

Building Energy Use Benchmarking Guidance

April 15, 2010

**EISA SECTION 432 – Benchmarking of Federal Facilities
(42 U.S.C. 8253 Subsection (f), *Use of Energy and Water Efficiency Measures in
Federal Buildings*)**

I. Background

A. Authority – Benchmarking Requirements

Section 432 of the Energy Independence and Security Act of 2007 (EISA) requires the Secretary of the United States Department of Energy (DOE) to select or develop a building energy use benchmarking system and to issue guidance for use of the system. EISA requires the designated agency energy managers to enter energy use data for each metered building that is (or is a part of) a covered facility into a building energy use benchmarking system, such as the ENERGY STAR Portfolio Manager tool (Portfolio Manager) (see 42 U.S.C. 8253(f)(8)(A), as referenced in section III of this Guidance and in Appendix A). In addition, energy managers shall post and update the benchmarking data each year in the Web-Based tracking system developed by the Secretary of Energy to track compliance with Section 432 of EISA (see 42 U.S.C. 8253(f)(8)(C)).

EISA requires metered buildings that are (or are a part of) a Federal agency's covered facilities to be benchmarked for building energy performance. The Energy Policy Act of 2005 (EPAct 2005) (42 U.S.C 8253(e)(1)) requires agencies to install electric meters by October 1, 2012. Section 434(b) of EISA amends section 543(e)(1) of the National Energy Conservation Policy Act (42 U.S.C. 8253(e)(1)) to add the requirement of metering natural gas and steam by October 1, 2016.

B. Criteria for “Facilities” and “Covered Facilities”

1. Criteria for “Facilities”

As provided in EISA (42 U.S.C. 8253(f)(1)(C)), the term “facility” means “any building, installation, structure, or other property (including any applicable fixtures) owned or operated by, or constructed or manufactured and leased to, the Federal Government.” This includes:

- (1) “A group of facilities at a single location or multiple locations managed as an integrated operation,” and
- (2) “Contractor-operated facilities owned by the Federal Government.”

EISA excludes from this definition “any land or site for which the cost of utilities is not paid by the Federal Government.”

Individual Federal agencies have greater familiarity with their building stock than DOE. Each Federal agency is to determine whether its buildings qualify as “facilities” for benchmarking purposes, consistent with the statutory definition. However, in applying the definition of “facility,” DOE recommends that agencies interpret the phrase “managed as an integrated operation” to mean a group of buildings or structures that share the same servicing energy and water utilities so that utility data can be aggregated easily. This should facilitate logical groupings of buildings or structures while also ensuring that each Federal agency has the utility data needed for determining that the sum of all “covered facilities” meets the threshold, discussed below, of 75 percent of total facility energy use.

2. **Criteria for “Covered Facilities”**

As provided in EISA (42 U.S.C. 8253(f)(2)(B)), the term “covered facility” means “Federal facilities, including central utility plants and distribution systems and other energy intensive operations, that constitute at least 75 percent of facility energy use at each agency.”

Each Federal agency is to determine which of its facilities will be “covered facilities” consistent with the statutory definition for benchmarking purposes, provided that the combined energy use of the facilities determined to be covered facilities constitutes at least 75 percent of agency facility energy use. However, as discussed in DOE’s Guidance entitled “Facility Energy Management Guidelines and Criteria for Energy and Water Evaluations in Covered Facilities,”¹ DOE recommends that each agency limit the size and location of the individual buildings that comprise a single “covered facility” so that it is possible to complete the required comprehensive energy and water evaluation for the facility once every four years.

C. Definitions

Benchmarking - The process of accounting for and comparing a metered building’s current energy performance with its energy baseline, or comparing a metered building’s energy performance with the energy performance of similar types of buildings (based on use, such as comparing the energy performance of a hospital to that of other hospitals). Benchmarking can be used to compare

¹ “Facility Energy Management Guidelines and Criteria for Energy and Water Evaluations in Covered Facilities,” November 25, 2008, at <http://www1.eere.energy.gov/femp/regulations/guidance.html>.

performance over time, within and between peer groups, or to document top performers.

Building Energy Use Benchmarking System – A tool or system of tools that enables the energy performance of a metered building to be benchmarked. See definition of “benchmarking” above.

Energy Baseline – An initial period of metered energy consumption used as a point of reference for comparison purposes. For example, the Portfolio Manager tool uses a 12-month period of metered building energy consumption as the energy baseline.

Metered Building – A building with one or more meters (advanced or standard) installed to measure energy consumed within that building. Metered energy includes electricity, natural gas, and steam. Other utilities may be metered as an energy or water management best practice.

Rating – The relative indicator of performance obtained from a benchmarking tool. The rating allows the energy performance of the metered building or facility to be compared over time with itself and with the energy performances of similar types of buildings and facilities (based on use, such as comparing the energy performance of a hospital to that of other hospitals).

Web-Based Tracking System – See definition as provided in EISA (42 U.S.C. 8253(f)(7)), as referenced in section IV.A of this Guidance and in Appendix A.

II. Benchmarking Requirements

A. Metered Buildings

Agencies should begin to use a benchmarking tool to track energy performance as soon as electricity is metered. As more buildings are individually metered to meet the EAct 2005 and EISA Section 434(b) metering requirements for electricity, natural gas, and steam, those buildings are required to meet the EISA benchmarking requirements. The agency’s designated energy manager shall enter energy use data for each metered building that is (or is a part of) a covered facility. DOE has published guidance for implementing the metering requirements of EAct 2005². For buildings that consume multiple types of energy, a more complete picture of the building’s energy performance will occur after the required natural gas and steam meters are installed. All applicable sources of energy consumed by a building will need to be entered into the benchmarking

² “Guidance for Electric Metering in Federal Buildings,” February 3, 2006 (DOE/EE-0312), at http://www1.eere.energy.gov/femp/pdfs/adv_metering.pdf.

system, including chilled water, propane, fuel oil, etc., to obtain a complete and accurate benchmarking result that can be used to compare the building's energy performance with the energy performance of similar buildings. This data for unmetered energy types can be obtained from billing information provided by the energy suppliers.

B. Leased Buildings

EISA does not specify whether leased buildings should be benchmarked, only that each metered building that is (or is a part of) a covered facility shall be benchmarked (See 42 U.S.C. 8253(f)(8)(A)). This guidance applies to leased buildings that are both metered and qualify as a covered facility or part of a covered facility. Given that the energy consumption data for leased buildings only may be available to agencies that are responsible for paying the utility bill, the agency responsible for paying the utility bill is responsible for benchmarking and adding the benchmarking information into the Web-Based tracking system, unless that responsibility has been delegated to the agency(s) occupying the building.

C. Minimum Data Input Required for Benchmarking Metered Buildings

The following data is necessary in order to meet the EISA benchmarking requirements and to ensure that the designated energy managers have the information they need to ensure the agency fulfills the requirements of EISA Section 432.

1. Building Characteristics:
 - a) Type of building or facility (according to use, such as office, hospital, courthouse, warehouse, etc.);
 - b) Building or facility location - Depending on the benchmarking tool, this may be the climate zone or zip code;
 - c) All floor area (gross square feet) in the building.
2. Energy Consumption – Includes monthly or annual (depending on the benchmarking system) site energy consumed by the building and measured using standard or advanced meters. To obtain a complete and accurate benchmarking result, all sources of energy consumed by a building will need to be entered into the benchmarking system.

The aim of agency benchmarking should be to compare a building's performance to similar buildings (based on the use of the building, e.g., an office building to other office buildings) or to the building's prior year performance. Many buildings have different energy-using space types within the building, such as laboratory space and data center space within an office building. These space

types within the building should be indicated along with the correlating percent floor space of each.

D. Benchmarking Data Reported to the Web-Based Tracking System

The Web-Based tracking system (required under EISA) will be able to link to or receive the following benchmarking data, which shall be verified and updated at least annually in the Web-Based tracking system (See 42 U.S.C. 8253(f)(8)(C)):

1. Building characteristics:
 - a) Building or facility name/identifier
 - b) Type of building or facility (according to use, such as office, hospital, courthouse, warehouse, etc.)
 - c) Building or facility location - Depending on the benchmarking tool, this may be the climate zone or zip code
 - d) All floor area (gross square feet) in the building
2. Name of benchmarking tool used.
3. Energy consumption data
 - a) Indicate whether the results are for total energy consumed or only some of the energy consumed by the building, depending on what is currently metered
 - b) Annual site energy consumption in British Thermal Units (Btu) for the preceding 12 months
4. Benchmarking results:
 - a) Annual site energy use intensity (Btu/gross square foot/year)
 - b) Annual source energy consumption in Btu for the preceding 12 months
 - c) Annual source energy use intensity (Btu/gross square foot/year)
5. Benchmarking rating/score (if available).

An agency may request an exemption from disclosure for specific data for specific buildings for national security purposes. Such requests for exemption should be made to the Secretary of Energy (See 42 U.S.C. 8253(f)(7)(C)(ii)).

III. Benchmarking System

A. Selected Benchmarking System

DOE has selected the ENERGY STAR Portfolio Manager tool (Portfolio Manager) as the building energy use benchmarking system required for the building types discussed under this subheading (See 42 U.S.C. 8253(f)(8)). The Interagency Energy Management Task Force Benchmarking Workgroup

considered several tools for assessing or modeling the energy performance of a building, including EnergyPlus, EnergyIQ, Data Center Energy Profiler, Portfolio Manager, and Labs21. DOE selected Portfolio Manager because of the following characteristics:

1. Portfolio Manager compares the energy performance of a building to a statistically representative model created with data from DOE's Commercial Building Energy Consumption Survey (CBECS);
2. Portfolio Manager is able to provide an energy performance rating for several commercial building types that represent over 60 percent of the U.S. commercial floor space;
3. Portfolio Manager was designed for benchmarking and is capable of storing energy consumption data;
4. Portfolio Manager is a Web-based application with secure access. A Portfolio Manager user controls data access and chooses whether or not to share building data with other Portfolio Manager users;
5. All commercial and institutional buildings can use Portfolio Manager to track energy consumption over time, and also can track water consumption, energy costs, water costs, and carbon emissions (although the latter four sets of data are not required by the benchmarking section of EISA 2007); and
6. Portfolio Manager is simple to use, requires minimal, easy-to-acquire information, and is easily understood.

Portfolio Manager rates the energy consumed by a building or facility on a scale of 1 to 100, relative to similar buildings nationwide. Known as the ENERGY STAR Energy Performance Rating, this score is based on comparing twelve months of weather-normalized energy data for each meter in the facility to a twelve-month energy baseline. It also adjusts for the unique operating characteristics of the building, such as operating hours, occupancy, etc. The score indicates a percentile rank of the facility once all required data is entered. A score of 75 or higher qualifies the building to earn the ENERGY STAR Building Label. While attainment of the ENERGY STAR Building Label is encouraged, it is not required.

Building space types eligible to receive an Energy Performance Rating using Portfolio Manager include: offices, medical office buildings, hospitals, courthouses, warehouses, residence halls/dormitories, banks/financial institutions, hotels, K-12 schools, houses of worship, retail stores, supermarkets, and wastewater treatment plants. Ratings for additional building space types are added periodically. For mixed-use buildings, more than 50 percent of the gross floor area must be eligible for an Energy Performance Rating. For instance, to obtain an Energy Performance Rating for a building designated as an office

building, the building's gross floor area must be more than 50 percent office space. The remainder of the gross floor area may be occupied by other space types. Some space types, such as data centers, are limited to no more than 10 percent of the floor area of multiple-use buildings. Buildings must meet certain criteria, such as a minimum gross square footage (usually 5,000 square feet) in order to be eligible for an ENERGY STAR Energy Performance Rating.

For those buildings that are not eligible to receive an Energy Performance Rating using Portfolio Manager, the U.S. Environmental Protection Agency (EPA) has created a list of reference energy performance targets. These targets are based on average energy use values calculated across different types of buildings. These energy performance targets are neither normalized for climate nor adjusted for activities that may affect energy use. They are not as reliable as Energy Performance Ratings. All targets are expressed in energy use intensity and are derived from CBECS. Such buildings can be designated as "Other" space types in Portfolio Manager. Although they cannot receive a score, they can be compared to national averages, as defined in the energy performance target table referenced above.

Portfolio Manager can track the energy use intensity of a campus or other collection of buildings at the same geographic location. However, the campus cannot receive an Energy Performance Rating. The only exception to this is hospital campuses, which must include support facilities if they are not part of the main hospital building.

B. Alternate Benchmarking Tools

1. For building types that cannot receive an Energy Performance Rating using Portfolio Manager, such as some laboratories and data centers, a Federal agency shall use either of the following alternate benchmarking systems:
 - a) **Labs 21 Benchmarking Tool** – An online software tool designed to compare the performance of laboratory buildings and identify potential energy cost-savings opportunities (Note that EPA is currently developing an ENERGY STAR Energy Performance Rating capability for laboratory space in Portfolio Manager).
 - b) **Data Center Energy Profiler (DC Pro)** – An online software tool designed to benchmark energy used by data centers and identify potential energy cost-savings opportunities (Note that EPA is currently developing an ENERGY STAR Energy Performance Rating capability for data center space in Portfolio Manager).

No justification is needed if an agency chooses to use one of these tools to benchmark these particular building space types.

2. Federal agencies that already perform benchmarking using their own systems should submit a request to DOE to continue to do so in place of using Portfolio Manager.

In this case, a justification shall be submitted to DOE's Federal Energy Management Program for approval indicating reasons for selecting the alternate tool, including how it will meet the minimum data input requirements, the data output requirements to the Web-Based tracking system in this section of the guidance, and how it will provide a meaningful annual energy performance indicator comparing the building to similar buildings.

IV. Integration with Other EISA Section 432 Requirements

EISA Section 432 contains a number of provisions impacting energy and water efficiency in Federal buildings. Each Federal agency shall designate the covered facilities (as indicated in Section I.B) that will be subject to the benchmarking requirements set forth in this guidance. Each Federal agency also shall designate an energy manager who is responsible for conducting comprehensive evaluations, identifying and implementing energy and water conservation measures (ECMs), performing benchmarking on appropriate buildings, and entering the benchmarking information into the Web-Based tracking system.

A. Web-Based Tracking System

DOE is required to develop and deploy a Web-Based tracking system with an interface available to Congress and the public. The system will contain:

- Energy and water evaluations performed at covered facilities,
- Estimated costs and savings for measures identified and implemented,
- Measurement and verification of savings from implemented measures, and
- Benchmarking information.

B. Designation of Energy Managers

EISA stipulates that each Federal agency designate an energy manager for its covered facilities, who will ensure the facilities fulfill the requirements of Section 432 (see 42 U.S.C. 8253(f)(8)(A)). The energy manager will be responsible for overseeing several agency activities, including (but not limited to) the following:

- Benchmarking metered buildings,
- Entering the benchmarking data into the Web-Based tracking system,

- Performing energy and water evaluations, and
- Implementing identified energy and water efficiency measures.

C. Energy and Water Evaluations

Benchmarking can help energy managers more efficiently target buildings for improvements. Benchmarking results can serve as an indicator for energy managers of the level of potential energy savings available in a building. Comprehensive energy and water evaluations will identify those measures and the cost of implementation. Buildings with very low energy performance, as measured through benchmarking, may be good candidates for capital improvements that will bring the energy performance up to or above that of similar buildings, whereas buildings with middle-range energy performance benchmarking results are less likely to see cost-effectiveness from capital upgrades and may be better suited for improvements in operations and maintenance. It is important to note that benchmarking by itself will not identify ECMs for a building. Follow-on comprehensive energy and water evaluations, as required by EISA, will be needed to identify the specific ECMs appropriate for each building (See 42 U.S.C. 8253(f)(3) in Appendix A).

The EISA requirements for energy and water evaluations include:

1. A comprehensive energy and water evaluation for approximately 25 percent of the covered facilities shall be conducted each year;
2. An evaluation for each covered facility should be completed at least once every four years; and
3. The first sets of evaluations were due June 16, 2009.

D. Periodic Review

This guidance will be reviewed, as necessary, to accommodate changes in statutory requirements or related guidance.

V. Other Resources

1. **ASHRAE Handbooks** – including the 2009 ASHRAE Handbook—Fundamentals Chapter 19 “Energy Estimating and Modeling Methods.”
2. **ENERGY STAR Target Finder tool**
3. **Facility Energy Decision System (FEDS)** – DOE’s Pacific Northwest National Laboratory’s building energy efficiency software tool that quickly and objectively identifies energy efficiency improvements that maximize life-cycle savings.

4. **EnergyIQ** – DOE’s Lawrence Berkeley National Laboratory’s tool for preliminary opportunity-assessment purposes, and helps lay the groundwork for investment-grade audits and professional engineering calculations.
5. **Benchmarking Starter Kit** – The Benchmarking Starter Kit provides step-by-step guidance on how to benchmark a building using Portfolio Manager. The Benchmarking Starter Kit can be found on the ENERGY STAR website at www.energystar.gov.

Appendix A: EISA 2007 (Section 432)

The two sections of EISA that directly pertain to benchmarking are as follows:

1. **Web-Based Tracking System** (42 U.S.C. 8253(f)(7)(B)(i)) – *“Not later than 1 year after the date of enactment of this subsection, the Secretary shall develop and deploy a web-based tracking system required under this paragraph in a manner that tracks, at a minimum --”*

“(V) the benchmarking information disclosed under paragraph (8)(C).”
(42 U.S.C. 8253(f)(7)(B)(i)(V))

2. **Benchmarking of Federal Facilities** (42 U.S.C. 8253(f)(8)) --

“(A) IN GENERAL.--The energy manager shall enter energy use data for each metered building that is (or is a part of) a facility that meets the criteria established by the Secretary under paragraph (2)(B) into a building energy use benchmarking system, such as the Energy Star Portfolio Manager.

(B) SYSTEM AND GUIDANCE.--Not later than 1 year after the date of enactment of this subsection, the Secretary shall--

- (i) select or develop the building energy use benchmarking system required under this paragraph for each type of building; and*
- (ii) issue guidance for use of the system.*

(C) PUBLIC DISCLOSURE.--Each energy manager shall post the information entered into, or generated by, a benchmarking system under this subsections, on the web-based tracking system under paragraph (7)(B). The energy manager shall update such information each year, and shall include in such reporting previous years' information to allow changes in building performance to be tracked over time.”

The section of EISA that pertains to energy and water evaluations (42 U.S.C. 8253(f)(3)) provides:

“(3) ENERGY AND WATER EVALUATIONS

(A) EVALUATIONS. –Effective beginning on the date that is 180 days after the date of enactment of this subsection and annually thereafter, energy managers shall complete, for each calendar year, a comprehensive energy and water evaluation for approximately 25 percent of the facilities of each agency that meet the criteria under paragraph (2)(B) in a manner

that ensures that an evaluation of each such facility is completed at least once every 4 years.

*(B) **RECOMMISSIONING AND RETROCOMMISSIONING**—As part of the evaluation under subparagraph (A), the energy manager shall identify and assess recommissioning measures (or, if the facility has never been commissioned, retrocommissioning measures) for each such facility.”*