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DEPARTMENT OF ENERGY

10 CFR Part 433

[EERE–2022–BT–STD–0012]

RIN 1904–AE44

Baseline Energy Efficiency Standards Update for New Federal Commercial and Multi-Family High-Rise Residential Buildings

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Final rule.

SUMMARY: The U.S. Department of Energy (DOE) is publishing this final rule to implement provisions in the Energy Conservation and Production Act (ECPA) that require DOE to update the baseline Federal energy efficiency performance standards for the construction of new Federal commercial and multi-family high-rise residential buildings. This rule updates the baseline Federal commercial standard to the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 90.1–2019.

DATES: This rule is effective June 6, 2022.

The incorporation by reference of certain material listed in this rule is approved by the Director of the Federal Register as of June 6, 2022. The incorporation by reference of certain other material listed in this rule was approved by the Director of the Federal Register through January 5, 2016.

All Federal agencies shall design new Federal buildings that are commercial and multi-family high-rise residential buildings, for which design for construction began on or after April 7, 2023, using ASHRAE Standard 90.1–2019 as the baseline standard for 10 CFR part 433.

ADDRESSES: The docket, which includes this **Federal Register** notice and other supporting documents/materials, is available for review at *www.regulations.gov.* All documents in the docket are listed in the *www.regulations.gov* index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

This rulemaking can be identified by docket number EERE–2022–BT–STD–0012 and/or RIN number 1904–AE44. A link to the docket web page can be found at *www.energy.gov/eere/femp/notices-and-rules-related-federal-energy-management.* The docket web page contains instructions on how to access all documents, including public comments, in the docket.

FOR FURTHER INFORMATION CONTACT:

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SUPPLEMENTARY INFORMATION: DOE maintains a previously approved incorporation by reference and incorporates by reference the following standard into 10 CFR part 433:

ANSI/ASHRAE/IES Standard 90.1–2013, Energy Standard for Buildings Except Low-Rise Residential Buildings, I–P Edition, Copyright 2013.

ANSI/ASHRAE/IES Standard 90.1–2019, Energy Standard for Buildings Except Low-Rise Residential Buildings, I–P Edition, Copyright 2019.

Copies of ANSI/ASHRAE/IES Standards 90.1–2013 and 2019 can be obtained from ASHRAE, Inc., 1791 Tullie Circle, NE, Atlanta, GA 30329, or *www.ashrae.org.*

For a further discussion of these standards, see section VII.N of this document.

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I. Summary of the Final Rule

Section 305 of ECPA, as amended, requires DOE to determine whether the energy efficiency standards for new Federal buildings [1] should be updated to reflect revisions to ASHRAE Standard 90.1 based on the cost-effectiveness of the revisions. (42 U.S.C. 6834(a)(3)(B)) Accordingly, DOE conducted a cost-effectiveness analysis that found ASHRAE Standard 90.1–2019 to be cost-effective for new Federal commercial and multi-family high-rise residential buildings. DOE's assumptions and methodology for the cost-effectiveness of this rule are based on DOE's State building energy codes program's cost-effectiveness analysis of ASHRAE Standard 90.1–2016 and ASHRAE Standard 90.1–2019.[2] These assumptions and methodology also provide the basis for the environmental assessment (EA) for this rulemaking. Therefore, in this final rule, DOE updates the energy efficiency standards for new Federal buildings to ASHRAE Standard 90.1–2019 for buildings for which design for construction begins on or after one year after this rule is published in the **Federal Register**. (42 U.S.C. 6834(a)(3)(A))

To ensure consistency with ASHRAE Standard 90.1–2019, this final rule also limits the types of process and receptacle loads that may be excluded from the calculation of the 30 percent improvement beyond ASHRAE Standard 90.1 by revising 10 CFR 433.101(b) to require Federal agencies to include unregulated energy use (*i.e.,* process loads and receptacle loads not within the scope of ASHRAE Standard 90.1) when calculating the 30 percent improvement beyond ASHRAE Standard 90.1, except for energy-intensive process loads that are: (i) Driven by mission and operational requirements, not necessarily buildings, and (ii) not influenced by conventional building energy conservation measures.

This final rule also amends the definition for ''new Federal buildings'' in 10 CFR 433.2 to include buildings leased by Federal agencies and privatized military housing in accordance with amendments to the underlying statutory definition of this term made by the Energy Independence and Security Act (EISA) 2007.[3] This final rule also makes technical amendments to the definitions in 10 CFR 433.2 for consistency with the materials incorporated by reference in 10 CFR 433.3.

Additionally, in the discussion of final rule, DOE clarifies and reiterates several programmatic principles related to agencies' implementation of ASHRAE Standard 90.1. These clarifications do not represent changes to the regulations in 10 CFR part 433. However, DOE frequently receives repeat questions from Federal agencies expressing confusion over particular aspects of implementing ASHRAE Standard 90.1. Accordingly, DOE wishes to reduce agencies' confusion by clarifying several important principles of implementing ASHRAE Standard 90.1 in the discussion of final rule.

II. Introduction

A. Energy Conservation and Production Act Requirements

ECPA, as amended, requires DOE to establish building energy efficiency standards for all new Federal buildings. (42 U.S.C. 6834(a)(1)) The standards established under section 305(a)(1) of ECPA must contain energy efficiency measures that are technologically feasible, economically justified, and meet the energy efficiency levels in the applicable voluntary consensus energy codes specified in section 305. (42 U.S.C. 6834(a)(1)–(3)) Section 306(a) of ECPA further provides that each Federal agency and the Architect of the Capitol must adopt procedures to ensure that new Federal buildings will meet or exceed the Federal building energy efficiency standards established under section 305. (42 U.S.C. 6835(a)) ECPA Section 306(b) bars the head of a Federal agency from expending Federal funds for the construction of a new Federal building unless the building meets or exceeds the applicable baseline Federal building energy standards established under section 305. (42 U.S.C. 6835(b))

Under section 305 of ECPA, the referenced voluntary consensus code for new Federal commercial buildings (including multi-family high rise residential buildings) is ASHRAE Standard 90.1. (42 U.S.C. 6834(a)(2)(A)) DOE codified this referenced code as the baseline Federal building standard in its existing energy efficiency standards found in 10 CFR part 433. Also pursuant to section 305 of ECPA, DOE must establish, by rule, Federal building energy efficiency performance standards for new Federal buildings that require such buildings be designed to achieve energy consumption levels that are at least 30 percent below the levels established in the referenced code (baseline Federal building standard), if life-cycle cost (LCC) effective. (42 U.S.C. 6834(a)(3)(A)(i)(I)) These requirements do not extend to renovations or modifications to existing buildings.

Additionally, under section 305 of ECPA, not later than one year after the date of approval of each subsequent revision of the ASHRAE Standard or the International Energy Conservation Code (IECC), DOE must determine whether to amend the baseline Federal building standards with the revised voluntary standard based on the cost-effectiveness of the revised voluntary standard. (42 U.S.C. 6834(a)(3)(B)) It is this requirement that this rulemaking addresses. ASHRAE has updated Standard 90.1 from the version currently referenced in DOE's regulations at 10 CFR part 433. In this rule, DOE revises the latest baseline Federal building standard for 10 CFR part 433 from ASHRAE Standard 90.1–2013 to ASHRAE Standard 90.1–2019. DOE notes that although ASHRAE published an update to ASHRAE Standard 90.1 in 2016, this rule updates 10 CFR part 433 to ASHRAE Standard 90.1–2019 directly, without requiring agencies to comply with ASHRAE Standard 90.1–2016. DOE notes however that because development of ASHRAE Standard 90.1 is incremental from version to version, ASHRAE Standard 90.1–2019 does include all content in ASHRAE Standard 90.1–2016 that was not specifically removed or modified during the development of ASHRAE Standard 90.1–2019.

B. ASHRAE Standard 90.1

Standard 90.1 is recognized by the U.S. Congress as the national model energy code for commercial buildings under the ECPA. Standard 90.1 is developed under ANSI-approved consensus procedures and is under continuous maintenance by a Standing Standard Project Committee (commonly referenced as SSPC 90.1). Updates to

[1] For the purposes of discussion in this document, all references to ''Federal buildings'' subject to 10 CFR part 433 will include commercial and multi-family high-rise residential unless otherwise noted.

[2] See DOE's State building energy codes program analyses of the cost savings of the 2016 and 2019 ASHRAE 90.1 Standards at *www.energycodes.gov/sites/default/files/2020-07/90.1-2016_National_Cost-Effectiveness.pdf* and *www.energycodes.gov/sites/default/files/2021-07/90.1-2019_National_Cost-Effectiveness.pdf*, respectively.

[3] See section 433(b) of EISA 2007, Public Law 110–140, 121 Stat. 1614 (Dec. 19, 2007).

Standard 90.1 are published every three years in order for the Standard to be included in model building energy codes.

Standard 90.1 includes several paths for compliance in order to provide flexibility to users of the Standard. The prescriptive path, which is widely considered the most traditional, establishes criteria for energy-related characteristics of individual building components such as minimum insulation levels, maximum lighting power, and controls for lighting and heating, ventilation, air conditioning, and refrigeration (HVAC&R) systems. Some of those requirements are considered ''mandatory,'' meaning that they must be met even when one of the other optional paths are utilized (*e.g.,* performance path).

In addition to the prescriptive path, Standard 90.1 includes two optional whole building performance paths. The first, known as the Energy Cost Budget (ECB) method, provides flexibility in allowing a designer to ''trade-off'' compliance among various requirements of Standard 90.1. This effectively allows a designer to not meet a given prescriptive requirement if the impact on energy cost is offset by exceeding other prescriptive requirements, as demonstrated through established energy modeling protocols. A building is deemed in compliance when the annual energy cost of the proposed design is no greater than the annual energy cost of the reference building design (baseline). Additionally, Standard 90.1 includes a second performance approach, the Performance Rating Method in Appendix G of the Standard. Traditionally, Appendix G has been used to rate the performance of buildings that exceed the requirements of Standard 90.1 for ''beyond code'' programs, including the Leadership in Energy and Environmental Design (LEED) Rating System, Green Globes, ASHRAE Standard 189.1, the International Green Construction Code (IgCC), the National Green Building Standard (NGBS), and other above-code programs.

C. Regulatory Requirements of 10 CFR Part 433

The energy efficiency standards for the design and construction of new Federal commercial and multi-family high rise buildings required by section 305 of ECPA were established by DOE under 10 CFR part 433.[4] As required by section 305 of ECPA, the standards in 10 CFR part 433 require Federal buildings be designed to achieve energy consumption levels that are at least 30 percent below the levels set by the most recently adopted version of ASHRAE Standard 90.1. When it is not LCC effective to design new Federal buildings to exceed ASHRAE Standard 90.1 performance levels by 30 percent, new Federal buildings must be designed to exceed the ASHRAE Standard 90.1 performance levels up to the percentage that is LCC effective. (10 CFR 433.100(c)). Furthermore, new Federal buildings must, at minimum, be designed to achieve the baseline standards established in ASHRAE Standard 90.1. (10 CFR 433.100(a)(1)–(4), (c)).

To determine if achieving energy consumption at least 30 percent lower than the levels of ASHRAE Standard 90.1 is LCC effective, Federal agencies must use the life-cycle-cost-effectiveness procedures set out in subpart A of 10 CFR part 436. (10 CFR 433.8) A Federal agency may choose to use one of four methods to determine LCC effectiveness: Lower LCC (10 CFR 436.19), positive net savings (10 CFR 436.20), savings-to-investment ratio estimated to be greater than one (10 CFR 436.21), and an adjusted internal rate of return estimated to be greater than the discount rate as listed in OMB Circular Number A–94 ''Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs'' (10 CFR 436.22).

To determine if a proposed building's energy consumption levels are at least 30 percent better than ASHRAE Standard 90.1, Federal agencies must use the Performance Rating Method found in Appendix G of ASHRAE Standard 90.1, subject to the DOE-specific formula found in 10 CFR 433.101. *See* 10 CFR 433.101(a)(1)–(4). This requires the use of a whole building simulation tool and model for every new Federal building design. Similarly, if it is LCC effective for a proposed building's energy consumption levels to be at a percentage better than ASHRAE Standard 90.1, but less than 30 percent, Federal agencies must use the Performance Rating Method in Appendix G of ASHRAE Standard 90.1 to determine this percentage. However, Federal agencies may use the prescriptive or ECB methods in lieu of the Performance Rating Method when determining whether a proposed building's energy consumption levels comply with, or meet, the energy consumption levels of ASHRAE Standard 90.1.

Currently, for the purposes of calculating the 30 percent savings requirements in 10 CFR 433.100, Federal agencies must include energy consumption levels associated with the building envelope and energy consuming systems normally specified as part of the building design by ASHRAE Standard 90.1, such as space heating, space cooling, ventilation, service water heating (SWH), and lighting, but must not include receptacle and process loads not within the scope of ASHRAE Standard 90.1, such as specialized medical or research equipment and equipment used in manufacturing processes.[5] (10 CFR 433.101(b)) However, due to a change made by ASHRAE in Standard 90.1–2016, and retained in ASHRAE Standard 90.1–2019, unregulated process and receptacle loads must be accounted for in the whole building analysis to determine whether a Federal building design complies with, or meets, ASHRAE Standard 90.1–2019, and in the whole building simulation used to establish the baseline for applying the Appendix G Performance Rating Method. See section III.B for a more detailed discussion.

D. Synopsis of Changes to ASHRAE Standard 90.1 Between ASHRAE Standard 90.1–2013 and ASHRAE Standard 90.1–2019

Under its building energy codes program, DOE evaluated ASHRAE Standard 90.1–2016 and 90.1–2019 and determined that each version would improve energy efficiency in commercial buildings subject to the code relative to the previous version of the Standard. (*See* 83 FR 8463 and 86 FR 40543) The summaries of the changes between each version of the Standard in the following sections are taken directly from DOE's determinations and supporting analyses for ASHRAE Standard 90.1–2016 and ASHRAE Standard 90.1–2019.[6] Section

[4] For the purposes of discussion in this document, all references to ''Federal buildings'' subject to 10 CFR part 433 will include commercial and multi-family high-rise residential unless otherwise noted.

[5] ''Process load'' means the load on a building resulting from energy consumed in support of a manufacturing, industrial, or commercial process. Process loads do not include energy consumed maintaining comfort and amenities for the occupants of the building (including space conditioning for human comfort). ''Receptacle load,'' also known as ''plug load,'' means the load on a building resulting from energy consumed by any equipment plugged into electrical outlets. (10 CFR 433.2)

[6] See determinations for the 2016 and 2019 ASHRAE 90.1 Standards at *www.regulations.gov/document/EERE-2017-BT-DET-0046-0008* and *www.regulations.gov/document/EERE-2020-BT-DET-0017-0010*. See analysis of energy savings for the 2016 and 2019 ASHRAE 90.1 Standards at *www.energycodes.gov/sites/default/files/2021-07/02202018_Standard_90.1-2016_Determination_TSD.pdf* and *www.energycodes.gov/sites/default/files/2021-07/Standard_90.1-2019_Final_Determination_TSD.pdf*.

II.D.1 describes the changes between ASHRAE Standard 90.1–2013 and ASHRAE Standard 90.1–2016, and section II.D.2 describes the changes between ASHRAE Standard 90.1–2016 and ASHRAE Standard 90.1–2019.

1. Changes in ASHRAE From Standard 90.1–2013 to Standard 90.1–2016

ASHRAE publishes changes to Standard 90.1 as individual addenda to the preceding Standard, and then bundles them together to form the next published edition. In creating the 2016 edition, ASHRAE published 121 addenda in total (listed in Appendix H of Standard 90.1–2016). DOE characterized the individual addenda into four categories:

(1) Addenda that are clarifications, administrative, or update references to other documents;

(2) Addenda that modify prescriptive and mandatory design and construction requirements for the envelope, HVAC, SWH, power, lighting, and other equipment sections of the standard;

(3) Addenda that modify the performance path options for compliance (the energy cost budget, building envelope trade-off option, and performance rating method sections of Standard 90.1); or

(4) Addenda that modify normative references.

DOE analyzed these addenda in preliminary and final energy savings analyses in making its determination that changes in ASHRAE Standard 90.1–2016 would lead to improved overall energy efficiency in buildings subject to the code compared to the 2013 edition of the Standard. (*See* 83 FR 8463) A more detailed discussion of the individual addenda may be found in DOE's energy savings analysis technical support document (TSD) for the final determination, which may be accessed at *www.energycodes.gov/determinations.*

For the purposes of this final rule, the most significant changes in ASHRAE Standard 90.1–2016 and beyond are to the Appendix G Performance Rating Method. The changes include: moving to a fixed baseline for calculating baseline building costs in the Performance Rating Method, adjustments to the associated equation for demonstrating compliance with the Performance Rating Method, and the application of a second equation that includes selecting building type and climate zone from a new table included in the revision. These changes are discussed in more detail in this section. However, as before, the calculations in the Appendix G Performance Rating Method are expressed in terms of energy costs.

Another significant change is that the new Appendix G Performance Rating Method may now be used to demonstrate compliance with ASHRAE Standard 90.1. In previous versions of the Standard, the Appendix G Performance Rating Method could only be used to make ''beyond code'' determinations of a proposed building's energy efficiency improvement beyond ASHRAE Standard 90.1. To demonstrate compliance, users were required to use either the prescriptive path or the ECB model to determine compliance. With the changes to the Appendix G Performance Rating Method formula, users may now use the Performance Rating Method to determine compliance with ASHRAE Standard 90.1.

a. Fixed Baseline

In Standard 90.1–2016, Appendix G was redesigned to have a consistent baseline across future versions for purposes of calculating baseline building energy costs, as opposed to having a baseline based on the prescriptive requirements of each new Standard. The new baseline for the Appendix G Performance Rating Method is now fixed at a level of performance approximately equal to the requirements in ASHRAE Standard 90.1–2004. That baseline is then used in a new formula found in Section 4.2.1.1 of ASHRAE Standard 90.1–2016 to set a compliance baseline for buildings designed under ASHRAE Standard 90.1–2016. The formula uses factors for different building types and climate zones, the building performance factors (BPFs) which are established in ASHRAE Standard 90.1–2016, and will be updated in each subsequent version. The BPFs are based upon the percent improvement in energy cost savings that is required by each successive ASHRAE Standard 90.1 compared to the fixed baseline. The resulting target represents the increase in energy cost savings beyond the fixed baseline that is required in each successive ASHRAE Standard 90.1 for each building type and climate zone.

The intent of these changes is to encourage the development of software tools that implement the Appendix G Performance Rating Method by providing a consistent baseline for Standard 90.1–2016 and future versions. This would allow software developers to more easily update programs to account for subsequent versions of the Standard by simply updating the BPFs used in the subsequent Standard. These efforts could have significant value to Federal agencies because the software tools envisioned would perform both the baseline and proposed building performance calculations and keep track of the relationships between the baseline building performance and proposed building performance, as noted in Table G3.1 of the Appendix G Performance Rating Method in ASHRAE Standard 90.1–2016. While these tools do not currently exist, it is expected that adhering to a consistent baseline will encourage software development.

b. Revisions and Additions to the Formula for Demonstrating Compliance With the Appendix G Performance Rating Method

To accommodate the new baseline, and because ASHRAE Standard 90.1 prescriptive requirements are now significantly more stringent than that baseline, ASHRAE revised the formula for demonstrating compliance with, and improvement beyond, the Appendix G Performance Rating Method in Standard 90.1–2016. The new formula requires the user to determine a metric first established in ASHRAE Standard 90.1–2016, the Performance Cost Index (PCI), which is calculated as follows:

Performance Cost Index = proposed building performance/baseline building performance

To determine compliance with, or improvement beyond, ASHRAE Standard 90.1, the user must then compare the PCI with a PCI Target (PCI_t). The PCI_t is the energy cost value that a proposed building must meet in order to comply with ASHRAE Standard 90.1 and, as noted above, it represents the increase in energy cost savings beyond the fixed baseline that is required in new versions of ASHRAE Standard 90.1 for that specific building type and climate zone. Accordingly, where $PCI \leq PCI_t$ the proposed building design complies with ASHRAE Standard 90.1.

To calculate PCI_t, users must use the formula in Section 4.2.1.1, first established in ASHRAE Standard 90.1–2016 and repeated in Standard 90.1–2019, which is quoted below:

''When using Appendix G, the Performance Cost Index (PCI) shall be less than or equal to the Performance Cost Index Target (PCI_t) when calculated in accordance with the following:

$$PCI_t = [BBUEC + (BPF \times BBREC)]/BBP$$

Where:

PCI = Performance Cost Index calculated in accordance with section G1.2.

BBUEC = Baseline Building Unregulated Energy Cost, the portion of the annual energy cost of a baseline building design that is due to unregulated energy use.

BBREC = Baseline Building Regulated Energy Cost, the portion of the annual energy cost of a baseline building design that is due to regulated energy use.

BPF = Building Performance Factor from Table 4.2.1.1. For building area types not listed in Table 4.2.1.1, use ''all others.'' Where a building has multiple building area types, the required BPF shall be equal to the area-weighted average of the building area types.

BBP = Baseline Building Performance.''

This formula is used in conjunction with Table 4.2.1.1, which provides BPFs for 9 building area types: Multifamily, Healthcare/Hospital, Hotel/Motel, Office, Restaurant, Retail, School, Warehouse, and All Others. BPFs are also provided for 17 climate zones: 0A and 1A, 0B and 1B, 2A, 2B, 3A, 3B, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, and 8. Table 4.2.1.1 may be viewed in the online read-only version of ASHRAE Standard 90.1–2019.[7]

Definitions of Regulated and Unregulated Energy Use

As noted previously, there are two key terms used in the formula in Section 4.2.1.1 of ASHRAE Standard 90.1: ''regulated energy use'' and ''unregulated energy use.'' ASHRAE defines ''regulated energy use'' as ''energy used by building systems and components with requirements prescribed in sections 5 through 10. This includes energy used by HVAC, lighting, SWH, motors, transformers, vertical transportation, refrigeration equipment, computer-room cooling equipment, and other building systems, components, and processes with requirements in sections 5 through 10.'' ASHRAE defines ''unregulated energy use'' as ''energy used by building systems and components that is not regulated energy use (see regulated energy use).'' For purposes of clarity, DOE notes that the definition of ''regulated energy use'' should include SWH used for pools, both interior lighting and exterior lighting, and service water pressure booster systems.

DOE also notes that in ASHRAE Standard 90.1–2016, ASHRAE considered plug loads such as computers, printers, copiers, and other electronic devices to be ''unregulated energy use'' for purposes of ASHRAE Standard 90.1. While automatic receptacle control [8] for plug loads is required by Section 8.4.2 of ASHRAE Standard 90.1, the actual plug loads themselves are not regulated. DOE also notes that cooking equipment other than refrigeration equipment should be considered ''unregulated energy use'' as well. DOE notes that both plug loads and cooking equipment are covered by Federal energy efficient product procurement requirements in 10 CFR part 436.

2. Changes in ASHRAE From Standard 90.1–2016 to Standard 90.1–2019

In creating Standard 90.1–2019, ASHRAE published 88 addenda in total, of which:

- 29 are expected to decrease energy use (*i.e.,* increased energy savings);
- none are expected to increase energy use (*i.e.,* decreased energy savings), and;
- 59 are expected to have no direct impact on energy savings (such as administrative or clarifications or changes to alternative compliance paths).

DOE analyzed these addenda in preliminary and final energy savings analyses in making its determination that changes in ASHRAE Standard 90.1–2019 will lead to improved overall energy efficiency in buildings subject to the code compared to the 2016 edition of the Standard. (*See* 86 FR 20674 (April 21, 2021) and 86 FR 40543 (July 28, 2021)) A more detailed discussion of the individual addenda may be found in DOE's energy savings analysis TSD for the final determination, which may be accessed at *www.energycodes.gov/determinations.*

The 29 changes considered that are expected to decrease energy use are:

(1) Modified exceptions to exhaust air energy recovery requirements.

(2) Changes the term ''ventilation air'' to ''outdoor air'' in multiple locations. Adds an exception to allow systems intended to operate continuously not to install motorized outdoor air dampers. Changes return air dampers to require low leakage ratings.

(3) Provides a definition of ''occupied-standby mode'' and adds new ventilation air requirements for zones served in occupied-standby mode.

(4) Clarifies that exhaust air energy recovery ventilators (ERVs) should be sized to meet both heating and cooling design conditions unless one mode is specifically excluded by existing exceptions.

(5) Revises the exception to demand control ventilation (DCV) requirements to clarify that the exception only applies to systems with ERV required to meet section 6.5.6.1.

(6) Revises the definition of ''networked guest room control system'' and aligns HVAC and lighting time-out periods for guest rooms.

(7) Expands the exterior lighting power density (LPD) application table to cover additional exterior spaces that are not in the exterior LPD table.

(8) Adds heat recovery for the space conditioning requirement targeted specifically at in-patient hospitals.

(9) Restructures commissioning and functional testing requirements in all sections of Standard 90.1 to require verification or testing for smaller and simpler buildings and commissioning for larger and more complex buildings.

(10) Adds indoor pool dehumidifier energy recovery requirement.

(11) Implements Federal clean water pump requirements.

(12) Replaces Fan Energy Grade metric with Fan Energy Index metric.

(13) Revises supply air temperature reset controls.

(14) Eliminates the requirement that zones with direct digital control (DDC) have air flow rates that are no more than 20 percent of the zone design peak flow rate.

(15) Revises the prescriptive fenestration U-factor and solar heat gain coefficient (SHGC) requirements and makes them material neutral.

(16) Provides separate requirements for non-transient dwelling unit exhaust air energy recovery.

(17) Changes the interior LPD requirements for many space types.

(18) Adds a new chiller table for heat pump and heat recovery chillers.

(19) Revises the computer room air conditioner (CRAC) requirements to clarify these are for floor mounted units and adds a new table for ceiling mounted units.

(20) Adds a definition of Standby Power Mode Consumption. Increases the furnace efficiency requirements.

(21) Adds a new Table F–5 to specify DOE-covered residential water boiler efficiency requirements and notes that requirements in Table 6.8.1–6 apply only to products used outside the United States. Adds standby mode and improved efficiency as of January 15, 2021.

(22) Adds dry cooler efficiency requirements and slightly increases efficiency requirements for evaporative condensers.

(23) Combines the commercial refrigerator and freezer table with the refrigerated casework table into a single table. Increases efficiency requirements.

(24) Revises LPDs using the Building Area Method.

(25) Makes a similar change to the variable air volume (VAV) box minimums as Addendum *au* to 90.1–2016, but in exception 1 to section 6.5.2.1 where the same 20 percent requirement still existed.

(26) Cleans up the outdated language regarding walk-in cooler and walk-in freezer

[7] Table 4.2.1.1 of Standard 90.1–2019 is copyrighted by ASHRAE and is not included in this rule. However, a read-only copy of ANSI/ASHRAE/IES Standard 90.1–2019 may be found on the ASHRAE website at *www.ashrae.org/technical-resources/standards-and-guidelines* by scrolling down to ''Preview ASHRAE Standards and Guidelines'' and selecting ''Standard 90.1–2019 (I–P).'' Table 4.2.1.1 is found in Section 4 on page 47.

[8] ASHRAE Standard 90.1 uses the term ''automatic receptacle control'' without a specific definition, indicating that the common usage of this term should be used. However, ASHRAE Standard 90.1 does use the term ''automatic control device'' in conjunction with the term ''automatic receptacle control.'' The definition of ''automatic control device'' in ASHRAE Standard 90.1 is ''a device capable of automatically turning loads off and on without manual intervention.'' This definition implies that an ''automatic receptacle control'' is a device capable of automatically turning loads *plugged into a receptacle* off and on without manual intervention.

requirements and makes the requirements consistent with current Federal regulations.

(27) Adds new normative references and updates existing ones with new effective dates, including several addenda to ASHRAE Standard 62.1–2016.

(28) Updates the lighting control requirements for parking garages in section 9.4.1.2.

(29) Changes the daylight responsive requirements from continuous dimming or stepped control to continuous dimming required for all spaces and adds a definition of continuous dimming.

The remaining 59 changes were considered administrative in nature or were determined to not be energy related. These changes are discussed in more detail in Appendix A of Preliminary Energy Savings Analysis: ANSI/ASHRAE/IES Standard 90.1–2019.[9] One change that is considered administrative in DOE's determination but is significant to this rulemaking is that ASHRAE updated the BPFs in Table 4.2.1.1 that are used in the Performance Rating Method in Standard 90.1–2019. This change reflects the increased performance of buildings designed to Standard 90.1–2019. The changes made to the Performance Rating Method that are discussed previously in section II.D.1 were carried over from ASHRAE Standard 90.1–2016 and included in ASHRAE Standard 90.1–2019.

III. Discussion of the Final Rule

DOE is issuing this action as a final rule. As indicated previously, DOE must determine whether the energy efficiency standards for new Federal buildings should be updated to reflect revisions to ASHRAE Standard 90.1 based on the cost-effectiveness of the revisions. (42 U.S.C. 6834(a)(3)(B)). In this final rule, DOE determines that the energy efficiency standards for new Federal buildings should be updated to reflect the 2019 revisions to ASHRAE Standard 90.1 based on the cost-effectiveness of the revisions. This final rule amends 10 CFR part 433 to update the referenced baseline Federal energy efficiency performance standards and provides a formula for Federal agencies to use when implementing the Appendix G Performance Rating Method based on the changes in ASHRAE Standard 90.1–2016, detailed in section II.D.1, that were carried over into ASHRAE Standard 90.1–2019. These amendments are described in sections II.D.1. and II.D.2. of this document. Additionally, DOE clarifies and reiterates several programmatic principles for Federal agencies implementing ASHRAE Standard 90.1 based on frequently asked questions received by DOE.

DOE also notes that there are a number of energy management requirements for Federal buildings found in statutory provisions, regulations, Executive Orders, and associated guidance, including, but not limited to the National Energy Conservation Policy Act, as amended (42 U.S.C. 8253–8258); the Energy Policy Act (EPAct) of 2005 (42 U.S.C. 15852); 10 CFR parts 433 and 435; and Executive Order 13834 (83 FR 23771 (May 22, 2018)). This final rule supports and does not supplant other legal requirements governing energy consumption in new Federal buildings. For example, by designing buildings to meet the ASHRAE Standard 90.1–2019 baseline, Federal agencies also help achieve the energy intensity reductions mandated under 42 U.S.C. 8253(a).

A. DOE's Analysis of the Cost-Effectiveness of ASHRAE Standard 90.1 as Applied to New Federal Buildings

DOE has determined that the energy efficiency standards for new Federal buildings should be updated to reflect the 2019 revisions to ASHRAE Standard 90.1 because these revisions are cost-effective for the Federal government. DOE's determination that the revisions to ASHRAE Standard 90.1 are cost effective for new Federal buildings is based on several forms of analysis.

DOE is required by ECPA section 304(b) to determine whether revisions to ASHRAE Standard 90.1 would improve energy efficiency in commercial buildings and must publish notice of its determination in the **Federal Register**. (42 U.S.C. 6833(b)(2)(A)). Although DOE's review of ASHRAE Standard 90.1 is required for the activities of DOE's State building energy codes program, DOE also uses the analysis as part of its review for purposes of the baseline standard update for new Federal buildings. Accordingly, DOE first compared ASHRAE Standard 90.1–2016 to the 2013 version of the standard and found that the revisions in the 2016 version achieved greater energy efficiency. (*See* 82 FR 34513 (July 25, 2017)). This determination was subject to notice and comment. (*See* 83 FR 8463 (Feb. 27, 2018)). In that determination, DOE found that the 2016 version of Standard 90.1 would have energy cost, source energy, and site energy savings of 8.3, 7.9, and 6.8 percent, respectively, compared to the 2013 version of Standard 90.1. Similarly, DOE compared ASHRAE Standard 90.1–2019 to the 2016 version of the standard and found that the revisions in the 2019 version would achieve greater energy efficiency. (*See* 86 FR 20674 (April 21, 2021)) This determination was subject to notice and comment. (*See* 86 FR 40543; July 28, 2021). In that determination, DOE found that the 2019 version of Standard 90.1 would have energy cost, source energy, and site energy savings of 4.3, 4.3, and 4.7 percent, respectively, compared to the 2016 version of Standard 90.1. DOE also conducted an independent, supplemental analysis of the updated ASHRAE Standard 90.1 as applied to the Federal sector, and found that the 2019 version of Standard 90.1 would have energy cost, source energy, and site energy savings of 11.3, 11.3, and 11.2 percent, respectively, compared to the 2013 version of Standard 90.1.

Second, DOE conducted an analysis of the cost-effectiveness of the updated ASHRAE Standard 90.1 as part of DOE's required activities for its building energy codes program and found the updated version to be cost-effective. DOE determines the cost effectiveness of revisions to ASHRAE Standard 90.1 as part of DOE's participation in the code development process. Section 307(b) of ECPA requires DOE to participate in the ASHRAE code development process and to assist in determining the cost-effectiveness of the voluntary standards. (42 U.S.C. 6836). DOE is required to periodically review the economic basis of the voluntary building energy codes and participate in the industry process for review and modification, including seeking adoption of all technologically feasible and economically justified energy efficiency measures. (42 U.S.C. 6836(b)).

Finally, DOE conducted an independent, supplemental analysis of ASHRAE Standard 90.1–2019 as applied to the Federal sector (baseline ASHRAE Standard 90.1–2013), and found that the energy efficiency gains resulted in $161.9 million annual life-cycle-cost net savings overall for an assumed 19.54 million square feet of annual new Federal construction, with a cumulative net present value (NPV) of total benefits of $1.66 billion (at a 7-percent discount rate) and $3.48 billion (at a 3-percent discount rate). This NPV expresses the estimated total value of future operating cost savings minus the estimated increased building costs for new Federal construction for 2022–2051 with a 30-year lifetime, along with monetized estimates of climate and health benefits. As part of the development of this rule, for the purpose of complying with the requirements of Executive Order 12866, DOE considered the estimated monetary benefits from the reduced emissions of CO_2, CH_4, N_2O, NO_X, and SO_2 that are

[9] *www.energycodes.gov/sites/default/files/2021-07/20210407_Standard_90.1-2019_Determination_TSD.pdf.*

expected to result from this rule. On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22–30087) granted the federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana* v. *Biden,* No. 21–cv–1074–JDC–KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from ''adopting, employing, treating as binding, or relying upon'' the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. In the absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits where appropriate and permissible under law. These results are discussed in greater detail in section IV of this document.

DOE's assumptions and methodology for the supplemental review cost-effectiveness of this rule are based on the cost-effectiveness analysis of ASHRAE Standard 90.1–2016 and ASHRAE Standard 90.1–2019 conducted by DOE's State building energy codes program. These assumptions and methodology also provide the basis for the EA for this rulemaking. In this supplemental review, DOE recognized differences in Federal sector building types and attempted to address these differences by drawing functional equivalencies among building types that were analyzed in the cost-effectiveness analysis described above. DOE also calculated the weighted average incremental costs for the 14 Federal building types that most closely matched the prototypes analyzed in DOE's cost-effectiveness analysis of Standard 90.1–2019. These Federal building types comprise 79.3 percent of estimated Federal construction. DOE assumes that all other Federal building types are represented by the average of the Federal buildings that were mapped to DOE's cost-effectiveness analysis building types. The results of this supplemental review are discussed in detail in section IV of this document.

Accordingly, based on these analyses, DOE has determined that the energy efficiency standards for new Federal buildings should be updated to reflect the 2019 revisions to ASHRAE Standard 90.1 based on the cost-effectiveness of the revisions.

B. Federal Agency Implementation of Changes to the Appendix G Performance Rating Method in ASHRAE Standard 90.1–2016 and ASHRAE Standard 90.1–2019

As previously discussed, ASHRAE Standard 90.1–2016 was the first version of Standard 90.1 in which the Appendix G Performance Rating Method may be used to demonstrate compliance with Standard 90.1. In previous versions, Appendix G was limited to demonstrating the percentage improvement above Standard 90.1. Federal agencies can now use Appendix G for both compliance and demonstrating the percentage improvement better than ASHRAE Standard 90.1–2019. Federal agencies may also choose to use one of the other compliance methods (the prescriptive path or the ECB method) to demonstrate compliance with Standard 90.1–2019. However, Federal agencies can only use the Appendix G Performance Rating Method for calculating the 30 percent improvement beyond ASHRAE Standard 90.1 as required in 10 CFR 433.100 and 433.101.

DOE notes that not all Federal building types are explicitly covered by the BPFs listed in Table 4.2.1.1 of ASHRAE Standard 90.1–2019. DOE plans to work with Federal agencies to define the most appropriate building area type for various types of buildings constructed in the Federal sector, such as courthouses, barracks, and industrial type facilities.

To calculate the percent improvement beyond ASHRAE Standard 90.1–2019, Federal agencies must use the formula in new 10 CFR 433.101(a)(5). The formula is as follows:

Percent improvement beyond code = $100 \times ((PCIt—PCI)/PCIt)$

Where

PCI = Performance Cost Index, as defined in Appendix G of ASHRAE Standard 90.1–2019, and

PCI_t = Performance Cost Index Target, as calculated in Section 4.2.1.1 of ASHRAE Standard 90.1–2019

This formula differs from previous formulas that DOE has required in 10 CFR 433.101 due to the new ASHRAE requirement to calculate PCI_t to determine whether a proposed building design exceeds the energy costs savings of ASHRAE Standard 90.1–2019.

Importantly, section 4.2.1.1 requires that the Baseline Building Unregulated Energy Consumption (BBUEC) be included in the calculation of a building's PCI_t. DOE notes that Federal agencies have always been required to include energy consumption that has generally been ''unregulated'' by ASHRAE Standard 90.1 (*i.e.,* certain process loads and receptacle loads) for purposes of determining compliance with ASHRAE Standard 90.1. Additionally, Federal agencies are required to include such unregulated energy use to conduct the required whole building simulation to establish the baseline for applying the Appendix G Performance Rating Method.

However, Federal agencies are currently required to exclude unregulated energy use not within the scope of ASHRAE Standard 90.1 when determining whether a design has met the required 30 percent improvement below ASHRAE Standard 90.1. (10 CFR 433.101(b)) In the initial promulgation of the energy efficiency standards for Federal commercial and multi-family high rises, DOE stated that such an exclusion for process loads was warranted because process loads in government facilities typically involve specialized equipment for which improvements in energy efficiency may affect the functionality of the equipment or where improvements are not available at all. Additionally, some Federal buildings use most of their energy serving process loads, and application of the energy savings requirement to these buildings would likely place an undue burden on the rest of the building if the 30 percent savings is to be achieved. (*See* 72 FR 72565, 72567–72568 (Dec. 21, 2007)). With respect to receptacle loads, DOE stated that it is often not possible to identify all receptacle loads when a building is designed or constructed as the occupants will to some degree establish what is plugged in, and that as equipment is replaced over time the initial savings from receptacle loads may diminish. (*See* 72 FR 72567–72568) Moreover, DOE stated that the energy efficiency of many receptacle loads was addressed in section 104 of EPAct 2005 (Pub. L. 109–58), which requires Federal agencies to purchase energy efficient appliances and equipment. (42 U.S.C 8259b).

However, due to ASHRAE's explicit inclusion of unregulated energy use in the PCI_t equation, in this final rule, DOE limits the types of unregulated loads that may be excluded from the calculation of the 30 percent improvement beyond ASHRAE Standard 90.1. This final rule revises 10 CFR 433.101(b) to require Federal agencies to include unregulated energy use (*i.e.,* process loads and receptacle loads not within the scope of ASHRAE Standard 90.1) in agencies'

determination of PCI_t when calculating the 30 percent improvement beyond ASHRAE Standard 90.1, except for energy-intensive process loads that are (i) driven by mission and operational requirements, not necessarily buildings, and (ii) not influenced by conventional building energy conservation measures. Examples would include training simulators, health-care equipment, facilities which generate and/or transmit electricity or steam, waterway shipping locks, and transmitters and other types of electronic installations. This exception aligns with DOE's exception for certain assumed exclusions of structures and processes under the Federal energy performance and reporting requirements of section 543 of the National Energy Conservation Policy Act (NECPA), as amended by EPAct.[10] (*See* 42 U.S.C. 8253(a)) This final rule also removes paragraph (b) from 10 CFR 433.100, as this paragraph is duplicative of the current paragraph (b) in 10 CFR 433.101, and is not reflective of the changes in this final rule. Moreover, the content in this paragraph, how to incorporate process and receptacle loads in the calculation of the 30 percent improvement, is best placed in 10 CFR 433.101, which prescribes the equations for the 30 percent improvement calculation.

DOE acknowledges that the inclusion of unregulated loads into the 30 percent or more determination is a change from prior practice. However, the changes in this final rule ensure consistency between ASHRAE Standard 90.1–2019 and the application of the Standard to Federal buildings, as required by section 305 of ECPA, while still providing agencies the flexibility to exclude unique mission-focused, energy-intensive process loads from the 30 percent improvement calculation so that the functionality of such loads is not jeopardized and an undue burden is not placed on the rest of the building if the 30 percent savings is to be achieved. The inclusion of unregulated energy, particularly receptacle loads, into the 30 percent improvement calculation may mean that fewer building designs will meet the 30 percent threshold, where such designs would otherwise meet that threshold if unregulated energy loads were excluded from the calculation. However, DOE believes that the inclusion of unregulated energy use into this calculation is more consistent with the text of section 305 of EPAct 2005, which requires that Federal buildings be designed to achieve energy savings of 30 percent or more below ASHRAE Standard 90.1, without reference to or exception for process or receptacle loads. Moreover, DOE notes that such buildings consume the same amount of energy, regardless of whether unregulated energy is included in the 30 percent or more calculation. Additionally, DOE reiterates that a building design is compliant with 10 CFR 433.100 even if the design does not meet the 30 percent or more threshold, provided the design obtains the most energy savings below ASHRAE Standard 90.1 that is cost-effective, in accordance with 10 CFR 433.100(c) (now section 433.100(b)).

C. Definition of ''New Federal Building''

The definition of ''New Federal building'' in 10 CFR part 433 has not previously been updated to match what is found in 42 U.S.C. 6832(6). EISA 2007 (Pub. L. 110–140, 121 Stat. 1614 (Dec. 19, 2007)) updated the definition of ''Federal building'' to include privatized military family housing and leased buildings. Accordingly, in order to bring 10 CFR part 433 into agreement with 42 U.S.C. 6832(6), DOE is updating the definition of ''New Federal building'' to mean '' any new building (including a complete replacement of an existing building from the foundation up) to be constructed by, or for the use of, any Federal agency. Such term shall include new buildings (including a complete replacement of an existing building from the foundation up) built for the purpose of being leased by a Federal agency, and privatized military housing.''

D. Programmatic Clarifications for Implementing ASHRAE Standard 90.1

As noted previously, DOE is clarifying and reiterating several programmatic principles regarding implementation of ASHRAE Standard 90.1–2019 in the preamble of final rule. The clarifications and reiterations are not changes to the regulatory text. Instead, DOE is taking this opportunity to provide answers and clarifications for frequent questions that DOE receives from Federal agencies in order to reduce confusion over agencies' implementation of ASHRAE Standard 90.1.

1. Whole Building Simulation and Model for Appendix G Performance Rating Method

Based on frequent questions regarding the issue, DOE reiterates that the use of the ASHRAE Standard 90.1 Appendix G Performance Rating Method requires the consideration of the building envelope and the use of a whole-building simulation tool and simulation model for the chosen tool of the proposed building design. As noted previously, Federal agencies must use the Performance Rating Method when determining if their proposed buildings are 30 percent or better beyond ASHRAE Standard 90.1. Since all Federal agencies must determine if they can meet the 30 percent or more threshold, this means that all Federal agencies must use a whole building simulation tool and a building model for every new Federal building design. Additionally, where a Federal agency uses the Performance Rating Method to determine compliance with ASHRAE Standard 90.1–2019, the agency must use a whole building simulation tool and whole building model.

2. DOE and Agency Roles When Applying ASHRAE Standard 90.1

DOE has often received questions regarding enforcement of the energy efficiency standards for Federal commercial and multi-family high rise buildings, including for situations when agencies may seek exceptions to particular aspects of ASHRAE Standard 90.1. Specifically, agencies have asked whether DOE is the ''authority having jurisdiction'' referenced in ASHRAE Standard 90.1, and whether DOE is the ''authority having jurisdiction'' for purposes of granting exceptions to aspects of the Standard for Federal agencies. As with prior versions of ASHRAE Standard 90.1, Standard 90.1–2019 provides some flexibility to building designers based upon the type of code requirement at issue. Standard 90.1 contains ''prescriptive requirements,'' which may have exceptions to them or may be ''traded off'' in the Performance Rating Method if designers are unable or choose not to meet a specific prescriptive requirement. Such an approach means that another building component would need to be improved beyond what was required prescriptively by the Standard for that component, or else the overall score of the building design under the Performance Rating Method will be lowered. Standard 90.1 also contains ''mandatory requirements,'' which may not be traded off with other requirements. However, Standard 90.1

[10] Section 543 of NECPA requires agencies to meet specific energy reduction targets, report progress towards such targets, perform periodic energy consumption evaluations, and implement periodic energy conservation measures where feasible. (42 U.S.C. 8253). Section 543(c)(3) of NECPA requires DOE to issue guidelines that establish criteria for exclusions to these performance and reporting requirements. These exclusions are outlined in ''Guidelines Establishing Criteria for Excluding Buildings from the Energy Performance Requirements of Section 543 of the National Energy Conservation Policy Act as Amended by the Energy Policy Act of 2005,'' (Jan. 27, 2006), available at: *www.energy.gov/eere/femp/downloads/guidelines-establishing-criteria-excluding-buildings-energy-performance.*

allows building designs to be excepted from meeting certain mandatory requirements in certain situations if allowed by the ''authority having jurisdiction,'' ''building code official,'' and/or ''code official.'' For example, the ''authority having jurisdiction'' or ''code official'' is the person who authorizes the use of alternative materials, methods of construction, or design (see, *e.g.,* section 4.1.3 of Standard 90.1–2019), and is also the person charged with determining if there is a conflict between the Standard and other laws or requirements and how to address such conflict (see section 4.1.5 of Standard 90.1–2019).

For the purposes of the energy efficiency standards for Federal buildings, DOE does not have authority to grant exceptions to the Standard for any Federal agency. The statute does not provide a specific enforcement authority beyond the statutory requirements, but section 548(a) of NEPCA (42 U.S.C. 8258(a)) requires Federal agencies to submit to DOE an annual report that describes activities to meet the energy management requirements of section 543 of NECPA (42 U.S.C. 8253). This submittal includes a list of all new Federal buildings owned, operated, or controlled by the Federal agency, for which designs were started since the beginning of FY 2007 (begun since October 1, 2006), and a statement specifying whether the Federal buildings are expected to meet or exceed the Federal building efficiency standards in 10 CFR part 433, as applicable. (See *www.energy.gov/eere/femp/downloads/annual-energy-management-data-report*). The DOE Annual Energy Management Data Report Reporting workbook and associated guidance can be found on the DOE Federal Energy Management Program (FEMP) website.[11] Federal agencies themselves are responsible for implementing the energy efficiency standards for Federal buildings and meeting any applicable statutory and regulatory requirements. Accordingly, where the terms are used in ASHRAE Standard 90.1, Federal agencies are their own ''authority having jurisdiction,'' ''building official,'' and/or ''code official,'' and may use their own best judgment in determining whether to exempt a proposed Federal building from aspects of the Standard or seek an alternative energy conservation measure to meet a particular aspect of the Standard where such exceptions or alternatives are permitted by the Standard. However, agencies must still comply with all relevant Federal energy efficiency statutes and regulations, including 10 CFR part 433. DOE notes that, as a general rule, any prescriptive requirement in ASHRAE Standard 90.1–2019 can be ''traded off'' in the Performance Rating Method if agencies are unable or choose not to meet a specific prescriptive requirement. Such an approach means that another building component would need to be improved beyond what was required prescriptively by the Standard for that component, or else the overall score of the building design under the Performance Rating Method will be lowered. With respect to mandatory requirements in the Standard, DOE notes that, as the ''authority having jurisdiction,'' ''building official,'' or ''code official,'' agencies should only be making exceptions to mandatory requirements where the Standard allows for the ''authority having jurisdiction,'' ''building official,'' and/or ''code official'' to make exceptions to such requirements. DOE welcomes Federal agencies' questions and requests for assistance in implementing the energy efficiency standards for Federal buildings, and DOE will provide guidance and assistance upon request.

IV. Methodology, Analytical Results, and Conclusion

A. Cost-Effectiveness

DOE's assumptions and methodology for the cost-effectiveness of this rule are based on cost-effectiveness analysis of ASHRAE Standard 90.1–2016 and ASHRAE Standard 90.1–2019 conducted by DOE's State building energy codes program,[12] as well as DOE's EA for this rulemaking.[13] As described in the EA, DOE identified a rate of new Federal commercial construction of 19.54 million square feet per year with a distribution of building types as shown in Table IV.1. The distribution of building types is based on an extraction of the latest 10 years of new construction data entered into the Federal Real Property Portfolio Management System (FRPP MS).[14] Table IV.1 also shows the prototype buildings incorporated into computer simulations that are used to estimate energy use in each building type. DOE derived these prototype buildings from 16 building types in 17 climate zones [15] using its Commercial Prototype Building models.[16] Of the 16 prototype buildings, DOE developed costs for 6 prototype buildings to determine the cost effectiveness of ASHRAE Standard 90.1–2016 and ASHRAE Standard 90.1–2019. DOE then extracted the cost-effectiveness information for those prototype buildings and weighted those values as appropriate to obtain an average cost effectiveness value for building types found in the Federal commercial sector.

TABLE IV.1—NEW FEDERAL COMMERCIAL AND HIGH-RISE MULTI-FAMILY CONSTRUCTION VOLUME BY BUILDING TYPE

Building type	Fraction of Federal construction volume (by floor area) (%)	Assumed BECP prototypes for energy savings	Assumed BECP prototypes for cost effectiveness
Office	20.74	Small Office, Medium Office, Large Office	Small Office, Large Office.
Dormitories and Barracks	14.85	Small Hotel, Mid-rise Apartment, High-rise Apartment.	Small Hotel, Mid-rise Apartment.

[11] Federal Comprehensive Annual Energy Reporting Requirements *www.energy.gov/eere/femp/federal-facility-consolidated-annual-reporting-requirements.*

[12] See DOE's analysis of the cost savings of the 2016 and 2019 ASHRAE 90.1 Standards at *www.energycodes.gov/sites/default/files/2020-07/90.1-2016_National_Cost-Effectiveness.pdf* and *www.energycodes.gov/sites/default/files/2021-07/90.1-2019_National_Cost-Effectiveness.pdf,* respectively.

[13] The Environmental Assessment (EA) (DOE/EA–2165) is entitled, ''Environmental Assessment for Final Rule, 10 CFR part 433, 'Energy Efficiency Standards for New Federal Commercial and Multi-Family High-Rise Residential Buildings' Baseline Standards Update''. The EA may be found in the docket for this rulemaking and at *www.energy.gov/nepa/doeea-2165-energy-efficiency-standards-new-federal-commercial-and-multi-family-high-rise.*

[14] See *www.realpropertyprofile.gov/FRPPMS/FRPP_Login.*

[15] Briggs, R.S., R.G. Lucas, and Z.T. Taylor. 2003. ''Climate classification for building energy codes and standards: Part 1—Development Process.'' ASHRAE Transactions 109(1): 109:121. American Society of Heating, Refrigerating and Air-Conditioning Engineers. Atlanta, Georgia.

[16] DOE's prototype buildings are described at *www.energycodes.gov/prototype-building-models.*

TABLE IV.1—NEW FEDERAL COMMERCIAL AND HIGH-RISE MULTI-FAMILY CONSTRUCTION VOLUME BY BUILDING TYPE—Continued

Building type	Fraction of Federal construction volume (by floor area) (%)	Assumed BECP prototypes for energy savings	Assumed BECP prototypes for cost effectiveness
School	14.33	Secondary School	Primary School.
Service	13.31	Stand-alone Retail, Non-refrigerated Warehouse	Stand-alone Retail.
Other Institutional Uses	5.90	None*	None.
Hospital	5.57	Hospital	Small Office, Large Office.
Warehouses	5.37	Non-Refrigerated Warehouse	None.
Laboratories	4.37	Medium Office, Hospital	Small Office, Large Office.
All Other	3.45	None	None.
Outpatient Healthcare Facility	3.35	Outpatient Healthcare	Small Office.
Industrial	2.36	None	None.
Child Care Center	1.18	Primary School	Primary School.
Communications Systems	1.11	None	None.
Prisons and Detention Centers	1.01	None	None.
Family Housing	0.68	Mid-rise Apartment	Mid-rise Apartment.
Navigation and Traffic Aids	0.53	None	None.
Land Port of Entry	0.53	Non-refrigerated Warehouse	None.
Border/Inspection Station	0.49	Small Office, Non-refrigerated Warehouse	Small Office.
Facility Security	0.31	Small Office	Small Office.
Data Centers	0.23	None	None.
Museum	0.19	None	None.
Comfort Station/Restrooms	0.07	Non-refrigerated Warehouse	None.
Public Facing Facility	0.05	Stand-alone Retail	Stand-alone Retail.
Aviation Security Related	0.01	Small Office	Small Office.
Post Office	0.01	Stand-alone Retail	Stand-alone Retail.

*Note that energy savings and cost-effectiveness mapping are not available for a number of Federal building types, with other institutional uses, warehouses, and all other being the largest Federal building types with no reliable mapping. As described in this section, DOE considered energy savings and costs for these unmapped Federal building types to be equivalent to the weighted energy savings and cost for the mapped Federal building types.

DOE has determined incremental construction first cost information for the building types and climate zones analyzed for ASHRAE Standard 90.1–2016 versus ASHRAE Standard 90.1–2013 (see Table IV.2),[17] ASHRAE Standard 90.1–2019 versus ASHRAE Standard 90.1–2016 (see Table IV.3), and for ASHRAE Standard 90.1–2019 versus ASHRAE Standard 90.1–2013 (see Table IV.4).

TABLE IV.2—INCREMENTAL CONSTRUCTION FIRST COST (2020$) FOR ASHRAE STANDARD 90.1–2016 VS. ASHRAE STANDARD 90.1–2013

Prototype	Value	ASHRAE climate zone*				
		2A	3A	3B	4A	5A
Small Office	First Cost	$673	$584	$515	$1,666	$641
	$/ft2	0.12	0.11	0.09	0.30	0.12
Large Office	First Cost	261,781	268,194	196,408	354,808	223,553
	$/ft2	0.52	0.54	0.39	0.71	0.45
Stand-alone Retail	First Cost	19,608	20,240	19,740	21,563	19,363
	$/ft2	0.79	0.82	0.80	0.87	0.78
Primary School	First Cost	(126,946)	(121,994)	(116,139)	(94,722)	(122,894)
	$/ft2	(1.72)	(1.65)	(1.57)	(1.28)	(1.66)
Small Hotel	First Cost	(104,866)	(104,624)	(104,396)	(101,194)	(103,044)
	$/ft2	(2.43)	(2.42)	(2.42)	(2.34)	(2.38)
Mid-rise Apartment	First Cost	(18,343)	(17,490)	(18,113)	(12,445)	(25,126)
	$/ft2	(0.54)	(0.52)	(0.54)	(0.37)	(0.74)

*Negative costs (shown in parentheses) indicate a reduction in cost due to changes in the code, usually due to reduced HVAC capacity. In this particular transition from ASHRAE Standard 90.1–2013 to ASHRAE Standard 90.1–2016, the cost reduction was mainly because of smaller and less expensive HVAC equipment since the building HVAC load had decreased. This cost reduction is part of the first cost calculation. Note that in addition to reduced equipment costs, there is reduced ductwork or piping costs as well.

[17] Note that the values in Table VI.2 have been adjusted to reflect 2020$ from the table that appears in DOE's determination of energy savings for Standard 90.1–2016, which were in 2018$. This adjustment was made using the GDP deflator value to correct for inflation between 2018 and 2020. Organization for Economic Co-operation and Development, GDP Implicit Price Deflator in United States, retrieved from FRED, Federal Reserve Bank of St. Louis; *fred.stlouisfed.org/series/USAGDPDEFAISMEI*, Updated February 17, 2021. These values have also been adjusted to reflect the same underlying economic assumptions as the 2019 version, and sales tax has also been removed.

TABLE IV.3—INCREMENTAL CONSTRUCTION FIRST COST (2020$) FOR ASHRAE STANDARD 90.1–2019 VS. ASHRAE STANDARD 90.1–2016

Prototype	Value	ASHRAE climate zone*				
		2A	3A	3B	4A	5A
Small Office	First Cost	($9,527)	($9,787)	($9,890)	($9,521)	($9,563)
	$/ft2	(1.73)	(1.78)	(1.80)	(1.73)	(1.74)
Large Office	First Cost	(989,010)	(976,327)	(930,667)	(1,037,775)	(997,955)
	$/ft2	(1.98)	(1.96)	(1.87)	(2.08)	(2.00)
Stand-alone Retail	First Cost	(33,532)	(33,999)	(34,505)	(34,348)	(34,957)
	$/ft2	(1.36)	(1.38)	(1.40)	(1.39)	(1.42)
Primary School	First Cost	(156,050)	(141,073)	(153,621)	(149,787)	(151,492)
	$/ft2	(2.11)	(1.91)	(2.08)	(2.03)	(2.05)
Small Hotel	First Cost	26,805	26,218	26,335	26,078	25,616
	$/ft2	0.62	0.61	0.61	0.60	0.59
Mid-rise Apartment	First Cost	(12,251)	(12,645)	(13,894)	(8,127)	(7,839)
	$/ft2	(0.36)	(0.37)	(0.41)	(0.24)	(0.23)

*Negative costs (shown in parentheses) indicate a reduction in cost due to changes in the code, usually due to reduced HVAC capacity. In this particular transition from ASHRAE Standard 90.1–2016 to ASHRAE Standard 90.1–2019, the cost reduction was mainly because of smaller and less expensive HVAC equipment since the building HVAC load had decreased. This cost reduction is part of the first cost calculation.

Table IV.4 combines the incremental first costs associated with the 2016 and 2019 versions of ASHRAE Standard 90.1. The 2016 analysis was adjusted to use the same underlying economic assumptions as the 2019 version, including fuel prices, fuel price escalations, and labor and material costs. Additionally, the underlying calculations for both the 2016 and 2019 versions were adjusted to remove sales tax, as Federal building construction may be exempt from State sales tax, depending on the State.

TABLE IV.4—INCREMENTAL CONSTRUCTION FIRST COST (2020$) FOR ASHRAE STANDARD 90.1–2019 VS. ASHRAE STANDARD 90.1–2013

Prototype	Value	ASHRAE climate zone*				
		2A	3A	3B	4A	5A
Small Office	First Cost	($8,854)	($9,204)	($9,375)	($7,855)	($8,922)
	$/ft2	(1.61)	(1.67)	(1.70)	(1.43)	(1.62)
Large Office	First Cost	(727,229)	(708,133)	(734,259)	(682,967)	(774,402)
	$/ft2	(1.46)	(1.42)	(1.47)	(1.37)	(1.55)
Stand-alone Retail	First Cost	(13,924)	(13,759)	(14,765)	(12,785)	(15,593)
	$/ft2	(0.56)	(0.56)	(0.60)	(0.52)	(0.63)
Primary School	First Cost	(282,996)	(263,067)	(269,760)	(244,509)	(274,386)
	$/ft2	(3.83)	(3.56)	(3.65)	(3.31)	(3.71)
Small Hotel	First Cost	(78,060)	(78,406)	(78,061)	(75,117)	(77,428)
	$/ft2	(1.81)	(1.81)	(1.81)	(1.74)	(1.79)
Mid-rise Apartment	First Cost	(30,594)	(30,136)	(32,007)	(20,571)	(32,965)
	$/ft2	(0.91)	(0.89)	(0.95)	(0.61)	(0.98)

*Negative costs (shown in parentheses) indicate a reduction in cost due to changes in the code, usually due to reduced HVAC capacity. In this particular transition from ASHRAE Standard 90.1–2013 to ASHRAE Standard 90.1–2019, the cost reduction was mainly because of smaller and less expensive HVAC equipment since the building load had decreased. This cost reduction is part of the first cost calculation. Note that in addition to reduced equipment costs, there may be reduced duct-work or piping costs as well.

DOE used data from Table IV.1 and Table IV.4 to calculate preliminary values for overall incremental first cost of construction for Federal commercial and high-rise, multi-family residential buildings. DOE calculated the incremental first cost of the Federal building types based on the DOE cost prototypes shown in the far-right column of Table IV.1 of this document. DOE then calculated the weighted average incremental cost for mapped Federal building types based on their corresponding BECP prototypes, which represent an estimated 79.3 percent of new Federal construction. This weighted incremental cost was assigned to un-mapped Federal building types, and a total weighted incremental cost was calculated by multiplying the incremental cost for each Federal building type by the fraction of Federal construction shown in Table IV.1 of this document.

The national incremental first cost for building types was developed by multiplying the average (across climate zones) incremental first cost of the prototypes (determined from the DOE State building energy codes program ASHRAE Standard 90.1 cost-effectiveness analysis) by the fraction of the Federal sector construction volume shown in Table IV.1, and then multiplying that by the total estimate of Federal new construction floorspace.[18] DOE estimates that total first cost outlays for new Federal buildings will be less under ASHRAE Standard 90.1–2019 than ASHRAE Standard 90.1–2013, primarily due to lower HVAC equipment costs for some building types (See Table IV.2). The resulting total incremental first cost estimate is a savings of $32.67 million per year. The average first cost decrease is $1.67 per square foot.

DOE also analyzed the relative impact of the final rule on the first cost of new constructed Federal buildings as a percentage of the overall annual cost of newly constructed Federal commercial and high-rise buildings. In order to estimate the total cost of construction for new Federal buildings, DOE obtained estimated construction costs for new Federal commercial and high-rise multifamily buildings were

[18] For the Federal office building, the small and large office prototype first costs were averaged. For the Federal education building, the primary school prototype first cost was used. For the Federal dormitories/barracks building type, the small hotel and mid-rise apartment prototype first costs were averaged.

obtained from RS Means (2020) [19] for the six building types analyzed in DOE's cost-effectiveness report. These new construction costs were weighted by the percent of Federal floorspace to develop an average cost of a new Federal building of $198 per square foot, as shown in Table IV.5. This average construction cost may be multiplied by the 19.54 million square feet of new Federal construction per year used in this rulemaking to estimate the annual total cost of new Federal commercial and high-rise multi-family construction of $3.86 billion. As previously noted, first cost savings associated with this rulemaking are estimated at $32.67 million per year, indicating a potential cost reduction in new Federal construction costs of 0.85 percent ($32.67 million divided by $3.86 billion).

TABLE IV.5—FIRST COST OF TYPICAL NEW FEDERAL BUILDING IN $/ft2

Federal building type	Weight (%)	First cost * ($)	Weighted cost ($)
Office	20.74	210	43.51
Barracks and Dormitories	14.85	217	32.18
School	14.33	225	32.25
Service	13.31	116	15.44
Hospital	5.57	200	11.14
Laboratories	4.37	200	8.73
Outpatient Healthcare Facility	3.35	220	7.38
Child Care Center	1.18	225	2.67
Family Housing >3 Stories	0.68	218	1.48
Border/Inspection Station	0.49	220	1.07
Facility Security	0.31	220	0.69
Aviation Security Related	0.01	220	0.02
Public Facing Facility	0.05	116	0.06
Post Office	0.01	116	0.01
Remaining Federal Stock	20.75	198	41.00
Federal Average	100.00	198	197.62

* All building first cost data from RS Means 2020.

For annual average (first year) energy cost savings, DOE used a similar approach to that used for incremental first cost. That is, DOE developed the national first year energy cost savings [20] for building types by multiplying the average (across climate zones) energy cost savings (determined from the DOE ASHRAE Standard 90.1 cost-effectiveness analysis) by the fraction of the Federal sector construction volume shown in Table IV.1, and then multiplying that by the total estimate of Federal new construction floorspace.[21] Table IV.6 [22] and Table IV.7 show annual energy cost savings by prototype buildings for ASHRAE Standard 90.1–2016 compared to ASHRAE Standard 90.1–2013 and for ASHRAE Standard 90.1–2019 compared to ASHRAE Standard 90.1–2016 respectively, and Table IV.8 shows the combined energy cost savings associated with the 2016 and 2019 versions of ASHRAE Standard 90.1. As was done for the incremental cost analysis, the 2016 energy cost savings analysis was adjusted to use the same underlying economic assumptions as the 2019 version, including fuel prices, fuel price escalations, labor and material costs, and the removal of sales tax. The resulting total annual energy cost savings for 19.54 million square feet of annual construction was estimated to be $3.4 million. The average annual energy savings in year 1 was estimated to be $0.17 per square foot. Note the annual energy cost savings are for one year of Federal commercial and high-rise multi-family residential construction and that those savings would accumulate over the evaluation period.

TABLE IV.6—AVERAGE FIRST YEAR ENERGY COST SAVINGS (2020) FOR ASHRAE STANDARD 90.1–2016 VS. ASHRAE STANDARD 90.1–2013

Prototype	Value	ASHRAE climate zone *				
		2A	3A	3B	4A	5A
Small Office	First Cost	$597	$583	$589	$557	$591
	$/ft2	0.11	0.11	0.11	0.10	0.11
Large Office	First Cost	37,492	39,844	19,652	49,019	45,108
	$/ft2	0.08	0.08	0.04	0.10	0.09

[19] RS Means. 2020. RS Means Building Construction Cost Data, 78th Ed. Construction Publishers & Consultants. Norwell, MA.

[20] The energy costs used were the national average energy costs used by ASHRAE in the development of Standard 90.1–2019. To quote the cost-effectiveness analysis report ''Energy rates used to calculate the energy costs from the modeled energy usage were $0.98/therm for fossil fuel and $0.1063/kWh for electricity. These rates were used for the 90.1–2019 energy analysis and derived from the EIA data. These were the values approved by the SSPC 90.1 for cost-effectiveness for the evaluation of individual addenda during the development of 90.1–2019.''

[21] For the Federal office building, the small and large office prototype LCCs were weighted by estimated fraction of small and large offices observed in the FRPP MS database over the past 10 years of construction. For the Federal education building, the primary school prototype LCC was used. For the Federal dorm/barracks building type, the small office, small hotel and mid-rise apartment prototype LCCs were averaged.

[22] Note that the values in Table VI.6 have been adjusted to reflect 2020$ from the table that appears in DOE's determination of energy savings for Standard 90.1–2016, which were in 2018$. This adjustment was made using the GDP deflator value to correct for inflation between 2018 and 2020. Organization for Economic Co- operation and Development, GDP Implicit Price Deflator in United States, retrieved from FRED, Federal Reserve Bank of St. Louis; *fred.stlouisfed.org/series/USAGDPDEFAISMEI*, Updated February 17, 2021. These values have also been adjusted to reflect the same underlying economic assumptions as the 2019 version.

TABLE IV.6—AVERAGE FIRST YEAR ENERGY COST SAVINGS (2020$) FOR ASHRAE STANDARD 90.1–2016 VS. ASHRAE STANDARD 90.1–2013—Continued

Prototype	Value	ASHRAE climate zone*				
		2A	3A	3B	4A	5A
Stand-alone Retail	First Cost	3,324	3,214	2,895	3,075	2,778
	$/ft2	0.13	0.13	0.12	0.12	0.11
Primary School	First Cost	15,245	16,130	11,841	15,560	16,377
	$/ft2	0.21	0.22	0.16	0.21	0.22
Small Hotel	First Cost	6,964	6,594	6,025	7,193	8,019
	$/ft2	0.16	0.15	0.14	0.17	0.19
Mid-rise Apartment	First Cost	1,715	1,615	1,649	1,461	1,881
	$/ft2	0.05	0.05	0.05	0.04	0.06

TABLE IV.7—AVERAGE FIRST YEAR ENERGY COST SAVINGS (2020$) FOR ASHRAE STANDARD 90.1–2019 VS. ASHRAE STANDARD 90.1–2016

Prototype	Value	ASHRAE climate zone*				
		2A	3A	3B	4A	5A
Small Office	First Cost	$278	$259	$271	$237	$235
	$/ft2	0.05	0.05	0.05	0.04	0.04
Large Office	First Cost	36,020	36,525	29,947	29,898	31,038
	$/ft2	0.07	0.07	0.06	0.06	0.06
Stand-alone Retail	First Cost	2,674	2,309	2,395	2,035	1,927
	$/ft2	0.11	0.09	0.10	0.08	0.08
Primary School	First Cost	6,320	6,085	6,945	5,411	5,439
	$/ft2	0.09	0.08	0.09	0.07	0.07
Small Hotel	First Cost	4,002	3,754	3,833	3,364	3,203
	$/ft2	0.09	0.09	0.09	0.08	0.07
Mid-rise Apartment	First Cost	1,747	1,581	732	542	522
	$/ft2	0.05	0.05	0.02	0.02	0.02

TABLE IV.8—AVERAGE FIRST YEAR ENERGY COST SAVINGS (2020$) FOR ASHRAE STANDARD 90.1–2019 VS. ASHRAE STANDARD 90.1–2013

Prototype	Value	ASHRAE climate zone*				
		2A	3A	3B	4A	5A
Small Office	First Cost	$874	$842	$860	$794	$826
	$/ft2	0.16	0.15	0.16	0.14	0.15
Large Office	First Cost	73,512	76,369	49,598	78,917	76,146
	$/ft2	0.15	0.15	0.10	0.16	0.15
Stand-alone Retail	First Cost	5,998	5,522	5,290	5,111	4,705
	$/ft2	0.24	0.22	0.21	0.21	0.19
Primary School	First Cost	21,565	22,215	18,786	20,971	21,816
	$/ft2	0.29	0.30	0.25	0.28	0.29
Small Hotel	First Cost	10,966	10,348	9,858	10,557	11,222
	$/ft2	0.25	0.24	0.23	0.24	0.26
Mid-rise Apartment	First Cost	3,462	3,196	2,381	2,003	2,403
	$/ft2	0.10	0.09	0.07	0.06	0.07

For LCC net savings, DOE used a similar approach to that used for incremental first cost and first year energy cost savings. That is, DOE developed the national annual LCC net savings [23] for building types by multiplying the average (across climate zones) LCC net savings (determined from the DOE ASHRAE Standard 90.1 cost-effectiveness analysis) by the fraction of the Federal sector construction volume shown in Table IV.1, and then multiplying that by the total estimate of Federal new construction floorspace.[24] Table IV.9 [25] and Table IV.10 show annual LCC net savings by prototype buildings for ASHRAE Standard 90.1–2016 compared to ASHRAE Standard 90.1–2013 and for ASHRAE Standard 90.1–2019 compared to ASHRAE Standard 90.1–2016 respectively, and Table IV.11 shows the combined LCC associated with the 2016 and 2019 versions of ASHRAE Standard 90.1. As was done for the incremental cost analysis, the 2016 LCC analysis was adjusted to use the same underlying

[23] The energy costs used were the national average energy costs used by ASHRAE in the development of Standard 90.1–2019. To quote the cost-effectiveness analysis report ''Energy rates used to calculate the energy costs from the modeled energy usage were $0.98/therm for fossil fuel and $0.1063/kWh for electricity. These rates were used for the 90.1–2019 energy analysis and derived from the EIA data. These were the values approved by the SSPC 90.1 for cost-effectiveness for the evaluation of individual addenda during the development of 90.1–2019.''

[24] For the Federal office building, the small and large office prototype LCCs were weighted by estimated fraction of small and large offices observed in the FRPP MS database over the past 10 years of construction. For the Federal education building, the primary school prototype LCC was used. For the Federal dorm/barracks building type, the small office, small hotel and mid-rise apartment prototype LCCs were averaged.

[25] Note that the values in Table IV.9 have been adjusted to reflect 2020$ from the table that appears in DOE's determination of energy savings for Standard 90.1–2016, which were in 2018$. This adjustment was made using the GDP deflator value to correct for inflation between 2018 and 2020. Organization for Economic Co-operation and Development, GDP Implicit Price Deflator in United States, retrieved from FRED, Federal Reserve Bank of St. Louis; *fred.stlouisfed.org/series/USAGDPDEFAISMEI*, Updated February 17, 2021. These values have also been adjusted to reflect the same underlying economic assumptions as the 2019 version, and sales tax has also been removed.

economic assumptions as the 2019 version, including fuel prices, fuel price escalations, labor and material costs, and the removal of sales tax. The resulting total LCC net savings for 19.54 million square feet of annual construction was estimated to be $161.9 million. The average LCC net savings in year 1 was estimated to be $8.29 per square foot. Note the annual LCC savings are for one year of Federal commercial and high-rise multi-family residential construction and that those savings would accumulate over the LCC evaluation period. For the purpose of this analysis, DOE relied on a 30-year period.[26]

TABLE IV.9—ANNUAL LIFE-CYCLE COST (LCC) NET SAVINGS (2020$) FOR ASHRAE STANDARD 90.1–2016 VS. ASHRAE STANDARD 90.1–2013

Prototype	ASHRAE climate zone				
	Value				
	2A	3A	3B	4A	5A
Small Office:					
Total	$11,545	$11,362	$11,605	$9,814	$11,502
$/ft²	2.10	2.07	2.11	1.78	2.09
Large Office:					
Total	393,008	459,357	166,387	584,969	722,155
$/ft²	0.79	0.92	0.33	1.17	1.45
Stand-alone Retail:					
Total	297,938	294,578	289,116	290,447	287,461
$/ft²	12.07	11.93	11.71	11.76	11.64
Primary School:					
Total	383,418	394,371	299,407	349,720	402,682
$/ft²	5.18	5.33	4.05	4.73	5.44
Small Hotel:					
Total	244,166	236,409	225,204	244,098	261,430
$/ft²	5.65	5.47	5.21	5.65	6.05
Mid-rise Apartment:					
Total	67,323	63,971	65,950	54,724	83,693
$/ft²	2.00	1.90	1.95	1.62	2.48

TABLE IV.10—ANNUAL LIFE-CYCLE COST (LCC) NET SAVINGS (2020$) FOR ASHRAE STANDARD 90.1–2019 VS. ASHRAE STANDARD 90.1–2016

Prototype	ASHRAE climate zone				
	Value				
	2A	3A	3B	4A	5A
Small Office:					
Total	$22,458	$22,257	$22,670	$21,425	$21,303
$/ft²	4.08	4.05	4.12	3.89	3.87
Large Office:					
Total	2,140,166	2,137,734	1,907,461	2,083,232	2,054,131
$/ft²	4.29	4.29	3.83	4.18	4.12
Stand-alone Retail:					
Total	120,306	113,599	117,007	108,246	106,638
$/ft²	4.87	4.60	4.74	4.38	4.32
Primary School:					
Total	395,974	370,009	398,497	367,937	372,306
$/ft²	5.35	5.00	5.39	4.97	5.03
Small Hotel:					
Total	604,477	600,247	601,537	592,772	590,215
$/ft²	13.99	13.89	13.92	13.72	13.66
Mid-rise Apartment:					
Total	88,940	89,183	73,209	57,750	56,579
$/ft²	2.64	2.64	2.17	1.71	1.68

TABLE IV.11—ANNUAL LIFE-CYCLE COST (LCC) NET SAVINGS (2020$) FOR ASHRAE STANDARD 90.1–2019 VS. ASHRAE STANDARD 90.1–2013

Prototype	ASHRAE climate zone				
	Value				
	2A	3A	3B	4A	5A
Small Office:					
Total	$34,003	$33,620	$34,274	$31,238	$32,805
$/ft²	6.18	6.11	6.23	5.68	5.96
Large Office:					
Total	2,533,174	2,597,090	2,073,848	2,668,200	2,776,287
$/ft²	5.08	5.21	4.16	5.35	5.57
Stand-alone Retail:					

[26] Lavappa, P. and J. Kneifel. 2021. Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis-2021 Annual Supplement to NIST Handbook 135.

TABLE IV.11—ANNUAL LIFE-CYCLE COST (LCC) NET SAVINGS (2020$) FOR ASHRAE STANDARD 90.1–2019 VS. ASHRAE STANDARD 90.1–2013—Continued

Prototype	ASHRAE climate zone				
	Value				
	2A	3A	3B	4A	5A
Total	418,244	408,176	406,123	398,693	394,099
$/ft²	16.94	16.53	16.45	16.15	15.96
Primary School:					
Total	779,392	764,380	697,904	717,657	774,987
$/ft²	10.54	10.33	9.44	9.70	10.48
Small Hotel:					
Total	848,643	836,656	826,742	836,871	851,646
$/ft²	19.64	19.37	19.14	19.37	19.71
Mid-rise Apartment:					
Total	156,263	153,154	139,159	112,474	140,271
$/ft²	4.63	4.54	4.12	3.33	4.16

DOE determined that the total incremental first cost estimate for Federal buildings (as mapped to the prototype buildings in Table IV.1) is a savings of $32.67 million per year, with an average first cost decrease of $1.67 per square foot. DOE determined that the total first year energy cost estimate is a savings of $3.4 million per year, with an average first year energy cost savings of $0.17 per square foot. DOE estimated $161.9 million in annual LCC net savings for the entire Federal commercial and multi-family high-rise buildings sector with an average LCC net savings of $8.29 per square foot.

DOE also conducted a net benefits and costs analysis using a 30-year analysis period and an assumed building lifetime of 30 years. The building lifetime assumption was made to correspond with availability of underlying data from the cost-effectiveness analysis conducted by DOE's State building energy codes program.

DOE calculated the net present value (NPV) of the change in equipment cost and reduced operating cost associated with the difference between ASHRAE 90.1–2013 and ASHRAE 90.1–2019. The NPV is the value in the present of a time-series of costs and savings, equal to the present value of savings in operating cost minus the present value of the increased total equipment cost to consumers.

DOE determined the total increased equipment cost for each year of the analysis period (2022–2051) using the incremental construction cost described previously. DOE determined the present value of operating cost savings for each year from the beginning of the analysis period to the year when all Federal buildings constructed by 2051 have been retired, assuming a 30-year lifetime of the building.

The average annual operating cost includes the costs for energy, repair or replacement of building components (*e.g.,* heating and cooling equipment, lighting, and envelope measures), and maintenance of the building. DOE determined the per-unit annual savings in operating cost based on the savings in energy costs plus replacement and maintenance cost savings, which were calculated in the underlying cost-effectiveness analysis by DOE's State building energy codes program. While DOE used the methodology and prices described above to calculate first year energy cost savings and LCC net savings, for the NPV calculations, DOE determined the per-unit annual savings in operating cost by multiplying the per square foot annual electricity and natural gas savings in energy consumption by the appropriate energy price from EIA's *AEO2021*.[27] DOE forecasted energy prices based on projected average annual price changes in EIA's *AEO2021* to develop the operating cost savings through the analysis period.

DOE uses national discount rates to calculate national NPV. DOE estimated NPV using both a 3-percent and a 7-percent real discount rate, in accordance with the Office of Management and Budget's guidance to Federal agencies on the development of regulatory analysis, particularly section E therein: *Identifying and Measuring Benefits and Costs.*[28] The NPV is the sum over time of the discounted net savings.

The present value of increased equipment costs is the annual total cost increase in each year (the difference between ASHRAE 90.1–2019 and ASHRAE 90.1–2013), discounted to the present, and summed throughout the analysis period (2022 through 2051). Because new construction is held constant through the analysis period, the installed cost is constant.

The present value of savings in operating cost is the annual savings in operating cost (the difference between ASHRAE 90.1–2019 and ASHRAE 90.1–2013), discounted to the present and summed through the analysis period (2022 through 2051). Savings are decreases in operating cost associated with the higher energy efficiency associated with buildings designed to ASHRAE 90.1–2019 compared to ASHRAE 90.1–2013. Total annual savings in operating cost are the savings per square foot multiplied by the number of square feet that survive in a particular year through the lifetime of the buildings constructed in the last year of the analysis period.

B. Monetization of Emissions Reduction Benefits

As part of the development of this rule, for the purpose of complying with the requirements of Executive Order 12866, DOE considered the estimated monetary benefits from the reduced emissions of CO_2, CH_4, N_2O, NO_X, and SO_2 that are expected to result from this rule. In order to make this calculation analogous to the calculation of the NPV of consumer benefit, DOE considered the reduced emissions expected to result over the lifetime of buildings constructed in the analysis period. This section summarizes the basis for the values used for monetizing the emissions benefits and presents the values considered in this rule.

On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22–30087) granted the federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana* v. *Biden,* No. 21–cv–1074–

[27] DOE—U.S. Department of Energy. 2021. Annual Energy Outlook 2021 with Projections to 2050. Washington, DC Available at *www.eia.gov/outlooks/aeo/.*

[28] Office of Management and Budget. OMB Circular A–4, Regulatory Analysis. 2003. OMB: Washington, DC September 17, 2003. *www.whitehouse.gov/sites/whitehouse.gov/files/omb/circulars/A4/a-4.pdf.*

JDC–KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from ''adopting, employing, treating as binding, or relying upon'' the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. In the absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits where appropriate and permissible under law.

1. Monetization of Greenhouse Gas Emissions

For the purpose of complying with the requirements of Executive Order 12866, DOE estimates the monetized benefits of the reductions in emissions of CO_2, CH_4, and N_2O by using a measure of the social cost (''SC'') of each pollutant (*e.g.,* SC–GHGs). These estimates represent the monetary value of the net harm to society associated with a marginal increase in emissions of these pollutants in a given year, or the benefit of avoiding that increase. These estimates are intended to include (but are not limited to) climate-change-related changes in net agricultural productivity, human health, property damages from increased flood risk, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services. DOE exercises its own judgment in presenting monetized climate benefits as recommended by applicable Executive Orders and guidance, and DOE would reach the same conclusion presented in this notice in the absence of the social cost of greenhouse gases, including the February 2021 Interim Estimates presented by the Interagency Working Group on the Social Cost of Greenhouse Gases. DOE exercises its own judgment in presenting monetized climate benefits as recommended by applicable Executive Orders, and DOE would reach the same conclusion presented in this notice in the absence of the social cost of greenhouse gases, including the February 2021 Interim Estimates presented by the Interagency Working Group on the Social Cost of Greenhouse Gases.

DOE estimated the global social benefits of CO_2, CH_4, and N_2O reductions (*i.e.,* SC–GHGs) using the estimates presented in the Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990 published in February 2021 by the Interagency Working Group on the Social Cost of Greenhouse Gases (IWG) (IWG, 2021).[29] The SC–GHGs is the monetary value of the net harm to society associated with a marginal increase in emissions in a given year, or the benefit of avoiding that increase. In principle, SC–GHGs includes the value of all climate change impacts, including (but not limited to) changes in net agricultural productivity, human health effects, property damage from increased flood risk and natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services. The SC–GHGs therefore, reflects the societal value of reducing emissions of the gas in question by one metric ton. The SC–GHGs is the theoretically appropriate value to use in conducting benefit-cost analyses of policies that affect CO_2, N_2O and CH_4 emissions. As a member of the IWG involved in the development of the February 2021 SC–GHG TSD), the DOE agrees that the interim SC–GHG estimates represent the most appropriate estimate of the SC–GHG until revised estimates have been developed reflecting the latest, peer-reviewed science.

The SC–GHGs estimates presented here were developed over many years, using transparent process, peer-reviewed methodologies, the best science available at the time of that process, and with input from the public. Specifically, in 2009, an interagency working group (IWG) that included the DOE and other executive branch agencies and offices was established to ensure that agencies were using the best available science and to promote consistency in the social cost of carbon ($SC–CO_2$) values used across agencies. The IWG published $SC–CO_2$ estimates in 2010 that were developed from an ensemble of three widely cited integrated assessment models (IAMs) that estimate global climate damages using highly aggregated representations of climate processes and the global economy combined into a single modeling framework. The three IAMs were run using a common set of input assumptions in each model for future population, economic, and CO_2 emissions growth, as well as equilibrium climate sensitivity (ECS)—a measure of the globally averaged temperature response to increased atmospheric CO_2 concentrations. These estimates were updated in 2013 based on new versions of each IAM. In August 2016 the IWG published estimates of the social cost of methane ($SC–CH_4$) and nitrous oxide ($SC–N_2O$) using methodologies that are consistent with the methodology underlying the $SC–CO_2$ estimates. The modeling approach that extends the IWG $SC–CO_2$ methodology to non-CO_2 GHGs has undergone multiple stages of peer review. The $SC–CH_4$ and $SC–N_2O$ estimates were developed by Marten et al. (2015) and underwent a standard double-blind peer review process prior to journal publication. In 2015, as part of the response to public comments received to a 2013 solicitation for comments on the $SC–CO_2$ estimates, the IWG announced a National Academies of Sciences, Engineering, and Medicine review of the $SC–CO_2$ estimates to offer advice on how to approach future updates to ensure that the estimates continue to reflect the best available science and methodologies. In January 2017, the National Academies released their final report, Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide, and recommended specific criteria for future updates to the $SC–CO_2$ estimates, a modeling framework to satisfy the specified criteria, and both near-term updates and longer-term research needs pertaining to various components of the estimation process (National Academies, 2017).[30] Shortly thereafter, in March 2017, President Trump issued Executive Order 13783, which disbanded the IWG, withdrew the previous TSDs, and directed agencies to ensure $SC–CO_2$ estimates used in regulatory analyses are consistent with the guidance contained in OMB's Circular A–4, ''including with respect to the consideration of domestic versus international impacts and the consideration of appropriate discount rates'' (E.O. 13783, Section 5(c)).

On January 20, 2021, President Biden issued Executive Order 13990, which re-established the IWG and directed it to ensure that the U.S. Government's estimates of the social cost of carbon and other greenhouse gases reflect the

[29] See Interagency Working Group on Social Cost of Greenhouse Gases, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide. Interim Estimates Under Executive Order 13990, Washington, DC, February 2021. Available at: *www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf* (last accessed March 17, 2021).

[30] See National Academies of Sciences, Engineering, and Medicine. 2017. Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide. Washington, DC: The National Academies Press. *doi.org/10.17226/24651.*

best available science and the recommendations of the National Academies (2017). The IWG was tasked with first reviewing the SC–GHG estimates currently used in Federal analyses and publishing interim estimates within 30 days of the E.O. that reflect the full impact of GHG emissions, including by taking global damages into account. The interim SC–GHG estimates published in February 2021, specifically the SC–CH_4 estimates, are used here to estimate the climate benefits for this rule. The E.O. instructs the IWG to undertake a fuller update of the SC–GHG estimates by January 2022 that takes into consideration the advice of the National Academies (2017) and other recent scientific literature.

The February 2021 SC–GHG TSD provides a complete discussion of the IWG's initial review conducted under E.O. 13990. In particular, the IWG found that the SC–GHG estimates used under E.O. 13783 fail to reflect the full impact of GHG emissions in multiple ways. First, the IWG found that a global perspective is essential for SC–GHG estimates because it fully captures climate impacts that affect the United States and which have been omitted from prior U.S.-specific estimates due to methodological constraints. Examples of omitted effects include direct effects on U.S. citizens, assets, and investments located abroad, supply chains, and tourism, and spillover pathways such as economic and political destabilization and global migration. In addition, assessing the benefits of U.S. GHG mitigation activities requires consideration of how those actions may affect mitigation activities by other countries, as those international mitigation actions will provide a benefit to U.S. citizens and residents by mitigating climate impacts that affect U.S. citizens and residents. If the United States does not consider impacts on other countries, it is difficult to convince other countries to consider the impacts of their emissions on the United States. As a member of the IWG involved in the development of the February 2021 SC–GHG TSD, DOE agrees with this assessment and, therefore, in this rule DOE centers attention on a global measure of SC–GHG. This approach is the same as that taken in DOE regulatory analyses from 2012 through 2016. Prior to that, in 2008 DOE presented Social Cost of Carbon (SCC) estimates based on values the Intergovernmental Panel on Climate Change (IPCC) identified in literature at that time. As noted in the February 2021 SC–GHG TSD, the IWG will continue to review developments in the literature, including more robust methodologies for estimating a U.S.-specific SC–GHG value, and explore ways to better inform the public of the full range of carbon impacts. As a member of the IWG, DOE will continue to follow developments in the literature pertaining to this issue.

Second, the IWG found that the use of the social rate of return on capital (7 percent under current OMB Circular A–4 guidance) to discount the future benefits of reducing GHG emissions inappropriately underestimates the impacts of climate change for the purposes of estimating the SC–GHG. Consistent with the findings of the National Academies (2017) and the economic literature, the IWG continued to conclude that the consumption rate of interest is the theoretically appropriate discount rate in an intergenerational context (IWG 2010, 2013, 2016a, 2016b), and recommended that discount rate uncertainty and relevant aspects of intergenerational ethical considerations be accounted for in selecting future discount rates. As a member of the IWG involved in the development of the February 2021 SC–GHG TSD, DOE agrees with this assessment and will continue to follow developments in the literature pertaining to this issue.

While the IWG works to assess how best to incorporate the latest, peer reviewed science to develop an updated set of SC–GHG estimates, it set the interim estimates to be the most recent estimates developed by the IWG prior to the group being disbanded in 2017. The estimates rely on the same models and harmonized inputs and are calculated using a range of discount rates. As explained in the February 2021 SC–GHG TSD, the IWG has recommended that agencies to revert to the same set of four values drawn from the SC–GHG distributions based on three discount rates as were used in regulatory analyses between 2010 and 2016 and subject to public comment. For each discount rate, the IWG combined the distributions across models and socioeconomic emissions scenarios (applying equal weight to each) and then selected a set of four values recommended for use in benefit-cost analyses: An average value resulting from the model runs for each of three discount rates (2.5 percent, 3 percent, and 5 percent), plus a fourth value, selected as the 95th percentile of estimates based on a 3 percent discount rate. The fourth value was included to provide information on potentially higher-than-expected economic impacts from climate change. As explained in the February 2021 SC–GHG TSD, and DOE agrees, this update reflects the immediate need to have an operational SC–GHG for use in regulatory benefit-cost analyses and other applications that was developed using a transparent process, peer-reviewed methodologies, and the science available at the time of that process. Those estimates were subject to public comment in the context of dozens of proposed rulemakings as well as in a dedicated public comment period in 2013.

DOE's derivations of the SC–GHGs (*i.e.,* SC–CO_2, SC–N_2O, and SC–CH_4) values used for this rule are discussed in the following sections, and the results of DOE's analyses estimating the benefits of the reductions in emissions of these pollutants are presented in section VII.A of this document.

a. Social Cost of Carbon

The SC–CO_2 values used for this rule were generated using the values presented in the 2021 update from the IWG's February 2021 TSD. Table IV.12 shows the updated sets of SC–CO_2 estimates from the latest interagency update in 5-year increments from 2020 to 2050. For purposes of capturing the uncertainties involved in regulatory impact analysis, DOE has determined it is appropriate include all four sets of SC–CO_2 values, as recommended by the IWG.[31]

[31] For example, the February 2021 TSD discusses how the understanding of discounting approaches suggests that discount rates appropriate for intergenerational analysis in the context of climate change may be lower than 3 percent.

TABLE IV.12—ANNUAL SC–CO_2 VALUES FROM 2021 INTERAGENCY UPDATE, 2020–2050

[2020$ per metric ton CO_2]

Year	Discount rate			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
2020	14	51	76	152
2025	17	56	83	169
2030	19	62	89	187
2035	22	67	96	206
2040	25	73	103	225
2045	28	79	110	242
2050	32	85	116	260

In calculating the potential global benefits resulting from reduced CO_2 emissions, DOE used the values from the 2021 interagency report, adjusted to 2020$ using the implicit price deflator for gross domestic product (''GDP'') from the Bureau of Economic Analysis. For each of the four sets of SC–CO_2 cases specified, the values for emissions in 2020 were $14, $51, $76, and $152 per metric ton avoided (values expressed in 2020$). DOE derived values from 2051 to 2070 based on estimates published by EPA.[32] These estimates are based on methods, assumptions, and parameters identical to the 2020–2050 estimates published by the IWG. DOE derived values after 2070 based on the trend in 2060–2070 in each of the four cases in the IWG update.

DOE multiplied the CO_2 emissions reduction estimated for each year by the SC–CO_2 value for that year in each of the four cases. To calculate a present value of the stream of monetary values, DOE discounted the values in each of the four cases using the specific discount rate that had been used to obtain the SC–CO_2 values in each case.

b. Social Cost of Methane and Nitrous Oxide

The SC–CH_4 and SC–N_2O values used for this rule were generated using the values presented in the 2021 update from the IWG.[33] Table IV.13 shows the updated sets of SC–CH_4 and SC–N_2O estimates from the latest interagency update in 5-year increments from 2020 to 2050. To capture the uncertainties involved in regulatory impact analysis, DOE has determined it is appropriate to include all four sets of SC–CH_4 and SC–N_2O values, as recommended by the IWG.

TABLE IV.13—ANNUAL SC–CH_4 AND SC–N_2O VALUES FROM 2021 INTERAGENCY UPDATE, 2020–2050

[2020$ per metric ton]

Year	SC–CH_4				SC–N_2O			
	Discount rate and statistic				Discount rate and statistic			
	5%	3%	2.5%	3%	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile	Average	Average	Average	95th percentile
2020	670	1500	2000	3900	5800	18000	27000	48000
2025	800	1700	2200	4500	6800	21000	30000	54000
2030	940	2000	2500	5200	7800	23000	33000	60000
2035	1100	2200	2800	6000	9000	25000	36000	67000
2040	1300	2500	3100	6700	10000	28000	39000	74000
2045	1500	2800	3500	7500	12000	30000	42000	81000
2050	1700	3100	3800	8200	13000	33000	45000	88000

DOE multiplied the CH_4 and N_2O emissions reduction estimated for each year by the SC–CH_4 and SC–N_2O estimates for that year in each of the cases. To calculate a present value of the stream of monetary values, DOE discounted the values in each of the cases using the specific discount rate that had been used to obtain the SC–CH_4 and SC–N_2O estimates in each case.

2. Monetization of Other Air Pollutants

DOE estimated the monetized value of NO_X and SO_2 emissions reductions from electricity generation using benefit per ton estimates based on air quality modeling and concentration-response functions conducted for the Clean Power Plan final rule. 84 FR 32520. DOE used EPA's values for NO_X (as $PM_{2.5}$) and SO_2 for 2020, 2025, and 2030 calculated with discount rates of 3 percent and 7 percent, and EPA's values for ozone season NO_X, which do not involve discounting since the impacts are in the same year as emissions. DOE used linear interpolation to define values for the years between 2020 and 2025 and between 2025 and 2030; for years beyond 2030 the values are held constant.

DOE also estimated the monetized value of NO_X and SO_2 emissions reductions from site use of natural gas in buildings impacted by this rule using benefit-per-ton estimates from the EPA's

[32] See EPA, *Revised 2023 and Later Model Year Light-Duty Vehicle GHG Emissions Standards: Regulatory Impact Analysis,* Washington, DC, December 2021. Available at: *www.epa.gov/system/files/documents/2021-12/420r21028.pdf* (last accessed January 13, 2022).

[33] See Interagency Working Group on Social Cost of Greenhouse Gases, *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide. Interim Estimates Under Executive Order 13990,* Washington, DC, February 2021. Available at: *www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf* (last accessed March 17, 2021).

Benefits Mapping and Analysis Program. Although none of the sectors covered by EPA refers specifically to residential and commercial buildings, the sector called ''area sources'' would be a reasonable proxy for residential and commercial buildings.[34] The EPA document provides high and low estimates for 2025 and 2030 at 3- and 7-percent discount rates.[35] DOE used the same linear interpolation and extrapolation as it did with the values for electricity generation. DOE primarily relied on the low estimates to be conservative.

DOE multiplied the emissions reduction (in tons) in each year by the associated $/ton values, and then discounted each series using discount rates of 3 percent and 7 percent as appropriate. On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22–30087) granted the federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana* v. *Biden,* No. 21–cv–1074–JDC–KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from relying on ''adopting, employing, treating as binding, or relying upon'' the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. In the absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits in accordance with applicable Executive Orders, and applicable guidance.

C. Conclusion

This analysis results in a cumulative net present value (NPV) of total benefits of the rule of $1.66 billion (at a 7-percent discount rate) and $3.48 billion (at a 3-percent discount rate). This NPV expresses the estimated total value of future operating cost savings minus the estimated increased building costs for new Federal construction for 2022–2051 with a 30-year lifetime and includes monetized climate and health benefits (see Table IV.14). DOE estimates climate benefits from a reduction in greenhouse gases (GHG) using four different estimates of the social cost of CO_2 (''SC–CO_2''), the social cost of methane (''SC–CH_4''), and the social cost of nitrous oxide (''SC–N_2O''). Together these represent the social cost of GHG (SC–GHG). DOE used interim SC–GHG values developed by an Interagency Working Group on the Social Cost of Greenhouse Gases (IWG).[36] [37] DOE does not have a single central SC–GHG point estimate and it emphasizes the importance and value of considering the benefits calculated using all four SC–GHG estimates. DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits, but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions.

The benefits and costs of the rulemaking can also be expressed in terms of annualized values. The annualized net benefit is (1) the annualized national economic value (expressed in 2020$) of the benefits from building to ASHRAE 90.1–2019, consisting primarily of operating cost savings from using less energy), minus increases in building costs, and (2) the annualized monetary value of the benefits of climate (GHG) and health (NO_X, and SO_2) emission reductions. Table IV.15 shows the annualized values for this rulemaking, expressed in 2020$. In the tables, total benefits for both the 3-percent and 7-percent cases are presented using the average GHG social costs with 3-percent discount rate, but the Department emphasizes the importance and value of considering the benefits calculated using all four SC–GHG cases.

TABLE IV.14—SUMMARY OF MONETIZED ECONOMIC BENEFITS AND COSTS

[Billion 2020$]
[2022–2051 plus 30-year lifetime]

	Billion $2020
3% discount rate	
Consumer Operating Cost Savings	1.86
Climate Benefits *	0.38
Health Benefits **	0.60
Total Benefits †	2.84
Consumer Incremental Product Costs ††	−0.64
Net Benefits	3.48
7% discount rate	
Consumer Operating Cost Savings	0.65

[34] ''Area sources'' represents all emission sources for which states do not have exact (point) locations in their emissions inventories. Because exact locations would tend to be associated with larger sources, ''area sources'' would be fairly representative of small dispersed sources like homes and businesses.

[35] ''Area sources'' are a category in the 2018 document from EPA, but are not used in the 2021 document cited above. See: *www.epa.gov/sites/default/files/2018-02/documents/sourceapportionmentbpttsd_2018.pdf.*

[36] See Interagency Working Group on Social Cost of Greenhouse Gases, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide. Interim Estimates Under Executive Order 13990, Washington, DC, February 2021. *https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalvSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf.*

[37] On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22–30087) granted the federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana* v. *Biden,* No. 21–cv–1074–JDC–KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from ''adopting, employing, treating as binding, or relying upon'' the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. In the absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits where appropriate and permissible under law.

TABLE IV.14—SUMMARY OF MONETIZED ECONOMIC BENEFITS AND COSTS—Continued

[Billion 2020$]

[2022–2051 plus 30-year lifetime]

	Billion $2020
Climate Benefits *	0.38
Health Benefits **	0.22
Total Benefits †	1.25
Consumer Incremental Product Costs ††	−0.41
Net Benefits	1.66

Note: This table presents the costs and benefits associated with Federal new commercial and multi-family high-rise buildings built in 2022–2051. These results include benefits to consumers which accrue after 2051 from the buildings constructed in 2022–2051.

* Climate benefits are calculated using four different estimates of the social cost of carbon (SC–CO_2), methane (SC–CH_4), and nitrous oxide (SC–N_2O) (model average at 2.5 percent, 3 percent, and 5 percent discount rates; 95th percentile at 3 percent discount rate). Together these represent the social cost of greenhouse gases (SC–GHG). For presentational purposes of this table, the climate benefits associated with the average SC–GHG at a 3 percent discount rate are shown but the Department does not have a single central SC–GHG point estimate, and it emphasizes the importance and value of considering the benefits calculated using all four SC–GHG estimates. See section IV.B of this document for more details.

** Health benefits are calculated using benefit-per-ton values for NO_X and SO_2. DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits, but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions. The health benefits are presented at real discount rates of 3 and 7 percent. See section IV.B of this document for more details.

† Total and net benefits include consumer operating cost savings and benefits related to public health and climate. On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22–30087) granted the federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana* v. *Biden,* No. 21–cv–1074–JDC–KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from ''adopting, employing, treating as binding, or relying upon'' the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. In the absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits where appropriate and permissible under law.

†† Costs include incremental equipment costs as well as installation costs.

TABLE IV.15—ANNUALIZED MONETIZED BENEFITS, COSTS, AND NET BENEFITS

[Million 2020$]

[2022–2051 plus 30-year lifetime]

Category	Million 2020$/year	
	3% Discount rate	7% Discount rate
Consumer Operating Cost Savings	94.9	52.5
Climate Benefits *	19.1	19.1
Health Benefits **	30.7	18.1
Total Benefits †	144.8	89.7
Costs ††	−32.7	−32.7
Net Benefits	177.5	122.4

Note: This table presents the costs and benefits associated with Federal new commercial and multi-family high-rise buildings built in 2022–2051. These results include benefits to consumers which accrue after 2051 from the buildings constructed in 2022–2051.

* Climate benefits are calculated using four different estimates of the social cost of carbon (SC–CO_2), methane (SC–CH_4), and nitrous oxide (SC–N_2O) (model average at 2.5 percent, 3 percent, and 5 percent discount rates; 95th percentile at 3 percent discount rate). Together these represent the social cost of greenhouse gases (SC–GHG). For presentational purposes of this table, the climate benefits associated with the average SC–GHG at a 3 percent discount rate are shown, but the Department does not have a single central SC–GHG point estimate, and it emphasizes the importance and value of considering the benefits calculated using all four SC–GHG estimates. See section IV.B of this document for more details.

** Health benefits are calculated using benefit-per-ton values for NO_X and SO_2. DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits, but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions. The health benefits are presented at real discount rates of 3 and 7 percent. See section IV.B of this document for more details.

† Total and net benefits include consumer operating cost savings and benefits related to public health and climate. On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22–30087) granted the federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana* v. *Biden,* No. 21–cv–1074–JDC–KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from ''adopting, employing, treating as binding, or relying upon'' the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. In the absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits where appropriate and permissible under law.

†† Costs include incremental equipment costs as well as installation costs.

Accordingly, DOE has determined that the implementation of ASHRAE Standard 90.1–2019 versus Standard 90.1–2013 for Federal commercial and multi-family high-rise buildings is cost-effective. DOE is presenting monetized climate benefits in accordance with the applicable Executive Orders and DOE would reach the same conclusion

presented in this notice in the absence of the social cost of greenhouse gases, including the February 2021 Interim Estimates presented by the Interagency Working Group on the Social Cost of Greenhouse Gases.

V. Compliance Date

This final rule applies to new Federal commercial and multi-family high-rise residential buildings for which design for construction begins on or after one year from the publication date of this rulemaking in the **Federal Register**. (42 U.S.C. 6834(a)(1)) Such buildings must be designed to exceed the energy efficiency level of the appropriate updated voluntary standard by 30 percent if LCC effective. However, at a minimum, such buildings must achieve the energy efficiency equal to that of the appropriate updated voluntary standard. One year lead time before the design for construction begins is consistent with DOE's previous updates to the energy efficiency baselines and the original statutory mandate for Federal building standards. One year lead time before design for construction begins helps minimize compliance costs to agencies, which may have planned buildings in various stages of design and allows for design changes to more fully consider LCC-effective measures (as opposed to having to revise designs in development, which may make incorporation of energy efficiency measure more difficult or expensive).

VI. Reference Resources

DOE first prepared this list of resources to help Federal agencies achieve building energy efficiency levels for the original rulemaking establishing the baseline energy performance standards for new Federal commercial and multi-family high-rise residential buildings. DOE has reviewed these resources and believes that they continue to be useful for helping agencies maximize their energy efficiency levels. DOE has updated this resource list as necessary. These resources come in many forms and in a variety of media. Resources are provided for all buildings, and also specifically for commercial and multi-family high-rise residential buildings. FEMP offers an online search database of tools that can help agencies reduce energy use and meet Federal laws and requirements. Tools include software, calculators, data sets, and databases created by DOE and other Federal organizations. This resource can be found at *www.energy.gov/eere/femp/federal-energy-management-tools.*

A. Resources for Commercial and Multi-Family High-Rise Residential Buildings

The following references and sources are provided to aid interested parties in gathering additional information and specifics regarding various aspects of this rule.

(1) Energy Efficient Products—FEMP and U.S. Environmental Protection Agency (EPA) ENERGY STAR Program

www.energy.gov/eere/femp/search-energy-efficient-products
www.energy.gov/eere/femp/energy-efficient-products-and-energy-saving-technologies

Federal agencies are required by EPAct 2005 and 10 CFR part 436 to specify FEMP designated or ENERGY STAR equipment, including building mechanical and lighting equipment and builder-supplied appliances, for purchase and installation in all new construction unless the agency can show that the use of such equipment is not life-cycle cost-effective. This equipment is generally more efficient than the corresponding requirements of ASHRAE Standard 90.1–2019 and may be used to achieve part of the savings required of Federal building designs. (This rule does not require the use of EnergyStar or FEMP-designated equipment, but the FEMP websites, accessed through the previous links, are provided as useful resources for achieving part of the energy savings required by the rule.)

(2) LCC Analysis—FEMP

www.wbdg.org/FFC/NIST/hdbk_135.pdf
nvlpubs.nist.gov/nistpubs/ir/2018/NIST.IR.85-3273-33.pdf

As detailed previously, agencies are required to determine the percentage beyond compliance with ASHRAE Standard 90.1 that would be life-cycle cost effective and to design new Federal buildings to achieve that percentage. DOE has promulgated LCC analysis rules in 10 CFR part 436 subpart A *Life-Cycle Cost Methodology and Procedures* (55 FR 48220, Nov. 20, 1990, as amended at 61 FR 32650, June 25, 1996) that conform to requirements in the Federal Energy Management Improvement Act of 1988 (Pub. L. 100–615) and subsequent energy conservation legislation. LCC guidance and required discount rates and energy price projections are determined annually by FEMP and the Energy Information Administration (EIA) and are published in the Annual Supplement to The National Institute of Standards and Technology (NIST) Handbook 135: ''Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis.''

(3) Building Energy Efficiency Support Resources—DOE Building Technologies Office

www.energy.gov/eere/buildings/building-technologies-office
www.energy.gov/eere/buildings/building-energy-modeling
www.energy.gov/eere/buildings/about-building-energy-modeling

The website for DOE's Building Technologies Office provides information, case studies, and tools to help evaluate energy efficiency, renewable energy, and sustainability in buildings. The Whole-Building Energy Modeling (BEM) is a versatile, multipurpose tool that is used in new building and retrofit design, code compliance, green certification, qualification for tax credits and utility incentives, and real-time building control. BEM can be used to assess the inherent performance of a building while controlling for specific use and operation.

(4) ASHRAE Standard 90.1–2019—ASHRAE

www.ashrae.org/technical-resources/standards-and-guidelines/read-only-versions-of-ashrae-standards

The baseline energy efficiency standard for commercial and multi-family high-rise buildings is ANSI/ASHRAE/IESNA Standard 90.1–2019. A read-only version of Standard 90.1–2019 can be found at the link ''Standard 90.1–2019, Energy Standard for Buildings Except Low-Rise Residential Buildings.''

(5) Whole Building Design Guide (WBDG)—National Institute of Building Sciences

www.wbdg.org
www.wbdg.org/design-objectives/sustainable/optimize-energy-use

The WBDG is a web-based portal providing government and industry practitioners with one-stop access to up-to-date information on a wide range of building-related guidance, criteria, and technology from a ''whole buildings'' perspective. Currently, WBDG is organized into three major categories—design guidance, project management, and operations & maintenance. Development of the WBDG is a collaborative effort among Federal agencies, private sector companies, non-profit organizations, and educational institutions.

(6) International Institute for Sustainable Laboratories (I2SL)

www.i2sl.org/resources/toolkit.html

Laboratory Benchmarking Tool

https://lbt.i2sl.org/

This website focuses on improving the energy efficiency and environmental performance of laboratory space. The website includes training, educational resources, and design and benchmarking tools focused on laboratories.

(7) Sustainable Facilities Tool—GSA Office of Federal High-Performance Buildings

https://sftool.gov/ www.gsa.gov/about-us/organization/office-of-governmentwide-policy/office-of-federal-highperformance-buildings

The GSA is tasked with putting our nation's public servants into efficient, healthy buildings and buying goods and services that provide maximum value to the taxpayer. The Sustainable Facilities Tool (SFTool) was created by the GSA Office of Federal High-Performance Green Buildings to connect Federal planners with new sustainability solutions and to assist the GSA in realizing healthier, more efficient workplaces. SFTool is an interactive website designed to show the user how to build, buy, and operate green property. Project managers can derive the most value from the SFTool by using it to understand Federal sustainability requirements; build effective project delivery teams and inform project planning; educate partners and stakeholders on the benefits of considering sustainable solutions; and discover high-performance, green building options and products.

(8) ASHRAE Advanced Energy Design Guide (AEDG) Series

www.ashrae.org/technical-resources/aedgs

To promote building energy efficiency, ASHRAE and its partners are making the AEDGs available for free download. The zero-energy guides offer designers and contractors the tools needed for achieving zero energy buildings. The 50 percent guides offer designers and contractors the tools needed for achieving a 50 percent energy savings compared to buildings that meet the minimum requirements of Standard 90.1–2004, and the 30 percent guides offer a 30 percent energy savings compared to buildings that meet the minimum energy requirements of Standard 90.1–1999. ASHRAE, in collaboration with the American Institute of Architects (AIA), IES, U.S. Green Building Council (USGBC), and DOE, continues to develop the AEDG series.

(9) ASHRAE Standard 90.1 Performance Based Compliance (Section 11 and Appendix G)

www.energycodes.gov/performance_based_compliance#tools

The website for DOE's Building Energy Codes Program (BECP) provides further information and tools to assist with the performance rating method, including the following:

- Spreadsheet-based compliance forms that meet the documentation requirements of ASHRAE Standard 90.1–2019 section 11 and Appendix G,
- The ASHRAE Standard 90.1 section 11 and Appendix G Submittal Review Manual (the Manual), a comprehensive reference for reviewing modeling-based submittals, and
- The 2010 and 2016 Performance Rating Method Reference Manuals, which include procedure and process descriptions to help provide consistency and accuracy to users of the Performance Rating Method.

VII. Regulatory Analysis

A. Review Under Executive Order 12866, ''Regulatory Planning and Review''

This final rule is an ''economically significant regulatory action'' under Executive Order 12866, ''Regulatory Planning and Review.'' 58 FR 51735 (October 4, 1993). Accordingly, this action was subject to review by the Office of Information and Regulatory Affairs in the Office of Management and Budget (OMB). OMB has completed its review. DOE has also reviewed this regulation pursuant to Executive Order 13563, issued on January 18, 2011. 76 FR 3281 (January 21, 2011). E.O. 13563 is supplemental to and explicitly reaffirms the principles, structures, and definitions governing regulatory review established in Executive Order 12866.

As discussed previously in this final rule, DOE is required to determine, based on cost-effectiveness, whether the standards for Federal buildings should be updated to reflect an amendment to the ASHRAE Standard. As stated previously, DOE complied with the statutory language by analyzing the cost-effectiveness of ASHRAE Standard 90.1–2019, which included, through DOE's involvement in the ASHRAE code development process, consideration of ASHRAE's cost-effectiveness criteria for Standard 90.1–2019.

Review under Executive Order 12866 requires an analysis of the economic effect of the rule. For this purpose, DOE estimated incremental first cost (in this case, the difference between the cost of a building designed to meet ASHRAE Standard 90.1–2019 and a building designed to meet ASHRAE Standard 90.1–2013) for the Federal commercial and high-rise multi-family residential buildings sector, as well as LCC net savings. First, DOE estimated that the annual full fuel cycle national energy savings would be 0.273 trillion Btu (associated with one year of Federal construction), that the cumulative (over the 30-year analysis period) full fuel cycle national energy savings would be 0.12 quadrillion Btu, and that the cumulative (including building lifetime savings) full fuel cycle national energy savings would be 0.23 quadrillion Btu (see Table VII.1, Table VII.2, and Table VII.3). Based on these energy savings and using the methodology described in section IV, DOE estimated the resulting incremental first cost, first year energy cost savings, and annual LCC net savings. DOE determined that the total incremental first cost estimate is a savings of $32.67 million per year, with an average first cost decrease of $1.67 per square foot. DOE determined that the total first year energy cost estimate is a savings of $3.4 million, with an average first year energy cost savings of $0.17 per square foot. DOE estimated $161.9 million in annual LCC net savings for the entire Federal commercial and multi-family high-rise buildings sector with an average LCC net savings of $8.29 per square foot. (See Table VII.4).

Table VII.5 shows the monetized economic benefits and costs expected to result from this rulemaking. Using a 7-percent discount rate for consumer benefits and costs and health benefits, and a 3-percent discount rate case for GHG social (climate) costs, the estimated cost of this rulemaking is −$0.41 billion in increased equipment costs, while the estimated benefits are $0.65 billion in reduced equipment operating costs, $0.38 billion in climate benefits, and $0.22 billion in health benefits. In this case, the net monetized benefit amounts to $1.66 billion. Using a 3-percent discount rate for all monetized benefits and costs, the estimated cost of this rulemaking is −$0.64 billion in increased equipment costs, while the estimated benefits are $1.86 billion in reduced equipment operating costs, $0.38 billion in climate benefits, and $0.60 billion in health benefits. In this case, the net monetized benefit amounts to $3.48 billion.

Table VII.6 shows the annualized monetized economic benefits and costs expected to result from this rulemaking. Using a 7-percent discount rate for consumer benefits and costs and health benefits, and a 3-percent discount rate case for GHG social (climate) costs, the

estimated cost of this rulemaking is −$32.7 million per year in increased equipment costs, while the estimated annual benefits are $52.5 million in reduced equipment operating costs, $19.1 million in climate benefits, and $18.1 million in health benefits. In this case, the net monetized benefit amounts to $122.4 million per year. Using a 3-percent discount rate for all monetized benefits and costs, the estimated cost of this rulemaking is −$32.7 million per year in increased equipment costs, while the estimated annual benefits are $94.9 million in reduced equipment operating costs, $19.1 million in climate benefits, and $30.7 million in health benefits. In this case, the net monetized benefit amounts to $177.5 million per year.

TABLE VII.1—ANNUAL ENERGY SAVINGS FOR ASHRAE STANDARD 90.1–2019 VS. ASHRAE STANDARD 90.1–2013

Category	Results—ASHRAE 90.1–2019 compared to ASHRAE 90.1–2013 baseline (TBtu)
Annual Site National Energy Savings (Trillion Btu)	0.106
Annual Source National Energy Savings (Trillion Btu)	0.261
Annual Full Fuel Cycle National Energy Savings (Trillion Btu)	0.273

TABLE VII.2—CUMULATIVE ENERGY SAVINGS FOR ASHRAE STANDARD 90.1–2019 VS. ASHRAE STANDARD 90.1–2013

[30-year analysis period]

Category	Results—ASHRAE 90.1–2019 compared to ASHRAE 90.1–2013 baseline (quads)
Cumulative Site National Energy Savings (quads)	0.049
Cumulative Source National Energy Savings (quads)	0.115
Cumulative Full Fuel Cycle National Energy Savings (quads)	0.120

TABLE VII.3—CUMULATIVE LIFETIME ENERGY SAVINGS FOR ASHRAE STANDARD 90.1–2019 VS. ASHRAE STANDARD 90.1–2013

[2022–2051 plus 30-year lifetime]

Category	Results—ASHRAE 90.1–2019 compared to ASHRAE 90.1–2013 baseline (quads)
Cumulative Lifetime Site National Energy Savings (quads)	0.095
Cumulative Lifetime Source National Energy Savings (quads)	0.223
Cumulative Lifetime Full Fuel Cycle National Energy Savings (quads)	0.232

TABLE VII.4—COST-EFFECTIVENESS RESULTS FOR ASHRAE STANDARD 90.1–2019 VS. ASHRAE STANDARD 90.1–2013

[2020$]

Category	Results—ASHRAE 90.1–2019 compared to ASHRAE 90.1–2013 baseline
Average LCC Net Savings (2020$)	$8.29/ft^2.
Annual LCC Net Savings (2020$)	$161.9 million.
First Year Energy Cost Savings (2020$)	$0.17/ft^2.
Total First Year Energy Cost Savings (2020$)	$3.4 million.
Incremental First Cost (2020$)	−$1.67/ft^2.
Total Incremental First Cost (2020$)	−$32.7 million.

TABLE VII.5—SUMMARY OF MONETIZED ECONOMIC BENEFITS AND COSTS

[Billion 2020$]

[2022–2051 plus 30-year lifetime]

	Billion $2020
3% discount rate	
Consumer Operating Cost Savings	1.86

TABLE VII.5—SUMMARY OF MONETIZED ECONOMIC BENEFITS AND COSTS—Continued

[Billion 2020$]

[2022–2051 plus 30-year lifetime]

	Billion $2020
Climate Benefits *	0.38
Health Benefits **	0.60
Total Benefits †	2.84
Consumer Incremental Product Costs ††	−0.64
Net Benefits	3.48
7% discount rate	
Consumer Operating Cost Savings.	
Consumer Operating Cost Savings	0.65
Climate Benefits *	0.38
Health Benefits **	0.22
Total Benefits †	1.25
Consumer Incremental Product Costs ††	−0.41
Net Benefits	1.66

Note: This table presents the costs and benefits associated with Federal new commercial and multi-family high-rise buildings built in 2022–2051. These results include benefits to consumers which accrue after 2051 from the buildings constructed in 2022–2051.

* Climate benefits are calculated using four different estimates of the social cost of carbon (SC–CO_2), methane (SC–CH_4), and nitrous oxide (SC–N_2O) (model average at 2.5 percent, 3 percent, and 5 percent discount rates; 95th percentile at 3 percent discount rate). Together these represent the social cost of greenhouse gases (SC–GHG). For presentational purposes of this table, the climate benefits associated with the average SC–GHG at a 3 percent discount rate are shown, but the Department does not have a single central SC–GHG point estimate, and it emphasizes the importance and value of considering the benefits calculated using all four SC–GHG estimates. See section IV.B of this document for more details.

** Health benefits are calculated using benefit-per-ton values for NO_X and SO_2. DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits, but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions. The health benefits are presented at real discount rates of 3 and 7 percent. See section IV.B of this document for more details.

† Total and net benefits include consumer operating cost savings and benefits related to public health and climate. On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22–30087) granted the federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana* v. *Biden,* No. 21–cv–1074–JDC–KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from ''adopting, employing, treating as binding, or relying upon'' the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. In the absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits where appropriate and permissible under law.

†† Costs include incremental equipment costs as well as installation costs.

TABLE VII.6—ANNUALIZED MONETIZED BENEFITS, COSTS, AND NET BENEFITS

[Million 2020$]

[2022–2051 plus 30-year lifetime]

Category	Million 2020$/year	
	3% Discount rate	7% Discount rate
Consumer Operating Cost Savings	94.9	52.5
Climate Benefits *	19.1	19.1
Health Benefits **	30.7	18.1
Total Benefits †	144.8	89.7
Costs ††	−32.7	−32.7
Net Benefits	177.5	122.4

Note: This table presents the costs and benefits associated with Federal new commercial and multi-family high-rise buildings built in 2022–2051. These results include benefits to consumers which accrue after 2051 from the buildings constructed in 2022–2051.

* Climate benefits are calculated using four different estimates of the social cost of carbon (SC–CO_2), methane (SC–CH_4), and nitrous oxide (SC–N_2O) (model average at 2.5 percent, 3 percent, and 5 percent discount rates; 95th percentile at 3 percent discount rate). Together these represent the social cost of greenhouse gases (SC–GHG). For presentational purposes of this table, the climate benefits associated with the average SC–GHG at a 3 percent discount rate are shown but the Department does not have a single central SC–GHG point estimate, and it emphasizes the importance and value of considering the benefits calculated using all four SC–GHG estimates. See section IV.B of this document for more details.

** Health benefits are calculated using benefit-per-ton values for NO_X and SO_2. DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits, but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions. The health benefits are presented at real discount rates of 3 and 7 percent. See section IV.B of this document for more details.

† Total and net benefits include consumer operating cost savings and benefits related to public health and climate. On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22–30087) granted the federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana* v. *Biden,* No. 21–cv–1074–JDC–KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from ''adopting, employing, treating as binding, or relying upon'' the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. In the absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits where appropriate and permissible under law.

†† Costs include incremental equipment costs as well as installation costs.

B. Review Under the Administrative Procedure Act

This rule, which updates energy efficiency performance standards for the design and construction of new Federal buildings, is a rule relating to public property, and therefore is not subject to the rulemaking requirements of the Administrative Procedure Act, including the requirement to publish a notice of proposed rulemaking. (See 5 U.S.C. 553(a)(2)) Additionally, DOE notes that the determinations regarding the increase in energy efficiency for commercial buildings using ASHRAE Standard 90.1–2016 and 90.1–2019 in the context of State building codes were subject to notice and comment. *See* 82 FR 34513 (July 25, 2017) for the preliminary determination and 83 FR 8463 (February 27, 2018) for the final determination on Standard 90.1–2016. *See* 86 FR 20674 (April 21, 2021) for the preliminary determination and 86 FR 40543 (July 28, 2021) for the final determination on Standard 90.1–2019. The determinations made in the context of the State codes are equally applicable in the context of Federal buildings. DOE finds that providing notice and comment again in the context of Federal buildings would therefore be unnecessary. (*See* 5 U.S.C. 553(b)(B)) The fact that the voluntary consensus codes apply to Federal buildings as opposed to the general building stock does not require a different evaluation of energy efficiency and cost-effectiveness.

C. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires the preparation of an initial regulatory flexibility analysis for any rule that by law must be proposed for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by Executive Order 13272, ''Proper Consideration of Small Entities in Agency Rulemaking,'' 67 FR 53461 (August 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of General Counsel's website (*https://energy.gov/gc/office-general-counsel*).

As noted previously, DOE has determined that a notice of proposed rulemaking is not required by 5 U.S.C. 553 or any other law for issuance of this rule. As such, the analytical requirements of the Regulatory Flexibility Act do not apply. 5 U.S.C. 605(b).

D. Review Under the Paperwork Reduction Act of 1995

This rulemaking will impose no new information or record keeping requirements. Accordingly, OMB clearance is not required under the Paperwork Reduction Act. (44 U.S.C. 3501 *et seq.*)

E. Review Under the National Environmental Policy Act of 1969

DOE prepared an EA (DOE/EA–20165) entitled, ''Environmental Assessment for Final Rule, 10 CFR part 433, 'Baseline Energy Efficiency Standards Update for New Federal Commercial and Multi-Family High-Rise Residential Buildings' '',[38] pursuant to the Council on Environmental Quality's (CEQ's) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR parts 1500–1508), the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321 *et seq.*), and DOE's NEPA Implementing Procedures (10 CFR part 1021).

The EA addresses the possible incremental environmental effects attributable to the application of the final rule. The only anticipated impact would be a decrease in outdoor air pollutants resulting from decreased fossil fuel burning for energy use in Federal buildings. Therefore, DOE has issued a Finding of No Significant Impact (FONSI), pursuant to NEPA, the regulations of the Council on Environmental Quality (40 CFR parts 1500–1508), and DOE's regulations for compliance with NEPA (10 CFR part 1021).

To identify the potential environmental impacts that may result from implementing the final rule on new Federal commercial buildings, DOE compared the requirements of the final rule updating energy efficiency performance standard for Federal new commercial and multi-family high rise residential buildings to ASHRAE Standard 90.1–2019 with the ''no-action alternative'' of using the current Federal standards (ASHRAE Standard 90.1–2013). This comparison is identical to that undertaken by DOE in its determinations of energy savings of those standards and codes.

Accordingly, DOE concludes in the EA that new Federal buildings designed and constructed to Standard 90.1–2019 will use less energy than new Federal buildings designed and constructed to Standard 90.1–2013 because Standard 90.1–2019 is more efficient than Standard 90.1–2013. This decrease in energy usage translates to reduced emissions of carbon dioxide (CO_2), nitrogen oxides (NO_X), mercury (Hg), and methane (CH_4) over the 30-year period examined in the EA. As reported in the EA, cumulative emission reductions for 30 years of construction and operation for Federal buildings built during the analysis period (2022 through 2051) were estimated at up to 4.5 million metric tons of CO_2, up to 6.9 thousand tons of NO_X, up to 0.01 tons of Hg, up to 33.5 thousand tons of CH_4, up to 1.6 thousand tons of SO_2, and up to 0.04 thousand tons of N_2O. In conducting the net benefits analysis, DOE also calculated the energy savings and associated emissions corresponding to the analysis period plus the lifetime of the building to capture the full benefits stream associated with Federal buildings constructed from 2022 through 2051. For 30 years of construction and operation including building lifetime, cumulative emission reductions were estimated at up to 8.4 million metric tons of CO_2, up to 13.1 thousand tons of NO_X, up to 0.02 tons of Hg, up to 64.5 thousand tons of CH_4, up to 3.0 thousand tons of SO_2, and up to 0.08 thousand tons of N_2O.

[38] The EA and FONSI may be found in the docket for this rulemaking and at *www.energy.gov/nepa/doeea-2165-energy-efficiency-standards-new-federal-commercial-and-multi-family-high-rise.*

F. Review Under Executive Order 13132, ''Federalism''

Executive Order 13132, ''Federalism,'' 64 FR 43255 (August 4, 1999), imposes certain requirements on agencies formulating and implementing policies or regulations that preempt State law or that have federalism implications. The Executive order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. (*See* 65 FR 13735) DOE examined this rule and determined that it does not preempt State law and does not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. No further action is required by Executive Order 13132.

G. Review Under Executive Order 12988, ''Civil Justice Reform''

With respect to the review of existing regulations and the promulgation of new regulations, section 3(a) of Executive Order 12988, ''Civil Justice Reform,'' 61 FR 4729 (February 7, 1996), imposes on Federal agencies the general duty to adhere to the following requirements: (1) Eliminate drafting errors and ambiguity; (2) write regulations to minimize litigation; and (3) provide a clear legal standard for affected conduct, rather than a general standard and promote simplification and burden reduction. Section 3(b) of Executive Order 12988 specifically requires that executive agencies make every reasonable effort to ensure that the regulation: (1) Clearly specifies the preemptive effect, if any; (2) clearly specifies any effect on existing Federal law or regulation; (3) provides a clear legal standard for affected conduct, while promoting simplification and burden reduction; (4) specifies the retroactive effect, if any; (5) adequately defines key terms; and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of Executive Order 12988 requires Executive agencies to review regulations in light of applicable standards in section 3(a) and section 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, this rule meets the relevant standards of Executive Order 12988.

H. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA) (Pub. L. 104–4) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and tribal governments and the private sector. For a proposed regulatory action likely to result in a rule that may cause the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a) and (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and tribal governments on a proposed ''significant intergovernmental mandate'' and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect small governments. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820. DOE's policy statement is also available at *https://energy.gov/sites/prod/files/gcprod/documents/umra_97.pdf*. This final rule contains neither an intergovernmental mandate nor a mandate that may result in the expenditure of $100 million or more in any year by State, local, and tribal governments, in the aggregate, or by the private sector, so these requirements under the Unfunded Mandates Reform Act do not apply.

I. Review Under the Treasury and General Government Appropriations Act of 1999

Section 654 of the Treasury and General Government Appropriations Act of 1999 (Pub. L. 105–277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This final rule would not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

J. Review Under Executive Order 12630, ''Governmental Actions and Interference With Constitutionally Protected Property Rights''

DOE has determined, under Executive Order 12630, ''Governmental Actions and Interference with Constitutionally Protected Property Rights,'' 53 FR 8859 (March 18, 1988), that this rule would not result in any takings which might require compensation under the Fifth Amendment to the United States Constitution.

K. Review Under the Treasury and General Government Appropriations Act, 2001

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516, note) provides for agencies to review most disseminations of information to the public under guidelines established by each agency pursuant to general guidelines issued by OMB. OMB's guidelines were published at 67 FR 8452 (February 22, 2002), and DOE's guidelines were published at 67 FR 62446 (October 7, 2002). Pursuant to OMB Memorandum M–19–15, Improving Implementation of the Information Quality Act (April 24, 2019), DOE published updated guidelines which are available at *www.energy.gov/sites/prod/files/2019/12/f70/DOE%20Final%20Updated%20IQA%20Guidelines%20Dec%202019.pdf*. DOE has reviewed this final rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

L. Review Under Executive Order 13211, ''Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use''

Executive Order 13211, ''Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use,'' 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to the Office of Information and Regulatory Affairs (OIRA) a Statement of Energy Effects for any proposed significant energy action. A ''significant energy action'' is defined as any action by an agency that promulgated or is expected to lead to promulgation of a final rule, and that: (1) Is a significant regulatory action under Executive Order 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or

(3) is designated by the Administrator of OIRA as a significant energy action. For any proposed significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use should the proposal be implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use. DOE's EIA estimates that new construction in the commercial sector will range from 1.91 billion square feet per year in 2022 to 2.52 billion square feet per year in 2050.[39] This rule is expected to incrementally reduce the energy usage of approximately 19.54 million square feet of Federal commercial and high-rise multi-family residential construction annually.[40] Thus, the rule represents approximately 1.17 percent of the expected annual U.S. commercial construction in 2022, falling to approximately 0.89 percent in the year 2050. This final rule would not have a significant adverse effect on the supply, distribution, or use of energy and, therefore, is not a significant energy action. Accordingly, DOE has not prepared a Statement of Energy Effects.

M. Review Under Section 32 of the Federal Energy Administration Act of 1974

Under section 301 of the Department of Energy Organization Act (Pub. L. 95–91), DOE must comply with section 32 of the Federal Energy Administration Act of 1974 (Pub. L. 93–275), as amended by the Federal Energy Administration Authorization Act of 1977 (Pub. L. 95–70). (15 U.S.C. 788) Section 32 provides that where a proposed rule authorizes or requires use of commercial standards, the final rule must inform the public of the use and background of such standards. In addition, section 32(c) requires DOE to consult with the U.S. Department of Justice (DOJ) and the Federal Trade Commission (FTC) concerning the impact of the commercial or industry standards on competition.

Although section 32 specifically refers to the proposed rule stage, DOE is meeting these requirements at the final rule stage because there was no proposed rule for this action. This final rule incorporates testing methods contained in the following commercial standard: ANSI/ASHRAE/IES Standard 90.1–2019, Energy Standard for Buildings Except Low-Rise Residential Buildings, 2019, American Society of Heating Refrigerating and Air-Conditioning Engineers, Inc., ISSN 1041–2336.

DOE has evaluated these standards and notes that ASHRAE Standard 90.1 Standard is developed under ANSI-approved consensus procedures and is under continuous maintenance by a Standing Standard Project Committee. ASHRAE has established a program for regular publication of addenda, or revisions, including procedures for timely, documented, consensus action on requested changes to ASHRAE Standard 90.1. ANSI approved the final addendum for inclusion in the 2016 edition in August 2016 and in the 2019 edition in October 2019. Standard 90.1–2016 was published in October 2016 and Standard 90.1–2019 was published in October 2019. However, DOE is unable to conclude whether ASHRAE Standard 90.1 fully complies with the requirements of section 32(b) of the Federal Energy Administration Act (FEAA) (*i.e.,* whether they were developed in a manner that fully provides for public participation, comment, and review). DOE has consulted with both the Attorney General and the Chairman of the FTC about the impact on competition of using the methods contained in these standards and has received no comments objecting to their use.

N. Description of Materials Incorporated by Reference

In this final rule, DOE incorporates by reference ANSI/ASHRAE/IES Standard 90.1–2019, Energy Standard for Buildings Except Low-Rise Residential Buildings, (I–P Edition), 2019. This standard provides minimum requirements for energy efficient designs for buildings except for low-rise residential buildings. Copies of this standard are available from ASHRAE, Inc., 180 Technology Parkway NW, Peachtree Corners, GA 30092, (404) 636–8400, *www.ashrae.org.* ASHRAE provides a free, online, read-only version of Standard 90.1–2019 available at *www.ashrae.org/technical-resources/standards-and-guidelines.* Users must scroll down to locate and click on Standard 90.1–2019 (IP).

The Director of the Federal Register previously approved ANSI/ASHRAE/IES 90.1–2004, 2007, 2010, and 2013, Energy Standard for Buildings Except Low-Rise Residential Buildings for incorporation by reference in 10 CFR part 433.

VIII. Congressional Notification

As required by 5 U.S.C. 801, DOE will report to Congress on the promulgation of this rule prior to its effective date. The report will state that it has been determined that the rule is a ''major rule'' as defined by 5 U.S.C. 804(2).

IX. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this final rule.

List of Subjects in 10 CFR Part 433

Buildings and facilities, Energy conservation, Engineers, Federal buildings and facilities, Housing, Incorporation by reference.

Signing Authority

This document of the DOE was signed on March 28, 2022, by Kelly J. Speakes-Backman, Principal Deputy Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of DOE. This administrative process in no way alters the legal effect of this document upon publication in the **Federal Register**.

Signed in Washington, DC, on March 29, 2022.

Treena V. Garrett,

Federal Register Liaison Officer, U.S. Department of Energy.

For the reasons set forth in the preamble, DOE amends chapter II Subchapter D of title 10 of the Code of Federal Regulations as set forth below:

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

■ 1. The authority citation for part 433 continues to read as follows:

Authority: 42 U.S.C. 6831–6832; 6834–6835; 42 U.S.C. 7101 *et seq.*

■ 2. Amend § 433.2 by:

■ a. In the definition of ''*ASHRAE Baseline Building 2004*'', removing the text ''ANSI/ASHRAE/IES Standard 90.1–2004, Energy Standard for Buildings Except Low-Rise Residential Buildings, January 2004'' and adding, in

[39] *See* Table A5 of the 2021 Annual Energy Outlook at *www.eia.gov/outlooks/aeo/excel/aeotab_5.xlsx.*

[40] *See* Regulatory Analysis Section A. Review Under Executive Order 12866, ''Regulatory Planning and Review'' above for origin of the 25.85 million square foot estimate.

its place, the text, ''ASHRAE 90.1–2004'';

■ b. In the definition of ''*ASHRAE Baseline Building 2007*'', removing the text ''ANSI/ASHRAE/IES Standard 90.1–2007, Energy Standard for Buildings Except Low-Rise Residential Buildings, December 2007'' and adding, in its place, the text, ''ASHRAE 90.1–2007'';

■ c. In the definition of ''*ASHRAE Baseline Building 2010*'', removing the text ''ANSI/ASHRAE/IES Standard 90.1–2010, Energy Standard for Buildings Except Low-Rise Residential Buildings, 2010'' and adding, in its place, the text, ''ASHRAE 90.1–2010'';

■ d. In the definition of ''*ASHRAE Baseline Building 2013*'', removing the text ''ANSI/ASHRAE/IES Standard 90.1–2013, Energy Standard for Buildings Except Low-Rise Residential Buildings, 2013'' and adding, in its place, the text, ''ASHRAE 90.1–2013'';

■ e. Adding in alphabetical order the definition of ''ASHRAE Baseline Building 2019''; and

■ f. Revising the definition of ''New Federal building''.

The addition and revision read as follows:

§ 433.2 Definitions.

* * * * *

ASHRAE Baseline Building 2019 means a building that is otherwise identical to the proposed building but is designed to meet, but not exceed, the energy efficiency specifications in ASHRAE 90.1–2019 (incorporated by reference, see § 433.3).

* * * * *

New Federal building means any new building (including a complete replacement of an existing building from the foundation up) to be constructed by, or for the use of, any Federal agency. Such term shall include new buildings (including a complete replacement of an existing building from the foundation up) built for the purpose of being leased by a Federal agency, and privatized military housing.

* * * * *

■ 3. Amend § 433.3 by:

■ a. Revising paragraph (a) and the introductory text of paragraph (b); and

■ b. Adding paragraph (b)(5).

The revision and addition read as follows:

§ 433.3 Materials incorporated by reference.

(a) Certain material is incorporated by reference into this subpart with the approval of the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. To enforce any edition other than that specified in this section, DOE must publish a document in the **Federal Register** and the material must be available to the public. All approved material is available for inspection at DOE, and at the National Archives and Records Administration (NARA). Contact DOE at: The U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, Sixth Floor, 950 L'Enfant Plaza SW, Washington, DC 20024, (202) 586–9127, *Buildings@ee.doe.gov*, *https://www.energy.gov/eere/buildings/building-technologies-office*. For information on the availability of this material at NARA, email: *fr.inspection@nara.gov*, or go to: *www.archives.gov/federal-register/cfr/ibr-locations.html*. The material may be obtained from the sources in the following paragraphs of this section.

(b) *ASHRAE.* American Society of Heating Refrigerating and Air-Conditioning Engineers, Inc., 180 Technology Parkway NW, Peachtree Corners, GA 30092; (404) 636–8400; *www.ashrae.org*.

* * * * *

(5) ANSI/ASHRAE/IES 90.1–2019, (''ASHRAE 90.1–2019''), Energy Standard for Buildings Except Low-Rise Residential Buildings, I–P Edition, copyright 2019, IBR approved for §§ 433.2, 433.100 and 433.101.

■ 4. Amend § 433.100 by:

■ a. Revising paragraph (a)(4) and adding paragraph (a)(5);

■ b. Removing paragraph (b);

■ c. Redesignating paragraph (c) as (b); and

■ d. Revising newly redesignated paragraph (b).

The revisions and addition read as follows:

§ 433.100 Energy efficiency performance standard.

(a) * * *

(4) All Federal agencies shall design new Federal buildings that are commercial and multi-family high-rise residential buildings, for which design for construction began on or after November 6, 2016, but before April 7, 2023, to:

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

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

(5) All Federal agencies shall design new Federal buildings that are commercial and multi-family high-rise residential buildings, for which design for construction began on or after April 7, 2023, to:

(i) Meet ASHRAE 90.1–2019, (incorporated by reference, see § 433.3); and

(ii) If LCC effective, achieve energy consumption levels, calculated consistent with paragraph (b) of this section, that are at least 30 percent below the levels of the ASHRAE Baseline Building 2019.

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

■ 5. Amend § 433.101 by:

■ a. Revising paragraph (a)(4) and adding paragraph (a)(5); and

■ b. Revising paragraph (b).

The revisions and addition read as follows:

§ 433.101 Performance level determination.

(a) * * *

(4) For Federal buildings for which design for construction began on or after November 6, 2016, but before April 7, 2023, each Federal agency shall determine energy consumption levels for both the ASHRAE Baseline Building 2013 and proposed building by using the Performance Rating Method found in Appendix G of ASHRAE 90.1–2013 (incorporated by reference, see § 433.3), except the formula for calculating the Performance Rating in Section G1.2 shall read as follows:

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

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

(5) For Federal buildings for which design for construction began on or after April 7, 2023, each Federal agency shall determine energy consumption levels for both the ASHRAE Baseline Building 2019 and proposed building by using the Performance Rating Method found in Appendix G of ASHRAE 90.1–2019 (incorporated by reference, see § 433.3). The formula for determining the percentage improvement shall be as follows:

Percentage Improvement = 100 × (1 − PCI/PCIt)

Where

PCI = Performance Cost Index calculated in accordance with Section G1.2 of ASHRAE Standard 90.1–2019

PCIt = Performance Cost Index Target calculated by formula in Section 4.2.1.1 of ASHRAE Standard 90.1–2019

(b) Energy consumption for the purposes of calculating the 30 percent savings requirements shall include the building envelope and energy consuming systems normally specified as part of the building design by ASHRAE Standard 90.1 such as space heating, space cooling, ventilation, service water heating, and lighting, and all process and receptacle loads, except for energy-intensive process loads that are driven by mission and operational requirements, not necessarily buildings, and not influenced by conventional building energy conservation measures.

[FR Doc. 2022–06949 Filed 4–6–22; 8:45 am]

BILLING CODE 6450–01–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 71

[Docket No. FAA–2021–0596; Airspace Docket No. 20–AGL–15]

RIN 2120–AA66

Amendment of V–6, V–10, V–30, V–100, and V–233 in the Vicinity of Litchfield, MI

AGENCY: Federal Aviation Administration (FAA) DOT.

ACTION: Final rule; withdrawal.

SUMMARY: This action withdraws the final rule published in the **Federal Register** on March 21, 2022, amending VHF Omnidirectional Range (VOR) Federal airways V–6, V–10, V–30, V–100, and V–233 in the vicinity of Litchfield, MI, due to the planned decommissioning of the VOR portion of the Litchfield, MI, VOR/Distance Measuring Equipment (VOR/DME) navigational aid. Unanticipated issues affecting the completion of related VOR Minimum Operational Network (MON) Program instrument procedure amendments and the associated flight inspection activities required to adopt those amendments have made this withdrawal action necessary.

DATES: As of April 7, 2022, the final rule published on March 21, 2022 (87 FR 15879) is withdrawn.

FOR FURTHER INFORMATION CONTACT: Colby Abbott, Rules and Regulations Group, Office of Policy, Federal Aviation Administration, 800 Independence Avenue SW, Washington, DC 20591; telephone: (202) 267–8783.

SUPPLEMENTARY INFORMATION:

History

The FAA published a final rule in the **Federal Register** for Docket No. FAA–2021–0596 (87 FR 15879; March 21, 2022) amending VOR Federal airways V–6, V–10, V–30, V–100, and V–233 due to the planned decommissioning of the VOR portion of the Litchfield, MI, VOR/DME. The effective date of that rule is May 19, 2022. Subsequent to the final rule, unanticipated requirements and issues affecting the completion of related instrument procedure amendments and the associated flight inspection activities required to adopt those amendments by the published effective date have been identified. As a result, the planned Litchfield, MI, VOR decommissioning has been slipped to April 20, 2023.

FAA's Conclusions

The FAA has reviewed the Litchfield, MI, VOR decommissioning project and determined additional time is required to complete the related instrument procedure amendments and associated flight inspection activities to ensure an efficient implementation and integration with other ongoing VOR MON program actions. Therefore, the final rule is being withdrawn.

The existing VOR Federal airways (V–6, V–10, V–30, V–100, and V–233) addressed in the final rule remain unchanged.

The FAA will publish a new notice of proposed rulemaking action at a later date, using a new airspace docket number, to coincide with the slipped Litchfield, MI, VOR decommissioning now planned for April 20, 2023.

List of Subjects in 14 CFR Part 71

Airspace, Incorporation by reference, Navigation (air).

The Withdrawal

■ Accordingly, pursuant to the authority delegated to me, the final rule published in the **Federal Register** on March 21, 2022 (87 FR 15879), FR Doc. 2022–05546, is hereby withdrawn.

Authority: 49 U.S.C. 106(f), 106(g), 40103, 40113, 40120; E.O. 10854; 24 FR 9565, 3 CFR, 1959–1963 Comp., p. 389.

Issued in Washington, DC, on March 31, 2022.

Scott M. Rosenbloom,

Manager, Airspace Rules and Regulations.

[FR Doc. 2022–07206 Filed 4–6–22; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF COMMERCE

Bureau of Industry and Security

15 CFR Part 744

[Docket No. 220331–0082]

RIN 0694–AI67

Additions of Entities to the Entity List

AGENCY: Bureau of Industry and Security, Commerce.

ACTION: Final rule.

SUMMARY: In response to the Russian Federation's (Russia's) further invasion of Ukraine on February 24, 2022, the Department of Commerce is amending the Export Administration Regulations (EAR) by adding 120 entities under 120 entries to the Entity List. These 120 entities have been determined by the U.S. Government to be acting contrary to the national security interests or foreign policy of the United States and will be listed on the Entity List under the destinations of Belarus and Russia.

DATES: This rule is effective April 1, 2022.

FOR FURTHER INFORMATION CONTACT: Chair, End-User Review Committee, Office of the Assistant Secretary for Export Administration, Bureau of Industry and Security, Department of Commerce, Phone: (202) 482–5991, Email: *ERC@bis.doc.gov.*

SUPPLEMENTARY INFORMATION:

Background

The Entity List (supplement no. 4 to part 744 of the Export Administration Regulations (EAR)) identifies entities for which there is reasonable cause to believe, based on specific and articulable facts, that the entities have been involved, are involved, or pose a significant risk of being or becoming involved in activities contrary to the national security or foreign policy interests of the United States. The EAR (15 CFR parts 730–774) imposes additional license requirements on, and limit the availability of most license exceptions for exports, reexports, and transfers (in-country) to listed entities. The license review policy for each listed entity is identified in the ''License Review Policy'' column on the Entity List, and the impact on the availability of license exceptions is described in the relevant **Federal Register** document that added the entity to the Entity List. The Bureau of Industry and Security (BIS) places entities on the Entity List pursuant to part 744 (Control Policy: End-User and End-Use Based) and part 746 (Embargoes and Other Special Controls) of the EAR. Paragraphs (b)(1)