DEPARTMENT OF COMMERCE

Implementation Handbook for the Strategic Sustainability Performance Plan

AUGUST 2013

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This handbook has been created to assist the United States Department of Commerce (DOC) with implementing the goals and targets established in its *Strategic Sustainability Performance Plan*. In collaboration with DOC energy management personnel, staff from the National Renewable Energy Laboratory (NREL) produced this handbook. NREL is a national laboratory of the U.S. Department of Energy operated by the Alliance for Sustainable Energy, LLC.

This *Implementation Handbook for the Strategic Sustainability Performance Plan* is approved under the authority of Chapter 1 of the Department's Energy and Environmental Management Manual dated 13 September 12 and DAO 217-16 dated 5 April 12.

Approved by:

Robert Tomiak, Associate Director
Office of Sustainable Energy & Environmental Programs

Date:

19 August 2013

Acronyms and Abbreviations

BAS	building automation systems
BOD	biological oxygen demand
Btu	British thermal unit
C&D	construction and demolition
CEQ	Council on Environmental Quality
CFL	compact fluorescent lamp
CH_4	methane
CHP	combined heat and power
CO_2	carbon dioxide
CPG	Comprehensive Procurement Guideline
DOC	U.S. Department of Commerce
DOE	U.S. Department of Energy
EA	environmental assessment
eGRID	Emissions & Generation Resource Integrated Database
EIA	Energy Information Administration
EIS	environmental impact statement
EISA	Energy Independence and Security Act
EMS	Environmental Management System
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPAct	Energy Policy Act
EPCRA	Emergency Planning and Community Right-to-Know Act
EPEAT	Electronic Product Environmental Assessment Tool
EPP	Environmentally Preferable Purchasing
ESPC	energy savings performance contract
FAR	Federal Acquisition Regulation
FEC	Federal Electronics Challenge
FEMP	Federal Energy Management Program
FY	fiscal year
GEC	Green Electronics Council
GHG	greenhouse gas
GSA	U.S. General Services Administration
GSF	gross square feet
GWP	global warming potential
HFC	hydrofluorocarbon
HPSB	high-performance sustainable building
HVAC	heating, ventilation, and air conditioning
HVACR	HVAC and refrigeration
ILA	industrial, landscaping, and agricultural
IMBY	In My Backyard
IPCC	Intergovernmental Panel on Climate Change
kWh	kilowatt-hour
LED	light-emitting diode
LEED	Leadership in Energy and Environmental Design
MIS	Management Information System
MMBtu	million British thermal units
MOU	memorandum of understanding
MRR	Mandatory Reporting of Greenhouse Gases Rule
MSW	municipal solid waste

$MTCO_2e$	metric tons of carbon dioxide equivalent
N_2O	nitrous oxide
NC	new construction
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NREL	National Renewable Energy Laboratory
O&M	operations and maintenance
ODS	ozone-depleting substances
OMB	Office of Management and Budget
OU	operating unit
P2	pollution prevention
PFC	perfluorocarbon
PNR	Passenger Name Record
POV	personally operated vehicle
PV	photovoltaic
R2	Responsible Recyclers
REC	renewable energy certificate
retro-Cx	retrocommissioning
RSF	Research Support Facility
SF_6	sulfur hexafluoride
SNAP	Significant New Alternatives Policy
SSPP	Strategic Sustainability Performance Plan
T&D	transmission and distribution
TSD	technical support document
UESC	Utility Energy Services Contract
U.S.	United States
USDA	U.S. Department of Agriculture
WTE	waste to energy
WWTP	wastewater treatment plant

Table of Contents

1. INTRODUCTION 1

2. GREENHOUSE GAS REDUCTION 2

2.1 Greenhouse Gas Basics 2

2.1.1 What Are GHGs? 2

2.1.2 Why Are GHGs Important? 3

2.1.3 What Are Scopes? 4

2.1.4 What Is a GHG Inventory? 6

2.1.5 Why Are GHG Inventories Important? 7

2.2 Background 7

2.2.1 Scope 1 Emissions Sources 7

2.2.2 Scope 2 Emissions Sources 10

2.2.3 Scope 3 Emissions Sources 11

2.3 Implementation Strategies 12

2.3.1 Scope 1 Reduction Strategies 14

2.3.2 Scope 2 Reduction Strategies 15

2.3.3 Scope 3 Reduction Strategies 17

2.4 Greenhouse Gas Resources 19

3. HIGH-PERFORMANCE SUSTAINABLE BUILDINGS 20

3.1 High-Performance Sustainable Building Basics 20

3.1.1 What Are High-Performance Sustainable Buildings? 20

3.1.2 Why Are HPSBs Important? 21

3.2 Implementation Strategies 22

3.2.1 Leased Facilities 24

3.2.2 Owned Facilities 26

3.2.3 New Construction and Major Renovation Strategies 30

3.3 HPSB Resources 31

4. REGIONAL AND LOCAL PLANNING 32

4.1 Regional and Local Planning Basics 32

4.1.1 What Is Planning and Why Is It Important? 32

4.2 Implementation Strategies 33

4.2.1 Transportation 33

4.2.2 Facility Planning and Operations 34

4.2.3 Environmental Initiatives 35

4.3 Planning Resources 36

5. WATER USE EFFICIENCY AND MANAGEMENT 37
5.1 Water Use Basics 37
5.1.1 What Is Water Efficiency and Management? 37
5.1.2 Why Is Water Efficiency and Management Important? 38
5.2 Background 38
5.3 Implementation Strategies 39
5.3.1 Potable Water Reduction Strategies 39
5.3.2 Nonpotable Water Reduction Strategies 40
5.4 Water Resources 41
6. POLLUTION PREVENTION AND WASTE ELIMINATION 42
6.1 Pollution Prevention Basics 42
6.1.1 What Is Pollution Prevention? 42
6.1.2 Why Is P2 Important? 42
6.1.3 What Are the Key Pollution Sources at DOC Facilities? 43
6.2 Implementation Strategies 43
6.2.1 Purchasing 44
6.2.2 Operational Practices 44
6.2.3 Recycling and Composting 44
6.2.4 Construction 45
6.2.5 Measurement 45
6.3 Pollution Prevention Resources 45
7. SUSTAINABLE ACQUISITION 46
7.1 Sustainable Acquisition Basics 46
7.1.1 What Is Sustainable Acquisition? 46
7.1.2 Why Is Sustainable Acquisition Important? 46
7.2 Background 47
7.2.1 Types of Acquisition 47
7.3 Implementation Strategies 52
7.3.1 Sustainable Procurement Training 52
7.3.2 Performance Criteria for Sustainability Attributes 52
7.3.3 Energy Efficient and Sustainable Products 52
7.3.4 Product Cost-Effectiveness 53
7.3.5 Sustainable Acquisition Language in Solicitations and Contracts 53
7.3.6 Sustainable Acquisition Practices and Sustainability Programs 54
7.3.7 Monitoring and Reporting Progress 54
7.4 Sustainable Acquisition Resources 55

8. ELECTRONICS STEWARDSHIP 56
8.1 Electronics Stewardship Basics 56
8.1.1 What Is Electronics Stewardship? 56
8.1.2 Why Is Electronics Stewardship Important? 56
8.2 Background 57
8.2.1 Types of Acquisition 57
8.3 Implementation Strategies 58
8.3.1 Sustainable Electronics Procurement Training 58
8.3.2 Procurement Criteria 58
8.3.3 Energy Efficient and Sustainable Products 59
8.3.4 Product Cost-Effectiveness 59
8.3.5 Sustainable Acquisition Language in Solicitations and Contracts 60
8.3.6 Power Management Program 60
8.3.7 Electronics Recycling, Reclamation, and Reuse Recycling 61
8.4 Electronics Stewardship Resources 61
9. AGENCY-SPECIFIC INNOVATION AND GOVERNMENT-WIDE SUPPORT 62
9.1 Innovation and Support Basics 62
9.2 Background 62
9.3 Implementation Strategies 62
9.3.1 Onsite Innovation 62
9.3.2 Government-Wide Support 63
9.4 Innovation and Support Resources 63

Tables and Figures

TABLE 2-1. GWPS AND ATMOSPHERIC LIFETIMES OF THE PRINCIPAL GHGS 3
TABLE 2-2. MAJOR AREAS OF IMPLEMENTATION FOCUS IN GHG EMISSIONS REDUCTION FOR DOC FACILITIES 13
TABLE 3-1. MAJOR AREAS OF IMPLEMENTATION FOCUS IN HPSB FOR DOC FACILITIES 23
TABLE 5-1. DOC WATER USE INTENSITY AND COST FOR 2010 38
TABLE 7-1. COVERED PRODUCT CATEGORIES FOR FEDERAL ENERGY EFFICIENCY PROCUREMENT REQUIREMENTS 49

FIGURE 2-1. ILLUSTRATION OF THE GREENHOUSE EFFECT 2
FIGURE 2-2. FEDERAL DEFINITIONS AND EMISSION SOURCES INCLUDED IN SCOPES 1, 2, AND 3 5
FIGURE 2-3. COMMON SOURCES OF GHG EMISSIONS FROM FEDERAL FACILITIES 6
FIGURE 2-4. DOC'S FY10 INVENTORY RESULTS 7
FIGURE 3-1. NREL'S RSF IS CONSIDERED A HIGH-PERFORMANCE SUSTAINABLE BUILDING (HPSB) 21
FIGURE 3-2. ENERGY END USES IN BUILDINGS 22
FIGURE 3-3. DIRECTIONAL DAYLIGHTING FEATURES *PHOTO BY SCOTT HUFFMAN, NREL* 28
FIGURE 5-1. TYPICAL OFFICE WATER USE 37
FIGURE 6-1. FLOW OF MATERIALS AND WASTE BEFORE, DURING AND AFTER PRODUCT USE 43
FIGURE 8-1. ENVIRONMENTAL IMPACTS OF THE CRADLE-TO-GRAVE CONCEPT 57

1. Introduction

The United States Department of Commerce (DOC) has established specific goals within its Strategic Sustainability Performance Plan (SSPP), which is required of all Federal agencies as part of Executive Order (EO) 13514.[1] Each year as part of the annual greenhouse gas inventory and sustainability data report to the Office of Management and Budget (OMB) and Council on Environmental Quality (CEQ), DOC Operating Units (OU) are required to submit updated five-year plans to help the Office of the Secretary project out year progress against each Sustainability goal. The Office of Sustainable Energy and Environmental Programs (OSEEP), in conjunction with the National Renewable Energy Laboratory (NREL), developed this handbook to help OUs to identify and plan projects within the various Sustainability areas.

This handbook is intended to provide background information, describe first steps, and identify the most common types of projects to guide facility and operations managers during the planning and programming process. Operating Units should encourage their facility and/or operations managers use this handbook as a reference to more effectively manage resources and improve performance against each Sustainability goal.

The handbook sections generally follow the structure and goals in the SSPP:

- Greenhouse Gases
- High-Performance Sustainable Buildings and Regional and Local Planning
- Water Use Efficiency and Management
- Pollution Prevention and Waste Elimination
- Sustainable Acquisition
- Electronics Stewardship
- Agency-Specific Innovation and Government-Wide Support.

Each section presents information on the specific topics and gives additional resources for further information.

[1] "Federal Leadership in Environmental, Energy, and Economic Performance." Federal Facilities Environmental Stewardship & Compliance Assistance Center, October 5, 2009. Accessed February 2012: http://www.fedcenter.gov/programs/eo13514/.

2. Greenhouse Gas Reduction

United States Department of Commerce Greenhouse Gas Reduction Targets

The United States Department of Commerce (DOC) has established reduction targets for agency-wide Scope 1 and 2 and Scope 3 greenhouse gas (GHG) emissions. These targets were submitted to the Council on Environmental Quality (CEQ) and the Office of Management and Budget (OMB) in accordance with EO 13514 and are included in DOC's Strategic Sustainability Performance Plan (SSPP).

- *Scope 1 and 2 GHG reduction target: Reduce agency-wide Scope 1 and 2 GHG emissions by 21% in absolute terms by fiscal year (FY) 2020, relative to an FY 2008 baseline.*
- *Scope 3 GHG reduction target: Reduce agency-wide Scope 3 GHG emissions by 6% in absolute terms by FY 2020, relative to an FY 2008 baseline.*

2.1 Greenhouse Gas Basics

2.1.1 What Are GHGs?

GHGs are trace gases in the lower atmosphere that trap heat through a natural process known as the "greenhouse effect." GHGs allow sunlight to freely enter the atmosphere; however, when sunlight strikes the Earth's surface, some of this energy is radiated back toward space as infrared radiation, or heat. GHGs in the atmosphere then capture some of this radiation, warming the Earth's surface and lower atmosphere. Figure 2-1 depicts the greenhouse effect.[2] GHGs are emitted to the atmosphere through a variety of both natural and human processes. The six commonly accepted GHGs are:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulfur hexafluoride (SF_6)

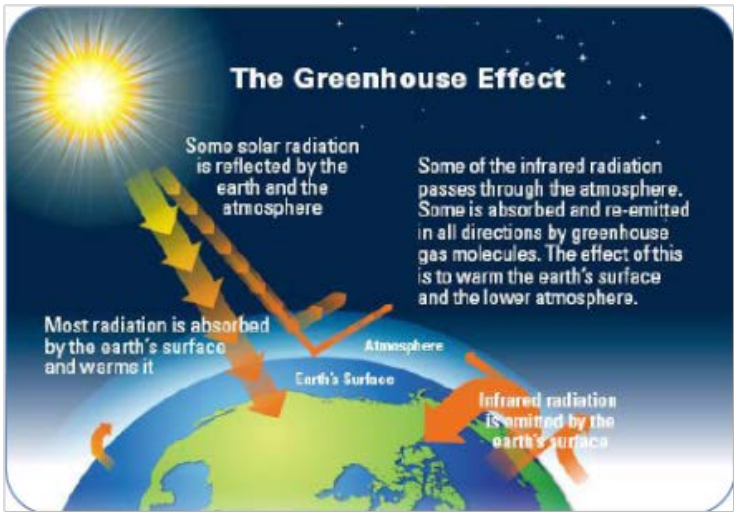

Figure 2-1. Illustration of the Greenhouse Effect

[2] "Frequently Asked Questions About Global Warming and Climate Change: Back to Basics." U.S. Environmental Protection Agency, April 2009. Accessed February 2012: http://www.epa.gov/climatechange/downloads/Climate_Basics.pdf.

Most international and national reporting programs (including federal GHG accounting under Executive Order [EO] 13514) require including these gases in GHG inventories.

Not all GHGs are created equal. Although all GHGs can trap heat in the Earth's atmosphere, different GHGs have varying heat-trapping abilities and atmospheric lifetimes. To facilitate comparison among GHGs, a global warming potential (GWP) value is assigned to each gas. GWP represents the heat-trapping impact of a GHG relative to CO_2, which has a GWP of 1.0 and functions as a warming "index." GWP is generally calculated over a certain time interval (often 100 years). For instance, N_2O has a 100-year GWP of 310, meaning that 1 ton of N_2O traps 310 times more heat than 1 ton of CO_2 over 100 years.

A single metric capable of describing all GHG emissions is metric tons of CO_2 equivalent ($MTCO_2e$). To calculate $MTCO_2e$, the mass of emissions from each GHG emitted is multiplied by the GWP for that gas. For instance, methane has a GWP of 21, meaning that 1 ton of CH_4 is 21 times more potent than 1 ton of CO_2. One ton of CH_4 emissions is therefore equal to 21 $MTCO_2e$. Table 2-1 shows the GWPs and atmospheric lifetimes of the six principal GHGs.

Table 2-1. GWPs and Atmospheric Lifetimes of the Principal GHGs

Greenhouse Gas	GWP*	Atmospheric Lifetime (years)
CO_2	1	50 to 200+
CH_4	21	12
N_2O	310	114
HFCs	140 to 11,700†	<15
PFCs	6,500 to 17,700†	50,000
SF_6	23,900	3,200

*100-year GWP. Source: U.S. Environmental Protection Agency (EPA) Mandatory Reporting of Greenhouse Gases Rule (MRR) (74 Federal Registry [FR] 56260).

†Many different individual gases constitute HFCs and PFCs, so a range of GWP values is associated with each.

2.1.2 Why Are GHGs Important?

The greenhouse effect is a natural process that keeps the planet habitable. International research, however, has linked human activities such as fossil fuel combustion, agriculture, and deforestation to a dramatic increase in the concentration of GHGs in the atmosphere since the beginning of the industrial revolution. Adding more GHGs to the atmosphere increases the amount of heat energy that the atmosphere can hold. This heat energy drives many of the natural systems on the Earth, including long-term weather patterns, or climate.

The rapid increase in atmospheric GHG concentrations is one driver of climate change, which refers to any distinct change in measures of climate (such as temperature, rainfall, snow, or wind patterns) lasting for long periods of time. According to the Intergovernmental Panel on Climate Change (IPCC),[3] climate change is likely to result in the following global trends:

[3] The IPCC is the leading international body devoted to reviewing and assessing recent peer-reviewed scientific literature relevant to the understanding of climate change. The IPCC produces authoritative reports on the current state of knowledge of climate change. The most recent assessment is the Fourth Assessment Report, "Renewable Energy Sources and Climate Change Mitigation." Intergovernmental Panel on Climate Change, 2012. Accessed February 2012: http://www.ipcc.ch/index.htm.

- Increased precipitation and flooding in storm-affected areas (e.g., the northern and eastern United States)
- Increased risk of drought in areas distant from storm tracks (e.g., the southwestern United States)
- Increased hurricane intensity
- Sea level rise caused by melting polar ice sheets
- Expanded insect ranges, leading to increased insect-borne illnesses
- Variable effects on food production, water resources, and biodiversity

One important manifestation of climate change is global warming, an increase in the average temperature of Earth's surface and atmosphere. According to the National Oceanic and Atmospheric Administration (NOAA), the rate of warming across the planet has been approximately three times greater over the past 30 years than it was over the past 100 years.

The IPCC has concluded that most of the warming seen since the 1950s can very likely be attributed to the increase in GHG emissions from human activities. If GHGs continue to be emitted at or above the current rate, the average global temperature could rise between 3° and 7°F by 2100, intensifying many of the trends just listed.

In response to the growing scientific consensus on the relationship between GHGs and climate change, international, national, regional, and local governments and institutions have increasingly created regulations to control GHG emissions. The information presented in this section relates to GHG reporting and management as it pertains specifically to the federal requirements established in EO 13514 and other federal regulations. DOC site managers should be aware, however, of any regional or state programs that might require additional reporting.[4] In particular, sites with direct emissions exceeding 25,000 $MTCO_2e$ annually could be required to report emissions through the EPA Greenhouse Gas Reporting Program (40 CFR part 98).[5]

2.1.3 What Are Scopes?

GHGs arise from a variety of sources that are directly or indirectly related to an organization's mission and operations. To describe the relationship between an organization and its emission sources, EO 13514 characterizes GHG emissions in three categories, called scopes, depending on the level of operational control an organization has over the emissions source. Figure 2-2 shows the three scopes and the emissions sources required to be included within each scope.[6]

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[4] Several states, including California, Wisconsin, and West Virginia, have started implementing either mandatory or voluntary reporting of GHG emissions from major sources. The current state policies related to GHG reporting are available online. (The organization's former name was Pew Center on Global Climate Change.) "State Legislation from Around the Country." The Center for Climate and Energy Solutions (C2ES). Accessed February 2012: http://www.pewclimate.org/what_s_being_done/in_the_states/state_legislation.cfm.

[5] 40 CFR part 98 applies to direct GHG emitters, fossil fuel suppliers, industrial gas suppliers, and facilities that inject CO_2 underground for sequestration or other reasons. For details and an applicability tool to determine whether a facility is subject to the Mandatory Reporting of Greenhouse Gases Rule (74 FR 56260), see "Greenhouse Gas Reporting Program." U.S. Environmental Protection Agency. Accessed June 5, 2012: http://www.epa.gov/climatechange/emissions/ghgrulemaking.html.

[6] The required emission sources for federal inventories reflect the requirements established in the *Federal Greenhouse Gas Accounting and Reporting Guidance*. The White House, October 6, 2010. Accessed February 2012: http://www.whitehouse.gov/sites/default/files/microsites/ceq/ghg_guidance_document_0.pdf. Annual reporting requirements may vary depending on any further guidance put forth by CEQ in the future.

Scope 1

Direct GHG emissions from sources that are owned or controlled by the federal agency.

- Stationary combustion
- Fleets, vehicles, and equipment
- Fugitive refrigerants and fluorinated-gases
- Agency-operated wastewater treatment facilities
- Agency-operated landfills
- Process emissions

Scope 2

Direct GHG emissions resulting from the generation of electricity, heat, or steam purchased by a federal agency.

- Purchased electricity
- Purchased steam and hot water
- Purchased chilled water
- Purchased steam or hot water from combined heat and power (CHP) facilities

Scope 3

GHG emissions from sources not owned or controlled by a federal agency but related to agency activities such as vendor supply chains, delivery services, and employee travel and commuting.

- Transmission and distribution losses associated with purchased electricity
- Employee business travel (air and ground)
- Employee commuter travel
- Contracted wastewater treatment
- Contracted waste disposal

Figure 2-2. Federal Definitions and Emission Sources Included in Scopes 1, 2, and 3

Using the three scopes helps to define an agency's overall carbon footprint and clarify which emissions sources the agency can directly manage or indirectly influence through policy and technology decisions. When comparing agency emissions with those of other organizations both within and outside the federal government, however, it should be understood that double counting is inherent in the use of the three scopes. For instance, Scope 2 emissions associated with an agency's purchased electricity are generated at an independent facility like a utility rather than in any plant owned or controlled by the agency. As a result, an agency's Scope 2 emissions are a utility's Scope 1 emissions.

The sources and scopes for federal GHG accounting and reporting are also displayed in Figure 2-3[9] and described further in Section 2.2 Background.

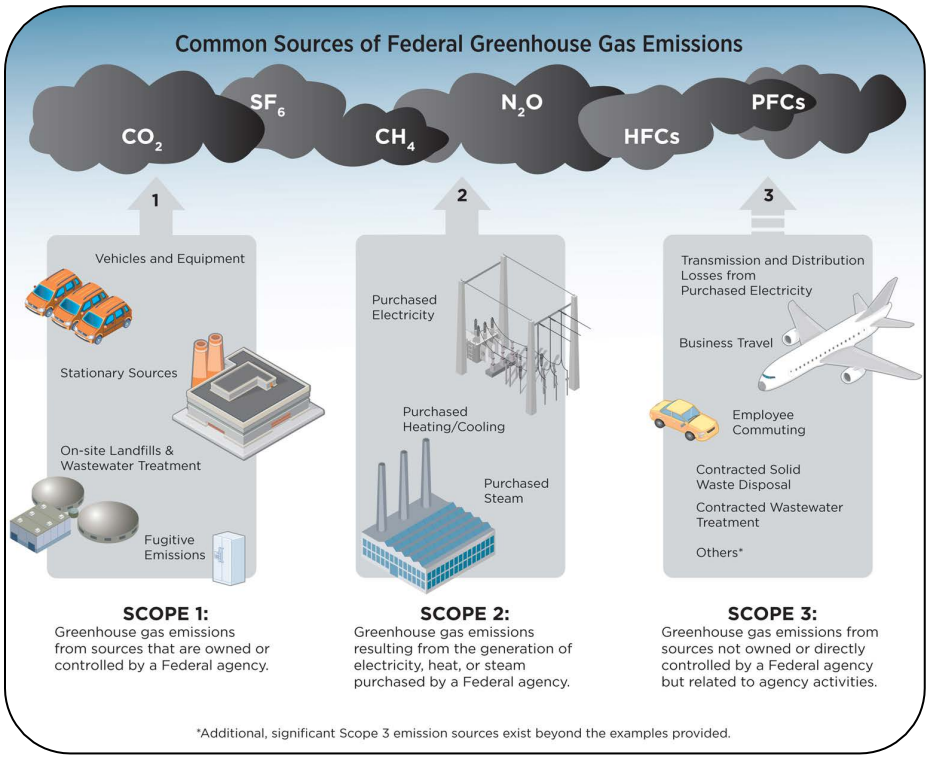

Figure 2-3. Common Sources of GHG Emissions from Federal Facilities

2.1.4 What Is a GHG Inventory?

A GHG inventory is a comprehensive and quantified accounting of an agency's GHG emissions and sources. A reliable GHG inventory embodies five core principles of GHG accounting and reporting: relevance, completeness, consistency, transparency, and accuracy.[7]

Under EO 13514, agencies must "establish and report to the CEQ Chair and OMB Director a comprehensive inventory of absolute greenhouse gas emissions, including Scope 1, Scope 2, and specified Scope 3 emissions." [8] Absolute emissions refer to "total greenhouse gas emissions without normalization for activity levels and include any allowable consideration of sequestration." Federal emissions inventories are reported annually each January for the preceding fiscal year.

The instructions for preparing federal GHG inventories are detailed in the *Federal Greenhouse Gas Accounting and Reporting Guidance* and its associated *Technical Support Document* (TSD), which are released by the White House CEQ.[9] Per EO 13514, periodic revisions to the Guidance and the TSD may be made to ensure the reporting procedures and methods are consistent with international best practices.

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[7] The GHG accounting and reporting principles were first established in the *GHG Protocol Corporate Accounting and Reporting Standard*, which was developed by the World Resources Institute and the World Business Council for Sustainable Development through the Greenhouse Gas Protocol Initiative. You can download the Corporate Standard along with a variety of other GHG protocols from "Standards." Greenhouse Gas Protocol, 2012. Accessed February 2012: http://www.ghgprotocol.org/.

[8] EO 13514, Section 2(c).

[9] *Federal Greenhouse Gas Accounting and Reporting Guidance*. The White House, October 6, 2010. Accessed February 2012: http://www.gas.gov/graphics/fas/Sec9GHG_Accounting_Reporting_Guidance.pdf. *Federal Greenhouse Gas Accounting and Reporting Guidance: Technical Support Document*. The White House, October 6, 2010. Accessed February 2012: http://www.whitehouse.gov/sites/default/files/microsites/ceq/technical_support_document_1.pdf.

2.1.5 Why Are GHG Inventories Important?

In addition to helping agencies comply with the requirements of EO 13514, a GHG inventory can serve a variety of purposes. At a macro level, a GHG inventory can reveal the magnitude of an organization's "carbon footprint," which is an indicator of the organization's overall contribution to climate change.

A comprehensive GHG inventory also serves as a valuable resource management tool. By converting seemingly disparate environmental measurements (e.g., energy consumption, waste generation, and business or commuter miles traveled by mode) into the unifying sustainability metric of $MTCO_2e$, a GHG inventory makes comparing many different impact areas possible. By looking across emissions sources and deciding which are the largest emitters, policymakers can make informed decisions about which strategies, policies, and investments best help the agency or unit meet GHG targets in a cost-effective way. Whether undertaken at the site or headquarters level, this type of portfolio management is best informed by detailed GHG inventory data. Finally, developing annual GHG inventories to track emissions over time also helps an agency identify trends and track progress toward meeting reduction targets.

2.2 Background

The FY10 greenhouse gas inventory results for DOC illustrate where the largest emissions can be found within DOC's operations. Figure 2-4 shows that the largest emissions are associated with Scope 2 activities within the Operating Units and DOC headquarters. This section describes the emissions sources within each Scope in further detail.

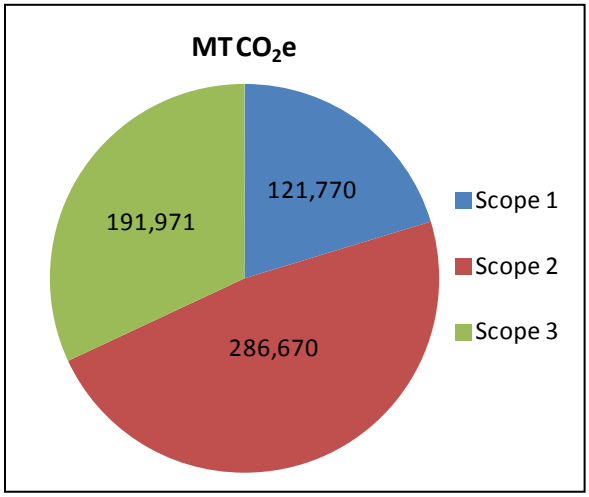

Figure 2-4. DOC's FY10 Inventory Results

2.2.1 Scope 1 Emissions Sources

Scope 1 emissions sources are direct emissions from sources owned or controlled by DOC. For the purposes of meeting Federal reporting requirements, DOC's Scope 1 emissions sources include stationary combustion, mobile combustion, fugitive refrigerants and F-gases, and wastewater treatment.[10]

[10] Fugitive landfill and process emissions are also required reporting categories under EO 13514; however, DOC does not currently produce any emissions associated with those sources.

Stationary Combustion

Federal agencies are required to report emissions that result from fuels combusted in stationary sources such as boilers, furnaces, turbines, and emergency generators. Generally, stationary combustion takes place onsite to generate electricity, heat, cooling, or steam for use at a nearby facility or campus.

> ***Stationary Combustion***
> **Common DOC Sources**
>
> - Natural gas purchased from the utility but combusted onsite
> - Diesel fuel consumed in emergency generators

Applicability to DOC operations. If DOC pays the energy bills directly (e.g., natural gas bill from the utility or direct purchase of diesel fuel or propane for use in generators) for its stationary combustion sources, it must report these emissions sources. Reporting is required for all facilities that meet this criterion, regardless of size.

For leased facilities, DOC must report GHG emissions from stationary combustion sources only if DOC pays the energy bills directly. For instance, if DOC leases a facility from the General Services Administration (GSA) and GSA pays the energy bills directly, DOC should not report its natural gas consumption in this facility as a Scope 1 emission source (in this case, the emissions would be included in GSA's Scope 1 inventory). When facility managers are able to work with their landlord to obtain energy data, however, DOC encourages voluntary reporting of emissions from fully serviced leased spaces as Scope 3.[11]

Measurement methods. Scope 1 emissions from stationary combustion are generally calculated indirectly based on the quantity and type of fuel consumed (e.g., gallons of diesel). This information is most commonly found on energy bills or fuel purchase records. Default, fuel-specific emissions factors (given in the TSD) are then applied to determine total CO_2, CH_4, and N_2O emissions.

Mobile Combustion

Mobile combustion sources include fleet vehicles, equipment, non-road vehicles, vessels, and aircraft operated by DOC.

> ***Mobile Sources***
> **Common DOC Sources**
>
> - All fleet vehicles reported in the Federal Automotive Statistical Database
> - Research aircraft
> - Maintenance equipment (e.g., lawnmowers and snow plows)

Applicability to DOC operations. DOC must report emissions associated with all mobile sources for which the agency purchases fuel. In most cases, this includes vehicles leased from GSA or a commercial entity. GSA Fleet vehicles can be tracked and reported easily through the GSA Federal Automotive Statistical Tool (FAST). FAST provides a number of reports, including inventory, cost miles driven, and fuel consumption. These reports are available throughout the year with a customer number and access code. More information is available on the FAST website.

Emissions associated with employee commuting and business travel in vehicles for which DOC does not purchase fuel are reported as Scope 3 emissions.

Measurement methods. Like stationary combustion emissions, GHG emissions resulting from mobile combustion sources are calculated based on the type and quantity of fuel consumed. The type, age, and emissions control technology of each vehicle, along with miles traveled, can also be helpful in developing an accurate GHG inventory from mobile sources; however, these data elements are not required for Federal reporting.

[11] A "fully serviced" lease refers to a lease in which the landlord, not the lessee, directly pays the utility bills.

Fugitive Emissions: Refrigerants and F-Gases[12]

As defined in the *Federal Greenhouse Gas Accounting and Reporting Guidance,* fugitive emissions "result from intentional or unintentional releases of GHGs from within the agency's organizational boundary." [13] DOC's primary sources of fugitive emissions are HFCs from refrigeration and air-conditioning equipment. Other potential sources of fugitive emissions include equipment leaks from seals, joints, and gaskets; CH_4 leaks from gas transport; SF_6 emissions from leaking electrical equipment; and CH_4 emissions from coal mines and venting.

Fugitive Refrigerants and F-Gases
Common DOC Sources

- HFC and PFCs used in refrigeration and air conditioning equipment
- Research equipment

Applicability to DOC operations. DOC reports all fugitive emissions from sources over which the agency has operational control. This includes refrigeration and research equipment owned or operated by DOC. In leased facilities, DOC need not report refrigerants used in air-conditioning equipment if the agency has no authority to enact operational policies governing the use, maintenance, or upgrade of this equipment.

Measurement methods. Fugitive emissions associated with refrigerants and F-gases are generally calculated based on a material balance method that accounts for net consumption of F-gases and any change in installed equipment charge. The minimum amount of information required to calculate these emissions is the mass of each gas purchased or issued and the quantity returned to supply each year.

Fugitive Emissions: Onsite Wastewater Treatment

Another source of Scope 1 fugitive emissions is onsite wastewater treatment, which releases CH_4 and biogenic CO_2[14]. All types of onsite wastewater treatment plants (WWTPs), including those with anaerobic digestion, those with or without nitrification/denitrification, lagoons, and septic systems, are subject to reporting.

Fugitive Emissions: Wastewater Treatment
Common DOC Sources

- Septic systems
- On-site wastewater treatment facilities

Applicability to DOC operations. DOC must report emissions associated only with onsite, agency-owned WWTPs in its Scope 1 inventory. Most sites do not own a WWTP and contract for wastewater treatment. Contracted wastewater treatment is considered a Scope 3 emissions source and is described in Section 2.2.3 Scope 3 Emissions Sources.

Measurement methods. Wastewater treatment emissions are calculated indirectly based on the total number of people each system serves. If facility-specific data (such as digester gas produced, fraction of CH4 in biogas, and BOD5 load)[15] are known, they can be incorporated into the calculation methods to obtain a more accurate result.

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[12] F-gases are fluorinated gases such as hydorfluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6). These gases have a much greater global warming potential (GWP) than carbon dioxide and are used in fire protection systems, solvents, refrigerants, high voltage switchgear, aerosols and industrial processes.

[13] *Federal Greenhouse Gas Accounting and Reporting Guidance*. The White House, October 6, 2010. Accessed February 2012: http://www.gas.gov/graphics/fas/Sec9GHG_Accounting_Reporting_Guidance.pdf; p. 11.

[14] Biogenic emissions are emissions of volatile organic compounds from vegetation and emissions of nitrogen oxides from soil. These are naturally occurring, but also occur during decomposition of waste.

[15] BOD_5 is a term for the biochemical oxygen demand of wastewater during decomposition occurring over a 5-day period. "Terms and Acronyms." U.S. Environmental Protection Agency. Accessed February 2012: http://iaspub.epa.gov/sor_internet/registry/termreg/searchandretrieve/termsandacronyms/search.do.

Other Scope 1 Emissions

Federal agencies are also required to report Scope 1 fugitive emissions associated with agency-owned and operated landfills, which produce CH_4 and biogenic CO_2. Process emissions—those that result from manufacturing or processing chemicals and materials—are also a required reporting category.

Applicability to DOC operations. DOC does not currently own or operate any landfills, nor does the agency produce any process emissions. Therefore, the agency does not report Scope 1 emissions from these two emissions sources.

DOC does, however, report its contracted solid waste disposal as a Scope 3 emissions source. Section 2.2.3 Scope 3 Emissions Sources gives more details.

2.2.2 Scope 2 Emissions Sources

Electricity, steam, hot water, or chilled water that DOC purchases (e.g., from a utility or combined heat and power [CHP] facility), but does not produce are considered Scope 2 emissions sources.

Scope 2 Emissions
Common DOC Sources

- Purchased electricity
- Purchased steam

Applicability to DOC operations. The applicability of the Scope 2 reporting requirement mirrors that of the Scope 1 stationary combustion requirement. If DOC directly pays the energy bills for the electricity, steam, and hot or cold water serving its facilities, it must report these emissions sources, regardless of facility size.

For leased facilities, DOC must report Scope 2 GHG emissions sources only if DOC pays the energy bills directly. For instance, if DOC leases a facility from GSA and GSA pays the energy bills directly, DOC should not report its electricity use in this facility as a Scope 2 emissions source (in this case, the emissions would be included in GSA's Scope 2 inventory). When facility managers are able to work with their landlord to obtain energy data, however, DOC encourages voluntary reporting of emissions from fully serviced leased spaces as Scope 3.

Measurement methods. Scope 2 emissions are calculated based on the quantity of electricity, steam, and hot or cold water purchased (e.g., kilowatt-hour [kWh] electricity or million British thermal units [MMBtu] steam purchased annually). For purchased electricity, the location of the facility must also be reported because electricity emissions are computed based on the Emissions & Generation Resource Integrated Database (eGRID) region in which the electricity is generated.[16] For purchased steam, hot water, and chilled water, if information about the generation facility is available (e.g., distribution loss factors, boiler efficiency, or coefficient of performance), these data can help develop more accurate estimates of Scope 2 emissions from these sources.

Renewable energy generation (e.g., through onsite systems) or purchase (e.g., through renewable energy certificates [RECs] or green power purchase agreements) that reduce purchased electricity should also be tracked and reported. Emissions reductions are calculated based on the quantity of energy (e.g., in MMBtu or MWh) generated or purchased annually as well as the generation technology (e.g., solar, wind, or biomass). The location of renewable electricity generating systems is key to data entry so that the emissions reductions reflect the factor for the eGRID region in which the renewable energy system is displacing conventional electricity.

[16] eGRID is an EPA database of the emissions associated with nearly all electricity generated in the United States. eGRID develops electricity-related GHG emissions factors for 26 U.S. subregions. Federal facilities are required to use eGRID subregion factors to calculate Scope 2 electricity emissions. For more information, including the current eGRID factors, see "eGRID." U.S. Environmental Protection Agency. Accessed February 2012: http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html.

2.2.3 Scope 3 Emissions Sources

Scope 3 emissions refer to indirect emissions resulting from sources not owned or controlled by a federal agency but related to agency activities. Currently, federal agencies are required to include the following Scope 3 emission sources in their inventories: transmission and distribution (T&D) losses associated with purchased electricity, federal employee business air travel, federal employee business ground travel, federal employee commuting, contracted wastewater treatment, and contracted solid waste disposal.[17] The paragraphs that follow describe each category in more detail.

Transmission and Distribution Losses

T&D losses occur as a result of inefficiencies in the systems that transport electricity from its generation to its end use. Although DOC does not have operational control of these systems, T&D losses are directly proportional to the amount of electricity consumed by the agency. Reducing DOC electricity consumption through energy efficiency and onsite renewable energy generation, then, also decrease these emissions.

Applicability to DOC operations. Scope 3 emissions associated with T&D losses must be reported for all purchased electricity that DOC reports in its Scope 2 inventory (i.e., all electricity for which DOC pays the energy bills directly). T&D losses associated with purchased steam, hot water, or chilled water are not reported in this category; these losses are automatically accounted for in the Scope 2 emission calculations from these sources.

Measurement methods. T&D loss emissions are calculated by applying a percentage loss factor to purchased electricity (federal GHG inventories apply the national average T&D loss factor for electricity, which is 6.18%), and then using appropriate eGRID factors to determine the emissions associated with this electricity loss.

Federal Employee Business Air Travel

The DOC reports Scope 3 emissions associated with agency employee business travel on aircraft owned and operated by an independent third party.

Applicability to DOC operations. DOC is required to report emissions associated with all business travel for its employees. Reporting emissions from business travel by DOC contractors or associated non-federal employees is not required.

Measurement methods. DOC's Scope 3 business air travel emissions are automatically calculated in the GSA Travel Management Information System (Travel MIS) {http://www.gsa.gov/portal/content/104348}. This system calculates air travel emissions based on the Passenger Name Record (PNR), which is the unique travel record created for each air trip. The robust emissions allocation calculations embedded in the GSA Travel MIS accounts for a variety of factors, including distance traveled, fuel burn rate, cargo and passenger allocation, and passenger load.

Federal Employee Business Ground Travel

Business ground travel emissions are also a required Scope 3 reporting category. Currently, the only required business ground travel emissions source is rental cars, although additional sources such as bus, metro, commuter rail, or personal vehicle can be voluntarily included.

Applicability to DOC operations. The same parameters noted for business air travel apply.

[17] The Guidance also allows agencies to voluntarily report additional Scope 3 categories, such as visitors to federal sites, enteric fermentation, and manure management systems. Additional Scope 3 reporting requirements (e.g., fully serviced leased assets, emissions resulting from vendor and contractor operations) could be added by CEQ in the future. This Guidance will be updated as necessary to reflect current reporting requirements.

Measurement methods. To calculate GHG emissions associated with business ground travel, the number of miles traveled using each mode (e.g., rental car, bus, or metro) is multiplied by the emissions factors for that mode. Federal GHG reporting for rental car emissions assumes an average number of miles per trip, so the only required data element is the number of agency business trips associated with a rental car. The GSA Travel MIS can track rental car reservations.

Federal Employee Commuting

Employee commuting represents the largest emissions source within DOC's baseline FY 2008 inventory across all scopes. Employee commuting emissions result from federal employees traveling to and from DOC work sites in a variety of modes, including personally operated vehicles (POVs), buses, and carpooling.

Applicability to DOC operations. DOC is required to report emissions associated with all federal employee commuting, but not commuting by DOC contractors or associated non-federal employees.

Measurement methods. Scope 3 GHG emissions associated with employee commuting are calculated based on the number of miles traveled annually by each mode (e.g., POV, carpool, bus, and bicycle). This information can be collected using human resources data on the number of employees or by surveying employees on their commuting practices.

Contracted Wastewater Treatment

Contracted wastewater treatment emissions occur at independent third-party WWTPs that collect and treat wastewater from DOC facilities.

Applicability to DOC operations. DOC must report contracted wastewater treatment emissions associated with all of its federal employees, regardless of whether they are located in a DOC-owned or -leased facility. Emissions should not, however, be reported for DOC contractors or other non-federal employees who work or visit DOC facilities.

Measurement methods. Scope 3 contracted wastewater treatment emissions are calculated based on the number of federal employees served by these systems. Emissions are calculated based on national defaults and on assumptions about system type, treatment technology, and other factors. Emissions also depend on the number of workdays federal employees are onsite. Telecommuting or alternative work schedules that reduce the wastewater load by decreasing the number of employees using onsite systems should be accounted for in emissions calculations. If DOC sites can obtain site-specific data from their wastewater treatment providers, more accurate estimates can be developed.

Contracted Solid Waste Disposal

Like contracted wastewater treatment, contracted solid waste disposal (also referred to as municipal solid waste [MSW]) produces emissions in landfills not controlled by DOC; however, DOC contributes to the waste stream that produces these emissions and therefore accounts for these emissions in its Scope 3 inventory.

Applicability to DOC operations. To encourage waste reduction wherever possible, waste emissions should be reported for all DOC facilities, regardless of whether they are owned by DOC or leased from another organization. The destination or method of disposal should also be reported, because methods such as waste to energy (WTE), composting or recycling facilities are preferable to sending waste to landfills.

Measurement methods. Biogenic CO_2 and CH_4 emissions associated with contracted solid waste disposal are calculated based on the mass of solid waste disposed. As with contracted wastewater treatment, national defaults and assumptions about landfill characteristics (e.g., landfill gas production, collection loss, and flaring) can be used to calculate emissions; however, if DOC sites can obtain site-specific data, including data on the

use of WTE facilities that capture landfill methane and use it to produce energy, more accurate estimates can be developed.

2.3 Implementation Strategies

The approach to reducing GHG emissions varies by scope. Although numerous opportunities for GHG mitigation exist, this section emphasizes the major areas of focus for DOC facilities (see Table 2-2). These approaches can help DOC sites more effectively manage and reduce GHG emissions in support of DOC emissions reduction goals.

Table 2-2. Major Areas of Implementation Focus in GHG Emissions Reduction for DOC Facilities

Category	Action
Scope 1: Fugitive Emissions	Initiate a leak detection and repair campaign.
	Establish an equipment replacement strategy.
	Create a refrigerant substitution program.
	Work with procurement staff to specify environmentally preferable equipment and refrigerants.
Scope 2: Onsite Energy Efficiency and Renewable Energy	Conduct energy audits of buildings following Energy Independence and Security Act (EISA) 2007 requirements.
	Create a database of assets to benchmark building and equipment performance.
	Monitor performance and use information to influence decisions.
	Conduct a renewable energy feasibility study.
	Determine costs and payback associated with renewable energy technologies.
	Create a strategic energy plan that includes building energy efficiency measures and renewable energy installations.
Scope 2: Green Power and Renewable Energy Certificates	Consider purchasing green power from utilities.
	Consider green pricing program options.
	Consider selling renewable energy certificates when installing onsite renewables.
Scope 3: Employee Commuting	Collect site-specific commuting data.
	Promote telework.
	Encourage alternative work schedules.
	Develop and promote resources for public transportation and carpooling.
	Raise awareness of alternative commuting options.
Scope 3: Employee Business Travel	Encourage the use of web meetings, video conferencing, and telepresence.
	Facilitate joint trips.
	Reduce ground travel impacts.

2.3.1 Scope 1 Reduction Strategies

Reduction methods for Scope 1 GHG emissions focus on direct emissions from sources owned or controlled by DOC.

Fugitive Emissions: Refrigerants and F-Gases

The following methods for reducing fugitive emissions are available to DOC site and facility managers:

- **Initiate a leak detection and repair campaign** that:
  - Monitors leaks using maintenance sheets or automated systems that track refrigerant charge.
  - Uses portable, infrared gas leak imaging cameras that show gases the eye cannot detect in laboratories and along gas lines.
  - Repairs all leaks detected and continues monitoring.
- **Establish an equipment replacement strategy** to reduce the types of equipment that use refrigerants or produce cooling. Prioritizing equipment that uses natural cooling, is energy efficient, and requires less refrigerant or alternative technologies to refrigerants would be beneficial to reducing high-GWP refrigerants.
- **Create a refrigerant substitution program** where refrigerants with available substitutes are replaced by specifying the replacements to operations and maintenance (O&M) staff and contractors. More information about refrigerant substitutes is available on the EPA's Significant New Alternatives Policy Program website (http://www.epa.gov/ozone/snap/).
- **Work with procurement staff** to specify equipment and refrigerants with a lower environmental impact. This ensures that equipment is purchased with GWP in mind. Establish guidelines for including GWP guidelines in various procurement systems and communicate those guidelines to procurement staff members. Although DOC is not required to report refrigerants in leased facilities, this may be one area where DOC can influence leases through contractual agreements.

As mentioned previously, DOC's primary sources of fugitive emissions are HFCs from refrigeration and air-conditioning equipment, typically from leaks in broken seals, joints, or gaskets. The three GHGs of note in refrigerants and electrical equipment are HFCs, PFCs, and SF_6. These gases are important to monitor because of their GWP. For example, SF_6, has 23,000 times the heat-trapping potential of CO_2.

Facilities managers are often responsible for managing fugitive emissions in a space owned or operated by DOC. In leased spaces, tenants have a limited ability to influence the use and management of refrigerants and F-gases. Fugitive emissions management can be initiated at any time in a building's life cycle, although it is more advantageous to start earlier rather than later.

To effectively manage fugitive emissions, the mass of each gas purchased or issued and the quantity returned to the supply each year are needed to determine if there are leaks in closed-loop refrigerant systems, equipment, or processes. Keeping detailed maintenance records helps track any leaks and their locations. Additionally, maintenance records help with monitoring the type of refrigerants used. This assists in GHG inventory development and can also indicate where alternatives could be employed. Improved tracking of fugitive emissions is a low-cost activity that can typically be performed in house.

Large heating, ventilation, and air conditioning (HVAC) systems typically contain atmospheric and refrigerant charge pressure monitoring, allowing facility managers to observe the rate of leakage in closed-loop refrigerant systems and to identify potential locations for repairs.

2.3.2 Scope 2 Reduction Strategies

Reduction methods for Scope 2 GHG emissions focus on indirect emissions from purchased energy sources outside DOC's operational control.

Onsite Energy Efficiency and Renewable Energy

One of the most effective ways to reduce Scope 1 and 2 emissions is to improve the energy efficiency of buildings and equipment. The amount of energy generated through onsite combustion to create electricity, heat, cooling, or steam, as well as purchased energy, can be reduced through efficiency measures. Renewable energy technologies can then be used to reduce the demand on conventional resources even further. Efficiency measures should always be employed before considering renewable energy for a site.

Energy consumption is typically monitored through onsite maintenance records and fuel consumption logs or with energy bills for purchased fuels. Consumption is generally recorded in kWh, British thermal units (Btus), or gallons of diesel fuel. The efficiency of onsite equipment can be tracked through maintenance records indicating flue gas levels and efficiency rates during regular testing.

Historically, agencies reduced emissions through energy efficiency and renewable energy techniques either due to federal requirements, such as the Energy Policy Act (EPAct) or Energy Independence and Security Act (EISA) of 2007, or due to the desire to manage resources more effectively. Energy efficiency can be categorized by low- and higher-cost options. Low-cost options should be addressed first; higher-cost options can be integrated into major renovation or new construction schedules. These options include the following:

- **Conduct energy audits of buildings.** In order to comply with the Energy Independence and Security Act (EISA) of 2007, agencies must conduct energy and water audits of 25% of covered facilities' square footage each year, so that an evaluation of each facility is completed at least once every four years. Covered facilities include those buildings that constitute at least 75% of the agency's facility energy use.
- **Monitor performance and use** of buildings and equipment by:
  - Prioritizing energy efficiency upgrades based on cost, payback, and highest energy consuming buildings and equipment
  - Tracking replacement schedules and replacing equipment with energy efficient options
  - Tracking renovation schedules and incorporating efficient designs into new construction to incorporate efficient designs (see Section 3. High-Performance Sustainable Buildings).
- **Conduct a renewable energy feasibility study** to determine where resources are good for potential siting. Useful resources for no-cost, fast feasibility studies include the following online tools:
  - Renewable Energy Resource Map[18]
  - Solar PV Calculator, PVWatts™[19]
  - Solar PV and Wind Calculator, In My Backyard (IMBY).[20]

[18] "Renewable Resources Maps & Data." National Renewable Energy Laboratory, September 29, 2010. Accessed February 2012: http://www.nrel.gov/renewable_resources/.
[19] "Renewable Resource Data Center: PVWatts." National Renewable Energy Laboratory. Accessed February 2012: http://www.nrel.gov/rredc/pvwatts/.
[20] "Electric Infrastructure Systems: In My Backyard." National Renewable Energy Laboratory. Accessed February 2012: http://www.nrel.gov/eis/imby/.

After a quick study, a consultant can determine the costs of conducting a more in-depth feasibility study.

- **Determine the costs and payback associated with renewable energy technologies** at the various sites within each Operating Unit.
- **Create a strategic energy plan** that includes building energy efficiency measures and renewable energy installations. Such a plan should be based on information obtained from energy efficiency and renewable energy monitoring and feasibility studies.

Green Power and Renewable Energy Certificates

Participating in green power purchase programs can play a significant role in meeting GHG reduction goals. Consider the various mechanisms available for DOC sites.

- **Renewable energy certificates.** These tradable commodities represent the environmental attributes associated with a unit of energy produced from renewable energy sources. RECs are generally sold separately from electricity, so consumers who buy RECs need not purchase green power directly to realize the energy or environmental benefits associated with this power. RECs can be purchased to offset Scope 2 emissions sources regardless of whether a building is owned or leased.

- **Green power markets.** These competitive electricity markets facilitate the sale of green power through multiple suppliers. Depending on the regulations that influence the local power market, sites may be able to purchase green power directly from a supplier or work with the local utility to offer green pricing programs to consumers. Purchasing green power may not be possible for leased spaces where electricity is purchased through the building owner.

- A **green pricing program.** This is a type of power market where utilities allow consumers the option to purchase electricity from renewable energy resources (usually at a premium). Green pricing may not be possible for leased spaces where electricity is purchased through the building owner.

- **Carbon offsets.** Carbon offsets are not currently allowed in federal GHG accounting to reduce Scope 1 and 3 emissions, however it is important to note what offsets are. Offsets are tradable commodities which represent a unit of emissions avoided or reduced. GHG reduction projects, such as landfill gas capture, renewable energy generation, or reforestation, generate carbon offsets. These may be considered by the government in the future.

Sites can either purchase or generate green power or RECs. Purchasing RECs may be a less expensive means for meeting energy or emissions goals than undertaking capital projects, particularly when financial or physical resources are limited. Purchasing RECs affects a site's emissions inventory or energy profile. Alternatively, sites that implement renewable energy or environmental projects could sell the environmental benefits from these projects to make the projects financially feasible.

Considerations for Renewable Energy Purchases

When examining renewable energy purchase programs to meet their goals, facility managers should consider long-term risk, product certifications, and standards.

- **Long-term risk assessment.** REC costs are unpredictable, and purchasing these commodities to meet energy and GHG goals does not necessarily offer the benefit of reduced risk associated with long-term green power purchases or onsite generation of renewable energy. Managers should seek to optimize a combination of capital projects, programs, and REC purchase options when designing a long-term energy strategy.

- **Certifications and standards.** Verifying the environmental attributes associated with RECs is critical to ensuring a transparent marketplace. When purchasing RECs, facility managers should choose products that have achieved certification. Similarly, measuring and verifying actual emissions reductions is required when the RECs associated with onsite projects are sold.

2.3.3 Scope 3 Reduction Strategies

Reduction methods for Scope 3 GHG emissions focus on indirect emissions from sources not owned or controlled by DOC but related to DOC activities.

Transmission and Distribution Losses

DOC's Scope 3 emissions from T&D losses are directly associated with the agency's electricity purchases. Consequently, actions that reduce electricity consumption from the grid also result in a corresponding decrease in emissions associated with T&D losses. Implementing the onsite energy efficiency and renewable energy measures discussed in the previous section not only decrease Scope 2 emissions but also reduce DOC's Scope 3 T&D emissions.[21]

Employee Commuting

Federal employee commuting represents DOC's largest Scope 3 emissions source, comprising two-thirds of the agency's Scope 3 inventory in 2010. Across the agency, DOC is working to reduce emissions associated with employee commuting by increasing low-cost practices such as teleworking, alternative work schedules, and carpooling programs. DOC also gives bikers and walkers access to onsite shower and locker facilities. At the site level, various strategies could help launch successful commuter programs.

- **Collect site-specific commuting data.** Site-level commuter data, a valuable initial input into the design of an effective commuter program, are most frequently collected with a commuter survey. The GSA Carbon Footprint Tool[22] hosts a commuter survey compatible with federal GHG reporting requirements. Site managers should develop additional questions that generate information on current mode and frequency of travel along with employee attitudes toward alternative commuting options. Determining, for instance, whether employees do not carpool because they lack information or awareness rather than interest can help target educational campaigns and direct investments to promoting alternatives that the site's population is likely to adopt.

- **Promote telework.** Teleworking allows eligible employees to eliminate emissions generated by commuting for the days on which they telework. Under Public Law 111-292, the Telework Enhancement Act of 2010,[23] all federal agencies are required to establish policies under which eligible employees can be authorized to telework. Telework.Gov[24] provides information, resources, and training to assist coordinators and managers in planning, deploying, publicizing, and evaluating telework programs. Additionally, DOC has designated several telework coordinators to manage telework programs and provide guidance.[25]

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[21] As of early 2012, green power and renewable energy purchases or certificates are not applied to reducing T&D losses because they do not reduce electricity purchased from the grid and transmitted directly to the site.

[22] "The Carbon Footprint Tool: Your Agency's Best Resource for GHG Reduction." GSA Carbon Footprint Tool. Accessed February 2012: https://www.carbonfootprint.gsa.gov/.

[23] "Chapter 65—Telework." One Hundred Eleventh Congress of the United States of America at the Second Session, January 5, 2010. Accessed February 2012: http://www.gpo.gov/fdsys/pkg/BILLS-111hr1722enr/pdf/BILLS-111hr1722enr.pdf.

[24] Telework.Gov. Accessed February 2012: http://www.telework.gov/Index.aspx.

[25] The points of contact for DOC's telework coordinators are listed at http://www.gsa.gov/portal/content/113697#doc (accessed June 12, 2012).

- **Encourage alternative work schedule.** Schedules that reduce employee commuting and associated emissions include compressed work weeks (i.e., working longer hours each day to shorten the work week) and flexible or staggered work hours (i.e., spreading arrival and departure times to reduce congestion and improve travel time). Site coordinators should develop policies that define employee eligibility for alternative work schedules and develop resources that raise employee and manager awareness of alternative work schedule procedures.

- **Develop and promote resources for public transportation and carpooling.** Internal ride-share websites help employees find carpools and vanpools in their areas. Consider providing transit passes for staff to encourage alternative modes of commuting. To supplement these resources, consider implementing a "guaranteed ride home" program that offers free rides home when emergencies arise for employees who ride-share or take public transportation.

- **Raise awareness of alternative commuting options.** A centralized repository, such as an intranet site, can increase accessibility of commuter information resources. These resources can include descriptions of DOC's telework program, alternative work schedule contracts and policies, links to carpooling resources, public transportation schedules, relevant training, location of onsite showers and bike racks, recognition of employees who have adopted alternatives, and information on the personal and organizational benefits of alternative commuting.

- **Encourage the use of alternative vehicles.** Dedicated parking spots for alternative fuel vehicles, such as hybrid or natural gas powered vehicles, can encourage their use.

Employee Business Travel

Emissions associated with federal employee business travel comprise 22% of DOC's Scope 3 inventory. A variety of strategies can help reduce emissions from business air and ground travel.

- **Encourage the use of web meetings, video conferencing, and telepresence.** When in-person travel is not necessary to support DOC's mission (e.g., some conferences or training sessions), encourage alternatives that facilitate virtual meetings. This could involve installing or upgrading technology and offering employee training on its use. Similarly, when hosting an event or conference, virtual participation can be offered as an option for attendees.

- **Facilitate joint trips.** As applicable, employees can plan trips that accomplish multiple objectives at once to reduce the number of business trips taken by individuals. For local business travel, colleagues can carpool or rideshare.

- **Reduce ground travel impacts.** Staff can use public transit and high fuel economy rental vehicles while on business travel to the extent practical. Sites could establish official travel policies to support this requirement.

Contracted Solid Waste Disposal

DOC can reduce Scope 3 emissions resulting from contracted solid waste disposal by minimizing the quantity of waste sent to landfills. See Section 6, Pollution Prevention and Waster Elimination, for strategies that reduce DOC's waste and the corresponding Scope 3 emissions.

2.4 Greenhouse Gas Resources

Greenhouse Gas Basics

- **eGRID**
  http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html
- **EPA Global Warming and Climate Change FAQ**
  http://www.epa.gov/climatechange/downloads/Climate_Basics.pdf
- **EPA GHG Reporting Program**
  http://www.epa.gov/climatechange/emissions/ghgrulemaking.html
- **FedCenter Federal Energy Management Program (FEMP) and CEQ Reporting Resources**
  http://www.fedcenter.gov/programs/greenhouse/inventoryreporting/fempceqresources/index.cfm
- **Federal GHG Accounting and Reporting Guidance**
  http://www.whitehouse.gov/sites/default/files/microsites/ceq/ghg_guidance_document_0.pdf
- **GHG Protocol Initiative**
  http://www.ghgprotocol.org/
- **IPCC**
  http://www.ipcc.ch/index.htm
- **Center for Climate and Energy Solutions (formerly Pew Center on Global Climate Change)**
  http://www.pewclimate.org/what_s_being_done/in_the_states/state_legislation.cfm

Reduction Methods

- **Commuter Choice Primer: An Employer's Guide to Implementing Effective Commuter Choice Programs**
  http://ntl.bts.gov/lib/jpodocs/repts_pr/13669.html
- **EPA Green Power Partnership**
  http://www.epa.gov/greenpower/index.htm
- **EPA Significant New Alternatives Policy Program**
  http://www.epa.gov/ozone/snap/
- **Green-e**
  http://www.green-e.org/
- **GSA Alternative Workplace Solutions**
  http://www.gsa.gov/portal/content/102702
- **National Renewable Energy Laboratory (NREL) report, *Using Renewable Energy Purchases to Achieve Institutional Carbon Goals: A Review of Current Practices and Considerations***
  http://apps3.eere.energy.gov/greenpower/pdfs/49938.pdf
- ***Guide to Purchasing Green Power***
  http://www.epa.gov/greenpower/documents/purchasing_guide_for_web.pdf
- **Renewable Energy Resource Map**
  http://www.nrel.gov/gis/mapsearch.html**Solar PV Calculator, PVWatts**
  http://www.nrel.gov/rredc/pvwatts/
- **Solar PV and Wind Calculator, IMBY**
  http://mercator.nrel.gov/imby/
- **Telework.gov**
  http://www.telework.gov/Index.aspx
- **U.S. Department of Energy (DOE) Green Power Network**
  http://apps3.eere.energy.gov/greenpower/about/index.shtml

3. High-Performance Sustainable Buildings

United States Department of Commerce High-Performance Sustainable Buildings Targets

- *Beginning in fiscal year (FY) 2020, all new federal buildings are designed to achieve zero net energy by FY 2030.*
- *All new construction, major renovation or repair, and alteration of federal buildings comply with the* Guiding Principles for Federal Leadership in High-Performance and Sustainable Buildings (*Guiding Principles; see footnote 25).*
- *At least 15% of the agency's existing buildings and building leases meet Guiding Principles by FY 2015 (5,000 gross square feet [GSF] threshold for existing buildings and building leases).*
- *Demonstrate annual progress toward 100% conformance with Guiding Principles for the entire building inventory.*
- *Demonstrate use of cost-effective, innovative building strategies to minimize energy, water, and materials consumption.*
- *Manage existing building systems to reduce energy, water, and materials consumption in a manner that achieves a net reduction in agency-deferred maintenance costs.*
- *Optimize performance of the agency's real property portfolio—examine opportunities to decrease environmental impact through consolidation, reuse, and disposal of existing assets before adding new assets.*
- *Ensure use of best practices and technology in rehabilitation of historical federal properties.*

3.1 High-Performance Sustainable Building Basics

3.1.1 What Are High-Performance Sustainable Buildings?

Executive Order (EO) 13423[26] and EO 13514 require agencies to ensure new construction and major renovations comply with the 2006 *Federal Leadership in High-Performance and Sustainable Buildings Memorandum of Understanding* (MOU).[27] The MOU, which was signed at the White House Summit on Federal Sustainable Buildings on January 24, 2006, establishes a set of principles for integrated design, energy performance, water conservation, indoor environmental quality, and materials. The overarching goal is to help federal agencies and organization reduce the total ownership cost of facilities; improve energy efficiency and water conservation; provide safe, healthy, and productive built environments; and promote sustainable environmental stewardship.[28]

[26] "EO13423." FedCenter.gov, Federal Facilities Environmental Stewardship & Compliance Assistance Center, January 5, 2012. Accessed February 2012: http://www.fedcenter.gov/programs/eo13423/.
[27] *Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding*. U. S. Federal Government, 2006. Accessed February 2012: http://www.epa.gov/oaintrnt/documents/sustainable_mou_508.pdf.
[28] "Whole Building Design Guide." National Institute of Building Sciences, 2012. Accessed February 2012: http://www.wbdg.org/

Agencies are making an effort to construct buildings to meet standards for high performance and sustainability, according to the Guiding Principles. Agencies are required to incorporate the five Guiding Principles into owned and leased buildings with floor area greater than 5,000 GSF. One example of a newly constructed building is at the National Renewable Energy Laboratory (NREL) campus in Golden, Colorado. NREL's Research Support Facility (RSF) was designed to achieve net-zero standards. Locally sourced or recycled materials were used to reduce construction waste, the building was constructed in a narrow fashion to maximize natural daylighting, and the campus was landscaped appropriately for the climate to reduce water consumption. Figure 3-1 shows the RSF, which was awarded a Leadership in Energy and Environmental Design (LEED) Platinum designation.

Figure 3-1. NREL's RSF is considered a High-Performance Sustainable Building (HPSB)
Photo by Dennis Schroeder, NREL/PIX 17820

HPSB mandates apply to new construction and major renovation, and improvements to water and energy consumption apply to existing buildings. See the Crosswalk of Sustainability Goals and Targets[29] to learn more about the mandates that apply to specific buildings. This section breaks down measures by leased facilities, owned facilities, and new construction or major renovation.

3.1.2 Why Are HPSBs Important?

The federal government is the largest facility owner in the United States. It owns or leases 406,000 buildings, with 3.29 billion GSF of space.[30] Over the past ten years, the federal government has spent an average of $20 billion annually on new and retrofit construction projects.[31] With a federal building stock that includes every major building type in all climatic zones, extensive industry partnerships, and world-class building systems research, the federal government is in a unique position to lead the HPSB initiative and make an impressive

[29] "Crosswalk of Sustainability Goals and Targets." U.S. Department of Energy Office of Environmental Policy and Assistance and Federal Energy Management Program, August 2010. Accessed February 2012: http://www1.eere.energy.gov/femp/pdfs/sustainabilitycrosswalk.pdf.

[30] *GSA Office of Government-Wide Policy Property Report*. Office of Management and Budget Federal Real Property Council, 2009. http://www.gsa.gov/graphics/ogp/FY2009_FRPR_Statistics.pdf

[31] "Construction Spending." U.S. Census Bureau. . Accessed February 2012: http://www.census.gov/construction/c30/fedpage.html.

impact. Overall, buildings account for nearly 40% of the nation's total energy consumption (72% of total electrical consumption) and 13% of total water consumption.[32] HPSBs target energy and water consumption and incorporate sustainability relating to materials and landscaping choices.

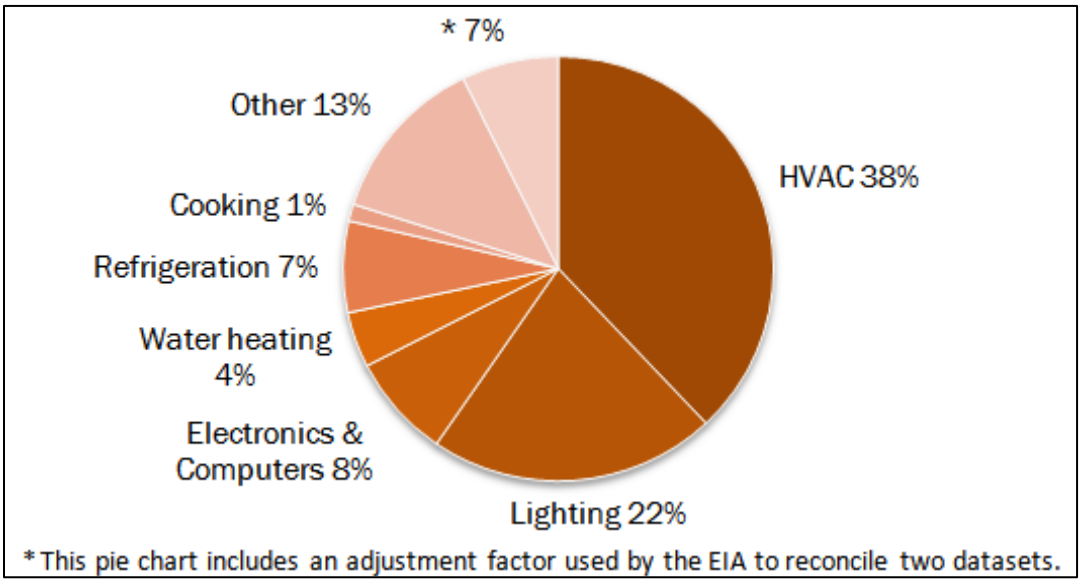

Figure 3-2. Energy End Uses in Buildings

Although the greatest opportunities for HPSBs are in new construction, existing buildings need improvement as well. To improve the performance of buildings, it is important to know how energy and water are consumed within typical buildings. The energy end uses in commercial buildings are heating, ventilation, and air conditioning (HVAC), lighting, and equipment (also referred to as plug loads), as shown in Figure 3-2.[33] Water is consumed in restrooms, kitchens, and cooling equipment, and by landscaping. Sites that focus on these areas can reduce energy and water use. Implementing conservation measures also enables compliance with federal regulations, covered further in Section 2.

3.2 Implementation Strategies

The approach to reducing energy and water consumption within buildings varies depending on the building age, construction, and location. Although numerous opportunities for improvement exist, this section emphasizes the major areas of focus for DOC facilities (see Table 3-1). These approaches can help DOC sites more effectively manage and reduce consumption in support of the agency's energy and water reduction goals. All savings associated with the following implementations methods needs to be reported to DOC in order for credit to be given to sites complying with the Guiding Principles, which in turn impacts Office of Management and Budget (OMB) Scorecard Performance for Green Buildings.

[32] *Buildings and Their Impact on the Environment: A Statistical Summary.* U.S. Environmental Protection Agency: Green Building, April 22, 2009. Accessed February 2012: http://www.epa.gov/greenbuilding/pubs/gbstats.pdf.

[33] *Buildings Energy Data Book*. U. S. Department of Energy Office of Energy Efficiency and Renewable Energy, March 2011. Accessed February 2012: http://buildingsdatabook.eren.doe.gov/docs%5CDataBooks%5C2010_BEDB.pdf.

Table 3-1. Major Areas of Implementation Focus in HPSB for DOC Facilities

Category	Action
LEASED FACILITIES[34]	Initiate a green lease program.
	Initiate a green equipment procurement program.
	Improve HVAC energy performance.
	Create an awareness campaign.
	Initiate a bulb and ballast replacement program.
	Install occupancy and daylighting sensors.
	Incorporate water-saving technologies, gray-water reuse for landscaping, stormwater runoff, and xeriscaping design where applicable into lease solicitations.
	Work with lessors to determine energy and other utility cost and consumption to inform greenhouse gas (GHG) reporting. For new or replacement leases, include regular reporting of utility consumption and cost as part of the lease contract.
OWNED FACILITIES	Initiate a retrocommissioning program.
	Initiate an energy efficient equipment replacement program.
	Make fabric improvements to the building envelope during major renovation.
	Install cool or green roofs where applicable and when cost-effective.
	Incorporate daylighting strategies.
	Incorporate water-saving technologies, gray-water reuse for landscaping, stormwater runoff, and xeriscaping design where applicable.
	Conduct a renewable energy feasibility study and research green power procurement options.
NEW CONSTRUCTION AND MAJOR RENOVATIONS	Consider certifying buildings or following the principles of third-party certification systems such as LEED, Green Globes, and Living Buildings, following the Guiding Principles.
	Maximize energy efficiency through building envelope measures.
	Implement efficient equipment.
	Use integrated design wherever feasible.
	Incorporate building-integrated technologies wherever cost-effective.

[34] The recommended actions for leased facilities should be incorporated in the requirements development for any acquisition of new or replacement leases. Where possible, these mitigation actions should be included in the solicitation. Upgrades to leases in place may be limited because of the accounting rules and lease scoring.

3.2.1 Leased Facilities

Reduction methods for energy and water within buildings focus on direct emissions from sources within leased facilities. These methods include changes to procurement requirements, efficient lighting, and green leases. Although the reduction potential is greater in DOC-owned buildings, reductions are required in new leased facilities. These methods of implementation reveal measures that are easily achievable without a lot of effort in leased facilities. (see the resources in Section 3.3 for examples and information). The requirement changes must be implemented through lease competition opportunities. It may require relocation to facilities that meet the green procurement clauses in the General Services Administration (GSA) or GSA-delegated solicitation. Using green lease clauses in competed lease actions for long-term space needs is preferred to retrofitting through post-occupancy tenant improvement investments in locations that must be recompeted within five years.

Efficient Equipment Procurement Options

Procuring more energy and water efficient equipment in leased facilities reduces the consumption associated with DOC operations in leased facilities.

- **Initiate a green procurement program.** Work with staff who request government-furnished equipment and with the GSA or real property contracting officer with procurement authority to initiate any green procurement program where preference is given to energy- and water-conserving equipment. Changes to leased premises must be made through the lease contract and the authorized contracting officer. The U.S. Environmental Protection Agency (EPA) has created guidelines and templates for educating vendors and personnel. DOC should phase out energy-intensive equipment and use Federal Acquisition Regulation (FAR) clause 52.223-15, Energy Efficiency in Energy-Consuming Products, in all applicable government contracts and solicitations. Equipment that replaces existing equipment should meet specific performance criteria, such as ENERGY STAR® or WaterWise labeling. More information is available in Section 7, Sustainable Acquisition and Section 8. Electronics Stewardship; and on the ENERGY STAR website.[35] Where strategies require investment that the lessor passes along in rent or the Operating Unit is expected to pay for up front, DOC should consider energy savings performance contracts (ESPCs) where the lessor incurs savings and DOC sees benefits from the savings.

Heating, Ventilation, Air Conditioning, and Refrigeration

Improving HVAC and refrigeration (HVACR) consumption typically produces the greatest reduction in electricity consumption in facilities, because these areas have the highest energy intensity. Although improvements might be more limited in leased facilities, especially in multitenant leases, site managers should discuss improvements that might be covered and those that might be cost-shared with their GSA or GSA-delegated contracting officer. More efficient equipment lowers energy consumption, which lowers energy bills. Where energy bills are lumped into a lease payment, DOC needs to ensure the lower energy bill costs were taken into account on the lease agreements. Methods for achieving this may include requesting that the lessor install submetering for DOC spaces and that actual energy costs are charged, as opposed to estimates.

- **Improve HVAC energy performance.** Discuss improvements to equipment that is either inefficient or older than 15 years. Measures for consideration could include replacing packaged air-conditioning units, repairing or replacing dampers and controllers, replacing window air-conditioning units with higher efficiency units, retrofitting or replacing cooling towers, installing economizers/optimizers on HVACR equipment, installing variable air volume or variable speed fans, reprogramming or installing building automation systems (BAS), installing demand control ventilation (supplying only the required fresh air to the space) and using natural ventilation with operable windows, and monitoring lessee energy consumption.

[35] "Purchasing & Procurement." U.S. Environmental Protection Agency. Accessed February 2012: http://www.energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing.

Efficient Lighting

Lighting accounts for almost 40% of electricity consumption in the United States,[36] indicating a significant opportunity for electrical savings along with reduced lighting costs. Conventional incandescent bulbs can waste about 90% of their energy through heat, which increases the cooling load requirements of buildings. New technologies are available, however. Compact fluorescent lamp (CFL) bulbs are about four times more efficient than incandescent bulbs and last significantly longer. Light-emitting diode (LED) bulbs can have better light quality, less heat, greater efficiency, and longer life than CFL bulbs, but with a higher initial cost. Major changes to lighting should be considered carefully to ensure they are taken into account in the design. Improving lighting efficiency is one way to reduce electricity consumption in leased facilities. Energy performance in existing lighting systems can be improved by replacing older inefficient bulbs, lamp types, and ballasts with more efficient versions.

- **Create an awareness campaign.** The easiest, most cost-effective approach to reduce energy consumption in lighting is creating an awareness campaign. Educating staff and encouraging them to switch lights off in unoccupied areas requires a minimal amount of resources. Depending on the success of the program, savings can range from 3% to 5%. More information is available on the U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP) website.[37]

- **Initiate a bulb and ballast replacement program.** Replacing inefficient T12 bulbs with more efficient T8 or T5 bulbs can reduce lighting loads significantly. T5 replacements often require a conversion kit to size the ballasts to the lamp. DOC could replace these bulbs when they burn out or work with the facilities managers to replace them in a phased approach. See the Lighting Replacement Guide in the Lighting Technology Overview for more information on applicable replacements based on color rendering and tasks.[38]

  Magnetic ballasts can be replaced with more efficient electronic ballasts, except where there may be technical incompatibilities (e.g., electronic ballasts should not be used near sensitive electronic equipment). Phase out any magnetic ballasts in favor of more efficient electronic counterparts with instant start ballasts. More information is available in the Federal Lighting Guide.[39]

- **Install occupancy and daylighting sensors.** Lighting control strategies reduce lighting energy use by up to 35% compared to conventional lighting systems without controls. Occupancy and daylighting sensors can be installed where the use of space and hours of operation make the space a good candidate for controls, such as foyers and meeting rooms. Sensors switch lights off or dim them when natural lighting levels are adequate or when occupants are not detected in the room. More information on controls is available in the Federal Lighting Guide (see footnote 39).

Leasing Options

A number of leasing options exist for DOC sites and can be captured in a green lease program.

- **Initiate a green lease program.** Green leasing is a required concept by which agencies specify (subject to market availability) requirements for lease solicitations based on energy performance and sustainability for facilities. GSA's green leasing policy is required where buildings must meet LEED-NC (new construction) of Silver or above and are of a specific size. GSA policies are a good resource when

[36] "Lighting in Commercial Buildings." U.S. Energy Information Administration, April 2009. Accessed February 2012: http://www.eia.gov/emeu/cbecs/cbecs2003/lighting/lighting1.html.
[37] "Creating an Energy Awareness Program." U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, July 2007. Accessed February 2012: http://www1.eere.energy.gov/femp/pdfs/yhtp_ceap_hndbk.pdf.
[38] *Lighting Technology Overview* (CTV021), The Carbon Trust, March 2007.
[39] "Federal Lighting Guide." U.S. Department of Energy, Federal Energy Management Program, June 1998. Accessed February 2012: http://www1.eere.energy.gov/femp/pdfs/fed_light_gde.pdf.

establishing an agency-wide or Operating Unit-level green leasing program.[40] Of particular interest are GSA's RSL-2010-2 Green Lease Policies and Procedures for Lease Acquisition and appendices.

During negotiations for green leasing, an agency might be able to request cost-effective improvements to operational equipment such as HVAC, lighting, chillers, and controls as well as insulation and windows. The rules of solicitation must be followed, however, so it is wise to determine the most appropriate method for this activity in accordance with the most recent rules. See Potential Cost Effective Energy Efficiency and Conservation Improvements for Leased Buildings for more information.[41]

3.2.2 Owned Facilities

Reduction methods for energy and water within buildings focus on direct emissions from sources owned or controlled by DOC (discussed in more detail in Section 2). Each DOC Operating Unit should create a database of buildings and equipment of existing property, as outlined in Section 2 to benchmark and prioritize actions. This section covers the most commonly recommended actions for owned, existing facilities that assist with reducing resource consumption and lowering utility bills. One factor to consider is that agencies are required to reduce the area of leased or owned buildings needed to support the missions by consolidation, floor plan changes, and disposal of underutilized assets. When considering lease and retrofit options, agencies should bear these considerations in mind. As such, prioritization of buildings where DOC has a long-term mission should occur. Consideration for newer buildings should also be included in this exercise to identify where to make savings or where to construct net-zero energy buildings.

Retrocommissioning and Retrofitting

A number of retrofitting options exist, including retrocommissioning.

- **Initiate a retrocommissioning program.** Retrocommissioning (retro-Cx) refers to ensuring that existing buildings and their components are operating as intended or needed. Because retro-Cx focuses on adjusting and tuning up building equipment to optimize building and equipment performance and efficiency, it affects both operations (e.g., control settings) and maintenance performance (e.g., potential identification of degrading components). Also, retro-Cx activities usually result in low- or no-cost repairs and adjustments that facilities operations staff can address and maintain.

Numerous case studies of retro-Cx activities have shown operations and maintenance (O&M)-related energy efficiency improvements of 5%–30%, covering a wide range of building uses. Further, most of these retro-Cx efforts report simple payback periods of less than two years, with many less than six months.

A retro-Cx program typically involves multiple steps: (1) conducting energy/retro-Cx audits, (2) prioritizing buildings to retro-Cx based on age and performance of equipment, (3) implementing the retro-Cx measures, and (4) monitoring energy savings related to retro-Cx measures. An example retro-Cx statement of work as part of energy audits is available on the FEMP website.[42] A case study of a retro-Cx project in a data center is also available.[43]

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[40] "Green Lease Policies and Procedures for Leave Acquisition, RSL-2007-12." U.S. General Services Administration, Public Buildings Service, December 27, 2007. Accessed February 2012: http://www.gsa.gov/portal/content/101755#grn07-12.

[41] "Green Lease Policies and Procedures." General Services Administration, December 27, 2007. Accessed February 2012: http://www.gsa.gov/portal/content/103656.

[42] "Example Retro-Commissioning Scope of Work." U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, Federal Energy Management Program, December 2003. Accessed February 2012: http://www1.eere.energy.gov/femp/pdfs/11_3_exampleretrocommissioningsow.pdf.

[43] "Retro-Commissioning Increases Data Center Efficiency at Low-Cost: Success at Savannah River Site (SRS) at Low-Cost." U.S. Department of Energy Office of Energy Efficiency and Renewable Energy FEMP, December 2010. Accessed February 2012: http://www1.eere.energy.gov/femp/pdfs/datacenter_savannah.pdf.

HVAC Systems

Because HVAC systems are typically the highest energy consumers in office buildings, significant savings could be realized in DOC facilities if energy efficiency measures are implemented.

- **Initiate an energy efficient equipment replacement program.** Benchmark equipment based on age and performance from work orders or maintenance records. Records should be analyzed to prioritize which boilers, chillers, fans, and rooftop air-conditioning units, among other pieces of equipment, should be replaced within the first year of the replacement program. Priority should be given to equipment with multiple maintenance requests or work orders over a few months to a year, or equipment nearing its warranty or expected performance lifetime. Equipment should be replaced with more efficient models. Both Section 7, Sustainable Acquisition, and Leasing Options in 3.2.1, Leased Facilities, provide more information related to replacement programs. Equipment should be replaced with more efficient models when it is broken and due for replacement or during major renovation where equipment is scheduled for replacement.

Building Envelope

Building energy consumption can be reduced through retrofits to the building's envelope in several ways.

- **Make fabric improvements.** The majority of heat in the winter and cool air in the summer is lost through a building's fabric (walls, roof, windows, and doors). Although the amount of heat or cooling lost through a building's envelope depends on the R- and U-values of the building materials and the local climate, typical percentages illustrate the proportion of loss through various building components.

  On average, a building loses 35% of conditioned air through infiltration or conduction through the walls, 25% through the roof, 10% through windows and doors, and 15% through the ground floor. The remaining losses are attributed to drafts and ventilation. Thermal images indicate areas of heat loss from buildings. Red indicates areas where heat is being lost and blue indicates colder areas. Heat is lost through the walls and windows, whereas the beams and floors have a higher R-value and lower heat loss. Improving the envelope by increasing insulation, and thus the R-value, reduces the amount of losses to the outside environment.

  As with energy efficient equipment replacement, an inventory of existing insulation on buildings should be taken through energy auditing. Low insulation levels or material R-values should be improved to recommended levels. DOE's R-value calculator can be a useful tool to determine recommended levels for the various climates where DOC buildings are located.[44]

  Similarly, improving glazing (e.g., on windows and doors) adds benefits to a building's energy performance. Cracked or broken glazing or gaps between the glass and the frame should be repaired or replaced. When replacing windows, consider buying in bulk at a higher U-value for increased savings. More information is available on the DOE website relating to the volume purchase program for high-efficiency windows.[45]

- **Install a cool or green roof.** Cool or green roofs could be an option for some DOC facilities. Cool roofs, which are constructed with light-colored roofing materials, have increased reflectance. Vegetation is grown on a "green roof," which acts as an insulation and a natural heat dissipater through evapotranspiration (i.e., when moisture evaporates from the vegetation, heat is drawn away from the

[44] "R-Value Recommendations." U.S. Department of Energy Assistant Secretary Energy Efficiency and Renewable Energy, DOE/CE-0180, January 31, 2008. Accessed February 2012: http://www.ornl.gov/sci/roofs+walls/insulation/ins_16.html.

[45] "High-Performance Window Volume Purchase." U.S. Department of Energy Office of Energy Efficiency and Renewable Energy. Accessed February 2012: http://www1.eere.energy.gov/buildings/windowsvolumepurchase/.

building through the evaporation process). Cool roofs achieve the greatest savings in hotter climates (generally climate zones 1–3)[46] where cooling loads are high, and are well suited for retrofits in buildings where roofing material is being replaced. Green roofs should be installed only on buildings where the roof structure can support the additional weight of the vegetation and growing material More information on cool roofs is available in the DOE's cool roof guide,[47] and green roof information is available on the EPA website.[48]

Lighting

In addition to the lighting retrofits mentioned in previous sections, here are some additional possibilities for improvements to lighting.

- **Incorporate daylighting.** Natural daylighting features, when incorporated with daylighting sensors, can save significant amounts of electricity. Various options are available for controlling the amount of daylight entering into a building, including high-performance glazing, skylights, tubular daylighting devices that direct daylight into the interior of a building, solar shading devices, and daylight-responsive lighting controls. In addition, interior design features such as room finishes (e.g., furniture design, space planning, and lighter wall colors) can be optimized.

  The photos in Figure 3-3 show a significant difference in directional daylighting by using controlled features. The left image shows two windows, one with a louvered window device (on the left), which directs daylight into the interior of an office building, and one without the device (on the right). The lighting on the white ceiling reflects into the center of the office to the left (where the window louver is installed), but not to the right (where the window louver is missing). This is a simple, low-cost measure that integrates daylighting design features to reduce the amount of electric lighting needed in a space. Daylighting measures can also count toward renewable energy certificates (RECs) for Energy Policy Act (EPAct) 2005 and EO 13423 requirements.

Figure 3-3. Directional Daylighting Features
Photo by Scott Huffman, NREL

[46] Climate zones can be determined by using resources available from the U.S. Department of Energy. Accessed September 2012: http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/ba_climateguide_7_1.pdf.
[47] "Guidelines for Selecting Cool Roofs." U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, Building Technologies Program, V.1.2, July 2010. Accessed February 2012: http://www1.eere.energy.gov/femp/pdfs/coolroofguide.pdf.
[48] "Green Roofs." EPA. Accessed February 2012: http://epa.gov/heatisland/mitigation/greenroofs.htm.

- **Reduce overhead lighting levels and use task lights.** Building illumination levels are often greater than necessary. Furthermore, illuminating an entire space to a level suitable for the workspace results in areas that receive more light than necessary. Reducing the amount of overhead light by removing lamps from ceiling fixtures, while providing task lights for each desk, can reduce electricity consumption by providing only the light needed when employees are at their desks. Be sure to purchase ENERGY STAR qualified task lights.

- **Improve site lighting efficiency.** Site lighting, or exterior lighting, energy consumption can be reduced significantly with some simple measures. Photosensors or timers can be added to exterior lights to ensure they only operate when there is no daylight. Exterior lights that emit no light above the horizontal or into the sky reduce light pollution and direct the light to where it is needed. The California Energy Commission provides guidance on reducing energy consumption from site lighting.[49]

Water Conservation

Several methods for reducing water consumption within owned facilities are available to DOC.

- **Incorporate water-saving technologies.** Replacing older, less efficient equipment with newer, more efficient models is a low-cost method to reduce water consumption. WaterWise labeled toilets and urinals, along with low-flow faucets, are examples of office fixtures that can be replaced to reduce water consumption. Laboratory equipment is another example where water conservation can be implemented. A replacement program that tracks the water consumption of equipment, the replacement date, and more efficient model replacements is suggested for all DOC-owned facilities.

- **Manage stormwater runoff.** At DOC sites, stormwater runoff is associated with impermeable surfaces and buildings that prevent water from soaking into the ground. Most stormwater discharges are considered point sources; operators of these sources require a National Pollutant Discharge Elimination System (NPDES) permit before discharge is allowed. Basic stormwater management prevents harmful pollutants from entering bodies of water. DOC needs to explore options based on the type of activities conducted and the permitting required. More information is available on the EPA website.[50]

- **Incorporate xeriscaping.** Industrial, landscaping, and agricultural (ILA) water reductions can be made through xeriscaping, a water conservation technique employed throughout the country. Xeriscaping is a form of landscaping that uses plants that require less water. For example, instead of planting a species of grass that requires a lot of watering, DOC sites could plant native vegetation that might need very little additional irrigation after it is established. More information is available on EPA's GreenScapes website.[51]

Renewable Energy

Specific federal mandates and legislation require renewable energy implementation. Renewable energy feasibility studies and green energy procurement options assist DOC in meeting its goals.

- **Conduct a renewable energy feasibility study.** A feasibility study determines where to install renewable energy technologies based on resource availability and space options. A study should be conducted to prioritize all DOC sites based on resources, space and financial viability.

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[49] "Reduction of Outdoor Lighting." CA.gov, The California Energy Commission, Accessed February 2012: http://www.energy.ca.gov/efficiency/lighting/outdoor_reduction.html.

[50] "National Pollutant Discharge Elimination System (NPDES)." U.S. Environmental Protection Agency. Accessed February 2012: http://cfpub.epa.gov/npdes/home.cfm?program_id=6.

[51] "Wastes – Resource Conservation – Reduce, Reuse, Recycle – GreenScapes." U.S. Environmental Protection Agency. Accessed February 2012: http://www.epa.gov/epawaste/conserve/rrr/greenscapes/lrgscl.htm.

- **Research green-power procurement**, Energy Savings Performance Contracts, Power Purchase Agreements and Utility Energy Services Contracting (UESC) options for sites where renewable energy technologies cannot be installed directly onsite, either on the property or on buildings. More information is available in Section 9.

3.2.3 New Construction and Major Renovation Strategies

Reduction methods for energy and water within buildings focus on direct emissions from sources owned or controlled by DOC. The greatest opportunity for incorporating energy- and water-saving technologies is during new construction and major renovations. Costs are typically lower when work is in progress on a building and more efficient models and approaches can be integrated into the process.

Third-Party Certification Standards

Although not a requirement, following third-party certification standards often drives more sustainable projects. Complying with the Guiding Principles is a goal for DOC and will also guide sites to be more efficient and sustainable.

- **Certify to or follow the principles of LEED, Green Globes, Guiding Principles, and Living Buildings.** Multiple third-party certification programs exist, and most of them cover the same content as the Guiding Principles. DOC site managers should become familiar with each program and their standards and decide which set of standards best aligns with the site's sustainability goals. If a DOC site is undertaking a construction or renovation project, LEED Platinum designation could be the goal for that specific project. All new construction and major renovation should, at the very least, apply the Guiding Principles during the design and construction/renovation phases.

Energy and Water Efficiency

Energy and water efficiency measures can be easily incorporated during construction and renovation.

- **Maximize energy efficiency through building envelope measures.** Insulation, high R-value building materials, high U-value windows, and other building features that reduce energy consumption should be incorporated into construction requirements during design. Energy modeling should be performed for all new construction to influence design and material decisions.

- **Implement efficient equipment.** Equipment that is energy and water efficient should be specified during the design and procurement phase.

- **Use integrated design.** Natural daylighting, rainwater harvesting, and gray-water systems are examples of integrated design features. Energy and water modeling should be used during the design phase to determine which design features are most cost-effective and result in the greatest energy and water savings for DOC sites.

Building-Integrated Technologies

Building-integrated technologies are most cost-effective when integrated into the design of a new building, but can also be incorporated during major renovation.

- **Incorporate building-integrated technologies.** Certain technologies can be directly incorporated into a building to optimize building performance, including lighting, space heating, and electricity generation. Building-integrated photovoltaics are technologies where photovoltaic (PV) panels are incorporated into roof shingles, slates, or glazing. Transpired solar collectors, with preheated ventilation systems, and solar absorption cooling technologies need to be designed specifically for a building. Newer technologies are becoming available on the market and manufacturers and developers are always looking for pilot studies in which to implement and test the technologies.

One example of such a technology is a hybrid solar water/HVAC system that allows for water heating and space conditioning with one system. Design staff should consider these technologies and incorporate them where cost-effective.

Materials

Sourcing local materials where available and using ENERGY STAR or Electronic Product Environmental Assessment Tool (EPEAT®)[52]-certified products assist with meeting DOC sustainability goals and following the Guiding Principles. Section 7, Sustainable Acquisition, gives more information.

Water Conservation

Water conservation measures are important to consider in new construction and major renovation. Section 5. Water Use Efficiency and Management, gives more information.

3.3 HPSB Resources

- **Buildings and their Impact on the Environment: A Statistical Summary**
  http://www.epa.gov/greenbuilding/pubs/gbstats.pdf
- **DOE Green Roofs**
  http://epa.gov/heatisland/mitigation/greenroofs.htm
- **DOE R-Value Recommendations**
  http://www.ornl.gov/sci/roofs+walls/insulation/ins_16.html
- **DOE High-Performance Windows Volume Purchase**
  http://www1.eere.energy.gov/buildings/windowsvolumepurchase/**EPA Stormwater Program**
  http://cfpub.epa.gov/npdes/home.cfm?program_id=6
- **EPA Large-Scale Landscapes**
  http://www.epa.gov/epawaste/conserve/rrr/greenscapes/lrgscl.htm
- **EPA Environmentally Preferable Purchasing**
  http://www.epa.gov/epp/
- **Federal Lighting Guide**
  http://www1.eere.energy.gov/femp/pdfs/fed_light_gde.pdf
- **FEMP Crosswalk of Sustainability Goals and Targets**
  http://www1.eere.energy.gov/femp/pdfs/sustainabilitycrosswalk.pdf
- **National Institute of Building Sciences, Whole Building Design Guide**
  http://www.wbdg.org/references/fhpsb_policy.php
- **Green Lease Policies and Procedures**
  http://www.gsa.gov/portal/content/103656
- **U.S. Energy Information Administration (EIA): Lighting in Commercial Buildings**
  http://www.eia.gov/emeu/cbecs/cbecs2003/lighting/lighting1.html
- **Whole Building Design Guide: Daylighting**
  http://www.wbdg.org/resources/daylighting.php

[52] "EPEAT." EPEAT, Inc. Accessed February 2012: http://www.epeat.net/.

4. Regional and Local Planning

United States Department of Commerce Planning Targets

- *Incorporate, into existing policy and guidance, consultation with local and metropolitan planning organizations about the impact or potential impact of federal actions on local transportation infrastructure and local development plans.*
- *Align agency policies to increase effectiveness of local planning efforts for transportation, energy resources, and the environment.*
- *Increase effectiveness of regional measures that enhance integrity of local ecosystems and watersheds.*
- *Update agency policy and guidance to ensure all environmental impact statements (EISs) and environmental assessments (EAs) required under the National Environmental Policy Act (NEPA) for proposed new or expanded federal facilities identify and analyze impacts associated with energy (including alternative energy sources) and climate change, as appropriate.*
- *Integrate methods and practices necessary to achieve the goals of this plan into agency master planning documents (i.e., high-performance sustainable building [HPSB] goals, pollution prevention [P2] and waste reduction goals, water use reduction goals, sustainable acquisition goals, and electronic stewardship and data center consolidation).*
- *Update agency policy and guidance to ensure coordination and (where appropriate) consultation with federal, state, tribal, and local management authorities about impacts to local ecosystems, watersheds, and environmental management associated with proposed new or expanded federal facilities.*
- *Discuss agency participation in critical local and regional efforts and initiatives (i.e., Executive Order [EO] on Chesapeake Bay Protection and Restoration, and EO on Stewardship of the Ocean, Our Coasts, and the Great Lakes).*

4.1 Regional and Local Planning Basics

4.1.1 What Is Planning and Why Is It Important?

Under EO 13514, the federal government is increasing consideration of the environmental impact of federal facilities at regional and local levels. In support of the EO, the United States Department of Commerce (DOC) has developed specific goals that help its Operating Units better incorporate environmental and community effects in their planning activities. Particular emphasis is given to transportation to and from DOC facilities, facility energy resources, ecosystems, watersheds, construction of HPSBs, and facility operations.

Focus Planning Efforts

- Transportation
- Energy
- Ecosystems and Watersheds
- High-Performance Facilities
- Facility Operations
- Climate Change

Operating Units are also asked to discuss climate change vulnerabilities in their EAs and to support environmental initiatives within their communities and regions to the extent possible. To meet these goals, it is essential to develop a vision that supports long-range growth and to consider life-cycle effects of facility operations.

Facility planning should be both internally and externally focused. Internally, planning should emphasize developing a vision and long-term goals for the campus, looking to minimize the impact of facility operations and build-out on the environment, the staff, and the community. Externally, Operating Units should consider what influence or impacts they may have on local or regional efforts, integrate physical site boundaries, connect to transportation and utility systems, protect the surrounding environment, and engage the adjacent community and government agencies. In the planning process, it may be beneficial to engage key stakeholders, seeking input from other federal agencies, state and city governments, facility occupants, community members, and technical experts. Through these elements, Operating Units can help the federal government forge stronger relationships with staff, neighbors, and key regional and local stakeholders, and help establish more sustainable facilities. During the process it's important to be aware of various requirements, such as the fact that leases comply with local zoning and building codes, NEPA needs to be referenced and is to be used to inform the local government, and also that agencies are required to notify local governments of plans to develop and close facilities. All of these factors influence the planning process.

4.2 Implementation Strategies

Facility managers influence internal and external planning efforts through their input and involvement. Although some training may be required on key issues, implementation strategies, and stakeholder engagement, the basic elements of planning described in the following sections can be readily adopted by DOC sites. When moving forward with these measures, the cost-effectiveness and the social and environmental benefits must be assessed to determine the most appropriate actions for each site to meet the EO goals.

4.2.1 Transportation

Facility managers and planners should consider both the availability and the effect of transportation options associated with their site. These options differ between existing facilities and new facilities. For existing facilities, managers should promote alternative transportation options to staff. Alternative transportation not only reduces the facility's effects on the surrounding community and environment, but also helps Operating Units meet other EO goals by achieving greenhouse gas (GHG) reductions in business travel and commuting (see Section 2. Greenhouse Gas Reduction).

Support Alternative Transportation

- Transit passes
- Carpool/vanpool programs
- Alternative work schedules
- Teleworking programs
- Bike/pedestrian amenities

As an example, facility managers should consider offering free or discounted transit passes, implementing carpool or vanpool programs with financial or preferential parking incentives, and establishing alternative work schedule or teleworking programs to reduce transportation effects.

It is important for Operating Units to inform staff about alternative transportation options by making transit schedules available, helping connect potential carpool or vanpool participants, and educating staff on available alternative work programs. Existing facilities can also create a pedestrian- and bicycle-friendly environment on campus with sidewalks, bike racks, and showering facilities, which encourage staff to explore alternative means of commuting and business travel. It may be necessary to establish or revise existing policies to support campus and community transportation goals.

In the context of campus growth or leased space selection, it is important to consider the fundamental aspects of sustainable development. Green building rating systems and sustainable community development frameworks, such as Leadership in Energy and Environmental Design (LEED) for Neighborhood Development, offer best practices for building new HPSBs that are sensitive to the surrounding environment.

To the extent possible, facility managers should encourage in-fill or site redevelopment when constructing new facilities to minimize their impact on habitat and ecosystems. Development should also consider proximity to transportation options, regional trails, and existing employment centers to reduce automobile trips for staff commuting and business travel and the required parking footprint. On campus, managers should establish a walkable environment that enables staff to access campus buildings without vehicles. Shuttling systems may be necessary for large campuses to help staff circulate within the facility and reduce reliance on personal vehicles.

Outside the DOC facility, it is important to be involved in regional transportation efforts. As an active participant in dialogues with local and metropolitan planning organizations about the impact or potential impact of federal actions on local transportation infrastructure and local development plans, Operating Units can help support more sustainable transportation options for their facilities. This interaction may help facilities advocate for new transit routes to help Operating Unit staff use alternative means of commuting. Regional transportation involvement also helps facility managers understand any community concerns about transportation to and from the site, so that they can be readily addressed.

Promote Sustainable Development

- In-fill/ redevelopment
- Proximity to transportation
- Sensitivity to habitat and ecosystems

Relevant information from these interactions should be incorporated into existing facility policy and guidance to increase the sensitivity of planning efforts to both community and regional transportation goals. Facility managers are encouraged to increase their awareness of and involvement in local and regional transportation issues through regular reviews of community and regional transportation initiative websites and participation in working groups.

4.2.2 Facility Planning and Operations

Comprehensive facility planning supports the design, construction, maintenance, and operation of HPSBs that strengthen the vitality and livability of the communities where DOC facilities are located. In this vein, it is important that facility planning documents, including campus strategic and master plans, integrate information from the surrounding community on desired land use, development, and connectivity as well as specific energy and environmental goals. These plans may be included in the Portfolio and Building Asset Plans. Facility managers should establish an open dialogue with community planners to understand the community vision and align campus initiatives to the extent possible.

Align with Community Goals

- Energy
- Environment
- Development

Campus strategic and master plans and relevant policies should also integrate methods and practices necessary to achieve all EO goals, including HPSBs, pollution prevention, waste reduction, water use reduction, sustainable acquisition, electronic stewardship, and data center consolidation (see goal-specific sections for more detail). When developing new DOC facilities, site managers should use a collaborative, integrated planning and design process throughout project planning and delivery (see Section 3. High-Performance Sustainable Buildings). The EO goals should be incorporated in the design and planned for in the life-cycle operations of a new building.

Integrating the EO goals into facility operational practices helps Operating Units enhance the sustainability of their campus operations. DOC sites should uphold community environmental and energy goals through their planning and development work. This can be achieved in the planning phases by identifying local recycling and composting facilities or orienting a new building to maximize solar exposure. Although some goals are more relevant to DOC-owned buildings, all facilities should—to the extent possible—uphold these objectives. In

leased spaces, this can be achieved by including green clauses in the lease contract; owned spaces can implement onsite renewable energy systems.

Incorporating planning goals into facility operations might require training for Operating Unit staff, particularly in real estate, environmental, and energy functional areas. Staff should also get involved in brainstorming sessions, participate in webinars, and engage key community leaders to increase their knowledge of local issues and the potential for synergy between DOC sites and the broader community.

4.2.3 Environmental Initiatives

DOC single and multi-building sites should increase the effectiveness of regional measures that enhance the integrity of local ecosystems and watersheds. This can be accomplished by participating in critical local and regional efforts and initiatives, such as efforts on Chesapeake Bay protection and restoration or on Stewardship of the Oceans, Our Coasts, and the Great Lakes. Technical experts at DOC sites can bring substantial knowledge to local and regional environmental efforts. Operating Units should track these initiatives and work internally to encourage staff participation. In this way, DOC can support the environment and the local community.

Support Environmental Goals

- Regional and Local Initiatives
- Renewable Energy
- Climate Change Assessments

Depending on site location, protecting wetlands and other sensitive habitats, maintaining wildlife corridors, and upholding water quality are important concerns. By partnering with the local community, DOC facilities can support community-wide efforts for ecosystem and watershed protection and adopt these efforts within the organization. To support this, DOC-owned sites should develop policies that promote environmental best practices in new development and ongoing operations. These practices can be adopted from local and regional planning documents.

DOC single and multi-building sites should also update agency policy and guidance to ensure all EISs and EAs required under NEPA for proposed new or expanded federal facilities identify and analyze impacts associated with energy (including alternative energy sources) and climate change. The NEPA process requires coordinating with appropriate federal, state, local, and tribal governments to ensure all environmental, historical, and cultural resource issues are resolved before any project is implemented. Within DOC, the National Oceanic and Atmospheric Administration (NOAA) has been delegated authority for NEPA and is responsible for overseeing completion of all NEPA-related requirements. DOC should also update agency policy and guidance to ensure coordination and, where appropriate, consultation with federal, state, tribal, and local management authorities about impacts to local ecosystems, watersheds, and environmental management associated with proposed new or expanded federal facilities.

All DOC sites should evaluate impacts from energy use and alternative energy when developing new projects as discussed in previous sections. When feasible, sites should use onsite renewable energy or purchase power from renewable sources to support both community and EO goals.

DOC sites should also assess climate vulnerability to understand climate change risks and adaptation options. Sites should consider possible scenarios under which climate change would pose significant operational challenges and develop strategies and measures to mitigate these risks. Climate change assessments can be costly and require technical expertise, including specific knowledge of climate modeling, downscaling, and scenario planning. Sites should engage other research laboratories, universities, climate action groups, and communities to understand their local climate change projections and develop appropriate action plans.

4.3 Planning Resources

- **Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding**
  http://www.energystar.gov/ia/business/Guiding_Principles.pdf
- **Federal High Performance and Sustainable Buildings**
  http://www.wbdg.org/references/fhpsb.php
- **ICLEI STAR Community Index**
  http://www.icleiusa.org/sustainability/star-community-index
- **Rocky Mountain Land Use Institute: Sustainable Community Development Code Framework**
  http://www.law.du.edu/index.php/rmlui/rmlui-practice/code-framework/model-code
- **U.S. Environmental Protection Agency (EPA) Tools and Resources for Sustainable Communities**
  http://www.epa.gov/smartgrowth/partnership/tools.html#codes
- **U.S. Green Building Council Leadership in Energy & Environmental Design Rating System for Neighborhood Development**
  http://www.usgbc.org/DisplayPage.aspx?CMSPageID=148
- **Using LEED as a Resource for Campus Sustainability Planning**
  http://www.usgbc.org/ShowFile.aspx?DocumentID=6145

5. Water Use Efficiency and Management

United States Department of Commerce Water Reduction Targets

- *Reduce potable water-use intensity by at least 26% by fiscal year (FY) 2020.*
- *Reduce industrial, landscaping, and agricultural water use by at least 20% by FY 2020.*
- *Identify and implement water reuse strategies.*
- *Achieve objectives established by U.S. Environmental Protection Agency (EPA) in Stormwater Guidance for Federal Facilities.*

5.1 Water Use Basics

5.1.1 What Is Water Efficiency and Management?

Water efficiency uses water-saving technologies to save water resources. Low-flow toilets and water-saving faucets are examples of technologies commonly applied to reduce water consumption. Managing water resources through techniques such as monitoring water consumption and identifying leaks to reduce wasted water often coincides with water efficiency. Using technologies and managing water consumption are important steps to increasing sustainability within an agency. Figure 5-1 depicts water end use in a typical office building. [53] Understanding where water is consumed and how it can be reduced allows facility managers to effectively manage water use.

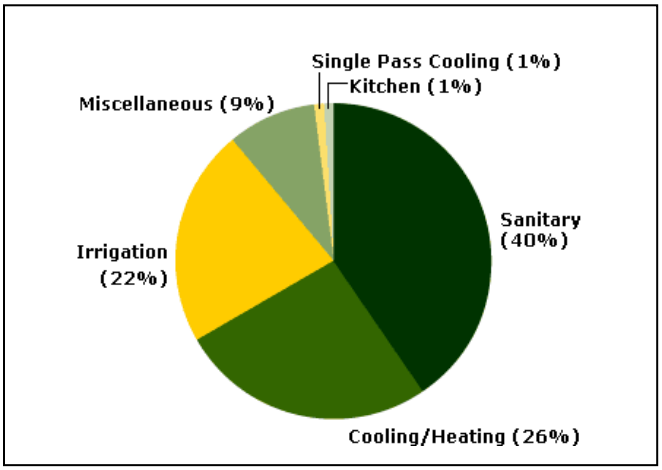

Figure 5-1. Typical Office Water Use

[53] "Laboratory Water Use vs. Office Water Use." U.S. Environmental Protection Agency, Greening EPA, August 16, 2011. Accessed February 2012: http://www.epa.gov/oaintrnt/water/lab_vs_office.htm.

5.1.2 Why Is Water Efficiency and Management Important?

With population increasing, experts estimate that at least 36 states will face water shortages by 2013.[54] federal mandates such as Executive Order (EO) 13423 are being implemented to reduce and manage water more effectively. EO 13423 requires federal agencies to implement water efficiency measures (purchase, installation, and implementation). Since 2008, agencies have been required to reduce water consumption intensity through cost-effective life-cycle measures by 16% by 2015. Without continued water use reduction, the DOC anticipates not meeting the reduction mandates established. These factors highlight that water efficiency and management is important for reducing water consumption and meeting agency and EO 13423 targets. Operating units must assess facilities and implement conservation and efficiency projects. Water treatment, pumping, and delivery also use energy. When a site uses water efficiently and manages it effectively, the resource is protected to ensure future use and the site also reduces energy consumption as a whole. Efficiency and management are describe further in Section 5.2 Background.

5.2 Background

Understanding the areas of reduction allows for targeted reduction measures. Although energy and water audits can confirm where inefficiencies are occurring, reduction measures can be applied in three basic areas—potable water, nonpotable water, and industrial, landscaping, and agricultural (ILA) applications.

Water Consumption
Major DOC Sources

- Potable Water
- Nonpotable/ILA Water

Potable water is higher quality water that can be consumed by humans. In the federal sector, approximately half of the potable water delivered is used for domestic purposes (in kitchens and bathrooms). The remaining balance is attributed to landscaping and building systems such as boilers, chillers, cooling towers, and steam systems. **Nonpotable water** is lower quality water that should not be consumed humans, but can be used in ILA applications and in building systems.

Based on data estimated by DOC, the agency reduced water consumption between 2007 and 2010. In 2007, DOC used 42 gallons per square foot (gal/ft^2); in 2010, consumption was reduced to 33.6 gal/ft^2. In 2010, the area with the greatest consumption was potable water, as summarized in Table 5-1.

Table 5-1. DOC Water Use Intensity and Cost for 2010

Water Type	Annual Consumption (Thousands of Gallons)	Annual Cost (Thousands of $)	Unit Cost ($/Thousands of Gallons)
Potable	345,286	$3,225	$9
ILA/Nonpotable Water	529	$268	$507

[54] "Water Conservation." U.S. Environmental Protection Agency, Greening EPA, August 16, 2011. Water Conservation. Accessed February 2012: http://www.epa.gov/oaintrnt/water/index.htm.

5.3 Implementation Strategies

The most common approaches to lessening water consumption reduce both potable and nonpotable water use. DOC has committed to identify and implement all applicable no-cost and low-cost water conservation measures. All measures with payback periods of less than 10 years should be implemented. DOC is undertaking energy and water audits on a four-year rotation schedule. The water audit results are used to identify facilities and processes where water conservation measures are most beneficial.

Potable water use can be reduced by implementing a leak detection program, installing low-flow fixtures, and diminishing process water consumption through efficiency and conservation. Nonpotable water use can be reduced through technologies such as soil and rain irrigation sensors, gray-water systems, and pervious pavement coupled with storage systems, and through activities such as effective management of cooling towers and wastewater treatment facilities.

The approach to reducing water depends on the types of infrastructure and the timing of retrofits and renovation projects as well as cost incentives such as rebates from utilities, Energy Savings Performance Contracts (ESPCs) and Utility Energy Services Contracting (UESC). Although numerous opportunities for mitigation exist, the following sections emphasize the major areas of focus for DOC facilities. These approaches can help DOC sites more effectively manage and reduce water and associated emissions in support of DOC reduction goals.

5.3.1 Potable Water Reduction Strategies

To reduce potable water use intensity by 26% by 2020, DOC is targeting low-cost measures that reduce water consumption with a quick payback period (less than 10 years). Reduction methods for potable water focus on equipment and facilities owned or controlled by DOC. Potable water reductions can be made by implementing metering and leak detection programs, installing low-flow fixtures, and reducing process water consumption through efficiency and conservation.

Initiate Metering and Leak Detection Programs

Following the implementation plan outlined by DOC's Energy Workgroup, DOC sites will meet water metering goals and initiate leak detection programs. Where water meters are required, advanced meters should be installed. Water utilities often offer rebates and incentives for installations as well as support in monitoring water consumption using data captured by the advanced meter. These data need to be reviewed by a dedicated staff member or team to determine where water consumption can be reduced and through which measures. A leak detection program should be initiated at all DOC sites to determine where potable water is lost through leaking pipes or connections. The basic activities within each type of program are described next.

- **Initiate a metering program.** One of the most effective ways to reduce water consumption is to more closely monitor water use. A meter installation and replacement program requires DOC to first analyze the current state of water meters at each facility. Sites need to report the type and age of each water meter as well as whether each facility is metered for water consumption. The following activities are part of initiating a metering program.

    - Collect information about which sites are currently metering water consumption at facilities and in processes, such as laboratories or manufacturing.

    - Identify UESC, bulk purchase programs, or other incentives available through water utilities where sites do not have water meters.

    - Establish a schedule for replacing or installing water meters at sites where advanced metering would be beneficial and cost-effective.

- Create a monitoring program to collect monthly water consumption data and analyze water use consumption and reduction.

- **Initiate a leak detection program.** Determining where leaks exist in water systems is essential to mitigating water consumption. A basic leak detection program includes the following.

  - Monitor leaks using maintenance sheets and water-consumption logs. Water bills should be monitored for the amount of water delivered to the site and the amount of water sent to a wastewater treatment facility.

  - Use water leak imaging cameras in laboratories and along water lines to reveal where water leaks occur.

  - Repair all leaks that are detected and continue to monitor.

- **Install water conservation technologies.** A replacement strategy could be implemented to reduce the types of equipment that use water or use equipment that uses water more efficiently. Prioritize equipment that uses less water, is energy or water efficient, and has a WaterSense® label.[55]

- **Install low-flow fixtures.** One of the most effective ways to reduce water consumption is through low-flow fixtures. For example, aerators for faucets reduce the amount of water consumed by as much as 60%, are easy to install, and are inexpensive. Standard faucets in bathrooms and kitchens within DOC facilities should be fitted with faucet aerators unless design engineers explicitly state that aerators will interfere with operations.

- **Integrate rainwater harvesting and pervious pavement.** These two integrated design approaches can be incorporated into DOC sites during new construction and major renovation.

  - Rainwater harvesting is not allowed in every part of the country, so this needs more research for specific DOC facilities. Collecting and using rainwater in gray-water systems or for irrigation reduces the amount of potable water needed for flushing wastewater systems and for landscaping.

  - Pervious pavement provides a method of stormwater runoff control and allows water to percolate into the ground without flushing pollutants into streams and rivers. When coupled with underground water storage, pervious pavement can also act as a type of rainwater harvesting system. The natural filtering process of dirt and stones is beneficial in the collection process.

5.3.2 Nonpotable Water Reduction Strategies

DOC has established a goal to reduce nonpotable water use by at least 20% by 2020. As with potable water reductions, DOC is targeting low-cost measures that reduce water consumption with a quick payback period (less than 10 years). Reduction methods for nonpotable water focus on equipment and facilities owned or controlled by DOC that are more process-oriented.

- **Conduct water audits and implement results:** Following the implementation plan outlined by DOC's Energy Workgroup, DOC sites will meet water metering goals and use the results from water audits to

[55] "WaterSense" Accessed February 2012: http://www.epa.gov/watersense/.

incorporate water-saving measures into specific sites. Results should be compiled and analyzed to determine where improvements can be made in the following areas:

- Cooling tower management
- Water efficient landscaping
- Gray-water system integration
- Onsite wastewater treatment systems
- Pervious pavement coupled with storage tanks so water can be reused
- Alternatives to water-intensive technologies and processes
- Improved boiler and steam systems
- Improvements to single-pass cooling equipment.

- **Identify and implement water reuse strategies.** During new construction and major renovation, DOC should incorporate process systems, water recycling, rainwater harvesting, gray water, and pervious pavement wherever cost-effective and applicable.

- **Implement water recycling and gray-water systems.** Recycling water from laboratory processes or from sources that do not contain contaminants (such as wastewater or toxins) can be an effective way to reduce potable water consumption. DOC sites that are designing and building new facilities or doing a major renovation should incorporate these water-saving systems during the design phase.

- **Manage stormwater appropriately.** Rainwater harvesting, vegetated roofing, pervious pavement, and underground storage for water runoff are measures that fall within stormwater management. Each site needs to be evaluated during major renovation and new construction to incorporate these systems where possible. Rainwater and underground storage water can be used in gray-water systems or for irrigation.

5.4 Water Resources

Water Basics

- **EPA Wastes – Resource Conservation – Reduce, Reuse, Recycle - GreenScapes**
  http://www.epa.gov/epawaste/conserve/rrr/greenscapes/lrgscl.htm
- **EPA Water Conservation**
  http://water.epa.gov/polwaste/nps/chap3.cfm
- **Pervious Pavement Information**
  http://www.perviouspavement.org/

6. Pollution Prevention and Waste Elimination

United States Department of Commerce Pollution Prevention and Waste Elimination Targets

- *Increase source reduction of pollutants and waste.*
- *Divert at least 50% of nonhazardous solid waste by fiscal year (FY) 2015, excluding construction and demolition (C&D) debris.*
- *Divert at least 50% of C&D materials and debris by FY 2015.*
- *Reduce printing paper use.*
- *Increase use of uncoated paper that contains at least 30% postconsumer fiber.*
- *Reduce and minimize the acquisition, use, and disposal of hazardous chemicals and materials.*
- *Increase diversion of compostable and organic materials from the waste stream.*
- *Implement integrated pest management and landscape management practices to reduce and eliminate the use of toxic and hazardous chemicals and materials; increase agency use of acceptable alternative chemicals and processes.*
- *Decrease agency use of chemicals to assist each Operating Unit in achieving FY 2020 greenhouse gas (GHG) reduction targets. Report in accordance with sections 301–313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 (42 U.S.C. § 11001 et seq.).*

6.1 Pollution Prevention Basics

6.1.1 What Is Pollution Prevention?

As defined by EPA, pollution prevention (P2) refers to any efforts that reduce or eliminate waste at the source by modifying production processes, promoting the use of nontoxic or less-toxic substances, implementing conservation techniques, and reusing materials rather than sending them into the waste stream. P2 mitigates negative impacts on the community and environment by reducing the generation, consumption, and disposal of materials. Waste and pollution generated by regular site operations as well as construction activities are addressed under P2 goals.

The United States Department of Commerce (DOC) P2 policies can be found in the *Energy and Environmental Management Manual*, which integrates all relevant federal mandates. P2 goals are managed department-wide through DOC's Environmental Management System (EMS); however, each Operating Unit is responsible for executing the P2 goals.

6.1.2 Why Is P2 Important?

Historically, the Pollution Prevention Act required all federal facilities to deploy pollution prevention as the first choice in environmental management. Executive Order (EO) 13423 added to this regulation, calling for all federal agencies to maintain cost-effective waste prevention and recycling programs. Under this EO, facilities are also required to reduce their acquisition, use, and disposal of toxic materials and chemicals. EO 13514 further defined P2 to focus on diverting waste, reducing hazardous materials, and establishing low-impact pest

management and landscaping practices. Although the nature of site operations differs for each DOC facility, each site can make significant contributions to improve their local environments by implementing appropriate P2 strategies.

6.1.3 What Are the Key Pollution Sources at DOC Facilities?

When defining the scope of P2 activities, all inputs and outputs to a facility should be considered. Inputs include all materials required to continually support the site as well as materials needed for temporary activities such as construction. Outputs are associated with the consumption of these materials, which includes packaging as well as emissions to air, water, or land. Within each facility's operational boundaries, efficient operational practices should be adopted to minimize the need for input materials and waste or pollution generated. Reducing material use at the source also reduces waste and pollution generated.

Figure 6-1. Flow of materials and waste before, during and after product use

DOC operations generate waste through the consumption of office materials and chemicals as part of day-to-day operations. Office waste includes paper, office supplies, food, electronics, and associated packaging. Maintaining DOC-owned office environments requires chemicals for cleaning, pest control, landscaping, and general maintenance activities. These chemicals create packaging waste and their use also has the potential to emit pollutants to the environment. Research activities demand the use of ongoing consumables, such as pipettes or wipes as well as chemicals, which introduce pollution sources to the environment. In DOC-owned facilities, waste is also generated through construction activities, including remodeling, demolition, and new construction.

6.2 Implementation Strategies

When operating with P2 in mind, site managers should look for opportunities to reduce material demands and waste through purchasing, operational practices, recycling or composting programs, and waste diversion from construction activities. Financial and environmental tradeoffs can be associated with using environmentally sensitive materials. Although they may be more costly to purchase, the added environmental or health and safety benefits can outweigh the financial burden. When purchasing materials, site managers should always consider whether more environmentally sensitive alternatives exist and if the cost justifies the added benefits, including EO goals. Grant and funding opportunities may be available to help establish new waste reduction programs (refer to the U.S. Environmental Protection Agency [EPA] P2 website for more information).[56]

How to Establish P2 at Your Facility

- Sustainable purchasing
- Operational practices
- Waste diversion

[56] "Pollution Prevention (P2)." U.S. Environmental Protection Agency. Accessed February 2012: http://www.epa.gov/p2/.

6.2.1 Purchasing

When acquiring materials, environmental impacts can be reduced by purchasing products that:

- Are reusable
- Are made of environmentally preferable materials
- Contain high recycled content
- Have recyclable/compostable packaging
- Are manufactured locally
- Are environmentally sensitive.

These efforts reduce upstream impacts associated with the manufacture of products as well as the downstream impacts from their use and disposal. By selecting office products such as paper with a high recycled content, sites can reduce their environmental burdens and uphold EO goals. Section 7, Sustainable Acquisition, gives more detail on sustainable purchasing and source reduction.

6.2.2 Operational Practices

By minimizing, repurposing, and reusing materials, sites can become more efficient in their operational practices and greatly reduce their environmental impacts. These operational practices can be established through policies, programs, education, and outreach that define and create an understanding of P2 objectives.

For example, sites should reduce the use of toxic chemicals and use low-emissions materials for all building modifications, maintenance, and cleaning. To support these objectives, green cleaning policies and low-emissions material specifications should be developed so that all products purchased for site operations, including composite wood products, adhesives, sealants, interior paints and finishes, solvents, carpet systems, janitorial supplies, and furnishings, pose minimal impacts to the work environment. Further information on low-emissions and nontoxic products can be found in the *Guiding Principles for High Performance Sustainable Buildings* and the Leadership in Energy and Environmental Design (LEED) for Existing Buildings rating system. Site managers should use these reference documents to establish their own policies and standards for reducing hazardous chemicals.

Chemicals are also required for research and ongoing site maintenance such as pest management and landscaping maintenance. Site managers should evaluate existing practices to identify all chemicals and materials used, then participate in working groups that are investigating chemical alternatives for toxic and high global warming potential (GWP) chemicals such as sulfur hexafluoride (SF_6). Less hazardous alternatives should be considered along with the possibility of eliminating chemical use. Sitewide policies should also be developed for DOC-owned facilities that require environmentally sensitive procedures for maintenance activities using the Guiding Principles and LEED.

Sites should also adopt operational practices that promote efficiency as required under the Administrative Cost Saving program. For example, creating standard printer settings that duplex can drastically reduce paper consumption. Also, by establishing waste minimization policies and educating staff on the importance of reusing, recycling, and repurposing materials before disposal, sites can dramatically reduce waste generation. Developing programs that allow staff to share used office supplies can save money by giving products a second life.

6.2.3 Recycling and Composting

Implementing awareness and education campaigns about P2 and waste elimination can be an effective way to reduce waste and promote resource efficiency. Campaigns should include education and outreach for staff on the importance of environmentally sensitive purchasing, materials reuse, and appropriate disposal methods. Operating Unit P2 goals should be clearly communicated to staff along with resources to help support these objectives, including sustainable purchasing guides, policies, signage, and facilities such as designated areas for recycling and composting.

Although practical for all facilities, establishing recycling and composting programs is most easily implemented in DOC-owned buildings. Doing so in leased spaces requires the participation of building managers and cleaning crews as well as other building tenants. To establish a program, site managers should first investigate local haulers of recycling and compost. Many communities have established recycling programs that pick up recyclables along with landfill waste. In these areas, it is important to clearly identify which materials can be recycled and whether recyclables need to be separated into multiple streams so that staff disposes of materials appropriately.

Composting haulers may need to be contracted separately because this service is not typically available in most communities. Composting in cafeterias is possible through agreements with food service providers. It is important to know what is accepted by which hauling company so that staff can be educated on proper disposal methods. When initiating a recycling or composting program, starting with a pilot area (e.g., one building) on campus will help facility managers understand what signage, training, and collection facilities are needed before rolling out the program to the entire Operating Unit. It is also important to understand local codes and where challenges need to be overcome.

6.2.4 Construction

All sites undergoing remodeling or new construction can significantly reduce environmental impacts through product selection, planning, and design. The LEED New Construction rating system includes credits to encourage reuse, repurposing, and compact development that minimizes impacts to the surrounding community and environment. When feasible for projects, sites should ensure these LEED principles are incorporated into the site planning and design documents. During construction, sites should require that contractors perform activities within specified boundaries to minimize impacts on the surrounding area. To the extent possible, all construction waste should be recycled or reused so that it is diverted from a landfill. Contract specifications should require that contractors track the quantity of waste diverted from a landfill for reporting purposes.

6.2.5 Measurement

Each Operating Unit is responsible for tracking the tons of contracted and onsite solid waste disposed of each fiscal year for GHG reporting. Sites should also track the quantity recycled, composted, and reused as metrics for their progress in waste elimination. Additional tools are available on the National Pollution Prevention Roundtable site to help with this effort.[57]

6.3 Pollution Prevention Resources

- **EPA Pollution Prevention (P2) Program**
  http://www.epa.gov/p2/
- **Federal Guiding Principles for High Performance Sustainable Buildings**
  http://www.wbdg.org/references/fhpsb.php
- **National Pollution Prevention Roundtable, P2 Tools**
  http://www.p2.org/category/general-resources/p2-data-calculators/
- **U.S. Green Building Council LEED Rating System for Existing Buildings**
  http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221
- **U.S. Green Building Council LEED Rating System for New Construction and Major Renovations**
  http://www.usgbc.org/DisplayPage.aspx?CMSPageID=220

[57] "P2 Measurement Tools." National Pollution Prevention Roundtable, November 1, 2011. Accessed February 2012: http://www.p2.org/category/general-resources/p2-data-calculators/.

7. Sustainable Acquisition

United States Department of Commerce Sustainable Acquisition Targets

- *Ensure that 95% of new contract actions—including task and delivery orders under new contracts and existing contracts—require the supply or use of products and services that are energy efficient (ENERGY STAR or Federal Energy Management Program [FEMP]-designed), water efficient, biobased, environmentally preferable (excluding Electronic Product Environmental Assessment Tool [EPEAT]-registered products), non-ozone depleting, contain recycled content, or nontoxic or less toxic alternatives.*
- *Update agency affirmative procurement plans (green purchasing plans and environmentally preferable purchasing plans), policies, and programs to ensure all federally mandated designated products and services are included in all relevant acquisitions.*

7.1 Sustainable Acquisition Basics

7.1.1 What Is Sustainable Acquisition?

Sustainable acquisition refers to procuring products and services that meet United States Department of Commerce (DOC) acquisition requirements while reducing environmental and human health impacts associated with the product's or service's production, use, and disposal. As described in EO 13514, sustainable acquisition encompasses procuring products and services that fall within six general categories:

- Energy efficient
- Water efficient
- Biobased
- Environmentally preferable
- Recycled content
- Non-ozone-depleting.

7.1.2 Why Is Sustainable Acquisition Important?

Procuring products and services is crucial to DOC's day-to-day activities. Due to energy, water, and material inputs and outputs associated with the production, use, and disposal of products, acquisition represents a key target area for improving DOC's sustainability performance. Sustainable acquisition is required under Executive Order (EO) 13514 and other federal mandates and regulations, including the Resource Conservation and Recovery Act; the Farm Security and Rural investment Act of 2002; the Food, Conservation, and Energy Act of 2008; the Clean Air Act; EISA 2007; EPAct 2005; EO 13423; and Federal Acquisition Regulation (FAR).

Sustainable acquisition conserves resources and lowers costs. For instance, energy and water efficient products have a lower life-cycle cost than conventional products, meaning that the energy and water savings associated with operating these products over their lifetimes are equal to or greater than any additional capital costs relative to conventional products. By facilitating lower consumption of resources, procuring these products also helps DOC meet its energy and water intensity goals and resulting greenhouse gas (GHG)

emissions reduction targets. Reduced consumption of fossil fuels also contributes to heightened energy security and independence by lowering reliance on foreign energy resources.

Furthermore, through its purchasing policies, DOC can help the federal government play a leadership role in positively influencing the broader consumer society. As the single largest buyer of energy- and water-consuming products in the world, the federal government can affect global markets by setting standards for its acquisition practices and increasing demand for products that reduce environmental impacts. Increased demand and production for these products improves availability and lowers the price for all consumers.[58] Promoting increased sales and broader use of sustainable products and services also creates and expands green markets and jobs, helping DOC realize its mission of encouraging economic growth and sustainable development.

7.2 Background

7.2.1 Types of Acquisition

DOC's acquisition policy is codified in the Commerce Acquisition Manual's Green Procurement Program (CAM parts 1323.70 and 1313.301) and Procurement Memorandum 2011-04. These policies meet or exceed federal goals for acquiring sustainable products and services, including energy and water efficient products, biobased products, recycled content products, environmentally preferable products/services, and non-ozone-depleting substances. Most of these products are associated with labeling or other types of designation programs that differentiate these from conventional products.

Energy Efficient Products

Federal mandates, including Energy Independence and Security Act (EISA) 2007, EPAct 2005, EOs 13221 and 13423, and FAR, require federal agencies to purchase energy efficient products. In the federal context, energy efficient products are those that are ENERGY STAR-qualified or that meet FEMP-designated efficiency requirements. Additionally, FEMP establishes mandatory standby power consumption thresholds for energy-consuming products purchased by federal agencies. Other nongovernmental programs (such as EPEAT®) that focus specifically on reducing energy consumption of electronics are described in Section 8. Electronics Stewardship.

Applicability to DOC procurement procedures. In accordance with EPAct 2005, the requirement to purchase ENERGY STAR-qualified and FEMP-designated products applies to products and equipment purchased through any agency procurement action, including (1) direct purchases from federal supply agencies and commercial sources; (2) indirect purchases through acquisitions carried out under construction, renovation, and service contracts; and (3) individual purchases using government credit cards.

Federal requirements for energy efficient products apply only to the product categories covered by ENERGY STAR or FEMP, which are detailed in Table 7-1 and on FEMP's website.[59] Energy-consuming devices that do not fall into a covered product category are not required to meet these mandates. Additionally, EPAct 2005 and FAR allow the following exceptions that must be provided by the head of an agency in writing: "An agency is not required to procure an ENERGY STAR or FEMP-designated product if the head of the agency determines in writing that: a) No ENERGY STAR or FEMP-designated product is reasonably available that meets the functional requirements of the agency; or b) No ENERGY STAR or FEMP-designated product is cost-effective over the life of the product taking energy savings into account."

[58] "Energy-Efficient Product Procurement." U.S. Department of Energy, Federal Energy Management Program, October 3, 2011. Accessed February 2012: http://www1.eere.energy.gov/femp/technologies/procuring_eeproducts.html.
[59] "Covered Product Categories." U.S. Department of Energy, Federal Energy Management Program. Accessed February 2012: http://www1.eere.energy.gov/femp/technologies/eep_purchasingspecs.html.

ENERGY STAR®

The U.S. Department of Energy (DOE) and U.S. Environmental Protection Agency (EPA) joint ENERGY STAR program is a voluntary labeling program focusing on the consumer market. Products that have earned the ENERGY STAR label offer significant energy savings over conventional products in their class while maintaining performance and exhibiting favorable life-cycle costs. ENERGY STAR awards its label to building products (including envelope and roofing), commercial appliances, commercial food service equipment, computers and electronics, heating and cooling, lighting, and plumbing products along with a variety of residential products. In addition to office products, ENERGY STAR specifications may be applicable to DOC break rooms, shower facilities, and housing.

FEMP Designation

Unlike ENERGY STAR, FEMP does not label or designate specific products. Instead, as authorized by Congress, FEMP establishes minimum energy efficiency levels within certain product categories (see Table).[60] Products that meet FEMP-designated requirements achieve efficiency levels within the top 25% of their product class. Like ENERGY STAR products, products that meet FEMP's designated efficiency levels also have lower life-cycle costs than base models, offering significant energy savings across the federal government. federal agencies are required to purchase only those products that meet these designated efficiency levels. FEMP's energy efficiency requirements cover products not necessarily included in the ENERGY STAR program, such as commercial boilers and luminaires.

Low Standby Power

As defined by FEMP, standby power is consumed when electronics and appliances such as computers, printers, and televisions are operating in their lowest power-consuming mode. This level of consumption typically occurs when a device is switched off or when it is not performing its primary purpose, and accounts for 5%–10% of residential energy use. In commercial applications (or federal facilities) the consumption could be significantly higher. Federal mandates, including EISA 2007 and EO 13221, require federal agencies to procure products that operate at a maximum standby power level of 1–2 watts or less, depending on the device.[61] Federal purchases must meet standby power requirements in addition to other efficiency requirements—ENERGY STAR or FEMP designation.

Fleet Vehicles

EO 13423 requires that federal agencies with 20 or more vehicles decrease annual petroleum consumption by two percent per year through fiscal year (FY) 2015 compared to an FY 2005 baseline. Federal agencies must also increase annual alternative fuel use by 10 percent each year compared to the previous year (starting at the FY 2005 baseline). Managing fleet vehicles and setting guidelines for the procurement of new vehicles offers an opportunity to reduce greenhouse gas emissions, fuel costs, and national dependence on foreign petroleum. Methods to reduce fuel consumption and costs include setting efficiency guidelines for new vehicles, ensuring that the smallest vehicle suitable for the task is deployed, purchasing alternative fuel vehicles, and improving maintenance practices. "Getting Started: A Guide to Creating a Compliance Strategy"[62] contains a guide to complying with federal mandates and reducing fuel use.

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[60] For more information on FEMP's criteria and procedures for designating products, see "Product Designation Process." U.S. Department of Energy, Federal Energy Management Program. Accessed February 2012: http://www1.eere.energy.gov/femp/technologies/eep_fempdesignatedproducts.html.

[61] For a list of products and their required standby power levels, see "Federal Energy Efficiency Acquisition Guidance and Requirements for Low Standby Power Products." U.S. Department of Energy, Federal Energy Management Program, December 2011. Accessed February 2012: http://www1.eere.energy.gov/femp/technologies/buying_low_standby.html.

[62] For details on a strategy to reduce fleet vehicle emissions, see "Getting Started: A Guide to Creating a Compliance Strategy." U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, (n.d.). Accessed April 2012: http://www1.eere.energy.gov/femp/pdfs/fedfleet_getting_started.pdf.

Table 7-1. Covered Product Categories for Federal Energy Efficiency Procurement Requirements

Covered Product Category	Commercial Products	Residential Products
Space Heating and Cooling	▪ Boilers ▪ Central air conditioners ▪ Chillers (air- and water-cooled electric) ▪ Heat pumps (air- and ground-source)	▪ Room air conditioners ▪ Central air ▪ Boilers ▪ Fans (ceiling, ventilating) ▪ Gas furnaces ▪ Air-source heat pumps
Water Heaters	▪ Commercial gas	▪ Electric resistance storage ▪ Heat pump ▪ Residential gas (condensing, storage, whole-home tankless) ▪ Solar
Building Envelope	▪ Cool roofing products	▪ Windows, doors, and skylights
Food Service Equipment and Appliances	▪ Dishwashers ▪ Fryers ▪ Griddles ▪ Hot food holding cabinets ▪ Ice machines (air- and water-cooled) ▪ Ovens ▪ Refrigerators and freezers ▪ Steam cookers ▪ Pre-rinse spray valves	▪ Dishwashers ▪ Refrigerators ▪ Freezers
Lighting	▪ Fluorescent ballasts ▪ Light-emitting diode (LED) lighting ▪ Light bulbs (compact fluorescent lamps [CFLs], LED) ▪ Luminaires (fluorescent, downlight, industrial high bay)	▪ Light fixtures ▪ Decorative light strings
Office Equipment and Electronics	▪ Computers ▪ Displays and computer monitors ▪ Enterprise servers ▪ Imaging equipment (copiers, digital duplicators, fax machines, mailing machines, multifunction devices, printers, scanners) ▪ Televisions	▪ Audio/video ▪ Battery chargers ▪ Cordless phones ▪ Set-top and cable boxes
Appliances and Other	▪ Clothes washers ▪ Vending machines ▪ Water coolers	▪ Clothes washers ▪ Room dehumidifiers ▪ Room air cleaners and purifiers
WaterSense Plumbing		▪ Faucets, showerheads, toilets, and urinals

Water Efficient Products

Water efficient products reduce water consumption, resulting in a corresponding decrease in water bills as well as energy bills, because energy is needed to treat, transport, and heat or cool water. The EPA sponsors the WaterSense program, which labels products and programs that meet EPA water efficiency criteria for each product category (faucets, showerheads, toilets, urinals, and weather-based irrigation controllers). WaterSense products are 20% more efficient than average products in these categories.

Biobased Products

Under Section 9002 of the Farm Security and Rural Investment Act of 2002, 7 U.S.C. 8102, federal agencies are required to purchase biobased products within designated categories, unless the biobased products are not reasonably available, available only at an unreasonable price, or fail to meet applicable performance standards.[63] As defined by the Farm Bill, a biobased product is a "commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials";[64] or an intermediate ingredient or feedstock. In general, biobased products replace petroleum-based products.

BioPreferred® Program Designated Product Categories

- Construction
- Food service
- Groundskeeping
- Industrial lubricants and fluids
- Janitorial
- Personal care
- Miscellaneous

The U.S. Department of Agriculture (USDA) manages the BioPreferred program, which designates categories of biobased products as well as the minimum biobased content (at least 25%) within the category. The BioPreferred program is a market-wide voluntary labeling program that also includes a federal procurement preference program.[65] Federal agencies are required to give preferential consideration to USDA-designated product categories when making acquisitions.

Using products that contain wood harvested via sustainable forestry practices also supports sustainable acquisition. Multiple nongovernmental programs certify forestry products made from wood materials that have been harvested using certain environmentally friendly practices. For instance, the Forest Stewardship Council® certifies forest products that meet certain social, economic, and ecological criteria throughout the product production chain.[66]

[63] "Guidelines for Designating Biobased Products for Federal Procurement." Federal Register, Vol. 70, No. 7, January 11, 2005. Accessed February 2012: http://www.biopreferred.gov/files/03-31347.pdf.
[64] See footnote 56.
[65] The BioPreferred Program designates 64 product categories required for preferred federal purchasing. For category details, see "Product Categories." U.S. Department of Agriculture, BioPreferred Program. Accessed February 2012: http://www.biopreferred.gov/ProductCategories.aspx.
[66] Forest Stewardship Council International Center. Accessed February 2012: http://www.fsc.org/107.html.

Recycled Content Products

Products that contain recycled content are manufactured with materials that are recovered or diverted from solid waste streams. Using these products helps lower the energy and water requirements associated with extracting and manufacturing similar products from virgin materials. Additionally, products made from recovered materials protect natural resources and habitats by reducing the extraction (e.g., drilling, mining, and logging) of virgin materials.

EPA's Comprehensive Procurement Guideline Categories

- Construction products
- Landscaping products
- Nonpaper office products
- Paper and paper products
- Park and recreation products
- Transportation products
- Vehicular products
- Miscellaneous products

Under Section 6002 of the Resource Conservation and Recovery Act, federal agencies are required to purchase products that contain a minimum level of recycled content, as designated by EPA. This requirement applies only to those products on which DOC and its contractors spends more than $10,000 annually. Through its Comprehensive Procurement Guideline (CPG), EPA designates products within eight categories that can be made with recovered materials and recommends practices for buying these products.[67] Within these categories, federal agencies are required to purchase products that contain the highest level of recoverable material practicable, as long as these products meet performance requirements and are available at a reasonable cost.

Environmentally Preferable Products and Services

EO 13423 defines "environmentally preferable" as "products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose." In addition to the other products described in this section, environmentally preferable products and services can include those that improve air quality (e.g., by having low or no volatile organic compounds or by reducing or improving air emissions) or have low toxicity. Products that lower impacts on human health (e.g., reduced skin irritants in cleaning products) are also included.

These products can also reduce waste by using recyclable packaging or allowing the buyer to return packaging to the manufacturer for reuse. A variety of nongovernmental programs provide labeling services and other resources to help buyers identify these projects. The EPA's Environmentally Preferable Purchasing (EPP) program gives an overview of environmental attributes, procurement guidance, tools, case studies, and government and nongovernmental websites that help federal procurement officials find and evaluate environmentally preferable building and construction, carpet, cleaning, electronic, fleet, food service, landscaping, meeting and conference, office supply, and paper materials.[68]

Non-Ozone-Depleting Substances

When emitted into the atmosphere, certain chemicals damage the Earth's ozone layer, which protects the planet's surface from ultraviolet radiation and the health and environmental impacts that result from exposure to this radiation. Nearly all nations, including the United States, ratified the Montreal Protocol on Substances that Deplete the Ozone Layer to reduce and eventually eliminate the production and use of ozone-depleting substances (ODS). Title VI of the U.S. Clean Air Act implements the U.S.'s commitment under the Montreal Protocol by requiring the gradual end to the production of ODS chemicals.

EPA's Significant New Alternatives Policy (SNAP) program identifies and publishes lists of acceptable and unacceptable substitutes for ODS. To ensure these substitutes reduce human health and environmental risk

[67] "Wastes – Resource Conservation – Comprehensive Procurement Guidelines." U.S. Environmental Protection Agency. Accessed February 2012: http://www.epa.gov/epawaste/conserve/tools/cpg/index.htm.

[68] "Environmentally Preferable Purchasing (EPP)." U.S. Environmental Protection Agency, April 13, 2011. Accessed February 2012: http://www.epa.gov/epp/index.htm.

compared to the use of Class I or II ODS compounds, EPA evaluates each substitute based on its atmospheric impacts, exposure assessments, toxicity, flammability, and other environmental impacts. EPA substitutes identified through the SNAP program fall into several industrial sectors, shown in the sidebar.

EPA SNAP Program Industrial Sectors

- Refrigeration and air conditioning
- Foam blowing agents
- Cleaning solvents
- Fire suppression and explosion protection
- Aerosols
- Sterilants
- Tobacco expansion
- Adhesives, coatings, and inks

7.3 Implementation Strategies

The following strategies provide several starting points and resources for institutionalizing sustainable acquisition and incorporating the sustainability considerations and environmental attributes described previously into procurement processes.

7.3.1 Sustainable Procurement Training

DOC mandates and offers sustainable acquisition training for contracting officers, purchasing agents and assistants, contracting officer representatives, and purchase cardholders. This training increases awareness of sustainable acquisition requirements and practices.

7.3.2 Performance Criteria for Sustainability Attributes

Establishing sustainability performance criteria for products and purchases makes it easier to evaluate available products relative to environmental attributes. The EPA EPP program's Database of Environmental Information for Products and Services allows users to search by product category or name to determine applicable environmental standards and specifications for a variety of product categories. These standards reference federal and industry standards and labeling programs.[69]

7.3.3 Energy Efficient and Sustainable Products

Many tools and resources exist to help consumers in the federal government and in the broader market identify products with sustainable or environmentally friendly features. Besides the several federal labeling, certification, and designation programs intended to help buyers differentiate energy and water efficient, biobased, recycled content, environmentally preferable, and non-ozone-depleting products, other programs exist in the consumer market. Labels and certifications can be helpful in identifying certain characteristics; however, acquisitions professionals should be wary of misleading claims and seek certifications developed by independent third parties through a transparent process. The resources described next facilitate easy identification of products and services that meet federal sustainable acquisition requirements.

- **General Services Administration (GSA) Advantage Environmental Program.** GSA offers many tools and resources to implement sustainable acquisition programs and practices and to help agencies identify and procure green products and services.[70]

- **Green products compilation.** GSA maintains a database for SNAP of designated green products separated into 18 categories and differentiated as recycled content, biobased content/BioPreferred, ENERGY STAR, FEMP-designated, WaterSense, and alternative fuel. The Green Products Compilation contains only those products for which the federal government (DOE, EPA, or USDA) has issued designations or guidance for environmental and energy attributes.[71]

[69] "Database of Environmental Information for Products and Services." U.S. Environmental Protection Agency. Accessed February 2012: http://yosemite1.epa.gov/oppt/eppstand2.nsf/Pages/Search.html?Open.
[70] Accessed February 2012: https://www.gsaadvantage.gov/advantage/main/start_page.do
[71] "Green Products Compilation." U.S. General Services Administration. Accessed February 2012: http://www.gsa.gov/greenproductscompilation.

- **ENERGY STAR products.** In addition to databases of qualified ENERGY STAR products, the ENERGY STAR website also offers specification, buying guidance, and procurement resources for each product category.[72]
- **Low standby power products.** The FEMP Standby Power Data Center allows users to search by company, brand name, product type, and other characteristics to determine whether a particular product meets federal standby power purchasing requirements.[73]
- **WaterSense products.** WaterSense has a database of products that have earned the WaterSense label, searchable by category, brand, model name, and model number.[74]
- **Biobased products.** The BioPreferred catalog allows the user to search by keyword or browse products that are eligible for preferred federal procurement or are USDA Certified Biobased Products.[75]
- **Recycled content products.** EPA's CPG Product Supplier Directory is a database of available suppliers of products in the eight CPG categories.[76]
- **Non-ozone-depleting substances.** The list of substitutes for ODS identified through the SNAP program is available online.[77]

7.3.4 Product Cost-Effectiveness

Where sustainable or environmentally preferable products have higher up-front costs than conventional products and services, evaluating the cost-effectiveness of these products over the lifetime of the product is important for evaluating their value. FEMP has developed several energy and cost-savings calculators for the product categories covered by the energy efficiency procurement requirements.[78] Similarly, USDA has developed a Product Life-Cycle Cost Checklist to identify total life-cycle costs of biobased products compared to their nonbiobased counterparts.[79]

7.3.5 Sustainable Acquisition Language in Solicitations and Contracts

Performance criteria for sustainable and environmental product attributes can be incorporated into various functional components of solicitations and contracts. For example, a scope of work could require periodic reporting on green product purchases and request information from vendors about the specific ways in which the vendor might fulfill environmental requirements, along with documentation of previous experience in specifying, purchasing, and fulfilling requirements. Statements that establish compliance with environmental requirements as a criterion for award also send a strong message to vendors that sustainable acquisition is a priority for DOC.

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[72] "Find ENERGY STAR Products." U.S. Environmental Protection Agency, ENERGY STAR. Accessed February 2012: http://www.energystar.gov/index.cfm?c=products.pr_find_es_products.

[73] "Standby Power Data Center." U.S. Department of Energy, Federal Energy Management Program. Accessed February 2012: http://www1.eere.energy.gov/femp/technologies/search_standbypower_center.aspx.

[74] "Product Search." U.S. Environmental Protection Agency, WaterSense. Accessed February 2012: http://www.epa.gov/WaterSense/product_search.html.

[75] "BioPreferred® Catalog." U.S. Department of Agriculture. Accessed February 2012: http://www.catalog.biopreferred.gov/bioPreferredCatalog/faces/jsp/catalogLanding.jsp?SMSESSION=NO.

[76] "CPG Product Supplier Directory." U.S. Environmental Protection Agency, Waste - Resource Conservation - Comprehensive Procurement Guidelines. Accessed February 2012: http://www.epa.gov/wastes/conserve/tools/cpg/directory.htm.

[77] "List of Substitutes." U.S. Environmental Protection Agency, Ozone Layer Protection - Alternatives/SNAP, August 19, 2010. Accessed February 2012: http://www.epa.gov/ozone/snap/lists/index.html.

[78] "Federal Energy Efficiency Acquisition Guidance and Requirements for Low Standby Power Products." U.S. Department of Energy, Federal Energy Management Program, January 11, 2012. Accessed February 2012: http://www1.eere.energy.gov/femp/technologies/buying_low_standby.html.

[79] "Life Cycle Cost Checklist." Soy Biobased Products, 2012. Accessed February 2012: http://www.soybiobased.org/resources/tools-and-other-resource-information/life-cycle-cost-checklist/.

Many templates and examples of contract language for sustainable acquisition are available. In accordance with FAR requirements, federal agencies must include certain language specifying energy efficiency requirements for energy-consuming products in solicitations and contracts. Model contract language is defined in FAR and is available on the FEMP website.[80] Sample contract language is also provided on the FEMP website for energy efficient information technology and construction products. The Federal Electronics Challenge (FEC) also offers model contract language for energy efficient electronics.[81] For biobased products, the USDA provides template contracting language for various types of services that use biobased products, including custodial services, food services/cafeteria, grounds maintenance, minor construction, operations and maintenance (O&M), and vehicle maintenance.[82] The USDA BioPreferred program also provides a factsheet on purchasing BioPreferred designated items using purchase cards, as well as a listing of supply sites where these items are available. Finally, the EPA EPP Database of Environmental Information for Products and Services supplies contract language directing or requesting contractors to use specific types of environmentally preferable products or services.[83]

7.3.6 Sustainable Acquisition Practices and Sustainability Programs

Procuring products and services plays a role in virtually every other sustainability program that DOC undertakes. Harmonizing sustainable acquisition with other department-, site-, or facility-level sustainability initiatives,[84]can compound benefits across these programs and help DOC meet and exceed its sustainability goals. For instance, Section 6, Pollution Prevention and Waste Elimination, discusses establishing recycling and composting programs to reduce waste from DOC activities. Implementing these programs will be particularly successful if site managers also promote procuring recyclable and compostable materials (and work with suppliers to encourage product or packaging take-back services) that can be processed by waste reduction programs at the end of their useful life. Purchasing recyclable and compostable products will help DOC meet its sustainable acquisition and its waste reduction targets.

Similarly, reducing the environmental impact of materials (by using cost-effective, environmentally preferable, recycled content, biobased, and non-ozone-depleting substance products that meet performance requirements) is Principle V of the *Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings Guidance.* Sustainable acquisition can therefore help DOC implement the Guiding Principles and meet its high-performance sustainable building (HPSB) goals.

7.3.7 Monitoring and Reporting Progress

Effectively monitoring and reporting progress toward meeting sustainable acquisition targets is essential to tracking compliance and also offers insight into site and department purchasing trends, informing the development of best practices, and lessons learned across DOC's operations. Strategies for reducing the reporting burden associated with tracking sustainable acquisitions include adding reporting requirements to procurement programs and defining vendor tracking and reporting requirements in contracts.

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[80] "Model Acquisition Language for Energy-Efficient Product Contracts." U.S. Department of Energy, Federal Energy Management Program, September 14, 2011. Accessed February 2012: http://www1.eere.energy.gov/femp/technologies/eep_modellang.html.

[81] "Acquisition and Procurement." Federal Electronics Challenge. Accessed February 2012: http://www.federalelectronicschallenge.net/resources/aquisit.htm.

[82] "Contract Templates." U.S. Department of Agriculture. Accessed February 2012: http://www.biopreferred.gov/Procurement_Resources.aspx?SMSESSION=NO.

[83] "Database of Environmental Information for Products and Services: Contract Language, Specifications, and Policies." U.S. Environmental Protection Agency, Environmentally Preferable Purchasing (EPP). Accessed February 2012: http://yosemite1.epa.gov/oppt/eppstand2.nsf/Pages/Contracts.html?Open.

[84] *Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings Guidance. Accessed June 12, 2012:* http://www.wbdg.org/pdfs/hpsb_guidance.pdf.

7.4 Sustainable Acquisition Resources

- **DOC Acquisition Manual (parts 1332.70 and 1313.301)**
  http://oam.eas.commerce.gov/CAPPS_cam.html
- **DOC Green Purchasing Environmental Designees**
  http://www.osec.doc.gov/oas/environmental/purchasing.htm
- **ENERGY STAR**
  http://www.energystar.gov/
- **EPA Comprehensive Procurement Guideline Program**
  http://www.epa.gov/epawaste/conserve/tools/cpg/index.htm
- **EPA Environmentally Preferable Purchasing program**
  http://www.epa.gov/epp/index.htm
- **EPA SNAP Program**
  http://www.epa.gov/ozone/snap/
- **FedCenter: Acquisition**
  http://www.fedcenter.gov/programs/buygreen
- **FEMP Energy-Efficient Product Procurement Website**
  http://www1.eere.energy.gov/femp/technologies/procuring_eeproducts.html
- **GSA Advantage Environmental Program**
  https://www.gsaadvantage.gov/advantage/main/start_page.do
- **GSA Green Products Compilation**
  http://www.gsa.gov/greenproductscompilation
- **USDA BioPreferred® Program**
  http://www.biopreferred.gov/?SMSESSION=NO
- **WaterSense**
  http://www.epa.gov/watersense/

8. Electronics Stewardship

United States Department of Commerce Electronics Stewardship Targets

- *Establish and implement policy and guidance to ensure use of power management, duplex printing, and other energy efficient or environmentally preferred options and features on all eligible agency electronic products.*
- *Update agency policy to reflect environmentally sound practices for disposition of all agency excess or surplus electronics products.*
- *Update agency policy to ensure implementation of best management practices for energy efficient management of servers and federal data centers.*
- *Identify how the agency intends to meet technology energy-consumption reduction goals in its data centers.*
- *Develop agency plans to meet the technology energy-reduction goals in data centers and identify covered versus noncovered facilities.*
- *Develop plans to increase the quantity of electronics assets disposed of through sound practices, including how United States Department of Commerce (DOC) is using or plans to use programs such as disposal through GSAXcess®, recycling through UNICOR, donation through the General Service Administration (GSA) Computers for Learning or other non-profit organizations, or recycling through a private recycler certified under the Responsible Recyclers (R2) guidance or equivalent.*

8.1 Electronics Stewardship Basics

8.1.1 What Is Electronics Stewardship?

Purchasing, using, and disposing of electronics such as computers, printers, and mobile phones have significant environmental impacts. The life-cycle management of electronics from procurement to disposal, including their operation, is termed electronics stewardship. Executive Order (EO) 13423 and EO 13514 contain goals applicable to electronics stewardship. Some of those goals include advancing sustainable acquisition of electronics, disposing of electronics in a more sustainable manner, and implementing best management practices for electronics while they are in operation.

8.1.2 Why Is Electronics Stewardship Important?

The importance of electronics stewardship lies in the ability to choose equipment that has less of an impact on the environment and uses less energy. Many electronics are manufactured using heavy metals and toxins that may leach into the natural environment on disposal, negatively affecting both plants and animals. DOC encourages staff to choose equipment that is manufactured in a more environmentally friendly manner, uses fewer harmful materials, and is more energy efficient. DOC also encourages disposition of electronics in a responsible, less harmful manner. This section contains guidance on achieving DOC's goals to responsibly manage electronic procurement, energy consumption and disposal.

In November 2010, the President established an Interagency Task Force on Electronics Stewardship charged with developing a national strategy for electronics stewardship. A national strategy was released in July 2011 detailing the federal government's plan to enhance electronics management throughout the product life-cycle.

Benchmarks have been established and will be updated to guide federal agencies on electronics stewardship. The strategy and benchmarks are available online.[85]

Figure 8-1 illustrates the various impacts throughout the life of a product from manufacture to disposal, from cradle to grave.

Figure 8-1. Environmental impacts of the cradle-to-grave concept

8.2 Background

8.2.1 Types of Acquisition

The federal government purchases information technology equipment and services worth billions of dollars each year. As such, opportunities exist to lead in the environmentally sound and cost-effective management of electronics assets throughout their lifetimes. DOC's acquisition policy is codified in the Commerce Acquisition Manual as the Green Procurement Program (CAM parts 1323.70 and 1313.301) and Procurement Memorandum 2011-04. These policies meet or exceed federal goals for acquiring sustainable products and services, including energy efficient products, recycled content products, and environmentally preferable products and services.

Electronics Products

Federal mandates, including Energy Independence and Security Act (EISA) 2007, Energy Policy Act (EPAct) 2005, EOs 13221 and 13423, and Federal Acquisition Regulation (FAR), require federal agencies to purchase energy efficient products. In the federal context, energy efficient products are those that are ENERGY STAR-qualified or that meet Federal Energy Management Program (FEMP)-designated efficiency requirements. Additionally, FEMP establishes mandatory standby power consumption thresholds for energy-consuming products purchased by federal agencies. More information on energy efficiency in electronics is given in Section 7, Sustainable Acquisition. Other nongovernmental programs, such as the Electronic Product

[85] "National Strategy for Electronics Stewardship." Interagency Task Force on Electronics Stewardship, July 20, 2011. Accessed February 2012: http://www.epa.gov/epawaste/conserve/materials/ecycling/taskforce/docs/strategy.pdf. "Agency Benchmarks to the Federal National Strategy for Electronics Stewardship." FedCenter.gov, February 16, 2012. http://www.fedcenter.gov/Documents/index.cfm?id=18853.

Environmental Assessment Tool (EPEAT®), that focus specifically on reducing energy consumption of electronics are described in this section.

Applicability to DOC procurement procedures. In accordance with EO 13423 and EO 13514, federal agencies are required to:

- Advance sustainable acquisition to ensure that 95% of new contract actions, including task and delivery orders for products and services—with the exception of weapons system acquisition—are energy efficient (e.g., ENERGY STAR, FEMP, or EPEAT-certified).

- Use environmentally sound practices for disposing of all agency excess or surplus electronics products.

EO 13423, Section 2(h) requires that federal agencies (1) enable the ENERGY STAR feature on agency computers and monitors and (2) establish and implement policies to extend the useful life of agency electronics.

EO 13514, Section 2(h) further requires that agencies promote electronics stewardship by:

- Ensuring procurement preferences for EPEAT-registered electronic products

- Establishing and implementing policies to enable power management, duplex printing, and other energy efficient or environmentally preferable features on all eligible agency electronics

- Implementing best management practices for energy efficient management of servers and federal data centers.

These programs are required to follow life-cycle cost-effectiveness and sustainability criteria. Life-cycle cost-effective is defined as "the life-cycle costs of a product, project, or measure are estimated to be equal to or less than the base case" (i.e., current or standard practice or product) (EO 13423, Section 9). Sustainability is defined as the ability to "create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirement of present and future generations of Americans" (EO 13423, Section 9 and EO 13514, Section 19(l)).

8.3 Implementation Strategies

The following strategies offer starting points and resources for institutionalizing sustainable acquisition and incorporating the sustainability considerations and environmental attributes described previously into procurement processes.

8.3.1 Sustainable Electronics Procurement Training

DOC mandates and provides sustainable acquisition training for contracting officers, purchasing agents and assistants, contracting officer representatives, and purchase cardholders. This training increases awareness of sustainable acquisition requirements and practices. Although procurement strategies are discussed in Section 7, Sustainable Acquisition, it is important to reiterate these methods as they relate specifically to electronics stewardship.

8.3.2 Procurement Criteria

Establishing criteria for products and purchases allows available products to be evaluated relative to the environmental attributes described earlier. Specifying that electronics meet EPEAT and ENERGY STAR criteria ensures the cradle-to-grave approach is considered within procurement, including the energy performance of the equipment. DOC strives to achieve U.S. Environmental Protection Agency (EPA) Federal Electronics Challenge (FEC) Platinum Level Award, which recognizes electronics stewardship that helps the federal

government improve its sustainable practices when purchasing, managing, and disposing of its electronics assets. The FEC checklist is useful in determining the questions to consider during the electronics acquisition and procurement process.[86]

8.3.3 Energy Efficient and Sustainable Products

Agencies are required to "advance sustainable acquisition to ensure 95% of new contract actions including task and delivery orders, for products and services with the exception of acquisition of weapon systems, are energy-efficient." Many tools and resources are available to help identify products with sustainable or environmentally friendly features. Section 7, Sustainable Acquisition, references several federal labeling, certification, and designation programs intended to help buyers differentiate among energy and water efficient, biobased, recycled content, environmentally preferable, and non-ozone-depleting products.

The resources described next facilitate easy identification of products and services that meet federal requirements specifically for electronics stewardship.

- **EPEAT.** This is an online tool intended to help purchasers select and compare computer desktops, laptops, and monitors based on their environmental attributes. EPEAT is managed by the Green Electronics Council (GEC) and is dedicated to informing purchasers of the environmental criteria of electronics products. GEC provides guidance for purchasers and manufacturers and hosts the database of EPEAT-registered products. EPEAT-registered computer desktops, laptops, and monitors must meet the IEEE 1680-2006 standard for environmental performance standard for electronics products.[87]

- **ENERGY STAR products.** The ENERGY STAR website also offers specifications, buying guidance, and procurement resources for each product category.[88]

- **Low standby power products.** FEMP's Standby Power Data Center allows users to search by company, brand name, product type, and other characteristics to determine whether a particular product meets federal standby power purchasing requirements.[89]

- **Recycled content products.** EPA's Comprehensive Procurement Guideline (CPG) Product Supplier Directory is a database of available suppliers of products in the eight CPG categories.[90]

- **The Federal Electronics Challenge.** This partnership program encourages federal agencies to purchase green electronics, reduce impacts of electronics during use, and manage used electronics in an environmentally safe manner. Case studies are available to foster ideas and share experiences.[91]

8.3.4 Product Cost-Effectiveness

Where sustainable or environmentally preferable products have higher up-front costs than conventional products and services, determining the cost-effectiveness of these products over the lifetime of the product is

[86] "Acquisition and Procurement Planning Checklist." Federal Electronics Challenge, September 26, 2007. Accessed February 2012: http://www.federalelectronicschallenge.net/resources/docs/plancheck.pdf.
[87] "EPEAT Registry Search Options." EPEAT. Accessed February 2012: http://ww2.epeat.net/searchoptions.aspx.
[88] "Find ENERGY STAR Products." ENERGY STAR. Accessed February 2012: http://www.energystar.gov/index.cfm?c=products.pr_find_es_products.
[89] "Standby Power Data Center." U.S. Department of Energy, Federal Energy Management Program. Accessed February 2012: http://www1.eere.energy.gov/femp/technologies/search_standbypower_center.aspx.
[90] "CPG Product Supplier Directory." U.S. Environmental Protection Agency, Wastes - Resource Conservation - Comprehensive Procurement Guidelines. Accessed February 2012: http://www.epa.gov/epawaste/conserve/tools/cpg/database.htm.
[91] "Agency-Level Stewardship." Federal Electronics Challenge. Accessed June 12, 2012: http://www.federalelectronicschallenge.net/agency.htm.

important for evaluating the value of these products. The FEC resources include a Total Cost of Ownership Calculator Tool,[92] a spreadsheet tool that compares the costs of different electronics options. The cost calculator includes the life-cycle management of IT equipment and decisions that may have an environmental impact.

8.3.5 Sustainable Acquisition Language in Solicitations and Contracts

Performance criteria for sustainable electronics attributes can be incorporated into various functional components of solicitations and contracts. For example, a scope of work could require reporting on electronics product purchases and request information from vendors regarding the specific ways the vendor might fulfill environmental requirements and documentation of previous experience in specifying, purchasing, and fulfilling requirements. Statements that establish compliance with environmental requirements as a criterion for award also send a strong message to vendors that sustainable acquisition is a priority for DOC. Resources such as the FEC's memo template[93] can help communicate involvement in sustainable electronics procurement.

8.3.6 Power Management Program

Although acquisition and proper disposal of electronics are essential to any electronic stewardship program, it is equally important to manage power consumption responsibly. A power management program should be initiated at each DOC Operating Unit as a low-cost measure. A management program can include working with IT staff to ensure (1) ENERGY STAR or power savings features are enabled on agency computers and monitors, (2) policies are adjusted or written to enable network updates in an energy efficient manner (i.e., updates occurring regularly are scheduled to occur when the user turns the computer on once per week, as opposed to requesting staff to leave computers on over the weekend for updates and maintenance), and (3) servers and network equipment are managed in an energy-efficient and sustainable manner.

Power-saving features are available on most computers and monitors. These features should be enabled to maximize energy savings when the user has stepped away from the computer (e.g., after 15 minutes the monitor can power down and the computer can enter standby or hibernate).

Policies supporting the responsible management of electronics may need to be revised or written to increase energy savings. Policies may include items such as:

- Requiring each Operating Unit to ban the use of personal printers, except in specific situations (e.g., due to medical reasons or job requirements)
- Requiring network printers to enable the default settings for black and white printing, double-sided printing, and any other applicable settings, and have the capability to scan and email documents to manage resources associated with printing
- Requiring the use of ENERGY STAR equipment for ultimate power savings.

Server and network management can include server virtualization/consolidation, the use of thin clients, and a requirement for staff to purchase laptops instead of tower CPUs, among others. Several resources are available to improve server and network management.

- **The EPA's Low Carbon IT Campaign.** This campaign provides more resources and information on how to reduce consumption associated with computers, printers, fax machines, etc.[94]

[92] Available for download as an Excel spreadsheet. See "Total Cost of Ownership (TCO) Calculator Tool." FedCenter.gov, July 3, 2007. Accessed February 2012: http://www.fedcenter.gov/Bookmarks/index.cfm?id=8205.

[94] "Welcome to ENERGY STAR Low Carbon IT." ENERGY STAR. Accessed February 2012: http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_mgt_low_carbon.

[94] "Welcome to ENERGY STAR Low Carbon IT." ENERGY STAR. Accessed February 2012: http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_mgt_low_carbon.

- **FEMP's Energy Efficient Product Procurement List**. The list contains resources for product procurement aligned with energy consumption standards not covered by other EPA programs.[95]
- **The U.S. Department of Energy (DOE) Advanced Manufacturing Office.** This DOE office offers information on data center consolidation and some calculators for estimating potential savings associated with specific design measures.[96]

8.3.7 Electronics Recycling, Reclamation, and Reuse Recycling

Recycling electronics prevents valuable materials from going into the waste stream. DOC Operating Units need to explore the options to recycle or donate for reuse any used electronics. Computer, television, and cell phone manufacturers as well as electronics retailers offer recycling programs. Certified recycling programs should be identified and all electronics need to be cleared of agency-sensitive materials before they are recycled or issued for reuse.

The EPA's eCycling program offers more information on possible options for recycling and reusing electronics.[97] Information is also available about electronic waste and recycling options under the EPA's eCycling resources section.[98]

8.4 Electronics Stewardship Resources

- **Commerce Acquisition Manual**
  http://oam.eas.commerce.gov/CAPPS_cam.html
- **DOE Advanced Manufacturing Office Website for Data Center Efficiency**
  http://www1.eere.energy.gov/industry/datacenters/
- **Electronic Product Environmental Assessment Tool (EPEAT®)**
  www.epeat.net
- **ENERGY STAR Products**
  http://www.energystar.gov/index.cfm?c=products.pr_find_es_products
- **EPA eCycling Program**
  http://www.epa.gov/wastes/conserve/materials/ecycling/index.htm
- **EPA Low Carbon IT Campaign**
  http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_mgt_low_carbon
- **FedCenter: Acquisition**
  http://www.fedcenter.gov/programs/buygreen
- **FEC Website**
  www.federalelectronicschallenge.net
- **FEMP Energy-Efficient Product Procurement Website**
  http://www1.eere.energy.gov/femp/technologies/procuring_eeproducts.html
- **Low Standby Power Products**
  http://www1.eere.energy.gov/femp/technologies/search_standbypower_center.aspx

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[95] "Energy-Efficient Product Procurement." U.S. Department of Energy, Federal Energy Management Program, October 3, 2011. Accessed February 2012: http://www1.eere.energy.gov/femp/technologies/procuring_eeproducts.html.

[96] "Saving Energy in Data Centers." U.S. Department of Energy, Advanced Manufacturing Office, February 9, 2012. Accessed February 2012: http://www1.eere.energy.gov/industry/datacenters/.

[97] "Where Can I Donate or Recycle My Old Computer or Other Electronic Products?" U.S. Environmental Protection Agency, Wastes - Resource Conservation - Common Wastes & Materials - eCycling, Accessed February 2012: http://www.epa.gov/epawaste/conserve/materials/ecycling/donate.htm.

[98] "Resources." U.S. Environmental Protection Agency, Wastes - Resource Conservation - Common Wastes & Materials - eCycling, Accessed February 2012: http://www.epa.gov/epawaste/conserve/materials/ecycling/pubs.htm.

9. Agency-Specific Innovation and Government-Wide Support

United States Department of Commerce Innovation and Government-Wide Support Target

The mission of the United States Department of Commerce (DOC) is to create the conditions for economic growth and opportunity by promoting innovation, entrepreneurship, competitiveness, and stewardship.

9.1 Innovation and Support Basics

Innovation refers to leading edge research performed, developed, and deployed within DOC to support sustainability goals. Environmental stewardship and sustainable development are crucial to DOC's ability to fulfill its mission. For this reason, DOC strives to go beyond federal mandates to inspire sustainability and demonstrate leadership and innovation in advanced technologies, sustainable development, climate change research, and efficiency programs. Government-wide support refers to assistance provided by an Operating Unit to another Operating Unit or Federal agency in meeting sustainability goals.

9.2 Background

Opportunities for OUs to demonstrate innovation and government-wide support vary based on the type of research performed, funding availability, and agency needs. Sites should look for ways to provide leadership and innovation through projects, programs, and initiatives in subject areas related to their core focus. By sharing technical knowledge, expertise, and success stories unique to a facility, OUs can educate other federal agencies and help them more readily adopt new technologies and approaches that reduce their impacts on the community and environment. Through information sharing, DOC's OUs and other federal agencies will be able to collectively respond to Executive Order (EO) 13514 and demonstrate the federal government's cooperative leadership in sustainability.

9.3 Implementation Strategies

9.3.1 Onsite Innovation

DOC emphasizes innovation in its research as well as the planning, design, and implementation of sustainability-related projects at its OUs. Seeking opportunities to showcase research and innovative capabilities helps DOC demonstrate leadership. These opportunities vary from site to site, but can be generally categorized in four areas.

- **Advanced Technologies.** Leverage DOC's research in energy efficiency, renewable energy, net-zero energy, and smart grid to improve the performance of facilities in DOC and in other federal agencies. Through continued development and deployment of high performing technologies, DOC can showcase leading edge research and help the federal government demonstrate the feasibility and benefits of advanced technologies.

- **Sustainable Development.** Implement high-performance buildings and low-impact development principles at DOC sites. To the extent possible, leverage alternative financing mechanisms such as

Power Purchase Agreements and Energy Savings Performance Contracts to implement onsite efficiency measures. Demonstrating leadership in sustainable site development helps reduce the federal government's impacts on the community and the environment, and makes the most efficient use of taxpayer dollars.

- **Leading Edge Research.** DOC's research on climate change and renewable energy is contributing to significant scientific advances. Sharing research findings in these areas will continue to help the government provide cutting edge solutions to the growing challenges in the environment.

- **Efficiency Program.** Develop programs and implement systems to facilitate measuring and tracking sustainability goals. Web-based systems, tools, and frameworks that help quantify and determine reduction opportunities for energy, greenhouse gas, water, transportation, and waste, as well as opportunities for sustainable acquisition, high-performance buildings, and electronic stewardship, help contribute to DOC's pursuit of innovation.

9.3.2 Government-Wide Support

OUs are encouraged to share knowledge and experiences by participating in technical task forces, committees, and interagency working groups. This involvement is an opportunity for information sharing and assistance in using limited resources while benefiting from the vast expertise available across the federal government. Developing partnerships with other OUs and federal agencies can also be beneficial in pursuing collective sustainability goals. Through these efforts, DOC can expand its mission, improve the performance of its sites, and help other agencies improve their sustainability.

9.4 Innovation and Support Resources

U.S. Environmental Protection Agency

- **Climate Change**
  http://www.epa.gov/climatechange/
- **ENERGY STAR Program**
  http://www.energystar.gov/
- **Significant New Alternatives Policy (SNAP) Program**
  http://www.epa.gov/ozone/snap/

U.S. Department of Energy

- **Federal Energy Management Program (FEMP)**
  http://www1.eere.energy.gov/femp/
- **FEMP Project Funding**
  http://www1.eere.energy.gov/femp/financing/mechanisms.html
- **Office of Energy Efficiency and Renewable Energy Commercial Building Initiative**
  http://www1.eere.energy.gov/buildings/commercial_initiative/
- **Lawrence Berkeley National Laboratory**
  http://www.lbl.gov/
- **National Renewable Energy Laboratory**
  http://www.nrel.gov/
- **Oak Ridge National Laboratory**
  http://www.ornl.gov/
- **Pacific Northwest National Laboratory**
  http://www.pnl.gov/

Other Resources

- **FedCenter**
  http://www.fedcenter.gov/
- **U.S. Green Building Council Leadership in Energy and Environmental Design (LEED)**
  http://www.usgbc.org/DisplayPage.aspx?CMSPageID=222