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Revision 2

INL High-Performance and Sustainable Building Strategy

September 2019

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Changing the World's Energy Future

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Idaho National Laboratory
Idaho Falls, Idaho 83415

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EXECUTIVE SUMMARY

High-performance buildings are reliable, cost-effective, and sustainable structures that minimize energy and water use, reduce solid waste and pollutant emissions, and limit the depletion of natural resources while also providing a thermally and visually comfortable working environment that increases productivity for building occupants.

As Idaho National Laboratory (INL) is the nation's premier nuclear energy research laboratory, the physical infrastructure requires continual updating and re-purposing to help accomplish that mission. INL's infrastructure must incorporate high-performance sustainable design features to be fiscally responsible and reflect an image of innovation to the public and prospective employees.

INL is a large consumer of energy with annual energy costs exceeding $9M. In the current fiscal reality and with energy costs constantly increasing, this High-Performance and Sustainable Building Strategy will help engineering and construction project teams design facilities that are sustainable and will help to reduce life-cycle operating costs while providing INL employees with a safe and healthy working environment.

With these goals in mind, the recommendations described in this document are intended to form INL's foundation for sustainable and high-performance building standards. This strategy incorporates the latest federal and Department of Energy (DOE) orders and directives including Executive Order (EO) 13834, "Efficient Federal Operations" and its associated implementing instructions, DOE Order 436.1, "Departmental Sustainability," the DOE Sustainability Report and Implementation Plan (SRIP), the INL Site Sustainability Plan (SSP), and Code of Federal Regulations (CFR).

This document identifies the requirements of the Guiding Principles for Sustainable Federal Buildings (Guiding Principles) and briefly highlights the requirements of Leadership in Energy and Environmental Design (LEED®) Gold certification. LEED Gold certification, while optional, can be used to meet many of the requirements of the Guiding Principles.

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ACRONYMS

AP	Accredited Professional
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
CFR	Code of Federal Regulations
CPG	Comprehensive Procurement Guideline
DOE	Department of Energy
DOE-ID	Department of Energy Order Idaho Operations Office
DOE O	Department of Energy Order
EISA	Energy Independence and Security Act
EO	Executive Order
EPA	Environmental Protection Agency
EPAct	Energy Policy Act
FAR	Federal Acquisition Regulation
FEMP	Federal Energy Management Program
FSRIA	Farm Security and Rural Investment Act
FY	Fiscal Year
GBCI	Green Building Certification Institute
GHG	Greenhouse Gas
GSA	General Services Administration
GSF	gross square feet
GWP	global warming potential
HVAC	heating, ventilation, and air conditioning
I2SL	International Institute for Sustainable Laboratories
INL	Idaho National Laboratory
LED	light-emitting diode
LEED®	Leadership in Energy and Environmental Design
NECPA	National Energy Conservation Policy Act
OMB	Office of Management and Budget
PEMP	Performance Evaluation and Measurement Plan
RCRA	Resource Conservation and Recovery Act
REC	Renewable Energy Certificate
SNAP	Significant New Alternative Policy
SPO	Sustainability Performance Office
SRIP	Sustainability Report and Implementation Plan
SSP	Site Sustainability Plan
USGBC	U.S. Green Building Council

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INL High-Performance and Sustainable Building Strategy

1. INTRODUCTION

Idaho National Laboratory's (INL) mission is to discover, demonstrate, and secure innovative nuclear energy solutions, other clean energy options, and critical infrastructure. To achieve this mission, additional state-of-the-art buildings may be required and modifications to existing buildings certainly will be required.

INL is composed of five campuses that are necessary to achieve United States (U.S.) Department of Energy (DOE) objectives: Research and Education Campus, Advanced Test Reactor Complex, Materials and Fuels Complex, Specific Manufacturing Capability Complex, and the remaining Sitewide areas including Central Facilities Area along with various outlying facilities and functions. As INL advances nuclear energy, it is important to showcase INL's innovative and sustainable character. This is particularly effective by designing, constructing, and operating sustainable and high-performance buildings.

Construction of new facilities can be achieved through various funding mechanisms including private-sector funding, university funding, and government line-item funding; therefore, it is important to clarify INL's high-performance building goals and commitment to sustainability in advance.

The goal of this document is to establish the foundation for design and construction of high-performance buildings at INL. The focus is on the technical and functional requirements that address the operational issues specific to INL's geographical region as well as other economically sustainable practices such as energy efficiency and resource-use minimization. INL can improve the functionality and efficiency of its buildings by committing to sustainability goals that meet applicable codes and regulations, while also addressing the many requirements in Executive and DOE Orders.

Revision 2 of this document incorporates the latest federal and DOE Orders, including Executive Order (EO) 13834, "Efficient Federal Operations" and associated implementing instructions, DOE Order (DOE O) 436.1, "Departmental Sustainability," the DOE Sustainability Report and Implementation Plan (SRIP), the INL Site Sustainability Plan (SSP), and the latest guidelines, trends, and observations in high-performance building construction along with a brief discussion of the Leadership in Energy and Environmental Design (LEED®) green building rating system.

This revised High-Performance and Sustainable Building Strategy has been aligned with the DOE SRIP and is based on the criteria set forth in the Guiding Principles for Sustainable Federal Buildings and Associated Instructions (Guiding Principles) published in February 2016 by the Council on Environmental Quality. The Guiding Principles are divided into two sections: one for new construction and major renovations, and the other for existing buildings. Compliance with the Guiding Principles is a federal requirement and is not optional. LEED certification is optional and can be used to meet many of the requirements of the Guiding Principles.

2. BACKGROUND, CONTACTS, AND REGULATORY DRIVERS

In the U.S., commercial and residential buildings consume 38% of energy in general and 75% of all electricity (Energy Information Administration), while accounting for 12% of all greenhouse gas emissions (Environmental Protection Agency). The goal of high-performance building design is to use a holistic approach to lessen a building's impact on the environment and operational funding needs.

High-performance buildings offer several benefits that address these significant energy and environmental issues:

- Reduced energy and water consumption and their associated utility costs
- Reduced waste materials going to landfills
- Reliable, healthy, and comfortable environment that promotes productivity and employee retention.

A significant component of INL's vision is to be a leading laboratory for sustainability performance in the U.S. and globally. Achieving sustainability means simultaneous consideration of economic prosperity, environmental quality, and social equity.

The Sustainable INL Program was established in September 2007 and is committed to improving energy and resource efficiency, responsible environmental stewardship, and fiscal responsibility. The Sustainable INL Program relies heavily on management and employee participation to achieve its goals.

Information on the Sustainable INL Program may be found on the internal INL website at https://fss.inl.gov/sustainability or contact:

- Chris Ischay (Program Manager, 208-526-4382, christopher.ischay@inl.gov)
- Ernest Fossum (Energy Manager, 208-526-2513, ernest.fossum@inl.gov)
- Maryl Fisher (Sustainability Analyst, 208-526-8340, maryl.fisher@inl.gov).

The requestor and project manager for a new, leased, or existing INL building project are responsible for ensuring that the Guiding Principles for Sustainable Federal Buildings are addressed during project design and construction. The Guiding Principles are a compilation of sustainability-related requirements, as outlined in applicable federal regulations along with Executive and DOE orders, which include the following policy drivers:

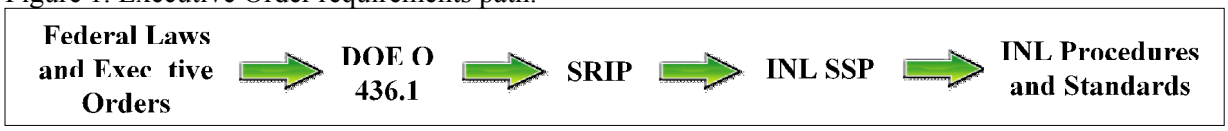
- Code of Federal Regulations (CFR) Title 10 Energy, Part 433, Subpart A, "Energy Efficiency Performance"
- 48 CFR 970.5223-7, "Sustainable Acquisition Program"
- Executive Order 13834, "Efficient Federal Operations" and implementing instruction
- Energy Policy Acts (EPAct) of 1992 and 2005
- Energy Independence and Security Act (EISA) of 2007
- DOE Order (DOE O) 436.1, "Departmental Sustainability"
- DOE SRIP
- INL SSP.

2.1 Energy Policy Flow Down to INL

10 CFR 433 outlines the Energy Efficiency Standards for the Design and Construction of New Federal Commercial Buildings. EO 13834 was issued to maintain ongoing federal sustainability leadership for high-performance sustainable buildings in the areas of energy efficiency, renewable

energy, reduction of toxic substances, recycling, and water conservation. The EO 13834 Fact Sheet is included in Attachment A for additional information. Federal laws and Executive Order requirements are flowed down to INL operations through the illustrated path in Figure 1.

Figure 1. Executive Order requirements path.



DOE O 436.1 is the document that connects the federal standards, orders, and directives to DOE and outlines the path for implementation. Although Executive and DOE Orders are regularly updated and superseded, DOE O 436.1 and its objectives remain in the INL contract.

Section 4, Requirements, of the DOE Order states in part:

> *Comply with the sustainability requirements contained in… the National Energy Conservation Policy Act (NECPA), the Energy Policy Acts (EPAct) of 1992 and 2005, the Energy Independence and Security Act (EISA) of 2007, and continue to adhere to the inventory and reporting requirements of Section 301 through 313 (including implementing regulations) of the Emergency Planning and Community Right-to-Know Act, the Pollution Prevention Act of 1990 at DOE facilities, related statutory and administrative requirements.*

DOE O 436.1 requires DOE to prepare an annual SRIP with accompanying guidance and direction. INL implements the SRIP through the INL SSP and INL procedures and standards. Critical outcomes and performance measures are reported in the INL Performance Evaluation and Measurement Plan (PEMP).

The SRIP goals and requirements applicable to the INL Site were developed to ensure that DOE meets the sustainability goals in the regulations and orders. These goals are summarized for reference in Table 1. INL reports on these goals to the DOE Idaho Operations Office (DOE-ID) annually and the goals are included in INL's PEMP.

Table 1. SRIP goals and metrics.

Goal	Metric
Facility Energy Efficiency	Reduce building energy intensity (Btu/ft²)
Efficiency Measures/Investments	EISA "covered" facilities evaluated for efficiency opportunities
Renewable Energy Use	Renewable electricity used as a percent of electricity use
Water Efficiency	Reduce potable water intensity (gal/ft²)
High Performance Sustainable Buildings	Percent of DOE owned buildings meeting the Guiding Principles
Transportation/Fleet Management	Reduction in petroleum fuel
Sustainable Acquisition	Purchase products per Federal Acquisition Regulation

2.2 Federal Energy Guidelines

2.2.1 Title 10, Part 433

Energy efficiency standards for federal buildings are addressed in the Code of Federal Regulations (CFR). The CFR is updated periodically and should be checked during construction design to confirm the appropriate version of ASHRAE 90.1 to use for the project. Below is a summary from Title 10, Part 433 of the CFR as of August 2019:

Title 10: Energy

PART 433—ENERGY EFFICIENCY STANDARDS FOR THE DESIGN AND CONSTRUCTION OF NEW FEDERAL COMMERCIAL AND MULTI-FAMILY HIGH-RISE RESIDENTIAL BUILDINGS

Contents

Subpart A—Energy Efficiency Performance

SOURCE: 79 FR 61569, Oct. 14, 2014, unless otherwise noted.

§433.100 Energy efficiency performance standard.

(a) (4) All Federal agencies shall design new Federal buildings that are commercial and multi-family high-rise residential buildings, for which design for construction began on or after November 6, 2016 to:

(i) Meet ASHRAE 90.1-2013, (incorporated by reference, see §433.3); and

(ii) If life-cycle cost-effective, achieve energy consumption levels, calculated consistent with paragraph (b) of this section, that are at least 30 percent below the levels of the ASHRAE Baseline Building 2013.

(b) Energy consumption for the purposes of calculating the 30 percent savings requirements shall include the building envelope and energy consuming systems normally specified as part of the building design by ASHRAE 90.1 such as space heating, space cooling, ventilation, service water heating, and lighting, but shall not include receptacle and process loads not within the scope of ASHRAE 90.1 such as specialized medical or research equipment and equipment used in manufacturing processes.

(c) If a 30 percent reduction is not life-cycle cost-effective, the design of the proposed building shall be modified so as to achieve an energy consumption level at or better than the maximum level of energy efficiency that is life-cycle cost-effective, but at a minimum complies with paragraph (a) of this section.

§433.101 Performance level determination.

(a) (4) For Federal buildings for which design for construction began on or after before November 6, 2016 each Federal agency shall determine energy consumption levels for both the ASHRAE Baseline Building 2013 and proposed building by using the Performance Rating Method found in Appendix G of ASHRAE 90.1-2013 (incorporated by reference, see §433.3), except the formula for

calculating the Performance Rating in paragraph G1.2 shall read as follows:

(i) Percentage improvement = 100 × ((Baseline building consumption − Receptacle and process loads) − (Proposed building consumption − Receptacle and process loads))/(Baseline building consumption − Receptacle and process loads) (which simplifies as follows):

(ii) Percentage improvement = 100 × (Baseline building consumption − Proposed building consumption)/(Baseline building consumption − Receptacle and process loads).

(b) Energy consumption for the purposes of calculating the 30 percent savings requirements in §433.100 shall include the building envelope and energy consuming systems normally specified as part of the building design by ASHRAE 90.1 such as space heating, space cooling, ventilation, service water heating, and lighting, but shall not include receptacle and process loads not within the scope of ASHRAE 90.1 such as specialized medical or research equipment and equipment used in manufacturing processes.

2.2.2 Energy Independence and Security Act of 2007

Building designs should preference heating systems powered by electricity or renewable sources rather than fossil fuels. Section 433 of EISA set forth the requirement that fossil fuel use in federal buildings be reduced in new building construction:

(I) The buildings shall be designed so that the fossil fuel-generated energy consumption of the buildings is reduced, as compared with such energy consumption by a similar building in fiscal year 2003 (as measured by Commercial Buildings Energy Consumption Survey or Residential Energy Consumption Survey data from the Energy Information Agency), by the percentage specified in the following table:

Fiscal Year	***Percentage Reduction***
2010	*55*
2015	*65*
2020	*80*
2025	*90*
2030	*100*

2.3 Federal Procurement Requirements

The sustainable acquisition requirements for federal procurement are included in EO 13834. The Implementing Instructions for Executive Order 13834 provide the following for procurement and acquisition:

> **EO 13834 Section 2(g):** *Acquire, use, and dispose of products and services, including electronics, in accordance with statutory mandates for purchasing preference, Federal Acquisition Regulation (FAR) requirements, and other applicable Federal procurement policies.*

Mandates for Purchasing Preference: Agencies must give purchasing preference to products that:

- Meet minimum requirements for recycled content as identified by EPA's Comprehensive Procurement Guideline (CPG) Program (42 U.S.C. § 6962)
- Are designated as biobased or BioPreferred by USDA. Agencies must also set yearly targets for number of biobased-only contracts awarded (7 U.S.C. § 8102)
- Are certified by ENERGY STAR or designated by Federal Energy Management Program (FEMP) as energy efficient products (42 U.S.C. § 8259b, 10 CFR Part 436, Subpart C).

Procurement of Substitutes for Ozone-depleting Substances: In accordance with 42 U.S.C. § 7671K and 7671L, agency procurement practices must maximize substitution of alternatives to ozone-depleting substances identified under EPA's Significant New Alternatives Policy (SNAP) program.

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3. GUIDING PRINCIPLES FOR SUSTAINABLE FEDERAL BUILDINGS

> *"There are a range of statutory requirements and references related to sustainable building design, construction, and operation. For E.O. 13834 implementation, a sustainable Federal building has the same meaning as a high-performance green building (42 U.S.C. § 17061(13)), which, when compared to similar buildings, reduces energy, water, and material use; improves occupant health and productivity; minimizes air and water pollution and waste generation; acquires sustainable products and services; increases reuse and recycling activities; and is located near multiple transportation modes."* (Implementing Instructions for Executive Order 13834 *Efficient Federal Operations*)

Per the Implementing Instructions, INL qualifies sustainable buildings, including existing buildings, new construction, and major renovations, using the Guiding Principles for Sustainable Federal Buildings and Associated Instructions (Guiding Principles), developed in 2008 and updated in 2016. For new construction and major renovations, INL is required to meet energy efficiency and sustainable design standards established by DOE at 10 CFR Part 433.

The Guiding Principles are the basis for INL sustainable design and construction. The Guiding Principles were developed in response to federal requirements and encompass six areas for both new construction and existing buildings:

1. Employ integrated design principles
2. Optimize energy performance
3. Protect and conserve water
4. Enhance indoor environmental quality
5. Reduce the environmental impact of materials
6. Assess and consider climate change impacts.

3.1 Documentation of the Guiding Principles

The Sustainable INL team will utilize design documents, construction documents, and vendor data submittals to establish compliance with the Guiding Principles. It is recommended that design teams meet with Sustainable INL early in the design process and throughout design and construction to ensure that proper documentation is developed and recorded.

3.2 New Construction and Major Renovation

All new construction and major renovation projects for buildings greater than 10,000 ft² are to follow the Guiding Principles.

Table 2 is a summary taken from "Determining Compliance with the Guiding Principles for Sustainable Federal Buildings," dated February 2016. The full text of the Guiding Principles can be found in Appendix B. The "Responsibility" column was added to provide general guidance to the main INL group responsible for achieving compliance.

CFR Title 10, Part 433 defines the current version of ASHRAE referred to in Section II. 3. Energy Efficiency of the table.

For new construction, Metrics 1 through 20 are required. For modernization, Metrics 1 through 18 and 21 are required.

Table 2. Guiding Principles for new construction and major renovation.

I. Employ Integrated Design Principles		**Responsibility**
1.	**Integrated Design**: Consider the environmental impact of siting decisions and use an integrated project team to establish energy and other environmental performance goals in the design process; follow sustainable landscape design principles; evaluate electric vehicle charging needs; consider design choices that improve environmental performance, support health and wellness of building occupants and consider climate risks including wildfire; and consider all stages of the building's life cycle.	Design team
2.	**Commissioning**: Commission and recommission at least every 4 years to optimize building performance using commissioning agents who are independent of the design and construction or operating team. Commissioning should be consistent with the Energy Independence and Security Act (EISA) Section 432.1 and Federal Energy Management Program (FEMP) commissioning guidance.	Design team/ Project management
II. Optimize Energy Performance		**Responsibility**
3.	**Energy Efficiency**: A. For new construction, ensure energy efficiency is 30% better than the current American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 90.1 standard, OR B. For modernization, ensure: 1) Energy use is 20% below the fiscal year (FY) 2015 energy use baseline, OR 2) Energy use is 30% below the FY 2003 energy use baseline, OR 3) The building has an ENERGY STAR® rating of 75 or higher, OR 4) For building types not in ENERGY STAR Portfolio Manager, where adequate benchmarking data exists, the building is in the top quartile of energy performance for its building type, AND C. For new construction and modernization, use energy efficient products, as required by statute.	Design team
4.	**Renewable and Clean Energy**: Evaluate and implement, where appropriate, life-cycle cost-effective renewable energy projects onsite, consider long-term offsite renewable sources and Renewable Energy Certificates (RECs), and utilize clean and alternative energy where possible.	Sustainable INL
5.	**Metering**: Install building level meters for electricity, natural gas, and steam; install advanced or standard meters as appropriate.	Design team
6.	**Benchmarking**: Benchmark building performance at least annually, preferably using ENERGY STAR Portfolio Manager; regularly monitor building energy	Sustainable INL

	performance against historic performance data and peer buildings.	

III. Protect and Conserve Water		Responsibility
7.	**Indoor Water Use**: A. Build to ASHRAE Standard 189.1-2014 Sections 6.3.2, 6.4.2, and 6.4.3, or current comparable ASHRAE standards, AND B. Use water-efficient products; install building level water meters; optimize cooling tower operations; and eliminate single pass cooling.	Design team
8.	**Outdoor Water Use**: A. Separately meter water for irrigation systems greater than 25,000 ft^2, AND B. Use water efficient landscapes, AND C. Limit potable water use for irrigation to 50% or more below conventional practices using methodologies from (but not the numeric requirements contained in) ASHRAE Standard 189.1-2014 Section 6.5.1, or current comparable ASHRAE standards, to calculate water use of conventional practices.	Design team
9.	**Alternative Water**: Consider alternative sources of water where cost-effective and permitted by local laws and regulations.	Design team
10.	**Stormwater Management**: For new construction meet or exceed EISA Section 438 stormwater management requirements.	Design team
IV. Enhance Indoor Environmental Quality		**Responsibility**
11.	**Ventilation and Thermal Comfort**: Meet current ASHRAE Standards 55 and either 62.1 or 62.2 for ventilation and thermal comfort.	Design team
12.	**Daylighting and Lighting Controls**: Maximize opportunities for daylighting in regularly occupied space, automatic dimming controls or accessible manual controls, task lighting, and shade and glare control.	Design team
13.	**Indoor Air Quality**: Develop and implement an indoor air quality policy that considers the following: moisture control, use of low emitting materials and products with low pollutant emissions, necessary protocols to protect indoor air quality during construction and in the finished building, prohibition of smoking in any form inside and within 25 feet of all building entrances, operable windows, and building ventilation intakes, and use of integrated pest management techniques.	Design team/ INL policies
14.	**Occupant Health and Wellness**: Promote opportunities for voluntary increased physical movement of building occupants, such as making stairwells an option for circulation, active workstations, fitness centers, and bicycle commuter facilities; and support convenient access to healthy dining options, potable water, daylight, plants, and exterior views.	Sustainable INL

V. Reduce the Environmental Impact of Materials		Responsibility
15.	**Material Content and Performance**: Procure products that meet the following requirements where applicable: A. Resource Conservation and Recovery Act (RCRA) Section 6002, AND B. Farm Security and Rural Investment Act (FSRIA) Section 9002, AND C. Federally Recommended Specifications, Standards and Ecolabels or are on the Federal Green Procurement Compilation for other green products, as appropriate, AND D. Avoid ozone depleting compounds and high global warming potential (GWP) chemicals.	Design team
16.	**Waste Diversion**: Where markets exist, provide reuse and recycling services for building occupants and divert at least 50% of non-hazardous, non-construction related materials from landfills.	Sustainable INL
17.	**Materials Management**: Where markets exist, divert at least 50% of construction and demolition materials from landfills.	Construction management
VI. Assess and Consider Climate Change Risks		**Responsibility**
18.	**Mission Criticality**: Determine long-term mission criticality of the physical asset and operations to be housed in the facility to inform the design of new construction and modernization to increase climate resilience.	Sustainable INL
19.	**Floodplain Considerations**: For new construction, avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and avoid floodplain development whenever there is a practicable alternative. (Not required for modernizations.)	Sustainable INL
20.	**Facility Design**: For new construction, balance options to address predicted climate change impacts against mission criticality, cost, and security to determine design parameters; at a minimum, include low and no cost resilience measures to address predicted climate conditions. (Not required for modernizations.)	Sustainable INL
21.	**Facility Adaptation**: For modernization, take action to mitigate identified risks, considering mission criticality, climate impacts, cost, and phased adaptation over time. (Not required for new construction.)	Sustainable INL

3.3 Existing Buildings

Sustainable INL typically selects existing buildings most likely to meet the Guiding Principles and develops upgrade projects as needed. This requirement can also be met by taking the Guiding Principles into consideration when upgrading a building for a new purpose or when simply upgrading/replacing operational equipment. Facilities management and engineering should notify and work with Sustainable INL to ensure these types of upgrades are consistent with the Guiding Principles.

The following summary table is taken from "Determining Compliance with the Guiding Principles for Sustainable Federal Buildings," dated February 2016. The full text of the Guiding Principles for existing buildings can be found in Appendix B, which covers sustainable operational and performance aspects of existing buildings. Full implementation of the Guiding Principles for existing buildings may require upgrade projects to improve performance or enhance operations.

Twelve of 18 metrics must be met: eight that are specified as required, plus four additional of the ten optional metrics. Any metric determined to be "not applicable" cannot be counted toward the required 12 metrics.

Table 3. Guiding Principles for existing buildings.

I. Employ Integrated Assessment, Operation, and Management Principles	
1.	**Integrated Assessment, Operation, and Management**: Through an integrated process and team, assess building and operating conditions and identify areas for improvement; establish operational goals for environmental performance; and incorporate goals into building management. [Required]
2.	**Commissioning**: Commissioning reports for certification purposes must be completed within years prior to certification date. Recommissioning should be completed at least every four years thereafter to optimize building performance. Use commissioning agents who are independent of the design and construction or operating team. Commissioning should be consistent with EISA Section 432.1 and FEMP commissioning guidance. [Required]
II. Optimize Energy Performance	
3.	**Energy Efficiency**: Ensure: The building has an ENERGY STAR rating of 75 or higher, OR Energy use is 20% below the FY 2015 energy use baseline, OR Energy use is 30% below the FY 2003 energy use baseline, OR Energy efficiency is 30% better than the current ASHRAE Standard 90.1, AND Use energy efficient products, as required by statute. [Required]
4.	**Renewable and Clean Energy**: Evaluate and implement, where appropriate, life-cycle cost-effective renewable energy projects onsite; consider long-term offsite renewable sources and RECs; and utilize clean and alternative energy where possible.
5.	**Metering**: Install building level meters for electricity, natural gas, and steam; install advanced or standard meters as appropriate.
6.	**Benchmarking**: Compare building performance with energy performance benchmarks at least annually, preferably using ENERGY STAR Portfolio Manager; regularly monitor building

	energy performance against historic performance data and peer buildings.
III. Protect and Conserve Water	
7.	**Indoor Water Use**: Install building level water meters, reduce water use 20% below FY 2007 baseline, and use water efficient products, OR Install building level meters, conduct an analysis of water use, identify and repair leaks, eliminate single-pass cooling, optimize cooling tower operations, and use water-efficient products. [Required]
8.	**Outdoor Water Use**: Install water meters for irrigation systems serving more than 25,000 ft^2 of landscape, AND either: Use water efficient landscaping, OR Limit potable water use for irrigation to 50% or more below conventional practices using methodologies from (but not the numeric requirements contained in) ASHRAE Standard 189.1-2014 Section 6.5.1, or current comparable standard, to calculate water use of conventional practices.
9.	**Alternative Water**: Consider alternative sources of water where cost-effective and permitted by local laws and regulations.
10.	**Stormwater Management**: Employ strategies that reduce storm water runoff and discharges of polluted water offsite to protect the natural hydrology and watershed health.
IV. Enhance Indoor Environmental Quality	
11.	**Ventilation and Thermal Comfort**: Meet the current ASHRAE Standard 55 and either Standard 62.1 or Standard 62.2 for ventilation and thermal comfort. [Required]
12.	**Daylighting and Lighting Controls**: Maximize opportunities for daylighting in regularly occupied space, automatic dimming controls or accessible manual controls, task lighting, and shade and glare control.
13.	**Indoor Air Quality**: Develop and implement an indoor air quality policy that considers the following: moisture control, use of low-emitting materials and products with low-pollutant emissions, necessary protocols to protect indoor air quality during construction and in the finished building, prohibition of smoking in any form inside and within 25 feet of all building entrances, operable windows, and building ventilation intakes, and use of integrated pest management techniques.
14.	**Occupant Health and Wellness**: Where feasible, promote opportunities for voluntary increased physical movement of building occupants such as making stairwells an option for circulation, active workstations, fitness centers and bicycle commuter facilities; and support convenient access to healthy dining options, potable water, daylight, plants, and exterior views.
V. Reduce the Environmental Impact of Materials	
15.	**Material Content and Performance**: Procure products that meet the following requirements where applicable: RCRA Section 6002, AND FSRIA Section 9002, AND

	Federally Recommended Specifications, Standards and Ecolabels or are on the Federal Green Procurement Compilation for other green products, as appropriate, AND Avoid ozone depleting compounds and high global warming potential (GWP) chemicals. [Required]
16.	**Waste Diversion**: Where markets exist, provide reuse and recycling services for building occupants and divert at least 50% of non-hazardous non-construction related materials from landfills. [Required]
17.	**Materials Management**: Where markets exist, divert at least 50% of construction and demolition materials from landfills.
VI. Assess and Consider Climate Change Risks	
18.	**Climate Resilience and Adaptation**: Determine long-term mission criticality of the physical asset and operations to be housed in the facility, AND Evaluate climate change impacts, including wildfire, based on mission criticality and cost, AND Implement no and low-cost actions to increase climate resilience. [Required]

3.4 Net Zero Energy Buildings

Net zero or zero energy buildings combine energy efficiency and renewable energy generation to consume only as much energy as can be produced onsite through renewable resources over a specified time period. Achieving zero energy is an ambitious yet increasingly achievable goal. DOE developed common national zero energy building definitions with supporting nomenclature and guidelines to facilitate its use (National Institute of Building Sciences):

Zero Energy Building: An energy-efficient building where, on a source energy basis, the actual annual delivered energy is less than or equal to the onsite renewable exported energy.

Zero Energy Campus: An energy-efficient campus where, on a source energy basis, the actual annual delivered energy is less than or equal to the onsite renewable exported energy.

Zero Energy Portfolio: An energy-efficient portfolio where, on a source energy basis, the actual annual delivered energy is less than or equal to the onsite renewable exported energy.

Zero Energy Community: An energy-efficient community where, on a source energy basis, the actual annual delivered energy is less than or equal to the onsite renewable exported energy.

Although not currently mandated by federal law, INL has a growing interest in developing zero energy buildings to meet the laboratory's contractual goals and in response to future regulatory mandates.

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4. LEASED BUILDINGS

Per EISA 2007 Section 435, INL is required to lease space in ENERGY STAR qualified buildings in accordance with 42 U.S.C. § 17091:

Except as provided in subsection (b), effective beginning on the date that is 3 years after December 19, 2007, no Federal agency shall enter into a contract to lease space in a building that has not earned the ENERGY STAR label in the most recent year.

(b) Exception—

(1) Application—

This subsection applies if—

(A) no space is available in a building described in subsection (a) that meets the functional requirements of an agency, including locational needs;

(B) the agency proposes to remain in a building that the agency has occupied previously;

(C) the agency proposes to lease a building of historical, architectural, or cultural significance (as defined in section 3306 (a)(4) of title 40) or space in such a building; or

(D) the lease is for not more than 10,000 gross square feet of space.

(2) Buildings without an ENERGY STAR label— If one of the conditions described in paragraph (2) [1] is met, the agency may enter into a contract to lease space in a building that has not earned the ENERGY STAR label in the most recent year if the lease contract includes provisions requiring that, prior to occupancy or, in the case of a contract described in paragraph (1)(B), not later than one year after signing the contract, the space will be renovated for all energy efficiency and conservation improvements that would be cost effective over the life of the lease, including improvements in lighting, windows, and heating, ventilation, and air conditioning systems.

Additionally, INL prefers new construction leases achieve the Guiding Principles. This requirement is the same for new construction leases as for DOE-owned new construction projects.

The preferred method for a new lease of an existing building or renewing an existing lease is to include language to show a preference for meeting the Guiding Principles. Guiding Principles may be met on a graded approach depending on factors such as length of the lease and size or significance of the facility. At a minimum, lease solicitations for existing buildings must include provisions that all cost-effective Guiding Principles-related upgrades be incorporated prior to INL occupancy. This preference will be evident through a grading system that encourages Guiding Principle upgrades as part of the overall solicitation process.

INL managers evaluating space options for smaller short-term or temporary leased facilities must work with the Sustainable INL program and with their procurement representative to ensure that new or renewal lease packages include provisions for a facility walkthrough and the implementation of identified practical upgrades relating to the Guiding Principles prior to INL occupancy. Smaller, short-term leased facilities are typically those leased on a temporary basis with little or no intent of becoming a permanent part of the INL facility inventory.

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5. LIFE-CYCLE COST EFFECTIVENESS

High-performance and sustainable building design and Guiding Principles implementation must be done in a cost-effective manner. The following resources must be used in the design and planning process to determine if cost effective parameters are satisfied. Documentation of the cost-effective analysis will be required by Sustainable INL to show proof for the Guiding Principles.

As per 10 CFR 436.11, "life-cycle cost" means the total cost of owning, operating, and maintaining a building over its useful life (including its fuel and water, energy, labor, and replacement components), determined on the basis of a systematic evaluation and comparison of alternative building systems, except that in the case of leased buildings, the life-cycle cost shall be calculated over the effective remaining term of the lease.

The DOE process for determining life-cycle cost effectiveness is found in 10 CFR Part 436, Subpart A, "Methodology and Procedures for Life Cycle Cost Analyses," which establishes a methodology and procedures for estimating and comparing the life-cycle costs of federal buildings, for determining the life-cycle cost effectiveness of energy conservation measures and water conservation measures, and for rank ordering life-cycle cost effective measures to design a new federal building or to retrofit an existing federal building. It also establishes the method by which efficiency shall be considered when entering into or renewing leases of federal building space.

The term "cost effectiveness" should include the use of benefit-cost analysis in accordance with Office of Management and Budget (OMB) Circulars A-94 as well as A-11, Capital Programming Guide.

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6. LEED®

Although the preferred method for designing and constructing high-performance buildings is by conformance to the Guiding Principles, the Leadership in Environmental and Energy Design (LEED) rating system provides a certification that can be used to promote the building's operational efficiency and meet many of the Guiding Principles requirements. If LEED certification is desired, the best strategy is to select LEED options that best meet the Guiding Principles. The SRIP states: "DOE will work with its programs to ensure LEED Gold and the Guiding Principles requirements are well-understood and implemented into all new construction and major renovation projects."

The LEED rating system and certification by the U.S. Green Building Council (USGBC) is one industry standard peer-reviewed mechanism for validating the design and construction of green buildings. While there is a small initial investment for preparing the LEED submittal package and the administrative fees to the USGBC for registering and certifying a building, the cost premium is typically recovered through reduced energy and operating costs of the building over its life. Furthermore, the documentation deliverables and building commissioning process required by both LEED and the Guiding Principles help to ensure that the building will perform according to its design potential.

Within the DOE complex, several sites have achieved LEED certification on new buildings. For a list of federal and private buildings certified through the USGBC, see http://www.usgbc.org/projects.

INL has several buildings that achieved LEED certification including:

- Center for Advanced Energy Studies (LEED Gold)
- Advanced Test Reactor-Complex Common Support Building (LEED Certified)
- Radiological Environmental Sciences Laboratory (LEED Gold)
- Energy Systems Laboratory (LEED Gold)
- Materials and Fuels Complex Irradiated Materials Characterization Laboratory (LEED Gold)
- Energy Innovation Laboratory (LEED Platinum).

Several LEED rating systems are available for specific buildings types and/or applications. The most applicable rating systems are LEED for Building Design and Construction (BD+C), LEED for Building Operations and Maintenance (O+M), and LEED for Interior Design and Construction (ID+C).

Additional information and details for each of the LEED rating systems may be found on the USGBC website: http://www.usgbc.org/leed.

Each LEED rating system measures the building's sustainable performance by focusing on the following five areas of sustainable design, which are similar and generally compatible with the six focus areas of the Guiding Principles:

- **Location and Transportation.** Promotes the use of commuting and alternative transportation such as bicycles, mass transit, and alternatively fueled vehicles.
- **Sustainable Sites.** Geared toward minimizing site disturbance; using responsible landscaping; and reducing light pollution.
- **Water Efficiency.** Covers design features that reduce potable water consumption and/or wastewater treatment demand.
- **Energy and Atmosphere.** Promotes energy efficiency and renewable energy consumption.
- **Materials and Resources.** Calls for efficient material use through the specification of recycled,

rapidly renewable, salvaged, and local building materials during design and the recycling of building waste during construction and occupancy. The goal is to minimize the demand for virgin materials and the harmful environmental effects associated with extracting and processing them, while lowering the total embodied energy content of the building.

- **Indoor Environmental Quality.** Promotes the health and productivity of building occupants by providing well-ventilated and thermally comfortable interior spaces, daylight and views, and materials that do not off-gas.

7. BEST PRACTICES

This section summarizes several best practices for achieving success when designing, acquiring, and/or operating high-performance buildings. It is not all encompassing, but it does outline design and construction recommendations that work well for INL's geographic area.

- Incorporate high-performance sustainable design requirements into the critical decision process and conceptual design as outlined in DOE O 413.3B and its associated guide DOE G 413.3-6A, Chg 1, "High Performance Sustainable Building."
- Integrated design is a requirement of the Guiding Principles. Attachment C, "Integrated Design Steps for Designers," provides an overview of integrated design for further discussion during each stage of the design and construction process. Using an integrated design process will help to ensure the building is designed in a holistic manner. Integrated design is a team approach that includes all stakeholders involved in the building design, construction, and eventual operation and ownership.
- Individual building systems should not be designed without considering their effect on other building systems. An example of good technical integrated design would be sizing heating, ventilation, and air conditioning (HVAC) to include the heat load from lighting systems. The constructed building would be more cost effective over its life if it is not over-heated or over-cooled and would likely have reduced capital costs during construction.
- Building design energy simulation is a significant part of integrated design. Energy simulation modeling results for energy use should be completed for each phase of the design process. These models should highlight energy/load reductions for each design alternative and energy efficiency measure.
- The best strategy for lighting is to first minimize the amount of general-area lighting needed and then control the light so it is not energized when areas are not occupied. Consider using task lighting whenever possible to reduce the amount of general area lighting needed.
- Investigate if natural light can provide all or some of the lighting in any spaces ("daylighting"). Then include daylighting and automated dimming controls in the design. Daylighting is akin to using renewable energy. It provides an improved work environment and reduces lighting system needs. Daylight simulation (physical or digital models) for critical functional spaces should be performed as part of the conceptual design and final design development packages.
- All internal and external lighting should be light-emitting diode (LED) technology. LED lighting will provide improved efficiency, quality, and quantity of light. LED lighting will also provide significant reduction in relamping and lighting-related maintenance over the lifetime of the building.
- Occupancy and/or vacancy control are required to meet ASHRAE 90.1. Consider the use of wireless lighting controls to reduce the cost of installation and make the final lighting control design more flexible. At a minimum, occupancy control should be provided to all common use areas such as restrooms, conference rooms, and break rooms.
- Specify the most efficient HVAC equipment that is cost effective. Specify set-back/set-up temperature control and economizer cycles for all HVAC equipment. Consider evaporative cooling and natural gas heating. Full building control systems are the preferred method of controlling all building functions including lighting and must be compatible with INL Engineering Specification 230914, "Instrumentation and Control Devices for HVAC."
- Carefully consider the following high-performance design strategies for INL's geographical area:
  - Night flush cooling
  - Cool roof (white) with R30 insulation (INL standard since 2010)

- High insulation levels throughout
- Entry vestibule design to mitigate against high winds.

- Calculate life-cycle costs to compare capital and projected operations and maintenance costs and utilize these results to make informed decisions during the design process.

There are also several post-construction and maintenance-related recommendations that will help the building manager better understand the overall operations of assigned buildings.

- **Ongoing Measurement and Verification**. As part of the measurement and verification required by the Guiding Principles, a regular summary of energy and water trending should be provided to building management personnel including a break down for HVAC, lighting, and plug loads when sub-metered, as a minimum. This trending and analysis can help the building manager identify systems that become less efficient over time or when controls may have failed.

- **Post Occupancy Evaluation**. Consider utilizing a staff survey to be completed for a new building at the end of Year 1, Year 2, Year 5, and then every 5 years to evaluate thermal and visual comfort, as well as other indoor environmental quality attributes. These results can be used in conjunction with the measurement and verification activities to better understand how HVAC systems and air distribution are changing over time.

8. INL RESOURCES

8.1 Certified Energy Manager

Each DOE site is required to have on staff a Certified Energy Manager.

- Primary INL Resource: Ernest Fossum, 208-526-2513

8.2 LEED Accredited Professionals

A LEED Accredited Professional (AP) has demonstrated knowledge in green building design and the LEED rating system through education or experience and taking a series of two exams: the LEED Green Associate, which covers general green building knowledge, and a specialty exam based on one of the LEED rating systems. Additional information is available on the Green Building Certification Institute (GBCI) Web site (www.gbci.org).

Building projects that include a LEED AP on the design team will earn a point towards LEED certification. But more importantly, a LEED AP on the project team will benefit the project by helping in the identification and documentation of concepts needed to meet the Guiding Principles.

INL has several LEED APs that can help with initial design specifications, work scope development, LEED credit evaluations, project review, and Guiding Principles documentation:

- Stephanie Austad, 208-526-2054
- Maryl Fisher, 208-526-8340
- Ernest Fossum, 208-526-2513.

8.3 USGBC Membership

USGBC members receive discounts when registering and certifying buildings, as well as purchasing training (workshops) and reference guides. Membership status also allows for access to additional material on the USGBC and GBCI websites.

INL's membership is under Battelle Corporate. Contact Maryl Fisher, 208-526-8340, for the Corporate Identification Number.

8.4 INL Organizations

Many organizations at INL are available to assist with the areas covered in this document including leasing new office or laboratory space, designing a new building, or making recommendations for renovating an existing building. These organizations and the appropriate contacts include:

- Applied Engineering: Kurt Ririe, 208-526-8799
- Construction Management: Eric Anderson, 208-526-8990
- Procurement Services: Kristen Mayes, 208-526-4466
- Project Management Office: Randall Bargelt, 208-526-2330
- Prime Contract Management/Leases: Adam Andersen, 208-526-1043
- Sustainable INL: Chris Ischay, 208-526-4382; or Ernest Fossum, 208-526-2513; or Maryl Fisher 208-526-8340.

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9. ADDITIONAL RESOURCES

Many resources are available within professional organizations as well as from other DOE laboratories that have successfully implemented high-performance building projects. The following resources, arranged alphabetically, are recommended for more information on designing, constructing, operating, and leasing high-performance sustainable buildings:

International Institute for Sustainable Laboratories, http://www.i2sl.org/

The International Institute for Sustainable Laboratories (I2SL) is devoted to the principles of sustainable laboratories and related high-technology facilities, from design to engineering to operation. Through worldwide partnerships and the exchange of technical expertise, I2SL will encourage the development of high-tech facilities that address the rapid pace of science, medicine, research, and development in an ever-changing and dynamic environment.

Smart Labs, https://betterbuildingsinitiative.energy.gov/accelerators/smart-labs

Coordinated by the U.S. DOE, partners work together to develop standardized approaches to overcoming common barriers to energy efficiency in laboratories.

Sustainable Facilities Tool, https://sftool.gov/

The Sustainable Facilities Tool (SFTool) provides information to help conserve resources and reduce operating costs by bringing together sustainability information, case studies, and a green product search. Use SFTool as a quick reference for day-to-day questions or dig deeper to understand more about efficiency, indoor environmental quality, conservation, and synergies between them.

Sustainability Performance Office, https://energy.gov/management/spo/sustainability-performance-office

The U.S. DOE Sustainability Performance Office (SPO) oversees departmental sustainability efforts required by Executive Order 13834, and related federal laws and regulations. SPO proactively leads DOE's sustainability efforts, collaborates with DOE programs, and promotes the cost-effective use of resources while monitoring the effectiveness of sustainability programs and initiatives.

University of Idaho Integrated Design Lab - Boise, www.idlboise.com

The University of Idaho Integrated Design Lab in Boise is dedicated to developing high-performing energy efficient buildings in the Intermountain West. This is approached through research, education and outreach efforts with students, owners, and professional design and construction teams to transform design practice and keep pace with technologies, materials, and methods of construction that best meet the needs of building owners and society in general. Those who utilize the resources available through the Integrated Design Lab will design and construct buildings that are more comfortable for people, follow best practice design approaches, require less energy to maintain and operate, and enhance the health and productivity of inhabitants.

USGBC Web site, www.usgbc.org

Green building resources including LEED checklists, reference guides and other technical information for the various LEED rating systems, information, and sign-up for courses and workshops. LEED Reference Guides available for purchase.

Whole Building Design Guide, www.wbdg.org

Portal providing government and industry practitioners with one-stop access to up-to-date information on a wide range of building-related guidance, criteria, and technology from a whole building perspective. Currently organized into three major categories—Design Guidance, Project Management and Operations & Maintenance. Website hosts FEMP training on sustainability topics including the Guiding Principles:

http://www.wbdg.org/continuing-education/femp-courses.

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10. SUMMARY

This High-Performance and Sustainable Building Strategy provides a guide for sustainable design at INL. Following the recommendations and requirements outlined will assist with obtaining the most sustainable, efficient, and healthy buildings possible for INL.

Including high-performance and sustainable technical and functional requirements early in the facility development process will result in the maximum sustainability possible for the least amount of capital outlay. If performed correctly, the resultant building will be more life-cycle cost effective and may even reduce the initial capital cost for design and construction.

Providing healthy sustainable buildings is the key for INL's future in attracting the best and brightest minds to support INL's mission.

The recommended review cycle for this document is annually or as needed to stay current with the most recent executive and DOE orders, as well as the latest versions of the Guiding Principles, LEED rating systems, and the relevant INL programs.

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11. REFERENCES

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10 CFR 436.11, "Methodology and Procedures for Life Cycle Cost Analyses", https://ecfr.io//Title-10/sp10.3.436.a.

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DOE-ID, "INL Site Sustainability Plan," DOE/ID-11383.

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DOE Order 436.1, "Departmental Sustainability," May 2, 2011, https://www.directives.doe.gov/directives-documents/400-series/0436.1-BOrder.

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Energy Information Administration, https://www.eia.gov/energyexplained/index.php, webpage accessed June 2019.

Environmental Protection Agency, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions, web page accessed June 2019.

Executive Order 13834, "Efficient Federal Operations" https://www.sustainability.gov/eo-efo.html.

Farm Security and Rural Investment Act (FSRIA), Section 9002, https://www.biopreferred.gov/BioPreferred/faces/pages/FSRIA.xhtml.

Green Building Certification Institute (GBCI), http://www.gbci.org/, webpage accessed September 2017.

INL Engineering Specification (SPECLINK) 230914, "Instrumentation and Control Devices for HVAC."

Leadership in Energy and Environmental Design (LEED®) Green Building Rating System, http://www.usgbc.org/leed.

National Energy Conservation Policy Act (NECPA), https://www1.eere.energy.gov/femp/pdfs/necpa_amended.pdf.

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Whitehouse, OMB Circular A-11, "Capital Programming Guide," https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/assets/a11_current_year/a11_2017/capital_programming_guide.pdf.

Congress, "Pollution Prevention Act of 1990," https://www.congress.gov/bill/101st-congress/house-bill/5931.

Resource Conservation and Recovery Act (RCRA) Section 6002, "Solid Waste Disposal Act," December 31, 2002, https://www.fedcenter.gov/_kd/Items/actions.cfm?action=Show&item_id=30257&destination=ShowItem.

U.S. Green Building Council (USGBC), *LEED Reference Guides*, www.usgbc.org, webpage accessed September 2017.

12. ATTACHMENTS

Attachment A, Executive Order 13834 Fact Sheet – "Efficient Federal Operations"

Attachment B, Guiding Principles for Sustainable Federal Buildings and Associated Instructions

Attachment C, Integrated Design Steps for Designers

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Attachment A

Executive Order 13834 Fact Sheet – "Efficient Federal Operations"

Attachment A

Executive Order 13834 Fact Sheet

https://www.sustainability.gov/pdfs/eo13834_instructions.pdf

Sustainability Goals	Goal Statement / Relevant Policy	Metrics	Performance Measures	Progress Milestones
Energy Reduction	E.O. 13834 Section 2(a): Achieve and maintain annual reductions in building energy use and implement energy efficiency measures that reduce costs.	British thermal units (Btu) used per gross square foot (GSF) of Federal building space (Btu/GSF).	Achieved 30 percent reduction in Btu/GSF relative to fiscal year (FY) 2003 and demonstrates annual progress for each fiscal year.	Agencies will identify targeted reduction for the next fiscal year in the annual Sustainability Plans.
Renewable Energy	E.O. Section 2(b): Meet statutory requirements relating to the consumption of renewable energy and electricity.	Percent of total electricity consumed from renewable sources.	At least 7.5 percent of total electricity consumption.	Agencies will identify target percentage consumption for the next fiscal year in annual Sustainability Plans.
Water Management	E.O 13834 Section 2(c): Reduce potable and non-potable water consumption and comply with stormwater management requirements.	Potable water intensity, measured in gallons per GSF of Federal building space.	Achieved 20 percent reduction relative to FY 2007 and demonstrates annual progress for each fiscal year.	Agencies will identify targeted reduction for the next fiscal year in annual Sustainability Plans.
Performance Contracting	E.O. 13834 Section 2(d): Utilize performance contracting to achieve energy, water, building modernization, and infrastructure goals.	Investment value of performance contracts awarded in dollars; and Number of contracts awarded.	Performance contracts awarded in the fiscal year.	Agencies will identify planned investment in dollars and planned number of projects/contract awards for the next two fiscal years in annual sustainability plans.

Sustainable Buildings	E.O. Section 2(e): Ensure that new construction and major renovations conform to applicable building energy efficiency requirements and sustainable design principles; consider building efficiency when renewing or entering into leases; implement space utilization and optimization practices; and annually assess and report on building conformance to sustainability metrics.	Percentage of buildings qualifying as sustainable buildings; and Percentage of GSF qualifying as sustainable. For owned buildings > 10,000 GSF.	At least 15 percent of buildings or GSF qualifying as sustainable; and Annual progress (either buildings or GSF).	Agencies will identify targeted percentage for the next fiscal year in annual Sustainability Plans.
Waste Management	E.O. 13834 Section 2(f): Implement waste prevention and recycling measures and comply with all Federal requirements with regard to solid, hazardous, and toxic waste management and disposal.	Tons of non-hazardous solid waste18 generated; and Percentage of non-hazardous solid waste sent to treatment and disposal facilities.		Agencies will identify target for percentage reduction in non-hazardous solid waste and percentage reduction sent to treatment and disposal facilities in annual Sustainability Plans.
Fleet Management	In accordance with E.O. 13834 Section 1, agencies are instructed to meet statutory requirements related to energy and environmental performance of vehicles in a manner that increases efficiency, optimizes performance, and reduces waste and costs.	Reduction in petroleum consumption; and Increase in alternative fuel consumption.	Achieved 20 percent petroleum reduction relative to FY 2005 and demonstrate annual progress each fiscal year.	Agencies will identify targets for petroleum reduction and alternative fuel increase for the next fiscal year in annual Sustainability Plans.
Acquisition	E.O. 13834 Section 2(g): Acquire, use, and dispose of products and services, including electronics, in accordance with statutory mandates for purchasing preference, Federal Acquisition Regulation (FAR) requirements, and other applicable Federal procurement policies.	Percentage of contract actions containing statutory environmental requirements; and Percentage of obligations (in dollars) containing statutory environmental requirements.	Increase in the percentage of contract actions and increase in percentage of obligations (in dollars) containing statutory environmental requirements, as compared to the previous fiscal year.	Agencies will identify targets for the next fiscal year in annual Sustainability Plans.

Electronics Stewardship	Agencies are instructed to manage electronics to reduce energy and environmental impacts in accordance with E.O. 13834 goals for Energy Reduction (Section 2(a)), Waste Management (Section 2(f)), and Acquisition (Section 2(g)).			
Data Center Management	Data centers are energy intensive operations that contribute to agency energy and water use and costs. OMB's Office of the Federal Chief Information Officer (OFCIO) leads development of policy and requirements for Federal data center management, including goals for consolidation, virtualization, optimization, efficiency, and transitioning to cloud-based solutions.			
Greenhouse Gas Management and Reporting	Pursuant to E.O. 13834 Section 2(h) and 42 U.S.C. § 17143, agencies are instructed to track and report on greenhouse gas (GHG) emissions and reductions.	Scope 1 and 2 GHG emissions in metric tons CO2e.		Reduction in Scope 1 and 2 GHG emissions from FY 2008 baseline will be reported annually.

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Attachment B

Guiding Principles for Sustainable Federal Buildings and Associated Instructions

The Council on Environmental Quality
February 2016

Guiding Principles for Sustainable Federal Buildings and Associated Instructions

I. Purpose

In 2006, Federal agencies owning and operating more than 90% of all Federal facilities signed the Memorandum of Understanding for Federal Leadership in High Performance and Sustainable Buildings (2006 Guiding Principles).

[1] The Memorandum contained the first set of Guiding Principles - overarching environmental performance goals - for new Federal buildings. The 2006 Guiding Principles addressed reducing energy and water use, conserving resources, minimizing waste, protecting indoor air quality, and requiring the use of integrated teams during the design, construction, and operation of new Federal facilities. An updated set of Guiding Principles, called "High Performance and Sustainable Buildings Guidance," December 2008, contained "Guiding Principles for Sustainable New Construction and Major Renovation" and "Guiding Principles for Sustainable Existing Buildings."[2] Previous Executive Orders (E.O.) 13423 (2006) and 13514 (2009) recognized green buildings as a key component in efforts to reduce environmental impacts, cut greenhouse gas (GHG) emissions, and lower the operating costs at Federal facilities. E.O. 13693, Planning for Federal Sustainability in the Next Decade, March 19, 2015, reaffirmed Federal green building efforts and called for revised Guiding Principles to reflect progress in green building design, construction, and operation practices; broaden considerations around protecting occupant health, wellness, and productivity; and address climate change risks.[3]

E.O. 13693 section 4(f) requires "…CEQ… [to] prepare and issue revised Guiding Principles for both new and existing Federal buildings…" For existing buildings, E.O. 13693 section 3(h)(ii) states that agencies will identify "…a percentage of at least 15 percent, by number or total square footage," of their "existing buildings above 5,000 gross square feet (GSF) that will, by fiscal year 2025, comply with the revised Guiding Principles for Federal Leadership in…Sustainable Buildings (Guiding Principles)…and making annual progress toward 100 percent conformance with the Guiding Principles for its building inventory." For new construction and modernization, E.O. 13693 recommits the Federal Government to these revised Guiding Principles, and beginning in fiscal year (FY) 2020, to design new buildings to be net-zero energy by FY 2030. The June 10, 2015 Implementing Instructions to E.O. 13693 confirmed that agencies "…shall ensure that all new major construction [and] renovation…of buildings over 5,000 gross square feet compl[y]with the Guiding Principles where cost-effective."[4] E.O. 13693 reconfirmed that green building work is an important part of Federal efforts to protect the environment, support communities, and address climate change.

This document updates and replaces the December 2008 Guiding Principles to:

1) Reflect the evolution of sustainable building design, construction, and operating practices since 2008,
2) Incorporate other building-related E.O. 13693 requirements,
3) Increase the economic and environmental benefits of Federal investments in facilities,
4) Enhance occupant health, wellness, and productivity,
5) Include climate resilience in building design, construction, and operations, and protect Federal facilities investments from the potential impacts of climate change, and 6) Provide information on tracking agency green building performance.

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1 www.fedcenter.gov/_kd/Items/actions.cfm?action=Show&item_id=4713&destination=ShowItem

2 www.wbdg.org/pdfs/hpsb_guidance.pdf

3 www.gpo.gov/fdsys/pkg/FR-2015-03-25/pdf/2015-07016.pdf

4 www.whitehouse.gov/sites/default/files/docs/eo_13693_implementing_instructions_june_10_2015.pdf

II. Applicability

The Guiding Principles for new construction and modernization apply to all new Federally owned buildings over 5,000 square feet. The Guiding Principles for existing buildings should be adopted for agencies' existing portfolio of Federally owned buildings over 5,000 square feet. Agencies must ensure that they meet the Guiding Principles on at least 15% of these existing buildings (either by building or by square footage) no later than FY 2025. Once an agency achieves 15% compliance, it should set annual targets and continue to strive to apply the guiding principles to 100% of its building inventory. The Guiding Principles do not apply to those buildings where a Report of Excess (ROE) has been submitted to GSA, a Determination of Disposal has been made, or the building has been classified as Surplus. Agencies should check the Annual Federal Real Property Profile Guidance for additional details. For facilities located outside of the United States, consider the provisions of Section 17 of E.O. 13693 to determine applicability of the Guiding Principles.

Leases will no longer be included in calculating compliance with the Guiding Principles. However, agencies should strive to incorporate as many of the Guiding Principles as possible in new lease actions.

When evaluating compliance with the Guiding Principles, the new construction and modernization criteria should be applied for all new construction and when the project that an agency is undertaking in an existing building is essentially a comprehensive replacement or restoration of virtually all major systems, interior work (such as ceilings, partitions, doors, floor finishes, etc.), and building elements and features.

The Guiding Principles apply to buildings, as well as some functions inherent in optimizing building utilization, including integrated design and operation and maintenance. Some of these concepts, such as occupant health and wellness, overlap with multiple principles. Occupant health and wellness represents a new focus area not included in the 2008 Guiding Principles and so it is highlighted as its own new principle below, despite overlap with other principles such as integrated design and indoor environmental quality. Examples of occupant health and wellness areas that overlap with multiple principles include indoor air quality, accessibility of staircases, fitness facilities, bicycle commuter facilities, and healthy dining options. Similarly, climate resilience and adaptation, which is new and therefore has a principle dedicated to it, also applies to other principles.

Although E.O. 13693 revoked several previous E.O.s and Presidential memoranda that applied to Federal buildings, the following documents still apply and should continue to be used in implementing the Guiding Principles: Sustainable Locations for Federal Facilities of September 15, 2011; Sustainable Practices for Designed Landscapes of October 31, 2011, as supplemented on October 22, 2014; Federal Greenhouse Gas Accounting and Reporting Guidance [Revision 1] of June 4, 2012; and Federal Agency Implementation of Water Efficiency and Management Provisions of Executive Order 13514 of July 10, 2013.

III. Agency Determination of a Building's Compliance with the Guiding Principles

Determining a Building's Compliance with the Guiding Principles

Each agency is responsible for evaluating its buildings for compliance with the Guiding Principles. This determination should be made on a building by building basis. Each agency should ensure that sufficient evidence and documentation is readily available to demonstrate compliance with the Guiding Principles. ENERGY STAR® Portfolio Manager is one of the tools available for agencies to use to organize and keep Guiding Principles documentation; this tool was specifically developed to assist agencies with implementation, documentation, and tracking the Guiding Principles.[5]

Documentation developed to meet the requirements of consensus-based third-party green building rating

[5] www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager

systems can be used to document compliance with the Guiding Principles. Note, however, that green building rating systems may meet many, but not all Guiding Principles. Therefore, required elements or sub-elements of the Guiding Principles not tracked by the third party rating system must also be met.

Guiding Principles that are "Not Applicable"

Previously, there was some ambiguity in determining compliance in buildings where one or more of the guiding principles, elements, or sub-elements were not applicable to the building under evaluation. For building evaluation purposes, "not applicable" may be used where the building's inherent function, mission, safety, or designation prevents compliance with a specific guiding principle, element, or sub-element. The use of "not applicable" should be minimized. For new construction and modernization, "not applicable" is equivalent to compliance with that guiding principle, element, or sub-element. However, for existing buildings, criteria that an agency determines to be "not applicable" do not count toward the total number of required metrics for an individual building. Agencies should document all determinations of non-applicability.

Protocols, Processes, Contracts, and Projects that May Apply to More than One Building

Individual buildings can be compliant with a guiding principle, element, or sub-element through "campus-wide" or "installation-wide" protocols, policies, contracts, or projects only where a given building is directly subject to that protocol, process, contract, or project. Examples of this approach include:

- Green cleaning requirements in a contract servicing all buildings on a campus would mean that each building serviced under that contract meets that particular requirement.
- A centralized or aggregated renewable energy project on an installation that is designated to serve a particular building or buildings on the installation can be used to qualify each of those buildings as meeting cost effective renewable and clean energy requirements.
- A stormwater management project that serves more than a single building site can benefit multiple buildings within the project boundary.
- Measures that protect a campus' utilities and make them more resilient can be applied to each building that benefits from those measures.

E.O. 13693 green building requirements are applied on an individual building basis to improve Federal building design, construction, and operating practices and to foster continuous improvement in building environmental performance. Thus, performance metrics such as energy use or water use cannot be applied to more than one building. Determination of compliance with the Guiding Principles cannot be determined at a campus-wide or installation-wide level.

Life Cycle Cost-Effective

Section 3 of E.O. 13693 states that the Guiding Principles should be applied where life cycle cost-effective. The term "cost-effectiveness" should include the use of benefit-cost analysis in accordance with OMB Circulars A-94 as well as A-11 Part 7 *Capital Programming Guide*.

Updating the Sustainable Building Information in the Federal Real Property Profile

Each agency is responsible for accurately updating Guiding Principles compliance data as part of the agency's annual Federal Real Property Profile (FRPP) submission. Currently, *Sustainability* is the data element that identifies whether or not a building has met the Guiding Principles. Agencies should check the most recent FRPP guidance documents, which are issued annually for specific reporting requirements.

Under E.O. 13693 Section 3 (h)(ii), the percentage of each agency's building inventory meeting the Guiding Principles will be calculated by: (1) gross square footage of subject buildings and (2) number of subject buildings. Agencies can report achievement toward the goal on the higher of the two calculations.

IV. Effective Date

The 2008 Guiding Principles for existing buildings can continue to be used to qualify buildings as meeting the Guiding Principles where agencies have already taken significant action and made substantial progress in transforming the building to meet the Guiding Principles. For existing buildings, completion of project design and/or the issuance of contracts that will result in meeting at least half of the required guiding principles, elements, and sub-elements is evidence of significant action and substantial progress. This group of existing buildings can apply the 2008 Guiding Principles to certify a building as meeting the Guiding Principles through September 30, 2017. The 2016 Guiding Principles will apply to all applicable existing buildings that have not yet crossed the significant action and substantial progress threshold, upon issuance.

The 2008 Guiding Principles for new construction and modernization requirements can be used only to qualify any new building or modernization where project design has been completed before the issuance of the 2016 Guiding Principles. The 2016 Guiding Principles for new construction and modernization requirements shall be used to qualify any new building or modernization as meeting the Guiding Principles for all new construction and modernization where a project design has not been completed.

Buildings that were determined to have met the 2008 Guiding Principles are considered to meet the Guiding Principles through FY 2025 as long as they continue to meet ongoing requirements such as Energy Independence and Security Act of 2007 (EISA) section 432 requirements including quadrennial evaluations, ongoing commissioning, benchmarking, and operating and maintenance requirements. Also, for these [grandfathered] buildings, agencies should add the sixth Guiding Principle on Resilience as they implement the ongoing requirements for a four year evaluation.

Likewise, buildings that have been determined to meet the 2016 Guiding Principles for new construction and modernization can be considered as meeting the Guiding Principles if they continue to meet ongoing sustainable operating requirements such as recommissioning every four years, benchmarking, waste diversion, etc.

V. General Provisions

The revised Guiding Principles shall be implemented consistent with applicable law and regulations, and subject to the availability of appropriations or other authorized funding. The revised Guiding Principles do not supersede or invalidate any existing laws, regulations, or other legal requirements. If there is any conflict between the revised Guiding Principles, and a statute, regulation, or executive order, the statute, regulation, or executive order governs. This document is intended solely to improve the internal management of the Executive Branch. It is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable by any party against the United States, its departments, agencies, or entities, its officers, employees, or agents, or any other person.

VI. Guiding Principles for Sustainable Buildings

A. Guiding Principles for New Construction and Modernization

1. Employ Integrated Design Principles

a. Sustainable Locations

Consider the environmental impact of siting decisions when making new facility investments and balance those concerns with cost and security. The guidance included in Implementing Instructions-Sustainable Locations for Federal Facilities highlights the need to strike the appropriate balance.[6] Consider site-specific long-term climate change impacts such as drought, flood, wind, and wildfire risks. Prioritize sites that offer robust transportation

[6] Implementing Instructions-Sustainable Locations for Federal Facilities:

options, including walking, biking, and transit, and minimize the combined greenhouse gas emissions of the building and associated commuter and visitor transportation emissions over the project's life. Leverage existing infrastructure, and align, where possible, with local and regional planning goals; protect natural, historic, and cultural resources.

b. Integrated Design

Use a collaborative, integrated process and team to plan, program, design, construct, commission, and transition to operation each new building project or modernization. Ensure that the process and team:

i. Integrate the use of OMB's Circular A-11, Part 7, *Capital Programming Guide*.

ii. Establish performance goals for energy, water, materials, indoor environmental quality, and daylighting along with other comprehensive design goals and ensure incorporation of these goals throughout the design and life cycle of the building.

iii. Follow sustainable landscape design principles[7] including protection and promotion of pollinator habitat.[8, 9]

iv. Evaluate and provide appropriate electric vehicle charging infrastructure, in accordance with applicable laws and regulations.

v. Consider design choices that improve environmental performance, protect historic properties, enhance indoor environmental quality, support health and wellness of building occupants, and address climate risks, including wildfire.

vi. Consider all stages of the building's life cycle.

c. Commissioning

Employ commissioning tailored to the size and complexity of the building and its system components in order to optimize and verify performance of building systems. Commissioning should be led by an experienced commissioning provider who is independent of the project design and construction team and the operations team. At a minimum, commissioning should include a commissioning plan, verification of the installation and performance of systems being commissioned, and a commissioning report that confirms identified issues were appropriately addressed. Follow EISA 2007 section 432 and associated Federal Energy Management Program (FEMP) commissioning guidance.[10, 11]

2. Optimize Energy Performance

a. Energy Efficiency

Employ strategies that minimize energy usage. Focus on reducing energy loads before

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www.whitehouse.gov/sites/default/files/microsites/ceq/implementing_instructions_-_sustainable_locations_for_federal_facilities_9152011.pdf

7 Guidance for Federal Agencies on Sustainable Practices for Designed Landscapes, October 31, 2011: www.whitehouse.gov/administration/eop/ceq/sustainability/landscaping-guidance

8 Presidential Memorandum -- Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators, June 20, 2014: www.whitehouse.gov/the-press-office/2014/06/20/presidential-memorandum-creatingfederal-strategy-promote-health-honey-b

9 Supporting the Health of Honey Bees and Other Pollinators, October 2014: www.whitehouse.gov/sites/default/files/docs/supporting_the_health_of_honey_bees_and_other_pollinators.pdf

10 42 U.S.C. § 8253(f): energy.gov/sites/prod/files/2014/07/f17/commissioning_fed_facilities.pdf

11 Guidance for the Implementation and Follow-up of Identified Energy and Water Efficiency Measures in Covered Facilities (per 42 U.S.C. 8253(f), Use of Energy and Water Efficiency Measures in Federal Buildings), September 2012: energy.gov/sites/prod/files/2013/10/f4/eisa_project_guidance.pdf

considering renewable or clean and alternative energy sources. Use energy efficient products as required by statute.[12]

b. Renewable and Clean Energy

Implement life cycle cost-effective renewable electric energy and thermal energy projects onsite. Consider long-term off-site sources of renewable power or Renewable Energy Certificates (RECs) where on-site opportunities are limited. Utilize clean and alternative energy sources where possible.[13]

c. Metering

To track and continuously optimize energy performance, install building level meters for electricity, natural gas, and steam. Install advanced meters as required by statute. Standard meters should be used when advanced meters are not appropriate.[14]

d. Benchmarking

Benchmark building performance at least annually, preferably using ENERGY STAR Portfolio Manager. Agencies should strive to benchmark unusual buildings and space types against similar facilities within their portfolios. Regularly monitor building energy performance against historic performance data and peer buildings to identify operating inefficiencies and conservation opportunities.[15]

3. Protect and Conserve Water

a. Indoor Water Use

Employ strategies that minimize water use and waste, including:

i. Water-Efficient Products

Purchase water conserving products, including WaterSense[16] and FEMP-designated products, as required by statute.

ii. Water Meters

Install building level water meters to allow for the management of water use during occupancy, including detection of leaks.

iii. Cooling Towers

Optimize cooling tower operations.

iv. Single Pass Cooling

Eliminate single pass cooling.

b. Outdoor Water Use

Use water efficient landscapes that incorporate native, non-invasive, drought tolerant, and low maintenance plant species and employ water efficient irrigation strategies to reduce outdoor potable water consumption. Install water meters for irrigation systems serving more than 25,000 square feet of landscaping.[17]

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[12] 42 U.S.C. § 8259b and 10 C.F.R. § 436.40 *et seq*.

[13] E.O. 13693, section 3(b), (c), (d), and (e) and associated definitions in section 19

[14] 42 U.S.C. § 8253(e): energy.gov/sites/prod/files/2014/11/f19/metering_guidance.pdf

[15] 42 U.S.C. § 8253(f) (8): energy.gov/sites/prod/files/2014/09/f18/benchmarking_guidance08-2014.pdf

[16] www3.epa.gov/watersense/

[17] DOE FEMP metering guidance: www.energy.gov/eere/femp/downloads/federal-building-metering-guidance-usc-

c. Alternative Water

Implement cost effective methods to utilize alternative sources of water such as harvested rainwater, treated wastewater, air handler condensate capture, grey water, and reclaimed water, to the extent permitted under local laws and regulations.[18]

d. Stormwater Management

Employ design and construction strategies that reduce stormwater runoff and discharges of polluted water offsite to protect the natural hydrology and watershed health. For any new construction per EISA section 438,[19] use site planning, design, construction, and maintenance strategies to maintain hydrologic conditions after development, or to restore hydrologic conditions following development, to the maximum extent that is technically feasible.

4. Enhance Indoor Environmental Quality

a. Ventilation and Thermal Comfort

Provide safe and healthy ventilation and thermal comfort.

b. Daylighting and Lighting Controls

Maximize opportunities for daylighting in regularly occupied space, except where not appropriate because of building function, mission, or structural constraints. Maximize the use of automatic dimming controls or accessible manual lighting controls, task lighting, and appropriate shade and glare control.

c. Indoor Air Quality

Take actions to ensure optimal indoor air quality, including:

i. Radon

Test for radon in buildings and mitigate high levels.

ii. Moisture Control

Establish policy and implement a moisture control strategy to prevent building materials damage, minimize mold growth, and reduce associated health risks.

iii. Use Low-Emitting Materials

Use low emitting materials for building construction, modifications, maintenance, and operations. In particular, specify the following materials and products to have low pollutant emissions: composite wood products, adhesives, sealants, interior paints and finishes, solvents, carpet systems, janitorial supplies, and furnishings.

iv. Indoor Air Quality during Construction

Establish a policy and implement necessary protocols to protect indoor air quality during construction and in the finished building.

v. Environmental Smoking Control

Prohibit smoking in any form within the building and within 25 feet of all building

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8253e-metering-energy-use

[18] Industrial, Landscape, and Agricultural Implementing Instructions, July 10, 2013: www.whitehouse.gov/sites/default/files/water_implementing_instructions.pdf

[19] http://www.epa.gov/greeningepa/technical-guidance-implementing-stormwater-runoff-requirements-federalprojects

entrances, operable windows, and building ventilation intakes.

vi. Integrated Pest Management

Use integrated pest management techniques as appropriate to minimize pesticide usage.

d. Occupant Health and Wellness

Promote opportunities for occupants to voluntarily increase physical movement such as making stairwells a desirable option for circulation, active workstations, fitness centers, and bicycle commuter facilities. Support occupant health by considering options such as providing convenient access to healthy dining options, potable water, daylight, plants, and exterior views.

5. Reduce the Environmental Impact of Materials

a. Material Content and Performance

Procure construction materials and building supplies that have a lesser or reduced effect on human health and the environment over their life cycle when compared with competing products or services that serve the same purpose, including:

i. Recycled Content and Comprehensive Procurement Guidelines

Use Resource Conservation and Recovery Act (RCRA) section 6002 compliant products that meet or exceed EPA's recycled content recommendations for building construction, modifications, operations, and maintenance.[20]

ii. Biobased Content

Per section 9002 of the Farm Security and Rural Investment Act (FSRIA), for USDA-designated products, use products with the highest content level per USDA's biobased content recommendations.[21]

iii. Other Green Products

Purchase products that meet Federally Recommended Specifications, Standards and Ecolabels[22] or are on the Federal Green Procurement Compilation.[23]

iv. Ozone Depleting Compounds and High Global Warming Potential (GWP) Chemicals

Do not use ozone depleting compounds and high GWP chemicals where EPA's Significant New Alternative Policy (SNAP) has identified acceptable substitutes or where other environmentally preferable products are available during construction, repair, or replacement at the end of life.[24]

b. Waste Diversion and Materials Management

Incorporate appropriate space, equipment, and transport accommodations for collection, storage, and staging of recyclable and, as appropriate, compostable materials in building design, construction, renovation, and operation. During construction, where markets or on-site recycling exist, divert at least 50% (by weight) of construction and demolition materials, excluding land clearing debris and material used as alternative daily cover, from landfills.

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[20] 42 U.S.C. 6962, EPA's Comprehensive Procurement Guidelines for Construction: www3.epa.gov/epawaste/conserve/tools/cpg/products/construction.htm

[21] 7 U.S.C. 8102, USDA's BioPreferred website: www.biopreferred.gov/BioPreferred/

[22] www2.epa.gov/greenerproducts/epas-recommendations-specifications-standards-and-ecolabels

[23] Green Procurement Compilation: sftool.gov/greenprocurement

[24] EPA SNAP website: www.epa.gov/snap

Maximize reuse or recycling of building materials, products, and supplies wherever possible. Provide reuse and recycling services, including composting, for building occupants, where markets or on-site recycling exist, and divert at least 50% of non-hazardous and non-construction related materials (by weight), from landfills.

6. Assess and Consider Climate Change Risks

Assess potential impacts and vulnerabilities, from both acute weather events and chronic climate changes, to inform the design of new construction and modernization and facility operations to increase climate resilience, including:

a. Mission Criticality

Determine the long-term mission criticality of the physical asset and operations to be housed in the facility.

b. Floodplain Considerations

For new construction, avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and avoid floodplain development whenever there is a practicable alternative.[25]

c. Facility Design

For new construction, based on the most recent National Climate Assessment,[26] determine key potential climate change impacts for the project location, identify projected climate changes, where feasible, during the useful life of the building, and incorporate those projections as performance targets for project design. Consider fire-resistant design and construction to enhance resilience to the impacts of wildfires and reduce risks to the lives of occupants in the event of a wildfire. Balance options to address predicted climate change impacts against mission criticality, cost, and security to determine design parameters. At a minimum, include low and no cost resilience measures to address predicted climate conditions.

d. Facility Adaptation

For modernization, focusing on the resilience of the physical facility, take action to mitigate identified physical risks considering mission criticality, potential climate change impacts, security, and cost. Consider phased adaptation over time.

B. Guiding Principles for Existing Buildings

1. Employ Integrated Assessment, Operation, and Management Principles

a. Integrated Assessment, Operation, and Management

Through an integrated process and team, identify and implement sustainable operations and maintenance policies that improve building environmental performance, protect natural, historic, and cultural resources, support occupant health and wellness, and improve the climate resilience of facilities and operations.

i. Integrate the use of OMB's Circular A-11, Part 7, Capital Programming Guide.

ii. Assess existing condition and operational procedures of the building and major building

[25] www.gpo.gov/fdsys/pkg/FR-2015-02-04/pdf/2015-02379.pdf

[26] Use Climate Science Supplement Appendix 3 of the 2014 National Climate Assessment and the NOAA Technical Report NESDIS 142-9, January 2013 Regional Climate Trends and Scenarios for the U.S. National Climate Assessment Part 9, Climate of the Contiguous United States, or most recent.

systems, adequacy of electric vehicle charging infrastructure, in accordance with applicable laws and regulations, and identify areas for improvement.

iii. Establish operational performance goals for energy, water, material use and recycling, and indoor environmental quality, and ensure incorporation of these goals throughout the remaining life cycle of the building and verify that they are being met.

iv. Incorporate goals into building management to ensure that operating decisions and tenant education are carried out with regard to integrated, sustainable building operations and maintenance.

v. Engage building occupants with building environmental performance information. Augment building operations and maintenance as needed using occupant feedback on work space satisfaction.

b. Commissioning

Meet the commissioning requirements of EISA 2007 section 432 and FEMP guidance.[27, 28] Employ recommissioning, tailored to the size and complexity of the building and its system components, in order to optimize and verify performance of building systems.

Recommissioning should be led by an experienced commissioning agent who is independent of the facility operations team. Building recommissioning should include a commissioning plan, verification of the performance of systems being commissioned, and a commissioning report that confirms identified issues were appropriately addressed.

2. <u>Optimize Energy Performance</u>

a. Energy Efficiency

Seek to achieve optimal energy efficiency and measure performance on a regular basis. Focus on reducing energy loads before considering renewable or clean and alternative energy sources. Use energy efficient products as required by statute.[29]

b. Renewable and Clean Energy

Implement cost-effective renewable electric energy and thermal energy projects on-site. Consider long-term off-site sources of renewable power or RECs where on-site opportunities are limited. Utilize clean and alternative sources where possible.[30]

c. Metering

To track and continuously optimize energy performance, install building level meters for electricity, natural gas, and steam. Install advanced meters as required by statute. Standard meters should be used when advanced meters are not appropriate.[31]

d. Benchmarking

Compare building performance with energy performance benchmarks at least annually, preferably using ENERGY STAR Portfolio Manager. Agencies should strive to benchmark unusual buildings and space types against similar facilities within their portfolios. Regularly

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[27] 42 U.S.C. § 8253(f): energy.gov/sites/prod/files/2014/07/f17/commissioning_fed_facilities.pdf

[28] Guidance for the Implementation and Follow-up of Identified Energy and Water Efficiency Measures in Covered Facilities (per 42 U.S.C. 8253(f), Use of Energy and Water Efficiency Measures in Federal Buildings), September 2012: energy.gov/sites/prod/files/2013/10/f4/eisa_project_guidance.pdf

[29] 42 U.S.C. § 8259b and 10 C.F.R. § 436.40 *et seq*.

[30] E.O. 13693, section 3(b), (c), (d), and (e) and associated definitions in section 19

[31] 42 U.S.C. § 8253(e): energy.gov/sites/prod/files/2014/11/f19/metering_guidance.pdf

monitor building energy performance against historic performance data and peer buildings to identify operating inefficiencies and conservation opportunities.[32]

3. Protect and Conserve Water

a. Indoor Water Use

Employ strategies that measure and minimize water usage, including:

i. Water Use Evaluations

Conduct an analysis and take action to monitor facility water use and identify and implement conservation opportunities.[33]

ii. Water-Efficient Products

Purchase water conserving products, including WaterSense[34] and FEMP-designated products, as required by statute.

ii. Water Meters

Install building level water meters to allow for the management of water use during occupancy, including detection of leaks.

iv. Cooling Towers

Optimize cooling tower operations.

v. Single Pass Cooling

Eliminate single pass cooling.

b. Outdoor Water Use

Use water efficient landscape and irrigation strategies to reduce outdoor potable water consumption.[35] The installation of water meters is required for irrigation systems serving more than 25,000 square feet of landscaping.[36]

c. Alternate Water

Implement cost effective methods to utilize alternative sources of water such as harvested rainwater, treated wastewater, air handler condensate capture, grey water, and reclaimed water, to the extent permitted under local laws and regulations.[37]

d. Stormwater Management

Employ strategies that reduce stormwater runoff and discharges of polluted water offsite to protect the natural hydrology and watershed health.[38]

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[32] 42 U.S.C. § 8253(f) (8): energy.gov/sites/prod/files/2014/09/f18/benchmarking_guidance08-2014.pdf

[33] www.energy.gov/eere/femp/developing-water-management-plan can provide an understanding of how to develop a water use analysis

[34] www3.epa.gov/watersense/

[35] Guidance for Federal Agencies on Sustainable Practices for Designed Landscapes, October 31, 2011: www.whitehouse.gov/administration/eop/ceq/sustainability/landscaping-guidance

[36] DOE FEMP metering Guidance: www.energy.gov/eere/femp/downloads/federal-building-metering-guidance-usc-8253e-metering-energy-use

[37] Implementing Instructions: Federal Agency Implementation of Water Efficiency and Management Provisions of E.O. 13514, July 10, 2013: www.whitehouse.gov/sites/default/files/water_implementing_instructions.pdf

[38] http://www.epa.gov/greeningepa/technical-guidance-implementing-stormwater-runoff-requirements-federalprojects

4. Enhance Indoor Environmental Quality

a. Ventilation and Thermal Comfort

Provide safe and healthy ventilation and thermal comfort.

b. Daylighting and Controls

Maximize opportunities for daylighting within the existing structure except where not appropriate because of building function, mission, or structural constraints. Maximize the use of automatic dimming controls or accessible manual lighting controls, task lighting where life cycle cost-effective, and appropriate shade and glare control.

c. Indoor Air Quality

Take actions to ensure optimal indoor air quality, including:

i. Radon

Test for radon in buildings and mitigate high levels.

ii. Moisture Control

Establish policy and implement a moisture control strategy to prevent building materials damage, minimize mold growth, and reduce associated health risks.

iii. Low-Emitting Materials

Use low-emitting materials for building modifications, maintenance, and operations. In particular, specify the following materials and products to have low pollutant emissions: composite wood products, adhesives, sealants, interior paints and finishes, solvents, carpet systems, janitorial supplies, and furnishings.

iv. Indoor Air Quality during Building Alterations

Establish a policy and implement necessary protocols to protect indoor air quality during renovations, repairs, and alterations, and during occupancy.

v. Environmental Smoking Control

Prohibit smoking in any form within the building and within 25 feet of all building entrances, operable windows, and building ventilation intakes.

vi. Integrated Pest Management

Use integrated pest management techniques as appropriate to minimize pesticide usage.

d. Occupant Health and Wellness

Promote opportunities for voluntary increased physical movement of building occupants such as making stairwells a desirable option for circulation, active workstations, fitness centers, and bicycle commuter facilities. Support occupant health by considering options such as providing convenient access to healthy dining options, potable water, daylight, plants, and exterior views where possible.

5. Reduce the Environmental Impact of Materials

a. Material Content and Performance

Procure products and supplies that have a lesser or reduced effect on human health and the environment over their life cycle when compared with competing products or services that serve the same purpose, including:

i. Recycled Content and Comprehensive Procurement Guidelines

Use RCRA section 6002 compliant products that meet or exceed EPA's recycled content recommendations for building construction, modifications, operations, and maintenance.[39]

ii. Biobased Content

Per section 9002 of the FSRIA, for USDA-designated products, use products with the highest content level per USDA's biobased content recommendations.[40]

iii. Other Green Products

Purchase products that meet Federally Recommended Specifications, Standards and Ecolabels[41] or are on the Federal Green Procurement Compilation.[42]

iv. Ozone Depleting Compounds and High Global Warming Potential Chemicals

Eliminate, to the maximum extent practicable, ozone depleting compounds and high GWP chemicals where EPA's SNAP has identified acceptable substitutes or where other environmentally preferable products are available.[43]

b. Waste Diversion and Materials Management

During alteration and repair projects, where markets or on-site recycling exist, divert at least 50% (by weight) of construction and demolition materials, excluding land clearing debris and material used as alternative daily cover, from landfills. Provide reuse and recycling services, including composting, for building occupants where markets or on-site recycling exist, and divert at least 50% of non-hazardous and non-construction related materials (by weight) from landfills. Provide salvage, reuse, and recycling services for waste generated from building operations, maintenance, repair and minor renovations, and discarded furnishings, equipment, and property.

6. Assess and Consider Climate Change Risks

Assess risks to facility and operations from both acute weather events and chronic climate changes, and implement action to increase climate resilience. Where possible, align with local and regional efforts to increase community resilience.

a. Mission Criticality

Determine the long-term mission criticality of the physical asset and the operations housed in the facility.

b. Risks from Climate Change

Assess facilities, and based on mission criticality, identify possible existing, short-term, and long-term physical and operational vulnerabilities related to potential climate impacts.[44] Consider fire-resistant operation and management to enhance resilience to the impacts of wildfires and reduce risks to the lives of occupants in the event of a wildfire.

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[39] 42 U.S.C. 6962, EPA's Comprehensive Procurement Guidelines for Construction: www3.epa.gov/epawaste/conserve/tools/cpg/products/construction.htm

[40] 7 U.S.C. 8102, USDA's BioPreferred website: http://www.biopreferred.gov/BioPreferred/

[41] www2.epa.gov/greenerproducts/epas-recommendations-specifications-standards-and-ecolabels

[42] Green Procurement Compilation: sftool.gov/greenprocurement

[43] EPA SNAP website: www.epa.gov/snap

[44] Use Climate Science Supplement Appendix 3 of the 2014 National Climate Assessment and the NOAA Technical Report NESDIS 142-9, January 2013 Regional Climate Trends and Scenarios for the U.S. National Climate Assessment Part 9, Climate of the Contiguous United States, or most recent.

c. Facility Adaptation

Focusing on the resilience of the physical facility, take action to mitigate identified physical risks considering mission criticality, potential climate change impacts, security, and cost.

Attachment C

Integrated Design Steps for Designers

Attachment C

Integrated Design Steps for Designers

BETTERBRICKS
Bottom line thinking on energy.

INTEGRATED DESIGN STEPS FOR DESIGNERS

The following describes key steps for the design team throughout the Integrated Design process. The steps are organized as a checklist for each of the traditional phases of design.

PRE-DESIGN

- Hold an early planning meeting (or Charrette) with the planning team (owner and planning consultants)
- Develop high performance goals, including a measurable energy performance goal, such as 25% less energy use than required by code
- Commit to an Integrated Design process
- Assemble a team experienced with Integrated Design or willing to spend the time to learn
- Identify roles and responsibilities for team members, including a champion for the Integrated Design process
- Determine financial criteria and priorities for design decisions
- Assess adequacy of the project budget and schedule, allow for additional time during Schematic Design for Integrated Design
- Encourage the owner to contract with a commissioning provider beginning with documentation of design intent and owner's project requirements during Schematic Design
- Gather climate and utility cost data
- Talk to local utilities, non-profits, state and federal agencies about available incentives and tax credits

SCHEMATIC DESIGN

- Hold a full design Charrette with all team members, including the users, and construction side, to kick-off the conceptual design
- Confirm and refine high performance goals and criteria
- Refine the building program and space functions, consider energy impacts of proximities
- Schedule periodic team meetings and support brainstorming and collaborative problem-solving
- Develop several design options that reduce loads on the building, look for synergies between climate, use, loads and systems
- Conduct simplified energy modeling and Life-Cycle Cost Analysis for design alternatives in order to make objective choices between options
- Compare results of this phase to the high performance goals

DESIGN DEVELOPMENT

- Discuss potential building systems and identify high efficiency options
- Conduct whole-building energy modeling to confirm the design meets the high performance goals, and to confirm eligibility for rating systems, incentives and tax credits
- Verify, with the owner, that the design documents at this stage contain the strategies to meet the performance goals
- Ask the whole team to help assess the preliminary cost model
- During value engineering, vigorously defend the value of high performance features as being integral to the whole building design and function

CONSTRUCTION DOCUMENTS

- Invite the commissioning provider, and maintenance and operations staff to conduct a document review of building systems
- Hold frequent coordination meetings to keep communication flowing among team members
- Update the cost model and schedule with input from the team
- Request documentation from the team that indicates how the project compares to the high performance goals set in Pre-Design
- Verify that the construction documents contain the strategies to meet the performance goals (consider asking the commissioning provider and contractor, to conduct this review)

CONSTRUCTION

- Conduct a construction kick-off meeting with the contractors and subcontractors to secure their commitment to the high performance goals before construction starts
- Review submittals and substitution requests for impact on the performance goals
- At the end of construction and prior to occupancy, allow time for the commissioning provider to complete functional testing and O&M training
- Review the commissioning report with the owner and have the contractor address any recommended repairs or alterations

OCCUPANCY

- Assist the owner and facility team to establish an ongoing energy management program, including training and periodic re-commissioning
- After the warranty period shakedown, verify that high performance goals were met, assess occupant satisfaction, and share feedback with the whole team