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: Notice of proposed rulemaking and announcement of public meeting.

SUMMARY: The U.S. Department of Energy (DOE) is proposing to amend its energy conservation standards for several classes of commercial heating, air-conditioning, and water-heating equipment. 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. Based upon its analysis of the energy savings potential of amended energy conservation standards and the lack of clear and convincing evidence to support more-stringent standards, DOE is proposing to adopt the amended standards in ASHRAE Standard 90.1 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 computer room air conditioners. DOE is also proposing updates to the current Federal test procedures to incorporate by reference the most current versions of the following relevant industry test procedures specified in ASHRAE Standard 90.1: Air-conditioning, Heating, and Refrigeration Institute (AHRI) 210/240 (small commercial package air conditioning and heating equipment); AHRI 340/360 (large and very large commercial package air conditioning and heating equipment); Underwriters Laboratories (UL) 727 and ANSI Z21.47 (commercial warm-air furnaces); and ANSI Z21.10.3 (commercial water heaters). Furthermore, DOE is proposing to adopt AHRI 1230 for newly-created classes of variable refrigerant flow air conditioners and heat pumps, ASHRAE 127 for computer room air conditioners, and AHRI 390 for single package vertical air conditioners and single package vertical heat pumps. In addition, DOE is announcing a public meeting to receive comment on its proposal and related issues.

DATES: *Meeting:* DOE will hold a public meeting on February 14, 2012, from 9 a.m. to 4 p.m., in Washington, DC. The meeting will also be broadcast as a webinar. See section X, ''Public Participation,'' for webinar information, participant instructions, and information about the capabilities available to webinar participants.

Comments: DOE will accept comments, data, and information regarding this notice of proposed rulemaking (NOPR) before and after the public meeting, but no later than April 2, 2012. For details, see section X, ''Public Participation,'' of this NOPR.

ADDRESSES: The public meeting will be held at the U.S. Department of Energy, Forrestal Building, Room 8E–089, 1000 Independence Avenue SW., Washington, DC 20585. To attend, please notify Ms. Brenda Edwards at (202) 586–2945. Please note that foreign nationals visiting DOE Headquarters are subject to advance security screening procedures. Any foreign national wishing to participate in the meeting, should advise DOE as soon as possible by contacting Ms. Edwards at the phone number above to initiate the necessary procedures. Please also note that any person wishing to bring a laptop computer into the Forrestal Building will be required to obtain a property pass. Visitors should avoid bringing laptops, or allow an extra 45 minutes. Persons may also attend the public meeting via webinar. For more information, refer to section X, ''Public Participation,'' of this NOPR.

Any comments submitted must identify the NOPR on Energy Conservation Standards and Test Procedures for ASHRAE Standard 90.1 Products, and provide docket number EERE–2011–BT–STD–0029 and/or Regulatory Information Number (RIN) 1904–AC47. Comments may be submitted using any of the following methods:

1. *Federal eRulemaking Portal: www.regulations.gov.* Follow the instructions for submitting comments.

2. *Email: ASHRAE90.1-2011-STD-0029@ee.doe.gov.* Include docket number EERE–2011–BT–STD–0029 and/or RIN 1904–AC47 in the subject line of the message.

3. *Mail:* Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, Mailstop EE–2J, 1000 Independence Avenue SW., Washington, DC 20585–0121. If possible, please submit all items on a compact disc (CD), in which case it is not necessary to include printed copies.

4. *Hand Delivery/Courier:* Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, 950 L'Enfant Plaza SW., Suite 600, Washington, DC 20024. Telephone: (202) 586–2945. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

No telefacsimilies (faxes) will be accepted. For detailed instructions on submitting comments and additional information on the rulemaking process, see section X of this document (Public Participation).

Docket: The docket 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: *www.regulations.gov.* This web page contains a link to the docket for this notice, along with simple instructions on how to access all documents, including public comments, in the docket. See section X, ''Public Participation,'' for further information on how to submit comments through *www.regulations.gov.*

For further information on how to submit a comment, review other public comments and the docket, or participate in the public meeting, contact Ms. Brenda Edwards at (202) 586–2945 or by email: *Brenda.Edwards@ee.doe.gov.*

FOR FURTHER INFORMATION CONTACT: Mr. Mohammed Khan, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, Mailstop EE–2J, 1000 Independence Avenue SW., Washington, DC 20585–0121. Telephone: (202) 586–7892. Email: *Mohammed.Khan@ee.doe.gov.*

Mr. Eric Stas, U.S. Department of Energy, Office of the General Counsel, Mailstop GC–71, 1000 Independence Avenue SW., Washington, DC 20585–0121. Telephone: (202) 586–9507. Email: *Eric.Stas@hq.doe.gov.*

SUPPLEMENTARY INFORMATION:

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I. Summary of the Proposed 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

[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 Continued

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 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.

Accordingly, this NOPR sets forth DOE's determination of scope for consideration of amended energy conservation standards with respect to certain heating, ventilating, air-conditioning, and water-heating equipment addressed in ASHRAE Standard 90.1–2010. Such inquiry is necessary to ascertain whether the revised ASHRAE efficiency levels have become more stringent, thereby ensuring that any new amended national standard would not result in prohibited ''backsliding.'' 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 with and without heat recovery; and computer room air conditioners), where possible,[2] 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). For the classes of water-cooled and evaporatively-cooled air conditioning and heating equipment, as well as the VRF equipment classes, DOE determined that the potential for energy savings from adopting more stringent levels than the ASHRAE Standard 90.1 levels was not significant, and, thus, DOE is proposing to adopt the ASHRAE Standard 90.1 levels without further analysis. (See section IV.B for further details.) For computer room air conditioners, DOE also analyzed the economic justification of amended national energy conservation standards at more-stringent efficiency levels, in addition to the energy savings potential. DOE did not identify any equipment on the market for evaporatively-cooled air conditioners with a capacity less than 240,000 Btu/h (small and large product classes) or VRF water-source heat pumps with a cooling capacity less than 17,000 Btu/h. As a result, DOE did not analyze the economic or energy savings potential of these amended national energy conservation standards, because there are currently no energy savings associated with these product classes, nor is there any available equipment information.

In light of the above, DOE has tentatively concluded that 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: (1) The revised efficiency levels in ASHRAE 90.1–2010[3] are more stringent than current national standards or represent new standards; and (2) their adoption as Federal energy conservation standards would result in energy savings where models exist below the revised efficiency levels. DOE has also tentatively concluded that there is not clear and convincing evidence as would justify adoption of more-stringent efficiency levels for this equipment.

Thus, in accordance with the criteria discussed elsewhere in this notice, DOE is proposing to amend its existing energy conservation standards for twelve equipment classes of water-cooled and evaporatively-cooled equipment and VRF water-source heat pumps less than 17,000 Btu/h (with and without heat recovery), and to establish new energy conservation standards for VRF water-source heat pumps at or greater than 135,000 Btu/h (with and without heat recovery) and thirty classes of computer room air conditioners by adopting the efficiency levels specified by ASHRAE Standard 90.1–2010.

The proposed standards for small water-cooled and evaporatively-cooled commercial package air conditioners, VRF water-source heat pumps less than 17,000 Btu/h, and computer room air conditioners less than 65,000 Btu/h would apply to equipment manufactured on or after the date two years after the effective date specified in ASHRAE Standard 90.1–2010 (*i.e.,* by June 1, 2013 for small water-cooled and evaporatively-cooled commercial package air conditioners, and by October 29, 2012 for VRF water-source heat pump less than 17,000 Btu/h and computer room air conditioners less than 65,000 Btu/h). (42 U.S.C. 6313(a)(6)(D)(i)) The proposed standards for large and very large water-cooled and evaporatively-cooled commercial package air conditioners, VRF water-source heat pumps equal to or greater than 135,000 Btu/h, and computer room air conditioners equal to or greater than 65,000 Btu/h would apply to such equipment manufactured on or after the date three years after the effective date specified in ASHRAE Standard 90.1–2010 (*i.e.,* by June 1, 2014 for large and very large water-cooled and evaporatively-cooled commercial package air conditioners, and by October 29, 2013 for VRF water-source heat pumps equal to or greater than 135,000 Btu/h and computer room air conditioners equal to or greater than 65,000 Btu/h). (42 U.S.C. 6313(a)(6)(D)(ii))

In addition, when the test procedures referenced in ASHRAE Standard 90.1 are updated, EPCA requires DOE to amend the test procedures for those ASHRAE equipment (which manufacturers are required to use in order to certify compliance with energy conservation standards mandated under EPCA) to be consistent with the amended industry test procedure. (42 U.S.C. 6314(a)(4)(B)) Specifically, these amendments would update the citations and incorporations by reference in

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.

[2] If DOE found there were no models available on the market for any equipment class, DOE did not perform an analysis of the energy savings potential of that equipment class.

[3] To obtain a copy of ASHRAE Standard 90.1–2010, visit *www.ashrae.org/technology/page/548* or contact the ASHRAE publications department by e-mail at *orders@ashrae.org* or by telephone at (800) 527–4723.

DOE's regulations 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-Fried Central Furnaces); and (5) ANSI Z21.10.3–2006 (Gas Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous). DOE is also proposing to adopt 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 also proposing to include an optional ''break-in'' provision in its test procedures for commercial air conditioning and heating equipment, in order to provide the manufacturer with the option of running the test unit for a set amount of time prior to testing the equipment. Such a provision could allow components within the unit to warm-up to conditions that are more characteristic of typical operation and more accurately reflect efficiencies achieved in the field. Lastly, DOE has identified a number of issues associated with its test procedures for which it is seeking comments from interested parties.

II. Introduction

The following section briefly discusses the statutory authority underlying today's proposal, as well as some of the relevant historical background related to the establishment of 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[4] 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.[5] 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.

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 products. 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 product.)

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.[6] DOE is conducting a separate rulemaking to further evaluate the efficiency levels for this equipment class.

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

[5] 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.

[6] 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.

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 product 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, EISA 2007 amended EPCA to require that at least once every 7 years, DOE must conduct an evaluation of the test procedures for all covered equipment and either amend 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 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 the test procedures 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 included in this rule (*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 plans to follow 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 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 NOPR 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 EO 13563, and the range of impacts analyzed in this rulemaking, the energy efficiency standard proposed 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).

Table II.1 below presents the equipment classes for which ASHRAE Standard 90.1–2010 efficiency levels differed from those in the previous version of ASHRAE Standard 90.1 (*i.e.,* ASHRAE Standard 90.1– 2007). Table II.1 also presents the existing Federal energy conservation standards and the corresponding standard levels in both ASHRAE Standard 90.1–2007 and ASHRAE Standard 90.1–2010 for those equipment classes. Section IV of this document assesses each of these equipment types to determine whether the amendments in ASHRAE Standard 90.1–2010 constitute increased energy efficiency levels, as would necessitate further analysis of the potential energy savings from amended Federal energy conservation standards, the conclusions of which are presented in the final column of Table II.1.

TABLE II.1—FEDERAL ENERGY CONSERVATION STANDARDS AND ENERGY EFFICIENCY LEVELS IN ASHRAE STANDARD 90.1–2007 AND ASHRAE STANDARD 90.1–2010 FOR SPECIFIC TYPES OF COMMERCIAL EQUIPMENT *

ASHRAE equipment class**	Energy efficiency levels in ASHRAE standard 90.1–2007	Energy efficiency levels in ASHRAE standard 90.1–2010	Federal energy conservation standards	DOE review triggered?
Commercial Warm-Air Furnaces				
Gas-Fired Commercial Warm-Air furnace	E_c = 80% Interrupted or intermittent ignition device, jacket losses not exceeding 0.75% of input rating, power vent or flue damper***	E_t = 80% Interrupted or intermittent ignition device, jacket losses not exceeding 0.75% of input rating, power vent or flue damper***	E_t = 80%	No
Commercial Package Air-Conditioning and Heating Equipment—Water-Cooled				
Water-cooled Air Conditioner, ≥65,000 and <135,000 Btu/h, Electric Resistance Heating or No Heating.	11.5 EER	12.1 EER (as of 6/1/11)	11.5 EER	Yes
Water-cooled Air Conditioner, ≥65,000 and <135,000 Btu/h, All Other Heating.	11.3 EER	11.9 EER (as of 6/1/11)	11.3 EER	Yes
Water-cooled Air Conditioner, ≥135,000 and <240,000 Btu/h, Electric Resistance Heating or No Heating.	11.0 EER	12.5 EER (as of 6/1/11)	11.0 EER	Yes
Water-cooled Air Conditioner, ≥135,000 and <240,000 Btu/h, All Other Heating.	10.8 EER	12.3 EER (as of 6/1/11)	11.0 EER	Yes
Water-cooled Air Conditioner, ≥240,000 Btu/h, Electric Resistance Heating or No Heating.	11.0 EER	12.4 EER (as of 6/1/11)	11.0 EER	Yes
Water-cooled Air Conditioner, ≥240,000 Btu/h, All Other Heating.	10.8 EER	12.2 EER (as of 6/1/11)	10.8 EER	Yes
Commercial Package Air-Conditioning and Heating Equipment—Evaporatively-Cooled				
Evaporatively-cooled Air Conditioner, ≥65,000 and <135,000 Btu/h, Electric Resistance Heating or No Heating.	11.5 EER	12.1 EER (as of 6/1/11)	11.5 EER	Yes
Evaporatively-cooled Air Conditioner, ≥65,000 and <135,000 Btu/h, All Other Heating.	11.3 EER	11.9 EER (as of 6/1/11)	11.3 EER	Yes
Evaporatively-cooled Air Conditioner, ≥135,000 and <240,000 Btu/h, Electric Resistance Heating or No Heating.	11.0 EER	12.0 EER (as of 6/1/11)	11.0 EER	Yes
Evaporatively-cooled Air Conditioner, ≥135,000 and <240,000 Btu/h, All Other Heating.	10.8 EER	11.8 EER (as of 6/1/11)	11.0 EER	Yes
Evaporatively-cooled Air Conditioner, ≥240,000 and <760,000 Btu/h, Electric Resistance Heating or No Heating.	11.0 EER	11.9 EER (as of 6/1/11)	11.0 EER	Yes
Evaporatively-cooled Air Conditioner, ≥240,000 and <760,000 Btu/h, All Other Heating.	10.8 EER	11.7 EER† (as of 6/1/11)	10.8 EER	Yes
Commercial Package Air-Conditioning and Heating Equipment—VRF Systems††				
VRF Air Conditioners, Air-cooled, <65,000 Btu/h	N/A	13.0 SEER	13.0 SEER	No
VRF Air Conditioners, Air-cooled, ≥65,000 and <135,000 Btu/h, Electric Resistance or No Heating.	N/A	11.2 EER	11.2 EER	No
VRF Air Conditioners, Air-cooled, ≥135,000 and <240,000 Btu/h, Electric Resistance or No Heating.	N/A	11.0 EER	11.0 EER	No
VRF Air Conditioners, Air-cooled, ≥240,000 Btu/h, Electric Resistance or No Heating.	N/A	10.0 EER	10.0 EER	No
VRF Heat Pumps, Air-cooled, <65,000 Btu/h	N/A	13.0 SEER 7.7 HSPF	13.0 SEER 7.7 HSPF	No

TABLE II.1—FEDERAL ENERGY CONSERVATION STANDARDS AND ENERGY EFFICIENCY LEVELS IN ASHRAE STANDARD 90.1–2007 AND ASHRAE STANDARD 90.1–2010 FOR SPECIFIC TYPES OF COMMERCIAL EQUIPMENT *—Continued

ASHRAE equipment class**	Energy efficiency levels in ASHRAE standard 90.1–2007	Energy efficiency levels in ASHRAE standard 90.1–2010	Federal energy conservation standards	DOE review triggered?
VRF Heat Pumps, Air-cooled, ≥65,000 and <135,000 Btu/h, without heat recovery, Electric Resistance or No Heating.	N/A	11.0 EER 3.3 COP	11.0 EER 3.3 COP	No
VRF Heat Pumps, Air-cooled, ≥65,000 and <135,000 Btu/h, with heat recovery, Electric Resistance or No Heating.	N/A	10.8 EER 3.3 COP	11.0 EER (electric resistance heating) 10.8 EER (no electric resistance heating)††† 3.3 COP	No
VRF Heat Pumps, Air-cooled, ≥135,000 and <240,000 Btu/h, without heat recovery, Electric Resistance or No Heating.	N/A	10.6 EER 3.2 COP	10.6 EER 3.2 COP	No
VRF Heat Pumps, Air-cooled, ≥135,000 and <240,000 Btu/h, with heat recovery, Electric Resistance or No Heating.	N/A	10.4 EER 3.2 COP	10.6 EER (electric resistance heating) 10.4 (no electric resistance heating)††† 3.2 COP	No
VRF Heat Pumps, Air-cooled, ≥240,000 Btu/h, without heat recovery, Electric Resistance or No Heating.	N/A	9.5 EER 3.2 COP	9.5 EER 3.2 COP	No
VRF Heat Pumps, Air-cooled, ≥240,000 Btu/h, with heat recovery, Electric Resistance or No Heating.	N/A	9.3 EER 3.2 COP	9.5 EER (electric resistance heating) 9.3 EER (no electric resistance heating)††† 3.2 COP	No
VRF Heat Pumps, Water-source, <65,000 Btu/h, without heat recovery.	N/A	12.0 EER 4.2 COP	11.2 EER (<17,000 Btu/h)‡ 12.0 EER (≥17,000 Btu/h and <65,000 Btu/h) 4.2 COP	Yes✧✧✧ for <17,000 Btu No for ≥17,000 Btu/h and <65,000 Btu/h
VRF Heat Pumps, Water-source, <65,000 Btu/h, with heat recovery.	N/A	11.8 EER 4.2 COP	11.2 EER (< 17,000 Btu/h)‡ 12.0 EER (≥17,000 Btu/h and <65,000 Btu/h) 4.2 COP	Yes✧✧✧ for <17,000 Btu No for ≥17,000 Btu/h and <65,000 Btu/h
VRF Heat Pumps, Water-source, ≥65,000 and <135,000 Btu/h, without heat recovery.	N/A	12.0 EER 4.2 COP	12.0 EER 4.2 COP	No
VRF Heat Pumps, Water-source, ≥65,000 and <135,000 Btu/h, with heat recovery.	N/A	11.8 EER 4.2 COP	12.0 EER 4.2 COP	No
VRF Heat Pumps, Water-source, ≥135,000 Btu/h, without heat recovery.	N/A	10.0 EER 3.9 COP	N/A	Yes✧✧✧
VRF Heat Pumps, Water-source, ≥135,000 Btu/h, with heat recovery.	N/A	9.8 EER 3.9 COP	N/A	Yes✧✧✧
Commercial Package Air-Conditioning and Heating Equipment—PTACs and PTHPs‡‡				
Package Terminal Air Conditioner, <7,000 Btu/h, Standard Size (New Construction)‡‡‡.	EER = 11.0	EER = 11.7 (as of 10/8/12)	EER = 11.7	No
Package Terminal Air Conditioner, ≥7,000 and <15,000 Btu/h, Standard Size (New Construction)‡‡‡.	EER = 12.5—(0.213 x Cap✧)	EER = 13.8—(0.300 x Cap✧) (as of 10/8/12)	EER = 13.8—(0.300 x Cap✧)	No
Package Terminal Air Conditioner, >15,000 Btu/h, Standard Size (New Construction)‡‡‡.	EER = 9.3	EER = 9.3	EER = 9.3	No
Package Terminal Heat Pump, <7,000 Btu/h, Standard Size (New Construction)‡‡‡.	EER = 10.8 COP = 3.0	EER = 11.9 COP = 3.3 (as of 10/8/12)	EER = 11.9 COP = 3.3	No
Package Terminal Heat Pump, ≥7,000 and <15,000 Btu/h, Standard Size (New Construction)‡‡‡.	EER = 12.3—(0.213 x Cap✧) COP = 3.2—(0.026 x Cap✧)	EER = 14.0—(0.300 x Cap✧) COP = 3.7—(0.052 x Cap✧) (as of 10/8/12)	EER = 14.0—(0.300 x Cap✧) COP = 3.7—(0.052 x Cap✧)	No
Package Terminal Heat Pump, >15,000 Btu/h, Standard Size (New Construction)‡‡‡.	EER = 9.1 COP = 2.8	EER = 9.5 COP = 2.9	EER = 9.5 COP = 2.9	No
Commercial Package Air-Conditioning and Heating Equipment—SDHV and TTW				
Through-the-Wall, Air-cooled Heat Pumps, ≤30,000 Btu/h.	12.0 SEER 7.4 HSPF	13.0 SEER 7.4 HSPF	13.0 SEER 7.7 HSPF	No
Small-Duct, High-Velocity, Air-cooled Heat Pumps, <65,000 Btu/h.	10.0 SEER 6.8 HSPF	N/A✧✧	13.0 SEER 7.7 HSPF	No
Air Conditioners and Condensing Units Serving Computer Rooms				
Air conditioners, air-cooled, <65,000 Btu/h	N/A	2.20 SCOP (downflow) 2.09 SCOP (upflow)	N/A	Yes✧✧✧
Air conditioners, air-cooled, ≥65,000 and <240,000 Btu/h.	N/A	2.10 SCOP (downflow) 1.99 SCOP (upflow)	N/A	Yes✧✧✧
Air conditioners, air-cooled, ≥240,000 Btu/h	N/A	1.90 SCOP (downflow) 1.79 SCOP (upflow)	N/A	Yes✧✧✧

TABLE II.1—FEDERAL ENERGY CONSERVATION STANDARDS AND ENERGY EFFICIENCY LEVELS IN ASHRAE STANDARD 90.1–2007 AND ASHRAE STANDARD 90.1–2010 FOR SPECIFIC TYPES OF COMMERCIAL EQUIPMENT *—Continued

ASHRAE equipment class**	Energy efficiency levels in ASHRAE standard 90.1–2007	Energy efficiency levels in ASHRAE standard 90.1–2010	Federal energy conservation standards	DOE review triggered?
Air conditioners, water-cooled, <65,000 Btu/h	N/A	2.60 SCOP (downflow) 2.49 SCOP (upflow)	N/A	Yes✧✧✧
Air conditioners, water-cooled, ≥65,000 and <240,000 Btu/h.	N/A	2.50 SCOP (downflow) 2.39 SCOP (upflow)	N/A	Yes✧✧✧
Air conditioners, water-cooled, ≥240,000 Btu/h	N/A	2.40 SCOP (downflow) 2.29 SCOP (upflow)	N/A	Yes✧✧✧
Air conditioners, water-cooled with fluid economizer, <65,000 Btu/h.	N/A	2.55 SCOP (downflow) 2.44 SCOP (upflow)	N/A	Yes✧✧✧
Air conditioners, water-cooled with fluid economizer, ≥65,000 and <240,000 Btu/h.	N/A	2.45 SCOP (downflow) 2.34 SCOP (upflow)	N/A	Yes✧✧✧
Air conditioners, water-cooled with fluid economizer, ≥240,000 Btu/h.	N/A	2.35 SCOP (downflow) 2.24 SCOP (upflow)	N/A	Yes✧✧✧
Air conditioners, glycol-cooled, <65,000 Btu/h	N/A	2.50 SCOP (downflow) 2.39 SCOP (upflow)	N/A	Yes✧✧✧
Air conditioners, glycol-cooled, ≥65,000 and <240,000 Btu/h.	N/A	2.15 SCOP (downflow) 2.04 SCOP (upflow)	N/A	Yes✧✧✧
Air conditioners, glycol-cooled, ≥240,000 Btu/h	N/A	2.10 SCOP (downflow) 1.99 SCOP (upflow)	N/A	Yes✧✧✧
Air conditioners, glycol-cooled with fluid economizer, <65,000 Btu/h.	N/A	2.45 SCOP (downflow) 2.34 SCOP (upflow)	N/A	Yes✧✧✧
Air conditioners, glycol-cooled with fluid economizer, ≥65,000 and <240,000 Btu/h.	N/A	2.10 SCOP (downflow) 1.99 SCOP (upflow)	N/A	Yes✧✧✧
Air conditioners, glycol-cooled with fluid economizer, ≥240,000 Btu/h.	N/A	2.05 SCOP (downflow) 1.94 SCOP (upflow)	N/A	Yes✧✧✧

* "E_c" means combustion efficiency; "E_t" means thermal efficiency; "EER" means energy efficiency ratio; "SEER" means seasonal energy efficiency ratio; "HSPF" means heating seasonal performance factor; "COP" means coefficient of performance; "Btu/h" means British thermal units per hour; and "SCOP" means sensible coefficient of performance.

** ASHRAE Standard 90.1–2010 equipment classes may differ from the equipment classes defined in DOE's regulations, but no loss of coverage will occur (*i.e.,* all previously covered DOE equipment classes remained covered equipment).

*** A vent damper is an acceptable alternative to a flue damper for those furnaces that draw combustion air from conditioned space.

† ASHRAE Standard 90.1–2010 specifies this efficiency level as 12.2 EER. However, as explained in section IV.B.2 of this NOPR, DOE believes this level was a mistake and that the correct level is 11.7 EER.

†† Variable Refrigerant Flow (VRF) systems are newly defined equipment classes in ASHRAE Standard 90.1–2010. As discussed in section IV.B.3 of this NOPR, DOE believes these systems are currently covered by Federal energy conservation standards for commercial package air conditioning and heating equipment.

††† For these equipment classes, ASHRAE sets lower efficiency requirements for equipment with heat recovery systems. DOE believes systems with heat recovery and electric resistance heating would be required to meet the current Federal standard for equipment with electric resistance heating (*i.e.,* the Federal standard level shown in the table). However, for equipment with heat recovery and no electric resistance heating, DOE believes heat recovery would be an "other" heating type allowing for a 0.2 EER reduction in the Federal minimum requirement.

‡ The Federal energy conservation standards for this equipment class are specified differently for equipment with cooling capacity <17,000 Btu/h. However, ASHRAE Standard 90.1–2010 does not distinguish this equipment class.

‡‡ For equipment rated according to the DOE test procedure, all EER values must be rated at 95°F outdoor dry-bulb temperature for air-cooled products and evaporatively-cooled products, and at 85°F entering water temperature for water-cooled products. All COP values must be rated at 47°F outdoor dry-bulb temperature for air-cooled products, and at 70°F entering water temperature for water-source heat pumps.

‡‡‡ "Standard size" refers to PTAC or PTHP equipment with wall sleeve dimensions ≥16 inches high, or ≥42 inches wide.

✧ "Cap" means cooling capacity in kBtu/h at 95°F outdoor dry-bulb temperature.

✧✧ ASHRAE Standard 90.1–2010 includes an efficiency level of 10.0 SEER for these products. However, as explained in section IV.B.5 of this NOPR, DOE believes that ASHRAE did not intend to set an efficiency level for these products.

✧✧✧ An energy-savings analysis for this class of equipment was not conducted for the notice of data availability published on May 5, 2011 due to either a lack of data or because there is no equipment on the market that would fall into this equipment class.

2. Notice of Data Availability

On May 5, 2011, DOE published a notice of data availability (May 2011 NODA) in the **Federal Register** 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, the May 2011 NODA presented for public comment DOE's analysis of the potential energy savings estimates for amended national energy conservation standards for types of commercial equipment based on: (1) The modified efficiency levels contained within ASHRAE Standard 90.1–2010; and (2) more-stringent efficiency levels. *Id.* at 25637. DOE has described these analyses and preliminary conclusions and sought input from interested parties, including the submission of data and other relevant information. *Id.*

In addition, DOE presented a discussion in the May 2011 NODA of the changes found in ASHRAE Standard 90.1–2010. *Id.* at 25630–37. The May 2011 NODA includes 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. As an initial matter, DOE sought to determine which requirements for covered equipment in ASHRAE Standard 90.1, if any, have been revised solely to reflect the level of the current Federal energy conservation standard (where ASHRAE is merely "catching up" to the current national standard), have been revised but lowered, have been revised to include design requirements without changes to the efficiency level, or have had any other revisions made that do not increase the standard level, in which case, DOE is not triggered to act under 42 U.S.C. 6313(a)(6) for that particular product type. For those types of equipment in ASHRAE Standard 90.1 for which ASHRAE actually increased efficiency levels above the current Federal standard, DOE subjected that equipment to the potential energy savings analysis discussed above and presented the results in the May 2011 NODA for public comment. 76 FR 25622, 25644–47 (May 5, 2011). 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.

As a result of the preliminary determination of scope set forth in the May 2011 NODA, DOE found that there were equipment types for which ASHRAE increased the efficiency levels (thereby triggering further analysis) including: (1) Water-cooled and evaporatively-cooled air conditioners; (2) two classes of VRF water-source heat pumps with and without heat recovery; and (3) computer room air conditioners (which were not previously covered). 76 FR 25622, 25644–47 (May 5, 2011). 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. 76 FR 25622, 25637–46 (May 5, 2011). 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.

III. General Discussion of Comments Regarding the ASHRAE Process and DOE's Interpretation of EPCA's Requirements With Respect to ASHRAE Equipment

In response to its request for comment on the May 2011 NODA, DOE received seven 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 section summarizes the issues raised in these comments, along with DOE's responses.

A. The ASHRAE Process

In response to the preliminary determination of scope and analyses set forth in the May 2011 NODA, DOE received several comments regarding the ASHRAE process for considering revised efficiency levels for certain commercial heating, ventilating, air-conditioning, and water heater equipment.

Edison Electric Institute (EEI) stated that it supported the efficiency levels for equipment shown in ASHRAE Standard 90.1–2010, because the efficiency levels were created through a consensus-based process, DOE's analysis shows energy savings for all ASHRAE values analyzed, and adopting ASHRAE values would ensure a streamlined approach. (EEI, No. 7 at p. 1–2) [7] The Air-Conditioning, Heating, and Refrigeration Institute (AHRI) stated that AHRI and its members were participants in the development of ASHRAE Standard 90.1–2010, and that revisions to ASHRAE Standard 90.1 are developed through a consensus process. AHRI encouraged DOE to adopt the efficiency levels in ASHRAE Standard 90.1–2010 as Federal minimum efficiency standards. (AHRI, No. 11 at p. 1, 3)

DOE maintains its position expressed in the March 20, 2009 NOPR, as restated below. While DOE recognizes that efficiency levels in ASHRAE Standard 90.1–2010 are the result of a consensus process, EPCA clearly sets forth DOE's obligations in terms of considering amendments when ASHRAE revises Standard 90.1. Specifically, EPCA directs that if ASHRAE Standard 90.1 is amended, 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 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)) In order to determine if more-stringent efficiency levels would meet EPCA's criteria, DOE must review the efficiency levels in ASHRAE Standard 90.1–2010 and more-stringent efficiency levels for their energy savings and economic potentials irrespective of whether the efficiency levels were part of a consensus standard. 74 FR 12000, 12006.

B. The Definition of "Amendment" With Respect to the Efficiency Levels in ASHRAE Standard 90.1

The Appliance Standards Awareness Project (ASAP), the Natural Resources Defense Council (NRDC), the Northwest Energy Efficiency Alliance (NEEA), and the Northwest Power and Conservation Council (NPCC) submitted a joint comment (hereafter referred to as "The Advocates" comment), which argued that although efficiency levels did not change for warm-air furnaces, ASHRAE 90.1–2010 contains design requirements (interrupted or intermittent ignition device, jacket losses not exceeding 0.75 percent of the input rating, and either power venting or a flue damper) that qualify as an amendment that triggers DOE's review. (The Advocates, No. 8 at p. 2–3) The Advocates stated in previous comments attached as Exhibit B, "The plain language of EPCA ties DOE's duty to review and update Federal standards to ASHRAE's amendment of its own standards regardless of the direction or nature of the ASHRAE change." (The Advocates, No. 8 at Exhibit B, p. 3) The Advocates further note that the prescriptive requirements for warm-air furnaces meet DOE's own definition of "amendment," because it increases the level of efficiency for this equipment type. (The Advocates, No. 8 at Exhibit B p. 4, referring to 73 FR 40771) Even if DOE decides it cannot adopt multi-metric standards, the Advocates believe that ASHRAE's action triggers a DOE review of the warm-air furnaces standard. (The Advocates, No. 8 at Exhibit B p. 4)

DOE does not agree with the Advocates' 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, DOE views the trigger as attached to an increased efficiency level. 74 FR 36312, 36320 (July 22, 2009). Further, 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 standard," which DOE interprets as referring to an energy efficiency level.

The Advocates also argued that EPCA authorizes DOE to adopt a multi-metric standard. (The Advocates, No. 8 at p. 3) DOE has previously noted that Congress intended 42 U.S.C. 6313 to result in DOE "maintain[ing] uniform national standards consistent with those set in ASHRAE/IESNA Standard 90.1." (The Advocates, No. 8 at p. 3, referring to 72 FR 10038, 10042 (March 7, 2007)) The Advocates, therefore, contend that DOE must read the statute as permitting sufficient authority to harmonize standards with ASHRAE Standard 90.1. (The Advocates, No. 8 at p. 3) The

[7] "EEI, No. 7 at p. 2" refers to: (1) To a statement that was submitted by the Edison Electric Institute and is recorded in the docket under "Energy Conservation Program for Certain Industrial Equipment: Energy Conservation Standards for Commercial Heating, Air-Conditioning, and Water-Heating Equipment," Docket Number EERE–2011–BT–STD–0029, as comment number 7; and (2) a passage that appears on pages 1–2 of that statement.

Advocates also state that several products (commercial storage water heaters, instantaneous water heaters, and commercial heat pumps) are already subject to multiple efficiency requirements, some of which are based on multi-part requirements in ASHRAE Standard 90.1. (The Advocates Comment, No. 8 at p. 3) The Advocates asserted that DOE's position that it lacks legal authority to apply more than one requirement in a standard for a given product was developed by DOE during the Bush administration in the residential furnaces rulemaking, and that it reversed the agency position taken previously in the central air conditioner docket. Therefore, the Advocates urged DOE to reconsider the policy. (The Advocates, No. 8 at Exhibit C p. 2)

In response, if ASHRAE adds a prescriptive requirement for equipment where an efficiency level is already specified, DOE does not believe it has the authority to use a dual descriptor for a single equipment type. EPCA authorizes the Secretary to amend the energy conservation standards for specified equipment. (42 U.S.C. 6313(a)(6)), 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 light of the above, DOE maintains its position (stated in the July 2008 notice of data availability) 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). 73 FR 40770, 40771 (July 16, 2008).

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

Pacific Gas and Electric Company, Southern California Gas Company, and San Diego Gas and Electric submitted a joint comment in response to the May 2011 NODA, with Southern California Edison (SCE) submitting an identical comment (hereafter referred to together as the CA IOU comment). Both the CA IOU comment and the Advocates comment argued that DOE should expand the scope of the rulemaking to include additional product classes. (CA IOU, Nos. 10 and 12 at p. 1; The Advocates, No. 8 at p. 1) Both comments specifically recommended considering amended standards for commercial air-cooled unitary air conditioners and heat pumps and commercial water heaters, arguing that higher efficiency levels would be technologically feasible and that potential national energy savings would be significant (commercial air-cooled unitary air conditioners and heat pumps) or would likely be significant (commercial water heaters). (CA IOU, Nos. 10 and 12 at p. 2; The Advocates, No. 8 at p. 5, 9) The Advocates also requested that DOE evaluate whether there are potentially significant savings for unitary water-source heat pumps. (The Advocates, No. 8 at p. 6) In addition, EEI recommended that if DOE reviews products for higher efficiency standards, it should take a fuel-neutral approach and analyze the energy savings potential from increasing energy efficiency standards for gas and oil-fired furnaces and boilers in addition to the electric products triggered by ASHRAE 90.1–2010. (EEI, No. 7 at p. 2)

The Advocates also argued that the six-year look back provision in the Energy Independence and Security Act of 2007 (EISA 2007)[8] compels DOE to review standards for all product classes, including those specifically mentioned above, that are more than five years old. (The Advocates, No. 8 at p. 1, 5–6, 9) The Advocates stated that the plain language of the provision applies to all final rules setting standards, including those issued prior to EISA 2007. (The Advocates, No. 8 at p. 2) These commenters also stated that it would be unreasonable to read the provision to exclude the most out-of-date standards, because the purpose of the provision is to keep standards up-to-date. (The Advocates, No. 8 at p. 2) Further, it was noted that the U.S. Department of Energy May 2011 Strategic Plan commits the Department to reviewing minimum appliance efficiency standards at least every 5 years. (The Advocates, No. 8 at p. 1)

The Advocates argued that EISA 2007 does not provide a temporal limitation on what is included in the ''any final rule'' language used. (The Advocates, No. 8 at Exhibit A p. 7) The Advocates also cited several Supreme Court cases in which ''any'' is interpreted to have an expansive meaning encompassing all species of the category in question. (The Advocates, No. 8 at Exhibit A p. 6–7) Therefore, the Advocates contend that the six-year review must be applied to all products that have a final rule regardless of when it was issued (*i.e.,* including those issued prior to December 19, 2007, the enactment date of EISA 2007). (The Advocates, No. 8 at Exhibit A p. 7) These commenters use this rationale to support their recommendation above for DOE to expand the scope of the present rulemaking to include additional product classes.

In response, DOE previously addressed similar comments in a March 20, 2009 Notice of Proposed Rulemaking related to ASHRAE products. 74 FR 12000. In that document, DOE acknowledged that EISA 2007 directs DOE to assess whether there is a need to update Federal energy conservation standards for certain commercial equipment (*i.e.,* ASHRAE equipment) after a certain amount of time has elapsed. However, DOE also noted that it did 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. DOE did not agree that it was late or that it should immediately initiate review of certain commercial equipment. *Id.* at 12007.

DOE largely reiterated its position in the July 22, 2009 Final Rule related to ASHRAE products. 74 FR 36312, 36321. In response to DOE's previously stated position, the Advocates acknowledged that the provision is not retroactive, but rather is prospective as it requires reviews going forward. (The Advocates, No. 8 at Exhibit A p. 8–9) The Advocates also acknowledged that some final rules were already more than six years old when the amendment was enacted, and that Congress did not specifically provide a transition period. (The Advocates, No. 8 at Exhibit A p. 9) However, the Advocates contend that this does not mean DOE was out of

[8] The Energy Independence and Security Act of 2007 incorporated a provision commonly known as the ''six-year look back,'' requiring DOE to review ''any final rule establishing or amending a standard'' every six years and either publish a notice indicating that new standards are not required or begin a rulemaking proposing new standards. (42 U.S.C. 6313(a)(6)(C))

compliance at the time of enactment, but rather that DOE must begin the process of reviewing standards more than six years old. (The Advocates, No. 8 at Exhibit A p. 9)

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). As the products in question (*i.e.,* commercial air-cooled unitary air conditioners and heat pumps, commercial water heaters, and unitary water-source heat pumps) have not been the subject of a final rule since before 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. However, as a matter of policy, DOE's May 2011 Strategic Plan expressed a goal of reviewing appliance standards at least every five years, and, accordingly, DOE will make an effort to review standards for ASHRAE products on a similar schedule, consistent with statutory mandates and available resources.

IV. General Discussion of the Changes in ASHRAE Standard 90.1–2010 and Determination of Scope for Further Rulemaking Activity

As discussed above, before beginning an analysis of the potential 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 or not the ASHRAE Standard 90.1–2010 efficiency levels actually represented an increase in efficiency above the current Federal standard levels. This section discusses each equipment class where the ASHRAE Standard 90.1–2010 efficiency level differs from the current Federal standard level, along with DOE's preliminary conclusion as to the action DOE is taking with respect to that equipment.

A. Commercial Warm-Air Furnaces

Under 42 U.S.C. 6311(11)(A), a ''warm air furnace'' is defined as ''a self-contained oil- or gas-fired furnace designed to supply heated air through ducts to spaces that require it and includes combination warm air furnace/electric air-conditioning units but does not include unit heaters and duct furnaces.'' In its regulations, DOE defines a ''commercial warm air furnace'' as a ''warm air furnace that is industrial equipment, and that has a capacity (rated maximum input) of 225,000 Btu per hour or more.'' 10 CFR 431.72.

Gas-fired commercial warm-air furnaces are fueled by either natural gas or propane. The Federal minimum energy conservation standard for gas-fired commercial warm-air furnaces corresponds to the efficiency level in ASHRAE Standard 90.1–1989, which specifies for equipment with a capacity of 225,000 Btu/h or more, the thermal efficiency at the maximum rated capacity (rated maximum input) must be no less than 80 percent. 10 CFR 431.77(a). The Federal minimum energy conservation standard for gas-fired commercial warm-air furnaces applies to equipment manufactured on or after January 1, 1994. 10 CFR 431.77.

The current Federal standard for gas-fired commercial warm-air furnaces is in terms of ''thermal efficiency,'' which is defined as ''100 percent minus percent flue loss.'' 10 CFR 431.72. The previous version of ASHRAE Standard 90.1 (*i.e.,* ASHRAE Standard 90.1–2007) specified a minimum efficiency level of 80 percent combustion efficiency, but it defined ''combustion efficiency'' as ''100 percent minus flue losses'' in the footnote to the efficiency table for commercial warm-air gas-fired furnaces, which references ANSI Z21.47–2001, ''Standard for Gas-Fired Central Furnaces,'' as the test procedure. In its analysis for the 2009 NOPR regarding standards for ASHRAE equipment in which DOE considered the updates in ASHRAE Standard 90.1–2007, DOE noted that upon reviewing the efficiency levels and methodology specified in ASHRAE Standard 90.1–2007, ASHRAE changed the efficiency metric for gas-fired commercial warm-air furnaces in name only, and not in the actual test or calculation method. 74 FR 12000, 12008–09 (March 20, 2009). Therefore, DOE stated its understanding that despite using the term ''combustion efficiency'' rather than ''thermal efficiency,'' ASHRAE did not intend to change the substance of the metric. Consequently, DOE left the existing Federal energy conservation standards in place for gas-fired commercial warm-air furnaces, which specify a ''thermal efficiency'' of 80 percent using the definition of ''thermal efficiency'' presented at 10 CFR 431.72.

ASHRAE Standard 90.1–2010 updated the tabulated requirements for gas-fired commercial warm-air furnaces to specify a minimum efficiency level of 80 percent ''thermal efficiency'' and references ANSI Z21.47–2006, ''*Standard for Gas-Fired Central Furnaces,''* as the test procedure. ANSI Z21.47–2006 defines ''thermal efficiency'' as ''100 percent minus flue losses,'' which is the same as DOE's definition of ''thermal efficiency'' for this equipment. Because of this, DOE believes that the purpose of the ASHRAE metric change to ''thermal efficiency'' was to clarify the alignment to the existing Federal standards and the ANSI Z21.47–2006 test procedure. As a result, DOE tentatively concluded in the May 2011 NODA that this change does not constitute a revision to the actual efficiency level for gas-fired commercial warm-air furnaces and that no further action by the Department is required.

In response to the preliminary review set forth in the May 2011 NODA, the Advocates commented that DOE must review requirements for warm-air furnaces because ASHRAE Standard 90.1–2010 contains new design requirements that are not included in the Federal standards, which they view as constituting an amendment that triggers DOE review. (The Advocates, No. 8 at p. 2–3) Further, the Advocates urged DOE to adopt all the requirements for gas-fired and oil-fired warm-air furnaces included in ASHRAE 90.1–2010 (*i.e.,* efficiency level and design requirements) as Federal standards, as these requirements are included as part of the Implementation of National Consensus Appliance Agreements Act (INCAAA, S. 398). (The Advocates, No. 8 at p. 2) In addition, the CA IOUs urged DOE to adopt all requirements, including prescriptive (design) requirements, for warm-air furnaces. (CA IOU, Nos. 10 and 12, at p. 2)

For the reasons explained in section III.B, DOE does not view the ASHRAE Standard 90.1 design requirements for warm-air furnaces as triggering DOE review of the efficiency levels for those products. Further, DOE has determined that incorporation of the design requirements in ASHRAE Standard 90.1–2010 for commercial warm-air furnaces is beyond the scope of its legal authority, because the language of EPCA authorizes DOE to establish a performance standard or a single design standard and does not permit DOE to adopt both a performance standard and design standard. The fact that pending legislation, if passed, may convey such authority does not have any bearing on DOE's current authority. Thus, DOE has not changed its preliminary view set forth in the May 2011 NODA, and consequently, DOE proposes to leave the existing Federal energy conservation standards in place for commercial warm-air furnaces.

B. Commercial Package Air-conditioning and Heating Equipment

EPCA, as amended, defines ''commercial package air conditioning and heating equipment'' as air-cooled, evaporatively-cooled, water-cooled, or water-source (not including ground water-source) electrically operated, unitary central air conditioners and central air conditioning heat pumps for commercial use. (42 U.S.C. 6311(8)(A); 10 CFR 431.92) EPCA also defines ''small,'' ''large,'' and ''very large'' commercial package air conditioning and heating equipment based on the equipment's rated cooling capacity. (42 6311(8)(B)–(D); 10 CFR 431.92) ''Small commercial package air conditioning and heating equipment'' means equipment rated less than 135,000 Btu per hour (cooling capacity). (42 6311(8)(B); 10 CFR 431.92) ''Large commercial package air conditioning and heating equipment'' means equipment rated at or above 135,000 Btu per hour and less than 240,000 Btu per hour (cooling capacity). (42 U.S.C. 6311(8)(C); 10 CFR 431.92) ''Very large commercial package air conditioning and heating equipment'' means equipment rated at or above 240,000 Btu per hour and less than 760,000 Btu per hour (cooling capacity). (42 U.S.C. 6311(8)(D); 10 CFR 431.92)

1. Water-Cooled Equipment

The current Federal energy conservation standards for the six classes of water-cooled commercial package air conditioners for which ASHRAE Standard 90.1–2010 amended efficiency levels are shown in Table II.1. The Federal energy conservation standards for water-cooled equipment are differentiated based on the cooling capacity (*i.e.,* small, large, or very large) and heating type (*i.e.,* electric resistance heating/no heating or some other type of heating). ASHRAE Standard 90.1–2010 increased the energy efficiency levels for all six equipment classes to efficiency levels that surpass the current Federal energy conservation standard levels. Therefore, the Department conducted an analysis of the potential energy savings due to amended standards for these products in the May 2011 NODA.

In response to the May 2011 NODA, the Advocates, the CA IOUs, and EEI recommended that DOE adopt the ASHRAE Standard 90.1–2010 efficiency levels for water-cooled equipment, given that the potential national energy savings from efficiency levels above those in ASHRAE Standard 90.1–2010 are very small. (The Advocates, No. 8 at p. 5; CA IOU, Nos. 10 and 12 at p. 1; EEI, No. 7 at p. 2) Upon reviewing the results of the potential energy savings analysis in the May 2011 NODA, DOE agrees with the submitted comments. Because of the minimal energy savings available from this equipment (see section VIII.B.1), DOE has not conducted further analyses on these products and is proposing in today's NOPR to adopt the energy efficiency levels contained in ASHRAE Standard 90.1–2010 for water-cooled commercial package air conditioning and heating equipment.

2. Evaporatively-Cooled Equipment

The current Federal energy conservation standards for the six classes of evaporatively-cooled commercial package air conditioners for which ASHRAE Standard 90.1–2010 amended efficiency levels are shown in Table II.1 above. Similar to water-cooled equipment, Federal energy conservation standards divide evaporatively-cooled equipment based on the cooling capacity (*i.e.,* small, large, or very large) and heating type (*i.e.,* electric resistance heating/no heating or some other type of heating). ASHRAE Standard 90.1–2010 increased the energy efficiency levels for all six equipment classes to efficiency levels that surpass the current Federal energy conservation standard levels.

DOE reviewed the market for evaporatively-cooled equipment and could not identify any models available on the market in the ''small'' unit product class (*i.e.,* cooling capacity <135,000 Btu/h) and the ''large'' unit product class (*i.e.,* cooling capacity ≥135,000 and <240,000 Btu/h). Because there is currently no equipment in these classes being manufactured, DOE believes there are no energy savings associated with these classes at this time. Therefore, it is not possible to assess the potential for additional energy savings at the levels in ASHRAE Standard 90.1–2010 or more-stringent levels. Thus, DOE did not perform a potential energy-savings analysis for the small and large equipment classes of evaporatively-cooled commercial package air conditioners.

For very large (*i.e.,* cooling capacity ≥240,000 Btu/h) evaporatively-cooled air conditioners, DOE was able to identify a number of models on the market, and, therefore, DOE conducted an analysis of the potential energy savings for these products in the May 2011 NODA. For very large evaporatively-cooled air conditioners, ASHRAE Standard 90.1–2010 set the efficiency level for equipment with electric resistance or no heating at 11.9 EER and for equipment with all other heating at 12.2 EER. However, ASHRAE historically has set the levels for equipment with other heating at 0.2 EER points below the efficiency levels for equipment with electric heating or no heating, which would make the expected efficiency level for very large evaporatively-cooled equipment with other heating 11.7 EER. In February 2011, the Department received a letter from AHRI indicating that the ASHRAE Standard 90.1–2010 efficiency level for very large evaporatively-cooled equipment with other heating is incorrect, and that the correct minimum energy efficiency standard for this category is 11.7 EER, as would be expected given the historical ASHRAE Standard 90.1 efficiency levels for these products. (AHRI, No. 0001 at p. 1) Further, AHRI indicated that at the winter 2011 ASHRAE meeting, the ASHRAE 90.1 committee approved an addendum for public review that corrects this error. In March 2011, ASHRAE released Proposed Addendum j to ASHRAE Standard 90.1–2010, which corrects the value from 12.2 to 11.7 EER. Based on release of the public review draft of this addendum, the Department tentatively decided in the May 2011 NODA to analyze the potential energy savings for this category at an ASHRAE Standard 90.1 level of 11.7 EER.

In response to the May 2011 NODA, the Advocates, CA IOUs, and EEI recommended that DOE adopt the ASHRAE Standard 90.1–2010 levels for evaporatively-cooled equipment, given that the potential national energy savings from efficiency levels above those in ASHRAE Standard 90.1–2010 are very small. (The Advocates, No. 8 at p. 5; CA IOU, Nos. 10 and 12 at p. 1; EEI, No. 7 at p. 2) In addition, AHRI agreed that overall energy savings for evaporatively-cooled units less than 240,000 Btu/h cannot be estimated because none exist on the market, but that DOE should still adopt ASHRAE Standard 90.1–2010 levels for those product classes. (AHRI, No. 11 at p. 2) AHRI also agreed with DOE's recognition of Proposed Addendum j in regards to the EER correction for very large evaporatively-cooled equipment. (AHRI, No. 11 at p. 1)

DOE agrees with these comments, and because of the minimal energy savings associated with more-stringent levels for very large equipment (see section VIII.B.1) and the lack of models on the market for small and large equipment, DOE has not conducted further analyses on these products. Accordingly, DOE is proposing to adopt the energy efficiency levels contained in ASHRAE Standard 90.1–2010 for evaporatively-cooled commercial package air conditioning and heating equipment.

3. Variable Refrigerant Flow Equipment

ASHRAE Standard 90.1–2010 created a separate product class for variable refrigerant flow (VRF) air-conditioning and heating equipment. These products are currently covered under DOE's standards for commercial air conditioners and heat pumps, but they are not broken out as a separate product class.

In general, a VRF system will have a single condensing unit serving multiple evaporator coils within a building. Specific ''subclasses'' of variable refrigerant flow heat pumps equipped with heat recovery capability have been specified in ASHRAE Standard 90.1–2010 with less-stringent efficiency requirements than specified for VRF systems without heat recovery. (Heat recovery capability provides for shuttling of heat from one part of the building to another and allows for simultaneous cooling and heating of different zones within a building.) Specifically, 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.[9] 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 tentatively 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 tentatively 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)) The proposed changes to the Code of Federal Regulations can be found at the end of this NOPR.

Table IV.1 shows the ASHRAE Standard 90.1–2010 efficiency levels for VRF water-source heat pumps in comparison to the current Federal minimum energy conservation standards for water-source heat pumps, which DOE has preliminarily determined would apply to VRF systems. For water-source VRF heat pumps, ASHRAE Standard 90.1–2010 generally maintains the existing energy efficiency requirements that apply to commercial package air-conditioning and heating equipment (water-source) for the VRF systems, with several notable exceptions. 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. For VRF water-source heat pumps over 135,000 Btu/h, ASHRAE sets standards for products where DOE did not previously have standards. As a result, the Department conducted further analysis for these classes in the May 2011 NODA. DOE began by reviewing the current market for VRF water-source heat pumps with cooling capacities either less than 17,000 Btu/h or equal to or greater than 135,000 Btu/h and less than 760,000 Btu/h. The Department did not identify any models under 17,000 Btu/h on the market. DOE did identify 19 models greater than 135,000 Btu/h on the market and attempted to contact the manufacturer producing most of these models, but DOE was unable to obtain EER information for most of the models and had no shipment information for this product class. Because DOE could not identify any VRF water-source heat pumps being manufactured with cooling capacities less than 17,000 Btu/h, DOE believes that there are no energy savings associated with this equipment class. Therefore, DOE did not perform a potential energy-savings analysis for this equipment. Due to the lack of information and data on VRF water-source heat pumps with cooling capacities greater than 135,000 Btu/h available at the time of the NODA, the Department did not conduct a preliminary energy saving estimate for the additional energy savings beyond the levels anticipated in ASHRAE Standard 90.1–2010 for these VRF water-source heat pumps.

TABLE IV.1—COMPARISON OF FEDERAL ENERGY CONSERVATION STANDARDS FOR WATER-SOURCE HEAT PUMPS TO ASHRAE STANDARD 90.1–2010 REQUIREMENTS FOR VRF WATER-SOURCE HEAT PUMPS

Existing federal equipment class	Federal minimum energy conservation standard	ASHRAE standard 90.1–2010 Efficiency level for newly-established VRF equipment class
Water-source Heat Pump <17,000 Btu/h	11.2 EER	12.0 EER (without heat recovery) 11.8 EER (with heat recovery)
	4.2 COP	4.2 COP
Water-source Heat Pump ≥17,000 and <65,000 Btu/h	12.0 EER	12.0 EER (without heat recovery) 11.8 EER (with heat recovery)
	4.2 COP	4.2 COP
Water-source Heat Pump ≥65,000 and <135,000 Btu/h	12.0 EER	12.0 EER (without heat recovery) 11.8 EER (with heat recovery)
	4.2 COP	4.2 COP
Water-source Heat Pump ≥135,000 and <760,000 Btu/h	N/A	10.0 EER (without heat recovery) 9.8 EER (with heat recovery) 3.9 COP

[9] Section 136 of the Energy Policy Act of 2005 (EPACT 2005; Pub. L. 109–58) amended EPCA to include separate minimum efficiency requirements for commercial package air-cooled air conditioners and heating equipment with ''all other heating system types that are integrated into the equipment'' and with electric resistance or no heating.

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 noted in section III.B, if ASHRAE Standard 90.1 lowers its efficiency level as compared to the Federal minimum standard level, 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). Therefore, DOE did not consider the lower EER requirements for systems with heat recovery and will not perform an analysis of those product classes. The proposed changes to the Code of Federal Regulations to clarify which energy conservation standards VRF water-source heat pumps must meet can be found at the end of this NOPR.

In response to the May 2011 NODA, AHRI agreed that there are no products available on the market in the category of less than 17,000 Btu/h water-source VRF heat pumps. (AHRI, No. 11 at p. 3) AHRI also commented that VRF water-source heat pumps with a cooling capacity greater than 135,000 Btu/h comprise a new equipment class, and as such, DOE should accept that an analysis to estimate energy savings cannot be done because of the unavailability of data. (AHRI, No. 11 at p. 3) AHRI encouraged DOE to adopt the efficiency standards for these products in ASHRAE Standard 90.1–2010. (AHRI, No. 11 at p. 3)

With regard to the 0.2 EER reduction for systems with heat recovery, AHRI noted that DOE should consider this requirement because non-VRF water-source heat pumps are not a proper comparative product for determining appropriate VRF water-source heat pump efficiency levels (in regard to backsliding) because: (1) Non-VRF water-source heat pumps do not use the type of heating components used by VRF systems, and (2) the components that require the 0.2 EER reduction provide overall energy savings in the system that are not reflected in EER calculations. (AHRI, No. 11 at p. 5) Mitsubishi also submitted a comment in which it also noted that DOE's comparison of VRF water-source heat pumps to non-VRF water-source heat pumps is not appropriate because the non-VRF water-source heat pumps do not contain gas-fired heat exchangers like the unitary systems, which Mitsubishi believes would be a better comparison to the VRF system. (Mitsubishi, No. 13 at p. 3) Mitsubishi further noted that regardless of the comparison, DOE should adopt the 0.2 EER reduction because DOE is not legally prohibited from adopting an amendment that is a reduction of EER levels. (Mitsubishi, No. 13 at p. 2, referring to 42 USC 6313(a)(6)(A)) Mitsubishi stated that the 0.2 EER reduction is necessary due to the increased pressure drop in the refrigerant levels due to the BC (branch circuit) controller, which works in unison with the outdoor unit to provide simultaneous cooling and heating needs. (Mitsubishi, No. 13 at p. 2)

In response to comments from AHRI and from Mitsubishi regarding the 0.2 EER deduction for water-source heat pumps with heat recovery, DOE has determined that while there may be certain additional efficiency penalties for the incorporation of heat recovery in VRF water-source heat pumps, DOE believes that under the statutory scheme for commercial equipment standards, the corresponding existing product class is a water-source heat pump in which condenser heat is rejected to water, not air. 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 under 42 U.S.C. 6295(o)(1) and 42 U.S.C. 6316(a), regardless of the provision in 42 U.S.C. 6313(a)(6)(A)) providing for adoption of ASHRAE Standard 90.1 efficiency levels. For VRF water-source heat pumps less than 17,000 Btu/h, the ASHRAE Standard 90.1–2010 levels with or without heat recovery exceed the current Federal standards. For VRF water-source heat pumps at or greater than 135,000 Btu/h, no current Federal standards exist. In both cases, DOE may adopt the ASHRAE 90.1–2010 efficiency levels for VRF water-source heat pumps with and without heat recovery.

Since the May 2011 NODA, AHRI released a certified product directory for VRF water-source heat pumps, thereby allowing DOE to perform an energy use analysis for VRF water-source heat pumps equal to or greater than 135,000 Btu/h similar to those presented for other products in the May 2011 NODA. This analysis is discussed in detail in section V. The preliminary analysis showed that only minimal energy savings are available for surpassing ASHRAE efficiency levels for these products (see section VIII.B.2), so DOE did not conduct any further energy or economic analysis for these products. DOE agrees with AHRI's suggestion to adopt the ASHRAE Standard 90.1–2010 level for these products and is proposing to do so for VRF water-source heat pumps either less than 17,000 Btu/h or equal to or greater than 135,000 Btu/h with and without heat recovery.

4. Packaged Terminal Air Conditioners and Heat Pumps

EPCA defines a ''packaged terminal air conditioner'' as ''a wall sleeve and a separate unencased combination of heating and cooling assemblies specified by the builder and intended for mounting through the wall. It includes a prime source of refrigeration, separable outdoor louvers, forced ventilation, and heating availability by builder's choice of hot water, steam, or electricity.'' (42 U.S.C. 6311(10)(A)) EPCA defines a ''packaged terminal heat pump'' as ''a packaged terminal air conditioner that utilizes reverse cycle refrigeration as its prime heat source and should have supplementary heat source available to builders with the choice of hot water, steam, or electric resistant heat.'' (42 U.S.C. 6311(10)(B)) DOE codified these definitions at 10 CFR 431.92 in a final rule published in the **Federal Register** on October 21, 2004. 69 FR 61962, 61970.

DOE adopted amended energy conservation standards for this class of equipment in a final rule published in the **Federal Register** on October 7, 2008. 73 FR 58772, 58828–30. The adopted Federal standards exceeded the standards in ASHRAE Standard 90.1–2007. These Federal standards apply to standard size equipment manufactured on or after October 8, 2012, and to non-standard size equipment manufactured on or after October 7, 2010. The CFR currently states that the compliance dates are September 30, 2012, and September 30, 2010, for standard size and non-standard size equipment, respectively. 10 CFR 431.97(c). The compliance dates currently included in the CFR for package terminal air conditioners and heat pumps were calculated from the date of issuance of the final rule for those products (*i.e.,* September 29, 2008), but should have been calculated from the publication date in the **Federal Register** (*i.e.,* October 7, 2008). Therefore, DOE is proposing in today's notice to correct the compliance dates to October 8, 2012 and October 7, 2010 for compliance with standards for standard size and non-standard size package terminal air conditioners and heat pumps, respectively.

ASHRAE Standard 90.1–2010 increased the efficiency levels for standard size equipment in comparison to the efficiency levels in ASHRAE Standard 90.1–2007. However, the efficiency levels specified by ASHRAE Standard 90.1–2010 for these equipment classes meet but do not exceed the Federal standards established by DOE in the October 2008 final rule. Because ASHRAE seems to be harmonizing the levels in ASHRAE Standard 90.1–2010 with the Federal levels rather than increasing the minimum efficiency, DOE tentatively concluded in the May 2011 NODA that it is not required to take action on these products at this time. DOE did not receive any comments on this subject and is maintaining its position in this NOPR.

5. Small-Duct, High-Velocity, and Through-the-Wall Equipment

EPCA does not separate small-duct high-velocity (SDHV) or through-the-wall (TTW) 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 and TTW heat pumps. (42 U.S.C. 6311(8)(B))

ASHRAE Standard 90.1–2010 increased some of the efficiency levels for these classes of equipment. Specifically, ASHRAE Standard 90.1–2010 increased the efficiency requirements for TTW heat pumps to 13.0 SEER and 7.4 HSPF in comparison to the efficiency levels of 12.0 SEER and 7.4 HSPF in ASHRAE Standard 90.1–2007. However, in March 2011, ASHRAE issued Proposed Addendum h for public review that would correct the minimum SEER for these products to 12.0 SEER.[10] For SDHV heat pumps, ASHRAE Standard 90.1–2010 did not increase the cooling efficiency requirement of 10.0 SEER beyond that in ASHRAE 90.1–2007. In addition, although ASHRAE 90.1–2007 specified a heating efficiency requirement of 6.8 HSPF, ASHRAE 90.1–2010 did not specify any heating efficiency level for SDHV heat pumps.

In the May 2011 NODA, DOE noted that Proposed Addendum h and another Proposed Addendum j,[11] would both remove the SDHV product class from the standards tables entirely, with Addendum j stating: ''In addition the small duct high velocity requirements have been dropped by DOE and they are only allowing such systems under waiver clause so the addendum has also made a change to remove the small duct high velocity systems from table 6.8.1a and table 6.8.1b.'' 76 FR 25622, 25633 (May 5, 2011) (*quoting* ASHRAE Addenda h and j). Therefore, DOE concluded that ASHRAE did not intend to specify any efficiency levels for these products in ASHRAE Standard 90.1–2010. *Id.*

In response, DOE notes that the Federal energy conservation standards for commercial types of TTW and SDHV heat pumps, which are 13.0 SEER and 7.7 HSPF, were established for the overall equipment category of small commercial package air-conditioning and heating equipment by EISA 2007, which amended EPCA. (42 U.S.C. 6313(a)(7)(D)) Because the ASHRAE Standard 90.1–2010 efficiency levels for TTW equipment meet or do not exceed the DOE standards and because DOE believed that through the issuance of Addenda h and j, ASHRAE was removing requirements for this equipment from within ASHRAE 90.1 (and thus also not proposing new, higher efficiency requirements), DOE tentatively concluded in the May 2011 NODA that it was not required to take action on these products at this time. 76 FR 25622, 25633 (May 5, 2011).

In response to the May 2011 NODA, AHRI commented that DOE is incorrect in assuming that Addendum j removes SDHV systems from the scope of coverage of ASHRAE Standard 90.1. (AHRI, No. 11 at p. 2) It stated that the current minimum SEER requirement for SDHV units in ASHRAE Standard 90.1–2010 applies to all models, both single-phase and three-phase electrical power with a cooling capacity less than 65,000 Btu/h. (AHRI, No. 11 at p. 2) AHRI stated that three-phase SDHV with a cooling capacity less than 65,000 Btu/h are still covered by ASHRAE Standard 90.1–2010 despite the omission in Addendum j (which AHRI believed deals only with single-phase SDHV systems covered under the National Appliance Energy Conservation Act (NAECA)). (AHRI, No. 11 at p. 2) AHRI stated that DOE must consider the ASHRAE Standard 90.1 SEER requirement for three-phase SDHVs and adopt it as the Federal standard or propose an alternate requirement. AHRI recommended that DOE consider establishing the minimum requirements for three-phase SDHV models at 11 SEER and 6.8 HSPF. (AHRI, No. 11 at p. 2)

In addition, Unico requested that SDHV be retained as a product class with a minimum efficiency of 11 SEER/ 6.8 HSPF and that the product manufacturer must have an exception for this as granted by DOE. (Unico, No. 14 at p. 2) (Currently, three manufacturers of SDHV products have been granted exception relief by DOE's Office of Hearings and Appeals (OHA) allowing for the sale of SDHV products meeting efficiency of 11 SEER and 6.8 HSPF.[12]) Unico recommended that DOE create a commercial SDHV product class that mirrors the consumer single-phase product class due to similar operating conditions. (Unico, No. 14 at p. 2)

In response to the AHRI and Unico comments, DOE did not intend to imply that SDHV are removed from the scope of ASHRAE Standard 90.1, but notes that the removal of an efficiency requirement for a covered product within ASHRAE Standard 90.1 is indicative that ASHRAE is not proposing a higher standards for the equipment and that DOE, thus, has no requirement or legal ability to react to ASHRAE Standard 90.1 efficiency levels for the equipment. In both the case of the published ASHRAE Standard 90.1–2010 efficiency levels for SDHV, or the removal of published values as a result of Addendum j, 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 higher 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'' found in 42 U.S.C. 6295(o)(1) and 42 U.S.C. 6316(a). 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.

[10] Proposed Addendum h to Standard 90.1–2010, *Energy Standard for Buildings Except Low-Rise Residential Buildings* (First Public Review, March 2011) (Last accessed March 2011) (Available at *: https://osr.ashrae.org/default.aspx*).

[11] Proposed Addendum j to Standard 90.1–2010, *Energy Standard for Buildings Except Low-Rise Residential Buildings* (First Public Review, March 2011) (Last accessed March 2011) (Available at*: https://osr.ashrae.org/default.aspx*).

[12] Department of Energy: Office of Hearings and Appeals, Decision and Order, Case #TEE 0010 (2004) (Available at: *http://www.oha.doe.gov/cases/ee/tee0010.pdf*) and Case #TEE 0026 (2005) (Available at: *http://www.oha.doe.gov/cases/ee/tee0026.pdf*).

DOE did not receive any comments regarding TTW heat pumps and is maintaining its position in today's NOPR. The efficiency levels shown in ASHRAE Standard 90.1–2010 or in Addendum h, meet or do not exceed the current Federal standard for 3-phase, less than 65,000 Btu/h small package cooling and heating equipment, and, thus, DOE is not required to take action on these products at this time. DOE has no authority to set standards for any products of this type lower than the current Federal minimum.

6. Single-Package Vertical Air Conditioners and Single-Package Vertical Heat Pumps

DOE issued standards for single-package vertical air conditioner and heat pump units (SPVUs) as part of the March 23, 2009 final rule technical amendment in response to mandated efficiency levels for SPVUs established in the EISA 2007 legislation. 74 FR 12058, 12073–74. However, SPVUs are subject to a provision established by EISA 2007, which amended the applicable provisions of EPCA such that not later than three years after the date of this statutory provision's enactment (*i.e.,* December 19, 2007), the Secretary must review the most recently published ASHRAE Standard 90.1 with respect to single-package vertical air conditioners and single-package vertical heat pumps using the procedures established under 42 U.S.C. 6313(a)(6). (42 U.S.C. 6313(a)(10)(B))

The Department interprets the provision at 42 U.S.C. 6313(a)(10)(B) as constituting a separate trigger to evaluate standards higher than the ASHRAE Standard 90.1 level. SPVUs are considered classes within the broader scope of small, large, and very large commercial package air-conditioning and heating equipment. EPCA, as amended, directs DOE to conduct a review of the energy savings potential sometime in the three-year interval, and DOE believes this separate trigger is a one-time mechanism, after which SPVUs revert to the normal ''ASHRAE trigger.'' Accordingly, DOE commenced analytical work on these products along with the other equipment that is subject to the current ''ASHRAE trigger'' in the May 2011 NODA.

Upon review of the SPVU market, DOE identified several models of SPVUs in the small equipment class. However, DOE did not identify any models of SPVUs in the very large category or any models of single package vertical heat pumps (SPVHPs) in the large category. The Department identified only five models of single package vertical air conditioners (SPVACs) in the large category, and these were all close to the upper size limit of the small category, at 70,000 Btu/h or less. As a result of the apparent lack of a market for very large SPVUs and large SPVHPs (as demonstrated by the small size of the market (five models) and accompanying lack of shipment estimates for the large SPVACs), for the May 2011 NODA, DOE conducted complete preliminary energy saving estimates for only the small equipment classes. Additionally, DOE used the energy saving results for small SPVACs to derive an estimate of the potential energy savings for large SPVACs.

In response to the May 2011 NODA, the CA IOUs encouraged DOE to conduct additional analysis for SPVUs above the current ASHRAE levels due to DOE's preliminary analysis of higher levels showing potential reduction of national energy consumption of 0.5 quads over 30 years. (CA IOU, Nos. 10 and 12 at p. 2) The Advocates also agreed that the amendments to EISA 2007 compel review of the existing standards for SPVUs and consideration of levels above those contained in ASHRAE 90.1–2010. (The Advocates, No. 8 at p. 7)

DOE concurs with these comments. As a result of the potential for high energy savings from increasing the efficiency levels for SPVUs, and the fact that any of these levels would be higher than the ASHRAE levels, DOE is conducting additional analysis for these products along the 30-month timeline for more-stringent standards, as allowed by EPCA. (42 U.S.C. 6313(a)(6)(B)) No further results regarding these products' efficiency are presented in today's NOPR, and the results of the additional analysis for SPVUs will be presented in a separate NOPR in the future, consistent with that timeline. However, DOE is proposing to adopt AHRI 390 as the DOE test procedure for this equipment.

C. Air Conditioners and Condensing Units Serving Computer Rooms

Air conditioners and condensing units serving computer rooms operate similarly to other types of commercial packaged air conditioners in that they provide space conditioning using a refrigeration cycle consisting of a compressor, condenser, expansion valve, and evaporator. However, air conditioners and condensing units serving computer rooms are typically designed to maintain the temperature in the conditioned space within a narrow range (*i.e.,* minimizing temperature swings) and to maintain a specific relative humidity. This equipment is commonly capable of humidifying or dehumidifying the air and then, if necessary, reheating it to maintain a specific humidity.

ASHRAE Standard 90.1–2010 created a separate product class for ''air conditioners and condensing units serving computer rooms,'' and set efficiency levels using the sensible coefficient of performance (SCOP) metric, as measured using the test method in ASHRAE Standard 127–2007, ''Method of Testing for Rating Computer and Data Processing Room Unitary Air Conditioners.'' The product classes and efficiency levels established in ASHRAE Standard 90.1–2010 are set forth in Table II.1 above.

Prior to this equipment having separate efficiency levels and test procedures specified in ASHRAE Standard 90.1, DOE discussed such units using the terminology ''computer room air conditioners'' in an August 9, 2000 NOPR (65 FR 48828, 48830–31) and an October 21, 2004 direct final rule (69 FR 61962, 61967). In the August 2000 NOPR, DOE determined that computer room air conditioners were not covered as part of the commercial packaged air conditioning and heating equipment classes in EPCA and subsequently upheld this position in the October 2004 direct final rule. DOE made this determination because at the time of passage of the Energy Policy Act of 1992 (EPACT 1992, Pub. L. 102–486, which gave DOE the authority to cover commercial package air-conditioning and heating equipment), the statute excluded this equipment, and as a result, DOE concluded that it lacked the authority to regulate this equipment. The basis for DOE's decision stemmed from the scope of ASHRAE Standard 90.1, which at the time specified that the standard did not cover ''equipment and portions of building systems that use energy primarily to provide for industrial, manufacturing, or commercial processes.'' (See section 2.3(c) of ASHRAE 90.1 standards prior to ASHRAE Standard 90.1–2010; cited at 65 FR 48828, 48830 (August 9, 2000)). Further, the House Report on EPACT 1992 (H.R. Rep. No. 474, 102d Cong., 2d Sess., pt. 1 at 175 (1992)) pointed out that the efficiency standards contained in the bill were developed by ASHRAE in ASHRAE Standard 90.1. DOE concluded that this indicated that the efficiency standards for commercial products in EPACT 1992 would have the same scope as the version of ASHRAE Standard 90.1 current at the time of the legislation's enactment (*i.e.,* ASHRAE Standard 90.1–89), which did not cover computer room air conditioners. As a result, DOE concluded at the time that it did not have the authority to cover computer room air conditioners. However, DOE stated in both the NOPR and direct final rule that ''if some of the relevant circumstances were to change—if, for example, ASHRAE Standard 90.1 were to incorporate efficiency standards and test procedures for this equipment or the equipment was to become widely used for conventional air conditioning applications—the Department might revisit this issue.'' 65 FR 48828, 48831 (August 9, 2000) (supporting this point); 69 FR 61962, 61967 (Oct. 21, 2004) (making the quotation).

ASHRAE Standard 90.1–2010 experienced expanded scope as compared to previous versions of ASHRAE Standard 90.1, including process loads (*e.g.,* computer rooms) and creation of a separate product class for ''air conditioners and condensing units serving computer rooms.'' EPCA generally directs DOE to follow ASHRAE Standard 90.1 when it is amended with respect to certain equipment types, including commercial package air conditioning and heating equipment. Thus, DOE has tentatively concluded that because ASHRAE has expanded the scope of Standard 90.1 to include air conditioners and condensing units serving computer rooms, the scope of DOE's obligations pursuant to EPCA with regard to ASHRAE products has similarly expanded to encompass these products. As such, DOE tentatively concluded in the May 2011 NODA that it had the authority to review the ASHRAE Standard 90.1–2010 efficiency levels for air conditioners and condensing units serving computer rooms and to establish minimum energy conservation standard levels for this equipment. 76 FR 25622, 25634 (May 5, 2011). However, DOE did not perform a potential energy savings analysis for this equipment as a part of the NODA due to the lack of available data, and instead, DOE requested data and information from interested parties that would allow it to conduct a potential energy savings analysis as part of this proceeding.

Lastly, although DOE addressed computer room air conditioners in the August 2000 NOPR and October 2004 direct final rule, DOE never formally defined this term. In reviewing ASHRAE Standard 90.1–2010, DOE noted that ASHRAE does not define a class of equipment in terms of physical characteristics, but rather an application (*i.e.,* ''serving computer rooms''). Because air conditioners and condensing units serving computer rooms have the same basic components as conventional air conditioners, there is some difficulty in defining ''air conditioners and condensing units serving computer rooms'' such that they can be clearly differentiated from conventional commercial packaged air conditioners and heat pumps. DOE reviewed the definitions in both ASHRAE 127–2007, *Method of Testing for Rating Computer and Data Processing Room Unitary Air Conditioners,* (the test procedure specified in ASHRAE Standard 90.1–2010 for air conditioners and condensing units serving computer rooms) and Title 20 in the California Code of Regulations (which establishes California's requirements for this equipment), and found in the May 2011 NODA that the definitions in each of the above sources do not contain criteria that would allow DOE to clearly differentiate this type of equipment from conventional equipment, without overlapping. 76 FR 25622, 25634 (May 5, 2011). DOE revisited the issue of defining ''computer room air conditioners'' for this NOPR, and it is discussed further in section VI.A.1 below.

In response to the May 2011 NODA, the Advocates supported DOE's determination that it has the authority to review the ASHRAE Standard 90.1–2010 efficiency levels for computer room air conditioners and establish energy conservation standards. (The Advocates, No. 8 at p. 7) AHRI suggested that DOE should adopt the ASHRAE Standard 90.1 approach for computer room air conditioners. (AHRI, No. 11 at p. 3) The Advocates stated that potential energy savings for computer room air conditioners may be significant, and the CA IOUs also noted that computer room air conditioners have high potential energy savings, particularly given their market penetration. (The Advocates, No. 8 at p. 7; CA IOU, Nos. 10 and 12 at p. 3–4) The Advocates and the CA IOUs recommended that DOE ensure that any standards established for computer room air conditioners be at least as stringent as the current California standards. (The Advocates, No. 8 at p. 7; CA IOU, Nos. 10 and 12 at p. 3–4)

In response to the suggestions from stakeholders, DOE undertook an analysis to estimate the potential energy savings associated with computer room air conditioners, and to perform a cost-benefit analysis of standard levels above the ASHRAE Standard 90.1–2010 levels. DOE has obtained additional information for this equipment and conducted an energy and economic savings analysis, which is discussed in Section VI. However, as discussed in that section, DOE believes that clear and convincing evidence does not exist as would justify standards beyond those in ASHRAE Standard 90.1–2010. As a result, DOE is proposing to adopt energy efficiency standards for computer room air conditioners at the levels set forth in ASHRAE Standard 90.1–2010. See sections VI and VIII for a summary of DOE's analysis, results, and conclusions for computer room air conditioners.

D. Coverage of Commercial Package Air Conditioning and Heating Equipment That Are Exclusively Used as Part of Industrial or Manufacturing Processes

DOE received an inquiry from an interested party regarding the applicability of DOE's regulatory program for commercial package air conditioning and heating equipment in terms of equipment that is used exclusively for industrial or manufacturing processes. Specifically, Engineered Air asked the Department to clarify it's position on the following three issues: (1) In units where centrifugal condenser fans are required, the specified EERs cannot be met due to the motor horsepower required on the condenser fan; (2) applicability of the regulatory program in applications where the DX unit functions without ANY regard to the comfort of the occupants, the EERs may not be met; and (3) DOE's position on enforcing its regulations since DOE's regulations are broader than the scope of ASHRAE Standard 90.1. (Engineered Air, No. 15 at p. 1)

As mentioned above with regard to air conditioners and condensing units serving computer rooms, ASHRAE Standard 90.1–2010 expanded the scope of its coverage as compared to previous versions of ASHRAE Standard 90.1. 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)). While DOE still believes it is ASHRAE's intent to continue to exclude most of those equipment types that are used solely for manufacturing and industrial processes, 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.

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, then DOE also believes it is not covered under DOE's regulatory program. Just like manufacturers, DOE will make this determination on a case-by-case basis after considering the facts of the particular model in question. In making such a 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. DOE seeks comments on ways manufacturers currently differentiate commercial package air conditioning and heating equipment used solely for manufacturing and industrial processes from that equipment of the same type that is used in buildings. This is identified as issue 1 in section X.E, ''Issues on Which DOE Seeks Comment.''

With respect to Engineered Air's specific questions, DOE believes the above guidance will help manufacturers like Engineered Air evaluate the applicability of the Department's regulatory equipment to the specific basic models it manufactures. All equipment distributed in commerce in the U.S. that meets DOE's definition of commercial package air conditioning and heating equipment that is not subject to the Department's exclusion guidance set forth above must meet the Federal energy conservation standards regardless of technology or design. DOE actively enforces all of its energy conservation standards for all covered products and equipment.

E. Test Procedures

EPCA requires DOE to amend any test procedures for ASHRAE products to the latest version generally accepted by the industry or the rating procedures developed or recognized by industry, as referenced in ASHRAE/IES Standard 90.1, unless the Secretary determines that clear and convincing evidence exists that the latest version of the industry test procedure does not meet the requirements for test procedures described under 42 U.S.C. 6314(a)(2)–(3).[13] (42 U.S.C. 6314(a)(4)(A)–(B)) The latest version of the ASHRAE Standard 90.1, ASHRAE Standard 90.1–2010, updated its referenced test procedures to the latest generally accepted industry test procedures for small commercial package air conditioners and heating equipment (AHRI 210/240–2008, *Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment*), large and very large commercial package air conditioners and heating equipment (AHRI 340/360–2007, *Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment*), commercial warm-air furnaces (UL 727–2006, *Standard for Safety for Oil-Fired Central Furnaces,* and ANSI Z21.47–2006, *Standard for Gas-Fired Central Furnaces*), and commercial water heaters (ANSI Z21.10.3–2004, *Gas Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous*). In the May 2011 NODA, DOE reviewed each of these test procedures and described the changes in comparison to the previous version of the test procedure. 76 FR 25622, 25634–37 (May 5, 2011). These changes are described further in the sections below.

Additionally, ASHRAE Standard 90.1–2010 adopts new test procedures for measuring the efficiency of variable refrigerant flow equipment (AHRI 1230–2010, *Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment*) and air conditioners and condensing units serving computer rooms (ASHRAE 127–2007, *Method of Testing for Rating Computer and Data Processing Room Unitary Air Conditioners*). ASHRAE Standard 90.1–2010 also lists AHRI 390–2003, *Performance Rating of Single Package Vertical Air-Conditioners and Heat Pumps,* as the test procedure for SPVACs and SPVHPs, for which there are currently no DOE test procedures. An initial assessment of these test procedures is presented below.

Lastly, DOE is required to review the test procedures for covered ASHRAE equipment at least once every seven years. (42 U.S.C. 6314(a)(1)(A)) In addition to the updates to the referenced standards (which are discussed in the subsections below), DOE is seeking comments on any other relevant issues that would affect the test procedures for the ASHRAE equipment addressed in today's NOPR (*i.e.,* those equipment for which DOE has been triggered). Interested parties are welcome to comment on any aspect of these test procedures as part of this comprehensive 7-year-review. This is identified as issue 2 in section X.E, ''Issues on Which DOE Seeks Comment.''

1. Small[14] (<65,000 Btu/h Cooling Capacity) Commercial Package Air Conditioners and Heating Equipment

For small commercial package air conditioners and heating equipment, ASHRAE Standard 90.1–2010 updated its referenced test procedure from AHRI 210/240–2003 to AHRI 210/240–2008. Between the 2003 and 2008 versions of AHRI 210/240, AHRI made several updates, which are summarized here and discussed in further detail in the May 2011 NODA. 76 FR 25622, 25635 (May 5, 2011). AHRI 210/240–2008 references DOE's test procedure for residential central air conditioners and heat pumps contained at 10 CFR part 430, subpart B, Appendix M. AHRI updated the 210/240 test procedure for small commercial air conditioners and air-source heat pumps with a cooling capacity less than 65,000 Btu/h to reflect the recent updates the DOE made to its test procedure for residential central air conditioners and heat pumps at 10 CFR part 430, subpart B, Appendix M. In doing so, AHRI updated the definitions for ''heating seasonal

[13] The relevant statutory provisions at 42 U.S.C. 6314(a)(2)–(3) state that test procedure shall be reasonably designed to produce test results which reflect energy efficiency, energy use, and estimated operating costs of a type of industrial equipment and shall not be unduly burdensome to conduct. If the test procedure is a procedure for determining estimated annual operating costs, such costs shall be calculated from measurements of energy use in a representative average-use cycle.

[14] EPCA defines ''small commercial package air conditioning and heating equipment'' as commercial package air conditioning and heating equipment that are 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.

performance factor'' and ''seasonal energy efficiency ratio'' to match the definitions for those terms in DOE's residential central air conditioner and heat pump test procedure. AHRI also added definitions for ''tested combination, ''small duct, high velocity system,'' ''space-constrained product,'' and ''through-the-wall air conditioner and heat pump,'' that match the DOE's definitions at 10 CFR 430.2. Further, AHRI reorganized and added tables specifying the criteria for the standard rating conditions for the various types of equipment to be identical to those contained in the DOE test procedure for residential central air conditioners and heat pumps at 10 CFR part 430, subpart B, Appendix M.

In the NODA, DOE tentatively concluded that these changes did not significantly impact the energy efficiency metric of small commercial air conditioners and heat pumps with a cooling capacity less than 65,000 Btu/h. In response, DOE received comment from AHRI agreeing with DOE's tentative conclusion in the NODA. (AHRI, No. 11 at p. 4) DOE did not receive any comments or information that would cause it to reconsider the adoption of the updated AHRI 210/240–2008 test method. As a result, DOE is proposing to incorporate by reference AHRI 210/240–2008 into the Federal test procedure for small commercial air conditioners and heat pumps with a cooling capacity less than 65,000 Btu/h.

Additionally, through review of the AHRI certification program for commercial unitary equipment, DOE has discovered that the use of a compressor ''break-in'' period is common when testing commercial unitary equipment. By way of explanation, the AHRI certification program provides for an optional ''break-in'' period, which allows a manufacturer to have the testing laboratory run the equipment for a period of time before beginning the test. This break-in period is particularly important for scroll compressors, which may be less efficient when first started and may require time to warm up to achieve optimal performance. Once the compressor is broken in, the performance should be more representative of the actual field performance. EPCA requires that test procedures be reasonably designed to produce test results which reflect energy efficiency, energy use, and estimated operating costs for a typical type of equipment (or class thereof) during a representative use cycle, and shall not be unduly burdensome to conduct. (42 U.S.C. 6314(a)(2))

DOE believes that allowing for an optional break-in period will provide manufacturers more flexibility to produce test results that reflect energy efficiency of their units in a manner that is representative of their average use. At the same time, DOE recognizes that requiring the break-in period may add significant testing costs and burden, and, thus, DOE believes the break-in period should be optional to allow manufacturers to use this period at their discretion. Therefore, DOE is proposing to create a provision in its test procedures at 10 CFR 431.96 that would allow manufacturers the option of a ''break-in'' period not to exceed 16 hours to warm up the equipment's compressor and components. This 16-hour time limit of the ''break-in'' period that DOE is proposing matches the period used by AHRI in its Operations Manual for Unitary Large Equipment Certification Program.[15] DOE believes that this limit is likely common practice in industry. Lastly, if manufacturers choose to use a break-in period when testing their equipment, DOE will be proposing to require that in addition to reporting to DOE the efficiency rating for their products, manufacturers must also report the amount of time (up to 16 hours) used to break in their equipment to achieve the efficiency being represented. Note, DOE will update the certification provisions pending the outcome of this proposal in the upcoming certification, compliance, and enforcement rulemaking. DOE seeks comments on all aspects of this proposal, including the need for an optional break-in period and the length of time that should be allowed for such a period. This is identified as issue 3 in section X.E, ''Issues on Which DOE Seeks Comment.''

2. Small (≥65,000 and <135,000 Btu/h Cooling Capacity), Large (≥135,000 and <240,000 Btu/h Cooling Capacity) and Very Large (≥240,000 and <760,000 Btu/h Cooling Capacity) Commercial Package Air Conditioners and Heating Equipment

ASHRAE Standard 90.1–2010 updated its referenced test procedure for small, large, and very large commercial package air conditioners and heating equipment with a cooling capacity greater than or equal to 65,000 Btu/h (AHRI 340/360) from the 2004 version (currently referenced in DOE's test procedures) to the 2007 version. Between these two versions of AHRI 340/360, AHRI expanded the scope of the standard to include air-cooled packaged unitary air-conditioners with a cooling capacity from 250,000 Btu/h to less than 760,000 Btu/h. AHRI also added a tolerance to the minimum external static pressure measurement (from 0.0 inches of H_2O to 0.05 inches of H_2O).

In the May 2011 NODA, DOE concluded that these changes did not significantly impact the measurement of energy efficiency of small (≥65,000 Btu/h), large, and very large commercial package air conditioners and heat pumps. 76 FR 25622, 25636 (May 5, 2011). In response to this conclusion, DOE received comment from AHRI agreeing with DOE's position in the NODA. (AHRI, No. 11 at p. 4) DOE did not receive any other comments on this topic. As a result, DOE is proposing to incorporate by reference AHRI 340/360–2007 into the DOE test procedure for small, large, and very large commercial air conditioners and heat pumps with a cooling capacity greater than or equal to 65,000 Btu/h but less than 760,000 Btu/h.

For small (≥65,000 Btu/h), large, and very large commercial package air conditioning and heating equipment, DOE is also proposing to add the optional ''break-in'' time of no more than 16 hours, as discussed in the small (<65,000 Btu/h) commercial package air conditioners and heating equipment subsection above (section IV.E.1). DOE believes that adding this option will allow the test procedure to be more representative of the actual performance characteristics of small (≥65,000 Btu/h), large, and very large commercial package air conditioners and heating equipment, while not increasing the burden on manufacturers. Note, DOE will update the certification provisions pending the outcome of this proposal in the upcoming certification, compliance, and enforcement rulemaking. DOE seeks comment on the need for an optional break-in period for small, large, and very large commercial package air conditioning and heating equipment, and the length of time that should be allowed for such a period. This is identified as issue 4 in section X.E, ''Issues on Which DOE Seeks Comment.''

3. Commercial Oil-Fired Warm-Air Furnaces

ASHRAE Standard 90.1–2010 updated its reference test procedure for commercial oil-fired warm-air furnaces (UL 727) from the 1994 version of the standard to the 2006 version of the standard. The DOE test procedure for determining the energy efficiency of commercial warm-air furnaces

[15] See: *http://www.ahrinet.org/App_Content/ahri/files/Certification/OM%20pdfs/ULE%20OM%20December%202010.pdf.*

references part of UL 727 for commercial oil-fired warm-air furnaces. 10 CFR 431.76. Within the sections of UL 727 referenced by the DOE test procedure, the only substantive change from the 1994 version to the 2006 version of UL 727 was the removal of a passage from the scope section that allowed manufacturers to propose alternate revisions to the requirements of UL 727 if their product's features, components, materials, or systems are unsafe when used with the UL 727 test procedure.

In the May 2011 NODA, DOE concluded that this change did not significantly impact the energy efficiency metric for commercial oil-fired warm-air furnaces. 76 FR 25622, 25636 (May 5, 2011). In response, DOE received comment from AHRI agreeing with DOE's tentative conclusion. (AHRI, No. 11 at p. 4) DOE did not receive any other comments on this topic. Thus, DOE is proposing to amend its test procedures at 10 CFR 431.76 to reference UL 727–2006 for commercial oil-fired warm-air furnaces.

4. Commercial Gas-Fired Warm-Air Furnaces

ASHRAE Standard 90.1–2010 updated its referenced test procedure for commercial gas-fired warm-air furnaces (ANSI Z21.47) from the 1998 version (currently referenced in DOE's test procedure) to the 2006 version. Between the two versions of ANSI Z21.47, ANSI updated the sections that DOE references in its test procedure for determining the energy efficiency of commercial gas-fired warm-air furnaces. In the relevant sections, ANSI expanded the scope to include optional special construction provisions for furnaces designed to operate at altitudes over 2000 feet. ANSI also added a new section, which is not part of the referenced DOE test procedure but caused the Thermal Efficiency section (which is relevant) to move from section 2.38 to section 2.39. In the May 2010 NODA, DOE summarized these updates and stated its tentative conclusion that they do not substantively impact the measurement of energy efficiency for commercial gas-fired warm-air furnaces. 76 FR 25622, 25636 (May 5, 2011).

In response, DOE received comment from AHRI agreeing with DOE's conclusion in the NODA. (AHRI, No. 11 at p. 4) DOE did not receive any other comments from interested parties pertaining to this issue. Thus, DOE is proposing to amend its test procedure at 10 CFR 431.76 to reference ANSI Z21.47–2006 for commercial gas-fired furnaces warm-air furnaces.

5. Commercial Water Heaters

ASHRAE Standard 90.1–2010 updated its referenced test procedure for commercial gas-fired water heaters (ANSI Z21.10.3) from the 1998 version to the 2004 version. Between these two versions, ANSI moved the relevant sections for thermal efficiency test and standby loss test to Exhibit G and added a provision to limit the duration of the standby loss test to a maximum of 48 hours if there is no cutout (*i.e.,* the thermostat acts to shut off the burner) after the 24-hour mark. This addition closely matches the additional stipulation in DOE's test procedure for commercial gas-fired water heaters at 10 CFR 431.106, which references the ANSI Z21.10.3–1998 test procedure, but adds that the maximum duration of the test should be 48 hours if the water heater is not in heating mode at that time. The difference between the two tests is the ANSI version ends the test immediately at the 48-hour mark, whereas the DOE test procedure would allow time after the 48-hour mark for the water heater to finish its heating cycle. Because DOE's test procedure already includes a provision regarding the duration of the standby test, the provision will supersede this update to ANSI Z21.10.3.

In the May 2010 NODA, DOE tentatively concluded that these updates would not significantly affect the measurement of energy efficiency for commercial gas-fired water heaters. 76 FR 25622, 25636 (May 5, 2011). In response, DOE received comment from AHRI agreeing with DOE's conclusion in the NODA. (AHRI, No. 11 at p. 4) However, the American Gas Association (AGA) expressed concern that water heaters that comply with the version of ANSI Z21.10.3 currently referenced by DOE's test procedure may be found in non-compliance under the revised test method and suggested that DOE do testing in order to provide data on the impact of this change. (AGA, No. 9 at p. 1)

In response, DOE again reviewed the changes to the ANSI Z21.10.3 test procedure for commercial water heating equipment. DOE notes that the only change in the relevant sections of the ANSI Z21.10.3–1998 test procedure is the duration limit for the standby loss test in the event that a cutout does not occur. As noted above, this duration limit is superseded by DOE's duration limit specified in 10 CFR 431.106, which has been in place since the October 21, 2004 direct final rule. 69 FR 61974, 61984. As a result, the standby loss test changes in ANSI Z21.10.3–2004 would similarly be superseded by DOE's requirements for the standby loss test; and for all practical purposes, the test will continue to be required to be conducted in the same manner as before this proposed rule. Thus, DOE does not believe that the new changes to the test procedure will cause any currently-compliant water heaters to be found in noncompliance. Because DOE believes that the incorporated provisions of the water heater test procedure in ANSI Z21.10.3–2004 will be conducted in the same manner as those referenced in the previous test procedure, DOE does not believe that testing is required to support its tentative conclusion that there will be no difference in equipment efficiency as determined by the updated test procedure.

AGA also requested clarification on the current DOE efficiency requirement for electric and oil-fired commercial storage water heaters and was concerned that the standby loss test changes in ANSI Z21.10.3–2004 would also affect the ratings for these equipment classes. AGA stated its interpretation that the current standby loss requirements for these products stem from the 1989 version of ASHRAE Standard 90.1 and that editions of the ASHRAE Standard 90.1 since then contain standby loss requirements that are less stringent for commercial electric water heaters and, accordingly, are not adoptable by DOE. (AGA, No. 9 at p.1) In response, the efficiency requirements for electric and oil-fired commercial storage water heaters are listed at 10 CFR 431.110. Oil-fired storage water heaters must have a minimum thermal efficiency of 78 percent and a maximum standby loss of $Q/800+110(V_r)^{1/2}$ (Btu/h), where Q is the nameplate input rate in Btu/h and V_r is the rated volume. Electric water heaters do not currently have a minimum thermal efficiency but have a maximum standby loss of $0.30+27/V_m$ (%/hr), where V_m is the measured storage volume. The standards for oil-fired commercial storage water heaters were promulgated in a final rule published in the **Federal Register** on January 12, 2001, which adopted the efficiency levels in ASHRAE Standard 90.1–1999 (66 FR 3336), and the Energy Policy Act of 1992 (EPACT 1992) set the standards for electric commercial water heaters (EPACT 1992, Pub. L. 102–486, Oct. 24, 1992). ASHRAE Standard 90.1–1999 did revise the efficiency level for electric water heaters; however, DOE determined that the revised level was a less stringent standard than the current Federal standard (66 FR 3336, 3350 (Jan. 12, 2001)). Subsequent editions of ASHRAE Standard 90.1 still contain this revised efficiency level, but DOE still maintains that the current Federal standard set by EPACT 1992 is more stringent than the ASHRAE efficiency level.

DOE is proposing to amend its test procedure at 10 CFR 431.106 to incorporate by reference ANSI Z21.10.3–2006 for commercial gas-fired water heaters. DOE seeks additional comment on this proposal to adopt ANSI Z21.10.3–2006, which is identified as issue 5 in section X.E, ''Issues on Which DOE Seeks Comment.''

6. Air Conditioners and Condensing Units Serving Computer Rooms

ASHRAE Standard 90.1–2010 specifies ASHRAE 127–2007, *Method of Testing for Rating Computer and Data Processing Room Unitary Air Conditioners,* as the test procedure for determining the sensible coefficient of performance (SCOP) of air conditioners and condensing units serving computer rooms. ASHRAE 127–2007 defines and establishes a test method for computer room air conditioners. As noted above, EPCA directs DOE to prescribe the generally accepted industry testing procedures or rating procedures developed or recognized by ASHRAE, as referenced in ASHRAE Standard 90.1, unless there is clear and convincing evidence that to do so would not produce test results which reflect the energy efficiency or energy use during an representative average use cycle or that the test procedure would be unduly burdensome to conduct. (42 U.S.C. 6314(a)(2)–(4) DOE reviewed ASHRAE 127–2007 to determine whether it meets the requirements of EPCA for incorporation by reference as part of the Federal test method for determining compliance with minimum energy conservation standards.

ASHRAE 127–2007 contains provisions that make it better suited for computer room air conditioners than the current commercial packaged air conditioner test procedures (*i.e.,* AHRI 210/240 and AHRI 340/360). The ASHRAE 127–2007 test procedure places an emphasis on sensible cooling [16] by establishing the SCOP metric, which is a measure of the sensible cooling output divided by the electrical input of all components, excluding reheaters and humidifiers (*e.g.,* the input of the compressors, fans, controls, air-cooled condenser, or air-cooled fluidcooler fans if used). Sensible cooling is important in computer room air conditioners because the cooling load in most server and computer rooms deals almost exclusively with a sensible heat load, meaning that there is very little moisture removed from the air inside the room. There is a very low latent heat load (*i.e.,* heat load associated with the removal of moisture in the air) because very little outside air actually reaches the room, and there is almost no outside water in the room, which would alter the humidity of the computer room. A typical air conditioner used for space conditioning will encounter both a latent load and a sensible load. However, unlike other types of air conditioners, a computer room air conditioner will have an almost exclusively sensible cooling load, so it is reasonable that the metric for measuring energy efficiency would place an emphasis on sensible cooling. DOE believes that the SCOP metric under ASHRAE 127–2007 is a useful metric for measuring the energy efficiency of computer rooms and data rooms due to its emphasis on sensible cooling.

In addition, ASHRAE 127–2007 contains a standard rating test for reheating/dehumidification/humidification systems, which are important functions of computer room air conditioners. The humidity of a computer room is an important aspect to control, as too much humidity can cause condensation on the electronic equipment (which has the potential to render the equipment inoperable) and too little humidity may cause potentially hazardous static discharges.

Because ASHRAE 127–2007 is tailored to computer room air conditioners, DOE believes it will provide a more representative efficiency rating, which is more reflective of the actual efficiency of the unit. DOE believes that ASHRAE 127–2007 is reasonably designed to produce test results that reflect the energy efficiency, energy use, and estimated operating costs during a representative average use cycle and is not unduly burdensome to conduct, as outlined in EPCA. (42 U.S.C. 6314(a)(2)). In response to the May 2011 NODA, AHRI encouraged DOE to adopt ASHRAE 127 as the test procedure for air conditioners and condensing units serving computer rooms. (AHRI, No. 11 at p. 4) DOE did not receive any other comments from interested parties pertaining to this issue. For the reasons above, DOE is proposing to adopt ASHRAE 127–2007 as the test method for computer room air conditioners; however, DOE notes several possible issues with the test procedure in the paragraphs below. DOE seeks comment on this proposal, as well as the need for potential modifications for the computer room air conditioner test procedures, and this is identified as issue 6 in section X.E, ''Issues on Which DOE Seeks Comment.''

DOE notes that on July 14, 2011, ASHRAE published a public draft review of a revision to ASHRAE 127. A preliminary review of this draft revealed that ASHRAE created four different application classes to meet the industry need to modify equipment to accept higher return temperatures. Each application class has a different standard rating condition. ASHRAE also changed the water temperature conditions for water-cooled direct expansion units to match the conditions in AHRI 340/360 plus a typical cooling tower approach. This update also renames the SCOP and adjusted sensible coefficient of performance (ASCOP) metrics as Net Sensible Coefficient of Performance Rating (NSenCOP) and Integrated Net Sensible Rating (iNSenCOP), respectively. The NSenCOP is to be published at five rating conditions as opposed to four for SCOP (the four rating test conditions A–D in addition to iNSenCOP). The public comment period for the review of this draft has closed. DOE is not proposing to adopt the draft revisions to ASHRAE 127 because they have not been finalized yet, but DOE seeks comments about how to treat the revisions. This is identified as issue 6 in section X.E, ''Issues on Which DOE Seeks Comment.''

Lastly, DOE notes that the SCOP metric in ASHRAE 127–2007 does not measure part-load performance, and may not properly account for efficiency features that improve the part-load performance, such as variable speed fan motors and multi-stage compressors. Computer room air conditioners operate virtually all year round with a varying load, depending on how active the computer room is and the outdoor conditions. DOE requests comments on the shortcomings of this test procedure and the SCOP metric, and further improvements that could be made. See Section X.E, ''Issues on Which DOE Seeks Comment.''

For computer room air conditioners, DOE is also requesting comment on the appropriateness of allowing an optional ''break-in'' time of no more than 16 hours, similar to those being proposed for other commercial air conditioning and heating equipment in this notice (as discussed in section IV.E.1). DOE believes that adding this option could

[16] ''Sensible cooling'' is the cooling effect that causes a decrease 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.

allow the test procedure to be more representative of the actual performance characteristics of computer room air conditioners, while not increasing the burden on manufacturers. DOE seeks comment on the need for an optional break-in period for computer room air conditioners, and the length of time that should be allowed for such a period, if it is needed. This is identified as issue 17 in section X.E, ''Issues on Which DOE Seeks Comment.''

7. Variable Refrigerant Flow Systems

ASHRAE Standard 90.1–2010 specifies AHRI 1230, *Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment,* as the test procedure for variable refrigerant flow systems. As noted previously, EPCA directs DOE to prescribe the ''generally accepted industry testing procedures or rating procedures developed or recognized by the Air-Conditioning and Refrigeration Institute or by the American Society of Heating, Refrigeration and Air Conditioning Engineers, as referenced in ASHRAE/IES Standard 90.1'' unless there is clear and convincing evidence that to do so would not produce test results which reflect the energy efficiency or energy use during an representative average use cycle or that the test procedure would be unduly burdensome to conduct. (42 U.S.C. 6314(a)(2)–(4)) DOE reviewed AHRI 1230–2010 to determine whether it meets the requirements of EPCA for incorporation by reference as part of the Federal test method for determining compliance with minimum energy conservation standards.

DOE first addressed the issue of AHRI 1230 in the October 22, 2007 test procedure final rule for residential air conditioners and heat pumps. 72 FR 59906. In that final rule, DOE decided not to adopt ARI 1230 at the time for residential VRF products, because ARI 1230 had not been finalized yet. DOE also noted that the draft test procedure lacked information on: (1) How to conduct intermediate speed tests; (2) whether any indoor units are to be turned off for part-load test; and (3) how to interpolate EER and COP in the intermediate speed range. *Id.* at 59909.

Since 2008, DOE has issued 13 waivers to 5 different manufacturers exempting them from the commercial air conditioning and heat pump test procedures (AHRI 210/240 or AHRI 340/360).[17] In all 13 cases, the equipment in question was a multi-split variable refrigerant flow air conditioner or heat pump. For these types of equipment, there are multiple indoor units that are paired with a single outdoor unit, and the indoor and outdoor units can be mixed and matched to create different systems with a wide array of possible combinations. For example, one major manufacturer has a product line that can have as many as 38 different interior units connected to a single outdoor unit. Those 38 interior units can be selected in any combination from a pool of 43 unique indoor models. Then, when considering that the indoor units in the system could also be paired with any one of 7 unique outdoor models, the number of possible combinations becomes astronomical. DOE recognized that the vast number of combinations of units that would need to be tested would overwhelm any testing laboratory, so it granted test procedure waivers for these units and required these units to be tested using an alternative test procedure that DOE developed. The only restriction in terms of the number of interior units is that the total capacity of all the indoor units must be comparable to the capacity of the outdoor unit. This alternate test procedure (which is outlined in each test procedure waiver granted by DOE for this equipment) permits the manufacturer to designate a ''tested combination'' for each outdoor unit. Each ''tested combination'' must have between two and five indoor units and must be tested using according to the applicable DOE test procedure. Manufacturers must release the test results for those ''tested combinations,'' and for the non-tested combinations, manufacturers can represent the energy use as equal to the tested combination, provided that the outdoor units are the same.

In addition, manufacturers brought up several other issues in the petitions for test procedure waivers that related to applying the commercial air conditioning test procedure to VRF systems. Manufacturers asserted that: (1) There is no provision to accommodate having indoor units operating at different static pressures; (2) there is no precise number of part-load tests for fully variable speed; and (3) it does not account for simultaneous heating and cooling. DOE notes that the fact that multi-split systems can simultaneously heat and cool a building does not impact the efficiency rating, because the efficiency metric (*i.e.,* EER) is a single point rating metric and does not measure seasonal energy use.

AHRI 1230–2010 contains the same definition and procedures for rating the efficiency of a ''tested combination'' as the alternative DOE test procedure that DOE developed in response to the waivers. AHRI 1230–2010 also contains specific language on how to test multiple indoor units, the number of tests for variable speed compressors, and how to test for simultaneous cooling and heating efficiency, which should mitigate manufacturer complaints regarding the existing DOE test procedure for commercial package air conditioning and heating equipment as it applies to VRF systems. AHRI 1230–2010 also tests for EER and COP at the same rating conditions as AHRI 210/240 and AHRI 340/360. Thus, these systems should test for EER in the same way as other commercial air conditioners and heat pumps once the systems are set up according to AHRI 1230–2010.

In February 2011, AHRI amended the test procedure in Addendum 1 to AHRI 1230 to modify the definition of ''tested combination'' to contain between 2 and 12 indoor units as opposed to between 2 and 5 indoor units. DOE believes this change merely extends the range of a tested combination and has no effect on the efficiency metric of the system. DOE believes this test procedure properly addresses all the concerns of testing VRF systems, results in a rating that reasonably reflects the energy efficiency of these systems, and would not be unduly burdensome to conduct.

In response, DOE received a comment from AHRI which encouraged DOE to adopt AHRI 1230–2010, stating that a deliberate and open process was used to develop this test procedure and that it incorporates the alternative test procedure initially developed by DOE to cover VRF equipment. (AHRI, No. 11 at p. 4) The Advocates and CA IOUs, however, encouraged DOE to conduct a test procedure rulemaking for VRF equipment in order to eliminate the need for manufacturers to seek test procedure waivers for this equipment. (Advocates, No. 8 at p. 5, CA IOUs, No. 10,12 at p. 3) DOE believes that AHRI 1230–2010 incorporates all of the alternative test procedure that DOE developed through its waiver process, is a comprehensive test procedure for VRF systems, and would not be unduly burdensome to conduct. Manufacturers of VRF systems should not need to seek a test procedure waiver from AHRI

[17] Daikin AC (Americas) Inc. (73 FR 39680 (July 10, 2008); 74 FR 15955 (April 8, 2009); 74 FR 16373 (April 10, 2009); 75 FR 22581 (April 29, 2010); 75 FR 25224 (May 7, 2010); 76 FR 34685 (June 14, 2011)).

Mitsubishi Electric and Electronics USA, Inc. (74 FR 35860 (July 21, 2009); 74 FR 66311 (Dec. 15, 2009); 74 FR 66315 (Dec. 15, 2009); 76 FR 40714 (July 11, 2011)).

LG (74 FR 66330 (Dec. 15, 2009)).

Sanyo North America Corporation (75 FR 41845 (July 19, 2010)).

Carrier Corporation (76 FR 31951 (June 2, 2011)).

1230–2010 with Addendum 1. Further, DOE notes that EPCA generally directs DOE to prescribe the industry testing procedures as referenced in ASHRAE Standard 90.1, unless there is clear and convincing evidence that to do so would not produce test results consistent with the requirements of EPCA. (42 U.S.C. 6314(a)(2)–(4)). DOE believes AHRI 1230 meets the requirements of EPCA, and, therefore, is proposing to adopt AHRI 1230–2010 with Addendum 1 as the test procedure for VRF systems. DOE seeks comment on this proposal, and this issue is identified as issue 7 in section X.E, ''Issues on Which DOE Seeks Comment.''

For VRF systems, DOE is also proposing to add the optional ''break-in'' time of no more than 16 hours, as discussed in the small (<65,000 Btu/h) commercial package air conditioners and heating equipment subsection above (section IV.E.1). DOE believes that adding this option will allow the test procedure to be more representative of the actual performance characteristics of VRF systems, while not increasing the burden on manufacturers. Note, DOE will update the certification provisions pending the outcome of this proposal in the upcoming certification, compliance, and enforcement rulemaking. DOE seeks comment on the need for an optional break-in period for VRF systems, and the length of time that should be allowed for such a period. This is identified as issue 7 in section X.E, ''Issues on Which DOE Seeks Comment.''

8. Single Package Vertical Air Conditioners and Single Package Vertical Heat Pumps

For single package vertical air conditioners and single package vertical heat pumps, ASHRAE Standard 90.1–2010 lists AHRI 390–2003, ''Performance Rating of Single Packaged Vertical Air-Conditioners and Heat Pumps,'' as the referenced test procedure. Commercial SPVACs and SPVHPs were not distinguished as separate classes of commercial air conditioning and heating equipment in DOE's regulations until EISA 2007 amended EPCA to set efficiency standards specifically for this equipment (codified at 42 U.S.C. 6313(a)(10)), which DOE subsequently codified in its regulations through a final rule published on March 23, 2009. 74 FR 12058. Although EISA 2007 specified minimum energy conservation standards for SPVACs and SPVHPs, it did not specify the applicable test procedure for measuring the energy efficiency of SPVACs and SPVHPs. As discussed previously, according to EPCA, the test procedures for ASHRAE products shall be those generally accepted industry testing procedures or rating procedures developed or recognized by AHRI or ASHRAE, as referenced in ASHRAE Standard 90.1, and shall be reasonably designed to product test results which reflect energy efficiency or energy use of those products. Further, when a test procedure in ASHRAE Standard 90.1 is amended, EPCA directs DOE to amend its test procedure for the product as necessary to be consistent with the amended industry test procedure, unless doing so would not meet the requirements for test procedures described in 42 U.S.C. 6314(a)(2) and (3). (42 U.S.C. 6314(a)(4)(A)–(B))

DOE reviewed AHRI 390–2003 and believes the procedure is reasonably designed to produce test results which reflect energy efficiency of SPVACs and SPVHPs. In the May 2011 NODA, DOE requested comment about the adoption of AHRI 390–2003 as the test method for SPVACs and SPVHPs. 76 FR 25622, 25635 (May 5, 2011). DOE received a comment from AHRI encouraging DOE to adopt AHRI 390–2003, in which AHRI remarked that this test procedure was developed with input from DOE. (AHRI, No. 11 at p. 4) DOE did not receive any other comments on this topic. As a result, DOE is proposing to adopt AHRI 390–2003 as its test procedure for SPVACs and SPVHPs.

In addition, for this equipment DOE is proposing to add the optional ''break-in'' time of no more than 16 hours, as discussed in the small (<65,000 Btu/h) commercial package air conditioners and heating equipment subsection above (section IV.E.1). DOE believes that adding this option will allow the test procedure to be more representative of the actual performance characteristics of SPVACs and SPVHPs, while not increasing the burden on manufacturers. Note, DOE will update the certification provisions pending the outcome of this proposal in the upcoming certification, compliance, and enforcement rulemaking. DOE seeks comment on the need for an optional break-in period for small, large, and very large commercial package air conditioning and heating equipment, and the length of time that should be allowed for such a period. This is identified as issue 8 in section X.E, ''Issues on Which DOE Seeks Comment.''

9. Additional Specifications for Testing of Commercial Package Air Conditioning and Heating Equipment, Including VRF Systems

As part of its ongoing testing efforts in support of DOE's regulatory program, DOE has encountered situations where the Department has received *ad hoc* requests from manufacturers regarding the need for tailored modifications to the testing set-up or operating conditions for a basic model. The Department is reiterating that DOE will use only the conditions specified in the DOE test procedure for a given covered equipment, along with any additional guidance that is presented in the installation and/or operating manuals shipped with those units for any DOE-initiated testing. For example, the Department typically uses the optimal charge settings in the installation manuals of commercial package air conditioning and heating equipment when they are specified for a given basic model. No additional information (*i.e.,* additional specificity for the placement or types of specific testing sensors) will be used for any DOE verification or enforcement testing that are not part of the aforementioned documents.

DOE does not intend for this clarification to change the way manufacturers currently test their products for the purposes of determining their certified ratings for each basic model. Instead, DOE wishes to harmonize the way it conducts its testing with the testing done by manufacturers. Consequently, DOE seeks comments generally on whether there are additional settings beyond the tolerances in the test procedure or additional specifications for the test set-up that DOE should consider for testing of all types of commercial air conditioning and heating equipment as part of this rulemaking. If such settings are basic-model specific, DOE could, for example, come up with a way for manufacturers to disclose these instructions as part of their initial certifications for a given basic model. With the separation of VRF systems as a separate equipment class and the complexity inherent in testing this type of equipment, DOE specifically seeks comment on the testing conditions, the basic model operating points, and set-up for this equipment. This is identified as issue 9 in section X.E, ''Issues on Which DOE Seeks Comment.''

10. Sampling Plans for Commercial Heating, Ventilating, and Air-Conditioning Equipment

For purposes of certification testing, the determination that a basic model complies with the applicable conservation standard must be based on testing conducted using DOE's testing procedures and the sampling procedures, which are found in 10 CFR Part 429.43 for commercial heating, ventilating, and air conditioning equipment. The sampling procedures provide that ''a sample of sufficient size shall be tested to insure [compliance].'' A minimum of two units must be tested to certify a basic model as compliant. This minimum is implicit in the requirement to calculate a mean—an average—which requires at least two values. Under no circumstances is a sample size of one (1) authorized. Manufacturers may need to test more than two samples depending on the variability of their sample. Therefore, the sample size can be an important element when evaluating the compliance of a basic model.

DOE uses statistically meaningful sampling procedures for selecting test specimens of commercial and industrial equipment, which would require the manufacturer to select a sample at random from a production line and, after each unit or group of units is tested, either accept the sample or continue sampling and testing additional units until a rating determination can be made. DOE did not propose a specific sample size for each product because the sample size is determined by the validity of the sample and how the mean compares to the standard, factors which cannot be determined in advance.

In this proposed rule, DOE is proposing that the existing sampling procedures in 10 CFR part 429.43 be applied to any new covered equipment being addressed by testing procedures in this NOPR, including VRF systems, SPVUs, and CRACs. DOE believes this type of equipment is similar to the other types of commercial heating, ventilating, and air-conditioning equipment subject to DOE's existing sampling procedures for certification testing and does not warrant differential treatment.

F. Definitional Changes

As discussed in the preceding sections, DOE is proposing to include in its regulations separate standards and test procedures for VRF systems, and new standards and test procedures for computer room air conditioners. Additionally, after the enactment of EISA 2007, DOE created separate standards for single package vertical air conditioners and heat pumps in its regulations at 10 CFR 431.97 (74 FR 12058, 12073–74 (March 23, 2009)), and is proposing to adopt a test procedure for those equipment in today's notice. Further, DOE's regulations at 10 CFR 431.97 also include ''very large'' commercial package air conditioning and heating equipment. To be consistent with the treatment of other commercial HVAC equipment and to reduce ambiguity, DOE is proposing to modify the definition of ''Commercial HVAC & WH product'' that was added to 10 CFR 431.2 by a March 7, 2011 final rule for certification, compliance, and enforcement for consumer products and commercial and industrial equipment. 76 FR 12422, 12503. DOE proposes to modify the definition so that it explicitly includes very large commercial package air conditioners and heating equipment, single package vertical air conditioners, single package vertical heat pumps, computer room air conditioners, variable refrigerant flow multi-split air conditioners, and variable refrigerant flow multi-split heat pumps.

V. Methodology for VRF Water-Source Heat Pumps

This section addresses the analysis DOE has performed for this rulemaking with respect to VRF water-source heat pumps. As mentioned in section IV.B.3, DOE performed a preliminary National Energy Savings analysis for VRF water-source heat pumps greater than 135,000 Btu/h, equivalent to that performed for the May 2011 NODA for other product categories. DOE was unable to perform this analysis at the time of the NODA because AHRI had not yet released a database of efficiency information for these products, and DOE was unable to obtain sufficient EER information from a review of manufacturer Web sites. As a result of the minimal energy savings demonstrated by DOE's analysis for the NOPR (the results of which are summarized in section VIII.B.2), DOE did not conduct further energy savings or economic analyses. In addition, in response to the May 2011 NODA, AHRI confirmed that there are no VRF water-source heat pumps being manufactured with cooling capacities below 17,000 Btu/h, so DOE did not perform a potential energy-savings analysis for this product class.

A. Definitions of ''VRF Multi-Split Air Conditioners'' and ''VRF Multi-Split Heat Pumps''

VRF water-source heat pumps are part of the larger VRF system equipment class. VRF systems are a subset of commercial air conditioning and heating equipment, which ASHRAE Standard 90.1–2010 placed into separate equipment classes. As a result, in today's NOPR, DOE is proposing to separate the VRF equipment classes from the other classes of commercial package air conditioning and heating equipment. Neither EPCA nor DOE's regulations in the CFR define ''variable refrigerant flow system.'' DOE examined the definitions for VRF systems in ASHRAE Standard 90.1–2010 and AHRI Standard 1230, the proposed test procedure for this equipment.

ASHRAE Standard 90.1–2010 defines a ''variable refrigerant flow system'' as ''an engineered direct expansion (DX) multi-split system incorporating at least one variable capacity compressor distributing refrigerant through a piping network to multiple indoor fan coil units each capable of individual zone temperature control, through integral zone temperature control devices and common communications network. Variable refrigerant flow utilizes three or more steps of control on common, interconnecting piping.'' AHRI Standard 1230, the test procedure cited by ASHRAE Standard 90.1–2010 for use with this equipment, uses the term ''variable refrigerant flow multi-split system'' and defines it as ''a split system air-conditioner or heat pump incorporating a single refrigerant circuit, with one or more outdoor units, at least one variable speed compressor or an alternative compressor combination for varying the capacity of the system by three or more steps, multiple indoor fan coil units, each of which is individually metered and individually controlled by a proprietary control device and common communications network. The system shall be capable of operating as an air conditioner or a heat pump. Variable refrigerant flow implies three or more steps of control on common, inter-connecting piping.''

In both cases, the definitions use the term ''multi-split'' to distinguish such units from ''mini-split,'' with the indoor units of the latter systems only being able to be controlled by one thermostat (as opposed to multi-split, which can be controlled by multiple thermostats). Because DOE believes that it is important to distinguish VRF systems as multi-split systems, DOE is proposing to formulate these definitions with the term ''multi-split'' in the title for this equipment class based on the definitions above. DOE believes that these proposed definitions incorporate all the unique features of this equipment class, most notably the individually-controlled indoor units which operate independently from other indoor units. DOE proposes the definitions of ''variable refrigerant flow multi-split air conditioner'' and ''variable refrigerant flow multi-split heat pump'' to read as follows:

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.

These definitions clearly delineate VRF air conditioners and heat pumps as a sub-category of commercial package air conditioning and heating equipment and are structured in such a way to ensure that there are no overlaps with any other covered equipment class. There is also a subcategory of VRF systems that have heat recovery; therefore, DOE is also proposing to define ''heat recovery'' in the context of variable refrigerant flow multi-split air conditioners or variable refrigerant flow multi-split heat pumps to read as follows:

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.

DOE is requesting comment on its proposed definitions of ''variable refrigerant flow multi-split air conditioner,'' ''variable refrigerant flow multi-split heat pump,'' and ''heat recovery.'' This is identified as issue 10 in section X.E, ''Issues on Which DOE Seeks Comment.''

B. Annual Energy Use

Annual per-unit energy use estimates for VRF water-source heat pumps at or greater than 135,000 Btu/h cooling capacity were developed based on whole building energy simulation of a medium-sized prototype office building in 15 locations around the U.S, with each location representing one of 15 unique climate zones within the U.S.[18] The prototype office building model used two water-source VRF systems in conjunction with a gas-fired boiler and a single cooling tower to serve the condensing water loop for the VRF systems. The simulation tool was a commercial version of the DOE2.1E building simulation tool, with the capability to model water-source VRF equipment using custom DOE2.1E functions. This simulation tool also provides actual performance curves obtained from equipment manufacturers for a number of specific equipment models, including many water-source VRF condensing units and indoor sections.

DOE simulated the medium office building using actual equipment selections corresponding to three different efficiency levels identified in the AHRI certified product directory for VRF multi-split air conditioners and heat pumps.[19] These efficiency levels corresponded to: (1) The lowest efficiency level identified in the directory and close to the ASHRAE baseline; (2) an efficiency level corresponding to the highest efficiency level identified for ducted systems; and (3) an efficiency level near the highest efficiency identified for ductless systems. The AHRI 1230–2010 test procedure provides that each condensing unit be tested as both a ducted system (representing equipment using indoor units that are connected to short distribution ducts) and as a ductless system (representing equipment using ductless indoor sections that provide conditioned air directly to the building space served). Because of a higher external static pressure when testing ducted units, the rated efficiency (EER and COP) of a given condensing unit is lower when tested as a ducted system than when tested as a ductless system. The two higher efficiency levels simulated utilized the same condensing unit but represent ratings as a ducted and as a ductless system respectively. The lowest EER level simulated was represented by a lower-performing condensing unit in a ducted system configuration.

DOE performed simulations of the prototype office building at these three VRF efficiency levels in each climate for systems with and without heat recovery. As the ratings data do not identify the indoor units used, DOE selected a representative ducted indoor section and developed supply fan power estimates based on that unit for ducted systems representing the first two efficiency levels simulated. For non-ducted systems where there was a large variety of indoor sections available, DOE developed an average fan power estimate based on average supply fan power data for five different ductless indoor section designs. DOE then used that average ductless fan power estimate in simulating the building with VRF systems at this third, highest, efficiency level.

The annual electrical energy use for the VRF equipment, including each condensing unit and all associated evaporator units, was extracted from the simulation results for each building simulated and normalized by cooling capacity to provide estimates of annual VRF cooling, heating, and fan energy consumption at the average cooling capacities estimated by DOE for the two VRF product classes. For water-source VRF systems greater than 135,000 Btu/h without heat recovery, DOE estimated the average cooling capacity at 216,000 Btu/h based on the average for available equipment found in the 2011 AHRI certified products directory.[20] For water-source VRF systems with heat recovery, DOE estimated the average cooling capacity at 192,000 Btu/h using the same data source.

DOE calculated the national average energy use for VRF systems with and without heat recovery at each efficiency level using commercial building construction weights previously developed by DOE and assigned to each of the 15 U.S. climate zones. For each equipment class, DOE developed linear relationship between the national average cooling energy use and the reciprocal of the cooling EER for each consecutive pair of three efficiencies modeled. DOE also developed a linear relationship between the national average heating energy use and the

[18] Briggs, R.L., R.G. Lucas, and Z.T. Taylor, *Climate Classification for Building Energy Codes and Standards: Part 1—Development Process* and Part 2—Zone Definitions, Maps, and Comparisons, ASHRAE Transactions (2003) (1) pp. 4610–4611.

[19] Directory of Certified Variable Refrigerant Flow (VRF) Multi-Split Air Conditioning and Heat Pump Equipment: 2011 Edition (Effective Date: Sept. 16, 2011) (Last accessed on Sept. 26, 2011) (Available at: *http://www.ahridirectory.org/ahridirectory/pages/home.aspx*).

[20] See: *http://www.ahridirectory.org/ahridirectory/pages/vrf/VRFDirectory_20110916.pdf.*

reciprocal of the heating COP for each consecutive pair of efficiencies modeled. DOE then used these relationships to estimate the annual average cooling and heating energy use at the ASHRAE baseline efficiency level and at four higher efficiency levels, including the highest EER and COP levels found in the AHRI certified product directory for each product class (identified as max-tech levels for this analysis). Level 2 corresponded to the highest efficiency found for ducted VRF equipment in the AHRI directory. DOE held the fan energy use constant for levels at and below level 2 to that estimated based on the ducted VRF simulations. DOE determined that the max-tech level corresponded to a ductless system and estimated the energy use at the max-tech level using the linear relationship between the higher two efficiencies simulated. Annual energy use at level 3 was calculated based on interpolation between level 2 and the max-tech level. In all, DOE developed annual energy consumption estimates for efficiency levels at EER values of 10.0, 11.0, 12.0, 13.0, and 14.5 for water-source VRF heat pumps without heat recovery. DOE developed annual energy consumption estimates for efficiency levels at EER values of 9.8, 11.0, 12.0, 13.0, and 14.5 for water-source VRF heat pumps with heat recovery.

C. Shipments

DOE obtained historical (1989–2009) water-source heat pump shipment data from the U.S. Census.[21] Table V.1 exhibits the shipment data provided for a selection of years, while the full data set can be found in chapter 7 of the NOPR TSD.[22] DOE used these shipment data to extrapolate shipments into the future based on the historical trend.

TABLE V.1—TOTAL SHIPMENTS OF WATER-SOURCE HEAT PUMPS

Year	Units shipped
1990	139,864
1994	99,321
2000	133,654
2005	141,410
2009	180,101

As these shipment data represent water-source heat pumps generally and not VRF water-source heat pumps specifically, DOE undertook research to ascertain the number of models of water-source heat pumps in total, and VRF water-source heat pumps specifically. DOE used AHRI's Directories of Certified Product Performance for Water-to-Air and Water-to-Water Heat Pumps (excluding groundwater loop and ground loop) and VRF Multi-Split Water-to-Air Heat Pumps for this purpose.[23] DOE supplemented the AHRI Directory for VRF systems with information from manufacturers' Web sites to capture as much of the market as possible. DOE used the ratio of VRF water-source heat pump greater than 135,000 Btu/h models to all water-source heat pump models on the market (164:4277) to estimate VRF water-source heat pump shipments. DOE also used the ratio of VRF water-source heat pumps greater than 135,000 Btu/h without heat recovery to all VRF water-source heat pumps greater than 135,000 Btu/h to allocate shipments into the two product classes (106:164). The complete historical data set and the projected shipments can be found in chapter 7 of the NOPR TSD.

DOE then reviewed the AHRI Certified Product Directory to determine the distribution of efficiency levels for commercially-available models of VRF water-source heat pumps greater than 135,000 Btu/h. DOE bundled the efficiency levels into ''efficiency ranges'' and determined the percentage of models within each range. The distribution of efficiencies in the base case can be found in chapter 8 of the NOPR TSD. It is important to note that DOE did not identify any models on the market for either class of equipment with an EER below those specified in ASHRAE Standard 90.1–2010.

For the standards case, DOE assumed shipments at lower efficiencies were most likely to roll up into higher efficiency levels in response to more-stringent energy conservation standards. For each efficiency level analyzed within a given equipment class, DOE used a ''roll-up'' scenario to establish the market shares by efficiency level for the year in which compliance with amended standards is required (*i.e.,* 2013). DOE estimated that 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. Available information also suggests that all equipment efficiencies in the base case that were above the standard level under consideration would not be affected. As an example, Table V.2 shows the distribution of efficiencies within the base-case and the roll-up scenarios to establish the distribution of efficiencies in the standards cases for VRF water-source heat pumps without heat recovery.

TABLE V.2—DISTRIBUTION OF EFFICIENCIES IN THE BASE CASE AND STANDARDS CASES FOR VRF WATER-SOURCE HEAT PUMPS >135 KBtu WITHOUT HEAT RECOVERY

Efficiency level	Efficiency ranges (EER)*					
	9.5–9.7	9.8–10.4	10.5–11.5	11.6–12.5	12.6–13.4	13.5+
Market Baseline	0%	3%	73%	15%	3%	5%
Efficiency Level 1—ASHRAE (10.0 EER)		3%	73%	15%	3%	5%
Efficiency Level 2—(11.0 EER)			76%	15%	3%	5%
Efficiency Level 3—(12.0 EER)				92%	3%	5%
Efficiency Level 4—(13.0 EER)					95%	5%
Efficiency Level 5—''Max-Tech''—(14.5 EER)						100%

* DOE binned models into efficiency ranges surrounding the EER of each efficiency level; the specific bins were chosen to maintain the same market average efficiency (when the number of models in each range is multiplied by the efficiency level EER) as calculated using the full distribution of models.

Using the distribution of efficiencies in the base case and in the standards cases, as well as the unit energy consumption (UEC) for each specified EER (discussed previously), DOE calculated market-weighted average

[21] *http://www.census.gov/manufacturing/cir/historical_data/ma333m/index.html, http://permanent.access.gpo.gov/lps38720/.*

[22] *http://www1.eere.energy.gov/buildings/appliance_standards/commercial/ashrae_products_docs_meeting.html.*

[23] See: *www.ahridirectory.org.*

efficiency values. The market-weighted average efficiency value represents the average efficiency of the total units shipped at a specified amended standard level. The market-weighted average efficiency values for the base case and the standards cases for each efficiency level analyzed are provided in chapter 8 of the ASHRAE NOPR TSD.

D. Other Analytical Inputs

1. Site-to-Source Conversion

DOE converted the annual site energy savings into the annual amount of energy saved at the source of electric generation (*i.e.,* primary energy), using site-to-source conversion factors over the analysis period (calculated from the Energy Information Agency's (EIA's) *Annual Energy Outlook 2011* (*AEO2011*) projections).[24] DOE derived the annual conversion factors by dividing the delivered electricity to the commercial sector plus loss for each forecast year in the United States, as indicated in *AEO2011,* by the delivered electricity to the commercial sector for each forecasted year.

2. Product Lifetime

DOE used a product lifetime of 19 years for VRF water-source heat pumps based on the ASHRAE 2011 HVAC Applications Handbook.[25]

3. Compliance Date and Analysis Period

For purposes of calculating the national energy savings (NES), DOE used an analysis period of 2013 (the assumed compliance date if DOE were to adopt the ASHRAE levels as Federal standards for large and very large products) through 2042. This is the standard analysis period of 30 years that DOE typically uses in its NES analysis. While the analysis period remains the same for assessing the energy savings of Federal standard levels higher than the ASHRAE levels, those energy savings would not begin accumulating until 2017 (the assumed compliance date if DOE were to determine that standard levels more stringent than the ASHRAE levels are justified).

If DOE were to propose a rule prescribing energy conservation standards at the efficiency levels contained in ASHRAE Standard 90.1–2010, EPCA states that any such standards shall become effective on or after a date which is two or three years (depending on equipment size) after the effective date of the applicable minimum energy efficiency requirement in the amended ASHRAE standard (*i.e.,* ASHRAE Standard 90.1–2010). (42 U.S.C. 6313(a)(6)(D)) For VRF water-source heat pumps in this rulemaking, ASHRAE Standard 90.1–2010 does not specify an effective date; therefore, the effective date is assumed to be the publication date of ASHRAE Standard 90.1–2010, or October 29, 2010. Thus, if DOE decides to adopt the levels in ASHRAE Standard 90.1–2010, the rule would apply to large and very large equipment (the product class analyzed here) manufactured on or after October 29, 2013, which is three years from the effective date specified in ASHRAE Standard 90.1–2010.

If DOE were to propose a rule prescribing energy conservation standards higher than the efficiency levels contained in ASHRAE Standard 90.1–2010, under EPCA, any such standard would apply to for products manufactured four years after the date of publication of the final rule in the **Federal Register.** (42 U.S.C. 6313(a)(6)(D)) Thus, for products for which DOE might adopt a level more stringent than the ASHRAE efficiency level, the rule would apply to products manufactured on or after a date which is four years from the date of publication of the final rule adopting standards higher than the ASHRAE efficiency levels (30 months after publication of the revised ASHRAE Standard 90.1, which was October 29, 2010). Under this timeline, compliance with such more-stringent standards would be required no later than April 29, 2017.

VI. Methodology for Computer Room Air Conditioners

This section addresses the analyses DOE has performed for this rulemaking with respect to computer room air conditioners. A separate subsection addresses each analysis. In overview, DOE used a spreadsheet to calculate the life-cycle cost (LCC) and payback periods (PBPs) of potential energy conservation standards. DOE used another spreadsheet to provide shipments forecasts and then calculate national energy savings and net present value impacts of potential amended energy conservation standards.

A. Market Assessment

To begin its review of the ASHRAE Standard 90.1–2010 efficiency levels, DOE developed information that provides an overall picture of the market for the equipment concerned, including the purpose of the equipment, the industry structure, and market characteristics. This activity included both quantitative and qualitative assessments based primarily on publicly-available information. The subjects addressed in the market assessment for this rulemaking include equipment classes, manufacturers, quantities, and types of equipment sold and offered for sale. The key findings of DOE's market assessment are summarized below. For additional detail, see chapter 2 of the NOPR TSD.

1. Definitions of ''Computer Room Air Conditioners''

As discussed in the May 2011 NODA, the 2010 version of ASHRAE Standard 90.1 modified the scope of the standard to include air conditioning equipment used for process cooling and set efficiency levels for computer room air conditioners. 76 FR 25622, 25633–34 (May 5, 2011). Given this expansion of scope, DOE tentatively determined that it has the authority to consider and adopt standards for this equipment. *Id.* However, DOE currently does not have a definition for ''computer room air conditioner,'' because DOE's regulations do not currently cover this equipment class. Because ASHRAE Standard 90.1–2010 expanded its scope to include air conditioners and condensing units serving computer rooms and DOE has decided to consider standards for this equipment, DOE must now define this equipment.

As noted in section IV.C, computer room air conditioners operate in a similar manner to other commercial air conditioners, in that they provide space conditioning using a refrigeration cycle with a compressor, condenser, expansion valve, and an evaporator. However, computer room air conditioners are designed to maintain the temperature in a narrow range, to minimize temperature swings, and to maintain a specific relative humidity (usually between 40 and 55 percent). The equipment usually must be able to both humidify and dehumidify the air to maintain humidity at desired levels, and they are sometimes called ''precision air

[24] *AEO2011* can be accessed at: *http://www.eia.gov/forecasts/aeo/.*

[25] 2011 ASHRAE Handbook HVAC Applications. ASHRAE, 2011. Atlanta GA (Available at *www.ashrae.org*). ASHRAE's handbook does not list a service life for VRF equipment specifically, but it does provide service life estimates for water-source heat pumps generally. In this regard, ASHRAE cites two different studies for equipment service life. The first study of this type of equipment reported a service life of 19 years. The second, more-recent study cited suggests a service life of 24 years for all classes of direct expansion cooling systems. This second study relies heavily on extrapolation of a survival curve based on a sample of 1907 DX equipment observations from various equipment classes from which 284 units had actually been replaced and most were still in service. (ASHRAE Research Project 1237–TRP *Interactive Web-based Owning and Operating Cost Database Final Report,* July 2005. Available at www.ashrae.org) However, as VRF products are new to the U.S. with relatively little data on lifetime, DOE has relied on the older, more conservative, 19-year service life estimate for its analysis.

conditioners'' because of this requirement. However, although the characteristics listed above are common among computer room air conditioners, not all computer room air conditioners are equipped with humidity control options; DOE found that typically, such features are optional, as much of the equipment is custom-built for a specific application.

DOE is not aware of any components in computer room air conditioners that are exclusive to only computer room air conditioners and not to commercial air conditioners used for comfort conditioning (or vice versa) that could be used to effectively differentiate the two types of units on the basis of their construction. Further, DOE notes that the class of computer room air conditioners is defined in ASHRAE Standard 90.1 as an application (*i.e.,* units that serve computer rooms), rather than based on a specific physical characteristic or component that differentiates the equipment from other commercial package air conditioning equipment. DOE also examined the definitions in ASHRAE Standard 127–2007 (Method of Testing for Rating Computer and Data Processing Room Unitary Air Conditioners). Specifically, DOE reviewed the definition of ''computer and data processing room (CDPR) unitary air conditioner'' contained in that standard and found that there are no distinct physical characteristics used to differentiate computer room air conditioners from other commercial air conditioning and heating equipment. DOE believes, therefore, that this equipment is typically identified in the marketplace based on its intended application (*i.e.,* how the equipment is marketed), rather than on differentiating physical components.

In the NODA, DOE requested comment on an appropriate approach for establishing a definition for ''computer room air conditioner.'' 76 FR 25622, 25634 (May 5, 2011). In response, AHRI suggested that DOE use the product's rated performance and the relevant rating standard (SCOP and ASHRAE 127, respectively) to distinguish air conditioners and condensing units designed for serving computer rooms from other types of commercial packaged air conditioning and heating equipment covered by EPCA. (AHRI, No. 11 at p. 4) DOE did not receive any other comments on this issue.

As noted above, DOE found that the operating conditions for computer room air conditioners are different from those for air conditioners used for comfort conditioning. Different humidity and temperature conditions and a higher sensible load could lead manufacturers of computer room air conditioners to optimize their equipment to perform best at the rating conditions found in ASHRAE Standard 127 (a test method specifically for computer and data processing room air conditioners), rather than AHRI Standard 210/240 or 340/360 (test methods for commercial package air conditioning equipment used for comfort conditioning). Because of this, DOE believes that manufacturers of computer room air conditioners would likely test those units according to ASHRAE Standard 127, while manufacturers of commercial package air conditioners intended for use in comfort conditioning applications would test those units according to either AHRI Standard 210/240 or AHRI Standard 340/360, depending on the cooling capacity of the unit.

As a result, DOE is proposing in today's NOPR to define a ''computer room air conditioner'' based on how the equipment is marketed exclusively for use and which test standard is used to rate the performance of the equipment. DOE proposes the following definition of ''computer room air conditioner'':

Computer room air conditioner means a unit of commercial package air conditioning and heating equipment that is advertised, marketed, and/or sold specifically for use in computer rooms, data processing rooms, or other precision cooling applications, and is rated for performance using ASHRAE Standard 127. Such equipment may not be marketed or advertised as equipment for any other space conditioning applications, and may not be rated for performance using AHRI Standard 210/240 or AHRI Standard 340/360.

DOE seeks comment on its proposed definition of ''computer room air conditioner,'' as well as on alternatives to this proposed definition. DOE is particularly interested in information on physical characteristics or features that could possibly be used to differentiate between computer room air conditioners and other types of commercial package air conditioners. This is identified as issue 11 in Section X.E, ''Issues on Which DOE Seeks Comment.''

2. Equipment Classes

As noted above, there are currently no Federal energy conservation standards for computer room air conditioners. Different classes of computer room air conditioners are distinguished by several factors in ASHRAE Standard 90.1–2010, which include the net sensible cooling capacity (*i.e.,* small, large, or very large), orientation of airflow through the equipment (*i.e.,* upflow or downflow), heat rejection method (*i.e.,* air-cooled, water-cooled, or glycol-cooled), and whether a fluid economizer is used.[26] Using these characteristics, ASHRAE Standard 90.1–2010 divided computer room air conditioners into thirty equipment classes and set the efficiency levels shown in Table VI.1.

TABLE VI.1—ASHRAE STANDARD 90.1–2010 COMPUTER ROOM AIR CONDITIONERS 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	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

[26] A ''fluid economizer'' is a system configuration potentially available where an external fluid cooler 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 for significant direct coiling from the liquid-to-air cooling coil

TABLE VI.1—ASHRAE STANDARD 90.1–2010 COMPUTER ROOM AIR CONDITIONERS EFFICIENCY LEVELS—Continued

Equipment type	Net sensible cooling capacity	Minimum SCOP efficiency	
		Downflow units	Upflow units
	≥240,000 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	2.35	2.24
Air Conditioners, Glycol-Cooled (rated at 40% propylene glycol)	<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	2.10	1.99
Air Conditioner, Glycol-Cooled (rated at 40% propylene glycol) 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	2.05	1.94

In general, DOE divides equipment 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)) In the context of the present rulemaking, DOE believes net sensible cooling capacity (*i.e.,* small, large, or very large), orientation (*i.e.,* upflow or downflow), heat rejection method (*i.e.,* air-cooled, water-cooled, or glycol-cooled), and use of a fluid economizer are all performance-related features that affect computer room air conditioner efficiency (*i.e.,* SCOP). By examining the characteristics of equipment available on the market, DOE found computer room air conditioners in a wide range of efficiencies depending on their design and features. Consequently, DOE is proposing to use the same thirty equipment classes in ASHRAE Standard 90.1–2010 to differentiate between types of computer room air conditioners.

3. Review of Current Market for Computer Room Air Conditioners

In order to obtain the information needed for the market assessment for this rulemaking, DOE consulted a variety of sources, including manufacturer literature, manufacturer Web sites, and the California Energy Commission (CEC) Appliance Efficiency Database. The information DOE gathered serves as resource material throughout the rulemaking. The sections below provide an overview of the computer room air conditioner market assessment, and chapter 2 of the NOPR TSD provides additional detail on the market assessment, including citations to relevant sources.

a. Trade Association Information

There is no trade association that represents computer room air conditioner manufacturers. AHRI is the trade association representing most manufacturers of commercial air conditioning and heating equipment; however, AHRI does not have a subsection for computer room air conditioners, and the major manufacturers of computer room air conditioners that DOE identified are not AHRI members.[27]

b. Manufacturer Information

DOE initially identified manufacturers of computer room air conditioners through conversations with industry experts and by examining the California Energy Commission (CEC) appliance efficiency database.[28] Manufacturers that DOE identified include American Power Conversion, Compu-Aire, Data Aire, Liebert, and Stulz. DOE reviewed 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 equipment class.

c. Market Data

Using the CEC database and manufacturer literature gathered from manufacturer Web sites, DOE compiled a database of 1,364 computer room air conditioner models from the five manufacturers it identified. These units included 452 air-cooled units, 248 water-cooled units without a fluid economizer, 174 water-cooled units with a fluid economizer, 237 glycol-cooled units without a fluid economizer, and 253 glycol-cooled units with a fluid economizer. These units can also be divided by size categories and orientation, and a full breakdown of the number of units in each equipment class can be found in chapter 2 of the NOPR TSD. Of the 1,364 computer room air conditioners in DOE's database, DOE was only able to obtain efficiency data for 208 units, which accounts for approximately 15 percent of the database (see section VI.B.4 of this NOPR for information about how DOE estimated efficiency data). Because computer room air conditioner manufacturers are not currently required to report efficiency information to DOE, most manufacturers do not publish efficiency information in their product literature. DOE gathered available efficiency information for two manufacturers from the CEC database (where manufacturers are required to report efficiency information in if they sell models in California) and one other manufacturer's product literature (which was the only manufacturer that provided efficiency information in their product literature). DOE did not find any efficiency information for equipment from two of the five manufacturers of computer room air conditioners.

The average SCOP for each equipment class where DOE had adequate data is shown in the Table VI.2.

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

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

TABLE VI.2—AVERAGE SCOP FOR COMPUTER ROOM AIR CONDITIONER EQUIPMENT CLASSES

Equipment class	Size category	Upflow orientation average SCOP	Downflow orientation average SCOP
Air-Cooled	<65,000 Btu/h	2.49	2.61
	≥65,000 Btu/h and <240,000 Btu/h	2.64	2.64
	≥240,000 Btu/h	(1)	2.25
Water-Cooled	<65,000 Btu/h	2.76	2.90
	≥65,000 Btu/h and <240,000 Btu/h	2.76	2.78
	≥240,000 Btu/h	(1)	2.45
Water-Cooled with a Fluid Economizer	<65,000 Btu/h	(1)	(1)
	≥65,000 Btu/h and <240,000 Btu/h	(1)	(1)
	≥240,000 Btu/h	(1)	(1)
Glycol-Cooled	<65,000 Btu/h	2.66	2.71
	≥65,000 Btu/h and <240,000 Btu/h	(1)	2.62
	≥240,000 Btu/h	(1)	2.49
Glycol-Cooled with a Fluid Economizer	<65,000 Btu/h	(1)	2.43
	≥65,000 Btu/h and <240,000 Btu/h	(1)	2.48
	≥240,000 Btu/h	(1)	2.38

[1] No information.

Chapter 2 of the NOPR TSD contains additional information drawn from the data that was used to inform DOE's analysis, such as the average sensible capacities for each equipment class. DOE used the information gathered in the market assessment as the foundation for developing the price-efficiency relationship in the engineering analysis. Additionally, DOE used the market data, along with other sources, to estimate the shipments of computer room air conditioners. Further details regarding the development of shipments estimates and forecasts can be found in section VI.F of this NOPR.

B. Engineering Analysis

The engineering analysis establishes the relationship between the cost and efficiency of a piece of equipment DOE is evaluating for potential amended energy conservation standards. This relationship serves as the basis for cost-benefit calculations for individual consumers and the Nation. The engineering analysis identifies representative baseline equipment, which is the starting point for analyzing possible energy efficiency improvements. For covered ASHRAE equipment, DOE sets the baseline at the ASHRAE Standard 90.1 efficiency level, because by statute, DOE cannot adopt any level below the revised ASHRAE level. The engineering analysis then identifies higher efficiency levels and the incremental increase in product cost associated with achieving the higher efficiency levels. After identifying the baseline models and cost of achieving increased efficiency, DOE estimates the additional costs to the customer through an analysis of contractor costs and markups, and uses that information in the downstream analyses to examine the costs and benefits associated with increased equipment efficiency.

DOE typically structures its engineering analysis around one of three methodologies: (1) The design-option approach, which calculates the incremental costs of adding specific design options to a baseline model; (2) the efficiency-level approach, which calculates the relative costs of achieving increases in energy efficiency levels without regard to the particular design options used to achieve such increases; and/or (3) the reverse-engineering or cost-assessment approach, which involves a ''bottom-up'' manufacturing cost assessment based on a detailed bill of materials derived from tear-downs of the product being analyzed.

1. Approach

For this analysis, DOE used an efficiency-level approach in conjunction with a pricing survey to develop the price-efficiency relationships for the various classes of computer room air conditioners. 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 capture a variety of designs available on the market and focused on the price of units at different SCOP ratings. The efficiency levels that DOE considered in the engineering analysis were representative of computer room air conditioners currently produced by manufacturers 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 cost-efficiency relationship for computer room air conditioners. (See chapter 3 of the NOPR 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 using reverse-engineering. However, given the limited analysis time allowed by EPCA, DOE proceeded with an efficiency-level approach 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.

2. Representative Input Capacities for Analysis

Computer room air conditioners are separated into three size categories based upon the equipment's net sensible cooling capacity: (1) <65,000 Btu/h; (2) ≥65,000 Btu/h and <240,000 Btu/h; and (3) ≥240,000 Btu/h and <760,000 Btu/h. For each equipment size category, DOE chose a representative capacity for analysis. The representative capacity chosen was the average sensible capacity (rounded to the nearest ton [29]) of all models that DOE found on the market in a given product class. DOE collected pricing data as close to the representative capacity as possible; however, given the limited amount of data available, it was not always possible for DOE to obtain pricing information for models exactly at the representative capacity. Consequently, DOE obtained pricing for units as close as possible to the representative capacity (generally within 15 percent of the representative capacity) and then normalized the price in order to estimate the price at the representative capacity by calculating the price based on the price per Btu per hour and adjusting it accordingly.

For computer room air conditioners with a sensible cooling capacity less than 65,000 Btu/h, DOE collected data at the representative size of 36,000 Btu/h and normalized the cost to that capacity. For computer room air conditioners with a sensible cooling capacity greater than 65,000 Btu/h and less than 240,000 Btu/h, DOE collected data at the representative size of 132,000 Btu/h and normalized the cost to that capacity. For computer room air conditioners with a sensible cooling capacity greater than 240,000 Btu/h, DOE collected data for five total units with efficiency data in these equipment classes and normalized it to a representative capacity of 288,000 Btu/h. See chapter 2 of the NOPR TSD for information about the capacity information that DOE found for equipment on the market and chapter 3 of the TSD for more detail about the representative capacities selected.

3. Baseline Equipment

DOE selected baseline efficiency levels as reference points for each equipment class, against which it measured changes resulting from potential amended energy conservation standards. DOE defined the baseline efficiency levels in the engineering analysis and the LCC and PBP analyses as reference points to compare the technology, energy savings, and cost of equipment with higher energy efficiency levels. A baseline piece of equipment refers to a model having features and technologies typically found in equipment currently offered for sale. The baseline model in each equipment class represents the typical characteristics of equipment in that class. Typically, units at the baseline efficiency level just meet Federal energy conservation standards and provide basic consumer utility. However, since computer room air conditioners are a new equipment class, there are no current Federal standards for these units. Further, EPCA requires that DOE must adopt either the ASHRAE Standard 90.1–2010 levels or more stringent levels. Therefore, because the ASHRAE Standard 90.1–2010 levels were the lowest levels that DOE could adopt, DOE used those levels as the baseline efficiency level for the purposes of its analysis. Table VI.3 shows the baseline efficiency level for each computer room air conditioner equipment class in the downflow orientation.[30]

TABLE VI.3—BASELINE SCOP EFFICIENCY LEVEL

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

[29] One ton of cooling capacity is equivalent to 12,000 Btu/h.

[30] As discussed in section VI.B.6, DOE focused its analysis on downflow models to reduce the total number of product classes requiring analysis. The SCOP for upflow models were reduced by 0.11 SCOP, and the upflow class was combined with the downflow class.

4. Identification of Efficiency Information and Efficiency Levels for Analysis

Since DOE does not currently regulate computer room air conditioners, manufacturers are not required to report or rate the efficiency of their equipment. Therefore, DOE relied on efficiency information found in manufacturer literature (for those manufacturers who voluntarily rate their equipment efficiency) and in the CEC database (as CEC does require manufacturers to certify the efficiency ratings for their computer room air conditioners being sold in California). Because SCOP is a new efficiency metric in ASHRAE 127–2007, all efficiency data DOE gathered were in the form of EER, as measured by the previous version of ASHRAE 127 (*i.e.,* ASHRAE 127–2001). DOE only found EER data for three of the five manufacturers. ASHRAE 127–2007 contains a ''rule-of-thumb'' method for determining SCOP using the EER as measured by ASHRAE 127–2001 and the sensible heat ratio (SHR).[31] DOE used the ''rule-of-thumb'' method to approximate SCOP ratings based on EER information contained in the CEC database and manufacturer literature, as well as SHR information found in manufacturer specification sheets. As noted above, this method allowed DOE to estimate SCOP ratings for 15 percent of the total units in its database, for which this information was available. Upon examining the market, DOE concluded that only four equipment classes contained enough models with efficiency information to adequately select efficiency levels based on the efficiency of models on the market. 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 VI.4. Chapter 3 of the NOPR TSD shows additional details on the efficiency levels selected for analysis.

TABLE VI.4—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
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

5. 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[32] 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 NOPR TSD for additional details about the pricing data DOE received.

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

Due to a lack of efficiency data and small number of models on the market for certain equipment classes, DOE did not analyze each of the 30 equipment classes created by ASHRAE Standard 90.1 separately. Rather, DOE analyzed the equipment classes with the largest numbers of models on the market (and as a result the most data available) and used a variety of assumptions to extrapolate that analysis to the equipment classes with less information available.

DOE only considered downflow units in its engineering analysis. In reviewing the models available in its database, DOE found that each given equipment model (characterized by a product line and model number) was generally available in both an upflow and downflow configuration, and review of specific equipment indicated that the internal components could be optionally arranged by the manufacturer for either an upflow or downflow orientation. Therefore, DOE assumed that downflow units and upflow units generally have the same major components, but that those components are arranged differently. DOE assumed that the price of the units would likely be nearly the same and that the incremental cost of increasing efficiency would also be the same. However, DOE observed the 0.11 SCOP reduction in the ASHRAE Standard 90.1–2010 efficiency levels for upflow units as compared to downflow units. DOE believes this difference is a result of the additional static pressure that the blower fan must overcome in the upflow orientation, as required in the ASHRAE 127 test

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

[32] As noted in section VI.B.4, only three manufacturers provided efficiency data. DOE obtained pricing from all manufacturers for which it had efficiency data.

procedure. By assuming that the results of a cost-benefit analysis for the upflow classes for a given incremental change in SCOP would have the same results as the downflow class (because the incremental cost and efficiency gains would be the same), DOE was able to focus on the downflow equipment classes where more data were available.

Among the downflow equipment classes, DOE found there was only enough efficiency information to analyze four equipment classes: (1) Small (*i.e.,* sensible capacity less than 65,000 Btu/h) air-cooled; (2) large (*i.e.,* sensible capacity greater than or equal to 65,000 Btu/h but less than 240,000 Btu/h) air-cooled; (3) small (*i.e.,* sensible capacity less than 65,000 Btu/h) water-cooled; and (4) large (*i.e.,* sensible capacity greater than or equal to 65,000 Btu/h but less than 240,000 Btu/h) water-cooled. For the other 11 downflow equipment classes, DOE had to extrapolate the analysis based on these four primary equipment classes due to a lack of efficiency and pricing data for those equipment classes.

To extrapolate the data and generate a price-efficiency relationship for the very large (*i.e.,* sensible capacity greater than or equal to 240,000 Btu/h but less than 760,000 Btu/h) air-cooled and very large water-cooled equipment classes, DOE modified the price-efficiency curves for the large air-cooled and large water-cooled equipment classes, respectively. In each case, DOE shifted the relationship down by the difference in SCOP specified between the equipment classes in ASHRAE Standard 90.1–2010. Then, using the limited pricing data collected in the very large equipment classes, DOE found the percent difference between a large unit and very large unit for a given manufacturer (or manufacturers if multiple points were available). DOE multiplied the prices by the average percentage difference between a very large unit and a large unit of the same model line to estimate the price-efficiency relationship for the very large equipment classes.

For the three glycol-cooled equipment classes (*i.e.,* small, large, and very large), DOE was able to collect a limited amount of pricing data, and DOE found that the prices of glycol-cooled units were identical to those for water-cooled units in the same product line. Therefore, DOE modeled the cost-efficiency curves for glycol-cooled units after the water-cooled equipment by maintaining the same pricing, but shifting the curves to account for the decrease in SCOP that DOE believes results from a decrease in heat transfer for glycol-cooled units as compared to water-cooled units. DOE shifted the curves by the same amount as the difference in the ASHRAE Standard 90.1–2010 efficiency levels between each respective equipment class.

For the six computer room air conditioner equipment classes with a fluid economizer (*i.e.,* small, large, and very large water-cooled, and small, large, and very large glycol-cooled), DOE translated the efficiency data and prices from the corresponding water-cooled or glycol-cooled equipment classes. Because a fluid economizer adds additional external static pressure that must be overcome by the blower fan, DOE believes these units generally will require more fan power and have lower SCOP ratings than equivalent models without an economizer. Therefore, DOE shifted the efficiency down 0.05 SCOP, which was the efficiency difference for computer room air conditioners with fluid economizers versus those without an economizer in ASHRAE Standard 90.1–2010. From the limited pricing data that DOE was able to collect for units with fluid economizers, DOE found the percentage difference in price for equipment with a fluid economizer compared to the same model without a fluid economizer. DOE then increased the pricing in the price-efficiency relationships for each equipment class by the percentage difference found for adding a fluid economizer to generate the price-efficiency relationship for the equipment classes with fluid economizers.

7. Engineering Analysis Results

The result of the engineering analysis is a set of price-efficiency curves. Creating the price-efficiency curves involved plotting the manufacturer price versus efficiency and using an exponential regression analysis to fit a curve that best defines the aggregated data. When DOE examined the pricing data for each individual manufacturer, DOE found there was no correlation between pricing and efficiency. Only when 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 used an exponential regression to determine the relationship between price and efficiency across the three manufacturers. Table VI.5 and Table VI.6 below show the price-efficiency data for the four primary equipment classes, for which DOE had enough information to do a regression analysis. The results for the equipment classes where DOE had to extrapolate the price-efficiency relationship are contained in chapter 3 of the NOPR TSD.

TABLE VI.5—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 VI.6—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

TABLE VI.6—WATER-COOLED COMPUTER AIR CONDITIONERS PRICE-EFFICIENCY DATA—Continued

<65,000 Btu/h		≥65,000 Btu/h and <240,000 Btu/h	
SCOP	Price	SCOP	Price
3.20	7,562.12	3.10	31,279.07
3.40	6,124.84	3.30	42,040.32

DOE notes that the results for the small (< 65,000 Btu/h) water-cooled equipment class are counter-intuitive, because the correlation between price and efficiency showed a decrease in price for increased efficiency for that equipment class. This result is likely the result of not having enough data points to develop a statistically significant trend between price and efficiency. In addition, as discussed above, manufacturers might have different reasons for pricing the different features other than equipment efficiency, and, thus, there would be no correlation between efficiency and price for individual manufacturers. 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 the pricing analysis. DOE seeks comment on the results of the pricing analysis and requests information and data regarding price-efficiency trends for computer room air conditioners. This is identified as issue 12 in section X.E, ''Issues on Which DOE Seeks Comments.''

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 which 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 is that a mechanical contractor orders the equipment from a manufacturer or distributor who provides the equipment at a price delivered to the job site. The mechanical contractor then adds his own markup and provides installation services. Because of the specialized nature of the equipment, 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 cost to customers using a markup chain beginning with the mechanical contractor cost. Because of the complexity of installation, DOE estimated most sales of CRAC equipment involved mechanical contractors. Consequently, DOE did not develop separate markups for other distribution chains.

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 NOPR 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 VI.7).

TABLE VI.7—DISTRIBUTION CHANNELS FOR CRAC EQUIPMENT

Channel 1 (replacements)	Channel 2 (New construction)
Mechanical Contractor.	Mechanical Contractor
Customer	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 to convert the incremental increase in mechanical contractor cost of higher-efficiency equipment to 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 [33] 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 2010 State-by-State sales tax data reported by the Sales Tax Clearinghouse.[34] 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 distribution of CRAC equipment by building type or business type, so the percentage distribution 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 NOPR 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 EER 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 adequately 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 which estimates the annual energy consumption for each

[33] 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 at: *http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-ds_name=EC0723I1&-_lang=en.*

[34] The Sales Tax Clearinghouse. Table of State sales tax rates along with combined city and county rates. (Last accessed Nov. 2, 2011) (Available at: *https://thestc.com/STRates.stm*).

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. 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 fan power. The sum of the CRAC condensing unit power and the CRAC 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 analysis 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.[35] As CRAC equipment is used to cool internally-generated thermal loads and is generally not climate dependent, DOE believes that this figure would also apply to CRAC equipment in the U.S. 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.[36] 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 for 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.

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.[37] 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.

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 customers' 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 90.1–2007 and more-stringent efficiency levels, the compliance date for a new DOE energy conservation standard for any equipment class would depend upon 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.H.1 below 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 only begin to accrue after the compliance date for such higher standard once adopted by DOE. To account for this difference and to facilitate comparison, DOE presumes 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 estimates 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 this period 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.[38] 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

[35] 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*).

[36] EnergyPlus Engineering Reference included with EnergyPlus simulation software version 6.0 (Available at: *http://apps1.eere.energy.gov/buildings/energyplus*).

[37] S. Wilcox and W. Marion, *Users Manual for TMY3 Data Sets,* NREL/TP–581–43156 (May 2008).

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

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 and described in detail in chapter 6 of the ASHRAE NOPR TSD.

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.[39]

The LCC analysis used the estimated annual energy use for each CRAC equipment unit described in section V.D. 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 the shipment of CRAC equipment to different States.

As mentioned above, DOE generated LCC and PBP results by building type and State and used developed weighting factors to generate national average LCC savings and PBP for each efficiency level. As 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.

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 VI.8 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.

TABLE VI.8—SUMMARY OF INPUTS AND KEY ASSUMPTIONS USED IN THE LCC AND PBP ANALYSES

Inputs	Description
Affecting Installed Costs	
Equipment Price	Equipment price was derived by multiplying manufacturer sales price or MSP (distributor'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.
Installation Cost	Installation cost includes installation labor, installer overhead, and any miscellaneous materials and parts, derived from *RS Means CostWorks 2011.*[40]
Affecting Operating Costs	
Annual Energy Use	Annual unit energy consumption for each class of equipment at each efficiency level estimated in a per-State basis using a spreadsheet model and a population-based mapping of climate locations to States.
Electricity Prices	DOE developed average electricity prices based on EIA's Form 861 data for 2010.[41]
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.
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.
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.
Discount Rate	Mean real discount rates for all buildings range from 2.7 percent for education buildings to 4.5 percent for office building owners.

[39] Damodaran Online, Leonard N. Stern School of Business, New York University (Jan. 2011) (Available at: *www.stern.nyu.edu/~adamodar/New_Home_Page/data.html*).

TABLE VI.8—SUMMARY OF INPUTS AND KEY ASSUMPTIONS USED IN THE LCC AND PBP ANALYSES—Continued

Inputs	Description
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.
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.

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

[41] Electric Sales, Revenue, and Average Price 2009 (Data accessed on May 10, 2011 at *http://www.eia.doe.gov/cneaf/electricity/esr/esr_sum.html*). Inflator—2009 to 2010 dollars from EIA *AEO 2011* GDP Price Index (Accessed on 4/27/2011 at *http://www.eia.doe.gov/oiaf/aeo/tablebrowser/#release=AEO2011&subject=0-AEO2011&table=18-AEO2011&region=0-0&cases=ref2011-d020911a*).

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 VI.B, 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 through the distribution channel. As explained in section VI.C, all CRAC equipment is assumed to be delivered by the manufacturer through a distributor 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 forecast a price trend for the NOPR, DOE derived an inflation-adjusted index of the PPI for miscellaneous refrigeration and air-conditioning equipment over 1990–2010. 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 couple of years will continue is very uncertain and that the observed data 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 forecast for the LCC and PBP analysis are equal to the 2011 values for each efficiency level in each equipment class. Appendix 8–D of the NOPR TSD describes the historic data and the derivation of the price forecast.

DOE requests comments on the most appropriate trend to use for real (inflation-adjusted) computer room air conditioner prices.

b. Installation Costs

DOE derived national average installation costs for CRAC equipment from data provided in *RS Means CostWorks 2011* (RS Means) specifically for CRAC equipment.[42] RS Means provides estimates for installation costs for CRAC units by equipment capacity, as well as cost indices that reflect the variation in installation costs for 295 cities in the United States. The RS Means data identifies 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. DOE did not have data to calibrate the extent to which installation cost might change as efficiency increased. For purposes of the NOPR LCC analysis, DOE assumed that installation cost would not increase as a function of increased efficiency.

[42] RS Means CostWorks 2011, R.S. Means Company, Inc. 2011, Kingston, Massachusetts (Available at: *http://www.meanscostworks.com/*).

This is identified as Issue 13 under ''Issues on Which DOE Seeks Comment'' in section X.E of today's NOPR.

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 NOPR TSD.

d. Electricity Prices

Electricity prices are used to convert the electric energy savings from higher-efficiency equipment into energy cost savings. Because of the variation in annual electricity consumption savings and equipment costs 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 Energy Information Administration (EIA) data for 2010. 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 CBECS[43] data set to identify the average prices the three building types paid and compared them with the average prices all commercial customers paid.[44] 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

[43] EIA's Commercial Buildings Energy Consumption Survey, Energy Information Agency (Public use microdata available at: *http://www.eia.doe.gov/emeu/cbecs/cbecs2003/public_use_2003/cbecs_pudata2003.html*).

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

average commercial 2010 State price data.

DOE weighted the prices each building type paid in each State by the estimated sales of CRAC equipment to each building type to obtain a weighted-average national electricity price for 2010. 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 (adjusted to 2011$) range from approximately $0.066 per kWh to approximately $0.216 per kWh. (See chapter 6 of the ASHRAE NOPR TSD for further details.)

The electricity price trends provide the relative change in electricity costs for future years. DOE applied the *AEO2011* reference case as the default scenario and extrapolated the trend in values at the Census Division level from 2025 to 2035 of the forecast to establish prices in 2030 to 2060. This method of extrapolation is in line with methods the EIA uses to forecast fuel prices for the Federal Energy Management Program. DOE provides a sensitivity analysis of the LCC savings and PBP results to different fuel price scenarios using both the *AEO2011* high-price and low-price forecasts in the ASHRAE NOPR TSD.

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. DOE estimated annual routine maintenance costs for CRAC equipment as $84 per year for capacities up to 288 kBtu per hr and $102 per year for larger capacities, reported in the *RS Means CostWorks 2011* database. Because data were not available to indicate how maintenance costs vary with equipment efficiency, DOE decided to use preventive maintenance costs that remain constant as equipment efficiency increases.

f. Repair Costs

The repair cost is the cost to the customer of replacing or repairing components that have failed in the CRAC equipment. 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/hr) and 15 T (180,000 Btu/hr), 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. 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 NOPR TSD for details on the development of repair costs.

g. Equipment Lifetime

DOE defines ''equipment lifetime'' as the age when 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 years 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 and applied this distribution to all classes of CRAC equipment analyzed. Chapter 6 of the ASHRAE NOPR TSD contains a discussion of equipment lifetime.

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.

To estimate the WACC of CRAC equipment purchasers, DOE used a sample of over 2000 companies grouped to be representative of operators of each of three commercial building types (health care, education, and office) drawn from a database of 7,369 U.S. companies presented on the Damodaran Online Web site.[45] 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 composite tax exempt bond rates for AA-rated municipal bonds. Federal office space was assumed to use the Federal bond rate, derived as the 40-year geometric average of long term (> 10 years) U.S. government securities. 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 used the final sample of companies to represent purchasers of CRAC equipment. For each company in the sample, DOE derived the cost of debt, percent debt financing, and systematic company risk from information on the Damodaran Online Web site. Damodaran estimated the cost of debt financing from the long-term Federal government bond rate (6.74 percent) and the standard deviation of the stock price. DOE then determined the weighted average values for the cost of debt, range of values, and standard deviation of WACC for each category of the sample companies. Deducting expected inflation from the cost of capital provided estimates of real discount rate by ownership category. 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 NOPR 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

[45] Damodaran financial data used for determining cost of capital available at: *http://pages.stern.nyu.edu/~adamodar/* for commercial businesses. Data for determining financing for public buildings available at: *http://finance.yahoo.com/bonds/composite_bond_rates.*

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 NOPR TSD provides additional details about the PBP.

F. National Impact Analysis—National Energy Savings and Net Present Value 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, which are expected to result from amended 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 product class. DOE calculated new energy savings in each year relative to a base case, defined as 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 a base-case scenario.

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 NES and NPV analysis periods begin with the earliest expected compliance date of amended Federal energy conservation standards (*i.e.,* 2012 or 2013), assuming DOE adoption of the baseline 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 from 2012 to 2041 or 2013 to 2042 to calculate the total NES for that period. 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 an increased demand for its service. EIA in its National Energy Modeling System (NEMS) model assumes a certain elasticity factor to account for an increased demand for service due to the increase in cooling (or heating) efficiency.[46] EIA refers to this as an efficiency rebound. 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 they are installed in; and (2) additional instances of air conditioning computer rooms where it was not being cooled before.

The first instance does not occur often because computer rooms are generally cooled to the level required for safe operation of the servers and other equipment. As inanimate objects, computers have no desire for further cooling, and 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. Therefore, DOE did not assume a rebound effect in the present NOPR analysis. DOE seeks input from interested parties on whether there will be a rebound effect for improvements in the efficiency of computer room air conditioners. If interested parties believe a rebound effect would occur, DOE is interested in receiving data quantifying the effects, as well as input regarding how should DOE quantify this in its analysis. This is identified as Issue 14 under ''Issues on Which DOE Seeks Comment'' in section X.E of today's NOPR.

To estimate NPV, DOE calculated the net impact as the difference between total operating cost savings (including electricity cost savings) and increases in total installed costs (including customer prices). 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. As noted in section VI.E.2.a, DOE used a constant price assumption as the default price forecast. 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

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

air conditioners bought on or after 2012 or 2013, depending on product class, and summed the discounted values to provide the NPV of 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 NOPR 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 first 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 forecasts provided annual and cumulative values for all four output parameters described above.

2. Shipments Analysis

Equipment shipments are an important element in the estimate of the future impact of a potential standard. DOE developed shipment projections and, in turn, calculated equipment stock by assuming that in each year, each existing computer room air conditioner either ages by one year or breaks 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.[47] DOE then used the ratio of business establishments in the United States compared to Australia to inflate Australia shipments to the U.S. market. The inflator used was 13.2. Table VI.9 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 NOPR TSD. DOE used these shipments data to extend a shipments trend into the future.

TABLE VI.9—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	1140	15,058
2015	1320	17,436
2020	1526	20,157

DOE allocated overall shipments into product classes using a two-step process. First, DOE used Australian market share 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 can be found in chapter 7 of the ASHRAE NOPR TSD.

Table VI.10 shows the forecasted shipments for the different equipment classes of computer room air conditioners for selected years from 2012 to 2042 (with start and end years dependent on the product class), as well as the cumulative shipments. 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 higher first costs and repair costs. Therefore, DOE presumed that the shipments projection does not change with higher standard levels. DOE seeks input on this assumption. This is identified as Issue 15 under ''Issues on Which DOE Seeks Comment'' in section X.E of today's NOPR. Chapter 7 of the NOPR TSD provides additional details on the shipments forecasts.

TABLE VI.10—SHIPMENTS FORECAST FOR COMPUTER ROOM AIR CONDITIONERS

Equipment	Units shipped by year and equipment class								
	2012/2013	2015	2020	2025	2030	2035	2040	2041/2042	Cumulative shipments (2012/2013–2041/2042)
Air conditioners, air-cooled, <65,000 Btu/h	671	732	847	922	1,015	1,109	1,202	1,221	28,518
Air conditioners, air-cooled, ≥65,000 to <240,000 Btu/h	7,499	7,951	9,192	10,009	11,023	12,038	13,052	13,457	315,793

[47] 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*).

TABLE VI.10—SHIPMENTS FORECAST FOR COMPUTER ROOM AIR CONDITIONERS—Continued

Equipment	Units shipped by year and equipment class								
	2012/2013	2015	2020	2025	2030	2035	2040	2041/2042	Cumulative shipments (2012/2013–2041/2042)
Air conditioners, air-cooled, ≥240,000 Btu/h	1,677	1,778	2,056	2,239	2,466	2,693	2,919	3,010	70,636
Air conditioners, water-cooled, <65,000 Btu/h	74	81	94	102	112	122	133	135	3,152
Air conditioners, water-cooled, ≥65,000 to <240,000 Btu/h	1,233	1,308	1,512	1,646	1,813	1,980	2,147	2,213	51,940
Air conditioners, water-cooled, ≥240,000 Btu/h	470	498	576	627	690	754	817	843	19,780
Air conditioners, water-cooled with fluid economizers, <65,000 Btu/h	46	50	58	63	70	76	82	84	1,954
Air conditioners, water-cooled with fluid economizers, ≥65,000 to <240,000 Btu/h	1,036	1,098	1,270	1,383	1,523	1,663	1,803	1,859	43,628
Air conditioners, water-cooled with fluid economizers, ≥240,000 Btu/h	180	190	220	240	264	288	313	322	7,563
Air conditioners, glycol-cooled, <65,000 Btu/h	69	75	87	95	104	114	124	126	2,935
Air conditioners, glycol-cooled, ≥65,000 to <240,000 Btu/h	1,233	1,308	1,512	1,646	1,813	1,980	2,147	2,213	51,940
Air conditioners, glycol-cooled, ≥240,000 Btu/h	387	410	474	516	569	621	673	694	16,288
Air conditioners, glycol-cooled with fluid economizers, <65,000 Btu/h	69	75	87	95	104	114	124	126	2,935
Air conditioners, glycol-cooled with fluid economizers, ≥65,000 to <240,000 Btu/h	1,431	1,517	1,754	1,910	2,103	2,297	2,490	2,567	60,250
Air conditioners, glycol-cooled with fluid economizers, ≥240,000 Btu/h	345	366	423	461	508	554	601	620	14,542
Total	16,420	17,437	20,162	21,954	24,177	26,403	28,627	29,490	691,854

Note: Total shipments shown in this table may not exactly match those in Table VI.9 as a result of rounding during allocation to product classes.

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 within 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. The difference in equipment efficiency between the base case and standards cases was the basis for determining the reduction in per-unit annual energy consumption that could result from amended standards.

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 frozen 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 may change voluntarily over time.

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 TSD. DOE seeks input on its basis for the NES-forecasted base-case distribution of efficiencies and its prediction of how amended energy conservation standards would affect the distribution of efficiencies in the standards case. This is identified as Issue 16 under ''Issues on Which DOE Seeks Comment'' in section X.E of today's NOPR.

4. National Energy Savings and Net Present Value

The computer room air conditioner equipment stock is the total number of computer room air conditioners in each equipment class purchased or shipped from previous years that have survived until the point at which stock is taken. The NES spreadsheet,[48] through use of the shipments model, keeps track of the total number of computer room air conditioners shipped each year. For purposes of the NES and NPV analyses, DOE assumes that shipments of CRAC units survive for 15 years, at the end of which time they are removed from stock.

The national annual energy consumption is the product of the annual unit energy consumption and the number of computer room air conditioner units of each vintage in the stock, summed over all vintages. This approach accounts for differences in unit energy consumption from year to year. In determining national annual energy consumption, DOE calculated the annual energy consumption at the site (*i.e.*, million kWh consumed by computer room air conditioners) and

[48] The NES spreadsheet can be found on the DOE's ASHRAE Products Web site at: *http://www1.eere.energy.gov/buildings/appliance_standards/commercial/ashrae_products_docs_meeting.html.*

multiplied that by a conversion factor to account for generation and distribution losses, resulting in annual energy consumption at the source (or primary energy). DOE then summed the source or primary energy savings over a 30-year period to arrive at NES.

Table VI.11 summarizes the inputs to the NES spreadsheet model along with a brief description of the data sources. The results of DOE's NES and NPV analysis are summarized in section VIII.B.3.b below and described in detail in chapter 7 of the NOPR TSD.

TABLE VI.11—SUMMARY OF NES AND NPV MODEL INPUTS

Inputs	Description
Shipments	Annual shipments based on Australian data adjusted to the U.S. (see chapter 7 of the NOPR TSD).
Compliance Date of Standard	2017 for adoption of a more-stringent efficiency level than those specified by ASHRAE Standard 90.1–2010. 2012 or 2013 for adoption of the efficiency levels specified by ASHRAE Standard 90.1–2010.
Base-Case Efficiencies	Distribution of base-case shipments by efficiency level.
Standards-Case Efficiencies	Distribution of shipments by efficiency level for each standards case. Standards-case annual shipment-weighted market shares remain the same as in the base case and each standard level for all efficiencies above the efficiency level being analyzed. All other shipments are at the efficiency level.
Annual Energy Use per Unit	Annual national weighted-average values are a function of efficiency level. (See chapter 4 of the NOPR TSD.)
Total Installed Cost per Unit	Annual weighted-average values are a function of efficiency level. (See chapter 5 of the NOPR TSD.)
Annualized Maintenance and Repair Costs per Unit.	Annual weighted-average values are a function of efficiency level. (See chapter 5 of the NOPR TSD.)
Escalation of Fuel Prices	*AEO2011* forecasts (to 2035) and extrapolation for beyond 2035. (See chapter 8 of the NOPR TSD.)
Site-Source Conversion	*AEO2011* forecasts (to 2035) and extrapolation for beyond 2035. (See chapter 8 of the NOPR TSD.)
Discount Rate	3 percent and 7 percent real.
Present Year	Future costs are discounted to 2012.

G. Other Issues

1. Compliance Date of the Proposed Amended Energy Conservation Standards

Generally, covered equipment to which a new or amended energy conservation standard applies must comply with the standard if such equipment is manufactured or imported on or after a specified date. In today's NOPR, 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 propose 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 [49]) manufactured on or 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 [50]) manufactured on or 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 propose 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 or 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 in a future rulemaking. 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 or 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).[51]

Table VI.12 presents the anticipated compliance dates of an amended energy conservation standard for each equipment class for which DOE

[49] 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.

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

[51] 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 complaince date for DOE adoption of more-stringent standards.

developed a potential energy savings analysis.

TABLE VI.12—COMPLIANCE DATES OF AN AMENDED 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 to <240,000 Btu/h	October 29, 2013	April 29, 2017.
Air conditioners, air-cooled, ≥240,000 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 to <240,000 Btu/h	October 29, 2013	April 29, 2017.
Air conditioners, water-cooled, ≥240,000 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 to <240,000 Btu/h	October 29, 2013	April 29, 2017.
Air conditioners, water-cooled with fluid economizers, ≥240,000 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 to <240,000 Btu/h	October 29, 2013	April 29, 2017.
Air conditioners, glycol-cooled, ≥240,000 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 to <240,000 Btu/h	October 29, 2013	April 29, 2017.
Air conditioners, glycol-cooled with fluid economizers, ≥240,000 Btu/h	October 29, 2013	April 29, 2017.

VII. Methodology for Emissions Analysis and Monetizing Carbon Dioxide and Other Emissions Impacts

A. 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,[52] 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 proposed 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 NOPR, DOE used the version of NEMS–BT based on *AEO 2011.* For the final rule, DOE intends to revise the emissions analysis using the most current version of NEMS–BT, which may be based on *AEO 2012.*

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 (DC). SO_2 emissions from 28 eastern States and DC 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 (DC Circuit) (see *North Carolina* v. *EPA,* 550 F.3d 1176 (DC 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 (Aug. 2, 2010)), and 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/*). Because the *AEO 2011* NEMS used for today's NOPR assumes the implementation of CAIR, DOE has not been able to take into account the effects of the Transport Rule for this rulemaking.[53]

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.

As discussed above, the *AEO 2011* NEMS used for today's NOPR 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

[52] 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.)

[53] DOE notes that future iterations of the NEMS–BT model will incorporate any changes necessitated by issuance of the Transport Rule.

energy conservation standards that are the subject of today's NOPR 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 proposed 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 NOPR.

In the absence of caps, a DOE energy conservation standard could reduce Hg emissions, and DOE used NEMS–BT to estimate these reductions. Although at present there are no national, Federally binding regulations for mercury from EGUs, on March 16, 2011, EPA proposed national emissions standards for hazardous air pollutants (NESHAPs) for mercury and certain other pollutants emitted from coal and oil-fired EGUs. 76 FR 24976. The NESHAPs do not include a trading program and, as such, DOE's energy conservation standards would likely reduce Hg emissions. However, for the emissions analysis for this rulemaking, DOE estimated mercury emissions reductions using NEMS–BT based on *AEO2011,* which does not incorporate the NESHAPs. DOE expects that future versions of the NEMS–BT model will reflect the implementation of the NESHAPs.

B. Monetizing Carbon Dioxide and Other Emissions Impacts

As part of the development of this proposed 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 NOPR, 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 NOPR 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 [54] 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 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

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

effects,[55] 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.

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 proposed 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.[56] 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 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 VII.1.

[55] 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.

[56] The models are described in appendix 15–A of the NOPR TSD.

TABLE VII.1—SOCIAL COST OF CO_2, 2010–2050
[In 2007 dollars per metric ton]

Year	Discount rate (%) 5 Average	3 Average	2.5 Average	3 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 $67.6 per metric ton avoided (values expressed in 2010$).[57] To monetize the CO_2 emissions reductions expected to result from new or amended standards for the product classes in today's NOPR, 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 16–A of the NOPR 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 NOPR 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 $4,623 per ton in 2010$).[58] 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.[59]

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 once again monetizes Hg in its rulemakings.

VIII. Analytical Results

A. Efficiency Levels Analyzed

1. Water-Cooled and Evaporatively-Cooled Products

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 VIII.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 proposed 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.

[57] 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.

[58] 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.

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

TABLE VIII.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–<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–<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–<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–<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–<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–<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–<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–<760,000 Btu/h	40	Baseline—10.8 ASHRAE—11.7 12.5 Max-Tech—13.1

2. VRF Water-Source Heat Pumps

Table VIII.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 proposed 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 VIII.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 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 with heat recovery	215	Baseline—9.5 ASHRAE—9.8 11 12 13 Max-Tech—14.5

3. Computer Room Air Conditioners

Table VIII.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 proposed 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 VIII.3—EFFICIENCY LEVELS ANALYZED FOR COMPUTER ROOM AIR CONDITIONERS

Equipment class	Representative capacity *kBtu/h*	Efficiency levels analyzed (SCOP–127)
Air conditioners, air-cooled, <65,000 Btu/h	40	Market Baseline—2.00 ASHRAE—2.20 2.40 2.60 Max-Tech—2.80
Air conditioners, air-cooled, ≥65,000 to <240,000 Btu/h	100	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	280	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	30	Market Baseline—2.40 ASHRAE—2.60 2.80 3.00 3.10 Max-Tech—3.30

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

Equipment class	Representative capacity *kBtu/h*	Efficiency levels analyzed (SCOP–127)
Air conditioners, water-cooled, ≥65,000 to <240,000 Btu/h	106	Market Baseline—2.30 ASHRAE—2.50 2.70 2.90 3.10 Max-Tech—3.30
Air conditioners, water-cooled, ≥240,000 Btu/h	260	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	30	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 to <240,000 Btu/h	118	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	280	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	32	Market Baseline—2.30 ASHRAE—2.50 2.70 2.90 3.10 Max-Tech—3.30
Air conditioners, glycol-cooled, ≥65,000 to <240,000 Btu/h	100	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	260	Market Baseline—1.90 ASHRAE—2.10 2.30 2.50 2.70 Max-Tech—2.90

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

Equipment class	Representative capacity *kBtu/h*	Efficiency levels analyzed (SCOP–127)
Air conditioners, glycol-cooled with fluid economizers, <65,000 Btu/h	20	Market Baseline—2.25 ASHRAE—2.45 2.65 2.85 3.05 Max-Tech—3.25
Air conditioners, glycol-cooled with fluid economizers, ≥65,000 to <240,000 Btu/h	118	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	280	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 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 VIII.4 to Table VIII.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 mentioned in section IV.B.1 and IV.B.2, DOE did not conduct an economic analysis for this equipment category, because of the minimal energy savings.

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

Efficiency level	Primary energy savings estimate * (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 VIII.5—POTENTIAL ENERGY SAVINGS ESTIMATES FOR SMALL WATER-COOLED EQUIPMENT WITH OTHER HEAT

Efficiency level	Primary energy savings estimate * (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 VIII.6—POTENTIAL ENERGY SAVINGS ESTIMATES FOR LARGE WATER-COOLED EQUIPMENT WITH ELECTRIC RESISTANCE OR NO HEAT

Efficiency level	Primary energy savings estimate * (quads)	
	Historical shipment trend	Shipments fixed to 2009
Level 1—ASHRAE—12.5 EER	0.00014	0.00027
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 VIII.7—POTENTIAL ENERGY SAVINGS ESTIMATES FOR LARGE WATER-COOLED EQUIPMENT WITH OTHER HEAT

Efficiency level	Primary energy savings estimate * (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 VIII.8—POTENTIAL ENERGY SAVINGS ESTIMATES FOR VERY LARGE WATER-COOLED EQUIPMENT WITH ELECTRIC RESISTANCE OR NO HEAT

Efficiency level	Primary energy savings estimate * (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 VIII.9—POTENTIAL ENERGY SAVINGS ESTIMATES FOR VERY LARGE WATER-COOLED EQUIPMENT WITH OTHER HEAT

Efficiency level	Primary energy savings estimate * (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 VIII.10—POTENTIAL ENERGY SAVINGS ESTIMATES FOR VERY LARGE EVAPORATIVELY-COOLED EQUIPMENT WITH ELECTRIC RESISTANCE OR NO HEAT

Efficiency level	Primary energy savings estimate* (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
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 VIII.11—POTENTIAL ENERGY SAVINGS ESTIMATES FOR VERY LARGE EVAPORATIVELY-COOLED EQUIPMENT WITH OTHER HEAT

Efficiency level	Primary energy savings estimate* (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 VIII.12 and Table VIII.13 show the potential energy savings resulting from the analyses conducted as part of today's NOPR (see section V). 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 mentioned in section IV.B.3, DOE did not conduct an economic analysis for this equipment category.

TABLE VIII.12—POTENTIAL ENERGY SAVINGS FOR VRF WATER-SOURCE HEAT PUMPS >135,000 BTU/H WITHOUT HEAT RECOVERY

Efficiency level	Primary energy savings estimate* (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 VIII.13—POTENTIAL ENERGY SAVINGS FOR VRF WATER-SOURCE HEAT PUMPS >135,000 BTU/H WITH HEAT RECOVERY

Efficiency level	Primary energy savings estimate* (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[60]) for each equipment class, relative to the baseline computer room air conditioner 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 NOPR TSD provides 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 VIII.14 through Table VIII.23 below. These outputs include the proportion of computer room air conditioner purchases in which the purchase of a computer room air conditioner that is compliant with the amended 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 VIII.14—SUMMARY LCC AND PBP RESULTS FOR COMPUTER ROOM AIR CONDITIONERS, AIR-COOLED, <65,000 BTU/H

Efficiency level	Life-cycle cost (2011$)			Life-cycle cost savings (2011$)				Payback period (years)
	Installed cost	Discounted operating cost	LCC	Average savings	% of consumers that experience			
					Net cost	No impact	Net benefit	Median
Baseline	11,982	32,039	44,021					
1	13,471	29,822	43,294	809	3	89	8	8.5
2	15,222	28,140	43,362	212	17	68	14	10.2
3	17,281	26,756	44,037	(587)	65	23	12	12.1
4	19,700	25,623	45,323	(1,761)	90	5	6	14.5

* Numbers in parentheses indicate negative LCC savings.

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

Efficiency level	Life-cycle cost (2011$)			Life-cycle cost savings (2011$)				Payback period (years)
	Installed cost	Discounted operating cost	LCC	Average savings	% of consumers that experience			
					Net cost	No impact	Net benefit	Median
Baseline	39,412	121,532	160,945					
1	41,651	110,885	152,536	9,334	0	98	2	2.6
2	44,063	102,936	146,999	6,406	0	78	22	3.0
3	46,664	96,523	143,187	5,895	0	33	67	3.5
4	49,467	91,289	140,756	6,437	1	2	97	4.0

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

Efficiency level	Life-cycle cost (2011$)			Life-cycle cost savings (2011$)				Payback period (years)
	Installed cost	Discounted operating cost	LCC	Average savings	% of consumers that experience			
					Net cost	No impact	Net benefit	Median
Baseline	56,879	286,458	343,337					
1	60,102	258,403	318,505	27,198	0	98	2	1.4
2	63,577	237,739	301,316	19,713	0	78	22	1.7
3	67,322	221,326	288,648	19,071	0	33	67	1.9
4	71,358	208,099	279,458	22,152	0	2	98	2.2

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

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

Efficiency level	Life-cycle cost (2011$)			Life-cycle cost savings (2011$)				Payback period (years)
	Installed cost	Discounted operating cost	LCC	Average savings	% of consumers that experience			
					Net cost	No impact	Net benefit	Median
Baseline	23,748	29,266	53,014					
1	20,311	27,237	47,548	5,455	0	72	28	(21.5)
2	17,527	25,621	43,148	7,389	0	49	51	(20.9)
3	15,273	24,215	39,488	8,003	0	13	87	(20.3)
4	13,447	22,984	36,430	10,213	0	3	97	(19.7)

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

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

Efficiency level	Life-cycle cost (2011$)			Life-cycle cost savings (2011$)				Payback period (years)
	Installed cost	Discounted operating cost	LCC	Average savings	% of consumers that experience			
					Net cost	No impact	Net benefit	Median
Baseline	22,983	109,615	132,598					
1	28,614	104,631	133,245	(672)	20	72	8	15.4
2	36,183	101,867	138,049	(5,118)	54	42	4	22.4
3	46,355	100,831	147,186	(12,844)	79	20	1	35.9
4	60,027	101,734	161,761	(25,278)	96	4	0	64.6

* Numbers in parentheses indicate negative LCC savings.

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

Efficiency level	Life-cycle cost (2011$)			Life-cycle cost savings (2011$)				Payback period (years)
	Installed cost	Discounted operating cost	LCC	Average savings	% of consumers that experience			
					Net cost	No impact	Net benefit	Median
Baseline	42,217	239,903	282,120					
1	52,902	227,027	279,929	2,133	13	72	15	11.1
2	67,262	219,010	286,272	(5,292)	49	42	9	15.4
3	86,562	214,580	301,142	(18,696)	77	20	3	22.4
4	112,498	214,030	326,528	(40,964)	96	4	0	36.0

* Numbers in parentheses indicate negative LCC savings.

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

Efficiency level	Life-cycle cost (2011$)			Life-cycle cost savings (2011$)				Payback period (years)
	Installed cost	Discounted operating cost	LCC	Average savings	% of consumers that experience			
					Net cost	No impact	Net benefit	Median
Baseline	25,059	19,565	44,624					
1	21,422	18,442	39,864	4,759	0	72	28	(40.3)
2	18,476	17,541	36,017	6,459	0	49	51	(39.3)
3	16,090	16,763	32,853	6,960	0	13	87	(38.3)
4	14,158	16,086	30,244	8,832	0	3	97	(37.3)

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

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

Efficiency level	Life-cycle cost (2011$)			Life-cycle cost savings (2011$)				Payback period (years)
	Installed cost	Discounted operating cost	LCC	Average savings	% of consumers that experience			Median
					Net cost	No impact	Net benefit	
Baseline	24,169	73,475	97,645					
1	30,129	71,967	102,095	(4,439)	25	72	3	41.5
2	38,138	71,937	110,075	(10,105)	58	42	0	34.1
3	48,903	73,290	122,193	(19,437)	80	20	0	(66.1)
4	63,372	76,298	139,669	(33,672)	96	4	0	(75.0)

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

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

Efficiency level	Life-cycle cost (2011$)			Life-cycle cost savings (2011$)				Payback period (years)
	Installed cost	Discounted operating cost	LCC	Average savings	% of consumers that experience			Median
					Net cost	No impact	Net benefit	
Baseline	44,469	157,416	201,886					
1	55,777	152,704	208,481	(6,568)	25	72	3	30.5
2	70,973	151,095	222,068	(16,717)	57	42	1	40.7
3	91,397	152,234	243,631	(33,664)	80	20	0	43.1
4	118,844	156,568	275,412	(59,831)	96	4	0	(57.8)

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

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

Efficiency level	Life-cycle cost (2011$)			Life-cycle cost savings (2011$)				Payback period (years)
	Installed cost	Discounted operating cost	LCC	Average savings	% of consumers that experience			Median
					Net cost	No impact	Net benefit	
Baseline	24,353	29,757	54,110					
1	20,916	27,643	48,559	5,540	0	72	28	(20.2)
2	18,132	25,962	44,094	7,501	0	49	51	(19.7)
3	15,878	24,509	40,387	8,117	0	13	87	(19.2)
4	14,052	23,241	37,293	10,350	0	3	97	(18.6)

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

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

Efficiency level	Life-cycle cost (2011$)			Life-cycle cost savings (2011$)				Payback period (years)
	Installed cost	Discounted operating cost	LCC	Average savings	% of consumers that experience			Median
					Net cost	No impact	Net benefit	
Baseline	24,377	123,088	147,465					
1	30,001	116,846	146,847	594	15	72	13	11.9
2	37,559	113,489	151,048	(3,901)	52	42	6	17.8
3	47,717	112,428	160,145	(11,921)	78	20	2	29.1
4	61,368	113,891	175,258	(25,047)	96	4	0	50.4

* Numbers in parentheses indicate negative LCC savings.

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

Efficiency level	Life-cycle cost (2011$)			Life-cycle cost savings (2011$)				Payback period (years)
	Installed cost	Discounted operating cost	LCC	Average savings	% of consumers that experience			
					Net cost	No impact	Net benefit	Median
Baseline	42,217	266,128	308,345					
1	52,902	250,960	303,862	4,429	10	72	18	9.2
2	67,262	242,073	309,336	(3,308)	44	42	14	13.2
3	86,562	238,019	324,581	(17,633)	76	20	4	20.2
4	112,498	239,151	351,650	(41,761)	95	4	1	35.1

* Numbers in parentheses indicate negative LCC savings.

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

Efficiency level	Life-cycle cost (2011$)			Life-cycle cost savings (2011$)				Payback period (years)
	Installed cost	Discounted operating cost	LCC	Average savings	% of consumers that experience			
					Net cost	No impact	Net benefit	Median
Baseline	25,664	24,815	50,479					
1	22,027	23,156	45,183	5,295	0	72	28	(28.2)
2	19,081	21,851	40,932	7,159	0	49	51	(27.6)
3	16,695	20,727	37,422	7,717	0	13	87	(26.9)
4	14,763	19,751	34,514	9,808	0	3	97	(26.3)

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

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

Efficiency level	Life-cycle cost (2011$)			Life-cycle cost savings (2011$)				Payback period (years)
	Installed cost	Discounted operating cost	LCC	Average savings	% of consumers that experience			
					Net cost	No impact	Net benefit	Median
Baseline	25,563	102,580	128,143					
1	31,514	98,451	129,965	(1,802)	23	72	5	21.0
2	39,512	96,813	136,325	(7,200)	55	42	3	33.4
3	50,261	97,235	147,496	(16,388)	79	20	1	40.8
4	64,708	99,990	164,697	(30,857)	96	4	0	22.4

* Numbers in parentheses indicate negative LCC savings.

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

Efficiency level	Life-cycle cost (2011$)			Life-cycle cost savings (2011$)				Payback period (years)
	Installed cost	Discounted operating cost	LCC	Average savings	% of consumers that experience			
					Net cost	No impact	Net benefit	Median
Baseline	44,469	220,328	264,797					
1	55,777	209,958	265,735	(891)	21	72	7	15.4
2	70,973	204,967	275,941	(10,569)	53	42	5	23.3
3	91,397	204,265	295,662	(27,375)	77	20	3	32.3
4	118,844	208,311	327,156	(54,306)	95	4	1	34.8

* Numbers in parentheses indicate negative LCC savings.

b. National Impact Analysis

i. Amount and Significance of Energy Savings

To estimate the energy savings through 2041 or 2042 due to amended 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 VIII.29 shows the forecasted national energy savings at each of the considered standard levels. (See chapter 8 of the NOPR TSD.) As mentioned in section VI.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 VIII.29—SUMMARY OF CUMULATIVE NATIONAL ENERGY SAVINGS FOR COMPUTER ROOM AIR CONDITIONERS

[Energy savings for units sold from 2012 to 2041 or 2013 to 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 to <240,000 Btu/h	–**	0.006	0.059	0.196	0.364
Air conditioners, air-cooled, ≥240,000 Btu/h	–**	0.004	0.034	0.112	0.206
Air conditioners, water-cooled, <65,000 Btu/h	0.00003	0.0001	0.0003	0.0007	0.0010
Air conditioners, water-cooled, ≥65,000 to <240,000 Btu/h	0.0009	0.0088	0.0246	0.0435	0.0634
Air conditioners, water-cooled, ≥240,000 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 to <240,000 Btu/h	0.0004	0.0038	0.0106	0.0187	0.0273
Air conditioners, water-cooled with fluid economizers, ≥240,000 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 to <240,000 Btu/h	0.001	0.011	0.031	0.054	0.078
Air conditioners, glycol-cooled, ≥240,000 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 to <240,000 Btu/h	0.001	0.010	0.027	0.047	0.067
Air conditioners, glycol-cooled with fluid economizers, ≥240,000 Btu/h	0.0005	0.0054	0.0147	0.0257	0.0369

* 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 is a measure of the cumulative benefit or cost of standards to the Nation. 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. DOE used this discount rate to approximate the opportunity cost of capital in the private sector, because recent OMB analysis has found the average rate of return on capital to be near this rate. DOE also used the 3-percent rate to capture the potential effects of standards on private customers' consumption (*e.g.,* reduced purchasing of equipment due to higher prices for equipment and purchase of reduced amounts of energy). This 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 VIII.30 and Table VIII.31 provide an overview of the NPV results. (See chapter 7 of the NOPR TSD for further detail.)

TABLE VIII.30—SUMMARY OF CUMULATIVE NET PRESENT VALUE 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	0.0003	(0.0005)	(0.0060)	(0.0174)
Air conditioners, air-cooled, ≥65,000 to <240,000 Btu/h	0.01	0.10	0.29	0.44
Air conditioners, air-cooled, ≥240,000 Btu/h	0.01	0.07	0.22	0.37
Air conditioners, water-cooled, <65,000 Btu/h	0.001	0.003	0.006	0.009
Air conditioners, water-cooled, ≥65,000 to <240,000 Btu/h	(0.008)	(0.053)	(0.166)	(0.377)
Air conditioners, water-cooled, ≥240,000 Btu/h	(0.001)	(0.026)	(0.097)	(0.239)
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 to <240,000 Btu/h	(0.02)	(0.08)	(0.20)	(0.41)
Air conditioners, water-cooled with fluid economizers, ≥240,000 Btu/h	(0.005)	(0.023)	(0.061)	(0.127)
Air conditioners, glycol-cooled, <65,000 Btu/h	0.001	0.003	0.006	0.008
Air conditioners, glycol-cooled, ≥65,000 to <240,000 Btu/h	(0.003)	(0.044)	(0.157)	(0.375)
Air conditioners, glycol-cooled, ≥240,000 Btu/h	0.002	(0.017)	(0.077)	(0.200)
Air conditioners, glycol-cooled with fluid economizers, <65,000 Btu/h	0.001	0.003	0.005	0.008
Air conditioners, glycol-cooled with fluid economizers, ≥65,000 to <240,000 Btu/h	(0.01)	(0.08)	(0.24)	(0.53)

TABLE VIII.30—SUMMARY OF CUMULATIVE NET PRESENT VALUE 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 Btu/h	(0.004)	(0.031)	(0.10)	(0.23)

* Numbers in parentheses indicate negative NPV.

TABLE VIII.31—SUMMARY OF CUMULATIVE NET PRESENT VALUE 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	0.001	0.002	(0.004)	(0.021)
Air conditioners, air-cooled, ≥65,000 to <240,000 Btu/h	0.03	0.26	0.76	1.25
Air conditioners, air-cooled, ≥240,000 Btu/h	0.02	0.18	0.54	0.93
Air conditioners, water-cooled, <65,000 Btu/h	0.003	0.006	0.012	0.017
Air conditioners, water-cooled, ≥65,000 to <240,000 Btu/h	(0.006)	(0.079)	(0.280)	(0.671)
Air conditioners, water-cooled, ≥240,000 Btu/h	0.006	(0.028)	(0.150)	(0.407)
Air conditioners, water-cooled with fluid economizers, <65,000 Btu/h	0.001	0.003	0.006	0.009
Air conditioners, water-cooled with fluid economizers, ≥65,000 to <240,000 Btu/h	(0.03)	(0.14)	(0.37)	(0.77)
Air conditioners, water-cooled with fluid economizers, ≥240,000 Btu/h	(0.008)	(0.039)	(0.110)	(0.235)
Air conditioners, glycol-cooled, <65,000 Btu/h	0.002	0.006	0.011	0.016
Air conditioners, glycol-cooled, ≥65,000 to <240,000 Btu/h	0.004	(0.058)	(0.258)	(0.665)
Air conditioners, glycol-cooled, ≥240,000 Btu/h	0.01	(0.01)	(0.12)	(0.34)
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 to <240,000 Btu/h	(0.02)	(0.14)	(0.43)	(0.97)
Air conditioners, glycol-cooled with fluid economizers, ≥240,000 Btu/h	(0.003)	(0.047)	(0.17)	(0.41)

* 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 VIII.32 presents the estimated reduction in generating capacity in 2042 attributable to the efficiency levels that DOE considered in this rulemaking.

TABLE VIII.32—REDUCTION IN NATIONAL ELECTRIC GENERATING CAPACITY IN 2042 UNDER EVALUATED EFFICIENCY LEVELS

	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 product classes covered in today's NOPR could also produce environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases associated with electricity production. Table VIII.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 NOPR TSD.

As discussed in section VII.A, 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 VIII.33—SUMMARY OF EMISSIONS REDUCTION ESTIMATED FOR PRODUCT EFFICIENCY LEVELS

[Cumulative in 2012 or 2013 through 2042 or 2043]

	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 proposed 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 VII.B, 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 VIII.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 NOPR TSD.

TABLE VIII.34—ESTIMATES OF GLOBAL PRESENT VALUE OF CO_2 EMISSIONS REDUCTION UNDER PRODUCT EFFICIENCY LEVELS

Eff 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
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 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 NOPR 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 NOPR. The low and high dollar-per-ton values that DOE used are discussed in section VII.B.2. Table VIII.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 VIII.35—ESTIMATES OF PRESENT VALUE OF NO_X EMISSIONS REDUCTION IN 2012–2042 UNDER PRODUCT EFFICIENCY LEVELS

Efficiency level	3% Discount rate	7% Discount rate
	Million 2011$	
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. Proposed Standards

1. Water-Cooled and Evaporatively-Cooled 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. For the reasons discussed in section IV.B, DOE agrees with commenters that the energy savings from increasing national energy conservation standards for water-cooled and evaporatively-cooled equipment above the levels specified by ASHRAE Standard 90.1–2010 would be very minimal. As such, DOE does not have ''clear and convincing evidence'' that significant additional conservation of energy would result from adoption of more-stringent standard levels. Therefore, DOE did not examine whether the levels are economically justified, and DOE is proposing to adopt the energy efficiency levels for these products as set forth in ASHRAE Standard 90.1–2010. Table VIII.36 presents the proposed energy conservation standards and compliance dates for water-cooled and evaporatively-cooled equipment.

TABLE VIII.36—PROPOSED 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.

TABLE VIII.36—PROPOSED ENERGY CONSERVATION STANDARDS FOR WATER-COOLED AND EVAPORATIVELY-COOLED EQUIPMENT—Continued

Equipment type	Subcategory	Size category (input)	Efficiency level (EER)	Compliance date
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, as explained in section IV.B.2 of this NOPR, DOE has determined that this level was mistakenly reported and that the correct level is 11.7 EER.

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. For the reasons discussed in section VIII.B.2, the energy savings for more-stringent efficiency levels for VRF water-source heat pumps greater than 135,000 Btu/h would be minimal. 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 proposing to adopt the energy efficiency levels for these products as set forth in ASHRAE Standard 90.1–2010.[61] Table VIII.37 presents the proposed amended energy conservation standards and compliance dates for VRF water-source heat pumps.

TABLE VIII.37—PROPOSED 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	10.0 EER 3.9 COP	October 29, 2013.
VRF Water-Source Heat Pumps.	With Heat Recovery	≥135,000 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.
** 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. As discussed in Section V.D.3, compliance dates for Federal standards would be two or three years after the effective date in ASHRAE, depending on product size.

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 conditioner 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 tentatively 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 VI.B.4, 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

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

(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 quads 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 quads to 0.98 quads. 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 VI.G.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, Level 1 creates positive NPV, while Levels 2 through 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 considered before proposing 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 VI.B.4, 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 VI.B.1, 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.

In light of the above, DOE would again restate the statutory test for adopting energy conservation standards more stringent than the levels in ASHRAE Standard 90.1. DOE must have ''clear and convincing'' evidence in order to propose efficiency levels more stringent than those specified in ASHRAE Standard 90.1–2010, and for the reasons explained in this notice, the totality of information does not meet the level necessary to support these more-stringent efficiency levels for computer room air conditioners. Consequently, DOE has tentatively decided to propose the efficiency levels in ASHRAE Standard 90.1–2010 as amended energy conservation standards for all 30 computer room air conditioner equipment classes. Table VIII.38 presents the proposed energy conservation standards for computer room air conditioners.

By proposing to adopt the efficiency levels in ASHRAE Standard 90.1–2010 as amended energy conservation standards, DOE would be setting a minimum floor for these previously unregulated products. This would allow the industry time to transition to coverage of these products, would require manufacturers to begin submitting efficiency data, and would spur the tracking of shipments. These data would 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))

DOE seeks comments from interested parties on its proposed amended energy conservation standards for computer room air conditioners, as well as the other efficiency levels considered. Although DOE currently believes that it would be appropriate to adopt the efficiency levels in ASHRAE Standard 90.1–2010 for computer room air conditioners, DOE may consider the possibility of setting standards at more-stringent efficiency levels if public comments and additional data supply clear and convincing evidence in support of such an approach.

TABLE VIII.38—PROPOSED 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	1.90	October 29, 2013.
Air conditioners, air-cooled	Upflow	≥240,000 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	2.40	October 29, 2013.
Air conditioners, water-cooled	Upflow	≥240,000 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	2.35	October 29, 2013.
Air conditioners, water-cooled with fluid economizer.	Upflow	≥240,000 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	2.10	October 29, 2013.
Air conditioners, glycol-cooled	Upflow	≥240,000 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.
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	2.05	October 29, 2013.
Air conditioners, glycol-cooled with fluid economizer.	Upflow	≥240,000 Btu/h	1.94	October 29, 2013.

IX. Procedural Issues and Regulatory Review

A. Review Under Executive Order 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 the standards in this rule 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 NOPR 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 maximize net benefits.

Consistent with Executive Order 13563, and the range of impacts analyzed in this rulemaking, the energy conservation standards proposed in this NOPR 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*).

For manufacturers of water-cooled and evaporatively-cooled air conditioners, computer room air conditioners, and VRF water-source heat pumps with a cooling capacity equal to or greater than 135,000 Btu/h, 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 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.

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[62]), 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 750-employee threshold set by the SBA to be small businesses. DOE identified 3

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

manufacturers that qualify as a small business: 2 computer room air conditioner manufacturers (out of the 5 total identified) and 1 water-cooled air conditioner manufacturer (of the 8 total identified). DOE did not identify any small business manufacturers of evaporatively-cooled air conditioners or water-source VRF heat pump manufacturers.

DOE has reviewed today's proposed 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 proposed revisions to the test procedures. Since DOE is proposing to adopt 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 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 proposed in today's NOPR 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. DOE notes that this document proposes adoption of 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 proposed for adoption in this NOPR 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 proposes the use of a new test procedure where none was previously required. However, for all equipment types (including computer room air conditioners) the proposed 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 does not believe the additional burden imposed by today's proposal will have a significant adverse impact on a large number of small manufacturers. DOE requests public comment on the impact of this proposed rule on small entities. This is identified as issue 18 in section X.E, ''Issues on Which DOE Seeks Comment.''

For the reasons stated above, DOE certifies that the proposed rule, if promulgated, would 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. DOE will transmit 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 the ASHRAE equipment addressed in today's NOPR must certify to DOE that their equipment comply with any applicable energy conservation standards. In certifying compliance, manufacturers must test their equipment according to the applicable DOE test procedures for the given equipment type, 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 the ASHRAE equipment at issue in this NOPR. (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 of 1969 (42 U.S.C. 4321 *et seq.*), DOE has determined that the proposed 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 proposed 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 proposed rule. DOE's CX determination for this proposed rule is available at *http://cxnepa.energy.gov/.*

E. Review Under Executive Order 13132

Executive Order 13132, ''Federalism,'' 64 FR 43255 (August 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 proposed rule and has tentatively 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 are the subject of today's proposed rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, as set forth in EPCA. (42 U.S.C. 6297(d) 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; (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 sections 3(a) and 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, the proposed 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 proposed regulatory action likely to result in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (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.*

Today's proposed rule contains neither an intergovernmental mandate nor a mandate that may result in the 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 NOPR 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 tentatively 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 proposed 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 proposed rule.

L. 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. 70 FR 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.*

X. Public Participation

A. Attendance at the Public Meeting

The time, date, and location of the public meeting are listed in the **DATES** and **ADDRESSES** sections at the beginning of this notice. If you plan to attend the public meeting, please notify Ms. Brenda Edwards at (202) 586–2945 or *Brenda.Edwards@ee.doe.gov.* As explained in the **ADDRESSES** section, foreign nationals visiting DOE Headquarters are subject to advance security screening procedures. Any foreign national wishing to participate in the meeting should advise DOE of this fact as soon as possible by contacting Ms. Brenda Edwards to initiate the necessary procedures.

In addition, you can attend the public meeting via webinar. Webinar registration information, participant instructions, and information about the capabilities available to webinar participants will be published on DOE's Web site at: *http://www1.eere.energy.gov/buildings/appliance_standards/commercial/ashrae_products_docs_meeting.html.* Participants are responsible for ensuring their systems are compatible with the webinar software.

B. Procedure for Submitting Request To Speak and Prepared General Statements for Distribution

Any person who has an interest in the topics addressed in this notice, or who is representative of a group or class of persons that has an interest in these issues, may request an opportunity to make an oral presentation at the public meeting. Such persons may hand-deliver requests to speak to the address show in the **ADDRESSES** section at the beginning of this notice between 9 a.m. and 4 p.m., Monday through Friday, except Federal holidays. Requests may also be sent by mail or email to Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, Mailstop EE–2J, 1000 Independence Avenue SW., Washington, DC 20585–0121, or *Brenda.Edwards@ee.doe.gov.* Persons who wish to speak should include in their request a computer diskette or CD–ROM in WordPerfect, Microsoft Word, PDF, or text (ASCII) file format that briefly describes the nature of their interest in this rulemaking and the topics they wish to discuss. Such persons should also provide a daytime telephone number where they can be reached.

DOE requests persons selected to make an oral presentation to submit an advance copy of their statements at least one week before the public meeting. DOE may permit persons who cannot supply an advance copy of their statement to participate, if those persons have made advance alternative arrangements with the Building Technologies Program. As necessary, request to give an oral presentation should ask for such alternative arrangements.

Any person who has plans to present a prepared general statement may request that copies of his or her statement be made available at the public meeting. Such persons may submit requests, along with an advance electronic copy of their statement in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format, to the appropriate address shown in the **ADDRESSES** section at the beginning of this notice. The request and advance copy of statements must be received at least one week before the public meeting and may be emailed, hand-delivered, or sent by mail. DOE prefers to receive requests and advance copies via email. Please include a telephone number to enable DOE staff to make follow-up contact, if needed.

C. Conduct of the Public Meeting

DOE will designate a DOE official to preside at the public meeting and may also use a professional facilitator to aid discussion. The meeting will not be a judicial or evidentiary-type public hearing, but DOE will conduct it in accordance with section 336 of EPCA (42 U.S.C. 6306). A court reporter will be present to record the proceedings and prepare a transcript. DOE reserves the right to schedule the order of presentations and to establish the procedures governing the conduct of the public meeting. There shall not be discussion of proprietary information, costs or prices, market share, or other commercial matters regulated by U.S. anti-trust laws. After the public meeting, interested parties may submit further comments on the proceedings, as well as on any aspect of the rulemaking, until the end of the comment period.

The public meeting will be conducted in an informal, conference style. DOE will present summaries of comments received before the public meeting, allow time for prepared general statements by participants, and encourage all interested parties to share their views on issues affecting this rulemaking. Each participant will be allowed to make a general statement (within time limits determined by DOE), before the discussion of specific topics. DOE will allow, as time permits, other participants to comment briefly on any general statements.

At the end of all prepared statements on a topic, DOE will permit participants to clarify their statements briefly and comment on statements made by others. Participants should be prepared to answer questions by DOE and by other participants concerning these issues. DOE representatives may also ask questions of participants concerning other matters relevant to this rulemaking. The official conducting the public meeting will accept additional comments or questions from those attending, as time permits. The presiding official will announce any further procedural rules or modification of the above procedures that may be needed for the proper conduct of the public meeting.

A transcript of the public meeting will be posted on the DOE Web site and will be included in the docket, which can be viewed as described in the *Docket* section at the beginning of this notice. In addition, any person may buy a copy of the transcript from the transcribing reporter.

D. Submission of Comments

DOE will accept comments, data, and information regarding this proposed rule before or after the public meeting, but no later than the date provided in the **DATES** section at the beginning of this proposed rule. Interested parties may submit comments, data, and other information using any of the methods described in the **ADDRESSES** section at the beginning of this notice.

Submitting comments via www.regulations.gov. The *www.regulations.gov* Web page will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment itself or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Otherwise, persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to *www.regulations.gov* information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information (CBI)). Comments submitted through *www.regulations.gov* cannot be claimed as CBI. Comments received through the Web site will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section below.

DOE processes submissions made through *www.regulations.gov* before posting. Normally, comments will be posted within a few days of being submitted. However, if large volumes of comments are being processed simultaneously, your comment may not be viewable for up to several weeks. Please keep the comment tracking number that *www.regulations.gov* provides after you have successfully uploaded your comment.

Submitting comments via email, hand delivery/courier, or mail. Comments and documents submitted via email, hand delivery, or mail also will be posted to *www.regulations.gov*. If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information in a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments.

Include contact information each time you submit comments, data, documents, and other information to DOE. If you submit via mail or hand delivery/courier, please provide all items on a compact disc (CD), if feasible, in which case it is not necessary to submit printed copies. No telefacsimiles (faxes) will be accepted.

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, that are written in English, and that are free of any defects or viruses. Documents should not contain special characters or any form of encryption and, if possible, they should carry the electronic signature of the author.

Campaign form letters. Please submit campaign form letters by the originating organization in batches of between 50 to 500 form letters per PDF or as one form letter with a list of supporters' names compiled into one or more PDFs. This reduces comment processing and posting time.

Confidential Business Information. Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email, postal mail, or hand delivery/courier two well-marked copies: One copy of the document marked confidential including all the information believed to be confidential, and one copy of the document marked non-confidential with the information believed to be confidential deleted. Submit these documents via email or on a CD, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Factors of interest to DOE when evaluating requests to treat submitted information as confidential include: (1) A description of the items; (2) whether and why such items are customarily treated as confidential within the industry; (3) whether the information is generally known by or available from other sources; (4) whether the information has previously been made available to others without obligation concerning its confidentiality; (5) an explanation of the competitive injury to the submitting person which would result from public disclosure; (6) when such information might lose its confidential character due to the passage of time; and (7) why disclosure of the information would be contrary to the public interest.

It is DOE's policy that all comments may be included in the public docket, without change and as received, including any personal information provided in the comments (except information deemed to be exempt from public disclosure).

E. Issues on Which DOE Seeks Comment

Although DOE welcomes comment on any aspect of this proposal, DOE is particularly interested in receiving comments and views of interested parties concerning the following issues:

1. How manufacturers currently differentiate commercial package air conditioning and heating equipment used solely for manufacturing and industrial processes from that equipment of the same type that is used in buildings.

2. Any aspect of the test procedures affected by this rule as part of DOE's comprehensive 7-year-review requirement.

3. DOE's proposed adoption of AHRI 210/240–2008 as the test procedure for small (<65,000 Btu/h) commercial package air conditioning and heating equipment. DOE is also interested in receiving comment on the need for an optional ''break-in'' period for this equipment, and whether 16 hours is an appropriate maximum length for the break-in period.

4. DOE's proposed adoption of AHRI 340/360–2007 as the test procedure for small (≥65,000 Btu/h and <135,000 Btu/h), large, and very large commercial package air conditioning and heating equipment. DOE is also interested in receiving comment on the need for an optional ''break-in'' period for this equipment, and whether 16 hours is an appropriate maximum length for the break-in period.

5. DOE's proposed adoption of ANSI Z21.10.3–2006 for commercial water heating equipment, and DOE's finding that the updated test method will not impact measured efficiency.

6. DOE's proposed adoption of ASHRAE Standard 127–2007 for computer room air conditioners. DOE is also interested in receiving comment on how to treat the draft revisions that ASHRAE has made to standard 127, and on any shortcomings with the test procedure that may require modification.

7. DOE's proposed adoption of AHRI 1230–2010 with Amendment 1 for VRF systems. DOE is also interested in receiving comment on the need for an optional ''break-in'' period for this equipment, and whether 16 hours is an appropriate maximum length for the break-in period.

8. DOE's proposed adoption of AHRI 390–2003 as the test procedure for single package vertical air conditioners and single package vertical heat pumps. DOE is also interested in receiving comment on the need for an optional ''break-in'' period for this equipment, and whether 16 hours is an appropriate maximum length for the break-in period.

9. The testing conditions, the basic model operating points, and set-up for variable refrigerant flow multi-split air conditioners and heat pumps.

10. DOE's proposed definitions of ''variable refrigerant flow multi-split air conditioner,'' ''variable refrigerant flow multi-split heat pump,'' and ''heat recovery.''

11. DOE's proposed definition of ''computer room air conditioner.'' DOE is specifically interested in whether there are any physical features or components that could allow DOE to differentiate between computer room air conditioners and commercial package air conditioners used for comfort conditioning

12. The results of DOE's pricing analysis, and any data or information on the price-efficiency relationship for computer room air conditioners

13. Does computer room air conditioner installation cost increase as a function of increased efficiency? If so, how should the increase in cost be estimated or derived?

14. Is there a rebound effect in computer room air conditioner equipment energy use as a result of improvements in the efficiency of such units?

15. Would shipments of computer room air conditioners change with higher standard levels?

16. 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.

17. The need for an optional ''break-in'' period for computer room air conditioners, similar to the period being proposed for other types of commercial air conditioning and heating equipment.

18. The impact of DOE's proposed standards on small business manufacturers.

XI. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of today's notice of proposed rulemaking.

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 December 20, 2011.

Kathleen B. Hogan,

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

For the reasons set forth in the preamble, DOE proposes to amend part 431 of Chapter II, Subchapter D, of Title 10 of the Code of Federal Regulations to read 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 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, 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 Z21.47–2006, ''*Gas-Fired Central Furnaces,*'' approved on July 27, 2006, IBR approved for § 431.76.

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

(2) 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 Standard Z21.47–2006 or UL Standard 727–2006, (incorporated by reference, see § 431.75), perform only the procedures pertinent to the measurement of the steady-state efficiency.

(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), and 4.2.1 (Basic Test Arrangements for Direct Vent Control Furnaces) of ANSI Standard 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 Standard 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 Standard 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 Standard 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 Standard 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 Standard 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 Standard Z21.47–2006 (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 Standard 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 unit of commercial package air conditioning and heating equipment that is advertised, marketed, and/or sold specifically for use in computer rooms, data processing rooms, or other precision cooling applications, and is rated for performance using ASHRAE Standard 127, (incorporated by reference, see § 431.95). Such equipment may not be marketed or advertised as equipment for any other space conditioning applications, and may not be rated for performance using AHRI Standard 210/240 or AHRI Standard 340/360. (incorporated by reference, see § 431.95).

* * * * *

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 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) AHRI Standard 210/240–2008, ''*Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment,*'' approved April 21, 2008, IBR approved for § 431.96.

(2) AHRI Standard 310/380–2004 (CSA C744–04), ''*Standard for Packaged Terminal Air-Conditioners and Heat Pumps,*'' approved September 2004, IBR approved for § 431.96.

(3) AHRI Standard 340/360–2007, ''*Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment,*'' approved September 2007, IBR approved for § 431.96.

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

(5) AHRI Standard 1230–2010, ''*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, IBR approved for § 431.96.

(6) 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, 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 *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, and variable refrigerant flow systems.

(b) *Testing and calculations.* 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.

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

Product	Category	Cooling capacity	Energy efficiency descriptor	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	AHRI Standard 210/240–2008
	Air-Cooled AC and HP.	≥65,000 Btu/h and <135,000 Btu/h.	EER and COP	AHRI Standard 340/360–2004
	Water-Cooled and Evaporatively-Cooled.	<65,000 Btu/h	EER	AHRI Standard 210/240–2008
		≥65,000 Btu/h and <135,000 Btu/h.	EER	AHRI Standard 340/360–2004
	Water-Source HP	<135,000 Btu/h	EER and COP	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	AHRI Standard 340/360–2004
	Water-Cooled and Evaporatively-Cooled AC.	≥135,000 Btu/h and <240,000 Btu/h.	EER	AHRI Standard 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	AHRI Standard 340/360–2004
	Water-Cooled and Evaporatively-Cooled AC.	≥240,000 Btu/h and <760,000 Btu/h.	EER	AHRI Standard 340/360–2004
Packaged Terminal Air-Conditioners and Heat Pumps.	AC and HP	<760,000 Btu/h	EER and COP	AHRI Standard 310/380–2004
Computer Room Air Conditioners	AC	<760,000 Btu/h	SCOP	ASHRAE Standard 127–2007
Variable Refrigerant Flow Multi-split Systems.	AC and HP	<760,000 Btu/h	EER and COP	AHRI Standard 1230–2010
Single Package Vertical Air Conditioners and Single Package Vertical Heat Pumps.	AC and HP	<760,000 Btu/h	EER and COP	AHRI Standard 390–2003

[1] Incorporated by reference, see § 431.95.

(c) *Optional break-in period for tests conducted using AHRI 210/240–2008, AHRI 340/360–2004, AHRI 1230–2010, and AHRI 390–2003.* Manufacturers may optionally specify a ''break-in'' period, not to exceed 16 hours, to operate the equipment under test prior to conducting the test method specified by AHRI 210/240–2008, AHRI 340/360–2004, AHRI 1230–2010, or AHRI 390–2003.

8. Section 431.97 is revised to read as follows:

§ 431.97 Energy efficiency standards and their compliance dates.

(a) 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 or 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)

Product	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.

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)—Continued

Product	Cooling capacity	Sub-category	Heating type	Efficiency level	Compliance date: Products manufactured on and after
			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.
		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.
		HP	All	EER = 11.2	October 29, 2003.
	≥17,000 Btu/h and <65,000 Btu/h.	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].

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)—Continued

Product	Cooling capacity	Sub-category	Heating type	Efficiency level	Compliance date: Products manufactured on and after
			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)

Product	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

Product	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.	EER = 12.1	June 1, 2013.
		All Other Types of Heating.	EER = 11.9	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.	EER = 12.5	June 1, 2014.
		All Other Types of Heating.	EER = 12.3	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.	EER = 12.4	June 1, 2014.
		All Other Types of Heating.	EER = 12.2	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.	EER = 12.1	June 1, 2013.
		All Other Types of Heating.	EER = 11.9	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.	EER = 12.0	June 1, 2014.
		All Other Types of Heating.	EER = 11.8	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.	EER = 11.9	June 1, 2014.
		All Other Types of Heating.	EER = 11.7	June 1, 2014.

(b) 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

Product	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

Product	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.

(c) 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

Product	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.

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

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

(d) 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.

(e) Each variable refrigerant flow air conditioner or heat pump manufactured on or after the effective 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

Product	Cooling capacity	Heating type [1]	Efficiency level	Compliance date: Products manufactured and after
VRF Multi-Split Air Conditioners (Air-Cooled).	<65,000 Btu/h	All	13.0 SEER	June 16, 2008.
	≥65,000 and <135,000 Btu/h.	No Heating or Electric Resistance Heating.	11.2 EER	January 1, 2010.

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

Product	Cooling capacity	Heating type [1]	Efficiency level	Compliance date: Products manufactured and after
		All Other Types of Heating.	11.0 EER	January 1, 2010.
	≥135,000 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 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 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 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 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	October 29, 2012.
			4.2 COP	October 29, 2003.
		With heat recovery	11.8 EER	October 29, 2012.
			4.2 COP	October 29, 2003.
	≥17,000 and <65,000 Btu/h.	All	12.0 EER 4.2 COP	October 29, 2003.
	≥65,000 and <135,000 Btu/h.	All	12.0 EER 4.2 COP	October 29, 2003.
	≥135,000 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 a new section 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 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_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://wwww.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 Z21.10.3–2004, CSA 4.3–2004, Sections 2.1.7, 2.3.3, 2.3.4, 2.30, Figure 3, and Exhibit G, *Volume III, ''Storage Water Heaters With Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous,''* approved on July 2, 2004, IBR approved for § 431.106.

(2) 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:

Product	Energy efficiency descriptor	Use test setup, equipment and procedures in subsection labeled ''Method of Test'' of	With these additional stipulations
Gas-fired Storage and Instantaneous Water Heaters and Hot Water Supply Boilers.*	Thermal Efficiency Standby Loss	ANSI Z21.10.3–2004, Exhibit G1 ANSI Z21.10.3–2004, Exhibit G2	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 cutout 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.
Oil-fired Storage and Instantaneous Water Heaters and Hot Water Supply Boilers.*	Thermal Efficiency Standby Loss	ANSI Z21.10.3–2004, Exhibit G1 ANSI Z21.10.3–2004, Exhibit G2	
Electric Storage and instantaneous Water Heaters	Standby Loss	ANSI Z21.10.3–2004, Exhibit G2	

* 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.

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