[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 431

[Docket No. EERE-2013-BT-STD-0007]

RIN: 1904-AC95

Energy Conservation Program: Energy Conservation Standards for Small, Large, and Very Large Commercial Package Air Conditioning and Heating Equipment

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

ACTION: Request for information (RFI) and notice of document availability.

SUMMARY: Pursuant to the American Energy Manufacturing Technical Corrections Act, the U.S. Department of Energy (DOE) is initiating an effort to determine whether to amend the current energy conservation standards for certain commercial air-conditioning and heating equipment. This notice seeks to solicit information from the public to help DOE determine whether national standards more stringent than those that are currently in place would result in a significant amount of additional energy savings and whether those national standards would be technologically feasible and economically justified. Separately, DOE also seeks information from the public on the merits of adopting the integrated energy efficiency ratio (IEER) as the energy efficiency descriptor for small, large, and very large air-cooled commercial air

conditioners and heat pumps.

DATES: Written comments and information are requested on or before **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: Interested parties are encouraged to submit comments electronically. However, comments may be submitted by any of the following methods:

- Federal eRulemaking Portal: www.regulations.gov. Follow the instructions for submitting comments.
- E-mail to the following address: CommPkgACHP2013STD0007@ee.doe.gov. Include docket number EERE-2013-BT-STD-0007 and/or RIN 1904-AC95 in the subject line of the message. All comments should clearly identify the name, address, and, if appropriate, organization of the commenter.
- Postal Mail: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, Mailstop EE-2J, Request for Information for Commercial Air Conditioners and Heat Pumps, Docket No. EERE-2013-BT-STD-0007 and/or RIN 1904-AC95, 1000 Independence Avenue, SW., Washington, DC 20585-0121. Please submit one signed paper original.
- Hand Delivery/Courier: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, Sixth Floor, 950 L'Enfant Plaza, SW., Washington, DC 20024. Please submit one signed paper original.

Instructions: All submissions received must include the agency name and docket number

and/or RIN for this rulemaking. No telefacsimilies (faxes) will be accepted.

Docket: The docket is available for review at www.regulations.gov, including Federal Register notices, public meeting attendees' 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 webpage can be found at: http://www.regulations.gov/#!docketDetail;D=EERE-2013-BT-STD-0007. This webpage contains a link to the docket for this notice on the www.regulations.gov website. The www.regulations.gov webpage contains simple instructions on how to access all documents, including public comments, in the docket.

For 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 e-mail: Brenda.Edwards@ee.doe.gov.

FOR FURTHER INFORMATION CONTACT: Direct requests for additional information may be sent to Mr. Joshua Cocciardi, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, EE–2J, 1000 Independence Avenue, SW., Washington, DC 20585–0121. Telephone: 202–287–1656. E-mail: Joshua.Cocciardi@ee.doe.gov.

Mr. Michael Kido, 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. E-mail: Michael.Kido@hq.doe.gov.

For information on how to submit or review public comments, contact Ms. Brenda Edwards, 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) 586-2945. E-mail: Brenda.Edwards@ee.doe.gov.

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I. Introduction

A. Authority

Title III, Part C[1] of the Energy Policy and Conservation Act of 1975 (EPCA or the Act), Pub. L. 94-163 (42 U.S.C. 6311-6317, as codified), added by Pub. L. 95-619, Title IV, §441(a), established the Energy Conservation Program for Certain Industrial Equipment, which includes provisions covering the commercial heating and air-conditioning equipment that is the subject of this notice.[2] In general, this program addresses the energy efficiency of certain types of

[1] For editorial reasons, upon codification in the U.S. Code, Part C was re-designated Part A-1.
[2] All references to EPCA in this document refer to the statute as amended through the American Energy Manufacturing Technical Corrections Act of 2012, Pub. L. 112-210 (Dec. 18, 2012).

commercial and industrial equipment. Relevant provisions of the Act 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).

Section 342(a) of EPCA concerns energy conservation standards for small, large, and very large, air-cooled commercial package air conditioning and heating equipment (also known generally as unitary air conditioning and heating equipment). (42 U.S.C. 6313(a)) This category of equipment has a rated capacity between 64,000 Btu/h and 760,000 Btu/h. The equipment is designed to heat and cool commercial buildings and is typically located on the building's rooftop. Section 5(b) of the American Energy Manufacturing Technical Corrections Act of 2012 (Pub. L. No. 112-210 (Dec. 18, 2012) (AEMTCA)) amended Section 342(a)(6) of EPCA, which concerns the amendment of energy conservation standards for certain types of commercial and industrial equipment. At issue here is the inclusion of a requirement for DOE to consider amending the standards for "any covered equipment as to which more than 6 years has elapsed since the issuance of the most recent final rule establishing or amending a standard for the product as of the date of AEMTCA's enactment, December 18, 2012. (42 U.S.C. 6313(a)(6)(C)(vi)) DOE must issue either a notice of determination that the current standards do not need to be amended or a notice of proposed rulemaking containing proposed standards by December 31, 2013. See 42 U.S.C. 6313(a)(6)(C)(i) and (vi) (as amended by AEMTCA).[3]

For small, large, and very large air-cooled commercial package air conditioners (ACs) and heating pumps (HPs), the last final rule issued by DOE was on October 18, 2005, which

[3] Subparagraph (A) and subparagraph (B) refer to 42 U.S.C. 6313(a)(6).

codified both the amended standards for small and large equipment and the new standards for very large equipment set by the Energy Policy Act of 2005, Pub. L. No. 109-58 (Aug. 8, 2005) (EPAct 2005). 70 FR 60407. Consistent with the new requirements Congress enacted as part of AEMTCA, DOE is required to publish either a notice of determination that standards for these equipment types do not need to be amended, or a notice of proposed rulemaking proposing amended energy conservation standards for these equipment types.

In order to meet the new requirements added by AEMTCA, DOE is reviewing the standards that are already in place affecting those products listed in 42 U.S.C. 6313(a) for which more than six years have elapsed since the issuance of the most recent final rule. Under Section 6313(a), DOE must either adopt those standards developed by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) – or to adopt levels more stringent than the ASHRAE levels if there is clear and convincing evidence in support of doing so. AEMTCA added to this procedure a specified deadline within which DOE must act with respect to those standards for which more than six years have elapsed since the issuance of the relevant final rule. (42 U.S.C. 6313(a)(6)(A)(i) and (vi)) Today's notice represents the initiation of the mandatory review process imposed by AEMTCA and seeks input from the public to assist DOE with its determination on whether to amend the current standards pertaining to small, large, and very large air-cooled commercial package air conditioners and heating equipment ranging in cooling capacity from 65,000 Btu/h to 760,000 Btu/h. In making this determination, DOE must evaluate whether there is clear and convincing evidence that more stringent national standards than the ones established pursuant to the ASHRAE-process described above would result in significant energy savings, be technologically feasible and economically justified. By statute,

DOE may promulgate or amend existing energy conservation standards only if the resulting standards would (1) yield a significant savings in energy use and (2) be both technologically feasible and economically justified. The current Federal standards, for this equipment, are shown in Table 1.

Table 1. Minimum Cooling and Heating Efficiency Levels for Air-Cooled Commercial Air Conditioners and Heat Pumps, ≥65,000 Btu/h and <760,000 Btu/h

Equipment Type	Cooling Capacity	Sub-Category	Heating Type	Efficiency Level	Compliance Date
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	1/1/2010
			All Other Types of Heating	EER = 11.0	1/1/2010
		HP	No Heating or Electric Resistance Heating	EER = 11.0 COP = 3.3	1/1/2010
			All Other Types of Heating	EER = 10.8 COP = 3.3	1/1/2010
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	1/1/2010
			All Other Types of Heating	EER = 10.8	1/1/2010
		HP	No Heating or Electric Resistance Heating	EER = 10.6 COP = 3.2	1/1/2010
			All Other Types of Heating	EER = 10.4 COP = 3.2	1/1/2010
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	1/1/2010
			All Other Types of Heating	EER = 9.8	1/1/2010
		HP	No Heating or	EER = 9.5	1/1/2010

			Electric Resistance Heating	COP = 3.2	
			All Other Types of Heating	EER = 9.3 COP = 3.2	1/1/2010

A. Background

On October 29, 1999, ASHRAE and the Illuminating Engineering Society of North America (IESNA) adopted Standard 90.1–1999, which included amended efficiency levels for commercial air conditioners and heat pumps. DOE evaluated these efficiency levels and subsequently adopted levels affecting 18 different equipment categories in a 2001 final rule. 66 FR 3336 (Jan. 12, 2001). However, the final rule's notice also indicated that DOE planned to further evaluate commercial air-cooled air conditioners and heat pumps with rated capacities between 65,000 Btu/h and 240,000 Btu/h because the initial analyses indicated that more stringent standards would be technologically feasible and economically justified. Id. at 3349. On June 12, 2001, the Department published a Framework Document that described analytical approaches to evaluate energy conservation standards for these larger commercial air conditioners and heat pumps (i.e. capacities between 65,000 Btu/h and 240,000 Btu/h) and presented this analytical framework to stakeholders at a public workshop. On July 29, 2004, DOE issued an Advance Notice of Proposed Rulemaking (ANOPR) to solicit public comments on its preliminary analyses for this equipment. 69 FR 45461. Subsequently, Congress enacted EPAct 2005, which, among other things, established amended standards for small and large commercial air-cooled air conditioners and heat pumps and new standards for very large air-cooled air conditioners and heat pumps. As a result, EPAct 2005 displaced the rulemaking effort that DOE had already begun. DOE codified these new statutorily-prescribed standards on October 18, 2005. 70 FR 60407.

B. Rulemaking Process

DOE generally follows specific criteria when prescribing amended standards for covered equipment. See generally 42 U.S.C. 6313(a)(6)(B)-(C). An amended standard for covered equipment must be designed to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. Furthermore, DOE may not adopt any amended standard that would not result in the significant conservation of energy. Moreover, DOE may not prescribe a standard for certain equipment, if (1) no test procedure has been established for the equipment, or (2) if DOE determines by rule that, in cases where a standard has been proposed, the proposed standard is not technologically feasible or economically justified. In deciding whether a proposed amended standard is economically justified, DOE must determine whether the benefits of the standard exceed its burdens. DOE must make this determination after receiving comments on the proposed standard, and by considering, to the greatest extent practicable, the following seven factors:

1. The economic impact of the standard on manufacturers and consumers of the equipment subject to the standard;

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

3. The total projected amount of energy savings, or as applicable, water savings, likely to result directly from the imposition of the standard;

4. Any lessening of the utility or the performance of the covered equipment likely to

result from the imposition of 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 imposition of the standard;

6. The need for national energy and water conservation; and

7. Other factors the Secretary of Energy (Secretary) considers relevant. (See generally 42 U.S.C. 6313(a)(6)(B))

As part of this decision-making process, there must also be clear and convincing evidence that the adoption of a national standard that is more stringent than the level set by ASHRAE would result in the significant additional conservation of energy and is technologically feasible and economically justified. See generally 42 U.S.C. 6313(a)(6)(A). Accordingly, EPCA requires that there be clear and convincing evidence that the adoption of standards more stringent than those set by ASHRAE would lead to significant energy savings and that achieving those standards would be both technologically feasible and, separately, economically justified using the seven criteria listed above.

In assessing the appropriateness of amending the standards that are currently in place for small, large, and very large commercial air-cooled air conditioners and heat pumps, DOE is planning to conduct in-depth technical analyses in the following areas to meet the statutory criteria for prescribing amended standards: (1) engineering; (2) energy use; (3) markups; (4) life-cycle cost and payback period; (5) national impacts; (6) manufacturer impacts; (7) emission impacts; (8) utility impacts; (9) employment impacts; and (10) regulatory impacts. These analyses are the same ones DOE routinely applies when evaluating potential standards for a

given type of product or equipment. DOE will also conduct several other analyses that support those previously listed, including the market and technology assessment, the screening analysis (which contributes to the engineering analysis), and the shipments analysis (which contributes to the national impact analysis). As detailed throughout this RFI, DOE is specifically publishing this notice as the first step in the analysis process and is specifically requesting input and data from interested parties to aid in the development of the technical analyses.

II. Energy Efficiency Descriptors

As part of this analysis, DOE is giving very serious consideration to the possible replacement of the existing efficiency descriptor (i.e., energy efficiency ratio (EER)) with a new energy-efficiency descriptor (i.e., integrated energy efficiency ratio (IEER)). Unlike the EER metric, which utilizes only the efficiency of equipment operating at full load conditions, IEER factors in the equipment's efficiency while operating at part-load conditions of 75%, 50%, and 25% of capacity as well as during full load. This is accomplished by weighting the full- and part-load efficiencies with the average amount of time operating at each loading point; IEER provides a more representative measure of the energy consumption in actual operation. Moreover, IEER incorporates variations of outside temperature from design temperatures for part-load operation that further increase the accuracy of the metric.

Since 2007, ASHRAE has been specifying in its Standard 90.1 the use of an energy efficiency metric that captures part-load performance. ASHRAE first published specifications for part-load energy efficiency in their Standard 90.1-2007 based on the integrated part load value (IPLV). In *Addendum s* from the 2008 Supplement to Standard 90.1-2007, ASHRAE

replaced IPLV for commercial air conditioning and heat pump equipment with IEER, effective January 1, 2010. According to ASHRAE, that change was made to improve the accuracy when rating part-load performance of commercial air conditioning and heating equipment.[4]

EPCA authorizes DOE to establish "energy conservation standards" that set either a single performance standard or a single design requirement—not both. See 42 U.S.C. 6311(18). As such, DOE can choose to implement an energy conservation standard using one or the other. In the case of small, large, and very large commercial air-cooled ACs and HPs, ASHRAE Standard 90.1 recommends two performance requirements; EER and IEER. Because EPCA does not specify a particular metric that DOE must use when measuring the efficiency of the equipment at issue in this notice, changing that metric from one type (e.g. EER) to another (e.g. IEER) is permissible. DOE also notes that in amending standards for a given type of product or equipment, DOE must ensure that a potential new standard would not result in reduced stringency when compared to the current Federal standards. See, e.g. 74 FR 36322 and 42 U.S.C. 6313(a)(6)(B)(iii)(I).

As part of its consideration, DOE examined whether part-load performance is currently being used and accepted for rating commercial air conditioners and heat pumps. On January 2, 2009, the Environmental Protection Agency (EPA) issued a draft ENERGY STAR specification for Light Commercial Air Conditioners and Heat Pumps products, i.e., small and large air-cooled air conditioners and air-source heat pumps, which proposed to adopt IEER as part of the

[4] ASHRAE. ASHRAE Addenda. 2008 Supplement. http://www.ashrae.org/File%20Library/docLib/Public/20090317_90_1_2007_supplement.pdf

minimum energy efficiency criteria.[5] In a January 30, 2009 letter regarding EPA's draft, AHRI expressed support for IEER as well as for the ENERGY STAR program to adopt IEER. Recently, the Consortium for Energy Efficiency (CEE), an organization for energy efficiency advocates, has adopted IEER for its Tier 0, 1, and 2 efficiencies for unitary air conditioning and heat pump products, i.e., small, large, and very large air-, water-, and evaporatively-cooled air conditioners and air- and water-source heat pumps.[6]

IEER has also gained support through efforts such as DOE's Commercial Building Energy Alliance (CBEA) technology transfer program, which sponsors the High Performance Rooftop Unit Challenge (RTU Challenge). This program provides a market mechanism that reduces barriers for manufacturers to procure greater than 18-IEER 10-ton equipment and encourages the private sector to commit to adopt energy-efficient equipment. Carrier, Lennox, 7AC Technologies, and Rheem are participating in the RTU Challenge, while participant McQuay has already produced certified equipment that meets or exceeds 18 IEER. In conjunction with manufacturer support, fourteen CBEA-member private entities,[7] such as Target Corp., Macy's, Inc., McDonald's Corp., and others, have also signaled their support and indicated their strong interest in potentially purchasing high-efficiency rooftop units, a sign of their confidence in the RTU Challenge and its ability to use IEER to accurately portray the energy use of commercial air-cooler air conditioners and heat pumps in the field.

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[5] ENERGY STAR. Re: EPA Proposed Draft Energy Star Specification for Light Commercial HVAC Equipment. http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/lhvac/AHRI_Comments_D1.pdf

[6] Consortium for Energy Efficiency. CEE Commercial Unitary AC and HP Specification. http://www.cee1.org/files/CEE_CommHVAC_UnitarySpec2012.pdf

[7] U.S. Department of Energy. Building Technologies Program. High Performance Rooftop Unit Challenge Fact Sheet. http://apps1.eere.energy.gov/buildings/publications/pdfs/alliances/techspec_rtus.pdf

Lastly, DOE conducted a market analysis to compare the two metrics based on publicly available ratings of equipment currently available in the market. DOE is making available for comment a document that provides the methodology and results of the investigation of the relationship between IEER and EER for commercial air-cooled air conditioners and heat pumps with cooling capacities between 65,000 Btu/hr and 760,000 Btu/hr (i.e., 5 and 63 tons). In addition, it looks at the variance of heating efficiency (i.e., coefficient of performance or COP) with IEER and EER. The document is available at: http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/77. Ultimately, if DOE were to decide after considering the comments in response to this notice to migrate to the IEER metric, DOE would transition the existing Federal energy conservation standards to the new metric by identifying the appropriate baseline energy-efficiency levels to use in the analysis. From that point forward, all of the technical and economic analyses would be conducted using the new metric, IEER, in the evaluation of potential amended energy conservation standards for small, large, and very large air-cooled ACs and HPs. Consequently, DOE seeks comments and data regarding its consideration of transitioning metrics and the analysis conducted on the currently available models.

III. Request for Information and Comments

In the next section, DOE identifies a variety of issues on which it seeks input and data in order to aid its development of the technical and economic analyses to determine whether amended energy conservation standards may be warranted. In addition, DOE welcomes comments on other issues relevant to the conduct of this rulemaking that may not specifically be identified in this notice.

A. Test Procedure

DOE recently reviewed and adopted amended test procedures for small, large, and very large, air-cooled commercial package air conditioning and heating equipment in a final rule published on May 16, 2012. 77 FR 28928. These test procedures incorporate by reference certain sections of the Air-Conditioning, Heating, and Refrigeration Institute's (AHRI) 2007 Standard for Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment (AHRI 340/360-2007) along with the addition of a handful of other additional testing specifications. AHRI is an industry trade group representing air conditioning, heating and refrigeration manufacturers.

In light of DOE's consideration to switch from EER to IEER, DOE conducted a preliminary review of the current Federal test procedures for small, large, and very large air-cooled ACs and HPs. As part of its final rule issued on May 16, 2012, DOE adopted AHRI Test Standard 340/360-2007. 77 FR 28928. DOE found that the methods and procedures for testing and rating equipment with an IEER already exist within its test procedure. However, DOE specifically seeks comment on any test procedure issues relating to IEER and the existing Federal procedures that DOE should consider as part of this rulemaking.

A1) DOE requests comment on the existing DOE test procedure for small, large, and very large air-conditioning equipment and its suitability for establishing a performance rating based on IEER.

B. Market Assessment

The market and technology assessment provides information about the commercial air conditioner and heat pump industry that will be used throughout the rulemaking process. For example, this information will be used to determine whether the existing equipment class structure requires modification based on the statutory criteria for setting such classes and to explore the potential for technological improvements in the design and manufacturing of such equipment. The Department uses qualitative and quantitative information to assess the past and present industry structure and market characteristics. DOE will use existing market materials and literature from a variety of sources, including industry publications, trade journals, government agencies, and trade organizations. Additionally, DOE will consider conducting interviews with manufacturers to assess the overall market for commercial air conditioners and heat pumps.

The current equipment classes as established in EPAct 2005 for small, large, and very large, air-cooled ACs and HPs divide this equipment into twelve equipment classes characterized by rated cooling capacity, equipment type (air conditioner versus heat pump), and heating type. As a starting point, DOE plans to use the existing equipment class structure as shown in Table 1 of 10 CFR part 431.97. However, DOE will consider additional equipment classes for capacities or other performance-related features that inherently effect efficiency and justify the establishment of a different energy conservation standard. For instance, additional equipment classes may be warranted to differentiate between split and packaged type units or to further segment the capacities of the equipment covered in this analysis.

B1) DOE requests feedback on the current equipment classes and seeks information

regarding other equipment classes it should consider for inclusion in its analysis.

C. Technology Options for Consideration

DOE uses information about existing and past technology options and prototype designs to help identify technologies that manufacturers could use to meet and/or exceed energy conservation standards. In consultation with interested parties, DOE intends to develop a list of technologies to consider in its analysis. Initially, this list will include all those technologies considered to be technologically feasible and will serve to establish the maximum technologically feasible design. DOE is currently considering the specific technologies and design options listed below.

- Electro-hydrodynamic enhanced heat transfer
- Copper rotor motor with improved efficiency
- Improved refrigerants
- Evaporator coil area (keeping the number of coil rows the same)
- Condenser coil area (keeping the number of coil rows the same)
- Coil rows (keeping face area the same)
- Condenser fan diameters
- Evaporator fan
- Air leakage paths within the unit
- Coil row (keeping coil heat transfer the same)
- Microchannel heat exchangers
- Deep coil heat exchangers
- Low-pressure-loss filters

- High efficiency fan motors
- High efficiency compressors
- Multiple compressors
- Thermal expansion valves
- Electronic expansion valves
- Air foil centrifugal fans
- Backward-curved centrifugal fans
- Synchronous (toothed) belts
- Direct-drive fans
- High efficiency propeller condenser
- High-side solenoid valve or discharge line check-valve to minimize pressure equalization
- Heat-pipes (for high latent loads)
- Sub-coolers
- Demand-control ventilation strategy

C1) DOE seeks information related to these or other unlisted, efficiency improving technologies as to their applicability to the current market and how these technologies improve efficiency of small, large, and very large commercial air-cooler ACs and HPs as rated by AHRI 340/360-2007.

C2) Additionally, DOE requests comment on which of the listed technologies and/or other technologies not mentioned that may preferentially improve the IEER more than the EER for commercial air conditioners and heat pumps.

D. **Engineering Analysis**

The engineering analysis estimates the cost-efficiency relationship of equipment at different levels of increased energy efficiency. This relationship serves as the basis for the cost-benefit calculations for commercial customers, manufacturers, and the nation. In determining the cost-efficiency relationship, DOE will estimate the increase in manufacturer cost associated with increasing the efficiency of equipment above the baseline to the maximum technologically feasible ("max-tech") efficiency level for each equipment class. The baseline model is used as a reference point for each equipment class in the engineering analysis and the life-cycle cost and payback-period analyses. Typically, DOE would consider equipment that just meets the minimum energy conservation standard as baseline equipment. However, DOE is considering whether to replace the current cooling performance energy efficiency descriptor, EER, with IEER, and a single EER level can correspond to a range of IEERs. If DOE decides to transition to a new efficiency descriptor, DOE would have to establish a baseline IEER for each equipment class, and could consider the minimum, median, average, or maximum IEER in the applicable range.

D1) DOE requests comment on approaches that it should consider when determining a baseline IEER for each equipment class, including information regarding the merits and/or deficiencies of such approaches.

D2) DOE also seeks comment on an appropriate baseline IEER for each equipment class and analysis supporting such selected baseline efficiency levels.

D3) DOE requests information on max-tech efficiency levels achievable in the current market in terms of IEER, EER, and COP as applicable.

In order to create the cost-efficiency relationship, DOE anticipates that it will structure its engineering analysis using the reverse-engineering (or cost-assessment) approach. A reverse-engineering or cost-assessment approach relies on a teardown analysis of representative baseline efficient to highly efficient units that employ maximum technologically feasible designs. A teardown analysis (or physical teardown) determines the production cost of a piece of equipment by disassembling the equipment "piece-by-piece" and estimating the material and labor cost of each component. A supplementary method called a catalog teardown uses published manufacturer catalogs and supplementary component data to estimate the major physical differences between a piece of equipment that has been physically disassembled and another piece of similar equipment. These two methods would be used together to help DOE determine the cost effectiveness of any standards that it may consider as part of a standards rulemaking to amend the levels currently in place.

D4) DOE requests feedback on using a reverse engineering approach supplemented with catalog teardowns and requests comment on what the appropriate representative capacities would be for each equipment class.

In the 2004 ANOPR, the Department proposed to address the energy efficiency of commercial air-cooled heat pumps by developing functions relating COP to EER. This method

was also used by industry to establish minimum performance requirements for ASHRAE 90.1-1999. AHRI supplied the ASHRAE 90.1-1999 committee with curves relating the COP as a function of EER, and the committee then set the minimum COP levels based on EER. 69 FR 45460, 45468. Due to the previous acceptance of this method, DOE is considering a similar approach for this rulemaking. If DOE transitions to use IEER as the energy efficiency descriptor, then DOE may establish minimum COP levels based on IEER. DOE has conducted a market analysis and evaluated the relationship between IEER and COP in a technical support document published to coincide with this notice[8]. DOE recognizes that COP does not integrate part load efficiency and that a correlation between COP and IEER may not be robust for this reason.

D5) DOE seeks information about potential issues related to using IEER as the cooling performance efficiency metric when developing a correlation between COP and IEER.

E. **Markups Analysis**

To carry out the life-cycle cost (LCC) and payback period (PBP) calculations, DOE needs to determine the cost to the commercial customer of baseline equipment that satisfies the currently applicable standards, and the cost of the more-efficient unit the customer would purchase under potential amended standards. By applying a multiplier called a "markup" to the manufacturer's selling price, DOE is able to estimate the commercial customer's price.

For DOE's 2004 ANOPR, two types of distribution channels were defined to describe

[8] The document is available at: http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/77

how the equipment passes from the manufacturer to the customer. In the first distribution channel, the manufacturer sells the equipment to a wholesaler. The wholesaler sells the equipment to a mechanical contractor, who then sells it to a general contractor. In the final step to this first channel, the general contractor sells the equipment to the customer/end user (and installs it). In the second distribution channel, the manufacturer sells the equipment directly to the customer through a national account. 69 FR 45460, 45476. For this rulemaking, DOE intends to characterize the distribution of equipment with the same channels developed for the 2004 ANOPR, with modifications to reflect the current status of equipment distribution.

E1) DOE seeks input from stakeholders on whether the distribution channels described above are still relevant for small and large air-cooled commercial air conditioners and heat pumps, and whether they are also relevant for very large air-cooled equipment.

Based on information that equipment manufacturers provided, commercial customers were estimated to purchase 50 percent of equipment through small mechanical contractors, 32.5 percent through large mechanical contractors, and the remaining 17.5 percent through national accounts. In addition, 30 percent of commercial air-conditioning equipment was estimated to be purchased for the new construction market while the remaining 70 percent was estimated to serve the replacement market. In the case of the replacement market, where equipment is purchased through a mechanical contractor, the mechanical contractor purchases equipment directly from the wholesaler (i.e., a general contractor is not involved). 69 FR 45460, 45476.

E2) DOE seeks input on the percent of equipment being distributed through the various

types of distribution channels, and whether the share of equipment through each channel varies based on equipment capacity.

To develop markups for the parties involved in the distribution of the equipment, DOE utilized several sources including: (1) the Air-conditioning & Refrigeration Wholesalers Association's 1998 Wholesaler PROFIT Survey Report to develop wholesaler markups, (2) the Air Conditioning Contractors of America's (ACCA) financial analysis for the heating, ventilation, air-conditioning, and refrigeration (HVACR) contracting industry to develop mechanical contractor markups, and (3) U.S. Census Bureau economic data for the commercial and institutional building construction industry to develop general contractor markups.

D3) DOE seeks recent data to establish the markups for the parties involved with the distribution of the equipment addressed by today's notice.

F. **Energy Use Analysis**

The purpose of the energy use analysis is to assess the energy and peak demand savings potential of different equipment efficiencies in the building types that utilize the equipment. DOE intends to base the energy use analysis for the current effort on building simulation data compiled for the 2004 ANOPR. The simulation database includes hourly profiles for over 1,000 commercial buildings, which were based on building characteristics from the 1995 Commercial Building Energy Consumption Survey (CBECS) for the subset of buildings using the type of equipment covered by the standards. Each building was assigned to a specific location and a typical meteorological year hourly weather file (referred to as TMY2) was used to represent local

weather. The simulations capture variability in cooling loads due to factors such as building activity, schedule, occupancy, local weather and shell characteristics. Because the building simulation data developed for the 2004 ANOPR are based on the 1995 CBECS, DOE intends to take a number of steps to update the building simulation database for this analytical effort and with any subsequent proposed rulemaking that DOE may issue.

DOE intends to adjust the 1995 CBECS building weights to match the most recent CBECS (2003), and to account for changes to the distribution of total floor space by geographic region and building type. CBECS 2012 is currently in development but will not be available in time for DOE to use as part of its rulemaking effort. In addition, the 1995 CBECS sample may not include examples of recent innovations in building shell or window technologies that reduce cooling loads. DOE intends on reviewing other data sets, for example, the technology penetration curves used in the National Energy Modeling System (NEMS) commercial demand module,[9] to determine whether a significant fraction of the current building population is not represented by the building simulation database used for the 2004 ANOPR.

The TMY2 weather data set was updated in 2008 to TMY3. For each location in the building database, the two weather data sets will be compared to determine whether there has been a change to either the monthly maximum temperatures or monthly cooling degree days. DOE intends to adjust the estimated cooling loads and energy use accordingly.

The range of capacities covered by the current effort that DOE may consider is likely to

[9] The National Energy Modeling System (NEMS) is a computer-based, energy-economy modeling system of the U.S. designed and implemented by the Energy Information Administration (EIA) of the U.S. DOE.

be broader than that considered in the 2004 ANOPR, and includes much larger capacity units. For the 2004 ANOPR, a design day simulation was used to determine the total cooling capacity requirement for a building. The simulation assumed this would be met by a number of identical units of fixed capacity. The updated analysis will consider the possibility that a smaller number of larger capacity units may be used. Further, DOE intends to apply the building simulation database to very large equipment (i.e., equipment with capacities between 240,000 Btu/h and 760,000 Btu/h.)

DOE requests comment or seeks input from stakeholders on the following issues pertaining to the energy use analysis:

F1) For different cooling technologies, the relationship between efficiency and the instantaneous load level;

F2) The current distribution of equipment efficiencies in the building population;

F3) For a given cooling load shape, how equipment energy use scales as a function of capacity, i.e., whether two air-conditioning units of a certain capacity use the same total cooling energy as one air-conditioning unit of twice the capacity; and

F4) Whether the building simulations developed for small and large air-conditioning equipment are applicable to very large equipment.

G. **Life-Cycle Cost and Payback Period Analysis**

The purpose of the LCC and PBP analysis is to analyze the effects of potential amended energy conservation standards on customers of commercial air-cooled air-conditioning and heating equipment by determining how a potential amended standard would affect their

operating expenses (usually decreased) and their total installed costs (usually increased).

DOE intends to analyze the potential for variability and uncertainty by performing the LCC and PBP calculations on a representative sample of individual commercial buildings. DOE plans to utilize the sample of buildings developed for the energy use analysis and the corresponding simulations results. Within a given building, one or more air-conditioning units may serve the building's space-conditioning needs, depending on the cooling load requirements of the building. As a result, the Department intends to express the LCC and PBP results as the number of ACs and HPs experiencing economic impacts of different magnitudes. DOE plans to model both the uncertainty and the variability in the inputs to the LCC and PBP analysis using Monte Carlo simulation and probability distributions. As a result, the LCC and PBP results will be displayed as distributions of impacts compared to the base case conditions.

G1) DOE requests comment from stakeholders on the overall method that it intends to use when conducting the LCC and PBP analysis.

Inputs to the LCC and PBP analysis are categorized as: (1) inputs for establishing the purchase expense, otherwise known as the total installed cost, and (2) inputs for calculating the operating expense.

The primary inputs for establishing the total installed cost are the baseline customer price, standard-level customer price increases, and installation costs. Baseline customer prices and standard-level customer price increases will be determined by applying markups to manufacturer

price estimates. The installation cost is added to the customer price to arrive at a total installed cost. For DOE's 2004 ANOPR, DOE developed installation costs from RS Means *Mechanical Cost Data*. 69 FR 45460, 45480. DOE intends to develop installation costs for any potential rulemaking it may conduct for the equipment addressed by today's notice using the most recent RS Means data available. For the 2004 ANOPR, DOE varied installation cost as a function of equipment weight. Because weight tends to increase with equipment efficiency, installation cost increased with equipment efficiency. 69 FR 45460, 45481. DOE intends to develop similar relationships for this analysis and for any proposed rulemaking that may be issued.

G2) DOE seeks input on the approach and data sources it intends to use to develop installation costs, specifically, its intention to use the most recent RS Means *Mechanical Cost Data* and to vary installation cost based on equipment weight.

The primary inputs for calculating the operating costs are equipment energy consumption and power demand, equipment efficiency, electricity prices and forecasts, maintenance and repair costs, equipment lifetime, and discount rates. Both equipment lifetime and discount rates are used to calculate the present value of future operating expenses.

The equipment energy consumption is the site energy use associated with providing space-conditioning to the building. The power demand is the maximum power requirement of the equipment (i.e., the peak demand) for a specific period of time. DOE intends to utilize updated building simulation results from its 2004 ANOPR to establish equipment energy use and demand.

For projecting equipment efficiency, DOE will use the most appropriate metric to characterize efficiency, whether it is EER or IEER. The building simulations conducted for the 2004 ANOPR assigned specific baseline and standard level EERs to the equipment to determine its corresponding energy consumption and peak demand. 69 FR 45460, 45482. If DOE utilizes an IEER as the metric for equipment efficiency, the updating of the building simulation results will address how equipment efficiency, expressed as IEER, will impact energy use and demand.

Electricity prices are the price per kilowatt-hour paid by each customer for electricity. For the 2004 ANOPR, DOE determined electricity prices based on tariffs from a representative sample of electric utilities. 69 FR 45460, 45481-82. This approach calculates energy expenses based on actual electricity prices that customers are paying. DOE intends to retain the tariff-based approach for its analysis and plans to update its electricity prices based on recent or current tariffs. Future electricity prices will likely be forecasted using trends from the Energy Information Administration's most recent Annual Energy Outlook.

G3) DOE seeks comment on its tariff-based approach for developing electricity prices. DOE seeks input on specific data sources available for collecting tariffs.

Maintenance costs are costs associated with maintaining the operation of the equipment. For DOE's 2004 ANOPR, DOE developed maintenance costs from RS Means *Facilities Maintenance & Repair Cost Data*. 69 FR 45460, 45485. DOE intends to develop maintenance costs for its analysis using the most recent RS Means data available. For the 2004 ANOPR, DOE

estimated that maintenance costs do not vary with equipment efficiency. 69 FR 45460, 45485. DOE intends to use the same assumption as part of its analysis in determining whether amending the current standards is appropriate under the statutory criteria.

G4) DOE seeks input on the approach and data sources it intends to use to develop maintenance costs, specifically, its intention to use the most recent RS Means *Facilities Maintenance & Repair Cost Data* and in assuming that maintenance costs do not vary with equipment efficiency.

Repair costs are associated with repairing or replacing components that have failed. For the 2004 ANOPR, DOE estimated that repair costs varied as function of customer equipment price. 69 FR 45460, 45485. DOE intends to determine whether repair costs continue to vary with equipment prices as part of its determination analysis.

G5) DOE seeks comment as to whether repair costs vary as a function of equipment price. DOE also requests any data or information on developing repair costs.

Equipment lifetime is the age at which the equipment is retired from service. For the 2004 ANOPR, DOE based equipment lifetime on a retirement function, which was based on the use of a Weibull probability distribution, with a resulting median lifetime of 15 years. 69 FR 45460, 45486. DOE intends to use the same retirement function for its analysis.

G6) DOE seeks comment on its approach of using a Weibull probability distribution to

characterize equipment lifetime. DOE also requests any data or information that demonstrates whether equipment lifetime has a median value of 15 years and whether equipment lifetime varies based on equipment class.

The discount rate is the rate at which future expenditures are discounted to establish their present value. For the 2004 ANOPR, DOE derived the discount rates by estimating the cost of capital of companies that purchase air-cooled air-conditioning equipment. 69 FR 45460, 45486-87. DOE intends to apply this approach for its analysis and to update its data sources for calculating the cost of capital of companies that purchase air-cooled air-conditioning equipment.

DOE measures LCC and PBP impacts of potential standard levels relative to a base case that reflects the likely market in the absence of amended standards. DOE plans to develop market-share efficiency data (i.e., the distribution of equipment shipments by efficiency) for the equipment classes DOE is considering, for the year in which compliance with any amended standards would be required.

G7) DOE requests data on current efficiency market shares (of shipments) by equipment class, and also similar historic data. In particular, DOE needs efficiency data for very large equipment.

G8) DOE also requests information on expected trends in efficiency over the next five years.

H. **Shipments Analysis**

DOE uses shipment projections by equipment class to calculate the national impacts of standards on energy consumption, net present value (NPV), and future manufacturer cash flows.

For the 2004 ANOPR, DOE developed a shipments model for small and large air-cooled air-conditioning and heating equipment driven by historical shipments data. 69 FR 45492. The accuracy of the shipments model is highly dependent on historical shipments data as the data is used not only to build up an equipment stock but also to calibrate the shipments model.

H1) DOE seeks recent historical shipments data for small, large, and very large air conditioners and heat pumps. Because very large equipment were not considered in the 2004 ANOPR, DOE is especially in need of shipments data for this class of equipment.

The shipments model for the 2004 ANOPR considered three market segments: (1) new commercial buildings acquiring equipment, (2) existing buildings replacing broken equipment, and (3) existing buildings acquiring new equipment for the first time. It considered two stock categories: (1) equipment that has received only normal maintenance repairs, and (2) equipment that has had its useful life extended through additional repairs. To determine whether a customer would choose to repair rather than replace their air-conditioning equipment, the shipments model explicitly accounted for the combined effects of changes in purchase price, annual operating cost, and the value of commercial floor space on the purchase versus repair decision. Changes to the purchase price and operating costs due to standards were the drivers for shipment estimates for the standards cases relative to the base case (the case without standards). Because purchase

price had more of an effect on shipments than operating costs, standards case shipments estimated for the 2004 ANOPR were 0.2-percent to 5-percent lower than the base case, depending on the increased price associated with the standard level. Extended repairs, i.e., repairing the equipment rather than purchasing a new unit, accounted for 80-percent of the shipments decrease with the remaining 20-percent due to forgone shipments to new construction. DOE intends to utilize the same approach to develop the shipments model for this rulemaking

H2) DOE requests comment on the approach it intends on using to develop the shipments model and shipments forecasts for this rulemaking.

For the 2004 ANOPR, DOE utilized U.S. Census Bureau data to establish historical new construction floor space as well as historical stock floor space. The Annual Energy Outlook was used to forecast both new construction and stock floor space. Together with historical equipment saturation data from CBECS, DOE was able to estimate shipments to the three market segments identified above. The utility function to estimate the repair versus replacement decision was based on income per square foot data from the Building Owners and Managers Association (BOMA) *Commercial Building Survey* reports, purchase price data estimated from the Bureau of Labor Statistics, and operating cost data derived from the LCC and PBP analysis. 69 FR 45493. DOE intends to update all of the above data sources for the development of the shipments model for its analysis.

H3) DOE seeks input on the approach and data sources it intends to use in developing the shipments model and shipments forecasts for this analysis.

I. National Impact Analysis

The purpose of the national impact analysis (NIA) is to estimate aggregate impacts of potential efficiency standards at the national level. Impacts that DOE reports include the national energy savings (NES) from potential standards and the national NPV of the total customer benefits.

To develop the NES, DOE calculates annual energy consumption for the base case and the standards cases. DOE calculates the annual energy consumption using per-unit annual energy use data multiplied by projected shipments.

To develop the national NPV of customer benefits from potential standards, DOE calculates annual energy expenditures and annual equipment expenditures for the base case and the standards cases. DOE calculates annual energy expenditures from annual energy consumption by incorporating forecasted energy prices, using shipment projections and average energy efficiency projections. DOE calculates annual equipment expenditures by multiplying the price per unit times the projected shipments. The difference each year between energy bill savings and increased equipment expenditures is the net savings or net costs.

A key component of DOE's estimates of NES and NPV are the equipment energy efficiencies forecasted over time for the base case and for each of the standards cases. For the 2004 ANOPR, DOE used a combination of historical commercial and residential equipment efficiency data to forecast efficiencies for the base case. To estimate the impact that standards

have in the year compliance becomes required, DOE used a "roll-up" scenario which assumes that equipment efficiencies in the base case that do not meet the standard level under consideration would "roll up" to meet the new standard level and equipment shipments at efficiencies above the standard level under consideration are not affected. 69 FR45460, 45489-90. DOE intends to use the same methods for conducting the NIA for this analysis.

I1) In addition to historical efficiency data (see section III.H), DOE also requests information on expected trends in efficiency over the long run.

J. Submission of Comments

DOE invites all interested parties to submit in writing by **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**, comments and information on matters addressed in this notice and on other matters relevant to DOE's consideration of a new efficiency descriptor and amended energy conservations standard for commercial air-cooled air conditioners and heat pumps. After the close of the comment period, DOE will begin collecting data, conducting the analyses, and reviewing the public comments, as needed. These actions will be taken to aid in the development of a NOPR for commercial air-cooled air conditioners and heat pumps if DOE decides to replace EER with IEER and amend the standards for such equipment.

DOE considers public participation to be a very important part of the process for developing test procedures. DOE actively encourages the participation and interaction of the public during the comment period in each stage of the rulemaking process. Interactions with and between members of the public provide a balanced discussion of the issues and assist DOE in the rulemaking process. Anyone who wishes to be added to the DOE mailing list to receive future notices and information about this rulemaking should contact Ms. Brenda Edwards at (202) 586–2945, or via e-mail at Brenda.Edwards@ee.doe.gov.

Issued in Washington, DC, on January 25, 2013.

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

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