



Report to the Ranking Member,
Committee on Homeland Security and
Governmental Affairs, U.S. Senate

July 2015

FEDERAL GREEN BUILDING

Federal Efforts and
Third-Party
Certification Help
Agencies Implement
Key Requirements,
but Challenges
Remain

GAO Highlights

Highlights of [GAO-15-667](#), a report to the Ranking Member, Committee on Homeland Security and Governmental Affairs, U.S. Senate

Why GAO Did This Study

As the nation's largest energy consumer, the federal government spent about \$7 billion in fiscal year 2014 to provide energy to over 275,000 federally owned or leased buildings. Federal law and policies for improving sustainability across the federal government include “green building” provisions—construction and maintenance practices designed to make efficient use of resources and reduce environmental impacts, among other benefits. A March 2015 executive order required CEQ to revise key green building requirements and extended the time frames for implementation in existing buildings. Third-party certification systems are used to assess how well green building elements are incorporated into a building's design and operation.

GAO was asked to review federal green building efforts and agencies' use of third-party certification systems. This report examines (1) federal efforts to support agencies' implementation of key green building requirements, (2) select agencies' use of third-party certification systems, and (3) challenges select agencies face in implementing requirements. GAO reviewed federal requirements; agency policies and guidance; and interviewed officials from agencies with supporting roles and agencies with experience implementing the requirements and using different certification systems. GAO also reviewed documentation and interviewed representatives from third-party certification organizations.

GAO is not making recommendations. CEQ, DOD, DOE, EPA, GSA, OMB, and VA reviewed a draft report and most provided technical comments that GAO incorporated, as appropriate.

View [GAO-15-667](#). For more information, contact Frank Rusco at (202) 512-3841 or ruscof@gao.gov, Brian J. Lepore at (202) 512-4523 or leporeb@gao.gov, or David J. Wise at (202) 512-2834 or wised@gao.gov.

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Federal Efforts and Third-Party Certification Help Agencies Implement Key Requirements, but Challenges Remain

What GAO Found

The Council on Environmental Quality (CEQ), Department of Energy (DOE), Environmental Protection Agency (EPA), General Services Administration (GSA), and Office of Management and Budget (OMB) provide guidance, oversight, training, and other support to agencies implementing key federal green building requirements. For example, DOE offers training on measuring and reporting on the implementation of requirements, among other things. Also, EPA's Energy Star Portfolio Manager is a web-based tool agencies and other entities can use to measure and track buildings' energy and water use. According to officials, some federal support efforts will need to be updated when the revised requirements are issued, as called for in the March 2015 executive order.

All of the select agencies GAO reviewed—Department of Defense (DOD), DOE, EPA, GSA, and the Department of Veterans Affairs (VA)—use third-party certification systems to help implement key federal green building requirements for new construction and major renovation projects. While certification does not ensure that a building meets all requirements, agencies have developed tools to ensure that any remaining federal requirements are implemented at their buildings, and officials noted that there are additional benefits to using these systems. For example, officials stated that certification provides a well-established framework for documenting and ensuring compliance; serves as a tool to communicate with contractors and the public; and reduces the need for additional staff to verify that a building meets requirements. Of the select agencies GAO reviewed, none require third-party certification for existing buildings, but three have developed their own systems for assessing the implementation of key requirements for existing buildings. Several agencies stated that they are not certain how they will use third-party certification systems in the future after the revisions to key green building requirements are issued. For example, EPA and VA officials stated that they may reevaluate their requirement to certify specific projects after the revised green building requirements are issued.

Regardless of whether they use certification systems, the agencies GAO reviewed identified a variety of challenges in implementing current green building requirements, including challenges related to their building inventories, missions, and the criteria for evaluating compliance. For example, DOD officials said that the sheer number of buildings in their inventory proves challenging. In addition, according to officials from several agencies, their building inventories include certain building types, such as laboratories, hospitals, and industrial buildings for which some requirements are difficult to implement. VA cited mission concerns, including new safety requirements and extended hours to address patient backlogs, as a challenge to implementing energy and water conservation requirements. Also, some agency officials said that the criteria for evaluating compliance with the requirements can be a disincentive to implementing some requirements because no credit is received unless all of the requirements are implemented. Forthcoming revisions to key green building requirements may address some of these challenges. CEQ officials said that they were aware of the challenges and want to ensure that they are not providing any disincentives for agencies to meet some of the requirements even if they cannot meet all.

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Abbreviations

ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.
CEQ	Council on Environmental Quality
DOD	Department of Defense
DOE	Department of Energy
EISA	Energy Independence and Security Act of 2007
EPA	Environmental Protection Agency
FEMP	Federal Energy Management Program
GSA	General Services Administration
Guiding Principles	Guiding Principles for Federal Leadership in High Performance and Sustainable Building
LEED	Leadership in Energy and Environmental Design
NREL	National Renewable Energy Laboratory
OASD EI&E	Office of the Assistant Secretary of Defense for Energy, Installation, and Environment
OMB	Office of Management and Budget
SFTool	Sustainable Facilities Tool
VA	Department of Veterans Affairs

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July 23, 2015

The Honorable Thomas R. Carper
Ranking Member
Committee on Homeland Security and Governmental Affairs
United States Senate

Dear Senator Carper:

The federal government is the nation's largest energy consumer, spending about \$7 billion in fiscal year 2014 to provide energy to its facilities, including over 275,000 federally owned or leased buildings.¹ These buildings affect our environment, economy, and the productivity and health of the workers and visitors who use them. Numerous federal policies aim to improve federal energy and environmental management and take advantage of the opportunity that the size and scope of the government's operations present to implement sustainable practices on a large scale, lower costs, and reduce the environmental impact of federal buildings. Federal law, executive orders, and policies include provisions specifically related to "green building." Green building generally refers to designing, constructing, operating, and maintaining buildings to use resources efficiently, reduce environmental impacts, and provide long-term financial and health benefits, including through lower annual operating costs and better indoor air quality. Specifically, green building includes the use of strategies to support objectives that include the following:

- *integrated design*—use collaborative planning and design processes that involve a variety of stakeholders in decision making for all stages of a building's life cycle, including planning, building, and operation;
- *energy conservation or efficiency*—reduce energy consumption or use renewable sources of energy;

¹Data on the federal government's energy use are from the Department of Energy's (DOE) Comprehensive Annual Energy Data and Sustainability Performance data set. Data on federal property holdings are from the General Services Administration's (GSA) fiscal year 2014 Federal Real Property Profile data set, which includes buildings in the United States and U.S. territories.

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- *water conservation or efficiency*—reduce water consumption inside and outside the building;
 - *indoor environmental quality*—enhance indoor environmental quality through ventilation, controlling pollution sources, and using low pollution-emitting materials;
 - *environmental impact of materials*—reduce the environmental impact of materials by minimizing waste and using products with high recycled content, among other things; and
 - *sustainable siting or location measures*—use of certain strategies when deciding on building location, including discouraging development on previously undeveloped land and minimizing a building’s impact on the nearby ecosystem, among other things.

Federal law and policies direct agencies to implement green building requirements in federally owned and leased buildings. The *Guiding Principles for Federal Leadership in High Performance and Sustainable Building* (Guiding Principles)—originally a 2006 memorandum of understanding among 19 federal agencies to commit to the design, construction, and operation of green buildings—were updated in 2008 and incorporated relevant requirements in federal law. In this report, we refer to the 2008 Guiding Principles and the statutory requirements referenced within them as the key federal green building requirements.² The Guiding Principles include one set of requirements for new construction and major renovations and a separate set for existing buildings, and we refer to these together as the Guiding Principles. Agencies are operating under the goal of ensuring that all new construction and major renovation and 15 percent of existing buildings and leases over 5,000 gross square feet comply with the Guiding Principles by fiscal year 2015 as required by the recently revoked Executive Order 13514 (*Federal Leadership in Environmental, Energy, and Economic Performance*).³ In March 2015, a new executive order—

²In some cases, we refer specifically to the Guiding Principles when the information does not directly involve the statutory requirements referenced within the Guiding Principles.

³Starting with Executive Order 13423 (*Strengthening Federal Environmental, Energy, and Transportation Management*) in January 2007, three executive orders directed agencies to ensure that a portion of federal buildings implement the Guiding Principles. Executive Order 13514 (*Federal Leadership in Environmental, Energy, and Economic Performance*) and Executive Order 13423 were both revoked by Executive Order 13693 (*Planning for Federal Sustainability in the Next Decade*). According to Council on Environmental Quality (CEQ) officials, agencies are continuing to work towards the green building goals laid out in Executive Order 13514 and will begin working on the updated goals of Executive Order 13693 in 2016.

Executive Order 13693 (*Planning for Federal Sustainability in the Next Decade*)—called for the Council on Environmental Quality (CEQ) to revise the Guiding Principles by August 16, 2015.⁴ Further, it called for agencies to identify a percentage of at least 15 percent of the agency’s existing buildings above 5,000 gross square feet that will, by fiscal year 2025, comply with the revised Guiding Principles. The 2008 Guiding Principles called for a review every 2 years, at a minimum, to keep pace with evolving sustainable building practices and new regulations and legislation. Over the past several years, working groups were established to provide input to inform revisions to the Guiding Principles and these groups made recommendations accordingly. The Guiding Principles have not been revised since 2008, but CEQ officials told us that they have been working on the revisions. These officials said that there have been advancements in policy and technology since 2008, and the need to reflect those advancements in the Guiding Principles is one reason for the revision. Executive Order 13693 established a deadline for CEQ to prepare and issue revised Guiding Principles for both new and existing federal buildings including consideration of climate change resilience and employee and visitor wellness, which were areas not included in the 2008 Guiding Principles.

Private industry and federal agencies use green building certification systems developed by third-party entities to assess how green building elements are incorporated into the design and operation of a building. The third-party entity conducts an assessment that rates a building by awarding points in different categories, such as water and energy consumption. A building may achieve different rating levels within a certification system depending on how many points it achieves. Federal agencies are not required to use a third-party certification system but, if an agency chooses to use a system, the Energy Independence and Security Act of 2007 (EISA) requires that the system meet certain criteria outlined in the Department of Energy’s (DOE) regulation on the use of these systems.⁵

⁴As of June 12, 2015, the revised Guiding Principles were not complete, but CEQ officials told us that they are working toward meeting the August 16, 2015 deadline to complete the revision.

⁵Department of Energy, *Green Building Certification Systems for Federal Buildings*, Final Rule, 79 Fed. Reg. 61563 (Oct. 14, 2014).

You asked us to review federal green building efforts and the use of third-party certification systems to help implement federal green building requirements. This report examines (1) federal efforts that support agencies' implementation of key federal green building requirements; (2) select agencies' use of third-party green building certification systems to help implement key federal green building requirements; and (3) the challenges, if any, select agencies face implementing key federal green building requirements.

To address these objectives, we reviewed federal law, other federal green building requirements, and related policies and guidance; interviewed agency officials; and reviewed documentation and interviewed officials from third-party certification systems. To identify the key federal green building requirements that federal agencies must implement at their buildings, we reviewed our prior work on green buildings,⁶ and identified and reviewed the primary sources of green building requirements in federal law, executive orders, and policies aimed at achieving sustainability goals across the federal government. We determined that the Guiding Principles, including their references to existing statute, reflect the most relevant and detailed source of federal green building requirements, and for the purpose of this review, the Guiding Principles and the statutory requirements referenced within them comprise the key federal green building requirements. Appendix I lists the requirements in the Guiding Principles. We interviewed officials from agencies that either had roles in supporting the implementation of federal green building requirements—DOE; the Environmental Protection Agency (EPA); the General Services Administration (GSA); CEQ, including the Office of Federal Sustainability; and the Office of Management and Budget (OMB)—which we refer to as supporting agencies, or agencies with experience implementing the requirements—the Department of Defense (DOD) including the Air Force, Army, Navy, and the Office of the Assistant Secretary of Defense for Energy, Installations, and Environment (OASD EI&E); DOE; EPA; GSA; and the Department of Veterans Affairs (VA)—which we refer to as select agencies. We identified DOE, EPA, GSA, CEQ, and OMB as supporting agencies because they have been

⁶GAO, *Green Building: Federal Initiatives for the Nonfederal Sector Could Benefit from More Interagency Collaboration*, [GAO-12-79](#) (Washington, D.C.: Nov. 2, 2011) and *Federal Energy Management: Agencies Are Taking Steps to Meet High-Performance Federal Building Requirements, but Face Challenges*, [GAO-10-22](#) (Washington, D.C.: Oct. 30, 2009).

assigned responsibilities for supporting federal green building efforts, such as developing guidance or chairing working groups, or have assumed such responsibilities. We included DOD, DOE, EPA, GSA, and VA as select agencies with experience implementing the requirements based on the size of their building inventories, energy use, and experience with the use of different third-party certification systems. We included DOE, EPA, and GSA as both supporting and select agencies to obtain information related to their supporting roles and experience implementing green building requirements. In addition, for the five select agencies we obtained responses to a standard set of questions and interviewed headquarters and building-level officials. The information obtained from these agencies is not generalizable across the federal government, but together the select agencies own or lease a significant portion of federal buildings (about 63 percent of buildings and 84 percent of square footage) and account for approximately 77 percent of the energy consumed by federal buildings and facilities.

To examine federal efforts that support agencies' implementation of key federal green building requirements, we reviewed prior GAO reports and agency documentation and interviewed officials from supporting and select agencies. To examine select agencies' use of third-party green building certification systems to help implement key federal green building requirements, we reviewed policy documents, such as DOD's *Unified Facilities Criteria*, and we interviewed headquarters and building-level officials from select agencies. We reviewed federal reports on the use of third-party certification by federal agencies, such as Pacific Northwest National Laboratory's 2012 *Green Building Certification System Review*. We also reviewed documentation and interviewed representatives of the U.S. Green Building Council, the Green Building Initiative, Green Business Certification Inc., and the International Living Future Institute. To examine the challenges, if any, select agencies face implementing key federal green building requirements, we reviewed agency documents, such as Strategic Sustainability Performance Plans, and interviewed officials from select agencies. To get information about government-wide challenges agencies face in implementing key green building requirements, we interviewed supporting agency officials and attended and reviewed Interagency Sustainability Working Group presentations.

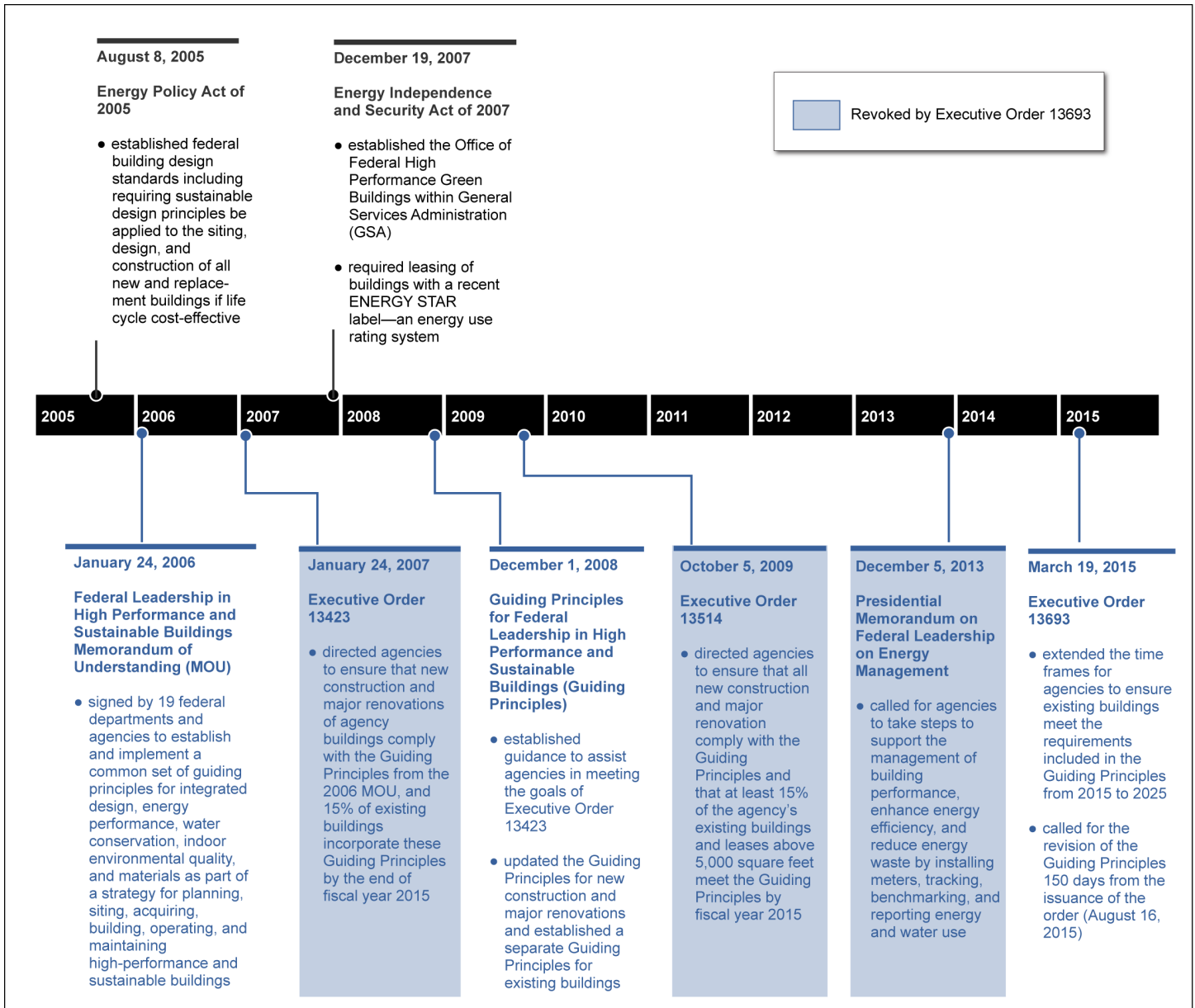
We conducted this performance audit from October 2014 to July 2015 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that

the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Federal policy aimed at promoting sustainability in federal facilities sets goals for reducing greenhouse gas emissions and implementing key green building requirements, among other areas. Green building goals established by executive order in 2009 built on previous efforts to establish federal green building policy. Figure 1 shows the timeline of sources of key green building requirements from 2005 through June 2015. In March 2015, the third executive order to require compliance with the Guiding Principles—Executive Order 13693—revoked two prior executive orders and certain other green building policies and extended the time frames for agencies' existing buildings to comply with the Guiding Principles from 2015 to 2025.

Figure 1: Timeline of the Sources of Key Federal Green Building Requirements 2005-2015



Sources: GAO analysis of federal law, executive orders, and other policies. | GAO-15-667

Note: Executive Order 13693 does not revoke the 2006 memorandum of understanding or the 2008 Guiding Principles. After 2015, the 2008 Guiding Principles will no longer be in effect because Executive Order 13693 revoked the executive orders that require implementation of the Guiding Principles and called for their revision. Executive Order 13693 requires CEQ to prepare and issue revised Guiding Principles for both new and existing federal buildings including consideration of climate change resilience and employee and visitor wellness.

Key federal green building requirements include dozens of specific requirements related to five Guiding Principles: employ integrated design principles, optimize energy performance, protect and conserve water, enhance indoor environmental quality, and reduce the environmental impact of materials. The requirements range from requirements to reduce water consumption to others aimed at improving indoor environmental quality, including tobacco smoke control and daylighting requirements.⁷ See appendix I for the specific requirements included in the Guiding Principles which are currently undergoing revision. CEQ officials said that the revisions will include consideration of climate change resilience and employee and visitor wellness as called for in Executive Order 13693. The current criteria for determining whether a building complies with the Guiding Principles include either (1) demonstrating a building was compliant with each of the five Guiding Principles or (2) documenting that a commitment to third-party certification for a building was made prior to October 1, 2008, and that the building obtained the certification. In addition, for leased buildings, a building is considered compliant if either (1) the building was third-party certified at any time or (2) the agency demonstrated compliance with the appropriate set of Guiding Principles (those for new construction and major renovations or existing buildings). As of June 12, 2015, the revised Guiding Principles were not complete, but CEQ officials told us that they are working toward meeting the August 16, 2015, deadline to complete the revision.

OMB's sustainability and energy scorecard assesses federal agency performance in meeting federal sustainability goals.⁸ The goal for green building is based on the extent to which agencies meet intermediate goals toward the 2015 goal of implementing the Guiding Principles for all new construction and major renovation and at least 15 percent of existing buildings and leases over 5,000 square feet. In fiscal year 2013, 10 of the 16 agencies that received green buildings scores had not met intermediate goals, or could not demonstrate compliance with the Guiding Principles for new construction, major renovations, or leases, and

⁷Daylighting requirements call for buildings to achieve a minimum amount of daylight exposure in a certain amount of the space.

⁸Agencies are assessed on several sustainability areas including energy intensity, water intensity, fleet petroleum use, greenhouse gas emissions, green building, and renewable energy use. Agencies are also evaluated on demonstrating progress toward implementing additional goals and requirements such as Energy Independence and Security Act of 2007 requirements for federal agencies to reduce energy intensity.

received a red score on the scorecard.⁹ Of the 5 select agencies we reviewed, 2 received a red score—DOD and DOE—and 3 received a green score—EPA, GSA, and VA.

Federal agencies have been using third-party green building certification systems since the late 1990s. The third-party certification systems most commonly used in the United States and by federal agencies are the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) and the Green Building Initiative's Green Globes.¹⁰ Buildings can achieve different rating levels within the certification systems depending on how many points are earned. LEED's rating levels include Certified, Silver, Gold, and Platinum; and Green Globes' rating levels include one, two, three, or four Green Globes. These systems have certifications for the design and construction of new buildings and the operations and maintenance of existing buildings, among others.

While federal agencies are not required to use third-party certification systems, if agencies use such a system it must meet certain criteria identified by DOE, including that the system be nationally recognized

⁹Fiscal year 2013 scorecards are the most recent available as of June 10, 2015. We were able to identify green building scores for 16 of the 24 agencies subject to the Chief Financial Officers Act; the remaining 8 agencies either do not have scores in the area of green building because they do not own any buildings or we could not identify fiscal year 2013 scorecards for the agency. According to the fiscal year 2013 OMB scorecard, an agency achieves a green score if it demonstrates implementation of the Guiding Principles for new, existing, and leased buildings; and the agency is on track to meet the 15 percent goal by 2015 by reporting that at least 11 percent of buildings greater than 5,000 gross square feet meet the Guiding Principles. An agency achieves a yellow score if it incorporates the Guiding Principles into all new design contracts for construction, major renovations, and leases; and at least 11 percent of the gross square footage of its building inventory over 5,000 gross square feet meets the Guiding Principles. An agency achieves a red score if it cannot demonstrate compliance with the Guiding Principles on new construction, major renovations, or leases; and/or less than 11 percent of its building inventory, either by number of buildings or gross square footage of its building inventory over 5,000 gross square feet meets the Guiding Principles.

¹⁰The Living Building Challenge is another third-party certification system that was reviewed by Pacific Northwest National Laboratory in 2012. However, representatives of the International Living Future Institute, which administers the system, told us the system has not been used by federal agencies. See appendix III for more information on LEED, Green Globes, and the Living Building Challenge.

within the building industry.¹¹ With respect to new construction and major renovations, EISA requires the Secretary of Energy, in consultation with GSA and DOD, to identify a certification system and level that the Secretary determines to be the most likely to encourage a comprehensive and environmentally-sound approach to certifying green buildings. GSA is required to evaluate and compare third-party green building certification systems at least once every 5 years to support DOE's recommendation. In 2013, GSA recommended that federal agencies obtain at least a LEED Silver rating or, if using Green Globes, at least two Green Globes for new construction and major renovations.

As part of GSA's evaluation of certification systems, it recommended in 2013 that federal agencies continue to use these systems. In addition, in 2013, the National Research Council issued a report that recommended that DOD continue to require new buildings and major renovations use LEED Silver or an equivalent system.^{12,13} Table 1 includes additional information on federal reviews of third-party green building certification systems.

¹¹Department of Energy, *Green Building Certification Systems for Federal Buildings*, Final Rule, 79 Fed. Reg. 61563 (Oct. 14, 2014). DOE's final rule requires that, if an agency uses a third-party certification system, the system must: (1) allow assessors and auditors to independently verify the criteria and measurement metrics of the system; (2) be developed by a certification organization that: (i) provides an opportunity for public comment on the system, and (ii) provides an opportunity for development and revision of the system through a consensus-based process; (3) be nationally recognized within the building industry; (4) be subject to periodic evaluation and assessment of the environmental and energy benefits that result under the rating system; and (5) include a verification system for postoccupancy assessment of the rated buildings to demonstrate continued energy and water savings at least every 4 years after initial occupancy.

¹²Section 2830 of the National Defense Authorization Act for Fiscal Year 2012, Pub. L. No. 112-81, 125 Stat. 1298, 1695 (Dec. 31, 2011), required the Secretary of Defense to submit a report to the congressional defense committees with a cost-benefit analysis, return on investment, and long-term payback of specific energy-efficiency and sustainability standards used by DOD for military construction and renovation. DOD requested the National Research Council establish a committee of experts to conduct an evaluation to inform its report to Congress.

¹³The National Research Council's study states that the additional incremental costs to design and construct green buildings are relatively small when compared to the total costs over a building's life cycle. Specifically, the study found that research studies indicate that the incremental costs to design and construct green buildings typically range from 0 to 8 percent higher than the costs to design and construct conventional buildings, depending on the methodology used in the study and the type of building analyzed. None of the studies focused on the long-term cost-effectiveness attributable to the use of green building certification systems.

Table 1: Reviews of Third-Party Green Building Certification Systems for Use by Federal Agencies

Year	Source	Summary
2014	Department of Energy's (DOE) Final Rule on Green Building Certification Systems	DOE identified the criteria that a certification system must meet as required in the Energy Independence and Security Act of 2007. Specifically, the system under which the building is certified must: (1) allow assessors and auditors to independently verify the criteria and measurement metrics of the system; (2) be developed by a certification organization that: (i) provides an opportunity for public comment on the system; and (ii) provides an opportunity for development and revision of the system through a consensus-based process; (3) be nationally recognized within the building industry; (4) be subject to periodic evaluation and assessment of the environmental and energy benefits that result under the rating system; and (5) include a verification system for postoccupancy assessment of the rated buildings to demonstrate continued energy and water savings at least every 4 years after initial occupancy. The building must be certified to a level that promotes the guidelines referenced in Executive Order 13423 and Executive Order 13514.
	General Services Administration (GSA), <i>Green Building Certification System: Supplemental Review of U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) v4 Systems</i>	The objective of the review was to determine the alignment between federal high-performance green building requirements and three LEED v4 systems—the current version of LEED at the time of the review. GSA found that these systems did not fully align with all of the federal requirements.
2013	GSA Administrator's Letter to the Secretary of Energy	GSA recommended that agencies, among other items, continue using third-party certification systems; select one system at the agency or bureau level—either LEED or Green Globes; and use system credits that align with federal requirements.
	National Research Council, <i>Energy Efficiency Standards and Green Building Certification Systems Used by the Department of Defense for Military Construction and Major Renovations</i>	The National Defense Authorization Act of 2012 required DOD to submit a report to Congress on the impact of specific energy efficiency and sustainability standards used by DOD for military construction and repair. The National Research Council conducted the study on DOD's behalf and recommended that DOD continue to require new buildings or major renovations be designed to achieve a LEED-Silver or equivalent rating. It also found that the incremental costs to design and construct high-performance or green-certified buildings is relatively small compared to the total costs over a building's life cycle.
2012	Pacific Northwest National Laboratory, <i>Green Building Certification System Review</i>	The review analyzed three systems—LEED, Green Globes, and the Living Building Challenge—against multiple criteria. The review found that none of the systems completely aligned with all of the federal requirements.

Source: GAO analysis of studies. | GAO-15-667

Federal Efforts to Support Implementation of Key Green Building Requirements Include Oversight, Training, and Other Tools Provided by Several Agencies

Several agencies—CEQ, DOE, EPA, GSA, and OMB—provide oversight, training, and other tools to support agencies' implementation of key federal green building requirements. Officials from these supporting agencies told us that when the Guiding Principles are revised later this year, they will need to update some of their efforts. Below are examples of federal efforts to support agencies' implementation of key green building requirements. A more detailed list of federal efforts to support agencies is included in appendix II.

- *OMB and CEQ provide guidance and oversight of agencies' implementation of key green building requirements.* CEQ evaluates and OMB approves agency Strategic Sustainability Performance Plans—annual documents that describe an agency's strategy and plans for, and progress toward achieving green building and other sustainability goals. CEQ provides agencies with a template each year that includes guidance on how to report agency progress toward implementing the Guiding Principles for its buildings, along with other sustainability goals such as agency-wide greenhouse gas reductions and water use efficiency and management. CEQ is required to review and evaluate the plans, and OMB is required to review and approve the plans. According to OMB staff, the review ensures agencies have addressed all relevant sustainability goals, including green building.

As discussed above, OMB's annual sustainability and energy scorecards score agencies on whether they make progress toward sustainability goals, including the goal for green buildings—implementing the Guiding Principles for all new construction and major renovations and for at least 15 percent of existing buildings over 5,000 square feet. OMB staff told us fiscal year 2015 scorecards will continue to evaluate progress toward the 2015 goal outlined in Executive Order 13514, but it will need to update the metric for fiscal year 2016 to reflect the revised Guiding Principles and revised agency goals as outlined in Executive Order 13693.

- *DOE provides training, benchmarking, and other tools to support agencies' implementation of key green building requirements.* Officials from DOE's Federal Energy Management Program (FEMP) described the program as being on the front line of providing assistance to other agencies regarding sustainability issues. It provides education, training, guidance, and technical assistance for agencies implementing key green building requirements. Specifically, FEMP provides both web-based and in-person training on implementing the Guiding Principles and also offers web-based training on related topics, such as best practices in operations and maintenance. Several

of the agencies we spoke with told us their staff has participated in FEMP training on the Guiding Principles. The web-based, on-demand training provides an overview of each of the five Guiding Principles and covers best practices for measuring and reporting on implementation. FEMP officials told us this training will have to be updated to reflect the revised Guiding Principles. FEMP had not planned to update the training this year since the timing of the revisions was unknown until Executive Order 13693 set a deadline for completion of the revision, and officials told us updating the training may require a reallocation of FEMP's current budget. FEMP also offers customized training for agencies. For example, GSA worked with FEMP to develop training sessions that provided customized information on GSA's approach to documenting compliance with the Guiding Principles.

DOE is also a resource for information for agencies with questions about key green building requirements. For example, a Navy official told us the Navy obtained assistance from FEMP subject matter experts about energy conservation measures and found the assistance it received very helpful. An official from DOE's Sustainability Performance Office—its internal office that oversees departmental sustainability efforts—told us the official has reached out to DOE's Pacific Northwest National Laboratory for assistance on technical matters, such as benchmarking water use and energy modeling.

In addition, DOE provides support to agencies implementing requirements for buildings to benchmark energy use through its Labs21 energy benchmarking tool. Labs21 is a benchmarking tool designed specifically for laboratories, which are more energy intensive than other building types and, therefore, cannot be compared directly to other building types, such as office buildings. According to DOE, Labs21 enables agencies to compare the performance of their laboratories to similar facilities and thereby help identify potential energy cost savings opportunities.

DOE also co-chairs—along with GSA—the Interagency Sustainability Working Group. According to FEMP officials, the working group provides officials from federal agencies a forum for information exchange and collaboration on sustainability issues. Bimonthly meetings include an opportunity for staff from each agency to highlight agency progress in green building, view presentations on a variety of sustainability issues, and network with staff from other federal agencies. According to FEMP officials, the working group is also a place for FEMP and GSA to get real-time feedback on agency needs,

which they can then share with the Office of Federal Sustainability—formerly the Office of the Federal Environmental Executive—and OMB.

- *EPA provides benchmarking and other tools to support agencies' implementation of key green building requirements.* EPA's ENERGY STAR Portfolio Manager is a web-based system for federal agencies and other entities to measure and track data on buildings, such as energy and water use. Portfolio Manager has an energy benchmarking feature that agencies can use to implement the benchmarking requirement in the Guiding Principles. Specifically, the feature compares a building's energy use to that of other, similar buildings and gives the building a score on a scale from 1 to 100—a score of 50 represents median energy performance, while a score of 75 or better indicates the building is a top performer.¹⁴ The Guiding Principles state a preference for agencies to use Portfolio Manager for energy benchmarking, and DOE guidance designates Portfolio Manager as the benchmarking system for federal buildings.¹⁵ According to an EPA official, it is unlikely that the benchmarking feature of Portfolio Manager will need to be substantially updated in response to the revised Guiding Principles.

ENERGY STAR Portfolio Manager also includes a Sustainable Buildings Checklist that is designed specifically to assist agencies with assessing their existing buildings against the Guiding Principles. The checklist includes all five Guiding Principles and asks users to check whether the action has been completed, to identify the responsible team member, and to upload relevant supporting documentation. For example, to document compliance with the commissioning requirement in the Guiding Principles, a user can upload a commissioning report, or to document compliance with the energy efficiency requirement, a user can upload an ENERGY STAR

¹⁴Portfolio Manager can provide a score for many buildings types, such as hospitals, data centers, warehouses, and offices, but not for other building types including laboratories.

¹⁵DOE guidance designated Portfolio Manager as the benchmarking tool for metered buildings that are, or are part of, covered facilities under 42 U.S.C. § 8253(f)(8). These covered facilities must constitute at least 75 percent of facility energy use at each agency.

certification.¹⁶ Agencies can track progress for individual buildings and across their building portfolio. The Sustainable Buildings Checklist may need to be revised when the Guiding Principles are revised, but an EPA official that manages ENERGY STAR could not comment on what resources may be needed to update the system without seeing the revisions.

- *GSA provides educational tools and green leasing language to help agencies implement key green building requirements.* GSA's Office of Federal High-Performance Green Buildings provides technical and best practice advice to federal agencies. For example, it developed the Sustainable Facilities Tool (SFTool), a web-based tool for facility managers, leasing specialists, and project managers that provides education on sustainability issues. SFTool allows users to explore a virtual building—including spaces such as a cafeteria, conference room, or reception area—to identify opportunities to incorporate the Guiding Principles and other sustainability requirements into a building project. SFTool also includes an annotated copy of Executive Order 13693 with hotlinks that define key terms or provide links to more detailed information or tools. Officials stated they will revise SFTool when the Guiding Principles are revised, but they do not expect to make major changes.

GSA also has green lease policies and procedures and has developed green lease clauses that agency officials told us can be used to ensure a lease aligns with the Guiding Principles. According to GSA officials, they have developed more than 30 green lease clauses that may be appropriate for leases of different sizes and complexity.¹⁷ GSA officials said they do not know how much time or effort will be required to update green leasing language in response to the revised Guiding Principles without knowing what the content of the revisions will be. However, officials said it could take 6 months or more to undergo the necessary reviews.

¹⁶The term commissioning means a process of ensuring that all facility systems perform interactively in accordance with the design documentation and intent of the facility, as well as the operational needs of the owner of the facility, including preparation of operation personnel. The primary goal of commissioning is to ensure fully functional systems that can be properly operated and maintained during the useful life of the facility.

¹⁷The Energy Efficiency Improvement Act of 2015 required GSA to develop model commercial leasing provisions that promote energy efficiency, among other goals. GSA may use these provisions in leases it enters into where the federal agency is a landlord or tenant. Pub. L. No. 114-11, § 102, 129 Stat. 182, 183 (April 30, 2015).

Agencies Use Third-Party Certification to Help Implement Key Federal Green Building Requirements

All five select agencies use third-party certification systems to help implement key federal green building requirements for new construction and major renovation projects. While third-party certification does not ensure that a building meets all of the key requirements, agencies we reviewed have developed various tools to ensure that any remaining federal requirements are implemented at their buildings after third-party certification and noted that there are additional benefits to using these systems beyond helping to implement key requirements. Of the select agencies we reviewed, none require third-party certification for existing buildings, but three of the agencies have developed their own systems for assessing the implementation of key requirements for existing buildings. Table 2 shows the third-party certification requirements for new construction and major renovation projects for each of the five select agencies, including the DOD military services.

Table 2: Summary of Select Federal Agencies' Current Policies Requiring Third-Party Certification for New Construction and Major Renovations

Agency	Policy or guidance	Requirement
Department of Defense (DOD)	<i>Unified Facilities Criteria 1-200-02: High Performance and Sustainable Building Requirements</i> (August 2014) <i>Sustainable Buildings Policy</i> (November 2013)	Each service is responsible for establishing a process to ensure new construction and major renovations with costs greater than \$2.5 million are meeting requirements. ^a That process should include third-party certification using a system approved by the General Services Administration's review of third-party certification systems—two Green Globes or Leadership in Energy and Environmental Design (LEED) Silver. A DOD building that meets the <i>Unified Facilities Criteria</i> requirements shall be considered by DOD as compliant with the requirements of law and the Guiding Principles.
Army	<i>Sustainable Design and Development Policy Update</i> (December 2013)	New construction and comprehensive renovations that meet LEED Minimum Program Requirements must attain LEED Silver certification. ^b
Air Force	<i>Sustainable Design and Development Implementation Guidance</i> (June 2011)	All projects that meet LEED 2009's Minimum Program Requirements must achieve a minimum rating of LEED Silver. A project must attain at least 20 points for energy efficiency and water conservation.
Navy	<i>Sustainable Buildings Policy</i> (September 2014)	Navy policy does not specify a certification system but states that the Navy will pursue greater energy and water efficiency when those measures reduce the total ownership cost of a facility. ^c
Department of Energy	<i>Order 413.3B, Program and Project Management for the Acquisition of Capital Assets</i> (November 2010)	All new construction and major renovation projects must achieve LEED Gold certification at a minimum, absent an approved waiver from the Acquisition Executive.
Environmental Protection Agency (EPA)	<i>Facilities Manual: Architecture and Engineering Guidelines</i> (June 2013)	All new construction and major renovation projects greater than 5,000 square feet should strive for LEED Gold, but achieve a minimum rating of LEED Silver. ^d

Agency	Policy or guidance	Requirement
General Services Administration	<i>PBS-P100, Facilities Standards for the Public Buildings Service</i> (March 2015)	All new construction and substantial renovations must achieve, at a minimum, a LEED Gold rating.
Department of Veterans Affairs (VA)	<i>Sustainable Design Manual</i> (May 2014) <i>VA Directive 0056 – Sustainable Buildings Program</i> (October 2012)	All new construction projects and major renovations must achieve a minimum certification of LEED Silver or two Green Globes.

Sources: GAO analysis of agency policy and guidance documents. | GAO-15-667

^aThe specific requirements that must be met, which include the *Guiding Principles for Federal Leadership in High Performance and Sustainable Building*, are laid out in the *Unified Facilities Criteria*.

^bThe U.S. Green Building Council requires new construction and major renovation projects to have specific characteristics in order to qualify for LEED certification, including that it is a permanent space, has a floor area of at least 1,000 square feet, and an occupancy rate of one full-time equivalent staff per year.

^cDOD's *Unified Facilities Criteria* defines total ownership cost as the total of all direct and indirect costs associated with an asset or acquisition over its entire life cycle.

^dAccording to EPA officials, the agency does not require the use of a specific certification system.

Officials from all five select agencies (DOE, EPA, GSA, VA, Air Force, and Army) told us that third-party certification helps ensure compliance with key green building requirements by holding contractors and agency project teams accountable for incorporating the requirements. EPA and GSA officials stated that requiring contractors to achieve third-party certification holds them accountable for incorporating sustainable elements into the design of a building. EPA officials also said that the third party verifies that a contractor is completing the necessary documentation for certification, which can also be used by the agency to demonstrate compliance with key requirements. In addition, we heard from EPA, VA, Air Force, and Army officials that third-party certification can provide assurance that project teams are helping the agency to meet key requirements. Army officials stated that certification drives accountability for project teams. GSA headquarters and building-level officials told us that certification provided external validation that their projects accomplished what the project teams intended.

Select agency officials noted that using third-party certification systems does not ensure that all of the key federal green building requirements are met. Pacific Northwest National Laboratory's review of third-party certification systems found that, of the three systems reviewed, none

fulfilled all federal green building requirements.^{18,19} Pacific Northwest National Laboratory evaluated the new construction categories for Green Globes, LEED, and the Living Building Challenge against 27 federal green building requirements and found that 10 of the 27 requirements were fully met using Green Globes, 11 using LEED, and 11 using the Living Building Challenge.^{20,21} Several select agencies (Air Force, Army, EPA, GSA, and VA) have developed crosswalks that align specific credit categories in third-party certification systems with key federal green building requirements. Officials at the National Renewable Energy Laboratory (NREL) stated that they used crosswalks developed by GSA and the Department of the Interior while designing its Research Support Facility, which obtained a LEED Platinum rating and, according to NREL's 2014 Site Sustainability Management Plan, complies with the Guiding Principles.²²

¹⁸Pacific Northwest National Laboratory, *Green Building Certification System Review* (Richland, Washington: March 2012).

¹⁹See appendix III for more information on these third-party certification systems.

²⁰The 27 requirements in the Pacific Northwest National Laboratory report consist of all of the requirements in the Guiding Principles, as well as additional EISA requirements that include those related to acoustics and greenhouse gas emissions.

²¹These numbers represent (1) requirements that would automatically be met if a building was certified because the category is mandatory for certification, and the third-party certification system and federal requirement fully align, and (2) the certification system has an optional category that, if attained, would meet the federal requirement. The report listed other categories: (1) the certification system has an optional category which is not fully aligned with a federal requirement and would require additional effort to fulfill the federal requirement and (2) a federal requirement is not an identified category within the certification system.

²²NREL, *Site Sustainability Plan FY14* (Golden, CO: December 2013).

National Renewable Energy Laboratory

The Department of Energy's National Renewable Energy Laboratory (NREL) has six Leadership in Energy and Environmental Design (LEED) Platinum-certified buildings on its Golden, Colorado, campus, including the Science and Technology Facility and the Research Support Facility. Platinum is the highest certification rating that a LEED project can attain.

Science and Technology Facility

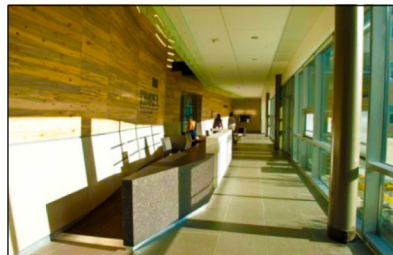


Source: NREL (photo). | GAO-15-667

The 71,000 square-foot building, certified in 2007, is the first federal LEED Platinum building. The facility includes both offices and laboratories.

- The east-west orientation of the building provides natural lighting through windows on the north and south facades.
- About 80 percent (by weight) of the construction, demolition, and land-clearing waste was recycled or salvaged.
- A sloping butterfly roof over the office space helps direct collected stormwater into ponds, which is then used to irrigate the grounds.

Research Support Facility



Source: NREL (photo). | GAO-15-667

The 360,000 square-foot office building and data center was certified Platinum in 2011. It is a net zero energy building, which means that its energy needs are entirely supplied by renewable energy sources.

- Rooftop photovoltaic solar panels
- Operable, triple-glazed windows allow fresh air to naturally cool building
- All workspaces are daylit

Source: GAO analysis of National Renewable Energy Laboratory documents. | GAO-15-667

Officials from GSA's Office of Federal High Performance Green Buildings stated that once the Guiding Principles are revised, GSA may develop a new crosswalk between the Guiding Principles and third-party certification systems that agencies can use.²³ Officials from several agencies (DOE, EPA, VA, and Air Force) said that such a document would be helpful. VA and Air Force officials noted that while a general crosswalk would be a good starting point, they would need to customize it based on their specific needs. For example, VA officials stated that they use the health care facilities-specific certification for medical centers, which is not very

²³In March 2015, Executive Order 13693 required that CEQ issue revised Guiding Principles within 150 days of the order.

common across the federal government, and they would have to make sure that a general crosswalk made sense for those buildings. Air Force officials stated that the DOD policy and its crosswalk will be updated when the Guiding Principles are revised; in the past when updating DOD policy they used GSA guidance and customized it through the “DOD lens.”

Officials from agencies we spoke with said that their agencies use different tools to ensure that remaining federal requirements are implemented at their buildings after third-party certification. Several agencies developed guidance for project managers. For example, according to VA officials, its *Sustainable Design Manual* was developed to be a one-stop shop for new construction and major renovations, including guidance on how to meet requirements that are not covered by obtaining third-party certification. Several agencies (EPA, VA, Navy, Air Force, and Army) have developed a checklist that project managers must submit. The checklists provide guidance on what is needed to meet the requirements through third-party certification and by other means. The Army and Air Force checklists provide the text of the requirement, the statutory or executive source, and specific design elements that can be included to meet the requirement. Several agencies we spoke with (DOE, EPA, GSA, and VA) require specific language in contracts to ensure that contractors comply with all requirements, even those that did not align with the third-party certification system.

In addition to helping agencies implement key federal green building requirements, agency officials and building energy managers (DOE, EPA, GSA, Army, Air Force, Navy, OASD EI&E, and VA) that we spoke with mentioned other benefits of using third-party certification, including the following:

Provides a well-established framework. Some third-party certification systems are recognized industry standards and familiar to contractors. An interagency group co-chaired by DOD, DOE, and GSA found that the main benefit of using third-party certification systems is that they have a robust infrastructure that is able to keep up with an evolving

marketplace.²⁴ Furthermore, Pacific Northwest National Laboratory reported that some federal agencies found the systems to be useful tools for documenting and tracking a building's progress toward meeting requirements in its review of third-party certification systems.²⁵ In addition, these systems offer frameworks for reducing energy and water use in buildings, compared with design approaches and practices used for conventional buildings, according to the National Research Council's review.²⁶ The National Research Council's review also found that these systems can help establish explicit and traceable objectives for future building performance and a feedback loop to determine if the objectives were met. VA building-level officials stated that, because of the strict documentation requirements, they use a third-party certification system as a guide even when they do not pursue formal certification.

Reduces need for additional staff. DOD officials (Air Force, Army, and Navy) stated that using third-party certification reduces the need for additional staff to conduct certain activities. Specifically, current staff would have an increased workload or agencies would need additional personnel if they used their own system to validate a building's compliance with the key requirements. Air Force headquarters and building-level officials stated they do not have sufficient personnel to implement their own system and that using a third-party eliminates the need to rely on staff to ensure a building complies with key requirements. A Navy official stated that third-party certification provides a level of subject matter expertise that their staff currently do not have. Army officials also stated that third-party certifiers already have the subject matter expertise and for the government to gain that level of expertise would require significant time and effort.

²⁴EISA Interagency Ad-hoc Discussion Group, *Co-chairs Memorandum on Green Building Certification System Review*, 2012. As part of the EISA-required review of green building certification systems, DOD, DOE, and GSA co-chaired a discussion group based on the Pacific Northwest National Laboratory's 2012 report on green building certification systems.

²⁵Pacific Northwest National Laboratory, *Green Building Certification System Review* (Richland, Washington: March 2012).

²⁶National Research Council, *Energy-Efficiency Standards and Green Building Certification Systems Used by the Department of Defense for Military Construction and Major Renovation* (Washington, D.C.: 2013).

Serves as a communication tool. Officials from some agencies (Army, EPA, and OASD EI&E) and GSA building-level officials said that certification can be used as a tool to communicate the agencies' sustainability efforts with its own staff, the public, and contractors. According to Army and OASD EI&E officials, third-party certification provides a common language across industry and government to evaluate and measure sustainability features. GSA building-level officials told us that obtaining certification was an important method for them to communicate GSA's sustainability efforts to the public. Specifically, third-party certification provided a recognizable label to show the public the agency's use of sustainable practices in the recent renovation of a large federal office building. EPA officials we spoke with stated that because a third-party system is a trusted brand it is like a building received a seal of approval.

According to some agency headquarters and building-level officials (Air Force, Army, EPA, and Navy), although third-party certification can reduce the need for additional staff resources, certification is a resource-intensive process. Some agency headquarters and building-level officials (Air Force, Army, Navy, and EPA) stated that the current process to complete certification involves some costs. The monetary costs for certification vary project-to-project, according to several agency officials (Air Force, EPA, and VA). GSA and DOE building-level officials said that it was difficult to isolate the cost of certifying their buildings because certification fees were paid for by the contractors designing and constructing the building, so these costs are included as part of the overall contract award. Officials from GSA stated that the cost of certifying a new construction or major renovation project is, on average, 0.012 percent of the total project budget. A study completed in 2004 for GSA estimated that the documentation costs associated with obtaining LEED certification ranged from about \$22,000 to about \$34,000 per project, although GSA officials told us that since 2004 these costs have decreased as the market has changed.²⁷ According to Green Building

²⁷ *GSA LEED Cost Study*, Steven Winter Associates, Inc. (2004). This study was undertaken to estimate the costs to develop green federal buildings using LEED version 2.1. The report provided a review of cost implications of achieving Certified, Silver, and Gold LEED-ratings for two building types constructed by GSA: a five-story courthouse and a mid-rise federal office building. The documentation costs include fees to register the project and other fees associated with the certification process, and the range of estimates cited depended on factors including whether a consultant was used to manage certification and project type.

Initiative representatives, the typical total agency costs for Green Globes certification are about \$12,000 to \$30,000 per project. In addition to certification fees, some agencies also allocate staff resources for administrative purposes, such as reviewing the documentation submitted by contractors. Representatives of one third-party certification system stated that, in working with federal agencies, they have found that the biggest element of the cost of certification for the agencies is the agency staff time. A Navy official stated that the time needed to complete all of the documentation was a limitation because staff have other higher-priority responsibilities. According to Army officials, documentation to support certification also could be particularly challenging for less experienced project teams or for small contractors. Despite the current staff resources needed to oversee third-party certification, Army officials stated that it is still less expensive to use a third-party system than to develop, execute, and oversee their own. The costs for the Army to obtain third-party certification are negligible relative to the costs of the design elements needed to meet key requirements, according to these officials.

Officials from several agencies we spoke with are not certain how they will use third-party certification systems in the future. Air Force officials stated that they are currently updating the implementing guidance for its sustainability policy. As part of DOD's process, OASD EI&E and Air Force officials are determining how the use of third-party certification for new construction projects will be most valuable to help ensure and demonstrate compliance with federal requirements, which could include the use of certification systems aimed specifically at assessing compliance with the Guiding Principles. According to EPA and VA officials, the agencies may reevaluate the use of third-party certification depending on the new version of the Guiding Principles. A DOE official said that it will continue to allow the use of third-party certification but may not require it anymore.

While none of the five select agencies require third-party certification of existing buildings, three agencies (EPA, GSA, and VA) developed their own systems for assessing the implementation of key requirements at existing buildings. GSA developed a methodology using a third-party certification system—LEED Volume Program for Operations and Maintenance—as a framework to identify the type of documentation needed to achieve certification, as well as compliance with key federal requirements. GSA mapped each of the Guiding Principles, federal regulations, and mandates, and the agency's operational policies against one or more LEED for Existing Buildings credit categories. It found that, in some cases, GSA's policies were more restrictive than LEED's and, in

other cases, LEED's requirements were more restrictive. The methodology GSA developed requires a building to meet the most restrictive category, whether it is based on the third-party certification system or GSA policy. According to GSA, project teams can meet approximately 80 percent of key requirements by obtaining LEED-Certified for Existing Buildings Operations and Maintenance. In addition, on an annual basis, GSA officials said that they use the LEED Volume Program for Operations and Maintenance to pursue certification for approximately one existing building in each of its 11 regions.

Agencies Face Challenges Implementing Key Requirements Based on Their Building Inventories, Missions, and Competing Priorities

Select agencies face challenges implementing key federal green building requirements because of the characteristics of their building inventories, mission-related concerns, competing priorities, and the criteria used to evaluate compliance with the Guiding Principles, which can be a disincentive to implementing some requirements. Forthcoming revisions to the Guiding Principles may address some of these challenges, and we discuss them under the appropriate challenge. CEQ officials told us they are aware of and plan to consider these challenges as they complete the revisions.

Characteristics of Building Inventories

The characteristics of building inventories that present a challenge to agencies as they implement key federal green building requirements include the age, number, and other characteristics of existing buildings; special-use buildings (e.g., laboratories, hospitals, and industrial spaces); leased space; and historic preservation status.

Age, Number, and Other Characteristics of Existing Buildings

Officials from several agencies (DOD, DOE, EPA, and VA) told us that implementing requirements at existing buildings is more challenging than for new construction or major renovations. According to officials from DOD (Navy and OASD EI&E), this is because many of their buildings are old. Air Force officials told us that the majority of the existing building inventory incorporated the building standards in place at the time they were constructed and, as a result, have mechanical or other systems that do not incorporate current requirements. In addition, VA officials said that existing buildings are more difficult than new construction because certain design features that could help implement requirements such as passive solar—a building design that uses structural elements of a building to heat and cool it without the use of mechanical equipment—in many cases can only be incorporated when constructing a new building, or with

greatly increased technical difficulty and cost in existing buildings. These officials said that retrofitting an existing building is also challenging if the building is occupied because occupants may require relocation, which entails moving and other costs. In addition, according to OASD EI&E officials, in some cases, existing buildings may have been inadequately maintained as a result of funding shortfalls. In January 2003, we designated federal real property as a high-risk area, in part, due to the deteriorating condition of some government facilities.²⁸ We previously reported that the deteriorated conditions were due, in part, to the age of many federal facilities (often over 50 years old) and other factors that resulted in agencies deferring some maintenance and repair of their facilities.²⁹ We reported that delaying or deferring routine maintenance and repairs can, in the short term, diminish the performance of these systems and, in the long term, shorten service life. In addition, we have previously reported on opportunities to concurrently address deferred maintenance and repair backlogs and reduce energy consumption. For example, in January 2009, we concluded that agencies can replace old systems—such as heating and air conditioning, electrical, and plumbing—with new, more efficient systems that would lead to energy savings and reduce or eliminate deferred maintenance and repair associated with the systems.³⁰

DOD officials (Army and OASD EI&E) said that the sheer number of existing buildings in their portfolios is a challenge. According to DOD's 2014 Strategic Sustainability Performance Plan, significantly increasing the percentage of DOD buildings that comply with the Guiding Principles is a challenge given the tens of thousands of older, existing buildings. According to Army officials, about 90,000 of the 150,000 existing buildings in the Army's inventory meet the threshold requiring compliance—buildings greater than 5,000 square feet—with the Guiding Principles. Officials from the Air Force noted that improving existing

²⁸GAO, *High-Risk Series: Federal Real Property*, [GAO-03-122](#) (Washington, D.C.: January 2003).

²⁹GAO, *Federal Real Property: Improved Transparency Could Help Efforts to Manage Agencies' Maintenance and Repair Backlogs*, [GAO-14-188](#) (Washington, D.C.: Jan. 23, 2014).

³⁰GAO, *Real Property: Infrastructure Investment Presents Opportunities to Address Long-standing Real Property Backlogs and Reduce Energy Consumption*, [GAO-09-324T](#) (Washington, D.C.: Jan. 22, 2009).

buildings involves a process including building assessment, determining the work needed to elevate the buildings into compliance, identifying funding, and executing the projects, among other steps. According to these officials, obtaining the funding and executing the project could take multiple fiscal years to accomplish.

In addition, according to DOD's 2014 Strategic Sustainability Performance Plan, part of the challenge posed by DOD's existing buildings is that a large fraction of them do not have meters in place to track electricity use, and making investment decisions related to retrofits requires accurate consumption data.³¹ Also, according to DOD and DOE officials, federal buildings are often configured and managed as campuses and, although the Guiding Principles are building-specific, DOD officials said that they are more successful implementing certain requirements, such as on-site renewable energy, at the campus level.

Special-Use Buildings
(Laboratories, Hospitals, and
Industrial Spaces)

According to officials from several agencies (DOD, DOE, EPA, and VA) their building inventories include certain building types, such as laboratories, hospitals, and industrial buildings for which some requirements are difficult to implement. For example, according to DOE's 2014 Strategic Sustainability Performance Plan, DOE's building inventory consists of special-use facilities—scientific laboratories, accelerators, light sources, supercomputers and data centers, and industrial facilities—and, as a result of these factors, DOE is challenged with integrating sustainability into aging infrastructure and energy-intensive processes.

Hospitals have much higher energy intensities compared with offices and other types of buildings and also have fewer opportunities for reducing energy use, according to VA's 2014 Strategic Sustainability Performance Plan.³² According to VA's plan, future reductions in energy use at VA hospitals will be challenging because of strict medical standards, energy-intensive medical equipment, and the increasing number of patient visits. In addition, VA officials said that its hospitals are already more energy

³¹To address this deficiency, DOD issued a metering policy in April 2013 to increase the metering of DOD facilities in order to promote better energy and water management; the policy requires the use of advanced metering to capture a minimum of 60 percent of electricity and natural gas use by the end of fiscal year 2020. According to DOD's Annual Energy Management Report for fiscal year 2013, DOD had either standard or advanced electricity meters installed at 32,560 buildings.

³²Energy intensity is the ratio of energy consumption to the total floor space in a building.

efficient than the average U.S. hospital; it has already implemented the most cost-effective measures for improving energy efficiency; and additional measures would be more costly. Similarly, laboratories use significantly more energy and present greater environmental challenges than offices, according to EPA's 2014 Strategic Sustainability Performance Plan. EPA officials told us that laboratories have resource-intensive equipment and mechanical systems. For example, EPA's laboratory designs include single-pass air cooling systems that use more resources than other systems. However, EPA officials told us that they plan to classify laboratories according to risk and identify those where they can adjust the number of air flows accordingly to conserve resources.

Several DOD officials (Air Force, Army, and Navy) told us that many of the buildings in their inventory are industrial, which creates challenges for implementing certain key requirements. For example, the Air Force's inventory includes aircraft maintenance facilities, ground vehicle maintenance facilities, hangars, and storage warehouses, and implementing certain requirements such as daylighting in these spaces can be challenging. Army officials noted that DOD's industrial buildings' energy use differs from more traditional energy use that most energy conservation measures are geared to address.

According to officials from several agencies (DOD, DOE, and VA), it is difficult to apply the Guiding Principles to certain buildings or spaces. The Guiding Principles were written for more typical commercial buildings and applying them to different building types can be challenging, according to DOD officials. According to one DOE official, it would be helpful if the revisions provided some flexibility based on building type because DOE has diverse property types including office space, laboratories, and highly-secure industrial facilities such as nuclear sites. Similarly, according to VA officials, ideally the new Guiding Principles would allow specialized buildings such as medical centers a path to compliance that acknowledges their unique mission-based characteristics.

Leased Space

Officials from several agencies (DOD, GSA, and VA) identified challenges implementing requirements for leased space. For example, according to GSA officials, leases are often in buildings where the government only has a partial presence and certain requirements—such as overall water consumption reduction—cannot be met without steps being taken for the whole building. Challenges implementing the requirements for leased space may be affected by the new Executive Order and revisions to the Guiding Principles. Executive Order 13693 differs from Executive Order

13514 with regard to leases. Specifically, Executive Order 13514 required that agencies ensure that at least 15 percent of the agency's existing buildings (above 5,000 gross square feet) and building leases (above 5,000 gross square feet) meet the Guiding Principles. However, Executive Order 13693 does not call for leased space to meet the Guiding Principles, but rather requires that agencies ensure that all new agency lease solicitations over 10,000 rentable square feet include, among other specifications, (1) criteria for energy efficiency either as a required performance specification or as a source selection evaluation factor and (2) requirements for building lessor disclosure of carbon emission or energy consumption data for that portion of the building occupied by the agency that may be provided by the lessor through submetering or estimation from prorated occupancy data, whichever is more cost-effective.

Historic Preservation Status

Officials from several agencies (DOD, GSA, and VA) said that implementing key requirements at historic buildings is a challenge because historic preservation requirements limit what can be done to retrofit these buildings.³³ For example, according to Army and Navy officials, implementing new technologies to reduce energy use may be difficult because the exterior appearance or interior features of a building may need to be maintained or replacement of windows may not be allowed. Air Force officials noted that meeting both green building and historic preservation requirements often leads to less conventional design and construction solutions, which can significantly impact both cost and the ability to complete the project. According to GSA officials, renovating an historic building to implement key requirements is generally deemed more expensive than moving into a leased building that does not have the same stringent historic preservation requirements.

While agencies identified buildings with historic preservation status as posing a challenge to their ability to implement requirements, GSA's renovation of two historic buildings—50 United Nations Plaza Federal Office Building in San Francisco, California, and the Wayne N. Aspinall Federal Building and U.S. Courthouse in Grand Junction, Colorado—both

³³Section 106 of the National Historic Preservation Act requires each federal agency to identify and consider the effects of projects they carry out, approve, or fund on historic properties. The process requires each federal agency to consider public views and concerns about historic preservation issues when making final project decisions.

incorporated green building requirements and received LEED Platinum certification.

Figure 2: 50 United Nations Plaza Federal Office Building and Wayne N. Aspinall Federal Building and U.S. Courthouse



Sources: Blake Marvin/HKS, Inc. (left photo) and General Services Administration (right photo). | GAO-15-667

The renovations to the 50 United Nations Plaza Federal Office Building included new mechanical, electrical, lighting, and plumbing systems; roof replacement and refurbishment of existing historic wood windows; and restoration of the historically significant interiors and central courtyard, as well as redesign of office interiors. GSA estimated that the building at 50 United Nations Plaza would achieve annual energy savings of about 59 percent compared with a comparable building and projected annual energy savings for this project of about \$393,958. In addition, according to GSA officials, although GSA could not include a photovoltaic solar array on the roof of the Wayne Aspinall Federal Building in the manner that it originally planned because historic preservation officers said it would violate the integrity of the building, GSA worked with the engineers on the project to come up with an alternative strategy to incorporate a smaller solar array on-site.

Mission-Related Concerns

Officials from all five select agencies (DOD, DOE, EPA, GSA, and VA) told us that mission-related concerns can make implementing certain key requirements challenging. For example, VA must implement new safety requirements in its hospitals and other buildings with overnight stays to

help prevent and control health-care associated Legionella disease (Legionnaires' disease) and implementing these requirements will increasingly impact the agency's ability to implement energy and water conservation requirements, according to VA officials. Specifically, the new safety requirements will increase water and energy demand because they require, among other activities, (1) increased flushing of hot and cold water at outlets and (2) maintaining specific water temperature ranges—cold water should be kept at or below 67 degrees to the greatest extent practicable, and hot water should be kept no lower than 124 degrees.³⁴ Cooling water below 67 degrees in hot environments where cold water is commonly warmer than 67 degrees requires additional energy, and flushing water systems increases water use, according to VA officials. VA officials also said that the goals of reducing energy use and wait times for veterans are in conflict; specifically, VA is extending medical center hours to address a backlog of patients, which will increase its energy use. In addition, Air Force and VA officials told us that implementing daylighting requirements—which call for a minimum amount of daylight exposure in a certain amount of the space—is challenging due to mission-specific requirements.³⁵ Specifically, Air Force officials also told us that daylighting may be contrary to what the space is used for or potentially detrimental to the mission. For example, daylighting may not be possible because of security concerns in spaces, such as a Sensitive Compartmented Information Facility—an enclosed area within a building that does not have windows and is used to process sensitive information—or it is not

³⁴The water safety requirements include (1) flushing and disinfection of potable water piping and system components prior to placing into service, (2) required regular flushing of low-flow and low-use water lines and fixtures to prevent water stagnation and to maintain temperature and biocide level control, (3) maintaining potable water within specific temperature ranges—hot water at or above 124 degrees Fahrenheit throughout the piping system (hot water storage tanks 140 degrees Fahrenheit or higher); cold water should be maintained at or below 67 degrees Fahrenheit in the piping system or in storage tanks which may require cooling of water in certain environments, and (4) emergency remediation of potable water system(s), when warranted, by either thermal eradication (flushing of piping and fixtures for 30 minutes with 160 degree Fahrenheit or higher water) or use of chemicals to “shock” the water system and associated components followed by thorough flushing. Veterans Health Administration Directive 1061, *Prevention of Healthcare-Associated Legionella Disease and Scald Injury from Potable Water Distribution Systems* (Washington, D.C.: 2014).

³⁵Daylighting is the controlled admission of natural light into a building through daylight apertures, such as skylights and windows, coupled with lighting control systems to reduce electric lighting and save energy.

practical in a space, such as a command control center where daylight could disrupt the ability to view screens.

Competing Priorities

Officials from all five select agencies (DOD, DOE, EPA, GSA, and VA) told us that they face challenges because they have multiple priorities that compete for limited resources. In addition, DOD and DOE officials said that there are limited incentives to implement requirements that do not have any economic benefit. Specifically, according to DOD officials, the use of limited resources to implement certain key requirements—such as those that aim to improve indoor air quality—can be difficult to justify because they may not also reduce energy use or operating costs. Also, DOD officials said that green buildings can increase occupant productivity and morale, but there is no way to include these intangible benefits in a life-cycle cost analysis. According to VA officials and its 2014 Strategic Sustainability Performance Plan, retaining green building features in already-designed new construction projects is challenging due to budget constraints and the need to address higher priority, mission-based needs. Officials told us that ensuring green building elements are retained and not removed at the end of the project to reduce costs if the project looks like it will go over budget is challenging. According to EPA's 2014 Strategic Sustainability Performance Plan, its laboratory mechanical system upgrades are complex and frequently take several years to design, complete, and commission, and finding ways to fund projects in a time of reduced resources, including sustainable building improvement projects, is challenging.

Criteria for Evaluating Compliance

Officials from DOD and DOE told us that the criteria used to evaluate compliance with the Guiding Principles—which require a building to meet all of the dozens of requirements included in the Guiding Principles—can be a disincentive to implementing some requirements at an individual building because they receive no credit for implementing one requirement if they do not implement all the requirements. Air Force officials said that the current criteria encourage agencies to focus on investing in high-performing buildings for which a relatively small investment results in compliance. These officials said that this is in conflict with an approach focused on addressing the worst performing buildings and systems first and, as a result, pursuing compliance in isolation would be in conflict with the agency-wide energy and water strategies. Revisions to the Guiding Principles could affect this challenge if, as Air Force officials stated, the criteria used to evaluate implementation is adjusted to allow buildings to demonstrate progress as opposed to being an all or nothing standard.

CEQ officials could not comment on whether the all or nothing approach would be reconsidered as part of the revision, but officials said that they were aware of that issue and want to ensure that they are not providing any disincentives for agencies to meet some of the requirements even if they cannot meet all.

Agency Comments

We provided CEQ, DOD, DOE, EPA, GSA, OMB, and VA with a draft of this report for their review and comment. DOE and VA provided written comments, reproduced in appendix IV and V, respectively, and also provided technical comments that were incorporated, as appropriate. CEQ, DOD, EPA, GSA, and OMB either had no comments or provided technical comments that were incorporated, as appropriate.

We are sending copies of this report to the appropriate congressional committees; the Chairman of the Council on Environmental Quality; the Administrators of the General Services Administration and the Environmental Protection Agency; the Director of the Office of Management and Budget; and the Secretaries of Defense, Energy, and Veterans Affairs. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff members have any questions about this report, please contact Frank Rusco at (202) 512-3841 or ruscof@gao.gov, Brian J. Lepore at (202) 512-4523 or leporeb@gao.gov, or David J. Wise at (202) 512-2834 or wised@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff members who made major contributions to this report are listed in appendix VI.

Sincerely yours,



Frank Rusco
Director, Natural Resources and Environment



Brian J. Lepore
Director, Defense Capabilities and Management



David J. Wise
Director, Physical Infrastructure

Appendix I: 2008 Guiding Principles for Sustainable New Construction, Major Renovations, and Existing Buildings

	New construction and major renovations	Existing buildings
I. Employ integrated design and operations and maintenance principles		
Employ integrated design principles & operations and maintenance management	<p>Use a collaborative, integrated planning and design process that</p> <ul style="list-style-type: none"> establishes and maintains an integrated project team as described on the Whole Building Design Guide http://www.wbdg.org/design/engage_process.php in all stages of a project's planning and delivery; integrates the use of the Office of Management and Budget's A-11, Section 7, Exhibit 300: Capital Asset Plan and Business Case Summary; establishes performance goals for siting, energy, water, materials, and indoor environmental quality along with other comprehensive design goals and ensures incorporation of these goals throughout the design and lifecycle of the building; and considers all stages of the building's lifecycle, including deconstruction. 	<p>Use an integrated team to develop and implement policy regarding sustainable operations and maintenance.</p> <ul style="list-style-type: none"> Incorporate sustainable operations and maintenance practices within the appropriate Environmental Management System. Assess existing condition and operational procedures of the building and major building systems and identify areas for improvement. Establish operational performance goals for energy, water, material use and recycling, and indoor environmental quality, and ensure incorporation of these goals throughout the remaining lifecycle of the building. Incorporate a building management plan to ensure that operating decisions and tenant education are carried out with regard to integrated, sustainable building operations and maintenance. Augment building operations and maintenance as needed using occupant feedback on work space satisfaction.
Employ commissioning to optimize and verify performance of fundamental building systems ^a	<p>Employ commissioning practices tailored to the size and complexity of the building and its system components in order to verify performance of building components and systems and help ensure that design requirements are met. This should include an experienced commissioning provider, inclusion of commissioning requirements in construction documents, a commissioning plan, verification of the installation and performance of systems to be commissioned, and a commissioning report.</p>	<p>Employ recommissioning, tailored to the size and complexity of the building and its system components in order to optimize and verify performance of fundamental building systems.^b</p> <p>Commissioning must be performed by an experienced commissioning provider.</p> <p>When building commissioning has been performed, the commissioning report, summary of actions taken, and schedule for recommissioning must be documented. In addition, meet the requirements of Energy Independence and Security Act of 2007 (EISA), Section 432 and associated Federal Energy Management Program (FEMP) guidance.</p> <p>Building recommissioning must have been performed within 4 years prior to reporting a building as meeting the Guiding Principles.</p>
II. Optimize energy performance		
Increase energy efficiency	<p>Establish a whole building performance target that takes into account the intended use, occupancy, operations, plug loads, other energy demands, and</p>	<p>Three options can be used to measure energy efficiency performance:</p> <ul style="list-style-type: none"> Option 1: Receive an ENERGY STAR®

Appendix I: 2008 Guiding Principles for Sustainable New Construction, Major Renovations, and Existing Buildings

	New construction and major renovations	Existing buildings
	design to earn the ENERGY STAR® targets for new construction and major renovation where applicable. For new construction, reduce energy use by 30% compared to the baseline building performance rating per the American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., (ASHRAE)/Illuminating Engineering Society of North America Standard 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential. For major renovations, reduce the energy use by 20 percent below prerenovations 2003 baseline. Laboratory spaces may use the Labs21 Laboratory Modeling Guidelines.	rating of 75 or higher or an equivalent Labs21 Benchmarking Tool score for laboratory buildings. <ul style="list-style-type: none"> Option 2: Reduce measured building energy use by 20% compared to building energy use in 2003 or a year thereafter with quality energy use data. Option 3: Reduce energy use by 20% compared to the ASHRAE 90.1-2007 baseline building design if design information is available.
Use energy efficient products	Use ENERGY STAR® and FEMP-designated energy efficient products, where available.	Use ENERGY STAR® and FEMP-designated energy efficient products, where available.
Measurement and verification	Per the Energy Policy Act of 2005 Section 103, install building level electricity meters to track and continuously optimize performance. Per EISA Section 434, include equivalent meters for natural gas and steam, where natural gas and steam are used.	Per the Energy Policy Act of 2005 Section 103, install building level electricity meters to track and continuously optimize performance. Per EISA Section 434, include equivalent meters for natural gas and steam, where natural gas and steam are used.
Benchmarking	Compare actual performance data from the first year of operation with the energy design target, preferably by using ENERGY STAR® Portfolio Manager for building and space types covered by ENERGY STAR®. Verify that the building performance meets or exceeds the design target, or that actual energy use is within 10% of the design energy budget for all other building types. For other building and space types, use an equivalent benchmarking tool such as the Labs21 benchmarking tool for laboratory buildings.	Compare annual performance data with previous years' performance data, preferably by entering annual performance data into the ENERGY STAR® Portfolio Manager. For building and space types not available in ENERGY STAR®, use an equivalent benchmarking tool, such as the Labs21 benchmarking tool for laboratory buildings.
On-site renewable energy	Per Executive Order 13423, implement renewable energy generation projects on agency property for agency use, when lifecycle cost-effective. Per the Energy Independence and Security Act (EISA) Section 523, meet at least 30% of the hot water demand through the installation of solar hot water heaters, when life cycle cost-effective.	Per Executive Order 13423, implement renewable energy generation projects on agency property for agency use, when life cycle cost-effective.
III. Protect and conserve water		
Reduce water consumption (and increase reuse)	Indoor Water. Employ strategies that in aggregate use a minimum of 20% less potable water than the indoor water use baseline calculated for the building, after meeting the Energy Policy Act of 1992, Uniform Plumbing Codes 2006, and the International Plumbing Codes 2006 fixture performance requirements. The installation of water meters is encouraged to allow for the management of water use during occupancy. The	Indoor Water. Two options can be used to measure indoor potable water use performance: <ul style="list-style-type: none"> Option 1: Reduce potable water use by 20% compared to a water baseline calculated for the building. The water baseline, for buildings with plumbing fixtures installed in 1994 or later, is 120% of the Uniform Plumbing Codes 2006 or the International Plumbing Codes 2006 fixture performance requirements. The

Appendix I: 2008 Guiding Principles for Sustainable New Construction, Major Renovations, and Existing Buildings

	New construction and major renovations	Existing buildings
	use of harvested rainwater, treated wastewater, and air conditioner condensate should also be considered and used where feasible for nonpotable use and potable use where allowed.	water baseline for plumbing fixtures older than 1994 is 160% of the Uniform Plumbing Codes 2006 or the International Plumbing Codes 2006 fixture performance requirements, or <ul style="list-style-type: none"> Option 2: Reduce building measured potable water use by 20% compared to building water use in 2003, or a year thereafter with quality water data.
	Outdoor Water. Use water efficient landscape and irrigation strategies, such as water reuse, recycling, and the use of harvested rainwater, to reduce outdoor potable water consumption by a minimum of 50% over that consumed by conventional means. The installation of water meters for locations with significant outdoor water use is encouraged.	Outdoor Water. Three options can be used to measure outdoor potable water use performance: <ul style="list-style-type: none"> Option 1: Reduce potable irrigation water use by 50% compared to conventional methods. Option 2: Reduce building related potable irrigation water use by 50 percent compared to measured irrigation water use in 2003 or a year thereafter with quality water data. Option 3: Use no potable irrigation water.
Reduce stormwater runoff	Employ design and construction strategies that reduce storm water runoff and discharges of polluted water off-site. Per EISA Section 438, to the maximum extent technically feasible, maintain or restore the predevelopment hydrology of the site with regard to temperature, rate, volume, and duration of flow using site planning, design, construction, and maintenance strategies.	Employ strategies that reduce storm water runoff and discharges of polluted water off-site. Per EISA Section 438, where redevelopment affects site hydrology, use site planning, design, construction, and maintenance strategies to maintain hydrologic conditions during development, or to restore hydrologic conditions following development, to the maximum extent that is technically feasible.
Measurement of water use	N/A	Install water meters for building sites with significant indoor and outdoor water use is encouraged. If only one meter is installed, reduce potable water use (indoor and outdoor combined) by at least 20% compared to building water use in 2003, or a year thereafter with quality water data.
Process water	Per the Energy Policy Act of 2005 Section 109, when potable water is used to improve a building's energy efficiency, deploy life cycle cost-effective water conservation measures.	Per the Energy Policy Act of 2005 Section 109, when potable water is used to improve a building's energy efficiency, deploy life cycle cost-effective water conservation measures.
Water-efficient products	Specify the Environmental Protection Agency's (EPA) WaterSense-labeled products or other water conserving products, where available. Choose irrigation contractors who are certified through a WaterSense labeled program.	Specify EPA's WaterSense-labeled products or other water conserving products, where available. Choose irrigation contractors who are certified through a WaterSense labeled program.
IV. Enhance indoor environmental quality		
Ventilation/thermal comfort	Meet ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy, including continuous humidity control within established ranges per climate zone, and ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality.	Meet ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy and ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality.
Moisture control	Establish and implement a moisture control strategy for controlling moisture flows and	Provide policy and illustrate the use of an appropriate moisture control strategy to prevent

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	New construction and major renovations	Existing buildings
	condensation to prevent building damage, minimize mold contamination, and reduce health risks related to moisture.	building damage, minimize mold contamination, and reduce health risks related to moisture. For façade renovations, Dew Point analysis and a plan for cleanup or infiltration of moisture into building materials are required.
Daylighting and lighting controls	Achieve a minimum daylight factor of 2% (excluding all direct sunlight penetration) in 75% of all space occupied for critical visual tasks. Provide automatic dimming controls or accessible manual lighting controls, and appropriate glare control.	Automated lighting controls (occupancy/vacancy sensors with manual-off capability) are provided for appropriate spaces including restrooms, conference and meeting rooms, employee lunch and break rooms, training classrooms, and offices. Two options can be used to meet additional daylighting and lighting controls performance expectations: <ul style="list-style-type: none"> • Option 1: Achieve a minimum daylight factor of 2% (excluding all direct sunlight penetration) in 50% of all space occupied for critical visual tasks, or • Option 2: Provide occupant controlled lighting, allowing adjustments to suit individual task needs, for 50% of regularly occupied spaces.
Low-emitting materials	Specify materials and products with low pollutant emissions, including composite wood products, adhesives, sealants, interior paints and finishes, carpet systems, and furnishings.	Use low emitting materials for building modifications, maintenance, and cleaning. 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.
Tobacco smoke control	Implement a policy and post signage indicating that smoking is prohibited within the building and within 25 feet of all building entrances, operable windows, and building ventilation intakes during building occupancy.	Prohibit smoking within the building and within 25 feet of all building entrances, operable windows, and building ventilation intakes.
Integrated pest management	N/A	Use integrated pest management techniques as appropriate to minimize pesticide usage. Use EPA-registered pesticides only when needed.
Protect indoor air quality during construction	Follow the recommended approach of the Sheet Metal and Air Conditioning Contractor's National Association Indoor Air Quality Guidelines for Occupied Buildings under Construction, 2007. After construction and prior to occupancy, conduct a minimum 72-hour flush-out with maximum outdoor air consistent with achieving relative humidity no greater than 60%. After occupancy, continue flush-out as necessary to minimize exposure to contaminants from new building materials.	N/A
V. Reduce environmental impact of materials		
Sustainable acquisition of products and services	Recycled content. Per Section 6002 of the Resource Conservation and Recovery Act, for EPA-designated products, specify products	Recycled content. Per Section 6002 of the Resource Conservation and Recovery Act, for EPA-designated products, use products meeting

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	New construction and major renovations	Existing buildings
	<p>meeting or exceeding EPA’s recycled content recommendations. For other products, specify materials with recycled content when practicable. If EPA-designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them shall be included in all solicitations relevant to construction, operation, maintenance of, or use in the building. EPA’s recycled content product designations and recycled content recommendations are available on EPA’s Comprehensive Procurement Guideline website at <www.epa.gov/cpg>.</p> <p>Biobased content. Per Section 9002 of the Farm Security and Rural Investment Act, for USDA-designated products, specify products with the highest content level per USDA’s biobased content recommendations. For other products, specify biobased products made from rapidly renewable resources and certified sustainable wood products. If these designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them shall be included in all solicitations relevant to construction, operation, maintenance of, or use in the building. USDA’s biobased product designations and biobased content recommendations are available on USDA’s BioPreferred web site at <www.usda.gov/biopREFERRED>.</p> <p>Environmentally preferable products. Use products that have a lesser or reduced effect on human health and the environment over their lifecycle when compared with competing products or services that serve the same purpose. A number of standards and ecolabels are available in the marketplace to assist specifiers in making environmentally preferable decisions. For recommendations, consult the Federal Green Construction Guide for Specifiers at <www.wbdg.org/design/greenspec.php>.</p>	<p>or exceeding EPA’s recycled content recommendations [for building modifications, maintenance, and cleaning]. For other products, use materials with recycled content such that the sum of postconsumer recycled content plus one-half of the preconsumer content constitutes at least 10% (based on cost or weight) of the total value of the materials in the project. If EPA-designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them shall be included in all solicitations relevant to construction, operation, maintenance of, or use in the building. EPA’s recycled content product designations and recycled content recommendations are available on EPA’s Comprehensive Procurement Guideline website at <www.epa.gov/cpg>.</p> <p>Biobased content. Per Section 9002 of the Farm Security and Rural Investment Act, for USDA-designated products, use products with the highest content level per USDA’s biobased content recommendations. For other products, use biobased products made from rapidly renewable resources and certified sustainable wood products. If these designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them shall be included in all solicitations relevant to construction, operation, maintenance of, or use in the building. USDA’s biobased product designations and biobased content recommendations are available on USDA’s BioPreferred website at <www.usda.gov/biopREFERRED>.</p> <p>Environmentally preferable products. Use products that have a lesser or reduced effect on human health and the environment over their lifecycle when compared with competing products or services that serve the same purpose. A number of standards and ecolabels are available in the marketplace to assist specifiers in making environmentally preferable decisions. For recommendations, consult the Federal Green Construction Guide for Specifiers at <www.wbdg.org/design/greenspec.php>.</p>
Pollution prevention/solid waste diversion/recycling	Incorporate adequate space, equipment, and transport accommodations for recycling in the building design. During a project’s planning stage, identify local recycling and salvage operations that could process site-related construction and demolition materials. During construction, recycle or salvage at least 50% of the nonhazardous	Provide reuse and recycling services for building occupants, where markets or on-site recycling exist. Provide salvage, reuse, and recycling services for waste generated from building operations, maintenance, repair and minor renovations, and discarded furnishings, equipment and property. This could include such things as

Appendix I: 2008 Guiding Principles for Sustainable New Construction, Major Renovations, and Existing Buildings

	New construction and major renovations	Existing buildings
	construction, demolition and land clearing materials, excluding soil, where markets or on-site recycling opportunities exist. Provide salvage, reuse and recycling services for waste generated from major renovations, where markets or on-site recycling opportunities exist.	beverage containers and paper from building occupants, batteries, toner cartridges, outdated computers from an equipment update, and construction materials from a minor renovation.
Reduce chemical use	Eliminate the use of ozone depleting compounds during and after construction where alternative environmentally preferable products are available, consistent with either the Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990, or equivalent overall air quality benefits that take into account lifecycle impacts.	Eliminate the use of ozone depleting compounds where alternative environmentally preferable products are available, consistent with either the Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990, or equivalent overall air quality benefits that take into account lifecycle impacts.

Source: Adapted from the Interagency Sustainability Working Group's High Performance and Sustainable Buildings Guidance (December 2008), which established the Guiding Principles for Existing Buildings and updated the Guiding Principles for Sustainable New Construction and Major Renovations. | GAO-15-667

Note: The Guiding Principles presented here are currently undergoing revision. Executive Order 13693 requires the chair of the Council on Environmental Quality to prepare and issue revised Guiding Principles for both new and existing federal buildings including consideration of climate change resilience and employee and visitor wellness.

^aThe term commissioning means a process of ensuring that all facility systems perform interactively in accordance with the design documentation and intent of the facility; and the operational needs of the owner of the facility, including preparation of operation personnel. The primary goal of commissioning is to ensure fully functional systems that can be properly operated and maintained during the useful life of the facility.

^bThe term recommissioning means a process of commissioning a facility or system beyond the project development and warranty phases of the facility or system. The primary goal of recommissioning is to ensure optimum performance of a facility, in accordance with design or current operating needs, over the useful life of the facility, while meeting building occupancy requirements.

Appendix II: Select Federal Efforts to Support Implementation of Key Federal Green Building Requirements

Agency/effort	Purpose/description
Council on Environmental Quality	
Implementing Instructions on Sustainable Locations for Federal Facilities	Provides instructions to federal agencies on designing, constructing, maintaining, and operating buildings in sustainable locations, as called for in Executive Order 13514, <i>Federal Leadership in Environmental, Energy, and Economic Performance</i> .
Implementing Instructions for Federal Agency Implementation of Water Efficiency and Management Provisions of Executive Order 13514	Provides instructions to federal agencies on implementation of water use efficiency and management goals in Executive Order 13514, <i>Federal Leadership in Environmental, Energy, and Economic Performance</i> .
Department of Energy (DOE)	
Federal Energy Management Program (FEMP) Guiding Principles for Federal Leadership in High- Performance and Sustainable Building (Guiding Principles) training	Web-based and in-person training on the Guiding Principles, including training customized to an agency's needs.
Federal Building Metering Guidance	Establishes guidelines for agencies to meter their buildings for energy (electricity, natural gas, and steam) and water. Among other guidance, defines which buildings are appropriate to meter and provides metering prioritization recommendations for those agencies with limited resources.
Federal Building Energy Use Benchmarking Guidance	Designates ENERGY STAR Portfolio Manager as the building energy use benchmarking system to use for federal facilities. Describes minimum data inputs and public disclosure requirements, among other things.
Commissioning education and training	Training and educational tools that describe types of building commissioning—including recommissioning and continuous commissioning—and when and where each might best be used to ensure that a facility performs according to its design and the needs of its owners and occupants.
Lifecycle cost analysis training and education	Training and education on applying lifecycle cost analysis to evaluate the cost-effectiveness of energy and water efficiency investments, with assistance provided by the National Institute of Standards and Technology.
FEMP designated energy efficient products	Identifies products that are in the upper 25% of their class in energy efficiency. FEMP sets efficiency levels for product categories that have the potential to generate significant federal energy savings.
Labs21 energy benchmarking tool	Allows laboratory owners to compare the performance of their laboratories to similar facilities and thereby help identify potential energy cost savings opportunities.
Environmental Protection Agency	
ENERGY STAR Portfolio Manager benchmarking tool	Online tool for tracking and assessing energy and water use. Certain property types can receive a 1-100 ENERGY STAR score, which compares a building's energy performance to similar buildings nationwide.
ENERGY STAR Portfolio Manager sustainable buildings checklist	Designed to assist agencies in assessing their existing buildings against the Guiding Principles, including serving as a repository for compliance documents.
Environmentally Preferable Purchasing Program	Offers guidance and tools for purchasing products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose.
Technical Guidance on Implementing Stormwater Runoff Requirements	Gives agencies a framework to help them reduce storm water runoff from development projects and protect water resources.

Appendix II: Select Federal Efforts to Support Implementation of Key Federal Green Building Requirements

Agency/effort	Purpose/description
WaterSense	Aims to provide consumers with easy ways to save water, as both a label for products—such as toilets and sinks—and an information resource to help people use water more efficiently.
General Services Administration (GSA)	
Sustainable Facilities Tool (SFTool)	Web-based tool intended for facility managers, leasing specialists, and project managers that provides education on sustainability issues, including on the Guiding Principles.
Green leasing language	Developed leasing clauses that can be used to demonstrate the lease complies with the Guiding Principles.
DOE and GSA	
Interagency Sustainability Working Group	Provides sustainability officials from federal agencies a forum for information exchange and feedback on sustainability issues.
Verification Guide for Purchasers of Sustainable Products	Describes preaward and postaward procurement actions to verify compliance with a contract's sustainable requirements, and provides resources for confirming a contractor has provided acceptable documentation to show compliance with sustainable requirements.
Office of Management and Budget	
Sustainability/Energy Scorecards	Score agencies on whether they are meeting intermediate goals for compliance with sustainability goals, including for the Guiding Principles.

Sources: GAO analysis of agency information. | GAO-15-667

Appendix III: Third-Party Certification Systems Reviewed or Required by Select Federal Agencies

System name	Administrator	Summary	Areas of focus	Certification types	Rating levels
Leadership in Energy and Environmental Design (LEED®)	U.S. Green Building Council	<p>Projects attain a rating through the achievement of all prerequisites and points in different categories related to the eight areas of focus. The total possible points vary based on the version of LEED that is used.^a</p> <p>LEED is a web-based system and all documentation is submitted online.</p> <p>Green Business Certification Inc. provides the third-party certification service by reviewing the submitted documentation.</p>	Integrative process Sustainable sites Water efficiency Energy and atmosphere Materials and resources Indoor environmental quality Location and transportation Innovation	Building design and construction ^b (includes new construction, major renovations, data centers and healthcare) Interior design and construction (includes commercial interiors) Building operations and maintenance (includes existing buildings) Neighborhood development	Certified Silver Gold Platinum
Green Globes®	Green Building Initiative	<p>Projects attain a rating through the achievement of points in different categories related to seven areas of focus. A project can attain a total of 1,000 points.</p> <p>Complete an initial web-based survey, and subsequent documentation is submitted to the third-party assessor or can be submitted online.</p> <p>An on-site assessment is required for certification. The third-party assessor is contracted by the Green Building Initiative.</p>	Site Water Energy Resources Indoor environment Emissions Project/environmental management	New construction Continuous improvement of existing buildings Sustainable interiors	One Globe Two Globes Three Globes Four Globes

**Appendix III: Third-Party Certification Systems
Reviewed or Required by Select Federal
Agencies**

System name	Administrator	Summary	Areas of focus	Certification types	Rating levels
Living Building Challenge SM	International Living Future Institute	<p>Projects attain 'Living' status by completing all the imperatives, or categories, related to seven petals, or areas of focus. 'Living' status means that a building is regenerative, not just green.</p> <p>A building can receive Petal Certification if it meets the requirements of three or more petals, including water, energy, or materials.</p> <p>A project can complete petals in three typologies, or certification types.</p> <p>A project can attain Net Zero Energy certification by demonstrating through actual performance data that it produces more energy than it consumes.</p>	Place Water Energy Materials Health & happiness Equity Beauty	Buildings Renovations Landscape and infrastructure	Living Building Challenge Award and Certificate Petal Recognition Net Zero Energy Certification

Sources: GAO analysis of the General Services Administration, *Supplemental Review of USGBC's LEED v4 Systems* (2014); Pacific Northwest National Laboratory, *Green Building Certification System Review* (2012); and documents from the Whole Building Design Guide and third-party certification systems. | GAO-15-667

Note: In addition to the third-party certification systems described in this table, Green Business Certification Inc. and Green Building Initiative have programs that assess compliance with the *Guiding Principles for Federal Leadership in High Performance and Sustainable Building*.

^aFor example, under LEED 2009, there are a total of 100 possible points, and under LEED v4 there are a total of 110 possible points.

^bThis is not a comprehensive list of categories and subcategories for LEED certification. Examples of other categories include retail, schools, and hospitality.

Appendix IV: Comments from the Department of Energy



Department of Energy
Washington, DC 20585

July 8, 2015

Mr. Franklin Rusco
Director
Natural Resources and Environment
U.S. Government Accountability Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Rusco:

The Department of Energy (DOE) welcomes the opportunity to respond to the U.S. Government Accountability Office (GAO) in its draft report on FEDERAL GREEN BUILDING: Federal Efforts and Third-Party Certification Help Agencies Implement Key Requirements But Challenges Remain (GAO-15-667). DOE's Office of Energy Efficiency and Renewable Energy's Federal Energy Management Program has reviewed the report in coordination with other DOE offices and programs that participated in the GAO engagement; our comments are detailed in the attachment to this letter.

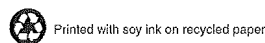
DOE appreciates the contribution GAO has made to prepare a comprehensive review of sustainable building implementation programs across key regulated agencies and sustainable buildings support agencies, including DOE. We look forward to continuing to work with GAO on helping the Federal government meet its sustainable buildings goals. If you have any questions concerning the report or our response, please contact me or Timothy Unruh, Director of the Federal Energy Management Program, at (202) 586-5772.

Sincerely,

A handwritten signature in black ink, appearing to read "KBH", is written over a horizontal line.

Kathleen B. Hogan
Deputy Assistant Secretary for Energy Efficiency
Energy Efficiency and Renewable Energy

Enclosure



Appendix V: Comments from the Department of Veterans Affairs



DEPARTMENT OF VETERANS AFFAIRS
WASHINGTON DC 20420

July 10, 2015

Mr. Frank Rusco
Director, Natural Resources
and Environment
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Rusco:

The Department of Veterans Affairs (VA) has reviewed the Government Accountability Office's (GAO) draft report, "**FEDERAL GREEN BUILDING: Federal Efforts and Third-Party Certification Help Agencies Implement Key Requirements But Challenges Remain**" (GAO-15-667). VA generally agrees with GAO's conclusions.

The enclosure provides technical comments to the draft report. VA appreciates the opportunity to comment on your draft report.

Sincerely,

A handwritten signature in black ink that reads "Robert L. Nabors II". The signature is stylized and includes a large flourish at the end.

Robert L. Nabors II
Chief of Staff

Enclosure

Appendix VI: GAO Contacts and Staff Acknowledgments

GAO Contacts

Frank Rusco, (202) 512-3841 or ruscof@gao.gov
Brian J. Lepore, (202) 512-4523 or leporeb@gao.gov
David J. Wise, (202) 512-2834 or wised@gao.gov

Staff Acknowledgments

In addition to the individuals named above, Karla Springer (Assistant Director), Harold Reich (Assistant Director), Sara Vermillion (Assistant Director), Janice Ceperich, John Delicath, Swati Deo, Debra Draper, Philip Farah, Cindy Gilbert, Geoffrey Hamilton, Armetha Liles, Marietta Mayfield Revesz, and Barbara Timmerman made key contributions to this report.

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