U.S. DEPARTMENT OF ENERGY

2019 Sustainability Report and Implementation Plan

Report to the Office of Management and Budget and the Council on Environmental Quality

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Executive Summary

This is the Department of Energy's (DOE or Department) action plan to carry out Executive Order 13834, *Efficient Federal Operations* (E.O. 13834). It is designed to be a plan that can, and will over time, propel DOE to become the leader in the government for efficiency. DOE will become a leader not only in energy and water efficiency, but in all the elements of the Executive Order, allowing DOE to sustain its mission for decades to come. DOE operates a nationwide system of 17 National Laboratories that provides world-class scientific, technological, and engineering capabilities as well as oversees operations at 83 field locations and headquarters in Washington, D.C. – with over 14,000 Federal employees and 95,000 management and operating contractors and other contractor employees.

The following steps are key to the sustainability action plan:

- We will understand our performance.
- We will identify projects that can save the Department money and pursue them with vigor.
- We will actively engage with our stakeholders and private sector partners to ensure quality contracting and project execution.
- We will identify and eliminate barriers to new opportunities.
- We will cheer our successes.

Our primary strategy is to ensure that all sites are executing their responsibilities to evaluate energy and water consumption as required by statute, and to use the results of those evaluations, along with advanced analytics of other data, to create and prioritize projects that can save the Department money. Our second strategy is to share this information with program leaders to ensure that funds can be budgeted to the sites or to seek financing through energy savings performance contracts (ESPCs) and utility energy services contracts (UESCs). Two additional key strategies are to continue to add sites using the 50001 Ready tool developed by FEMP and engage additional sites to join the SmartLabs partnership. DOE is exploring the use of savings reinvestment programs (SRPs) at the site or program level. SRPs may provide DOE sites with consistent and dedicated resources to fund additional measures.

E.O. 13834 directs Federal agencies to manage their buildings, vehicles, and overall operations to optimize energy and environmental performance, reduce waste, and cut costs. DOE will continue to reduce facility energy and water usage intensity by promoting the installation of advanced building-level meters, implementing cost-effective efficiency measures, and exploring all funding options for infrastructure upgrades, including appropriated funds, ESPCs, UESCs, and power purchase agreements (PPAs). In an effort to maximize our use of reliable, resilient, clean energy in meeting statutory requirements, DOE will explore on-site energy opportunities including renewable energy sources, small modular nuclear technologies, microgrids, combined heat and power systems, and other new and existing technologies. These technologies can ensure continuation of our operations and resilience to disruption from many sources, including accidents, natural disasters, and physical- or cyber-attacks, while increasing efficiency through reduced line losses, on-site use of waste heat, and use of state-of-the-art technology.

In Fiscal Year (FY) 2018, DOE achieved a 1.2 percent reduction in energy intensity from FY 2017, and a 38.2 percent reduction from the FY 2003 baseline. Additionally, DOE successfully reduced potable water intensity by 2.9 percent from the previous year, equating to a 32.4 percent reduction from the FY 2007 baseline. However, as DOE's mission activities continue to grow, it will become more challenging to continue achieving annual reductions especially in water intensity. The anticipated growth in operational demands to fulfil DOE's vital mission activities, such as additional high performance computing centers, will make it difficult for DOE to achieve continued energy and water intensity reductions.

To counter the costs and potential environmental impacts of this growth, DOE will follow the key steps of our sustainability action plan as we identify, evaluate, and implement opportunities to reduce inefficiencies and optimize performance at our sites through facility, waste, and fleet management. Our data show that in the last five years, 176 energy or water

conservation measures (collectively, ECMs) with a ten-year payback or less were identified for implementation across 20 sites with a combined estimated average annual savings of over $5 million in energy and water costs. DOE will prioritize these measures through business-case analysis and determine which ones would have the greatest impact per dollar invested, and then engage the programs and sites to ensure that there is a plan for implementation. Facility management activities will focus on the adoption of technologies that reduce energy and water consumption, and continued energy and water efficiency evaluations of DOE's facilities as required under 42 U.S.C §8253(f)(3). Procurement opportunities will be assessed for sustainability, to determine the inclusion of appropriate clauses for energy efficient products, biobased products, recycled content products, or other environmental attributes as required by statute. For waste management and pollution prevention, DOE will focus on preventing or reducing waste at its source wherever feasible, leveraging the Environmental Management Systems (EMS) already in place. Pollutants and waste that cannot be prevented through source reduction will be diverted from entering the waste stream through environmentally-safe and cost-effective reuse or recycling initiatives. Fleet management will focus on fleet optimization, vehicle right-sizing, the use of alternative fuels, and reducing petroleum consumption. By continuing to improve efficiency in the management of DOE's sites, the Department is optimizing environmental performance while reducing costs.

Implementation Summary: Facility Management

1. FACILITY ENERGY EFFICIENCY

FY 2018 Energy Intensity Progress (Btu/GSF):

38.2 percent reduction from FY03
1.2 percent decrease from FY17

FY 2019-FY 2020 Plan:

1 percent reduction in FY19 from FY18
1 percent reduction in FY20 from FY19

Implementation Status:

In FY 2018, DOE achieved a 1.2 percent energy intensity reduction from FY 2017 and a 38.2 percent energy intensity reduction from FY 2003. DOE leverages infrastructure investments to improve the sustainability and efficiency of its operations. DOE utilizes strategies such as redesigning interior space, upgrading aging equipment, and installing energy meters and sub-meters to monitor, benchmark, and help identify opportunities to reduce facility energy consumption. Meters allow sites to identify where energy is most consumed and direct their efforts to maximize energy reductions and financial savings. DOE sites continue to conduct energy evaluations to comply with the Energy Independence and Security Act of 2007 (EISA), §432 (42 U.S.C §8253(f)(3)). The evaluations are used to identify efficiency and conservation measures along with assessing performance of implemented measures. Furthermore, a few sites also incorporate energy efficiency and sustainability evaluations into all on-site facility projects using appropriate checklists. Specific highlights from FY 2018 include:

- Argonne National Laboratory (ANL) implemented an automated meter-reading program for all network-connected meters across the site's campus; the program was internally developed and it reduces errors associated with manual reading and entry of meter readings, while also performing regular data validation checks to flag erroneous or suspect readings; and
- Thomas Jefferson National Accelerator Facility (TJNAF) achieved significant improvements in energy intensity with a 36 percent reduction from FY 2003, and a 6 percent reduction from the prior year. In FY 2018, they continued to implement energy conservation measures and realized the benefits from reducing the power usage effectiveness (PUE) rating of their data centers through a major, multi-year consolidation, reconfiguration, and renovation project.

Some of DOE's largest sites have experienced significant increases in energy intensity due to increases in their missions. DOE excludes approximately 15 percent of its roughly 127 million gross square footage (GSF) from the facility energy efficiency goal (in accordance with published guidelines). These excluded facilities make up 37 percent of DOE's total energy use. Most

excluded facilities are high energy mission-specific facilities (HEMSF) engaged in scientific research and industrial processes that are critical to meeting the missions of the Department and are extremely energy intensive compared to typical government building assets. Additional high performance computing data centers to meet Exascale performance levels, as well as other HEMSFs, are anticipated in the near future. As the energy and water consumption to fulfill DOE's mission increases, so do our sustainability challenges. Thus, we must build the business case for efficiency and conservation measures, help sites to ensure prioritization of money-saving projects in the budget process, and assist those programs to secure funding for efficiency opportunities.

Priority Strategies & Planned Actions

The Department's Sustainability Performance Office (SPO) will continue to measure and benchmark performance of DOE sites, assist programs in identifying high-value, high impact, cost-effective energy efficiency projects at sites by analyzing site data and working with both program and site personnel to identify projects that can help offset mission-driven increases in energy demand and increase the resilience of our energy infrastructure. In FY 2019, SPO spearheaded a Federal Utilities Working Group with DOE's Power Marketing Administrations (PMAs) and the Tennessee Valley Authority (TVA) to engage the utilities and share challenges/best practices for meeting sustainability goals. The purpose of this working group is to encourage the exchange of ideas between the PMAs and TVA on cost effective efficiency measures and projects that will help all parties meet their sustainability goals, provide significant cost savings, and benefit the overall mission.

DOE will focus efforts on promoting and sharing best practices from energy efficiency project successes to assist DOE sites with improving facility energy management and performance. For example, Lawrence Berkeley National Lab (LBL) and Argonne National Lab (ANL) have worked to integrate their sustainability, project management, operations and maintenance practices together to support "continuous commissioning" and efficiency planning throughout the organization. In about one year, LBL was able to identify projects that save 5.1 million kilowatt hours (kWh) of electricity and over $350,000 annually. In addition, sites will continue to install and replace building level meters on facilities with high energy use, and SPO will continue to work with sites to prioritize and complete the installation of meters in the remaining 9 percent of applicable buildings and in new construction. SPO will also offer training and connect sites to help with the planning/installation process of meters. DOE building performance data will be entered into EPA's Portfolio Manager (PM) as required and used by SPO and other offices to identify areas of opportunity. DOE's SPO plans to update the agency metering plan beginning in 2020 with an estimated release date during the summer of 2021.

DOE's two-year plan includes focusing on re-commissioning or retro-commissioning programs for top energy intensive buildings. For instance, Stanford Linear Accelerator Laboratory (SLAC) is strategizing to implement a Science Laboratories Infrastructure (SLI) Program-funded $96 million Campus Building Renovation Project (CBRP) that includes remodeling up to four laboratory and office buildings that will each be designed to perform at least 30 percent more energy efficiently than the energy code, American Society of Refrigeration, Air-Conditioning Engineers (ASHRAE) Standard 90.1. These renovations have the potential to improve the efficiency of the campus-wide chilled water distribution system with the added instrumentation and controls.

Since one of DOE's challenges is the large quantity of laboratory space, some of which are quite old and energy intensive, several sites will also continue to adopt and implement recommendations from the Better Building's Smart Labs Initiative, a national leadership initiative with the goal of improving energy efficiency in laboratory buildings by at least 20 percent in ten years or less. Furthermore, when cost-effective, sites will utilize energy management systems to improve efficiencies. DOE's SPO is implementing an agency level DOE's 50001 Ready Program, an online self-guided approach based on ISO 50001 This program establishes an energy management system to plan, identify, prioritize, and implement projects that will improve energy performance, and each site will have the opportunity to join their plan with that of the agency wide plan. DOE expects energy consumption in goal and excluded facilities to increase, in terms of BTUs, by approximately 36 percent by FY 2028. This increase will be caused by anticipated growth in operational demands to fulfil DOE's mission in upcoming years. However, despite the increase in tasks to fulfil DOE's mission energy consumption, DOE still expects an overall energy intensity decrease of only one percent.

2. EFFICIENCY MEASURES, INVESTMENT, AND PERFORMANCE CONTRACTING

FY 2018 Performance Contracting – Investment value and number of new projects awarded:

$44.8 M / 1 project awarded in FY18

FY 2019-FY 2020 Plan:

$0 / 0 projects anticipated in FY19
1 project anticipated in FY20

Implementation Status

As stated in our executive summary, we will ensure that sites are properly evaluating energy and water consumption as required by statute. SPO will use the data collected from sites to help prioritize and facilitate energy-saving projects that save the Department money. DOE considers life-cycle cost analysis when selecting all sustainability projects for funding. Return on investment and net present value are calculated in accordance with OMB Circular A-94, Guidelines and Discount Rates For Benefit-Cost Analysis of Federal Programs. Performance contracts are often complex and resource intensive in the initial stages of a project, necessitating significant cost savings over the contractual performance period to be cost effective. DOE sites frequently struggle to find cost effective measures, in part due to DOE's low-cost electricity contract prices in most regions of the country. The following are examples of efficiency measures, investment, and performance contracting in FY 2018:

- Los Alamos National Laboratory (LANL) awarded a 16 year ESPC for a Steam Plant Replacement Project to purchase $44.8 million of capital improvements and upgrades with a life of contract cost of $128 million. The project has guaranteed cost savings calculated at $129 million and annual energy savings of approximately 181 billion BTU. ;
- ANL completed 24 energy and water savings projects using their In-House Energy and Water Reinvestment Program – saving an estimated $90,177 annually and with a payback period of only 5.4 years; and
- Oak Ridge National Laboratory (ORNL) began using a project management tool which includes steps to measure and validate efficiency measures and analyze life-cycle cost. ORNL invested $929,000 of appropriated funds into sustainability projects this year with estimated cost savings of $220,000.

In FY 2019, DOE will continue an assessment focused on efficiency opportunities in the headquarters' Forrestal building, as well as other opportunities across the complex.

Coordinating with FEMP, DOE reviews and tracks all active DOE ESPC contracts to ensure they are meeting expectations and, if not, DOE follows up with programs to explore corrective actions. DOE has 17 active projects as reported in FEMP's Indefinite-Delivery Indefinite-Quality (IDIQ) ESPC Life of Contract Report (April 2019). Nine of the 17 projects are reported as having potential performance issues because some of the Energy Conservation Measure(s) are not achieving savings estimated by the ESCO at the time of the contract's execution. Collectively, these projects are exceeding the total guaranteed savings by 0.61 percent[1].

Priority Strategies & Planned Actions

Performance contracting vehicles that will be considered by DOE sites include ESPCs, UESCs, and PPAs, as well as projects with appropriated funds that include performance guarantees. In FY 2019, five major sites are exploring opportunities for performance-based contracts, but given their long development cycles, DOE anticipates at least one awarded in FY 2020. DOE will ensure that all key stakeholders in the performance contracting process, especially agency legal and procurement staff, are appropriately trained to effectively understand and develop quality performance contracts. Furthermore, DOE will also explore the use of performance contracts for on-site energy generation projects to increase DOE's energy security and resilience.

[1]Contractors generally guarantee less savings than their engineering models estimate, to provide a margin of error. Many FEMP documents use 95 percent as a "rule of thumb" for this margin. A recent Oak Ridge study found that guaranteed savings were 92 percent. See *Reported Energy and Cost Savings from the DOE ESPC Program: FY 2016,* Bob Slattery, ORNL/SPR-2018/803, May 2018.

As required by 42 U.S.C §8253(f)(3), DOE sites will continue to evaluate buildings to identify energy and water efficiency measures. DOE will continue to work with programs and sites to prioritize cost effective projects for implementation via the most appropriate funding mechanism, including performance contracts.

DOE's SPO is also working with sites, programs, and DOE headquarters' staff to explore savings reinvestment programs. This will help create a funding source that can grow over time and be used to fund sustainability projects that will both support their mission and further site sustainability efforts. Finally, DOE will continue its efforts to explore the use of data analysis and visualization tools to determine the life-cycle cost-effectiveness of efficiency conservation measures reported in DOE's Sustainability Dashboard.

3. RENEWABLE ENERGY

FY 2018 Renewable Electricity Use:

30.5 percent of total electricity in FY18

FY 2019-FY 2020 Plan:

30.5 percent of total electricity in FY19

30.5 percent of total electricity in FY20

Implementation Status

To meet renewable energy goals, DOE has installed on-site renewable energy at DOE facilities as well as purchased energy from systems located on non-DOE Federal or Indian land, and purchased green energy and renewable energy certificates (RECs). In FY 2018, DOE achieved this goal by purchasing 25.3 percent green energy and RECs and producing 5.2 percent on-site with bonus credits per 42 U.S.C. §15852 (or 2.6[2] percent on-site renewable electricity without bonus credits). Because budgetary decisions are made at the program level, the option to purchase green energy and RECs may vary annually. DOE will continue to prioritize the installation of on-site renewable systems and SPO will assist sites with evaluating the potential of new renewable energy production on DOE land. DOE has also used the National Renewable Energy Laboratory's (NREL) Renewable Energy Planning and Optimization (REopt) tool and System Advisor Model (SAM) to prioritize and identify renewable energy potential and projects that can be implemented by FY 2020. One highlight from FY 2018 includes:

- Nevada National Security Site (NNSS) successfully commissioned a new 424 kW solar array at their Mercury Fire Station, making it the first NNSS net-zero energy facility.

While several DOE sites have successfully incorporated on-site renewable projects, the economic feasibility of on-site renewable energy systems continues to challenge other sites due to low-cost electricity at DOE's sites. DOE's SPO continues to work with sites to identify opportunities and build business cases for investing in on-site renewable energy systems.

Priority Strategies & Planned Actions

DOE's objective will be to increase our use of renewable energy to cost-effectively achieve 7.5 percent production on DOE land before bonus credits. To achieve this DOE will utilize advanced analytical tools, such as REopt, to determine feasibility for renewables at the various site locations. DOE will continue to explore options such as PPAs to construct and operate renewable generation systems and also consider a variety of renewable energy sources and energy storage capabilities for implementation to increase the resilience of our energy infrastructure, wherever feasible. Where appropriate, long-term off-site renewable sources and RECs will be considered for purchase, if necessary, to meet statutory requirements. DOE will continue to encourage inter- and intra-agency collaboration to share best practices and lessons learned from investing in on-site renewable energy sources.

Sites with mission critical energy security concerns will be evaluating microgrid applications, such as local generation, on-site renewables, and energy storage, over the next few years. SPO continues to work with DOE sites to evaluate the feasibility of

[2] In DOE's FY 2018 Sustainability Plan, it was noted that 6.3% of the renewable energy without bonuses was produced on-site. Of this 6.3%, only 2.7% was on DOE land with the remaining produced on land owned by other Federal agencies. In both FY 2017 and FY 2018, 140.2 GWh of electricity was produced on DOE land.

installing renewable energy systems. SPO is working with several sites to identify the feasibility of roof top solar PV systems and anticipates projects to be funded and implemented in the near future.

4. WATER EFFICIENCY

FY 2018 Water Intensity Progress (Gal/GSF):

32.4 percent reduction from FY07

2.9 percent reduction from FY17

FY 2019-FY 2020 Plan:

0.5 percent reduction in FY19 from FY18

0.5 percent reduction in FY20 from FY 19

Implementation Status

DOE developed a Strategic Water Management Plan in FY 2016 that analyzed DOE's potential for achieving water consumption reductions. The plan concluded that the most cost-efficient water conservation measures include implementing operational changes and best management practices; sites are continuing to adopt these practices. Other identified measures in the plan include retrofitting and replacing equipment and processes using all available sources of funds, from appropriated general plant funds to performance contracts, to implement capital projects. As a result, more sites are focusing their water use efficiency efforts on repairing leaks and replacing water and steam-intensive equipment – supporting the significant reduction of 2.9 percent from FY 2017.

The reliance on water-intensive, mission-critical activities presents a unique challenge for DOE. Many DOE sites use water for evaporative cooling towers, and process heat removal for mission-driven industrial applications such as cooling accelerators, supercomputers, and data centers. The agency priority goal within DOE to reach Exascale supercomputing power, 1000 times faster than the previous generation, cannot be accompanied by similar increases in demand for energy and cooling water. DOE scientists and site personnel, with the active encouragement of headquarters, are pursuing use of wastewater and higher heat levels on the chips to reduce cooling demands and related water use. A remaining challenge in finding cost effective projects at some sites is that they have a low payback or no payback due to no-cost water use agreements with local municipalities or use of on-site wells.

Despite these challenges, FY 2018 was an exceptional year for water intensity reduction at DOE. DOE sites continue to implement the Water Management plan and also conduct water evaluations to comply with EISA §432. The evaluations are used to identify additional water conservation measures, and assess the performance of implemented measures. Several DOE sites are now employing proactive water management strategies, such as switching to air compressors, fixing leaks, and reusing reclaimed wastewater for cooling, to reduce their water consumption. These activities led to an overall water intensity reduction by 32.4 percent from the 2007 baseline and a 2.9 percent reduction from FY 2017. Some highlights from FY 2018 include:

- Portsmouth Gaseous Diffusion Plant achieved an impressive reduction of 57 percent from the FY 2007 baseline, and a 16 percent reduction from FY 2017. In FY 2018, they focused on reducing their water consumption by fixing the leaks in water and steam distribution systems, and by switching to an air compressor which is cooled by a closed-loop system that only uses water for make-up, not once-through cooling;
- Lawrence Livermore National Laboratory (LLNL) converted a garden to use treated well water for irrigation – saving 1.4 million gallons of potable water; and
- Los Alamos National Laboratory (LANL) sent over 27 million gallons of reclaimed wastewater from their Sanitary Effluent Reclamation Facility to the Strategic Computing Complex for reuse within its cooling towers.

Priority Strategies & Planned Actions

DOE will continue to implement the Strategic Water Management Plan to increase water efficiency at DOE sites. DOE's SPO plans to update the plan beginning in 2020 with an estimated release date during the summer of 2021. Building on these successful sustainability efforts, DOE will continue to deploy closed-loop, capture, recharge, and/or reclamation systems, as applicable. For example, the replacement of once through process cooling at the Thomas Jefferson National Laboratory with a recirculating system is anticipated to be completed in FY 2019, and LLNL is exploring reuse of treated effluent as cooling water. Additionally, reducing process water consumption and addressing chilled water utilization efficiencies through a water management plan continue to be core strategies undertaken by DOE.

DOE's two-year plan focuses on identifying the potential for water reduction projects. As feasible, sites will conduct periodic water balance studies to determine water sources, uses, and losses. Any inflow and infiltration issues, steam leakages, or underground non-potable and potable water leakages will be identified and addressed. High efficiency technologies will be installed during the rehabilitation of existing buildings and in the design of new buildings for more efficient water management. Additionally, SPO will continue to share best practices and lessons learned across DOE's sites to ensure the most cost-effective and innovative projects are undertaken across the DOE complex.

5. HIGH PERFORMANCE SUSTAINABLE BUILDINGS

FY 2018 Sustainable Buildings Progress:

214 sustainable Federal buildings

12.8 percent of buildings / 10.5 percent of gross square footage (GSF)

FY 2019-FY 2020 Plan:

14 percent of buildings in FY19

15 percent of buildings in FY20

Implementation Status

In FY 2018, DOE achieved 12.8 percent of applicable buildings or 10.5 percent by GSF meeting the Guiding Principles for Sustainable Federal Buildings (GPs). During FY 2018, DOE sites took significant action to move their facilities towards GP compliance. Examples from FY 2018 include:

- Fermi National Accelerator Laboratory carried out a detailed assessment in order to create a strategic plan for certifying nine buildings to reach the 15 percent target;
- Pacific Northwest National Laboratory (PNNL) finished the certification process for a recently completed High Performance Sustainable Building (HPSB) using the GPs. This was the second new facility at PNNL to use the GPs as a path toward HPSB status; and
- The Albuquerque Complex completed the design and started construction of the New Albuquerque Complex Project, which will implement the GPs and is on track to achieve Leadership in Energy and Environmental Design (LEED) Gold.

DOE orders require that Departmental elements incorporate the *Guiding Principles for Federal Leadership in High Performance and Sustainable Building* into the preliminary design phase of all construction undertaken by the programs or the management and operations contractors. As DOE continues to modernize its physical plant, more buildings will meet these requirements. However, DOE is challenged by integrating sustainability into mission-critical, energy intensive, and aging infrastructure. DOE has experienced difficulties in finding life-cycle cost effective steps to help meet the energy and water requirements in the GPs for existing buildings due to the age of infrastructure (nearing end of useful life). Of note, low utility rates at many DOE sites make efficiency economics more difficult.

Priority Strategies & Planned Actions

The requirements to incorporate the *Guiding Principles* into new construction and major renovation should continue to move toward higher performance. In particular, the National Nuclear Security Administration is undertaking a major asset revitalization effort that actively incorporates sustainability in design, and as a major portion of DOE's fixed assets, NNSA will continue making an important contribution to DOE's progress. In addition, DOE will continue to actively promote energy management, cost-effective conservation measures, and building-level and data center metering to help move toward our target of 15 percent of buildings meeting the GPs. DOE will explore the potential for integration of EISA §432 evaluations and GP assessments with program and site real estate master planning to streamline and reduce redundancies. We will continue to assess progress and identify areas for improvement, establish operational goals for environmental performance, and incorporate sustainability goals into building management. Identified life-cycle cost-effective projects will be implemented as feasible. Several examples of projects on the horizon include:

- SLAC is strategizing to implement a $96 million Campus Building Renovation Project (CBRP) in FY 2022-2025 to renovate 4 laboratory and office buildings to meet the GPs. This effort is in addition to planned certification of 3 existing buildings by FY 2021 which are currently in the process of upgrades; and

- The Integrated Genomics Building at Lawrence Berkeley National Laboratory is scheduled to complete construction in summer 2019 and is designed to meet energy efficiency targets (consuming less than 30 percent of the energy used by the current facility), use no natural gas, and offset about 15 percent of its total energy use with rooftop photovoltaics. DOE's SPO continues to strategize with the program to secure funds for these photovoltaics.

DOE will compare building performance with energy performance benchmarks annually, and regularly monitor building energy performance against historic performance data and peer buildings. DOE will continue to install building level meters, as cost effective, and sites will conduct analyses of water use, identify and repair leaks, eliminate single pass cooling, optimize cooling tower operations, and use water efficient products.

6. WASTE MANAGEMENT AND DIVERSION

FY 2018 Non-hazardous Waste Management and Diversion:

46,167 metric tons of non-hazardous solid waste generated*

35.4 percent sent to treatment and disposal facilities

**not including construction and demolition waste*

Implementation Status

DOE diverts a portion of its non-hazardous municipal solid waste (MSW) and non-hazardous construction and demolition (C&D) debris through the implementation of various recycling, recovery, and reuse methods and strategies. In FY 2018, DOE sent 35.4 percent of MSW to landfill, diverting the other 64.4 percent. Waste minimization programs are established at many DOE sites to reduce the generation and toxicity of waste. Some examples include:

- Nevada National Security Site's (NNSS) Atlas Building Transition Project diverted 214,280 pounds of scrap metal from the NNSS landfill that was later sold at public auction. Many items were transferred to another laboratory, re-deployed internally and excessed. The project included the complete removal of the Atlas machine, which conducted pulsed power research and testing, related systems, all of the supporting structures in the building, a 40,000 gallon oil storage tank, and the steel canopy outside of the building. The disassembly began in February 2018 and was completed in June 2018;
- Argonne National Laboratory (ANL) launched their food scrap and paper towel composting program, which is expected to increase their municipal solid waste diversion rate by 24 percent in FY 2019 after full implementation; and
- Brookhaven National Laboratory (BNL) achieved a recycling rate of 71 percent – utilizing special containers, labels, flyers, and websites to promote the program.

In addition to tracking and managing MSW and C&D waste, DOE sites continue to independently report on the management of toxic chemicals in accordance with the requirements of 42 U.S.C. §11001 *et. seq.* Waste minimization programs are established at many DOE sites to reduce the generation and toxicity of waste. Reporting is tracked through EPA's Toxic Release Inventory (TRI) web-based reporting program (TRI-MEweb). DOE sites use chemical management systems to provide supply-chain efficiency, establish tighter control of chemical purchases, and identify alternatives. These systems assist with chemical inventory reduction by tracking expired and excess chemicals. Radiologically contaminated materials are a DOE mission-related challenge that result in waste that cannot be diverted or recycled.

Priority Strategies & Planned Actions

In FY 2019 and FY 2020, DOE will continue to use source reduction as the primary waste management strategy. For example, DOE is working through its Invasive Species Workgroup and Sustainable Acquisition Working Group to determine which pesticides are in use at the sites. Using this list, DOE is identifying less toxic, more environmentally friendly alternatives for those pesticides, which reduces the procurement of hazardous products and consequently, potentially hazardous waste. Sites will also reduce waste generation through elimination, reuse, and recycling in an effort to maintain or increase their waste diversion rate. DOE will share lessons learned and best practices from successful and innovative MSW and C&D recycling programs and net zero waste programs with sites and laboratories. An example includes:

- Beginning in December 2018, National Renewable Energy Laboratory (NREL) started using a new, centralized waste container system that will nearly eliminate the need for project-based waste reporting and will greatly improve the accuracy of C&D waste diversion. This year NREL will work on enhancing signage at the recycle stations on both of their campuses to improve diversion and provide better clarity for employees and visitors using recycling facilities.

With anticipated growth in operational demands to fulfil DOE's mission, the Department may realize increases in waste generation and waste sent to landfills. DOE will continue to encourage and promote waste minimization best practices at its sites. The Department will strive for an annual reduction in waste sent to landfill of at least 0.5 percent per year. DOE will also track the acquisition and use of hazardous chemicals and materials at the site-level, as well as promote the use of alternative and less toxic chemicals and materials whenever possible. DOE will continue to implement integrated pest management and improved landscape management practices to reduce and eliminate the use of toxic and hazardous chemicals and materials.

Implementation Summary: Fleet Management

1. TRANSPORTATION / FLEET MANAGEMENT

FY 2018 Petroleum Reduction Progress (Gal):

37.3 percent reduction in petroleum fuel since 2005

2.8 percent reduction in petroleum fuel since FY17

FY 2019-FY 2020 Plan:

2.0 percent reduction in FY19 from FY18

2.0 percent reduction in FY20 from FY19

Implementation Status

DOE has continued to exceed the petroleum reduction goal, reducing consumption by 37.3 percent from FY 2005 and 2.8 percent from the prior year. Various actions taken such as right-sizing, switching to alternative fuels, or reducing miles traveled have all contributed to DOE's progress. Some examples include:

- Lawrence Livermore National Laboratory (LLNL) replaced 20 petroleum vehicles with 20 electric vehicles as well as added four level II and four level I electric charging stations in FY 2018; and
- Idaho National Laboratory reduced petroleum consumption by 37 percent in FY 2018 from the FY 2005 baseline. One effort implemented includes the installation of solar panels on all regular buses to reduce idling for cooling. Reduced idling also lowered maintenance costs.

DOE's overarching strategy for vehicle management optimizes fleet performance by right-sizing and right-typing its fleet as detailed in the current Vehicle Allocation Methodology (VAM). DOE has reduced associated fleet management costs by modernizing the Department's fleet. DOE has also streamlined reporting and compliance requirements by leveraging the Asset Level Data (ALD) capabilities in the General Services Administration (GSA) Federal Fleet Management System (FedFMS) to facilitate external reporting and provide data to support fleet management decisions. While DOE has been able to reduce fleet size at certain sites and national laboratories, increased and accelerated defense-related missions will likely continue to require overall fleet growth.

EPAct 2005 Section 701 requires that agencies use alternative fuel in all dual fueled alternative fueled vehicles (AFVs) except in vehicles for which the agency received a waiver. DOE struggles to achieve this goal due to the remote locations of its various sites and lack of alternative fuel availability and infrastructure. For example, many national laboratories and power marketing administrations operate in remote locations where alternative fuels are either very expensive or unavailable altogether.

Priority Strategies & Planned Actions

DOE will continue to optimize fleet as detailed in the Vehicle Allocation Methodology (VAM) in 2019. In 2020, the VAM will be updated by DOE Headquarters. Sites continue to annually assess their fleet inventory for replacement opportunities and

right-sizing. Agency-owned light duty to medium duty vehicles older than six years will be replaced when authorized in future appropriation legislation. As a result of a study with GSA, DOE will move from agency-owned vehicles to GSA fleet, where mission-compatible and as cost-effective.

DOE will use the most recent ALD when making fleet operations, management, acquisition, and disposal decisions. The Department will continue efforts to improve the accuracy of ALD data in GSA Drive-thru and FedFMS in 2019. In FY 2019, DOE began the process of enabling FedFMS to auto-capture fuel, mileage, maintenance, and repair costs from SmartPay3® fleet credit card transaction reports.

In FY 2018, DOE's total fleet inventory included 14,222 vehicles. Of this total, 8,711 (61 percent) of DOE's fleet were AFVs. In FY 2018, with a total of 57 electric and 39 plug-in hybrid electric vehicles, which is an increase from 14 fully electric and 35 plug-in hybrids in FY 2017. Electric vehicle acquisition and charging station installations are expected to continue to increase in the next two years as the availability and number of options expands.

Implementation Summary: Cross-Cutting Operations

1. SUSTAINABLE ACQUISITION / PROCUREMENT

FY 2018 Sustainable Acquisition Progress:

16.3 percent of contract actions and 56.4 percent of obligations (in dollars), for a total of $17.8 billion in contract actions with statutory environmental requirements

Implementation Status

DOE is committed to sustainable acquisition of products and services to the maximum extent practicable, and in accordance with statutory mandates for the procurement of recycled content, energy efficient, and biobased products. DOE engages in a number of activities to ensure the acquisition of sustainable products and services across the Department.

To educate sites on the latest developments, trends, and policy updates, DOE holds bi-monthly Sustainable Acquisition Working Group (SAWG) meetings. The DOE SAWG community of practitioners also use this peer-to-peer platform to share best practices and lessons learned with each other.

DOE incentivizes leadership through its voluntary GreenBuy Award program which 1) simplifies Federal sustainable acquisition requirements and 2) identifies verified sustainable products and services. The backbone of the program is the Priority Products List – a list of products that DOE sites purchase in large quantities, spend large amounts on, and could present health and/or environmental issues. Focusing on product purchases pertinent to DOE sites simplified the process for compliance with sustainable acquisition requirements. Since its inception in 2011, 49 percent of DOE's reporting sites have been recognized with a GreenBuy Award and more than 70 percent have submitted nominations to this voluntary award program.

Priority Strategies & Planned Actions

DOE will continue to share information, tools, resources, and best practices to assist sites and programs in their efforts to purchase more sustainable products and services. It will continue to incentivize sustainable acquisition efforts through the GreenBuy Awards Program and offer other training and assistance programs.

DOE will also work closely with its procurement professionals to improve the quality of data and tracking of sustainable acquisition through the Federal Procurement Data System (FPDS). DOE is exploring the feasibility and cost of using the DOE Sustainability Dashboard to collect sustainable acquisition compliance data for sites where management and operating contractors are unable to report in FPDS. As we work to improve data quality, we will have a better understanding of where DOE stands, and be able to provide specific, measureable targets for the agency.

2. ELECTRONICS STEWARDSHIP

FY 2018 Electronics Stewardship Progress:

94.1 percent of newly purchased or leased equipment met energy efficiency requirements

98.4 percent of equipment with power management enabled*

99.2 percent of electronic equipment disposed using environmentally sound methods

**excluding exempted equipment*

Implementation Status

The Department's sustainable lifecycle management of electronics covers three phases: purchasing, use, and end-of-life. Annual performance is tracked through the DOE Sustainability Dashboard. DOE uses third-party calculators to translate electronics stewardship activities into environmental and cost benefits. In FY 2018 alone, DOE's electronics stewardship activities saved the Department 62.8 million kWh of electricity and $3.8 million.

DOE purchases and leases environmentally sustainable electronic products. Purchasing EPEAT-registered electronics ensures that the Department receives ENERGY STAR certified products that meet Federal low standby power requirements and have additional positive environmental attributes, such as recycled/biobased content. In FY 2018, DOE's purchases of EPEAT-registered electronics avoided the use of over 7,000 kg of toxic substances.

DOE enables and maintains power management on eligible ENERGY STAR certified desktop computers, monitors, and notebook computers. Power management at DOE sites increased between FY 2017 and FY 2018, from 75.6 percent to 96.0 percent of eligible computers, and from 98.6 percent to 99.9 percent of eligible monitors for a total increase (both computer and monitors) from 83.5 percent to 98.4 percent.

DOE reuses, donates, sells for reuse, or responsibly recycles excess and surplus electronics. Reuse and recycling electronics diverted 1.2 million kg of non-hazardous solid waste from landfills, for reuse at schools and nonprofits and for recovery of valuable and critical materials. Electronics which do not have reuse value are responsibly recycled through UNICOR, the U.S. Postal Service BlueEarth program, and electronics recyclers independently certified to third party standards for safe and environmentally sound recycling. Disposal of electronics, in lieu of reuse or recycling, is only used when electronics cannot be radiologically cleared for release. These recycling-ineligible electronics make up less than 1 percent of end-of-life electronics each year. In FY 2018, two DOE sites reported using non-certified electronics recyclers. DOE will reach out to these sites to help them find and transition to certified recyclers, to ensure responsible end-of-life disposition of used electronics.

Priority Strategies & Planned Actions

DOE will continue to sustainably manage electronics, as outlined above, to ensure ongoing cost savings and environmental benefits. Approximately 21 percent of computers at DOE are exempt from power management, and many of these are appropriately marked exempt due to their use in mission critical functions, such as laboratory experiments or security monitoring. DOE is committed to eliminating all unnecessary exemptions to computer power management, and enabling these computers, to maximize energy and cost savings. DOE will continue to provide technical assistance and site training to ensure exemptions are used appropriately and resolve technical and security concerns at individual DOE sites.

3. GREENHOUSE GAS EMISSIONS

FY 2018 Scope 1&2 Greenhouse Gas (GHG) Emissions:

47.7 percent reduction from FY 2008

7.8 percent reduction from FY 2017

Implementation Status

DOE's efforts have achieved a significant 47.7 percent reduction in Scope 1 & 2 greenhouse gas (GHG) emissions from the FY 2008 baseline and a 7.8 percent reduction from the previous year. DOE's significant Scope 1 & 2 GHG emissions improvements from FY 2017 are a result of a 7.7 percent reduction in facility energy-related emissions, a 12.0 percent reduction in on-site wastewater treatment-related emissions, and a 3.0 percent reduction in fleet fuel-related emissions.

Since the FY 2008 baseline, DOE has reduced its total fugitive GHG emissions by 56.9 percent, and sulfur hexafluoride (SF_6) emissions (the Department's primary fugitive gas) by 57.8 percent. DOE non-SF_6 fugitive emissions also decreased by 48.2 percent from the FY 2008 baseline. At many DOE sites, mission-related activities are expected to grow, increasing energy demand, in particular electricity consumption. As a result, DOE will be challenged to sustain these reductions.

Priority Strategies & Planned Actions

In an effort to counter the cost and potential environmental impacts of the anticipated growth in operational demands to fulfil DOE's mission, DOE will target additional lifecycle cost-effective reductions, including energy reductions, fugitive and refrigerant reductions, and expanding commuting options. DOE will continue to look for opportunities to further reduce fugitive emissions of high-impact GHG gases, such as SF6, and pursue the application of environmentally preferable substitute gases wherever feasible.

In the next two years, DOE will continue performing site-level energy assessments and implementing cost-effective energy conservation measures to maximize efficiency. DOE will continue to explore opportunities for on-site energy generation, including clean and renewable energy sources, using advanced resilient technologies to further drive down our environmental footprint and sustain mission critical needs. For instance, DOE's SPO is carrying out a request for information from DOE sites to help with the implementation of future on-site and renewable energy projects. DOE will continue to share best practices and monitoring/control technologies during the Fugitive Emissions Working Group to improve fugitive emissions management and support fugitive emissions reduction strategies.