LEASED ASSET ENERGY AND GHG REPORTING INTERPRETIVE GUIDANCE

U.S. GENERAL SERVICES ADMINISTRATION
OFFICE OF FEDERAL HIGH-PERFORMANCE GREEN BUILDINGS

JULY 2013

Leased Asset Energy and GHG Reporting Interpretive Guidance

EXECUTIVE SUMMARY

This document presents guidance on estimating and voluntarily reporting leased asset energy use and greenhouse gas (GHG) emissions data. It contains a practical set of guidelines and best practices for agencies developing their own policies and processes for leasing, energy data collection and estimation, and GHG reporting. It is *not* federal policy for energy reporting or GHG accounting.

Many federal leases are fully serviced: tenants pay flat monthly fees for energy rather than paying for actual measured use. Other leases require tenants to pay utilities directly for their campus or buildings, but usage data may not be available at the individual building or tenant level. Despite such limitations, available data, combined with some basic estimating assumptions, may permit agencies to estimate energy and GHG emissions for voluntary reporting to the Federal Energy Management Program in accordance with the revised guidance.[1]

Reporting itself does not reduce energy use, GHGs, or costs. Furthermore, energy consumption estimates are usually inadequate for tracking progress and developing energy reduction strategies. Estimates do not provide portfolio and facility energy managers with the detailed information necessary to understand, evaluate, and reduce consumption by heating and cooling systems, lighting, and plug-load devices. As such, agencies can greatly benefit from estimating to adopting a "measure, manage, and improve" approach.

To support this progression, this guidance

- summarizes the roles of real property, portfolio energy, and facility energy managers in energy and GHG reporting;
- briefly explains lease types and the energy and GHG reporting challenge emerging from fully serviced leases;

[1] White House Council on Environmental Quality, *Federal Greenhouse Gas Accounting and Reporting Guidance*, Revision 1, June 4, 2012.

- identifies best practices for portfolio and facility energy managers' use of estimating energy usage to assist in voluntary reporting of fully serviced leases; and
- summarizes a "measure, manage, and improve" approach intended to move past estimation and to realize reduce energy consumption, operational costs, and GHG emissions.

Contents

Figures

Tables

1. INTRODUCTION

The federal government is one of the largest owners of facilities and buildings in the United States. Agencies not only occupy their own buildings but also lease space in a vast number of federally and privately owned properties. Historically, energy consumption and cost data reporting has been required annually for "federal facilities," including campuses, buildings, and some leases.[2]

In 2009, Executive Order (EO) 13514 expanded these reporting requirements to include direct and indirect greenhouse gas (GHG) emissions.[3] Section 9 of EO 13514 requires the Department of Energy (DOE) Federal Energy Management Program (FEMP) and other federal partners to develop recommendations to guide GHG reporting. In October 2010, the Council on Environmental Quality (CEQ) issued its *Federal Greenhouse Gas Accounting and Reporting Guidance*. In 2011, all federal agencies started reporting GHG data, including energy use and costs, to FEMP using a standardized worksheet, known as the GHG and Sustainability Report. In June 2012, CEQ released revised guidance that encourages agencies to voluntarily report FY12 GHG emissions for all agency-leased facilities, both federally and privately owned, and suggests that this may become a requirement in the future.

Purpose

This document offers a practical set of guidelines and best practices for agencies developing their own energy management policies and processes for leasing, energy metering and estimation,[4] and GHG and sustainability reporting. It also presents a "measure, manage, and improve" approach to transition from estimation to a practical measurement approach that helps reduce energy consumption, operational costs, and GHG emissions. It is *not* a federal policy for energy reporting or GHG accounting.

---

[2] Richard Kidd, memorandum to Federal Agency Energy Coordinators, "Reporting Guidance for FY 2009 Annual Report on Federal Government Energy Management," September 18, 2009. These energy reduction goals and reporting requirements are found in the National Energy Conservation Policy Act (NECPA), Energy Policy Act (EPAct) of 2005, EO 13423, and Energy Independence and Security Act (EISA) of 2007. See also the Department of Energy (DOE) Federal Energy Management Program (FEMP), *Guidelines Establishing Criteria for Excluding Buildings*, January 7, 2006, www1.eere.energy.gov/femp/pdfs/ exclusion_criteria.pdf.

[3] White House, EO 13514, "Federal Leadership in Environmental, Energy, and Economic Performance," October 5, 2009, www.whitehouse.gov/assets/documents/2009fedleader_eo_rel.pdf.

[4] Per FEMP, *Guidance for Electric Metering in Federal Buildings*, February 3, 2006, meters "cumulatively measure, record and store aggregated [utility] data that is periodically retrieved for use in customer billing" purposes. Metering may include energy management goals as well. Submeters are metering devices installed below the level necessary for utility billing and are used in energy conservation and management at the building, building system, tenant, circuit, and device levels.

Intended Use and Structure

This interpretive guidance describes an approach for real property, portfolio energy and facility energy managers for reducing energy consumption, costs, and GHG emissions. It describes

- the roles of real property, portfolio and facility energy managers in energy and GHG reporting (Section 2);
- lease types and the energy reporting challenge emerging from fully serviced leases (Section 3);
- best practices for portfolio and facility energy managers in estimating energy usage in fully serviced leases (Sections 4 and 5);
- best practices for portfolio and facility energy managers in estimating and reporting energy usage in fully serviced leases (Section 6); and
- a measure, manage, and improve approach that can be used to reduce energy consumption, costs, and GHGs (Section 7).

The appendices give more in-depth background and resources on leasing categories, relevant statutory and executive agency requirements, energy estimation methods, and energy, cost, and GHG reporting requirements.

2. WHO MANAGES AND REPORTS ENERGY-GHG DATA?

Estimating, reporting, and acting on energy consumption reduction requirements primarily involve three federal positions (Table 1). This section discusses their roles and responsibilities.

Table 1. Responsibilities for Estimating, Reporting, and Conserving Energy

Responsible party	Role		
	Estimating	Reporting	Conserving
Senior sustainability officer	N/A	Responsible	Responsible
Portfolio energy manager	Performs	Performs	Contributes
Facility energy manager	Contributes	Contributes	Performs

Senior Sustainability Officers

EO 13514 requires all executive branch departments and federal agencies to identify a senior sustainability officer (SSO). This designated official is responsible

for signing off on every GHG emission report, including energy and cost reporting. In doing so, SSOs are held accountable for ensuring

- the accuracy and annual submission of the GHG emission report, and
- progress toward meeting the agency's energy and GHG reduction goals and targets, as well as advanced metering mandates.

Portfolio Energy Managers

Although the SSO is ultimately accountable, federal agencies that own or operate facilities often employ portfolio energy managers, who exercise functional responsibility for coordinating and aggregating energy and GHG reporting. Headquarters, bureau, or regional portfolio energy managers can be responsible for

- policies guiding energy management, and
- governing the energy reporting data calls to their respective bureaus, commands, regions, facilities, or even buildings.

Some agencies utilize regional portfolio energy managers, who are responsible for energy management and reporting in a particular geographic area. These portfolio energy managers oversee the compilation and reporting of energy data, as well as analysis and performance monitoring. Portfolio energy managers at the headquarters level frequently coordinate the aggregation of regional data for submittal of reports to FEMP through the SSO.

Decisions for voluntary energy and GHG reporting of leased facilities can pose new data challenges for portfolio energy managers. Estimation can meet these needs in the near term (see Section 4), but obtaining energy data is far superior and eliminates much of the need for energy consumption proxies and estimation in federal "covered" facilities,[5] goal-excluded buildings, and the remaining GHG inventory sources. However, estimates may be necessary for the FY12 voluntary GHG reporting of fully serviced lease inventories.

Facility Energy Managers

Under EISA Section 423, federal "covered" facilities must identify an energy manager. Although many facilities had such managers before EISA, this change spotlights their central role. Facility energy managers partner with both portfolio energy managers and local building managers to

[5] A "covered" facility is "a group of facilities at a single location or multiple locations managed as an integrated operation" that represent 75 percent of an agency's energy use. See DOE, "Facility Management/Benchmarking," *Federal Energy Management Program*, www1.eere.energy.gov/femp/regulations/eisa.html.

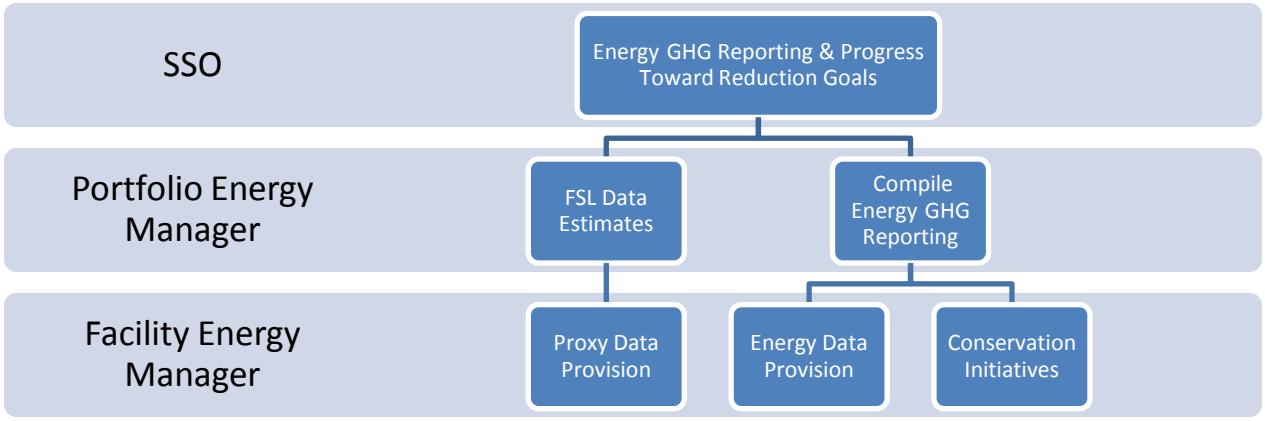
- advise on implementing the agency's energy management policies,
- collect and report on energy and cost data,
- identify energy conservation measure (ECM) opportunities, and
- make the case for funding and executing ECM projects.

Energy and facility managers can use energy data to identify a variety of opportunities for cost reduction—such as scheduling activities outside peak usage periods—and to analyze costs and benefits to justify energy investments. These detailed data can help in prioritizing submittals for ECM projects. Ultimately, the capture of actual energy consumption data can help facility, building, and energy managers collaborate on reducing energy consumption and operating costs with tenant organizations and occupants.

Primary Energy and GHG Reporting Roles

Figure 1 shows a hierarchy of energy estimation and GHG reporting activities that the three responsible parties perform. The remainder of this document serves these parties and their respective activities.

Figure 1. Primary Energy and Reporting Hierarchy



Note: FSL = Fully Serviced Lease.

3. Leased Facilities and the Fully Serviced Lease Challenge

As discussed, voluntary reporting of leased facilities began in FY12 GHG and Sustainability Report. The revised CEQ guidance indicates that leased asset reporting may become required in the future. What does this mean for portfolio and facility energy managers?

Lease Types, Ownership, and Control

The General Services Administration (GSA), on behalf of a federal tenant, often arranges facility leases with a private landlord. The leases are categorized as fully serviced, single-net, or triple-net. The type of lease determines the availability of data on energy use and cost, as well as the reporting responsibility under various statutes. It also influences which party keeps the savings from reducing energy use and which can receive incentives to invest in energy efficiency.

GSA leases may also reflect different occupancy situations, including sole tenant, majority tenant, or minority tenant. Table 2 shows the percentage breakdown by lease type and tenancy of GSA's lease portfolio as of August 2012.

Table 2. GSA Federal Tenant Lease Portfolio (Percentage of Total Leases)

Type of lease	Sole tenant	Majority tenant	Minor tenant
Total	22	26	43
Fully serviced	93	93	95
Single-net	7	7	4
Triple-net	<1	<1	<1

Regardless of tenancy, almost all GSA leases on behalf of federal agencies (more than 93 percent) are fully serviced, and much of the remainder are single-net arrangements.

CEQ's revised guidance requires agencies to report energy and GHG data where they maintain operational control and have the ability and incentive to reduce consumption and cost. It defines operational control as more than simply paying fuel or utility bills, but also having the broader "responsibility for an activity or process and the authority to implement operating policies associated with the activity or process."[6] On the basis of this definition and current energy reporting guidance, Table 3 summarizes how lease and ownership arrangements impact tenant data availability, control, and GHG reporting.

[6] Operational control refers to responsibility for directly paying energy bills, operations and maintenance (O&M) of an occupied building, or direct control over a certain activity.

Table 3. Lease Types, Building Ownership, and Control

Definition	Building ownership	Access to tenant energy data and control	GHG reporting
Fully serviced lease[a]			
The landlord has responsibility for O&M, including paying all utilities	Private	Energy data: no Cost data: no Control: plug load only	Federal tenant reports all emissions as Scope 3[b]
	Federal agency[c]	Energy data: no[d] Cost data: no[d] Control: plug load only	Federal tenant reports all emissions as Scope 3[b] Federal landlord reports as Scope 1 or 2 emissions
Single-net lease			
Operating leases where the occupant directly pays a portion of the utility costs	Private	Energy data: partial Cost data: partial Control: lighting and plug load only	Federal tenant reports Scope 2 electric usage emissions for which it is billed Federal tenant reports all remaining electricity use centralized system emissions as Scope 3[b]
	Federal agency	Energy data: partial Cost data: partial Control: lighting and plug load only	Federal tenant reports Scope 2 electric usage emissions for which it is billed Federal tenant reports all remaining electricity use centralized system emissions as Scope 3[b] Federal landlord reports as Scope 1 or 2 emissions, except those reported as Scope 2 by the tenant agency
Triple-net lease			
Operating leases in which the occupant has responsibility for O&M, including paying utilities, which include those associated with the building mechanical systems	Private	Energy data: yes Cost data: yes Control: HVAC, lighting, and plug load	Federal tenant reports Scope 1 and 2 emissions
	Federal agency[e]	Energy data: yes Cost data: yes Control: HVAC, lighting, and plug load	Federal tenant reports Scope 1 and 2 emissions

Note: HVAC = heating, ventilation, and air conditioning.

[a] Data centers and server farms should be excluded. Furthermore, strict differentiation should be made between succeeding/superseding and new/newly replacing leases in this category.

[b] Does not apply to leases smaller than 10,000 gross square feet (gsf). Reporting for those greater than 10,000 gsf is voluntary in FY12 and thereafter.

[c] These leases may be referred to as an "occupancy agreement" between federal departments.

[d] Energy use and cost are not connected, but the leasing federal agency may be able to collect energy and GHG data without contract modification.

[e] These situations may be referred to as a "delegation" from the federal landlord to the tenant agency.

Although Table 3 summarizes who may have the needed energy and cost data, it does not specify how or at what level the data are generated. The table reflects control over the equipment, such as responsibility for O&M, but it does not reflect the extent of occupant's use of those systems. The extent of occupant control is an acknowledged gray area concerning operational control as defined for federal energy and GHG reporting purposes.

Federal Facilities and Fully Serviced Lease Gap

Energy management requirements for energy consumption and cost reporting apply to federal facilities, including campuses, buildings, and some leases.[7] EO 13514 and subsequent CEQ Section 9 guidance required federal agency reporting for GHG emissions accounting and inventory. This change not only requires more detailed data, such as types of fuels or the location of use, but also encourages voluntary reporting for leased facilities, even those privately owned. Previously, some leased assets, such as privately owned, fully serviced leases, were not only excluded from energy reduction goals, but even from FEMP energy reporting, because tenant agencies would not have the necessary energy consumption data.[8]

For situations where energy use is not metered in a federal, fully serviced lease or usage data are unavailable in a private, fully serviced lease, the next two sections offers portfolio energy managers estimation methods to meet near-term reporting needs. To emphasize the value of energy consumption data, Section 7 introduces the measure, manage, and improve approach for facility energy managers.

4. BEST PRACTICES FOR ESTIMATING AND REPORTING

Starting in FY12, federal agencies may choose to voluntarily report GHG emissions from federal and private, fully serviced leases to FEMP. Portfolio energy managers have been preparing FEMP energy and cost reporting for covered facilities and EISA goal-excluded buildings for several years and, as a result of EO 13514, have been responsible for reporting GHG emissions since FY10. However, voluntary agency reporting of fully serviced leases or a future shift to mandatory reporting of fully serviced leases could be a new, challenging scenario, where managers are tasked to report energy usage and GHG emissions but utility consumption data are not unavailable.[9] Metered data and utility bill are the preferred first choice for reporting. However, agencies deciding to or required to report fully serviced leases may need to estimate energy usage should such data are not readily available or obtainable.

---

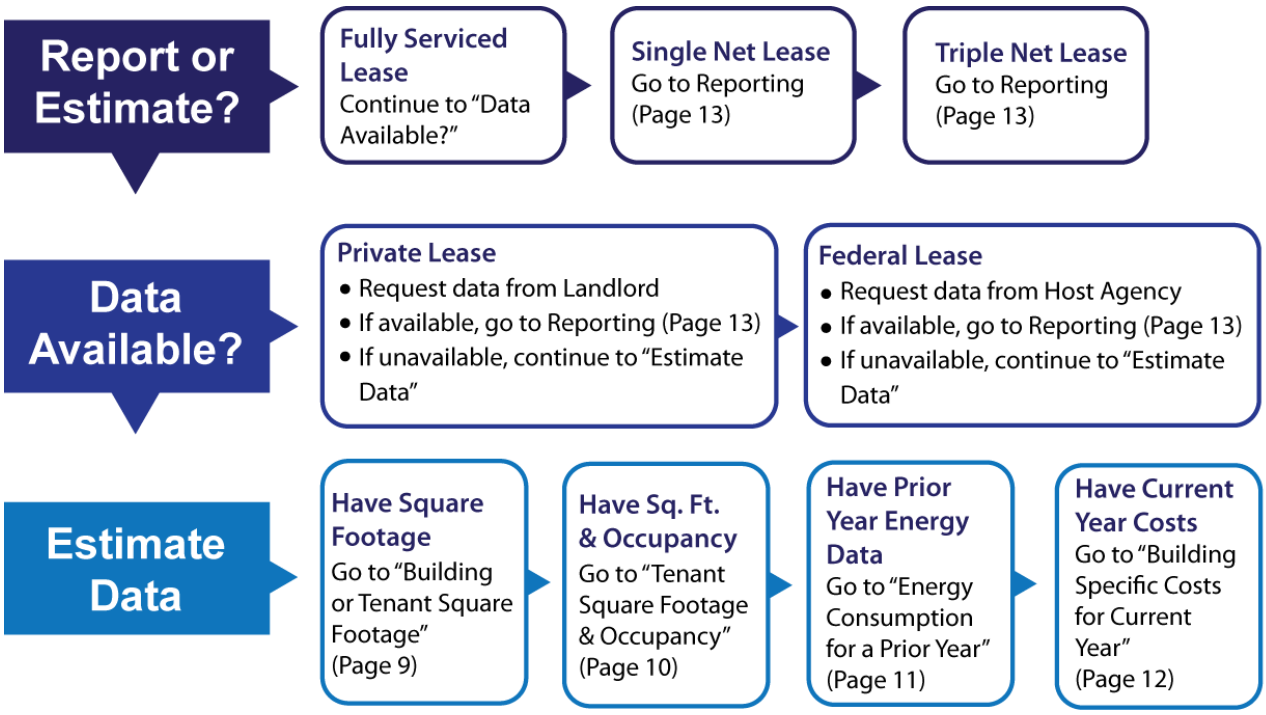
[7] DOE FEMP, *Guidelines Establishing Criteria for Excluding Buildings*, January 7, 2006, www1.eere.energy.gov/femp/pdfs/ exclusion_criteria.pdf.

[8] See Note 2.

[9] By statute, federal tenant energy use must by measured using a utility-grade meter if the tenant is billed for its consumption.

As such, Figure 2 and this section introduce energy data estimation best practices for three types of leases. It introduces four approaches for using commonly available data as proxy inputs for use in annual energy data estimation formulas.

Figure 2. Energy Data Estimation Process



These estimation approaches should only be considered interim measures until monthly or annual utility metered data can be made available or until power or fuel submetering efforts are underway.[10] Estimates should only be a stopgap because they cannot tie actual energy consumption to its costs. They do, however, supply the essential information that portfolio energy managers need to allocate energy use in fully serviced leases and to report both the annual estimates and actual fiscal year utility bill data.

5. Energy Data Estimation

Portfolio energy managers can use the basic methods described below to estimate energy use and GHG emissions from leased space. These methods can use commonly available data (Table 4) to estimate energy consumption and rough

[10] Submetering programs and initiatives may focus on measuring energy consumption at the building, process, or plug-load level. Buildings may be submetered where utility contracts are maintained at the facility, not the building level. Process load submetering may focus on the building systems and equipment, such as HVAC or lighting. Plug-load submetering can include electrical circuit and even device-level data collection and monitoring.

order of magnitude costs for use in the FEMP GHG and Sustainability Data Report.

Table 4. Proxy Data Sources for Estimating Leased Space Energy

Data element	Potential source
Total building area—square feet[a]	Building owner or local assessment records
Total tenant space—rentable square feet	Lease contract
Building occupancy rate—percent occupied	Building owner or facility manager
Building utilities cost—electricity, natural gas, fuel oil, or propane	Building owner or facility manager
Building energy record from prior year—kilowatt hours (kWh), thousands of standard cubic feet, thousands of gallons	Building owner or facility manager

[a] Unless specified otherwise, "square feet" refers to *gross* square feet for consistency with CEQ's revised Section 9 guidance. Confirming that square footage data and energy intensity factors refer to gsf—rather than "useable square feet" or "rentable square feet"—is important. Useable square feet is the rented space solely for tenant use. Rentable square feet includes useable square footage and an allocated amount of building common areas. Gsf includes tenant, common, and support spaces. See Building Owners and Managers Association International standards for more details.

Managers can estimate energy use for the leased space using proxy energy intensity factors, allocation formulas, building-specific historical energy data, or building-specific utility cost data. In general, this technique involves multiplying proxy input data by fuel-specific energy intensity factors to yield estimated energy consumption. Figure 3 shows this approach.

Figure 3. Proxy Data Estimation

An energy intensity factor represents a typical amount of energy used per square foot of space for various types of facilities, such as offices or warehouses, and can be expressed in terms of a particular energy source type. For example, an office building electrical intensity factor could be expressed in units of kWh/gsf/year. Proxy data inputs, such as gsf, are multiplied by the appropriate energy intensity factors to estimate usage data for electricity, natural gas, fuel oil, or propane. The following methods detail this approach on the basis of the proxy data available.

Building or Tenant Square Footage

In leased spaces where only building square footage and a basic building characteristic are available, facility energy managers can use the following method for estimating annual energy consumption.

Step 1: Determine the building gross square footage from data sources, such as the building owner, lease documentation, or even local tax assessment records. If the lease is in a multi-tenant facility, use the occupant's rentable square footage instead of the building's total gross square footage.

Step 2: Identify and select the energy intensity factor that seems most appropriate for the building type, use, configuration, and source of energy. It may be available from

- government or industry surveys, such as the Commercial Buildings Energy Consumption Survey of the Energy Information Administration (EIA),
- utility companies,
- known energy intensity factors derived from a comparable facility or building,
- a building-specific survey with temporary metering, or
- an ENERGY STAR Statement of Energy Performance.

Step 3: Calculate the estimated energy use by multiplying the building area by the selected energy intensity factor, using the following equation:

Estimated energy use = building area × energy intensity factor.

Step 4: Calculate the total estimated energy cost by identifying local utility or fuel cost rates for each type used and multiplying them by the calculated estimated energy use (Step 3):

Total estimated cost = estimated energy use by type × utility rate.

Step 5: Following CEQ's Section 9 guidance, enter this estimate into the FEMP GHG and Sustainability Data Report.[11]

TENANT SQUARE FOOTAGE AND OCCUPANCY

Facility energy managers can use the following estimation method for leased spaces in multi-tenant facilities where building-wide energy use and gsf, tenant gsf, and building occupancy rates are available.

[11] Adapted from the Climate Registry, "General Reporting Protocol 1.1: Updates and Clarifications," July 15, 2011, www.theclimateregistry.org/downloads/2011/07/2011.07.15-GRP_Updates_and_Clarifications.pdf; and Office of Management and Budget (OMB), Circular No. A-45 Revised, "Rental and Construction of Government Quarters," October 20, 1993, online at www.whitehouse.gov/omb/circulars_a045/.

Step 1: Determine energy use for the entire building from purchase records, utility bills, or meter readings for building electricity, natural gas or other fuel use.

Step 2: Determine the building gsf from data sources, such as the building owner, lease documentation, or even local tax assessment records.

Step 3: Determine the area leased by the tenant.

Step 4: Determine the building occupancy rate (% occupied area) from the building owner, facility manager, local real estate records, or direct surveys.

Step 5: Calculate the estimated energy use using the following equation:

Estimated energy use =
(tenant's area/building area) × (building energy use/occupancy rate).

Step 6: Calculate the total estimated energy cost by identifying local utility or fuel cost rates for each type used and then multiplying them by the calculated estimated energy use (Step 5):

Total estimated cost = estimated energy use by type × utility rate.

Step 7: Following CEQ's Section 9 guidance, enter this estimate into the FEMP GHG and Sustainability Data Report.[12]

BUILDING-SPECIFIC ENERGY CONSUMPTION FROM PRIOR REPORTING YEAR

In some cases, operational or cost information about the specific building or facility may be available. If energy use during a prior reporting year is known for the specific building, current usage for leased space may be estimated by normalizing for heating and cooling degree days.

Step 1: Determine the building energy used in a prior reporting year from fuel purchase records, utility bills, or meter readings.

Step 2: Estimate the annual energy used for heating and cooling as a percentage of the total energy consumed. These should be based on the increased energy consumed during winter months and summer months, respectively. If monthly data are not available, use the best recommendation of the energy or building manager.

Step 3: Determine the annual heating and cooling degree days in the region for the year being estimated and the proxy year. The National Climatic Data Center

[12] Adapted from the Climate Registry, "General Reporting Protocol 1.1," May 2008, www.theclimateregistry.org/downloads/GRP.pdf.

website has information on heating and cooling degree days by month and state at: www7.ncdc.noaa.gov/CDO/CDODivisionalSelect.jsp#.

Step 4: Calculate the estimated energy using the following equation:

$$\left[\frac{E_P \times E_h}{D_{HP}} \times \frac{D_{HI}}{1}\right] + \left[\frac{E_P \times E_C}{D_{CP}} \times \frac{D_{CI}}{1}\right] + \left[(1 - E_h - E_C) \times E_p\right]$$

Where

E_P = energy used in proxy year,
E_h = percentage of energy used for heating,
D_{HP} = heating degree days in the proxy year,
D_{HI} = heating degree days in inventory year,
E_C = percentage of energy used for cooling
D_{CP} = cooling degree days in the proxy year, and
D_{CI} = cooling degree days in the inventory year.

Calculate the total estimated energy cost by identifying local utility or fuel cost rates for each type used and multiplying them by the calculated estimated energy use (Step 4):

Total estimated cost = estimated energy use by type × utility rate.

Step 5: Following CEQ's Section 9 guidance, enter this estimate into the FEMP GHG and Sustainability Data Report.[13]

BUILDING-SPECIFIC COSTS FOR CURRENT YEAR

Energy use for the year may also be estimated from known or estimated energy expenditures to date in the current year.

Step 1: Determine annual energy bills from purchase records or electricity bills.

Step 2: Determine the building's local utility rates per unit or average energy costs per unit[14] for the appropriate location.[15]

---

[13] Adapted from the Climate Registry, "Local Government Operating Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories," Version 1.1, May 2010, equation 6.13; www.theclimateregistry.org/downloads/2010/05/2010-05-06-LGO-1.1.pdf.

[14] For average fuel and electricity rates, see EIA's Short-Term Energy Outlook Interactive Data Viewer and Electricity Data Browser, www.eia.gov/electricity/data/browser/.

[15] See Table 14.x, Climate Registry, "General Reporting Protocol 1.1: Updates and Clarifications," July 15, 2011.

Step 3: Estimate energy using the following equation:

Estimated energy use =
annual energy expenditures × (100/average unit cost).

Step 4: Calculate the total estimated energy cost by identifying local utility or fuel cost rates for each type used and then multiplying them by the calculated estimated energy use (Step 3):

Total estimated cost = estimated energy use by type × utility rate.

Step 5: Following CEQ's Section 9 guidance, enter this estimate into the FEMP GHG and Sustainability Data Report.

6. Energy, Cost, and GHG Data for Reporting

Whether from the fully serviced lease estimates, landlord-supplied utility bills, facility meters, or building submetering, portfolio energy managers must collect and compile energy consumption and cost data to prepare the FEMP GHG and Sustainability Data Report before review and submittal by their SSOs.

For campus- or building-level electricity usage, the FEMP data report contains four separate reporting tabs. The minimum information required for electricity reporting is the building name, facility/building type, location (ZIP code), and annual kWh consumed, which are all entered into the appropriate form. The form automatically calculates GHG emissions from each input, specific to subregion delineated in the Environmental Protection Agency's (EPA's) Emissions & Generation Resource Integrated Database. For information on the form's calculation methods, see the CEQ Section 9 Technical Support Document.[16]

(See Appendix C for additional background on FEMP GHG and Sustainability reporting.)

Estimated energy consumption, cost data, and location data will help agencies with their voluntary GHG and sustainability reporting. However, reporting is only the first step: reducing energy use, costs, and GHG emissions requires energy data to manage consumption and seize conservation opportunities.

[16] *Federal Greenhouse Gas Accounting and Reporting Guidance Technical Support Document*, October 6, 2010.

7. MEASURING, MANAGING, AND IMPROVING

Measuring

Measuring consumption is important in improving the energy performance of federal buildings. If it isn't measured, it can't be effectively managed. For instance, in many fully serviced leases, federal agency tenants pay flat monthly fees for utilities based on the square footage they occupy rather than on how much energy they actually use. Other types of arrangements may require tenants to pay utilities for their campus or buildings directly, but usage data may not be available at the individual building or tenant levels.

FEMP guidance emphasizes that

> a fundamental [principle] should be that payments for utilities be based on measured usage, so there is an incentive for building occupants to conserve utility resources.

The previous section furnishes methods for estimating energy use and GHG emissions, but best practice dictates that agencies transition to real energy consumption data as soon as possible. Estimates do not produce the kind of real data needed for effective management or for establishing effective energy reduction strategies. Likewise, estimated data does not enable agencies to see or receive credit for their progress. This is why metering plays such an important role in measuring actual consumption, informing better management, and enabling performance moving forward.

However, any metering or monitoring effort should be carefully approached and consider the purpose, data needed, technical feasibility, and utility of investments. For example, energy metering is focused on the amount of consumption while power quality applications are for more sophisticated, dynamic power management to protect sensitive equipment. Table 5 shows three common purposes and key considerations.

Table 5. Metering, Monitoring, and Considerations

Considerations	Energy metering	Power monitoring	Power quality
Purpose	Energy consumption management	Power demand and energy management	Process support and equipment protection
Driver	Conservation and cost reduction	Utility demand response and cost reduction	Protect equipment and mission critical processes
System/equipment	Device, process, system, and building	Device to building	Device to building
Meters	Simple handheld to advanced network	Enhanced to advanced network	Advanced network

Table 5. Metering, Monitoring, and Considerations

Considerations	Energy metering	Power monitoring	Power quality
Parameters	kWh, therms, $/kWh, and $/therm	Watts, kVA, and power factor	Volts, amps, and cycles
Time interval	Minute, hour, day, month, and year	Millisecond to year	Millisecond to year
Accuracy and precision	Consumer grade to utility meter	Consumer grade to utility smart meter	Building management to utility smart meter
Configuration	Standalone single to multiple embedded	Standalone single to multiple embedded	Standalone single to multiple embedded
Data storage	None to networked	Standalone to networked	Standalone to networked
Communication	None, wired, LAN, and wireless	None, wired, LAN, and wireless	None, wired, LAN, and wireless
Display	Manual reading to dashboard	Data file to analysis dashboard	Data file to analysis dashboard

Note: kVA = kilovolt amps and LAN = local area network.

All three of these applications require clarity of purpose, understanding of value to occupant mission, and technical expertise to effectively make the case for the investment in data acquisition, collection, and analysis. For the purposes of this guidance, we focus on energy submetering in fully serviced leases, but further discussion of the role and value of metering, submetering, and monitoring is available in GSA's "Submetering Comparison" (Appendix F) and their forthcoming "Submetering Primer."

Energy metering (and submetering) efforts can help building and energy managers realize opportunities to reduce energy consumption, GHG emissions, and cost, but efforts need to keenly focus on return on investment. Measurement and collection of such data can be used to inform

- energy procurement and billing,
- baselining and optimizing building performance,
- project measurement and verification,
- equipment and plug-load diagnostic, and
- occupant awareness and behavior change

Submetering can be implemented at different scales and for different functions, such as the building system (HVAC, lighting, or plug load), tenant space, circuit, or even specific devices.

However, virtually all of GSA leases are fully serviced and have varying tenancy situations that determine the applicable submetering approach, data needed, feasi-

bility, and value proposition for the tenant and landlord. These considerations apply even more to GSA's single-net and triple-net leases, given the utility costs incurred. Table 6 shows scenarios and elements to consider when deciding to submeter, collect data and how doing so requires knowledge of the fully serviced lease tenancy situation, building characteristics, and return on investment.

Table 6. Submetering Scenarios and Decision Elements

Elements	New building sole tenant	Existing building sole tenant	Existing building majority tenant	Existing building minor tenant
GSA leases (%)	22		26	43
Influence with landlord investment	Substantial	Major	Minor	Minimal
Building systems applicable	All systems	HVAC, lighting, and plug load	HVAC, lighting, and plug load	Lighting and plug load
Building installation barriers and cost	Minimal	Major	Major	Substantial
Utility savings and payback potential	Substantial	Major	Minor	Minimal

Tenant agency mission requirements (such as security or manufacturing) and use profiles (such as an 8-hour office or a 24/7 server farm) add other elements in determining whether submeter collection of data is useful and the level needed to inform meaningful energy and GHG management. However, the lease scales can likewise help identify candidate leases for management attention and efforts.

Managing

These data enable and support managing energy and operating costs. While measuring energy consumption does not equate to effective management or conservation, doing either without such data is highly challenging if not impossible. These data provide situational awareness and the basis for monitored metrics, such as energy intensity and GHG emissions.

The data also enable portfolio energy managers to assess progress toward statutory and agency goals. Energy and cost data drive energy management at various scales, such as at federal campuses, buildings, and tenant offices. In doing so, they can provide energy managers with valuable insights into utility cost, building system O&M, and office equipment configurations.

However, the approach, return on investment, and value depend on the management effort's purpose, goals, design, and implementation. The following three O&M examples illustrate potential goals and the approach used at these different scales:

1. *Facility complexes over 100,000 gsf*, such as the Harry S. Truman Building with 2,022,466 rentable square feet, are the key energy management

opportunities. Given their size, analysis of these facility's energy usage profile and building system performance quickly identifies utility cost saving opportunities (such as peak management and demand response) and energy conservation investments (building envelop, HVAC, and lighting upgrades) that may yield worthwhile results and payback, particularly benefiting from the economy of scale.

2. Active, effective, and persistent energy management efforts in *buildings between 10,000 and 100,000 gsf* can also save energy and reduce costs but not at the same scale as larger complexes. Conversely, the greater numbers of such buildings offer a significant opportunity for realizing energy and cost savings. Energy manager efforts to review building and equipment demand profiles, identify inefficient equipment and configurations, and develop compelling return-on-investment business cases give them a foundation for engaging asset managers to make sound yet incremental investments. For additional information and examples, refer to the GSA Knowledge Network's "Submetering Business Case."

3. Landlord and tenant office spaces *under 10,000 gsf* can likewise benefit from proactive energy management programs focused on building HVAC and lighting opportunities. Office-oriented energy management efforts focused on plug loads can likewise yield positive results but require more sophisticated and collaborative efforts to achieve energy and cost reduction objectives. Successful efforts, such as those studied by the University of Washington, first focused on developing equipment and user demand profiles.[17]

At any scale, energy managers can generate real results by applying energy management principles or even by developing a formal energy management program or system, such as those based on ISO 5000: 2011.[18] Within these frameworks, energy managers can develop equipment and user consumption profiles that can be used for the planning, evaluating, and executing conservation efforts as well as for working with tenants to demonstrate quick wins. Equipment configuration and replacement fixes can be made to fit the available budget and desired payback time horizon. Progress is monitored in a targeted manner so that the lessons learned are appropriately applied and investment cost is weighed against savings.

---

[17] Adam Stoeckle, Joel Loveland, and Rob Peña, *Plug Loads and People: Observations and Analysis from the Field* (draft), 2012 Summer Study on Energy Efficiency in Buildings, American Council for an Energy-Efficient Economy, Integrated Design Lab, University of Washington.

[18] DOE's *eGuide Lite* and *eGuide to ISO 5000.1* are introductory references to energy management, www1.eere.energy.gov/energymanagement/.

Improving

Measurement and management help improve performance and reduce energy consumption, but incentives ultimately spur these changes. Thoughtfully designed energy management programs generate data that can guide management strategies, investment, and operational decisions that produce real energy-reduction benefits. Measured data can help analyze and prioritize submittals for energy conservation projects. Further, if a facility participates in energy savings performance contracts or utility energy services contracts, measurement and verification is critical to the ability of energy managers to validate the project's effectiveness and monitor realized savings.

Energy savings, lower utility costs, and better performance drive portfolio and building managers, but tenant incentives are a critical element of success, particularly in fully serviced lease situations. Building energy managers can use data and management metrics to develop useful operational and behavioral approaches, which can help achieve deeper energy savings. However, focusing on energy management improvements that better serve agencies' missions can help frame performance incentives, particularly where higher-efficiency buildings provide a better work environment.[19]

Energy and GHG reporting for leased assets are currently voluntary, but reducing energy consumption and operating costs are not. Portfolio and building energy managers alike should aim to transition from estimation methods to the measure, manage, and improve approach as soon as practical. Doing so is a best practice but moreover good stewardship of finite budgetary resources.

[19] Evan Mills, "Amplifying Real Estate Value through Energy & Water Management: From ESCO [energy service company] to 'Energy Services Partner,'" *2004 ACEEE [American Council for an Energy-Efficient Economy] Summer Study on Energy Efficiency in Buildings*, August 22–27, 2004, evanmills.lbl.gov/pubs/pdf/energy_services_partners.

APPENDIX A: DEFINITIONS

Covered facility. A group of facilities at a single location or multiple locations "managed as an integrated operation" that represents 75 percent of an agency's energy use.[20]

Federal building. Any building, structure, or facility, or part thereof, including the associated energy-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. This term also means a collection of such buildings, structures, or facilities and their energy-consuming support systems.[21]

Federal facility. Any building that is constructed, renovated, leased, or purchased in part or in whole for use by the federal government.[22]

Operational control. Responsibility for directly paying energy bills, O&M of an occupied building, or direct control over a certain activity.[23]

[20] See Note 7.
[21] NECPA, as amended by EPAct.
[22] EISA, Section 401.
[23] See Note 1.

APPENDIX B: LEASE TYPES

Federal facility leases typically involve federal tenants and either a federal landlord, such as GSA, or a private landlord. The lease types, detailed below, are categorized as fully serviced, single-net, or triple-net. The type of lease often determines the availability of data on energy use and cost, as well as the reporting responsibility under various statutes. It also influences which party has an incentive to invest in energy efficiency and which, consequently, might also consider metering.

Data availability, reporting, and investment incentives for leases in multi-tenant buildings are more complex. All tenants use centralized building operations such as HVAC systems and lobby lighting to some degree. Without submetering at the tenant level, estimates of energy use among them must employ a common metric, such as rentable square footage. In many cases, the estimation technique is not tied to the actual energy use, and tracking the effectiveness of energy-efficiency investments by individual tenants is not possible.

Reporting requirements for energy and GHGs can differ for various standards. In general, reporting standards assess either operational or financial control to determine which party is responsible for reporting. The type of lease largely determines the party that has either operational or financial control of a given facility. However, gray areas arise, such as under leases where the landlord owns and maintains the HVAC system but the tenant sets the temperature, leaving open the question of which actually has control.

The preferred approach in such nuanced situations would be to assert that the responsible party is also the one who can be motivated to bring about change. However, that ideal is often compromised by the reality of data availability and must be tempered through cooperation and partnership.

In the following sections, we describe how lease types influence submetering decisions as they relate to reporting and managing energy use and GHG emissions.

Fully Serviced Leases

Under fully serviced leases, the landlord is responsible for O&M, including paying for all utilities. Occupants pay a flat rate independent of the amount of energy they actually consume. Landlords pay for these services directly to the utility or provider, and they may maintain usage data. For leases between agency occupants and federal landlords, energy data may be available to the tenants. In existing leases with private landlords, federal occupants may not have access to or be contractually entitled to their energy consumption data, but could request it from the landlord or provider with the caveat that the latter is not legally required to furnish it. Moving forward, it may be prudent for all lease contracts, even fully serviced leases, to require landlords to give occupants access to such data.

Although occupants in fully serviced leases do not directly pay for the energy they use, they do have control over lighting and plug-load demands. The landlord is responsible for maintaining facility equipment and operations, including HVAC equipment, lighting systems, and the building envelope. These impact a building's energy consumption, but investment decisions regarding these systems are generally outside occupant control. However, tenant activities and choices also influence electricity and fuel demand, regardless of the technologies installed.

In the case of fully serviced leases in multi-tenant buildings, occupants can establish a mutually beneficial dialog and partner with the landlord to estimate their prorated share of the building's total energy consumption for reporting Scope 3 GHG emissions. In the absence of an approach tailored to the situation, agency tenants should use the estimation best practices described in Section 5.

Single-Net Leases

Under single-net leases, the occupant typically pays a monthly flat rate for occupancy and a portion of utility costs directly to the provider. The landlord controls and pays for maintaining and operating building mechanical systems, while the occupant pays directly for the electricity consumed through lighting and plug loads. As a result, energy use for lighting and plug-load data are readily available to occupants through monthly energy bills.

Under these conditions, landlords generally have little incentive to invest in energy-efficient lighting equipment, because they would not benefit from savings in monthly energy bills. The tenants themselves have an incentive to modify activities and behavior, but they may hesitate to invest in high-cost infrastructure upgrades to a property they do not own. Similarly, landlords are incentivized to invest in energy-efficient mechanical systems, such as HVAC, while tenants are not.

In the case of single-net leases in multi-tenant buildings, occupants need to engage and work with the landlord to determine their share of energy consumption for centralized building systems and common areas to identify and report Scope 3 GHG emissions. In the absence of an approach tailored to the situation, agency tenants should use the estimation best practices presented in Section 5.

Triple-Net Lease

Under triple-net leases, the occupant has responsibility for building O&M, including mechanical systems, and paying for all utilities.

Under triple-net leases, the occupants have access to detailed monthly energy use and cost data. They have an incentive to modify behavior to reduce monthly bills and emissions. Depending on the length of the lease, occupants may also be motivated to invest in energy-efficient equipment and upgrades.

For triple-net leases held with a federal or non-federal entity as the landlord, the occupant should report all emissions as Scope 1 or 2, as appropriate, and follow Section 9 best practices to account for and report energy consumption and GHG emissions, as appropriate.

Lease Types, Ownership, and Control

For federal tenants, evolving guidance has led to confusion over responsibility to report energy data, how to collect such data, and how to use the data for GHG reporting. CEQ's Section 9 guidance requires agencies to report energy and GHG data where they maintain operational control and, hence, have both the ability and incentive to reduce consumption and cost. Section 2.1.3 defines operational control as more than paying fuel or utility bills, including the broader "responsibility for activity or process and the authority to implement operating policies associated with the activity or process."[24] From this definition and existing energy reporting guidance, Table B-1 summarizes how lease and ownership arrangements impact tenant data availability and control.

Table B-1. Lease Types, Building Ownership, and Control

Lease type	Definition	Building ownership	Tenant data and control
Fully serviced	The landlord has responsibility for O&M, including paying all utilities	Private	Energy data: no Cost data: no Control: plug load only
		Federal agency[a]	Energy data: no[b] Cost data: no[b] Control: plug load only
Single-net	Operating leases where the occupant pays a portion of the utility costs directly	Private	Energy data: partial Cost data: partial Control: lighting and plug load only
		Federal agency	Energy data: partial Cost data: partial Control: lighting and plug load only

[24] Operational control refers to responsibility for directly paying energy bills, O&M of an occupied building, or direct control over a certain activity.

Table B-1. Lease Types, Building Ownership, and Control

Lease type	Definition	Building ownership	Tenant data and control
Triple-net	Operating leases for which the occupant has responsibility for O&M, including paying utilities, which include those associated with the building mechanical systems	Private	Energy data: yes Cost data: yes Control: HVAC, lighting, and plug load
		Federal agency[c]	Energy data: yes Cost data: yes Control: HVAC, lighting, and plug load

[a] These leases may be referred to as an "occupancy agreement" between federal departments.

[b] Energy use and cost are not connected, but the leasing federal agency may be able to collect energy and GHG data without contract modification.

[c] These situations may be referred to as a "delegation" from the federal landlord to the tenant agency.

Although this table summarizes who may need energy and cost data, it does not specify how or the level at which the data are generated. It assumes that a leased campus, facility, or building has some level of metering, but the type of data produced can vary widely. In addition, it reflects nominal control over the equipment and not the occupant's use of those systems, which is an acknowledged gray area concerning operational control.

APPENDIX C: REPORTING REQUIREMENTS FOR ENERGY AND GHGS

Federal energy management requirements and goals began more than 30 years ago with the passage of NECPA. It remains the foundation for most current energy requirements and was expanded by amendments in EPAct 2005 and EISA. EOs 13423 and 13514 set additional mandates for federal agencies to reduce energy intensity in federal buildings and expand reporting of GHG emissions.[25,26]

The main statutes and policies on tracking energy use, reporting GHGs, and deploying metering reside in EPAct 2005 Section 103, EISA Sections 432 and 434(b), EO 13423 Section 2, and EO 13514 Section 2.

Energy Management and Reporting

The statutes and policies that govern energy management and reporting have evolved since NECPA. Section 432 of EISA remains the principal NECPA amendment that requires federal agencies to benchmark, track, and report energy usage. Through this amendment, Congress mandated that federal agencies designate energy managers at government facilities and assign responsibilities to them, such as conducting a comprehensive energy evaluation of each covered facility every 4 years. Other goals established by EOs support reductions in energy intensity. Tracking these reductions requires energy managers to consistently account for or accurately estimate energy usage. Table C-1 shows current energy management and reporting requirements.

[25] White House, EO 13423, "Strengthening Federal Environmental, Energy, and Transportation Management," January 24, 2007, www.whitehouse.gov/sites/default/files/omb/procurement/green/eo13423_instructions.pdf, and EO 13514, "Federal Leadership in Environmental, Energy, and Economic Performance," October 5, 2009, edocket.access.gpo.gov/2009/pdf/E9-24518.pdf.

[26] DOE FEMP, "Federal Operations and Maintenance Requirements," www1.eere.energy.gov/femp/program/om_requirements.html.

Table C-1. Energy Management and Reporting Requirements

Statute or EO	Section	Requirement
EISA	§432	Requires agencies to identify all covered facilities that constitute at least 75% of the agency's facility energy use. Establishes a framework for facility project management and benchmarking. Designated energy managers are responsible for the following: ◆ Completing comprehensive energy and water evaluations of 25% of covered facilities each year, so that an evaluation of each facility is completed at least once every 4 years ◆ Following up on implemented measures, including fully commissioning equipment, putting O&M plans in place, and measuring and verifying energy and water savings ◆ Using a web application to certify and track compliance for energy and water evaluations, project implementation and follow-up measures, and estimated cost and savings ◆ Entering energy use data for each metered building into a benchmarking system, such as the ENERGY STAR Portfolio Manager.
EO 13423	§2(a)	3% annual reduction in building energy intensity through FY15, or 30% total reduction by FY15. Baseline is FY03.
EO 13423	§2(f)	All new agency construction and renovation complies with the Guiding Principles.[a]
EO 13423	§2(f)	15% of existing federal building inventory complies with Guiding Principles.
EO 13514	§2(g)(ii)	All new agency construction and renovation complies with the Guiding Principles.

[a] Memorandum of Understanding, "Federal Leadership In High Performance and Sustainable Buildings," attachment: "Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings," January 2006.

GHG Reporting

Provisions of EO 13514 (Table C-2) and the CEQ Section 9 guidance that followed require federal agencies to measure, report, and reduce GHG emissions from multiple sources, including fuel combustion or electricity consumption. Because these emissions result from the production or use of energy, energy-related activity data are necessary for calculating accurate emission estimates.[27] Increasing the quality of energy consumption data, such as via meters, will better enable federal agencies to identify and account for GHG emissions and, more important, reduce their energy use and emissions. Furthermore, future releases of the Section 9 guidance are anticipated to include leased assets—such as privately owned,

[27] Section 9 guidance explains the GHG accounting and reporting protocol in more detail.

fully serviced leases—which are currently excluded from mandated FEMP energy reporting requirements.

Table C-2. GHG Reporting and Management Requirements

Statute or EO	Section	Requirement
EO 13514	§2(c)	Comprehensive inventory of Scope of 1, 2, and 3 emissions (Baseline FY10)
EO 13514	§2(a)	Establish FY20 percentage reduction targets of Scope 1 and 2 GHG emissions (Baseline FY08)
EO 13514	§2(b)	Establish FY20 percentage reduction targets of Scope 3 GHG emissions (Baseline FY08)

Federal Facilities and Fully Serviced Leases

Energy management requirements for consumption and cost reporting apply to "federal facilities," including campuses, buildings, and some government leases.[28] EO 13514 and CEQ Section 9 guidance requires federal agencies to report GHG emissions accounting and fuel inventory. This change does not only require more detailed data, such as fuels and their location, but the newly revised guidance encourages voluntary reporting of privately owned, leased facilities. Privately owned, fully serviced leases have generally been excluded from energy reduction goals and FEMP reporting because tenant agencies would not have the necessary energy consumption data to do so.[29]

[28] DOE FEMP, *Guidelines Establishing Criteria for Excluding Buildings*, January 7, 2006, www1.eere.energy.gov/femp/pdfs/ exclusion_criteria.pdf.

[29] DOE FEMP, "Reporting Guidance for FY 2009 Annual Report on Federal Government Energy Management," September 18, 2009.

APPENDIX D: APPLICABLE STATUTORY AND POLICY DRIVERS

Statutory and executive driver	Section	Requirements	Source	Former statute
NECPA				
EPAct 1992	§158	Requires the creation of energy audit teams available to all federal agencies. It also included the establishment of a monitoring program for the implementation of energy efficiency improvements at federal facilities.	FEMP: EPAct of 1992	
EPAct 2005	§103(e)(1)	Requires all federal buildings to be metered or submetered—to the maximum extent practicable—by October 1, 2012, to ensure efficient energy use and reduce the cost of electricity used in federal facilities. "Maximum extent practicable" includes facilities where installation is feasible and a sensible application of metering technology; where meters will provide useful data and information that leads to improved energy management practices or O&M improvements resulting in energy and/or energy-related cost savings; and cost effectiveness.	DOE Efficiency and Renewable Energy, "Guidance for Electric Metering in Federal Buildings" (February 2006)	The metering requirements of EPAct 2005 amended Section 543 of NECPA (42 United States Code 8253).
EPAct 2005	§103(e)(3)	Requires federal agencies to submit to the US DOE an implementation plan identifying personnel responsible for achieving metering requirements, and any determination by the agency that advanced meters or metering systems are not practical in their specific situation. The plan was to be delivered to DOE/FEMP no later than August 3, 2006, and will address implementation of metering requirements by the end of FY12.	FEMP: Federal O&M Requirements	
EPAct 2005	§203	Renewable electricity consumption should not be less than 3% in FY07–09; increasing to 5% in FY10–12; increasing to 7.5% in FY13 and beyond.	FEMP: Federal O&M Requirements	
EISA	§431	3% annual reduction in building energy intensity through 2015, or 30% total reduction by 2015 (Baseline 2003).	EISA	

Statutory and executive driver	Section	Requirements	Source	Former statute
EISA	§432	Requires agencies to identify all covered facilities that constitute at least 75% of the agency's facility energy use. Establishes a framework for facility project management and benchmarking. Designated energy managers are responsible for: ◆ Completing comprehensive energy and water evaluations of 25% of covered facilities each year, so that an evaluation of each facility is completed at least once every 4 years. ◆ Following up on implemented measures, including fully commissioning equipment, putting O&M plans in place, and measuring and verifying energy and water savings. ◆ Using a web application to certify and track compliance for energy and water evaluations, project implementation and follow-up measures, and estimated cost and savings. ◆ Entering energy use data for each metered building into a benchmarking system, such as the ENERGY STAR Portfolio Manager.	FEMP: Federal O&M Requirements	
EISA	§433	New buildings and buildings undergoing major renovations shall reduce their fossil fuel-generated energy consumption (baseline 2003) by 55% (2010), 65% (2015), 80% (2020), 90% (2025), and 100% (2030).	EISA	
EISA	§434(a)	Requires agencies to employ the most energy efficient designs, systems, and equipment based on life-cycle cost effectiveness.	EISA	
EISA	§434(b)	Each agency shall provide for equivalent metering of natural gas and steam (not later than October 1, 2016), including development of installation plans.	FEMP: Federal O&M Requirements	Section 434(b) amends Section 543(e)(1) of NECPA
EISA	§523	30% of hot water demand in new buildings and major renovations must be solar (if life-cycle cost effective).	EISA	
EISA	§1301	Establishes a policy to use "Smart Grid" technology to modernize the electric utility transmission and distribution system. This includes the use of meters that allow flow of information in two directions.	EISA	
EO 13514	§2(a)	Establish FY20 percentage reduction targets of Scope 1 and 2 GHG emissions (Baseline FY08).	EO 13514	
EO 13514	§2(a)(i)	Reduce building energy intensity.	EO 13514	

Statutory and executive driver	Section	Requirements	Source	Former statute
EO 13514	§2(a)(ii)	Increase agency use of renewable energy.	EO 13514	
EO 13514	§2(a)(ii)	Implement new renewable energy generation projects on agency property.	EO 13514	
EO 13514	§2(b)	Establish FY20 percentage reduction targets of Scope 3 GHG emissions (Baseline FY08).	EO 13514	
EO 13514	§2(c)	Comprehensive inventory Scope of 1, 2, and 3 emissions (Baseline FY10).	EO 13514	
EO 13514	§2(g)(i)	All new buildings that begin the planning process in 2020 or after are designed to achieve zero-net-energy by 2030.	EO 13514	
EO 13514	§2(g)(ii)	All new agency construction and renovation complies with the Guiding Principles.	EO 13514	
EO 13514	2(g)(iv) and (v)	Pursue cost-effective, innovative strategies, including management of buildings systems, to reduce energy, water, and material use.	EO 13514	
EO 13514	§2(g)(vi)	Identify opportunities to dispose of and consolidate unused real property assets toward sustainability.	EO 13514	
EO 13514	§2(g)(vii)	Ensure retrofitting and renovation of federally owned historic properties promotes the building's long-term viability.	EO 13514	
EO 13514	§2(h)	95% of all new contracts including contract modifications (with the exception of weapons systems) require products and services that are ◆ energy-efficient, ◆ water-efficient, ◆ bio-based, ◆ environmentally preferable, ◆ non-ozone depleting, ◆ contain recycled-content, and ◆ non-toxic or less-toxic alternatives.	EO 13514	
EO 13514	§2(h)(v)	Implement best practices in energy efficient management of servers and data centers.	EO 13514	
EO 13514	§2(i)(ii)	Establish and implement policies to enable power management, duplex printing, and other energy efficient or environmentally preferable features.	EO 13514	
EO 13514	§2(j)	Continue implementation of existing environmental management systems.	EO 13514	

Statutory and executive driver	Section	Requirements	Source	Former statute
EO 13514	§4(b)	OMB uses scorecard to measure agency progress in implementing the EO.	EO 13514	
EO 13514	§5(g)	CEQ provides the President with government-wide GHG emissions target.	EO 13514	
EO 13514	§8	Develop and implement agency Strategic Sustainability Performance Plan, integrated with mission, budget, existing planning procedures, and coordinated with General Counsel, Chief Information Officer, Chief Administrative Officer, and senior real property officer.	EO 13514	
EO 13514	§8	Agencies submit updates on progress and performance at least annually if not more often.	EO 13514	
EO 13514	§9, §10, §11, §12, §13, §14 and §16	Federal agencies coordinate to develop recommendations or guidance for CEQ on GHG accounting and reporting tools, sustainable locations for federal facilities, federal local transportation logistics, federal fleet management, and vendor and contractor Scope 3 emissions strategies, stormwater management, and adaptation to support efforts toward the goals of the EO.	EO 13514	
EO 13423	§2(a)	3% annual reduction in building energy intensity through FY15, or 30% total reduction by FY15 (Baseline FY03).	EO 13423	Compare with EO 13514 §2(a)(i)
EO 13423	§2(b)	At least 50% of statutorily required renewables comes from “new” (as of 1999) sources.	EO 13423	Compare with EO 13514 §2(a)(ii)
EO 13423	§2(b)	Implement new renewable energy generation projects on agency property for agency use.	EO 13423	Compare with EO 13514 §2(a)(ii)
EO 13423	§2(f)	All new agency construction and renovation complies with the Guiding Principles.	EO 13423	Compare with EO 13514 §2(g)(ii)
EO 13423	§2(f)	15% of existing federal building inventory complies with Guiding Principles.	EO 13423	Compare with EO 13514 §2(g)(iii)
EO 13423	§3(b)	Implement an environmental management system to support goals of EO.	EO 13423	Compare with EO 13514 §2(j)

APPENDIX E: TECHNICAL METHOD REFERENCES

Approach	Formula	Description	Resource	Organization
Estimate energy use based on energy intensity factors obtained from government surveys or industry experts	Estimated energy use = useable office space × energy intensity factor	Multiply leased area by an energy intensity factor. These factors are available from DOE EIA's Commercial Buildings Energy Consumption Survey, surveys of government-owned facilities or from publicly documented sources like industry reports.	*General Reporting Protocol 1.1: Updates and Clarifications, July 15, 2011*; and *Circular No. A-45 Revised*	The Climate Registry
Estimate electricity use based on generator-specific or utility-developed factors	Estimated energy use = useable office space × energy intensity factor	Suppliers of energy services may have their own estimates for energy intensity. Certification or third-party verification of this data is likely to be more accurate than nationwide intensity factors.	*General Reporting Protocol 1.1, May 2008* and *General Reporting Protocol 1.1: Updates and Clarifications*	The Climate Registry
Estimate electricity use based on known energy intensity at comparable facility	Estimated energy use = (energy use at comparable facility/size of comparable facility) × (size of leased facility)	Multiply leased area by an energy intensity factor for a similar sized building with a comparable use.	*Local Government Operating Protocol 1.1*	The Climate Registry
Estimate energy use based on survey or temporary metering data	Not defined	Sampling or metering energy use is another approach to estimate energy consumption. This approach requires an energy professional to track or survey energy usage over an operating schedule that an entity can account for.	*General Reporting Protocol 1.1, May 2008* and *General Reporting Protocol 1.1: Updates and Clarifications*	The Climate Registry
Ask for your building's ENERGY STAR rating, energy intensity, energy costs per square foot, and other significant metrics	N/A	The building owner or management company may have benchmarked the building through ENERGY STAR Portfolio Manager. If so, the building will have a Statement of Energy Performance.	*Tenant's Guide: Reducing the Environmental Impact of Leased Space*	EPA ENERGY STAR Program
Estimate energy use for leased space based on the facility's total annual consumption	Estimated energy use = (entity's area/building area) × (building energy use/occupancy rate)	This is the primary method in use to estimate energy use when utility records are available for the building but submetering readings are unavailable. It assumes that all occupants of the building have similar energy consuming habits. This method is also favored by real estate professionals.	*General Reporting Protocol 1.1, May 2008*	The Climate Registry

Approach	Formula	Description	Resource	Organization
Estimate electricity use based on proxy year data	See "Local Government Operating Protocol 1.1," Equation 6.13	If electricity use data for the building is available for a previous year, an estimate of electricity use may be made by normalizing for heating and cooling degree days. Annual heating and cooling degree days are available from the National Oceanic and Atmospheric Administration National Weather Service Climate Prediction Center.	*Local Government Operating Protocol 1.1* and *Circular No. A-45 Revised*	The Climate Registry; US White House, OMB
Estimate electricity use based on energy expenditures	Estimated electricity use = (annual energy expenditures) x (100/average kWh cost)	Estimate energy use based on known or estimated energy expenditures and average electricity costs for specific types of facilities. Average electricity costs may be found in The Climate Registry "Updates and Clarifications," or Form EIA-826.	*General Reporting Protocol 1.1, May 2008* and *General Reporting Protocol 1.1: Updates and Clarifications*	The Climate Registry
Obtain utility bills or metered data	N/A	In some cases it may be difficult for a partner to obtain utility bills or metering data for a site included in their inventory, for example, from leased office space. However, it is recommended that they try to obtain utility bills or metered data to calculate electricity use activity data.	*Greenhouse Gas (GHG) Inventory Guidance*	EPA Climate Leaders Program

APPENDIX F: GSA SUBMETERING COMPARISON

What Type Of Submetering Is Right For Me?

What Kind of Submeter Do I Need?

This simple guide allows you to compare the strengths and limitations of available low-to-moderate cost submeter types so you can match tool capabilities to your project goals. The variety and capability of device-oriented electrical submeters is expanding. But increased options make it more challenging to choose the most effective tool.

When Might Submeters Be Helpful?

Submeters help Facility Managers, energy managers and tenant organizations identify:
1) inefficient equipment;
2) use and configuration alternatives; and
3) equipment and user profile management opportunities.

Submetering Comparison Chart

Simple

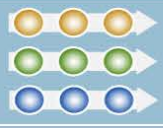
A device able to measure instantaneous power and cumulative energy data but requires manual reading and recording.

Enhanced

A device able to measure and record interval data but requires manual data file download.

Advanced

A device able to measure and record time-series interval data, communicate data to a remote location, and integrated into an energy management or building automation system.

	Simple	Enhanced	Advanced
Data Unprocessed power and energy information collected by the submeters.			
Cost Submetering equipment and installation cost.			
Labor The labor required to operate and maintain the submetering effort, such as data recording.			
Analysis Expertise required to utilize the data and apply it to energy management decisions.			

Goals, Devices, Submeters, And Benefits

Goal	Types Of Applicable Devices	Submeter Type	How You Use It
Identify inefficient equipment	**Productivity Equipment** Printers, copiers, fax machines and their configurations.	All	Inform equipment replacement priorities and alternative configurations.
Understand use and configuration	**Kitchen** Refrigerator, water heater, coffee makers, and dishwashers. Configuration and occupant use profiles.	Enhanced & Advanced	Realign operation and maintenance priorities and inform equipment replacement. Identify alternative configurations and engage tenants on conservation efforts.
Develop equipment and user profile opportunities	**Workstation** Laptop, monitor, phone, and task lights. Different user profiles (research, admin and managers).	Enhanced & Advanced	Quantify energy use, compare products, and inform equipment purchase and issues. Evaluate equipment configurations, peak use profiles, and demand management practices.

Key References:

- Lobato, C., Pless, S., Sheppy, M. and Torcellini, P., "Reducing Plug and Process Loads for a Large Scale, Low Energy Office Building: NREL's Research Support Facility," NREL/CP-5500-49002, National Renewable Energy Laboratory, February 2011. Available online at http://www.nrel.gov/docs/fy11osti/49002.pdf
- National Renewable Energy Laboratory, "Assessing and Reducing Plug and Process Loads in Office Buildings." Available online at http://www.nrel.gov/docs/fy11osti/51199.pdf
- Pacific Northwest National Laboratory, "Building Cost & Performance Metrics: Data Collection Protocol, PNNL-18325, March 2009. Available online at http://www.pnl.gov/main/publications/external/technical_reports/PNNL-18325.pdf
- Stoeckle, Adam, Joel Loveland, and Rob Peña, Plug Loads and People: Observations and Analysis from the Field (DRAFT), 2012 Summer Study on Energy Efficiency in Buildings, American Council for an Energy-Efficient Economy, Integrated Design Lab, University of Washington, College of Built Environments, Department of Architecture, February 14th, 2012.

APPENDIX G: RESOURCES

Capehart, B.L. et al., Guide to Energy Management, Sixth Edition, CRC Press.

Kircher, Kevin, Girish Ghatikar, Steve Greenberg, Dave Watson, Rick Diamond, and Dale Sartor, "Toward the Holy Grail of Perfect Information: Lessons Learned Implementing an Energy Information System in a Commercial Building," 2010 ACEEE Summer Study on Energy Efficiency in Building, eis.lbl.gov/pubs/holy-grail-perfect-info.pdf.

Lobato, C., Pless, S., Sheppy, M. and Torcellini, P., "Reducing Plug and Process Loads for a Large Scale, Low Energy Office Building: NREL's Research Support Facility," NREL/CP-5500-49002, National Renewable Energy Laboratory, February 2011, www.nrel.gov/docs/fy11osti/49002.pdf.

Metzger et al., "Plug Load Behavioral Change Demonstration Project," Technical Report NREL/TP-7A40-52248, August 2011, www.nrel.gov/docs/fy11osti/52248.pdf.

Mills, Evan, "Amplifying Real Estate Value through Energy & Water Management: From ESCO to "Energy Services Partner,"" 2004 ACEEE Summer Study on Energy Efficiency in Buildings, August 22–27, 2004, evanmills.lbl.gov/pubs/pdf/energy_services_partners.

Millstein, Don, "A Cool Million Payoff," Energy and Environmental Management, Second Quarter 2011.

Moorefield, L., B. Frazer and P. Bendt, PhD, "Office Plug Load Field Monitoring Report," California Energy Commission, PIER Energy-Related Environmental Research Program, CEC-500-2011-010, 2008.

National Renewable Energy Laboratory, "Assessing and Reducing Plug and Process Loads in Office Buildings," www.nrel.gov/docs/fy11osti/51199.pdf.

Pacific Northwest National Laboratory, "Building Cost & Performance Metrics: Data Collection Protocol, PNNL-18325, March 2009, www.pnl.gov/main/publications/external/technical_reports/PNNL-18325.pdf.

Paciorek, Sukanya, Egan, Daniel and Jabaji, Renad, Vornado's Energy Information Portal, Unprecedented Visibility, Steven L. Newman Real Estate Institute, Baruch College, CUNY, Fall 2010, www.baruch.cuny.edu/realestate/pdf/Unprecedented-Visibility-Vornado-White-Paper.pdf.