility is now underway. Development of standard ground lease requirements are underway to enable the start of privately funded development at Discovery Park in parallel with the SUSC. Initial agreements for utility services to Discovery Park have been reached to enable finalization and installation as needed to support development. The initial phase of development of Discovery Park, called Upton Square, would include the SUSC, a dormitory-like housing facility and a possible education center. These three facilities would largely serve existing BNL staff and visitors and have little to no impact on local traffic. The later phases of Discovery Park development would include creation of technology partnership facilities which could bring in an additional 1200 to 1500 daily visitors to BNL when fully built-out. This added traffic demand will be discussed with Suffolk County (William Floyd Parkway) and Brookhaven Town (Longwood Road) and be evaluated as part of the National Environmental Policy Act (NEPA) process for the technology partnership area development. Note that the potential Yaphank/BNL commuter rail station discussed above could significantly reduce the number of vehicles coming to BNL from current values.

Fugitives & 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).

Performance Status

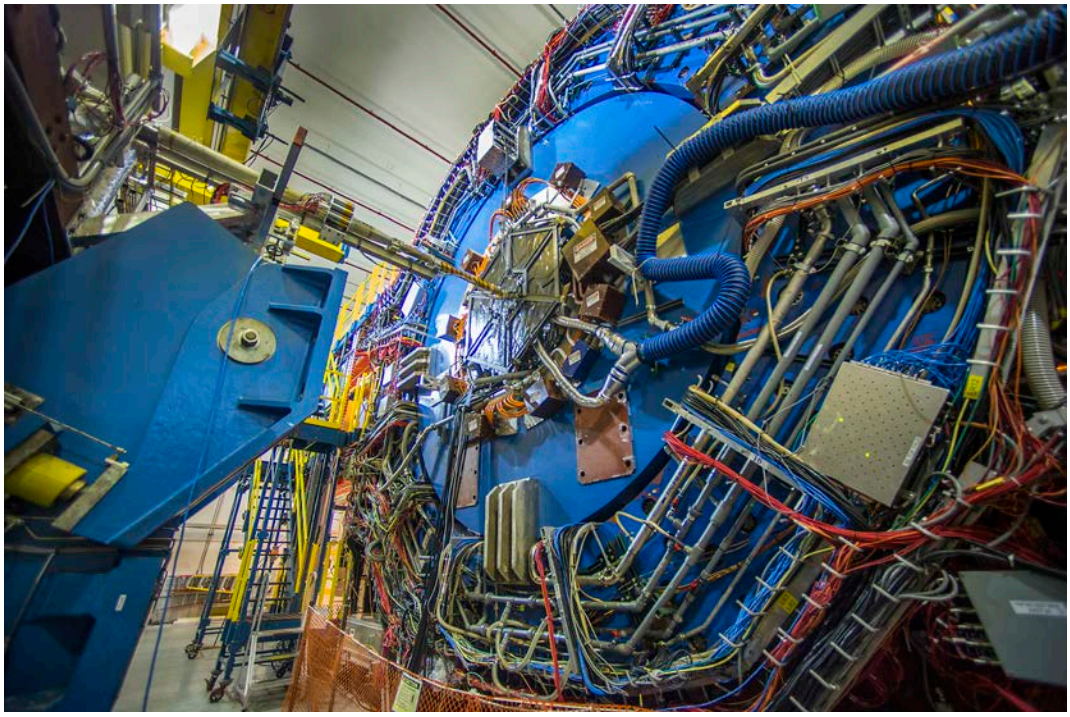
A variety of activities and operations at BNL use greenhouse gases for different purposes. The largest user of greenhouse gases at BNL is the Tandem Van de Graaff Facility. The two Tandem accelerator vessels with a combined storage volume of 16,050 ft^3 are filled with an insulating gas mixture consisting of 46%v SF_6, 44%v N_2, 6%v CO_2, and 4%v O_2. Annually, there are some emissions of SF_6 and CO_2 due to insulating gas leaks and the transfer of insulating gases during periodic maintenance of the Tandem accelerators.

The table below provides a summary of the sources of BNL fugitive greenhouse gas emissions in FY20.

Table 4: Fugitive GHG Emissions

Source	Activity	Gas	GHG Emissions ($MtCO_2e$)
Tandem Van de Graff	Insulating gas leaks	SF_6	4,112.28
		CO_2	0.00
	Accelerator gas transfers	SF_6	25.13
STAR Experiment	Detector gas purging	CH_4	8.29
		CO_2	0.00
		HFC-134a	1,900.31
		SF_6	221.32
Fleet Vehicle Repair	Fleet Motor Vehicle A/C Leaks	HFC-134a	11.09
Whole Site		CF_4	3.35
Refrigeration/AC Equipment	Gas Leaks	R-410A	14.97
LEReC Accelerator DC Gun	SF_6 service cart compressor leak	SF_6	620.51
Current Landfill	Methane generation	CH_4	34.85
Wastewater Treatment Plant	Effluent discharges	N_2O	0.58

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 2020 Relativistic Heavy Ion Collider experimental run.



STAR Detector at the Relativistic Heavy Ion Collider (RHIC)

On June 25, the Environmental Protection Division worked with 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.

Preventative maintenance inspections of eight 15.5 kV sulfur hexafluoride (SF_6) gas insulated switches were conducted in FY20 as part of BNL's proactive program to identify and mitigate leaks of the Laboratory's SF_6 gas insulated high-energy equipment. Recorded equipment temperature readings and pressure gauge readings during the inspection provided no evidence of SF_6 leaks.

Plans and Projected Performance

The annual preventative maintenance inspections for twenty-seven 15.5 kV SF_6 gas insulated switches and eight 72.5 kV SF_6 gas insulated circuit breakers to be conducted in FY21 were released in October 2020.

Electronic Stewardship

This category focuses on the acquisition, operations and management, and disposal techniques of all electronics reported, as well as efforts to consolidate and optimize high performance computers (HPCs)/data centers.

Performance Status

Acquisition/Operations

The Laboratory requires that all printers, laptops, and desktop computers ordered through the E-Pro system have an EPEAT "Gold" certification. BNL was awarded the 2020 Green Electronic Council's EPEAT award for purchases of environmentally preferred computers and other electronics.

During FY20 the Laboratory implemented printer management software that remotely manage printers and 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, going forward.

End of Life

BNL's procurement system is effective at managing electronics at end-of-life. Tagged equipment is identified at end-of-life and sent for recycling through a certified R2 recycler. Nearly 46 tons was sent for recycling during 2020, though that number is nearly half of the 2019 volume due primarily to COVID-19 impacts as well as the site-wide initiative during 2019 to upgrade hardware, which inflated 2019's number. Functional equipment sent for recycling is pulled back out and set aside for reuse.

BNL reused 898 computers, laptops and tablets during FY20 as well as a variety of small electronics avoiding purchases of new equipment.

BNL held one Home Electronics pickup day. The second planned day was cancelled due to COVID-19 work restrictions. The main purpose of this activity is to promote employee awareness and engagement in proper electronics disposal and is very popular with staff.

BNL received the "Green Electronics Council's 2020 EPEAT Purchaser Award" at the Gold Level.

BNL held one employee household E-Waste collection day during FY20

The figure below summarizes the amount of electronic equipment that has been recycled annually by BNL since 2006.

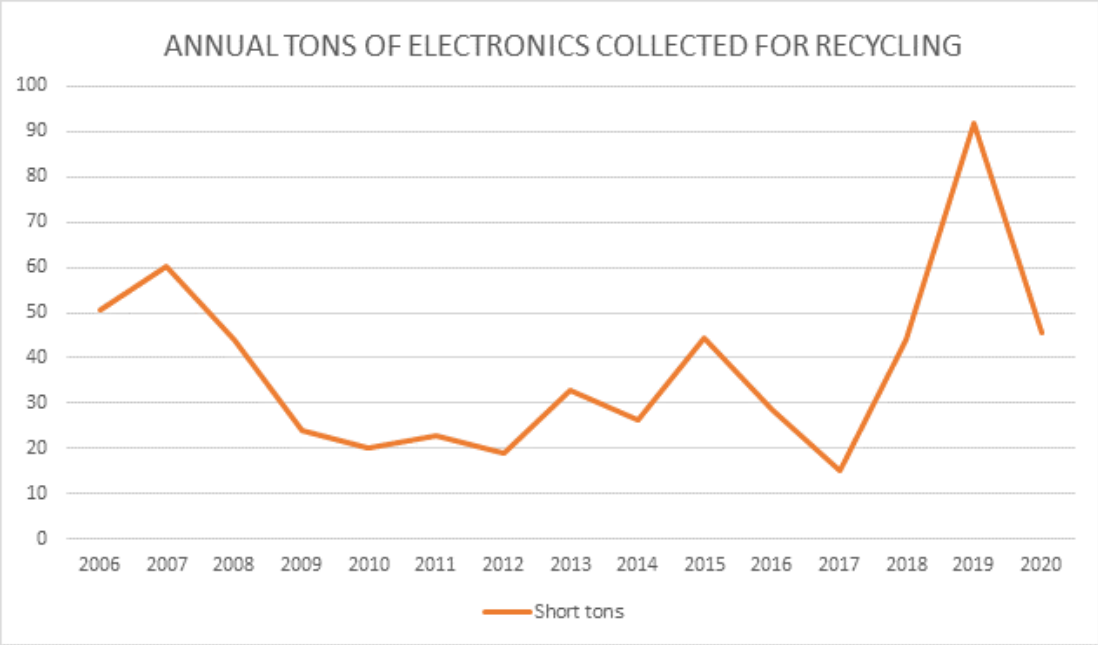


Figure 14: Annual Tons of Electronics Collected for Recycling

Data Centers

Existing 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. Previously, BNL had two data centers based on the former definition. A comprehensive assessment has yet to be completed but it is clear that additional resources will be needed to meet the goal of a PUE < 1.5. Four of the eight data centers will require the installation of additional metering in order to determine the actual PUE. The metering effort is in process with one new meter installed in FY20 and at least one new data center meter planned for FY21.

New Data Centers

The data center associated with the CFR project is currently in the construction phase with initial operation estimated to begin in June 2021. The design and construction are expected to result in a PUE of < 1.3 in accordance with the recent DCOI.

Plans and Projected Performance

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 FY21, 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 has completed the process of implementing the software and migrating printers.

End of Life

BNL will maintain its successful end-of-life electronics program including the Home Electronics pick up day by continuing to meet the objective to collect 100% of tagged electronics for recycling or reuse and also to break out electronics weights from home electronics pick up days and track that value separately.

Data Centers

Existing Data Centers

Meeting the PUE of 1.5 for the existing data centers will require a significant investment. Additional metering is in progress with at least one new meter to be installed in FY21.

The new metering will help to identify prioritized areas for actions and resources needed to meet the PUE 1.5 requirement.

New Data Centers

As previously mentioned, the data center associated with the CFR project is currently in the construction phase with initial operation estimated to begin in June 2021. The design and construction are expected to result in a PUE of < 1.3 in accordance with the recent DCOI.

Resilience

This category focuses on resilience-related topics and implementing policies to improve energy performance and to consider environmental factors in resilience planning. 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.

Performance Status

With response to COVID-19, BNL Office of Emergency Management (OEM) conducted a tabletop exercise with senior laboratory leadership from Human Resources (HR), Information Technology Division (ITD), F&O operations and the Occupational Medicine Clinic (OMC) among others. This exercise was held in February of 2020 prior to significant community spread locally. The goal of the exercise was to review established policies and procedures at the Laboratory including the BNL Pandemic Plan.

OEM declared a continuity event in March. Prior to the declaration, OEM met with Continuity Emergency Response Group (CERG) DOE O 150.1 A Continuity Programs. The CERG meeting reviewed potential impacts to BNL's seven Mission Essential Functions. BNL entered Min-Safe Operations due to the COVID-19 Pandemic.

OEM has participated on the following weekly video teleconference/WebEx meetings in response to COVID-19: COVID-19 Task Force, DOE Science Laboratories, Emergency Managers, DOE HQ SC Lab Synch Call, and Emergency Support Function-8 (ESF-8, representatives from local and state public health agencies). Additionally, monthly meetings were held with DOE-HQ COOP.

OEM also led (and continues to lead) a monthly conference call with the DOE Science Lab Emergency Manager's. This call includes emergency managers from across the DOE science lab community and is used to facilitate information sharing and standardization. Included on the call are managers from Argonne National Laboratory (ANL), Oak Ridge National Laboratory (ORNL), Lawrence Berkley National Laboratory (LBNL), Pacific Northwest National Laboratory (PNNL), Princeton Plasma Physics Laboratory (PPPL), Stanford Linear Accelerator (SLAC), Thomas Jefferson National Accelerator Laboratory (TJNAF), Fermi National Laboratory, and the National Renewable Energy Laboratory (NREL).

OEM is a member of the DOE Emergency Management Issues Special Interest Groups (EMI SIG) sponsored by DOE NA -41 Office of Plans and Policy and holds monthly WebEx meetings. OEM is a member of the Steering Committee consisting of managers from all the DOE sites and all have been instrumental in sharing COVID-19 information. Since COVID-19 initially affected the New York area, OEM shared the immediate response information with the other sites. The many conference calls and email data calls provided lessons learned and ideas for future use. Communication amongst the other labs was an important part in integrating best practices at BNL for operations related to COVID response.

On May 22, OEM successfully conducted a drill on establishing a virtual EOC for the emergency response organization. The drill required all EOC members to meet on Microsoft Teams. OEM demonstrated how to establish a Virtual EOC in the event of an operational emergency, which occurred during the time BNL operated in Min-Safe mode during the pandemic.

OEM requested and consolidated all the Recovery Plans from the Directorates, Departments, and Offices to assist in establishing phased staffing levels used during the Min-Safe Operating Mode and the Resumption of Operations Planning.

For the Phase 1 Resumption of Operations at BNL, OEM prepared a crosswalk using the NYS reopening requirements for business and the Resumption of Operations Planning to assure state and local compliance.

Essential Personnel Onsite at BNL During Min-Safe Operations

OEM developed and managed the upgrade of the Essential Personnel Program allowing line organizations to manage personnel in real time based on programmatic needs. BNL entered Min-Safe operations (starting in March 2020) and leveraged the enhanced upgraded Essential Personnel program to its maximum potential. This benefitted both Min-Safe operations and the Resumption of Operations Phase 1 & 2. Ensuring only authorized personnel were allowed onsite was critical to maximize social distancing for personnel safety.

Plans and Projected Performance

OEM performs five joint self-assessments with BSHO and ten partial self-assessments. The following table outlines the five-year plan for assessments:

Table 5: Emergency Management Five-Year Assessment Plan

Program Elements	2021	2022	2023	2024	2025
EP.01 All-Hazards Planning Bases (00409)	S	S	**X**	S	**X**
EP.02 Program Administration (00410)	S	**X**	S	**X**	S
EP.03 Training and Drills (00411)	**X**	S	S	S	S
EP.04 Emergency Operations System (00412)	S	S	**X**	S	**X**
EP.05 Readiness Assurance (00413)	**X**	S	S	S	S
EP.06 Emergency Response Organization (00414)	S	**X**	S	**X**	S
EP.07 Offsite Response Interfaces (00415)	S	S	**X**	S	**X**
EP.08 Emergency Facilities and Equipment/Systems (00416)	**X**	S	S	S	S
EP.09 Emergency Categorization/ Classification (00417)	S	**X**	S	**X**	S
EP.10 Notification and Communication (00418)	**X**	S	S	S	S
EP.11 Consequence Assessment (00419)	S	**X**	S	**X**	S
EP.12 Protective Actions (00420)	S	S	**X**	S	**X**
EP.13 Emergency Medical Support (00421)	**X**	S	S	**X**	S
EP.14 Emergency Public Information (00422)	S	**X**	S	S	S
EP.15 Termination and Recovery (00423)	S	S	**X**	S	**X**

The following table outlines the five-year plan for drills and exercises based on the response program elements required.

Table 6: Emergency Management Drill and Exercise Five-Year Plan

Response Program Element	FY21	FY22	FY23	FY24	FY 25
Emergency Response Organization	X	X	X	X	X
Offsite Response Interfaces		X		X	
Emergency Facilities and Equipment	X	X	X	X	X
Categorization and Classification	X	X	X	X	X
Notifications and Communications	X	X	X	X	X
Consequence Assessment	X	X	X	X	X
Protective Actions and Reentry	X	X	X	X	X
Emergency Medical Support		X		X	
Emergency Public Information	X	X	X	X	X
Termination and Recovery	X		X		X

Appendix A: Dashboard Data Accuracy Self-Certification

Self-Certification of the Dashboard

BNL has utilized the built-in approval process within DOE's Sustainability Dashboard to certify the accuracy and completeness of the data submission.

Appendix B: Excluded Buildings Self-Certification Process

Self-Certification of Excluded Buildings

BNL has utilized the built-in approval process within DOE's Sustainability Dashboard to certify the FY20 Excluded Buildings List.

Appendix C: Comprehensive Scorecard

Facility Management

Energy Intensity

Goal: 30% energy intensity (Btu per gross square foot) reduction in goal-subject buildings by FY 2015 from a FY 2003 baseline and 1.0% YOY thereafter.
Interim Target (FY 2020): -1.0%

Current Performance: -3.1%

	FY 2015	FY 2019 (PY)	FY 2020	% Change from Baseline	% Change from Last Year
Purchased Utilities (MMBtu)	718,305.2	690,241.0	687,410.0	-4.3%	-0.4%
Purchased Renewables (MMBtu)	0.0	0.0	0.0	N/A%	N/A%
Goal-subject GSF	2,957,443.0	2,921,657.0	2,921,462.0	-1.2%	-0.0%
Energy Intensity (Btu/GSF)	**242,880.5**	**236,249.8**	**235,296.6**	**-3.1%**	**-0.4%**

Clean Energy

Goal: Continue to increase non-electric thermal usage. YOY increase; no set target but an indicator in the OMB scorecard.
Interim Target (FY 2020): 0.0%

Current Performance: 6.0%

	FY 2019 (PY)	FY 2020	% Change from Last Year	% Compliant
Grid Electricity	917,803	961,201	4.7%	
Non-renewable Thermal Energy	625,408	616,397	-1.4%	
On-Site Renewable Energy	0	0.0	N/A%	
Purchased Green Electricity	0	0.0	N/A%	
Renewable Energy Certificates	68,240	75,064	10.0%	
Bonuses			N/A%	
Total Renewable Energy with Bonuses (MMBtu)	**94,017**	**100,841**	**7.3%**	**N/A%**
Total Energy Consumed (MMBtu)	**1,543,211**	**1,577,598**	**2.2%**	

Renewable Electricity

Goal:"Renewable Electric Energy" requires that renewable electric energy account for not less than 7.5% of a total agency electric consumption by FY 2013 and each year thereafter.
Interim Target (FY 2020): 30.5%

Current Performance: 9.0%

	FY 2019 (PY)	FY 2020	% Change from Last Year	% Compliant
Grid Electricity	268,993	281,712	4.7%	
On-Site Renewable Energy	0	0.0	N/A%	
Purchased Green Electricity	0	0.0	N/A%	
Renewable Energy Certificates	20,000	22,000		
Bonuses	3,739	3,337	-10.8%	
Total Renewable Electricity with Bonuses (MWh)	**23,739**	**25,337**	**6.7%**	**0.3%**
Total Electricity Consumed (MWh)	**268,993**	**281,712**	**4.7%**	

Potable Water Intensity

Goal: 20% potable water intensity (Gal per gross square foot) reduction by FY 2015 from a FY 2007 baseline and 0.5% YOY thereafter.
Interim Target (FY 2020): -0.5%

Current Performance: -45.6%

	FY 2007	FY 2019 (PY)	FY 2020	% Change from Baseline	% Change from Last Year
Water Consumption (million gal)	412.9	368,520.0	389.4	-5.7%	-99.9%
Aquifer Recharge (million gal)	322.1	313.2	331.0	2.8%	5.7%
Total GSF	4,081,900.0	4,815,914.0	4,826,599.0	18.2%	0.2%
Water Intensity (Gal/GSF)	**22.3**	**76,456.3**	**12.1**	**-45.7%**	**-100.0%**

Non-Potable Water Consumption

Goal: Non-potable freshwater consumption (Gal) reduction of industrial, landscaping, and agricultural (ILA). YOY reduction; no set target.
Interim Target (FY 2020): 0.0%

Current Performance: 0.0%

	FY 2010	FY 2019 (PY)	FY 2020	% Change	% Change from Last Year
Industrial	0.0	0.0	0.0	N/A%	N/A%
Landscaping	0.0	0.0	0.0	N/A%	N/A%
Agricultural	0.0	0.0	0.0	N/A%	N/A%
Total Non-Potable Water (million gal)	**0.0**	**0.0**	**0.0**	**N/A%**	**N/A%**

Sustainable Buildings

Goal: At least 15% (by count) of owned existing buildings to be compliant with the revised Guiding Principles for Sustainable Buildings by FY 2021, with annual progress thereafter.
Interim Target (FY 2020): 15.0%

Current Performance: 18.4%

	Building Count	GSF
Guiding Principles Certified	14	1,202,796
Total Applicable*	76	4,100,945
Performance (%)	**18.42%**	**29.33%**

* Applicable means buildings and trailers that are DOE owned or DOE leased where the gross/rentable SqFt is greater than 5,000.

Fleet Management

Fleet Petroleum

Goal: 20% reduction in annual petroleum consumption by FY 2015 relative to a FY 2005 baseline and 2.0 % YOY thereafter.
Interim Target (FY 2020): -2.0%

Current Performance: -100.0%

	FY 2005	FY 2020	% Change
Gasoline	5,488,033	0	-100.0%
Diesel	1,751,377	0	-100.0%
Biodiesel*	162,050	0	-100.0%
Total Petroleum (GGE)	**7,401,460**	**0**	**-100.0%**

* Includes only the diesel content of B20

Fleet Alternative Fuel

Goal: 10% increase in annual alternative fuel consumption by FY 2015 relative to a FY 2005 baseline; maintain 10% increase thereafter.
Interim Target (FY 2020): 10.0%

Current Performance: 0.0%

	FY 2005	FY 2020	% Change
E-85	401,903	0	-100.0%
Biodiesel*	102,852	0	-100.0%
CNG	69,914	0	-100.0%
Other*	50,035	0	-100.0%
Total Alternative (GGE)	**624,704**	**0**	**-100.0%**

* Biodiesel contains B100 plus the biodiesel content from B20. Other contains LNG, LPG, and electric

Fleet Greenhouse Gas Emissions/Mile

Goal: Non-potable freshwater consumption (Gal) reduction of industrial, landscaping, and agricultural (ILA). YOY reduction; no set target.
Interim Target (FY 2020): 0.0%

Current Performance: 0.0%

	FY 2014	FY 2020	% Change
Fleet Fuel GHG (MtCO2e)	0.7	0.0	-100.0%
Fleet Miles (x1000)	792.0	0.0	-100.0%
Greenhouse Gas Emissions / Mile (gCO2e/Mile)	**1.0**	**0.0**	**-100.0%**

Waste Management

Municipal Solid Waste

Goal: Divert at least 50 percent of non-hazardous solid waste (excluding construction and demolition debris)
Interim Target (FY 2020): 50.0%

Current Performance: 83.8%

	FY 2020	%
Off-Site Landfills	390.1	16.2%
On-Site Landfills	0.0	0.0%
Waste to Energy*	0.0	0.0%
Non-diverted Waste	***390.1***	***16.2%***
Diverted Waste	444.1	18.4%
On-Site Composted	1,580.1	65.5%
Off-Site Composted	0.0	0.0%
Waste to Energy Credit	0.0	0.0%
Total Diverted Waste	***2,024.2***	***83.8%***
Total Waste (metric tons)	**2,414.3**	**100.0%**

* For E.O. 13693, waste to energy does not count as diverted waste, but some credit may be applied

Construction & Demolition

Goal: Divert at least 50 percent of construction and demolition materials and debris
Interim Target (FY 2020): 50.0%

Current Performance: 0.0%

	FY 2020	%
Landfilled C&D Waste	0.0	0.0%
Diverted C&D Waste	0.0	0.0%
Total C&D Waste (metric tons)	**0.0**	**0.0%**

Electronics Stewardship

Electronics Acquisition

Goal: 100 percent of eligible electronics procurements must be environmentally sustainable (e.g. EPEAT)
Interim Target (FY 2020): 95.0%

Current Performance: 98.0%

	EPEAT Acquired	Total Acquired	%
Monitors	408	422	96.7%
Computers	1,027	1,041	98.7%
Imaging Equipment	60	60	100.0%
Televisions	0	0	N/A%
Total Acquired	**1,497**	**1,527**	**98.0%**

Electronics Recycling

Goal: Dispose of 100 percent of electronics through government programs and certified recyclers
Interim Target (FY 2020): 100.0%

Current Performance: 100.0%

	Amount	%
Transferred or Donated	0.000	0.0%
Recycled by Certified Recycler	41.386	100.0%
Recycled by non-Certified Recycler	0.000	0.0%
Amount disposed (e.g. landfill)	0.000	0.0%
Total Electronics Waste (metric tons)	**41.386**	**100.0%**

Duplex Printing

Goal: Implement and actively use duplex printing features of 100 percent of eligible printers
Interim Target (FY 2020): 100.0%

Current Performance: 0.0%

	Total Owned	Duplex Enabled	Incapable	%
Total Printers	**0**	**0**	**0**	**0.0%**

Power Management

Goal: Implement and actively use power management features on 100 percent of eligible computers (PCs & laptops) and monitors
Interim Target (FY 2020): 100.0%

Current Performance: 31.8%

	Total Owned	PM Enabled	Exempt	%
Monitors	0	0	0	N/A%
Computers	3,546	1,112	45	31.8%
Total Items	**3,546**	**1,112**	**45**	**31.8%**

Acquisition

Sustainable Acquisition

Goal: Ensure 95 percent of new contract actions for products and services meet sustainable acquisition requirements
Interim Target (FY 2020): 95.0%

Current Performance: 0.0%

	Contracts Reviewed	Contracts Without Opportunity	Contracts Meeting All Requirements	%
Number of Contracts	**0.0**	**0.0**	**0.0**	**0.0%**

Greenhouse Gas Management

Scope 1 & 2 Greenhouse Gas Emissions

Goal: YOY scope 1 & 2 GHG emissions reduction from a FY 2008 baseline.
Interim Target (FY 2020): 0.0%

Current Performance: -41.4%

	FY 2008	FY 2019 (PY)	FY 2020	% Change from Baseline	% Change from Last Year
Facility Energy	198,085.9	114,105.3	122,413.2	-38.2%	7.3%
Non-Fleet V&E Fuel	265.6	294.8	375.3	41.3%	27.3%
Fleet Fuel	942.4	313.8	0.0	-100.0%	-100.0%
Fugitive Emissions	6,266.9	5,163.4	6,917.3	10.4%	34.0%
On-Site Landfills	65.4	36.6	34.9	-46.6%	-4.6%
On-Site WWT	2.1	2.5	0.6	-71.4%	-76.0%
Renewables	0.0	0.0	0.0	N/A%	N/A%
RECs	0.0	0.0	-9,305.3	N/A	N/A
Total (MtCO2e)	**205,628.2**	**119,916.4**	**120,435.9**	**-41.4%**	**0.4%**

Scope 3 Greenhouse Gas Emissions

Goal: YOY scope 3 GHG emissions reduction from a FY 2008 baseline.
Interim Target (FY 2020): 0.0%

Current Performance: -68.5%

	FY 2008	FY 2019 (PY)	FY 2020	% Change from Baseline	% Change from Last Year
T&D Losses*	10,700.2	3,783.1	0.0	-100.0%	-100.0%
T&D RECs Credit	0.0	0.0	-613.0	N/A	N/A
Air Travel	3,398.7	7,208.3	2,569.8	-24.4%	-64.3%
Ground Travel	473.0	170.1	208.9	-55.8%	22.8%
Commute	4,929.0	5,439.9	3,673.0	-25.5%	-32.5%
Off-Site MSW	212.8	591.3	373.8	75.7%	-36.8%
Off-Site WWT	0.0	0.0	0.0	N/A%	N/A%
Total (MtCO2e)	**19,713.6**	**17,192.7**	**6,212.6**	**-68.5%**	**-63.9%**

* Includes T&D losses for purchased renewable electricity

Appendix D: List of Acronyms & Abbreviations

AFV	Alternative Fuel Vehicles
AGS	Alternating Gradient Synchrotron
ANL	Argonne National Laboratory
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ATF	Accelerator Test Facility
BAS	Building Automation System
BHSO	Brookhaven Site Office
BLCC	Building Life-Cycle Cost
BNL	Brookhaven National Laboratory
BMP	Best Management Practice
BORE	Beneficial Occupancy Readiness Evaluation
BSA	Brookhaven Science Associates
Btu	British thermal unit
C&D	Construction & Demolition Debris
C-AD	Collider-Accelerator Department
CAFE	Corporate Average Fuel Economy
CD	Critical Decision
CEM	Certified Energy Manager
CERG	Continuity of Emergency Response Group
CERN	European Organization for Nuclear Research
CFL	Computers for Learning
CFM	Certified Facility Manager
CFN	Center for Functional Nanomaterials
CFR	Code of Federal Regulations
CFR	Core Facility Revitalization
CHP	Combined Heat and Power
CLCPA	Climate Leadership and Community Projection Act
CMS	Chemical Management System
COOP	Continuity of Operations Plan
CSF	Central Steam Facility
CSI	Computational Science Initiative
CURP	Critical Utility Rehabilitation Project
DBT	Design Based Threat
DCOI	Data Center Optimization Initiative
DOE	Department of Energy
ECM	Efficiency & Conservation Measures
EIC	Electron-ion collider
EHSS	Office of Environment, Health, Safety & Security
EISA	Energy Independence and Security Act
EMI SIG	Emergency Management Issues Special Interest Groups
EMS	Environmental Management System
EO	Executive Order
EOC	Emergency Operations Center
EPA	Environmental Protection Agency

EPEAT	Electronic Product Environmental Assessment Tool
EPHA	Emergency Preparedness Hazard Assessment
EPP	Environmentally Preferable Purchasing
ERO	Emergency Response Organization
ESCO	Energy Service Company
ESF	Emergency Support Functions
ESPC	Energy Savings Performance Contract
ESSH	Environmental, Security, Safety & Health
EU	Energy & Utilities
EUI	Energy Utilization Index
F&O	Facilities and Operations
FAA	Federal Aviation Administration
FCA	Facility Condition Assessment
FCE	Facility Complex Engineer
FCM	Facility Complex Manager
FEMP	Federal Energy Management Program
FIMS	Federal Information Management System
FPDS	Federal Procurement Data System
FY	fiscal year
gal	gallons
GHG	Greenhouse Gas
GOCO	Government-Owned, Contractor-Operated
GP	Guiding Principle
gpf	gallons per flush
GPM	Gallons Per Mile
GSA	U.S. General Services Administration
gsf	gross square feet
HASP	Health and Safety Plan
HEMSF	High-Energy Mission-Specific Facility
HFC	hydrofluorocarbon
HPC	High-Performance Computing
HPSB	High Performance Sustainable Buildings
HQ	Headquarters
HR	Human Resources
HVAC	heating, ventilation, and air-conditioning systems
IESNA	Illuminating Engineering Society of North America
IFM	Integrated Facility Management
IFMA	International Facilities Management Association
IGA	Investment Grade Audit
IGPP	Institutional General Plant Projects
ILA	industrial, landscaping, and agricultural
ISB-I	Interdisciplinary Science Building I
ITD	Information Technology Division
JFK	John F. Kennedy International Airport
kV	kilovolt
kW	kilowatt
kWh/yr	kilowatt hour per year
LBNL	Lawrence Berkley National Laboratory

LCC	Life-Cycle Cost
LDT	light-duty truck
LEED	Leadership in Energy & Environmental Design
LI	Long Island
LINAC	linear accelerator
LIPA	Long Island Power Authority
LIRR	Long Island Railroad
LISF	Long Island Solar Farm
LOB	Laboratory Office Building
M&V	measurement and verification
mmBtu	one million Btu
MPO	Modernization Project Office
MSW	Municipal Solid Waste
MTA	Metropolitan Transportation Authority
$MtCO_2e$	metric tons of carbon dioxide equivalent
MW	megawatts
MWh	megawatt hours
NEPA	National Environmental Policy Act
NPCC	Northeast Power Coordinating Council, Inc.
NREL	National Renewable Energy Laboratory
NSERC	Northeast Solar Energy Research Center
NSLS-I	National Synchrotron Light Source
NSLS-II	National Synchrotron Light Source II
NYC	New York City
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSERDA	New York State Energy Research and Development Authority
ODS	ozone depleting substance
OEM	Office of Emergency Management
OH&P	Overhead and Profit
OMB	Office of Management and Budget
OMC	Occupational Medicine Clinic
ORNL	Oak Ridge National Laboratory
PA	Preliminary Assessment
PAP	Performance Assurance Plan
PE	Professional Engineer
PFAS	per- and polyfluoroalkyl substances
PFC	perfluorocarbon
PHENIX	Pioneering High Energy Nuclear Interaction Experiment
PM	preventative maintenance
PNNL	Pacific Northwest National Laboratory
PPPL	Princeton Plasma Physics Laboratory
PPM	Procurement and Property Management
PSC	Public Service Commission
PUE	power utilization effectiveness
PV	photovoltaic
RACF	RHIC ATLAS Computing Facility
RCA	recycled concrete aggregate

RE	Renewable Energy
REC	Renewable Energy Credit
RFP	Request for Proposals
RHIC	Relativistic Heavy Ion Collider
SC	Office of Science
SF_6	Sulfur Hexafluoride
SLAC	Stanford Linear Accelerator
SLI	Science Laboratories Infrastructure
SNAP	Significant New Alternative Policy
SPO	Sustainability Performance Office
SSP	Site Sustainability Plan
STAR	Solenoidal Tracker at RHIC
STP	Sewage Treatment Plant
SUF	Service Usage Forms
SUSC	Science User Support Center
SUV	Sports Utility Vehicle
SWP	Safe Work Plan
T&D	Transmission & Distribution
TEC	total estimated cost
THIRA	Threat and Hazard Identification and Risk Assessment
TJNAF	Thomas Jefferson National Accelerator Laboratory
TOF	time of flight
UESC	Utility Energy Service Contract
USDA	U.S. Department of Agriculture
WWII	World War II
YOY	Year-over-year