DEPARTMENT OF ENERGY

10 CFR Part 431

[Docket No. EERE–2011–BT–STD–0029]

RIN 1904–AC47

Energy Conservation Program for Certain Industrial Equipment: Energy Conservation Standards and Test Procedures for Commercial Heating, Air-Conditioning, and Water-Heating Equipment

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

ACTION: Final rule.

SUMMARY: The U.S. Department of Energy (DOE) is amending its energy conservation standards for small, large, and very large water-cooled and evaporatively-cooled commercial package air conditioners, and variable refrigerant flow (VRF) water-source heat pumps less than 17,000 Btu/h. DOE is adopting new energy conservation standards for computer room air conditioners and VRF water-source heat pumps with a cooling capacity at or greater than 135,000 Btu/h and less than 760,000 Btu/h. Pursuant to the Energy Policy and Conservation Act of 1975 (EPCA), as amended, DOE must assess whether the uniform national standards for these covered equipment need to be updated each time the corresponding industry standard—the American National Standards Institute (ANSI)/American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)/Illuminating Engineering Society of North America (IESNA) Standard 90.1 (ASHRAE Standard 90.1)—is amended, which most recently occurred on October 29, 2010. The levels DOE is adopting are the same as the efficiency levels specified in ASHRAE Standard 90.1–2010. DOE has determined that the ASHRAE Standard 90.1–2010 efficiency levels for the equipment types listed above are more stringent than existing Federal energy conservation standards and will result in economic and energy savings compared existing energy conservation standards. Furthermore, DOE has concluded that clear and convincing evidence does not exist, as would justify more-stringent standard levels than the efficiency levels in ASHRAE Standard 90.1–2010 for any of the equipment classes. DOE is also updating the current Federal test procedures or, for certain equipment, adopting new test procedures to incorporate by reference the most current versions of the relevant industry test procedures specified in ASHRAE Standard 90.1–2010. Furthermore, DOE is adopting additional test procedure provisions to include with modification certain instructions from Air-Conditioning, Heating, and Refrigeration Institute (AHRI) operations manuals in that organization's test procedures that would clarify the application of the DOE test procedures and harmonize DOE testing with the testing performed by industry.

DATES: This rule is effective July 16, 2012.

Compliance Dates:

See Table 1 of section II.C of the **SUPPLEMENTARY INFORMATION** section of this final rule for the compliance dates associated with the new/amended test procedures, the new/amended energy conservation standards, and the representation requirements by equipment type.

The incorporation by reference of certain publications listed in this rule was approved by the Director of the Federal Register on July 16, 2012.

ADDRESSES: The docket for this rulemaking is available for review at *www.regulations.gov*, including **Federal Register** notices, public meeting attendee lists and transcripts, comments, and other supporting documents/materials. All documents in the docket are listed in the *www.regulations.gov* index. However, not all documents listed in the index may be publicly available, such as information that is exempt from public disclosure.

A link to the docket Web page can be found at: *http://www.regulations.gov/#!docketDetail;dct=FR%252BPR%252BN%252BO%252BSR%252BPS;rpp=25;po=0;D=EERE-2011-BT-STD-0029.* The *www.regulations.gov* Web page contains simple instructions on how to access all documents, including public comments, in the docket.

For further information on how to review the docket, contact Ms. Brenda Edwards at (202) 586–2945 or by email: *Brenda.Edwards@ee.doe.gov.*

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SUPPLEMENTARY INFORMATION: This final rule incorporates by reference into part 431 the following standards:

- American National Standards Institute Z21.47–2006 (ANSI Z21.47–2006), ''*Gas-Fired Central Furnaces,*'' approved on July 27, 2006.
- American National Standards Institute Z21.10.3–2011, (ANSI Z21.10.3–2011), ''*Gas Water Heaters, Volume III, Storage Water Heaters With Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous,*'' approved on March 7, 2011.

Copies of ANSI Z21.47–2006 and ANSI Z21.10.3–2011 can be obtained from the American National Standards Institute, 25 W. 43rd Street, 4th Floor, New York, NY 10036, (212) 642–4900, or go to *http://www.ansi.org.*

- Air-Conditioning, Heating, and Refrigeration Institute Standard 210/240–2008 (AHRI 210/240–2008), ''*Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment,*'' approved by ANSI on October 27, 2011 and updated by addendum 1 in June 2011 and addendum 2 in March 2012.
- Air-Conditioning, Heating, and Refrigeration Institute Standard 340/360–2007 (AHRI 340/360–2007), ''*Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment,*'' approved by ANSI on October 27, 2011 and updated by addendum 1 in December 2010 and addendum 2 in June 2011.
- Air-Conditioning, Heating, and Refrigeration Institute Standard 390–2003 (AHRI 390–2003), dated 2003, ''*Performance Rating of Single Package Vertical Air-Conditioners and Heat Pumps.*''
- Air-Conditioning, Heating, and Refrigeration Institute Standard 1230–2010 (AHRI 1230–2010), ''*Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment,*'' approved by ANSI on August 2, 2010 and updated by addendum 1 in March 2011.

Copies of AHRI 210/240–2008, AHRI 340/360–2007, AHRI 390–2003, and AHRI 1230–2010 can be obtained from the Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Blvd., Suite 500, Arlington, VA 22201, (703) 524–8800, or go to *http://www.ahrinet.org.*

- American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 127–2007, (ASHRAE 127–2007), ''*Method of Testing for Rating Computer and Data Processing Room Unitary Air*

Conditioners,'' approved on June 28, 2007

Copies of ASHRAE 127–2007 can be obtained from American Society of Heating, Refrigerating, and Air-Conditioning Engineers, 1791 Tullie Circle, NE., Atlanta, Georgia 30329, (404) 636–8400, or go to *http://www.ashrae.org.*

• Underwriters Laboratories, Inc. Standard 727–2006 (UL 727–2006), ''*Standard for Safety for Oil-Fired Central Furnaces,*'' approved April 7, 2006.

Copies of UL 727–2006 can be obtained from Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062, (847) 272–8800, or go to *http://www.ul.com.*

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I. Summary of the Final Rule

The Energy Policy and Conservation Act (EPCA) (42 U.S.C. 6291 *et seq.*), as amended, requires DOE to consider amending the existing Federal energy conservation standard for certain types of listed commercial and industrial equipment (generally, commercial water heaters, commercial packaged boilers, commercial air-conditioning and heating equipment, and packaged terminal air conditioners and heat pumps) each time ASHRAE Standard 90.1, *Energy Standard for Buildings Except Low-Rise Residential Buildings,* is amended with respect to such equipment. (42 U.S.C. 6313(a)(6)(A)) For each type of equipment, EPCA directs that if ASHRAE Standard 90.1 is amended,[1] DOE must adopt amended energy conservation standards at the new efficiency level in ASHRAE Standard 90.1, unless clear and convincing evidence supports a determination that adoption of a more-stringent efficiency level as a national standard would produce significant additional energy savings and be technologically feasible and economically justified. (42 U.S.C. 6313(a)(6)(A)(ii)) If DOE decides to adopt as a national standard the efficiency levels specified in the

[1] Although EPCA does not explicitly define the term ''amended'' in the context of ASHRAE Standard 90.1, DOE provided its interpretation of what would constitute an ''amended standard'' in a final rule published in the **Federal Register** on March 7, 2007 (hereafter referred to as the ''March 2007 final rule''). 72 FR 10038. In that rule, DOE stated that the statutory trigger requiring DOE to adopt uniform national standards based on ASHRAE action is for ASHRAE to change a standard for any of the equipment listed in EPCA section 342(a)(6)(A)(i) (42 U.S.C. 6313(a)(6)(A)(i)) by increasing the energy efficiency level for that equipment type. *Id.* at 10042. In other words, if the revised ASHRAE Standard 90.1 leaves the standard level unchanged or lowers the standard, as compared to the level specified by the national standard adopted pursuant to EPCA, DOE does not have the authority to conduct a rulemaking to consider a higher standard for that equipment pursuant to 42 U.S.C. 6313(a)(6)(A). DOE subsequently reiterated this position in a final rule published in the **Federal Register** on July 22, 2009. 74 FR 36312, 36313.

amended ASHRAE Standard 90.1, DOE must establish such standard not later than 18 months after publication of the amended industry standard. (42 U.S.C. 6313(a)(6)(A)(ii)(I)) If DOE determines that a more-stringent standard is appropriate under the statutory criteria, DOE must establish such more-stringent standard not later than 30 months after publication of the revised ASHRAE Standard 90.1. (42 U.S.C. 6313(a)(6)(B)) ASHRAE officially released ASHRAE Standard 90.1–2010 on October 29, 2010, thereby triggering DOE's above-referenced obligations pursuant to EPCA to determine for those equipment with efficiency level changes beyond the current Federal standard, whether: (1) The amended industry standard should be adopted; or (2) clear and convincing evidence exists to justify more-stringent standard levels.

DOE published a notice of proposed rulemaking on January 17, 2012 (January 2012 NOPR), in the **Federal Register** describing DOE's determination of scope for considering new and amended energy conservation standards with respect to certain heating, ventilating, air-conditioning, and water-heating equipment addressed in ASHRAE Standard 90.1–2010. 77 FR 2356, 2366–79. ASHRAE Standard 90.1–2010 amended its efficiency levels for small, large, and very large water-cooled and evaporatively-cooled air conditioners and variable refrigerant flow water-source heat pumps with a cooling capacity less than 17,000 Btu/h, and adopted new efficiency levels for variable refrigerant flow water-source heat pumps with a cooling capacity equal to or greater than 135,000 Btu/h and less than 760,000 Btu/h,with and without heat recovery. In addition, ASHRAE Standard 90.1–2010 expanded its scope to include certain process cooling equipment, namely ''air conditioners and condensing units serving computer rooms'' (hereafter referred to as ''computer room air conditioners''). ASHRAE Standard 90.1–2010 also updated its referenced test procedures for several equipment types.

In determining the scope of the rulemaking, DOE is statutorily required to ascertain whether the revised ASHRAE efficiency levels have become more stringent than the current Federal energy conservation standard, thereby ensuring that any new amended national standard would not result in ''backsliding,'' which is prohibited under 42 U.S.C. 6295(o)(1). For those equipment classes for which ASHRAE set more-stringent or new efficiency levels (*i.e.,* small, large, and very large water-cooled and evaporatively-cooled air conditioners; variable refrigerant flow water-source heat pumps with a cooling capacity either less than 17,000 Btu/h or equal to or greater than 135,000 Btu/h and less than 760,000 Btu/h, with and without heat recovery; and computer room air conditioners), DOE analyzed the energy savings potential of amended national energy conservation standards (at both the new ASHRAE Standard 90.1 efficiency levels and more-stringent efficiency levels) in the May 5, 2011 notice of data availability (NODA) (76 FR 25622) and the January 17, 2012 NOPR (77 FR 2356). For equipment where more-stringent standard levels than the ASHRAE efficiency levels would result in significant energy savings (*i.e.,* computer room air conditioners), DOE analyzed the economic justification for more-stringent levels in the January 2012 NOPR. 77 FR 2356, 2382–98 (Jan. 17, 2012).

The energy conservation standards being adopted in today's final rule, which apply to small, large, and very large water-cooled and evaporatively-cooled air conditioners; variable refrigerant flow water-source heat pumps with a cooling capacity either less than 17,000 Btu/h or equal to or greater than 135,000 Btu/h and less than 760,000 Btu/h, with and without heat recovery; and computer room air conditioners, satisfy all applicable requirements of EPCA and will achieve the maximum improvements in energy efficiency that are technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A)) DOE has concluded that, based on the information presented and its analyses, there is not clear and convincing evidence justifying adoption of more-stringent efficiency levels for this equipment.

Thus, in accordance with the criteria discussed in this notice, DOE is amending the energy conservation standards (or for certain equipment adopting new standards) for small, large, and very large water-cooled and evaporatively-cooled air conditioners; variable refrigerant flow water-source heat pumps with a cooling capacity either less than 17,000 Btu/h or equal to or greater than 135,000 Btu/h and less than 760,000 Btu/h, with and without heat recovery; and computer room air conditioners by adopting the efficiency levels specified by ASHRAE Standard 90.1–2010. Pursuant to EPCA, the compliance date for amended energy conservation standards based upon the levels in ASHRAE Standard 90.1 is either two or three years after the effective date of the requirement in the amended ASHRAE standard, depending on the type and size of the equipment. (See 42 U.S.C. 6313(a)(6)(D)) In the present case, the amended standards apply to equipment manufactured on and after the date either 2 or 3 years after the effective date specified in ASHRAE Standard 90.1–2010, depending on the type of equipment. Table I.1 presents the energy conservation standards that DOE is adopting in today's final rule and their respective compliance dates.

TABLE I.1—CURRENT AND AMENDED/NEW FEDERAL ENERGY CONSERVATION STANDARDS FOR CERTAIN ASHRAE EQUIPMENT

Equipment class	Current Federal energy conservation standard	Amended or new Federal energy conservation standard	Compliance date of amended/new Federal energy conservation standard
Commercial Package Air Conditioning and Heating Equipment—Water-Cooled			
Water-cooled Air Conditioner, ≥65,000 Btu/h and <135,000 Btu/h, Electric Resistance Heating or No Heating.	11.5 EER	12.1 EER	6/1/2013
Water-cooled Air Conditioner, ≥65,000 Btu/h and <135,000 Btu/h, All Other Heating.	11.3 EER	11.9 EER	6/1/2013
Water-cooled Air Conditioner, ≥135,000 Btu/h and <240,000 Btu/h, Electric Resistance Heating or No Heating.	11.0 EER	12.5 EER	6/1/2014
Water-cooled Air Conditioner, ≥135,000 Btu/h and <240,000 Btu/h, All Other Heating.	11.0 EER	12.3 EER	6/1/2014

TABLE I.1—CURRENT AND AMENDED/NEW FEDERAL ENERGY CONSERVATION STANDARDS FOR CERTAIN ASHRAE EQUIPMENT—Continued

Equipment class	Current Federal energy conservation standard	Amended or new Federal energy conservation standard	Compliance date of amended/new Federal energy conservation standard
Water-cooled Air Conditioner, ≥240,000 Btu/h and <760,000 Btu/h, Electric Resistance Heating or No Heating.	11.0 EER	12.4 EER	6/1/2014
Water-cooled Air Conditioner, ≥240,000 Btu/h and <760,000 Btu/h, All Other Heating.	10.8 EER	12.2 EER	6/1/2014
Commercial Package Air Conditioning and Heating Equipment—Evaporatively-Cooled			
Evaporatively-cooled Air Conditioner, ≥65,000 Btu/h and <135,000 Btu/h, Electric Resistance Heating or No Heating.	11.5 EER	12.1 EER	6/1/2013
Evaporatively-cooled Air Conditioner, ≥65,000 Btu/h and <135,000 Btu/h, All Other Heating.	11.3 EER	11.9 EER	6/1/2013
Evaporatively-cooled Air Conditioner, ≥135,000 Btu/h and <240,000 Btu/h, Electric Resistance Heating or No Heating.	11.0 EER	12.0 EER	6/1/2014
Evaporatively-cooled Air Conditioner, ≥135,000 Btu/h and <240,000 Btu/h, All Other Heating.	11.0 EER	11.8 EER	6/1/2014
Evaporatively-cooled Air Conditioner, ≥240,000 Btu/h and <760,000 Btu/h, Electric Resistance Heating or No Heating.	11.0 EER	11.9 EER	6/1/2014
Evaporatively-cooled Air Conditioner, ≥240,000 Btu/h and <760,000 Btu/h, All Other Heating.	10.8 EER	11.7 EER	6/1/2014
Variable Refrigerant Flow Water-Source Heat Pumps			
VRF Mulit-Split Heat Pumps, Water-source, <17,000 Btu/h, without heat recovery.	11.2 EER	12.0 EER, 4.2 COP	10/29/2012
VRF Mulit-Split Heat Pumps, Water-source, <17,000 Btu/h, with heat recovery.	11.2 EER	11.8 EER, 4.2 COP	10/29/2012
VRF Mulit-Split Heat Pumps, Water-source, ≥135,000 and <760,000 Btu/h, without heat recovery.	N/A	10.0 EER, 3.9 COP	10/29/2013
VRF Mulit-Split Heat Pumps, Water-source, ≥135,000 and <760,000 Btu/h, with heat recovery.	N/A	9.8 EER, 3.9 COP	10/29/2013
Computer Room Air Conditioners			
Computer Room Air Conditioner, air-cooled, <65,000 Btu/h	N/A	2.20 SCOP (downflow), 2.09 SCOP (upflow).	10/29/2012
Computer Room Air Conditioner, air-cooled, ≥65,000 Btu/h and <240,000 Btu/h.	N/A	2.10 SCOP (downflow), 1.99 SCOP (upflow).	10/29/2013
Computer Room Air Conditioner, air-cooled, ≥240,000 Btu/h and <760,000 Btu/h.	N/A	1.90 SCOP (downflow), 1.79 SCOP (upflow).	10/29/2013
Computer Room Air Conditioner, water-cooled, <65,000 Btu/h	N/A	2.60 SCOP (downflow), 2.49 SCOP (upflow).	10/29/2012
Computer Room Air Conditioner, water-cooled, ≥65,000 Btu/h and <240,000 Btu/h.	N/A	2.50 SCOP (downflow), 2.39 SCOP (upflow).	10/29/2013
Computer Room Air Conditioner, water-cooled, ≥240,000 Btu/h and <760,000 Btu/h.	N/A	2.40 SCOP (downflow), 2.29 SCOP (upflow).	10/29/2013
Computer Room Air Conditioner, water-cooled with fluid economizer, <65,000 Btu/h.	N/A	2.55 SCOP (downflow), 2.44 SCOP (upflow).	10/29/2012
Computer Room Air Conditioner, water-cooled with fluid economizer, ≥65,000 Btu/h and <240,000 Btu/h.	N/A	2.45 SCOP (downflow), 2.34 SCOP (upflow).	10/29/2013
Computer Room Air Conditioner, water-cooled with fluid economizer, ≥240,000 Btu/h and <760,000 Btu/h.	N/A	2.35 SCOP (downflow), 2.24 SCOP (upflow).	10/29/2013
Computer Room Air Conditioner, glycol-cooled, <65,000 Btu/h	N/A	2.50 SCOP (downflow), 2.39 SCOP (upflow).	10/29/2012
Computer Room Air Conditioner, glycol-cooled, ≥65,000 Btu/h and <240,000 Btu/h.	N/A	2.15 SCOP (downflow), 2.04 SCOP (upflow).	10/29/2013
Computer Room Air Conditioner, glycol-cooled, ≥240,000 Btu/h and <760,000 Btu/h.	N/A	2.10 SCOP (downflow), 1.99 SCOP (upflow).	10/29/2013
Computer Room Air Conditioner, glycol-cooled with fluid economizer, <65,000 Btu/h.	N/A	2.45 SCOP (downflow), 2.34 SCOP (upflow).	10/29/2012
Computer Room Air Conditioner, glycol-cooled with fluid economizer, ≥65,000 Btu/h and <240,000 Btu/h.	N/A	2.10 SCOP (downflow), 1.99 SCOP (upflow).	10/29/2013
Computer Room Air Conditioner, glycol-cooled with fluid economizer, ≥240,000 Btu/h and <760,000 Btu/h.	N/A	2.05 SCOP (downflow), 1.94 SCOP (upflow).	10/29/2013

In addition, DOE is adopting amendments to its test procedures for a number of ASHRAE equipment types, which manufacturers will be required to use to certify compliance with energy conservation standards mandated under EPCA. *See* 42 U.S.C. 6314(a)(4) and 10 CFR parts 429 and 431. Specifically, these amendments, which were proposed in the January 2012 NOPR, update the citations and incorporations by reference to the most recent version of the following industry standards: (1) AHRI 210/240–2008 (Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment); (2) AHRI 340/360–2007 (Performance Rating of Unitary Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment); (3) UL 727–2006 (Standard for Safety for Oil-Fired Central Furnaces); (4) ANSI Z21.47–2006 (Standard for Gas-Fired Central Furnaces); and (5) ANSI Z21.10.3–2011 [2] (Gas Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous). DOE is also adopting three new test procedures for VRF equipment (AHRI 1230–2010), computer room air conditioners (ASHRAE 127–2007), and single package vertical units (AHRI 390–2003). In addition to harmonizing the test procedures with the latest versions in ASHRAE Standard 90.1, DOE also reviewed each of these test procedures in their totality as part of DOE's seven-year review required by EPCA. DOE is including several additional provisions in its test procedures based on a review of AHRI operations manuals. The additional provisions include an optional ''break-in'' period for testing for commercial air-conditioning and heating equipment, which was proposed in the January 2012 NOPR (77 FR 2356, 2374 and 2378 (Jan. 17, 2012)), as well as provisions for setting up the equipment (determining refrigerant charge and indoor air flow quantity), allowing for manufacturer involvement and for the use of correction factors for refrigerant line length in VRF testing, which were proposed in DOE's March 2012 supplemental notice of proposed rulemaking (SNOPR). 77 FR 16769, 16777–79 (March 22, 2012).

[2] At certain places in the January 2012 NOPR, DOE mistakenly referred to ''ANSI Z.21.10.3–2006,'' which does not exist, so DOE clarified in the March 2012 SNOPR that it meant to refer to ''ANSI Z.21.10.3–2004'' in all instances where ANSI Z21.10.3–2006 was mentioned in the January 2012 NOPR. 77 FR 16769, 16779–80 (March 22, 2012). However, as explained in section IV.B of this final rule, DOE has decided to adopt an updated version of that standard, ANSI Z.21.10.3–2011, based on comments from interested parties.

II. Introduction

The following section briefly discusses the statutory authority underlying today's final rule, as well as some of the relevant historical background related to the establishment of energy conservation standards for water-cooled and evaporatively-cooled air conditioners, variable refrigerant flow water-source heat pump systems, and computer room air conditioners.

A. Authority

Title III, Part C [3] of the Energy Policy and Conservation Act of 1975 (EPCA or the Act), Public Law 94–163 (42 U.S.C. 6311–6317, as codified), added by Public Law 95–619, Title IV, § 441(a), established the Energy Conservation Program for Certain Industrial Equipment, which includes the commercial heating, air-conditioning, and water-heating equipment that is the subject of this rulemaking.[4] In general, this program addresses the energy efficiency of certain types of commercial and industrial equipment. Relevant provisions of the Act specifically include definitions (42 U.S.C. 6311), energy conservation standards (42 U.S.C. 6313), test procedures (42 U.S.C. 6314), labelling provisions (42 U.S.C. 6315), and the authority to require information and reports from manufacturers (42 U.S.C. 6316).

EPCA contains mandatory energy conservation standards for commercial heating, air-conditioning, and water-heating equipment. (42 U.S.C. 6313(a)) Specifically, the statute sets standards for small, large, and very large commercial package air-conditioning and heating equipment, packaged terminal air conditioners (PTACs) and packaged terminal heat pumps (PTHPs), warm-air furnaces, packaged boilers, storage water heaters, instantaneous water heaters, and unfired hot water storage tanks. *Id.* In doing so, EPCA established Federal energy conservation standards that generally correspond to the levels in ASHRAE Standard 90.1, as in effect on October 24, 1992 (*i.e.,* ASHRAE Standard 90.1–1989), for each type of covered equipment listed in 42 U.S.C. 6313(a). The Energy Independence and Security Act of 2007 (EISA 2007) amended EPCA by adding definitions and setting minimum energy conservation standards for single-package vertical air conditioners (SPVACs) and single-package vertical heat pumps (SPVHPs). (42 U.S.C. 6313(a)(10)(A)) The efficiency standards for SPVACs and SPVHPs established by EISA 2007 correspond to the levels contained in ASHRAE Standard 90.1–2004, which originated as addendum ''d'' to ASHRAE Standard 90.1–2001.

[3] For editorial reasons, upon codification in the U.S. Code, Part C was redesignated Part A–1.

[4] All references to EPCA in this document refer to the statute as amended through the Energy Independence and Security Act of 2007, Public Law 110–140.

In acknowledgement of technological changes that yield energy efficiency benefits, Congress further directed DOE through EPCA to consider amending the existing Federal energy conservation standard for each type of equipment listed, each time ASHRAE Standard 90.1 is amended with respect to such equipment. (42 U.S.C. 6313(a)(6)(A)) For each type of equipment, EPCA directs that if ASHRAE Standard 90.1 is amended, DOE must publish in the **Federal Register** an analysis of the energy savings potential of amended energy efficiency standards within 180 days of the amendment of ASHRAE Standard 90.1. (42 U.S.C. 6313(a)(6)(A)(i)) EPCA further directs that DOE must adopt amended standards at the new efficiency level in ASHRAE Standard 90.1, unless clear and convincing evidence supports a determination that adoption of a more-stringent level would produce significant additional energy savings and be technologically feasible and economically justified. (42 U.S.C. 6313(a)(6)(A)(ii)) If DOE decides to adopt as a national standard the efficiency levels specified in the amended ASHRAE Standard 90.1, DOE must establish such standard not later than 18 months after publication of the amended industry standard. (42 U.S.C. 6313(a)(6)(A)(ii)(I)) However, if DOE determines that a more-stringent standard is justified under 42 U.S.C. 6313(a)(6)(A)(ii)(II), then it must establish such more-stringent standard not later than 30 months after publication of the amended ASHRAE Standard 90.1. (42 U.S.C. 6313(a)(6)(B)) (In addition, DOE notes that pursuant to the EISA 2007 amendments to EPCA, under 42 U.S.C. 6313(a)(6)(C), the agency must periodically review its already-established energy conservation standards for ASHRAE equipment. Under this requirement, the next review that DOE would need to conduct must occur no later than six years from the issuance of a final rule establishing or amending a standard for a covered type of equipment.)

EISA 2007 also amended EPCA to require that DOE review the most recently published ASHRAE Standard 90.1 (*i.e.,* ASHRAE Standard 90.1–2010) with respect to SPVACs and SPVHPs in accordance with the procedures established for ASHRAE equipment under 42 U.S.C. 6313(a)(6). (42 U.S.C.

6313(a)(10)(B)) However, DOE believes that this one-time requirement is separate and independent from the requirement described in the paragraph above for all ASHRAE products and that it requires DOE to evaluate potential standards higher than the ASHRAE Standard 90.1–2010 level for single-package vertical air conditioners and heat pumps, even if the efficiency levels for SPVACs and SPVHPs have not changed since the last version of ASHRAE Standard 90.1.[5] DOE is conducting a separate rulemaking to further evaluate the efficiency levels for this equipment class.

EPCA also requires that if a test procedure referenced in ASHRAE Standard 90.1 is updated, DOE must update its test procedure to be consistent with the amended test procedure in ASHRAE Standard 90.1, unless DOE determines that the amended test procedure is not reasonably designed to produce test results which reflect the energy efficiency, energy use, or estimated operating costs of the ASHRAE equipment during a representative average use cycle. In addition, DOE must determine that the amended test procedure is not unduly burdensome to conduct. (42 U.S.C. 6314(a)(2) and (4))

Additionally, the Energy Independence and Security Act of 2007 (EISA 2007; Pub. L. 110–140) amended EPCA to require that at least once every 7 years, DOE must conduct an evaluation of each test procedure for any covered equipment and either amend the test procedure (if the Secretary determines that the amended test procedure would more accurately or fully comply with the requirements of 42 U.S.C. 6314(a)(2)–(3)) or publish notice in the **Federal Register** of any determination not to amend a test procedure. (42 U.S.C. 6314(a)(1)(A)) Under this requirement, DOE must review each test procedure for the various types of ASHRAE equipment not later than December 19, 2014 (*i.e.,* 7 years after the enactment of EISA 2007). Thus, the final rule resulting from this rulemaking will satisfy the requirement to review the test procedures for the certain types of ASHRAE equipment addressed in this rulemaking (*i.e.,* those equipment for which DOE has been triggered) within seven years.

On October 29, 2010, ASHRAE officially released and made public ASHRAE Standard 90.1–2010. This action triggered DOE's obligations under 42 U.S.C. 6313(a)(6), as outlined above.

When considering the possibility of a more-stringent standard, DOE's more typical rulemaking requirements under EPCA apply (*i.e.,* a determination of technological feasibility, economic justification, and significant energy savings). For example, EPCA provides that in deciding whether such a standard is economically justified, DOE must determine, after receiving comments on the proposed standard, whether the benefits of the standard exceed its burdens by considering, to the greatest extent practicable, the following seven factors:

(1) The economic impact of the standard on manufacturers and consumers of the products subject to the standard;

(2) The savings in operating costs throughout the estimated average life of the product in the type (or class) compared to any increase in the price, initial charges, or maintenance expenses of the products likely to result from the standard;

(3) The total projected amount of energy savings likely to result directly from the standard;

(4) Any lessening of the utility or the performance of the products likely to result from the standard;

(5) The impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from the standard;

(6) The need for national energy conservation; and

(7) Other factors the Secretary considers relevant.

(42 U.S.C. 6295(o)(2)(B)(i)–(ii); 42 U.S.C. 6316(a))

EPCA, as codified, also contains what is known as an ''anti-backsliding'' provision, which prevents the Secretary from prescribing any amended standard that either increases the maximum allowable energy use or decreases the minimum required energy efficiency of a covered product. (42 U.S.C. 6295(o)(1)) Also, the Secretary may not prescribe an amended or new standard if interested persons have established by a preponderance of the evidence that such standard would likely result in the unavailability in the United States of any covered product type (or class) of performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available in the United States at the time of the Secretary's finding. (42 U.S.C. 6295(o)(4))

Further, EPCA, as codified, establishes a rebuttable presumption that a standard is economically justified if the Secretary finds that the additional cost to the consumer of purchasing a product complying with an energy conservation standard level will be less than three times the value of the energy (and, as applicable, water) savings during the first year that the consumer will receive as a result of the standard, as calculated under the applicable test procedure. (42 U.S.C. 6295(o)(2)(B)(iii) and 42 U.S.C. 6316(a))

Additionally, when a type or class of covered equipment such as ASHRAE equipment, has two or more subcategories, DOE often specifies more than one standard level. DOE generally will adopt a different standard level than that which applies generally to such type or class of products for any group of covered products that have the same function or intended use if DOE determines that products within such group: (A) Consume a different kind of energy from that consumed by other covered products within such type (or class); or (B) have a capacity or other performance-related feature which other products within such type (or class) do not have and which justifies a higher or lower standard. (42 U.S.C. 6295(q)(1); 42 U.S.C. 6316(a)) In determining whether a performance-related feature justifies a different standard for a group of products, DOE generally considers such factors as the utility to the consumer of the feature and other factors DOE deems appropriate. In a rule prescribing such a standard, DOE includes an explanation of the basis on which such higher or lower level was established. (42 U.S.C. 6295(q)(2); 6316(a)) DOE followed a similar process in the context of today's rulemaking.

DOE has also reviewed this regulation pursuant to Executive Order 13563, issued on January 18, 2011 (76 FR 3281 (Jan. 21, 2011)). Executive Order 13563 is supplemental to and explicitly reaffirms the principles, structures, and definitions governing regulatory review established in Executive Order 12866. To the extent permitted by law, agencies are required by Executive Order 13563 to: (1) Propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify); (2) tailor regulations to impose the least burden on society, consistent with obtaining regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulations; (3) select, in choosing among alternative regulatory approaches, those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other

[5] Once DOE has completed its rulemaking obligations under 42 U.S.C. 6313(a)(10)(B), SPVACs and SPVHPs will be treated similar to other ASHRAE equipment going forward.

advantages; distributive impacts; and equity); (4) to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt; and (5) identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public.

DOE emphasizes as well that Executive Order 13563 requires agencies to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible. In its guidance, the Office of Information and Regulatory Affairs has emphasized that such techniques may include identifying changing future compliance costs that might result from technological innovation or anticipated behavioral changes. For the reasons stated in the preamble, DOE believes that today's final rule is consistent with these principles, including the requirement that, to the extent permitted by law, benefits justify costs and that net benefits are maximized.

Consistent with Executive Order 13563, and the range of impacts analyzed in this rulemaking, the energy efficiency standard adopted herein by DOE achieves maximum net benefits.

B. Background

1. ASHRAE Standard 90.1–2010

As noted above, ASHRAE released a new version of ASHRAE Standard 90.1 on October 29, 2010. The ASHRAE standard addresses efficiency levels for many types of commercial heating, ventilating, air-conditioning (HVAC), and water-heating equipment covered by EPCA. ASHRAE Standard 90.1–2010 revised its efficiency levels for certain commercial equipment and revised its scope to include additional equipment, but for the remaining equipment, ASHRAE left in place the preexisting levels (*i.e.,* the efficiency levels specified in EPCA or the efficiency levels in ASHRAE Standard 90.1–2007). Specifically, DOE determined in the January 2012 NOPR that ASHRAE updated its efficiency levels for small, large, and very large water-cooled and evaporatively-cooled commercial package air conditioners; variable refrigerant flow (VRF) water-source heat pumps less than 17,000 Btu/h; and VRF water-source heat pumps at or greater than 135,000 Btu/h and less than 760,000 Btu/h. ASHRAE Standard 90.1–2010 also revised its scope to include certain commercial equipment used for industrial and process cooling, namely ''air conditioners and condensing units serving computer rooms.'' 77 FR 2356, 2361–63 (Jan. 17, 2012).

In addition, ASHRAE Standard 90.1–2010 updated the following referenced test procedures to the most recent version of the industry standards: AHRI 210/240–2008 (small commercial package air-conditioning and heating equipment); AHRI 340/360–2007 (large and very large commercial package air-conditioning and heating equipment); Underwriters Laboratories (UL) 727–2006 (oil-fired commercial warm-air furnaces); ANSI Z21.47–2006 (gas-fired commercial warm-air furnaces); and ANSI Z21.10.3–2004 [6] (commercial water heaters). Lastly, ASHRAE Standard 90.1–2010 specified new test procedures for certain equipment, including: ASHRAE 127–2007 (computer room air conditioners); and AHRI 1230–2010 (variable refrigerant flow air conditioners and heat pumps).

2. Previous Rulemaking Documents

Subsequent to the release of ASHRAE Standard 90.1–2010, DOE published a notice of data availability (NODA) in the **Federal Register** on May 5, 2011 (May 2011 NODA) and requested public comment as a preliminary step required pursuant to EPCA when DOE considers amended energy conservation standards for certain types of commercial equipment covered by ASHRAE Standard 90.1. 76 FR 25622. Specifically, in the May 2011 NODA, DOE presented a discussion of the changes found in ASHRAE Standard 90.1–2010, which included a description of DOE's evaluation of each ASHRAE equipment type in order for DOE to determine whether the amendments in ASHRAE Standard 90.1–2010 have increased efficiency levels. *Id.* at 25630–37. As an initial matter, DOE sought to determine which requirements for covered equipment in ASHRAE Standard 90.1, if any, were revised solely to reflect the level of the current Federal energy conservation standard (where ASHRAE is merely ''catching up'' to the current national standard), were revised but lowered, were revised to include design requirements without changes to the efficiency level, or were revised to include any other revisions made that did not increase the standard level, in which case, DOE was not triggered to act under 42 U.S.C. 6313(a)(6) for that particular equipment type. For those types of equipment in ASHRAE Standard 90.1 for which ASHRAE actually increased efficiency levels above the current Federal standard (*i.e.,* water-cooled and evaporatively-cooled air conditioners; two classes of VRF water-source heat pumps with and without heat recovery; and computer room air conditioners (which were not previously covered)), DOE subjected that equipment to the potential energy savings analysis for amended national energy conservation standards based on: (1) The modified efficiency levels contained within ASHRAE Standard 90.1–2010; and (2) more-stringent efficiency levels. DOE presented its methodology, data, and results for the preliminary energy savings analysis developed for the water-cooled and evaporatively-cooled equipment classes in the May 2011 NODA for public comment. *Id.* at 25637–46. For the remaining equipment classes, DOE requested data and information that would allow it to accurately assess the energy savings potential of those equipment classes. Additionally, for single package vertical air conditioners and heat pumps, although the levels in ASHRAE Standard 90.1–2010 were unchanged, DOE performed an analysis of their potential energy savings as required by 42 U.S.C. 6313(a)(10)(B). Lastly, DOE presented an initial assessment of the test procedure changes included in ASHRAE Standard 90.1–2010. *Id.* at 25644–47.

Following the NODA, DOE published a notice of proposed rulemaking in the **Federal Register** on January 17, 2012 (the January 2012 NOPR), and requested public comment. 77 FR 2356. In the January 2012 NOPR, DOE proposed amended energy conservation standards for small, large, and very large water-cooled and evaporatively-cooled commercial package air conditioners; variable refrigerant flow (VRF) water-source heat pumps less than 17,000 Btu/h; VRF water-source heat pumps at or greater than 135,000 Btu/h and less than 760,000 Btu/h; and new energy conservation standards for computer room air conditioners. DOE presented its methodology, data, and results for its analysis of two classes of variable refrigerant flow water-source heat pumps and for its analysis of computer room air conditioners.

In addition, DOE's NOPR also proposed the adoption of amended test procedures for small commercial package air-conditioning and heating equipment; large and very large commercial package air-conditioning and heating equipment; commercial warm-air furnaces; and commercial water heaters. Furthermore, DOE proposed to adopt new test procedures

[6] A later edition of the ANSI Z21.10.3 standard, ANSI Z21.10.3–2011, was approved by ANSI on March 7, 2011.

for variable refrigerant flow equipment, single package vertical air conditioners and heat pumps, and computer room air conditioners. Following the publication of the NOPR, DOE held a public meeting on February 14, 2012, to receive feedback from interested parties on its proposals and analyses.

At the public meeting, a variety of issues were discussed, including DOE's proposed definition for ''computer room air conditioner,'' DOE's proposed adoption of the ASHRAE Standard 90.1–2010 efficiency levels for computer room air conditioners and other equipment, and DOE's proposed adoption of the most recent industry test methods. In response to concerns raised at the public meeting regarding DOE's proposed definition of ''computer room air conditioner'' and recommendations to include in DOE's test procedures certain provisions in AHRI operations manuals, DOE published an SNOPR on March 22, 2012, which proposed a refined definition of ''computer room air conditioner'' and proposed to adopt several clarifications to its test procedures based on information found in AHRI operations manuals. 77 FR 16769.

C. Compliance Dates for Amended/New Federal Test Procedures, Amended/New Federal Energy Conservation Standards, and Representations for Certain ASHRAE Equipment

This final rule specifies the compliance dates for new and amended test procedures, new and amended energy conservation standards, and representations as shown in Table 1 below.

TABLE 1—COMPLIANCE DATES FOR AMENDED/NEW FEDERAL TEST PROCEDURES, AMENDED/NEW FEDERAL ENERGY CONSERVATION STANDARDS, AND REPRESENTATIONS FOR CERTAIN ASHRAE EQUIPMENT

Equipment class	Compliance with the amended/new test procedure is required on or after:	All representations of energy use/efficiency must be made using the amended test procedures on or after:	Compliance with the amended/new standard is required on or after:
Commercial Warm Air Furnaces			
Gas-fired and Oil-fired Commercial Warm Air Furnaces	May 13, 2013	May 13, 2013	N/A
Commercial Package Air-Conditioning and Heating Equipment—Air-Cooled			
Air-cooled Air Conditioner and Heat Pump, <65,000 Btu/h	May 13, 2013	May 13, 2013	N/A
Air-cooled Air Conditioner and Heat Pump, ≥65,000 Btu/h and <135,000 Btu/h.	May 13, 2013	May 13, 2013	N/A
Air-cooled Air Conditioner and Heat Pump, ≥135,000 Btu/h and <240,000 Btu/h.	May 13, 2013	May 13, 2013	N/A
Air-cooled Air Conditioner and Heat Pump, ≥240,000 Btu/h and <760,000 Btu/h.	May 13, 2013	May 13, 2013	N/A
Commercial Package Air-Conditioning and Heating Equipment—Water-Cooled			
Water-cooled Air Conditioner, ≥65,000 Btu/h and <135,000 Btu/h	May 13, 2013	May 13, 2013	6/1/2013
Water-cooled Air Conditioner, ≥135,000 Btu/h and <240,000 Btu/h	May 13, 2013	May 13, 2013	6/1/2014
Water-cooled Air Conditioner, ≥240,000 Btu/h and <760,000 Btu/h	May 13, 2013	May 13, 2013	6/1/2014
Commercial Package Air-Conditioning and Heating Equipment—Evaporatively-Cooled			
Evaporatively-cooled Air Conditioner, ≥65,000 Btu/h and <135,000 Btu/h.	May 13, 2013	May 13, 2013	6/1/2013
Evaporatively-cooled Air Conditioner, ≥135,000 Btu/h and <240,000 Btu/h.	May 13, 2013	May 13, 2013	6/1/2014
Evaporatively-cooled Air Conditioner, ≥240,000 Btu/h and <760,000 Btu/h.	May 13, 2013	May 13, 2013	6/1/2014
Packaged Terminal Air Conditioners and Heat Pumps			
Packaged Terminal Air Conditioners and Heat Pumps	May 13, 2013	May 13, 2013	N/A
Variable Refrigerant Flow Equipment*			
VRF Multi-Split Air Conditioners and Heat Pumps, Air-Cooled, <760,000 Btu/h.	May 13, 2013	May 13, 2013	N/A
VRF Multi-Split Heat Pumps, Water-source, <17,000 Btu/h	October 29, 2012	May 13, 2013	10/29/2012
VRF Multi-Split Heat Pumps, Water-source, ≥17,000 Btu/h and <135,000 Btu/h.	May 13, 2013	May 13, 2013	N/A
VRF Multi-Split Heat Pumps, Water-source, ≥135,000 and <760,000 Btu/h.	May 13, 2013	May 13, 2013	10/29/2013
Computer Room Air Conditioners			
Computer Room Air Conditioner, air-cooled/water-cooled/water-cooled with fluid economizer/glycol-cooled, <65,000 Btu/h.	October 29, 2012	May 13, 2013	10/29/2012
Computer Room Air Conditioner, air-cooled/water-cooled/water-cooled with fluid economizer/glycol-cooled, ≥65,000 Btu/h and <240,000 Btu/h.	May 13, 2013	May 13, 2013	10/29/2013

TABLE 1—COMPLIANCE DATES FOR AMENDED/NEW FEDERAL TEST PROCEDURES, AMENDED/NEW FEDERAL ENERGY CONSERVATION STANDARDS, AND REPRESENTATIONS FOR CERTAIN ASHRAE EQUIPMENT—Continued

Equipment class	Compliance with the amended/new test procedure is required on or after:	All representations of energy use/efficiency must be made using the amended test procedures on or after:	Compliance with the amended/new standard is required on or after:
Computer Room Air Conditioner, air-cooled/water-cooled/water-cooled with fluid economizer/glycol-cooled, ≥240,000 Btu/h and <760,000 Btu/h.	May 13, 2013	May 13, 2013	10/29/2013
Single Package Vertical Units			
Single Package Vertical Air Conditioners and Heat Pumps	July 16, 2012	May 13, 2013	N/A
Commercial Water Heaters and Hot Water Supply Boilers			
Gas-fired Storage and Instantaneous Water Heaters and Hot Water Supply Boilers, Oil-fired Storage and Instantaneous Water Heaters and Hot Water Supply Boilers, and Electric Storage and Instantaneous Water Heaters.	May 13, 2013	May 13, 2013	N/A

* For those basic models of variable refrigerant flow equipment currently being tested using a test procedure waiver, the methods prescribed by the test procedure waiver may continue to be used until the mandatory compliance date of the amended test procedure prescribed by this final rule.

III. General Discussion of Comments Received

In response to its request for comment on the January 2012 NOPR and March 2012 SNOPR, DOE received nine written comments from manufacturers, trade associations, utilities, and energy efficiency advocates. As discussed above, these comments are available in the docket for this rulemaking and are available for review by following the instructions in the **ADDRESSES** section. The following sections summarize the issues raised in these comments, along with DOE's responses.

A. The Definition of ''Amendment'' With Respect to the Efficiency Levels in ASHRAE Standard 90.1

In the January 2012 NOPR, DOE reiterated its position about what constitutes an amendment to ASHRAE Standard 90.1, thereby triggering DOE review. 77 FR 2356, 2364 (Jan. 17, 2012). DOE maintained its position originally taken in the July 22, 2009 final rule for ASHRAE equipment (74 FR 36312, 36320 (July 22, 2009)) that the trigger to review the Federal standard levels for ASHRAE equipment is an increase in the ASHRAE Standard 90.1 efficiency level, and that other changes do not qualify as a trigger for review. *Id.* Further, DOE noted that because EPCA does not explicitly define the term ''amended'' in the context of ASHRAE Standard 90.1, DOE provided its interpretation of what would constitute an ''amended standard'' in a final rule published in the **Federal Register** on March 7, 2007. 72 FR 10038. In that rule, DOE stated that the statutory trigger requiring DOE to adopt uniform national standards based on ASHRAE action is for ASHRAE to change a standard for any of the equipment listed in EPCA section 342(a)(6)(A)(i) (42 U.S.C. 6313(a)(6)(A)) by increasing the energy efficiency level for that equipment type. *Id.* at 10042. DOE noted in the January 2012 NOPR that the section cited above refers to ''the minimum level * * * specified in the amended ASHRAE standard,'' which DOE interprets as referring to an energy efficiency level. 77 FR 2356, 2364 (Jan. 17, 2012). Consequently, DOE did not review the standard levels for commercial warm-air furnaces because the incorporation of design requirements did not meet DOE's interpretation of an amendment to ASHRAE Standard 90.1 that would trigger DOE action. *Id.*

Earthjustice stated that ASHRAE Standard 90.1 has amended levels for warm-air furnaces requiring incorporation of an interrupted or intermittent ignition device, a maximum level of jacket losses, and either power venting or a flue damper, and that this amendment triggers DOE to review the efficiency levels for commercial warm-air furnaces. (Earthjustice, No. 34 at p. 3) Earthjustice stated that DOE's reasoning for why no review of commercial warm-air furnaces is needed is flawed, because there is nothing in the language of EPCA that suggests that only amendments that alter a numeric performance metric trigger DOE's obligation for review. (Earthjustice, No. 34 at p. 3)

Earthjustice commented that in the NOPR, DOE's view that ''the minimum level'' only refers to the numeric value of an ASHRAE Standard 90.1 performance standard ignores the fact that EPCA frequently uses ''level'' and ''standard'' interchangeably. It stated that the language of section 342(a)(6)(A)(ii)(II) shows that Congress meant for the total content of ASHRAE Standard 90.1 to serve as the baseline for DOE's amended standards, and not for any ASHRAE Standard 90.1 numeric performance metric alone to be definitive. (Earthjustice, No. 34 at p. 4) Earthjustice also stated that EPCA uses the word ''level'' to characterize both performance standards and design requirements, arguing that section 342(a)(5) specifies ''standard levels'' for storage water heaters, instantaneous water heaters, and unfired water storage tanks, and includes under this heading design requirements for tank insulation and ignition devices. Earthjustice also stated that section 325(o)(2)(B)(iii) of EPCA provides that there is a rebuttable presumption that a ''standard level'' is justified if its costs to the consumer can be recouped in three years, and that DOE has applied this provision when evaluating design requirements for gas cooking products. Earthjustice commented that these other uses of ''level'' in EPCA indicates that Congress did not intend to withhold DOE's obligation to review the standards for warm-air furnaces when ASHRAE increases the stringency of Standard 90.1 while leaving the existing thermal efficiency level unchanged. (Earthjustice, No. 34 at p. 4–5)

Earthjustice stated that even if DOE adopts the position that it cannot adopt the particular standards contained in ASHRAE Standard 90.1, DOE still is obligated to examine potential standards for warm-air furnaces. (Earthjustice, No. 34 at p. 3) Earthjustice also asserted that DOE's view that EPCA bars it from adopting standards that impose multiple metric requirements has been refuted in multiple analyses and is erroneous, and attached a memorandum on the central air conditioner rule as an example and justification of why multiple metrics are allowable. (Earthjustice, No. 34 at p. 5) Earthjustice argued that DOE's refusal to grant any weight to the acceptance of multiple design requirements for warm-air furnaces into ASHRAE Standard 90.1 contrasts with the Department's recognition in the residential furnace rulemaking that consensus recommendations enabling the achievement of the congressional objectives underlying EPCA should be given special consideration when resolving ambiguities in the statutory language. The commenter stated that DOE has recognized in the NOPR that the ''efficiency levels in ASHRAE Standard 90.1–2010 are the result of a consensus process'' (77 FR 2356, 2364 (Jan. 17, 2012)) and that ''EPCA generally directs DOE to follow ASHRAE Standard 90.1 when it is amended'' (77 FR 2356, 2372 (Jan. 17, 2012)). (Earthjustice, No. 34 at p. 5)

DOE does not agree with Earthjustice's assertion that DOE is required to review changes in ASHRAE Standard 90.1–2010 that do not increase the efficiency level when compared to the current Federal energy conservation standards for a given type of equipment. As it did in the July 2009 final rule for ASHRAE products, DOE views the trigger as attached to an increased efficiency level. 74 FR 36312, 36320 (July 22, 2009). Further, as noted above, since EPCA does not explicitly define the term ''amended'' in the context of ASHRAE Standard 90.1, DOE provided its interpretation of what would constitute an ''amended standard'' in a final rule published in the **Federal Register** on March 7, 2007. 72 FR 10038. In that rule, DOE stated that the statutory trigger requiring DOE to adopt uniform national standards based on ASHRAE action is for ASHRAE to change a standard for any of the equipment listed in EPCA section 342(a)(6)(A)(i) (42 U.S.C. 6313(a)(6)(A)) by increasing the energy efficiency level for that equipment type. *Id.* at 10042. The section cited above refers to ''the minimum level specified in the amended ASHRAE/IES Standard 90.1,'' which DOE interprets as referring to an energy efficiency level.

If ASHRAE adds a prescriptive requirement for equipment where an efficiency level is already specified, DOE has concluded that it does not have the authority to use a dual descriptor for a single equipment type. Pursuant to 42 U.S.C. 6313(a)(6), the Secretary has authority to amend the energy conservation standards for specified equipment, but under 42 U.S.C. 6311(18), the statute's definition of the term ''energy conservation standard'' is limited to: (A) A performance standard that prescribes a minimum level of energy efficiency or a maximum quantity of energy use for a product; or (B) a design requirement for a product.

The language of EPCA authorizes DOE to establish a performance standard or a single design standard. As such, DOE maintains its position stated in the July 2009 final rule that a standard that establishes both a performance standard and a design requirement is beyond the scope of DOE's legal authority, as would be a standard that included more than one design requirement. 74 FR 36312, 36322 (July 22, 2009). In this case, ASHRAE Standard 90.1–2010 recommends three design requirements, which goes beyond EPCA's limit of one design requirement for the specified covered equipment.

In summary, the statutory scheme envisions DOE being triggered by ASHRAE action which provides DOE with a regulatory choice between increased ASHRAE levels and even more stringent levels. If ASHRAE has not changed the standard level, the regulatory choice contemplated under 42 U.S.C. 6313(a)(6)(A) cannot be made. Furthermore, DOE disagrees with the suggestion that Earthjustice's views on the issue of the ASHRAE trigger reflects the broad consensus of interested parties, thereby deserving special consideration; although ASHRAE Standard 90.1–2010 may be the result of a consensus process, DOE believes Earthjustice's view does not represent a broad consensus position among all stakeholders, particularly among manufacturers. Moreover, in seeking greater deference for consensus recommendations, the commenter is alluding to a separate EPCA provision (codified at 42 U.S.C. 6295(p)(4)) in which Congress authorized publication of direct final rules upon DOE's receipt of a consensus agreement with recommended standards submitted by interested parties who are fairly representative of relevant points of view. However, that statutory provision is not applicable to the ASHRAE products at issue here. In light of the above, DOE maintains its position that if the revised ASHRAE Standard 90.1 leaves the standard level unchanged or lowers the standard, as compared to the level specified by the national standard adopted pursuant to EPCA, DOE does not have the authority to conduct a rulemaking to consider a higher standard for that equipment pursuant to 42 U.S.C. 6313(a)(6)(A).

B. DOE's Review of ASHRAE Equipment Independent of the ASHRAE Standards Process

In the January 2012 NOPR, DOE noted that it plans to implement the six-year look back provision in EPCA prospectively and believes that the clock for the six-year look back does not commence until a final rule is published for a given product or equipment after the enactment of EISA 2007 (which occurred on December 19, 2007). 77 FR 2356, 2365–66 (Jan. 17, 2012). For any type of ASHRAE equipment that has not been the subject of a final rule since the enactment of EISA 2007, review under the look back provision will not be required until after the next update of standards is completed following a trigger by updates to the corresponding ASHRAE Standard 90.1 efficiency levels. After that point, if ASHRAE does not update standards within six years, DOE will be compelled to review the standards under the six-year look back provision. *Id.*

ASAP and NRDC stated that DOE must consider updating standards for the ASHRAE products for which there was not a revision if DOE last set standards more than six years ago. The commenters referred to the Joint Comment on the NODA for the basis of the argument. (ASAP and NRDC, No. 35 at p. 1–2) Earthjustice also alleged that the NOPR failed to fulfill EPCA's legal mandates with respect to multiple products. (Earthjustice, No. 34 at p. 1) Earthjustice stated that DOE's position that it has no authority to act pursuant to section 342(a)(6)(A)(i) to amend standards for ASHRAE equipment until ASHRAE first amends its own standards undermines the plain intent of Congress by insulating equipment from review, potentially in perpetuity. (Earthjustice, No. 34 at p. 2) Earthjustice stressed that ''any final rule'' in section 342(a)(6) includes all final rules for a covered product no matter when it was finalized. (Earthjustice, No. 34 at p. 2)

Earthjustice stated that Congress granted DOE the authority to proceed in the face of ASHRAE inaction through a provision added to EPCA by section 342(a)(6) of EPACT 2005, which gave DOE the ability to act on ASHRAE standards without a trigger. (42 U.S.C. 6313(a)(6), subsequently amended by EISA 2007) In the EISA 2007 amendments to EPCA, Earthjustice stated that Congress then directed DOE to review standards when ASHRAE left them unaltered for too long. (42 U.S.C. 6313(a)(6)(C)) Earthjustice asserted that the NOPR's reading of 42 U.S.C. 6313(a)(6) rolls back the clock to 2004, leaving in limbo equipment as to which ASHRAE has been inattentive. (Earthjustice, No. 34 at p. 2–3) Earthjustice expressed its view that DOE must abandon the NOPR's flawed rationale and commence a review of the standards for all products for which the existing standards are more than six years old. (Earthjustice, No. 34 at p. 3)

In response, DOE notes that it has determined previously that it plans to implement the six-year look back provision prospectively and believes that the clock for the six-year look back does not commence until a final rule is published for a given product or equipment after the enactment of EISA 2007 (which occurred on December 19, 2007). DOE does not believe it was Congress's intention to apply these requirements retroactively, so that DOE would immediately be in violation of its legal obligations upon passage of the statute, thereby failing from its inception.

C. General Discussion of the Changes to ASHRAE Standard 90.1–2010 and Determination of Scope

As discussed above, before beginning an analysis of economic impacts and energy savings that would result from adopting the efficiency levels specified by ASHRAE Standard 90.1–2010 or more-stringent efficiency levels, DOE first sought to determine whether the amended ASHRAE Standard 90.1 efficiency levels represented an increase in efficiency above the current Federal standard levels. DOE discussed each equipment class where these levels differ from the current Federal standard level, along with DOE's preliminary conclusion as to the action DOE would take with respect to that equipment in the January 2012 NOPR. *See* 77 FR 2356, 2366–73 (Jan. 17, 2012). DOE tentatively concluded from this analysis that the only efficiency levels that represented an increase in efficiency above the current Federal standards were those for certain classes of water-cooled and evaporatively-cooled commercial package air conditioners, VRF water-source heat pumps, and computer room air conditioners. For a more detailed discussion of this approach, readers should refer to the preamble to the January 2012 NOPR. *See Id.* DOE received two comments on this approach.

AHRI did not agree with DOE's conclusion that it cannot adopt separate minimum efficiency standards for three-phase Small Duct High-Velocity Heat Pumps. AHRI stated that these products are a unique subcategory of commercial package air-conditioning and heating equipment and that the removal of minimum efficiency standards for these products from ASHRAE Standard 90.1–2010 was an error. Accordingly, AHRI recommended that DOE specify distinct minimum efficiency standards for these models. (AHRI, No. 30 at p. 2)

In response, DOE maintains its position as stated in the January 2012 NOPR. 77 FR 2356, 2370–71 (Jan. 17, 2012). More specifically, DOE notes that EPCA does not separate small-duct high-velocity (SDHV) heat pumps from other types of small commercial package air-conditioning and heating equipment in its definitions. (42 U.S.C. 6311(8)) Therefore, EPCA's definition of ''small commercial package air conditioning and heating equipment'' would include SDHV heat pumps. (42 U.S.C. 6311(8)(B)) Furthermore, ASHRAE Standard 90.1–2010 did not propose a higher standard for this equipment, and the minimum Federal efficiency standards for three-phase, less than 65,000 Btu/h small commercial package air-conditioning and heating equipment, at 13 SEER and 7.7 HSPF, are more stringent than the levels originally proposed for SDHV in ASHRAE Standard 90.1–2010. DOE cannot adopt lower efficiency levels due to the prohibition against ''backsliding.'' As such, DOE is prohibited from adopting the original ASHRAE Standard 90.1–2007 SEER requirement for three-phase SDHVs as the Federal standard, and DOE has no requirement to consider higher levels for three-phase SDHV equipment.

Mitsubishi expressed its support for DOE's proposal to adopt the amended efficiency standards in ASHRAE Standard 90.1–2010 for small, large, and very large water-cooled and evaporatively-cooled commercial package air conditioners and especially for the two categories of VRF water-source heat pumps. However, Mitsubishi also recommended that DOE adopt the full range of capacities for both categories of VRF systems. (Mitsubishi, No. 33 at p. 1)

In response, DOE reiterates its position as stated in the January 2012 NOPR. 77 FR 2356, 2368–69 (Jan. 17, 2012). The efficiency requirements in ASHRAE Standard 90.1–2010 for air-cooled VRF heat pumps with heat recovery are equivalent to the Federal minimum energy conservation standards defined for air-cooled heat pumps with ''all other heating system types that are integrated into the equipment,'' and the efficiency requirements for air-cooled VRF heat pumps without heat recovery are equivalent to the Federal minimum standards for air-cooled heat pumps with electric resistance or no heating. The VRF systems with heat recovery specified by ASHRAE may also be provided with electric resistance heating systems as a back-up. For air-cooled VRF heat pump systems that have both electric resistance heating and heat recovery heating capability, the Department has concluded that these systems must meet the efficiency requirements contained in EPCA for small, large, and very large air-cooled central air-conditioning heat pumps with electric resistance heating, which are codified at 10 CFR 431.97(b). (42 U.S.C. 6313(a)(7)–(9)) In addition, the Department has concluded that air-cooled VRF systems without electric resistance heating but with heat recovery can qualify as having an ''other'' means of heating, and that these systems must meet the efficiency requirements contained in EPCA for small, large, and very large air-cooled central air-conditioning heat pumps with other heating, which are codified at 10 CFR 431.97(b). (42 U.S.C. 6313(a)(7)–(9))

For water-source VRF heat pumps, ASHRAE Standard 90.1–2010 generally maintains efficiency levels equivalent to the existing Federal minimum energy conservation standards for water-source heat pumps. DOE has decided that under the statutory scheme for commercial equipment standards, a water-source heat pump in which condenser heat is rejected to water, not air, is the corresponding existing product class for water-source VRF heat pumps. There are only two equipment classes for which ASHRAE Standard 90.1–2010 levels are not equivalent to the existing Federal minimum energy conservation standards: (1) For VRF water-source heat pumps under 17,000 Btu/h, ASHRAE Standard 90.1–2010 raises the efficiency levels above current Federal energy conservation standards; (2) For VRF water-source heat pumps over 135,000 Btu/h and less than 760,000 Btu/h, ASHRAE sets standards for products where DOE did not previously have standards.

In addition to the changes for the equipment classes discussed above, ASHRAE Standard 90.1–2010 includes efficiency levels for VRF water-source heat pumps that provide for a 0.2 EER reduction in the efficiency requirement for systems with heat recovery. However, the current Federal minimum standards for water-source heat pumps do not provide for any reduction in the EER requirements for equipment with ''other'' heating types. Therefore, the 0.2

EER reduction below the current Federal standard levels for the VRF water-source heat pump equipment classes in which ASHRAE did not raise the standard from the existing Federal minimum for water-source heat pumps (*i.e.,* water-source heat pumps with cooling capacities greater than or equal to 17,000 Btu/h and less than 65,000 Btu/h and for water-source heat pumps with cooling capacities greater than or equal to 65,000 Btu/h and less than 135,000 Btu/h) would result in a decrease in stringency in comparison to current standards.

As such, DOE is prohibited from adopting an efficiency level lower than the current Federal standards for water-source heat pumps less than 135,000 Btu/h cooling capacity due to the ''anti-backsliding'' provision, regardless of the provision in 42 U.S.C. 6313(a)(6)(A)) providing for adoption of ASHRAE Standard 90.1 efficiency levels.

In summary, after considering the public comments, DOE has decided to retain its approach, as stated in the January 2012 NOPR, that the only efficiency levels that represented an increase in efficiency above the current Federal standards were those for certain classes of water-cooled and evaporatively-cooled commercial package air conditioners and heat pumps, VRF water-source heat pumps less than 17,000 Btu/h and at or above 135,000 Btu/h and less than 760,000 Btu/h in cooling capacity, and computer room air conditioners.

D. The Proposed Energy Conservation Standards

In the January 2012 NOPR, DOE proposed to adopt the efficiency levels in ASHRAE Standard 90.1–2010 for twelve classes of water-cooled and evaporatively-cooled air conditioners, four classes of VRF water-source heat pumps, and thirty classes of computer room air conditioners. 77 FR 2356, 2415–18 (Jan. 17, 2012). DOE received several comments in response to its proposal.

EEI endorsed DOE's proposal to adopt the energy efficiency standards for the equipment that were updated and published in ASHRAE Standard 90.1–2010. (EEI, No. 29 at p. 2) AHRI and Mitsubishi supported DOE's adoption of the amended efficiency standards for small, large, and very large water-cooled and evaporatively-cooled commercial package air conditioners and the two categories of variable refrigerant flow water-source heat pumps. (AHRI, No. 30 at p. 1; Mitsubishi, No. 33 at p. 1) The Department of Justice (DOJ) concluded that the proposed standards are not likely to have an adverse effect on competition. (DOJ, No. 37 at p. 2) In reaching this conclusion, DOJ noted the absence of any competitive concerns raised by industry participants at the public meeting and that the proposed levels corresponded to the latest version of the relevant industry consensus standard. *Id.* Thus, for the reasons stated previously, in today's final rule, DOE is adopting efficiency levels at the levels published in ASHRAE Standard 90.1–2010 for twelve classes of water-cooled and evaporatively-cooled air conditioners and four classes of VRF water-source heat pumps.

Regarding computer room air conditioners (CRACs), ASAP expressed concern that the levels set by DOE should not be weaker than the existing California energy conservation standards or lower than the levels for other commercial package air conditioners. (ASAP, NOPR Public Meeting Transcript at p. 78, 149) ASAP argued: (1) That significantly higher efficiency levels are technically feasible for CRACs; (2) that there are many models of CRACs on the market that exceed the levels specified in ASHRAE Standard 90.1–2010; and (3) that the potential energy savings associated with CRACs are significant and should be fully captured to the extent possible. (ASAP, NOPR Public Meeting Transcript at p. 132) ASAP and NRDC stated that DOE should evaluate whether greater cost-effective savings could be achieved through more-stringent standards for CRACs. These commenters suggested that the efficiency levels set by the California Energy Commission (CEC) may be higher than the levels in ASHRAE Standard 90.1 for air-cooled CRACs. In particular, they urged DOE to further evaluate raising the standard for air-cooled CRACs ≥65,000 Btu/h and <240, 000 Btu/h and air-cooled CRACs ≥240,000 Btu/h, stating that according to DOE's analysis in the NOPR, efficiency level three for units at and above 65,000 Btu/h but less than 240,000 Btu/h would be cost-effective and would save 0.20 quads, and that efficiency level four for units at and above 240,000 Btu/h would be cost-effective and would save 0.21 quads. (NRDC and ASAP, No. 35 at p. 2)

In response, DOE notes that the requirements for adopting Federal energy conservation standards for ASHRAE equipment are explicitly set forth in EPCA. (42 U.S.C. 6313(a)(6)) Of particular relevance here, DOE must determine if clear and convincing evidence exists that standards that are more stringent than the levels in ASHRAE Standard 90.1 would save a significant additional amount of energy and would be technologically feasible and economically justified. (42 U.S.C. 6313(a)(6)(A)(ii)(II)) In the January 2012 NOPR, DOE determined that more-stringent levels would save a significant amount of energy and are technologically feasible. 77 FR 2356, 2416–17 (Jan. 17, 2012). Accordingly, as required by EPCA, DOE undertook an analysis to examine the economic justification of more-stringent energy conservation standards for computer room air conditioners. As explained in further detail in section VI.D.3 of this notice, due to the limited amount of data available regarding equipment cost and efficiency and shipments, and the resulting uncertainties in the economic analysis, DOE has concluded that it lacks clear and convincing evidence as would justify the adoption of more-stringent levels. In considering the comments from ASAP and NRDC, DOE examined the analysis leading to the adoption of the CEC computer room air conditioner standards. Upon reviewing the documentation of the CEC efficiency requirements, DOE did not discover any data or information that provided clear and convincing evidence that the levels set by the CEC were economically justified on a National level. Therefore, consistent with its earlier position, DOE has concluded that clear and convincing evidence does not exist that would allow the adoption of Federal energy conservation standards for computer room air conditioners that are more stringent than the efficiency levels in ASHRAE Standard 90.1–2010. However, DOE anticipates that the adoption of CRAC energy conservation standards in today's final rule will lead to the generation of CRAC shipments data and other information that will be useful in considering more-stringent standards in DOE's next rulemaking related to computer room air conditioners.

E. Coverage of Commercial Package Air-Conditioning and Heating Equipment Used Exclusively as Part of Industrial or Manufacturing Processes

In the January 2012 NOPR, DOE offered clarification of how it views equipment that is used exclusively for industrial or manufacturing processes. DOE explained that if equipment meets the definition of ''commercial package air conditioning and heating equipment'' in 10 CFR 431.92, is used exclusively for manufacturing and/or industrial processes, and is not listed as one of the equipment types specifically added to ASHRAE Standard 90.1, then DOE believes it is not covered under DOE's regulatory program. 77 FR 2356, 2372–73 (Jan. 17, 2012). Further, DOE stated that it will make this determination on a case-by-case basis after considering the facts of the particular model in question, including how the model is advertised, marketed, and/or sold for use in buildings, the extent to which the equipment provides comfort conditioning to occupants, and how the equipment is designed and manufactured. *Id.* DOE requested comment on ways that manufacturers differentiate between equipment that is used solely for manufacturing and industrial processes and that used for comfort cooling in buildings.

In response, AHRI commented that manufacturers differentiate air conditioners used for manufacturing and industrial processing by: (1) Omission (by not rating the model to the Federal efficiency test procedure or not listing the model in the manufacturer's catalog of comfort cooling and heating products); (2) by incorporating special operation features which would not be appropriate for the purpose of comfort cooling or heating; or (3) by listing the equipment as complying with a safety standard specific for industrial uses and processes. (AHRI, No. 30 at p. 2) Carrier commented that it does not differentiate between commercial package air-conditioning and heating equipment used in buildings versus those used solely for manufacturing and industrial processes. (Carrier, No. 28 at p. 3) Engineered Air stated that a unit for a single-focus, process-driven use should be exempt from standards, and the company provided the specific example of preconditioned air units that are used under jet bridges at airports to cool jet planes. (Engineered Air, No. 36 at p. 1)

DOE notes that none of the responses provide DOE with a set of feature(s) or characteristic(s) associated with the equipment, such as a physical characteristic or component, that would allow manufacturers and DOE to objectively and consistently differentiate between comfort-cooling equipment and equipment that is intended solely for industrial processes. But the comment responses, in particular Carrier's, point to the fact that some manufacturers use the same equipment to serve both markets. DOE believes the comment responses illustrate the importance for DOE to clearly explain the decision process for DOE and manufacturers to determine whether a given basic model is covered by DOE's regulatory program.

As mentioned in the March 2012 SNOPR, ASHRAE Standard 90.1–2010 expanded the scope of its coverage as compared to previous versions of ASHRAE Standard 90.1. 77 FR 16769, 16770 (March 22, 2012). Previous versions of ASHRAE Standard 90.1 did not apply to equipment and portions of building systems that use energy primarily to provide for industrial, manufacturing, or commercial processes (see ASHRAE Standard 90.1–2007, section 2.3(c)). As discussed in the March 2012 SNOPR, DOE still believes it is ASHRAE's intent to continue to exclude most of those equipment types that are used for manufacturing and industrial processes, despite the fact that ASHRAE Standard 90.1–2010 now applies to new equipment or building systems used in manufacturing or industrial processes that are specifically identified in the standard (*i.e.,* ''air conditioners and condensing units serving computer rooms''). *Id.* at 16774. DOE did not receive any comments suggesting that ASHRAE intended a general, rather than limited, broadening of coverage regarding these types of equipment.

In order to aid regulated entities in determining whether their equipment falls within the scope of DOE's definition of ''commercial package air conditioning and heating equipment'' and, thus, is subject to DOE's regulatory requirements, DOE is providing the following guidance. If the equipment meets the definition of ''commercial package air conditioning and heating equipment'' in 10 CFR 431.92, is used exclusively for manufacturing and/or industrial processes, and is not listed as one of the equipment types specifically added to ASHRAE Standard 90.1's scope, then DOE does not consider such equipment to be covered under DOE's regulatory program. Manufacturers need to make this determination by comparing the characteristics of each basic model to DOE's regulatory definitions. Just like manufacturers, DOE will make this determination on a case-by-case basis after considering the facts of the particular basic model in question if questions arise regarding coverage. In making such determination, DOE will consider factors such as how the model is advertised, marketed, and/or sold for use in buildings, the extent to which the equipment provides comfort conditioning to occupants, and how the equipment is designed and manufactured. For equipment that is used in commercial or industrial buildings, that has a design similar to that of equipment used in manufacturing processes, but provides comfort conditioning, DOE considers such equipment to meet the definition of ''commercial package air conditioning and heating equipment'' and consequently to be covered under ASHRAE Standard 90.1–2010. DOE notes that the fact that equipment may be advertised, marketed, and/or sold as part of industrial or manufacturing processes is not a mutually exclusive determination that the models are exempt them from coverage by DOE's standards for equipment in buildings. In the example of identical equipment used to serve both markets, DOE would consider that covered under DOE's regulatory program unless a specific basic model had an attribute that would preclude it from meeting the definition of ''commercial package air conditioning and heating equipment.''

All equipment distributed in U.S. commerce that meets DOE's definition of ''commercial package air conditioning and heating equipment'' and is not subject to the Department's exclusion guidance set forth above must meet the applicable Federal energy conservation standards regardless of technology or design.

F. Definitions for Variable Refrigerant Flow Systems

In the January 2012 NOPR, DOE proposed the following three definitions relating to the newly-covered variable refrigerant flow equipment classes— ''variable refrigerant flow multi-split air conditioners,'' ''variable refrigerant flow multi-split heat pumps,'' and ''heat recovery'':

Variable Refrigerant Flow Multi-Split Air Conditioner means a unit of commercial package air conditioning and heating equipment that is configured as a split system air-conditioner incorporating a single refrigerant circuit, with one or more outdoor units, at least one variable-speed compressor or an alternate compressor combination for varying the capacity of the system by three or more steps, and multiple indoor fan coil units, each of which is individually metered and individually controlled by an integral control device and common communications network and which can operate independently in response to multiple indoor thermostats. Variable refrigerant flow implies three or more steps of capacity control on common, inter-connecting piping.

Variable Refrigerant Flow Multi-Split Heat Pump means a unit of commercial package air conditioning and heating equipment that is configured as a split system heat pump that uses reverse cycle refrigeration as its primary heating source and which may include secondary supplemental heating by means of electrical resistance, steam, hot water, or gas. The equipment incorporates a single refrigerant circuit, with one or more outdoor units, at least one variable-speed compressor or an alternate compressor combination for varying the capacity of the system by three or more steps, and multiple indoor fan coil units, each of which is individually metered and individually controlled by a control device and common communications network and which can operate independently in response to multiple indoor thermostats. Variable refrigerant flow implies three or more steps of capacity control on common, inter-connecting piping.

Heat Recovery (in the context of variable refrigerant flow multi-split air conditioners or variable refrigerant flow multi-split heat pumps) means that the air conditioner or heat pump is also capable of providing simultaneous heating and cooling operation, where recovered energy from the indoor units operating in one mode can be transferred to one or more other indoor units operating in the other mode. A variable refrigerant flow multi-split heat recovery heat pump is a variable refrigerant flow multi-split heat pump with the addition of heat recovery capability.

77 FR 2356, 2379–80 (Jan. 17, 2012).

On this issue, AHRI, Mitsubishi, and Carrier submitted comments agreeing with these proposed definitions. (AHRI, No. 30 at p. 5, Mitsubishi, No. 33 at p. 2, and Carrier, No. 28 at p. 3) DOE received no other comments from stakeholders on these definitions. Thus, DOE is adopting the definitions as proposed in today's final rule.

IV. Test Procedure Amendments and Discussion of Related Comments

In the January 2012 NOPR, DOE proposed to update the DOE test procedures for several types of ASHRAE equipment by incorporating the most recent version of the industry test methods referenced in ASHRAE Standard 90.1–2010. For certain types of equipment that had not previously been subject to energy conservation standards, DOE proposed to adopt new test procedures referenced in ASHRAE Standard 90.1–2010. Additionally, DOE conducted a substantive review of all of the test procedures that were updated in ASHRAE Standard 90.1–2010 in their entirety in order to satisfy the 7-year review provision for test procedures discussed in section II.A. As part of its review, DOE proposed to allow for an optional break-in period to allow the unit to achieve optimal performance before testing for small, large, and very large commercial air conditioners, variable refrigerant flow air conditioners and heat pumps, and single package vertical air conditioners and single package vertical heat pumps. 77 FR 2356, 2424–33 (Jan. 17, 2012). In the March 2012 SNOPR, DOE proposed to include in its test procedures several clarifying provisions, along with certain provisions (with some modification) from AHRI operations manuals (AHRI OMs) that would harmonize equipment testing so that it is performed consistently at all test laboratories. 77 FR 16769, 16781–82 (March 22, 2012). The updates to the test procedures being adopted as part of today's rule are discussed in the subsections immediately below.

DOE received a general comment about the 7-year review process for test procedure updates from AHRI. AHRI commented that the 7-year review requirement is too infrequent, because most AHRI and ASHRAE standards are amended at intervals of 5 years or less. Therefore, AHRI asserted that DOE should conduct test procedure rulemakings to incorporate by reference new or revised industry test procedures once they are referenced in ASHRAE Standard 90.1. (AHRI, No. 30 at p. 2)

In response, DOE notes that the 7-year requirement stems from 42 U.S.C. 6314(a)(1)(A), which requires that DOE shall conduct an evaluation of the test procedures for any covered equipment class and either amend the test procedures (if the Secretary determines that amended test procedures would more accurately or fully comply with the requirements of 42 U.S.C. 6314(a)(2)–(3)) or publish a notice in the **Federal Register** of any determination not to amend a test procedure. This requirement compels DOE to take action on any test procedure that has not been reviewed within a 7-year timeframe. For the test procedures for covered ASHRAE equipment, DOE is also guided by EPCA that if an industry test procedure referenced in DOE's regulations is updated, DOE must assess the updated industry procedure and amend the test procedure for the product as necessary to be consistent with the amended industry test procedure or rating procedure, unless DOE determines that the amended test procedure is not reasonably designed to produce test results which reflect the energy efficiency, energy use, or estimated annual operating costs of the ASHRAE product during a representative average use cycle. (42 U.S.C. 6314(a)(2)–(4)) Thus, given that DOE has two triggers for reviewing the test procedures for covered ASHRAE equipment—the 7-year review requirement and the requirement for review subsequent to an update of the industry standard—DOE will consider any industry test procedure revisions in a timely manner.

As noted above, in the March 2012 SNOPR, DOE examined the AHRI operations manuals to identify areas where potential clarification to the DOE test procedure for commercial package air-conditioning and heating equipment may be needed and proposed to include several clarifications in the Federal test procedures. 77 FR 16769, 16774–79 (March 22, 2012). In the March 2012 SNOPR, DOE proposed to omit section 6.5 from AHRI 210/240–2008, section 6.3 of AHRI 340/360–2007, section 5.11 from ASHRAE 127–2007, section 6.4 from AHRI 390–2003, and section 6.6 from AHRI 1230–2010 from its regulations at 10 CFR 431.96, which provide tolerance values for ratings of tested equipment to comply with that standard. Instead, DOE clarified that manufacturers must follow the equipment type-specific procedures in 10 CFR 429 when determining whether equipment ratings are within acceptable tolerance limits. DOE also issued guidance on various other aspects of testing, including defective samples, test set-up, enhancement devices, refrigerant charge, and rating air flow rates. 77 FR 16769, 16777–78 (March 22, 2012). DOE determines whether a unit is defective on a case-by-case basis as part of its certification and enforcement program as listed in 10 CFR 429.110(d)(3). As a general guidance for remaining topics, DOE will only consider information contained in the equipment's installation and operations manual (I&O manual) for conducting assessment and enforcement testing. That is, DOE will install the equipment for testing as is outlined in the I&O manual using any enhancement devices that are documented in the I&O manual as being a part of the equipment's basic model. If the I&O manual specifies a range of refrigerant charge or pressure, it will be valid for the equipment to be tested using any refrigerant charge within that range, unless the manufacturer specifies otherwise in the I&O manual. If the I&O manual does not specify a rating air flow rate for testing, DOE will use the nominal air flow rate (typically 400 scfm/ton) for testing.

In response to the SNOPR, stakeholders submitted comments on DOE's clarifications related to tolerances in its test procedures. Rheem did not support DOE's decision with regard to the tolerances. Rheem stated that the current DOE regulations clearly incorporate by reference the entire ARI Standard 340/360–2004, including section 6.3 relating to tolerances, and that DOE's attempt to excise this protocol is procedurally inappropriate and at odds with the congressional balancing or regulatory determination that resulted in the current energy conservation standards; and, thus, it is illegal. (Rheem, No. 32 at p. 2) EEI recommended that DOE not tighten the tolerance of test procedure results because this would increase costs to the manufacturers of testing equipment and to commercial customers. (EEI, No. 29 at p. 1) Carrier commented that the issue of AHRI 340/360 tolerances does not apply to initial ratings, and it also stated that AHRI is in the process of modifying this requirement to adopt the note in section 6.5 of AHRI 210/240, which states that ''[p]roducts covered by the National Appliance Energy Conservation Act (NAECA) shall be rated in accordance with 10 CFR Part 430, Section 24 m (1)(i)–(ii)'' so that DOE will not have to make an exception to the AHRI procedure. (Carrier, No. 28 at p. 5) AHRI stated that the tolerances specified in AHRI 340/360 do not apply to ratings that are certified to DOE but applies only to verification testing conducted by AHRI. (AHRI, No. 30 at p. 3) AHRI also commented that any issues pertaining to certification and enforcement should be addressed in a future NOPR for that topic. However, AHRI commented that DOE's policy of not applying a tolerance to the results of an assessment test is inconsistent with both DOE's certification procedures and the fundamental nature of any empirical test method. AHRI reasoned that is it wrong for DOE to employ a ''zero tolerance'' policy for assessment tests, arguing that DOE should try to harmonize the sampling plan probability levels between enforcement and assessment testing and further noting that the sampling plan for three-phase HVAC systems should not be more stringent than residential HVAC systems. (AHRI, No. 30 at p. 6–8) Rheem also encouraged DOE to open a separate rulemaking, including public hearings and stakeholder discussions, with regard to the proposed changes related to testing and compliance with energy conservation standards. (Rheem, No. 32 at p. 1)

In response, DOE reiterates what it stated in the March 2012 SNOPR, that it has its own tolerances as part of its certification and enforcement program that have been established since 2006. 77 FR 16769, 16777 (March 22, 2012). As AHRI notes in its comments, the tolerances in the AHRI standards do not apply to DOE's regulatory program and only apply to AHRI's verification program. Omitting the specific section on the tolerances used in AHRI's verification program from being incorporated by reference in the DOE test procedure does not change how manufacturers have to conduct testing for DOE's regulatory program and how DOE conducts verification or enforcement testing. Omission of the AHRI verification program tolerances only serves to clarify to manufacturers that DOE does not employ AHRI's verification tolerance, which is a flat 5-percent tolerance, in its regulatory program. DOE believes this will help alleviate any confusion that may be introduced from the different tolerances used as part of DOE's regulatory program and AHRI's verification program.

As to AHRI's specific comment regarding a tolerance associated with assessment testing conducted by DOE, DOE's regulations do not include a specific tolerance that is applied to an assessment test. DOE disagrees with commenters who suggest that DOE employs a zero-percent tolerance policy on any assessment test conducted. DOE specifically adopted provisions, which allow it to conduct enforcement testing if DOE has reason to believe that a basic model is not in compliance. 10 CFR 429.110. While DOE has the authority under the statute to, at any time, test a basic model to assess whether the basic model is in compliance with the applicable energy conservation standard(s), assessment testing is only one method DOE utilizes to better inform its decision making when deciding whether to pursue enforcement testing. *See* 10 CFR 429.104; 76 FR 12422, 12495 (March 7, 2011). Should DOE decide to revisit its current approach for assessment testing, it would do so in the next certification, compliance, and enforcement rulemaking.

DOE also received other comments on its guidance on other aspects of testing as well. AHRI stated that the AHRI operation manuals only provide clarification and detailed instructions on how the AHRI certification program conducts those test procedures and do not counter or revise the Federal efficiency test methods. The commenter acknowledged that DOE is not required to consider including guidelines or checklists in AHRI operations manuals in the Federal test procedure, but it did encourage DOE to use the guidelines in any verification testing. (AHRI, No. 30 at p. 6) Rheem commented that DOE should use the guidelines in the AHRI operations manual in any testing done by DOE to ensure proper and consistent testing and evaluation of a product's performance. (Rheem, No. 32 at p. 2) Rheem also commented that DOE's proposed changes in 10 CFR 431.96(e) are new and previously unannounced, and the company does not see the logic or utility in providing certification or testing specifications in installation and operations manuals used in the field. Rheem argued that the industry would need a minimum of 6 months to revise its technical literature if this requirement were to be imposed and that the industry should be allowed to supplement printed material through its Web site or other electronic means. (Rheem, No. 32 at p. 2)

In response to these comments, DOE agrees that testing should be done in a consistent manner to achieve a level playing field for all manufacturers, as reflected in the proposed test procedure amendments which DOE published for notice and comment. By adopting some of the guidance in the AHRI OMs, DOE hopes to clarify what is and is not allowed during testing conducted by manufacturers for DOE's regulatory program and DOE-initiated testing. In certain cases, the AHRI OMs require manufacturers to provide information related to testing that is not publically disclosed. DOE reiterates its position in the January 2012 NOPR and the March 2012 SNOPR that if manufacturers have specific conditions or instructions used in generating their energy efficiency ratings, they must be clearly provided in the I&O manual shipped with the unit. 77 FR 2356, 2378 (Jan. 17, 2012); 77 FR 16769, 16778 (March 22, 2012). In DOE's view, the commercial customer has a right to know the operating conditions that are used to generate the certified efficiency values, including rated airflow and rated capacity.

Regarding Rheem's assertion that a minimum of 6 months would be required to update technical literature to accommodate this requirement, DOE notes that the compliance dates are as specified in the **DATES** section of this notice and any testing done after the compliance dates would incorporate all additions to the DOE test procedure in this final rule; these compliance dates generally provide 6 months or more for manufacturers to make any requisite changes to their I&O manuals. DOE may also reference online specification sheets for rated information prior to the compliance date of the test procedure amendments, provided that those specification sheets contain specific version numbers, revision dates, and rating information; however, DOE reiterates that it is adopting provisions that require manufacturers to disclose any rated conditions for testing in the information shipped with the units themselves in this final rule. DOE notes that when manufacturers are required to comply with the certification provisions for most types of the commercial equipment subject to this rulemaking, DOE will use the rated values certified by the manufacturers in addition to any information in the installation and operation manuals.

A. Commercial Package Air-Conditioning and Heating Equipment

As explained in the May 2011 NODA and the January 2012 NOPR, DOE examined the differences between the current DOE test procedure and the updated industry test procedures referenced in ASHRAE Standard 90.1–2010 for small,[7] large, and very large commercial package air-conditioning and heating equipment. 76 FR 25622, 25634–36 (May 5, 2011); 77 FR 2356, 2373–74 (Jan. 17, 2012). In the January 2012 NOPR, DOE proposed to incorporate by reference AHRI 210/240–2008 into the Federal test procedure for small (<65,000 Btu/h cooling capacity) commercial package air-conditioning and heating equipment and AHRI 340/360–2007 into the Federal test procedure for small (≥65,000 Btu/h and <135,000 Btu/h cooling capacity), large, and very large commercial package air-conditioning and heating equipment. *Id.* Additionally, in the January 2012 NOPR, DOE also proposed to add an optional ''break-in'' period (no more than 16 hours) for small, large, and very large commercial package air conditioning and heating equipment. *Id.*

Mitsubishi and EEI supported DOE's proposed adoption of AHRI 210/240–2008 and AHRI 340/360–2007. (Mitsubishi, No. 33 at p. 1–2 and EEI, No. 29 at p. 2) Rheem and Engineered Air also supported DOE's proposed adoption of AHRI 340/360–2007. (Rheem, No. 32 at p. 3 and Engineered Air, No. 36 at p. 2) AHRI recommended that DOE should also include addenda 1 and 2 to AHRI 210/240–2008 as part of the review process and adopt them as appropriate. (AHRI, No. 30 at p. 3) These addenda made several updates to the test standard, which are discussed in detail in the paragraphs immediately below. Carrier urged DOE to adopt addenda 1 and 2 to AHRI 210/240–2008 as well. (Carrier, No. 28 at p. 2) Carrier also noted that DOE should also adopt addenda 1 and 2 to AHRI 340/360–2007, which specify tolerances on external static pressures and include a correction on the test method for integrated energy efficiency ratio (IEER), and encouraged DOE to check with AHRI regarding the latest addenda prior to finalizing its rulemaking. (Carrier, No. 28 at p. 2)

In response to stakeholder comments, DOE reviewed the addenda to AHRI 210/240–2008 and to AHRI 340/360–2007. The addenda to AHRI 210/240–2008 generally replace any references to the part-load metric (*i.e.,* integrated part load value (IPLV)) with references to the new part load metric (*i.e.,* IEER). The addenda to AHRI 340/360–2007 expand the scope of the standard to include air-cooled package unitary air conditioners with cooling capacities from 250,000 Btu/h to less than 760,000 Btu/h, add a -0.00 inch H_2O to a 0.05 inch H_2O tolerance to the external static pressure test condition, and add an external static pressure equation and a tolerance to the leaving dry-bulb temperature to the IEER part-load test. Because DOE does not regulate part-load performance of commercial package air-conditioning and heating equipment and because the external static pressure tolerance update harmonizes the required measurements with those in the test procedure for residential air-conditioning equipment, DOE determined that the addenda would not impact the Federal energy efficiency ratings for small, large, and very large commercial air conditioners and heat pumps. As noted above, EPCA directs DOE to review and adopt the most recent version of industry test procedures for equipment covered by ASHRAE Standard 90.1, provided that the industry test procedures are not unduly burdensome to conduct and provide an accurate assessment of the energy efficiency or energy use of the equipment. Accordingly, DOE is incorporating by reference AHRI 210/240–2008 with addenda 1 and 2 and AHRI 340/360–2008 with addenda 1 and 2 in 10 CFR 431.96.

On the topic of compressor break-in periods, Rheem supported DOE's proposal of a break-in period of 16 hours for small commercial equipment and recommended the same amount of time for large and very large equipment. (Rheem, No. 32 at p. 3) Carrier also supported the inclusion of a compressor break-in period for small, large, and very large commercial air conditioners and heat pumps and stated that a 16- to 20-hour compressor break-in period at 95 °F would be sufficient. However, Carrier also commented that to reduce the time equipment is in the test room, the break-in run may sometimes be conducted outside the test room, in which case ambient air temperature may be lower than the 95 °F specified in the test method. When the ambient air temperature is lower than 95 °F, Carrier stated that longer break-in times of up to 50 hours may be necessary. (Carrier, No. 28 at p. 2) AHRI also agreed that a compressor break-in period is necessary for small, large, and very large commercial package air-conditioning and heating equipment, but it recommended, based on AHRI's experience, that the compressor break-in should be at minimum 16 hours. AHRI recommended that DOE allow a compressor break-in period to be the longer of 16 hours or the amount of time it takes for the system to achieve four consecutive 30-minute averages of cooling capacity that do not deviate more than 2 percent between each average and 1 percent from hour to hour. (AHRI, No. 30 at p. 3) Mitsubishi supported the same approach as AHRI. (Mitsubishi, No. 33 at p. 1–2)

DOE believes that setting a minimum compressor break-in period, as suggested by AHRI and Mitsubishi, would unnecessarily increase testing cost to manufacturers whose equipment could stabilize in less than 16 hours. Interested parties did not provide additional data supporting how ambient temperatures may impact compressor break-in time and why a longer break-in time may be warranted. To Carrier's comment regarding the ambient conditions for the break-in period, DOE does not always perform the break-in period in a conditioned space at 95 °F. DOE believes that running the break-in period in a conditioned room adds unnecessary burden on both the industry and on DOE for testing, given the unknown impact on product performance. DOE is reluctant to add an ambient temperature requirement to the break-in period in absence of data suggesting there is a large impact on product performance. DOE's proposal in the NOPR matched the 16-hour maximum period used by AHRI in its Operations Manual for Unitary Large Equipment Certification Program, so DOE is puzzled by AHRI's comment suggesting deviation from this approach. Therefore, DOE is not adopting a minimum length for the break-in period. Rather, DOE is adopting a break-in period that will allow manufacturers to run equipment for any amount of time up to a maximum time limit of up to 20 hours, as suggested by Carrier, because DOE believes that the comments indicate that a break-in period of slightly longer than the 16 hours proposed in the NOPR may be required for certain equipment. DOE recognizes that different compressors will require different amounts of break-in time to achieve optimal performance and appreciates the suggestion by AHRI and Mitsubishi to determine the length of the break-in period based on the stabilization of equipment's cooling capacity. However, DOE notes that determining the break-in period using a method based on stabilizing cooling capacity would require the testing entity

[7] EPCA defines ''small commercial package air conditioning and heating equipment'' as ''commercial package air conditioning and heating equipment that is rated below 135,000 Btu/h (cooling capacity).'' (42 U.S.C. 6311(8)(B)) ASHRAE 90.1–2010 generally divides covered commercial package air conditioners into the following class sizes: (1) <65,000 Btu/h; (2) ≥65,000 and <135,000 Btu/h; (3) ≥135,000 and <240,000 Btu/h; and (4) ≥240,000 Btu/h and <760,000 Btu/h. Thus, ''small'' commercial package air conditioners, as defined by EPCA, are split into two size classes in ASHRAE Standard 90.1–2010: (1) <65,000 Btu/h and (2) ≥65,000 and <135,000 Btu/h.

to continually monitor cooling capacity, which DOE believes may increase the testing burden. Therefore, DOE is not adopting a provision requiring that the break-in period, if used, be determined in any specific manner, but rather is adopting a provision that gives the manufacturer the option of determining the appropriate length of the break-in period using any method deemed appropriate up to a maximum time limit of 20 hours. The lack of a minimum time limit allows the manufacturer to conduct the break-in at its discretion or to allow any break-in period below the maximum time limit that the manufacturer feels is necessary and appropriate, and, thus, minimizes the burden of this addition to the test procedure. The maximum time limit on the optional compressor break-in period prevents an indefinite amount of time being allowed if a unit were to not stabilize and achieve optimal performance. Thus, DOE is adopting an optional compressor break-in allowing manufacturers to conduct a break-in period for any amount of time deemed necessary by the manufacturer, up to a maximum period of 20 hours. Any manufacturer who elects to use this optional compressor break-in period in its certification testing should record this information (including the duration) in the test data underlying the certified ratings that is required to be maintained under 10 CFR 429.71. DOE will use the exact same break-in period for any DOE-initiated testing as the manufacturer used in its certified ratings. In the case an alternate efficiency determination method (AEDM) is used to develop the certified ratings, DOE will use the maximum 20-hour break-in period, which DOE believes will provide the unit sufficient time to stabilize and achieve optimal performance.

B. Commercial Warm-Air Furnaces and Commercial Water Heaters

In the May 2011 NODA and the January 2012 NOPR, DOE examined and proposed to incorporate by reference the three updated test procedures for commercial warm-air furnaces and commercial water heaters referenced in ASHRAE Standard 90.1–2010: UL 727–2006 for commercial oil-fired warm-air furnaces, ANSI Z21.47–2006 for commercial gas-fired warm-air furnaces, and ANSI Z21.10.3–2004 for commercial water heaters. 76 FR 25622, 25636–37 (May 5, 2011); 77 FR 2356, 2374–76 (Jan. 17, 2012). DOE tentatively determined that the changes in the updated test procedures do not substantially impact the measurement of energy efficiency for commercial warm-air furnaces or commercial water heaters. In the March 2012 SNOPR, DOE also explained its position on tolerances and test-set up for conducting the tests for this equipment. 77 FR 16769, 16777–78 (March 22, 2012).

In response to the January 2012 NOPR, AHRI supported DOE's proposal for adopting UL 727–2006 and ANSI Z21.47–2006, but it recommended that DOE should incorporate the latest version of ANSI Z21.10.3 (*i.e.,* the 2011 version of the standard). AHRI added that the thermal efficiency and standby loss tests in that edition of the ANSI standard have not changed from the 2004 edition, which is the version that DOE had proposed to adopt in the NOPR. (AHRI, No. 30 at p. 1 and 3) Rheem also supported the adoption of ANSI Z21.10.3 for commercial water heating equipment but similarly urged DOE to adopt the 2011 version of that standard. (Rheem, No. 32 at p. 3) EEI endorsed DOE's adoption of all the proposed test procedures for commercial warm-air furnaces and commercial water heaters. (EEI, No. 29 at p. 2)

DOE was triggered under EPCA to review and adopt the most recent version of the industry test methods for equipment covered by ASHRAE Standard 90.1, provided that the industry test method meets the requirements of EPCA for test procedures. In response to the comments from AHRI and Rheem, DOE reviewed the 2011 version of ANSI Z21.10.3. DOE agrees with Rheem and AHRI that adopting ANSI Z21.10.3–2011 would not alter the DOE test method or the energy efficiency ratings for commercial water heaters as compared to adopting ANSI Z21.10.3–2004, which was proposed for adoption in the NOPR. However, when reviewing ANSI Z21.10.3–2011, DOE discovered an apparent error in the text of Exhibit G, *Efficiency Test Procedures,* in section G.1, *Thermal Efficiency Test.* The relevant text states that ''[w]ater-tube water heaters shall be installed as shown in Figure 3, Arrangement for Testing Water-tube Type Instantaneous and Circulating Water Heaters.'' DOE notes that Figure 3 in ANSI Z1.10.3–2011 deals with direct vent terminal clearances, and that Figure 2 is titled ''Arrangement for Testing Water-tube Type Instantaneous and Circulating Water Heaters,'' and depicts the test set-up for water-tube water heaters. Therefore, DOE believes this was a drafting error and that the correct figure to reference would be Figure 2. DOE is adopting such correction in today's final rule. In all other regards, DOE has concluded that ANSI Z21.10.3–2011 meets the requirements of EPCA for incorporation into DOE's test procedures, and it is the most up-to-date version of the industry standard that is currently available. Thus, DOE is incorporating by reference ANSI Z21.10.3–2011 for commercial water heaters. DOE is also incorporating by reference UL 727–2006 for commercial oil-fired warm-air furnaces, ANSI Z21.47–2006 for commercial gas-fired warm-air furnaces, as proposed in the January 2012 NOPR.

DOE did not receive any comments specifically related to commercial warm-air furnaces and commercial water heaters on the issues of tolerances, defective units, and test set-up. For the same reasons explained in section IV.A, DOE is not adopting AHRI's tolerances, will determine if a unit is defective on a case-by-case basis according to 10 CFR 429.110(d)(3), and will set up equipment for testing using only the equipment's I&O manual shipped with the unit.

C. Computer Room Air Conditioners

In the January 2012 NOPR, DOE proposed to incorporate by reference ASHRAE 127–2007 as the basis for the Federal test procedure for computer room air conditioners, which was the test procedure referenced in ASHRAE Standard 90.1–2010. 77 FR 2356, 2376 (Jan. 17, 2012). DOE believes that this industry test procedure is best suited to measure the energy efficiency of computer room air conditioners due to its emphasis on the sensible coefficient of performance (SCOP) metric. SCOP emphasizes the computer room air conditioners' sensible cooling [8] ability, which is the predominant type of heating load in computer rooms. Energy efficiency ratio (EER), on the other hand, incorporates latent cooling, which could be detrimental in large quantities for computer rooms, because too much latent cooling could dry out the computer room, potentially causing harmful static discharges. DOE also asked for comment regarding the use of a compressor ''break-in'' period for this equipment, part-load performance and potential shortcomings of the SCOP metric, and how to treat the potential revisions of ASHRAE 127–2007 released as draft for public review on July 14, 2011 . The new ASHRAE 127–2012, officially released on February 24, 2012, introduces a new efficiency metric

[8] ''Sensible cooling'' is the cooling effect that causes an increase in the dry-bulb temperature, which is the actual temperature of the air. ''Latent cooling'' is the cooling effect that causes a decrease in the wet-bulb temperature or the moisture content of the air, which is similar to the temperature one feels.

called net sensible coefficient of performance (NSenCOP) to replace the SCOP metric, which had caused some confusion with another term in ASHRAE Standard 90.1 with the same acronym. Also, NSenCOP now incorporates the electric usage of the heat rejection equipment used by fluid-cooled computer room air conditioners (SCOP omitted this electric power in its equations).

DOE also notes that even though AHRI does not currently have a certification program or operations manual for this equipment, the same DOE guidance that applies to commercial package air-conditioning and heating equipment for determining the appropriate test set-up, enhancement devices, refrigerant charge, rating air flow rates, and whether a test sample is defective (as explained in section IV.A) is applicable for this equipment.

In response to the January 2012 NOPR and the March 2012 SNOPR, EEI endorsed DOE's adoption of the ASHRAE 127 test procedures for computer room air conditioners. (EEI, No. 29 at p. 2) NEEA stated that DOE should review the possibility of adopting ASHRAE 127–2012 as the test procedure for computer room air conditioners because the updated test procedure has now been finalized. (NEEA, No. 31 at p. 1) AHRI and NEEA commented that there are significant improvements in the new draft of ASHRAE 127 (ASHRAE 127–2012) which would provide a more representative efficiency rating and allow for a better selection of models for any specific application and would provide some new efficiency metrics. (AHRI, No. 30 at p. 4 and NEEA, No. 31 at p. 1) AHRI suggested that DOE should delay the rulemaking in order to adopt the revised ASHRAE 127–2012 test procedure and not adopt the current ASHRAE 127–2007 test procedure. AHRI further commented that if DOE adopts the ASHRAE 127–2007 test procedure, it would be an injudicious use of resources and an unnecessary burden on manufacturers, because manufacturers would have to spend significant time and money to comply with the 2007 version of ASHRAE and then more time and money to retest all their models using ASHRAE 127–2012, when it is adopted in the next ASHRAE Standard 90.1 rulemaking. AHRI asserted that delaying the rulemaking in order to adopt the revised ASHRAE Standard 127 would not be a lost opportunity for energy savings but that it would provide a better opportunity for effective energy savings because of improved metrics, additional application classes, and added rating conditions. (AHRI, No. 30 at p. 4) In addition, ASAP commented that the SCOP metric (in ASHRAE 127–2007) does not reflect very well how computer room air conditioners perform in the field and that energy saving technologies such as variable speed fans are not captured in the SCOP metric. Instead, ASAP urged DOE to consider a test procedure with a metric that does capture part-load performance. (ASAP, Public Meeting Transcript, No. 20 at pp. 43–44). Similarly, NEEA urged DOE to value part-load operation efficiency of CRACs more than full-load operation efficiency, because in the field, computer room air conditioners tend to be oversized and operate at part-load most or all of the time. (NEEA, No. 31 at p. 2)

In response, DOE notes that EPCA provides the requirements for adopting amended or new standards for ASHRAE equipment. When the efficiency levels in ASHRAE Standard 90.1 are updated with respect to covered equipment, DOE must either adopt those levels as Federal standards within 18 months of the publication of the most recent version of ASHRAE Standard 90.1, or adopt more stringent Federal levels within 30 months. Once ASHRAE decides to act by amending Standard 90.1, EPCA does not provide DOE with discretion to delay the adoption of minimum standards pending test procedure updates as AHRI suggests. Because DOE must adopt energy conservation standards for computer room air conditioners within the time constraints laid out by EPCA, DOE must also adopt a test method for determining compliance with the minimum standard. DOE has found that ASHRAE Standard 127–2007 meets the statutory requirements for incorporation into DOE's test procedures and is appropriate for rating CRACs using the SCOP metric. In contrast, the new ASHRAE 127–2012 standard is not referenced in ASHRAE Standard 90.1–2010, and, as a result, the efficiency levels that DOE considered were based on ASHRAE 127–2007. In order to justify the adoption of efficiency levels other than those contained in the most recent version of ASHRAE Standard 90.1, DOE notes that it would have to provide clear and convincing evidence that such levels are technologically feasible and economically justified. Due to the fact that ASHRAE 127–2012 has only been recently finalized, DOE was unable to find any test data showing the results of testing to this standard, and how the results compare to those obtained using the previous version of ASHRAE Standard 127. Therefore, there is no basis for DOE to adopt ASHRAE 127–2012 and corresponding standards at this time. DOE believes that pursuing the use of the updated industry test procedure standard would unnecessarily delay the rulemaking for computer room air conditioners, and ultimately, the result would be that not enough information is available to promulgate standards at levels other than those in ASHRAE Standard 90.1–2010. If the ASHRAE 127–2012 test method and corresponding efficiency levels using the new metric are included in the next version of ASHRAE Standard 90.1, DOE will review the amended test procedure and efficiency levels at that time, as required by EPCA.

For the above reasons, in today's rulemaking, DOE is adopting a test procedure for computer room air conditioners by incorporating by reference ASHRAE 127–2007.

Regarding the break-in period for computer room air conditioners, AHRI commented that computer room air conditioners should be allowed the same opportunity for a compressor break-in period as the other commercial package air-conditioning and heating equipment. (AHRI, No. 30 at p. 6) At the February 14, 2012 NOPR public meeting, Emerson stated that for all compressors, the break-in period is essential to stabilize the compressor's performance and efficiency. (Emerson, Public Meeting Transcript, No. 20 at p. 49)

Because computer room air conditioners mainly use scroll compressors like other commercial package air conditioners, DOE agrees that computer room manufacturers should be allowed the same opportunity for an optional compressor ''break-in'' period. Thus, DOE is adopting the same provision for an optional compressor break-in as it is adopting for other commercial air-conditioning equipment. Manufacturers may opt to use a break-in period for computer room air conditioners for any length of time, up to a maximum time of 20 hours. Manufacturers who elect to use this optional compressor break-in period in its certification testing should record this information (including the duration) as part of the test data underlying the certified ratings that is required to be maintained under 10 CFR 429.71.

D. Variable Refrigerant Flow Air-Conditioning and Heating Equipment

In this final rule, DOE is incorporating by reference AHRI 1230–2010 with addendum 1 as the basis for the Federal test procedure for variable refrigerant flow equipment and is adopting the use of an optional compressor break-in period for variable refrigerant flow equipment. DOE initially discussed its proposals for testing this equipment in the January 2012 NOPR. 77 FR 2356, 2377–78 (Jan. 17, 2012). In the March 2012 SNOPR, DOE asked for comment regarding the need for a compressor break-in period longer than 16 hours for this equipment class. 77 FR 16769, 16776–77 (March 22, 2012). Also in the March 2012 SNOPR, DOE proposed to allow a manufacturer representative to witness assessment and enforcement testing and to adjust the compressor speed during testing, and DOE requested comment on these proposals. *Id.* at 16778–79. In the SNOPR, DOE also stated that manufacturers must document their certification set-up (including the fixed compressor speed) and maintain this documentation as part of their test data underlying certification so that DOE can request the documentation from the manufacturer on an as-needed basis. *Id.* Lastly, DOE proposed in the March 2012 SNOPR to adopt correction factors for the refrigerant line lengths for VRF systems only in instances where the physical constraints of the testing laboratory require a longer than minimum refrigerant line length. *Id.* at 16779. DOE also sought comment from stakeholders about its proposal to include these refrigerant line length correction factors.

Mitsubishi, Carrier, and EEI agreed with DOE's proposed adoption of AHRI 1230–2010 with addenda 1 for VRF systems. (Mitsubishi, No. 33 at p. 2, Carrier, No. 28 at p. 3, and EER, No. 29 at p. 2) There were no comments from stakeholders objecting to this proposal. DOE agrees with the submitted comments and is incorporating by reference AHRI 1230–2010 with addenda 1 into the Federal test procedure for VRF systems as part of today's final rule.

With respect to the break-in period for VRF systems, AHRI commented that VRF systems should be allowed the same compressor break-in period as it recommended for small, large, and very large commercial package air conditioners and heat pumps—the longer of 16 hour or the amount of time it takes for the system to complete 4 consecutive 30-minute cycles where the cooling capacity does not vary by more than 2 percent between each average and 1 percent from hour to hour. (AHRI, No. 30 at p. 4) Carrier stated that the compressor break-in period for VRF systems should be the same as for other commercial package air conditioners and heat pumps, as noted in section IV.A.

DOE agrees with these comments and believes that the break-in period for VRF equipment should be the same as that for other commercial package air conditioners and heat pumps. Thus, DOE is adopting an optional compressor break-in period that allows manufacturers to break in VRF equipment prior to testing for any length of time up to a maximum of 20 hours. Manufacturers who elect to use this optional compressor break-in period during certification testing should record this information (including the duration) as part of the test data underlying the certified ratings that is required to be maintained under 10 CFR 429.71.

DOE also received several comments regarding the limited manufacturer involvement in assessment and enforcement testing proposed in the SNOPR. AHRI agreed with DOE's proposal to allow limited manufacturer involvement in the testing of VRF systems. (AHRI, No. 30 at p. 9) Carrier also supported allowing limited manufacturer involvement during testing of VRF systems in order to ensure that the system has been set up properly and to lock compressor speeds for regulatory testing. However, Carrier extended that logic, arguing that the need for limited manufacturer involvement is not unique to VRF systems and that all commercial equipment is typically commissioned by a factory-trained person and should be allowed limited manufacturer involvement during testing as well. (Carrier, No. 28 at p. 5) Mitsubishi agreed with DOE's proposal to allow limited manufacturer involvement but suggested that the language be revised to allow the manufacturer representative to adjust the ''modulating components'' and not just to fix the compressor speed in order to achieve stabilization. (Mitsubishi, No. 33 at p. 3) More specifically, Mitsubishi commented that permissible manufacturer involvement should be clarified to allow manufacturers to properly interface with the unit control and communication system, to modulate control equipment in response to test room cycles, and to require factory-trained and certified installation technicians. (Mitsubishi, No. 33 at p. 2)

DOE believes that due to the unusually complicated nature of VRF systems, manufacturer involvement is necessary to ensure that the system operates properly during testing; however, DOE does not agree with Carrier's suggestion that the manufacturers also be allowed to assist in testing for other more typical commercial equipment. As noted in the March 2012 SNOPR, DOE believes that, unlike the conventional unitary market, a representative from the VRF manufacturer's company will typically provide on-site expertise when a VRF system is installed in a building in order to help ensure proper operation. 77 FR 16769, 16779 (March 22, 2012). In the conventional unitary market, trained general contractors can set up the commercial unitary equipment in the field without direct involvement from a manufacturer representative, and, thus, it would be reasonable to assume that test laboratories will be able to set up and run the test procedure for commercial unitary equipment without manufacturer involvement. DOE agrees with Mitsubishi's comment that VRF manufacturers might need to adjust more than just the compressor speed and is revising the language to allow manufacturers to adjust only the ''modulating components'' during testing in the presence of a DOE representative in order to achieve steady-state operation. Thus, DOE will allow manufacturer involvement in the testing of VRF systems under the condition that the manufacturer representative adjust only the modulating components in the presence of a DOE representative and that the manufacturer documents the test set-up and fixed compressor speeds as part of the test data underlying the certified ratings.

Lastly, regarding the refrigerant line correction factors proposed in the March 2012 SNOPR, DOE received several comments. AHRI and Mitsubishi agreed with DOE's proposal to incorporate the refrigerant line length correction factors into the DOE test procedure for VRF equipment. (AHRI, No. 30 at p. 9 and Mitsubishi, No. 33 at p. 3) Carrier also commented that all VRF equipment should be tested with the standard line lengths as defined by the appropriate rating standard for which minimum efficiency requirements were developed. (Carrier, No. 28 at p. 5)

DOE agrees that manufacturers should be required to use the minimum refrigerant line lengths in AHRI 1230–2010 but also recognizes that there may be circumstances (*i.e.,* the physical limitations of the laboratory) where this is not possible. Only in such cases, DOE will allow manufacturers to use correction factors in their calculations. Thus, DOE is adopting the minimum refrigerant line length correction factors, which are only to be used in instances where it is not possible to set up the test using the line lengths listed in Table 3 of AHRI 1230–2010.

E. Single Package Vertical Air Conditioners and Heat Pumps

In the January 2012 NOPR, DOE proposed to incorporate by reference AHRI 390–2003 as the basis for the Federal test procedure for single package vertical air conditioners and single package vertical heat pumps and proposed to adopt an optional compressor ''break-in'' period of no more than 16 hours. 77 FR 2356, 2378 (Jan. 17, 2012). In the March 2012 SNOPR DOE asked for comment about the need for a longer break-in period for this equipment class. 77 FR 16769, 16776–77 (March 22, 2012).

Mitsubishi and EEI agreed with DOE's proposed adoption of AHRI 390–2003 for single package vertical air conditioners and single package vertical heat pumps. (Mitsubishi, No. 33 at p. 2 and EEI, No. 29 at p. 2) Carrier commented that single package vertical equipment with a cooling capacity greater than or equal to 65,000 Btu/h should be rated according to AHRI 340/360–2007 with addenda 1 and 2 in order to ensure consistency in testing and rating vertical package and other commercial packaged equipment. (Carrier, No. 28 at p. 3)

In response to stakeholder comment, DOE notes that EPCA directs DOE to review the test procedures as referenced in the most recent version of ASHRAE Standard 90.1. ASHRAE Standard 90.1–2010 references AHRI 390–2003 as the test method for all classes of SPVUs. Upon reviewing AHRI 390–2003, DOE believes that the standard is reasonably designed to produce test results which reflect energy efficiency, energy use, and estimated operating costs of all classes of single package vertical air conditioners and single package vertical heat pumps, as required by EPCA for adoption. Accordingly, DOE is incorporating by reference AHRI 390–2003 as the Federal test procedure for single package vertical air conditioners and single package vertical heat pumps as required by EPCA.

Regarding the break-in period for SPVUs, AHRI commented that SPVUs should be allowed the same compressor break-in period as AHRI recommended for small, large, and very large commercial package air conditioners and heat pumps, as noted in section IV.A (AHRI, No. 30 at p. 4) DOE agrees that the break-in period for SPVUs should be the same as for other air-conditioning and heating equipment, and, thus, DOE is adopting an optional compressor break-in period that allows the manufacturer to break in equipment for up to a maximum time of 20 hours before commencing testing.

Similar to commercial package air conditioners, as discussed in section IV.A, DOE reiterates that DOE will only use information contained in a manufacturer's I&O manual for setting up testing, using enhancement devices, setting refrigerant charges, and setting rating air flow rates.

V. Methodology and Discussion of Comments for Computer Room Air Conditioners

A. Market Assessment

To begin its analysis on computer room air conditioners, DOE researched publicly-available information to provide an overall outlook in terms of the market for this type of equipment. DOE researched information on the structure of the industry, the purpose of the equipment, manufacturers, and market characteristics. This assessment included both quantitative and qualitative information. The topics discussed in this market assessment include definitions, equipment classes, manufacturers, and efficiencies. For more details on any of these subjects, see Chapter 2 of the final rule TSD.

1. Definition of ''Computer Room Air Conditioner''

As discussed in the May 2011 NODA and the January 2012 NOPR, ASHRAE expanded the scope in Standard 90.1–2010 to include air conditioners and condensing units serving computer rooms. 76 FR 25622, 25633–34 (May 5, 2011); 77 FR 2356, 2382–83 (Jan. 17, 2012). Because of this expansion of scope, DOE has determined that it has the authority to consider and adopt standards for this equipment. *Id.* However, because DOE did not previously cover this equipment type and is only now considering standards for this equipment class, DOE does not currently have a definition for ''computer room air conditioner'' and must define this type of equipment. DOE initially proposed a definition of this term in the January 2012 NOPR and asked for comment on ways in which manufacturers differentiate commercial air conditioners used for manufacturing and industrial processes from commercial air conditioners used for comfort cooling. 77 FR 2356, 2383 (Jan. 17, 2012). Then, in light of stakeholder feedback at the NOPR public meeting, DOE published an SNOPR in the **Federal Register** on March 22, 2012, revising its proposed definition to read as follows:

> *Computer room air conditioner* means a basic model of commercial package air-conditioning and heating equipment that is: (1) Used in computer rooms, data processing rooms, or other purpose-specific cooling applications; (2) rated for sensible coefficient of performance (SCOP) and tested in accordance with 10 CFR 431.96; and (3) not a covered, consumer product under 42 U.S.C. 6291(1)–(2) and 6292. A computer room air conditioner may be provided with, or have as available options, an integrated humidifier, temperature, and/or humidity control of the supplied air, and reheating function.

77 FR 16769, 16773.

In response, Carrier commented that it does believe there is a basis to differentiate computer room air conditioners from commercial package air conditioners used for comfort conditioning because computer room units are designed to handle different load characteristics, most notably by focusing on sensible load and not latent cooling. (Carrier, No. 28 at p. 1) Panasonic commented that computer room air conditioners have a different operating range and that the tolerances on the relative humidity and temperature control is tighter. Panasonic stated that the very sophisticated computer rooms and data centers require 50 percent relative humidity, with a 10 percent tolerance, and a specific temperature; however, the commenter also said that 95 percent of data centers are less sensitive with regard to the operating ranges. (Panasonic, No. 20 at pp. 68–69) Mitsubishi commented that the DOE definition for ''computer room air conditioner'' should allow for dual ratings and certification for equipment and allow that products be used for multiple applications if they meet all applicable standards. (Mitsubishi, No. 33 at p. 2) At the NOPR public meeting, Danfoss commented that DOE should not restrict the use of a product and leave it up to competitive pressures to determine where manufacturers rate and market their products and that DOE's vigilance would prevent manufacturers from constantly switching equipment classes. (Danfoss, No. 20 at p. 64–66)

AHRI expressed disagreement with the proposed definition for ''computer room air conditioner,'' because the commenter argued that it is unnecessarily complex and overly broad. AHRI commented that the list of options that may be available with a computer room air conditioner is not necessary to the basic definition of the product and that the term ''purpose-specific cooling application'' is vague and confusing. AHRI recommended the following for a definition of ''computer room air conditioner'': ''Computer room air conditioners means a unit of commercial air conditioning equipment (packaged or split) that's intended by the manufacturer for use in computer rooms, data processing rooms, or other information technology cooling applications, and is rated for sensible coefficient of performance (SCOP) using ASHRAE Standard 127.'' (AHRI, No. 30 at p. 8)

In response, DOE notes that its authority to cover computer room air conditioners stems from the expansion of ASHRAE Standard 90.1's scope and DOE's obligations pursuant to EPCA with regards to ASHRAE equipment. DOE is not aware of, nor did commenters identify, any distinct physical characteristic(s) that would consistently differentiate computer room air conditioners from other comfort-cooling commercial package air conditioners. DOE agrees with AHRI's assertion that ''purpose-specific cooling application is vague'' and, therefore, is removing that term from the definition. DOE acknowledges that the list of illustrative features of computer room air conditioners is not essential to the definition; however, DOE is retaining that language, because DOE believes that a recitation of such characteristics would provide useful assistance to manufacturers, industry, and DOE in determining which equipment should be considered to meet the definition of ''computer room air conditioner.'' Furthermore, DOE agrees with Mitsubishi's comment that the ''computer room air conditioner'' definition should allow for dual rating and certification for equipment if the basic model meets all applicable Federal standards, and notes that the definition proposed in the SNOPR would not preclude dual rating. Although DOE agrees with several points made by commenters, and is modifying the definition of ''computer room air conditioner'' accordingly, DOE is not adopting AHRI's proposed definition wholesale because it lacks several important clarifications. First, as discussed above, DOE believes that the list of features of computer room air conditioners provides useful assistance to DOE and industry in distinguishing computer room air conditioners from other types of covered commercial air conditioners. Second, DOE believes that the definition must clarify that the unit is tested for SCOP, which must be determined in accordance with DOE's test procedures at 10 CFR 431.96. In addition, DOE believes the clarification that a computer room air conditioner cannot be a covered product under 42 U.S.C. 6291(1)–(2) and 6292 is important to distinguish this equipment from residential products. Thus, DOE is adopting the following definition for ''computer room air conditioner,'':

Computer Room Air Conditioner means a basic model of commercial package air-conditioning and heating equipment (packaged or split) that is: (1) Used in computer rooms, data processing rooms, or other information technology cooling applications; (2) rated for sensible coefficient of performance (SCOP) and tested in accordance with 10 CFR 431.96, and (3) not a covered consumer product under 42 U.S.C. 6291(1)–(2) and 6292. A computer room air conditioner may be provided with, or have as available options, an integrated humidifier, temperature, and/or humidity control of the supplied air, and reheating function.

DOE believes that this definition does not prohibit manufacturers of commercial package air conditioners used for comfort cooling from advertising equipment for use in computer rooms or from making representations using the SCOP rating for computer air conditioners. However, DOE notes that if manufacturers of commercial package air conditioners used for comfort cooling wish to make representations of SCOP ratings, they must do so using only the procedures established by DOE in 10 CFR 431.96 for computer room air conditioners.

In addition, in the March 2012 SNOPR, DOE proposed to clarify that any basic model that meets the definition of ''commercial package air-conditioning and heat equipment'' must be classified as one of the equipment types (*e.g.,* small, large, or very large commercial package air-conditioning and heat equipment, packaged terminal air conditioners or heat pumps, variable refrigerant flow systems, computer room air conditioners, and single package vertical units) for the purposes of determining the primary applicable test procedure and energy conservation standard. 77 FR 16769, 16773–74 (March 22, 2012). DOE proposed adding a new section to the beginning of 10 CFR 431.97 to make it clear that each manufacturer of a basic model that meets this definition does have a regulatory obligation in terms of standards compliance. In the March 2012 SNOPR, DOE proposed a revision to 10 CFR 431.97 to read as follows:

(a) All basic models of commercial package air-conditioning and heating equipment must be tested for performance using the applicable DOE test procedure in § 431.96, be compliant with the applicable standards set forth in paragraphs (b) through (f) of this section, and be certified to the Department under 10 CFR part 429, where required.

Id.

In response to this proposed change, AHRI commented that it does not agree with the proposed amendments to 10 CFR 431.97(a), because AHRI believes it is unnecessary and does not provide added clarity, but rather, it simply repeats the basic concept of DOE's certification, compliance, and enforcement regulations. (AHRI, No. 30 at p. 8)

DOE recognizes that the additional language in 10 CFR 431.97 repeats the basic concepts from DOE's certification compliance and enforcement regulations. However, DOE believes that including this statement in 10 CFR 431.97 will serve as a reminder to manufacturers of commercial air-conditioning and heating equipment that their basic models must be certified to one of the equipment classes according to the requirements set forth in 10 CFR part 429. In addition, the paragraph clarifies that all commercial package air-conditioning and heating equipment must be tested for performance using the applicable test procedure in 10 CFR 431.96. DOE, therefore, believes that this statement will help clarify its requirements, and accordingly, DOE is adopting this change in the final rule.

Finally, with regard to the third part of its definition for computer room air conditioners, specifically, that the equipment cannot be a covered consumer product under 42 U.S.C. 6291(1)–(2) and 6292, manufacturers should compare the characteristics of each basic model to the definition of a ''central air conditioner,'' as specified in 42 U.S.C. 6291(21). If any basic model in question meets the definition of a ''central air conditioner,'' the onus is on the manufacturer to provide justification that the equipment is not a covered consumer product under 42 U.S.C. 6291(1)–(2) and is instead subject to a different definition in DOE's regulatory program. In other words, all equipment meeting the definition of ''central air conditioner'' must be in compliance with the test procedure, standard, and certification provisions applicable to that product type. DOE will review the manufacturer's justification and make its own determination of coverage if questions arise regarding a given basic model.

2. Equipment Classes

ASHRAE Standard 90.1–2010 divides computer room air conditioners into 30 different equipment classes based on the net sensible cooling capacity (*i.e.,* <65,000 Btu/h; ≥65,000 Btu/h and <240,000 Btu/h; or ≥240,000 Btu/h and <760,000 Btu/h), orientation of airflow (*i.e.,* upflow or downflow), heat rejection method (*i.e.,* air-cooled, water-cooled, glycol-cooled), and the presence of a fluid economizer.[9] DOE generally

[9] A ''fluid economizer'' is a system configuration potentially available where an external fluid-cooler

divides equipment and product classes by the type of energy used or by capacity or other performance-related features that affect efficiency. Different energy conservation standards may apply to different equipment classes. (42 U.S.C. 6295(q)) Because DOE believes that net sensible cooling capacity, orientation, heat rejection method, and use of a fluid economizer are all performance-related features that affect computer room air conditioner efficiency (*i.e.,* SCOP), DOE is dividing computer room air conditioners into the 30 equipment classes shown in Table V.1. These are the same equipment classes DOE proposed to adopt in the January 2012 NOPR. 77 FR 2356, 2383–84; 2431 (Jan. 17, 2012).

TABLE V.1—COMPUTER ROOM AIR CONDITIONERS EQUIPMENT CLASSES AND EFFICIENCY LEVELS

Equipment type	Net sensible cooling capacity	Minimum SCOP efficiency	
		Downflow units	Upflow units
Air Conditioners, Air-Cooled	<65,000 Btu/h	2.20	2.09
	≥65,000 Btu/h and <240,000 Btu/h	2.10	1.99
	≥240,000 Btu/h and <760,000 Btu/h	1.90	1.79
Air Conditioners, Water-Cooled	<65,000 Btu/h	2.60	2.49
	≥65,000 Btu/h and <240,000 Btu/h	2.50	2.39
	≥240,000 Btu/h and <760,000 Btu/h	2.40	2.29
Air Conditioners, Water-Cooled with a Fluid Economizer.	<65,000 Btu/h	2.55	2.44
	≥65,000 Btu/h and <240,000 Btu/h	2.45	2.34
	≥240,000 Btu/h and <760,000 Btu/h	2.35	2.24
Air Conditioners, Glycol-Cooled	<65,000 Btu/h	2.50	2.39
	≥65,000 Btu/h and <240,000 Btu/h	2.15	2.04
	≥240,000 Btu/h and <760,000 Btu/h	2.10	1.99
Air Conditioner, Glycol-Cooled with a Fluid Economizer.	<65,000 Btu/h	2.45	2.34
	≥65,000 Btu/h and <240,000 Btu/h	2.10	1.99
	≥240,000 Btu/h and <760,000 Btu/h	2.05	1.94

3. Review of Current Market for Computer Room Air Conditioners

DOE consulted a wide variety of sources, including manufacturer literature, manufacturer Web sites, and the California Energy Commission (CEC) Appliance Efficiency Database to obtain the information needed for the market assessment for computer room air conditioners. The information gathered from these sources serves as a basis for the analyses preformed in this rulemaking. The sections below provide a general overview of the computer room air conditioner market. More detail, including citations to relevant sources, of the computer room air conditioner market can be found in Chapter 2 of the final rule TSD.

a. Trade Association Information

AHRI is the trade association representing most manufacturers of commercial air-conditioning and heating equipment; however, at the time of this final rule, AHRI did not have a certification program for computer room air conditioners, and with one exception, the major manufacturers of computer room air conditioners that DOE identified are not currently AHRI members. [10] However, in its public comments, AHRI indicated that earlier this year, it added a Datacom Cooling Section and certification program which covers manufacturers of computer room air conditioners. (AHRI, No. 30 at p. 1)

b. Manufacturer Information

DOE initially identified manufacturers of computer room air conditioners by conversing with industry experts, by examining the CEC appliance efficiency database,[11] and by examining individual manufacturers' Web sites. Manufacturers that DOE identified include American Power Conversion, Compu-Aire, Data Aire, Liebert, and Stulz. DOE reviewed their manufacturer literature to gain insight into product availability, technologies used to improve efficiency, and product characteristics (*e.g.,* cooling capacities) of the models in each of the 30 equipment classes.

c. Market Data

Using the CEC database and manufacturer literature, DOE compiled a database of 1,364 computer room air conditioner models from the five manufacturers it identified. Because manufacturers are not required to report efficiency information about computer room air conditioners, most manufacturers do not publish this information in their product literature. DOE gathered efficiency data in the form of energy efficiency ratio (EER) from the CEC database (where manufacturers are required to report efficiency information if they sell models in California) and an individual manufacturer's product literature. Of the 1,364 models in DOE's database, DOE was only able to obtain efficiency information for 208 units (from three of the five manufacturers), which accounts for 15.2 percent of the database (see chapter 2 of the final rule TSD for information about how DOE estimated efficiency data in SCOP). As noted above, DOE was only able to obtain efficiency information from three of the five known manufacturers because two of the manufacturers did not provide SCOP or EER information in product literature or in the CEC database. The full breakdown of these 1,364 units into the 30 equipment classes can be found in chapter 2 of the final rule TSD, along with information on the typical performance characteristics (*e.g.,*

is utilized for heat rejection (*i.e.,* for glycol-cooled or water-cooled equipment). The fluid economizer utilizes a separate liquid-to-air cooling coil within the CRAC unit and the cooled water or glycol fluid returning from the external fluid cooler to cool return air directly, much like a chilled water air handling unit (*i.e.,* without the use of compressors). The ''economizer'' cooling can either augment or can take the place of compressor cooling, but only when returning water or glycol fluid temperatures are low enough to provide significant direct cooling from the liquid-to-air cooling coil.

[10] For more information see: *http://www.ahrinet.org/ahri+members.aspx.*

[11] See: *http://www.appliances.energy.ca.gov/.*

average sensible cooling capacity, average SCOP) for each equipment class. DOE used the market data as a foundation for developing price-efficiency curves in the engineering analysis. Additionally, DOE used the market data, along with other sources, to estimate shipments of computer room air conditioners. Further details regarding the development of shipment estimates and forecasts can be found in section V.F.2. of this final rule.

B. Engineering Analysis

The engineering analysis establishes the relationship between higher-efficiency equipment and the cost of achieving that higher efficiency when evaluating energy conservation standards. The results from the engineering analysis serve as the basis for the cost-benefit calculations for the individual consumers and the Nation. As explained in the January 2012 NOPR, DOE used an efficiency-level approach in conjunction with a pricing survey to develop the price-efficiency relationships for the 30 classes of computer room air conditioners. 77 FR 2356, 2385–86 (Jan. 17, 2012). An efficiency-level approach allowed DOE to estimate the cost of achieving different SCOP levels in a timely manner (which was necessary to allow DOE to meet the statutorily-required deadlines for ASHRAE equipment in EPCA). The efficiency-level approach allowed DOE to focus on the price of the computer room air conditioners at different SCOP ratings while capturing a variety of designs available of the market. The efficiency levels that DOE analyzed in the engineering analysis were within the range of efficiencies of computer room air conditioners on the market at the time the engineering analysis was developed. DOE relied on data collected from equipment distributors of three large computer room air conditioner manufacturers to develop its price-efficiency relationship for computer room air conditioners. (See chapter 3 of the final rule TSD for further detail.)

Although there are certain benefits to using an efficiency-level approach with a pricing survey (namely the ability to conduct an analysis in a limited amount of time that spans a variety of equipment and technologies), DOE notes there are also drawbacks to this approach. The most significant drawback of such an approach is that equipment pricing is not always based solely on equipment cost and is often influenced by a variety of other factors. Factors such as whether the unit is a high-volume seller, whether the unit has premium features (such as more sophisticated controls or a longer warranty), and the differences in markup between different manufacturers all have an effect on the prices of computer room air conditioners. In certain instances, this can make it difficult to compare prices across manufacturers because of the number of different ways that manufacturers can decide to set pricing based on features that are not part of the basic equipment costs. As a result, the relationship between price and efficiency could be different from the relationship between manufacturer cost and efficiency that might be revealed through other engineering methods such as a design-option approach or a reverse-engineering approach. However, given the limited analysis time allowed by EPCA, DOE proceeded with an efficiency-level approach for computer room air conditioners in which it gathered the price of equipment at various efficiency levels. Nonetheless, DOE believes this approach provides a reasonable approximation of the cost increases associated with efficiency increases and could be conducted in a timely manner that would allow DOE to meet the deadlines specified in EPCA for ASHRAE products. The approach allowed DOE to provide an estimate of equipment prices at different efficiencies and spanned a range of technologies currently on the market that are used to achieve the increased efficiency levels. However, DOE also notes that there is a high level of uncertainty in the results based on such an approach due to the limited amount of data and information available about this particular type of equipment.

The following provides an overview of the engineering analysis. DOE first determined which equipment classes it would need to analyze. DOE only analyzed the downflow equipment classes because after examining equipment designs, DOE found that that upflow and downflow units have the same interior components and technologies, and that every upflow model could be optionally arranged by the manufacturer in a downflow orientation (but not vice-versa). DOE assumed that the efficiency cost and benefit of a given technology would be the same in both the downflow and upflow orientations, which allowed for an analysis in downflow orientation only (the results of which would be assumed to be true for upflow models as well). This reduced the number of equipment classes that DOE needed to analyze from 30 to 15. Then, DOE chose a representative baseline computer room air conditioner, which is the starting point for analyzing possible benefits of energy efficiency improvements. Next, DOE used efficiency data from the market assessment to identify higher efficiency levels above the baseline. DOE collected contractor pricing information for models at the baseline and those higher efficiency levels, and used that information to estimate the cost increase of achieving those higher efficiency levels. Then, for equipment classes where there was too little data available to directly analyze the cost of increasing efficiency, DOE estimated the cost-efficiency relationship based on the analysis done for the other classes where data were available. Further detail regarding the key inputs to the engineering analysis and the results generated are presented immediately below and in further detail in chapter 3 of the final rule TSD.

1. Representative Input Capacities for Analysis

As explained in the January 2012 NOPR, DOE reviewed the 15 analyzed equipment classes of computer room air conditioners. 77 FR 2356, 2386 (Jan.17, 2012). For each equipment class, DOE chose a representative net sensible input capacity as a starting point for the engineering analysis. In summary, DOE chose a representative capacity at the average sensible capacity for each of the three size categories regardless of heating type, orientation, or the presence of a fluid economizer. For computer room air conditioners with a sensible cooling capacity less than 65,000 Btu/h, DOE chose 36,000 Btu/h; for those with a sensible cooling capacity greater than or equal to 65,000 Btu/h and less than 240,000 Btu/h, DOE chose 132,000 Btu/h; and for those with a sensible cooling capacity greater than or equal to 240,000 Btu/h and less than 760,000 Btu/h, DOE chose 288,000 Btu/h. These representative capacities also corresponded to the net sensible capacity of most the models in the corresponding equipment class. DOE attained pricing information for models with sensible cooling capacities that were generally within 15 percent of these representative sensible capacities for all equipment classes for which adequate efficiency data were available. In response to the January 2012 NOPR, DOE did not receive any comments regarding the representative sensible capacities for analysis. See chapter 3 of the final rule TSD for more information about the representative sensible capacities DOE selected.

2. Baseline Equipment

Next, DOE selected baseline efficiency levels for 15 of the 30 equipment classes. DOE uses these baseline models as the basis against which it measures changes resulting from potential higher energy conservation standards. The engineering analysis, LCC analysis, and PBP analysis use the baseline efficiency as a reference point to compare the technology, energy savings, and the cost of equipment with higher efficiency levels. A baseline equipment model typically contains the features and technologies that are most common in a certain equipment class currently offered for sale. As explained in the January 2012 NOPR, DOE chose the efficiency levels in ASHRAE Standard 90.1–2010 as baseline efficiency levels for computer room air conditioners, because DOE cannot adopt minimum standards at levels that are less stringent than the ASHRAE Standard 90.1–2010 efficiency levels. 77 FR 2356, 2386 (Jan. 17, 2012). In response to the January 2012 NOPR, DOE did not receive any comments regarding the baseline efficiency levels selected. Table V.2 shows the baseline efficiency level for each computer room air conditioner equipment class in the downflow orientation.

TABLE V.2—BASELINE SCOP EFFICIENCY LEVEL

Equipment class	Size category	Representative sensible cooling capacity	Downflow orientation baseline SCOP
Air-Cooled	<65,000 Btu/h	36,000 Btu/h	2.2
	≥65,000 Btu/h and <240,000 Btu/h	132,000 Btu/h	2.1
	≥240,000 Btu/h and <760,000 Btu/h	288,000 Btu/h	1.9
Water-Cooled	<65,000 Btu/h	36,000 Btu/h	2.6
	≥65,000 Btu/h and <240,000 Btu/h	132,000 Btu/h	2.5
	≥240,000 Btu/h and <760,000 Btu/h	288,000 Btu/h	2.4
Water-Cooled with a Fluid Economizer	<65,000 Btu/h	36,000 Btu/h	2.55
	≥65,000 Btu/h and <240,000 Btu/h	132,000 Btu/h	2.45
	≥240,000 Btu/h and <760,000 Btu/h	288,000 Btu/h	2.35
Glycol-Cooled	<65,000 Btu/h	36,000 Btu/h	2.5
	≥65,000 Btu/h and <240,000 Btu/h	132,000 Btu/h	2.15
	≥240,000 Btu/h and <760,000 Btu/h	288,000 Btu/h	2.1
Glycol-Cooled with a Fluid Economizer	<65,000 Btu/h	36,000 Btu/h	2.45
	≥65,000 Btu/h and <240,000 Btu/h	132,000 Btu/h	2.1
	≥240,000 Btu/h and <760,000 Btu/h	288,000 Btu/h	2.05

3. Identification of Efficiency Information and Efficiency Levels for Analysis

As reported in detail in the January 2012 NOPR, DOE selected multiple efficiency levels for analysis for each of the 15 equipment classes directly analyzed. 77 FR 2356, 2387 (Jan. 17, 2012). In summary, because DOE does not currently regulate computer room air conditioners, manufacturers are not required to report or rate the efficiency of their equipment, and efficiency data are often either not available or only available as an EER value determined through testing with a previous version of the ASHRAE 127 standard. Thus, DOE had to translate the EER information found in manufacturer literature and in the CEC database into SCOP using a ''rule-of-thumb'' equation found in ASHRAE 127–2007. The ''rule-of-thumb'' equation uses the EER as measured by ASHRAE 127–2001 and the sensible heat ratio (SHR)[12] found in manufacturer specification sheets to estimate the SCOP. For more detail about this conversion, see chapter 3 of the final rule TSD.

In order to select efficiency levels for analysis, DOE examined available market data and concluded that enough efficiency information was available in only four equipment classes that would allow DOE to reasonably select SCOP efficiency levels for analysis for that equipment class. For the equipment classes where DOE did not have enough SCOP data to select efficiency levels, DOE translated the efficiency levels from one of the four previously mentioned equipment classes based on the SCOP differences between the different equipment classes as specified by ASHRAE Standard 90.1–2010. The efficiency levels selected for analysis for each equipment class are shown in Table V.3. Chapter 3 of the final rule TSD shows additional details on the efficiency levels selected for analysis. In response to the January 2012 NOPR, DOE did not receive any comments regarding the efficiency levels selected for analysis.

TABLE V.3—EFFICIENCY LEVELS FOR ANALYSIS OF COMPUTER ROOM AIR CONDITIONERS

Equipment	Efficiency levels (SCOP)				
	Baseline level	Level 1	Level 2	Level 3	Level 4
Air-Cooled, <65,000 Btu/h	2.20	2.40	2.60	2.80	3.00
Air-Cooled, ≥65,000 Btu/h and <240,000 Btu/h	2.10	2.35	2.60	2.85	3.10
Air-Cooled, ≥240,000 Btu/h and <760,000 Btu/h	1.90	2.15	2.40	2.65	2.90
Water-Cooled, <65,000 Btu/h	2.60	2.80	3.00	3.20	3.40
Water-Cooled, ≥65,000 Btu/h and <240,000 Btu/h	2.50	2.70	2.90	3.10	3.30
Water-Cooled, ≥240,000 Btu/h and <760,000 Btu/h	2.40	2.60	2.80	3.00	3.20
Water-Cooled with a Fluid Economizer, <65,000 Btu/h	2.55	2.75	2.95	3.15	3.35
Water-Cooled with a Fluid Economizer, ≥65,000 Btu/h and <240,000 Btu/h	2.45	2.65	2.85	3.05	3.25

[12] ''Sensible heat ratio'' is the ratio of a unit's sensible cooling capacity to its total (*i.e.*, sensible and latent) cooling capacity.

TABLE V.3—EFFICIENCY LEVELS FOR ANALYSIS OF COMPUTER ROOM AIR CONDITIONERS—Continued

Equipment	Efficiency levels (SCOP)				
	Baseline level	Level 1	Level 2	Level 3	Level 4
Water-Cooled with a Fluid Economizer, ≥240,000 Btu/h and <760,000 Btu/h	2.35	2.55	2.75	2.95	3.15
Glycol-Cooled, <65,000 Btu/h	2.50	2.70	2.90	3.10	3.30
Glycol-Cooled, ≥65,000 Btu/h and <240,000 Btu/h	2.15	2.35	2.55	2.75	2.95
Glycol-Cooled, ≥240,000 Btu/h and <760,000 Btu/h	2.10	2.30	2.50	2.70	2.90
Glycol-Cooled with a Fluid Economizer, <65,000 Btu/h	2.45	2.65	2.85	3.05	3.25
Glycol-Cooled with a Fluid Economizer, ≥65,000 Btu/h and <240,000 Btu/h	2.10	2.30	2.50	2.70	2.90
Glycol-Cooled with a Fluid Economizer, ≥240,000 Btu/h and <760,000 Btu/h	2.05	2.25	2.45	2.65	2.85

4. Pricing Data

Once DOE identified representative capacities and baseline units, and selected equipment classes and efficiency levels to analyze, DOE contacted three of the manufacturers of computer room air conditioners [13] to obtain pricing information for individual models in quantities of 10 units. DOE used 10 as a standard request that would be typical of a contractor installing the units in an office space. DOE received pricing information for 32 models total. DOE then used the pricing information in conjunction with the SCOP data (estimated from EER data) to build price-efficiency curves. See chapter 3 of the final rule TSD for additional details about the pricing data DOE received. DOE did not receive any comment about its approach of obtaining pricing information. DOE did receive a comment on the results of the pricing analysis which is addressed in section V.B.6. below.

5. Equipment Classes for Analysis and Extrapolation to Unanalyzed Equipment Classes

As explained in section V.B and in detail in the January 2012 NOPR, DOE did not directly analyze all 30 equipment classes of computer room air conditioners. 77 FR 2356, 2387–88 (Jan. 17, 2012). Rather, DOE analyzed the equipment classes with the largest number of models on the market (and as a result the most data available) and used a variety of assumptions to extrapolate the analysis to those equipment classes with less information available. In addition to only directly analyzing the downflow equipment classes (as explained above), DOE also only directly analyzed those equipment classes without a fluid economizer and assumed what the potential cost of adding a fluid economizer and what the potential efficiency effects of the economizer coil would be for those classes with a fluid economizer.

As in the January 2012 NOPR, DOE found that there was only enough efficiency information to directly analyze four equipment classes: (1) Small (*i.e.,* sensible cooling capacity less than 65,000 Btu/h) air-cooled; (2) large (*i.e.,* sensible cooling capacity greater than or equal to 65,000 Btu/h and less than 240,000 Btu/h) air-cooled; (3) small water-cooled; and (4) and large water-cooled. For the other 11 downflow equipment classes, DOE extrapolated the analysis based on these four primary equipment classes because of a lack of efficiency and pricing data for those other equipment classes. DOE did not receive any comments from stakeholders on the methodology of extrapolating the results to the equipment classes with inadequate data. Thus, DOE has not changed the methodology of extrapolating this data in this final rule. For information about how DOE extrapolated to these 11 equipment classes, see the January 2012 NOPR (77 FR 2356, 2387–88 (Jan. 17, 2012)) and chapter 3 of the final rule TSD.

6. Engineering Analysis Results

The results of the engineering analysis are reported in the form of price-efficiency tables that represent the cost to a contractor for equipment at the baseline levels and at more-stringent efficiency levels for each equipment class. The results of the engineering analysis are the basis for the downstream LCC and PBP analyses. Table V.4 and Table V.5 below show the engineering analysis results for the four equipment classes that were directly analyzed. Chapter 3 of the final rule TSD contains the price-efficiency tables for all 15 equipment classes of computer room air conditioners, including those that were not directly analyzed. In summary, when examining the pricing information for each individual manufacturer, DOE found there was no correlation between pricing and efficiency. Only when all the manufacturer data points were aggregated across all manufacturers for each equipment class did a correlation appear. Generally, there were manufacturers who sold lower-priced, lower-SCOP equipment and those who sold higher-priced, higher-SCOP equipment. DOE also notes that the results for the small (<65,000 Btu/h) water-cooled and glycol-cooled equipment classes are counter-intuitive because the correlation between price and efficiency showed an inverse trend. This result can be attributed to the lack of data points, which prevented a statistically significant trend between price and efficiency. In DOE's experience, an inverse correlation between price and efficiency is not typical, and thus, DOE believes additional data and analysis would possibly reveal a different relationship than this pricing analysis.

[13] As noted in section VA.3.c, DOE was able to obtain efficiency data for three of the five manufacturers. DOE obtained pricing from all manufacturers for which it had efficiency data.

TABLE V.4—AIR-COOLED COMPUTER ROOM AIR CONDITIONERS PRICE-EFFICIENCY DATA

<65,000 Btu/h		≥65,000 Btu/h and <240,000 Btu/h	
SCOP	Price	SCOP	Price
2.20	$6,681.09	2.10	$22,621.45
2.40	7,853.51	2.35	24,383.30
2.60	9,231.68	2.60	26,282.38
2.80	10,851.69	2.85	28,329.36
3.00	12,755.99	3.10	30,535.77

TABLE V.5—WATER-COOLED COMPUTER AIR CONDITIONERS PRICE-EFFICIENCY DATA

<65,000 Btu/h		≥65,000 Btu/h and <240,000 Btu/h	
SCOP	Price	SCOP	Price
2.60	$14,232.84	2.50	$12,883.01
2.80	11,527.69	2.70	17,315.28
3.00	9,336.69	2.90	23,272.43
3.20	7,562.12	3.10	31,279.07
3.40	6,124.84	3.30	42,040.32

EEI commented at the February 14, 2012, public meeting that DOE should state that its analyses for computer room air conditioners were limited and would affect the downstream life-cycle analysis. (EEI, Public Meeting Transcript, No. 20 at p. 85) DOE agrees with EEI in that its analysis was limited and contained a lot of uncertainty in its data because computer room air conditioners were not previously regulated and limited efficiency and price information is available. Because of this lack of clear data and other uncertainties in the analyses performed, DOE does not have clear and convincing evidence to adopt higher efficiency levels than ASHRAE Standard 90.1–2010, as discussed in section VI.D.3. of this final rule.

C. Markups To Determine Equipment Price

DOE understands that the price of CRAC equipment depends on the distribution channel the customer uses to purchase the equipment. Typical distribution channels for most commercial HVAC equipment include shipments that may pass through manufacturers' national accounts, or through entities including wholesalers, mechanical contractors, and/or general contractors. However, DOE understands that the typical distribution channel for CRAC equipment for either new construction or replacement involves a mechanical contractor ordering the equipment from a manufacturer representative or distributor who delivers the equipment to the job site at a ''contractor's price.'' The contractor's price includes the distributor's sales commission. The distributor does not take a separate markup. The manufacturer's sales price in both the NOPR and the final rule reflects the contractor's price. The mechanical contractor takes delivery, then adds a markup and provides installation services. Because the equipment is specialized, general contractors are not involved in the transaction, nor did DOE find any evidence of wholesaler involvement or national accounts for distribution of this specialized CRAC equipment. DOE developed equipment costs for mechanical contractors directly in the engineering analysis and estimated the cost to customers using a markup chain beginning with the mechanical contractor cost. Because of the complexity of installation, DOE assumed most sales of CRAC equipment involved mechanical contractors. Consequently, DOE did not develop separate markups for other distribution channels.

DOE developed supply chain markups in the form of multipliers that represent increases above the mechanical contractor cost. DOE applied these markups (or multipliers) to the mechanical contractor costs it developed from the engineering analysis. DOE then added sales taxes and installation costs to arrive at the final installed equipment prices for baseline and higher-efficiency equipment. See chapter 5 of the ASHRAE final rule TSD for additional details on markups. DOE identified two separate distribution channels for CRAC equipment to describe how the equipment passes from the mechanical contractor to the customer (Table V.6).

TABLE V.6—DISTRIBUTION CHANNELS FOR CRAC EQUIPMENT

Channel 1 (Replacements)	Channel 2 (New Construction)
Distributor or Manufacturer Representative (No Separate Markup) Mechanical Contractor Customer	Distributor or Manufacturer Representative (No Separate Markup) Mechanical Contractor Customer

DOE estimated a baseline markup and an incremental markup. DOE defined a ''baseline markup'' as a multiplier that converts the mechanical contractor cost of equipment with baseline efficiency to the customer purchase price for the equipment at the same baseline efficiency level. An ''incremental markup'' is defined as the multiplier used to convert the incremental increase in mechanical contractor cost of higher-efficiency equipment into the customer purchase price for the same equipment. Both baseline and incremental markups are independent of the CRAC equipment efficiency levels.

DOE developed the markups based on available financial data. DOE based the mechanical contractor markups on data from the 2007 U.S. Census Bureau financial data [14] for the plumbing, heating, and air-conditioning industry.

The overall markup is the product of all the markups (baseline or incremental) for the different steps within a distribution channel plus sales tax. DOE calculated sales taxes based on 2012 State-by-State sales tax data reported by the Sales Tax Clearinghouse.[15] Because both contractor costs and sales tax vary by State, DOE developed distributions of markups within each distribution channel by State. No information was available to develop State-by-State distributions of CRAC equipment by building or business type, so the percentage distributions of sales by business type are assumed to be the same in all States. The National distribution of the markups varies among business types. Chapter 5 of the ASHRAE final rule TSD provides additional detail on markups.

In response to the January 2012 NOPR, DOE received a comment from Panasonic Air Conditioning Group (Panasonic) that at least some distribution channels may include distributors, manufacturer's representatives, or sales representatives, and that, therefore, one link in the distribution channel was missing. (Panasonic, Public Meeting Transcript, pp. 97–98) However, DOE determined that the manufacturer sales prices used in the NOPR were contractor prices that included manufacturer sales representative or distributor charges and, therefore, did not require a separate markup. Chapter 5 of the ASHRAE final rule TSD provides additional detail on markups.

D. Energy Use Characterization

DOE's building energy use characterization assesses the annual energy use for each of the 15 classes of computer room air conditioners at the efficiency levels established in the engineering analysis. Because of the fixed 0.11 SCOP difference between upflow and downflow CRAC units established in ASHRAE Standard 90.1–2010 and presumed in the engineering analysis for all higher efficiency levels, DOE determined that the per-unit energy savings benefits for corresponding upflow computer room air conditioners at higher efficiency levels could be represented using these 15 downflow equipment classes. The energy use characterization assessed the energy use of computer room air conditioners using a purpose-built spreadsheet that estimates the annual energy consumption for each equipment class at each efficiency level. The spreadsheet uses a modified outside temperature bin analysis. For each air-cooled equipment class, the spreadsheet calculates fan energy and condensing unit power consumption at each 5 °F outdoor air dry bulb temperature bin. The condensing unit power in this context includes the compressor(s) and condenser fan(s) and/or pump(s) included as part of the equipment rating. For water-cooled and glycol-cooled equipment, the spreadsheet first estimates the condensing water supply temperature from either an evaporative cooling tower or a dry cooler for water-cooled and for glycol-cooled CRAC equipment, respectively, based on binned weather data. Using these results, DOE then estimates the condensing unit power consumption and adds to this the estimated supply fan power. The sum of the CRAC condensing unit power and the CRAC supply fan power is the estimated average CRAC total power consumption for each temperature bin. Annual estimates of energy use are developed by multiplying the power consumption at each temperature bin by the number of hours in that bin for each climate analyzed.

To implement DOE's analytical methodology, DOE estimated the average heat load on each type and size of CRAC equipment based on an average thermal load set at 65 percent of the nominal sensible capacity based on an estimate provided in an Australian energy performance standards report.[16] As CRAC equipment is used to cool internally-generated thermal loads which are generally not climate dependent, DOE believes that this figure would also apply to CRAC equipment in the United States. DOE did not have manufacturer efficiency or performance data as a function of the outdoor temperature or the fraction of full load. Accordingly, DOE used an example of the variation in full-load performance as a function of ambient air temperature (for air-cooled equipment) or entering fluid temperature (for water-cooled and glycol-cooled equipment) provided in the ASHRAE 127–2007 test procedure and based on computer simulations to adjust full-load performance from the SCOP rating condition. A part-load performance degradation was also included, based on the methodology outlined for unitary direct-expansion air-conditioning equipment presented in the DOE EnergyPlus simulation tool documentation.[17] For water-cooled and glycol-cooled equipment with economizer coils, DOE reduced the thermal load on the condensing unit during hours when the economizer would be expected to meet some or all of the sensible cooling load. Because the primary heat load met with computer room air conditioners is a sensible load and because DOE did not have data to adequately estimate the relative sensible load versus latent load during the year for computer rooms, DOE did not separately examine the latent load on the equipment as a function of conditions, but determined that the total energy use could be based on the SCOP performance.

While the computer room heat load met by CRAC equipment is generally not climate sensitive, the performance of the equipment is climate sensitive. DOE estimated the annual energy consumption for each equipment class at each efficiency level for 239 climate locations using typical meteorological year (TMY3) weather data.[18] DOE relied on population-based climate location weights to map the results for individual TMY locations to State-level annual energy consumption estimates for each U.S. State. DOE used the resulting State-by-State annual energy consumption estimates for each efficiency level in the subsequent life-cycle cost analysis. DOE received no comments on the January 2012 NOPR regarding the energy use analysis for CRAC equipment and retains the approach for this final rule.

[14] The 2007 U.S. Census Bureau financial data for the plumbing, heating, and air-conditioning industry is the latest version data set and was issued in August 2009. (Available by searching for Table EC0723A1 at: *http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t#none*).

[15] The Sales Tax Clearinghouse, Table of state sales tax rates along with combined city and county rates. (Last accessed January 11, 2012) (Available at: *https://thestc.com/STRates.stm*).

[16] EnergyConsult Pty Ltd., *Equipment Energy Efficiency Committee Regulatory Impact Statement Consultation Draft: Minimum Energy Performance Standards and Alternative Strategies for Close Control Air Conditioners,* Report No 2008/11 (2008) (Available at: *www.energyrating.gov.au*).

[17] U.S. Department of Energy-Office of Energy Efficiency and Renewable Energy. EnergyPlus Documentation, *Engineering Reference* (Available at: *http://apps1.eere.energy.gov/buildings/energyplus/pdfs/engineeringreference.pdf*).

[18] S. Wilcox and W. Marion, *Users Manual for TMY3 Data Sets,* National Renewable Energy Laboratory: Golden, CO., Report No. NREL/TP–581–43156 (2008).

E. Life-Cycle Cost and Payback Period Analyses

DOE conducted the life-cycle cost (LCC) and payback period (PBP) analyses to estimate the economic impacts of potential standards on individual customers of CRAC equipment. DOE first analyzed these impacts for CRAC equipment by calculating the change in customer LCCs likely to result from higher efficiency levels compared with the ASHRAE baseline efficiency levels for the 15 downflow CRAC classes discussed in the engineering analysis. DOE determined that the LCC benefits for higher efficiency levels for each downflow class of CRAC equipment would adequately represent LCC benefits for the corresponding upflow class. The LCC calculation considers total installed cost (contractor cost, sales taxes, distribution chain markups, and installation cost), operating expenses (energy, repair, and maintenance costs), equipment lifetime, and discount rate. DOE calculated the LCC for all customers as if each would purchase a new CRAC unit in the year the standard takes effect. Since DOE is considering both the efficiency levels in ASHRAE Standard 90.1–2010 and more-stringent efficiency levels, the compliance date for a new DOE energy conservation standard for any equipment class would depend on the efficiency level adopted. This is because the statutory lead times for DOE adoption of the ASHRAE Standard 90.1–2010 efficiency levels and the adoption of more-stringent efficiency levels are different. (See section V.I.1. for additional explanation regarding compliance dates.) However, the LCC benefits to the customer of standards higher than those in ASHRAE Standard 90.1–2010 can begin to accrue only after the compliance date for such a higher standard is adopted by DOE. To account for this fact and to facilitate comparison, DOE presumed that the purchase year for all CRAC equipment for purposes of the LCC calculation is 2017, the earliest year in which DOE can establish an amended energy conservation level at an efficiency level more stringent than the ASHRAE efficiency level. To compute LCCs, DOE discounted future operating costs to the time of purchase and summed them over the lifetime of the equipment.

Next, DOE analyzed the effect of changes in installed costs and operating expenses by calculating the PBP of potential standards relative to baseline efficiency levels. The PBP is the amount of time it would take the customer to recover the incremental increase in the purchase price of more-efficient equipment through lower operating costs. The PBP is the change in purchase price divided by the change in annual operating cost that results from the energy conservation standard. DOE expresses the PBP in years. Similar to the LCC, the PBP is based on the total installed cost and the operating expenses. However, unlike the LCC, DOE only considers the first year's operating expenses in the PBP calculation. Because the PBP does not account for changes in operating expense over time or the time value of money, it is also referred to as a simple PBP.

DOE conducted the LCC and PBP analyses using a commercially-available spreadsheet tool and a purpose-built spreadsheet model, available online.[19] This spreadsheet model developed by DOE accounts for variability in energy use and prices, installation costs, repair and maintenance costs, and energy costs. It uses weighting factors to account for distributions of shipments to different building types and States to generate national LCC savings by efficiency level. The results of DOE's LCC and PBP analyses are summarized in section VI.B.3. and described in detail in chapter 6 of the ASHRAE final rule TSD. DOE received comments on specific aspects of the LCC and PBP methods and input data. These comments are addressed in the appropriate subsections below.

1. Approach

Recognizing that each business that uses CRAC equipment is unique, DOE analyzed variability and uncertainty by performing the LCC and PBP calculations assuming a correspondence between business types and market segments (characterized as building types) for customers located in three types of commercial buildings (health care, education, and office). DOE developed financial data appropriate for the customers in each building type. Each type of building has typical customers who have different costs of financing because of the nature of the business. DOE derived the financing costs based on data from the Damodaran Online site.[20]

The LCC analysis used the estimated annual energy use for selected size units in each CRAC equipment class described in section V.B. The energy use characterization is described in section V.D and in greater detail in Chapter 4 of the final rule TSD. Because energy use of CRAC equipment is sensitive to climate, energy use varies by State. Aside from energy use, other important factors influencing the LCC and PBP analyses are energy prices, installation costs, equipment distribution markups, and sales tax. All of these are assumed to vary by State. At the national level, the LCC spreadsheets explicitly modeled both the uncertainty and the variability in the model's inputs, using probability distributions based on State population, which serves as a proxy for the shipment of CRAC equipment to different States.

As mentioned above, DOE generated LCC and PBP results by building type and State and used weighting factors to generate national average LCC savings and PBP for each efficiency level. Because there is a unique LCC and PBP for each calculated value at the building type and State level, the outcomes of the analysis can also be expressed as probability distributions with a range of LCC and PBP results. A distinct advantage of this type of approach is that DOE can identify the percentage of customers achieving LCC savings or attaining certain PBP values due to an increased efficiency level, in addition to the average LCC savings or average PBP for that efficiency level. DOE received no comments on its general LCC and PBP approach and has retained it for the final rule.

2. Life-Cycle Cost Inputs

For each efficiency level DOE analyzed, the LCC analysis required input data for the total installed cost of the equipment, its operating cost, and the discount rate. Table V.7 summarizes the inputs and key assumptions DOE used to calculate the customer economic impacts of all energy efficiency levels analyzed in this rulemaking. A more detailed discussion of the inputs follows.

[19] DOE's Life-Cycle Cost spreadsheet model can be found on the DOE's ASHRAE Products Web site at: *www1.eere.energy.gov/buildings/appliance_standards/commercial/ashrae_products_docs_meeting.html.*

[20] Damodaran Online, *The Data Page* (Last Accessed Jan. 2012) (Available at: <*www.stern.nyu.edu/~adamodar/New_Home_Page/data.html*>).

TABLE V.7—SUMMARY OF INPUTS AND KEY ASSUMPTIONS USED IN THE LCC AND PBP ANALYSES

Inputs	NOPR	Changes for the final rule
	Affecting Installed Costs	
Equipment Price	Equipment price was derived by multiplying manufacturer sales price or MSP (distributor's or manufacturer's representative's price delivered to a mechanical contractor at the job site, calculated in the engineering analysis) by mechanical contractor markups, as needed, plus sales tax from the markups analysis.	Sales taxes updates to 2012 rates. No other changes.
Installation Cost	Installation cost includes installation labor, installer overhead, and any miscellaneous materials and parts, derived from *RS Means CostWorks 2011.*[21]	Updated installation costs and relative regional cost multipliers from 2011 to 2012 conditions using *RS Means CostWorks 2012.*[22]
	Affecting Operating Costs	
Annual Energy Use	Annual unit energy consumption for each class of equipment at each efficiency level estimated on a per-State basis using a spreadsheet model and a population-based mapping of climate locations to States.	No change.
Electricity Prices	DOE developed average electricity prices based on EIA's Form 861 data for 2010.[23] Price projections based on *AEO 2011.*[24]	Updated from 2010 to 2011 using EIA Form 826 data for 2011.[25] Price projections based on *AEO 2011.*
Maintenance Cost	DOE estimated annual maintenance costs based on *RS Means CostWorks 2011* for CRAC equipment. Annual maintenance cost did not vary as a function of efficiency.	Updated maintenance using *RS Means CostWorks 2012* and to reflect more frequent maintenance schedules for all CRAC equipment.
Repair Cost	DOE estimated the annualized repair cost for baseline efficiency CRAC equipment based on cost data from *RS Means CostWorks 2011* (2010 data). DOE assumed that the materials components portion of the repair costs would vary in direct proportion with the MSP at higher efficiency levels because it generally costs more to replace components that are more efficient.	Updated repair costs using *RS Means CostWorks 2012.*
	Affecting Present Value of Annual Operating Cost Savings	
Equipment Lifetime	DOE estimated CRAC equipment lifetime ranged between 10 and 25 years, with an average lifespan of 15 years, based on estimates cited in available CRAC literature.	No change.
Discount Rate	Mean real discount rates for business types considered range from 2.68 percent for education to 4.51 percent for offices. Health care was 4.10 percent based on a limited sample.	Updated to early 2012 conditions. Additional business included in office category. Education was 2.98 percent. Office was 4.46 percent. Health care was 4.98 percent, based on an expanded sample.
Analysis Start Year	Start year for LCC is 2017, which is the earliest compliance date that DOE can set for new standards if it adopts any efficiency level for energy conservation standards higher than that shown in ASHRAE Standard 90.1–2010.	No change.
	Analyzed Efficiency Levels	
Analyzed Efficiency Levels	DOE analyzed the baseline efficiency levels (ASHRAE Standard 90.1–2010) and four higher efficiency levels for all 15 equipment classes. See the engineering analysis for additional details on selections of efficiency levels and cost.	No change.

a. Equipment Prices

The price of CRAC equipment reflects the application of distribution channel markups (mechanical contractor markups) and sales tax to the manufacturer sales price (distributor's price, delivered to the job site), which is the cost established in the engineering analysis. As described in section V.C, DOE determined mechanical contractor costs and markup for air-conditioning equipment. For each equipment class, the engineering analysis provided contractor costs for the baseline equipment and up to four higher equipment efficiencies.

The markup is the percentage increase in price as the CRAC equipment passes

[21] RS Means Company Inc., *RS Means CostWorks 2011* (2011) (Available at: <*www.meanscostworks.com/*>).

[22] RS Means Company, Inc., *RS Means CostWorks 2012* (2012) (Available at: <*www.meanscostworks.com/*>).

[23] U.S. Energy Information Administration, *Electric Sales, Revenue, and Average Price 2009* (Last accessed May 10, 2011) (Available at: <*www.eia.doe.gov/cneaf/electricity/esr/esr_sum.html*>). Inflator—2009 to 2010 dollars from EIA *AEO 2011* GDP Price Index. (Last accessed April 27, 2011 at <*www.eia.doe.gov/oiaf/aeo/tablebrowser/#release=AEO2011&subject=0-AEO2011&table=18-AEO2011&region=0-0&cases=ref2011-d020911a*>).

[24] U.S. Energy Information Administration, *Annual Energy Outlook 2011* (Available at: <*http://www.eia.gov/forecasts/aeo/data.cfm*>).

[25] U.S. Energy Information Administration, *Sales and Revenue Data by State, Monthly Back to 1990 (Form EIA–826)* (Last accessed Jan. 27, 2012) (Available at: <*http://www.eia.gov/cneaf/electricity/page/sales_revenue.xls*>).

through the distribution channel. As explained in section V.C, all CRAC equipment is assumed to be delivered to the mechanical contractor at the job site for installation without the involvement of a general contractor. This is assumed to happen whether the equipment is being purchased for the new construction market or to replace existing equipment.

To project a price trend for the final rule, DOE initially derived an inflation-adjusted index of the Producer Price Index (PPI) for miscellaneous refrigeration and air-conditioning equipment over 1990–2010.[26] These data show a general price index decline from 1990 to 2004, followed by a sharp increase, primarily due to rising prices of copper and steel products that go into this equipment. Given the slowdown in global economic activity in 2011, DOE believes that the extent to which the trends of the past few years will continue is very uncertain and that the observed data do not provide a firm basis for projecting future costs trends for CRAC equipment. Therefore, DOE used a constant price assumption as the default price factor index to project future computer room air conditioner prices in 2017. Thus, prices projected for the LCC and PBP analysis are equal to the 2011 values for each efficiency level in each equipment class. Appendix 8D of the final rule TSD describes the historical data and the derivation of the price projection.

DOE requested comments on the most appropriate trend to use for real (inflation-adjusted) computer room air conditioner prices. DOE received no comments on this issue and has retained the same approach for the final rule.

b. Installation Costs

For the NOPR, DOE derived national average installation costs for CRAC equipment from data provided in *RS Means CostWorks 2011* (RS Means) specifically for CRAC equipment.[27] RS Means provides estimates for installation costs for CRAC units by equipment capacity, as well as city cost indices that reflect the variation in installation costs. DOE uses the RS Means cost indexes for 288 cities in the United States to determine State-level markups. The RS Means data identify several cities in all 50 States and the District of Columbia. DOE incorporated location-based cost indices into the analysis to capture variation in installation cost, depending on the location of the customer.

For more-stringent efficiency levels, DOE recognized that installation costs could potentially be higher with larger units and higher-efficiency CRAC equipment due to larger sizes and more complex setup requirements. DOE utilized RS Means installation cost data from *RS Means CostWorks 2011* to derive installation cost curves by size of unit for the base-efficiency unit. These cost curves were updated for the final rule using *RS Means CostWorks 2012*.[28] DOE did not have data to calibrate the extent to which installation cost might change as efficiency increased. This was identified as Issue 13 under ''Issues on Which DOE Seeks Comment'' in section X.E of the January 2012 NOPR. 77 FR 2356, 2424 (Jan. 17, 2012).

DOE received two comments on the NOPR concerning its installation costs for the LCC analysis. Danfoss commented that installation costs in replacement and retrofit applications might be higher than for new applications, because higher-efficiency equipment may be larger and harder to adapt to existing spaces. (Danfoss, Public Meeting Transcript at p. 110) Emerson commented that installation costs in situations where much attention is paid to efficiency may be higher because of the intentions of the designer interested in energy efficiency, not the equipment itself. (Emerson, Public Meeting Transcript at pp. 110–111) DOE acknowledges that either of these comments may be correct under certain circumstances, but it does not have quantitative information that would allow computation of an installation cost curve that is sensitive to efficiency level. Accordingly, DOE is using average installation cost data from RS Means that spans a variety of installation circumstances at a range of capacities. These data indicated that installation costs for replacements overall were slightly less costly than new installations. In this final rule, DOE is maintaining the approach used in the NOPR, specifically that installation costs do not vary with efficiency level.

c. Annual Energy Use

DOE estimated the annual electricity consumed by each class of CRAC equipment, by efficiency level, based on the energy use characterization described in section V.D and in chapter 4 of the final rule TSD. DOE received no comments on energy use. Accordingly, DOE is maintaining the same approach in the final rule.

d. Electricity Prices

Electricity prices are used to convert the electric energy savings from higher-efficiency equipment into energy cost savings. Because annual electricity consumption savings and equipment costs vary across the country, it is important to consider regional differences in electricity prices. DOE used average effective commercial electricity prices at the State level from U.S. Energy Information Administration (EIA) data for 2011.[29] This approach captured a wide range of commercial electricity prices across the United States. Furthermore, different kinds of businesses typically use electricity in different amounts at different times of the day, week, and year, and therefore, face different effective prices. To make this adjustment, DOE used EIA's 2003 Commercial Building Energy Consumption Survey (CBECS)[30] data set to identify the average prices the three building types paid and compared them with the average prices paid by all commercial customers.[31] DOE used the ratios of prices paid by the three types of businesses to the national average commercial prices seen in the 2003 CBECS as multipliers to adjust the average commercial 2011 State price data.

DOE estimated the relative prices each building type paid in each State and the estimated relative sales of CRAC equipment to each building type in each State. The relative prices were compared with a weighted-average national electricity price for 2011. The State/building type weights reflect the probabilities that a given unit of CRAC equipment shipped will operate with a given fuel price. The original State-by-State average commercial prices in the NOPR (adjusted to 2011$) range from $0.066 per kWh to approximately $0.216 per kWh. The commercial electricity prices for each State used in the final rule were updated through October 2011 and range from $0.065 per kWh to $0.312 per kWh (See chapter 6 of the ASHRAE final rule TSD for further details.)

The electricity price trends provide the relative change in electricity costs

[26] Series ID PCU3334153334159; <*http://data.bls.gov/cgi-bin/srgate*>

[27] R.S. Means Company, Inc., *RS Means CostWorks 2011* (2011) (Available at: <*www.meanscostworks.com/*>).

[28] RS Means Company, Inc., *RS Means CostWorks 2012* (2012) (Available at: <*www.meanscostworks.com/*>).

[29] Not all of the 2011 data had been posted by EIA by the time calculations for the final rule were required. Consequently, prices for the period November 2010 through October 2011 were used.

[30] U.S. Energy Information Administration, *CBECS Public Use Microdata Files* (Last Accessed April 2012) (Available at: <*www.eia.doe.gov/emeu/cbecs/cbecs2003/public_use_2003/cbecs_pudata2003.html*>).

[31] EIA's 2003 CBECS is the most recent version of the data set.

for future years. DOE applied the *AEO 2011* reference case as the default scenario and extrapolated the trend in values at the Census Division level from 2025 to 2035 of the projection to establish prices in 2036 to 2060. This method of extrapolation is in line with methods EIA uses to project fuel prices for the Federal Energy Management Program (FEMP). DOE provides a sensitivity analysis of the LCC savings and PBP results to different fuel price scenarios using both the *AEO 2011* high-price and low-price projections in the ASHRAE final rule TSD.

DOE received no comments concerning either electricity prices or electricity price trends. Accordingly, DOE updated the data used in the NOPR to reflect the latest available prices and price forecasts and retained the same analytical approach for the final rule.

e. Maintenance Costs

Maintenance costs are the costs to the customer of maintaining equipment operation. Maintenance costs include services such as cleaning heat-exchanger coils and changing air filters. For the NOPR, DOE estimated annual routine maintenance costs for CRAC equipment as $84 per year for capacities up to 288 kBtu per hour and $102 per year for larger capacities, as reported in the *RS Means CostWorks 2011* database. For the final rule, these values were increased to account for recommended CRAC quarterly and semi-annual maintenance schedules and for changes in unit costs reflected in *RS Means CostWorks 2012.* Because data did not indicate how maintenance costs vary with equipment efficiency, DOE used preventive maintenance costs that remain constant as equipment efficiency increases. DOE received no comments on the NOPR concerning the maintenance cost estimates. DOE made no changes to the maintenance cost estimates for this final rule other than those updating the RS Means maintenance schedules and unit costs.

f. Repair Costs

The repair cost is the cost to the customer of replacing or repairing components that have failed in the CRAC equipment. For the NOPR, DOE estimated the one-time repair cost in *RS Means CostWorks 2011* as a percentage of MSP for capacities between 5 tons (T) (60,000 Btu/h) and 15 T (180,000 Btu/h), with the curve flattening at the 15 T percentage thereafter. DOE applied the percentage to the MSP for more-efficient equipment at each capacity for the one-time repair, then annualized the resulting repair costs. For the final rule, DOE updated repair costs using data in *RS Means CostWorks 2012.* DOE determined that annualized repair costs would increase in direct proportion with increases in equipment prices. Because the price of CRAC equipment increases with efficiency, the cost for component repair will also increase as the efficiency of equipment increases. See chapter 6 of the ASHRAE final rule TSD for details on the development of repair costs.

DOE received two comments on the January 2012 NOPR concerning repair cost estimates. The Appliance Standard Awareness Project (ASAP) questioned whether annualizing the present value of a future outlay results in the same value as directly calculating the present value of that outlay. (ASAP, Public Meeting Transcript at pp.114–116) Emerson commented that the time profile of failure rates for compressors, which would represent a significant portion of repair costs, are basically constant over time. Therefore, according to the comment, it makes no difference whether the cost was calculated for a single year or an equivalent annual cost. (Emerson, Public Meeting Transcript at pp. 116–117) For the final rule, DOE calculated annualized repair costs for CRAC equipment by first calculating the present value of a major repair at the mid-point of the average lifetime and then calculating the equivalent annual payment that would yield the same present value.

g. Equipment Lifetime

DOE defines ''equipment lifetime'' as the age at which a unit of CRAC equipment is retired from service. DOE reviewed available literature to establish typical equipment lifetimes. The literature offered a wide range of typical equipment lifetimes, ranging from 10 to 25 years. The data did not distinguish between classes of CRAC equipment. Consequently, DOE used a distribution of lifetimes between 10 and 25 years, with an average of 15 years based on review of a range of CRAC lifetime estimates found in published studies and online documents. DOE applied this distribution to all classes of CRAC equipment analyzed. Chapter 6 of the ASHRAE final rule TSD discusses equipment lifetime. DOE received no comments on the January 2012 NOPR regarding the distribution of equipment lifetimes or the average equipment lifespan used in the LCC analysis. Accordingly, no changes were made to this analysis for the final rule.

h. Discount Rate

The discount rate is the rate at which future expenditures are discounted to establish their present value. DOE determined the discount rate by estimating the cost of capital for purchasers of CRAC equipment. Most purchasers use both debt and equity capital to fund investments. Therefore, for most purchasers, the discount rate is the weighted-average cost of debt and equity financing, or the weighted-average cost of capital (WACC), less the expected inflation.

DOE updated the data sources for the final rule. As was done in the NOPR, to estimate the WACC of computer room air conditioner equipment purchasers that are private firms, DOE used a sample of more than 2,000 companies, grouped to represent operators of each of three commercial building types (health care, education, and office). These companies were drawn from a database of 5,891 U.S. companies presented on the Damodaran Online Web site in January 2012.[32] This database includes most of the publicly-traded companies in the United States. For most educational buildings and a portion of the office buildings occupied by public schools, universities, and State and local government agencies, DOE estimated the cost of capital based on a 40-year geometric mean of the Bond Buyer Go 20–Bond Municipal Bond Index.[33] Federal office space was assumed to use the Federal bond rate, derived as the 40-year geometric mean of long-term (>10 years) U.S. government securities.[34] When one or more of the variables needed to estimate the discount rate in the Damodaran dataset were missing or could not be obtained, DOE discarded the firm from the analysis. DOE further reduced the sample to exclude firms that were unlikely to use the computer rooms served by CRAC equipment. The WACC approach for determining discount rates accounts for the current tax status of individual firms on an overall corporate basis. DOE did not evaluate the marginal effects of increased costs, and, thus, depreciation due to more expensive equipment, on the overall tax status.

DOE received a comment on the January 2012 NOPR concerning the discount rates used in the LCC analysis.

[32] Damodaran financial data used for determining cost of capital is available at *http://pages.stern.nyu.edu/~adamodar/* for commercial businesses (Last accessed Jan. 27, 2012).

[33] Federal Reserve Bank of St. Louis, State and Local Bonds-Bond Buyer Go 20-Bond Municipal Bond Index (Last accessed April 6, 2012) (Available at: <*http://research.stlouisfed.org/fred2/series/MSLB20/downloaddata?cid=32995*>).

[34] Calculated as a 40-year geometric average of long-term (>10 year) U.S. government securities. Rate calculated with 1972–2011 data. Data source: U.S. Federal Reserve (Last accessed Jan. 23, 2012 at *www.federalreserve.gov/releases/h15/data.htm*).

Edison Electric Institute (EEI) requested that major retail and internet service companies be added to the businesses that would use computer rooms having CRAC equipment. (EEI, Public Meeting Transcript at p. 120) For the final rule, DOE added several additional types of businesses into the ''office'' category to broaden that classification. Retail and internet firms were included.

DOE used the final sample of companies to represent purchasers of CRAC equipment. For each company in the sample, DOE derived the cost of equity, cost of debt, percent debt financing, and systematic company risk from information on the Damodaran Online Web site. DOE estimated the cost of debt financing as the ''risk-free'' rate—long-term Federal government bond rate (6.61 percent)—added to a company-specific risk premium based on the standard deviation of its stock price. DOE estimated the cost of equity financing based on the risk-free rate, plus the product of the company-specific risk premium and an expected equity risk premium for firms facing average market risk. DOE then determined WACC for each company and the weighted average WACC for each category of the sample companies. Deducting expected inflation from the cost of capital provided estimates of real discount rate for each company. Based on this database, DOE calculated the weighted average after-tax discount rate for CRAC equipment purchases, adjusted for inflation, in each of the three building types used in the analysis. Chapter 6 of the ASHRAE final rule TSD contains the detailed calculations on the discount rate.

3. Payback Period

DOE also determined the economic impact of potential amended energy conservation standards on customers by calculating the PBP of more-stringent efficiency levels relative to a baseline efficiency level. The PBP measures the amount of time it takes the commercial customer to recover the assumed higher purchase expense of more-efficient equipment through lower operating costs. Similar to the LCC, the PBP is based on the total installed cost and the operating expenses for each building type and State, weighted on the probability of shipment to each market. Because the simple PBP does not take into account changes in operating expense over time or the time value of money, DOE considered only the first year's operating expenses to calculate the PBP, unlike the LCC, which is calculated over the lifetime of the equipment. Chapter 6 of the ASHRAE final rule TSD provides additional details about the PBP. DOE received no comments on the January 2012 NOPR concerning the PBP analysis. Accordingly, no changes were made to this analysis for the final rule.

F. National Impact Analysis

The national impact analysis (NIA) evaluates the effects of a proposed energy conservation standard from a national perspective rather than from the customer perspective represented by the LCC. This analysis assesses the net present value (NPV) (future amounts discounted to the present) and the national energy savings (NES) of total commercial customer costs and savings that are expected to result from amended and new standards at specific efficiency levels. For each efficiency level analyzed, DOE calculated the NPV and NES for adopting more-stringent standards than the efficiency levels specified in ASHRAE Standard 90.1–2010.

The NES refers to cumulative energy savings from 2012 through 2041 or 2013 through 2042, depending on the equipment class. DOE calculated energy savings in each year relative to a base case, which reflects DOE adoption of the efficiency levels specified by ASHRAE Standard 90.1–2010. DOE also calculated energy savings from adopting efficiency levels specified by ASHRAE Standard 90.1–2010 compared to the current market base case. The NPV refers to cumulative monetary savings. DOE calculated net monetary savings in each year relative to the base case (ASHRAE Standard 90.1–2010) as the difference between total operating cost savings and increases in total installed cost. Cumulative savings are the sum of the annual NPV over the specified period. DOE accounted for operating cost savings until 2055 or 2056, when the equipment installed in the 30th year after the compliance date of the amended standards should be retired.

1. Approach

The NES and NPV are a function of the total number of units in use and their efficiencies. Both the NES and NPV depend on annual shipments and equipment lifetime. Both calculations start by using the shipments estimate and the quantity of units in service derived from the shipments model.

With regard to estimating the NES, because more-efficient computer room air conditioners are expected to gradually replace less-efficient ones, the energy per unit of capacity used by the computer room air conditioners in service gradually decreases in the standards case relative to the base case. DOE calculated the NES by subtracting energy use under a standards-case scenario from energy use in the base case.

Unit energy savings for each equipment class are taken from the LCC spreadsheet for each efficiency level and weighted based on market efficiency distributions. To estimate the total energy savings for each efficiency level, DOE first calculated the national site energy consumption (*i.e.,* the energy directly consumed by the units of equipment in operation) for each class of computer room air conditioners for each year of the analysis period. The analysis period begins with the earliest expected compliance date of amended Federal energy conservation standards (*i.e.,* 2012 or 2013), assuming DOE adoption of the ASHRAE Standard 90.1–2010 efficiency levels. For the analysis of DOE's potential adoption of more-stringent efficiency levels, the earliest compliance date would be 2017, four years after DOE would likely issue a final rule requiring such standards. Second, DOE determined the annual site energy savings, consisting of the difference in site energy consumption between the base case and the standards case for each class of computer room air conditioner. Third, DOE converted the annual site energy savings into the annual amount of energy saved at the source of electricity generation (the source energy), using a site-to-source conversion factor. Finally, DOE summed the annual source energy savings over a 30-year period to calculate the total NES. DOE performed these calculations for each efficiency level considered for computer room air conditioners in this rulemaking.

DOE considered whether a rebound effect is applicable in its NES analysis. A rebound effect occurs when an increase in equipment efficiency leads to increased demand for its service. EIA in its National Energy Modeling System (NEMS) model assumes an efficiency rebound to account for an increased demand for service due to the increase in cooling (or heating) efficiency.[35] For the computer room air conditioning equipment market, there are two ways that a rebound effect could occur: (1) Increased use of the air-conditioning equipment within the commercial buildings in which such units are installed; and (2) additional instances of air-conditioning computer rooms that were not being cooled before.

DOE believes that the first instance does not occur often because computer rooms are generally cooled to the level

[35] An overview of the NEMS model and documentation is found at: *http://www.eia.doe.gov/oiaf/aeo/overview/index.html.*

required for safe operation of the servers and other equipment. Persons maintaining the equipment have no reason to deviate from the optimal range of environmental conditions. With regard to the second instance, computer room air conditioners are unlikely to be installed in previously uncooled computer rooms, because servers and other equipment that need to be cooled or otherwise space conditioned to the degree of precision that requires a computer room air conditioner already would be. Given the potential for computer equipment damage or diminished performance, running a computer room without the appropriate environmental controls from the outset is highly unlikely. DOE received no public comments in response to the January 2012 NOPR on the issue of rebound effect. Therefore, DOE did not assume a rebound effect in the analysis.

To estimate NPV, DOE calculated the net impact as the difference between total operating cost savings and increases in total installed costs. DOE calculated the NPV of each considered standard level over the life of the equipment using the following three steps. First, DOE determined the difference between the equipment costs under the standard-level case and the base case in order to obtain the net equipment cost increase resulting from the higher standard level. Second, DOE determined the difference between the base-case operating costs and the standard-level operating costs in order to obtain the net operating cost savings from each higher efficiency level. Third, DOE determined the difference between the net operating cost savings and the net equipment cost increase in order to obtain the net savings (or expense) for each year. DOE then discounted the annual net savings (or expenses) to 2012 for computer room air conditioners bought on or after 2012 or 2013, depending on product class, and summed the discounted values to provide the NPV for an efficiency level. An NPV greater than zero shows net savings (*i.e.,* the efficiency level would reduce customer expenditures relative to the base case in present value terms). An NPV that is less than zero indicates that the efficiency level would result in a net increase in customer expenditures in present value terms.

To make the analysis more transparent to all interested parties, DOE used a commercially-available spreadsheet tool to calculate the energy savings and the national economic costs and savings from potential amended standards. Chapter 8 of the final rule TSD explains the models and how to use them. Interested parties can review DOE's analyses by changing various input quantities within the spreadsheet.

Unlike the LCC analysis, the NES spreadsheet does not use distributions for inputs or outputs, but relies on national average equipment costs and energy costs developed from the LCC spreadsheet. DOE used the NES spreadsheet to perform calculations of energy savings and NPV using the annual energy consumption and total installed cost data from the LCC analysis. DOE forecasted the energy savings, energy cost savings, equipment costs, and NPV of benefits for equipment sold in each computer room air conditioner class from 2012 through 2041 or 2013 through 2042, depending on the product class. The forecast provided annual and cumulative values for all four output parameters described above. DOE received no public comments on these calculations. Accordingly, DOE maintained the same approach in this final rule.

2. Shipments Analysis

DOE developed shipment projections and, in turn, calculated equipment stock by assuming that in each year, each existing computer room air conditioners either age by one year or break down after a 15-year equipment life. DOE used the shipments projection and the equipment stock to determine the NES. The shipments portion of the spreadsheet model forecasts computer room air conditioner shipments from 2012 or 2013 to 2041 or 2042, depending on the product class.

Data on computer room air conditioner shipments in the U.S. were not available. To estimate U.S. shipments, DOE obtained historical and projected (2000–2020) computer room air conditioner shipment data from an Australian energy performance standards report.[36] DOE then used the ratio of business establishments in the U.S. compared to Australia to inflate Australian shipments to reflect the U.S. market. The inflator used was 13.2. Table V.8 exhibits the shipment data provided for a selection of years, while the full data set and the complete discussion of energy use indicators can be found in chapter 7 of the ASHRAE final rule TSD. DOE used these shipments data to extend a shipments trend into the future.

TABLE V.8—TOTAL SHIPMENTS OF COMPUTER ROOM AIR CONDITIONERS

[Units]

Year	Units shipped (Australian data)	Units shipped (U.S. estimate)
2000	850	11,228
2005	985	13,011
2010	1,140	15,058
2015	1,320	17,436
2020	1,526	20,157

DOE allocated overall shipments into product classes using a two-step process. First, DOE used Australian market shares to allocate shipments to six broad product classes. DOE then used the relative fraction of models for each equipment class reflected in DOE's market database to allocate shipments further into the 15 product classes analyzed. The complete discussion of shipment allocation and forecasted shipments for the different equipment classes can be found in chapter 7 of the ASHRAE final rule TSD.

As equipment purchase price and repair costs increase with efficiency, DOE recognizes that higher first costs and repair costs can result in a drop in shipments. However, DOE had no basis for estimating the elasticity of shipments for computer room air conditioners as a function of first costs, repair costs, or operating costs. In addition, because computer room air conditioners are necessary for their application, DOE believes shipments would not change as a result of the

[36] EnergyConsult Pty Ltd., Equipment Energy Efficiency Committee Regulatory Impact Statement Consultation Draft: Minimum Energy Performance Standards and Alternative Strategies for Close Control Air Conditioners, Report No. 2008/11 (Sept. 2008) (Available at: *www.energyrating.gov.au*).

higher first costs and repair costs considered in this rulemaking. Therefore, DOE assumed that the shipments projection does not change with higher standard levels. DOE received no comments on its shipments analysis in response to the January 2012 NOPR. Accordingly, DOE maintained its approach for this final rule.

3. Base-Case and Standards-Case Forecasted Distribution of Efficiencies

DOE reviewed the distribution of efficiency levels for commercially-available models within each equipment class in order to develop base-case efficiency distributions. DOE bundled the efficiency levels into ''efficiency ranges'' and determined the percentage of models within each range. DOE applied the percentages of models within each efficiency range to the total unit shipments for a given equipment class to estimate the distribution of shipments for the base case. Then, from those market shares and projections of shipments by equipment class, DOE extrapolated future equipment efficiency trends both for a base-case scenario and for standards-case scenarios.

For each efficiency level analyzed, DOE used a ''roll-up'' scenario to establish the market shares by efficiency level for the year that compliance would be required with amended standards (*i.e.,* 2017 if DOE adopts more-stringent efficiency levels than those in ASHRAE Standard 90.1–2010). DOE collected information that suggests the efficiencies of equipment in the base case that did not meet the standard level under consideration would roll up to meet the standard level. This information also suggests that equipment efficiencies in the base case that were above the standard level under consideration would not be affected. The base-case efficiency distributions for each equipment class are presented in chapter 7 of the ASHRAE final rule TSD.

For the base case, DOE had no basis to estimate potential change in efficiency market shares. Therefore, DOE assumed that, absent amended standards, forecasted market shares would remain constant until the end of the forecast period (30 years after the compliance date). This prediction could cause DOE to overestimate the savings associated with the higher efficiency levels discussed in this notice because computer room air conditioner efficiencies or relative efficiency class preferences could change over time.

In response to this approach in the January 2012 NOPR, AHRI stated that the analysis of the NES-forecasted base-case distribution of efficiencies and DOE's prediction of how amended energy conservation standards might affect the distribution of efficiencies in the standards case should be redone, with the assumption being that the applicable industry test procedure will be the new edition of ASHRAE Standard 127 (i.e., ASHRAE Standard 127–2012). AHRI stated that the result should be an improved forecast of energy savings. (AHRI, No. 30 at p. 6) In response, DOE notes that as mentioned in section IV.C, it is unable to adopt ASHRAE 127–2012, because there are no test data showing the results of testing to this standard (using the NSenCOP metric) and how they compare to those obtained using ASHRAE 127–2007 (using the SCOP metric, which is also the metric of the standard levels in ASHRAE Standard 90.1–2010), so DOE could not obtain clear and convincing evidence that any new efficiency levels based on ASHRAE 127–2012 would be technologically feasible or economically justified. Therefore, DOE is retaining the approach taken in the NOPR.

NEEA asked whether the national energy savings take into account the energy presumably lost due to reduced energy efficiency standards in the markets regulated by the California Energy Commission (CEC). NEEA provided a table comparing the CEC levels to the ASHRAE levels using the rule-of-thumb with a sensible heat ratio of 0.9, which suggested that in contrast to the CEC's EER requirement for several equipment classes, the corresponding SCOP level in ASHRAE Standard 90.1–2010 may be less stringent. (NEEA, No. at p. 2) In response, DOE notes that the rule-of-thumb method is approximate, and no test data are available to provide an accurate comparison between the EER standards required by the CEC and the SCOP levels in ASHRAE Standard 90.1–2010. Commenters provided no data that would help clarify this matter. In addition, DOE has no information on how the markets regulated by the CEC would react to a national standard and, therefore, how the distribution of efficiencies would be expected to change. As a result, DOE was not able to take this issue into account in its analyses.

G. Emissions Analysis

In the emissions analysis, DOE estimated the reduction in power sector emissions of carbon dioxide (CO_2), nitrogen oxides (NO_X), and mercury (Hg) from amended energy conservation standards for ASHRAE equipment. DOE used the NEMS–BT computer model,[37] which is run similarly to the *AEO* NEMS, except that equipment energy use is reduced by the amount of energy saved (by fuel type) at each efficiency level. The inputs of national energy savings come from the NIA spreadsheet model, while the output is the forecasted physical emissions. The net benefit of each efficiency level in today's final rule is the difference between the forecasted emissions estimated by NEMS–BT at each efficiency level and the *AEO 2011* Reference case, which incorporates projected effects of all emissions regulations promulgated as of January 31, 2011. NEMS–BT tracks CO_2 emissions using a detailed module that provides results with broad coverage of all sectors and inclusion of interactive effects. For today's final rule, DOE used the version of NEMS–BT based on *AEO 2011.*

SO_2 emissions from affected electric generating units (EGUs) are subject to nationwide and regional emissions cap-and-trade programs, and DOE has preliminarily determined that these programs create uncertainty about the impact of energy conservation standards on SO_2 emissions. Title IV of the Clean Air Act sets an annual emissions cap on SO_2 for affected EGUs in the 48 contiguous States and the District of Columbia (D.C.). SO_2 emissions from 28 eastern States and D.C. are also limited under the Clean Air Interstate Rule (CAIR, 70 FR 25162 (May 12, 2005)), which created an allowance-based trading program. Although CAIR was remanded to the Environmental Protection Agency (EPA) by the U.S. Court of Appeals for the District of Columbia Circuit (D.C. Circuit) (see *North Carolina* v. *EPA,* 550 F.3d 1176 (D.C. Cir. 2008)), it remained in effect temporarily, consistent with the D.C. Circuit's earlier opinion in *North Carolina* v. *EPA,* 531 F.3d 896 (D.C. Cir. 2008). On July 6, 2010, EPA issued the Transport Rule proposal, a replacement for CAIR. 75 FR 45210 (August 2, 2010). On July 6, 2011, EPA issued the final Transport Rule, titled the Cross-State Air Pollution Rule. 76 FR 48208 (August 8, 2011). (See *http://www.epa.gov/crossstaterule/*). On December 30, 2011, however, the D.C. Circuit stayed the new rules while a panel of judges

[37] EIA approves the use of the name ''NEMS'' to describe only an *AEO* version of the model without any modification to code or data. Because the present analysis entails some minor code modifications and runs the model under various policy scenarios that deviate from *AEO* assumptions, the name ''NEMS–BT'' refers to the model as used here. (BT stands for DOE's Building Technologies Program.)

reviews them, and told EPA to continue enforcing CAIR (see *EME Homer City Generation* v. *EPA,* No. 11–1302, Order at *2 (D.C. Cir. Dec. 30, 2011)). The *AEO 2011* NEMS–BT used for today's final rule assumes the implementation of CAIR.[38]

The attainment of emissions caps typically is flexible among EGUs and is enforced through the use of emissions allowances and tradable permits. Under existing EPA regulations, any excess SO_2 emissions allowances resulting from the lower electricity demand caused by the imposition of an energy conservation standard could be used to permit offsetting increases in SO_2 emissions by any regulated EGU. However, if the new and amended standards resulted in a permanent increase in the quantity of unused emissions allowances, there would be an overall reduction in SO_2 emissions from the standards. While there remains some uncertainty about the ultimate effects of energy conservation standards on SO_2 emissions covered by the existing cap-and-trade system, the NEMS–BT modeling system that DOE uses to forecast emissions reductions currently indicates that no physical reductions in power sector emissions would occur for SO_2. DOE acknowledges, however, that even though there is a cap on SO_2 emissions and uncertainty whether efficiency standards would reduce SO_2 emissions, it is possible that standards could reduce the compliance cost by reducing demand for SO_2 allowances.

As discussed above, the *AEO 2011* NEMS used for today's final rule assumes the implementation of CAIR, which established a cap on NO_X emissions in 28 eastern States and the District of Columbia. With CAIR in effect, the energy conservation standards that are the subject of today's final rule are expected to have little or no physical effect on NO_X emissions in those States covered by CAIR, for the same reasons that they may have little effect on SO_2 emissions. However, the final standards would be expected to reduce NO_X emissions in the 22 States not affected by CAIR. For these 22 States, DOE is using the NEMS–BT to estimate NO_X emissions reductions from the standards considered in today's final rule.

On February 16, 2012, EPA published national emissions standards for hazardous air pollutants (NESHAPs) for mercury and certain other pollutants emitted from coal and oil-fired EGUs. 77 FR 9304 (Feb. 16, 2012) (Final Rule). The NESHAPs do not include emissions caps and, as such, DOE's energy conservation standards would likely reduce Hg emissions. For the emissions analysis for this rulemaking, DOE estimated mercury emissions reductions using NEMS–BT based on *AEO 2011,* which does not incorporate the NESHAPs. DOE expects that future versions of the NEMS–BT model will reflect the implementation of the NESHAPs.

H. Monetizing Carbon Dioxide and Other Emissions Impacts

As part of the development of this final rule, DOE considered the estimated monetary benefits likely to result from the reduced emissions of CO_2 and NO_X that are expected to result from each of the considered efficiency levels. In order to make this calculation similar to the calculation of the NPV of customer benefit, DOE considered the reduced emissions expected to result over the lifetime of products shipped in the forecast period for each efficiency level. This section summarizes the basis for the monetary values used for each of these emissions and presents the values considered in this rulemaking.

For today's final rule, DOE is relying on a set of values for the social cost of carbon (SCC) that was developed by an interagency process. A summary of the basis for those values is provided below, and a more detailed description of the methodologies used is provided as an appendix to chapter 10 of the final rule TSD.

1. Social Cost of Carbon

Under section 1(b)(6) of Executive Order 12866, ''Regulatory Planning and Review,'' 58 FR 51735 (Oct. 4, 1993), agencies must, to the extent permitted by law, assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. The purpose of the SCC estimates presented here is to allow agencies to incorporate the monetized social benefits of reducing CO_2 emissions into cost-benefit analyses of regulatory actions that have small, or ''marginal,'' impacts on cumulative global emissions. The estimates are presented with an acknowledgement of the many uncertainties involved and with a clear understanding that they should be updated over time to reflect increasing knowledge of the science and economics of climate impacts.

As part of the interagency process that developed the SCC estimates, technical experts from numerous agencies met on a regular basis to consider public comments, explore the technical literature in relevant fields, and discuss key model inputs and assumptions. The main objective of this process was to develop a range of SCC values using a defensible set of input assumptions grounded in the existing scientific and economic literatures. In this way, key uncertainties and model differences transparently and consistently inform the range of SCC estimates used in the rulemaking process.

a. Monetizing Carbon Dioxide Emissions

The SCC is an estimate of the monetized damages associated with an incremental increase in carbon emissions in a given year. It is intended to include (but is not limited to) changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services. Estimates of the SCC are provided in dollars per metric ton of carbon dioxide.

When attempting to assess the incremental economic impacts of carbon dioxide emissions, the analyst faces a number of serious challenges. A recent report from the National Research Council[39] points out that any assessment will suffer from uncertainty, speculation, and lack of information about: (1) Future emissions of greenhouse gases; (2) the effects of past and future emissions on the climate system; (3) the impact of changes in climate on the physical and biological environment; and (4) the translation of these environmental impacts into economic damages. As a result, any effort to quantify and monetize the harms associated with climate change will raise serious questions of science, economics, and ethics and should be viewed as provisional.

Despite the serious limits of both quantification and monetization, SCC estimates can be useful in estimating the social benefits of reducing carbon dioxide emissions. Consistent with the directive in Executive Order 12866 discussed above, the purpose of the SCC estimates presented here is to make it possible for agencies to incorporate the social benefits from reducing carbon dioxide emissions into cost-benefit analyses of regulatory actions that have small, or ''marginal,'' impacts on cumulative global emissions. Most

[38] DOE notes that future iterations of the NEMS–BT model will incorporate any changes necessitated by the Transport Rule, if and when regulatory and judicial review of the rule is complete.

[39] National Research Council, ''Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use,'' National Academies Press: Washington, DC (2009).

Federal regulatory actions can be expected to have marginal impacts on global emissions.

For such policies, the agency can estimate the benefits from reduced (or costs from increased) emissions in any future year by multiplying the change in emissions in that year by the SCC value appropriate for that year. The net present value of the benefits can then be calculated by multiplying each of these future benefits by an appropriate discount factor and summing across all affected years. This approach assumes that the marginal damages from increased emissions are constant for small departures from the baseline emissions path, an approximation that is reasonable for policies that have effects on emissions that are small relative to cumulative global carbon dioxide emissions. For policies that have a large (non-marginal) impact on global cumulative emissions, there is a separate question of whether the SCC is an appropriate tool for calculating the benefits of reduced emissions. This concern is not applicable to this notice, and DOE does not attempt to answer that question here.

At the time of the preparation of this notice, the most recent interagency estimates of the potential global benefits resulting from reduced CO_2 emissions in 2010, expressed in 2010$, were $4.9, $22.3, $36.5, and $67.6 per metric ton avoided. For emissions reductions that occur in later years, these values grow in real terms over time. Additionally, the interagency group determined that a range of values from 7 percent to 23 percent should be used to adjust the global SCC to calculate domestic effects,[40] although preference is given to consideration of the global benefits of reducing CO_2 emissions.

It is important to emphasize that the interagency process is committed to updating these estimates as the science and economic understanding of climate change and its impacts on society improves over time. Specifically, the interagency group has set a preliminary goal of revisiting the SCC values within 2 years or at such time as substantially updated models become available, and to continue to support research in this area. In the meantime, the interagency group will continue to explore the issues raised by this analysis and consider public comments as part of the ongoing interagency process.

[40] It is recognized that this calculation for domestic values is approximate, provisional, and highly speculative. There is no *a priori* reason why domestic benefits should be a constant fraction of net global damages over time.

b. Social Cost of Carbon Values Used in Past Regulatory Analyses

To date, economic analyses for Federal regulations have used a wide range of values to estimate the benefits associated with reducing carbon dioxide emissions. In the model year 2011 CAFE final rule, the Department of Transportation (DOT) used both a ''domestic'' SCC value of $2 per ton of CO_2 and a ''global'' SCC value of $33 per ton of CO_2 for 2007 emission reductions (in 2007$), increasing both values at 2.4 percent per year. It also included a sensitivity analysis at $80 per ton of CO_2. See *Average Fuel Economy Standards Passenger Cars and Light Trucks Model Year 2011,* 74 FR 14196 (March 30, 2009) (Final Rule); Final Environmental Impact Statement Corporate Average Fuel Economy Standards, Passenger Cars and Light Trucks, Model Years 2011–2015 at 3–90 (Oct. 2008) (Available at: *http://www.nhtsa.gov/fuel-economy*). A domestic SCC value is meant to reflect the value of damages in the United States resulting from a unit change in carbon dioxide emissions, while a global SCC value is meant to reflect the value of damages worldwide.

A 2008 regulation proposed by DOT assumed a domestic SCC value of $7 per ton of CO_2 (in 2006$) for 2011 emission reductions (with a range of $0 to $14 for sensitivity analysis), also increasing at 2.4 percent per year. See *Average Fuel Economy Standards, Passenger Cars and Light Trucks, Model Years 2011–2015,* 73 FR 24352 (May 2, 2008) (Proposed Rule); Draft Environmental Impact Statement Corporate Average Fuel Economy Standards, Passenger Cars and Light Trucks, Model Years 2011–2015 at 3–58 (June 2008) (Available at: *http://www.nhtsa.gov/fuel-economy*). A regulation for packaged terminal air conditioners and packaged terminal heat pumps finalized by DOE in October of 2008 used a domestic SCC range of $0 to $20 per ton CO_2 for 2007 emission reductions (in 2007$). 73 FR 58772, 58814 (Oct. 7, 2008). In addition, EPA's 2008 Advance Notice of Proposed Rulemaking on Regulating Greenhouse Gas Emissions Under the Clean Air Act identified what it described as ''very preliminary'' SCC estimates subject to revision. 73 FR 44354 (July 30, 2008). EPA's global mean values were $68 and $40 per ton CO_2 for discount rates of approximately 2 percent and 3 percent, respectively (in 2006$ for 2007 emissions).

In 2009, an interagency process was initiated to offer a preliminary assessment of how best to quantify the benefits from reducing carbon dioxide emissions. To ensure consistency in how benefits are evaluated across agencies, the Administration sought to develop a transparent and defensible method, specifically designed for the rulemaking process, to quantify avoided climate change damages from reduced CO_2 emissions. The interagency group did not undertake any original analysis. Instead, it combined SCC estimates from the existing literature to use as interim values until a more comprehensive analysis could be conducted. The outcome of the preliminary assessment by the interagency group was a set of five interim values: Global SCC estimates for 2007 (in 2006$) of $55, $33, $19, $10, and $5 per ton of CO_2. These interim values represent the first sustained interagency effort within the U.S. government to develop an SCC for use in regulatory analysis. The results of this preliminary effort were presented in several proposed and final rules and were offered for public comment in connection with proposed rules, including the joint EPA–DOT fuel economy and CO_2 tailpipe emission proposed rules.

c. Current Approach and Key Assumptions

Since the release of the interim values, the interagency group reconvened on a regular basis to generate improved SCC estimates, which were considered for this final rule. Specifically, the group considered public comments and further explored the technical literature in relevant fields. The interagency group relied on three integrated assessment models (IAMs) commonly used to estimate the SCC: The FUND, DICE, and PAGE models.[41] These models are frequently cited in the peer-reviewed literature and were used in the last assessment of the Intergovernmental Panel on Climate Change. Each model was given equal weight in the SCC values that were developed.

Each model takes a slightly different approach to model how changes in emissions result in changes in economic damages. A key objective of the interagency process was to enable a consistent exploration of the three models while respecting the different approaches to quantifying damages taken by the key modelers in the field. An extensive review of the literature was conducted to select three sets of input parameters for these models: Climate sensitivity, socio-economic and emissions trajectories, and discount rates. A probability distribution for

[41] The models are described in appendix 15–A of the final rule TSD.

climate sensitivity was specified as an input into all three models. In addition, the interagency group used a range of scenarios for the socio-economic parameters and a range of values for the discount rate. All other model features were left unchanged, relying on the model developers' best estimates and judgments.

The interagency group selected four SCC values for use in regulatory analyses. Three values are based on the average SCC from three integrated assessment models, at discount rates of 2.5 percent, 3 percent, and 5 percent. The fourth value, which represents the 95th-percentile SCC estimate across all three models at a 3-percent discount rate, is included to represent higher-than-expected impacts from temperature change further out in the tails of the SCC distribution. For emissions (or emission reductions) that occur in later years, these values grow in real terms over time, as depicted in Table V.9.

TABLE V.9—SOCIAL COST OF CO_2, 2010–2050

[In 2007 dollars per metric ton]

Year	Discount rate (%)			
	5	3	2.5	3
	Average	Average	Average	95th Percentile
2010	4.7	21.4	35.1	64.9
2015	5.7	23.8	38.4	72.8
2020	6.8	26.3	41.7	80.7
2025	8.2	29.6	45.9	90.4
2030	9.7	32.8	50.0	100.0
2035	11.2	36.0	54.2	109.7
2040	12.7	39.2	58.4	119.3
2045	14.2	42.1	61.7	127.8
2050	15.7	44.9	65.0	136.2

It is important to recognize that a number of key uncertainties remain, and that current SCC estimates should be treated as provisional and revisable since they will evolve with improved scientific and economic understanding. The interagency group also recognizes that the existing models are imperfect and incomplete. The National Research Council report mentioned above points out that there is tension between the goal of producing quantified estimates of the economic damages from an incremental ton of carbon and the limits of existing efforts to model these effects. There are a number of concerns and problems that should be addressed by the research community, including research programs housed in many of the Federal agencies participating in the interagency process to estimate the SCC.

DOE recognizes the uncertainties embedded in the estimates of the SCC used for cost-benefit analyses. As such, DOE and others in the U.S. Government intend to periodically review and reconsider those estimates to reflect increasing knowledge of the science and economics of climate impacts, as well as improvements in modeling. In this context, statements recognizing the limitations of the analysis and calling for further research take on exceptional significance.

In summary, in considering the potential global benefits resulting from reduced CO_2 emissions, DOE used the most recent values identified by the interagency process, adjusted to 2010$ using the GDP price deflator. For each of the four cases specified, the values used for emissions in 2010 were $4.9, $22.3, $36.5, and $67.6 per metric ton avoided (values expressed in 2010$).[42] To monetize the CO_2 emissions reductions expected to result from new or amended standards for the product classes in today's final rule, DOE used the values identified in Table A1 of the ''Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866,'' which is reprinted in appendix 10–A of the final rule TSD, appropriately escalated to 2010$. 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 SCC values in each case.

2. Valuation of Other Emissions Reductions

DOE investigated the potential monetary benefit of reduced NO_X emissions from the efficiency levels it considered. As noted above, DOE has taken into account how new or amended energy conservation standards would reduce NO_X emissions in those 22 States not affected by the CAIR. DOE estimated the monetized value of NO_X emissions reductions resulting from each of the efficiency levels considered for today's final rule based on environmental damage estimates found in the relevant scientific literature. Available estimates suggest a very wide range of monetary values, ranging from $370 per ton to $3,800 per ton of NO_X from stationary sources, measured in 2001$ (equivalent to a range of $450 to $4,623 per ton in 2010$).[43] In accordance with OMB guidance, DOE conducted two calculations of the monetary benefits derived using each of the economic values used for NO_X, one using a real discount rate of 3 percent and the other using a real discount rate of 7 percent.[44]

DOE is aware of multiple agency efforts to determine the appropriate range of values used in evaluating the potential economic benefits of reduced Hg emissions. DOE has decided to await further guidance regarding consistent valuation and reporting of Hg emissions before it monetizes Hg in its rulemakings.

I. Other Issues

1. Compliance Dates of the Amended and New Energy Conservation Standards

Generally, covered equipment to which a new or amended energy conservation standard applies must comply with the standard if such

[42] Table A1 presents SCC values through 2050. For DOE's calculation, it derived values after 2050 using the 3-percent per year escalation rate used by the interagency group.

[43] For additional information, refer to U.S. Office of Management and Budget, Office of Information and Regulatory Affairs, *2006 Report to Congress on the Costs and Benefits of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities,* Washington, DC.

[44] OMB, Circular A–4: Regulatory Analysis (Sept. 17, 2003).

equipment is manufactured or imported on or after a specified date. In today's final rule, DOE is evaluating whether more-stringent efficiency levels than those in ASHRAE Standard 90.1–2010 would be technologically feasible, economically justified, and result in a significant amount of energy savings. If DOE were to adopt a rule prescribing energy conservation standards at the efficiency levels contained in ASHRAE Standard 90.1–2010, EPCA states that compliance with any such standards shall be required on or after a date which is two or three years (depending on equipment size) after the compliance date of the applicable minimum energy efficiency requirement in the amended ASHRAE/IES standard. (42 U.S.C. 6313(a)(6)(D)) DOE has applied this two-year or three-year implementation period to determine the compliance date of any energy conservation standard equal to the efficiency levels specified by ASHRAE Standard 90.1–2010 proposed by this rulemaking. Thus, if DOE decides to adopt the efficiency levels in ASHRAE Standard 90.1–2010, the compliance date of the rulemaking would be dependent upon the date specified in ASHRAE Standard 90.1–2010 or its publication date, if none is specified.

The rule would apply to equipment <65,000 Btu/h (10 product classes [45]) manufactured on and after October 29, 2012, which is two years after the publication date of ASHRAE Standard 90.1–2010, and to equipment ≥65,000 Btu/h (20 product classes [46]) manufactured on and after October 29, 2013, which is three years after the publication date of ASHRAE Standard 90.1–2010. Typically, equipment equal to or greater than 65,000 Btu/h and less than 135,000 Btu/h would have a compliance date two years after the publication of ASHRAE Standard 90.1. However, because ASHRAE Standard 90.1–2010 established a product class for computer room air conditioners that combines traditional small and large categories, DOE has decided to assign the later compliance date of three years after the publication of ASHRAE 90.1–2010 to all computer room air conditioner product classes that cover products between 65,000 Btu/h and 240,000 Btu/h.

If DOE were to adopt a rule prescribing energy conservation standards higher than the efficiency levels contained in ASHRAE Standard 90.1–2010, EPCA states that compliance with any such standards is required for products manufactured on and after a date which is four years after the date the rule is published in the **Federal Register.** (42 U.S.C. 6313(a)(6)(D)) DOE has applied this 4-year implementation period to determine the compliance date for any energy conservation standard higher than the efficiency levels specified by ASHRAE Standard 90.1–2010 that might be prescribed. Thus, for products for which DOE might adopt a level more stringent than the ASHRAE efficiency levels, the rule would apply to products manufactured on and after a date four years from the date of publication of the final rule, which the statute requires to be completed by April 29, 2013 (thereby resulting in a compliance date no later than April 29, 2017).[47]

Table V.10 presents the anticipated compliance dates of a new energy conservation standard for each equipment class of computer room air conditioners.

TABLE V.10—COMPLIANCE DATES FOR AN ENERGY CONSERVATION STANDARD FOR EACH EQUIPMENT CLASS OF COMPUTER ROOM AIR CONDITIONERS

Equipment class	Compliance date for adopting the efficiency levels in ASHRAE Standard 90.1–2010	Compliance date for adopting more-stringent efficiency levels than those in ASHRAE Standard 90.1–2010 (no later than * * *)
Air conditioners, air-cooled, <65,000 Btu/h	October 29, 2012	April 29, 2017.
Air conditioners, air-cooled, ≥65,000 and <240,000 Btu/h	October 29, 2013	April 29, 2017.
Air conditioners, air-cooled, ≥240,000 Btu/h and <760,000 Btu/h	October 29, 2013	April 29, 2017.
Air conditioners, water-cooled, <65,000 Btu/h	October 29, 2012	April 29, 2017.
Air conditioners, water-cooled, ≥65,000 and <240,000 Btu/h	October 29, 2013	April 29, 2017.
Air conditioners, water-cooled, ≥240,000 Btu/h and <760,000 Btu/h	October 29, 2013	April 29, 2017.
Air conditioners, water-cooled with fluid economizers, <65,000 Btu/h	October 29, 2012	April 29, 2017.
Air conditioners, water-cooled with fluid economizers, ≥65,000 and <240,000 Btu/h	October 29, 2013	April 29, 2017.
Air conditioners, water-cooled with fluid economizers, ≥240,000 Btu/h and <760,000 Btu/h	October 29, 2013	April 29, 2017.
Air conditioners, glycol-cooled, <65,000 Btu/h	October 29, 2012	April 29, 2017.
Air conditioners, glycol-cooled, ≥65,000 and <240,000 Btu/h	October 29, 2013	April 29, 2017.
Air conditioners, glycol-cooled, ≥240,000 Btu/h and <760,000 Btu/h	October 29, 2013	April 29, 2017.
Air conditioners, glycol-cooled with fluid economizers, <65,000 Btu/h	October 29, 2012	April 29, 2017.
Air conditioners, glycol-cooled with fluid economizers, ≥65,000 and <240,000 Btu/h	October 29, 2013	April 29, 2017.
Air conditioners, glycol-cooled with fluid economizers, ≥240,000 Btu/h and <760,000 Btu/h	October 29, 2013	April 29, 2017.

[45] The analysis only shows five product classes for this equipment size because DOE was able to analyze downflow and upflow units in combination. These units are nearly identical, but ASHRAE Standard 90.1–2010 identifies a 0.11 SCOP reduction in efficiency levels for upflow units as compared to downflow units (likely as a result of the additional static pressure that the blower fan must overcome in the upflow orientation). By adjusting the upflow units by 0.11 SCOP, DOE could analyze upflow and downflow units in combination.

[46] The analysis only shows ten product classes for this equipment size for the same reasons mentioned for equipment <65,000 Btu/h.

[47] Since ASHRAE published ASHRAE Standard 90.1–2010 on October 29, 2010, EPCA requires that DOE publish a final rule adopting more-stringent standards than those in ASHRAE Standard 90.1–2010, if warranted, within 30 months of ASHRAE action (*i.e.,* by April 2013). Thus, four years from April 2013 would be April 2017, which would be the anticipated compliance date for DOE adoption of more-stringent standards.

VI. Analytical Results

A. Efficiency Levels Analyzed

1. Water-Cooled and Evaporatively-Cooled Commercial Package Air-Conditioning and Heating Equipment

The methodology for water-cooled and evaporatively-cooled products was presented in the May 2011 NODA. 76 FR 25622, 25637–40 (May 5, 2011). Table VI.1 presents the baseline efficiency level and the higher efficiency levels analyzed for each equipment class of water-cooled and evaporatively-cooled products subject to today's final rule. The baseline efficiency levels correspond to the lowest efficiency levels currently available on the market. The efficiency levels above the baseline represent efficiency levels specified in ASHRAE Standard 90.1–2010 and higher efficiency levels where equipment is currently available on the market.

TABLE VI.1—EFFICIENCY LEVELS ANALYZED FOR WATER-COOLED AND EVAPORATIVELY-COOLED PRODUCTS

Equipment class	Representative capacity *(tons)*	Efficiency levels analyzed (EER)
Small Water-Cooled Air Conditioners, Electric or No Heat, ≥65,000 Btu/h and <135,000 Btu/h	8	Baseline—11.5 ASHRAE—12.1 13.0 14.0 15.0 Max-Tech—16.4
Small Water-Cooled Air Conditioners, Other Heat, ≥65,000 Btu/h and <135,000 Btu/h	8	Baseline—11.3 ASHRAE—11.9 13.0 14.0 15.0 Max-Tech—16.4
Large Water-Cooled Air Conditioners, Electric or No Heat, ≥135,000 Btu/h and <240,000 Btu/h	15	Baseline—11.0 ASHRAE—12.5 13.0 14.0 15.0 Max-Tech—16.1
Large Water-Cooled Air Conditioners, Other Heat, ≥135,000 Btu/h and <240,000 Btu/h	15	Baseline—11.0 ASHRAE—12.3 13.0 14.0 15.0 Max-Tech—16.1
Very Large Water-Cooled Air Conditioners, Electric or No Heat, ≥240,000 Btu/h and <760,000 Btu/h.	35	Baseline—11.0 ASHRAE—12.4 13.0 14.0 Max-Tech—14.8
Very Large Water-Cooled Air Conditioners, Other Heat, ≥240,000 Btu/h and <760,000 Btu/h	35	Baseline—10.8 ASHRAE—12.2 13.0 14.0 Max-Tech—14.8
Very Large Evaporatively-Cooled Air Conditioner, Electric or No Heat, ≥240,000 Btu/h and <760,000 Btu/h.	40	Baseline—11.0 ASHRAE—11.9 12.5 Max-Tech—13.1
Very Large Evaporatively-Cooled Air Conditioner, Other Heat, ≥240,000 and <760,000 Btu/h	40	Baseline—10.8 ASHRAE—11.7 12.5 Max-Tech—13.1

2. VRF Water-Source Heat Pumps

The methodology for VRF water-source heat pumps was presented in the January 2012 NOPR. 77 FR 2356, 2379–82 (Jan. 17, 2012). Table VI.2 presents the baseline efficiency level and the higher efficiency levels analyzed for each equipment class of VRF water-source heat pumps subject to today's final rule and with equipment on the market. The baseline efficiency levels correspond to the lowest efficiency levels currently available on the market. The efficiency levels above the baseline represent efficiency levels specified in ASHRAE Standard 90.1–2010 and higher efficiency levels where equipment is currently available on the market.

TABLE VI.2—EFFICIENCY LEVELS ANALYZED FOR VRF WATER-SOURCE HEAT PUMPS

Equipment class	Representative capacity *kBtu/h*	Efficiency levels analyzed (EER)
VRF Water-Source Heat Pumps, ≥135,000 Btu/h and <760,000 Btu/h, without heat recovery	242	Baseline—9.5 ASHRAE—10 11 12 13 Max-Tech—14.5
VRF Water-Source Heat Pumps, ≥135,000 Btu/h and <760,000 Btu/h, with heat recovery	215	Baseline—9.5 ASHRAE—9.8 11 12 13 Max-Tech—14.5

3. Computer Room Air Conditioners

The methodology for computer room air conditioners was presented in section V of today's final rule. Table VI.3 presents the market baseline efficiency level and the higher efficiency levels analyzed for each equipment class of computer room air conditioners subject to today's final rule. The market baseline efficiency levels correspond to the lowest efficiency levels currently available on the market. The efficiency levels above the baseline represent efficiency levels specified by ASHRAE Standard 90.1–2010 and efficiency levels above those specified in ASHRAE Standard 90.1–2010 where equipment is currently available on the market. Note that for the economic analysis, efficiency levels above those specified in ASHRAE Standard 90.1–2010 are compared to ASHRAE Standard 90.1–2010 as the baseline rather than the market baseline.

TABLE VI.3—EFFICIENCY LEVELS ANALYZED FOR COMPUTER ROOM AIR CONDITIONERS

Equipment class	Representative capacity *kBtu/h*	Efficiency levels analyzed (SCOP)
Air conditioners, air-cooled, <65,000 Btu/h	36	Market Baseline—2.00 ASHRAE—2.20 2.40 2.60 2.80 Max-Tech—3.00
Air conditioners, air-cooled, ≥65,000 Btu/h and <240,000 Btu/h	132	Market Baseline—2.10 ASHRAE—2.10 2.35 2.60 2.85 Max-Tech—3.10
Air conditioners, air-cooled, ≥240,000 Btu/h and <760,000 Btu/h	288	Market Baseline—1.90 ASHRAE—1.90 2.15 2.40 2.65 Max-Tech—2.90
Air conditioners, water-cooled, <65,000 Btu/h	36	Market Baseline—2.40 ASHRAE—2.60 2.80 3.00 3.20 Max-Tech—3.40
Air conditioners, water-cooled, ≥65,000 Btu/h and <240,000 Btu/h	132	Market Baseline—2.30 ASHRAE—2.50 2.70 2.90 3.10

TABLE VI.3—EFFICIENCY LEVELS ANALYZED FOR COMPUTER ROOM AIR CONDITIONERS—Continued

Equipment class	Representative capacity *kBtu/h*	Efficiency levels analyzed (SCOP)
		Max-Tech—3.30
Air conditioners, water-cooled, ≥240,000 Btu/h and <760,000 Btu/h	288	Market Baseline—2.20 ASHRAE—2.40 2.60 2.80 3.00 Max-Tech—3.20
Air conditioners, water-cooled with fluid economizers, <65,000 Btu/h	36	Market Baseline—2.35 ASHRAE—2.55 2.75 2.95 3.15 Max-Tech—3.35
Air conditioners, water-cooled with fluid economizers, ≥65,000 Btu/h and <240,000 Btu/h	132	Market Baseline—2.25 ASHRAE—2.45 2.65 2.85 3.05 Max-Tech—3.25
Air conditioners, water-cooled with fluid economizers, ≥240,000 Btu/h and <760,000 Btu/h	288	Market Baseline—2.15 ASHRAE—2.35 2.55 2.75 2.95 Max-Tech—3.15
Air conditioners, glycol-cooled, <65,000 Btu/h	36	Market Baseline—2.30 ASHRAE—2.50 2.70 2.90 3.10 Max-Tech—3.30
Air conditioners, glycol-cooled, ≥65,000 and <240,000 Btu/h	132	Market Baseline—1.95 ASHRAE—2.15 2.35 2.55 2.75 Max-Tech—2.95
Air conditioners, glycol-cooled, ≥240,000 Btu/h and <760,000 Btu/h	288	Market Baseline—1.90 ASHRAE—2.10 2.30 2.50 2.70 Max-Tech—2.90
Air conditioners, glycol-cooled with fluid economizers, <65,000 Btu/h	36	Market Baseline—2.25 ASHRAE—2.45 2.65 2.85 3.05 Max-Tech—3.25

TABLE VI.3—EFFICIENCY LEVELS ANALYZED FOR COMPUTER ROOM AIR CONDITIONERS—Continued

Equipment class	Representative capacity *kBtu/h*	Efficiency levels analyzed (SCOP)
Air conditioners, glycol-cooled with fluid economizers, ≥65,000 Btu/h and <240,000 Btu/h	132	Market Baseline—1.90 ASHRAE—2.10 2.30 2.50 2.70 Max-Tech—2.90
Air conditioners, glycol-cooled with fluid economizers, ≥240,000 Btu/h and <760,000 Btu/h	288	Market Baseline—1.85 ASHRAE—2.05 2.25 2.45 2.65 Max-Tech—2.85

B. Energy Savings and Economic Justification

1. Water-Cooled and Evaporatively-Cooled Commercial Package Air-Conditioning and Heating Equipment

DOE estimated the potential primary energy savings in quads (*i.e.,* 10^{15} Btu) for each efficiency level considered within each equipment class analyzed. Table VI.4 to Table VI.11 show the potential energy savings resulting from the analyses conducted as part of the May 2011 NODA. 76 FR 25622, 25637 (May 5, 2011). As discussed in the January 2012 NOPR, DOE did not conduct an economic analysis for this equipment category, because of the minimal energy savings. 77 FR 2356, 2405 (Jan. 17, 2012).

TABLE VI.4—POTENTIAL ENERGY SAVINGS FOR SMALL WATER-COOLED EQUIPMENT WITH ELECTRIC RESISTANCE OR NO HEAT

[2013–2042]

Efficiency level	Primary energy savings * (quads)	
	Historical shipment trend	Shipments fixed to 2009
Level 1—ASHRAE—12.1 EER	0.000005	0.000011
Level 2—13 EER	0.000018	0.000060
Level 3—14 EER	0.000044	0.000144
Level 4—15 EER	0.000074	0.000238
Level 5—"Max-Tech"—16.4 EER	0.000121	0.000388

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1–2010 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1–2010 standards were adopted.

TABLE VI.5—POTENTIAL ENERGY SAVINGS FOR SMALL WATER-COOLED EQUIPMENT WITH OTHER HEAT

[2013–2042]

Efficiency level	Primary energy savings * (quads)	
	Historical shipment trend	Shipments fixed to 2009
Level 1—ASHRAE—11.9 EER	0.0000005	0.0000013
Level 2—13 EER	0.0000024	0.0000082
Level 3—14 EER	0.0000053	0.0000174
Level 4—15 EER	0.0000085	0.0000276
Level 5—"Max-Tech"—16.4 EER	0.0000137	0.0000441

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1–2010 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1–2010 standards were adopted.

TABLE VI.6—POTENTIAL ENERGY SAVINGS FOR LARGE WATER-COOLED EQUIPMENT WITH ELECTRIC RESISTANCE OR NO HEAT

[2014–2043]

Efficiency level	Primary energy savings * (quads)	
	Historical shipment trend	Shipments fixed to 2009
Level 1—ASHRAE—12.5 EER	0.00014	0.00027

TABLE VI.6—POTENTIAL ENERGY SAVINGS FOR LARGE WATER-COOLED EQUIPMENT WITH ELECTRIC RESISTANCE OR NO HEAT—Continued

[2014–2043]

Efficiency level	Primary energy savings * (quads)	
	Historical shipment trend	Shipments fixed to 2009
Level 2—13 EER	0.00002	0.00008
Level 3—14 EER	0.00013	0.00032
Level 4—15 EER	0.00024	0.00056
Level 5—“Max-Tech”—16.1 EER	0.00039	0.00089

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1–2010 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1–2010 standards were adopted.

TABLE VI.7—POTENTIAL ENERGY SAVINGS FOR LARGE WATER-COOLED EQUIPMENT WITH OTHER HEAT

[2014–2043]

Efficiency level	Primary energy savings * (quads)	
	Historical shipment trend	Shipments fixed to 2009
Level 1—ASHRAE—12.3 EER	0.00001	0.00003
Level 2—13 EER	0.00001	0.00001
Level 3—14 EER	0.00002	0.00004
Level 4—15 EER	0.00003	0.00007
Level 5—“Max-Tech”—16.1 EER	0.00005	0.00010

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1–2010 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1–2010 standards were adopted.

TABLE VI.8—POTENTIAL ENERGY SAVINGS FOR VERY LARGE WATER-COOLED EQUIPMENT WITH ELECTRIC RESISTANCE OR NO HEAT

[2014–2043]

Efficiency level	Primary energy savings * (quads)	
	Historical shipment trend	Shipments fixed to 2009
Level 1—ASHRAE—12.4 EER	0.0002	0.0001
Level 2—13 EER	0.0001	0.0001
Level 3—14 EER	0.0005	0.0003
Level 4—“Max-Tech”—14.8 EER	0.0008	0.0005

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1–2010 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1–2010 standards were adopted.

TABLE VI.9—POTENTIAL ENERGY SAVINGS FOR VERY LARGE WATER-COOLED EQUIPMENT WITH OTHER HEAT

[2014–2043]

Efficiency level	Primary energy savings * (quads)	
	Historical shipment trend	Shipments fixed to 2009
Level 1—ASHRAE—12.2 EER	0.002	0.001
Level 2—13 EER	0.001	0.001
Level 3—14 EER	0.005	0.003
Level 4—“Max-Tech”—14.8 EER	0.008	0.005

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1–2010 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1–2010 standards were adopted.

TABLE VI.10—POTENTIAL ENERGY SAVINGS FOR VERY LARGE EVAPORATIVELY-COOLED EQUIPMENT WITH ELECTRIC RESISTANCE OR NO HEAT

[2014–2043]

Efficiency level	Primary energy savings * (quads)	
	Historical shipment trend	Shipments fixed to 2009
Level 1—ASHRAE—11.9 EER	0.00013	0.00009
Level 2—12.5 EER	0.00008	0.00005

TABLE VI.10—POTENTIAL ENERGY SAVINGS FOR VERY LARGE EVAPORATIVELY-COOLED EQUIPMENT WITH ELECTRIC RESISTANCE OR NO HEAT—Continued

[2014–2043]

Efficiency level	Primary energy savings* (quads)	
	Historical shipment trend	Shipments fixed to 2009
Level 3—"Max-Tech"—13.1 EER	0.00017	0.00011

*The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1–2010 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1–2010 standards were adopted.

TABLE VI.11—POTENTIAL ENERGY SAVINGS FOR VERY LARGE EVAPORATIVELY-COOLED EQUIPMENT WITH OTHER HEAT

[2014–2043]

Efficiency level	Primary energy savings* (quads)	
	Historical shipment trend	Shipments fixed to 2009
Level 1—ASHRAE—11.7 EER	0.0011	0.0007
Level 2—12.5 EER	0.0010	0.0007
Level 3—"Max-Tech"—13.1 EER	0.0019	0.0012

*The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1–2010 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1–2010 standards were adopted.

2. VRF Water-Source Heat Pumps

DOE estimated the potential primary energy savings in quads (*i.e.,* 10^{15} Btu) for each efficiency level considered within the two equipment classes of VRF water-source heat pumps at or greater than 135,000 Btu/h. Table VI.12 and Table VI.13 show the potential energy savings resulting from the analyses conducted as part of the January 2012 NOPR. 77 FR 2356, 2379–82 (Jan. 17, 2012). Because there appear to be no models on the market below ASHRAE Standard 90.1–2010 levels, there are no energy savings from adopting ASHRAE. However, there are also extremely minimal energy savings from adopting a higher standard. As discussed in the January 2012 NOPR, DOE did not conduct an economic analysis for this equipment category. *Id.* at 2368–70. In addition, DOE did not identify any models on the market less than 17,000 Btu/h, and, therefore, did not conduct any analyses for this equipment category. *Id.* at 2368.

TABLE VI.12—POTENTIAL ENERGY SAVINGS FOR VRF WATER-SOURCE HEAT PUMPS, ≥135,000 BTU/H AND <760,000 BTU/H, WITHOUT HEAT RECOVERY

[2013–2042]

Efficiency level	Primary energy savings* (quads)
Level 1—ASHRAE—10.0 EER	
Level 2—11 EER	0.0009
Level 3—12 EER	0.0174
Level 4—13 EER	0.0416
Level 5—"Max-Tech"—14.5 EER	0.0761

*The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1–2010 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1–2010 standards were adopted.

TABLE VI.13—POTENTIAL ENERGY SAVINGS FOR VRF WATER-SOURCE HEAT PUMPS, ≥135,000 BTU/H AND <760,000 BTU/H WITH HEAT RECOVERY

[2013–2042]

Efficiency level	Primary energy savings* (quads)
Level 1—ASHRAE—9.8 EER	
Level 2—11 EER	0.0008
Level 3—12 EER	0.0083
Level 4—13 EER	0.0195
Level 5—"Max-Tech"—14.5 EER	0.0358

*The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1–2010 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1–2010 standards were adopted.

3. Computer Room Air Conditioners

a. Economic Impacts on Commercial Customers

i. Life-Cycle Cost and Payback Period

To evaluate the economic impact of the efficiency levels on commercial customers, DOE conducted an LCC analysis for each efficiency level. More-efficient computer room air conditioners would affect these customers in two ways: (1) Annual operating expense would decrease; and (2) purchase price would increase. Inputs used for calculating the LCC include total installed costs (*i.e.,* equipment price plus installation costs), operating expenses (*i.e.,* annual energy savings, energy prices, energy price trends, repair costs, and maintenance costs), equipment lifetime, and discount rates.

The output of the LCC model is a mean LCC savings (or cost [48]) for each equipment class, relative to the baseline CRAC efficiency level. The LCC analysis also provides information on the percentage of customers that are negatively affected by an increase in the minimum efficiency standard.

DOE also performed a PBP analysis as part of the LCC analysis. The PBP is the number of years it would take for the customer to recover the increased costs of higher-efficiency equipment as a result of energy savings based on the operating cost savings. The PBP is an economic benefit-cost measure that uses benefits and costs without discounting. Chapter 5 of the final rule TSD provides

[48] An LCC cost is shown as a negative savings in the results presented.

detailed information on the LCC and PBP analyses.

DOE's LCC and PBP analyses provided five key outputs for each efficiency level above the baseline (*i.e.,* efficiency levels more stringent than those in ASHRAE Standard 90.1–2010), as reported in Table VI.14 through Table VI.28 These outputs include the proportion of CRAC purchases in which the purchase of a computer room air conditioner that is compliant with the new energy conservation standard creates a net LCC increase, no impact, or a net LCC savings for the customer. Another output is the average net LCC savings from standard-compliant equipment, as well as the average PBP for the customer investment in standard-compliant equipment.

TABLE VI.14—SUMMARY LCC AND PBP RESULTS FOR COMPUTER ROOM AIR CONDITIONERS, AIR-COOLED, <65,000 BTU/H

Efficiency level	Life-cycle cost (*2011$*)			Life-cycle cost savings				Payback period (*years*)
				Average savings (*2011$ **)	% of Consumers that experience			
	Installed cost	Discounted operating cost	LCC		Net cost	No impact	Net benefit	Median
Baseline	12,003	33,563	45,566	....	....	....	....	....
1	13,491	31,554	45,045	584	2	89	9	8.6
2	15,239	29,905	45,144	122	18	68	14	10.3
3	17,295	28,548	45,842	(648)	67	23	10	12.2
4	19,711	27,436	47,147	(1,828)	91	5	4	14.6

* Numbers in parentheses indicate negative LCC savings.

TABLE VI.15—SUMMARY LCC AND PBP RESULTS FOR COMPUTER ROOM AIR CONDITIONERS, AIR-COOLED, ≥65,000 AND <240,000 BTU/H

Efficiency level	Life-cycle cost (*2011$*)			Life-cycle cost savings				Payback period (*years*)
				Average savings (*2011$*)	% of Consumers that experience			
	Installed cost	Discounted operating cost	LCC		Net cost	No impact	Net benefit	Median
Baseline	38,943	118,114	157,057	....	....	....	....	....
1	41,179	108,190	149,369	8,535	0	98	2	2.6
2	43,588	100,283	143,871	6,378	0	78	22	3.0
3	46,185	93,872	140,057	5,894	0	33	67	3.5
4	48,984	88,606	137,590	6,474	0	2	98	3.9

TABLE VI.16—SUMMARY LCC AND PBP RESULTS FOR COMPUTER ROOM AIR CONDITIONERS, AIR-COOLED, ≥240,000 AND <760,000 BTU/H

Efficiency level	Life-cycle cost (*2011$*)			Life-cycle cost savings				Payback period (*years*)
				Average savings (*2011$*)	% of Consumers that experience			
	Installed cost	Discounted operating cost	LCC		Net cost	No impact	Net benefit	Median
Baseline	56,633	288,343	344,977	....	....	....	....	....
1	59,852	262,649	322,501	24,709	0	98	2	1.4
2	63,322	242,741	306,063	18,947	0	78	22	1.7
3	67,061	227,026	294,087	18,146	0	33	67	2.0
4	71,092	214,460	285,553	20,871	0	2	98	2.3

TABLE VI.17—SUMMARY LCC AND PBP RESULTS FOR COMPUTER ROOM AIR CONDITIONERS, WATER-COOLED, <65,000 BTU/H

Efficiency level	Life-cycle cost (*2011$*)			Life-cycle cost savings				Payback period (*years **)
				Average savings (*2011$*)	% of Consumers that experience			
	Installed cost	Discounted operating cost	LCC		Net cost	No impact	Net benefit	Median
Baseline	23,716	30,844	54,560	....	....	....	....	....
1	20,284	29,008	49,292	5,286	0	72	28	(21.7)
2	17,504	27,426	44,930	7,264	0	49	51	(21.1)
3	15,253	26,051	41,303	7,896	0	13	87	(20.5)
4	13,429	24,845	38,274	10,089	0	3	97	(19.9)

* Numbers in parentheses indicate negative payback period due to a declining installed cost at higher efficiency levels.

TABLE VI.18—SUMMARY LCC AND PBP RESULTS FOR COMPUTER ROOM AIR CONDITIONERS, WATER-COOLED, ≥65,000 BTU/H AND <240,000 BTU/H

Efficiency level	Life-cycle cost *(2011$)*			Life-cycle cost savings				Payback period *(years)*
	Installed cost	Discounted operating cost	LCC	Average savings *(2011$ *)*	% of Consumers that experience: Net cost	No impact	Net benefit	Median
Baseline	22,767	106,535	129,302	....	....	....	....	....
1	28,390	101,751	130,141	(774)	21	72	7	14.2
2	35,948	98,421	134,370	(4,582)	56	42	2	19.9
3	46,106	96,571	142,677	(11,622)	80	20	0	29.3
4	59,759	96,331	156,090	(23,097)	96	4	0	47.0

* Numbers in parentheses indicate negative LCC savings.

TABLE VI.19—SUMMARY LCC AND PBP RESULTS FOR COMPUTER ROOM AIR CONDITIONERS, WATER-COOLED, ≥240,000 AND <760,000 BTU/H

Efficiency level	Life-cycle cost *(2011$)*			Life-cycle cost savings				Payback period *(years)*
	Installed cost	Discounted operating cost	LCC	Average savings *(2011$ *)*	% of Consumers that experience: Net cost	No impact	Net benefit	Median
Baseline	42,240	240,877	283,117	....	....	....	....	....
1	52,910	230,552	283,462	(196)	17	72	11	12.6
2	67,250	224,068	291,318	(7,906)	54	42	4	18.6
3	86,522	221,566	308,088	(22,491)	79	20	1	29.7
4	112,423	223,494	335,917	(46,570)	96	4	0	54.6

* Numbers in parentheses indicate negative LCC savings.

TABLE VI.20—SUMMARY LCC AND PBP RESULTS FOR AIR CONDITIONERS, WATER-COOLED WITH FLUID ECONOMIZERS, <65,000 BTU/H

Efficiency level	Life-cycle cost *(2011$)*			Life-cycle cost savings				Payback period *(years *)*
	Installed cost	Discounted operating cost	LCC	Average savings *(2011$)*	% of Consumers that experience: Net cost	No impact	Net benefit	Median
Baseline	25,025	21,485	46,510	....	....	....	....	....
1	21,393	20,449	41,842	4,686	0	72	28	(40.7)
2	18,451	19,563	38,015	6,400	0	49	51	(39.7)
3	16,069	18,798	34,867	6,908	0	13	87	(38.7)
4	14,139	18,132	32,272	8,772	0	3	97	(37.7)

* Numbers in parentheses indicate negative payback period due to a declining installed cost at higher efficiency levels.

TABLE VI.21—SUMMARY LCC AND PBP RESULTS FOR COMPUTER ROOM AIR CONDITIONERS, WATER-COOLED WITH FLUID ECONOMIZERS, ≥65,000 BTU/H AND <240,000 BTU/H

Efficiency level	Life-cycle cost (*2011$*)			Life-cycle cost savings				Payback period (*years**)
	Installed cost	Discounted operating cost	LCC	Average savings (*2011$**)	% of Consumers that experience: Net cost	No impact	Net benefit	Median
Baseline	23,952	71,670	95,622	....	....	....	....	....
1	29,903	69,964	99,867	(4,179)	28	72	0	36.8
2	37,901	69,297	107,198	(9,336)	58	42	0	48.1
3	48,651	69,771	118,421	(17,987)	80	20	0	35.8
4	63,099	71,578	134,677	(31,244)	96	4	0	(73.0)

* Numbers in parentheses indicate either negative LCC savings or show a negative payback due to increased annual operating costs.

TABLE VI.22—SUMMARY LCC AND PBP RESULTS FOR COMPUTER ROOM AIR CONDITIONERS, WATER-COOLED WITH FLUID ECONOMIZERS, ≥240,000 AND <760,000 BTU/H

Efficiency level	Life-cycle cost (*2011$*)			Life-cycle cost savings				Payback period (*years**)
	Installed cost	Discounted operating cost	LCC	Average savings (*2011$**)	% of Consumers that experience			Median
					Net cost	No impact	Net benefit	
Baseline	44,489	161,303	205,792					
1	55,781	158,228	214,009	(8,064)	28	72	0	32.3
2	70,956	157,979	228,935	(18,795)	58	42	0	22.6
3	91,351	160,896	252,247	(36,931)	80	20	0	(43.7)
4	118,760	167,577	286,337	(64,864)	96	4	0	(57.2)

* Numbers in parentheses indicate either negative LCC savings or show a negative payback due to increased annual operating costs.

TABLE VI.23—SUMMARY LCC AND PBP RESULTS FOR COMPUTER ROOM AIR CONDITIONERS, GLYCOL-COOLED, <65,000 BTU/H

Efficiency level	Life-cycle cost (*2011$*)			Life-cycle cost savings				Payback period (*years**)
	Installed cost	Discounted operating cost	LCC	Average savings (*2011$**)	% of Consumers that experience			Median
					Net cost	No impact	Net benefit	
Baseline	23,764	31,335	55,099					
1	20,332	29,414	49,746	5,372	0	72	28	(20.5)
2	17,552	27,768	45,321	7,375	0	49	51	(20.0)
3	15,301	26,345	41,646	8,009	0	13	87	(19.5)
4	13,477	25,104	38,581	10,226	0	3	97	(19.0)

* Numbers in parentheses indicate negative payback period due to a declining installed cost at higher efficiency levels.

TABLE VI.24—SUMMARY LCC AND PBP RESULTS FOR COMPUTER ROOM AIR CONDITIONERS, GLYCOL-COOLED, ≥65,000 BTU/H AND <240,000 BTU/H

Efficiency level	Life-cycle cost (*2011$*)			Life-cycle cost savings				Payback period (*years**)
	Installed cost	Discounted operating cost	LCC	Average savings (*2011$**)	% of Consumers that experience			Median
					Net cost	No impact	Net benefit	
Baseline	22,857	118,862	141,719					
1	28,473	112,743	141,215	588	14	72	14	10.9
2	36,020	108,621	144,642	(3,117)	51	42	7	15.5
3	46,164	106,463	152,626	(10,236)	79	20	1	23.0
4	59,795	106,392	166,188	(22,091)	96	4	0	37.5

* Numbers in parentheses indicate negative LCC savings.

TABLE VI.25—SUMMARY LCC AND PBP RESULTS FOR COMPUTER ROOM AIR CONDITIONERS, GLYCOL-COOLED, ≥240,000 AND <760,000 BTU/H

Efficiency level	Life-cycle cost (*2011$*)			Life-cycle cost savings				Payback period (*years*)
	Installed cost	Discounted operating cost	LCC	Average savings (*2011$**)	% of Consumers that experience			Median
					Net cost	No impact	Net benefit	
Baseline	42,419	268,376	310,795					
1	53,089	256,260	309,349	1,633	13	72	15	10.6
2	67,430	249,398	316,828	(6,637)	51	42	7	16.3
3	86,702	247,905	334,607	(22,582)	79	20	1	28.0
4	112,602	252,346	364,948	(49,159)	96	4	0	48.4

* Numbers in parentheses indicate negative LCC savings.

TABLE VI.26—SUMMARY LCC AND PBP RESULTS FOR AIR CONDITIONERS, GLYCOL-COOLED WITH FLUID ECONOMIZERS, <65,000 BTU/H

Efficiency level	Life-cycle cost (*2011$*)			Life-cycle cost savings				Payback period (*years**)
	Installed cost	Discounted operating cost	LCC	Average savings (*2011$*)	% of Consumers that experience			Median
					Net cost	No impact	Net benefit	
Baseline	25,073	26,615	51,689	....	....	....	....	....
1	21,441	25,108	46,550	5,162	0	72	28	(28.4)
2	18,500	23,823	42,323	7,064	0	49	51	(27.8)
3	16,117	22,716	38,833	7,640	0	13	87	(27.1)
4	14,187	21,755	35,942	9,722	0	3	97	(26.4)

* Numbers in parentheses indicate negative payback period due to a declining installed cost at higher efficiency levels.

TABLE VI.27—SUMMARY LCC AND PBP RESULTS FOR COMPUTER ROOM AIR CONDITIONERS, GLYCOL-COOLED WITH FLUID ECONOMIZERS, ≥65,000 BTU/H AND <240,000 BTU/H

Efficiency level	Life-cycle cost (*2011$*)			Life-cycle cost savings				Payback period (*years*)
	Installed cost	Discounted operating cost	LCC	Average savings (*2011$**)	% of Consumers that experience			Median
					Net cost	No impact	Net benefit	
Baseline	24,041	99,288	123,328	....	....	....	....	....
1	29,984	95,100	125,083	(1,652)	23	72	5	18.0
2	37,971	92,626	130,597	(6,282)	55	42	3	27.3
3	48,705	91,890	140,595	(14,548)	79	20	1	45.3
4	63,131	93,060	156,191	(27,719)	96	4	0	49.5

* Numbers in parentheses indicate negative LCC savings.

TABLE VI.28—SUMMARY LCC AND PBP RESULTS FOR COMPUTER ROOM AIR CONDITIONERS, GLYCOL-COOLED WITH FLUID ECONOMIZERS, ≥240,000 AND <760,000 BTU/H

Efficiency level	Life-cycle cost (*2011$*)			Life-cycle cost savings				Payback Period (*years**)
	Installed cost	Discounted operating cost	LCC	Average savings (*2011$**)	% of Consumers that experience			Median
					Net cost	No impact	Net benefit	
Baseline	44,668	224,664	269,332	....	....	....	....	....
1	55,960	216,938	272,898	(3,338)	22	72	6	19.4
2	71,136	213,811	284,947	(13,598)	55	42	3	26.8
3	91,530	215,533	307,063	(31,974)	79	20	1	17.6
4	118,939	222,769	341,709	(61,294)	96	4	0	(45.0)

* Numbers in parentheses indicate negative LCC savings or show a negative payback due to increased annual operating costs.

b. National Impact Analysis

i. Amount and Significance of Energy Savings

To estimate the energy savings through 2041 or 2042 due to amended or new energy conservation standards, DOE compared the energy consumption of computer room air conditioners under the ASHRAE Standard 90.1–2010 efficiency levels to energy consumption of computer room air conditioners under higher efficiency standards. DOE also compared the energy consumption of computer room air conditioners under the ASHRAE Standard 90.1–2010 efficiency levels to energy consumption of computer room air conditioners under the current market base case. DOE examined up to four efficiency levels higher than those of ASHRAE Standard 90.1–2010. Table VI.29 shows the forecasted national energy savings at each of the considered standard levels. (See chapter 8 of the final rule TSD.) As mentioned in section V.B, DOE adjusted the efficiency rating (SCOP) upward for all upflow units in order to analyze the energy savings from only 15 classes of computer room air conditioners, with upflow and downflow units combined.

TABLE VI.29—SUMMARY OF CUMULATIVE NATIONAL ENERGY SAVINGS FOR COMPUTER ROOM AIR CONDITIONERS

[2012–2041 or 2013–2042]

Equipment class	National energy savings (quads) *				
	ASHRAE level	Efficiency level 1	Efficiency level 2	Efficiency level 3	Efficiency level 4
Air conditioners, air-cooled, <65,000 Btu/h	0.00018	0.0006	0.0021	0.0052	0.0086
Air conditioners, air-cooled, ≥65,000 and <240,000 Btu/h	**	0.006	0.059	0.196	0.364
Air conditioners, air-cooled, ≥240,000 and <760,000 Btu/h	**	0.004	0.034	0.112	0.206

TABLE VI.29—SUMMARY OF CUMULATIVE NATIONAL ENERGY SAVINGS FOR COMPUTER ROOM AIR CONDITIONERS—Continued

[2012–2041 or 2013–2042]

Equipment class	National energy savings (quads) *				
	ASHRAE level	Efficiency level 1	Efficiency level 2	Efficiency level 3	Efficiency level 4
Air conditioners, water-cooled, <65,000 Btu/h	0.00003	0.0001	0.0003	0.0007	0.0010
Air conditioners, water-cooled, ≥65,000 and <240,000 Btu/h	0.0009	0.0088	0.0246	0.0435	0.0634
Air conditioners, water-cooled, ≥240,000 and <760,000 Btu/h	0.0008	0.0079	0.0220	0.0388	0.0565
Air conditioners, water-cooled with fluid economizers, <65,000 Btu/h	0.00001	0.00004	0.00011	0.00021	0.00031
Air conditioners, water-cooled with fluid economizers, ≥65,000 and <240,000 Btu/h	0.0004	0.0038	0.0106	0.0188	0.0273
Air conditioners, water-cooled with fluid economizers, ≥240,000 and <760,000 Btu/h	0.0002	0.0016	0.0043	0.0076	0.0111
Air conditioners, glycol-cooled, <65,000 Btu/h	0.00003	0.00013	0.00033	0.00063	0.00092
Air conditioners, glycol-cooled, ≥65,000 and <240,000 Btu/h	0.001	0.011	0.031	0.054	0.078
Air conditioners, glycol-cooled, ≥240,000 and <760,000 Btu/h	0.0008	0.0080	0.0220	0.0384	0.0554
Air conditioners, glycol-cooled with fluid economizers, <65,000 Btu/h	0.00002	0.0001	0.0002	0.0005	0.0007
Air conditioners, glycol-cooled with fluid economizers, ≥65,000 and <240,000 Btu/h	0.001	0.010	0.027	0.047	0.067
Air conditioners, glycol-cooled with fluid economizers, ≥240,000 and <760,000 Btu/h	0.0005	0.0054	0.0147	0.0257	0.0370

* All energy savings from efficiency levels above ASHRAE Standard 90.1–2010 are calculated with those ASHRAE levels as a baseline.

** For these equipment classes, no models were identified below the efficiency levels shown in ASHRAE Standard 90.1–2010, so there are no energy savings for the ASHRAE Standard 90.1–2010 efficiency levels.

ii. Net Present Value

The NPV analysis measures the cumulative benefit or cost of standards to equipment customers from a national perspective. In accordance with OMB's guidelines on regulatory analysis (OMB Circular A–4, section E (Sept. 17, 2003)), DOE calculated NPV using both a 7-percent and a 3-percent real discount rate. The 7-percent rate is an estimate of the average before-tax rate of return on private capital in the U.S. economy, and reflects the returns to real estate and small business capital, as well as corporate capital. It approximates the opportunity cost of capital in the private sector. The 3-percent rate represents the rate at which society discounts future consumption flows to their present value. This rate can be approximated by the real rate of return on long-term government debt (*e.g.,* yield on Treasury notes minus annual rate of change in the Consumer Price Index), which has averaged about 3 percent on a pre-tax basis for the last 30 years. Table VI.30 and Table VI.31 provide an overview of the NPV results. (See chapter 7 of the final rule TSD for further detail.)

TABLE VI.30—CUMULATIVE NET PRESENT VALUE FOR POTENTIAL STANDARDS FOR COMPUTER ROOM AIR CONDITIONERS

[Discounted at seven percent]

Equipment class	Net present value (billion 2011$ *)			
	Efficiency level 1	Efficiency level 2	Efficiency level 3	Efficiency level 4
Air conditioners, air-cooled, <65,000 Btu/h	$0.0004	$(0.0000)	$(0.0048)	$(0.0154)
Air conditioners, air-cooled, ≥65,000 and <240,000 Btu/h	0.01	0.12	0.34	0.54
Air conditioners, air-cooled, ≥240,000 and <760,000 Btu/h	0.01	0.08	0.24	0.40
Air conditioners, water-cooled, <65,000 Btu/h	0.001	0.003	0.006	0.009
Air conditioners, water-cooled, ≥65,000 and <240,000 Btu/h	(0.004)	(0.041)	(0.140)	(0.332)
Air conditioners, water-cooled, ≥240,000 and <760,000 Btu/h	(0.001)	(0.026)	(0.102)	(0.251)
Air conditioners, water-cooled with fluid economizers, <65,000 Btu/h	0.001	0.002	0.003	0.005
Air conditioners, water-cooled with fluid economizers, ≥65,000 and <240,000 Btu/h	(0.02)	(0.07)	(0.18)	(0.38)
Air conditioners, water-cooled with fluid economizers, ≥240,000 and <760,000 Btu/h	(0.005)	(0.024)	(0.064)	(0.134)
Air conditioners, glycol-cooled, <65,000 Btu/h	0.001	0.003	0.006	0.008
Air conditioners, glycol-cooled, ≥65,000 and <240,000 Btu/h	0.002	(0.028)	(0.123)	(0.316)
Air conditioners, glycol-cooled, ≥240,000 and <760,000 Btu/h	0.002	(0.018)	(0.083)	(0.215)
Air conditioners, glycol-cooled with fluid economizers, <65,000 Btu/h	0.001	0.003	0.006	0.008
Air conditioners, glycol-cooled with fluid economizers, ≥65,000 and <240,000 Btu/h	(0.01)	(0.07)	(0.20)	(0.46)

TABLE VI.30—CUMULATIVE NET PRESENT VALUE FOR POTENTIAL STANDARDS FOR COMPUTER ROOM AIR CONDITIONERS—Continued

[Discounted at seven percent]

Equipment class	Net present value (billion 2011$ *)			
	Efficiency level 1	Efficiency level 2	Efficiency level 3	Efficiency level 4
Air conditioners, glycol-cooled with fluid economizers, ≥240,000 and <760,000 Btu/h	(0.004)	(0.033)	(0.106)	(0.242)

* Numbers in parentheses indicate negative NPV.

TABLE VI.31—CUMULATIVE NET PRESENT VALUE FOR POTENTIAL STANDARDS FOR COMPUTER ROOM AIR CONDITIONERS

[Discounted at three percent]

Equipment class	Net present value (billion 2011$ *)			
	Efficiency level 1	Efficiency level 2	Efficiency level 3	Efficiency level 4
Air conditioners, air-cooled, <65,000 Btu/h	$0.002	$0.003	$(0.002)	$(0.017)
Air conditioners, air-cooled, ≥65,000 and <240,000 Btu/h	0.03	0.29	0.88	1.48
Air conditioners, air-cooled, ≥240,000 and <760,000 Btu/h	0.02	0.19	0.58	1.00
Air conditioners, water-cooled, <65,000 Btu/h	0.003	0.007	0.012	0.018
Air conditioners, water-cooled, ≥65,000 and <240,000 Btu/h	0.003	(0.051)	(0.220)	(0.566)
Air conditioners, water-cooled, ≥240,000 and <760,000 Btu/h	0.007	(0.029)	(0.160)	(0.435)
Air conditioners, water-cooled with fluid economizers, <65,000 Btu/h	0.001	0.004	0.006	0.009
Air conditioners, water-cooled with fluid economizers, ≥65,000 and <240,000 Btu/h	(0.02)	(0.12)	(0.33)	(0.69)
Air conditioners, water-cooled with fluid economizers, ≥240,000 and <760,000 Btu/h	(0.008)	(0.042)	(0.117)	(0.251)
Air conditioners, glycol-cooled, <65,000 Btu/h	0.003	0.006	0.012	0.017
Air conditioners, glycol-cooled, ≥65,000 and <240,000 Btu/h	0.02	(0.02)	(0.18)	(0.53)
Air conditioners, glycol-cooled, ≥240,000 and <760,000 Btu/h	0.01	(0.02)	(0.13)	(0.38)
Air conditioners, glycol-cooled with fluid economizers, <65,000 Btu/h	0.002	0.006	0.011	0.015
Air conditioners, glycol-cooled with fluid economizers, ≥65,000 and <240,000 Btu/h	(0.01)	(0.10)	(0.34)	(0.82)
Air conditioners, glycol-cooled with fluid economizers, ≥240,000 and <760,000 Btu/h	(0.004)	(0.052)	(0.187)	(0.447)

* Numbers in parentheses indicate negative NPV.

C. Need of the Nation To Conserve Energy

Enhanced energy efficiency, where economically justified, improves the Nation's energy security, strengthens the economy, and reduces the environmental impacts or costs of energy production. Reduced electricity demand from energy conservation standards is also likely to reduce the cost of maintaining the reliability of the electricity system, particularly during peak-load periods. As a measure of this reduced demand, Table VI.32 presents the estimated reduction in generating capacity in 2042 – relative to the *AEO* Reference case – attributable to the efficiency levels that DOE considered in this rulemaking.

TABLE VI.32—REDUCTION IN NATIONAL ELECTRIC GENERATING CAPACITY IN 2042 UNDER CONSIDERED EFFICIENCY LEVELS (GIGAWATTS)

	Efficiency level				
	ASHRAE (baseline)	1	2	3	4
Water-Cooled and Evaporatively-Cooled Products	0.00	0.01	0.01	0.02	0.02
VRF Water-Source Heat Pumps	0.00	0.00	0.05	0.12	0.23
Computer Room Air Conditioners	0.01	0.12	0.47	1.09	1.81

Energy savings from standards for the equipment classes covered in today's final rule could also produce environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases associated with electricity production. Table VI.33 provides DOE's estimate of cumulative CO_2, NO_X, and Hg emissions reductions projected to result from the efficiency levels considered in this rulemaking. DOE reports annual CO_2, NO_X, and Hg emissions reductions for each efficiency level in chapter 9 of the final rule TSD.

As discussed in section V.G, DOE did not report SO_2 emissions reductions from power plants because there is uncertainty about the effect of energy conservation standards on the overall level of SO_2 emissions in the United States due to SO_2 emissions caps. DOE also did not include NO_X emissions reduction from power plants in States subject to CAIR, because an energy conservation standard would not affect the overall level of NO_X emissions in those States due to the emissions caps mandated by CAIR.

TABLE VI.33—SUMMARY OF EMISSIONS REDUCTION ESTIMATED FOR CONSIDERED EFFICIENCY LEVELS

[Cumulative in 2012–2041 or 2013–2042]

	Efficiency level				
	ASHRAE (baseline)	1	2	3	4
Water-Cooled and Evaporatively-Cooled Products					
CO_2 (*million metric tons*)	0.10	0.10	0.25	0.36	0.37
NO_X (*thousand tons*)	0.08	0.08	0.21	0.30	0.31
Hg (*tons*)	0.001	0.001	0.003	0.004	0.004
VRF Water-Source Heat Pumps					
CO_2 (*million metric tons*)	0.00	0.05	0.82	1.96	3.58
NO_X (*thousand tons*)	0.00	0.04	0.68	1.60	2.93
Hg (*tons*)	0.000	0.001	0.009	0.022	0.040
Computer Room Air Conditioners					
CO_2 (*million metric tons*)	0.18	2.14	8.06	18.7	31.1
NO_X (*thousand tons*)	0.14	1.76	6.62	15.4	25.6
Hg (*tons*)	0.001	0.023	0.087	0.203	0.337

As part of the analysis for this final rule, DOE estimated monetary benefits likely to result from the reduced emissions of CO_2 and NO_X that DOE estimated for each of the efficiency levels considered. As discussed in section V.H, DOE used values for the SCC developed by an interagency process. The four values for CO_2 emissions reductions resulting from that process (expressed in 2010$) are $4.9/ton (the average value from a distribution that uses a 5-percent discount rate), $22.3/ton (the average value from a distribution that uses a 3-percent discount rate), $36.5/ton (the average value from a distribution that uses a 2.5-percent discount rate), and $67.6/ton (the 95th-percentile value from a distribution that uses a 3-percent discount rate). These values correspond to the value of emission reductions in 2010; the values for later years are higher due to increasing damages as the magnitude of climate change increases.

Table VI.34 presents the global value of CO_2 emissions reductions at each efficiency level. For each of the four cases, DOE calculated a present value of the stream of annual values using the same discount rate as was used in the studies upon which the dollar-per-ton values are based. DOE calculated domestic values as a range from 7 percent to 23 percent of the global values, and these results are presented in chapter 10 of the final rule TSD.

TABLE VI.34—ESTIMATES OF GLOBAL PRESENT VALUE OF CO_2 EMISSIONS REDUCTION UNDER CONSIDERED EFFICIENCY LEVELS

Efficiency level	5% discount rate, average	3% discount rate, average	2.5% discount rate, average	3% discount rate, 95th percentile
	Million 2011$			
Water-Cooled and Evaporatively-Cooled Products				
ASHRAE (baseline)	0.5	2.4	4.1	7.4
1	0.5	2.5	4.3	7.7
2	1.2	6.3	10.6	19.1
3	1.8	9.0	15.2	27.4
4	1.8	9.2	15.6	28.1
VRF Water-Source Heat Pumps				
ASHRAE (baseline)	0.0	0.0	0.0	0.0
1	0.3	1.4	2.3	4.2
2	4.3	22.5	38.1	68.4
3	10.3	53.7	91.1	163.4
4	18.9	98.1	166.5	298.5
Computer Room Air Conditioners				
ASHRAE (baseline)	0.9	4.7	7.9	14.4
1	11.2	57.5	97.4	175.2
2	48.2	246.7	417.5	751.4

TABLE VI.34—ESTIMATES OF GLOBAL PRESENT VALUE OF CO_2 EMISSIONS REDUCTION UNDER CONSIDERED EFFICIENCY LEVELS—Continued

Efficiency level	5% discount rate, average	3% discount rate, average	2.5% discount rate, average	3% discount rate, 95th percentile
3	119.9	613.9	1038.7	1869.3
4	214.6	1099.0	1859.6	3346.6

DOE is well aware that scientific and economic knowledge about the contribution of CO_2 and other greenhouse gas (GHG) emissions to changes in the future global climate and the potential resulting damages to the world economy continues to evolve rapidly. Thus, any value placed in this rulemaking on reducing CO_2 emissions is subject to change. DOE, together with other Federal agencies, will continue to review various methodologies for estimating the monetary value of reductions in CO_2 and other GHG emissions. This ongoing review will consider the comments on this subject that are part of the public record for this and other rulemakings, as well as other methodological assumptions and issues. However, consistent with DOE's legal obligations, and taking into account the uncertainty involved with this particular issue, DOE has included in this final rule the most recent values and analyses resulting from the ongoing interagency review process.

DOE also estimated a range for the cumulative monetary value of the economic benefits associated with NO_X emissions reductions anticipated to result from amended standards for the equipment that is the subject of today's final rule. The low and high dollar-per-ton values that DOE used are discussed in section V.H. Table VI.35 presents the cumulative present values of NO_X emissions reductions for each efficiency level calculated using seven-percent and three-percent discount rates.

TABLE VI.35—ESTIMATES OF PRESENT VALUE OF NO_X EMISSIONS REDUCTION UNDER CONSIDERED EFFICIENCY LEVELS

Efficiency level	*Million 2011$*	
	3% Discount rate	7% Discount rate
Water-Cooled and Evaporatively-Cooled Products		
ASHRAE (baseline)	0.02 to 0.25	0.01 to 0.12.
1	0.02 to 0.24	0.01 to 0.10.
2	0.06 to 0.64	0.03 to 0.28.
3	0.09 to 0.92	0.04 to 0.40.
4	0.09 to 0.95	0.04 to 0.42.
VRF Water-Source Heat Pumps		
ASHRAE (baseline)	0.0 to 0.0	0.0 to 0.0.
1	0.01 to 0.13	0.01 to 0.05.
2	0.2 to 2.2	0.1 to 0.9.
3	0.5 to 5.2	0.2 to 2.2.
4	0.9 to 9.5	0.4 to 4.0.
Computer Room Air Conditioners		
ASHRAE (baseline)	0.04 to 0.46	0.02 to 0.22.
1	0.6 to 6.1	0.3 to 2.7.
2	2.4 to 24.6	1.0 to 10.7.
3	6.0 to 61.4	2.6 to 26.6.
4	10.7 to 109.8	4.6 to 47.6.

D. Amended and New Energy Conservation Standards

1. Water-Cooled and Evaporatively-Cooled Commercial Package Air-Conditioning and Heating Equipment

EPCA specifies that, for any commercial and industrial equipment addressed under 42 U.S.C. 6313(a)(6)(A)(i), DOE may prescribe an energy conservation standard more stringent than the level for such equipment in ASHRAE Standard 90.1, as amended, only if "clear and convincing evidence" shows that a more-stringent standard would result in significant additional conservation of energy and is technologically feasible and economically justified. (42 U.S.C. 6313(a)(6)(A)(ii)(II))

In evaluating more-stringent efficiency levels for water-cooled and evaporatively-cooled equipment than those specified by ASHRAE Standard 90.1–2010, DOE reviewed the results in terms of the significance of their energy savings. As noted in the January 2012 NOPR, DOE does not have "clear and convincing evidence" that significant additional conservation of energy would result from adoption of more-stringent standard levels. 77 FR 2356, 2415 (Jan. 17, 2012). Commenters on the NOPR did not provide any additional information to alter this conclusion. Therefore, DOE did not examine whether the levels are economically justified, and DOE is adopting the energy efficiency levels for these products as set forth in ASHRAE Standard 90.1–2010. Table VI.36 presents the energy conservation standards and compliance dates for water-cooled and evaporatively-cooled equipment.

TABLE VI.36—ENERGY CONSERVATION STANDARDS FOR WATER-COOLED AND EVAPORATIVELY-COOLED EQUIPMENT

Equipment type	Subcategory	Size category (Input)	Efficiency level (EER)	Compliance date
Small Water-Cooled Air Conditioners	Electric or No Heat	≥65,000 Btu/h and <135,000 Btu/h	12.1	June 1, 2013.
Small Water-Cooled Air Conditioners	Other Heat	≥65,000 Btu/h and <135,000 Btu/h	11.9	June 1, 2013.
Large Water-Cooled Air Conditioners	Electric or No Heat	≥135,000 Btu/h and <240,000 Btu/h	12.5	June 1, 2014.
Large Water-Cooled Air Conditioners	Other Heat	≥135,000 Btu/h and <240,000 Btu/h	12.3	June 1, 2014.
Very Large Water-Cooled Air Conditioners.	Electric or No Heat	≥240,000 Btu/h and <760,000 Btu/h	12.4	June 1, 2014.
Very Large Water-Cooled Air Conditioners.	Other Heat	≥240,000 Btu/h and <760,000 Btu/h	12.2	June 1, 2014.
Small Evaporatively-Cooled Air Conditioners.	Electric or No Heat	≥65,000 Btu/h and <135,000 Btu/h	12.1	June 1, 2013.
Small Evaporatively-Cooled Air Conditioners.	Other Heat	≥65,000 Btu/h and <135,000 Btu/h	11.9	June 1, 2013.
Large Evaporatively-Cooled Air Conditioners.	Electric or No Heat	≥135,000 Btu/h and <240,000 Btu/h	12.0	June 1, 2014.
Large Evaporatively-Cooled Air Conditioners.	Other Heat	≥135,000 Btu/h and <240,000 Btu/h	11.8	June 1, 2014.
Very Large Evaporatively-Cooled Air Conditioners.	Electric or No Heat	≥240,000 Btu/h and <760,000 Btu/h	11.9	June 1, 2014.
Very Large Evaporatively-Cooled Air Conditioners.	Other Heat	≥240,000 Btu/h and <760,000 Btu/h	† 11.7	June 1, 2014.

† ASHRAE Standard 90.1–2010 specifies this efficiency level as 12.2 EER. However, DOE has determined and AHRI has concurred that this level was mistakenly reported and that the correct level is 11.7 EER. (AHRI, No. 1 at p. 1).

2. VRF Water-Source Heat Pumps

As noted previously, EPCA specifies that, for any commercial and industrial equipment addressed under 42 U.S.C. 6313(a)(6)(A)(i), DOE may prescribe an energy conservation standard more stringent than the level for such equipment in ASHRAE Standard 90.1, as amended, only if ''clear and convincing evidence'' shows that a more-stringent standard would result in significant additional conservation of energy and is technologically feasible and economically justified. (42 U.S.C. 6313(a)(6)(A)(ii)(II))

In evaluating more-stringent efficiency levels for VRF water-source heat pumps than those specified by ASHRAE Standard 90.1–2010, DOE reviewed the results in terms of the significance of their energy savings. As discussed in the January 2012 NOPR, the energy savings for more-stringent efficiency levels for VRF water-source heat pumps equal to or greater than 135,000 Btu/h would be minimal. 77 FR 2356, 2416 (Jan. 17, 2012). In addition, there are no models on the market of VRF water-source heat pumps less than 17,000 Btu/h, so there are no energy savings predicted for this product class. As such, DOE does not have ''clear and convincing evidence'' that significant additional conservation of energy would result from adoption of more-stringent efficiency levels than those specified in ASHRAE Standard 90.1–2010. Therefore, DOE did not examine whether the levels are economically justified, and DOE is adopting the energy efficiency levels for these products as set forth in ASHRAE Standard 90.1–2010.[49] Table VI.37 presents the amended energy conservation standards and compliance dates for VRF water-source heat pumps.

TABLE VI.37—ENERGY CONSERVATION STANDARDS FOR VRF WATER-SOURCE HEAT PUMPS

Equipment type	Subcategory	Size category (Input)	Efficiency level	Compliance date **
VRF Water-Source Heat Pumps.	Without Heat Recovery	<17,000 Btu/h	12.0 EER 4.2 COP *	October 29, 2012.
VRF Water-Source Heat Pumps.	With Heat Recovery	<17,000 Btu/h	11.8 EER 4.2 COP *	October 29, 2012.
VRF Water-Source Heat Pumps.	Without Heat Recovery	≥135,000 Btu/h and <760,000 Btu/h.	10.0 EER 3.9 COP	October 29, 2013.
VRF Water-Source Heat Pumps.	With Heat Recovery	≥135,000 Btu/h and <760,000 Btu/h.	9.8 EER 3.9 COP	October 29, 2013.

* 4.2 COP is the existing Federal minimum energy conservation standard for water-source heat pumps <17,000 Btu/h. Although ASHRAE did not increase the COP level in Standard 90.1, it did increase the corresponding EER level for this equipment.

** ASHRAE Standard 90.1–2010 did not provide an effective date for these products, so it is assumed to be publication of ASHRAE Standard 90.1–2010, or October 29, 2010. Compliance dates for Federal standards are two or three years after the effective date in ASHRAE Standard 90.1, depending on product size.

[49] For other classes of VRF systems introduced by ASHRAE Standard 90.1–2010, DOE is not adopting new standards but is clarifying that existing standards for air-cooled or water-source heat pumps continue to apply. In addition, DOE is adopting a new test procedure for all classes of VRF equipment. The changes to the Code of Federal Regulations are found at the end of this final rule.

3. Computer Room Air Conditioners

As noted previously, EPCA specifies that, for any commercial and industrial equipment addressed under 42 U.S.C. 6313(a)(6)(A)(i), DOE may prescribe an energy conservation standard more stringent than the level for such equipment in ASHRAE Standard 90.1, as amended, only if ''clear and convincing evidence'' shows that a more-stringent standard would result in significant additional conservation of energy and is technologically feasible and economically justified. (42 U.S.C. 6313(a)(6)(A)(ii)(II))

In evaluating more-stringent efficiency levels for computer room air conditioners than those specified by ASHRAE Standard 90.1–2010, DOE reviewed the results in terms of their technological feasibility, significance of energy savings, and economic justification.

DOE has concluded that all of the SCOP levels considered by DOE are technologically feasible, as units with equivalent efficiency appeared to be available in the current market at all levels examined. As noted in section V.B.3., manufacturers are currently not reporting CRAC equipment efficiencies in terms of SCOP as defined and tested for in ASHRAE 127–2007. As a result, the efficiency data used to determine the SCOP levels for analysis were obtained using a rule-of-thumb method to convert EER (as determined using ASHRAE Standard 127–2001) to an estimate of the SCOP (as determined by ASHRAE Standard 127–2007), which lends some uncertainty to the SCOP ratings of computer room air conditioners. However, based on this mapping between EER and SCOP, DOE believes that all SCOP levels analyzed are technically feasible.

DOE examined the potential energy savings that would result from the efficiency levels specified in ASHRAE Standard 90.1–2010 and compared these to the potential energy savings that would result from efficiency levels more stringent than those in ASHRAE Standard 90.1–2010. DOE estimates that 0.01 quad of energy would be saved if DOE adopts the efficiency levels set in ASHRAE Standard 90.1–2010 for each computer room air conditioner equipment class specified in that standard. If DOE were to adopt efficiency levels more stringent than those specified by ASHRAE Standard 90.1–2010, the potential additional energy savings range from 0.07 quad to 0.98 quad. Associated with proposing more-stringent efficiency levels is a three-and-a-half to four-and-a-half-year delay in implementation (depending on equipment size) compared to the adoption of energy conservation standards at the levels specified in ASHRAE Standard 90.1–2010 (see section V.I.1.). This delay in implementation of amended energy conservation standards would result in a small amount of energy savings being lost in the first years (2012 through 2016) compared to the savings from adopting the levels in ASHRAE Standard 90.1–2010 (approximately 0.0001 quad); however, this loss may be compensated for by increased savings in later years. Taken in isolation, the energy savings associated with more-stringent standards might be considered significant enough to warrant adoption of such standards. However, as noted above, energy savings are not the only factor which DOE must consider.

In considering whether potential standards are economically justified, DOE also examined the NPV that would result from adopting efficiency levels more stringent than those set forth in ASHRAE Standard 90.1–2010. With a 7-percent discount rate, all of the efficiency levels examined by DOE resulted in negative NPV. With a 3-percent discount rate, Levels 1 and 2 create positive NPV, while Levels 3 and 4 create negative NPV. These results indicate that adoption of efficiency levels more stringent than those in ASHRAE Standard 90.1–2010 as Federal energy conservation standards would likely lead to negative economic outcomes for the Nation. Consequently, this criterion for adoption of more-stringent standard levels does not appear to have been met.

Furthermore, although DOE based it analyses on the best available data when examining the potential energy savings and the economic justification of efficiency levels more stringent than those specified in ASHRAE Standard 90.1–2010, DOE believes there are several limitations regarding that data which should be assessed when considering amended energy conservation standards for computer room air conditioners. As explained below, none of these concerns are likely to run in the direction of more-stringent standards.

First, DOE reexamined the uncertainty in its analysis of computer room air conditioners. As noted in section V.B.3, due to the lack of current coverage and certification requirements, no manufacturers currently test for the SCOP of their computer room air conditioner models, nor do they all report such information in their literature. DOE's efficiency information used in the analysis was the result of a ''rule-of-thumb'' method that provides an approximation of SCOP, but DOE did not obtain any actual SCOP efficiency information that resulted from testing, leading to uncertainty over whether the levels considered (particularly at the max-tech level) are technologically feasible and also adding uncertainty in the energy savings estimates. In addition, for certain equipment classes, DOE was unable to obtain enough information even to estimate SCOP for a useful portion of the models on the market. For those equipment classes, DOE had to analyze various efficiency levels above the ASHRAE Standard 90.1–2010 levels using SCOP levels that were estimated based on the SCOP differences established by ASHRAE Standard 90.1 between the different equipment classes. The combination of these factors leads to concerns about the viability of using the estimated SCOP data for the basis of this analysis. Such concerns are heightened the further one moves away from the efficiency levels in ASHRAE Standard 90.1–2010 in the context of this rulemaking.

Second, to assess the cost of increasing efficiency, DOE conducted a pricing survey in which DOE collected contractor price data across a range of efficiency levels, and examined the trend in price as efficiency increased. As noted in section V.B, the primary drawback to this approach is that contractor pricing can be based on a variety of factors, some of which have little or nothing to do with changes in equipment efficiency (*e.g.,* differences in manufacturer markups). This leads to unexpected results for certain equipment classes, including an observed trend of decreasing price with increasing efficiency for small water-cooled equipment based on the data collected, which reduces the certainty of the analysis in terms of economic justification. Therefore, the trends developed through such analyses may not be representative of the actual relationship between manufacturer cost and efficiency, or of what DOE would find if it used a design option approach with reverse engineering analysis (which is more time-intensive). Further, although there was generally a trend of increasing price with increased efficiency across all manufacturers for most product classes, there was little discernable trend between price and efficiency for each individual manufacturer, leading to additional doubts about the role of equipment efficiency in determining pricing. As a result, DOE believes the results of this analysis are highly uncertain, and that a more in-depth analysis of the relationship between cost of manufacturing and efficiency could lead to different results.

Third, due to the limited data on the existing distribution of shipments by efficiency level or historical efficiency trends, DOE was not able to assess possible future changes in either the available efficiencies of equipment in the computer room air conditioner market or the sales distribution of shipments by efficiency level in the absence of setting more-stringent standards. DOE recognizes that manufacturers may continue to make future improvements in the computer room air conditioner efficiencies even in the absence of mandated energy conservation standards. This possibility increases the uncertainty of the energy savings estimates. To the extent that manufacturers improve product efficiency and customers choose to purchase improved products in the absence of standards, the energy savings estimates would likely be reduced.

Fourth, as a result of a lack of shipment information for the United States, DOE's shipment analysis rests primarily on a single market report from Australia. While DOE attempted to use an appropriate inflator to adjust Australian shipments to the United States market, DOE recognizes the uncertainty inherent in this approach. DOE also based its equipment class allocations on market share for a few classes from the Australian report, as well as model availability in the United States. It is unknown whether the United States market mirrors the Australian market or whether model availability approximates shipment distributions. Any inaccuracy in the shipment forecast in total or by product class contributes to the uncertainty of the energy savings results and thus makes it difficult for DOE to determine that any energy savings are significant.

To repeat, to adopt energy conservation standards more stringent than the levels in ASHRAE Standard 90.1, DOE must have ''clear and convincing'' evidence in order to adopt efficiency levels more stringent than those specified in ASHRAE Standard 90.1–2010. For the reasons explained in the preceding paragraphs, the totality of information does not meet the level necessary to support more-stringent efficiency levels for computer room air conditioners. Consequently, although certain stakeholders have recommended that DOE adopt higher efficiency levels for some CRAC classes (as discussed in section III.D), DOE has decided to adopt the efficiency levels in ASHRAE Standard 90.1–2010 as amended energy conservation standards for all 30 computer room air conditioner equipment classes. Table VI.38 presents the energy conservation standards for computer room air conditioners.

By adopting the efficiency levels in ASHRAE Standard 90.1–2010 as energy conservation standards, DOE is setting a minimum floor for these previously unregulated products. This allows the industry time to transition to coverage of these products, requires manufacturers to begin submitting efficiency data, and will spur the tracking of shipments. These data will improve DOE's future analysis of computer room air conditioners. DOE notes that it will be able to undertake such an analysis without waiting for the trigger of a subsequent amendment of ASHRAE Standard 90.1, because of the six-year look back provision in the relevant EISA 2007 amendments to EPCA. (42 U.S.C. 6313(a)(6)(C))

TABLE VI.38—ENERGY CONSERVATION STANDARDS FOR COMPUTER ROOM AIR CONDITIONERS

Equipment type	Subcategory	Size category (input)	Efficiency level (SCOP–127)	Compliance date
Air conditioners, air-cooled	Downflow	<65,000 Btu/h	2.20	October 29, 2012.
Air conditioners, air-cooled	Upflow	<65,000 Btu/h	2.09	October 29, 2012.
Air conditioners, air-cooled	Downflow	≥65,000 Btu/h and <240,000 Btu/h	2.10	October 29, 2013.
Air conditioners, air-cooled	Upflow	≥65,000 Btu/h and <240,000 Btu/h	1.99	October 29, 2013.
Air conditioners, air-cooled	Downflow	≥240,000 Btu/h and <760,000 Btu/h	1.90	October 29, 2013.
Air conditioners, air-cooled	Upflow	≥240,000 Btu/h and <760,000 Btu/h	1.79	October 29, 2013.
Air conditioners, water-cooled	Downflow	<65,000 Btu/h	2.60	October 29, 2012.
Air conditioners, water-cooled	Upflow	<65,000 Btu/h	2.49	October 29, 2012.
Air conditioners, water-cooled	Downflow	≥65,000 Btu/h and <240,000 Btu/h	2.50	October 29, 2013.
Air conditioners, water-cooled	Upflow	≥65,000 Btu/h and <240,000 Btu/h	2.39	October 29, 2013.
Air conditioners, water-cooled	Downflow	≥240,000 Btu/h and <760,000 Btu/h	2.40	October 29, 2013.
Air conditioners, water-cooled	Upflow	≥240,000 Btu/h and <760,000 Btu/h	2.29	October 29, 2013.
Air conditioners, water-cooled with fluid economizer.	Downflow	<65,000 Btu/h	2.55	October 29, 2012.
Air conditioners, water-cooled with fluid economizer.	Upflow	<65,000 Btu/h	2.44	October 29, 2012.
Air conditioners, water-cooled with fluid economizer.	Downflow	≥65,000 Btu/h and <240,000 Btu/h	2.45	October 29, 2013.
Air conditioners, water-cooled with fluid economizer.	Upflow	≥65,000 Btu/h and <240,000 Btu/h	2.34	October 29, 2013.
Air conditioners, water-cooled with fluid economizer.	Downflow	≥240,000 Btu/h and <760,000 Btu/h	2.35	October 29, 2013.
Air conditioners, water-cooled with fluid economizer.	Upflow	≥240,000 Btu/h and <760,000 Btu/h	2.24	October 29, 2013.
Air conditioners, glycol-cooled	Downflow	<65,000 Btu/h	2.50	October 29, 2012.
Air conditioners, glycol-cooled	Upflow	<65,000 Btu/h	2.39	October 29, 2012.
Air conditioners, glycol-cooled	Downflow	≥65,000 Btu/h and <240,000 Btu/h	2.15	October 29, 2013.
Air conditioners, glycol-cooled	Upflow	≥65,000 Btu/h and <240,000 Btu/h	2.04	October 29, 2013.
Air conditioners, glycol-cooled	Downflow	≥240,000 Btu/h and <760,000 Btu/h	2.10	October 29, 2013.
Air conditioners, glycol-cooled	Upflow	≥240,000 Btu/h and <760,000 Btu/h	1.99	October 29, 2013.
Air conditioners, glycol-cooled with fluid economizer.	Downflow	<65,000 Btu/h	2.45	October 29, 2012.
Air conditioners, glycol-cooled with fluid economizer.	Upflow	<65,000 Btu/h	2.34	October 29, 2012.
Air conditioners, glycol-cooled with fluid economizer.	Downflow	≥65,000 Btu/h and <240,000 Btu/h	2.10	October 29, 2013.

TABLE VI.38—ENERGY CONSERVATION STANDARDS FOR COMPUTER ROOM AIR CONDITIONERS—Continued

Equipment type	Subcategory	Size category (input)	Efficiency level (SCOP–127)	Compliance date
Air conditioners, glycol-cooled with fluid economizer.	Upflow	≥65,000 Btu/h and <240,000 Btu/h	1.99	October 29, 2013.
Air conditioners, glycol-cooled with fluid economizer.	Downflow	≥240,000 Btu/h and <760,000 Btu/h	2.05	October 29, 2013.
Air conditioners, glycol-cooled with fluid economizer.	Upflow	≥240,000 Btu/h and <760,000 Btu/h	1.94	October 29, 2013.

VII. Procedural Issues and Regulatory Review

A. Review Under Executive Orders 12866 and 13563

Section 1(b)(1) of Executive Order 12866, ''Regulatory Planning and Review,'' 58 FR 51735 (Oct. 4, 1993), requires each agency to identify the problem that it intends to address, including, where applicable, the failures of private markets or public institutions that warrant new agency action, as well as to assess the significance of that problem. The problems that today's standards address are as follows:

(1) There is a lack of consumer information and/or information processing capability about energy efficiency opportunities in the commercial equipment market.

(2) There is asymmetric information (one party to a transaction has more and better information than the other) and/or high transactions costs (costs of gathering information and effecting exchanges of goods and services).

(3) There are external benefits resulting from improved energy efficiency of water-cooled and evaporatively-cooled commercial package air conditioners, variable refrigerant flow air conditioners, and computer room air conditioners that are not captured by the users of such equipment. These benefits include externalities related to environmental protection and energy security that are not reflected in energy prices, such as reduced emissions of greenhouse gases.

In addition, DOE has determined that today's regulatory action is not an ''economically significant regulatory action'' under section 3(f)(1) of Executive Order 12866. Accordingly, DOE has not prepared a regulatory impact analysis (RIA) for today's rule, and the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget (OMB) has not reviewed this rule.

DOE has also reviewed this regulation pursuant to Executive Order 13563, issued on January 18, 2011 (76 FR 3281 (Jan. 21, 2011)). Executive Order 13563 is supplemental to and explicitly reaffirms the principles, structures, and definitions governing regulatory review established in Executive Order 12866. To the extent permitted by law, agencies are required by Executive Order 13563 to: (1) Propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify); (2) tailor regulations to impose the least burden on society, consistent with obtaining regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulations; (3) select, in choosing among alternative regulatory approaches, those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity); (4) to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt; and (5) identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public.

DOE emphasizes as well that Executive Order 13563 requires agencies to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible. In its guidance, the Office of Information and Regulatory Affairs has emphasized that such techniques may include identifying changing future compliance costs that might result from technological innovation or anticipated behavioral changes. For the reasons stated in the preamble, DOE believes that today's final rule is consistent with these principles, including the requirement that, to the extent permitted by law, agencies adopt a regulation only upon a reasoned determination that its benefits justify its costs and select, in choosing among alternative regulatory approaches, those approaches that maximize net benefits.

Consistent with Executive Order 13563, and the range of impacts analyzed in this rulemaking, the energy conservation standards adopted in this final rule maximize net benefits to the extent permitted by EPCA.

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of an initial regulatory flexibility analysis (IRFA) for any rule that by law must be proposed for public comment, and a final regulatory flexibility analysis (FRFA) for any such rule that an agency adopts as a final rule, 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 the General Counsel's Web site (*www.gc.doe.gov*). DOE reviewed the January 2012 NOPR and today's final rule under the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003.

For manufacturers of small, large, and very large air-conditioning and heating equipment (including water-cooled and evaporatively-cooled equipment, CRACs, VRF systems, and SPVUs), commercial warm-air furnaces, and commercial water heaters, the Small Business Administration (SBA) has set a size threshold, which defines those entities classified as ''small businesses'' for the purposes of the statute. DOE used the SBA's small business size standards to determine whether any small entities would be subject to the requirements of the rule. 65 FR 30836, 30848 (May 15, 2000), as amended at 65 FR 53533, 53544 (Sept. 5, 2000) and codified at 13 CFR part 121. The size standards are listed by North American

Industry Classification System (NAICS) code and industry description and are available at *http://www.sba.gov/sites/default/files/Size_Standards_Table.pdf.* The ASHRAE equipment covered by this rule, with the exception of commercial water heaters, are classified under NAICS 333415, ''Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing.'' The SBA sets a threshold of 750 employees or fewer for an entity to be considered as a small business for this category. Commercial water heaters are classified under NAICS 333319, ''Other Commercial and Service Industry Machinery Manufacturing,'' for which SBA sets a size threshold of 500 employees or fewer for being considered a small business.

DOE examined each of the manufacturers it found during its market assessment and used publicly-available information to determine if any manufacturers identified qualify as a small business under the SBA guidelines discussed above. (For a list of all manufacturers of ASHRAE equipment covered by this rule, see Chapter 2 of the TSD.) DOE's research involved individual company Web sites, marketing research tools (*e.g.,* Hoovers reports [50]), and contacting individual companies to create a list of companies that manufacture the types of ASHRAE equipment affected by this rule. DOE screened out companies that do not have domestic manufacturing operations for ASHRAE equipment (*i.e.,* manufacturers that produce all of their ASHRAE equipment internationally). DOE also did not consider manufacturers which are subsidiaries of parent companies that exceed the employee threshold set by the SBA to be small businesses. DOE identified 46 total manufacturers impacted by the proposed amendments related to energy conservation standards and test procedures, including 14 that qualify as a small business.

DOE has reviewed today's final rule under the provisions of the Regulatory Flexibility Act and the policies and procedures published on February 19, 2003. 68 FR 7990. As part of this rulemaking, DOE examined not only the impacts on manufacturers of revised standard levels, but also the existing compliance costs manufacturers already bear as compared to the revised compliance costs, based on the revisions to the test procedures. Since DOE is adopting the efficiency levels in ASHRAE Standard 90.1–2010, which are part of the prevailing industry standard, DOE believes that manufacturers of water-cooled and evaporatively-cooled commercial package air conditioners and heating equipment, computer room air conditioners, and VRF water-source heat pumps with a cooling capacity equal to or greater than 135,000 Btu/h and less than 760,000 Btu/h are already producing equipment at these efficiency levels. For VRF water-source heat pumps with a cooling capacity below 17,000 Btu/h, DOE believes the efficiency levels being adopted in today's final rule are also part of the prevailing industry standard and that manufacturers would experience no impacts, because no such equipment is currently manufactured. Furthermore, DOE believes the industry standard was developed through a process which would attempt to mitigate the impacts on manufacturers, including any impacted small business manufacturers, while increasing the efficiency of this equipment.

In addition, DOE does not find that the costs associated with the adoption of updated test procedures for commercial package air-conditioning and heating equipment, commercial water-heating equipment, or commercial warm-air furnaces in this document would result in any significant increase in testing or compliance costs. For these types of equipment, DOE already has testing requirements, which have only minor differences from those being adopted in this notice. Furthermore, the provisions that DOE is adopting from AHRI operations manuals, are already general practice within the industry when conducting testing, and DOE does not expect these changes to have an impact on how the DOE test procedure is conducted. DOE notes that this document also adopts new test procedures for VRF systems and computer room air conditioners. However, VRF systems currently must be tested using the DOE test procedures for commercial package air conditioners and heating equipment. The procedure being adopted in this final rule is tailored to VRF systems, and DOE does not believe this procedure is more burdensome than the currently applicable test procedures. For computer room air conditioners, this notice adopts the use of a new test procedure where none was previously required. However, for all equipment types (including computer room air conditioners) the test procedures are part of the prevailing industry standard to test and rate equipment. DOE believes that manufacturers generally already use the accepted industry test procedures when testing their equipment, and that given its inclusion in ASHRAE Standard 90.1–2010, they would continue to use it in the future. Therefore, DOE has concluded that the additional burden imposed by today's rule will not have a significant adverse impact on a substantial number of small manufacturers.

DOE reached similar conclusions to those discussed above in the January 2012 NOPR and requested comment on the impacts of this rulemaking on small manufacturers. 77 FR 2356, 2420 (Jan. 17, 2012). In responding to this request for comment, Carrier stated generally that significant energy efficiency increases and consequently higher pricing can lead to decreased sales, especially in an economic downturn. (Carrier, No. 28 at p. 4) Engineered Air commented that their company is a small business and stated that the cost for complying with DOE standards was not at issue since DOE and ASHRAE 90.1–2010 were going to be closely aligned. Engineered Air stated that once October 18, 2013 passes, the building codes will require compliance to ASHRAE 90.1–2010, which would essentially force compliance with DOE regulations. (Engineered Air, No. 36 at pp. 3–4) DOE believes that Carrier's concerns about decreased sales are mitigated because the levels being adopted are part of the prevailing industry standard, which indicates that industry believes that these levels are both technologically achievable and economically justified, and that the impacts on manufacturers of complying with such standard levels would not be significant enough to warrant lower levels. Additionally, Engineered Air supports DOE's position that the impacts on small businesses will be minimal from the adoption of the ASHRAE Standard 90.1–2010 efficiency levels.

For the reasons stated above, DOE reaffirms its certification that this rule will not have a significant economic impact on a substantial number of small entities. Therefore, DOE did not prepare an initial regulatory flexibility analysis for the proposed rule or a final regulatory flexibility analysis for the final rule. DOE has transmitted its certification and a supporting statement of factual basis to the Chief Counsel for Advocacy of the SBA for review pursuant to 5 U.S.C. 605(b).

C. Review Under the Paperwork Reduction Act of 1995

Manufacturers of ASHRAE equipment addressed in today's final rule must

[50] For more information, see *http://www.hoovers.com/.*

certify to DOE that their equipment complies with any applicable energy conservation standards. In certifying compliance, manufacturers must test their equipment according to the DOE test procedures for ASHRAE equipment, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including ASHRAE equipment. 76 FR 12422 (March 7, 2011). The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (PRA). This requirement has been approved by OMB under OMB control number 1910–1400. Public reporting burden for the certification is estimated to average 20 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB Control Number.

D. Review Under the National Environmental Policy Act of 1969

Pursuant to the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*), DOE has determined that this rule fits within the category of actions included in Categorical Exclusion (CX) B5.1 and otherwise meets the requirements for application of a CX. See 10 CFR Part 1021, App. B, B5.1(b); 1021.410(b), and Appendix B, B(1)–(5). The rule fits within the category of actions because it is a rulemaking that establishes energy conservation standards for consumer products or industrial equipment, and for which none of the exceptions identified in CX B5.1(b) apply. Therefore, DOE has made a CX determination for this rulemaking, and DOE does not need to prepare an Environmental Assessment or Environmental Impact Statement for this rule. DOE's CX determination for this rule is available at *http://cxnepa.energy.gov/.*

E. Review Under Executive Order 13132

Executive Order 13132, ''Federalism.'' 64 FR 43255 (Aug. 10, 1999) imposes certain requirements on Federal 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. 65 FR 13735. DOE has examined this final rule and has determined that it would 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. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the equipment that is the subject of today's final rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297 and 6316(b)(2)(D)) No further action is required by Executive Order 13132.

F. Review Under Executive Order 12988

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 (Feb. 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. With regard to the review required by section 3(a), 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 final rule meets the relevant standards of Executive Order 12988.

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Public Law 104–4, sec. 201 (codified at 2 U.S.C. 1531). For a 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), (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 ''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 *www.gc.doe.gov.*

DOE has concluded that this final rule contains neither an intergovernmental mandate nor a mandate that would likely require expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of $100 million or more in any year. Accordingly, no assessment or analysis is required under the UMRA.

H. Review Under the Treasury and General Government Appropriations Act, 1999

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105–277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This 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.

I. Review Under Executive Order 12630

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

J. 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 Federal 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 (Feb. 22, 2002), and DOE's guidelines were published at 67 FR 62446 (Oct. 7, 2002). DOE has reviewed today's final rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

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 OIRA at OMB, a Statement of Energy Effects for any significant energy action. A ''significant energy action'' is defined as any action by an agency that promulgates 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 significant energy action, the agency must provide 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 has concluded that today's regulatory action, which sets forth energy conservation standards for certain types of ASHRAE equipment, is not a significant energy action because the new and amended standards are not a significant regulatory action under Executive Order 12866 and are not likely to have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as such by the Administrator at OIRA. Accordingly, DOE has not prepared a Statement of Energy Effects on the final rule.

L. 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; 42 U.S.C. 7101 *et seq.*), DOE must comply with all laws applicable to the former Federal Energy Administration, including 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; FEAA) Section 32 essentially provides in relevant part that, where a proposed rule authorizes or requires use of commercial standards, the notice of proposed rulemaking must inform the public of the use and background of such standards. In addition, section 32(c) requires DOE to consult with the Attorney General and the Chairman of the Federal Trade Commission (FTC) concerning the impact of the commercial or industry standards on competition.

The modifications to the test procedures addressed by this action incorporate testing methods contained in certain sections of the following commercial standards: (1) AHRI 210–240–2008; (2) AHRI 340–360–2007; (3) AHRI 390–2003; (4) AHRI 1230–2010; (5) UL 727–2006; (6) ANSI Z21.47–2006; (7) ANSI Z21.10.3–2011; (8) ASHRAE 127–2007. DOE has evaluated these standards and is unable to conclude whether they fully comply with the requirements of section 32(b) of the FEAA (*i.e.,* whether each was 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 concerning the impact on competition of requiring use of the methods contained in these standards, and neither recommended against incorporation of these standards.

M. Review Under the Information Quality Bulletin for Peer Review

On December 16, 2004, OMB, in consultation with the Office of Science and Technology Policy (OSTP), issued its Final Information Quality Bulletin for Peer Review (the Bulletin). 70 FR 2664 (Jan. 14, 2005). The Bulletin establishes that certain scientific information shall be peer reviewed by qualified specialists before it is disseminated by the Federal Government, including influential scientific information related to agency regulatory actions. The purpose of the bulletin is to enhance the quality and credibility of the Government's scientific information. Under the Bulletin, the energy conservation standards rulemaking analyses are ''influential scientific information,'' which the Bulletin defines as scientific information the agency reasonably can determine will have, or does have, a clear and substantial impact on important public policies or private sector decisions. *Id.* at 2667.

In response to OMB's Bulletin, DOE conducted formal in-progress peer reviews of the energy conservation standards development process and analyses and has prepared a Peer Review Report pertaining to the energy conservation standards rulemaking analyses. Generation of this report involved a rigorous, formal, and documented evaluation using objective criteria and qualified and independent reviewers to make a judgment as to the technical/scientific/business merit, the actual or anticipated results, and the productivity and management effectiveness of programs and/or projects. The ''Energy Conservation Standards Rulemaking Peer Review Report'' dated February 2007 has been disseminated and is available at the following Web site: *www1.eere.energy.gov/buildings/appliance_standards/peer_review.html.*

N. 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 not a ''major rule'' as defined by 5 U.S.C. 804(2).

VIII. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of today's final rule.

List of Subjects in 10 CFR Part 431

Administrative practice and procedure, Confidential business information, Energy conservation, Incorporation by reference, Reporting and recordkeeping requirements.

Issued in Washington, DC, on April 27, 2012.

Kathleen B. Hogan,

Deputy Assistant Secretary for Energy Efficiency, Energy Efficiency and Renewable Energy.

For the reasons set forth in the preamble, DOE amends part 431 of Chapter II, Subchapter D, of Title 10 of the Code of Federal Regulations as set forth below:

PART 431—ENERGY EFFICIENCY PROGRAM FOR CERTAIN COMMERCIAL AND INDUSTRIAL EQUIPMENT

■ 1. The authority citation for part 431 continues to read as follows:

Authority: 42 U.S.C. 6291–6317.

■ 2. Section 431.2 is amended by revising the definition of ''Commercial HVAC & WH product'' to read as follows:

§ 431.2 Definitions.

* * * * *

Commercial HVAC & WH product means any small, large, or very large commercial package air-conditioning and heating equipment, packaged terminal air conditioner, packaged terminal heat pump, single package vertical air conditioner, single package vertical heat pump, computer room air conditioner, variable refrigerant flow multi-split air conditioner, variable refrigerant flow multi-split heat pump, commercial packaged boiler, hot water supply boiler, commercial warm air furnace, instantaneous water heater, storage water heater, or unfired hot water storage tank.

* * * * *

■ 3. Section 431.75 is revised to read as follows:

§ 431.75 Materials incorporated by reference.

(a) *General.* DOE incorporates by reference the following test procedures into subpart D of part 431. The materials listed have been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Any subsequent amendment to the listed materials by the standard-setting organization will not affect the DOE regulations unless and until such regulations are amended by DOE. Materials are incorporated as they exist on the date of the approval, and a notice of any changes in the materials will be published in the **Federal Register**. All approved materials are available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call (202) 741–6030 or go to: *http://www.archives.gov/federal_register/code_of_federal regulations/ibr_locations.html.* Also, these materials are available for inspection at U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, 6th Floor, 950 L'Enfant Plaza SW., Washington, DC 20024, (202) 586–2945, or go to: *http://www1.eere.energy.gov/buildings/appliance_standards/.* The referenced test procedure standards are listed below by relevant standard-setting organization, along with information on how to obtain copies from those sources.

(b) *ANSI.* American National Standards Institute. 25 W. 43rd Street, 4th Floor, New York, NY 10036, (212) 642–4900, or go to: *http://www.ansi.org.*

(1) ANSI Z21.47–1998, (''ANSI Z21.47–1998''), ''*Gas-Fired Central Furnaces,*'' approved by ANSI on June 9, 1998, IBR approved for § 431.76.

(2) ANSI Z21.47–2006, (''ANSI Z21.47–2006''), ''*Gas-Fired Central Furnaces,*'' approved on July 27, 2006, IBR approved for § 431.76.

(3) Reserved.

(c) *ASHRAE.* American Society of Heating, Refrigerating and Air-Conditioning Engineers Inc., 1791 Tullie Circle, NE., Atlanta, Georgia 30329, (404) 636–8400, or go to: *http://www.ashrae.org.*

(1) ASHRAE Standard 103–1993, sections 7.2.2.4, 7.8, 9.2, and 11.3.7, ''*Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers,*'' approved on June 26, 1993, IBR approved for § 431.76.

(2) [Reserved].

(d) *HI.* Hydronics Institute Division of AHRI, 35 Russo Place, P.O. Box 218, Berkeley Heights, NJ 07922, (703) 600–0350, or go to: *http://www.ahrinet.org/hydronics+institute+section.aspx.*

(1) HI BTS–2000, sections 8.2.2, 11.1.4, 11.1.5, and 11.1.6.2, ''*Method to Determine Efficiency of Commercial Space Heating Boilers,*'' published January 2001, IBR approved for § 431.76.

(2) [Reserved].

(e) *UL.* Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062, (847) 272–8800, or go to: *http://www.ul.com.*

(1) UL 727 (UL 727–1994), ''*Standard for Safety Oil-Fired Central Furnaces,*'' published on August 1, 1994, IBR approved for § 431.76.

(2) UL 727 (UL 727–2006), ''*Standard for Safety Oil-Fired Central Furnaces,*'' approved April 7, 2006, IBR approved for § 431.76.

(3) [Reserved].

■ 4. Section 431.76 is revised to read as follows:

§ 431.76 Uniform test method for the measurement of energy efficiency of commercial warm air furnaces.

(a) This section covers the test procedures you must follow if, pursuant to EPCA, you are measuring the steady-state thermal efficiency of a gas-fired or oil-fired commercial warm air furnace with a rated maximum input of 225,000 Btu per hour or more. Where this section prescribes use of ANSI Z21.47 or UL 727, (incorporated by reference, see § 431.75), perform only the procedures pertinent to the measurement of the steady-state efficiency. Before May 13, 2013, where you see instructions to use ANSI Z21.47–2006 or UL 727–2006 in this section, you may use the relevant procedures in ANSI Z21.47–1998 or UL 727–1994. On or after May 13, 2013, you must use the relevant procedures in ANSI Z21.47–2006 or UL 727–2006.

(b) *Test setup*—(1) *Test setup for gas-fired commercial warm air furnaces.* The test setup, including flue requirement, instrumentation, test conditions, and measurements for determining thermal efficiency is as specified in sections 1.1 (Scope), 2.1 (General), 2.2 (Basic Test Arrangements), 2.3 (Test Ducts and Plenums), 2.4 (Test Gases), 2.5 (Test Pressures and Burner Adjustments), 2.6 (Static Pressure and Air Flow Adjustments), 2.39 (Thermal Efficiency) (note, this is 2.38 in ANSI Z21.47–1998 (incorporated by reference, see § 431.75)), and 4.2.1 (Basic Test Arrangements for Direct Vent Control Furnaces) of ANSI Z21.47–2006 (incorporated by reference, see § 431.75). The thermal efficiency test must be conducted only at the normal inlet test pressure, as specified in section 2.5.1 of ANSI Z21.47–2006, and at the maximum hourly Btu input rating specified by the manufacturer for the product being tested.

(2) *Test setup for oil-fired commercial warm air furnaces.* The test setup, including flue requirement, instrumentation, test conditions, and measurement for measuring thermal efficiency is as specified in sections 1 (Scope), 2 (Units of Measurement), 3 (Glossary), 37 (General), 38 and 39 (Test Installation), 40 (Instrumentation, except 40.4 and 40.6.2 through 40.6.7, which are not required for the thermal efficiency test), 41 (Initial Test Conditions), 42 (Combustion Test—Burner and Furnace), 43.2 (Operation Tests), 44 (Limit Control Cutout Test),

45 (Continuity of Operation Test), and 46 (Air Flow, Downflow or Horizontal Furnace Test), of UL 727–2006 (incorporated by reference, see § 431.75). You must conduct a fuel oil analysis for heating value, hydrogen content, carbon content, pounds per gallon, and American Petroleum Institute (API) gravity as specified in section 8.2.2 of HI BTS–2000 (incorporated by reference, see § 431.75). The steady-state combustion conditions, specified in Section 42.1 of UL 727–2006, are attained when variations of not more than 5 °F in the measured flue gas temperature occur for three consecutive readings taken 15 minutes apart.

(c) *Additional test measurements*—(1) *Measurement of flue CO_2 (carbon dioxide) for oil-fired commercial warm air furnaces.* In addition to the flue temperature measurement specified in section 40.6.8 of UL 727–2006, (incorporated by reference, see § 431.75) you must locate one or two sampling tubes within six inches downstream from the flue temperature probe (as indicated on Figure 40.3 of UL 727–2006). If you use an open end tube, it must project into the flue one-third of the chimney connector diameter. If you use other methods of sampling CO_2, you must place the sampling tube so as to obtain an average sample. There must be no air leak between the temperature probe and the sampling tube location. You must collect the flue gas sample at the same time the flue gas temperature is recorded. The CO_2 concentration of the flue gas must be as specified by the manufacturer for the product being tested, with a tolerance of ±0.1 percent. You must determine the flue CO_2 using an instrument with a reading error no greater than ±0.1 percent.

(2) *Procedure for the measurement of condensate for a gas-fired condensing commercial warm air furnace.* The test procedure for the measurement of the condensate from the flue gas under steady state operation must be conducted as specified in sections 7.2.2.4, 7.8, and 9.2 of ASHRAE Standard 103–1993 (incorporated by reference, see § 431.75) under the maximum rated input conditions. You must conduct this condensate measurement for an additional 30 minutes of steady state operation after completion of the steady state thermal efficiency test specified in paragraph (b) of this section.

(d) *Calculation of thermal efficiency*—(1) *Gas-fired commercial warm air furnaces.* You must use the calculation procedure specified in section 2.39, Thermal Efficiency, of ANSI Z21.47–2006 (incorporated by reference, see § 431.75). (Note, this is section 2.38 in ANSI Z21.47–1998 (incorporated by reference, see § 431.75))

(2) *Oil-fired commercial warm air furnaces.* You must calculate the percent flue loss (in percent of heat input rate) by following the procedure specified in sections 11.1.4, 11.1.5, and 11.1.6.2 of the HI BTS–2000 (incorporated by reference, see § 431.75). The thermal efficiency must be calculated as:

Thermal Efficiency (percent) = 100 percent − flue loss (in percent).

(e) *Procedure for the calculation of the additional heat gain and heat loss, and adjustment to the thermal efficiency, for a condensing commercial warm air furnace.* (1) You must calculate the latent heat gain from the condensation of the water vapor in the flue gas, and calculate heat loss due to the flue condensate down the drain, as specified in sections 11.3.7.1 and 11.3.7.2 of ASHRAE Standard 103–1993, (incorporated by reference, see § 431.75), with the exception that in the equation for the heat loss due to hot condensate flowing down the drain in section 11.3.7.2, the assumed indoor temperature of 70 °F and the temperature term T_{OA} must be replaced by the measured room temperature as specified in section 2.2.8 of ANSI Z21.47–2006 (incorporated by reference, see § 431.75).

(2) *Adjustment to the Thermal Efficiency for Condensing Furnace.* You must adjust the thermal efficiency as calculated in paragraph (d)(1) of this section by adding the latent gain, expressed in percent, from the condensation of the water vapor in the flue gas, and subtracting the heat loss (due to the flue condensate down the drain), also expressed in percent, both as calculated in paragraph (e)(1) of this section, to obtain the thermal efficiency of a condensing furnace.

■ 5. Section 431.92, is amended by adding the definitions ''Computer Room Air Conditioner,'' ''Heat Recovery,'' ''Sensible Coefficient of Performance, or SCOP,'' ''Variable Refrigerant Flow Multi-Split Air Conditioner'' and ''Variable Refrigerant Flow Multi-Split Heat Pump,'' in alphabetical order to read as follows:

§ 431.92 Definitions concerning commercial air conditioners and heat pumps.

* * * * *

Computer Room Air Conditioner means a basic model of commercial package air-conditioning and heating equipment (packaged or split) that is: Used in computer rooms, data processing rooms, or other information technology cooling applications; rated for sensible coefficient of performance (SCOP) and tested in accordance with 10 CFR 431.96, and is not a covered consumer product under 42 U.S.C. 6291(1)–(2) and 6292. A computer room air conditioner may be provided with, or have as available options, an integrated humidifier, temperature, and/or humidity control of the supplied air, and reheating function.

* * * * *

Heat Recovery (in the context of variable refrigerant flow multi-split air conditioners or variable refrigerant flow multi-split heat pumps) means that the air conditioner or heat pump is also capable of providing simultaneous heating and cooling operation, where recovered energy from the indoor units operating in one mode can be transferred to one or more other indoor units operating in the other mode. A variable refrigerant flow multi-split heat recovery heat pump is a variable refrigerant flow multi-split heat pump with the addition of heat recovery capability.

* * * * *

Sensible Coefficient of Performance, or SCOP means the net sensible cooling capacity in watts divided by the total power input in watts (excluding reheaters and humidifiers).

* * * * *

Variable Refrigerant Flow Multi-Split Air Conditioner means a unit of commercial package air-conditioning and heating equipment that is configured as a split system air conditioner incorporating a single refrigerant circuit, with one or more outdoor units, at least one variable-speed compressor or an alternate compressor combination for varying the capacity of the system by three or more steps, and multiple indoor fan coil units, each of which is individually metered and individually controlled by an integral control device and common communications network and which can operate independently in response to multiple indoor thermostats. Variable refrigerant flow implies three or more steps of capacity control on common, inter-connecting piping.

Variable Refrigerant Flow Multi-Split Heat Pump means a unit of commercial package air-conditioning and heating equipment that is configured as a split system heat pump that uses reverse cycle refrigeration as its primary heating source and which may include secondary supplemental heating by means of electrical resistance, steam, hot water, or gas. The equipment incorporates a single refrigerant circuit, with one or more outdoor units, at least one variable-speed compressor or an alternate compressor combination for varying the capacity of the system by three or more steps, and multiple indoor fan coil units, each of which is individually metered and individually controlled by a control device and common communications network and which can operate independently in response to multiple indoor thermostats. Variable refrigerant flow implies three or more steps of capacity control on common, inter-connecting piping.

* * * * *

■ 6. Section 431.95 is revised to read as follows:

§ 431.95 Materials incorporated by reference.

(a) *General.* DOE incorporates by reference the following test procedures into subpart F of part 431. The materials listed have been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Any subsequent amendment to the listed materials by the standard-setting organization will not affect the DOE regulations unless and until such regulations are amended by DOE. Materials are incorporated as they exist on the date of the approval, and a notice of any changes in the materials will be published in the **Federal Register**. All approved materials are available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call (202) 741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federalregulations/ibr_locations.html*. Also, this material is available for inspection at U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, 6th Floor, 950 L'Enfant Plaza SW., Washington, DC 20024, (202) 586–2945, or go to: *http://www1.eere.energy.gov/buildings/appliance_standards/*. The referenced test procedure standards are listed below by relevant standard-setting organization, along with information on how to obtain copies from those sources.

(b) *AHRI.* Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Blvd., Suite 500, Arlington, VA 22201, (703) 524–8800, or go to: *http://www.ahrinet.org*.

(1) ARI Standard 210/240–2003, ''2003 Standard for *Unitary Air-Conditioning & Air-Source Heat Pump Equipment,*'' published in 2003 (AHRI 210/240–2003), IBR approved for § 431.96.

(2) ANSI/AHRI Standard 210/240–2008, ''2008 Standard for *Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment,*'' approved by ANSI on October 27, 2011 and updated by addendum 1 in June 2011 and addendum 2 in March 2012 (AHRI 210/240–2008), IBR approved for § 431.96.

(3) ARI Standard 310/380–2004, ''*Standard for Packaged Terminal Air-Conditioners and Heat Pumps,*'' published September 2004 (AHRI 310/380–2004), IBR approved for § 431.96.

(4) ARI Standard 340/360–2004, ''2004 Standard for *Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment,*'' published in 2004 (AHRI 340/360–2004), IBR approved for § 431.96.

(5) ANSI/AHRI Standard 340/360–2007, ''2007 Standard for *Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment,*'' approved by ANSI on October 27, 2011 and updated by addendum 1 in December 2010 and addendum 2 in June 2011 (AHRI 340/360–2007), IBR approved for § 431.96.

(6) ANSI/AHRI Standard 390–2003, ''2003 Standard for *Performance Rating of Single Package Vertical Air-Conditioners and Heat Pumps,*'' dated 2003, (AHRI 390–2003), IBR approved for § 431.96.

(7) ANSI/AHRI Standard 1230–2010, ''2010 Standard for *Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment,*'' approved August 2, 2010 and updated by addendum 1 in March 2011 (AHRI 1230–2010), IBR approved for § 431.96.

(8) [Reserved].

(c) *ASHRAE.* American Society of Heating, Refrigerating and Air-Conditioning Engineers, 1791 Tullie Circle, NE., Atlanta, Georgia 30329, (404) 636–8400, or go to: *http://www.ashrae.org.*

(1) ASHRAE Standard 127–2007, ''*Method of Testing for Rating Computer and Data Processing Room Unitary Air Conditioners,*'' approved on June 28, 2007, (ASHRAE 127–2007), IBR approved for § 431.96.

(2) [Reserved].

(d) *ISO.* International Organization for Standardization, 1, ch. De la Voie-Creuse, Case Postale 56, CH–1211 Geneva 20, Switzerland, +41 22 749 01 11 or go to: *http://www.iso.ch/.*

(1) ISO Standard 13256–1, ''*Water-source heat pumps—Testing and rating for performance—Part 1: Water-to-air and brine-to-air heat pumps,*'' approved 1998, IBR approved for § 431.96.

(2) [Reserved].

■ 7. Section 431.96 is revised to read as follows:

§ 431.96 Uniform test method for the measurement of energy efficiency of commercial air conditioners and heat pumps.

(a) *Scope.* This section contains test procedures for measuring, pursuant to EPCA, the energy efficiency of any small, large, or very large commercial package air-conditioning and heating equipment, packaged terminal air conditioners and packaged terminal heat pumps, computer room air conditioners, variable refrigerant flow systems, and single package vertical air conditioners and single package vertical heat pumps.

(b) *Testing and calculations.* (1) Determine the energy efficiency of each covered product by conducting the test procedure(s) listed in the rightmost column of Table 1 of this section, that apply to the energy efficiency descriptor for that product, category, and cooling capacity, until compliance with this test procedure version is no longer required per the date shown in the 5th most column from the left of Table 1 of this section.

TABLE 1 TO § 431.96—TEST PROCEDURES FOR COMMERCIAL AIR CONDITIONERS AND HEAT PUMPS

Equipment type	Category	Cooling capacity	Energy efficiency descriptor	Test procedure required for compliance until	Use tests, conditions, and procedures [1] in
Small Commercial Packaged Air-Conditioning and Heating Equipment.	Air-Cooled, 3-Phase, AC and HP	<65,000 Btu/h	SEER and HSPF	May 13, 2013	ARI 210/240–2003.
	Air-Cooled AC and HP	≥65,000 Btu/h and <135,000 Btu/h.	EER and COP	May 13, 2013	ARI 340/360–2004.

TABLE 1 TO § 431.96—TEST PROCEDURES FOR COMMERCIAL AIR CONDITIONERS AND HEAT PUMPS—Continued

Equipment type	Category	Cooling capacity	Energy efficiency descriptor	Test procedure required for compliance until	Use tests, conditions, and procedures[1] in
	Water-Cooled and Evaporatively-Cooled AC	<65,000 Btu/h	EER	May 13, 2013	ARI 210/240–2003.
		≥65,000 Btu/h and <135,000 Btu/h.	EER	May 13, 2013	ARI 340/360–2004.
	Water-Source HP	<135,000 Btu/h	EER and COP	May 13, 2013	ISO Standard 13256–1 (1998).
Large Commercial Packaged Air-Conditioning and Heating Equipment.	Air-Cooled AC and HP	≥135,000 Btu/h and <240,000 Btu/h.	EER and COP	May 13, 2013	ARI 340/360–2004.
	Water-Cooled and Evaporatively-Cooled AC	≥135,000 Btu/h and <240,000 Btu/h.	EER	May 13, 2013	ARI 340/360–2004.
Very Large Commercial Packaged Air-Conditioning and Heating Equipment.	Air-Cooled AC and HP	≥240,000 Btu/h and <760,000 Btu/h.	EER and COP	May 13, 2013	ARI 340/360–2004.
	Water-Cooled and Evaporatively-Cooled AC	≥240,000 Btu/h and <760,000 Btu/h.	EER	May 13, 2013	ARI 340/360–2004.
Packaged Terminal Air Conditioners and Heat Pumps.	AC and HP	<760,000 Btu/h	EER and COP	May 13, 2013	AHRI 310/380–2004.

[1] Incorporated by reference, see § 431.95.

(2) On or after the compliance dates listed in Table 2 of this section, determine the energy efficiency of each type of covered equipment by conducting the test procedure(s) listed in the rightmost column of Table 2 of this section along with any additional testing provisions set forth in paragraphs (c), (d), and (e) of this section, that apply to the energy efficiency descriptor for that equipment, category, and cooling capacity. Note, the omitted sections of the test procedures listed in the rightmost column of Table 1 of this section shall not be used.

TABLE 2 TO § 431.96—TEST PROCEDURES FOR COMMERCIAL AIR CONDITIONERS AND HEAT PUMPS

Equipment type	Category	Cooling capacity	Energy efficiency descriptor	Compliance with test procedure required on or after	Use tests, conditions, and procedures[1] in
Small Commercial Packaged Air-Conditioning and Heating Equipment.	Air-Cooled, 3-Phase, AC and HP	<65,000 Btu/h	SEER and HSPF	May 13, 2013	AHRI 210/240–2008 (omit section 6.5).
	Air-Cooled AC and HP	≥65,000 Btu/h and <135,000 Btu/h.	EER and COP	May 13, 2013	AHRI 340/360–2007 (omit section 6.3).
	Water-Cooled and Evaporatively-Cooled AC	<65,000 Btu/h	EER	May 13, 2013	AHRI 210/240–2008 (omit section 6.5).
		≥65,000 Btu/h and <135,000 Btu/h.	EER	May 13, 2013	AHRI 340/360–2007 (omit section 6.3).
	Water-Source HP	<135,000 Btu/h	EER and COP	May 13, 2013	ISO Standard 13256–1 (1998).
Large Commercial Packaged Air-Conditioning and Heating Equipment.	Air-Cooled AC and HP	≥135,000 Btu/h and <240,000 Btu/h.	EER and COP	May 13, 2013	AHRI 340/360–2007 (omit section 6.3).
	Water-Cooled and Evaporatively-Cooled AC	≥135,000 Btu/h and <240,000 Btu/h.	EER	May 13, 2013	AHRI 340/360–2007 (omit section 6.3).
Very Large Commercial Packaged Air-Conditioning and Heating Equipment.	Air-Cooled AC and HP	≥240,000 Btu/h and <760,000 Btu/h.	EER and COP	May 13, 2013	AHRI 340/360–2007 (omit section 6.3).
	Water-Cooled and Evaporatively-Cooled AC	≥240,000 Btu/h and <760,000 Btu/h.	EER	May 13, 2013	AHRI 340/360–2007 (omit section 6.3).
Packaged Terminal Air Conditioners and Heat Pumps.	AC and HP	<760,000 Btu/h	EER and COP	May 13, 2013	AHRI 310/380–2004 (omit section 5.6).
Computer Room Air Conditioners.	AC	<65,000 Btu/h	SCOP	October 29, 2012	ASHRAE 127–2007 (omit section 5.11).
		<65,000 Btu/h and <760,000 Btu/h.	SCOP	May 13, 2013	ASHRAE 127–2007 (omit section 5.11).
Variable Refrigerant Flow Multi-split Systems.	AC	<760,000 Btu/h	EER and COP	May 13, 2013	AHRI 1230–2010 (omit sections 5.1.2 and 6.6).
Variable Refrigerant Flow Multi-split Systems, Air-cooled.	HP	<760,000 Btu/h	EER and COP	May 13, 2013	AHRI 1230–2010 (omit sections 5.1.2 and 6.6).

TABLE 2 TO § 431.96—TEST PROCEDURES FOR COMMERCIAL AIR CONDITIONERS AND HEAT PUMPS—Continued

Equipment type	Category	Cooling capacity	Energy efficiency descriptor	Compliance with test procedure required on or after	Use tests, conditions, and procedures [1] in
Variable Refrigerant Flow Multi-split Systems, Water-source.	HP	<17,000 Btu/h	EER and COP	October 29, 2012	AHRI 1230–2010 (omit sections 5.1.2 and 6.6).
Variable Refrigerant Flow Multi-split Systems, Water-source.	HP	≥17,000 Btu/h and <760,000 Btu/h.	EER and COP	May 13, 2013	AHRI 1230–2010 (omit sections 5.1.2 and 6.6).
Single Package Vertical Air Conditioners and Single Package Vertical Heat Pumps.	AC and HP	<760,000 Btu/h	EER and COP	July 16, 2012	AHRI 390–2003 (omit section 6.4).

[1] Incorporated by reference, see § 431.95.

(c) *Optional break-in period for tests conducted using AHRI 210/240–2008, AHRI 340/360–2007, AHRI 390–2003, AHRI 1230–2010, and ASHRAE 127–2007.* Manufacturers may optionally specify a ''break-in'' period, not to exceed 20 hours, to operate the equipment under test prior to conducting the test method specified by AHRI 210/240–2008, AHRI 340/360–2007, AHRI 390–2003, AHRI 1230–2010, or ASHRAE 127–2007 (incorporated by reference, see § 431.95). A manufacturer who elects to use an optional compressor break-in period in its certification testing should record this information (including the duration) in the test data underlying the certified ratings that is required to be maintained under 10 CFR 429.71.

(d) *Refrigerant line length corrections for tests conducted using AHRI 1230–2010.* For test setups where it is physically impossible for the laboratory to use the required line length listed in Table 3 of the AHRI 1230–2010 (incorporated by reference, see § 431.95), then the actual refrigerant line length used by the laboratory may exceed the required length and the following correction factors are applied:

Piping length beyond minimum, X (ft)	Piping length beyond minimum, Y (m)	Cooling capacity correction %
0> X ≤20	0> Y ≤6.1	1
20> X ≤40	6.1> Y ≤12.2	2
40> X ≤60	12.2> Y ≤18.3	3
60> X ≤80	18.3> Y ≤24.4	4
80> X ≤100	24.4> Y ≤30.5	5
100 > X ≤120	30.5> Y ≤36.6	6

(e) *Additional provisions for equipment set-up.* The only additional specifications that may be used in setting up the basic model for test are those set forth in the installation and operation manual shipped with the unit. Each unit should be set up for test in accordance with the manufacturer installation and operation manuals. Paragraphs (e)(1) through (3) of this section provide specifications for addressing key information typically found in the installation and operation manuals.

(1) If a manufacturer specifies a range of superheat, sub-cooling, and/or refrigerant pressure in its installation and operation manual for a given basic model, any value(s) within that range may be used to determine refrigerant charge or mass of refrigerant, unless the manufacturer clearly specifies a rating value in its installation and operation manual, in which case the specified rating value shall be used.

(2) The air flow rate used for testing must be that set forth in the installation and operation manuals being shipped to the commercial customer with the basic model and clearly identified as that used to generate the DOE performance ratings. If a rated air flow value for testing is not clearly identified, a value of 400 standard cubic feet per minute (scfm) per ton shall be used.

(3) For VRF systems, the test set-up and the fixed compressor speeds (*i.e.,* the maximum, minimum, and any intermediate speeds used for testing) should be recorded and maintained as part of the test data underlying the certified ratings that is required to be maintained under 10 CFR 429.71.

(f) *Manufacturer involvement in assessment or enforcement testing for variable refrigerant flow systems.* A manufacturer's representative will be allowed to witness assessment and/or enforcement testing for VRF systems. The manufacturer's representative will be allowed to inspect and discuss set-up only with a DOE representative and adjust only the modulating components during testing in the presence of a DOE representative that are necessary to achieve steady-state operation. Only previously documented specifications for set-up as specified under paragraphs (d) and (e) of this section will be used.

■ 8. Section 431.97 is revised to read as follows:

§ 431.97 Energy efficiency standards and their compliance dates.

(a) All basic models of commercial package air-conditioning and heating equipment must be tested for performance using the applicable DOE test procedure in § 431.96, be compliant with the applicable standards set forth in paragraphs (b) through (f) of this section, and be certified to the Department under 10 CFR part 429.

(b) Each commercial air conditioner or heat pump (not including single package vertical air conditioners and single package vertical heat pumps, packaged terminal air conditioners and packaged terminal heat pumps, computer room air conditioners, and variable refrigerant flow systems) manufactured on and after the compliance date listed in the corresponding table must meet the applicable minimum energy efficiency standard level(s) set forth in Tables 1, 2, and 3 of this section.

TABLE 1 TO § 431.97—MINIMUM COOLING EFFICIENCY STANDARDS FOR AIR-CONDITIONING AND HEATING EQUIPMENT

[Not including single package vertical air conditioners and single package vertical heat pumps, packaged terminal air conditioners and packaged terminal heat pumps, computer room air conditioners, and variable refrigerant flow multi-split air conditioners and heat pumps]

Equipment type	Cooling capacity	Sub-category	Heating type	Efficiency level	Compliance date: products manufactured on and after . . .
Small Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled, 3 Phase)	<65,000 Btu/h	AC	All	SEER = 13	June 16, 2008.
		HP	All	SEER = 13	June 16, 2008.
Small Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled)	≥65,000 Btu/h and <135,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 11.2	January 1, 2010.
			All Other Types of Heating	EER = 11.0	January 1, 2010.
		HP	No Heating or Electric Resistance Heating	EER = 11.0	January 1, 2010.
			All Other Types of Heating	EER = 10.8	January 1, 2010.
Large Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled)	≥135,000 Btu/h and <240,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 11.0	January 1, 2010.
			All Other Types of Heating	EER = 10.8	January 1, 2010.
Heating Equipment (Air-Cooled).	>240,000 Btu/h	HP	No Heating or Electric Resistance heating	EER = 10.6	January 1, 2010.
			All Other Types of Heating	EER = 10.4	January 1, 2010.
Very Large Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled)	≥240,000 Btu/h and <760,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 10.0	January 1, 2010.
			All Other Types of Heating	EER = 9.8	January 1, 2010.
		HP	No Heating or Electric Resistance Heating	EER = 9.5	January 1, 2010.
			All Other Types of Heating	EER = 9.3	January 1, 2010.
Small Commercial Packaged Air-Conditioning and Heating Equipment (Water-Cooled, Evaporatively-Cooled, and Water-Source).	<17,000 Btu/h	AC	All	EER = 12.1	October 29, 2003.
	≥17,000 Btu/h and <65,000 Btu/h	HP	All	EER = 11.2	October 29, 2003.
		AC	All	EER = 12.1	October 29, 2003.
		HP	All	EER = 12.0	October 29, 2003.
	≥65,000 Btu/h and <135,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 11.5	October 29, 2003.[1]
			All Other Types of Heating	EER = 11.3	October 29, 2003.[1]
		HP	All	EER = 12.0	October 29, 2003.[1]
Large Commercial Packaged Air-Conditioning and Heating Equipment (Water-Cooled, Evaporatively-Cooled, and Water-Source).	≥135,000 Btu/h and <240,000 Btu/h	AC	All	EER = 11.0	October 29, 2004.[2]
		HP	All	EER = 11.0	October 29, 2004.[2]
Very Large Commercial Packaged Air-Conditioning and Heating Equipment (Water-Cooled, Evaporatively-Cooled, and Water-Source).	≥240,000 Btu/h and <760,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 11.0	January 10, 2011.[2]
			All Other Types of Heating	EER = 10.8	January 10, 2011.[2]
		HP	No Heating or Electric Resistance Heating	EER = 11.0	January 10, 2011.[2]
			All Other Types of Heating	EER = 10.8	January 10, 2011.[2]

[1] And manufactured before June 1, 2013. See Table 3 of this section for updated efficiency standards.

[2] And manufactured before June 1, 2014. See Table 3 of this section for updated efficiency standards.

TABLE 2 TO § 431.97—MINIMUM HEATING EFFICIENCY STANDARDS FOR AIR-CONDITIONING AND HEATING EQUIPMENT

[Heat pumps]

Equipment type	Cooling capacity	Efficiency level	Compliance date: Products manufactured on and after . . .
Small Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled, 3 Phase).	<65,000 Btu/h	HSPF = 7.7	June 16, 2008.
Small Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled).	≥65,000 Btu/h and <135,000 Btu/h	COP = 3.3	January 1, 2010.
Large Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled).	≥135,000 Btu/h and <240,000 Btu/h	COP = 3.2	January 1, 2010.
Very Large Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled).	≥240,000 Btu/h and <760,000 Btu/h	COP = 3.2	January 1, 2010.
Small Commercial Packaged Air-Conditioning and Heating Equipment (Water-Source).	<135,000 Btu/h	COP = 4.2	October 29, 2003.

TABLE 3 TO § 431.97—UPDATES TO THE MINIMUM COOLING EFFICIENCY STANDARDS FOR WATER-COOLED AND EVAPORATIVELY-COOLED AIR-CONDITIONING AND HEATING EQUIPMENT

Equipment type	Cooling capacity	Heating type	Efficiency level	Compliance date: Products manufactured on and after . . .
Small Commercial Packaged Air-Conditioning and Heating Equipment (Water-Cooled).	≥65,000 Btu/h and <135,000 Btu/h	No Heating or Electric Resistance Heating All Other Types of Heating	EER = 12.1 EER = 11.9	June 1, 2013. June 1, 2013.
Large Commercial Packaged Air-Conditioning and Heating Equipment (Water-Cooled).	≥135,000 Btu/h and <240,000 Btu/h	No Heating or Electric Resistance Heating All Other Types of Heating	EER = 12.5 EER = 12.3	June 1, 2014. June 1, 2014.
Very Large Commercial Packaged Air-Conditioning and Heating Equipment (Water-Cooled).	≥240,000 Btu/h and <760,000 Btu/h	No Heating or Electric Resistance Heating All Other Types of Heating	EER = 12.4 EER = 12.2	June 1, 2014. June 1, 2014.
Small Commercial Packaged Air-Conditioning and Heating Equipment (Evaporatively-Cooled).	≥65,000 Btu/h and <135,000 Btu/h	No Heating or Electric Resistance Heating All Other Types of Heating	EER = 12.1 EER = 11.9	June 1, 2013. June 1, 2013.
Large Commercial Packaged Air-Conditioning and Heating Equipment (Evaporatively-Cooled).	≥135,000 Btu/h and <240,000 Btu/h	No Heating or Electric Resistance Heating All Other Types of Heating	EER = 12.0 EER = 11.8	June 1, 2014. June 1, 2014.
Very Large Commercial Packaged Air-Conditioning and Heating Equipment (Evaporatively-Cooled).	≥240,000 Btu/h and <760,000 Btu/h	No Heating or Electric Resistance Heating All Other Types of Heating	EER = 11.9 EER = 11.7	June 1, 2014. June 1, 2014.

(c) Each packaged terminal air conditioner (PTAC) and packaged terminal heat pump (PTHP) manufactured on or after January 1, 1994, and before October 8, 2012 (for standard size PTACs and PTHPs) and before October 7, 2010 (for non-standard size PTACs and PTHPs) must meet the applicable minimum energy efficiency standard level(s) set forth in Table 4 of this section. Each PTAC and PTHP manufactured on or after October 8, 2012 (for standard size PTACs and PTHPs) and on or after October 7, 2010 (for non-standard size PTACs and PTHPs) must meet the applicable minimum energy efficiency standard level(s) set forth in Table 5 of this section.

TABLE 4 TO § 431.97—MINIMUM EFFICIENCY STANDARDS FOR PTAC AND PTHP

Equipment type	Cooling capacity	Efficiency level	Compliance date: products manufactured on and after . . .
PTAC	<7,000 Btu/h	EER = 8.88	January 1, 1994.
	≥7,000 Btu/h and <15,000 Btu/h	EER = 10.0—(0.16 × Cap [1])	January 1, 1994.
	≥15,000 Btu/h	EER = 7.6	January 1, 1994.
PTHP	<7,000 Btu/h	EER = 8.88 COP = 2.72	January 1, 1994.
	≥7,000 Btu/h and <15,000 Btu/h	EER = 10.0—(0.16 × Cap [1]) COP = 1.3 + (0.16 × EER [2])	January 1, 1994.
	≥15,000 Btu/h	EER = 7.6 COP = 2.52	January 1, 1994.

[1] "Cap" means cooling capacity in thousand Btu/h at 95 °F outdoor dry-bulb temperature.
[2] The applicable minimum cooling EER prescribed in this table.

TABLE 5 TO § 431.97 UPDATED MINIMUM EFFICIENCY STANDARDS FOR PTAC AND PTHP

Equipment type	Cooling capacity	Sub-category	Efficiency level	Compliance date: products manufactured on and after . . .
PTAC	Standard Size	<7,000 Btu/h	EER = 11.7	October 8, 2012.
		≥7,000 Btu/h and <15,000 Btu/h	EER = 13.8 − (0.3 × Cap[1])	October 8, 2012.
		≥15,000 Btu/h	EER = 9.3	October 8, 2012.
	Non-Standard Size	<7,000 Btu/h	EER = 9.4	October 7, 2010.
		≥7,000 Btu/h and <15,000 Btu/h	EER = 10.9 − (0.213 × Cap[1])	October 7, 2010.
		≥15,000 Btu/h	EER = 7.7	October 7, 2010.
PTHP	Standard Size	<7,000 Btu/h	EER = 11.9 COP = 3.3	October 8, 2012.
		≥7,000 Btu/h and <15,000 Btu/h	EER = 14.0 − (0.3 × Cap[1]) COP = 3.7—(0.052 × Cap[1])	October 8, 2012.
		≥15,000 Btu/h	EER = 9.5 COP = 2.9	October 8, 2012.
	Non-Standard Size	<7,000 Btu/h	EER = 9.3 COP = 2.7	October 7, 2010.
		≥7,000 Btu/h and <15,000 Btu/h	EER = 10.8 − (0.213 × Cap[1]) COP = 2.9 − (0.026 × Cap[1])	October 7, 2010.
		≥15,000 Btu/h	EER = 7.6 COP = 2.5	October 7, 2010.

1 "Cap" means cooling capacity in thousand Btu/h at 95 °F outdoor dry-bulb temperature.

(d) Each single package vertical air conditioner and heat pump manufactured on or after January 1, 2010, must meet the applicable minimum energy efficiency standard level(s) set forth in this section.

TABLE 6 TO § 431.97 MINIMUM EFFICIENCY STANDARDS FOR SINGLE PACKAGE VERTICAL AIR CONDITIONERS AND SINGLE PACKAGE VERTICAL HEAT PUMPS

Equipment type	Cooling capacity	Sub-category	Efficiency level	Compliance date: Products manufactured on and after . . .
Single package vertical air conditioners and single package vertical heat pumps, single-phase and three-phase.	<65,000 Btu/h	AC	EER = 9.0	January 1, 2010.
		HP	EER = 9.0 COP = 3.0	January 1, 2010.
Single package vertical air conditioners and single package vertical heat pumps.	≥65,000 Btu/h and <135,000 Btu/h	AC	EER = 8.9	January 1, 2010.
		HP	EER = 8.9 COP = 3.0	January 1, 2010.
Single package vertical air conditioners and single package vertical heat pumps.	≥135,000 Btu/h and <240,000 Btu/h	AC	EER = 8.6	January 1, 2010.
		HP	EER = 8.6 COP = 2.9	January 1, 2010.

(e) Each computer room air conditioner with a net sensible cooling capacity less than 65,000 Btu/h manufactured on or after October 29, 2012, and each computer room air conditioner with a net sensible cooling capacity greater than or equal to 65,000 Btu/h manufactured on or after October 29, 2013, must meet the applicable minimum energy efficiency standard level(s) set forth in this section.

TABLE 7 TO § 431.97—MINIMUM EFFICIENCY STANDARDS FOR COMPUTER ROOM AIR CONDITIONERS

Equipment type	Net sensible cooling capacity	Minimum SCOP efficiency		Compliance date: Products manufactured on and after . . .
		Downflow unit	Upflow unit	
Computer Room Air Conditioners, Air-Cooled	<65,000 Btu/h	2.20	2.09	October 29, 2012.
	≥65,000 Btu/h and <240,000 Btu/h	2.10	1.99	October 29, 2013.
	≥240,000 Btu/h and <760,000 Btu/h	1.90	1.79	October 29, 2013.
Computer Room Air Conditioners, Water-Cooled	<65,000 Btu/h	2.60	2.49	October 29, 2012.
	≥65,000 Btu/h and <240,000 Btu/h	2.50	2.39	October 29, 2013.
	≥240,000 Btu/h and <760,000 Btu/h	2.40	2.29	October 29, 2013.
Computer Room Air Conditioners, Water-Cooled with a Fluid Economizer.	<65,000 Btu/h	2.55	2.44	October 29, 2012.
	≥65,000 Btu/h and <240,000 Btu/h	2.45	2.34	October 29, 2013.
	≥240,000 Btu/h and <760,000 Btu/h	2.35	2.24	October 29, 2013.
Computer Room Air Conditioners, Glycol-Cooled	<65,000 Btu/h	2.50	2.39	October 29, 2012.
	≥65,000 Btu/h and <240,000 Btu/h	2.15	2.04	October 29, 2013.
	≥240,000 Btu/h and <760,000 Btu/h	2.10	1.99	October 29, 2013.
Computer Room Air Conditioner, Glycol-Cooled with a Fluid Economizer.	<65,000 Btu/h	2.45	2.34	October 29, 2012.
	≥65,000 Btu/h and <240,000 Btu/h	2.10	1.99	October 29, 2013.
	≥240,000 Btu/h and <760,000 Btu/h	2.05	1.94	October 29, 2013.

(f) Each variable refrigerant flow air conditioner or heat pump manufactured on or after the compliance date listed in this table must meet the applicable minimum energy efficiency standard level(s) set forth in this section.

TABLE 8 TO § 431.97—MINIMUM EFFICIENCY STANDARDS FOR VARIABLE REFRIGERANT FLOW MULTI-SPLIT AIR CONDITIONERS AND HEAT PUMPS

Equipment type	Cooling capacity	Heating type[1]	Efficiency level	Compliance date: Products manufactured on and after . . .
VRF Multi-Split Air Conditioners (Air-Cooled)	<65,000 Btu/h	All	13.0 SEER	June 16, 2008.
	≥65,000 Btu/h and <135,000 Btu/h.	No Heating or Electric Resistance Heating.	11.2 EER	January 1, 2010.
		All Other Types of Heating	11.0 EER	January 1, 2010.
	≥135,000 Btu/h and <240,000 Btu/h.	No Heating or Electric Resistance Heating.	11.0 EER	January 1, 2010.
		All Other Types of Heating	10.8 EER	January 1, 2010.
	≥240,000 Btu/h and <760,000 Btu/h.	No Heating or Electric Resistance Heating.	10.0 EER	January 1, 2010.
		All Other Types of Heating	9.8 EER	January 1, 2010.
VRF Multi-Split Heat Pumps (Air-Cooled)	<65,000 Btu/h	All	13.0 SEER 7.7 HSPF	June 16, 2008.
	≥65,000 Btu/h and <135,000 Btu/h.	No Heating or Electric Resistance Heating.	11.0 EER 3.3 COP	January 1, 2010.
		All Other Types of Heating	10.8 EER 3.3 COP	January 1, 2010.
	≥135,000 Btu/h and <240,000 Btu/h.	No Heating or Electric Resistance Heating.	10.6 EER 3.2 COP	January 1, 2010.
		All Other Types of Heating	10.4 EER 3.2 COP	January 1, 2010.
	≥240,000 Btu/h and <760,000 Btu/h.	No Heating or Electric Resistance Heating.	9.5 EER 3.2 COP	January 1, 2010.
		All Other Types of Heating	9.3 EER 3.2 COP	January 1, 2010.
VRF Multi-Split Heat Pumps (Water-Source)* * *	<17,000 Btu/h	Without heat recovery	12.0 EER 4.2 COP	October 29, 2012. October 29, 2003.
		With heat recovery	11.8 EER 4.2 COP	October 29, 2012. October 29, 2003.
	≥17,000 Btu/h and <65,000 Btu/h	All	12.0 EER 4.2 COP	October 29, 2003.
	≥65,000 Btu/h and <135,000 Btu/h.	All	12.0 EER 4.2 COP	October 29, 2003.
	≥135,000 Btu/h and <760,000 Btu/h.	Without heat recovery	10.0 EER 3.9 COP	October 29, 2013.
		With heat recovery	9.8 EER 3.9 COP	October 29, 2013

[1] VRF Multi-Split Heat Pumps (Air-Cooled) with heat recovery fall under the category of "All Other Types of Heating" unless they also have electric resistance heating, in which case it falls under the category for "No Heating or Electric Resistance Heating."

■ 9. Add § 431.104 to read as follows:

§ 431.104 Sources for information and guidance.

(a) *General.* The standards listed in this paragraph are referred to in the DOE test procedures and elsewhere in this part but are not incorporated by reference. These sources are given here for information and guidance.

(b) *ASTM.* American Society for Testing and Materials, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19438–2959, 1–(877) 909–2786, or go to: *http://www.astm.org/index.shtml.*

(1) ASTM Standard Test Method C177–97, "Standard Test Method for

Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.''

(2) ASTM Standard Test Method C518–91, ''Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.''

(3) ASTM Standard Test Method D2156–80, ''Method for Smoke Density in Flue Gases from Burning Distillate Fuels.''

■ 10. Section 431.105 is revised to read as follows:

§ 431.105 Materials incorporated by reference.

(a) *General.* DOE incorporates by reference the following test procedures into subpart G of part 431. The materials listed have been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Any subsequent amendment to the listed materials by the standard-setting organization will not affect the DOE regulations unless and until such regulations are amended by DOE. Materials are incorporated as they exist on the date of the approval, and a notice of any change in the materials will be published in the **Federal Register**. All approved materials are available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call (202) 741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.* Also, this material is available for inspection at U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, 6th Floor, 950 L'Enfant Plaza, SW., Washington, DC 20024, (202) 586–2945, or go to: *http://www1.eere.energy.gov/buildings/appliance_standards* The referenced test procedure standards are listed below by relevant standard-setting organization, along with information on how to obtain copies from those sources.

(b) *ANSI.* American National Standards Institute, 25 W. 43rd Street, 4th Floor, New York, NY 10036, (212) 642–4900, or go to: *http://www.ansi.org.*

(1) ANSI Z21.10.3–1998 (''ANSI Z21.10.3–1998''), ''*Gas Water Heaters, Volume III, Storage Water Heaters With Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous,* Z21.10.3–1998, CSA 4.3–M98, and its Addenda, ANSI Z21.10.3a–2000, CSA 4.3a–M00,'' approved by ANSI on October 18, 1999, IBR approved for § 431.106.

(2) ANSI Z21.10.3–2011 (''ANSI Z21.10.3–2011''), ''*Gas Water Heaters, Volume III, Storage Water Heaters With Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous,*'' approved on March 7, 2011, IBR approved for § 431.106.

(3) [Reserved].

■ 11. Section 431.106 is revised to read as follows:

§ 431.106 Uniform test method for the measurement of energy efficiency of commercial water heaters and hot water supply boilers (other than commercial heat pump water heaters).

(a) *Scope.* This section covers the test procedures you must follow if, pursuant to EPCA, you are measuring the thermal efficiency or standby loss, or both, of a storage or instantaneous water heater or hot water supply boiler (other than a commercial heat pump water heater).

(b) *Testing and Calculations.* Determine the energy efficiency of each covered product by conducting the test procedure(s), set forth in the two rightmost columns of the following table, that apply to the energy efficiency descriptor(s) for that product:

TABLE 1 TO § 431.106—TEST PROCEDURES FOR COMMERCIAL WATER HEATERS AND HOT WATER SUPPLY BOILERS

[Other than commercial heat pump water heaters]

Equipment type	Energy efficiency descriptor	Use test setup, equipment and procedures in subsection labeled "Method of Test" of	Test procedure required for compliance until	With these additional stipulations
Gas-fired Storage and Instantaneous Water Heaters and Hot Water Supply Boilers *.	Thermal Efficiency Standby Loss	ANSI Z21.10.3–1998 **, § 2.9 ANSI Z21.10.3–1998 **, § 2.10	May 13, 2013 May 13, 2013	A. For all products, the duration of the standby loss test shall be until whichever of the following occurs first after you begin to measure the fuel and/or electric consumption: (1) The first cut-out after 24 hours or (2) 48 hours, if the water heater is not in the heating mode at that time. B. For oil and gas products, the standby loss in Btu per hour must be calculated as follows: SL (Btu per hour) = S (% per hour) × 8.25 (Btu/gal-F) × Measured Volume (gal) × 70 (degrees F).

TABLE 1 TO § 431.106—TEST PROCEDURES FOR COMMERCIAL WATER HEATERS AND HOT WATER SUPPLY BOILERS—Continued

[Other than commercial heat pump water heaters]

Equipment type	Energy efficiency descriptor	Use test setup, equipment and procedures in subsection labeled "Method of Test" of	Test procedure required for compliance until	With these additional stipulations
				C. For oil-fired products, apply the following in conducting the thermal efficiency and standby loss tests: (1) Venting Requirements—Connect a vertical length of flue pipe to the flue gas outlet of sufficient height so as to meet the minimum draft specified by the manufacturer. (2) Oil Supply—Adjust the burner rate so that: (a) The hourly Btu input rate lies within ±2 percent of the manufacturer's specified input rate, (b) the CO_2 reading shows the value specified by the manufacturer, (c) smoke in the flue does not exceed No. 1 smoke as measured by the procedure in ASTM–D–2156–80, and (d) fuel pump pressure lies within ±10 percent of manufacturer's specifications. D. For electric products, apply the following in conducting the standby loss test: (1) Assume that the thermal efficiency (Et) of electric water heaters with immersed heating elements is 98 percent. (2) Maintain the electrical supply voltage to within ±5 percent of the center of the voltage range specified on the water heater nameplate. (3) If the set up includes multiple adjustable thermostats, set the highest one first to yield a maximum water temperature in the specified range as measured by the topmost tank thermocouple. Then set the lower thermostat(s) to yield a maximum mean tank temperature within the specified range. E. Install water-tube water heaters as shown in Figure 2, "Arrangement for Testing Water-tube Type Instantaneous and Circulating Water Heaters."

* As to hot water supply boilers with a capacity of less than 10 gallons, these test methods become mandatory on October 21, 2005. Prior to that time, you may use for these products either (1) these test methods if you rate the product for thermal efficiency, or (2) the test methods in Subpart E if you rate the product for combustion efficiency as a commercial packaged boiler.

** Incorporated by reference, see § 431.105.

TABLE 2 TO § 431.106—TEST PROCEDURES FOR COMMERCIAL WATER HEATERS AND HOT WATER SUPPLY BOILERS

[Other than commercial heat pump water heaters]

Equipment type	Energy efficiency descriptor	Use test setup, equipment and procedures in subsection labeled "Method of Test" of	Test procedure required for compliance on and after	With these additional stipulations
Gas-fired Storage and Instantaneous Water Heaters and Hot Water Supply Boilers *.	Thermal Efficiency	ANSI Z21.10.3–2011 **, Exhibit G1	May 13, 2013	A. For all products, the duration of the standby loss test shall be until whichever of the following occurs first after you begin to measure the fuel and/or electric consumption: (1) The first cut-out after 24 hours or (2) 48 hours, if the water heater is not in the heating mode at that time. B. For oil and gas products, the standby loss in Btu per hour must be calculated as follows: SL (Btu per hour) = S (% per hour) × 8.25 (Btu/gal-F) × Measured Volume (gal) × 70 (degrees F). C. For oil-fired products, apply the following in conducting the thermal efficiency and standby loss tests: (1) Venting Requirements—Connect a vertical length of flue pipe to the flue gas outlet of sufficient height so as to meet the minimum draft specified by the manufacturer. (2) Oil Supply—Adjust the burner rate so that: (a) The hourly Btu input rate lies within ±2 percent of the manufacturer's specified input rate, (b) the CO_2 reading shows the value specified by the manufacturer, (c) smoke in the flue does not exceed No. 1 smoke as measured by the procedure in ASTM–D–2156–80, and (d) fuel pump pressure lies within ±10 percent of manufacturer's specifications. D. For electric products, apply the following in conducting the standby loss test: (1) Assume that the thermal efficiency (Et) of electric water heaters with immersed heating elements is 98 percent. (2) Maintain the electrical supply voltage to within ±5 percent of the center of the voltage range specified on the water heater nameplate. (3) If the set up includes multiple adjustable thermostats, set the highest one first to yield a maximum water temperature in the specified range as measured by the topmost tank thermocouple. Then set the lower thermostat(s) to yield a maximum mean tank temperature within the specified range. E. Install water-tube water heaters as shown in Figure 2, "Arrangement for Testing Water-tube Type Instantaneous and Circulating Water Heaters."
	Standby Loss	ANSI Z21.10.3–2011 **, Exhibit G2	May 13, 2013	
Oil-fired Storage and Instantaneous Water Heaters and Hot Water Supply Boilers *.	Thermal Efficiency	ANSI Z21.10.3–2011 **, Exhibit G1	May 13, 2013	
	Standby Loss	ANSI Z21.10.3–2011 **, Exhibit G2	May 13, 2013	
Electric Storage and Instantaneous Water Heaters.	Standby Loss	ANSI Z21.10.3–2011 **, Exhibit G2	May 13, 2013	

* As to hot water supply boilers with a capacity of less than 10 gallons, these test methods become mandatory on October 21, 2005. Prior to that time, you may use for these products either (1) these test methods if you rate the product for thermal efficiency, or (2) the test methods in Subpart E if you rate the product for combustion efficiency as a commercial packaged boiler.

** Incorporated by reference, *see* § 431.105.

Note: The following will not appear in the Code of Federal Regulations.

BILLING CODE 6450–01–P

U.S. DEPARTMENT OF JUSTICE
Antitrust Division

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March 27, 2012

Mr. Eric Fygi
Deputy General
Counsel Department
of Energy
Washington, DC
20585

Re: Energy Conservation Standards

Dear Deputy General Counsel Fygi:

I am responding to your January 31, 2012 letter seeking the views of the Attorney General about the potential impact on competition of proposed energy conservation standards for certain types of commercial heating, air-conditioning, and water-heating equipment. Specifically, you are proposing amended standards for small, large, and very large water-cooled and evaporatively-cooled commercial package air conditioners and variable refrigerant flow (VRF) water-source heat pumps less than 17,000 Btu/h, and proposing new standards for VRF water-source heat pumps greater than or equal to 135,000 Btu/h and computer room air conditioners. Your request was submitted under Section 325(o)(2)(B)(i)(V) of the Energy Policy and Conservation Act, as amended (ECPA), 42 U.S.C. 6295(o)(2)(B)(i)(5) and 42 U.S.C. 6316(a), which requires the Attorney General to make a determination of the impact of any lessening of competition that is likely to result from the imposition of proposed energy conservation standards. The Attorney General's responsibility for responding to requests from other departments about the effect of a program on competition has been delegated to the Assistant Attorney General for the Antitrust Division in 28 CFR § 0.40(g).

In conducting its analysis the Antitrust Division examines whether a proposed standard may lessen competition, for example, by substantially limiting consumer choice, by placing certain manufacturers at an unjustified competitive disadvantage, or by inducing avoidable inefficiencies in production or distribution of particular products. A lessening of competition could result in higher prices to consumers, and perhaps thwart the intent of the revised standards by inducing substitution to less efficient products.

We have reviewed the proposed standards contained in the Notice of Proposed Rulemaking (77 Fed. Reg. 2356, January 17, 2012). We have also reviewed supplementary information submitted to the Attorney General by the Department of Energy and listened by webinar to the February 14, 2009 public hearing on the proposed standards. Based on this review, our conclusion is that the proposed energy conservation standards for the above-mentioned types of commercial heating, air-conditioning, and water-heating equipment are unlikely to have a significant adverse impact on competition. In reaching our conclusion, we note the absence of any competitive concerns raised by industry participants at the hearing and that these proposed energy standards correspond to the latest version of the relevant industry consensus standard.

Sincerely,

Sharis A. Pozen

Acting Assistant Attorney General
Antitrust Division

[FR Doc. 2012–10650 Filed 5–15–12; 8:45 am]

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