U.S. DEPARTMENT OF ENERGY

Federal Building Metering Guidance

(per 42 U.S.C. § 8253(e), Metering of Energy Use)

November 2014 Update

United States Department of Energy
Washington, DC 20585

I. Background

The U.S. Department of Energy (DOE) is required by statute and Presidential Memorandum[1] to establish guidelines for agencies to meter their Federal buildings for energy (electricity, natural gas, and steam) and water. *See* 42 U.S.C. § 8253(e). DOE issued guidance in February 2006 on the installation of electric meters in Federal buildings. This document serves as an update to the 2006 guidance to account for more recent requirements and to reflect current metering practices within the Federal Government. This guidance defines which Federal buildings are appropriate to meter, provides metering prioritization recommendations for those agencies with limited resources, and requires that a metering implementation plan be submitted to DOE describing an agency's five-year plan.

This guidance document has been developed in coordination with an update to a separate *DOE Metering Best Practices* document, which serves as a reference tool and provides detailed information on energy and resource metering, the relevant metering technologies, relative costs, communications protocols, applications for data, and ideas for energy and cost savings.[2] The *Metering Best Practices* document will be re-issued shortly after this guidance document and agencies may find it as a useful reference when updating their five-year metering plans.

A. Authority

Pursuant to section 103 of the Energy Policy Act of 2005 (EPAct 2005), as amended (and codified at 42 U.S.C. § 8253(e)), agencies must adhere to the following metering requirements:[3]

- By October 1, 2012, in accordance with DOE guidance, all Federal buildings shall, for the purposes of efficient use of energy and reduction in the cost of electricity in such buildings, be metered.

---

[1] *See* Presidential Memorandum, Federal Leadership on Energy Management (Dec. 5, 2013) [hereinafter "Presidential Memorandum"], http://www.whitehouse.gov/the-press-office/2013/12/05/presidential-memorandum-federal-leadership-energy-management.

[2] The Presidential Memorandum, Federal Leadership on Energy Management (Dec. 5, 2013), required DOE to "revise and update the *Metering Best Practices* of August 2011." DOE later confirmed with the White House Council on Environmental Quality that the true intention was to require an update of the *DOE Federal Building Metering Guidance* of 2006.

[3] These metering requirements are reiterated in the 2008 "Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings," as developed pursuant to E.O. 13423, which require Federal agencies to install building-level electricity, natural gas, and steam meters in new major construction, renovation projects, and existing buildings (http://energy.gov/eere/femp/guiding-principles-Federal-leadership-high-performance-and-sustainable-buildings).

- Each agency shall use, to the maximum extent practicable, advanced meters or advanced metering devices that provide data at least daily and that measure at least hourly consumption of electricity in the Federal buildings of the agency.
- Not later than October 1, 2016, each agency shall provide for equivalent metering of natural gas and steam, in accordance with DOE guidance.
- Such data shall be incorporated into Federal energy tracking systems and made available to Federal facility managers.
- Not later than 12 months after the date guidelines are established, in a report submitted by the agency under 42 U.S.C. § 8258(a), each agency shall submit to DOE a plan describing how the agency will implement the metering requirement.

In developing guidance to carry out the statute, Congress directed DOE to:

- Establish exclusions from the metering requirements based on the de minimis quantity of energy use of a Federal building, industrial process, or structure;
- Take into consideration the cost of metering and the reduced cost of operation and maintenance expected to result from metering; the extent to which metering is expected to result in increased potential for energy management, increased potential for energy savings and energy efficiency improvement, and cost and energy savings due to utility contract aggregation; and DOE measurement and verification protocols;
- Establish priorities for types and locations of buildings to be metered based on cost-effectiveness and a schedule of one or more dates on which the metering requirements shall take effect; and
- Include recommendations concerning the amount of funds and the number of trained personnel necessary to gather and use the metering information to track and reduce energy use.

On December 5, 2013, President Obama issued a Presidential Memorandum[4] requiring agencies to continue to install building energy meters and sub-meters where cost-effective and appropriate; install water meters at agency buildings where cost-effective and appropriate; and enter monthly energy and water data into the Environmental Protection Agency (EPA) ENERGY STAR Portfolio Manager (Portfolio Manager) to enable performance management and benchmarking. The Presidential Memorandum also required DOE to update the February 2006 metering guidance to include definitions of the terms "cost-effective" and "appropriate," and to address the sub-metering of energy and water consumption in leased space.

[4] *See* Presidential Memorandum (Dec. 5, 2013), http://www.whitehouse.gov/the-press-office/2013/12/05/presidential-memorandum-federal-leadership-energy-management.

B. Definitions

Advanced meter: An advanced meter records energy or water consumption data hourly or more frequently and provides for daily or more frequent transmittal of measurements over a communication network to a central collection point. Features of advanced meters vary depending on the utility they are serving.

Advanced metering device: A separate electronic device coupled to a standard meter or to a building automation system that enables it to function as an advanced meter.

Agency: An executive agency as defined in section 105 of title 5, United States Code, including sub-agencies of the agency, and excluding the Government Accountability Office.

Appropriate: The installation of standard meters or advanced meters is "appropriate" in all Federal buildings that are not excluded from metering under Step 1 of the guidance.

Building function: The classification of a Federal building by its primary activity (e.g., office, [5] warehouse, education, etc.) as defined by the Federal Real Property Profile.

Cost-effective: Studies show reduced operation and maintenance costs when metered data is used to manage building energy consumption. These life-cycle cost savings exceed the life-cycle costs for installation and maintenance of the meters. Therefore, installation of meters is "cost effective" at all appropriate Federal buildings (including multi building installations). [6]

Covered facility: A facility that an agency has designated as subject to the requirements of section 432 of the Energy Independence and Security Act of 2007 (Pub. L. No. 110-140, as codified at 42 U.S.C. § 8253(f)), which requires agencies to designate covered facilities comprising at least 75 percent of their total facility energy use. A covered facility may be defined as a group of facilities at a single location or multiple locations managed as an integrated operation. A covered facility may also be a single building, if so identified by the agency.

---

[5] *See* 2008 Guidance for Real Property Inventory Reporting at http://www.whitehouse.gov/sites/default/files/omb/assets/omb/financial/fia/2008_data_reporting_instructions.pdf

[6] The use of energy and water data has been shown to result in changes to operations and maintenance practices, and the identification of projects that improve the energy efficiency of building equipment and systems. By implementing these changes, buildings have shown efficiency improvements of 10-20%. *See* Savings Persist with Monitoring-Based Commissioning http://www.energy.ca.gov/2008publications/CEC-500-2008-053/CEC-500-2008-053-FS.PDF, Where's the Beef in Continuous Commissioning? Results from 140 Buildings in Commercial Property and Higher Education http://www.aceee.org/files/proceedings/2012/data/papers/0193-000090.pdf, Methods and Applications of Monitoring Based Commissioning http://www.bcxa.org/ncbc/2011/documents/presentations/07_ncbc-2011-mbcx_methods_applications-english.pdf, and Army Metered Data Management System (MDMS): MDMS Successes http://www.calibresys.com/documents/service/Army%20MDMS.pdf

Federal building: Any building, structure, or part thereof, including the associated energy or water consuming support systems, which is constructed, renovated, leased, or purchased in whole or in part for use by the Federal Government and which consumes energy or water; such term also means a collection of buildings, structures or facilities and the energy or water consuming support systems for such collection. This document uses the term "facility" when referring to multiple buildings or sites and uses the term "building" to refer to individual structures.

Facility: Any building, installation, structure, or property (including any applicable fixtures) owned or operated by, or constructed or manufactured and leased to, the Federal Government. This document uses the term "facility" when referring to multiple buildings or sites and uses the term "building" to refer to individual structures.

High Performance and Sustainable Buildings: Federal buildings documented in the Federal Real Property database as meeting the High Performance and Sustainable Buildings Guiding Principles established under Executive Orders 13423 and 13514.

Standard meter: An electromechanical or solid state meter that cumulatively measures and records aggregated usage data that are periodically retrieved for use in customer billing or energy management. A meter that is not an advanced meter is considered to be a standard meter under this guidance.

Sub-Agency: A bureau, service, or other component within an agency that manages its buildings and facilities separate from its parent agency.

II. Metering Determination Process

Collectively, Federal statutes and the Presidential Memorandum mandate the installation of meters in Federal buildings where "appropriate" and "cost effective." This guidance therefore outlines a two-step process for the installation of meters in Federal buildings:

- Step 1 sets criteria for determining the types of Federal buildings for which the installation of meters is "appropriate."
- Step 2 provides instruction for the installation of meters at all "appropriate" Federal buildings, while recommending a cost-effective prioritization process for agencies with resource limitations.

III. Step 1: Is a Federal Building 'Appropriate' for Metering?

All Federal buildings shall be considered "appropriate" for energy or water metering (including advanced meters and standard meters) unless identified for potential exclusion using the criteria set forth below. Metering data is a minimum requirement for determining whether the potential installation of energy efficiency measures will be cost-effective.

Agencies may exclude a Federal building from the energy or water metering requirement if it meets at least one of the criteria below:

- The Federal building is planned to be sold or razed within the next five years.
- The Federal building is leased or owned, but the agency either does not pay the utility bill or does not pay the lessor for utilities based on actual consumption.
- The Federal building does not have an energy-consuming heating or cooling system or significant process loads.
- The Federal building generates electricity that is sold commercially to other parties in the course of regular business, where installing meters would require an impractical shut-down of service.
- The Federal building does not meet, or is expected not to meet, the *de minimis* thresholds set forth in Table 1 and Table 2.

Table 1 –Energy Metering Exclusions[7,8]

Federal Building	Threshold
Food Service / Sales	< 1,000 square feet
Warehouses	< 25,000 square feet
All Other Building Functions	< 5,000 square feet

[7] Energy metering exclusions were derived from analysis of the Commercial Building Energy Consumption Survey data, documented in the *Metering Best Practices* document.

[8] In instances where Federal buildings below 5,000 square feet are energy intensive (e.g., air traffic control towers), they shall be considered appropriate for metering and not excluded.

Table 2 –Water Metering Exclusions[9]

Federal Building	Threshold
Large Water Using Process	Consumption < 1,000 gal/day
Irrigated Landscape Area	< 25,000 square feet
All Building Functions	Consumption < 1,000 gal/day
All Building Functions	< 5,000 square feet

Information systems derived from utility revenue meters (e.g., monthly invoices, Green Button applications, etc.) can substitute for installing new meters if the information is incorporated in agency or sub-agency energy tracking systems. If the utility revenue meter is used on the main feeder line to a multi-building installation (e.g., campus, base, garrison, etc.), its data cannot be used to substitute for installing meters on individual buildings found within the installation.

Metering data shall be incorporated into agency energy tracking systems and made available to facility managers.

IV. Step 2: Metering Prioritization Process

Agencies shall install energy and water meters at all Federal buildings determined to be "appropriate" under Step 1. As required by statute, each agency is required to use, to the maximum extent practicable, advanced meters or advanced metering devices for energy. DOE recognizes that agencies may not have the resources necessary for the immediate implementation of advanced meters at all Federal buildings identified under Step 1. Accordingly, agencies with resource constraints are expected to prioritize the order in which advanced meters and advanced metering devices are to be applied to their Federal buildings.

Subsections IV.A and IV.B set forth a recommended method for prioritizing the installation of advanced energy meters and advanced water meters based on maximizing cost-effectiveness.

[9] Water metering exclusions were derived from the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 189.1 – Standard for the Design of High-Performance Green Buildings, documented in the *Metering Best Practices* document. The "less than 5,000 square foot" category was included to provide a *de minimis* size consistent with energy metering.

A. Energy Metering

For the purpose of maximizing cost effectiveness, it is recommended that the installation of advanced energy (electricity, natural gas, and steam) meters be prioritized as follows:

1) **New Constructions and Major Renovations** - install meters on the feeder line entering the Federal building. If the budget allows, sub-meter for high-energy end uses (e.g., high intensity loads, large energy consuming mission processes, etc.).

2) **Covered Facilities** – Install advanced meters (or track utility revenue meter data) for each feeder line (supply line) leading to the covered facility.[10] Give highest priority to metering covered facilities that are known to be the largest energy consumers. For covered facilities that are multi-building (campus) installations,[11] agencies should prioritize meters, in addition to feeder lines, in the following order:

   a) All self-generated electricity and steam supplied to installation (campus),

   b) All agency data centers[12] not planned for consolidation or closure, identified as part of the Federal Data Center Consolidation Initiative[13] and PortfolioStat,[14]

[10] Installing advanced meters at these locations is often useful as it does not require labor or additional systems to record and transfer data to energy tracking systems. However, it may not be practicable due to physical or administrative complications involving the load serving utility or distribution utility.

[11] For many agencies and sub-agencies, covered facilities may be multi-building installations (campuses, garrisons, bases, etc.). At these locations, energy and water services are actually large systems delivering resources to many individual buildings. Each system is comprised of a supply line and a collection of individual buildings, structures, interconnecting infrastructure, landscapes, mission support activities, and other energy and water consuming processes. Energy and water are purchased and invoiced on a system basis and are often tracked with the aid of utility revenue meters.

[12] Under the Federal Data Center Consolidation Initiative, a data center is defined as a closet, room, floor or building for the storage, management, and dissemination of data and information. Such a repository houses computer systems and associated components such as database applications and storage systems and data stores. A data center generally includes redundant or backup power supplies, redundant data communications connections, environmental controls (air conditioning, fire suppression, etc.) and special security devices housed in leased (including by cloud providers, owned, collocated, or stand-alone facilities…neither square footage nor Uptime Institute tier classifications are required to define a facility as a data center.

[13] *See* 2010 Memorandum for Chief Information Officers regarding the Federal Data Center Consolidation Initiative: http://www.whitehouse.gov/sites/default/files/omb/assets/egov_docs/federal_data_center_consolidation_initiative_02-26-2010.pdf

c) All other known energy-intensive building types (e.g., laboratories, hospitals, control towers, and food services),

d) All individual buildings 10,000 square feet or above,

e) All large energy-consuming mission support processes (training systems, industrial systems, communication transmitters, ship cold iron services, etc.),

f) All High Performance and Sustainable Buildings, if not already captured above, and

g) Remainder of "appropriate" buildings, largest first.

3) **Non-Covered Facilities** – Install advanced meters (or track utility revenue meter data) for each feeder line (supply line) leading to the facility. Give highest priority to metering Federal buildings that are known to be the largest energy consumers. For facilities that are multi-building (campus) installations prioritize meters, in addition to feeder lines, in the following order:

a) All agency self-generated electricity, including renewable energy sources,

b) All agency data centers[15] not planned for consolidation or closure, identified as part of the Federal Data Center Consolidation Initiative[16] and PortfolioStat,[17]

---

[14] *See* Fiscal Year 2013 and 2014 Memorandum for the Heads of Executive Departments and Agencies regarding PortfolioStat Guidance: M-13-09 (http://www.whitehouse.gov/sites/default/files/omb/memoranda/2013/m-13-09.pdf) and M-14-08 (http://www.whitehouse.gov/sites/default/files/omb/memoranda/2014/m-14-08.pdf).

[15] Under the Federal Data Center Consolidation Initiative, a data center is defined as a closet, room, floor or building for the storage, management, and dissemination of data and information. Such a repository houses computer systems and associated components such as database applications and storage systems and data stores. A data center generally includes redundant or backup power supplies, redundant data communications connections, environmental controls (air conditioning, fire suppression, etc.) and special security devices housed in leased (including by cloud providers, owned, collocated, or stand-alone facilities…neither square footage nor Uptime Institute tier classifications are required to define a facility as a data center.

[16] *See* Memorandum for Chief Information Officers regarding Federal Data Center Consolidation Initiative: http://www.whitehouse.gov/sites/default/files/omb/assets/egov_docs/federal_data_center_consolidation_initiative_02-26-2010.pdf

[17] *See* Fiscal Year 2013 and 2014 Memorandum for Heads of Executive Departments and Agencies regarding PortfolioStat Guidance: M-13-09 (http://www.whitehouse.gov/sites/default/files/omb/memoranda/2013/m-13-09.pdf) and M-14-08 (http://www.whitehouse.gov/sites/default/files/omb/memoranda/2014/m-14-08.pdf).

c) All other individual energy-intensive building types (e.g., laboratories, hospitals, control towers, and food services),

d) All large individual building – 10,000 square feet or above,

e) All High Performance and Sustainable Buildings – if not already captured above, and

f) Remainder of "appropriate" buildings – largest first.

B. Water Metering

For the purpose of maximizing cost-effectiveness, it is recommended the installation of advanced water meters be prioritized as follows:

1) **New Constructions and Major Renovations** - install advanced meters at the supply for the Federal building and for new landscape water use. If the budget allows, sub-meter for high-water end uses.

2) **Covered Facilities** – Install advanced meter (or track utility revenue meter data) for each water supply line leading to the covered facility.[18] Give highest priority to metering covered facilities that are the largest water consumers. For covered facilities that are multi-building (campus) installations[19] prioritize the installation of meters in addition to supply lines, in the following order:

   a) All well water and other internal supply lines to the installation (campus),

   b) Sufficient meters or other leak detection devices on distribution lines to effectively identify system losses.[20] Prioritize the largest distribution lines first,

   c) All water-intensive facilities including chiller plants, barracks, galleys/kitchens, dining facilities, swimming pools, gyms, golf courses, piers, dry docks, vehicle wash stations, industrial facilities, hospitals, prisons, water-intensive laboratories, and large landscape systems,

[18] Installing advanced meters at these locations is often useful as it does not require labor to record and transfer data to energy tracking systems. However, it may not be practicable due to physical or administrative complications involving the load serving utility or distribution utility.

[19] For many agencies and sub-agencies, covered facilities may be multi-building installations (campuses, garrisons, bases, etc.). At these locations, energy and water services are actually large systems delivering resources to multiple individual buildings. Each system is comprised of a supply line and a collection of individual buildings, structures, interconnecting infrastructure, landscapes, mission support activities, and other energy and water consuming processes. Energy and water are purchased and invoiced on a system basis and are often tracked with the aid of utility revenue meters.

[20] The majority of water losses occur in distribution lines between buildings and other uses.

d) All large individual building – 10,000 square feet or above,

e) All High Performance and Sustainable Buildings, if not already captured above, and

f) Remainder of "appropriate" buildings, largest first.

3) **Non-Covered Facilities** – Install advanced meter (or track utility revenue meter data) for each water supply line leading to the facility. Give highest priority to metering Federal buildings that are the largest water consumers. For facilities that are multi-building (campus) installations prioritize the installation of meters as follows:

a) All well water and other internal supply lines to the installation (campus),

b) Sufficient meters or other leak detection devices on distribution lines to effectively identify system losses.[21] Prioritize the largest distribution lines first,

c) All water-intensive facilities - including barracks, galleys/kitchens, dining facilities, swimming pools, gyms, golf courses, piers, dry docks, vehicle wash stations, industrial facilities, hospitals, prisons, water-intensive laboratories, and large landscape systems,

d) All large individual building – 10,000 square feet or above,

e) All High Performance and Sustainable Buildings – if not already captured above, and

f) Remainder of "appropriate" buildings – largest first.

V. Energy and Water Data Use

Each agency is required by statute to incorporate metered data into existing agency energy tracking systems and make data available to Federal facility managers. *See* 42 U.S.C. § 8253(e)(1).

Many agencies and sub-agencies have developed, or are in process of developing, metering data management systems. A meter data management system is a tool that automates the capture of data from advanced meters and can perform data analysis functions. Many have specialized business intelligence systems and dashboards designed for easy energy management analysis. Costs can vary widely and agencies and sub-agencies should conduct market research before procuring. It is advisable to designate and train personnel to analyze data at either the enterprise level and/or individual site locations.

[21] The majority of water losses occur in distribution lines between buildings and other uses.

Agencies are required to ensure that covered facility metered building energy and water data is entered into EPA's ENERGY STAR Portfolio Manager in monthly increments at the building level. Portfolio Manager can be used to track and assess the energy and water use of properties at the portfolio, campus, and/or building levels and offers a tool for tracking progress toward the High Performance and Sustainable Building Guiding Principles. It can help agencies understand performance by comparing annualized metrics for a specific property over time and among similar properties. There is nothing precluding agency facility managers from using Portfolio Manager to track and assess property performance. DOE, in coordination with EPA, is separately updating its *Building Energy Use Benchmarking Guidance* to provide further assistance to agencies in tracking their energy and water use in Portfolio Manager.

Green Button is a system developed by the North American Energy Standards Board for providing web-based secure access to energy bill account information, energy usage information, and energy consumption and usage data to customers of utilities and energy providers for the purposes of business management and energy usage management. It will be useful as a method of conveying utility-owned meter data to the agency or sub-agency metering data management system or to Portfolio Manager. DOE, in coordination with EPA, will issue separate guidance on the use of Green Button at Federal facilities.

VI. Five-Year Metering Plans

Not later than 12 months from the release of this guidance, each agency shall review, revise, and submit to the DOE Federal Energy Management Program its metering implementation plan, as required by 42 U.S.C. § 8253(e)(3). Each agency plan shall include a metering implementation plan for each individual sub-agency (bureau, component, service, etc.) within its jurisdiction. The updated agency plan shall consider resources required and prioritize metering implementation efforts for "appropriate" Federal buildings over the next five years. It is recognized that resource limitations may inhibit the installation of advanced meters at every "appropriate" Federal building within the five-year planning cycle. Consequently, agencies should provide a path forward for those remaining buildings following the initial five years.

For each agency and sub-agency, the metering implementation plans shall include:

- Prioritization and locations for installing appropriate and cost-effective meters,
- Anticipated milestones and timeline for next five years,
- Estimated amount of funding and personnel required to implement the plan,
- Description of Federal energy tracking systems that are made available to Federal facility managers,
- Identification of titles of personnel who will analyze the meter data,

- Description of how covered facility meter data will be entered into Energy Star Portfolio Manager,
- Utilization of Green Button data where appropriate to do so,
- Description of how any standard meter data will be incorporated into energy tracking systems and, where applicable, benchmarking systems - on a monthly basis,
- Description of any IT and cyber security barriers and how they are being addressed,
- Description of other implementation barriers and how they are being addressed, and
- Concurrence signatures from each sub-agency National Energy Manager (for Sub-Agency Plans) and the Agency National Energy Manager.

Parent agencies should submit their updated metering for their agency and associated sub-agencies to:

Saralyn Bunch
Project Manager
Federal Energy Management Program
Energy Efficiency and Renewable Energy
Department of Energy
Saralyn.Bunch@ee.doe.gov