FEMP Basic Onsite (ASHRAE Level 1 plus Renewable Energy, Water, and Life Cycle Cost Analysis) Audit Scope of Work Background and Instructions for Use

The purpose of this scope of work (SOW) is to provide federal agencies with a consistent solicitation resource to procure basic onsite audit services to satisfy the Energy Independence and Security Act of 2007 (EISA) Section 432 evaluation requirement[[1]](#footnote-1) for their covered facilities. This SOW can be used to procure a minimally compliant audit that closely approximates an ASHRAE Level 1 audit, with necessary additions (water efficiency and renewable energy measures must also be included, as well as a life cycle cost analysis [LCCA] of the recommended measures) to ensure EISA compliance.

Basic onsite audits are one of the several facility evaluation options available to federal agencies to complete the EISA evaluation requirement and receive tailored analysis toward meeting agency energy and water management goals. The Department of Energy (DOE) Federal Energy Management Program (FEMP) EISA evaluation resources for federal agencies include Facility Evaluation (Audit) Definitions[[2]](#footnote-2) that detail the different types of evaluations and a FEMP Audit Decision Tree[[3]](#footnote-3) which provides a selection process for federal agencies to help determine which facility evaluation type is best suited for unique site and data circumstances.

The SOW tasks present a methodology for agency facilities to receive the analysis and documentation from a contractor that satisfies the EISA requirement. These tasks can serve as a baseline for agencies to modify as necessary to better represent their specific facilities, analyze facility systems and characteristics of interest in more depth, and/or provide other desired deliverables. Agencies are also encouraged to discuss the extent of the SOW tasks when selecting their audit contractor to foster an understanding of the audit tasks as they pertain to the unique characteristics of the agency’s facilities.



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| **Project Title:** | Audit at (**Enter name of Facility/Facilities here**)  | **Date:** |  |
| **Facility Name or Identifier:**  |  |
| **Region, Station, Installation, or District:** |  |
| **Address, City, State, Zip Code:** |  |
| **Scope and Definitions** |
| **Scope:** The purpose of the Basic Onsite Audit scope of work (SOW) is to define the minimum activities and actions required to perform a Basic Onsite Audit. This SOW follows the methodology developed by the Department of Energy (DOE) Federal Energy Management Program (FEMP). The activities within this SOW include a review of facility performance and previous audit reports, identification of available measures, and meeting federal energy and water evaluation goals via performance of an onsite audit. The Basic Onsite Audit will evaluate the lifecycle costs of efficiency conservation measures for energy, water, building controls, and renewable energy. This audit could be expanded to include other synergistic activities, such as resilience or 50001 Ready program planning.The SOW is to:1. Provide Energy Independence and Security Act of 2007 (EISA) Section 432-compliant Onsite Basic Audit(s) for the following (**Agency Name**) facilities:

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| **Facility Name** | **Location (address, state, unit, latitude/longitude, etc.)** | **Real Property ID Number or Other Identifier** | **Gross Square Feet (ft2)** | **Predominant Use Type** |
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 1. Provide project management support for this audit agreement to complete tasks 1, 2, 3, and 4 according to the agreed-upon schedule for deliverables detailed in the Tasks and Deliverables sections of this document and maintain regular and timely communication with (**Agency Name**) energy management staff.

**Definitions:** For the purposes of this SOW, common audit definitions are provided in Appendix 1: Definitions at the end of this document. |
| **Tasks** |
| **Task 1: Review Historical Facility Data and Preliminary Energy and Water Use Analysis (Benchmarking)** *Task 1.1 Review Historical Utility Data and Utility Rate Analysis***(Agency Name**) shall be responsible for collecting and providing the list of buildings along with square footage to be audited as well as monthly utility use and cost data including electricity, water, natural gas and any other fuel types to the selected facility auditor. The data shall include a minimum of 12 consecutive months (up to three consecutive years shall be used as available) and the selected facility auditor shall analyze the utility bills and rate schedules to identify the marginal and blended rates of purchased utilities. *Task 1.2 Preliminary Energy and Water Use Analysis (Benchmarking)* (**Agency Name)** shall be responsible for providing the current benchmarking report of the buildings included under this SOW using Portfolio Manager, Asset Score, or agency/building type-specific benchmarking. Historical energy and water utility data should be used for benchmarking inputs, and benchmarking reports provided should be up to date and correct for each facility.  |
| If benchmarking for the facility has not been completed, then (**Agency Name**) staff shall work with the selected facility auditor to complete the facility benchmarking using Portfolio Manager, Asset Score, or agency/building type specific benchmarking completed using an agreed-upon method. *Task 1.3 Review Previous Energy and Water Audits and Interview Facilities Staff* (**Agency Name**) staff shall provide available building systems information such as as-built drawings and equipment schedules, building automation system (BAS) points lists and sequence of operation, occupancy setpoints and heating, ventilation, and air conditioning (HVAC) trends, and a copy of previous energy and water audits (including energy savings performance contracts [ESPC] and utility energy services contracts [UESC]) and renewable energy assessments, if available. If the site is under an ESPC, then a copy of recent measurement and verification reports should be requested and will be provided by (**Agency Name**).An initial interview shall be scheduled with the selected facility auditor and (**Agency Name facility/facilities**) facility staff to identify current space use, special problems (especially relating to thermal comfort or indoor air quality), and completed and/or planned facility renovations (e.g., building system overhauls of HVAC, controls, envelope) that influence available measures to identify. In addition, the recommended measures in previous audit reports should be discussed and recorded as completed or not implemented during the interview. The intention to pursue the unimplemented past recommended measures shall be discussed with the facility and energy management staff. **Task 2: Facility Site Survey** The site survey will include the following actions:1. Walkthrough of facility with appropriate personal protective equipment (PPE)
2. Interview equipment operators (if escort is not familiar with operations)
3. Identification of human-related behaviors (e.g., open dock doors in conditioned spaces, variable-frequency drives [VFDs] left in hand mode, windows open, water left running) impacting energy or water use
4. Identification of improper conditions and operations and maintenance (O&M) issues (e.g., equipment malfunctioning, filters not changed, faucets leaking, spaces being used for a different purpose than the systems were designed for)
5. Identification of major energy- and water-using systems, processes, and equipment
	1. Gather control strategies, equipment information of major components from nameplates or drawings
	2. Gather information on BAS sequence of operations, control setpoints, and sequences including unoccupied set-back schedule and current alarms
	3. Gather information on water fixture type, counts, flow rate, and usage estimates
6. By major space type, gather data:
7. To calculate or estimate plug loads density (W/ft2 or W/m2)
8. On the fraction of space heated and/or cooled
9. On the principal HVAC types serving the area
10. On the principal lighting types serving the area
11. Gather information to assess opportunities for renewable energy technologies, including factors such as:
12. Building orientation, neighboring features, and shading
13. Available roof and other space available for equipment
14. Thermal and electric loads
15. Electric metering configuration.

**Task 3: Data Analysis**After completion of the facility site survey, the following data analysis will be performed.***Task 3.1 Identification of Potential Energy, Water, and Renewable Energy Measures***The audit team will use a combination of data gathered in Task 1 (e.g., historical utility data, facility benchmarking) and supporting data and perceptions gathered in Task 2 to identify potential energy conservation measures (ECMs), water conservation measures (WCMs), and renewable energy measures, focusing on low- and no-cost measures. The analysis will begin with the recommended measures from previous audit reports reviewed in Task 1.3, if relevant. For recommended measures that were not implemented but remain relevant, life cycle cost analyses (LCCAs) will be updated to reflect current utility rates and implementation costs. The audit team shall then identify new measures from the facility data and conditions that were not accounted for in the past audit recommended measures. Consider the following categories of ECMs, WCMs, and renewable energy measures:1. Building envelope
2. Lighting
3. Plug loads (including office equipment, personal computers, and appliances)
4. HVAC (cooling, heating, air distribution, ventilation, and exhaust systems)
5. Building control (BAS, occupancy schedules, HVAC setpoints, setbacks, resets, etc.)
6. Water heating, chilled water, condenser, and domestic water systems and associated pumps
7. Steam systems
8. Refrigeration (except for food processing refrigeration)
9. Data centers and information technology infrastructure
10. Water consumption including irrigation, cooling towers, and domestic water use (including domestic hot water use)
11. Renewable energy technologies.

*Task 3.2. Analysis and Calculations*After identification of potential ECMs, WCMs, and renewable energy measures, the annual energy use and water use by component (e.g., heating systems, cooling systems, motors, pumps, fans, domestic water, lighting, plug loads, information technology) will be calculated. A site benchmark (relative to similar buildings) will be developed from these calculations. Energy calculations will be completed for all acceptable conservation measures. The ECMs, WCMs, and renewable energy measures will be divided into no- or low-cost measures and O&M-related ECMs and WCMs; capital-intensive ECMs and WCMs may also be identified but will likely require additional detailed analysis. RS Means or other cost estimating resources can be used to estimate the cost of low-cost equipment/systems (e.g., pipes, insulation). Building energy modeling or engineering calculations may be used. The REopt™ Lite web tool could be used to evaluate the economic viability of grid-connected solar photovoltaics, wind, and battery storage at the site.[[4]](#footnote-4) The models/calculations shall analyze energy savings, water savings, utility and O&M cost savings, and LCCA for all recommended measures. In addition, the audit shall include any identified O&M conservation measures and capital-intensive conservation measures (for further investigation via a more detailed audit and analysis process). **Task 4: Reporting and Deliverables** *Task 4.1 Basic Onsite Audit Report*The selected facility auditor shall provide an audit report with the following outline:1. Executive Summary
2. Overall assessment of benchmarking and energy performance
3. Table of recommended measures with savings and benefits
4. Introduction
5. Basic onsite audit scope
6. Key dates
7. Contact information of key stakeholders
8. Facility Description
9. Building information, including gross square feet, conditioned space, photographs, maps, etc.
10. Existing conditions
11. Historical Utility Data
12. Data summary and rate structure
13. Benchmarking
14. Energy, Water, and Renewable Energy Savings Opportunities (indicating updated recommended measures from past audits and those that are newly identified)
15. ECMs/WCMs/renewable energy measures. A write up shall be included for each ECM that includes the following for each facility:
* Description of the current condition, including equipment specifications/information, equipment counts, etc. and a write up for the recommended action
* The annual electricity, natural gas, or alternative fuel energy savings
* Implementation costs, O&M costs, annual cost savings, simple payback, and savings-to-investment ratio
* LCCA of recommended measure bundle
* Assumptions used to calculate energy savings and installed costs
1. O&M measures (as applicable)
2. ECMs considered but not evaluated (as applicable, such as capital-intensive measures not included in the scope of this audit).

*Task 4.2 Analysis Tools*A copy of the energy model and/or engineering calculations shall be provided to (**Agency Name**) in the original file format as requested for use in future audits or energy project development. Resilience related efforts shall be provided as a completed TRN profile or completed Baseline Development and Risk Assessment modules. *Task 4.3 Providing Data Input File for Upload to Compliance Tracking System* EISA 432 Compliance Tracking System (CTS) has a CTS Evaluation Template .xls document to support EISA 432 audit compliance by consolidating CTS audit data entry. The selected desk auditor shall provide the output results of the audit in the CTS Evaluation Template file for the (**Agency Name**) to upload to CTS. Note that CTS also accepts audit data from Building Sync XML (BSXML) and Energy Star Portfolio Manager CTS Export Template formats. The products of Tasks 4.1, 4.2 and 4.3 shall be provided to (**Agency Name)** staff by a means acceptable to the agency (e.g., email, file share, hard copy). |
| **Deliverables:** |
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| Task | Sub-task | Deliverable | Date  |
| 1 Review Historical Facility Data and Preliminary Energy and Water Use Analysis (Benchmarking)  | 1.1 | Completed/updated benchmarking for each facility  | TBD |
| 1.2 | Completed/updated benchmarking for each facility  | TBD |
| 1.3 | Coordinate with site to review facility conditions and past audits | TBD |
| 2 Facility Site Survey | 2.1 | Data gathered during the facility site survey will be used in Tasks 3.1 and 3.2 and will be included in Deliverable 4.1: Audit report | TBD |
| 3 Data Analysis | 3.1 | Identification of potential energy and water measures will be analyzed in Task 3.2 analysis and calculations | TBD |
| 3.2 | The findings from the analysis and calculations will be included in Deliverable 4.1: Audit report  | TBD |
| 4 Reporting and Deliverables | 4.1 | Audit report | TBD |
| 4.2 | Energy model and/or engineering calculations | TBD |
| 4.3 | CTS data upload file | TBD |

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| **Signatures:**  |
| Facility Auditor (Print Name and Signature): |  | Date: |  |
| (Agency Name) (Print Name and Signature):  |  | Date:  |  |

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Appendix 1: Audit Definitions

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| **Definitions:** For the purposes of this SOW, the following sections define the main terms used in this document.***50001 Ready[[5]](#footnote-5)*:** The DOE’s self-guided approach for facilities to establish an energy management system and self-attest to the structure of International Organization for Standardization (ISO) 50001, a voluntary global standard for energy management systems in industrial, commercial, and institutional facilities.***Desk Audit:*** An evaluation that identifies and analyzes energy and water measures from building information/data and records obtained without an onsite visit. The Desk Audit methodology described in this SOW combines inputs from benchmarking tools, such as EPA Portfolio Manager and/or DOE Building Asset Score, and previous EISA audits to assess previously recommended conservation measures yet to be implemented, identify available ECMs, WCMs, and renewable energy measures, estimate energy, water, and cost savings/economics, and generate an EISA-compliant audit report. The evaluation of measures can be completed using engineering calculations, building energy models, or other methods stipulated by the requesting entity. ***DOE Building Energy Asset Score[[6]](#footnote-6):*** DOE’s Building Energy Asset Score (Asset Score) is a national standardized tool for assessing the physical and structural energy efficiency of commercial and multifamily residential buildings. Asset Score generates a simple energy efficiency rating that enables comparison among buildings (benchmarking) and identifies opportunities to invest in energy efficiency upgrades. It is available for voluntary use and is free to use. The DOE Asset Score user inputs information using a standardized input form on the building’s assets such as the building envelope (roof, walls and windows), lighting, hot water, and HVAC systems which it uses to create an Open Studio energy model for the facility and provides a score ranging from one to 10 based on the energy efficiency of the building assets. Asset Score is one example of tools available for federal agencies to complete the required building benchmarking.***EPA Portfolio Manager[[7]](#footnote-7):*** EPA’s ENERGY STAR Portfolio Manager® is a free online tool that facility owners and managers can use to measure and track energy and water consumption, as well as greenhouse gas emissions. It uses monthly utility data and building information to create a weather normalized benchmark for the facility’s annual energy use versus similar facility types and building vintages. Federal agencies are required to use EPA Portfolio manager. Portfolio Manager is one example of the tools available for federal agencies to complete the required building benchmarking.***Energy Conservation Measure (ECM):*** An action taken in the operation or equipment in a building that reduces energy use of the building while maintaining or enhancing the building’s safety, comfort, and functionality. The term is sometimes known as energy efficiency measure (EEM). ***Energy Savings Performance Contract (ESPC)[[8]](#footnote-8):*** A performance contract where an energy services company (ESCO) identifies, finances, implements, and ensures the performance of projects whose cost savings are designed to pay back the retrofit costs over the term of the contract. The facility’s management team is provided a preliminary assessment to decide whether to enter the contract and trigger the investment grade audit.***Facility Auditor:*** A technical professional who assesses building systems and site conditions; analyzes and evaluates equipment and the impacts to energy and water use; and recommends strategies to optimize building resource utilization. ***Life-Cycle Cost Analysis (LCCA)[[9]](#footnote-9):*** An economic methodology to evaluate the implementation of a measure / project by examining the total cost over the course of the useful life of the measure/project. The simple payback and savings-to-investment ratio of measures are calculated in this analysis.***Recommissioning Measure[[10]](#footnote-10):*** An action taken in the building systems and controls to ensure optimum operation of a building in accordance with design and current building use. ***Renewable Energy Measure:*** Onsite solar photovoltaic, solar hot water, solar ventilation pre-heat, wind energy, biomass, waste to energy, landfill gas, or new hydroelectric generation capacity, ocean (including tidal, wave, current, and thermal), or geothermal for the building or campus.***Resilience Study*[[11]](#footnote-11):** A detailed assessment that determines facility resilience needs and goals, evaluates the current facility or site energy and water infrastructure, identifies critical loads, and develops solutions to address identified gaps, optimize energy and water use, and identify options for secure energy and water generation and storage. FEMP developed the technical resilience navigator (TRN)[[12]](#footnote-12) to guide organizations through these resilience study steps.***Simple Payback Period[[13]](#footnote-13)*:** Estimated initial ECM, WCM, or renewable energy measure cost divided by the first‐year calculated cost savings of the measure; the unit for simple payback period is years.***Savings to Investment Ratio (SIR)[[14]](#footnote-14):*** Metric comparing the net lifecycle savings of an ECM, WCM, or renewable energy measure to their lifecycle implementation costs. Defined as the net lifecycle savings present value of the measure divided by the present value of measure implementation cost.***Utility Energy Services Contract (UESC)[[15]](#footnote-15):*** A performance contract where a utility service provider identifies, finances, and implements projects whose cost savings are designed to pay back the retrofit costs over the term of the contract. The facility’s management team is provided a preliminary assessment to decide whether to enter the contract and trigger the investment grade audit.***Water Conservation Measure (WCM):*** An action taken in the operation or equipment of a facility that reduces water use of in the building systems. The term is sometimes known as water efficiency measure (WEM).  |

1. <https://www.govinfo.gov/content/pkg/BILLS-110hr6enr/pdf/BILLS-110hr6enr.pdf> [↑](#footnote-ref-1)
2. <https://www.energy.gov/eere/femp/energy-and-water-audits-federal-buildings> [↑](#footnote-ref-2)
3. <https://www.energy.gov/sites/prod/files/2020/11/f80/facility-evaluation-audit-decision-tree.pdf> [↑](#footnote-ref-3)
4. <https://reopt.nrel.gov/tool> [↑](#footnote-ref-4)
5. <https://www.energy.gov/eere/amo/50001-ready-program> [↑](#footnote-ref-5)
6. <https://www.energy.gov/eere/buildings/building-energy-asset-score> [↑](#footnote-ref-6)
7. <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager> [↑](#footnote-ref-7)
8. <https://www.energy.gov/eere/femp/process-procuring-federal-energy-savings-performance-contract> [↑](#footnote-ref-8)
9. <https://www.wbdg.org/resources/life-cycle-cost-analysis-lcca> [↑](#footnote-ref-9)
10. <https://www.energy.gov/eere/femp/commissioning-federal-buildings> [↑](#footnote-ref-10)
11. <https://www.energy.gov/eere/femp/energy-and-water-resilience-and-security> [↑](#footnote-ref-11)
12. <https://femp.energy.gov/resilience/> [↑](#footnote-ref-12)
13. <https://www.wbdg.org/resources/life-cycle-cost-analysis-lcca> [↑](#footnote-ref-13)
14. Ibid [↑](#footnote-ref-14)
15. <https://www.energy.gov/eere/femp/downloads/utility-energy-services-contracts-guide-0> [↑](#footnote-ref-15)