U.S. Environmental Protection Agency

Energy Management and Conservation Program

Fiscal Year 2016 Annual Report

Cover: The EPA's Andrew W. Breidenbach Environmental Research Center in Cincinnati, Ohio

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FISCAL YEAR 2016 HIGHLIGHTS

In FY 2016, the U.S. Environmental Protection Agency once again demonstrated leadership among federal agencies in the charge to reduce its carbon and environmental footprint. The EPA met or exceeded the goals required under Executive Order 13693, EO 13653, the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007 for federal greenhouse gas emission reductions, energy efficiency, water conservation, high performance sustainable buildings and solid waste diversion.

In FY 2016, the EPA focused on: reducing its Scope 1, 2 and 3 GHG emissions; completing or continuing progress on major energy efficiency capital improvement projects; implementing water conservation and stormwater management strategies; continuing completion of facility resiliency assessments; and improving its non-hazardous solid waste diversion rate. The EPA received a status score of "green" in every category for FY 2015 on its January 2016 U.S. Office of Management and Budget Sustainability/Energy scorecard, demonstrating the ongoing success of the agency's comprehensive approach to sustainability.

In June 2016, in accordance with the requirements of EO 13693, the EPA submitted a revised Strategic Sustainability Performance Plan to the OMB and the Council on Environmental Quality. The EPA's SSPP outlines the agency's plans to reduce GHG emissions, energy intensity, water use, solid waste and other resource use through 2025, and to incorporate sustainable design and operations across its facilities.

Scope 1, 2 and 3 GHG Emissions Decreased From FY 2008 Baseline

In FY 2016, the EPA reported Scope 1 and 2 GHG emissions of 55,428 metric tons of carbon dioxide equivalent. These emissions are 61 percent below the agency's FY 2008 baseline, which surpasses the EPA's Scope 1 and 2 GHG emissions reduction goal of 46 percent by FY 2025 from FY 2008. The EPA continued to implement energy efficiency measures at its facilities, improve fleet management practices and support its green power purchase program. Although some mobile emissions were higher this year due to activity on one of the agency's research vessels, the EPA anticipates further Scope 1 and 2 emission reductions in FY 2017 because of additional capital improvement projects underway or nearly complete.

The agency's estimated FY 2016 Scope 3 GHG emissions were 41,038 $MTCO_2e$, a decrease of 42.5 percent compared to the FY 2008 baseline, which surpassed the EPA's goal of 35 percent by FY 2025. A significant portion of the decrease since FY 2008 is due to a drop in Scope 3 GHG emissions related to business travel and employee commuting.

Energy Intensity Decreased 34.6 Percent From FY 2003 Baseline

The EPA's FY 2016 reported energy intensity was 260,469 British thermal units per gross square foot[1], a reduction in energy intensity of 34.6 percent compared to its FY 2003 baseline, which exceeded the 31.75 percent energy intensity reduction target for the agency under its EO 13693 goal[2]. The EPA completed or continued work on several major energy efficiency projects in FY 2016, which are outlined later in this report, and will continue to closely manage its energy use and make further progress in reducing its energy intensity in FY 2017.

The EPA continued to be a leader among federal agencies by purchasing green power and renewable energy certificates equal to 100 percent of its estimated FY 2016 electricity use. In FY 2017, the EPA intends to continue to cover all its agencywide emissions with RECs obtained through a blanket purchase agreement. Through this agreement and other existing green power contracts, the EPA will again purchase green power and RECs covering 100 percent of the EPA's estimated FY 2017 electricity use. In FY 2017, the EPA will work to exceed the EO 13693 renewable energy goals of using renewable electric energy for 30 percent of total building electricity use by FY 2025 and using renewable electric energy and alternative energy for 25 percent of total building energy use by FY 2025.

In FY 2016, the EPA completed EISA-required energy assessments and recommissioning for covered facilities at the Andrew W. Breidenbach Environmental Research Center in Cincinnati and the Main Building at the EPA's campus in Research Triangle Park, North Carolina, which collectively comprise more than 13 percent of the total energy use of the EPA's covered facilities. With the completion of these two assessments, the EPA met the June 2016 EISA requirement of completing assessments for 100 percent of covered facilities every four years (based on FY 2008 data, per EISA Section 432 guidance).

As of FY 2016, the EPA has installed electric, natural gas and steam meters at 100 percent of its reporting facilities, meeting the requirement of EPAct 2005 and EISA. In FY 2016, the EPA had advanced metering projects under design or under construction at seven laboratory facilities. Advanced metering hardware, which the EPA is required to install to the maximum extent practicable, is now in place, under design or under construction to capture 81 percent of agencywide reportable energy consumption.

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[1] To encourage lifecycle cost-effective energy projects that reduce source energy use but might increase site energy use, the U.S. Department of Energy, through its Federal Energy Management Program, allows agencies with eligible energy projects to apply a credit to their reportable annual energy intensity. In addition, as of FY 2016, FEMP provides a "weather normalization credit," which allows agencies to adjust their energy intensity to account for fluctuations in annual weather patterns. The EPA's energy savings figures account for these credits. Without them, the EPA's actual FY 2016 energy intensity was 264,908 Btu per GSF, or 33.5 percent below the FY 2003 baseline.

[2] Under EO 13693, federal agencies have two paths to compliance with energy intensity reduction requirements. Agencies that met the previous goal, outlined under EO 13423, of a 30 percent reduction by FY 2015 compared to a FY 2003 baseline, can elect to set a goal of a 47.5 percent reduction by FY 2025 compared to FY 2003. All other agencies are required to achieve a 25 percent reduction by FY 2025 compared to a FY 2015 baseline. Because the EPA achieved a 32.7 percent goal by FY 2015 compared to FY 2003, the agency has chosen to follow the goal of reducing its energy intensity 47.5 by FY 2025 compared to FY 2003.

Water Intensity Down 40.1 Percent From FY 2007 Baseline

In FY 2016, the EPA reduced its water use by 40.1 percent compared to its FY 2007 baseline, greatly exceeding the EO 13693 goal for the year of 18 percent. The EPA's water intensity in reporting laboratories was 21.3 gallons per GSF in FY 2016 (82.1 million total gallons), compared to the FY 2007 water intensity baseline of 35.6 gallons per GSF (136.5 million total gallons).

In FY 2016, the EPA completed or continued to make progress on water conservation projects at six of its laboratories, including the Kansas City Science and Technology Center in Kansas City, Kansas; the Manchester Environmental Laboratory in Port Orchard, Washington; the Robert S. Kerr Environmental Research Center in Ada, Oklahoma; the Gulf Ecology Division Laboratory in Gulf Breeze, Florida; the Science and Ecosystem Support Division Laboratory in Athens, Georgia; and the Region 2 Laboratory in Edison, New Jersey. The EPA also completed a water assessment for one EISA-covered facility in FY 2016.

The EPA also continued to exceed the requirements for reducing industrial, landscaping and agricultural water use set forth in EO 13693 of 2 percent reduction each year through FY 2025. The EPA estimates that it used 2.8 million gallons of nonpotable water for ILA applications in FY 2016, which is 97.9 percent lower than its FY 2010 baseline of 135.2 million gallons.

A Total of 25.4 Percent of EPA-Owned Buildings Meet the *Guiding Principles*

In FY 2016, eight of the EPA's owned buildings greater than 5,000 square feet—or 25.4 percent (by square feet)—met the *Guiding Principles*.

In addition to internally certifying buildings under the *Guiding Principles*, the EPA uses other systems to benchmark the environmental performance of its real property portfolio. In FY 2016, the EPA occupied 12 buildings certified under the U.S. Green Building Council's LEED® for Building Design and Construction rating system, as well as 17 buildings certified under the LEED for Building Operations and Maintenance rating system. Three headquarters office buildings and all 10 EPA regional offices have earned the ENERGY STAR® label. One headquarters office, four regional offices, and five smaller offices renewed their labels in 2016.

Solid Waste Diversion Rate Exceeds Internal, Federal Goals

EO 13693 requires federal agencies to divert at least 50 percent of non-hazardous solid waste annually. The EPA has set its own internal waste diversion goal of 60 percent. The agency exceeded both targets by achieving a waste diversion rate of 63.6 percent in FY 2016. Numerous EPA facilities significantly contributed to the agency's non-hazardous solid waste diversion rate through their ongoing recycling and composting efforts.

INTRODUCTION

In June 2016, the EPA submitted to the OMB and the CEQ an update to its SSPP, a comprehensive, multi-year planning document that identifies targets for reducing agencywide GHG emissions by FY 2025 and outlines the steps the agency will take to achieve those reductions. Through this plan, the EPA outlines its strategy for meeting federal sustainability requirements by reiterating its plans to reduce energy, water, waste and other resource use, and to incorporate sustainable design and operations across its facilities.

The plan details key agency priorities and strategies for achieving its sustainability goals, including: GHG emission reductions; sustainable buildings; renewable energy; water conservation; fleet management; sustainable acquisition; waste reduction and pollution prevention; performance contracting; electronics stewardship; and facility resilience, which the EPA will continue to refine over time. The EPA's latest SSPP is available at www.epa.gov/greeningepa.

MANAGEMENT AND ADMINISTRATION SUMMARY

The agency's Senior Sustainability Officer for the duties and responsibilities set forth by federal sustainability executive orders and other requirements is the Acting Assistant Administrator for the Office of Administration and Resources Management, Donna Vizian, who reports directly to the EPA Administrator.

The Federal Building Personnel Training Act, passed in 2010, requires the General Services Administration to identify the core competencies necessary for federal personnel performing building operations and maintenance, energy management, safety and design functions. The core competencies include: management of facility O&M; O&M performance; technology; energy management; safety; design; sustainability; water efficiency; project management; business, budget and contracting; leadership and innovation; and performance measures. In FY 2016, the EPA, in collaboration with the GSA, began developing a methodology for its facility managers to build the identified core competencies through training activities.

EO 13693 SUSTAINABLE BUILDINGS IMPLEMENTATION STRATEGY

EO 13693, *Planning for Federal Sustainability in the Next Decade,* was signed by President Barack Obama in March 2015. The EPA initiated its strategic planning efforts in FY 2015 and completed an internal plan in FY 2016 to guide its implementation of the following aspects of EO 13693: promoting the construction, operation and maintenance of buildings that consume net-zero energy, water and waste; meeting the revised *Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings* in 35 percent of its inventory by square feet by FY 2025; and installing fleet vehicle charging infrastructure at facilities where feasible.

In addition, the plan reiterates the EPA's commitment to continue to address other requirements of EO 13693, including: calculating and reporting Scope 3 greenhouse gas emissions for its leased buildings; exploring opportunities to consolidate space within its leased and owned facilities; and completing facility resiliency assessments.

GHG EMISSIONS INVENTORY AND REDUCTION EFFORTS

The EPA has maintained an agencywide GHG emissions inventory since FY 2008. In addition to quantifying direct and indirect emissions associated with energy consumption at the agency's 34 reporting facilities, the EPA's inventory accounts for: mobile emissions from fleet vehicles and equipment; fugitive emissions associated with building fire suppression and mobile air conditioning equipment; process emissions from laboratory research; and emissions from other activities associated with leased office and support space. The EPA's inventory also reflects the significant impact of the agency's green power and REC purchases.

In accordance with the requirements of EO 13693, the EPA committed to reducing its combined Scope 1 and 2 GHG emissions 46 percent by FY 2025 from its current FY 2008 baseline of 142,010 $MTCO_2e$, as well as reducing the required categories of Scope 3 GHG emissions by 35 percent by FY 2025 compared to its current FY 2008 baseline of 71,089 $MTCO_2e$. These goals strengthened the EPA's previous commitment per EO 13514 to reduce Scope 1 and 2 GHG emissions by 25 percent and Scope 3 GHG emissions by 8 percent. More details on the agency's GHG emission reduction strategies are available in the EPA's SSPP.

Reported Scope 1 and 2 GHG Emission Reductions

The EPA's Scope 1 and 2 GHG Emissions Have Decreased 61 Percent From Its FY 2008 Baseline

The EPA reported Scope 1 and 2 GHG emissions of 55,428 $MTCO_2e$ in FY 2016, 61.0 percent lower than the agency's FY 2008 baseline of 142,010 $MTCO_2e$ (see Figure 1 below). Even when the agency does not account for green power and REC purchases, the EPA's FY 2016 combined Scope 1 and 2 GHG emissions still decreased by 33,267 $MTCO_2e$, or 23.4 percent, relative to the agency's FY 2008 baseline.

As part of its long-term strategy to reduce GHG emissions and support the renewable energy market, the EPA has historically made extensive purchases of green power and RECs. Adjustments to Scope 2 GHG emissions based on those purchases have helped the agency far exceed its Scope 1 and 2 GHG emissions reduction targets between FY 2010 and FY 2016 (although even without accounting for RECs, energy intensity reductions have contributed greatly to the EPA's Scope 1 and 2 emissions reduction success).

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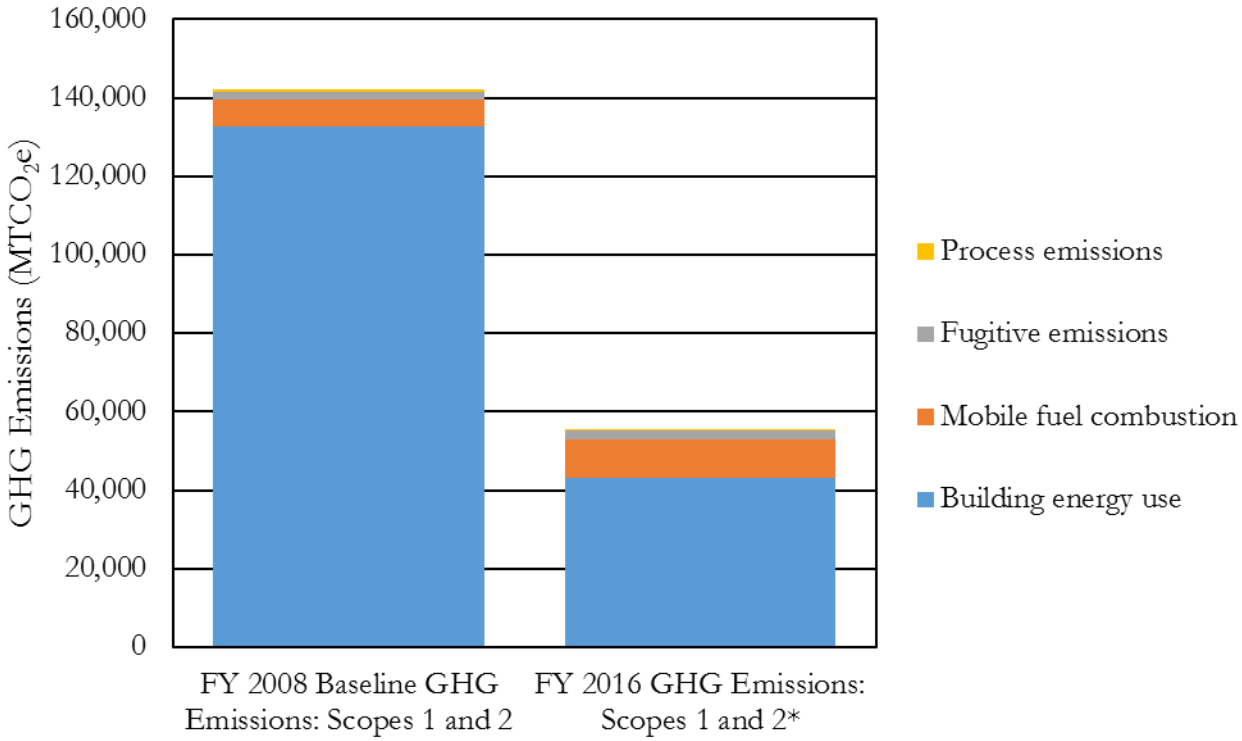
Figure 1. The EPA's Reported Scope 1 and 2 GHG Emissions: FY 2008 and FY 2016



*FY 2016 includes Scope 2 adjustments from REC purchases

While the agency plans to continue to purchase green power and RECs to meet the EO 13693 clean electricity requirement, current and anticipated appropriation levels could make it difficult for the EPA to maintain the Scope 1 and 2 GHG emissions reductions achieved to date. Therefore, the agency will refocus its GHG emissions reduction strategy through energy conservation measures, infrastructure improvements, space management and consolidation, and fleet efficiency.

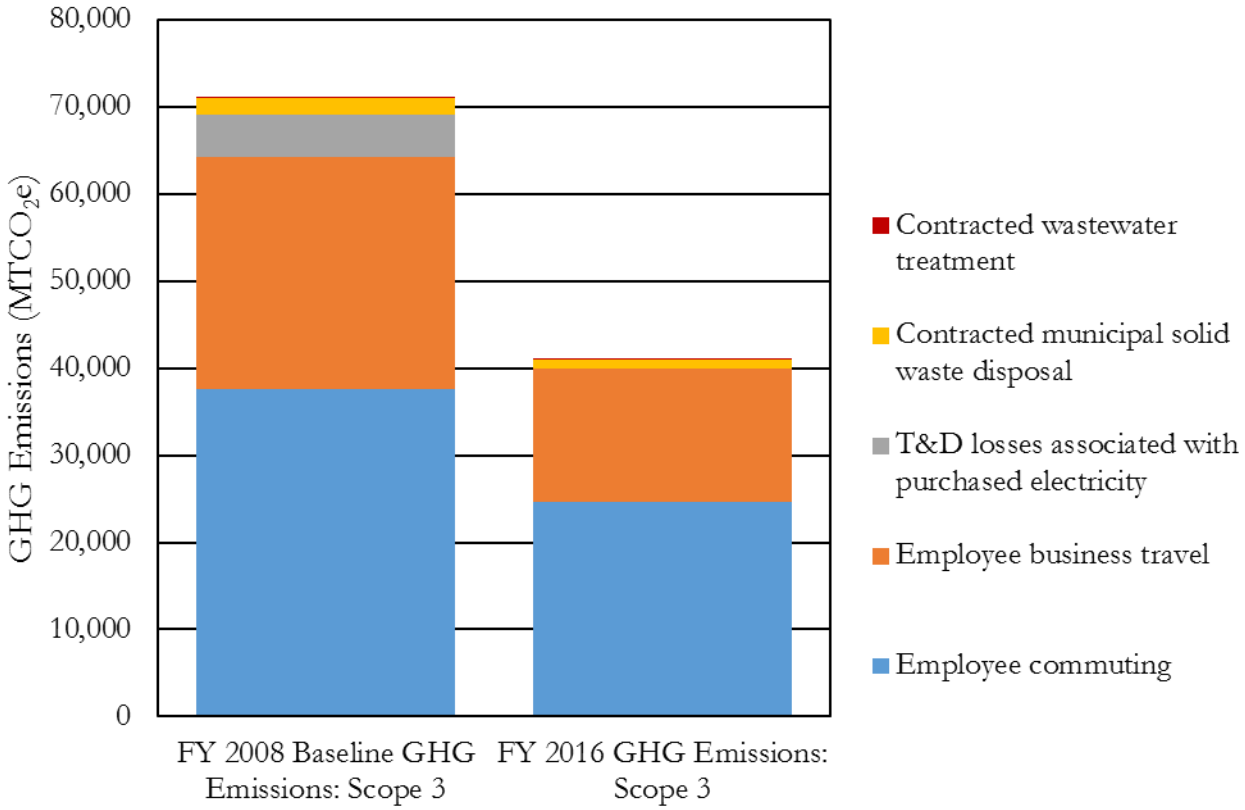
The EPA developed its FY 2025 Scope 1 and 2 GHG emissions reduction target using FEMP's Development of Agency Reduction Targets tool. Accounting for the EPA's projected energy conservation and onsite renewable energy projects, the tool generated several potential target scenarios ranging from conservative to aggressive. The EPA's final target of 46 percent by FY 2025 was not the most conservative scenario. It assumed the minimum renewable energy use through onsite and purchased sources required for federal agencies while setting a realistic achievable target based on anticipated appropriation levels.

Reported Scope 3 GHG Emission Reductions

The EPA's Scope 3 GHG Emissions Are 42.5 Percent Lower Than FY 2008 Baseline

Scope 3 GHG emissions include indirect emissions from sources that are not owned or directly controlled by the EPA but are related to the agency's activities, such as employee business travel and commuting; contracted solid waste disposal; and contracted wastewater treatment. In response to EO 13693, the EPA has committed to reduce the required subset of Scope 3 GHG emissions 35 percent by FY 2025 compared to the FY 2008 baseline of 71,089 $MTCO_2e$. In FY 2016, the EPA's estimated Scope 3 GHG emissions were 41,038 $MTCO_2e$, a decrease of 42.5 percent from the FY 2008 baseline. The agency's Scope 3 emissions performance includes a credit of 0.17 percent for its hosted onsite renewable project at the child care facility at its campus in RTP, North Carolina. The EPA's Scope 3 GHG emissions did increase compared to FY 2015, due mostly to more business air travel in FY 2016 compared to FY 2015.

Figure 2. The EPA's Reported Scope 3 GHG Emissions, FY 2008 and FY 2016



*FY 2016 includes T&D loss adjustments from REC purchases

Commuting Emissions

The EPA conducted its fourth agencywide employee commuter survey in October and November 2016 using the GSA's Scope 3 Commuter Survey, a component of GSA's Carbon Footprint Tool, and used the results to calculate employee commuting-related GHG emissions for FY 2016. More than 7,300 EPA employees completed the survey, a response rate of 43 percent. Average $MTCO_2e$ per EPA employee fell from 1.81 in FY 2014, when the last agencywide commuter survey was conducted, to 1.64 in FY 2016. EPA plans to continue to collect agencywide commuter data and encourage use of alternative commuting methods.

To facilitate telework capabilities across the agency, the EPA refreshed employee computers and other information technology hardware, and is continuing to provide tools and technologies such as video teleconferencing. Over time, these improvements will help the EPA reduce its Scope 3 GHG emissions associated with employee commuting.

Optional Sources of Scope 3 GHG Emissions

The EPA also voluntarily reports several categories of Scope 3 GHG emissions that were not required in FY 2016 by EO 13693. In FY 2016, Scope 3 GHG emissions from energy use at the EPA's non-reporting facilities (i.e., regional offices, headquarters facilities, warehouses) were 52,530 $MTCO_2e$, a decrease of 36.4 percent compared to the current FY 2008 baseline of 82,539 $MTCO_2e$.

During FY 2016, the EPA continued to evaluate options to improve the space use efficiency for its headquarters, which is made up of non-reporting facilities that are leased through the GSA. In FY 2016, EPA consolidated a majority of the employees from its Potomac Yard Two building in Arlington, Virginia, into its Potomac Yard One building. This consolidation increased space utilization, reduced the agency's rent by approximately $5.5 million and reduced the EPA's optional Scope 3 GHG emissions associated with energy use at non-reporting facilities.

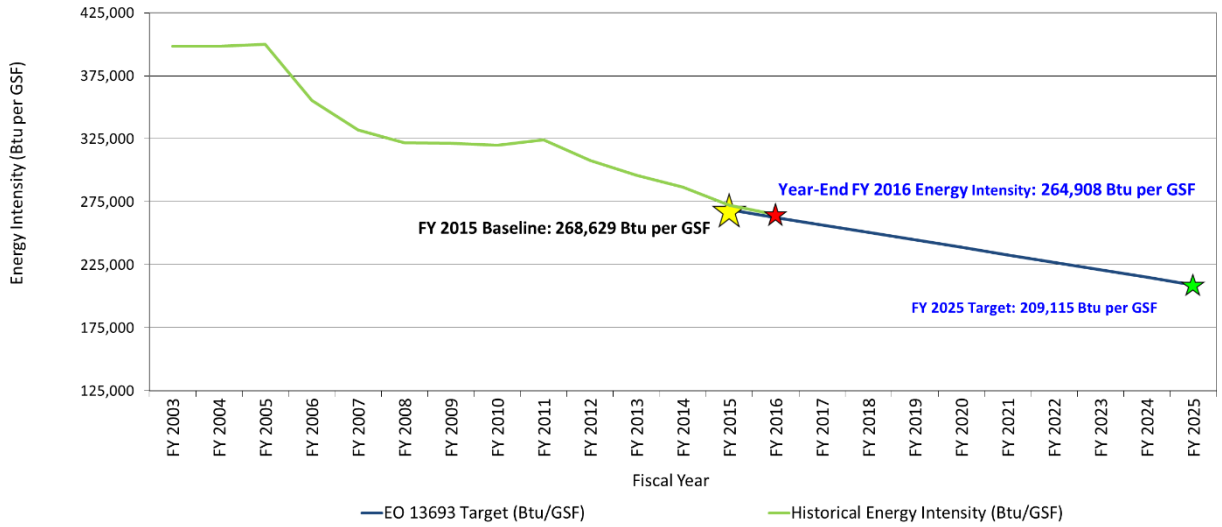
ENERGY EFFICIENCY PERFORMANCE

The EPA's FY 2016 Energy Intensity Has Decreased 34.6 Percent From FY 2003 Baseline

EO 13693 requires federal agencies to reduce their energy intensity by 25 percent, or 2.5 percent per year, by FY 2025 compared to a FY 2015 baseline. However, because the EPA exceeded the previous requirement, under EISA, of reducing its cumulative energy intensity by 30 percent by FY 2015, the agency has elected to pursue the alternative goal for compliance approved by the DOE and detailed in the *Implementing Instructions for EO 13693: Planning for Federal Sustainability in the Next Decade*. Specifically, the EPA has committed to a cumulative reduction of 47.5 percent in energy intensity by FY 2025 compared to its FY 2003 baseline. Therefore, the agency has a target to reduce its energy intensity by 1.75 percent per year through FY 2025 to achieve the cumulative 47.5 percent goal. The EPA's FY 2016 reported energy intensity was 260,469 Btu per GSF, which is 3.0 percent less than FY 2015 and 34.6 percent less than the FY 2003 baseline (see Figure 3 below). In absolute terms, the EPA's FY 2016 energy consumption was 1,025.2 billion Btu compared to its FY 2003 baseline of 1,481 BBtu.

The agency's FY 2016 energy intensity includes two credits created by FEMP. The source energy savings credit encourages lifecycle cost-effective energy projects that reduce source energy use, but might increase site energy use. The weather normalization credit accommodates for annual fluctuations in weather patterns. Without these credits, the EPA's actual FY 2016 energy intensity was 264,908 Btu per GSF, or 33.5 percent less than the FY 2003 baseline. By either measure, the EPA exceeded the FY 2016 energy use reduction requirements.

Figure 3. EPA Annual Energy Intensity Relative to its EISA/EO 13693 Target



Agencywide Energy Intensity and Percent Change From FY 2003 Baseline	
FY 2003 Baseline: 398,315 Btu/GSF	
FY 2004: 398,282 Btu/GSF: -0.01%	FY 2011: 322,129 Btu/GSF: -19.13%
FY 2005: 400,059 Btu/GSF: +0.44%	FY 2012: 304,837 Btu/GSF: -23.47%
FY 2006: 355,335 Btu/GSF: -10.79%	FY 2013: 292,895 Btu/GSF: -26.47%
FY 2007: 329,257 Btu/GSF: -17.34%	FY 2014: 283,784 Btu/GSF: -28.75%
FY 2008: 319,144 Btu/GSF: -19.88%	FY 2015: 268,629 Btu/GSF: -32.56%
FY 2009: 318,587 Btu/GSF: -20.02%	FY 2016: 260,469 Btu/GSF: -34.6 %
FY 2010: 317,139 Btu/GSF: -20.38%	

Safely Reducing Laboratory Ventilation Rates

In FY 2016, the EPA continued to implement new approaches to reduce its energy intensity and meet its Scope 1 and 2 GHG emissions reduction targets. These strategies included:

- *Adoption of lower fume hood airflow rates while maintaining safe working environments based on the new American National Standards Institute/American Industrial Hygiene Association/American Society of Safety Engineers Z9.5 standards.* Once fume hood airflow reductions are completed within a facility, the EPA typically rebalances the outside air supply and exhaust systems for the entire building.
- *Use of occupancy sensors to set air change-per-hour rates in laboratory modules based on occupancy.*
- *Use of fume hoods that can be safely "hibernated" when not needed.* A typical 5-foot, constant volume fume hood requires 1,000 to 1,200 cubic feet per minute of conditioned air when closed; a typical 5-foot, high performance, variable air volume fume hood requires 170 to 200 CFM of conditioned air when closed; and a typical 5-foot fume hood in hibernation mode requires 60 CFM of conditioned air.

In FY 2016, the EPA implemented airflow reduction measures at its Region 10 Laboratory in Manchester, Washington, based on a multi-year recommissioning effort. A defective valve was discovered and replaced in December 2015, which contributed to energy savings at the facility.

Energy Intensity Exclusions

In FY 2016, the EPA excluded one source of energy consumption—its aquatic research vessel, *Lake Explorer II*—from federal energy performance requirements, following the criteria included in FEMP's *Guidelines for Establishing Criteria for Excluding Buildings*. More information on this vessel is included in Appendix A of this report.

Life Cycle Cost Analysis

The EPA has well-established processes to evaluate the economic life cycle costs and return on investment for new facilities; major renovations; mechanical system upgrades and replacements; and other facility projects. Through the EPA's Five-Year Capital Investment Plan, Energy Conservation Plan, Water Conservation Strategy and Buildings and Facilities Capital Budgeting Process (i.e., the B&F Project Ranking Process), the agency ranks energy projects based on financial criteria,

including initial investment; energy and operational cost savings; absolute Btu and/or gallons of potable water saved per dollar; and potential for reducing facility maintenance.

For major new EPA facilities, GSA-owned buildings being renovated for the EPA or build-to-suit buildings leased by the GSA from private landlords for the EPA, the agency, as a standard operating practice, performs extensive energy modeling to ensure compliance with the requirement that new buildings and major renovations perform 30 percent better than the American Society of Heating, Refrigerating and Air-Conditioning Engineers 90.1 standard. During this process, the EPA weighs the cost of incremental mechanical system and building envelope investments against the energy cost savings that will result from these investments. The agency pursues energy efficiency performance beyond the 30 percent better than the ASHRAE standard when it can be achieved in a life cycle cost-effective manner.

EISA Section 432 Implementation—Energy Assessments

The EPA Completed its Second Four-Year Cycle of Energy Assessments for 100 Percent of Covered Facilities as Required by EISA

From July 2015 through June 2016, the EPA conducted energy assessments and recommissioning for facilities that represented more than 13 percent of the total energy use of the agency's covered facilities (based on FY 2008 data, per EISA Section 432 guidance). With the completion of this round of assessments, the EPA has met the EISA requirement for June 2016 to complete assessments for 100 percent of total energy use of covered facilities over a four-year period.

The agency collected information on potential energy conservation measures for facilities evaluated from July 2015 through June 2016 and compiled the associated implementation costs, estimated annual energy savings and estimated annual cost savings in a comprehensive report submitted to FEMP in June 2016. See Table 1 below for a list of the reported measures.

Table 1. Potential Energy-Saving Projects From FY 2016 EISA Energy Assessments

Facility	*Description of Potential Projects*	*Estimated Annual Energy Savings*
AWBERC in Cincinnati	Retro-commissioning for the existing 33 percent of the facility	0.416 billion Btu
	Replace existing 1800-ton chiller and install decoupler loop	1.249 billion Btu
	Main air handler optimization	0.208 billion Btu
Main Building in RTP, North Carolina	Replace variable air volume supply and exhaust systems	14.432 billion Btu
	Replace controller, reset static pressure, reduce air changes, set back temperature and reset occupancy sensors	16.073 billion Btu

The EPA is simultaneously focusing on implementing key projects identified during previous assessments and working with the facilities on measurement and verification efforts. The EPA will continue to re-evaluate its covered facilities per EISA requirements to identify more energy-saving opportunities, relying on the expertise of the federal energy managers at these facilities.

Completed Energy Retrofits and Capital Improvement Projects

The EPA has several projects underway that will contribute to the agency's future energy savings. In FY 2016, the EPA continued to make progress on several multiyear infrastructure replacement projects at its laboratories in Montgomery, Alabama, and Corvallis, Oregon.

In FY 2016, the EPA made progress on the energy efficiency efforts listed in Table 2 below, which represent more than 2.9 BBtu of total annual energy savings.

Table 2. Energy Conservation Projects Underway or Completed in FY 2016

Facility	*Description of Improvements*	*Estimated Annual Energy Savings*
National Analytical Radiation Environmental Laboratory in Montgomery, Alabama	Two AHUs replaced as part of completion of Phase 1 of IRP; Phase 2 to be completed by the end of FY 2017	1.4 billion Btu
Western Ecology Division Laboratory in Corvallis, Oregon	Design stage of Phase 1A of multi-year IRP	1.5 billion Btu

Energy Savings Performance Contracts

Like many other federal agencies, the EPA has limited capital funds to maintain existing laboratory infrastructure, replace aging infrastructure and reconfigure existing research laboratory space to meet mission-critical needs. When appropriate, the EPA considers ESPCs as a potential funding source for energy-saving projects, as they enable the agency to reduce the burden of up-front capital costs. Although many of the EPA's energy-saving or renewable energy projects are often not viable candidates for ESPCs due to the advanced age and complexity of mechanical systems, the laboratories' remote locations and the small project sizes, the agency continues to evaluate its pipeline of future energy projects for performance contracting opportunities.

In FY 2016, the EPA made significant progress on an ESPC that was awarded in December 2016, for a 25-year photovoltaic array at its Region 2 Laboratory in Edison, New Jersey. With a capacity of up to 1.5 megawatts, the proposed system is estimated to provide the Edison laboratory with more than 40 percent of its electricity through renewable sources.

The EPA continues to explore the feasibility of a utility energy service contract at its Region 10 Laboratory in Manchester, Washington. This project would replace the facility's existing fuel oil feeds with natural gas lines, netting significant cost savings for the agency and reducing particulate and GHG emissions from onsite fuel combustion.

Green Power Purchases

The EPA Continues to Purchase Green Power Equal to 100 Percent of Electricity Use

In FY 2006, the EPA became the first federal agency to purchase green power equal to 100 percent of its electricity use. A decade later, the EPA continues to be a leader among federal agencies by covering 100 percent of its estimated FY 2016 electricity use with purchased green power and RECs for the 11th consecutive year.

In August 2016, the EPA procured a blanket purchase agreement through the Defense Logistics Agency for a total of 235.6 million kilowatt-hours of RECs from the BPA vendor 3Degrees Group, Inc., that supported renewable energy generation from wind resources in three states—North Dakota, South Dakota and Oklahoma. Combined with three additional green power contracts, the EPA purchased 236 million kWh in delivered green power and RECs for FY 2016, enough to cover 100 percent of the agency's estimated annual electricity use at its facilities across the country.

To maximize the positive impacts of its green power purchases, the EPA continued using a solicitation strategy to procure a portion of its total RECs in FY 2016 from regions of the United States where renewable energy generation would displace electricity generated from the highest GHG-emitting conventional power plants, thus enabling the EPA to have a greater impact on GHG emission reductions. The EPA used the Emissions & Generation Resource Integrated Database, the agency's comprehensive source of data on the environmental characteristics of nearly all electric power generated in the United States, to quantify the impact of green power purchases from different regions on its Scope 1 and 2 GHG emissions. The EPA anticipates this targeted REC purchasing strategy will enable the agency to continue reducing Scope 2 GHG emissions from purchased electricity in the future.

The EPA plans to complete another blanket purchase agreement of RECs for FY 2017. With other small green power contracts, this BPA will represent 100 percent of the EPA's estimated FY 2017 conventional electricity consumption in its facilities.

Onsite Renewables and Alternative Generation

The EPA installs onsite renewable energy and alternative energy systems at its facilities where practical and cost-effective. These systems help the agency build energy resiliency, diversify its energy supply and reduce energy losses from transmission and distribution. In FY 2016, onsite renewable resources such as wind, solar and geothermal power, and also alternative energy from combined heat and power, or cogeneration, supplied the EPA with 8.9 BBtu, equivalent to 0.82 percent of the agency's energy use. Among the agency's numerous onsite renewable energy installations are:

- A ground source heat pump at the Robert S. Kerr Environmental Research Center in Ada, Oklahoma.
- A 100-kilowatt solar roof at the National Computer Center in RTP, North Carolina.

- A 109-kW hosted PV array on the roof of the First Environments Early Learning Center in RTP, North Carolina.
- A 55-kW, thin-film solar PV system on the roof of the Main Building E, and a 52.5-kW solar PV system on the roof of the Main Building B in RTP, North Carolina.
- A 5-kW solar PV array on the roof of the Atlantic Ecology Division Laboratory in Narragansett, Rhode Island.
- A 2-kW solar photovoltaic awning system at its New England Regional Laboratory in Chelmsford, Massachusetts.
- Solar hot water heating systems at the AED Laboratory in Narragansett, Rhode Island; the Region 2 Laboratory in Edison, New Jersey; and the Office of Research and Development Laboratory in Athens, Georgia.
- A 9.5-kW PV array on the roof at the Western Ecology Division Laboratory in Corvallis, Oregon.
- A cogeneration facility at its Region 9 Laboratory in Richmond, California.

As part of an ESPC, the EPA will soon develop a 1.5-MW solar PV installation for the Region 2 Laboratory in Edison, New Jersey. This project could generate an estimated 5 BBtu of solar energy.

Advanced Metering

Advanced Metering Hardware Installed or Under Construction to Capture 81 Percent of Agencywide Reportable Energy Consumption

EPAct 2005 and EISA require federal agencies to install advanced metering equipment for electricity (by FY 2012), and steam and natural gas (by FY 2016) to the maximum extent practicable, considering ROI and other criteria. By the end of FY 2016, 81 percent of EPA laboratories' energy use was measured by advanced metering hardware.

The EPA continues to add advanced metering capacity to its building inventory by upgrading existing meters and coupling metering hardware installations with major infrastructure replacement projects. In FY 2016, the EPA continued the design or construction of advanced metering projects at seven laboratories:

- AED Laboratory in Narragansett, Rhode Island (natural gas and water)
- AWBERC in Cincinnati (electricity, fuel oil, natural gas and water)
- Mid-Continent Ecology Division (MED) Laboratory in Duluth, Minnesota (electricity, natural gas and water)
- NAREL in Montgomery, Alabama (electricity, natural gas and water)
- National Vehicle and Fuel Emissions Laboratory in Ann Arbor, Michigan (electric submeters)
- ORD Laboratory in Athens, Georgia (electricity, natural gas and water)
- WED Laboratory in Corvallis, Oregon (electricity, natural gas and water)

In FY 2016, the EPA also made significant progress implementing and commissioning its national advanced metering software system. The EPA continued to procure metering software as a service

through an interagency agreement with the Department of Commerce's National Technical Information Service. The NTIS-hosted software system collects data from advanced meters across the EPA's facilities and includes dashboards, trend analysis reporting, data quality analysis capabilities and the ability to store historical data for reporting purposes. The system provides this information in usable formats and meets the advanced metering requirements of EPAct 2005 and EISA.

At the Environmental Science Center in Fort Meade, Maryland, the EPA performed commissioning of previously installed metering hardware in spring 2016 to ensure complete and accurate measurement and upstream communication of data from local meters to the EPA's national advanced metering system. This work included a physical inspection and point-to-point testing to ensure that data measured locally matched data appearing in the web-based user interface of the EPA's national advanced metering system. The EPA anticipates performing this process at additional laboratories in FY 2017, where a preliminary review of advanced metering data suggests that additional commissioning is necessary.

In FY 2017, the EPA will complete the design and installation of additional metering hardware at the seven facilities listed above, and will also identify additional advanced metering opportunities where it is cost-effective to do so.

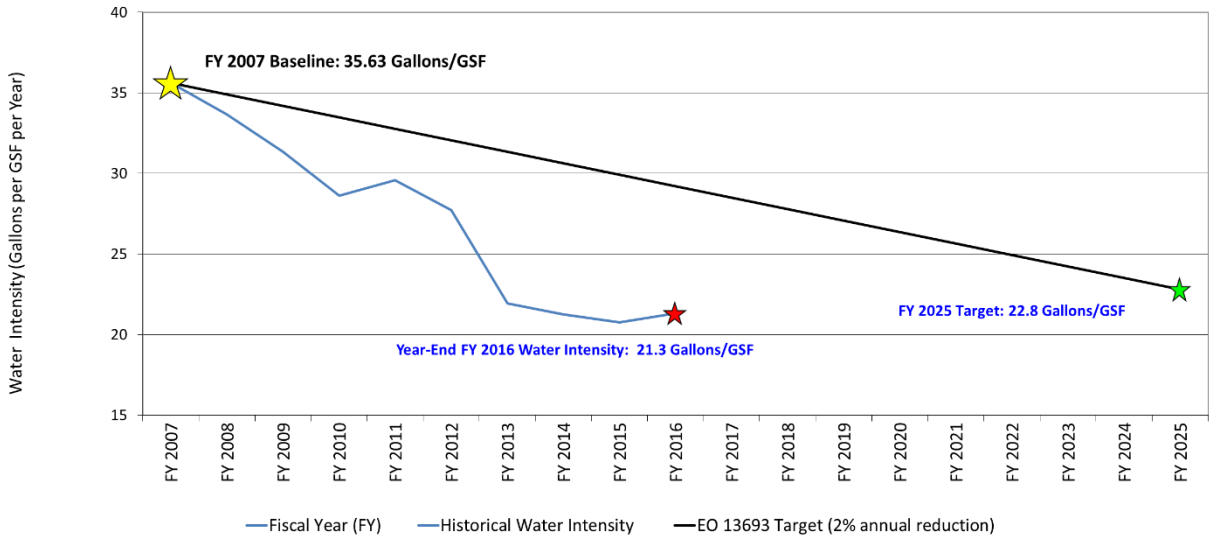
WATER CONSERVATION

The EPA's FY 2016 Water Intensity Is 40.1 Percent Lower Than Its FY 2007 Baseline

EO 13693 requires a 36 percent cumulative—or 2 percent per year—reduction in potable water intensity through FY 2025 compared to a FY 2007 baseline. The EPA continues to far exceed the annual EO 13693 requirements and has already surpassed the FY 2025 federal requirement for water conservation.

Through water-saving measures and capital improvement projects, the EPA achieved a water intensity of 21.3 gallons per GSF in FY 2016, which is a decrease of 40.1 percent compared with the FY 2007 baseline (see Figure 4 below). In absolute terms, EPA laboratories used a total of 82.1 million gallons of water in FY 2016 compared to 136.5 million gallons in FY 2007.

Figure 4. EPA Annual Water Intensity Relative to its EO 13693 Target



Agencywide Water Intensity and Percent Change From FY 2007 Baseline	
FY 2007 Baseline: 35.63 gal/GSF	
FY 2008: 33.66 gal/GSF: -5.52%	FY 2013: 21.95 gal/GSF: -38.39%
FY 2009: 31.35 gal/GSF: -12.00%	FY 2014: 21.25 gal/GSF: -40.36%
FY 2010: 28.61 gal/GSF: -19.70%	FY 2015: 20.77 gal/GSF: -41.71%
FY 2011: 29.59 gal/GSF: -16.95%	FY 2016: 21.33 gal/GSF: -40.13%
FY 2012: 27.74 gal/GSF: -22.15%	

For example, the Robert S. Kerr Environmental Research Center in Ada, Oklahoma, in honor of its 50th anniversary of operation, reduced facility potable water use by discontinuing use of its irrigation system. By eliminating supplemental irrigation on its landscape, the laboratory will save more than 400,000 gallons of water per year. The Kansas City STC in Kansas City, Kansas, reduced its water use by recommissioning its graywater system. Because of this recommissioning effort, equipment related to the system was repaired and replaced, thus prioritizing use of graywater over potable water, where available. This project will reduce the laboratory's potable water use by 286,000 gallons annually.

The EPA's FY 2016 water conservation efforts were guided by the agency's Water Conservation Strategy, which outlines water reduction projects and goals for facilities and is discussed in more detail in the agency's SSPP, as well as by water management plans for each facility that are updated after each water assessment.

EISA Section 423 Implementation—Water Assessments

From October 2015 through September 2016, the EPA completed water assessments for one covered facility and five non-covered facilities. For each water assessment, the EPA completes either an onsite examination, which involves a comprehensive review of water-using processes, or a "desk

audit," which involves reviewing the findings from the previous water assessment and updating the results with input from facility managers. The EPA conducted onsite assessments at the WED Laboratory in Corvallis, Oregon; the Pacific Coast Ecology Branch in Newport, Oregon; the Manchester Environmental Laboratory in Port Orchard, Washington; and the Edison Environmental Center in Edison, New Jersey. The EPA conducted desk audits at the Large Lakes Research Station in Grosse Ile, Michigan and the National Exposure Research Laboratory, Environmental Sciences Division in Las Vegas.

In FY 2017 and beyond, the EPA will analyze projects identified for these facilities for feasibility and cost effectiveness and work with facility managers to implement them. See Table 3 below for a list of the potential water-saving projects identified in the FY 2016 water assessments.

Table 3. Potential Water-Saving Projects From FY 2016 EISA Water Assessments

Facility	*Description of Potential Projects*	*Estimated Annual Water Savings*
Edison Environmental Center in Edison, New Jersey	Install 0.5 gallon per minute aerators on faucets throughout EEC with flow rates currently exceeding 0.5 gpm. For faucets within Building 205, install 1.0 gpm faucet aerators to allow activation of the instant hot water systems.	73,000 gallons
	Replace urinals in Buildings 205, 209, and 238 with 0.125 gallons per flush WaterSense labeled models.	53,000 gallons
	Replace 12 existing showerheads in Building 238 with WaterSense labeled models flowing at 1.75 gpm or less.	21,000 gallons
LLRS in Grosse Ile, Michigan	No water conservation projects were identified. All cost-effective water conservation projects previously recommended for this facility have been completed.	N/A
Manchester Environmental Laboratory in Port Orchard, Washington	Replace urinals with 0.25 gpf WaterSense labeled models.	33,000 gallons
	Install WaterSense labeled 1.5 gpm aerators on eight faucets with flow rates currently exceeding 1.5 gpm.	23,000 gallons
	Assuming user satisfaction, replace 1.5 gpm aerators with 1.0 gpm aerators on 12 faucets with flow rates exceeding 1.0 gpm.	14,000 gallons

Table 3. Potential Water-Saving Projects From FY 2016 EISA Water Assessments		
Facility	***Description of Potential Projects***	***Estimated Annual Water Savings***
	Replace four existing showerheads with WaterSense labeled models flowing at 1.75 gpm or less.	3,000 gallons
National Exposure Research Laboratory, Environmental Sciences Division in Las Vegas	No water conservation projects were identified, as the EPA plans to vacate this facility by FY 2018.	N/A
Pacific Coast Ecology Branch in Newport, Oregon	Install 0.5 gpm aerators on two remaining faucets (one in each men's restroom) with flow rates currently exceeding 0.5 gpm.	8,000 gallons
	Replace two existing pre-rinse spray valves in Room S115 with WaterSense labeled models flowing at 1.28 gpm or less.	2,000 gallons
	Replace six existing showerheads in analytical laboratory restrooms and dive locker with WaterSense labeled models flowing at 1.75 gpm or less.	1,000 gallons
	Use rainwater collected in a 300-gallon tank in the courtyard as make-up water for the water feature.	900 gallons
	Replace two existing non-water urinals with 0.125 gpf WaterSense labeled models.	160 gallons
WED Laboratory in Corvallis, Oregon	Fix leaky water connections and water basins at Terrestrial Effects Research Facilities evaporative coolers. Develop an effective preventative maintenance program to ensure TERF evaporative coolers continue to operate efficiently.	259,000 gallons
	Install automatic conductivity controllers on all cooling towers to control blowdown frequency. Increase conductivity set point to between 1,200 and 1,500 microsiemens per centimeter.	29,000 gallons
	Install 0.5 gpm aerators on six faucets within the Corvallis modular complex and trailers.	12,000 gallons

Table 3. Potential Water-Saving Projects From FY 2016 EISA Water Assessments		
Facility	***Description of Potential Projects***	***Estimated Annual Water Savings***
	Replace two existing showerheads in the TERF with 1.75 gpm WaterSense labeled models.	3,000 gallons

Water Conservation Retrofits and Capital Improvements

The EPA continued or completed numerous water conservation projects in FY 2016, as listed in Table 4 below, which helped to significantly reduce the agency's annual potable water use. The EPA estimates that projects completed in FY 2016 will save approximately 1.1 million gallons of potable water per year.

Table 4. Water Conservation Projects Underway or Completed in FY 2016		
Facility	***Description of Improvements***	***Estimated Annual Water Savings***
AWBERC in Cincinnati	Replaced the 2nd and 4th floor restroom toilets and urinals with WaterSense labeled models.	230,000 gallons
Gulf Ecology Division Laboratory in Gulf Breeze, Florida	Installed 0.5 gpm faucet aerators on 28 lavatory faucets.	87,000 gallons
	Replaced three existing toilets flushing at 3.5 gpf with WaterSense labeled models flushing at 1.28 gpf.	15,000 gallons
	Replaced one existing urinal with a WaterSense labeled model flushing at 0.125 gpf.	7,000 gallons
	Replaced three existing showerheads with WaterSense labeled models.	1,400 gallons
Kansas City STC in Kansas City, Kansas	Recommissioned graywater system and made required adjustments to optimize graywater use.	286,000 gallons
	Installed 0.5 gpm faucet aerators on two lavatory faucets on the 2nd floor.	7,000 gallons
Manchester Environmental Laboratory in Port Orchard, Washington	Retrofit eight faucets with 1.5 gpm faucet aerators.	23,000 gallons
	Replaced four existing showerheads with 1.75-gpm WaterSense labeled models.	3,000 gallons
Region 4 SESD Laboratory in Athens, Georgia	Installed 2.2 gpm faucet aerators on all laboratory faucets.	8,400 gallons
	Replaced six existing showerheads with 1.75-gpm WaterSense labeled models	8,000 gallons
Robert S. Kerr Environmental Research Center in Ada, Oklahoma	Discontinued use of the irrigation system.	435,000 gallons
	Installed 0.5 gpm faucet aerators on two lavatory faucets in the 2nd floor men's room.	6,000 gallons

Table 4. Water Conservation Projects Underway or Completed in FY 2016		
Facility	*Description of Improvements*	*Estimated Annual Water Savings*
	Replaced two air compressors that required single-pass cooling with air-cooled models.	1,800 gallons

Nonpotable ILA Water

EO 13693 requires a 30 percent cumulative—or 2 percent annual—reduction in ILA water use through FY 2025 compared to a FY 2010 baseline. The EPA calculated its FY 2010 baseline for agency nonpotable water use to be 135.2 million gallons.

As of the end of FY 2016, five EPA facilities use nonpotable ILA water from sources such as lakes, creeks and wells for irrigation and agricultural research purposes. These facilities include:

- MED Laboratory in Duluth, Minnesota
- NERL in Chelmsford, Massachusetts
- ORD Laboratory in Athens, Georgia
- SESD Laboratory in Athens, Georgia
- Willamette Research Station in Corvallis, Oregon

The EPA estimates that these facilities used a combined 2.8 million gallons of nonpotable water for ILA use in FY 2016. This amount is 97.9 percent lower than the FY 2010 baseline of 135.2 million gallons, and it exceeds the reduction requirements set forth in EO 13693. The EPA will continue assessing each facility's nonpotable water use through its EISA water assessments and will continue reducing the agency's nonpotable water use where possible.

SUSTAINABLE BUILDING DESIGN AND HIGH PERFORMANCE BUILDINGS

The EPA occupies approximately 9.7 million square feet of space in 305 individual buildings nationwide. The EPA promotes energy and resource efficiency, waste reduction, pollution prevention, indoor air quality and other environmental factors both during new construction and in existing buildings owned by the agency or leased by the GSA.

Transforming the EPA's existing buildings to facilities that meet federal high performance sustainable building standards is complex work. The EPA uses a multi-pronged approach, including: energy and water conservation projects; lighting system controls upgrades; scheduled recommissioning; ventilation and thermal comfort testing and improvements; and stormwater management system upgrades. The agency has also developed Building Management Plan templates—a comprehensive set of sustainable building management procedures and policies that represent best practices, minimum requirements, conformance assurance processes and performance standards that help ensure high performance sustainable building operations.

Upgrading Existing Agency-Owned Buildings to Meet the *Guiding Principles*

25.4 Percent of the EPA's FY 2016 Owned Inventory Meets the *Guiding Principles*

The EPA's facilities are divided among owned and leased buildings, which total approximately 9.7 million square feet. The EPA's owned inventory consists of about 3.3 million square feet in 167 buildings. The EPA leases the remaining 6.4 million square feet, which comprises 138 buildings either in GSA-owned facilities or in facilities leased from private owners. The EPA has committed to meeting the *Guiding Principles* in 35 percent (by square feet) of its owned buildings greater than 5,000 square feet by FY 2025.[3]

As of the end of FY 2016, eight buildings—or 25.4 percent (by square feet)—in the EPA's owned inventory met the *Guiding Principles*. The EPA buildings that meet the *Guiding Principles* are:

- AWBERC Main Building and Annex I in Cincinnati
- AWBERC Annex II in Cincinnati
- Building A Administration Wing in RTP, North Carolina
- ESC in Fort Meade, Maryland
- FEELC in RTP, North Carolina
- GED Laboratory Building 67 in Gulf Breeze, Florida
- LLRS in Grosse Ile, Michigan
- NCC in RTP, North Carolina

Implementing the *Guiding Principles*

To improve the environmental performance of EPA facilities so that they meet the *Guiding Principles*, the agency must coordinate numerous facility upgrades, including:

- Energy and water conservation projects
- Lighting controls upgrades
- Irrigation system curtailments or removals
- Stormwater management improvements
- Commissioning
- Verification that appropriate ventilation and thermal comfort standards are met
- Development of building management policies and plans

Multiple facilities have used and customized the EPA's Building Management Plan templates to improve their environmental performance and develop plans to meet the *Guiding Principles*.

[3] The EPA has 52 buildings in its FY 2016 inventory that are subject to this requirement.

Energy Efficiency/Sustainable Design in Lease Provisions

For new major lease acquisitions, the EPA works with the GSA to acquire high performance sustainable buildings that exceed the environmental performance of the facilities being replaced. The EPA has developed a variety of strategies to help the GSA meet these objectives. More details on these strategies are available below and in the agency's SSPP. In FY 2016, the EPA continued to work with the GSA on incorporating sustainable design and energy efficiency in lease procurements and renovations for the following facilities:

- Region 3 Office in Philadelphia
- Region 6 Office in Dallas
- Region 8 Office in Denver

Green Building Certifications

In addition to using its own internal system for certifying existing buildings as meeting the *Guiding Principles*, the EPA uses other green building and energy performance rating systems as part of its toolkit for acquiring high performance green buildings and ensuring their continued performance. The EPA has extensive experience with the LEED BD+C rating system. In addition, many of the buildings leased to the EPA by the GSA have achieved a LEED for Interior Design and Construction or LEED O+M rating.

The Region 10 Office in Seattle, Washington, received LEED Gold certification under the LEED ID+C version 2009 rating system in October 2015. In June 2016, the ESC in Fort Meade, Maryland, became the EPA's first laboratory to become LEED Certified under the LEED O+M rating system.

EPA now occupies 27 buildings with at least one LEED certification:

- AWBERC Annex II in Cincinnati (BD+C)
- Building A Administration Wing in RTP, North Carolina (BD+C)
- ESC in Fort Meade, Maryland (O+M)
- FEELC in RTP, North Carolina (BD+C)
- GED Laboratory Building 67 in Gulf Breeze, Florida (BD+C)
- La Plaza Buildings A, B, C, D, and E in Las Vegas (O+M)
- NCC in RTP, North Carolina (BD+C)
- NERL in Chelmsford, Massachusetts (BD+C)
- Potomac Yard One in Arlington, Virginia (BD+C, O+M)
- Region 1 Office in Boston (BD+C, O+M)
- Region 2 Caribbean Environmental Protection Division in Guaynabo, Puerto Rico (ID+C)
- Region 6 Office in Dallas (O+M)
- Region 7 Office in Lenexa, Kansas (BD+C, O+M)
- Region 8 Office in Denver (BD+C)
- Region 9 Office in San Francisco (ID+C, O+M)
- Region 10 Idaho Operations Office in Boise, Idaho (BD+C)
- Region 10 Office in Seattle (ID+C, O+M)
- Region 10 Washington Operations Office in Lacey, Washington (O+M)

- Robert N Giaimo Federal Building in New Haven, Connecticut (O+M)
- Southern California Field Office in Los Angeles (O+M)
- STC in Kansas City, Kansas (BD+C)
- William Jefferson Clinton Federal Building (East, West) in Washington (O+M)
- William Jefferson Clinton Federal Building (North, South) in Washington (O+M)

Of the 9.7 million square feet of laboratory, office and support space that the EPA occupies, 45 percent have met the *Guiding Principles* or received LEED green building certification.

ENERGY STAR Building Label

Since 2003, the EPA has required all large, newly leased buildings to have earned the ENERGY STAR building label prior to lease award or within 18 months of the completion date for new construction. The EPA's main headquarters buildings and all regional offices have earned the ENERGY STAR building label; four of the regional offices renewed the label during FY 2016. Following are the most recent years in which the buildings were labeled:

- Region 1 Office in Boston (2015)
- Region 2 Office in New York (2012)
- Region 3 Office in Philadelphia (2016)
- Region 4 Office in Atlanta (2013)
- Region 5 Office in Chicago (2012)
- Region 6 Office in Dallas (2013)
- Region 7 Office in Lenexa, Kansas (2016)
- Region 8 Office in Denver (2016)
- Region 9 Office in San Francisco (2016)
- Region 10 Office in Seattle (2013)

Use of ENERGY STAR and Other Energy-Efficient Products

For building products, the EPA specifies the use of ENERGY STAR and other energy-efficient products through its *Architecture and Engineering Guidelines* and GreenCheck process further described below.

For electronics, the EPA currently tracks and reports the purchase of ENERGY STAR qualified and FEMP-designated personal computers, notebook computers and monitors. The EPA will continue to track and report electronics stewardship data and evaluate areas for improvement across the lifecycle of electronics acquisition, O&M and end-of-life management. The EPA will continue to leverage its agency Electronics Stewardship Working Group to ensure coordination of improvement initiatives.

GreenCheck

GreenCheck is a process the EPA uses to formally identify environmental performance goals for each new facility, significant renovation/construction project and lease. These goals include meeting the requirements of EPAct 2005, EISA, the *Guiding Principles* and EO 13693, as well as the agency's

own requirements as reflected in its *Best Practice (Environmental) Lease Provisions* and *Architecture and Engineering Guidelines*. The EPA updates the GreenCheck checklist periodically to incorporate new requirements and address lessons learned from reviews.

All projects requiring funding in excess of $150,000 or affecting at least 5,000 GSF (or increasing impervious area by more than 5,000 GSF) qualify for a full GreenCheck review. In FY 2016, the EPA screened six construction projects and lease actions through the GreenCheck process.

Net-Zero Buildings

The EPA works to achieve net-zero-energy status in new buildings by attempting to minimize energy requirements through attentive design and construction. The building would then meet remaining energy needs through onsite renewable energy sources or, if that approach is impractical, by acquiring renewable energy on a long-term or permanent basis from offsite sources. The EPA plans to follow this approach for all new building designs starting in 2020, as required by EO 13693.

Based on a review of the most likely candidates for onsite renewable energy projects, the EPA is currently examining a few of its existing facilities that have the potential to pursue net-zero-energy status. Likewise, for net-zero-waste, the EPA is looking at facilities to see which have the best potential to achieve that status.

The EPA will work to achieve net-zero-water status in new buildings by incorporating efficient fixtures, appliances and systems in design and construction. The EPA will also determine the feasibility and life-cycle cost effectiveness of implementing alternative water sourcing, such as rainwater collection, air-handler condensate capture or greywater recycling systems, to supplement necessary potable water use. The EPA's goal is to use water as efficiently as feasible while sustaining the ability to accomplish the mission of each new facility.

In 2015, the EPA assessed its existing facilities to evaluate the potential to achieve net-zero-water status. To fully analyze each facility's potential, the EPA evaluated the status of water efficiency project implementation and the potential for water recycling, reuse or use of alternate water sources. Some measures that the EPA considers in evaluating net-zero-water potential include replacing plumbing fixtures with models representing the highest efficiency available and practical; identifying water conservation opportunities in building and research processes; and eliminating outdoor water use. The EPA also considered the location of each facility within its specific watershed, since EO 13693 requires that any water drawn from a watershed must be returned to the same watershed without compromising water quality. Based on this analysis, the EPA has identified three buildings at its Duluth, Minnesota, laboratory that are net-zero-water, and two additional buildings that have the potential to achieve net-zero-water status with the completion of water efficiency projects.

Facility Resiliency

In response to EO 13653, *Preparing the United States for the Impacts of Climate Change*, the EPA's 2014 Climate Change Adaptation Plan identified protecting agency facilities and operations from the impacts of climate change as a priority. To support this priority, the EPA conducted facility resiliency assessments at three laboratories in FY 2016–the AED Laboratory in Narragansett, Rhode Island; the MED Laboratory in Duluth, Minnesota; and the National Enforcement Investigations

Center Laboratory in Lakewood, Colorado. The EPA has now performed facility resiliency assessments in all six climate regions in the United States. In FY 2017, the EPA plans to complete additional facility assessments to expand its understanding of the agency's vulnerabilities to climate shifts and to identify opportunities to improve resilience if funding is available. The EPA will also update new construction and renovation master planning guidelines to incorporate best practices learned from its completed assessments, which will further enhance facility resiliency and ensure the EPA can continue to provide mission-critical services.

SOLID WASTE DIVERSION

The EPA's FY 2016 Waste Diversion Rate is 63.6 Percent

Based on data submitted by EPA facilities, including regional offices and regional and program laboratories, the agency achieved a 63.6 percent solid waste diversion rate in FY 2016, recycling 1,818 tons of recyclable materials and diverting 367 tons of organic waste from landfills through composting. EO 13693 requires federal agencies to divert at least 50 percent of non-hazardous solid waste annually. Through its recycling and composting efforts, the EPA has exceeded this goal, as well as its own internal goal of a 60 percent waste diversion rate. Several EPA facilities incorporated best practices or promoted awareness in FY 2016 to improve their recycling and composting programs, including:

- **Region 1.** The EPA's regional office in Boston has been composting since 2013, and in FY 2016 held a composting seminar, produced video messages to educate staff about materials that can be composted and conducted a compost comparison plant growth experiment on the building's green roof. The EPA's NERL in Chelmsford, Massachusetts, expanded its recycling program to cover non-toxic sample and chemical containers and polystyrene packing materials.

- **STC in Kansas City, Kansas.** The EPA Region 7 Laboratory initiated a composting program in FY 2016 for paper towels, food waste and compostable dinnerware. Collected materials are shipped off site, converted to compost and re-applied on the facility's landscape.

- **AED in Narragansett, Rhode Island.** AED expanded its food waste and composting to include fats, meats, bones and other items that were previously outside the scope of the facility's onsite composting operation.

According to EO 13693, a net-zero-waste building "is operated to reduce, reuse, recycle, compost or recover solid waste streams (except for hazardous and medical waste) thereby resulting in zero-waste disposal." The EPA is considering strategies for achieving net-zero-waste status at select facilities. The agency will continue to support source reduction, recycling, reuse, donation and composting at all its facilities.

APPENDIX A:
LIST OF EXCLUDED FACILITIES

FOR SUBMITTAL WITH THE EPA'S
ENERGY MANAGEMENT AND CONSERVATION PROGRAM
FY 2016 ANNUAL REPORT

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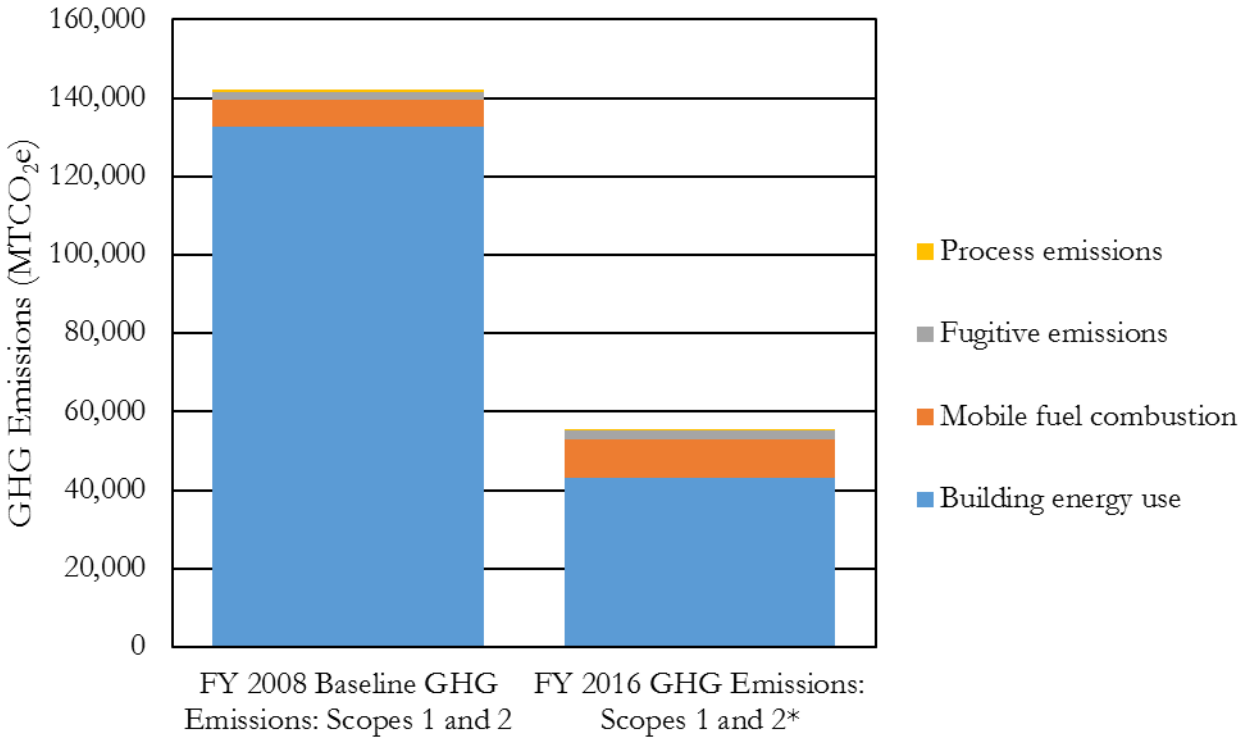
APPENDIX A – LIST OF EXCLUDED FACILITIES

Table A-1. List of Excluded Facilities

Facility	*Explanation*	*FY 2016 Energy Consumption*
Research Vessel, MED Laboratory, Duluth, Minnesota	A research vessel based out of the MED Laboratory in Duluth, Minnesota, consumes energy when it is docked; this is known as "cold iron energy." FEMP's *Guidelines for Establishing Criteria for Excluding Buildings*, dated January 27, 2006, states that "Federal ships that consume 'Cold Iron Energy' (energy used to supply power and heat to ships docked in port)," are "assumed to already be excluded from the energy performance requirements of Section 543" of EPAct 2005. Therefore, the EPA is reporting the energy consumed by this vessel in FY 2014 in the Energy Goal Excluded category of the *GHG and Sustainability Data Report* accompanying this narrative. The energy consumed by this vessel was, however, included in the agency's Scope 1 and 2 GHG emissions calculations per the EO 13514 *Federal Greenhouse Gas Accounting and Reporting Guidance.*	41,056 kWh

Figure 1. The EPA's Reported Scope 1 and 2 GHG Emissions: FY 2008 and FY 2016



*FY 2016 includes Scope 2 adjustments from REC purchases

While the agency plans to continue to purchase green power and RECs to meet the EO 13693 clean electricity requirement, current and anticipated appropriation levels could make it difficult for the EPA to maintain the Scope 1 and 2 GHG emissions reductions achieved to date. Therefore, the agency will refocus its GHG emissions reduction strategy through energy conservation measures, infrastructure improvements, space management and consolidation, and fleet efficiency.

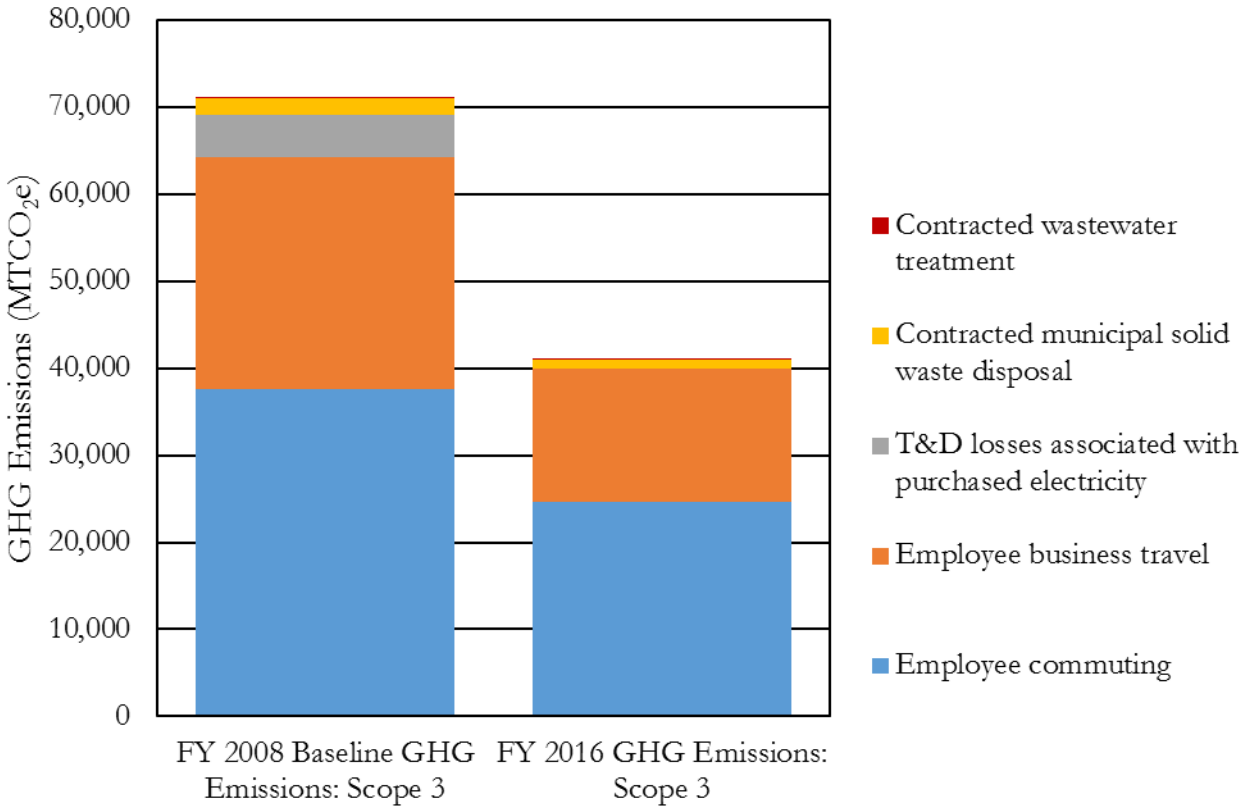
The EPA developed its FY 2025 Scope 1 and 2 GHG emissions reduction target using FEMP's Development of Agency Reduction Targets tool. Accounting for the EPA's projected energy conservation and onsite renewable energy projects, the tool generated several potential target scenarios ranging from conservative to aggressive. The EPA's final target of 46 percent by FY 2025 was not the most conservative scenario. It assumed the minimum renewable energy use through onsite and purchased sources required for federal agencies while setting a realistic achievable target based on anticipated appropriation levels.

Reported Scope 3 GHG Emission Reductions

The EPA's Scope 3 GHG Emissions Are 42.5 Percent Lower Than FY 2008 Baseline

Scope 3 GHG emissions include indirect emissions from sources that are not owned or directly controlled by the EPA but are related to the agency's activities, such as employee business travel and commuting; contracted solid waste disposal; and contracted wastewater treatment. In response to EO 13693, the EPA has committed to reduce the required subset of Scope 3 GHG emissions 35 percent by FY 2025 compared to the FY 2008 baseline of 71,089 $MTCO_2e$. In FY 2016, the EPA's estimated Scope 3 GHG emissions were 41,038 $MTCO_2e$, a decrease of 42.5 percent from the FY 2008 baseline. The agency's Scope 3 emissions performance includes a credit of 0.17 percent for its hosted onsite renewable project at the child care facility at its campus in RTP, North Carolina. The EPA's Scope 3 GHG emissions did increase compared to FY 2015, due mostly to more business air travel in FY 2016 compared to FY 2015.

Figure 2. The EPA's Reported Scope 3 GHG Emissions, FY 2008 and FY 2016



*FY 2016 includes T&D loss adjustments from REC purchases

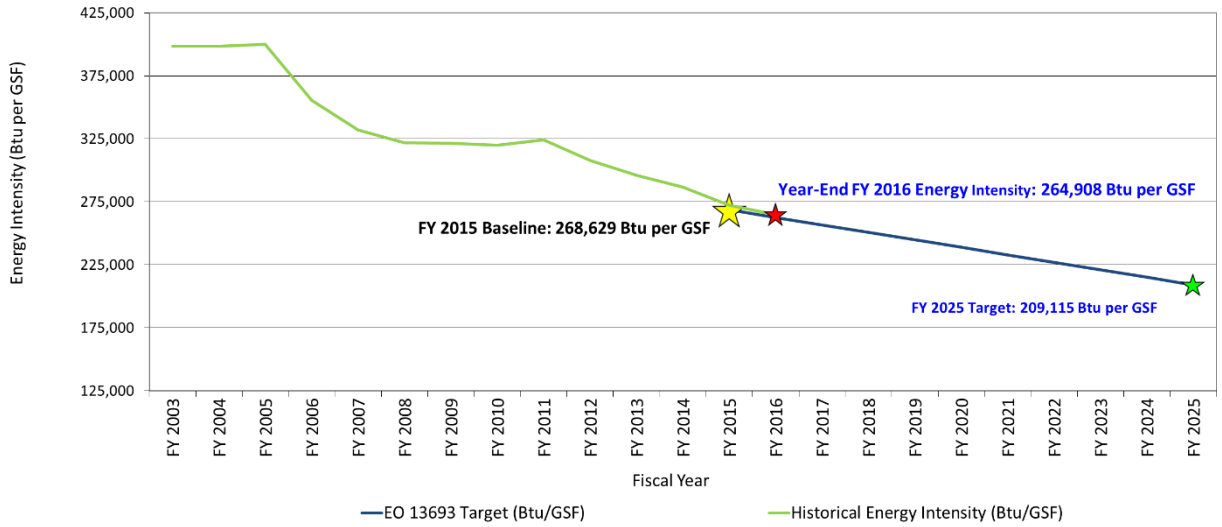
ENERGY EFFICIENCY PERFORMANCE

The EPA's FY 2016 Energy Intensity Has Decreased 34.6 Percent From FY 2003 Baseline

EO 13693 requires federal agencies to reduce their energy intensity by 25 percent, or 2.5 percent per year, by FY 2025 compared to a FY 2015 baseline. However, because the EPA exceeded the previous requirement, under EISA, of reducing its cumulative energy intensity by 30 percent by FY 2015, the agency has elected to pursue the alternative goal for compliance approved by the DOE and detailed in the *Implementing Instructions for EO 13693: Planning for Federal Sustainability in the Next Decade*. Specifically, the EPA has committed to a cumulative reduction of 47.5 percent in energy intensity by FY 2025 compared to its FY 2003 baseline. Therefore, the agency has a target to reduce its energy intensity by 1.75 percent per year through FY 2025 to achieve the cumulative 47.5 percent goal. The EPA's FY 2016 reported energy intensity was 260,469 Btu per GSF, which is 3.0 percent less than FY 2015 and 34.6 percent less than the FY 2003 baseline (see Figure 3 below). In absolute terms, the EPA's FY 2016 energy consumption was 1,025.2 billion Btu compared to its FY 2003 baseline of 1,481 BBtu.

The agency's FY 2016 energy intensity includes two credits created by FEMP. The source energy savings credit encourages lifecycle cost-effective energy projects that reduce source energy use, but might increase site energy use. The weather normalization credit accommodates for annual fluctuations in weather patterns. Without these credits, the EPA's actual FY 2016 energy intensity was 264,908 Btu per GSF, or 33.5 percent less than the FY 2003 baseline. By either measure, the EPA exceeded the FY 2016 energy use reduction requirements.

Figure 3. EPA Annual Energy Intensity Relative to its EISA/EO 13693 Target



including initial investment; energy and operational cost savings; absolute Btu and/or gallons of potable water saved per dollar; and potential for reducing facility maintenance.

For major new EPA facilities, GSA-owned buildings being renovated for the EPA or build-to-suit buildings leased by the GSA from private landlords for the EPA, the agency, as a standard operating practice, performs extensive energy modeling to ensure compliance with the requirement that new buildings and major renovations perform 30 percent better than the American Society of Heating, Refrigerating and Air-Conditioning Engineers 90.1 standard. During this process, the EPA weighs the cost of incremental mechanical system and building envelope investments against the energy cost savings that will result from these investments. The agency pursues energy efficiency performance beyond the 30 percent better than the ASHRAE standard when it can be achieved in a life cycle cost-effective manner.

EISA Section 432 Implementation—Energy Assessments

The EPA Completed its Second Four-Year Cycle of Energy Assessments for 100 Percent of Covered Facilities as Required by EISA

From July 2015 through June 2016, the EPA conducted energy assessments and recommissioning for facilities that represented more than 13 percent of the total energy use of the agency's covered facilities (based on FY 2008 data, per EISA Section 432 guidance). With the completion of this round of assessments, the EPA has met the EISA requirement for June 2016 to complete assessments for 100 percent of total energy use of covered facilities over a four-year period.

The agency collected information on potential energy conservation measures for facilities evaluated from July 2015 through June 2016 and compiled the associated implementation costs, estimated annual energy savings and estimated annual cost savings in a comprehensive report submitted to FEMP in June 2016. See Table 1 below for a list of the reported measures.

Table 1. Potential Energy-Saving Projects From FY 2016 EISA Energy Assessments

Facility	*Description of Potential Projects*	*Estimated Annual Energy Savings*
AWBERC in Cincinnati	Retro-commissioning for the existing 33 percent of the facility	0.416 billion Btu
	Replace existing 1800-ton chiller and install decoupler loop	1.249 billion Btu
	Main air handler optimization	0.208 billion Btu
Main Building in RTP, North Carolina	Replace variable air volume supply and exhaust systems	14.432 billion Btu
	Replace controller, reset static pressure, reduce air changes, set back temperature and reset occupancy sensors	16.073 billion Btu

Green Power Purchases

The EPA Continues to Purchase Green Power Equal to 100 Percent of Electricity Use

In FY 2006, the EPA became the first federal agency to purchase green power equal to 100 percent of its electricity use. A decade later, the EPA continues to be a leader among federal agencies by covering 100 percent of its estimated FY 2016 electricity use with purchased green power and RECs for the 11th consecutive year.

In August 2016, the EPA procured a blanket purchase agreement through the Defense Logistics Agency for a total of 235.6 million kilowatt-hours of RECs from the BPA vendor 3Degrees Group, Inc., that supported renewable energy generation from wind resources in three states—North Dakota, South Dakota and Oklahoma. Combined with three additional green power contracts, the EPA purchased 236 million kWh in delivered green power and RECs for FY 2016, enough to cover 100 percent of the agency's estimated annual electricity use at its facilities across the country.

To maximize the positive impacts of its green power purchases, the EPA continued using a solicitation strategy to procure a portion of its total RECs in FY 2016 from regions of the United States where renewable energy generation would displace electricity generated from the highest GHG-emitting conventional power plants, thus enabling the EPA to have a greater impact on GHG emission reductions. The EPA used the Emissions & Generation Resource Integrated Database, the agency's comprehensive source of data on the environmental characteristics of nearly all electric power generated in the United States, to quantify the impact of green power purchases from different regions on its Scope 1 and 2 GHG emissions. The EPA anticipates this targeted REC purchasing strategy will enable the agency to continue reducing Scope 2 GHG emissions from purchased electricity in the future.

The EPA plans to complete another blanket purchase agreement of RECs for FY 2017. With other small green power contracts, this BPA will represent 100 percent of the EPA's estimated FY 2017 conventional electricity consumption in its facilities.

Onsite Renewables and Alternative Generation

The EPA installs onsite renewable energy and alternative energy systems at its facilities where practical and cost-effective. These systems help the agency build energy resiliency, diversify its energy supply and reduce energy losses from transmission and distribution. In FY 2016, onsite renewable resources such as wind, solar and geothermal power, and also alternative energy from combined heat and power, or cogeneration, supplied the EPA with 8.9 BBtu, equivalent to 0.82 percent of the agency's energy use. Among the agency's numerous onsite renewable energy installations are:

- A ground source heat pump at the Robert S. Kerr Environmental Research Center in Ada, Oklahoma.
- A 100-kilowatt solar roof at the National Computer Center in RTP, North Carolina.

- A 109-kW hosted PV array on the roof of the First Environments Early Learning Center in RTP, North Carolina.
- A 55-kW, thin-film solar PV system on the roof of the Main Building E, and a 52.5-kW solar PV system on the roof of the Main Building B in RTP, North Carolina.
- A 5-kW solar PV array on the roof of the Atlantic Ecology Division Laboratory in Narragansett, Rhode Island.
- A 2-kW solar photovoltaic awning system at its New England Regional Laboratory in Chelmsford, Massachusetts.
- Solar hot water heating systems at the AED Laboratory in Narragansett, Rhode Island; the Region 2 Laboratory in Edison, New Jersey; and the Office of Research and Development Laboratory in Athens, Georgia.
- A 9.5-kW PV array on the roof at the Western Ecology Division Laboratory in Corvallis, Oregon.
- A cogeneration facility at its Region 9 Laboratory in Richmond, California.

As part of an ESPC, the EPA will soon develop a 1.5-MW solar PV installation for the Region 2 Laboratory in Edison, New Jersey. This project could generate an estimated 5 BBtu of solar energy.

Advanced Metering

Advanced Metering Hardware Installed or Under Construction to Capture 81 Percent of Agencywide Reportable Energy Consumption

EPAct 2005 and EISA require federal agencies to install advanced metering equipment for electricity (by FY 2012), and steam and natural gas (by FY 2016) to the maximum extent practicable, considering ROI and other criteria. By the end of FY 2016, 81 percent of EPA laboratories' energy use was measured by advanced metering hardware.

The EPA continues to add advanced metering capacity to its building inventory by upgrading existing meters and coupling metering hardware installations with major infrastructure replacement projects. In FY 2016, the EPA continued the design or construction of advanced metering projects at seven laboratories:

- AED Laboratory in Narragansett, Rhode Island (natural gas and water)
- AWBERC in Cincinnati (electricity, fuel oil, natural gas and water)
- Mid-Continent Ecology Division (MED) Laboratory in Duluth, Minnesota (electricity, natural gas and water)
- NAREL in Montgomery, Alabama (electricity, natural gas and water)
- National Vehicle and Fuel Emissions Laboratory in Ann Arbor, Michigan (electric submeters)
- ORD Laboratory in Athens, Georgia (electricity, natural gas and water)
- WED Laboratory in Corvallis, Oregon (electricity, natural gas and water)

In FY 2016, the EPA also made significant progress implementing and commissioning its national advanced metering software system. The EPA continued to procure metering software as a service

through an interagency agreement with the Department of Commerce's National Technical Information Service. The NTIS-hosted software system collects data from advanced meters across the EPA's facilities and includes dashboards, trend analysis reporting, data quality analysis capabilities and the ability to store historical data for reporting purposes. The system provides this information in usable formats and meets the advanced metering requirements of EPAct 2005 and EISA.

At the Environmental Science Center in Fort Meade, Maryland, the EPA performed commissioning of previously installed metering hardware in spring 2016 to ensure complete and accurate measurement and upstream communication of data from local meters to the EPA's national advanced metering system. This work included a physical inspection and point-to-point testing to ensure that data measured locally matched data appearing in the web-based user interface of the EPA's national advanced metering system. The EPA anticipates performing this process at additional laboratories in FY 2017, where a preliminary review of advanced metering data suggests that additional commissioning is necessary.

In FY 2017, the EPA will complete the design and installation of additional metering hardware at the seven facilities listed above, and will also identify additional advanced metering opportunities where it is cost-effective to do so.

WATER CONSERVATION

The EPA's FY 2016 Water Intensity Is 40.1 Percent Lower Than Its FY 2007 Baseline

EO 13693 requires a 36 percent cumulative—or 2 percent per year—reduction in potable water intensity through FY 2025 compared to a FY 2007 baseline. The EPA continues to far exceed the annual EO 13693 requirements and has already surpassed the FY 2025 federal requirement for water conservation.

Through water-saving measures and capital improvement projects, the EPA achieved a water intensity of 21.3 gallons per GSF in FY 2016, which is a decrease of 40.1 percent compared with the FY 2007 baseline (see Figure 4 below). In absolute terms, EPA laboratories used a total of 82.1 million gallons of water in FY 2016 compared to 136.5 million gallons in FY 2007.

Upgrading Existing Agency-Owned Buildings to Meet the *Guiding Principles*

25.4 Percent of the EPA's FY 2016 Owned Inventory Meets the *Guiding Principles*

The EPA's facilities are divided among owned and leased buildings, which total approximately 9.7 million square feet. The EPA's owned inventory consists of about 3.3 million square feet in 167 buildings. The EPA leases the remaining 6.4 million square feet, which comprises 138 buildings either in GSA-owned facilities or in facilities leased from private owners. The EPA has committed to meeting the *Guiding Principles* in 35 percent (by square feet) of its owned buildings greater than 5,000 square feet by FY 2025.[3]

As of the end of FY 2016, eight buildings—or 25.4 percent (by square feet)—in the EPA's owned inventory met the *Guiding Principles*. The EPA buildings that meet the *Guiding Principles* are:

- AWBERC Main Building and Annex I in Cincinnati
- AWBERC Annex II in Cincinnati
- Building A Administration Wing in RTP, North Carolina
- ESC in Fort Meade, Maryland
- FEELC in RTP, North Carolina
- GED Laboratory Building 67 in Gulf Breeze, Florida
- LLRS in Grosse Ile, Michigan
- NCC in RTP, North Carolina

Implementing the *Guiding Principles*

To improve the environmental performance of EPA facilities so that they meet the *Guiding Principles*, the agency must coordinate numerous facility upgrades, including:

- Energy and water conservation projects
- Lighting controls upgrades
- Irrigation system curtailments or removals
- Stormwater management improvements
- Commissioning
- Verification that appropriate ventilation and thermal comfort standards are met
- Development of building management policies and plans

Multiple facilities have used and customized the EPA's Building Management Plan templates to improve their environmental performance and develop plans to meet the *Guiding Principles*.

[3] The EPA has 52 buildings in its FY 2016 inventory that are subject to this requirement.

Center Laboratory in Lakewood, Colorado. The EPA has now performed facility resiliency assessments in all six climate regions in the United States. In FY 2017, the EPA plans to complete additional facility assessments to expand its understanding of the agency's vulnerabilities to climate shifts and to identify opportunities to improve resilience if funding is available. The EPA will also update new construction and renovation master planning guidelines to incorporate best practices learned from its completed assessments, which will further enhance facility resiliency and ensure the EPA can continue to provide mission-critical services.

SOLID WASTE DIVERSION

The EPA's FY 2016 Waste Diversion Rate is 63.6 Percent

Based on data submitted by EPA facilities, including regional offices and regional and program laboratories, the agency achieved a 63.6 percent solid waste diversion rate in FY 2016, recycling 1,818 tons of recyclable materials and diverting 367 tons of organic waste from landfills through composting. EO 13693 requires federal agencies to divert at least 50 percent of non-hazardous solid waste annually. Through its recycling and composting efforts, the EPA has exceeded this goal, as well as its own internal goal of a 60 percent waste diversion rate. Several EPA facilities incorporated best practices or promoted awareness in FY 2016 to improve their recycling and composting programs, including:

- **Region 1.** The EPA's regional office in Boston has been composting since 2013, and in FY 2016 held a composting seminar, produced video messages to educate staff about materials that can be composted and conducted a compost comparison plant growth experiment on the building's green roof. The EPA's NERL in Chelmsford, Massachusetts, expanded its recycling program to cover non-toxic sample and chemical containers and polystyrene packing materials.

- **STC in Kansas City, Kansas.** The EPA Region 7 Laboratory initiated a composting program in FY 2016 for paper towels, food waste and compostable dinnerware. Collected materials are shipped off site, converted to compost and re-applied on the facility's landscape.

- **AED in Narragansett, Rhode Island.** AED expanded its food waste and composting to include fats, meats, bones and other items that were previously outside the scope of the facility's onsite composting operation.

According to EO 13693, a net-zero-waste building "is operated to reduce, reuse, recycle, compost or recover solid waste streams (except for hazardous and medical waste) thereby resulting in zero-waste disposal." The EPA is considering strategies for achieving net-zero-waste status at select facilities. The agency will continue to support source reduction, recycling, reuse, donation and composting at all its facilities.