[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 431

[EERE-2022-BT-STD-0015]

Energy Conservation Program: Test Procedures and Energy Conservation Standards for Commercial Package Air Conditioners and Heat Pumps

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

ACTION: Request for information.

SUMMARY: The U.S. Department of Energy ("DOE") is considering potential amendments to the test procedures for air-cooled commercial package air conditioners and heat pumps with a rated cooling capacity greater than or equal to 65,000 Btu/h, evaporatively-cooled commercial package air conditioners, and water-cooled commercial package air conditioners. DOE is also considering whether to amend the current energy conservation standards for air-cooled commercial package air conditioners and heat pumps with a rated cooling capacity greater than or equal to 65,000 Btu/h. Through this request for information ("RFI"), DOE seeks data and information regarding issues pertinent to whether amended test procedures would more accurately or fully comply with the requirement that the test procedure produces results that measure energy use during a representative average use cycle for the equipment without being unduly burdensome to conduct, or reduce testing burden. DOE also welcomes written comments

from the public on any subject within the scope of this document (including those topics not specifically raised), as well as the submission of data and other relevant information.

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

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *www.regulations.gov*, under docket number EERE–2022–BT–STD–0015. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE–2022–BT–STD–0015, by any of the following methods:

1) *Email*: *CommPkgACHP2022STDandTP0015@ee.doe.gov*. Include the docket number EERE–2022–BT–STD–0015 in the subject line of the message.
2) *Postal Mail*: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 287-1445. If possible, please submit all items on a compact disc ("CD"), in which case it is not necessary to include printed copies.
3) *Hand Delivery/Courier*: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW., 6th Floor, Washington, DC, 20024. Telephone: (202) 287-1445. If

possible, please submit all items on a CD, in which case it is not necessary to include printed copies. Include docket number EERE–2022–BT–STD–0015 in the subject line of the message.

No telefacsimiles ("faxes") will be accepted. For detailed instructions on submitting comments and additional information on this process, see section III of this document.

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

The docket web page can be found at *www.regulations.gov/#!docketDetail;D=EERE-2022-BT-STD-0015*. The docket web page contains instructions on how to access all documents, including public comments, in the docket. See section III for information on how to submit comments through *www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT:

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Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-7335. Email: *ApplianceStandardsQuestions@ee.doe.gov*.

Mr. Michael Kido, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue SW, Washington, DC 20585. Telephone: (202) 586-8145. Email: *Michael.Kido@hq.doe.gov*.

For further information on how to submit a comment, or review other public comments and the docket contact the Appliance and Equipment Standards Program staff at (202) 287-1445 or by e-mail: *ApplianceStandardsQuestions@ee.doe.gov*.

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I. Introduction

Commercial package air conditioning and heating equipment is included in the list of "covered equipment" for which DOE is authorized to establish and amend energy conservation standards and test procedures. (42 U.S.C. 6311(1)(B)-(D)) This equipment includes air-cooled commercial unitary air conditioners with a rated cooling capacity greater than or equal to 65,000 British thermal units per hour ("Btu/h") ("ACUACs"), air-cooled commercial unitary heat pumps with a rated cooling capacity greater than or equal to 65,000 Btu/h ("ACUHPs"), evaporatively-cooled commercial unitary air conditioners ("ECUACs"), and water-cooled commercial unitary air conditioners ("WCUACs"), which are all the subject of this RFI.[1] (ACUACs, ACUHPs, ECUACs, and WCUACs are referred to collectively as "CUACs and CUHPs" in this document). The current DOE test procedures for CUACs and CUHPs are codified in Table 1 at title 10 of the Code of Federal Regulations ("CFR") part 431, subpart F, section 96. *See* 10 CFR 431.96. The current Federal energy conservation standards for ACUACs and ACUHPs are established at 10 CFR 431.97(b). The following sections discuss DOE's authority to establish and amend test procedures and energy conservation standards for CUACs and CUHPs, as

[1] While ACUACs with a rated cooling capacity less than 65,000 Btu/h are included in the broader category of CUACs, they are not addressed in this RFI. The test procedure and standards for those smaller capacity ACUACs are being addressed in separate rulemakings. *See* Docket Nos. EERE-2017-BT-TP-0031 and EERE-2022-BT-STD-0008, respectively. All references to CUACs and CUHPs made in this document exclude these lower capacity ACUACs.
Additionally, double-duct air conditioners and heat pumps (*i.e.*, double-duct systems) are included in the broader category of ACUACs. While the test procedure for double-duct systems is addressed in this document, the standards for them are not. DOE will address standards for double-duct systems in a future rulemaking. Accordingly, all references to standards for ACUACs and ACUHPs appearing in this document exclude double-duct systems.

well as relevant background information regarding DOE's considerations of test procedures and standards for this equipment.

A. Authority

The Energy Policy and Conservation Act, as amended ("EPCA"),[2] authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291-6317) Title III, Part C[3] of EPCA, added by Pub. L. 95-619, Title IV, § 441(a), established the Energy Conservation Program for Certain Industrial Equipment, which sets forth a variety of provisions designed to improve energy efficiency. This covered equipment includes small, large, and very large commercial package air conditioning and heating equipment. (42 U.S.C. 6311(1)(B)-(D)) Commercial package air conditioning and heating equipment includes CUACs and CUHPs, which are the subject of this NOPR.

The energy conservation program under EPCA consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of EPCA include definitions (42 U.S.C. 6311), test procedures (42 U.S.C. 6314), labeling provisions (42 U.S.C. 6315), energy conservation standards (42 U.S.C. 6313), and the authority to require information and reports from manufacturers (42 U.S.C. 6316).

[2] All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Pub. L. 116-260 (Dec. 27, 2020), which reflect the last statutory amendments that impact Parts A and A-1 of EPCA.
[3] For editorial reasons, upon codification in the U.S. Code, Part C was redesignated Part A-1.

The Federal testing requirements consist of test procedures that manufacturers of covered equipment must use as the basis for: (1) certifying to DOE that their equipment complies with the applicable energy conservation standards adopted pursuant to EPCA (42 U.S.C. 6316(b); 42 U.S.C. 6296), and (2) making representations about the efficiency of that equipment (42 U.S.C. 6314(d)). Similarly, DOE uses these test procedures to determine whether the equipment complies with relevant standards promulgated under EPCA.

Federal energy efficiency requirements for covered equipment established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6316(a) and (b); 42 U.S.C. 6297) DOE may, however, grant waivers of Federal preemption for particular State laws or regulations, in accordance with the procedures and other provisions of EPCA. (42 U.S.C. 6316(b)(2)(D))

Under 42 U.S.C. 6314, EPCA also sets forth the general criteria and procedures DOE is required to follow when prescribing or amending test procedures for covered equipment. EPCA requires that any test procedure prescribed or amended under this section must be reasonably designed to produce test results which reflect energy efficiency, energy use, or estimated operating cost of covered equipment during a representative average use cycle and requires that test procedures not be unduly burdensome to conduct. (42 U.S.C. 6314(a)(2))

EPCA requires that the test procedures for CUACs and CUHPs be those generally accepted industry testing procedures or rating procedures developed or recognized by the Air-Conditioning, Heating, and Refrigeration Institute ("AHRI") or by the American Society of Heating, Refrigerating and Air-Conditioning Engineers ("ASHRAE"), as referenced in ASHRAE Standard 90.1, "Energy Standard for Buildings Except Low-Rise Residential Buildings" ("ASHRAE Standard 90.1"). (42 U.S.C. 6314(a)(4)(A)) If such an industry test procedure is amended, DOE must update its test procedure to be consistent with the amended industry test procedure, unless DOE determines, by rule published in the *Federal Register* and supported by clear and convincing evidence, that the amended test procedure would not meet the requirements in 42 U.S.C. 6314(a)(2) and (3) related to representative use and test burden. (42 U.S.C. 6314(a)(4)(B) and 42 U.S.C. 6314(a)(4)(C))

EPCA also requires that, at least once every 7 years, DOE evaluate test procedures for each type of covered equipment, including CUACs and CUHPs, to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures to not be unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle. (42 U.S.C 6314(a)(1))

In addition, if the Secretary determines that a test procedure amendment is warranted, the Secretary must publish proposed test procedures in the *Federal Register*, and afford interested persons an opportunity (of not less than 45 days' duration) to

present oral and written data, views, and arguments on the proposed test procedures. (42 U.S.C 6314(b)) If DOE determines that test procedure revisions are not appropriate, DOE must publish its determination not to amend the test procedures. (42 U.S.C 6314(a)(1))

In EPCA, as amended by the Energy Policy Act of 1992 ("EPAct") (Pub. L. 102-486), Congress initially set mandatory energy conservation standards for certain types of commercial heating, air-conditioning, and water-heating equipment. (106 Stat. 2776, 2810-2814) Specifically, the statute set 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 initially establishing Federal energy conservation standards, the EPAct amendments to EPCA prescribed standards at levels that generally corresponded to the levels in ASHRAE Standard 90.1, as in effect on October 24, 1992 (*i.e.,* the 1989 edition of ASHRAE Standard 90.1), for each type of covered equipment listed.

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 covered equipment listed, each time ASHRAE amends Standard 90.1 with respect to such equipment. (42 U.S.C. 6313(a)(6)(A)) When triggered in this manner, DOE must undertake and publish an analysis of the energy savings potential of amended energy efficiency standards, and amend the Federal standards to establish a uniform national standard at the minimum

level specified in the amended ASHRAE Standard 90.1, unless DOE determines that there is clear and convincing evidence to support a determination that a more-stringent standard 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)(i)-(ii)) If DOE decides to adopt as a national standard the minimum 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, supported by clear and convincing evidence, that a more-stringent uniform national standard would result in significant additional conservation of energy and is technologically feasible and economically justified, then DOE must establish such more-stringent uniform national standard not later than 30 months after publication of the amended ASHRAE Standard 90.1. (42 U.S.C. 6313(a)(6)(A)(ii)(II) and 42 U.S.C. 6313(a)(6)(B))

Although EPCA does not explicitly define the term "amended" in the context of what type of revision to ASHRAE Standard 90.1 would trigger DOE's obligation, DOE's longstanding interpretation has been that the statutory trigger is an amendment to the standard applicable to that equipment under ASHRAE Standard 90.1 that increases the energy efficiency level for that equipment. *See* 72 FR 10038, 10042 (March 7, 2007). In other words, if the revised ASHRAE Standard 90.1 leaves the energy efficiency level unchanged (or lowers the energy efficiency level), as compared to the energy efficiency level specified by the uniform national standard adopted pursuant to EPCA, regardless of the other amendments made to the ASHRAE Standard 90.1 requirement (*e.g.*, the inclusion of an additional metric), DOE has stated that it 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). *See* 74 FR 36312, 36313 (July 22, 2009) and 77 FR 28928, 28937 (May 16, 2012). However, DOE notes that Congress adopted amendments to these provisions related to ASHRAE Standard 90.1 equipment under the American Energy Manufacturing Technical Corrections Act (Pub. L. 112-210 (Dec. 18, 2012)) ("AEMTCA"). In relevant part, DOE is prompted to act whenever ASHRAE Standard 90.1 is amended with respect to "the standard levels or design requirements applicable under that standard" to any of the enumerated types of commercial air conditioning, heating, or water heating equipment. (42 U.S.C. 6313(a)(6)(A)(i))

EPCA does not detail the exact type of amendment that serves as a triggering event. However, DOE has considered whether its obligation is triggered in the context of whether the specific ASHRAE Standard 90.1 requirement on which the most current Federal requirement is based is amended (*i.e.*, the regulatory metric or design requirement). For example, if an amendment to ASHRAE Standard 90.1 changed the metric for the standard on which the Federal requirement was based, DOE would perform a crosswalk analysis to determine whether the amended metric under ASHRAE Standard 90.1 resulted in an energy efficiency level that was more stringent than the current DOE standard. Conversely, if an amendment to ASHRAE Standard 90.1 were to add an additional metric by which a class of equipment is to be evaluated, but did not amend the requirement that is in terms of the metric on which the Federal requirement was based, DOE would not consider its obligation triggered.

In those situations where ASHRAE has not acted to amend the levels in Standard 90.1 for the equipment types enumerated in the statute, EPCA also provides for a 6-year-lookback to consider the potential for amending the uniform national standards. (42 U.S.C. 6313(a)(6)(C)) Specifically, pursuant to the amendments to EPCA under AEMTCA, DOE is required to conduct an evaluation of each class of covered equipment in ASHRAE Standard 90.1 "every 6 years" to determine whether the applicable energy conservation standards need to be amended. (42 U.S.C. 6313(a)(6)(C)(i)) DOE must publish either a notice of proposed rulemaking ("NOPR") to propose amended standards or a notification of determination that existing standards do not need to be amended. (42 U.S.C. 6313(a)(6)(C)) In proposing new standards under the 6- year review, DOE must undertake the same considerations as if it were adopting a standard that is more stringent than an amendment to ASHRAE Standard 90.1. (42 U.S.C. 6313(a)(6)(C)(i)(II)) This is a separate statutory review obligation, as differentiated from the obligation triggered by an ASHRAE Standard 90.1 amendment. While the statute continues to defer to ASHRAE's lead on covered equipment subject to Standard 90.1, it does allow for a comprehensive review of all such equipment and the potential for adopting more-stringent standards, where supported by the requisite clear and convincing evidence. That is, DOE interprets ASHRAE's not amending Standard 90.1 with respect to a product or equipment type as ASHRAE's determination that the standard applicable to that product or equipment type is already at an appropriate level of stringency, and DOE will not amend that standard unless there is clear and convincing evidence that a more stringent level is justified. As a preliminary step in the process of reviewing the changes to ASHRAE Standard 90.1, EPCA directs DOE to publish in the *Federal Register* for

public comment an analysis of the energy savings potential of amended standards within 180 days after ASHRAE Standard 90.1 is amended with respect to any of the covered equipment specified under 42 U.S.C. 6313(a). (42 U.S.C. 6313(a)(6)(A)).

B. Background

1. Test Procedure

DOE's existing test procedure for CUACs and CUHPs appears at 10 CFR 431.96 ("Uniform test method for the measurement of energy efficiency of commercial air conditioners and heat pumps"). The test procedure for ACUACs and ACUHPs specified in 10 CFR 431.96 references appendix A to subpart F of part 431, "Uniform Test Method for the Measurement of Energy Consumption of Air-Cooled Small (≥65,000 Btu/h), Large, and Very Large Commercial Package Air Conditioning and Heating Equipment" ("appendix A"). Appendix A references certain sections of ANSI/AHRI Standard 340/360-2007, "2007 Standard for Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment," approved by ANSI on October 27, 2011, and updated by addendum 1 in December 2010 and addendum 2 in June 2011 ("ANSI/AHRI 340/360-2007"); ANSI/ASHRAE Standard 37-2009, "Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment" ("ANSI/ASHRAE 37-2009"); and specifies other test procedure requirements related to minimum external static pressure ("ESP"), optional break-in period, refrigerant charging, setting indoor airflow, condenser head pressure controls, tolerance on capacity at part-load test points, and condenser air inlet temperature for part-load tests. The DOE test procedure for ECUACs and WCUACs with a rated cooling capacity of greater than or equal to 65,000 Btu/h specified in 10 CFR 431.96 incorporates by reference ANSI/AHRI

340/360-2007 (excluding Section 6.3 of ANSI/AHRI 340/360-2007 and including paragraphs (c) and (e) of 10 CFR 431.96). The DOE test procedure for ECUACs and WCUACs with a rated cooling capacity of less than 65,000 Btu/h incorporates by reference ANSI/AHRI Standard 210/240-2008, "2008 Standard for Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment," approved by ANSI on October 27, 2011, and updated by addendum 1 in June 2011 and addendum 2 in March 2012 ("ANSI/AHRI 210/240-2008").

On October 26, 2016, ASHRAE published ASHRAE Standard 90.1-2016, which included updates to the test procedure references for CUACs and CUHPs (excluding ECUACs and WCUACs with a rated cooling capacity less than 65,000 Btu/h) to reference AHRI Standard 340/360-2015, "2015 Standard for Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment" ("AHRI 340/360-2015"). On July 25, 2017, DOE published an RFI ("July 2017 TP RFI") to collect information and data to consider amendments to DOE's test procedures for certain categories of commercial package air conditioning and heating equipment, including CUACs and CUHPs. 82 FR 34427. As part of the July 2017 TP RFI, DOE identified several aspects of the currently applicable Federal test procedures for CUACs and CUHPs that might warrant modifications, in particular: incorporation by reference of the most recent version of the relevant industry standard(s); efficiency metrics and calculations; and clarification of test methods. 82 FR 34427, 34439-34448. DOE also requested comment on any additional topics that may inform DOE's decisions in a future test procedure rulemaking, including methods to reduce regulatory burden while ensuring the procedures' accuracies. 82 FR 34427, 34448.

On October 24, 2019, ASHRAE published ASHRAE 90.1-2019, which updated the AHRI Standard 340/360 reference to the 2019 edition, "2019 Standard for Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment" ("AHRI 340/360-2019"). On January 25, 2022, AHRI approved an updated version of its test method for CUACs and CUHPs, with the publication of AHRI Standard 340/360-2022, "2022 Standard for Performance Rating of Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment" ("AHRI 340/360-2022").

For ECUACs and WCUACs with a rated cooling capacity less than 65,000 Btu/h, ASHRAE 90.1-2016 references ANSI/AHRI 210/240-2008. After the publication of the July 2017 TP RFI, AHRI published AHRI Standard 210/240-2017, "2017 Standard for Performance Rating of Unitary Air-conditioning & Air-source Heat Pump Equipment," ("AHRI 210/240-2017"). ASHRAE 90.1-2019 references AHRI 210/240-2017 as the test procedure for ECUACs and WCUACs. After the publication of AHRI 210/240-2017, AHRI released two updates to the industry standard: (1) AHRI Standard 210/240-2017 with Addendum 1, "2017 Standard for Performance Rating of Unitary Air-conditioning & Air-source Heat Pump Equipment," ("AHRI 210/240-2017 with Addendum 1"), which was published in April 2019; and (2) AHRI Standard 210/240-2023, "2023 Standard for Performance Rating of Unitary Air-conditioning & Air-source Heat Pump Equipment," ("AHRI 210/240-2023"), which was published in May 2020.

Notably, ECUACs and WCUACs with a rated cooling capacity less than 65,000 Btu/h were removed from the scope of AHRI 210/240-2023. ECUACs and WCUACs

with a rated cooling capacity less than 65,000 Btu/h were instead included in the scope of AHRI 340/360-2022.

The updates in AHRI 340/360-2022, AHRI 210/240-2023, as well as comments received in the interim that relate to the CUAC and CUHP test procedure have prompted DOE to publish this RFI to investigate additional aspects of the CUAC and CUHP test procedure. Upon further evaluation, DOE has identified several issues that would benefit from further comment. DOE discusses these topics in section II.A of this document.[4]

2. Standards

In a direct final rule published on January 15, 2016, ("January 2016 direct final rule"), DOE adopted amended standards for ACUACs, and ACUHPs. 81 FR 2420. For ACUACs and ACUHPs, DOE adopted two tiers of amended standards with staggered compliance dates and changed the regulated cooling metric from energy efficiency ratio ("EER") to integrated energy efficiency ratio ("IEER").[5] 81 FR 2420, 2531-2532. The first tier of amended standards—with a compliance date of January 1, 2018—are equivalent to the IEER minimum efficiency levels for ACUACs and ACUHPs in

[4] In this RFI, DOE only summarizes comments received in response to the July 2017 TP RFI that relate to the topics of interest within this document. All other comments, which relate to different topics, will be summarized in a subsequent document that follows this RFI.

[5] The EER metric only accounts for the efficiency of the equipment operating at full load. The IEER metric factors in the efficiency of operating at part loads of 75 percent, 50 percent, and 25 percent of capacity, as well as the efficiency at full load. This is accomplished by weighting the full-load and part-load efficiencies with the average amount of time operating at each loading point. Additionally, IEER incorporates reduced condenser temperatures (*i.e.*, reduced outdoor ambient temperatures) for part-load operation.

ASHRAE 90.1-2016. The second tier of amended standards—with a compliance date of January 1, 2023—are more stringent than the levels in ASHRAE 90.1-2016.

The current energy conservation standards for ACUACs and ACUHPs are codified in DOE's regulations at 10 CFR 431.97.

Since publication of the January 2016 direct final rule, ASHRAE published an updated version of ASHRAE Standard 90.1 ("ASHRAE 90.1-2019"), which updated the minimum efficiency levels for ACUACs and ACUHPs to align with those adopted by DOE in the January 2016 direct final rule (*i.e.*, specifying two tiers of minimum levels for ACUACs and ACUHPs, with a 2023 compliance date for the second tier).

As a preliminary step in the process of reviewing the standards for ACUACs and ACUHPs, DOE published an RFI on May 12, 2020 ("May 2020 ECS RFI") to request data and information pursuant to its 6-year-lookback review. 85 FR 27941. The May 2020 ECS RFI sought information to help DOE inform its decisions, consistent with its obligations under EPCA. DOE received multiple comments from stakeholders in response to the May 2020 ECS RFI that prompted DOE to publish this RFI to investigate additional aspects of the ACUAC and ACUHP standards. Upon further evaluation, DOE has identified several issues that would benefit from further comment. DOE discusses these topics (including any comments received in response to the May 2020 ECS RFI that are related to these topics) in section II.B of this document. DOE also received

comments in response to the May 2020 ECS RFI that relate to the CUAC and CUHP test procedure, which are addressed in section in section II.A of this document.[6]

C. Standards Rulemaking Process

As discussed, DOE is required to conduct an evaluation of each class of covered equipment in ASHRAE Standard 90.1 every six years. (42 U.S.C. 6313(a)(6)(C)(i)) In making a determination of whether standards for such equipment need to be amended, DOE must follow specific statutory criteria. DOE must evaluate whether amended Federal standards would result in significant additional conservation of energy and are technologically feasible and economically justified. (42 U.S.C. 6313(a)(6)(C)(i) (referencing 42 U.S.C. 6313(a)(6)(A))

The significance of energy savings offered by a new or amended energy conservation standard cannot be determined without knowledge of the specific circumstances surrounding a given rulemaking.[7] For example, the United States has now rejoined the Paris Agreement on February 19, 2021. As part of that agreement, the United States has committed to reducing greenhouse gas ("GHG") emissions in order to limit the rise in mean global temperature.[8] As such, energy savings that reduce GHG emission have taken on greater importance. Additionally, some covered products and

[6] In this RFI, DOE only summarizes comments received in response to the May 2020 ECS RFI that relate to the topics of interest within this RFI. All other comments received, which relate to different topics, will be summarized and addressed in a subsequent document that follows this RFI.
[7]Procedures, Interpretations, and Policies for Consideration in New or Revised Energy Conservation Standards and Test Procedures for Consumer Products and Commercial/Industrial Equipment, 86 FR 70892, 70901 (Dec. 13, 2021).
[8] *See* Executive Order 14008, 86 FR 7619 (Feb. 1, 2021) ("Tackling the Climate Crisis at Home and Abroad").

equipment have most of their energy consumption occur during periods of peak energy demand. The impacts of these products on the energy infrastructure can be more pronounced than products with relatively constant demand. In evaluating the significance of energy savings, DOE considers differences in primary energy and full-fuel cycle ("FFC") effects for different covered products and equipment when determining whether energy savings are significant. Primary energy and FFC effects include the energy consumed in electricity production (depending on load shape), in distribution and transmission, and in extracting, processing, and transporting primary fuels (i.e., coal, natural gas, petroleum fuels), and thus present a more complete picture of the impacts of energy conservation standards. Accordingly, DOE evaluates the significance of energy savings on a case-by-case basis. To determine whether a standard is economically justified, EPCA requires that DOE determine 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 the manufacturers and consumers of the affected products;

2) The savings in operating costs throughout the estimated average life of the product compared to any increases in the initial cost, or maintenance expenses;

3) The total projected amount of energy and water (if applicable) 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 and water conservation; and

7) Other factors the Secretary considers relevant.

(42 U.S.C. 6313(a)(6)(B)(ii)(I)-(VII))

DOE fulfills these and other applicable requirements by conducting a series of analyses throughout the rulemaking process. Table I.1 shows the individual analyses that are performed to satisfy each of the requirements within EPCA.

Table I.1 EPCA Requirements and Corresponding DOE Analysis

EPCA Requirement	Corresponding DOE Analysis
Significant Energy Savings	• Shipments Analysis • National Impact Analysis • Energy and Water Use Determination
Technological Feasibility	• Market and Technology Assessment • Screening Analysis • Engineering Analysis
Economic Justification:	
1. Economic Impact on Manufacturers and Consumers	• Manufacturer Impact Analysis • Life-Cycle Cost and Payback Period Analysis • Life-Cycle Cost Subgroup Analysis • Shipments Analysis
2. Lifetime Operating Cost Savings Compared to Increased Cost for the Product	• Markups for Product Price Determination • Energy and Water Use Determination • Life-Cycle Cost and Payback Period Analysis
3. Total Projected Energy Savings	• Shipments Analysis • National Impact Analysis
4. Impact on Utility or Performance	• Screening Analysis • Engineering Analysis
5. Impact of Any Lessening of Competition	• Manufacturer Impact Analysis
6. Need for National Energy and Water Conservation	• Shipments Analysis • National Impact Analysis
7. Other Factors the Secretary Considers Relevant	• Employment Impact Analysis • Utility Impact Analysis • Emissions Analysis • Monetization of Emission Reductions Benefits[9] • Regulatory Impact Analysis

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

As detailed throughout this RFI, DOE is publishing this document seeking input and data from interested parties to aid in the development of the technical analyses on which DOE will ultimately rely to determine whether (and if so, how) to amend the standards for ACUACs and ACUHPs.

II. Request for Information and Comments

A. Test Procedure

In the following sections, DOE has identified a variety of issues on which it seeks input to determine whether, and if so how, amended test procedures for CUACs and CUHPs would (1) more accurately or fully comply with the requirements in EPCA that test procedures be reasonably designed to produce test results which reflect energy use during a representative average use cycle, without being unduly burdensome to conduct (42 U.S.C. 6314(a)(2)); or (2) reduce testing burden.

1. External Static Pressure Levels

ESP requirements simulate the resistance that the indoor fan must overcome from the air distribution system when installed in the field. The indoor ESP requirements for CUACs and CUHPs in the current DOE test procedure, through reference to AHRI 210/240-2008 and AHRI 340/360-2007, are shown in Table II.1 of this document. These

indoor ESP requirements align with those in Table 7 of AHRI 340/360-2022, the most up to date industry test procedure for CUACs and CUHPs.[10]

Table II.1: Indoor ESP requirements for CUACs and CUHPs per AHRI 210/240-2008 and AHRI 340/360-2007

Rated Cooling Capacity (kBtu/h)	ESP (in H_2O)
0 to 28.8*	0.10
29 to 42.5*	0.15
43 to 64.5*	0.20
65 to 70	0.20
71 to 105	0.25
106 to 134	0.30
135 to 210	0.35
211 to 280	0.40
281 to 350	0.45
351 to 400	0.55
401 to 500	0.65
501 and greater	0.75
*Only applicable for evaporatively and water-cooled units.	

In 2015, the Appliance Standards and Rulemaking Federal Advisory Committee ("ASRAC") working group for commercial package air conditioners ("Commercial Package Air Conditioners Working Group") agreed that the energy use analysis conducted for the January 2016 direct final rule should use higher ESPs than those specified in the DOE test procedure to help better simulate field applications. 81 FR 2420, 2470. Specifically, the Commercial Package Air Conditioners Working Group recommended ESPs of 0.75 and 1.25 in H_2O, which corresponded to the ESPs used in modified building simulations of the cooling load. *Id*. The ESP values recommended by

[10] ECUACs and WCUACs with cooling capacities less than 65,000 Btu/h were removed from the scope of the most recent version of AHRI 210/240, AHRI 210/240-2023, and were instead included in AHRI 340/360-2022.

the Commercial Package Air Conditioners Working Group did not vary with capacity. The Commercial Package Air Conditioners Working Group also developed a term sheet of recommendations as part of the negotiated rulemaking that led to the January 2016 direct final rule. (EERE-2013-BT-STD-0007-0093) The term sheet included recommendations for DOE to address in a future test procedure rulemaking. Consistent with the Commercial Package Air Conditioners Working Group's acknowledgement that higher ESPs would better represent field applications, Recommendation #2 of the term sheet recommended that DOE amend the test procedure for CUACs and CUHPs to better represent the total fan energy use by considering alternative ESPs. (*Id.* at p. 2) Higher ESPs would result in higher fan power measured during testing and would therefore result in fan energy use comprising a larger fraction of total energy use measured during the test.

In this RFI, DOE is further considering the Commercial Package Air Conditioners Working Group's recommendation to incorporate higher ESPs in the test procedure for CUACs and CUHPs to better represent fan energy use. There are several further indications that higher ESPs might be more representative of field conditions. As described in the following paragraphs, these include comments that DOE has received in response to the July 2017 TP RFI and May 2020 ECS RFI, and ESP values in the most recent version of AHRI 210/240.

In the July 2017 TP RFI, DOE recognized that DOE had previously received comment on the possibility that ESPs as measured in the field may be higher than those

found in the industry test standards. 82 FR 34427, 34440. DOE also requested comment on the typical field ESPs for ECUACs and WCUACs, whether field-installed ESPs typically vary with capacity, and whether the field applications of ECUACs and WCUACs are different from ACUACs with regards to the typical ducting installed on the system. *Id*.

In response to the July 2017 TP RFI, DOE received comments from several interested parties asserting that ESPs for ECUACs and WCUACs are the same as those for ACUACs, because ESP is determined by building and ducting types, and not the method for rejecting heat.[11] Goodman commented that ducting does not vary much among ECUACs, WCUACs, and ACUACs, but that variable air volume ("VAV") ductwork has different ESPs than constant air volume and single-zone ductwork, and that ECUACs are commonly installed with VAV ductwork.[12] (Goodman, EERE-2017-BT-TP-0018-0014 at p. 4) DOE also received comments from Carrier and Goodman indicating that ESP increases with capacity, because larger units serve larger areas, have longer ducts, and have higher airflows. (Carrier, EERE-2017-BT-TP-0018-0006 at p. 10; Goodman, EERE-2017-BT-TP-0018-0014 at p. 4)

[11] AHRI, EERE-2017-BT-TP-0018-0011 at p. 23; Appliance Standards Awareness Project, Alliance to Save Energy, American Council for an Energy Efficiency Economy, Northwest Energy Efficiency Alliance, and Northwest Power and Conservation Council (referred to collectively as "Joint Advocates"), EERE-2017-BT-TP-0018-0009 at p. 5; California Investor-owned Utilities ("CA IOUs"), EERE-2017-BT-TP-0018-0007 at p. 3; Carrier Corporation ("Carrier"), EERE-2017-BT-TP-0018-0006 at p. 10

[12] A VAV HVAC system controls the dry-bulb temperature within a space by varying the volumetric flow of heated or cooled supply air to the space. In contrast, a constant air volume HVAC system always provides the same volumetric flow of air to the space.

DOE received several comments on representative ESP values in response to the July 2017 TP RFI. AHRI and Carrier commented that higher static pressures than prescribed in AHRI 340/360 may exist in field installations due to poor practice of ductwork installation. (AHRI, EERE-2017-BT-TP-0018-0011 at p. 23; Carrier, EERE-2017-BT-TP-0018-0006 at p. 9) Carrier indicated that ASHRAE Standard 90.1 includes overall fan power allowances with ductwork pressure drops and other system losses. (Carrier, EERE-2017-BT-TP-0018-0006 at pp. 9-10) Carrier recommended that DOE conduct a field survey, stating that field ESP values can vary from very low numbers with concentric ducts to values up to 1.5 in H_2O for smaller systems. (*Id.* at p. 9) Carrier also indicated that field ESP values for VAV systems can range from 1 in H_2O to 2.5 in H_2O. (*Id.* at p. 10)

The Joint Advocates stated that the ESP requirements specified for ACUACs and ACUHPs should be no lower than the two values of 0.75 and 1.25 in H_2O that were used in the standards analysis conducted for the January 2016 direct final rule. (Joint Advocates, EERE-2017-BT-TP-0018-0009 at p. 5) The CA IOUs suggested that DOE use Title 24, Part 6 2016 Alternative Calculation Method ("ACM") Reference Manual as a resource for developing more field-representative ESP requirements, because it contains static pressure set points that were developed based on actual field conditions. (CA IOUs, EERE-2017-BT-TP-0018-0007 at p. 3) DOE reviewed the standard design supply fan static pressures specified on page 5-123 of the Title 24, Part 6 2016 ACM Reference Manual, and the specified values appear to be total static pressure (*i.e.*, the sum of ESP and internal static pressure), although it is not explicitly clear. Further, the values do not appear to be specific to CUACs and CUHPs; rather they apply to various kinds of

commercial heating, ventilation, and air-conditioning ("HVAC") equipment. The values range from 2.5 in H_2O to 4.5 in H_2O, increasing with airflow rate, the number of HVAC zones,[13] and the number of stories in a building.

Additionally, DOE received comments on ESP in response to the May 2020 ECS RFI. Verified stated that the ESPs in AHRI 340/360 are too low, and they referenced a research report in which they tested air conditioners with ESPs more representative of field conditions. (Verified, EERE-2019-BT-STD-0042-0011 at p. 5) That report indicated that typical field ESPs are 0.5 in H_2O for a CUAC with a capacity of 36,000 Btu/h and 1.2 in H_2O for a CUAC with a capacity of 90,000 Btu/h. [14] The CA IOUs reiterated their recommendation that DOE increase the ESP requirements for CUACs and CUHPs, and provided ESP data from two survey studies they conducted. (CA IOUs, EERE-2019-BT-STD-0042-0020 at pp. 3-4) Table II.2 contains the ESP values and number of units for each survey study, sorted by cooling capacity. The test, adjust, balance study used field data from a commissioning agent, and the permit review study used permit documents submitted to an online database. Both of these studies indicate median ESPs considerably higher than the ESPs required in AHRI 340/360-2022.

[13] An HVAC zone is a space or group of spaces, within a building with heating, cooling, and ventilating requirements, that are sufficiently similar so that desired conditions (*e.g.*, temperature) can be maintained throughout using a single sensor (*e.g.*, thermostat or temperature sensor).

[14] Page 40 of R. Mowris, E. Jones, R. Eshom, K. Carlson, P. Jacobs, J. Hill. 2016. Laboratory Test Results of Commercial Packaged HVAC Maintenance Faults. Prepared for the California Public Utilities Commission. Prepared by Robert Mowris & Associates, Inc. Available at: *www.calmac.org/publications/RMA_Laboratory_Test_Report_2012-15_v3.pdf.* The report refers to air conditioner sizes using tons of refrigeration, where 1 ton of refrigeration is equivalent to 12,000 Btu/h.

Table II.2 ESP Survey Results from CA IOUs

Cooling capacity (Btu/hr)	Test, adjust, balance study		Permit review study	
	Number of CUACs	Median ESP (in H_2O)	Number of CUACs	Median ESP (in H_2O)
71,000 to 105,000	26	0.84	59	0.75
106,000 to 134,000	10	1.16	14	0.88
135,000 to 210,000	20	1.705	33	0.80

The discussion in the previous paragraphs has outlined the indications suggesting that ESPs higher than those in AHRI 340/360-2022 might be more representative of CUAC operation. Comments from Carrier indicate that ESPs for CUACs can be as high as 2.5 in H_2O, and survey results from CA IOUs suggest that representative ESPs for units with capacities of 65,000 Btu/h to 210,000 Btu/h might range from 0.75 in H_2O to 1.7 in H_2O. Comments also suggest that ESP varies with building and duct type, but not with the heat rejection mechanism of CUACs, and that ESP might increase with capacity. DOE is considering revisions to the ESP requirements for testing CUACs and CUHPs. While the data on field ESPs that have been provided to DOE are informative, DOE is seeking further comments and data on field ESPs that would inform potential revisions to ESP requirements in the DOE test procedure.

Issue 1: DOE seeks further field data on the ESPs of CUACs and CUHPs with capacities of 65,000 Btu/h to 210,000 Btu/h. DOE is also seeking comment as to the most representative ESP values for these capacities, and whether the ESP values previously mentioned in stakeholder comments would be more representative.

Issue 2: DOE seeks field data on the ESPs of CUACs and CUHPs with sizes greater than 210,000 Btu/h (for which commenters have not yet included ESP data in their comments).

As discussed, the current DOE test procedure for ECUACs and WCUACs with a cooling capacity of less than 65,000 Btu/h references ANSI/AHRI 210/240-2008. Table 11 of ANSI/AHRI 210/240-2008 specifies ESP requirements that depend on capacity and range from 0.10 to 0.20 in H_2O for units with a rated cooling capacity less than 65,000 Btu/h. These ESP requirements align with those specified for ECUACs and WCUACs with a cooling capacity of less than 65,000 Btu/h in Table 7 of AHRI 340/360-2022. However, AHRI 210/240-2023 specifies higher ESP requirements for three-phase ACUACs with a cooling capacity of less than 65,000 Btu/h. Specifically, Table 10 of AHRI 210/240-2023 specifies an ESP requirement of 0.5 in H_2O for conventional units.[15] These ESP requirements in AHRI 210/240-2023 align with those specified in DOE's updated test procedure for central air conditioners and heat pumps ("CAC/HPs") at table 4 of appendix M1 to subpart B of 10 CFR part 430 ("appendix M1").

For WCUACs with a cooling capacity of less than 65,000 Btu/h, DOE's preliminary analysis shows that these units may typically be installed above dropped ceilings in commercial buildings. For ECUACs with a cooling capacity of less than 65,000 Btu/h, DOE's preliminary analysis shows that these units are primarily marketed

[15] Table 10 of AHRI 210/240-2023 indicates that conventional units are central air conditioners and heat pumps other than the following categories: ceiling-mount and wall-mount blower-coil systems, mobile home blower-coil systems, low-static blower-coil systems, mid-static blower-coil systems, small-duct high-velocity, and space-constrained product.

for residential applications, which suggests that it may be appropriate to align the ESP requirements for ECUACs with a cooling capacity of less than 65,000 Btu/h with those specified for CAC/HPs in appendix M1 (*i.e.*, 0.5 in H_2O for conventional units). Therefore, DOE is considering whether it is appropriate for the same ESP requirements to be applied for both WCUACs and ECUACs with a cooling capacity of less than 65,000 Btu/h.

Issue 3: DOE seeks comment and field data on ESPs for ECUACs and WCUACs with a cooling capacity of less than 65,000 Btu/h, and whether the ESPs typically differ between ECUACs and WCUACs. For both ECUACs and WCUACs with a cooling capacity of less than 65,000 Btu/h, DOE specifically requests feedback on whether representative ESPs would be 0.5 in H_2O (from AHRI 210/240-2023), the range of 0.10 to 0.20 in H_2O (from AHRI 340/360-2022), or alternate values.

2. Heating Mode

For heating mode tests of CUHPs, Table 6 of AHRI 340/360-2022 includes "Standard Rating Conditions" for both a "High Temperature Steady-state Test for Heating" and a "Low Temperature Steady-state Test for Heating" (conducted at 47 °F and 17 °F outdoor air dry-bulb temperatures, respectively). The relevant conditions for COP testing in the current DOE test procedure are high temperature standard rating conditions (*i.e.*, 47 °F outdoor air dry-bulb temperature). The DOE test procedure does not require CUHPs to be tested at the low temperature standard rating conditions and

does not account for performance at conditions lower than 47 °F outdoor air dry-bulb temperature. DOE is considering whether incorporating heating performance at temperatures lower than 47 °F would improve the representativeness of the DOE test procedure for CUHPs by reflecting a wider range of operating conditions. As part of this examination, DOE is further considering how such performance would differ between CUHPs with different types of supplementary heat (*e.g.*, electric resistance heat and furnaces) and the climate regions in which CUHPs are typically installed.

Issue 4: DOE requests data on the shipments of CUHPs by region. In particular, DOE is interested in determining whether CUHPs are predominantly installed in specific regions of the U.S.

Issue 5: DOE requests data on the distribution of supplementary heating types (*e.g.*, furnace, electric resistance, and none) shipped with CUHPs, and if that distribution has changed over time or is expected to change in the future.

Issue 6: DOE seeks comment and data as to the lowest outdoor temperatures at which CUHPs typically operate in mechanical heating mode (*i.e.*, what are typical compressor cut-out temperatures for CUHPs) and the extent to which the cut-out temperatures vary depending on the type of supplementary heating installed with the CUHP (*e.g.*, electric resistance heat or furnace).

3. Potential Revisions to IEER Metric

a. Fan Operation in Modes Other than Mechanical Cooling

The weighting factors for the IEER metric account for the hours of operation when mechanical cooling[16] is active; this includes mechanical-only cooling and integrated economizer/mechanical cooling operation[17] in climate zones that require economizers to be installed. The IEER metric does not account for economizer-only cooling. The current DOE test procedure also requires that for units that are unable to reduce their capacity at least as low as one of the part load rating points, the EER for that rating point is calculated using a cyclic degradation coefficient. The cyclic degradation equation accounts for supply fan operation continuously running when the compressor is cycling on and off to meet the required load and assumes that the supply fan continues to run at the same speed as it would at the lowest stage of compression.

The Commercial Package Air Conditioners Working Group term sheet included recommendation #2, which recommended that DOE initiate a rulemaking with a primary focus of better representing total fan energy use in the field to better represent the total fan energy use, including consideration of fan operation for operating modes other than mechanical cooling and heating. (EERE-2013-BT-STD-0007-0093 at p. 2) Similarly, the ASRAC Commercial and Industrial Fans and Blowers Working Group[18] ("CIFB

[16] "Mechanical cooling" and "mechanical heating" refer to a CUAC and CUHP using the refrigeration cycle to cool or heat the indoor space, and do not refer to other forms of unit operation (*e.g.*, economizing, ventilation, or supplemental heating).

[17] Integrated economizer/mechanical cooling operation occurs when the use of economizing provides additional cooling but is not sufficient to meet the cooling load, and simultaneous use of mechanical cooling is also needed.

[18] In 2015, DOE initiated the CIFB Working Group to engage in a negotiated rulemaking effort on the scope, test procedure, and standards for fans and blowers. 80 FR 17359 (April 1, 2015). The CIFB

Working Group") term sheet included recommendation #3, which identified a need for DOE's test procedures and related efficiency metrics for CUACs and CUHPs to more fully account for the energy consumption of supply and condenser fans embedded in regulated commercial air-conditioning equipment. (EERE-2013-BT-STD-0006-0179 at pp. 3-4) The CIFB Working Group recommended that in the next round of test procedure rulemakings, DOE should consider revising efficiency metrics that include energy use of supply and condenser fans to include the energy consumption during all relevant operating modes (*e.g.*, auxiliary heating mode, ventilation mode, and part-load operation). (*Id.*)

As part of the July 2017 TP RFI, DOE requested comment and data on the operation of CUAC and CUHP supply fans when there is no demand for heating and cooling, as well as the impact of ancillary functions (*e.g.*, primary heating, auxiliary heating, and economizers) on the use and operation of the supply fan. 82 FR 34427, 34440. DOE received comments in response to this request in the July 2017 TP RFI and also received comments on this topic in response to the May 2020 ECS RFI.

Multiple commenters expressed support for DOE to adopt a test procedure for total fan energy consumption per recommendation #2 of the Commercial Package Air Conditioners Working Group term sheet. Several commenters recommended evaluating energy use during operating modes other than mechanical cooling and heating (*e.g.*,

Working Group developed recommendations regarding the energy conservation standards, test procedures, and efficiency metrics for commercial and industrial fans and blowers in a term sheet (EERE-2013-BT-STD-0006-0179).

economizing, ventilation, and supplemental heating), including the frequency in which units operate in modes other than mechanical cooling or heating, in an effort to improve the representativeness of the test procedure. Commenters also indicated that additional data on field installation and use would likely be needed for further consideration of fan use in CUACs and CUHPs beyond that captured in the current DOE test procedure.[19]

Carrier stated that ASHRAE 90.1 and IECC require a minimum of two-speed fan operation so that the fan runs at low speed during ventilation and some of the economizer operation. (Carrier, EERE-2017-BT-TP-0018-0006 at p. 9) Carrier stated that fan power is typically reduced by around 70 percent, as it varies to the cube of the fan speed. (*Id.*) AHRI and Lennox stated that dual- or multi-speed fans are used to reduce energy consumption by operating at low speed during periods of ventilation or air circulation. (AHRI, EERE-2017-BT-TP-0018-0011 at pp. 22-23; Lennox, EERE-2017-BT-TP-0018-0008 at pp. 2-3)

Based on the comments received, DOE recognizes a need to further investigate fan operation during ventilation or air circulation/filtration and economizing. Specifically, while comments received indicate the prevalence of multi-speed fans that reduce fan speed in these operating modes, the commenters did not indicate how the fan

[19] AHRI, EERE-2017-BT-TP-0018-0011 at pp. 22-23; Joint Advocates, EERE-2017-BT-TP-0018-0009 at pp. 1 and 5; Appliance Standards Awareness Project, American Council for an Energy Efficiency Economy, California Energy Commission, Natural Resources Defense Council, and Northeast Energy Efficiency Partnerships (collectively referred to as "Joint Commenters"), EERE-2019-BT-STD-0042-0023 at pp. 2-3; CA IOUs EERE-2017-BT-TP-0018-0007 at p. 3 and EERE-2019-BT-STD-0042-0020 at pp. 2-4; Carrier, EERE-2017-BT-TP-0018-0006 at p. 9; Goodman, EERE-2017-BT-TP-0018-0014 at pp. 3-4; Lennox, EERE-2017-BT-TP-0018-0008 at pp. 2-3; Northwest Energy Efficiency Alliance ("NEEA"), EERE-2019-BT-STD-0042-0024 at pp. 2-3; Verified Inc., EERE-2019-BT-STD-0042-0022 at pp. 13-14.

speed in these operating modes typically compares to fan speed when operating at the lowest stage of compressor cooling.

Issue 7: DOE seeks feedback on whether the supply airflow or fan power for both variable air volume and staged air volume fans at the lowest stage of compression is typically the same supply airflow or fan power that would be seen during periods of ventilation, air circulation, and economizer-only cooling. If not, DOE seeks feedback on how the airflow or fan power during ventilation, air circulation, and economizer-only cooling modes typically compares to those at the lowest stage of compression.

DOE also recognizes a need to further investigate prevalence and operating hours of economizers. Section 6.5.1 of ASHRAE 90.1-2019 specifies the use of economizers for cooling systems with a cooling capacity greater than or equal to 54,000 Btu/h in all climate zones within the U.S. except for climate zone 1A, which consists of southern Florida, Hawaii, Guam, Puerto Rico, and the U.S. Virgin Islands.[20] However, at the time IEER was developed in 2007, ASHRAE 90.1 did not specify the use of economizers in climate zones 1A, 2A, 3A, and 4A (see ASHRAE 90.1-2007). Climate zones 2A, 3A, and 4A represent 52 percent of new commercial building construction according to a June 2020 report by Pacific Northwest National Laboratory ("June 2020 PNNL report")

[20] ASHRAE 90.1-2019 does not require economizers in cooling systems for which the rated efficiency exceeds the minimum cooling efficiency by more than the corresponding factor specified in Table 6.5.1-2 of ASHRAE 90.1-2019, which specifies different factors for each climate zone.

that developed updated weighting factors for new construction buildings.[21] Additionally, Carrier stated in response to the July 2017 TP RFI that 80 to 90 percent of CUAC units are built with economizers. (Carrier, EERE-2017-BT-TP-0018-0006 at p. 9) Given the large increase in commercial buildings for which ASHRAE Standard 90.1 specifies the use of economizers, DOE is interested in current data about economizers and ACUACs and CUHPs. DOE is also considering revisions to how economizer operating hours are accounted for in the IEER metric, particularly as DOE considers inclusion of operating hours corresponding to economizer-only cooling.

Issue 8: DOE requests data on the fraction of CUACs and CUHPs installed with economizers for each climate zone.

Issue 9: DOE requests data on the typical annual operating hours of economizer-only cooling (*i.e.*, no mechanical cooling) by building type and climate zone.

Issue 10: DOE requests comments or data on the method that was used to determine operating hours in each cooling mode (*i.e.,* mechanical cooling only mode, integrated economizing mode, and economizer-only cooling mode) during development of the current IEER metric. DOE is particularly interested in any aspects of that method that would be important to incorporate when revising the IEER metric.

[21] Lei, X., J.B. Butzbaugh, Y. Chen, J. Zhang, and M.I. Rosenberg. 2020. Development of National New Construction Weighting Factors for the Commercial Building Prototype Analyses (2003-2018). PNNL-29787, Pacific Northwest National Laboratory, Richland, WA.

b. Building Types

DOE understands that the current IEER metric was developed using the cooling loads for three building types (offices, retail, and schools), the shipment-weighted market shares for those three building types, and weather data from 15 representative cities, which each represented one of the 15 International Energy Conservation Code ("IECC") climates zones in the United States. These data were used to develop weighting factors at four different load conditions (100, 75, 50, and 25 percent) to represent the average load profile of an ACUAC or CUHP in the U.S. While DOE understands that offices, retail, and schools are large markets for ACUACs and CUHPs, there are other building types that have large volumes of ACUAC and CUHP installations. The DOE commercial reference buildings[22] and the ASHRAE building prototypes[23] assign a packaged rooftop air conditioner as the default HVAC equipment to the prototypes for full-service restaurants, quick-service restaurants, and non-refrigerated warehouses. The updated weighting factors for new construction building prototypes in the June 2020 PNNL report[24] show that full-service restaurants, quick-service restaurants, and non-refrigerated warehouses[25] represent over 14 percent of new construction buildings. Therefore, DOE is considering revisions to the IEER metric to include additional building types beyond offices, retail, and schools.

[22] Available at *www.energy.gov/eere/buildings/commercial-reference-buildings*
[23] Available at *www.energycodes.gov/prototype-building-models*
[24] Lei, X., J.B. Butzbaugh, Y. Chen, J. Zhang, and M.I. Rosenberg. 2020. Development of National New Construction Weighting Factors for the Commercial Building Prototype Analyses (2003-2018). PNNL-29787, Pacific Northwest National Laboratory, Richland, WA.
[25] DOE notes that a typical warehouse has three zones and not all are conditioned by a CUAC or CUHP, only the fine storage area (*i.e.,* area for storing fine art, antiques, and other items that are temperature-sensitive). The bulk storage area is not air-conditioned. The warehouse office is small enough that it would use a smaller capacity unit than a CUAC or CUHP.

Issue 11: DOE requests the shipment-weighted market share by building type for CUACs and CUHPs.

Issue 12: DOE requests comment or data on the supporting basis and method used to determine hourly cooling loads (for each building type and by building location) in developing the current IEER metric. DOE is particularly interested in any aspects of that method that would be important to incorporate if it should decide to revise the IEER metric.

4. Power Consumption of Heat Rejection Components for WCUACs

WCUACs are typically installed in the field with separate heat rejection components that reject heat from the water loop to outdoor ambient air, but these separate heat rejection components are not included in testing of WCUACs. These heat rejection components typically consist of a circulating water pump (or pumps) and a cooling tower. To account for the power that would be consumed by these components in field installations, Section 6.1.1.7 of AHRI 340/360-2022 specifies that WCUACs with cooling capacities less than 135,000 Btu/h shall add 10.0 W to the total power of the unit for every 1,000 Btu/h of cooling capacity.

The industry test procedure for dedicated outdoor air systems ("DOASes") – AHRI 920-2020, "2020 Standard for Performance Rating of Direct Expansion-Dedicated Outdoor Air System Units" – includes a different method to account for the additional power consumption of water pumps, with a pump power adder referred to as the "water pump effect" being added to the calculated total unit power. Specifically, Section 6.1.6 of AHRI 920-2020 specifies that the water pump effect is calculated with an equation

dependent on the water flow rate and liquid pressure drop across the heat exchanger, including a term that assumes a liquid ESP of 20 feet of water column. DOE is considering whether the AHRI 920-2020 approach would also be representative for WCUACs.

Issue 13: DOE seeks comment on the representativeness of the AHRI 920-2020 approach to account for power consumption of external heat rejection components in WCUACs, as compared to the approach in AHRI 340/360-2022.

Water-cooled air conditioners and heat pumps rely on pumps to circulate the water that transfers heat to or from refrigerant in the water-to-refrigerant coil. Most water-cooled units rely on external circulating water pumps; however, some water-cooled units in other equipment categories (*e.g.*, water-source heat pumps and DOASes) have integral pumps included within the unit that provide this function. For such units with integral pumps, test provisions are warranted to specify how to test with the integral pump – *e.g.*, provisions specifying the liquid ESP at which to operate the integral pump. AHRI 340/360-2022 does not contain provisions specific to testing WCUACs with integral pumps. In contrast, DOE recently proposed to require that water-source DOASes with integral pumps be tested with a liquid ESP of 20 ft of water column (consistent with the liquid ESP assumed in the aforementioned water pump effect calculation specified in AHRI 920-2020 for DOASes). 86 FR 36018, 36060. DOE is not aware of any WCUACs on the market that contain integral pumps, but if such units exist, then additional test provisions may be warranted.

Issue 14: DOE seeks comment on the prevalence of WCUACs with integral pumps. If such units exist, DOE seeks comment on what liquid ESP would be representative for testing.

B. Energy Conservation Standards

In the following sections, DOE has identified several issues on which it seeks input to aid in the development of the technical and economic analyses regarding whether amended standards for ACUACs and ACUHPs may be warranted.

DOE is considering amended energy conservation standards for ACUACs and ACUHPs (excluding double-duct systems). In the May 2020 ECS RFI, DOE sought comment regarding the various analyses that DOE routinely uses to analyze more stringent standards. 85 FR 27941. DOE received feedback from interested parties in response to the May 2020 ECS RFI indicating that it was premature to consider amended standards before the 2023 compliance date for the second tier of amended standards adopted in the January 2016 direct final rule.[26] At the present time, DOE recognizes that the ACUAC and ACUHP market is much closer to the 2023 compliance date than the market observed at the time of the May 2020 ECS RFI. Therefore, DOE welcomes any additional feedback in response to the questions posed in the May 2020 ECS RFI that may have changed since the publication of the May 2020 ECS RFI, particularly to the extent that ACUAC and ACUHP markets and technologies have changed in the last two years.

[26] AHRI, EERE-2019-BT-STD-0042-0014 at p. 3; Trane, EERE-2019-BT-STD-0042-0016 at p. 2.

Additionally, DOE is seeking specific feedback on alternative refrigerants (as raised by interested parties) and shipments in the following subsections.

1. Alternative Refrigerants

In the May 2020 ECS RFI, DOE presented the technology options screened out in the January 2016 direct final rule, which included alternative refrigerants, and requested comment generally on whether these technology options would continue to be screened out. 85 FR 27941, 27947. Several stakeholders provided feedback on the topic of alternative refrigerants.[27]

AHRI and Carrier recommended that DOE not consider alternative refrigerants as a technology option on the bases of technological feasibility and practicability to manufacture, install, and service. (AHRI, EERE-2019-BT-STD-0042-0014 at p. 5; Carrier, EERE-2019-BT-STD-0042-0013 at p. 7) The Joint Commenters suggested that DOE consider alternative refrigerants as a technology option for ACUACs and ACUHPs. (Joint Commenters, EERE-2019-BT-STD-0042-0023 at pp. 3-4) The Joint Commenters referenced testing conducted by Oak Ridge National Laboratory and Trane that found using R-452B as a replacement for R-410A improves efficiency by 5 percent. (*Id.*) NEEA and Trane recommended that DOE consider the effect of new low global warming

[27] AHRI, EERE-2010-BT-STD-0042-0014 at pp. 2, 4-7; Joint Commenters, EERE-2019-BT-STD-0042-0023 at pp. 3-4; CA IOUs, EERE-2019-BT-STD-0042-0020 at p. 5; Carrier, EERE-2019-BT-STD-0042-0013 at pp. 5, 7-8, 10; Goodman, EERE-2019-BT-STD-0042-0017 at p. 3; NEEA, EERE-2019-BT-STD-0042-0024 at p. 9; Trane, EERE-2019-BT-STD-0042-0016 at pp. 4-5, 7, 10.

potential ("GWP") refrigerants on efficiency, cost, design, and size of the units. (NEEA, EERE-2019-BT-STD-0042-0024 at p. 9; Trane, EERE-2019-BT-STD-0042-0016 at p. 7)

Several commenters stated that the use of low-GWP refrigerants with A2L categorization (*i.e.*, mildly flammable) would require new compressors, additional refrigerant detection sensors, enhanced leak testing for coils, and would result in increased manufacturing and channel distribution complexity. (AHRI, EERE-2019-BT-STD-0042-0014 at p. 6; Carrier, EERE-2019-BT-STD-0042-0013 at p. 5; Goodman, EERE-2019-BT-STD-0042-0017 at p. 3; Trane, EERE-2019-BT-STD-0042-0016 at p. 5) AHRI stated that the combined costs to add sensors, controls, and other components for these new refrigerants and the costs of those refrigerants will increase cost 10 to 15 percent over the minimum designs for the 2018 standards. (AHRI, EERE-2019-BT-STD-0042-0014 at p. 7)

DOE recognizes the transition away from the use of R-410A refrigerant in ACUACs and ACUHPs and the multiple drivers of this transition, including state[28] and ongoing Environmental Protection Agency ("EPA") regulations.[29] DOE understands that the implementation of mildly flammable refrigerants at the quantities that would be typically required for installation in commercial buildings requires an allowance under

[28] For example, California has implemented regulations that limit the use of high-GWP refrigerants. Beginning January 1, 2025, California will prohibit the use of refrigerants with a GWP greater than 750 in CUACs and CUHPs. *See* California Code of Regulations, Title 17, Division 3, Chapter 1, Subchapter 10 Climate Change, Article 4, Subarticle 5, section 95374(c).

[29] EPA completed a rulemaking to phase down production and consumption of hydrofluorocarbons ("HFCs") through an allowance allocation on October 5, 2021 (86 FR 55116) and set allowances for 2022 on October 7, 2021 (86 FR 55841). Additionally, EPA published a notice of its intent to conduct a traditional (*i.e.*, non-negotiated) rulemaking on December 29, 2021, with regard to restricting, fully, partially, or on a graduated schedule, the use of regulated substances, which includes high-GWP refrigerants, in a sector or subsector in which the regulated substance is used. 86 FR 74080.

state and local building codes. Further, DOE is aware that multiple manufacturers of ACUACs and ACUHPs have already announced plans to transition to a specific low-GWP refrigerant for their ACUAC and ACUHP models.

DOE notes that the earliest possible compliance date for amended standards for ACUACs and ACUHPs, barring any amendment of standards by ASHRAE 90.1, would be January 1, 2029. 42 U.S.C. 6313(a)(6)(C)(iv) Given the timelines of both enacted and potential state and Federal regulatory changes regarding the phasedown of high-GWP refrigerants, DOE understands low-GWP refrigerants may be used in ACUACs and ACUHPs in the U.S. by the time potential amended standards could take effect. As such, to inform an engineering analysis to evaluate more stringent standards, DOE is interested in the effects of the implementation of low-GWP refrigerants on efficiency and cost of ACUACs and ACUHPs.

Issue 15: DOE requests data on the impact of low-GWP refrigerants as replacements for R-410A on (1) the cooling and heating capacities and compressor power of ACUACs and ACUHPs at various temperature conditions, including, but not limited to, the temperatures currently included in the IEER metric; and (2) the size and design of heat exchangers and compressors used in ACUACs and ACUHPs.

Issue 16: DOE seeks any additional data and feedback on the cost of implementing low-GWP refrigerants in ACUACs and ACUHPs beyond the comments received in response to the May 2020 ECS RFI.

2. Shipments

DOE develops shipments forecasts of CUACs and CUHPs to calculate the national impacts of potential amended energy conservation standards on energy consumption, net present value, and future manufacturer cash flows. DOE shipments projections are based on available historical data broken out by equipment class and capacity. Current shipments estimates allow for a more accurate model that captures recent trends in the market and inform the no-new-standards case efficiency distribution. The national impact of a higher efficiency level is measured relative to the distribution of efficiency levels in the no-new-standards case. Therefore, the development of a no-new-standards case efficiency distribution has a significant impact on the national energy savings and new present value calculation in the national impact analysis. DOE received shipments data for years 2014 and earlier as part of the rulemaking for the January 2016 direct final rule, but DOE has no shipments data for years 2015 to the present. A time series of shipments is useful for projecting shipments accurately in the future because historical shipments are important for predicting the future market. A time series also enables DOE to better forecast trends in shipments by efficiency level in the national impact analysis.

In the May 2020 ECS RFI, DOE requested shipments data for ACUACs and ACUHPs but received none. 85 FR 27941, 27953. Given the importance of shipments data and the no-new-standards case efficiency distribution to the national impact analysis, DOE is again requesting current data on shipments and efficiency for ACUACs and ACUHPs.

Issue 17: DOE requests current shipments data for ACUACs and ACUHPs by equipment class, capacity, and efficiency level. If available, DOE requests historical shipments data going back to 2015. If disaggregated fractions of annual shipments are not available at the equipment class level by equipment size and efficiency level, DOE requests more aggregated fractions of annual shipments at the equipment category level.

III. Submission of Comments

DOE invites all interested parties to submit in writing by the date specified in the **DATES** section of this document, comments and information on matters addressed in this document and on other matters relevant to DOE's consideration of amended test procedures for CUACs and CUHPs and amended energy conservations standards for ACUACs and ACUHPs (excluding double-duct systems). After the close of the comment period, DOE will review the public comments received and may begin collecting data and conducting the analyses discussed in this document.

Submitting comments via *www.regulations.gov*. The *www.regulations.gov* web page requires you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies Office 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 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. If this instruction is followed, 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 website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

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 postal mail. Comments and documents submitted via email, hand delivery/courier, or postal 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 on 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 postal mail or hand delivery/courier, please provide all items on a CD, if feasible, in which case it is not necessary to submit printed copies. No 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, written in English and 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 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. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

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).

DOE considers public participation to be a very important part of the process for developing energy conservation standards. DOE actively encourages the participation and interaction of the public during the comment period in this process. Interactions with and between members of the public provide a balanced discussion of the issues and assist DOE. Anyone who wishes to be added to the DOE mailing list to receive future notices and information about this process or would like to request a public meeting should contact Appliance and Equipment Standards Program staff at (202) 287-1445 or via e-mail at *ApplianceStandardsQuestions@ee.doe.gov*.

Signing Authority

This document of the Department of Energy was signed on May 16, 2022, by Kelly J. Speakes-Backman, Principal Deputy Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on May 16, 2022.

X Kelly Speakes-Backman Digitally signed by Kelly Speakes-Backman
Date: 2022.05.16 10:34:39 -04'00'

Kelly J. Speakes-Backman
Principal Deputy Assistant Secretary for
Energy Efficiency and Renewable Energy