DEPARTMENT OF ENERGY

10 CFR Parts 429 and 431

[EERE–2023–BT–TP–0014]

RIN 1904–AD93

Energy Conservation Program: Test Procedure for Air-Cooled, Evaporatively-Cooled, and Water-Cooled Commercial Package Air Conditioners and Heat Pumps

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

ACTION: Final rule.

SUMMARY: The U.S. Department of Energy (''DOE'') is amending the Federal 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 to incorporate by reference the latest versions of the applicable industry test standards. Specifically, DOE is amending the current test procedure for this equipment for measuring the current cooling and heating metrics—integrated energy efficiency ratio (''IEER'') and coefficient of performance (''COP''), respectively; and establishing a new test procedure for this equipment that adopts two new metrics—integrated ventilation, economizer, and cooling (''IVEC'') and integrated ventilation and heating efficiency (''IVHE''). Testing to the IVEC and IVHE metrics will not be required until such time as compliance is required with any amended energy conservation standard based on the new metrics. Additionally, DOE is amending certain provisions of DOE's regulations related to representations and enforcement for the subject equipment.

DATES: The effective date of this rule is August 5, 2024. The amendments will be mandatory for testing the subject equipment starting May 15, 2025.

The incorporation by reference of certain material listed in this rule is approved by the Director of the Federal Register on August 5, 2024. The incorporation by reference of certain other materials listed in this rule were approved by the Director of the Federal Register as of January 22, 2016.

ADDRESSES: The docket, which includes **Federal Register** notices, public meeting webinar attendee lists and transcripts, comments, and other supporting documents/materials, is available for review at *www.regulations.gov* under docket number EERE–2023–BT–TP–0014. 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 those containing information that is exempt from public disclosure.

A link to the docket web page can be found at *www.regulations.gov/docket/EERE-2023-BT-TP-0014.* The docket web page contains instructions on how to access all documents, including public comments, in the docket.

For further information on how to review the docket, contact the Appliance and Equipment Standards Program staff at (202) 287–1445 or by email: *ApplianceStandardsQuestions@ee.doe.gov.*

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For further information on how to review the docket, contact the Appliance and Equipment Standards Program staff at (202) 287–1445 or by email: *ApplianceStandardsQuestions@ee.doe.gov.*

SUPPLEMENTARY INFORMATION: DOE maintains a previously approved incorporation by reference and incorporates by reference the following industry standards into parts 429 and 431:

AHRI Standard 340/360–2022 (I–P), *2022 Standard for Performance Rating of Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment,* AHRI-approved January 26, 2022 (''AHRI 340/360–2022'').

AHRI Standard 1340–2023 (I–P), *2023 Standard for Performance Rating of Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment,* AHRI-approved November 16, 2023 (''AHRI 1340–2023'').

Copies of AHRI 340/360–2022 and AHRI 1340–2023 can be obtained from the Air-Conditioning, Heating, and Refrigeration Institute (''AHRI''), 2311 Wilson Blvd., Suite 400, Arlington, VA 22201, (703) 524–8800, or online at: *www.ahrinet.org/standards/search-standards.*

ANSI/ASHRAE Standard 37–2009, *Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment,* ASHRAE-approved June 24, 2009 (''ANSI/ASHRAE 37–2009'').

Copies of ANSI/ASHRAE 37–2009 can be obtained from the American Society of Heating, Refrigerating and Air-Conditioning Engineers (''ASHRAE''), 180 Technology Parkway NW, Peachtree Corners, GA 30092, (404) 636–8400, or online at: *www.ashrae.org.*

See section IV.N of this document for a further discussion of these standards.

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I. Synopsis of the Final Rule

In this final rule, DOE updates its test procedures for CUACs and CUHPs by: (1) updating the reference in the Federal test procedure to the most recent version of the industry test procedure, AHRI 340/360–2022, for measuring integrated energy efficiency ratio (''IEER''), energy efficiency ratio (''EER''), and coefficient of performance (''COP''), consistent with the latest version of ASHRAE Standard 90.1; and (2) establishing a new test procedure that references a new industry test procedure, AHRI 1340–2023, which is consistent with recommendations from the ACUAC and ACUHP Working Group TP Term Sheet, including ones for the adoption of new efficiency metrics (*i.e.,* integrated ventilation, economizer, and cooling (''IVEC'') and integrated ventilation and heating efficiency (''IVHE'')) and new testing requirements.

To implement the changes, DOE is: (1) amending appendix A to incorporate by reference AHRI 340/360–2022 for CUACs and CUHPs, while maintaining the current efficiency metrics (*i.e.,* EER, IEER, and COP); and (2) adding a new appendix A1 to subpart F of 10 CFR part 431. At 10 CFR 431.96, ''Uniform test method for the measurement of energy efficiency of commercial air conditioners and heat pumps,'' DOE is listing appendix A1 as the applicable test method for CUACs and CUHPs for any subsequent energy conservation standards denominated in terms of IVEC and IVHE. Appendix A1 utilizes AHRI 1340–2023, including the new IVEC and IVHE efficiency metrics recommended by the ACUAC and ACUHP Working Group TP Term Sheet. Use of appendix A1 will not be required until such time as compliance is required with any amended energy conservation standard based on the new metrics, should DOE adopt such standards. After the date on which compliance with appendix A1 is required, appendix A will no longer be used as part of the Federal test procedure. DOE is also amending certain provisions within DOE's regulations for representation and enforcement consistent with the test procedure amendments.

Table I–1 summarizes the adopted amendments to the DOE test procedure for CUACs and CUHPs, the test procedure provision prior to the amendment, and the reason for each adopted change.

Table I-1 Summary of Changes in the Amended Test Procedure

DOE Test Procedure Prior to Amendment	Amended Test Procedure	Attribution
Incorporates by reference: 1. ANSI/AHRI 340/360-2007 for CUACs and CUHPs with a cooling capacity greater than or equal to 65,000 Btu/h; and 2. ANSI/AHRI 210/240-2008 for ECUACs and WCUACs with a cooling capacity less than 65,000 Btu/h.	Incorporates by reference AHRI 340/360-2022 and ANSI/ASHRAE 37-2009 in appendix A. Incorporates by reference AHRI 1340-2023 and ANSI/ASHRAE 37-2009 in a new appendix A1.	Update to the most recent industry test procedures.
Includes provisions for determining EER, IEER, and COP.	Maintains appendix A with provisions for determining EER, IEER, and COP. Establishes appendix A1 with provisions for determining EER2, COP2, IVEC, and IVHE.	Establish test procedure for new efficiency metrics recommended by the Working Group.
Does not include certain CUAC and CUHP provisions regarding over-rating capacity and specific components for determination of represented values in 10 CFR 429.43.	Includes provisions in 10 CFR 429.43 specific to CUACs and CUHPs to determine represented values for units with specific components (applies to representations of IVEC and IVHE in accordance with appendix A1 only), and to prevent cooling capacity over-rating.	Improve representativeness of test procedure.
Does not include certain CUAC- and CUHP-specific enforcement provisions in 10 CFR 429.134.	Adopts product-specific enforcement provisions for CUACs and CUHPs regarding: (1) testing of units with specific components; and (2) verification of cut-in and cut-out temperatures.	Clarify how DOE will conduct enforcement testing.

DOE has determined that the amendments to appendix A will not alter the measured efficiency of CUACs and CUHPs or require retesting or recertification solely as a result of DOE's adoption of the amendments to the test procedure. Additionally, DOE has determined that the amendments to appendix A will not increase the cost of testing. Representations of energy use or energy efficiency will be required to be based on testing in accordance with the amended test procedure in appendix A beginning 360 days after the date of publication of this test procedure final rule in the **Federal Register**.

DOE has determined that the new test procedure at appendix A1 will alter the measured efficiency of CUACs and CUHPs and, as a result, manufacturers would need to retest, or rerun the alternative efficiency determination method where allowed, prior to making any representations under the test procedure in appendix A1. Cost estimates for retesting are discussed in section III.K of this document. As discussed, use of appendix A1 will not be required until the compliance date of any amended energy conservation standard denominated in terms of the new metrics in appendix A1, should DOE adopt such standards.

The amendments to representation requirements in 10 CFR 429.43 will not be required until either 360 days after publication in the **Federal Register** of this test procedure final rule or beginning on the compliance date of amended standards for CUACs and CUHPs based on IVEC and IVHE (as applicable), depending on the specific provisions.

The effective date for the amended test procedures adopted in this final rule is 75 days after publication of this document in the **Federal Register**.

II. Authority and Background

Small, large, and very large commercial package air conditioning and heating equipment are 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)) Commercial package air conditioning and heating equipment includes as equipment categories air-cooled commercial unitary air conditioners with a rated cooling capacity greater than or equal to 65,000 Btu/h (''ACUACs'') and 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 the subject of this final rule.[1] (ECUACs, WCUACs, ACUACs, and ACUHPs, which includes double-duct equipment, are collectively referred to as ''CUACs and CUHPs'' in this document.) DOE's test procedures for CUACs and CUHPs are currently prescribed at title 10 of the Code of Federal Regulations (''CFR''), part 431, subpart F, § 431.96, table 1. The following sections discuss DOE's

[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 final rule. The test procedure for ACUACs with rated cooling capacity less than 65,000 Btu/h have been addressed in a separate rulemaking: *see* Docket No. EERE–2017–BT–TP–0031. All references within this final rule to ACUACs and ACUHPs exclude equipment with rated cooling capacity less than 65,000 Btu/h.

authority to establish and amend test procedures for CUACs and CUHPs and relevant background information regarding DOE's amendments to the test procedures for this equipment.

A. Authority

The Energy Policy and Conservation Act, Public Law 94–163 (42 U.S.C. 6291–6317, as codified), as amended (''EPCA''),[2] authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. Title III, Part C [3] of EPCA, added by Public Law 95–619, Title IV, section 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, the subject of this document.

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), energy conservation standards (42 U.S.C. 6313), test procedures (42 U.S.C. 6314), labeling provisions (42 U.S.C. 6315), and the authority to require information and reports from manufacturers (42 U.S.C. 6316; 42 U.S.C. 6296).

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 other 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 in limited circumstances 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 sets forth the criteria and procedures DOE must follow when prescribing or amending test procedures for covered equipment. Specifically, EPCA requires that any test procedures prescribed or amended under this section must be reasonably designed to produce test results which reflect energy efficiency, energy use, or estimated annual operating cost of a given type of covered equipment (or class thereof) during a representative average use cycle (as determined by the Secretary) and requires that such test procedures not be unduly burdensome to conduct. (42 U.S.C. 6314(a)(2)–(3))

EPCA generally requires that, at least once every seven 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)–(3)) DOE refers to these provisions as the ''lookback'' provisions and rulemakings conducted under these provisions as ''lookback'' rulemakings.

Specific to certain commercial equipment, including CUACs and CUHPs, EPCA requires that the test procedures be those generally accepted industry testing procedures or rating procedures developed or recognized by AHRI or 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)) Further, 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, in which case DOE may establish an amended test procedure that does satisfy those statutory provisions. (42 U.S.C. 6314(a)(4)(B) and (C)) DOE refers to these provisions as the ''ASHRAE trigger'' provisions and rulemakings conducted under these provisions as ''ASHRAE trigger'' rulemakings. As noted in the recent update to DOE's procedures, interpretations, and policies for consideration of new or amended energy conservation standards and test procedures, DOE considers an ASHRAE trigger to occur only when ASHRAE Standard 90.1 is updated to include an amended industry test procedure, and that referenced test procedure includes amendments relative to the existing DOE test procedure. 89 FR 24340, 24351 (April 8, 2024).

Whether pursuant to the lookback provision or the trigger provision, if DOE determines that a test procedure amendment is warranted, the Department 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 in the **Federal Register** its determination not to amend the test procedures. (42 U.S.C. 6314(a)(1)(A)(ii))

DOE is publishing this final rule in satisfaction of its aforementioned statutory obligations under EPCA. Specifically, in accordance with the ASHRAE trigger provisions at 42 U.S.C. 6314(a)(4)(B), DOE is updating appendix A to reference the most recent version of the industry test procedure, AHRI 340/360–2022, which was adopted in ASHRAE Standard 90.1–2022, and which includes amendments relative to the existing Federal test procedure at appendix A to subpart F to 10 CFR part 431.[4] Pursuant to section 6314(a)(4)(B), DOE also evaluated whether AHRI 340/360–2022 could provide representative results for the new efficiency metrics recommended by the Working Group (*i.e.,* IVEC and IVHE). While AHRI 340/360–2022 provides representative results for the current energy efficiency metrics, IEER, EER, and COP, it does not include, among other things, operating modes other than mechanical-cooling-only operation in the cooling metric, part-load heating tests, higher ESP requirements, or crankcase heater operation, which are integral to the IVEC and IVHE metrics recommended

[2] All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Public Law 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.

[4] As discussed in section I.B of this document, DOE was also triggered by updated industry test procedures in ASHRAE Standard 90.1–2016 and ASHRAE Standard 90.1–2019, both of which included amendments relative to the existing Federal test procedure. However, ASHRAE Standard 90.1–2022, and its referenced industry test procedure, AHRI 340/360–2022, supersedes these previous versions.

by the Working Group. A more complete discussion of the differences between the current efficiency metrics and the IVEC and IVHE efficiency metrics can be found in section III.D. Accordingly, as detailed below, DOE has determined, supported by clear and convincing evidence, that AHRI 340/360–2022 cannot provide representative energy use results for the IVEC and IVHE efficiency metrics.

As a result, consistent with 42 U.S.C. 6314(a)(4)(C), DOE is establishing a new test procedure, appendix A1, to measure energy use for the IVEC and IVHE efficiency metrics. DOE has determined that appendix A1 is reasonably designed to reflect energy use for the IVEC and IVHE efficiency metrics during a representative average use cycle without being unduly burdensome to conduct. (*See* 42 U.S.C. 6314(a)(4)(C); *id.* section 6314 (a)(2)) In particular, DOE notes that appendix A1 includes: (1) a more mathematically accurate representation of cooling efficiency; (2) an integrated heating metric rather than the single-point full-load COP metric, which includes performance at multiple outdoor air temperatures as well as other operating modes not previously accounted for in the COP metric (*i.e.,* part-load heating, heating-season ventilation hours, unoccupied no-load hours, and supplemental electric resistance heat operation); (3) operating modes other than mechanical-cooling-only operation in the cooling metric (*i.e.,* integrated mechanical and economizer cooling, economizer-only cooling, cooling season ventilation, unoccupied no-load hours); (4) higher external static pressure (''ESP'') requirements; (5) crankcase heater operation; and (6) oversizing of units in field installations.

As DOE has determined that the updated version of the industry test procedure, AHRI 340/360–2022, adopted in appendix A is more representative than the previous version of the test procedure referenced in appendix A (because it would more fully comply with the requirements that the test procedure be not 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) and because the test procedure adopted in appendix A1 is more representative for the new IVEC and IVHE metrics, this rulemaking also satisfies DOE's obligations under the lookback provisions at 42 U.S.C. 6314(a)(1)(A). For more details on the improved representativeness of AHRI 340/360–2022, see section III.E of this document.

B. Background

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 with a rated cooling capacity of greater than or equal to 65,000 Btu/h 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,'' referred to as ''appendix A'' in this document). 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, standard airflow and air quantity, 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.[5] 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''), excluding section 6.5 of ANSI/AHRI 210/240–2008 and including paragraphs (c) and (e) of 10 CFR 431.96.

On October 26, 2016, ASHRAE published ASHRAE Standard 90.1–2016, which included updates to the test procedure references for CUACs and CUHPs (excluding CUACs and CUHPs 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'').[6] This action by ASHRAE triggered DOE's obligations under 42 U.S.C. 6314(a)(4)(B), as outlined previously because AHRI 340/360–2015 included substantive changes compared to the current DOE test procedure at appendix A to subpart F of 10 CFR part 431. On July 25, 2017, DOE published a request for information (''RFI'') (''July 2017 TP RFI'') in the **Federal Register** 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.

At the time DOE published the July 2017 TP RFI, the applicable version of ASHRAE Standard 90.1 was the 2016 edition, which referenced AHRI Standard 340/360–2015, ''2015 Standard for Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment'' as the test procedure for CUACs and CUHPs. However, on October 24, 2019, ASHRAE published ASHRAE Standard 90.1–2019, which updated the relevant 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''). This action by ASHRAE again triggered DOE's obligations under 42 U.S.C. 6314(a)(4)(B), as outlined previously, because AHRI 340/360–2019 included substantive changes compared to the current DOE test procedure at appendix A to subpart F of 10 CFR part 431. In January 2022, AHRI published additional updates to its test procedure standard 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''), which DOE references in

[5] Paragraphs (c) and (e) of 10 CFR 431.96 address optional break-in provisions and additional provisions regarding set-up, respectively.

[6] The previous version of ASHRAE Standard 90.1 (*i.e.,* ASHRAE Standard 90.1–2013) references ANSI/AHRI 340/360–2007.

the amended test procedure in appendix A to subpart F of 10 CFR part 431, as established in this final rule.

For ECUACs and WCUACs with a rated cooling capacity less than 65,000 Btu/h, ASHRAE Standard 90.1–2016 references ANSI/AHRI 210/240–2008, which is referenced by the current Federal test procedure at 10 CFR 431.96 for this equipment. After the publication of the July 2017 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 Standard 90.1–2019 updated its reference to AHRI 210/240–2017 as the test procedure for ECUACs and WCUACs with rated cooling capacities less than 65,000 Btu/h. This action by ASHRAE triggered DOE's obligations under 42 U.S.C. 6314(a)(4)(B), as outlined previously, because AHRI 210/240–2017 included substantive changes compared to the current DOE test procedure for ECUACs and WCUACs with a rated cooling capacity less than 65,000 Btu/h at 10 CFR 431.96. However, after the publication of AHRI 210/240–2017, AHRI released two updates to that 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.[7]

On May 12, 2020, DOE published an RFI in the **Federal Register** regarding energy conservation standards for ACUACs, ACUHPs, and commercial warm air furnaces (''May 2020 ECS RFI''). 85 FR 27941. In response to the May 2020 ECS RFI, DOE received comments from various stakeholders, including ones related to the test procedure for ACUACs and ACUHPs.

On May 25, 2022, DOE published an RFI in the **Federal Register** regarding test procedures and energy conservations standards for CUACs and CUHPs (''May 2022 TP/ECS RFI''). 87 FR 31743.

On July 29, 2022, DOE published in the **Federal Register** a notice of intent to establish a working group for commercial unitary air conditioners and heat pumps (''Working Group'') to negotiate proposed test procedures and amended energy conservation standards for this equipment (''July 2022 Notice of Intent''). 87 FR 45703. The Working Group was established under the Appliance Standards and Rulemaking Federal Advisory Committee (''ASRAC'') in accordance with the Federal Advisory Committee Act (FACA) (5 U.S.C. App 2) and the Negotiated Rulemaking Act (''NRA'') (5 U.S.C. 561–570, Pub. L. 104–320). The purpose of the Working Group was to discuss, and if possible, reach consensus on recommended amendments to the test procedures and energy conservation standards for ACUACs and ACUHPs. The Working Group consisted of 14 voting members, including DOE. (*See* appendix A, Working Group Members, to Document No. 65 in Docket No. EERE–2022–BT–STD–0015) On December 15, 2022, the Working Group signed a term sheet of recommendations regarding ACUAC and ACUHP test procedures to be submitted to ASRAC, the contents of which are referenced throughout this final rule (referred to hereafter as the ''ACUAC and ACUHP Working Group TP Term Sheet''). (*See Id.*) The ACUAC and ACUHP Working Group TP Term Sheet was approved by ASRAC on March 2, 2023. These recommendations are discussed further in section III.D of this final rule.

In January 2023, ASHRAE published ASHRAE Standard 90.1–2022, which included updates to the test procedure references for CUACs and CUHPs with cooling capacities greater than or equal to 65,000 Btu/h, specifically referencing AHRI 340/360–2022. For ECUACs and WCUACs with capacities less than 65,000 Btu/h, ASHRAE Standard 90.1–2022 references AHRI 210/240–2023. 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 and are instead included in the scope of AHRI 340/360–2022.[8] DOE discusses this change in scope to the industry test procedure and comments received related to ECUACs and WCUACs with a cooling capacity less than 65,000 Btu/h in section III.E.3 of this final rule. These actions by ASHRAE again triggered DOE's obligations under 42 U.S.C. 6314(a)(4)(B) for ACUACs and ACUHPs, as outlined previously, because AHRI 340/360–2022 again included substantive changes compared to the current DOE test procedure at appendix A to subpart F of 10 CFR 431. While DOE was triggered previously with the publication of ASHRAE 90.1–2016 and ASHRAE 90.1–2019, the latest version, ASHRAE 90.1–2022, and its referenced industry test procedure, AHRI 340/360–2022, supersedes these previous versions. Therefore, in this final rule DOE evaluated the amendments under ASHRAE 90.1–2022 (*i.e.,* AHRI 340/360–2022) relative to the current Federal test procedures for the CUACs and CUHPs.

DOE published a notice of proposed rulemaking (''NOPR'') in the **Federal Register** on August 17, 2023, presenting DOE's proposals to amend the CUAC and CUHP test procedure (''August 2023 TP NOPR''). 88 FR 56392. The August 2023 TP NOPR also summarized and responded to comments pertaining to test procedures for CUACs and CUHPs received in response to the July 2017 TP RFI, the May 2020 ECS RFI, and the May 2022 TP/ECS RFI. *Id.* DOE held a public webinar related to the August 2023 TP NOPR on September 7, 2023 (hereafter, the ''NOPR public webinar'').

DOE received comments in response to the August 2023 TP NOPR from the interested parties listed in Table II–1, along with each commenter's abbreviated name used throughout this final rule. Discussion of relevant comments and DOE's responses are provided in appropriate sections of this document.

[7] AHRI 210/240–2023 notes at the beginning of the standard that while it was first published in May 2020, it establishes a method to rate residential central air conditioners and heat pumps consistent with the Federal test procedure for residential central air conditioners and heat pumps codified in 10 CFR part 430, subpart B, appendix M1 (''appendix M1''). Appendix M1 was required to be used coincident with the January 1, 2023 compliance date of Federal energy conservation standards denominated in terms of seasonal energy efficiency ratio 2 (''SEER2''), energy efficiency ratio 2 (''EER2''), and heating seasonal performance factor 2 (''HSPF2''). Therefore, despite being published in May 2020, this version was named AHRI 210/240–2023.

[8] ECUACs and WCUACs with a rated cooling capacity greater than or equal to 65,000 Btu/h are included in the scope of ANSI/AHRI 340/360–2007 and continue to be included in scope of the latest version of AHRI 340/360 (*i.e.,* AHRI 340/360–2022).

Table II-1 List of Commenters with Written Submissions Relevant to the Test Procedures for CUACs and CUHPs in Response to the August 2023 TP NOPR

Commenter(s)	Reference in this Final Rule	Comment No. in the Docket	Commenter Type
Air-Conditioning, Heating, and Refrigeration Institute	AHRI	15	Industry Trade Association
Appliance Standards Awareness Project, American Council for an Energy-Efficient Economy	ASAP & ACEEE	11	Efficiency Advocacy Organizations
Pacific Gas and Electric Company, San Diego Gas and Electric, and Southern California Edison (collectively referred to as the "California Investor-Owned Utilities")	CA IOUs	10	Utilities
Carrier Corporation	Carrier	8	Manufacturer
Lennox International Inc.	Lennox	9	Manufacturer
Northwest Energy Efficiency Alliance	NEEA	16	Efficiency Advocacy Organization
New York State Energy Research and Development Authority	NYSERDA	13	State Agency
Rheem Manufacturing Company	Rheem	12	Manufacturer
Trane Technologies	Trane	14	Manufacturer

A parenthetical reference at the end of a comment quotation or paraphrase provides the location of the item in the public record.[9] To the extent that interested parties have provided written comments that are substantively consistent with any oral comments provided during the September 7, 2023 NOPR public webinar, DOE cites the written comments throughout this final rule. DOE did not identify any oral comments provided during the NOPR public webinar that are not substantively addressed by written comments.

In response to the August 2023 TP NOPR, DOE received multiple comments regarding energy conservation standards for CUACs and CUHPs, particularly regarding standards for ECUACs, WCUACs, and double-duct systems. Comments regarding energy conservation standards are outside the scope of consideration for this test procedure rulemaking and are not addressed in this final rule. Topics related to energy conservation standards for CUACs and CUHPs would be addressed in separate rulemaking processes.

Following the publication of the August 2023 TP NOPR, AHRI published AHRI Standard 1340–2023, ''2023 Standard for Performance Rating of Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment'' (''AHRI 1340–2023''). This is an update to AHRI Standard 340/360 that incorporates the recommendations in the ACUAC and ACUHP Working Group TP Term Sheet. This updated industry standard has not yet been adopted in ASHRAE Standard 90.1, and as such does not constitute an ASHRAE trigger, as outlined previously.

III. Discussion

In the following sections, DOE outlines certain amendments to its test procedures for CUACs and CUHPs. For each amendment, DOE provides relevant background information, explains why the amendment is necessary, discusses relevant public comments, and discusses the approach DOE has implemented.

A. Scope of Applicability

This rulemaking applies to ACUACs and ACUHPs with a rated cooling capacity greater than or equal to 65,000 Btu/h, including double-duct air conditioners and heat pumps, as well as ECUACs and WCUACs of all capacities. Definitions that apply to CUACs and CUHPs are discussed in section III.B of this final rule.

DOE's regulations for CUACs and CUHPs cover both single-package units and split systems. See the definition of ''commercial package air-conditioning and heating equipment'' at 10 CFR 431.92. A split system consists of a condensing unit—which includes a condenser coil, condenser fan and motor, and compressor—that is paired with a separate component that includes an evaporator coil to form a complete refrigeration circuit for space conditioning. One application for

[9] The parenthetical reference provides a reference for information located in the docket of DOE's rulemaking to develop test procedures for CUACs and CUHPs. (Docket No. EERE–2023–BT–TP–0014, which is maintained at *www.regulations.gov*) The references are arranged as follows: (commenter name, comment docket ID number, page of that document).

condensing units is to be paired with an air handler (which includes an evaporator coil), such that the combined system (*i.e.,* the condensing unit with air handler) meets the definition of a split system CUAC or CUHP. It should be pointed out that AHRI has a certification program for unitary large equipment that includes certification of CUACs, CUHPs, and condensing units. DOE notes that as part of the AHRI certification program for unitary large equipment, manufacturers who sell air-cooled condensing units with a rated cooling capacity greater than or equal to 65,000 Btu/h and less than 135,000 Btu/h must certify condensing units as a complete system (*i.e.,* paired with an air handler) according to the AHRI 340/360 test procedure.[10] However, for condensing units with a rated cooling capacity greater than or equal to 135,000 Btu/h and less than 250,000 Btu/h, the AHRI certification program allows manufacturers to certify condensing units as a complete system according to AHRI 340/360 or optionally certify as a condensing unit only according to AHRI Standard 365, ''Standard for Performance Rating of Commercial and Industrial Unitary Air-Conditioning Condensing Units'' (''AHRI 365'').

In the August 2023 TP NOPR, DOE emphasized that these AHRI testing and certification requirements differ from the Federal test procedure at 10 CFR 431.96, which requires testing to ANSI/AHRI 340/360–2007 and does not permit certifying to DOE as a condensing unit only according to AHRI 365. 88 FR 56392, 56398–56399 (August 17, 2023). Additionally, the AHRI certification program does not include unitary split systems or condensing units with cooling capacities above 250,000 Btu/h, whereas the Federal test procedure and standards (codified at 10 CFR 431.96 and 431.97, respectively) cover all CUACs and CUHPs with cooling capacities up to 760,000 Btu/h. Once again, in the August 2023 TP NOPR, DOE emphasized that condensing unit models distributed in commerce with air handlers with cooling capacities up to 760,000 Btu/h are covered as commercial package air-conditioning and heating equipment (*see* definition at 10 CFR 431.92), and as such, they are subject to the Federal regulations specified for CUACs and CUHPs regarding test procedures (10 CFR 431.96), energy conservation standards (10 CFR 431.97), and certification and representation requirements (10 CFR 429.43). 88 FR 56392, 56398–56399 (August 17, 2023).

In response to the August 2023 TP NOPR, DOE received several comments regarding DOE's clarification of coverage of condensing units. Trane commented that single-package and split-system equipment are included in the DOE regulation, but stated that the AHRI certification program structure specific to split systems exists for several reasons. (Trane, No. 14 at p. 2) Trane stated that split systems between 65,000 Btu/h and 250,000 Btu/h are often matched sets, but split systems between 135,000 Btu/h to 250,000 Btu/h may be installed in applications where a stand-alone condenser is matched in the field with a non-matched air-handling unit, which Trane commented warrants a separate stand-alone condenser rating. Trane stated that in larger split-system applications (with capacities greater than 250,000 Btu/h) condensing units are often paired with: (1) semi-custom and custom air-handling units that are unique to that installation; (2) more than one air-handling unit, or (3) air-handling units manufactured by different HVAC manufacturers, or the system is built up in the field and all controls for the system are installed on site. Trane asserted that even considering only the air handlers offered by a single manufacturer, there would be thousands of condenser and air handler combinations that would require testing, alternative efficiency determination method (''AEDM'') development, and certification. Trane also stated that in split-system replacements, condensing units are often replaced more frequently than the air-handling unit. *Id.*

AHRI commented that certifying condensing units as a complete system (paired with an air handler) is appropriate for the capacity range between 65,000 and 135,000 Btu/h, but that rating models with capacities greater than or equal to 135,000 Btu/h as either a complete system (using AHRI 340/360) or as a condensing unit only (using AHRI 365) allows manufacturers to provide condensing units for installation in a system that may be connected to a number of different indoor equipment types. (AHRI, No. 15 at pp. 4–5) AHRI commented that using AHRI 365 to rate models allows manufacturers to meet customer needs when indoor equipment and controls with which the condensing unit would be paired in the field are not known. AHRI stated that there is no procedure in AHRI 340/360 nor AHRI 1340 for rating outdoor units such as condensing units without an indoor match. Furthermore, AHRI commented that DOE had not investigated the impact of this proposed change sufficiently and asserted that there could be serious consequences. *Id.*

In response to concerns raised by AHRI and Trane, DOE emphasizes that the clarification provided in the August 2023 TP NOPR regarding the coverage of condensing units paired with air handlers is not a change from the existing requirements for rating these models. Neither the current DOE test procedure nor the amended test procedures adopted in this final rule reference AHRI 365 for testing or rating condensing units only. Accordingly, in this final rule, DOE reiterates that condensing unit models distributed in commerce with air handlers with cooling capacities up to 760,000 Btu/h are covered as commercial package air-conditioning and heating equipment (*see* definition at 10 CFR 431.92), and as such, they are subject to the Federal regulations specified for CUACs and CUHPs regarding test procedures (10 CFR 431.96), energy conservation standards (10 CFR 431.97), and certification and representation requirements (10 CFR 429.43).

Regarding Trane's assertion as to the extent of testing, AEDM development, and certification needed, DOE notes that its regulations do not require that ratings for CUACs and CUHPs (including split systems that comprise a condensing unit and air handler) be developed through testing, and that AEDMs can be used to rate all such systems. DOE further notes that to the extent that manufacturers have developed simulations of condensing unit model performance in accordance with AHRI 365, such simulations could be used as the basis of an AEDM to rate condensing units paired with air handlers, provided the AEDM satisfies the minimum requirements specified at 10 CFR 429.70(c).

B. Definitions

1. CUAC and CUHP Definition

As in this final rule, DOE has previously used the colloquial terms ''commercial unitary air conditioners'' and ''commercial unitary heat pump'' (*i.e.,* CUACs and CUHPs), to refer to certain commercial package air conditioning and heating equipment, recognizing that CUAC is not a statutory term and is not currently used in the CFR. *See* 79 FR 58948, 58950 (Sept. 30, 2014); 80 FR 52676, 52676 (Sept. 1, 2015). As codified in regulation, the classes for which EPCA prescribed standards have been grouped under the headings ''commercial air conditioners

[10] *See* appendix A of the AHRI Unitary Large Equipment Certification Program Operations Manual (January 2024). This can be found at *www.ahrinet.org/system/files/2023-10/ULE_OM.pdf.*

and heat pumps'' (10 CFR 431.96(b), table 1) and ''air conditioning and heating equipment'' (10 CFR 431.97(b), table 1), although these are not defined terms. These classes have also been identified by the broader equipment type with which they are associated (*i.e.,* small, large, or very large commercial package air conditioning and heating equipment). *Id.*

In the August 2023 TP NOPR, DOE proposed to establish a definition for ''commercial unitary air conditioner and commercial unitary heat pump'' to assist in distinguishing between the regulated categories of commercial package air conditioning and heating equipment. 88 FR 56392, 56399–56400 (August 17, 2023). The proposed definition was structured to indicate categories of commercial package air conditioning and heating equipment that are excluded from the definition, rather than stipulating features or characteristics of CUACs and CUHPs. The proposed definition excluded single package vertical air conditioners and heat pumps (''SPVUs''), variable refrigerant flow multi-split air conditioners and heat pumps, and water-source heat pumps. Specifically, DOE proposed to define ''commercial unitary air conditioner and commercial unitary heat pump'' as any small, large, or very large air-cooled, water-cooled, or evaporatively-cooled commercial package air conditioning and heating equipment that consists of one or more factory-made assemblies that provide space conditioning; but does not include: (1) single package vertical air conditioners and heat pumps; (2) variable refrigerant flow multi-split air conditioners and heat pumps; (3) water-source heat pumps; (4) equipment marketed only for use in computer rooms, data processing rooms, or other information technology cooling applications, and (5) equipment only capable of providing ventilation and conditioning of 100-percent outdoor air marketed only for ventilation and conditioning of 100-percent outdoor air. *Id.* at 88 FR 56399. DOE also requested comment on the proposed definition for ''commercial unitary air conditioners and heat pumps.'' *Id.* at 88 FR 56400.

DOE received feedback from several commenters regarding the proposed definition for CUACs and CUHPs. AHRI, Rheem, and Trane commented that they did not agree that the proposed definition for CUACs and CUHPs is necessary or addresses any existing problems. (AHRI, No. 15 at p. 3; Rheem, No. 12 at pp. 1–2; Trane, No. 14 at p. 3) AHRI asserted that manufacturers, regulators, and design engineers understand the phrase ''unitary central air conditioners and central air-conditioning heat pumps for commercial application'' within the existing definition for ''commercial package air-conditioning and heating equipment'' as referring to CUACs and CUHPs. (AHRI, No. 15 at p. 3) AHRI also stated that the proposed definition for CUACs and CUHPs creates a circular reference to the existing definition of ''Commercial package air-conditioning and heating equipment.'' (*Id.*) AHRI further asserted that the proposed definition for CUACs and CUHPs should not be implemented, as the term is not referenced (or proposed) in 42 U.S.C. 6311. (*Id* at p. 4) AHRI did not support any changes that would separate small, large, or very large commercial package air conditioning and heating equipment from their designation as ''ASHRAE equipment'' per 42 U.S.C. 6313. (*Id.*)

Carrier, NEEA, and NYSERDA supported the proposed definition of ''commercial unitary air conditioner and commercial unitary heat pump.'' (Carrier, No. 8 at pp. 1–2; NEEA, No. 16 at pp. 3–4; NYSERDA, No. 13 at p. 3) Carrier recommended DOE also adopt the definitions for ''Commercial and Industrial Unitary Air-Conditioning Equipment'' and ''Commercial and Industrial Unitary Heat Pump'' in sections 3.4 and 3.5 of AHRI 340/360–2022 and sections 3.5 and 3.6 of AHRI 1340–202X Draft to provide additional clarity. (Carrier, No. 8 at pp. 1–2) NYSERDA recommended including ''packaged or split'' in the definition for additional clarity. (NYSERDA, No. 13 at p. 3)

NEEA also commented that the definition proposed for CUACs and CUHPs includes excluded products, which appeared contradictory to DOE's statement that models can meet the definition for multiple equipment categories. (NEEA, No. 16 at pp. 3–4) NEEA requested clarification regarding DOE's intent with the proposed definition. (*Id.*) AHRI also requested clarification as to why DOE used distinct descriptions for the fourth and fifth exclusions in the proposed CUAC and CUHP definition rather than using the already defined terms in 10 CFR 431.92, ''Computer room air conditioners,'' and ''Unitary dedicated outdoor air systems'' respectively. (AHRI, No. 15 at pp. 3–4)

After consideration of the comments received and upon further review, DOE is declining to finalize the proposed definition for CUACs and CUHPs in this final rule. DOE may consider adopting a definition for CUACs and CUHPs in a future rulemaking action.

2. Basic Model Definition

The current definition for ''basic model'' in DOE's regulations includes a provision applicable for ''small, large, and very large air-cooled or water-cooled commercial package air conditioning and heating equipment (excluding air-cooled, three-phase, small commercial package air conditioning and heating equipment with a cooling capacity of less than 65,000 Btu/h).'' 10 CFR 431.92. Additionally, the term in the current ''basic model'' definition includes ACUACs, ACUHPs, and WCUACs, but does not explicitly include ECUACs. However, the definition of ''commercial package air-conditioning and heating equipment'' at 10 CFR 431.92 makes clear that that term includes evaporatively-cooled equipment. Consequently, ECUACs are part of the relevant basic model definition, so the omission of the term ''evaporatively-cooled'' from the heading should not impact the proper functioning and use of the test procedure.

In the August 2023 TP NOPR, DOE proposed to update the definition of ''basic model'' so that this provision instead applies to the proposed defined term ''commercial unitary air conditioner and commercial unitary heat pump,'' which would also inherently include evaporatively-cooled equipment. 88 FR 56392, 56400 (August 17, 2023). DOE also proposed editorial changes more generally to the definition of ''basic model'' specified in 10 CFR 431.92 to address that the current wording could be misinterpreted to read as a definition of each equipment category, rather than as the definition of what constitutes a basic model for each equipment category. *Id.*

DOE did not receive any comments in response to its proposal to update the definition for ''basic model.'' As discussed in section III.B.1, DOE is not finalizing the proposed defined term ''commercial unitary air conditioner and commercial unitary heat pump.'' As such, DOE is applying the definition of ''basic model'' to the existing defined term ''commercial package air-conditioning and heating equipment'' at 10 CFR 431.92. Therefore, other than this terminology change, DOE is amending the definition for ''basic model'' as proposed, for the reasons discussed in the preceding paragraphs and in the August 2023 TP NOPR.

3. Double-Duct Definition

DOE established a definition for ''double-duct air conditioner or heat pump'' at 10 CFR 431.92 (referred to as ''double-duct air conditioners and heat pumps'' or ''double-duct systems'') in an energy conservation standards direct final rule published in the **Federal Register** on January 15, 2016 (''January 2016 Direct Final Rule''). 81 FR 2420, 2529. This definition was included in a term sheet by the ASRAC working group for commercial package air conditioners (''Commercial Package Air Conditioners Working Group'') as part of the rulemaking that culminated with the January 2016 Direct Final Rule. (*See* Document No. 93 in Docket No. EERE–2013–BT–STD–0007, pp. 4–5) DOE defines ''double-duct systems'' as air-cooled commercial package air conditioning and heating equipment that: (1) is either a horizontal single package or split-system unit or a vertical unit that consists of two components that may be shipped or installed either connected or split; (2) is intended for indoor installation with ducting of outdoor air from the building exterior to and from the unit, as evidenced by the unit and/or all of its components being non-weatherized, including the absence of any marking (or listing) indicating compliance with UL 1995,[11] ''Heating and Cooling Equipment,'' or any other equivalent requirements for outdoor use; (3) if it is a horizontal unit, a complete unit has a maximum height of 35 inches; if it is a vertical unit, a complete unit has a maximum depth of 35 inches; and (4) has a rated cooling capacity greater than or equal to 65,000 Btu/h and up to 300,000 Btu/h. 10 CFR 431.92.

In the August 2023 TP NOPR, DOE proposed to amend the ''double-duct air conditioner or heat pump'' definition consistent with the definition in both AHRI 340/360–2022 and the AHRI 1340–202X Draft. 88 FR 56392, 56400–56401 (August 17, 2023). AHRI 340/360–2022 and the AHRI 1340–202X Draft specify the following definition for ''double-duct systems'': an air conditioner or heat pump that complies with all of the following: (1) is either a horizontal single package or split-system unit; or a vertical unit that consists of two components that can be shipped or installed either connected or split; or a vertical single packaged unit that is not intended for exterior mounting on, adjacent interior to, or through an outside wall; (2) is intended for indoor installation with ducting of outdoor air from the building exterior to and from the unit, where the unit and/or all of its components are non-weatherized; (3) if it is a horizontal unit, the complete unit shall have a maximum height of 35 in. or the unit shall have components that do not exceed a maximum height of 35 in. If it is a vertical unit, the complete (split, connected, or assembled) unit shall have components that do not exceed maximum depth of 35 in.; (4) has a rated cooling capacity greater than and equal to 65,000 Btu/h and less than or equal to 300,000 Btu/h.

In comparison to DOE's definition, DOE noted the following regarding the definition for double-duct system in AHRI 340/360–2022 and the AHRI 1340–202X Draft: (1) vertical single packaged units not intended for exterior mounting on, adjacent interior to, or through an outside wall can be classified as double-duct systems; (2) the maximum dimensions apply to each component of a split system; and (3) the AHRI 340/360–2022 and AHRI 1340–202X Draft definition does not include compliance with UL 1995 as a criterion for determining whether a model is non-weatherized. In the August 2023 TP NOPR, DOE tentatively concluded that the definition for ''double-duct system'' in section 3.7 of AHRI 340/360–2022 and section 3.12 of the AHRI 1340–202X Draft more appropriately classifies double-duct systems and differentiates this equipment from other categories of commercial package air conditioning and heating equipment. 88 FR 56392, 56400–56401 (August 17, 2023).

DOE did not receive comment regarding the proposed revisions to the definition for ''double-duct air conditioner or heat pump.'' DOE has determined that the substance of the definitions for ''double-duct system'' in AHRI 340/360–2022 and AHRI 1340–2023 better implement the intent of DOE and the Commercial Package Air Conditioners Working Group to create a separate equipment class of ACUACs and ACUHPs that are designed for indoor installation and that require ducting of outdoor air from the building exterior. 81 FR 2420, 2446 (Jan. 15, 2016). Thus, DOE is revising the definition of ''double-duct air conditioner or heat pump'' in 10 CFR 431.92 as proposed in the August 2023 TP NOPR, which is consistent with the definition in section 3.2.7 of AHRI 1340–2023.

4. Metric Definitions

As mentioned in sections III.D.1 and III.D.2, and discussed in further detail in section III.E of this final rule, DOE is adopting new cooling and heating metrics in appendix A1 (*i.e.,* IVEC and IVHE). Additionally, DOE is adopting three metrics for optional representations in appendix A1, as discussed further in section III.E.6 of this final rule: energy efficiency ratio 2 (''EER2''), coefficient of performance 2 (''COP2''), and IVHE for colder climates (''$IVHE_C$''). In the August 2023 TP NOPR, DOE proposed to add new definitions at 10 CFR 431.92 for the terms ''IVEC,'' ''IVHE,'' ''EER2,'' and ''COP2'' that describe what each metric represents, the test procedure used to determine each metric, and specific designations applicable to each metric (*e.g.,* $IVHE_C$). 88 FR 56392, 56401 (August 17, 2023). DOE did not receive comment on the proposed definitions for ''IVEC,'' ''IVHE,'' ''EER2,'' and ''COP2.'' Therefore, DOE is adopting the definitions as proposed in the August 2023 TP NOPR.

C. Updates to Industry Standards

The following sections discuss the changes included in the most recent updates to AHRI 340/360 and ASHRAE 37, which are incorporated by reference in the current DOE test procedure for ACUACs and ACUHPs with a rated cooling capacity greater than or equal to 65,000 Btu/h at 10 CFR 431.96 and 10 CFR part 431, subpart F, appendix A. AHRI 340/360 is also incorporated by reference in the current DOE test procedure for ECUACs and WCUACs with a rated cooling capacity greater than or equal to 65,000 Btu/h at 10 CFR 431.96. The following sections also discuss the new industry test standard, AHRI 1340–2023, which DOE is incorporating by reference for use in the new DOE test procedure for CUACs and CUHPs at 10 CFR part 431, subpart F, appendix A1.

1. AHRI 340/360

As noted previously, DOE's current test procedures for ACUACs, ACUHPs, and ECUACs and WCUACs with a rated cooling capacity greater than or equal to 65,000 Btu/h incorporates by reference ANSI/AHRI 340/360–2007. DOE's current test procedure for ECUACs and WCUACs with a rated cooling capacity less than 65,000 Btu/h incorporates by reference ANSI/AHRI 210/240–2008.

The most recent version of ASHRAE Standard 90.1 (*i.e.,* ASHRAE Standard 90.1–2022) references AHRI 340/360–2022 as the test procedure for ACUACs, ACUHPs, and ECUACs and WCUACs with a rated cooling capacity greater than or equal to 65,000 Btu/h. ASHRAE Standard 90.1–2022 included updates to the test procedure references for ECUACs and WCUACs with capacities less than 65,000 Btu/h to reference AHRI 210/240–2023. However, ECUACs and WCUACs with capacities less than 65,000 Btu/h are outside of the scope of AHRI 210/240–2023 and are instead included in AHRI 340/360–2022. Given

[11] Underwriters Laboratory (UL) 1995, *UL Standard for Safety for Heating and Cooling Equipment* (UL 1995).

these changes to the relevant industry test standards, DOE believes that such reference was an oversight.

The following list includes substantive additions in AHRI 340/360–2022 as compared to the current Federal test procedures that apply to CUACs and CUHPs, which reference ANSI/AHRI 340/360–2007 and ANSI/AHRI 210/240–2008:

1. A method for testing double-duct systems at non-zero outdoor air ESP (see section 6.1.3.7 and appendix I of AHRI 340/360–2022);

2. A method for comparing relative efficiency of indoor integrated fan and motor combinations (''IFMs'') that allows CUACs and CUHPs with non-standard (*i.e.,* higher ESP) IFMs to be rated in the same basic model as otherwise identical models with standard IFMs (see section D4.2 of appendix D of AHRI 340/360–2022);

3. Requirements for indoor and outdoor air condition measurement (see appendix C of AHRI 340/360–2022);

4. Detailed provisions for setting indoor airflow and ESP (see sections 6.1.3.3–6.1.3.5 of AHRI 340/360–2022) and refrigerant charging instructions to be used in cases in which manufacturer's instructions conflict or are incomplete (see section 5.8 of AHRI 340/360–2022); and

5. ECUACs and WCUACs with cooling capacities less than 65,000 Btu/h are included within the scope of the standard.

As discussed, DOE is amending its test procedure for CUACs and CUHPs by incorporating by reference AHRI 340/360–2022 in appendix A. Section III.E discusses the specific sections of AHRI 340/360–2022 that DOE references in the amendments to appendix A adopted in this final rule. As discussed, DOE is adopting these amendments in accordance with the requirement that the test procedures for commercial package air conditioning and heating equipment be those generally accepted industry testing procedures or rating procedures developed or recognized by AHRI or ASHRAE, as referenced in ASHRAE Standard 90.1. (42 U.S.C. 6314(a)(4)(A)) As DOE has noted, ASHRAE Standard 90.1 references an incorrect industry standard for ECUACs and WCUACs with capacities less than 65,000 Btu/h, AHRI 210/240–2023, so DOE is amending appendix A to reference the applicable industry standard, AHRI 340/360–2022.

2. AHRI 1340

The recommendations of the ACUAC and ACUHP Working Group TP Term Sheet have been incorporated into an updated version of AHRI 340/360, denoted as AHRI 1340–2023, which supersedes AHRI 340/360–2022, but has not yet been adopted in ASHRAE Standard 90.1. In the August 2023 TP NOPR, DOE proposed to adopt the AHRI 1340–202X Draft, a draft version of AHRI 1340 available at the time. DOE noted its intent to update its incorporation by reference to the final published version of the AHRI 1340–202X Draft, unless there were substantive changes between the draft and published versions. 88 FR 56392, 56402 (August 17, 2023). Differences between the ACUAC/ACUHP Working Group TP Term Sheet, the AHRI 1340–202X Draft, and AHRI 1340–2023 are discussed in the paragraphs that follow.

The AHRI 1340–202X Draft proposed for adoption in the August 2023 TP NOPR includes recommendations from the ACUAC and ACUHP Working Group TP Term Sheet described in section III.D of this final rule (including the IVEC and IVHE metrics). The AHRI 1340–202X Draft also included the following revisions and additions to the IVEC and IVHE metrics not included in the ACUAC and ACUHP Working Group TP Term Sheet, which are discussed in detail in section III.E of this final rule:

1. Detailed test instructions for splitting ESP between the return and supply ductwork, consistent with ESP requirements recommended in the ACUAC and ACUHP Working Group TP Term Sheet;

2. Corrections to the hour-based IVEC weighting factors included in the ACUAC and ACUHP Working Group TP Term Sheet;

3. Correction of the equation in the ACUAC and ACUHP Working Group TP Term Sheet for calculating adjusted ESP for any cooling or heating tests conducted with an airflow rate that differs from the full-load cooling airflow;

4. Addition of separate hour-based weighting factors and bin temperatures to calculate a separate version of IVHE that is representative of colder climates, designated IVHEC;

5. Changes to the default fan power and maximum pressure drop used for testing coil-only systems;

6. Additional instruction for component power measurement during testing;

7. Corrections to equations used for calculating IVHE;

8. Provisions for testing with non-standard low-static indoor fan motors; and

9. Revision to the power adder for WCUACs that reflects power that would be consumed by field-installed heat rejection components.

Since publication of the August 2023 TP NOPR, the AHRI 1340–202X Draft was finalized and published as AHRI 1340–2023 in December 2023. DOE has reviewed AHRI 1340–2023 and has identified that AHRI 1340–2023 includes the previously discussed revisions and additions to the IVEC and IVHE metrics in the AHRI 1340–202X Draft that were not included in the ACUAC and ACUHP Working Group TP Term Sheet. AHRI 1340–2023 also includes several revisions and updates to the test procedures specified in the AHRI 1340–202X Draft. DOE reviewed these revisions and updates, which include the following items, and discusses them in detail in sections III.E.3, III.E.7, III.E.8, III.F, and III.H of this document. Those sections also include discussion of the justification for adopting the content of these changes (which are largely consistent with corresponding proposals in the August 2023 TP NOPR) in this final rule.

1. A method for calculating capacity and fan power adjustments for coil-only systems operating at part-load airflow, consistent with DOE's proposal in the August 2023 TP NOPR;

2. Addition of a method to verify cut-in and cut-out temperatures, consistent with DOE's proposal in the August 2023 TP NOPR but with additional specificity;

3. Addition of an optional boost 2 test for optional representations of 5 °F capacity and performance for systems with more than two operating levels;

4. Allowance for the test conducted at 5 °F and 17 °F at the boost heating operating level to be used for IVHE bins ranging from 5 °F to 21 °F;

5. Revisions to appendix D of AHRI 1340 to align with the specific components approach proposed by DOE in the August 2023 TP NOPR, and inclusion of provision for how to test models with drain pan heaters present; and

6. Revisions to the test temperatures for ECUACs and WCUACs and corresponding revision to the tower fan and pump power values for WCUACs.

Consistent with the proposals in the August 2023 TP NOPR, in this final rule DOE is incorporating by reference AHRI 1340–2023 in the new test procedure at appendix A1 as DOE has determined, supported by clear and convincing evidence, that AHRI 340/360–2022 cannot provide representative energy use results for the IVEC and IVHE efficiency metrics. Further, DOE has determined that AHRI 1340–2023 would not be unduly burdensome to conduct and reflects energy efficiency during a representative average use cycle for the

IVEC and IVHE efficiency metrics. Specific aspects of AHRI 1340–2023 are discussed in more detail in section III.E. Section III.E of this document also discusses comments received on DOE's proposal to adopt the AHRI 1340–202X Draft, as well as the specific sections of AHRI 1340–2023 that DOE references in appendix A1.

3. ASHRAE 37

ANSI/ASHRAE 37–2009, which provides a method of test for many categories of air conditioning and heating equipment, is referenced for testing CUACs and CUHPs by AHRI 340/360–2022 and AHRI 1340–2023. More specifically, sections 5 and 6 and appendices C, D, and E of AHRI 340/360–2022 and sections 5 and 6 and appendices C, D, and E of AHRI 1340–2023 reference methods of test in ANSI/ASHRAE 37–2009. DOE currently incorporates by reference ANSI/ASHRAE 37–2009 in 10 CFR 431.95, and the current incorporation by reference applies to the current Federal test procedure for ACUACs and ACUHPs specified at appendix A. The current Federal test procedures at 10 CFR 431.96 for ECUACs and WCUACs do not explicitly reference ANSI/ASHRAE 37–2009. In the August 2023 TP NOPR, DOE proposed to maintain the incorporation by reference of ANSI/ASHRAE 37–2009 to the proposed appendix A, which would also apply ANSI/ASHRAE 37–2009 to testing ECUACs and WCUACs, and to incorporate by reference ANSI/ASHRAE 37–2009 for use with appendix A1. 88 FR 56392, 56402 (August 17, 2023). DOE did not receive any comments regarding its proposal to incorporate by reference ANSI/ASHRAE 37–2009 to both appendices A and A1. Therefore, as proposed, DOE is maintaining its incorporation by reference of ANSI/ASHRAE 37–2009 in appendix A and incorporating by reference ANSI/ASHRAE 37–2009 in appendix A1. Section III.E of this document discusses the specific sections of ANSI/ASHRAE 37–2009 that DOE references in appendices A and A1.

D. Term Sheet Recommendations and Metrics

As previously mentioned, DOE published in the **Federal Register** the July 2022 Notice of Intent. 87 FR 45703 (July 29, 2022). DOE then established the Working Group in accordance with FACA and NRA. The Working Group consisted of 14 members and met six times, while the Working Group's subcommittee met an additional seven times. The Working Group meetings were held between September 20, 2022, and December 15, 2022, after which the Working Group successfully reached consensus on an amended test procedure. The Working Group signed a term sheet of recommendations on December 15, 2022. (*See* EERE–2022–BT–STD–0015–0065) The Working Group addressed the following aspects of the test procedure for ACUACs and ACUHPs:

1. *Mathematical representation of cooling efficiency:* The current cooling metric specified by AHRI 340/360–2022 (*i.e.,* IEER) represents a weighted average of the measured energy efficiency ratios (EER) measured at four distinct test conditions, whereas the IVEC metric is calculated as the total annual cooling capacity divided by the total annual energy use, as discussed further in section III.D.1 of this document. The Working Group agreed that this calculation approach provides a more mathematically accurate way of representing the cooling efficiency of ACUACs and ACUHPs compared to the current approach used for IEER. As part of this equation format, the IVEC metric also uses hour-based weighting factors to represent the time spent per year in each operating mode.

2. *Integrated heating metric:* The current heating metric for ACUHPs (*i.e.,* COP) represents the ratio of heating capacity to the power input, calculated at a single test condition of 47 °F. COP does not account for the performance at part-load or over the range of temperatures seen during an average heating season, and it does not include energy use in heating season ventilation mode. IVHE accounts for both full-load and part-load operation at a range of typical ambient temperatures seen during the heating season, and it includes energy use in heating season ventilation mode. Analogous to IVEC, the IVHE metric is calculated as the total annual heating load divided by the total annual energy use, as discussed further in section III.D.2 of this document, and the metric also uses hour-based weighting factors to represent the time spent per year in each operating mode.

3. *Operating modes other than mechanical cooling:* The IEER metric currently does not include the energy use of operating modes other than mechanical cooling, such as economizer-only cooling and cooling season ventilation. The newly established IVEC metric includes the energy use of these other modes.

4. *ESP:* The IVEC and IVHE metrics require increased ESPs—in comparison to the ESPs required for determining IEER and COP—to more accurately represent ESPs and corresponding indoor fan power that would be experienced in real-world installations.

5. *Crankcase heater operation:* The current IEER metric includes crankcase heater power consumption only when operating at part-load compressor stages (*i.e.,* for part-load cooling operation, crankcase heater power is included only for higher-stage compressors that are staged off, and it is not included for lower-stage compressors when all compressors are cycled off). The COP metric does not include any crankcase heater power consumption. In contrast, the IVEC and IVHE metrics include all annual crankcase heater operation, including when all compressors are cycled off in part-load cooling or heating, ventilation mode, unoccupied no-load hours, and in heating season (for ACUACs only).

6. *Oversizing:* The current IEER and COP metrics do not consider that ACUACs and ACUHPs are typically oversized in field installations. In contrast, the IVEC and IVHE metrics include an oversizing factor of 15 percent (*i.e.,* it is assumed that the unit's measured full-load cooling capacity is 15 percent higher than the peak building cooling load and peak building heating load). Accounting for oversizing is more representative of the load fractions seen in field applications and better enables the test procedure to differentiate efficiency improvements from the use of modulating/staged components.

Based on discussions related to these six topics, the Working Group developed the ACUAC and ACUHP Working Group TP Term Sheet, which includes the following recommendations:

1. A recommendation to adopt the latest version of AHRI 340/360–2022 with IEER and COP metrics required for compliance beginning 360 days from the date a test procedure final rule publishes (see Recommendation #0);

2. The IVEC efficiency metric, to be required on the date of amended energy conservation standards for ACUACs and ACUHPs (see Recommendation #1);

3. Hour-based weighting factors for the IVEC metric (see Recommendation #2);

4. Details on determination of IVEC, including provisions for determining IVEC in appendix B of the ACUAC and ACUHP Working Group TP Term Sheet (see Recommendation #3);

5. Target load fractions and temperature test conditions for IVEC, which account for oversizing (see Recommendation #4);

6. A requirement that representations of full-load EER be made in accordance

with the full-load ''A'' test (see Recommendation #5);[12]

7. A requirement to provide representations of airflow used for the full-load ''A'' test and the part-load ''D'' test (*i.e.,* the airflow used in the lowest-stage test for the D point), and a provision for determining the minimum airflow that can be used for testing (see Recommendation #6);

8. The IVHE efficiency metric (see Recommendation #7);

9. Hour-based weighting factors, load bins, and outdoor air temperatures for each bin (*i.e.,* temperatures used for the building heating load line, not test temperature conditions) for the IVHE metric (see Recommendation #8);

10. The test conditions and list of required and optional tests and representations for the IVHE metric (see Recommendation #9);

11. Provisions for manufacturers to certify cut-in and cut-out temperatures for heat pumps to DOE and provisions for a DOE verification test of those temperatures (see Recommendation #10);

12. Commitment of the Working Group to analyze ventilation and fan-only operation included in the IVEC and IVHE metrics to validate that these metrics adequately capture fan energy use during the energy conservation standards portion of the negotiated rulemaking. If the IVEC and IVHE levels do not adequately drive more efficient air moving systems that are technologically feasible and economically justified, the Working Group committed to developing a metric addressing furnace fan energy use (see Recommendation #11);

13. ESP requirements for the IVEC and IVHE metrics, requirements for splitting the ESP requirements between the return and supply ducts, and a requirement that certified airflow for full load and D bin be made public in the DOE Compliance Certification Database (see Recommendation #12);

14. Provisions requiring manufacturers to certify crankcase heater wattages and tolerances for certification (see Recommendation #13); and

15. Provisions that the contents of the ACUAC and ACUHP Working Group TP Term Sheet be implemented in a test procedure NOPR and final rule, with the final rule issuing no later than any energy conservation standards direct final rule (see Recommendation #14).

The following sections provide a summary of the development and final recommendations regarding the IVEC and IVHE cooling and heating metrics in the ACUAC and ACUHP Working Group TP Term Sheet.

1. IVEC

For the new cooling metric, the Working Group determined to prospectively modify the climate zones and building types accounted for in the test procedure as compared to those included in the existing DOE test procedure, in order to improve the representativeness of the metrics to better reflect the broad range of applications of CUACs and CUHPs. To do so, the Working Group utilized hour-based weighting factors, which represent the average time spent per year in each operating mode and load bin. To develop these weighting factors, members of the Working Group used building modeling developed by Carrier that was based on 10 ASHRAE Standard 90.1 building prototypes across all U.S. climate zones. (*See* EERE–2022–BT–STD–0015–0019) The resulting hour-based weighting factors are provided in Recommendation #2 of the ACUAC and ACUHP Working Group TP Term Sheet. (*See* EERE–2022–BT–STD–0015–0065)

The ACUAC and ACUHP Working Group concluded that including economizer-only cooling and cooling season ventilation operating modes in a seasonal cooling metric would improve the representativeness for ACUACs and ACUHPs, and as such, included these modes in the IVEC metric outlined in Recommendation #1 and the hour-based weighting factors in Recommendation #2 of the ACUAC and ACUHP Working Group TP Term Sheet. Appendix B of the ACUAC and ACUHP Working Group TP Term Sheet provides the recommended calculation method for the IVEC method and includes sections specifying the methods for including ventilation and economizer-only cooling operation in the calculation of IVEC. (*See* EERE–2022–BT–STD–0015–0065)

The Working Group also considered ESP requirements for the IVEC and IVHE metrics. Stakeholders indicated the need for higher ESP requirements to improve representativeness of field performance. Additionally, stakeholders discussed the importance of maintaining uniformity in testing of units at higher ESP conditions. (*See* EERE–2022–BT–STD–0015–0062 at p. 11) The ESP requirements agreed to by the Working Group are provided in Recommendation #12 of the ACUAC and ACUHP Working Group TP Term Sheet (*see* EERE–2022–BT–STD–0015–0065) and include the following:

1. *Higher ESP requirements for testing:* As discussed previously, the minimum ESP conditions recommended by the Working Group are provided in Table III–1.

Table III-1 Minimum ESP Requirements for IVEC and IVHE Recommended by the ACUAC and ACUHP Working Group

Rated Cooling Capacity	ESP (in. H_2O)
≥65 and <135 kBtu/h	0.75
≥135 and <240 kBtu/h	1.0
≥240 and <280 kBtu/h	1.0
≥280 and <760 kBtu/h	1.5

2. *Economizer pressure drop:* ASHRAE Standard 90.1–2022 requires the use of economizers for comfort cooling applications for almost all U.S. climate zones. The analysis conducted by Carrier in support of the Working Group indicates that over 96 percent of buildings require the use of economizers. (see EERE–2022–BT–STD–0015–0019 at p. 14) Economizers installed in CUACs and CUHPs add internal static pressure that the indoor

[12] Similar to the current test procedure for determining IEER, the test procedure recommended in the ACUAC and ACUHP Working Group TP Term Sheet includes four cooling tests designated with letters ''A,'' ''B,'' ''C,'' and ''D.'' The ''A'' test is a full-load cooling test, while the ''B,'' ''C,'' and ''D'' tests are part-load cooling tests.

fan has to overcome, even when the economizer dampers are closed. The current DOE test procedure does not require the installation of an economizer on a tested unit, and DOE is aware that manufacturers generally do not test CUACs and CUHPs with economizers installed. The ESP requirements specified by the current DOE test procedure are the same regardless of whether a unit is tested with or without an economizer. As such, testing a unit without an economizer does not reflect the total static pressure that would be experienced in the field for installations that require the use of an economizer. Accordingly, in order to better represent the fan power of ACUACs and ACUHPs that are typically installed with economizers, the Working Group recommended that for all units tested without an economizer installed, 0.10 in. H2O shall be added to the full-load ESP values specified in Table III–1.[13]

3. *Return and supply static split requirements:* Test procedures for CUACs and CUHPs include ESP requirements that reflect the total ESP applied within the return and supply ductwork of the test set-up. The current Federal test procedure does not specify requirements for how ESP is distributed during testing (*i.e.,* the relative contribution from return ductwork versus supply ductwork). Given the recommendation to increase the required ESP levels for testing, the Working Group concluded that the higher ESP conditions could cause variability in test results if the distribution of ESP between return ductwork and supply ductwork were not specified in the revised test procedure. Therefore, to ensure repeatable and reproducible testing conditions for CUAC and CUHP units, the Working Group recommended specifying that ESP requirements be split with 25 percent applied in the return ductwork and the remaining 75 percent applied in the supply ductwork. The Working Group further recommended that the fraction of ESP applied in the return ductwork shall have a −5/+0 percent tolerance (*i.e.,* the return static must be within 20 to 25 percent of the total ESP) for the full-load cooling test. In a case where there is no additional restriction on the return duct and more than 25 percent of the ESP is already applied in the return ductwork without a restriction, then greater than 25 percent ESP in the return ductwork will be allowed. Once set for the full-load cooling test, these restriction settings shall remain unchanged for the other cooling and heating tests conducted.

To incorporate the various changes involved in testing requirements and weighting factors already discussed, the Working Group created the IVEC metric provided in Recommendation #1 with further specifications in appendix B of the ACUAC and ACUHP Working Group TP Term Sheet. The IVEC metric is a summation formula analogous to the seasonal energy efficiency ratio 2 (''SEER2'') metric designated for residential central air conditioner and central air conditioning heat pumps (''CAC/HP'') equipment. (*See* appendix M1 to subpart B of 10 CFR part 430, ''Uniform Test Method for Measuring the Energy Consumption of Central Air Conditioners and Heat Pumps.'') Stated simply, the IVEC metric is calculated by dividing the total annual cooling capacity by the total annual energy use. Key aspects encompassed in the IVEC metric include the following:

1. *Accounting for energy consumed in different modes:* The IVEC metric includes energy use during mechanical cooling, integrated mechanical and economizer cooling, economizer-only cooling, cooling season ventilation, unoccupied no-load hours, and heating season operation of crankcase heat (for CUACs only). Appendix B of the ACUAC and ACUHP Working Group TP Term Sheet specifies instructions for determining energy consumption during each mode.

2. *Testing parameters:* The ACUAC and ACUHP Working Group TP Term Sheet further specifies instructions in appendix B for the mechanical cooling tests at each target mechanical load. These methodologies and tolerances mirror those specified in AHRI 340/360–2022, including a 3-percent tolerance on the target mechanical load for part-load tests, and in cases when the target mechanical load cannot be met within tolerance, instructions for using interpolation and cyclic degradation to determine the performance at the target test point.

3. *Target load percentages:* Recommendation #4 of the ACUAC and ACUHP Working Group TP Term Sheet includes target conditions for testing, including load percentages for testing units at part-load conditions. For each bin, the specified target load percent (%Loadi) reflects the average load as a percentage of the full-load capacity for that bin met by using all modes of cooling, and is used for determining total annual cooling provided in the numerator of the IVEC equation. The target mechanical load percent (%Loadi,mech) is the average load for each bin met only through mechanical cooling (*i.e.,* mechanical-only cooling and the mechanical portion of integrated mechanical and economizer cooling) and is the target load fraction used for the part-load cooling test for each bin.

As mentioned, the IVEC metric includes the annual operation of crankcase heaters for CUACs and CUHPs. Appendix B of the ACUAC and ACUHP Working Group TP Term Sheet further specifies the accounting of crankcase heater energy consumption in each operating mode. Recommendation #2 of the ACUAC and ACUHP Working Group TP Term Sheet specifies hour-based weighting factors to account for crankcase heat operation in unoccupied no-load cooling season hours for CUACs and CUHPs, as well as heating season hours for CUACs. Appendix B of the ACUAC and ACUHP Working Group TP Term Sheet also specifies that for part-load cooling tests, crankcase heat is accounted for in power measurements of higher-stage compressors that are staged off during testing, while crankcase heat operation of lower-stage compressors when cycled off as well as crankcase heat operation in other operating modes is calculated using the certified crankcase heater power.

The IVEC metric also accounts for a 15-percent oversizing factor. Accordingly, the target load percentages specified in Recommendation #4 include this 15-percent oversizing factor. Additionally, the A test condition is excluded from the IVEC calculation; however, the A test is still a required test point for determining full-load capacity.

IVEC includes outdoor and return air dry-bulb and wet-bulb test temperatures that differ from those used in the current test procedure for determining IEER, as shown in Table III–2.

[13] An economizer is an apparatus that supplies outdoor air to reduce or eliminate the need for mechanical cooling during mild or cooler weather.

Table III-2 IEER and IVEC Test Temperatures

Test Point	IEER Test Conditions		IVEC Test Conditions	
	Outdoor Air Dry-Bulb Temperature (°F)	Return Air Temperature (Dry-Bulb/ Wet-Bulb) (°F)	Outdoor Air Dry-Bulb Temperature (°F)	Return Air Temperature (Dry-Bulb/ Wet-Bulb) (°F)
A	95	80/67	95	80/67
B	81.5	80/67	85	77/64
C	68	80/67	75	77/64
D	65	80/67	65	77/64

The IVEC metric also limits the minimum airflow that can be used for testing. This minimum airflow limit calculation method is based on the average ventilation rate determined in building modeling performed to develop IVEC and is a function of the full-load cooling capacity. Unlike AHRI 340/360–2022 (*see* section 6.1.3.4.5), the provisions for determining IVEC do not specify separate test provisions for setting airflow during part-load tests of multi-zone variable air volume (''MZVAV'') units. Rather, the part-load airflow used for testing all CUACs and CUHPs will be based on the certified part-load cooling airflow.

2. IVHE

The IVHE metric specified in the ACUAC and ACUHP Working Group TP Term Sheet differs from the COP heating efficiency metric specified in the current DOE test procedure by the inclusion of heating season operating modes not currently accounted for, a combined seasonal performance metric rather than individual ratings at specific temperature conditions, and additional optional test conditions. In alignment with the development of the IVEC metric described in section III.D.1 of this final rule, the Working Group determined to utilize hour-based weighting factors to account for heating loads across more building types and climate zones than are included in the current DOE test procedure. The building heating load lines and hours developed for the IVHE metric rely on a similar ASHRAE Standard 90.1 building and climate zone analysis as the one conducted for the IVEC metric development. Additionally, in developing the heating load line on which the hour-based weighting factors rely, the Working Group utilized the previously discussed 15-percent oversizing factor and assumed a heat-to-cool ratio of 1, as outlined in Recommendation #8 (*i.e.,* assumed the peak building cooling load equals the peak building heating load).

The heating rating requirements recommended in the ACUAC and ACUHP Working Group TP Term Sheet include several distinct provisions regarding testing requirements from the existing DOE test procedure. In the current DOE test procedure, CUHPs are required to be tested only at a 47 °F full-load condition to generate a COP rating. Recommendation #9 of the ACUAC and ACUHP Working Group TP Term Sheet, however, introduces several provisions with significant differences from the existing DOE test procedure. First, the recommendation includes required testing at 47 °F and 17 °F full-load conditions, aligning with those previously specified in AHRI 340/360–2022. Additionally, the recommendation introduces optional part-load test conditions at both 47 °F and 17 °F temperature conditions, as well as test conditions for optional testing at a 5 °F full-load condition. Finally, the recommendation includes test requirements for optional boost tests at the 17 °F and 5 °F test conditions for variable-speed units. Additionally, the IVHE metric incorporates two operating modes previously excluded from the DOE test procedure: heating season ventilation mode and supplemental electric resistance heat operation. Lastly, the IVHE test conditions rely on the same ESP requirements per capacity bin as those specified for IVEC, as detailed in Recommendation #12. The airflow provisions pertaining to IVEC mentioned in section III.D.1 of this final rule (*i.e.,* a limit on minimum airflow used for testing and no separate test provisions for MZVAV units) apply to the test provisions for the IVHE metric as well.

The results from optional and required testing, as well as the newly included operating modes, are included in the calculation of the IVHE metric utilizing the weighting factors outlined in Recommendation #8 and calculation methods from appendix C of the ACUAC and ACUHP Working Group TP Term Sheet. The calculation methods for IVHE that implement these changes are further detailed in the paragraphs that follow.

The IVHE metric includes contributions from both mechanical and resistance heating to meet building heating load. Similar to the IVEC calculation approach, the IVHE metric is calculated by dividing the total annual building heating load by the total annual energy use.

Recommendations #8, #9, and #10, as well as appendices B and C of the ACUAC and ACUHP Working Group TP Term Sheet, provide the calculation methods for the IVHE metric. The hour-based weighting factors and bin temperatures for IVHE are included in Recommendation #8 of the ACUAC and ACUHP Working Group TP Term Sheet, which specifies 10 distinct load-based bins alongside weighting factors for heating season ventilation and operation of crankcase heat in unoccupied no-load heating season hours. The calculation methods outlined for the IVHE metric in the ACUAC and ACUHP Working Group TP Term Sheet are specified as the following:

1. *Building load calculation:* Recommendation #8 includes the calculation method for the building load in each load bin based on the measured full-load cooling capacity.

2. *Interpolation between temperatures:* Appendix C of the ACUAC and ACUHP Working Group TP Term Sheet specifies interpolation instructions for the various test temperatures specified in Recommendation #8. Interpolation instructions are specified for bins with temperatures between 17 °F and 47 °F. Appendix C also includes the following instructions for bins with temperatures less than 17 °F: (1) interpolation instructions to be used if the optional

5 °F test is conducted, and (2) extrapolation instructions utilizing the 47 °F and 17 °F test data to be used if the 5 °F test is not conducted.

3. *Determination of heating stage, auxiliary heat, and cyclic degradation:* For load bins in which the calculated building load exceeds the highest-stage mechanical heating capacity determined for the bin temperature, appendix C of the ACUAC and ACUHP Working Group TP Term Sheet includes calculation methods for determining the power required by auxiliary resistance heat and is included in the overall IVHE calculation. For load bins in which the calculated building load is lower than the lowest-stage mechanical heating capacity determined for the bin temperature, appendix C of the ACUAC and ACUHP Working Group TP Term Sheet includes calculation methodology for calculating power and incorporating cyclic degradation with a cyclic degradation factor of 0.25. This cyclic degradation methodology is consistent with the methodology specified in appendix M1 to subpart B of 10 CFR part 430 for residential central heat pumps. For load bins in which the calculated building load is in between the lowest-stage and highest-stage mechanical heating capacities determined for the bin temperature, appendix C of the ACUAC and ACUHP Working Group TP Term Sheet includes calculations for determining power based on interpolation between performance of mechanical heating stages.

4. *Defrost degradation:* The capacity calculations for all load bins with temperatures less than 40 °F include a defrost degradation coefficient, with calculations specified in appendix C of the ACUAC and ACUHP Working Group TP Term Sheet.

5. *Cut-out factor:* Recommendation #10 of the ACUAC and ACUHP Working Group TP Term Sheet specifies that manufacturers will certify cut-in and cut-out temperatures, or the lack thereof, to DOE to ensure resistance-only operation is included at temperatures below which mechanical heating would not operate. This restriction is implemented in calculations through a cut-out factor included in appendix C. DOE is not amending the certification or reporting requirements for ACUHPs in this final rule to require reporting cut-in and cut-out temperatures. Instead, DOE may consider proposals to amend the certification and reporting requirements for this equipment under a separate rulemaking regarding appliance and equipment certification.

6. *Crankcase heater power contribution:* In alignment with the inclusion of crankcase heater power contribution in IVEC, appendix C of the ACUAC and ACUHP Working Group TP Term Sheet specifies a method for incorporating crankcase heat power for all heating season operating modes for ACUHPs. Specifically, for part-load heating tests, crankcase heat is accounted for in power measurements of higher-stage compressors that are staged off during testing, while crankcase heat operation of lower-stage compressors when cycled off, as well as crankcase heat operation in other operating modes, is calculated using the certified crankcase heater power.

E. DOE Adopted Test Procedures and Comments Received

In the August 2023 TP NOPR, DOE proposed to maintain the current efficiency metrics of IEER, EER, and COP in appendix A, and reference AHRI 340/360–2022 in appendix A for measuring the existing metrics. 88 FR 56392, 56403–56404 (August 17, 2023). Additionally, DOE proposed to establish a new test procedure at appendix A1 that adopts the substance of the AHRI 1340–202X Draft, including the new IVEC and IVHE metrics, through incorporation by reference of a finalized version of that industry test standard. *Id.* The following sections discuss DOE's proposals, comments received, and DOE's adopted provisions regarding (1) AHRI 1340–2023 and the IVEC and IVHE metrics; (2) double-duct systems; (3) ECUACs and WCUACs; (4) the IVHE metric for colder climates; (5) the test conditions used in appendix A; (6) the test conditions used in appendix A1; (7) provisions introduced in the AHRI 1340–202X Draft that are not included in the ACUAC and ACUHP Working Group TP Term Sheet; and (8) heating test provisions introduced in AHRI 1340–2023.

1. Overall

As discussed, DOE proposed to establish a new test procedure at appendix A1 that would adopt the AHRI 1340–202X Draft, including the newly proposed IVEC and IVHE metrics. DOE noted its intent to ideally incorporate by reference a finalized version of that industry test standard. DOE further stated that if a finalized version of the AHRI 1340–202X Draft is not published before the test procedure final rule, or if there are substantive changes between the draft and published versions of the standard that are not supported by stakeholder comments in response to this NOPR, DOE may adopt the substance of the AHRI 1340–202X Draft or provide additional opportunity for comment on the final version of that industry consensus standard. *Id.* As noted in the August 2023 TP NOPR, certain provisions in the current appendix A and table 1 to 10 CFR 431.96(b) (*e.g.,* regarding minimum ESP, optional break-in) would be redundant with the reference to AHRI 340/360–2022, and, as such, DOE proposed to remove those explicit provisions from table 1 to 10 CFR 431.96(b) and appendix A, and instead reference them through the relevant provisions of the updated AHRI 340/360. *Id.*

Further, in both appendix A and appendix A1, DOE proposed to incorporate by reference ANSI/ASHRAE 37–2009. *Id.*

Specifically for appendix A1, DOE proposed to adopt certain sections of the AHRI 1340–202X Draft to determine IVEC and IVHE, which are generally consistent with the recommendations from the ACUAC and ACUHP Working Group TP Term Sheet. *Id.* The ACUAC and ACUHP Working Group TP Term Sheet applies only to the test procedures for ACUACs and ACUHPs, excluding double-duct systems. However, the AHRI 1340–202X Draft proposed for adoption in the August 2023 TP NOPR, as well as the final version of the standard (*i.e.,* AHRI 1340–2023), include additional provisions for determining IVEC and IVHE for double-duct systems, ECUACs, and WCUACs, indicating industry consensus that these metrics are appropriate for these categories of CUACs and CUHPs. *Id.* DOE requested comment on the proposed adoption of the IVEC and IVHE metrics as determined using the AHRI 1340–202X Draft in appendix A1 for all CUACs and CUHPs. *Id.*

On this topic, AHRI, ASAP & ACEEE, Carrier, the CA IOUs, Lennox, NEEA, Rheem, and Trane generally supported the proposal to adopt the IVEC and IVHE metrics as determined in the AHRI 1340–202X Draft, consistent with the ACUAC and ACUHP Working Group TP Term Sheet. (AHRI, No. 15 at pp. 1, 5; ASAP & ACEEE, No. 11 at p. 1; Carrier, No. 8 at p. 2; CA IOUs, No. 10 at pp. 1–2; Lennox, No. 9 at p. 2; NEEA, No. 16 at pp. 1–2; Rheem, No. 12 at p. 2, Trane, No. 14 at p. 1) NEEA specifically supported the ESP requirements proposed by DOE consistent with the recommendations of the ACUAC and ACUHP Working Group TP Term Sheet. (NEEA, No. 16 at p. 2) The CA IOUs stated that the new test procedure improves representativeness. (CA IOUs, No. 10 at p. 1) AHRI and ASAP & ACEEE acknowledged the efforts made by the AHRI Commercial Unitary Standards Technical Committee

(''STC'') and supported the corrections and additions to the ACUAC and ACUHP Working Group TP Term Sheet included in the AHRI 1340–202X Draft. (AHRI, No. 15 at pp. 1–2; ASAP & ACEEE, No. 11 at p. 1)

As proposed, DOE is adopting the most recent version of AHRI Standard 340/360 (*i.e.,* AHRI 340/360–2022) in appendix A for testing CUACs and CUHPs (including ACUACs, ACUHPs, ECUACs, WCUACs, and double-duct systems) to measure the current metrics—EER, IEER, and COP. Specifically, DOE is adopting the following sections of AHRI 340/360–2022: sections 3 (with certain exclusions [14]), 4, 5, and 6, and appendices A, C, D (excluding sections D1 through D3), and E. As proposed, DOE is also removing certain provisions from table 1 to 10 CFR 431.96(b) and the current appendix A that are redundant with the reference to AHRI 340/360–2022 adopted in appendix A in this final rule. As discussed, DOE is adopting these amendments in accordance with the requirement that the test procedures for commercial package air conditioning and heating equipment be those generally accepted industry testing procedures or rating procedures developed or recognized by AHRI or ASHRAE, as referenced in ASHRAE Standard 90.1. (42 U.S.C. 6314(a)(4)(A))

As discussed in section III.C.2 of this document, AHRI 1340–2023 includes certain updates that are not included in the ACUAC and ACUHP Working Group TP Term Sheet. Most of these updates were included in the AHRI 1340–202X Draft, and they are discussed in detail in section III.E.7 of this final rule. There are also several updates included AHRI 1340–2023 that were not included in the AHRI 1340–202X Draft, notably regarding ECUACs and WCUACs (discussed in further detail in section III.E.3 of this document) and boost heating tests (described in further detail in section III.E.8 of this document). Based on comments received and DOE's review of AHRI 1340–2023, DOE has determined that the updates to the test procedure in AHRI 1340–2023 are appropriate, consistent with the intent of the ACUAC and ACUHP Working Group TP Term Sheet and the intent of the provisions proposed in the August 2023 TP NOPR, and improve the representativeness of the test procedure.

DOE has determined that the recommendations specified in the ACUAC and ACUHP Working Group TP Term Sheet are consistent with the EPCA requirement that test procedures for covered equipment, including CUACs and CUHPs, be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs of a type of industrial equipment (or class thereof) during a representative average use cycle (as determined by the Secretary), and shall not be unduly burdensome to conduct (42 U.S.C. 6314(a)(2)). As a result, DOE is adopting a new test procedure in appendix A1 in accordance with the Term Sheet. Therefore, DOE is amending the test procedure for CUACs and CUHPs to adopt in the new appendix A1 the test provisions in AHRI 1340–2023 and ASHRAE 37–2009. DOE is adopting the following sections of AHRI 1340–2023 in appendix A1: sections 3 (with certain exclusions),[15] 4, 5 (excluding section 5.2), and 6.1 through 6.3, and appendices A, C, D (excluding sections D.1 and D.2), and E. Use of appendix A1 will not be required until the compliance date of amended energy conservation standards denominated in terms of the new metrics in appendix A1, should such standards be adopted.

As proposed, for appendices A and A1, DOE is incorporating by reference ANSI/ASHRAE 37–2009. Appendices A and A1 reference all sections of the industry test standard except sections 1 (Purpose), 2 (Scope), and 4 (Classifications).

2. Double-Duct Systems

As discussed in section III.B.3 of this final rule, double-duct systems are equipment classes of ACUACs and ACUHPs, either single package or split, designed for indoor installation in constrained spaces, such that outdoor air must be ducted to and from the outdoor coil.

Pursuant to the current DOE test procedure (which references ANSI/AHRI 340/360–2007), double-duct systems are tested and rated under the same test conditions at zero outdoor air ESP as conventional ACUACs and ACUHPs (*i.e.,* that are not double-duct systems). AHRI 340/360–2022 includes two different set of test provisions that can be used for testing double-duct systems. Section 6.1.3.7 of AHRI 340/360–2022 includes provisions for measuring performance at zero outdoor air ESP to determine the EER, IEER, and/or COP metrics, consistent with the current DOE test procedure. AHRI 340/360–2022 added an additional test method in appendix I for double-duct systems that specifies an outdoor air ESP requirement of 0.50 in. H_2O for double-duct systems. When testing with 0.50 in. H_2O outdoor air ESP, ratings are designated with the subscript ''DD'' (*e.g.,* EER_{DD}, COP_{DD}, and $IEER_{DD}$) to distinguish them from the ratings determined by testing at zero outdoor air ESP. ASHRAE Standard 90.1–2022 does not include any separate provisions for double-duct systems or the EER_{DD}, COP_{DD}, and/or $IEER_{DD}$ metrics; therefore, testing per Appendix I to AHRI 340/360–2022 is not required per ASHRAE Standard 90.1–2022. As a result, DOE's statutory obligation to consider the test procedures for CUACs and CUHPs referenced in ASHRAE Standard 90.1 (per 42 U.S.C. 6314(a)(4)(A)) does not include Appendix I to AHRI 340/360–2022.

The ACUAC and ACUHP Working Group TP Term Sheet did not include provisions for double-duct systems. However, the AHRI 1340–202X Draft included provisions for determining the new IVEC and IVHE metrics for double-duct systems. Specifically, similar to appendix I of AHRI 340/360–2022, the AHRI 1340–202X Draft applied a 0.50 in. H_2O outdoor air ESP requirement for determining IVEC and IVHE for double-

[14] DOE is not referencing the following provisions in section 3 of AHRI 340/360–2022 because the terms are either defined at 10 CFR 431.92 or are not needed for the DOE test procedure: 3.2 (Basic Model), 3.4 (Commercial and Industrial Unitary Air-conditioning Equipment), 3.5 (Commercial and Industrial Unitary Heat Pump), 3.7 (Double-duct System), 3.8 (Energy Efficiency Ratio), 3.12 (Heating Coefficient of Performance), 3.14 (Integrated Energy Efficiency Ratio), 3.23 (Published Rating), 3.26 (Single Package Air-Conditioners), 3.27 (Single Package Heat Pumps), 3.29 (Split System Air-conditioners), 3.30 (Split System Heat Pump), and 3.36 (Year Round Single Package Air-conditioners).

[15] DOE is not referencing the following provisions in section 3 of AHRI 1340–2023 because the terms are either defined at 10 CFR 431.92 or are not needed for the DOE test procedure: 3.2.2 (Barometric Relief Dampers), 3.2.3 (Basic Model), 3.2.5 (Commercial and Industrial Unitary Air-conditioning Equipment), 3.2.5.1 (Commercial and Industrial Unitary Air-Conditioning System), 3.2.5.2 (Commercial and Industrial Unitary Heat Pump), 3.2.7 (Double-duct System), 3.2.9 (Desiccant Dehumidification Component), 3.2.10 (Drain Pan Heater), 3.2.11.1 (Air Economizer), 3.2.12 (Energy Efficiency Ratio 2), 3.2.13 (Evaporative Cooling), 3.2.13.1 (Direct Evaporative Cooling System), 3.2.13.2 (Indirect Evaporative Cooling System), 3.2.14 (Fresh Air Damper), 3.2.15 (Fire, Smoke, or Isolation Damper), 3.2.17 (Hail Guard), 3.2.19 (Heating Coefficient of Performance 2), 3.2.20 (High-Effectiveness Indoor Air Filtration), 3.2.22 (Indoor Single Package Air-conditioners), 3.2.23 (Integrated Ventilation, Economizing, and Cooling Efficiency (IVEC)), 3.2.34 (Integrated Ventilation and Heating Efficiency (IVHE)), 3.2.29 (Non-standard Ducted Condenser Fan), 3.2.31.2 (Boost2 Heating Operational Level (B2)), 3.2.34 (Power Correction Capacitor), 3.2.35 (Powered Exhaust Air Fan), 3.2.36 (Powered Return Air Fan), 3.2.37 (Process Heat Recovery, Reclaim, or Thermal Storage Coil), 3.2.38 (Published Rating), 3.2.41 (Refrigerant Reheat Coil), 3.2.42 (Single Package Air-Conditioners), 3.2.43 (Single Package Heat Pumps), 3.2.45 (Sound Trap), 3.2.46 (Split System), 3.2.51 (Steam or Hydronic Heat Coils), 3.2.53 (UV Lights), 3.2.55 (Ventilation Energy Recovery System (VERS)), 3.2.56 (Year Round Single Package Air-conditioners), and 3.2.57 (Year Round Single Package Heat Pump).

duct systems. Other than this outdoor air ESP requirement, the AHRI 1340–202X Draft specified no differences in determining IVEC and IVHE for double-duct systems as compared to conventional ACUACs and ACUHPs. In the August 2023 TP NOPR, DOE proposed to: (1) maintain the existing metrics for double-duct systems and reference AHRI 340/360–2022 for double-duct systems in appendix A, and (2) adopt the IVEC and IVHE metrics for double-duct systems in appendix A1 as specified in the AHRI 1340–202X Draft. 88 FR 56392, 56421–56422 (August 17, 2023).

In response, Carrier supported the adoption of the IVEC and IVHE metric, as specified in AHRI 1340–202X, in appendix A1, as well as the proposal to maintain the test procedure from AHRI 340/360–2022 in appendix A without the provisions of appendix I of that test procedure. (Carrier, No. 8 at p. 3) AHRI similarly supported the adoption of IVEC and IVHE for double-duct systems in appendix A1. (AHRI, No. 15 at p. 2)

DOE notes that AHRI 1340–2023 maintains the same ESP conditions and method for determining IVEC and IVHE for double-duct systems as the method specified in the AHRI 1340–202X Draft. Because double-duct systems are installed indoors with ducting of outdoor air to and from the outdoor coil, DOE has concluded that testing at a non-zero outdoor air ESP (as specified in the AHRI 1340–2023) would be more representative of field applications than testing at zero outdoor air ESP (as specified in the current Federal test procedure). DOE has also concluded that the IVEC and IVHE metrics specified in AHRI 1340–2023 better capture actual energy use in the field than the COP, EER, and IEER metrics specified in the current DOE test procedure, for the reasons discussed throughout this final rule for ACUACs and ACUHPs more generally. Further, DOE has concluded that the application of the IVEC and IVHE metrics in AHRI 1340–2023 to double-duct systems reflect industry consensus that these metrics are suitable for double-duct systems. For these reasons and given the support expressed by stakeholders, DOE is adopting the provisions in AHRI 1340–2023 for determining IVEC and IVHE for double-duct systems in appendix A1.

As mentioned previously, the current cooling energy conservation standards for double-duct systems are in terms of EER and the current heating energy conservation standards are in terms of COP. Testing to the IVEC and IVHE metrics will not be required until such time as compliance is required with amended energy conservation standards for double-duct systems denominated in terms of IVEC and IVHE, should DOE adopt such standards. As discussed, DOE is also updating the current test procedure for all CUACs and CUHPs, including double-duct systems, in appendix A to reference AHRI 340/360–2022, maintaining the current EER and COP metrics until the compliance date of any energy conservation standards for double-duct systems denominated in terms of IVEC and IVHE. As discussed, ASHRAE Standard 90.1–2022 does not include any provisions specific to double-duct systems or standards denominated in terms of the EER_{DD}, COP_{DD}, and/or $IEER_{DD}$ metrics; therefore, testing double-duct systems at non-zero outdoor air ESP per Appendix I to AHRI 340/360–2022 which generates results in terms of EER_{DD}, COP_{DD}, and/or $IEER_{DD}$ (as opposed to testing a zero outdoor air ESP per section 6.1.3.7 of AHRI 340/360–2022 which generates results in terms of EER, COP, and/or IEER) is not required per ASHRAE Standard 90.1–2022. As a result, DOE's statutory obligation to consider the test procedures for CUACs and CUHPs referenced in ASHRAE Standard 90.1 (per 42 U.S.C. 6314(a)(4)(A)) does not include Appendix I to AHRI 340/360–2022.

3. ECUACs and WCUACs

a. Overall

The current DOE test procedure for ECUACs and WCUACs is specified at 10 CFR 431.96 and includes the EER metric. The ACUAC and ACUHP Working Group TP Term Sheet does not include provisions for ECUACs and WCUACs. However, the AHRI 1340–202X Draft includes provisions for determining the new IVEC and optional EER2 metric for ECUACs and WCUACs. The AHRI 1340–202X Draft and AHRI 1340–2023 provisions for determining IVEC and EER2 for ECUACs and WCUACs are largely the same as the provisions for ACUACs and ACUHPs; however, there are several provisions specific or unique to ECUACs and WCUACs, specifically regarding: (1) ESP requirements, (2) test temperatures, and (3) accounting for power of WCUAC heat rejection components.

In the August 2023 TP NOPR, DOE proposed to adopt the IVEC metric for ECUACs and WCUACs in appendix A1, as specified in the AHRI 1340–202X Draft, and sought comment on this proposal, including the test temperature requirements. 88 FR 56392, 56419–56420 (August 17, 2023).

In response to the August 2023 TP NOPR, Carrier supported the adoption of the IVEC metric for ECUACs and WCUACs in appendix A1 as specified in the proposed AHRI 1340–202X Draft. (Carrier, No. 8 at p. 2) Carrier also commented that the working version of AHRI 1340 (at the time of Carrier's comment) included updated test temperatures for determining IVEC and EER2 for ECUACs and WCUACs, and Carrier presented these updated test conditions. (*Id.*) AHRI also expressed support for DOE's proposal to adopt the IVEC and IVHE metrics for ECUACs and WCUACs. (AHRI, No. 15 at pp. 2, 5)

Trane supported the product classifications and water temperatures for WCUACs in AHRI 1340 but did not support adopting the IVEC metric for WCUACs as specified in AHRI 1340. Trane further stated that issues specific to WCUACs need to be addressed in order to adopt an IVEC metric for WCUACs that is truly representative of field applications. Trane asserted that the provisions in AHRI 1340 do not adequately consider the difference between indoor and outdoor single package units and stated that the vast majority of WCUACs are indoor packaged units. Trane further commented that WCUACs installed indoors most often use waterside economizers rather than airside economizers and are typically installed in the core of a multi-story office building, such that outdoor air for economizing or ventilation is not introduced through the WCUAC air handling section. Trane also commented that because WCUACs typically distribute conditioned air only within a single floor of a building, duct runs are typically shorter than for traditional rooftop systems, and, therefore, the ESP conditions included in AHRI 1340 should be different for WCUACs. (Trane, No. 14 at pp. 3–4)

Regarding Trane's concerns about the IVEC metric for WCUACs, DOE acknowledges that WCUACs have a range of applications that may not always align with the assumptions included in the analyses to develop the IVEC metric. However, DOE notes that this is also true for ACUACs and ACUHPs, which serve a wide range of applications and operate in a wide variety of different operating conditions. The intent of the IVEC metric, as developed by the Working Group, was to representatively capture performance of the U.S. national average of CUAC and CUHP applications, understanding that this ''average performance'' cannot perfectly represent the unique aspects of certain applications. DOE notes that the IVEC metric is specified for WCUACs in the recently published industry consensus test procedure AHRI 1340–

2023 consistent with DOE's proposals (with certain updated test conditions, as discussed). Therefore, DOE understands AHRI 1340–2023 and the IVEC metric specified in the test procedure to represent general industry consensus on a representative test procedure and metric for CUACs and CUHPs, including WCUACs.

AHRI 1340–2023 includes updates to the provisions for determining IVEC for ECUACs and WCUACs—specifically, the test temperature and accounting for power of WCUAC heat rejection components. The ESP requirements specified for ECUACs and WCUACs are unchanged from the AHRI 1340–202X Draft. These provisions are discussed in detail in the following subsections. DOE has concluded that the IVEC metric specified in AHRI 1340–2023 for ECUACs and WCUACs (including the ESP requirements, updated test temperatures, and updated WCUAC heat rejection component power allowances) is consistent with the proposed adoption of the IVEC metric specified in the AHRI 1340–202X Draft and meets the criteria in 42 U.S.C. 6314(a)(2)–(3). Accordingly, DOE is adopting the IVEC metric (as well as the optional EER2 metric) and associated test provisions specified in AHRI 1340–2023 in appendix A1 for ECUACs and WCUACs.

As mentioned previously, the current energy conservation standards for ECUACs and WCUACs are in terms of EER. Testing to the IVEC metric will not be required until such time as compliance is required with amended energy conservation standards for ECUACs and WCUACs denominated in terms of IVEC, should DOE adopt such standards. As discussed, DOE is also updating the current test procedure for all CUACs and CUHPs, including ECUACs and WCUACs, in appendix A to reference AHRI 340/360–2022, maintaining the current EER metric until the compliance date of any energy conservation standards for ECUACs and WCUACs denominated in terms of the IVEC metric. As discussed in section III.C.1 of this final rule, DOE has concluded that this amendment in Appendix A is consistent with the intent of the test procedure references for ECUACs and WCUACs in the latest published version of ASHRAE Standard 90.1.

b. ESP Requirements for ECUACs and WCUACs

The IVEC and EER2 metrics include higher ESP requirements than the current DOE test procedures and AHRI 340/360–2022. For ECUACs and WCUACs with cooling capacity greater than or equal to 65,000 Btu/h, the AHRI 1340–202X Draft specifies the same ESP requirements for determining IVEC and EER2 for ECUACs and WCUACs as for ACUACs and ACUHPs. For ECUACs and WCUACs with cooling capacity less than 65,000 Btu/h, there are no air-cooled equipment of comparable cooling capacity within the scope of the AHRI 1340–202X Draft. Therefore, the AHRI 1340–202X Draft includes an ESP requirement of 0.5 in. H_2O for testing ECUACs and WCUACs with cooling capacity less than 65,000 Btu/h, which is consistent with the ESP requirement specified in AHRI 210/240–2023 for comparable air-cooled equipment (*i.e.,* air-cooled, three-phase CUACs and CUHPs with cooling capacity less than 65,000 Btu/h). As discussed in the August 2023 TP NOPR, DOE understood that the provisions for determining IVEC and EER2 for ECUACs and WCUACs, specifically including the higher ESP requirements outlined in the AHRI 1340–202X Draft, reflect industry consensus that the IVEC metric (and optional EER2 metric) provide a more representative measure of energy efficiency for ECUACs and WCUACs. 88 FR 56392, 56419–56420 (August 17, 2023). AHRI 1340–2023 maintains the same ESP requirements as those outlined in the AHRI 1340–202X Draft. In this final rule, DOE maintains its conclusion that the ESP requirements specified for ECUACs and WCUACs in AHRI 1340–2023 are representative of field installations for ECUACs and WCUACs. As such, DOE is adopting the ESP requirements for testing ECUACs and WCUACs as outlined in AHRI 1340–2023.

c. ECUAC and WCUAC Test Temperatures and WCUAC Heat Rejection Components

ECUACs and WCUACs use different test temperatures than ACUACs and ACUHPs, and in the August 2023 TP NOPR, DOE presented test temperature requirements for full-load and part-load test points for determining IVEC for ECUACs and WCUACs, as specified in the AHRI 1340–202X Draft. 88 FR 56392, 56419–56420 (August 17, 2023).

WCUACs are typically installed in the field with separate heat rejection components [16] that reject heat from the water loop to outdoor ambient air, but these separate heat rejection components are not installed nor is their power measured during testing of WCUACs under the current DOE test procedure. 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.

Section 6.2.4.3 of the AHRI 1340–202X Draft includes similar provisions for accounting for the power of heat rejection components for WCUACs to those in AHRI 340/360–2022. However, unlike AHRI 340/360–2022, the heat rejection component power addition was not limited to units with cooling capacities less than 135,000 Btu/h in the AHRI 1340–202X Draft, and instead, it applied to WCUACs of all cooling capacities. DOE proposed the adoption of the approach specified in the AHRI 1340–202X Draft in the August 2023 TP NOPR. 88 FR 56392, 56420–56421 (August 17, 2023).

As noted by Carrier's comment (summarized in section III.E.3.a of this document), based on further discussions and analysis in AHRI Commercial Unitary STC meetings after the issuance of the AHRI 1340–202X Draft, the test conditions for ECUACs and WCUACs were updated in the published AHRI 1340–2023. Additionally, AHRI 1340–2023 includes different values to account for the power of heat rejection components of WCUACs as compared to the AHRI 1340–202X Draft. Both of these changes were related to a changed assumption in operation of cooling towers in water loops serving WCUACs.

The analysis conducted to develop the heat rejection component power adder and the WCUAC entering water temperature (''EWT'') test conditions in the AHRI 1340–202X Draft assumed constant cooling tower fan speed regardless of load level. In other words, the analysis to develop the AHRI 1340–202X Draft method assumed that the cooling tower fans do not slow down when there is less heat to reject in the cooling tower, and thus: (1) the cooling tower fan power does not reduce at lower load levels; and (2) the cooling tower approach [17] reduces significantly

[16] Separate heat rejection components (*e.g.,* a cooling tower or circulating water pump) are required for WCUACs but not used with ACUACs or ECUACs. ACUACs and ECUACs contain all components needed to reject heat to the ambient air surrounding the ACUAC or ECUAC. WCUACs, however, reject heat to a building's water loop. Separate components are needed to circulate the water in the water loop and reject heat from the water loop to the ambient air surrounding the building.

[17] For an evaporative cooling tower, the ''cooling tower approach'' is the difference between the cold water temperature (*i.e.,* the temperature of the cooled water leaving the cooling tower) and the outdoor air wet-bulb temperature.

at lower load levels. Specifically, as the cooling load reduces, the same amount of cooling tower airflow is being provided to reject less heat in the cooling tower, so the water is cooled in the cooling tower to a temperature closer to the outdoor air wet-bulb temperature, and, therefore, the water leaving the cooling tower (and entering the WCUAC) is at a lower temperature, resulting in a lower WCUAC EWT test condition.

The analysis conducted to develop the heat rejection component power adder and the WCUAC EWT test conditions in AHRI 1340–2023 assumes that variable frequency drives (''VFDs'') are used on cooling tower fans to reduce cooling tower fan speed (and thus cooling tower fan power) for lower cooling loads. The use of VFDs on cooling tower fans impacts both the cooling tower fan power and the WCUAC EWT. First, the cooling tower fan VFD reduces cooling tower fan power at part load. Therefore, instead of a single power adder in W per 1,000 Btu/h of cooling capacity applied regardless of the test being conducted (*i.e.,* independent of the test bin) as specified in the AHRI 1340–202X Draft, AHRI 1340–2023 includes four different condenser tower fan and pump power rate adders (in units of W per 1,000 Btu/h of cooling capacity)—a separate adder for each test bin, with the adders decreasing at lower load levels. Second, the reduced cooling tower fan speed at part load means that the cooling tower approach does not significantly reduce at lower load levels, because cooling tower airflow driving heat transfer in the cooling tower reduces along with the amount of heat rejected.[18] Correspondingly, the WCUAC part-load EWT test conditions in AHRI 1340–2023 are higher than the EWT test conditions in the AHRI 1340–202X Draft. The EWT test conditions for WCUACs in AHRI 1340–2023, which were developed based on the assumption that VFDs are used on cooling tower fans to reduce cooling tower fan speed, are the same as those included in Carrier's comment (Carrier, No. 8 at p. 2) in response to the August 2023 TP NOPR.

Additionally, AHRI 1340–2023 includes slight changes to the outdoor air wet-bulb temperature test conditions for ECUACs, based on updated analysis of representative temperatures. The outdoor air wet-bulb temperature requirements for ECUACs in AHRI 1340–2023 are the same as those included in Carrier's comment (Carrier, No. 8 at p. 2) in response to the August 2023 TP NOPR.

Table III–3 and Table III–4 show the test temperatures included in the AHRI 1340–202X Draft and the final test temperatures included in AHRI 1340–2023 for ECUACs and WCUACs, respectively.

Table III-3 IVEC Test Temperatures for ECUACs

	AHRI 1340-202X Draft IVEC Test Temperatures			AHRI 1340-2023 IVEC Test Temperatures		
Test Point	Outdoor Air Dry-Bulb (°F)	Outdoor Air Wet-Bulb (°F)	Make-up Water (°F)	Outdoor Air Dry-Bulb (°F)	Outdoor Air Wet-Bulb (°F)	Make-up Water (°F)
A	95	75	85	95	75	85
B	85	65	77	85	66	77
C	75	57	77	75	58	77
D	65	52	77	65	53	77

Table III-4 IVEC Test Temperatures for WCUACs

	AHRI 1340-202X Draft IVEC Test Temperatures		AHRI 1340-2023 IVEC Test Temperatures	
Test Point	Entering Water (°F)	Leaving Water (°F)*	Entering Water (°F)	Leaving Water (°F)*
A	85	95	85	95
B	72	-	74	-
C	62	-	66	-
D	55	-	61	-

* The AHRI 1340-202X Draft and AHRI 1340-2023 include a leaving water temperature condition only for the A test. Testing with the specified entering and leaving water temperature test determines the water flow rate used for the A test. For part-load tests, the AHRI 1340-202X Draft and AHRI 1340-2023 specify that the part-load water flow rate be set per the manufacturer's installation instructions; and for any full-load tests conducted at B, C, or D rating points (*i.e.*, for interpolation to reach the target percent load), that the water flow rate used match the flow rate measured for the A test. Therefore, a leaving water temperature is not specified for the B, C, and D tests.

[18] For the AHRI 1340–2023 EWTs, the assumed cooling tower approach is the same for B, C, and D bins –*i.e.,* as shown in Table III–3 and Table III–4, the difference between the outdoor air wet-bulb temperature in Table III–3 and the EWT in Table III–4 is 8 °F for the B, C, and D bins. Therefore, the EWT test conditions in AHRI 1340–2023 decrease for each part-load bin by the same amount as the outdoor air wet-bulb temperature test conditions.

Regarding the minor revisions to the ECUAC outdoor air wet-bulb temperatures in AHRI 1340–2023, DOE has concluded that these updated temperatures are representative of applications for ECUACs, and that adopting these slight updates to the proposed ECUAC test temperatures is consistent with the intent of the proposed approach and with comments from Carrier that included these updated temperatures. Therefore, in this final rule, DOE is adopting the ECUAC test temperatures specified in AHRI 1340–2023.

Regarding the test temperatures and heat rejection component power for WCUACs, DOE has concluded that VFDs are typically used on cooling tower fans to reduce cooling tower fan speed with reduced cooling load, and, therefore, concludes that assuming the presence of cooling tower fan VFDs is a more representative basis for determining the WCUAC EWTs and tower fan and pump power rate or ''TFPPR'' adders. Additionally, DOE has concluded that the updates to the approach in AHRI 1340–2023 (*i.e.,* updated WCUAC test temperatures and updated TFPPR approach) are generally consistent with the approach proposed in the August 2023 TP NOPR, but with more representative technical details. Further, DOE concludes that adopting the updated WCUAC test temperatures (and, thus, generally, the updated approach for developing WCUAC test temperatures and TFPPR values that assumes cooling tower fan VFDs) is consistent with comments from Carrier that included these updated temperatures.

However, DOE is aware of three issues in the WCUAC heat rejection components power adders (referred to in AHRI 1340–2023 as the TFPPR) used in Table 7 to AHRI 1340–2023. The first issue is a mismatch between how the TFPPR values were developed and how they were implemented in AHRI 1340–2023. Specifically, the TFPPR values in Table 7 to AHRI 1340–2023 were determined based on the full-load cooling capacity; therefore, the TFPPR value for each bin was intended to be multiplied by the full-load capacity. However, the approach implemented in AHRI 1340–2023 is inconsistent with these values—specifically, equations 8, 10, 11, and 13 specify to multiply the TFPPR by the cooling capacity determined for the test(s) performed for a given cooling bin. Because part-load cooling capacities are lower than full-load cooling capacities, multiplying the TFPPR value for a part-load cooling bin by the part-load capacity for that bin results in an unrepresentatively low tower fan and pump power calculated for the bin. To resolve this issue, DOE has concluded that the values should instead be based on the target cooling capacity for each part-load cooling bin, which aligns with the approach in equations 8, 10, 11, and 13 of AHRI 1340–2023 (*i.e.,* multiplying the TFPPR values by the measured cooling capacity for each bin).

The second issue is that the full-load cooling tower fan power was developed without consideration of the cooling tower fan motor efficiency; therefore, the calculation reflected a fan motor efficiency of 100 percent. Because 100 percent is a physically impossible motor efficiency (and, therefore, underestimates the amount of power a fan motor consumes), DOE has concluded that the TFPPR values should include a more representative (*i.e.,* lower) full-load fan motor efficiency.

The third issue is that the TFPPR values in AHRI 1340–2023 are based on an unrepresentatively low fan power at low loads. Specifically, the fan power was assumed to decrease cubically with decreasing cooling load.[19] However, this assumption does not account for VFD, motor, and transmission losses which do not decrease cubically with decreasing cooling load. At low cooling load (*e.g.,* for the D bin), this significantly underestimates cooling tower fan power because the VFD, motor, and transmission losses are underestimated. DOE has concluded that a more representative approach would be to account for the VFD, motor, and transmission losses when developing the relationship between cooling tower fan power and load. Accounting for these losses impacts the TFPPR values for the B, C, and D part-load bins.

Corrected TFPPR values that address these three issues with the values published in AHRI 1340–2023 are shown in Table III–5. DOE understands that the AHRI Commercial Unitary STC also plans to address the aforementioned issues with the TFPPR values that were published in AHRI 1340–2023. DOE expects that AHRI will consider including the corrected TFPPR values shown in Table III–5 and adopted in this final rule in a future version of AHRI 1340.

Table III-5 IVEC TFPPR Values for WCUACs

Test Bin	AHRI 1340-2023 TFPPR Values (W/1,000 Btu/h)	Corrected TFPPR Values (W/1,000 Btu/h)
A	0.0094	0.0102
B	0.0066	0.0099
C	0.0053	0.0121
D	0.0048	0.0430

For the reasons discussed in detail in the previous paragraphs, DOE has concluded that the updated TFPPR values shown in Table III–5 are generally consistent with the approach proposed in the August 2023 TP NOPR, but that the corrected TFPPR values provide a more representative accounting of WCUAC heat rejection component power than the values published in AHRI 1340–2023 or the AHRI 1340–202X Draft.

For these reasons, DOE is adopting the updated WCUAC IVEC test temperatures for IVEC in AHRI 1340–2023 and the TFPPR approach in AHRI 1340–2023 as modified by the revised TFPPR values shown in Table III–5.

4. IVHE for Colder Climates

As discussed in the August 2023 TP NOPR (*see* 88 FR 56392, 56416 (August 17, 2023)), it is likely that in the future manufacturers will develop CUHPs that

[19] The theoretical fan laws indicate that fan power decreases cubically with decreasing fan speed. It was assumed that cooling tower fan speed is proportional to cooling load (*i.e.,* heat to be rejected in the cooling tower), and, therefore, that cooling tower fan power decreases cubically with decreasing cooling load.

are designed for operation in colder climates, and correspondingly that the market for CUHPs in colder climates is expected to grow. Because the IVHE metric is based on the US national average climate across all US climate zones, the lowest bin temperature for calculating IVHE is 15.9 °F, and a small fraction of heating hours are at colder temperatures (*i.e.,* 19 percent of heating hours are in a load bin with a temperature colder than 32 °F, and less than 1 percent of heating hours are in a load bin with a temperature colder than 17 °F).

As a result, the AHRI 1340–202X Draft includes provisions that are distinct from the provisions used for IVHE, including weighting factors and temperature bins, for calculating a colder climate-specific IVHE metric, designated as $IVHE_C$. Specifically, $IVHE_C$ was developed using the same building heating analysis that was used to develop IVHE (as discussed in section III.D.2 of this final rule), but the $IVHE_C$ weighting factors and load bins were developed using the results for climates zones 5 and above (*i.e.,* climate zone 5 as well as all climate zones colder than climate zone 5), weighted by the share of the U.S. population in each of those climate zones. The use of only climate zones 5 and colder for $IVHE_C$ results in the following, compared to IVHE: lower outdoor dry-bulb temperature for each load bin, more heating season hours in all load bins, and a higher heating season building load. Specifically, for $IVHE_C$, 56 percent of heating hours are in a load bin with a temperature colder than 32 °F, and 12 percent of heating hours are in a load bin with a temperature colder than 17 °F. Further, because the defrost degradation coefficients specified in appendix C of the ACUAC and ACUHP Working Group TP Term Sheet depend on the outdoor temperature for each load bin (and $IVHE_C$ has colder bin temperatures than IVHE), the AHRI 1340–202X Draft also specifies separate defrost degradation coefficients for calculating $IVHE_C$. In the August 2023 TP NOPR, DOE proposed to adopt provisions for determining the $IVHE_C$ metric in appendix A1 via reference to the AHRI 1340–202X Draft and to allow for optional representations of $IVHE_C$ for CUHPs. 88 FR 56392, 56416 (August 17, 2023).

In response to the August 2023 TP NOPR, NEEA and NYSERDA supported DOE's proposal to include in the test procedure and allow optional representations of the colder climate $IVHE_C$. (NEEA, No. 16 at pp. 2–3; NYSERDA, No. 13 at p. 2)

Given the potential for the development of CUHPs designed for operation in colder climates and the expected increased number of shipments of CUHPs into colder climates, DOE recognizes the utility in having CUHP ratings for a separate IVHE metric that is specific to colder climates. AHRI 1340–2023 includes provisions for determining $IVHE_C$ that are generally consistent with the AHRI 1340–202X Draft, with the additional specificity discussed in section III.E.8 of this final rule. Correspondingly, DOE has concluded that the $IVHE_C$ metric as specified in AHRI 1340–2023 (including the minor updates in the published AHRI 1340–2023 that provide additional specificity as discussed in section III.E.8 of this document) is more representative of field conditions for CUHPs installed in colder US climates. Therefore, DOE is adopting provisions for determining the $IVHE_C$ metric in appendix A1 via reference to AHRI 1340–2023 and allowing for optional representations of $IVHE_C$ for CUHPs. Specifically, DOE is amending the test procedure so that IVHE will be the regulated heating metric when testing to appendix A1; therefore, should DOE adopt amended standards for CUHPs denominated in terms of IVEC and IVHE, all CUHPs will be required to certify compliance with IVHE standards, and additional representations of $IVHE_C$ will be optional.

5. Test Conditions Used for Current Metrics in Appendix A

AHRI 340/360–2022 designates certain test conditions for test procedures characterized as ''standard rating tests'' and certain other test conditions for test procedures characterized as ''performance operating tests.'' The ''standard rating tests'' are used for determining representations of cooling capacity, heating capacity, and cooling and heating efficiencies. The ''performance operating tests'' evaluate other operating conditions, such as ''maximum operating conditions'' (*see* section 8 of AHRI 340/360–2022). Specifically, Table 6 of AHRI 340/360–2022 specifies test conditions for standard rating and performance operating tests for CUACs and CUHPs. The relevant conditions for EER and IEER cooling tests are those referred to as ''standard rating conditions'' in AHRI 340/360–2022.

To clarify this distinction and consistent with its proposal to adopt AHRI 340/360–2022 in appendix A, DOE proposed in the August 2023 TP NOPR to specify explicitly in section 3 of appendix A that the cooling test conditions used for representations as required under the DOE regulations would be: (1) for equipment subject to standards in terms of EER, the ''Standard Rating Conditions, Cooling'' conditions specified in Table 6 of AHRI 340/360–2022; and (2) for equipment subject to standards in terms of IEER, the ''Standard Rating Conditions, Cooling'' and ''Standard Rating Part-Load Conditions (IEER)'' conditions specified in Table 6 of AHRI 340/360–2022. 88 FR 56392, 56412 (August 17, 2023).

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). To clarify which conditions are applicable for representations as required under the DOE regulations and consistent with its proposal to adopt AHRI 340/360–2022 in appendix A, DOE proposed to specify explicitly in section 3 of appendix A that the heating test conditions used for compliance are the ''Standard Rating Conditions (High Temperature Steady-state Heating)'' conditions specified in Table 6 of AHRI 340/360–2022. Further, DOE proposed to include the low-temperature (*i.e.,* 17 °F) heating test condition specified in Table 6 of AHRI 340/360–2022 (referred to as ''Low Temperature Steady-state Heating'') and specify in section 3 of appendix A that representations of COP at this low-temperature heating condition are optional. 88 FR 56392, 56412 (August 17, 2023).

DOE did not receive any comments in response to these proposals. Therefore, DOE is adopting the specification of the relevant test conditions in AHRI 340/360–2022 in appendix A as proposed. These amendments in appendix A are consistent with the test requirements referenced in the latest version of ASHRAE Standard 90.1.

6. Test Conditions Used for New Metrics in Appendix A1

Consistent with DOE's proposal to adopt the AHRI 1340–202X Draft for determining IVEC and IVHE, as discussed more fully in the August 2023 TP NOPR, DOE proposed to specify in section 3 of the proposed appendix A1 which test conditions in the AHRI 1340–202X Draft would be required and optional for rating to IVEC and IVHE. 88 FR 56392, 56412–56413 (August 17, 2023). DOE also proposed to include provisions for optional representations of the full-load efficiency metrics, EER2, $COP2_{47}$, $COP2_{17}$, and $COP2_5$, and specified the test conditions required for these optional representations. *Id.* DOE did not receive any comments regarding the proposed approach for specifying the required and optional test conditions. The test conditions in AHRI 1340–2023 align with those in the AHRI 1340–202X Draft except for certain test conditions for ECUACs and WCUACs, which are discussed in section III.E.3 of this final rule. Therefore, DOE is adopting the specification of test conditions in appendix A1 as proposed, referencing the corresponding test conditions in the published AHRI 1340–2023.

7. Provisions Introduced in the AHRI 1340–202X Draft

The AHRI 1340–202X Draft proposed for adoption in the August 2023 TP NOPR includes several provisions regarding the new IVEC and IVHE metrics that are not included in the ACUAC and ACUHP Working Group TP Term Sheet. DOE notes that the ACUAC and ACUHP Working Group TP Term Sheet includes provisions to allow changes to the recommendations in the term sheet if mistakes in the original recommendations are identified through further analysis or discussion between stakeholders. (*See* EERE–2022–BT–STD–0015–0065, Recommendations #2, #8, #11) Further, the AHRI 1340–202X Draft includes a number of additional test provisions that arose as a result of discussions between many interested stakeholders participating in the AHRI Commercial Unitary STC and that DOE has concluded are consistent with the intent of the ACUAC and ACUHP Working Group TP Term Sheet but provide additional guidance for determining IVEC and IVHE. DOE included discussion of provisions regarding the topics discussed in the following sub-sections in the August 2023 TP NOPR and proposed to adopt the provisions in the AHRI 1340–202X Draft regarding all of these topics. 88 FR 56392, 56416–56419 (August 17, 2023). DOE did not receive comment regarding the provisions in the AHRI 1340–202X Draft addressing these topics, and these provisions are also included in the published AHRI 1340–2023, consistent with DOE's proposals in the August 2023 TP NOPR. As discussed, DOE is adopting AHRI 1340–2023 for determining IVEC and IVHE in appendix A1, including these additional provisions not specified in the ACUAC and ACUHP Working Group TP Term Sheet, consistent with proposals in the August 2023 TP NOPR. The following sections discuss these provisions in further detail.

a. Cooling Weighting Factors Adjustment

Subsequent to the development of the ACUAC and ACUHP Working Group TP Term Sheet, additional analysis of the building models used to develop the weighting factors for the IVEC metric indicated that the recommended weighting hours included in the ACUAC and ACUHP Working Group TP Term Sheet are incorrect. Specifically, the weighting hour factors in the ACUAC and ACUHP Working Group TP Term Sheet over-represent mechanical-only cooling hours and underrepresent economizer-only and integrated-economizer hours for all IVEC load bins. DOE presented corrected weighting factors during the ACUAC and ACUHP standards negotiations, and no concerns were raised. (*See* EERE–2022–BT–STD–0015–0078 at p. 8) These corrected IVEC weighting factors were included in the AHRI 1340–202X Draft and remain the same in AHRI 1340–2023. DOE is adopting AHRI 1340–2023 for determining IVEC and IVHE in appendix A1, including these updated IVEC weighting factors.

b. ESP Testing Target Calculation

Recommendation #12 of the ACUAC and ACUHP Working Group TP Term Sheet includes an equation for determining adjusted ESP for cooling or heating tests that use an airflow that differs from the full-load cooling airflow. However, the equation specified in Recommendation #12 is missing a term for the full-load ESP. This equation was corrected in the AHRI 1340–202X Draft and remains the same in AHRI 1340–2023. DOE is adopting AHRI 1340–2023 for determining IVEC and IVHE in appendix A1, including this corrected equation for determining adjusted ESP.

c. Test Instructions for Splitting ESP Between Return and Supply Duct

As discussed previously, Recommendation #12 of the ACUAC and ACUHP Working Group TP Term Sheet specifies that ESP shall be split between return and supply ducts during testing, such that 25 percent of the ESP is applied in the return ductwork. However, the ACUAC and ACUHP Working Group TP Term Sheet does not contain explicit test se-tup instructions specifying how to achieve the split in ESP between return and supply ductwork. Section E11 in appendix E of the AHRI 1340–202X Draft and section E11 in appendix E of AHRI 1340–2023 include more detailed instructions regarding the duct and pressure measurement set-up, the measurement and adjustment of the return static pressure, and the restriction devices that can be used in the return ductwork to achieve the required split of between 20 and 25 percent of the total ESP applied to the return ductwork. The AHRI 1340–202X Draft and AHRI 1340–2023 also include the same test instructions for cases in which the ESP split is not achieved in the first test, as well as any exceptions to the specified tolerance requirement. DOE has concluded that these additional instructions provide a more consistent measurement of ESP and are aligned with the intent of Recommendation #12 of the ACUAC and ACUHP Working Group TP Term Sheet. Therefore, DOE is adopting these provisions of AHRI 1340–2023 for determining IVEC and IVHE.

d. Default Fan Power and Maximum Pressure Drop for Coil-Only Systems

DOE's current test procedure for CUACs and CUHPs references ANSI/AHRI 340/360–2007, and section 6.1 of that test standard specifies default fan power and corresponding capacity adjustment for ACUACs, ACUHPs, ECUACs, and WCUACs with a coil-only configuration (*i.e.,* without an integral indoor fan). Specifically, ANSI/AHRI 340/360–2007 requires that an indoor fan power of 365 Watts (''W'') per 1,000 standard cubic feet per minute (''scfm'') be added to power input for coil-only units and that the corresponding heat addition (*i.e.,* 1,250 Btu/h per 1,000 scfm) be subtracted from measured cooling capacity (and added to measured heating capacity), regardless of the capacity of the unit under test and regardless of full-load or part-load test conditions.

Section 6.1.1.6 of AHRI 340/360–2022 has the same requirement as ANSI/AHRI 340/360–2007 regarding default fan power and capacity adjustment of coil-only systems. Additionally, both section 6.1.3.2(d) of ANSI/AHRI 340/360–2007 and section 6.1.3.3.4 of AHRI 340/360–2022 specify that for coil-only systems, the pressure drop across the indoor assembly shall not exceed 0.30 in. H_2O for the full-load cooling test. If the measured pressure drop exceeds that value, then the industry test standards specify that the indoor airflow rate be reduced such that the measured pressure drop does not exceed the specified maximum pressure drop.

The AHRI 1340–202X Draft included different requirements for testing coil-only units as compared to ANSI/AHRI 340/360–2007 and AHRI 340/360–2022. First, section 5.17.4 of the AHRI 1340–202X Draft includes a higher maximum pressure drop across the indoor assembly of 1.0 in. H_2O when testing coil-only units, as compared to the maximum pressure drop of 0.3 in. H_2O specified in ANSI/AHRI 340/360–2007 and AHRI 340/360–2022. Second, section 6.2.4.2 of the AHRI 1340–202X Draft includes higher default fan power values than specified in ANSI/AHRI 340/360–2007 and AHRI 340/360–2022; these values were updated to reflect the higher ESP requirements used for IVEC and IVHE. Because the ACUAC and ACUHP Working Group TP Term Sheet and the AHRI 1340–202X Draft specify ESP requirements that vary by capacity bin, section 6.2.4.2 of the AHRI 1340–202X Draft specifies different default fan power adders and capacity adjustments for each capacity bin, developed based on fan power needed to overcome the ESP requirement for each bin. DOE proposed in the August 2023 TP NOPR to adopt the default fan power adders and capacity adjustments included in the AHRI 1340–202X Draft in appendix A1. 88 FR 56392, 56417 (August 17, 2023).

Lastly, while ANSI/AHRI 340/360–2007 and AHRI 340/360–2022 specify a single default fan power adder (and corresponding capacity adjustment) to be used for all tests, the AHRI 1340–202X Draft included separate default fan power adders and capacity adjustments for full-load tests and part-load tests (*i.e.,* tests conducted at an airflow lower than the full-load cooling airflow) to reflect that fan power does not decrease linearly with airflow (*i.e.,* reducing airflow in part-load operation would reduce fan power in field operation by more than would be calculated using a single power adder that is normalized by airflow). These part-load fan power adders and capacity adjustments were developed assuming a part-load airflow that is 67 percent of the full-load airflow. The AHRI 1340–202X Draft does not specify what values to use if the part-load airflow is between 67 and 100 percent of the full-load airflow. Alongside proposing to adopt the fan power adders specified in the AHRI 1340–202X Draft in the August 2023 TP NOPR, DOE proposed to adopt a linear interpolation approach in appendix A1 in the case where the part-load airflow for coil-only CUACs and CUHPs specified by a manufacturer for a test is between 67 and 100 percent of the full-load airflow, which would specify how to calculate the default fan power coefficient and capacity adjustment in such cases. 88 FR 56392, 56417 (August 17, 2023). The proposed approach is consistent with the approach adopted for the residential CAC/HP test procedure.[20]

Consistent with the basis of part-load values in the AHRI 1340–202X Draft on 67 percent of full-load cooling airflow, DOE also proposed in the August 2023 TP NOPR to clarify that for tests in which the manufacturer-specified airflow is less than the full-load cooling airflow, the target airflow for the test must be the higher of: (1) the manufacturer-specified airflow for the test; or (2) 67 percent of the airflow measured for the full-load cooling test. 88 FR 56392, 56417 (August 17, 2023).

AHRI 1340–2023 includes provisions consistent with those DOE proposed to adopt for testing coil-only units in the August 2023 TP NOPR. *Id.* Specifically, the already discussed maximum pressure drop and capacity and fan power adjustments included in sections 5.17.4 and 6.2.4.2 of the AHRI 1340–202X Draft are included in sections 5.17.2 and 6.2.4.3 of AHRI 1340–2023. Additionally, AHRI 1340–2023 includes provisions consistent with DOE's proposals regarding issues for testing coil-only units not addressed in the AHRI 1340–202X Draft. Specifically, section 6.2.4.2 of AHRI 1340–2023 includes the linear interpolation method to address cases in which the part-load airflow specified by a manufacturer for a test is between 67 and 100 percent of the full-load airflow. Further, section 5.18.4.2 of AHRI 1340–2023 includes the clarification regarding which target airflow should be used for tests in which the manufacturer-specified airflow is less than the full-load cooling airflow.

Accordingly, DOE has concluded that the coil-only test procedure in AHRI 1340–2023 aligns with the approach proposed in the August 2023 TP NOPR and represents industry consensus on the most appropriate and representative way to test and determine the IVEC and IVHE of coil-only systems. Therefore, DOE is adopting these provisions of AHRI 1340–2023 for determining IVEC and IVHE for coil-only units.

e. Component Power Measurement

Section E10 of the AHRI 1340–202X Draft and AHRI 1340–2023 include additional instruction regarding how the total unit, indoor fan, controls, compressor, condenser section, and crankcase heat power should be measured and accounted for during a test. This includes details that were not included in the ACUAC and ACUHP Working Group TP Term Sheet, as well as updates to address issues such as unique model designs and power meter precision that were identified after the term sheet was completed. For example, although the ACUAC and ACUHP Working Group TP Term Sheet specified that controls power be determined by subtracting all other power measurements from the total unit power, sections E10.1 and E10.2 of both the AHRI 1340–202X Draft and AHRI 1340–2023 require that controls power be measured. This is because controls power is a much smaller value than power consumed by other components of a CUAC or CUHP and, thus, is more accurately determined by measuring directly with a power meter of sufficient precision. Section E10.2 of both the AHRI 1340–202X Draft and AHRI 1340–2023 also allow for determination of compressor and condenser section power by measurement together or by subtraction from total power (*i.e.,* separate power measurement of power consumed by the compressor and condenser section is not required). These provisions address cases in which unique wiring of certain models may make separate measurement of compressor and condenser section power very difficult or impossible, in addition to cases in which the laboratory does not have enough power meters to measure all components separately. Section E10.3 of both the AHRI 1340–202X Draft and AHRI 1340–2023 also provide an equation for calculating default value(s) for crankcase heater power to address the case in which a manufacturer does not specify crankcase heater wattage.[21] Because DOE has concluded that these provisions will provide more repeatable and representative test results, DOE is adopting AHRI 1340–2023 for determining IVEC and IVHE in appendix A1, including these provisions for component power measurement.

f. Non-Standard Low-Static Indoor Fan Motors

As discussed in section III.D.1 of this document, DOE is adopting higher ESPs recommended by the Working Group and included in AHRI 1340–2023 in the appendix A1 Federal test procedure for CUACs and CUHPs. However, individual models of CUACs and CUHPs with indoor fan motors intended

[20] The CAC/HP test procedure final rule was published in the **Federal Register** on October 25, 2022, and can be found at 87 FR 64550.

[21] As discussed, Recommendation #13 of the ACUAC and ACUHP Working Group TP Term Sheet requires that manufacturers certify crankcase heater wattage for each heater. DOE is not adopting amendments to certification requirements in this rulemaking, and will instead address certification requirements in a separate rulemaking for certification, compliance, and enforcement.

for installation in applications with a low ESP may not be able to operate at the adopted full-load ESP requirements at the full-load indoor rated airflow. To address this situation, section 3.25 of the AHRI 1340–202X Draft and section 3.2.30 of AHRI 1340–2023 both define ''non-standard low-static indoor fan motors'' as motors which cannot maintain ESP as high as specified in the test procedure when operating at the full-load rated indoor airflow and that are distributed in commerce as part of an individual model within the same basic model that is distributed in commerce with a different motor specified for testing that can maintain the required ESP. Section 5.19.3.3 of the AHRI 1340–202X Draft and section 5.19.3.3 of AHRI 1340–2023 include the same test provisions for CUACs and CUHPs with non-standard low-static indoor fan motors that cannot reach the ESP within tolerance during testing, which require using the maximum available fan speed that does not overload the motor or motor drive, adjusting the airflow-measuring apparatus to maintain airflow within tolerance, and operating with an ESP as close as possible to the minimum ESP requirements for testing. This approach is consistent with the industry test standard referenced by the DOE test procedure for DX–DOASes (AHRI 920–2020).

As discussed in section III.F.5.a of this document, DOE is clarifying that representations for a CUAC or CUHP basic model must be based on the least efficient individual model(s) distributed in commerce within the basic model (with the exception specified in 10 CFR 429.43(a)(3)(vi)(A) for certain individual models with the components listed in table 6 to 10 CFR 429.43(a)(3)). DOE has concluded that the combination of: (1) the provisions in AHRI 1340–2023 for testing models with ''non-standard low-static indoor fan motors'' with (2) the requirement that basic models be rated based on the least efficient individual model (with certain exceptions, as discussed) provides an appropriate approach for handling CUAC and CUHP models with these motors—if an individual model with a non-standard low-static indoor fan motor is tested, the test will be conducted at an indoor airflow representative for that model. But because testing at the rated airflow for such an individual model will result in testing at an ESP lower than the requirement and, thus, a lower indoor fan power, the representations for that basic model will be required to be based on an individual model with an indoor fan motor that can achieve the ESP requirements at the rated airflow. Consistent with the adoption of AHRI 340/360–2023 in appendix A1, DOE is not deviating from the provisions for testing models with non-standard low-static indoor fan motors.

g. IVHE Equations

Section 6.3 of the AHRI 1340–202X Draft and section 6.3 of AHRI 1340–2023 both include several changes regarding the heating metric equations that differ from the provisions in appendix C of the ACUAC and ACUHP Working Group TP Term Sheet. DOE has concluded that these updated IVHE equations, described in the following paragraphs, provide for a more accurate calculation of IVHE. Further, Recommendation #9 of the ACUAC and ACUHP Working Group TP Term Sheet states that the equations in appendix C of the term sheet are subject to quality control checking (''QC'') for errors, with the intent remaining the same as voted on. DOE has concluded that the discussed deviations in the AHRI 1340–202X Draft and the published AHRI 1340–2023 hold the same intent of the recommendations set forth in the ACUAC and ACUHP Working Group TP Term Sheet. Therefore, DOE is adopting the provisions of AHRI 1340–2023 for determining IVHE in appendix A1, including the updated equations discussed in this section.

1. *Removal of the cut-out factor from certain equations:* Appendix C of the ACUAC and ACUHP Working Group TP Term Sheet includes a cut-out factor in IVHE calculations to reflect the dependence of unit performance on whether compressors are cut-out at a given bin temperature. However, the cut-out factor was inadvertently included in certain equations in appendix C of the ACUAC and ACUHP Working Group TP Term Sheet where it should not apply (*i.e.,* equations to determine unit performance that should not be impacted by the fraction of time in which compressors are cut out). Therefore, in the AHRI 1340–202X Draft and AHRI 1340–2023, the cut-out factor is removed from those equations where it was incorrectly applied in the ACUAC and ACUHP Working Group TP Term Sheet. For all CUHPs that DOE is aware of on the market today, the cut-in and cut-out temperatures are less than the temperature of the lowest load bin. As such, the cut-out factor only applies when the unit is operating at full-load capacity and does not affect the calculation of IVHE.

2. *Accounting for auxiliary heat when compressors are cut out:* When compressors are cut out, auxiliary heat would operate to meet the building load. This auxiliary heat operation is addressed in section b of appendix C of the ACUAC and ACUHP Working Group TP Term Sheet (*i.e.,* when building load exceeds the highest stage unit heating capacity at a given bin temperature), but was inadvertently excluded in sections c and d of appendix C of the ACUAC and ACUHP Working Group TP Term Sheet (*i.e.,* when building load is between capacities of a unit tested with multiple heating stages, or when building load is less than the capacity for the lowest tested compressor stage). Therefore, the AHRI 1340–202X Draft and AHRI 1340–2023 include corrections in these cases so that auxiliary heat demand is applied to meet building load in all cases in which compressors are cut out.

3. *Fan power applied in auxiliary heat-only mode:* In appendix C of the Term Sheet, the equations do not subtract the heat gain in the indoor airstream from the indoor fan (*i.e.,* ''fan heat'') from the auxiliary heat demand. The AHRI 1340–202X Draft and AHRI 1340–2023 address this issue by subtracting fan heat from auxiliary heat demand. Additionally, sections c and d of appendix C of the ACUAC and ACUHP Working Group TP Term Sheet assume that the fan would be either cycling between airflows when cycling between stages of compression or operating at the lowest-measured indoor airflow for any cooling or heating test when cycling on and off at the lowest stage of compression; however, the indoor fan would likely be operating at the airflow corresponding to the full-load heating test when operating in auxiliary heat mode. The AHRI 1340–202X Draft and AHRI 1340–2023 address this by applying fan power from the full-load heating test for auxiliary heat-only mode. However, DOE notes that because both fan heat and auxiliary heat apply heat to the indoor airstream with the same efficiency (*i.e.,* COP of 1), the airflow assumed for auxiliary heat-only mode does not impact results, as the fan heat resulting from an increase in fan power reduces the auxiliary heat needed to meet the building load by the same amount, resulting in no net change to calculated IVHE.

4. *Interpolation for variable-speed compressor systems:* When building load is between capacities of a unit tested with multiple heating stages, section c of appendix C of the Term Sheet includes a separate method for interpolating between stages for variable-speed compressor systems (*i.e.,* a method that interpolates capacity divided by power) from the method for all other units (*i.e.,* a method that linearly interpolates power). As part of

development of the AHRI 1340–202X Draft, it was determined that there were insufficient data to support a separate interpolation method for variable-speed compressor systems, and, therefore, the AHRI 1340–202X Draft and AHRI 1340–2023 apply the same linear interpolation method based on power for all units. The linear interpolation method for variable-speed compressor systems included in the AHRI 1340–202X Draft is also maintained in AHRI 1340–2023.

5. *Compressor operating levels for heating tests:* Recommendation #9 of the Term Sheet includes details on the required and optional tests based on configuration of the system (*i.e.,* single-stage, two or more stages, and variable-capacity). Required tests include a test at ''high'' operating level at 17 °F and 47 °F; optional tests include tests at low and intermediate operating levels at 17 °F and 47 °F, as well as high and ''boost'' operating levels at 5 °F. For variable-capacity systems, the Term Sheet specifies that the high speed and low speed at each temperature should be the normal maximum and minimum for each ambient temperature. The AHRI 1340–202X Draft includes additional explanation of which compressor speeds correspond to the low, medium, high, and boost designations at each test temperature. AHRI 1340–2023 maintains the explanations included in AHRI 1340–202X Draft and includes further explanation of the compressor operating levels, as discussed in section III.E.8.b of this final rule.

In the August 2023 TP NOPR, DOE tentatively concluded that these updated IVHE equations as described in the preceding paragraphs would provide for a more accurate calculation of IVHE. 88 FR 56392, 56419 (August 17, 2023). Further, Recommendation #9 of the ACUAC and ACUHP Working Group TP Term Sheet states that the equations in appendix C of the Term Sheet are subject to quality control checking (''QC'') for errors with the intent remaining the same as voted on. In the August 2023 TP NOPR, DOE tentatively concluded that the discussed deviations in the AHRI 1340–202X Draft hold the same intent of the recommendations set forth in the ACUAC and ACUHP Working Group TP Term Sheet. Therefore, DOE proposed to adopt the provisions of AHRI 1340–202X Draft for determining IVHE in appendix A1, including the updated equations discussed in this section. 88 FR 56392, 56418–56419 (August 17, 2023).

AHRI 1340–2023 includes the largely the same provisions as AHRI 1340–202X Draft for determining IVHE. Any differences between the provisions in AHRI 1340–202X Draft and AHRI 1340–2023 are discussed in section III.E.8 of this final rule. Therefore, DOE has concluded that that the updated IVHE equations in AHRI 1340–2023, as described in the preceding paragraphs, would provide for a more accurate calculation of IVHE than the equations in the ACUAC and ACUHP Working Group TP Term Sheet, and that the discussed deviations hold the same intent as the recommendations set forth in the ACUAC and ACUHP Working Group TP Term Sheet. Therefore, DOE is adopting in appendix A1 the approach for determining IVHE from AHRI 1340–2023.

DOE notes that appendix C of the ACUAC and ACUHP Working Group TP Term Sheet includes a provision that ''additional provisions, still TBD would apply for variable-speed compressors for which pairs of full-speed or minimum-speed tests are not run at the same speed.'' (*See* EERE–2022–BT–STD–0015–0065 at p. 14) The AHRI 1340–202X Draft does not include any provisions allowing for determination of capacity for a bin by interpolating between tests conducted at different compressor operating levels. In the August 2023 TP NOPR, DOE tentatively concluded that this approach is appropriate and that calculating IVHE with results from multiple tests at each compressor operating level would provide representative ratings for manufacturers that choose to include performance at operating levels beyond the required high operating level tests at 47 and 17 °F in their representations of IVHE. 88 FR 56392, 56419 (August 17, 2023). AHRI 1340–2023 also includes no such provisions allowing interpolation between tests conducted at different compressor operating levels. Therefore, DOE maintains its tentative conclusion from the August 2023 TP NOPR and is adopting the approach for determining IVHE from AHRI 1340–2023 unchanged.

8. Heating Test Provisions Not Included in the AHRI 1340–202X Draft

a. General

As discussed in the August 2023 TP NOPR (88 FR 56392, 56418–56419 (August 17, 2023)) and section III.E.7.g of this final rule, the AHRI 1340–202X Draft includes conditions for heating tests and calculations for the IVHE, $IVHE_C$, and COP2 metrics that DOE proposed to adopt in the August 2023 TP NOPR. AHRI 1340–2023 includes several updates to the heating test provisions as compared to the AHRI 1340–202X Draft. The following sections describe these updates and what DOE is adopting in this final rule.

b. Definitions of Heating Operating Levels

Table 26 to AHRI 1340–202X Draft and section 6.3.5 of AHRI 1340–202X Draft specify the heating operating levels to use and the requirements for each, but do not make clear the parameters included in defining an operating level. Section 3.2.31 of AHRI 1340–2023 includes definitions for all heating operating levels, as well as a general definition of ''operating level.'' Section 3.2.31.6 defines ''operating level'' as being determined by the number of compressors operating, the modulation level of each operating compressor, and the indoor fan speed. The definition indicates that the modulation level of a single compressor is determined by the speed, duty cycle, vapor injection setting, and state of any other operating parameters that affect the continuous capacity of the compressor at a single set of operating conditions.

DOE is adopting these AHRI 1340–2023 operating level definitions in the DOE test procedure for CUACs and CUHPs, because DOE has concluded that they provide appropriate clarity on how to determine the operating levels to be used for heating tests and are substantively consistent with the AHRI 1340–202X Draft, which DOE proposed to adopt in the August 2023 TP NOPR. The one exception is the definition for the ''boost2 heating operating level,'' which is discussed in section III.E.8.c of this final rule.

c. Boost2 Heating Operating Level and COP25

The AHRI 1340–202X Draft includes low, medium, high, and boost heating operating levels, with boost being the operating level with the highest heating capacity. The boost operating level uses the maximum compressor operating capacity that is allowed by the controls at 17 °F, and the airflow that is allowed by the controls at 17 °F when operating at the chosen compressor operating capacity. AHRI 1340–2023 includes all the same heating operating levels as the AHRI 1340–202X Draft, plus a boost2 heating operating level. AHRI 1340–2023 defines the ''boost2 operating level'' as an operating level allowed by the controls at 5 °F outdoor dry-bulb temperature with a capacity at 5 °F outdoor dry-bulb temperature that is greater than the capacity of the boost heating operating level at 5 °F outdoor dry-bulb temperature and less than or equal to the maximum capacity allowed by the controls at 5 °F outdoor dry-bulb temperature.

For units with a boost operating level, AHRI 1340–2023 specifies representations of $COP2_5$ be based on the capacity and power determined at the boost or boost2 heating operating level denoted as the H5B or H5B2 tests in Table 23 to AHRI 1340–2023. However, AHRI 1340–2023 does not allow the H5B2 test to be used in the calculation of IVHE or $IVHE_C$. As discussed in section III.E.7.g of this document, AHRI 1340–2023 does not include any provisions allowing for determination of capacity for a bin by interpolating between tests conducted at different compressor operating levels. Therefore, inclusion of results from the boost2 operating level would require at least two tests conducted at this operating level. Because there is no other test specified at a different outdoor dry-bulb temperature condition at this same boost2 operating level, AHRI 1340–2023 only allows the H5B2 test to be used to determine the capacity at 5 °F outdoor dry-bulb temperature or COP2 at 5 °F.

DOE has determined that including a boost2 heating operating level allows for manufacturers to make performance representations that adequately reflect boosted heating performance at lower temperatures. DOE notes that Recommendation #9 of the ACUAC and ACUHP Working Group TP Term Sheet includes the following: ''Manufacturers can make representations of COP and capacity at any of the following temperatures: 5 °F, 17 °F, and 47 °F, in accordance with the DOE test procedure, in addition to the IVHE metric that will be required for standards.'' (*See* EERE–2022–BT–STD–0015–0065 at p. 6) As mentioned in section III.E.4 of this final rule, DOE acknowledges that in the future manufacturers will likely develop CUHPs that are designed for operation in colder climates. This may include designing CUHPs that are capable of providing boosted heating capacity at low temperatures. DOE has determined that the inclusion of the boost2 heating operating level and the H5B2 test in AHRI 1340–2023 is consistent with the intent of Recommendation #9 of the Term Sheet. This will allow for manufacturers designing systems with boosted heating capacity at 5 °F that differs from the operating levels at higher outdoor temperatures to make representations of capacity and performance at 5 °F, and correspondingly provide commercial consumers interested in low-temperature heating performance an additional standardized metric to compare such performance across models. Further, DOE has concluded that the inclusion of the boost2 heating operating level and the H5B2 test in AHRI 1340–2023 is generally consistent with the AHRI 1340–202X Draft, in that it maintains the proposed allowance for optional representations at 5 °F, but adds additional options for manufacturers to determine this optional representation at the compressor speed most representative for a model. As discussed, testing at the boost2 heating operating level is optional and would not be required for determinations of IVHE. DOE is adopting the H5B2 test in its amended test procedure at appendix A1, but with two additional clarifying provisions not included in AHRI 1340–2023.

First, section 6.3.14.2 of AHRI 1340–2023 specifies that for determining the $COP2_5$ of units with a boost operating level, one must use the capacity and power determined for the H5B or H5B2 test, instead of the H5H test. These provisions indicate that optional $COP2_5$ representations for such units are based on a higher heating operating level but do not specify whether the H5B or H5B2 test is to be used for a unit that has both a boost heating operating level and a boost2 heating operating level. DOE has determined that additional specificity is warranted as to which test is used to determine optional $COP2_5$ representations—specifically, DOE has concluded that it should be clarified to use the highest applicable heating operating level to determine $COP2_5$. Therefore, DOE is adding the following clarification to section 5.3 of appendix A1: For units without a *boost heating operating level* and without a *boost 2 heating operating level,* use capacity and power determined for the H5H test. For units with a *boost heating operating level* and without a *boost 2 heating operating level,* use capacity and power determined for the H5B test. For units with a *boost 2 heating operating level,* use capacity and power determined for the H5B2 test.

Second, section 3.2.31.1 of AHRI 1340–2023 defines the ''boost heating operating level'' as the operating level that has the maximum capacity allowed by the controls at 17 °F outdoor dry-bulb temperature, with a capacity at 17.0 °F outdoor dry-bulb temperature that is greater than the capacity of the high heating operating level[22] at 17 °F. This means that there is no boost heating operating level if the high heating operating level is the heating operating level with the maximum capacity at 17 °F. Section 3.2.31.2 of AHRI 1340–2023 defines the ''boost2 heating operating level'' as an operating level allowed by the controls at 5 °F outdoor dry bulb-temperature with a capacity at 5 °F outdoor dry bulb-temperature that is greater than the capacity of the boost heating operating level at 5 °F and less than or equal to the maximum capacity allowed by the controls at 5 °F outdoor dry bulb-temperature.

Because the definition of the ''boost2 heating operating level'' relies on the capacity of the boost operating level, the definition implies that a model must have an operating level that meets the definition for the boost heating operating level in order for it to also have a boost2 heating operating level. This implication means that AHRI 1340–2023 would not allow the H5B2 test to be conducted for a model which has no boost heating operating level at 17 °F, even if that model has an operating level with a capacity at 5 °F that is greater than the capacity of the high heating operating level at 5 °F. DOE has determined that such a scenario is possible and should be accounted for in the definition for the ''boost2 heating operating level'' and the requirements for the H5B2 test.

As such, DOE is not adopting the definition for the ''boost2 heating operating level'' in section 3.2.31.2 of AHRI 1340–2023. Instead, DOE is adopting the following definition for the ''boost2 heating operating level'' in section 5.1 of appendix A1, which addresses the aforementioned scenario of a model with a boosted operating level at 17 °F but not 5 °F: ''An *operating level* allowed by the controls at 5.0 °F outdoor dry-bulb temperature with a capacity at 5.0 °F outdoor dry-bulb temperature that is less than or equal to the maximum capacity allowed by the controls at 5.0 °F outdoor dry-bulb temperature, and greater than the capacity of: (a) the *Boost Heating Operating Level* at 5.0 °F outdoor dry-bulb temperature, if there is an operating level that meets the definition for *Boost Heating Operating Level* specified in section 3.2.31.1 of AHRI 1340–2023; or (b) the *High Heating Operating Level* at 5.0 °F outdoor dry-bulb temperature, if there is not an operating level that meets the definition for *Boost Heating Operating Level*'' specified in section 3.2.31.1 of AHRI 1340–2023.

Correspondingly, DOE is also specifying in section 5.2 of appendix A1 updated requirements for the H5B2 test of AHRI 1340–2023 that are to be used in case a model has no heating operating level that meets the definition of ''boost

[22] Section 3.2.31.3 of AHRI 1340–2023 defines ''high heating operating level'' as the operating level with the maximum capacity that is allowed by the controls at 47.0 °F outdoor dry-bulb temperature.

heating operating level'' in section 3.2.31.1 of AHRI 1340–2023. Section 6.3.6 of AHRI 1340–2023 specifies to run the H5B2 test in Table 23 to AHRI 1340–2023 with an operating level allowed by the controls at 5.0 °F outdoor dry-bulb temperature that has a capacity at 5.0 °F outdoor dry-bulb temperature that is greater than the capacity of the *Boost Heating Operating Level* at 5.0 °F. In section 5.2 of appendix A1, DOE is instead adopting a revised version of that provision that replaces the comparison to capacity of the *Boost Heating Operating Level* at 5.0 °F with a comparison to capacity of the *High Heating Operating Level* at 5.0 °F.

As noted previously, DOE has concluded that the inclusion of the boost2 heating operating level and the H5B2 test in AHRI 1340–2023 is generally consistent with the AHRI 1340–202X Draft. Similarly, DOE has concluded that the provisions discussed in this section (*i.e.,* to allow use of the boost2 heating operating level for determining optional representations at 5 °F for a model which has no boost heating operating level at 17 °F, and to clarify which test should be used for optional $COP2_5$ representations depending on which heating operating levels apply at 5 °F) maintain the proposed allowance for optional representations at 5 °F, but add options and clarity for manufacturers to consistently determine this optional representation at the compressor speed most representative for a model.

DOE understands that the AHRI Commercial Unitary STC also plans to address the aforementioned clarifications regarding the instructions for which test to use for optional representation of $COP2_5$ and the definition of ''boost2 heating operating level'' that were published in AHRI 1340–2023. DOE expects that AHRI will consider including such clarifications in a future version of AHRI 1340, consistent with the clarifications adopted in this final rule.

d. Extrapolation of Boost Heating Operating Level to 21 °F

As discussed in section III.E.7.g of this final rule, AHRI 1340–202X Draft requires interpolation of capacity and power between tests of the same operating level at different outdoor air temperatures when calculating values for the temperature bins used in IVHE and $IVHE_C$. Extrapolation of capacity and power are not allowed in AHRI 1340–202X Draft.

Sections 6.3.8 and 6.3.9 of AHRI 1340–2023 allow for capacity and power from boost heating operating level tests conducted at 5 °F and 17 °F to be used to extrapolate boost heating operating level performance up to 21 °F. This allows manufacturers to take advantage of the boost heating operating level for calculations of the IVHE and $IVHE_C$ bins with outdoor air dry-bulb temperatures between 17 °F and 22 °F.[23]

DOE has determined that these provisions are appropriate and will allow for more representative accounting of performance for bin temperatures between 17 °F and 22 °F, which are conditions at which models would likely operate at boost heating operating level, as necessary, to meet the building load, if the model operated as such for tests at 17 °F (*i.e.,* it would be unlikely that a model would have a boost operating level that engages at 17 °F but not at 22 °F). Further, DOE has concluded that these provisions are generally consistent with the AHRI 1340–202X Draft in that the provisions maintain the same compressor operating levels for determining IVHE, but the upper temperature limit to which boost heating performance can be applied is being slightly extended (by 5 °F, from 17 °F to 22 °F) to more representatively account for performance between 17 °F to 22 °F. Therefore, DOE is adopting the provisions allowing extrapolation of boost heating operating level performance in sections 6.3.8 and 6.3.9 of AHRI 1340–2023.

e. Operating Levels Used for Optional COP217 Representations

As previously mentioned in section III.E.8.c of this document, AHRI 1340–2023 specifies that for units with a boost operating level, representations of $COP2_5$ is to be based on the capacity and power determined at the boost or boost 2 heating operating level denoted as the H5B or H5B2 test, instead of the H5H test. However, while AHRI 1340–2023 includes a boost operating level test at 17 °F (the H17B test), section 6.3.14.2 of AHRI 1340–2023 requires that $COP2_{17}$ be determined using the capacity and power determined for the H17H test and does not allow for the $COP2_{17}$ to be determined using the capacity and power determined for the H17B test if conducted. Similar to its conclusions regarding the use of the H5B or H5B2 test for determining $COP2_5$, DOE has determined it would be appropriate to require the H17B test to be used for representations of $COP2_{17}$ if conducted because representations of efficiency at the maximum capacity for a given test condition are common and useful for consumers and utilities. Therefore, DOE is also specifying in this final rule that the H17B test, if conducted, be used for determining $COP2_{17}$, in order to allow manufacturers to make optional representations of capacity and performance at that operating level for models that are capable of boost operation. DOE understands that the AHRI Commercial Unitary STC also plans to specify that the H17B test is to be used for determining $COP2_{17}$ if this test is conducted. DOE expects that AHRI will consider including prescribing the use of the H17B test in appropriate cases for representations of $COP2_{17}$, consistent with this final rule, in a future version of AHRI 1340.

9. Test Procedure Revisions Recommended for a Future Rulemaking

NYSERDA generally supported the proposed IVEC and IVHE metrics but commented that the heating test provisions proposed do not adequately account for fan energy consumed during auxiliary heating mode. (NYSERDA, No. 13 at pp. 2–3) NYSERDA recommended DOE consider the inclusion of an additional energy consumption term in the denominator of the IVHE calculation to account for supply fan energy use for commercial warm air furnaces, which NYSERDA stated would support recommendation #11 of the ACUAC and ACUHP Working Group TP Term Sheet. NYSERDA recommended addressing the fan energy consumption issue at the next appropriate juncture. (*Id.*)

NEEA recommended DOE consider the following items the next time the CUAC/HP test procedure is reviewed: (1) impacts of outside air damper leakage; (2) energy saving potential from energy recovery ventilators (''ERV''); (3) benefits of variable-capacity or variable-speed compressors, and (4) a controls verification procedure (''CVP''). (NEEA, No. 16 at p. 4)

At this time DOE has concluded that it does not have sufficient information or data to justify adopting deviations from the IVEC and IVHE metrics negotiated by the Working Group and included in the industry consensus test procedure AHRI 1340–2023. Therefore, DOE is adopting the IVEC and IVHE metrics as specified in AHRI 1340–2023.

Regarding NYSERDA's comments on fan energy consumption in the IVHE metric, DOE notes that IVHE is the heating metric for CUHPs and assumes electric resistance supplementary heat for all models. Dual fuel CUHPs (*i.e.,* CUHPs with gas furnace supplementary heat) will still have IVHE ratings that reflect electric resistance supplementary heat. The IVHE metric accounts for

[23] Table 22 of AHRI 1340–2023 specifies: (1) for the IVHE metric, bin temperatures of 21 °F and 18.1 °F for bin numbers 8 and 9; and (2) for the $IVHE_C$ metric, a bin temperature of 20.0 °F for bin number 5.

supply fan energy during all hours with a heating load, regardless of whether the IVHE calculations assume the heating load is met by mechanical heating only, electric resistance heating only, or both, as described in section III.D.2 of this document. Therefore, DOE has concluded that no fan energy use for CUHPs is unaccounted for in the IVHE metric. DOE recognizes NEEA's suggested topics for consideration in a future test procedure rulemaking, but consistent with NEEA's comment, DOE is not addressing these topics in this final rule.

F. Configuration of Unit Under Test

1. Summary

CUACs and CUHPs are sold with a wide variety of components, including many that can optionally be installed on or within the unit both at the factory and in the field. The following sections address the required configuration of units under test. In all cases, these components are distributed in commerce with the CUAC and CUHP but can be packaged or shipped in different ways from the point of manufacture for ease of transportation. Each optional component may or may not affect a model's measured efficiency when tested to the DOE test procedure adopted in this final rule. For certain components not directly addressed in the DOE test procedure, the August 2023 TP NOPR proposed more specific instructions on how each component should be handled for the purposes of making representations in 10 CFR part 429. 88 FR 56392, 56430–56433 (August 17, 2023). Specifically, the proposed instructions were intended to provide manufacturers with clarity on how components should be treated and how to group individual models with and without optional components for the purposes of representations to reduce burden. *Id.* DOE proposed these provisions in 10 CFR part 429 to allow for testing of certain individual models that can be used as a proxy to represent the performance of equipment with multiple combinations of components. *Id.*

In the August 2023 TP NOPR, DOE proposed to handle CUAC and CUHP components in two distinct ways to help manufacturers better understand their options for developing representations for their differing product offerings. *Id.* First, DOE proposed that the treatment of certain components be specified by the test procedure, such that their impact on measured efficiency is limited. *Id.* For example, a fresh air damper must be set in the closed position and sealed during testing, resulting in a measured efficiency that would be similar or identical to the measured efficiency for a unit without a fresh air damper. Second, DOE proposed provisions expressly allowing certain models to be grouped together for the purposes of making representations and allowing the performance of a model without certain optional components to be used as a proxy for models with any combinations of the specified components, even if such components would impact the measured efficiency of a model. *Id.* A steam/hydronic coil is an example of such a component. The efficiency representation for a model with a steam/hydronic coil is based on the measured performance of the CUAC and CUHP as tested without the component installed because the steam/hydronic coil is not easily removed from the CUAC and CUHP for testing.[24] *Id.*

In this final rule, DOE is adopting provisions regarding configuration of unit under test largely similar to those proposed, but with several differences from the proposed provisions, as discussed in the following sections. Specifically, the following sections provide a background for the proposed provisions, describe the proposed provisions, describe relevant updates in AHRI 1340–2023 that were not included in the AHRI 1340–202X Draft, summarize and respond to the comments that DOE received in response to the August 2023 TP NOPR, and discuss the provisions that DOE is adopting in this final rule.

2. Background

In 2013, ASRAC formed the Commercial HVAC Working Group to engage in a negotiated rulemaking effort regarding the certification of certain commercial heating, ventilating, and air conditioning equipment, including CUACs and CUHPs. (*See* 78 FR 15653 (March 12, 2013)) This Commercial HVAC Working Group submitted a term sheet (Commercial HVAC Term Sheet) providing the Commercial HVAC Working Group's recommendations. (*See* EERE–2013–BT–NOC–0023–0052 [25]) The Commercial HVAC Working Group recommended that DOE issue guidance under current regulations on how to test certain equipment features when included in a basic model, until such time as the testing of such features can be addressed through a test procedure rulemaking.

[24] Note that in certain cases, as explained further in section III.F.3.b of this document, the representation may have to be based on an individual model with a steam/hydronic coil.

[25] Available at *www.regulations.gov/document/EERE-2013-BT-NOC-0023-0052.*

The Commercial HVAC Term Sheet listed the subject features under the heading ''Equipment Features Requiring Test Procedure Action.'' (*Id* at pp. 3–9) The Commercial HVAC Working Group also recommended that DOE issue an enforcement policy stating that DOE would exclude certain equipment with specified features from DOE testing, but only when the manufacturer offers for sale at all times a model that is identical in all other features; otherwise, the model with that feature would be eligible for DOE testing. These features were listed under the heading ''Equipment Features Subject to Enforcement Policy.'' (*Id.* at pp. 9–15)

On January 30, 2015, DOE issued a Commercial HVAC Enforcement Policy addressing the treatment of specific features during DOE testing of commercial HVAC equipment. (*See www.energy.gov/gc/downloads/commercial-equipment-testing-enforcement-policies*) The Commercial HVAC Enforcement Policy stated that—for the purposes of assessment testing pursuant to 10 CFR 429.104, verification testing pursuant to 10 CFR 429.70(c)(5), and enforcement testing pursuant to 10 CFR 429.110—DOE would not test a unit with one of the optional features listed for a specified equipment type if a manufacturer distributes in commerce an otherwise identical unit that does not include that optional feature. (Commercial HVAC Enforcement Policy at p. 1) The objective of the Commercial HVAC Enforcement Policy is to ensure that each basic model has a commercially-available version eligible for DOE testing. That is, each basic model includes a model either without the optional feature(s) listed in the policy or that is eligible for testing with the feature(s). *Id.* The features in the Commercial HVAC Enforcement Policy for CUACs and CUHPs (*Id.* at pp. 1–3 and 5–6) align with the Commercial HVAC Term Sheet's list designated ''Equipment Features Subject to Enforcement Policy.'' (EERE–2013–BT–NOC–0023–0052, pp. 9–15)

By way of comparison, AHRI 340/360–2022 and AHRI 1340–202X Draft include appendix D, ''Unit Configuration for Standard Efficiency Determination—Normative.'' Section D3 to appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft includes a list of features that are optional for testing, and it further specifies the following general provisions regarding testing of units with optional features:

- If an otherwise identical model (within the basic model) without the feature is not distributed in commerce, conduct tests with the feature according to the individual provisions specified in section D3 to appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft.

- For each optional feature, section D3 to appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft includes explicit instructions on how to conduct testing for equipment with the optional feature present.

The optional features provisions in AHRI 340/360–2022 and AHRI 1340–202X Draft are generally consistent with DOE's Commercial HVAC Enforcement Policy, but the optional features in section D3 to appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft do not entirely align with the list of features included for CUACs and CUHPs in the Commercial HVAC Enforcement Policy.

DOE notes that the list of features and provisions in section D3 to appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft conflate components that can be addressed by testing provisions with components that, if present on a unit under test, could have a substantive impact on test results and that cannot be disabled or otherwise mitigated. This differentiation was central to the Commercial HVAC Term Sheet, which as noted previously, included separate lists for ''Equipment Features Requiring Test Procedure Action'' and ''Equipment Features Subject to Enforcement Policy,'' and remains central to providing clarity in DOE's regulations. Therefore, in the August 2023 TP NOPR, DOE tentatively determined that provisions more explicit than those included in section D3 of appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft are warranted to clarify treatment of models that include more than one optional component. 88 FR 56392, 56430 (August 17, 2023).

In order to provide clarity between test procedure provisions (*i.e.,* how to test a specific unit) and certification and enforcement provisions (*e.g.,* which model to test), DOE proposed in the August 2023 TP NOPR to exclude appendix D of AHRI 340/360–2022 or AHRI 1340–202X Draft from adoption and instead proposed related provisions in 10 CFR 429.43 and 429.134 and 10 CFR part 431, subpart F, appendices A and A1. *Id.*

3. Proposed Approach for Exclusion of Certain Components

DOE's proposals in August 2023 TP NOPR for addressing treatment of certain components are discussed in the following sub-sections.

a. Components Addressed Through Test Provisions of 10 CFR Part 431, Subpart F, Appendices A and A1

In the August 2023 TP NOPR, DOE proposed in 10 CFR part 431, subpart F, appendices A and A1, test provisions for specific components, including all of the components listed in section D3 to appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft, for which there is a test procedure action that limits the impacts on measured efficiency (*i.e.,* test procedure provisions specific to the component that are not addressed by general provisions in AHRI 340/360–2022 or AHRI 1340–202X Draft that negate the component's impact on performance). 88 FR 56392, 56430 (August 17, 2023). These provisions would specify how to test a unit with such a component (*e.g.,* for a unit with hail guards, remove hail guards for testing). These proposed test provisions were consistent with the provision in section D3 to appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft but include revisions for further clarity and specificity (*e.g.,* adding clarifying provisions for how to test units with modular economizers as opposed to units shipped with economizers installed). *Id.* Specifically, DOE proposed to require in appendices A and A1 that steps be taken during unit set-up and testing to limit the impacts on the measurement of these components:

- Air Economizers
- Barometric Relief Dampers
- Desiccant Dehumidification Components
- Evaporative Pre-cooling of Air-cooled Condenser Intake Air
- Fire/Smoke/Isolation Dampers
- Fresh Air Dampers
- Hail Guards
- High-Effectiveness Indoor Air Filtration
- Power Correction Capacitors
- Process Heat Recovery/Reclaim Coils/Thermal Storage
- Refrigerant Reheat Coils
- Steam/Hydronic Heat Coils
- UV Lights
- Ventilation Energy Recovery Systems (VERS)

The components were listed and described in the proposed table 1 to appendix A and table 1 to appendix A1. Test provisions for the components were provided in the tables. *Id.*

b. Components Addressed Through Representation Provisions of 10 CFR 429.43

Overall Approach

Consistent with the Commercial HVAC Term Sheet and the Commercial HVAC Enforcement Policy, in the August 2023 TP NOPR, DOE proposed provisions that explicitly allow representations for individual models with certain components to be based on testing for individual models without those components. 88 FR 56392, 56430–56433 (August 17, 2023). DOE proposed a table (table 6) at 10 CFR 429.43(a)(3)(v)(A) listing the components for which these provisions would apply. *Id.* 88 FR 56430–56431. DOE proposed the following components be listed in table 6 to 10 CFR 429.43(a)(3)(v)(A):

- Air Economizers
- Desiccant Dehumidification Components
- Evaporative Pre-cooling of Air-cooled Condenser Intake Air
- Fire/Smoke/Isolation Dampers
- Indirect/Direct Evaporative Cooling of Ventilation Air
- Non-Standard Ducted Condenser Fans
- Non-Standard Indoor Fan Motors
- Powered Exhaust/Powered Return Air Fans
- Process Heat Recovery/Reclaim Coils/Thermal Storage
- Refrigerant Reheat Coils
- Sound Traps/Sound Attenuators
- Steam/Hydronic Heat Coils
- Ventilation Energy Recovery Systems (VERS)

In the August 2023 TP NOPR, DOE proposed to specify that the basic model representation must be based on the least-efficient individual model that comprises a basic model, and clarified how this long-standing basic model provision interacts with the proposed component treatment in 10 CFR 429.43. *Id.* 88 FR 56431–56432. DOE tentatively concluded that regulated entities may benefit from clarity in the regulatory text as to how the least-efficient individual model within a basic model provision works in concert with the component treatment for CUACs and CUHPs. *Id.* The amendments proposed in the August 2023 TP NOPR explicitly state that excluding the specified components from consideration in determining basic model efficiency in certain scenarios is an exception to basing representations on the least-efficient individual model within a basic model. *Id.* In other words, the components listed in 10 CFR 429.43 are not being considered as part of the representation under DOE's regulatory framework if certain conditions are met as discussed in the following paragraphs, and, thus, their impact on efficiency is not reflected in the representation. In this case, the basic model's representation is generally determined by applying the testing and sampling provisions to the least-efficient individual model in the basic model that does not have a component listed in 10 CFR 429.43.

DOE proposed clarifying instructions for instances when individual models within a basic model may have more than one of the specified components and there may be no individual model without any of the specified components. *Id.* DOE proposed the concept of an otherwise comparable model group (''OCMG''). *Id.* An OCMG is a group of individual models within the basic model that do not differ in components that affect energy consumption as measured according to the applicable test procedure other than the specific components listed in table 6 to 10 CFR 429.43(a)(3)(v)(A) but may include individual models with any combination of such specified components. Therefore, a basic model can be composed of multiple OCMGs, each representing a unique combination of components that affect energy consumption as measured according to the applicable test procedure, other than the specified excluded components listed in table 6 to 10 CFR 429.43(a)(3)(v)(A). For example, a manufacturer might include two tiers of control systems within the same basic model, in which one of the control systems has sophisticated diagnostics capabilities that require a more powerful control board with a higher wattage input. CUAC and CUHP individual models with the ''standard'' control system would be part of OCMG A, while individual models with the ''premium'' control system would be part of a different OCMG B, because the control system is not one of the specified exempt components listed in table 6 to 10 CFR 429.43(a)(3)(v)(A). However, both OCMGs may include different combinations of specified exempt components. Also, both OCMGs may include any combination of characteristics that do not affect the efficiency measurement, such as paint color.

An OCMG identifies which individual models are to be used to determine a represented value. *Id.* Specifically, when identifying the individual model within an OCMG for the purpose of determining a representation for the basic model, only the individual model(s) with the least number (which could be zero) of the specific components listed in table 6 to 10 CFR 429.43(a)(3)(v)(A) is considered. This clarifies which individual models are exempted from consideration for determination of represented values in the case of an OCMG with multiple specified components and no individual models with zero specific components listed in table 6 to 10 CFR 429.43(a)(3)(v)(A) (*i.e.,* models with a number of specific components listed in table 6 greater than the least number in the OCMG are exempted). In the case that the OCMG includes an individual model with no specific components listed in table 1 to 10 CFR 429.43(a)(3)(i)(A), then all individual models in the OCMG with specified components would be exempted from consideration. The least-efficient individual model across the OCMGs within a basic model would be used to determine the representation of the basic model. In the case where there are multiple individual models within a single OCMG with the same non-zero least number of specified components, the least efficient of these would be considered.

DOE relies on the term ''comparable'' as opposed to ''identical'' to indicate that, for the purpose of representations, the components that impact energy consumption as measured by the applicable test procedure are the relevant components to consider. *Id.* In other words, differences that do not impact energy consumption, such as unit color and presence of utility outlets, would not warrant separate OCMGs.

The use of the OCMG concept results in the represented values of performance that are representative of the individual model(s) with the lowest efficiency found within the basic model, excluding certain individual models with the specific components listed in table 6 to 10 CFR 429.43(a)(3)(v)(A). *Id.* Specifically with regard to basic models of CUACs and CUHPs distributed in commerce with multiple different heating capacities of furnaces, the individual model with the lowest efficiency found within the basic model (with the aforementioned exception) would likely include the furnace with the highest offered heating capacity. Additionally, selection of the individual model with the lowest efficiency within the basic model would be required to consider all options for factory-installed components and manufacturer-supplied field-installed components (*e.g.,* electric resistance supplementary heat), excluding the specific components listed in table 6 to 10 CFR 429.43(a)(3)(v)(A). If manufacturers want to represent more-efficient models within the same group, they would be able to establish those units as new basic models and test and report the results accordingly. Further, the approach, as proposed, is structured to more explicitly address individual models with more than one of the specific components listed in table 6 to 10 CFR 429.43(a)(3)(v)(A), as well as instances in which there is no comparable model without any of the specified components. DOE developed a document of examples to illustrate the approach proposed in the August 2023 TP NOPR for determining represented values for CUACs and CUHPs with specific components, and in particular the OCMG concept (*see* EERE–2023–BT–TP–0014–0001).

DOE's proposed provisions in 10 CFR 429.43(a)(3)(v)(A) include each of the components specified in section D3 of AHRI 340/360–2022 for which the test provisions for a unit with these components may result in differences in ratings compared to testing a unit without these components. 88 FR 56392, 56431–56432 (August 17, 2023). DOE's proposed treatment for non-standard indoor fan motors and coated coils is discussed in the following sub-sections.

High-Static Non-Standard Indoor Fan Motors

The Commercial HVAC Enforcement Policy includes high-static indoor blowers or oversized motors as an optional feature for CUACs and CUHPs, among other equipment. The Commercial HVAC Enforcement Policy states that when selecting a unit of a basic model for DOE-initiated testing, if the basic model includes a variety of high-static indoor blowers or oversized motor options,[26] DOE will test a unit that has a standard indoor fan assembly (as described in the supplemental test instructions (''STI'') that is part of the manufacturer's certification, including information about the standard motor and associated drive that was used in determining the certified rating). This policy only applies where: (a) the manufacturer distributes in commerce a model within the basic model with the standard indoor fan assembly (*i.e.,* standard motor and drive), and (b) all models in the basic model have a motor with the same or better relative efficiency performance as the standard motor included in the test unit, as described in a separate guidance document discussed subsequently. If the manufacturer does not offer models with the standard motor identified in the STI or offers models with high-static motors that do not comply with the

[26] The Commercial HVAC Enforcement Policy defines ''high static indoors blower or oversized motor'' as an indoor fan assembly, including a motor, that drives the fan and can deliver higher external static pressure than the standard indoor fan assembly sold with the equipment. (*See www.energy.gov/sites/default/files/2019/04/f62/Enforcement_Policy-Commercial_HVAC.pdf. at p.6*)

comparable efficiency guidance, DOE will test any indoor fan assembly offered for sale by the manufacturer.

DOE subsequently issued a draft guidance document (Draft Commercial HVAC Guidance Document) on June 29, 2015 to request comment on a method for comparing the efficiencies of a standard motor and a high-static indoor blower/oversized motor.[27] As presented in the Draft Commercial HVAC Guidance Document, the relative efficiency of an indoor fan motor would be determined by comparing the percentage losses of the standard indoor fan motor to the percentage losses of the non-standard (oversized) indoor fan motor. The percentage losses would be determined by comparing each motor's wattage losses to the wattage losses of a corresponding reference motor. Additionally, the draft method contains a table that includes a number of situations with different combinations of characteristics of the standard motor and oversized motor (*e.g.,* whether each motor is subject to Federal standards for motors; whether each motor can be tested to the Federal test procedure for motors; whether each motor horsepower is less than 1 and specifies for each combination whether the non-standard fan enforcement policy would apply (*i.e.,* whether DOE would not test a model with an oversized motor, as long as the relative efficiency of the oversized motor is at least as good as performance of the standard motor)). DOE has not issued a final guidance document and is instead addressing the issue for CUACs and CUHPs in this test procedure rulemaking.

The current Federal test procedure does not address this issue. Section D4.1 of appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft provide an approach for including an individual model with a non-standard indoor fan motor as part of the same basic model as an individual model with a standard indoor fan motor. Under the approach in section D4.1 of appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft, the non-standard indoor fan motor efficiency must exceed the minimum value calculated using equation D1 in appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft. This minimum non-standard motor efficiency calculation is dependent on the efficiency of the standard fan motor and the reference efficiencies (determined per Table D1 of appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft) of the standard and non-standard fan motors.

Section D4.2 of appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft contain a method for how to compare performance for integrated fans and motors (IFMs). Because the fan motor in an IFM is not separately rated from the fan, this method compares the performance of the entire fan-motor assemblies for the standard and non-standard IFMs, rather than just the fan motors. This approach enables comparing relative performance of standard and non-standard IFMs, for which motor efficiencies could otherwise not be compared using the method specified in section D4.1 of appendix D of AHRI 340/360–2022 or AHRI 1340–202X Draft. Specifically, this method determines the ratio of the input power of the non-standard IFM to the input power of the standard IFM at the same duty point as defined in section D4.2 of appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft (*i.e.,* operating at the maximum ESP for the standard IFM at the rated airflow). If the input power ratio does not exceed the maximum ratio specified in Table D3 of appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft, the individual model with the non-standard IFM may be included within the same basic model as the individual model with the standard IFM. Section D4.2 of appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft allow these calculations to be conducted using either test data or simulated performance data.

The approaches in section D4 of appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft for high-static non-standard indoor fan motors and non-standard indoor IFMs generally align with the approaches of the Commercial HVAC Term Sheet, the Commercial HVAC Enforcement Policy, and the Draft Commercial HVAC Guidance Document, while providing greater detail and accommodating a wider range of fan motor options. For the reasons presented in the preceding paragraphs, DOE proposed in the August 2023 TP NOPR to adopt in table 6 to 10 CFR 429.43(a)(3)(v)(A) the provisions for comparing performance of standard and high-static non-standard indoor fan motors/IFMs in section D4 of appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft[28] for the determination of the represented efficiency value for CUACs and CUHPs at 10 CFR 429.43(a)(3). 88 FR 56392, 56432 (August 17, 2023).

Coated Coils

In the August 2023 TP NOPR, DOE proposed to exclude coated coils from the specific components list specified in 10 CFR 429.43 because DOE tentatively concluded that the presence of coated coils does not result in a significant impact to performance of CUACs and CUHPs, and, therefore, models with coated coils should be rated based on performance of models with coated coils present (rather than based on performance of an individual model within an OCMG without coated coils). 88 FR 56392, 56432–56433 (August 17, 2023).

c. Enforcement Provisions of 10 CFR 429.134

Consistent with the Commercial HVAC Term Sheet and the Commercial HVAC Enforcement Policy, in the August 2023 TP NOPR, DOE proposed provisions in 10 CFR 429.134(g)(2) regarding how DOE would assess compliance for basic models of CUACs and CUHPs that include individual models distributed in commerce if DOE cannot obtain for testing individual models without certain components consistent with the model that served as the basis of representation. 88 FR 56392, 56433 (August 17, 2023). Specifically, DOE proposed that if a basic model includes individual models with components listed at table 6 to 10 CFR 429.43(a)(3)(v)(A) and DOE is not able to obtain an individual model with the least number of those components within an OCMG (as defined in the proposed 10 CFR 429.43(a)(3)(v)(A)(*1*) and discussed in section III.F.3.b of this final rule), DOE may test any individual model within the OCMG. *Id.*

d. Testing Specially Built Units That Are Not Distributed in Commerce

Unlike section D3 to appendix D of AHRI 340/360–2022 and AHRI 1340–202X Draft, DOE's Commercial HVAC Enforcement Policy does not allow a manufacturer to test a model that is specially built for testing without a feature if models without that feature are not actually distributed in commerce. Because testing such specially built models would not provide ratings representative of equipment distributed in commerce, DOE tentatively concluded in the August 2023 TP NOPR that such

[27] Available at *www1.eere.energy.gov/buildings/appliance_standards/pdfs/draft-commercial-hvac-motor-faq-2015-06-29.pdf.*

[28] Per DOE's existing certification regulations, if a manufacturer were to use the proposed approach to certify a basic model, the manufacturer would be required to maintain documentation of how the relative efficiencies of the standard and non-standard fan motors or the input powers of the standard and non-standard IFMs were determined, as well as the supporting calculations. *See* 10 CFR 429.71.

approach is not appropriate. 88 FR 56392, 56433 (August 17, 2023). Therefore, consistent with the Commercial HVAC Enforcement Policy, DOE did not propose to allow testing of specially built units in its representation and enforcement provisions. *Id.*

4. Updates in AHRI 1340–2023

In the final version of AHRI 1340–2023, appendix D to AHRI 1340–2023 was updated to align with the approach and list of features proposed by DOE in the August 2023 TP NOPR, as discussed in section III.F.3 of this final rule. In addition, Table 37 to appendix D to AHRI 1340–2023 includes instructions specifying that drain pan heaters be disconnected during testing. DOE's consideration of this AHRI 1340–2023 provision for drain pan heaters is discussed in the following section.

5. Comments Received and Adopted Provisions

a. Overall Approach

DOE received several comments pertaining to DOE's proposed approach. Carrier stated that DOE's proposal for specific components was not fully clear to Carrier, but that if the intent is that the lowest-efficiency model should be used for representations of performance, Carrier agrees with that approach. (Carrier, No. 8 at p. 3) For rating models, Carrier also agreed that specially built models not distributed in commerce should not be allowed for compliance testing used to determine ratings. (*Id.*) Carrier commented that breaking into separate groups of components and introducing an additional concept of OCMG could create further confusion and undue complexity. (*Id.*) Carrier stated that it would like to see these provisions for specific components be laid out in a more straightforward manner to provide manufacturers clarity when choosing models for representations. (*Id.*) Rheem similarly commented that the proposed OCMG concept lacks clarity and recommended DOE explore ways to make the proposed regulatory text clearer with visual aids or examples. (Rheem, No. 12 at p. 2) Rheem recommended the regulatory language to remain the same as it is currently if no further explanation is provided. (*Id.*)

Regarding Carrier and Rheem's concerns, DOE's intent is for the lowest-efficiency model within a basic model to be used for representations of performance, as is stated in the provisions adopted at 10 CFR 429.43(a)(3)(vi)(A)(*1*) in this final rule.[29] DOE acknowledges that the ability to exclude certain specific components specified in table 7 to 10 CFR 429.43(a)(3)(vi)(A) from consideration when identifying the lowest-efficiency model means that there could be confusion in determining the least-efficient model(s) that can be used to determine representations for the basic model. This is the reason that the OCMG concept is required. As discussed, the OCMG formalizes the process by which a manufacturer can consider groups of individual models within a basic model that are comparable, other than the presence of certain specific components specified in table 7 to 10 CFR 429.43(a)(3)(vi)(A), and determine the individual model(s) that can be used to determine representations for the basic model. This ensures that the process is performed in the same way by all manufacturers and also by DOE, thereby preventing the potential for confusion and inaccurate representations. Regarding Carrier's and Rheem's requests for more clarity and visual aids, DOE notes that, as discussed, the Department has developed a document which includes visual aids and examples of how the OCMG concept works in application (*see* EERE–2023–BT–TP–0014–0001). This document presents several examples that make clear the OCMG concept and how it is used to determine the individual model(s) that can be used to determine representations for a basic model. DOE encourages stakeholders to review this document for additional clarification, and the Department will consider developing other forms of visual aid and examples should stakeholders request it.

For the reasons discussed in the previous paragraphs and the August 2023 TP NOPR, DOE is adopting its proposed approach for determining the configuration of a unit under test. DOE is also adopting two updates to the approach proposed in the August 2023 TP NOPR, as explained in the paragraphs that follow.

First, after consideration of comments received, DOE is changing the required compliance date to be when certifying to standards denominated in terms of IVHE and IVEC, should those standards be established, rather than starting 360 days after publication of the test procedure final rule in the **Federal Register** (as proposed). This is consistent with the approach that DOE has taken for establishing similar provisions for other categories of commercial air conditioning equipment; *i.e.,* for other categories such as CRACs (88 FR 21816, 21836–21837 (April 11, 2023)), variable refrigerant flow multi-split systems (87 FR 63860, 63892 (Oct. 20, 2022)), and SPVUs (87 FR 75144, 75166 (Dec. 7, 2022)), DOE specified a compliance date for similar "configuration of unit under test" provisions to be the compliance date of amended energy conservation standards in terms of the new metric. Additionally, this compliance date change ensures that manufacturers will have adequate time to learn and understand the process. As a result, the provisions that DOE is adopting in 10 CFR 429.43 and 429.134 will apply when certifying to standards denominated in terms of IVHE and IVEC or for assessment and enforcement testing of models subject to energy conservation standards denominated in terms of IVEC and IVHE, if such standards are adopted. Consistent with the compliance date for provisions in 10 CFR 429.43 and 429.134, DOE is also not adopting any test provisions for units with specific components in appendix A, and is instead only adopting such test provisions in appendix A1, which would be used when certifying compliance with standards in terms of IVHE and IVEC, should those standards be established.

Second, DOE is adopting in table 2 to appendix A1 the provision for how to test units with drain pan heaters specified in Table 37 to appendix D2 to AHRI 1340–2023 (*i.e.,* disconnect drain pan heaters for testing). Although not proposed in the August 2023 TP NOPR, DOE has concluded that this guidance for how to test units with drain pan heaters is appropriate and consistent with test provisions for other components that DOE proposed in the August 2023 TP NOPR.

As discussed, DOE's adopted provisions regarding configuration of unit under test in 10 CFR 429.43 and 429.134 apply to equipment subject to standards in terms of IVHE and IVEC.

b. Coated Coils

DOE received several comments in response to the proposal to exclude coated coils from the specific components list in 10 CFR 429.43. Carrier, Trane, AHRI, and Lennox opposed DOE's proposed exclusion of coated coils from the specific components list. (Carrier, No. 8 at p. 3; Trane, No. 14 at p. 4; AHRI, No. 15 at p. 6; Lennox, No. 9 at p. 2) AHRI asserted that DOE provided no data to support the proposal and that the

[29] In the August 2023 TP NOPR, DOE proposed the provisions regarding certain components addressed through representation provisions of 10 CFR 429.43(a)(3)(v). In this final rule, those provisions are instead being adopted at 10 CFR 429.43(a)(3)(vi). Further, the provisions proposed in table 6 to 10 CFR 429.43(a)(3)(v)(A) are being adopted in table 7 to 10 CFR 429.43(a)(3)(vi)(A).

proposal could more than double manufacturers' listed basic models. (AHRI, No. 15 at p. 6)

Trane stated that there are a multitude of coil coatings available in the marketplace and that many are customized per specific customer requests. (Trane, No. 14 at p. 4) Trane further commented that many coils undergo a special ''non-standard'' process to have coil coatings applied, often requiring coils to be sent to a third party prior to being installed in the unit during the manufacturing process, which adds significant lead time to the equipment as well as variability in types of coatings that are applied. (*Id.*) Trane argued that excluding coated coils from the list of specific components would necessitate extensive testing in order to develop adequate performance models for all cases. (*Id.*) Trane additionally stated that this would also multiply the number of listed models, as some coil coatings may have significant performance impacts while some may not. (*Id.*) Trane stated that units with coated coils only represent a very small fraction of the market, and, therefore, requiring all equipment to include coil coatings in the basic models is not representative of the vast majority of applications in the marketplace. (*Id.*) Trane also argued that this requirement would be unduly burdensome for manufacturers, given that coated coils represent such a small share of the market. (*Id.*)

Carrier stated that there is a negative impact to performance when a unit is first produced with coated coils, but Carrier asserted that the coating prevents degradation over the lifetime of the unit as compared to a unit with an uncoated coil in certain applications. (Carrier, No. 8 at p. 3) In the event that coated coils are removed from the list of specific components, Carrier stated that it is concerned that energy conservation will be reduced over the life of products in the applications that require these components. (*Id.*) If coated coils are excluded from the list of specific components, Carrier opposed the proposed 360-day compliance date for requirements for representations of those models, stating that compliance would require additional laboratory time and engineering resources that are currently fully allocated to refrigerating transition projects required to meet the Environmental Protection Agency's January 1, 2025 compliance date. (*Id.*)

In response, DOE notes that the comments received in response to the August 2023 TP NOPR indicate that some coil coatings may not have a significant impact on performance while other coil coatings would. Given that comments suggest that certain implementations of coated coils do not impact energy use whereas others do, DOE has determined that for those units for which coated coils do impact energy use, representations should include those impacts, thereby providing full disclosure for commercial customers.

Regarding Trane's assertion that including coated coils in representations would be unduly burdensome and assertions that the proposal would significantly increase the number of listed basic models, DOE notes that not all coil coatings would necessarily warrant separate basic models. DOE's definition for ''basic model'' at 10 CFR 431.92 specifies that a basic model for CUACs and CUHPs can comprise models with ''comparably performing'' heat exchangers, which allows for models with small variations in performance still to be included together in the same basic model, so long as, consistent with the clarifications adopted and previously discussed in this final rule, the representations for the basic model are based on the least-efficient configuration. Therefore, coil coatings with similar performance impacts could be rated within the same basic model, and coil coatings without a significant impact on performance could be included in the same basic model as models with no coil coatings.

DOE expects that manufacturers already have a general understanding of which coil coatings might have significant impacts on performance, based on coil coating material and thickness. To the extent that a manufacturer needs to determine whether a coil coating impacts performance, the manufacturer could presumably determine this for a given model and apply that understanding to other models. In other words, a given coil coating is likely to have similar impacts across all basic models of CUACs and CUHPs, such that finding that the coating has no substantive impact on performance for a given model likely indicates such a finding would apply to other models as well. Thus, DOE expects that there would be no need to separately confirm ''no impact'' from a given coil coating on each basic model for which it is offered. Further, DOE notes that AEDMs can be used to simulate performance of models with coated coils such that not all models require testing. Therefore, DOE has concluded that the proposed approach for coated coils is not unduly burdensome.

DOE disagrees with Trane's comment that requiring all equipment to include coil coatings in the basic models is not representative of the vast majority of applications in the marketplace. The proposed approach does not require that all representations for CUACs and CUHPs be based on the presence of coil coatings; to the extent that manufacturers offer a model with and without a coil coating that substantively impacts performance, the manufacturer can rate as separate basic models with and without the coil coatings. The basic model with ratings based on performance without the coil coating would represent the shipments of units without coil coatings. Further, for coil coatings that impact performance, ratings based on the presence of coil coatings are representative of shipments of units with such coil coatings, and performance ratings based on the presence of the coil coating provide a more accurate assessment of the unit's energy consumption to commercial consumers.

Regarding AHRI's assertion that DOE has not provided any data to support its proposal, DOE notes that comments received from both Trane and Carrier indicate that some coil coatings have negative performance impacts. Therefore, DOE concludes that no further data are needed to justify adopting a provision requiring that ratings reflect coated coils with substantive negative performance impacts, as this is consistent with DOE's statutory authority to prescribe test procedures that produce results that are representative of an average use cycle. Additionally, as discussed earlier in this section, to the extent that manufacturers produce units with coated coils that do not impact performance as compared to units with uncoated coils, the manufacturer may group such individual models together within the same basic model.

DOE disagrees with Carrier's assertion that including coated coils in representations will result in energy conservation being reduced over the life of products in the applications that require coated coils. DOE expects that commercial customers who are currently purchasing CUACs and CUHPs with coated coils do so because they understand coil protection to be important for their application, and DOE does not expect that such consumers would stop purchasing units with coated coils if ratings are required to reflect performance impacts of coated coils. However, the incorporation of performance impacts of coated coils into ratings for CUACs and CUHPs will provide commercial consumers with more accurate assessments of the energy consumption of various models of CUACs and CUHPs, and will, therefore, better elucidate any performance trade-offs associated with coil coatings and will better inform consumers as to coil coatings that may have less performance impact than others.

Regarding Carrier's concern about the timeline for required representations with coated coils, as previously discussed, DOE is adopting all provisions for specific components with a compliance date starting when certifying to standards in terms of IVHE and IVEC, should those standards be established, instead of the proposed compliance date of 360 days after publication of the final rule in the **Federal Register**. DOE has concluded that the adopted compliance date will provide adequate lead time for manufacturers to develop representations that reflect the amended test procedure and representation provisions adopted in this final rule.

For the reasons described in the previous paragraphs and consistent with the proposals in the August 2023 TP NOPR, DOE is not incorporating coated coils into DOE's provisions specified in 10 CFR 429.43(a)(3) that allow for the exclusion of specified components when determining represented values for CUACs and CUHPs.

G. Represented Values

In the following sections, DOE discusses requirements regarding represented values. To the extent DOE is adopting changes to the requirements specified in 10 CFR 429 regarding representations of CUACs and CUHPs, such amendments to 10 CFR part 429, will be required: (1) starting 360 days after the date of publication in the **Federal Register** of this final rule when certifying to an EER, IEER, or COP standard or (2) starting on the compliance date of amended energy conservation standards denominated in terms of IVEC or IVHE, should DOE adopt such standards. Prior to 360 days after the date of publication in the **Federal Register** of this final rule, the current requirements will apply.

1. Cooling Capacity

In the August 2023 TP NOPR, DOE proposed to adopt provisions relating to the represented value of cooling capacity at 10 CFR 429.43(a)(1)(iv), as well as the verification of cooling capacity during enforcement testing at 10 CFR 429.134(g). 88 FR 56392, 56433–56434 (August 17, 2023). The following sections include discussion of the proposals in the NOPR, responses to related comments, and the approaches adopted in this final rule.

a. Representations of Cooling Capacity

For CUACs and CUHPs, cooling capacity determines equipment class, which in turn determines the applicable energy conservation standard. 10 CFR 431.97. Cooling capacity also dictates the minimum ESP test condition applicable under Table 7 of AHRI 340/360–2022 (*i.e.,* larger capacity units are required to be tested at higher ESPs), which in turn affects the performance of the unit. Cooling capacity is a required represented value for all CUACs and CUHPs, but the requirements currently specified in 10 CFR 429.43(a)(1)(iv) regarding how the represented value of cooling capacity is determined only apply to ACUACs and ACUHPs.

In the August 2023 TP NOPR, DOE proposed to make certain modifications to these provisions and to expand the applicability of these provisions, as amended, to all of the CUACs and CUHPs that are the subject of this rulemaking. Specifically, DOE proposed that the represented value of cooling capacity must be between 95 and 100 percent of the mean of the total cooling capacities measured for the units in the sample. 88 FR 56392, 56433 (August 17, 2023). DOE also proposed in the August 2023 TP NOPR that for units where the represented value is determined through an AEDM, the represented value of cooling capacity must be between 95 and 100 percent of the total cooling capacity output simulated by the AEDM. *Id.* Additionally, DOE proposed to remove the existing requirement in 10 CFR 429.43(a)(1)(iv) that the represented value of cooling capacity correspond to the nearest appropriate Btu/h multiple according to Table 4 of ANSI/AHRI 340/360–2007 in order to allow manufacturers flexibility in certifying a rated value that provides a representation of cooling capacity that may be more meaningful for commercial consumers. *Id.* DOE argued that these proposals would ensure that the rated capacity is representative of the unit's performance, while allowing manufacturers to conservatively rate capacity if the manufacturer deemed such conservative rating necessary to ensure that equipment is capable of performing at the cooling capacity for which it is represented to consumers. *Id.* DOE requested comment on its proposals related to the representation of cooling capacity. *Id.*

Carrier supported DOE's cooling capacity representation proposal. (Carrier, No. 8 at p. 4) AHRI commented that it opposes DOE's proposal that represented capacity must be between 95 to 100 percent of measured or simulated capacity for units where the represented value is determined through an AEDM, asserting that this tolerance is too narrow given that manufacturers can rate capacity at 95 percent of development tests. AHRI further argued that the proposal allows for no (0 percent) tolerance for variation because tested capacity during enforcement could be at 105 percent (per DOE's proposal regarding cooling capacity used to determine ESP requirements during DOE testing, which is discussed in section III.G.1.b of this final rule). (AHRI, No. 15 at p. 6) Rheem commented that it opposed DOE's proposal for a one-sided tolerance to be within 95 to 100 percent of rated cooling capacity, arguing that this tolerance does not provide enough margin to account for factors that affect measurements such as manufacturing variation and test lab conditions. Instead, Rheem recommended that DOE consider adoption of a wider two-sided tolerance that accounts for measurement variability, such as 90 to 110 percent of rated capacity. (Rheem, No. 12 at p. 2) Lennox similarly commented that it opposes DOE's proposal to require that the measured cooling capacity must be between 95 and 100 percent of the represented value and argued the proposed tolerance is too narrow, given that manufacturers can rate up to 100 percent of the tested value. Lennox recommended DOE instead provide a tolerance range for measured capacity between 95 and 105 percent. (Lennox, No. 9 at p. 2)

As previously expressed, DOE's proposal to limit the represented value of cooling capacity to be within 95 and 100 percent of the mean of the total cooling capacities measured for the units in the sample (or simulated by an AEDM) was intended to allow manufacturers to conservatively rate capacity if the manufacturer deemed such conservative rating necessary to ensure that equipment is capable of performing at the cooling capacity for which it is represented to consumers, but it was also intended to prevent manufacturers from over-rating capacity. Comments from Rheem and Lennox suggest that the commenters misunderstood the proposal to be imposing a tolerance on the *measured* cooling capacity that is compared to the rated cooling capacity. To clarify, this provision specifies how represented values of cooling capacity are determined based on the sample of measured values (or values calculated in an AEDM) for a given basic model. Verification of rated cooling capacity, which is a separate issue, is discussed in the following section.

Rated cooling capacity is used to determine the ESP requirements used in testing; therefore, DOE has concluded that significant underrating or overrating of capacity could cause unintended consequences such as inequitable ratings due to differences in self declarations. Further, significant underrating or overrating of capacity would provide an inaccurate assessment to consumers of the amount of space cooling a model can provide. Additionally, the 95 to 100 percent tolerance is consistent with what has been adopted for other categories of commercial air-conditioning, such as DX–DOASes, SPVUs, and CRACs. *See* 10 CFR 429.43(a)(3)(i)(B)(*1*), (a)(3)(iii)(B), and (a)(3)(iv)(B).

Regarding comments on manufacturing variation and test variability, DOE notes that if a manufacturer develops ratings for a basic model based on testing, the manufacturer must test in accordance with 10 CFR 429.43(a)(1), which requires testing to be conducted on a sample consistent of no less than two units per basic model. The provisions at 10 CFR 429.43(a)(1) specify statistics used to develop represented values based on the mean and standard deviation of measurements—*i.e.,* reflecting the variation in measurements included in the sample. If a manufacturer chooses to consider more units or variation in measured performance using different test chambers, DOE does not limit the number of units or test chambers that can be used in the sample to develop a rating for a basic model. In other words, a manufacturer can include in the sample results from all testing it has conducted for a basic model; therefore, there should not be a scenario in which a manufacturer has test results suggesting that the mean of the sample does not accurately reflect performance of the basic model, because those test results can be included in the sample. Thus, there would be no basis for a manufacturer to: (1) underrate cooling capacity (as compared to the mean of measured values) by more than 5 percent; or (2) overrate cooling capacity.

Similar logic applies if a manufacturer develops ratings for a basic model based on AEDM simulations in accordance with 10 CFR 429.43(a)(2). DOE's regulations at 10 CFR 429.70 provide a minimum number of tested models needed for validation of an AEDM, but if a manufacturer is concerned that the tested models do not reflect what is likely to be the ''average'' performance for those models given manufacturing variation and test variability, DOE does not limit the number of units or test chambers that can be used in the test results used to validate an AEDM. Therefore, similar to development of ratings via testing, for AEDM-simulated models, there would be no basis for a manufacturer to: (1) underrate cooling capacity (as compared to the AEDM-simulated values) by more than 5 percent; or (2) overrate cooling capacity.

Consequently, DOE has concluded that the issues of manufacturing variation and test variability are sufficiently captured in DOE's existing regulations, so the Department is not adopting any wider tolerance on the represented cooling capacity than proposed. As such, DOE is adopting the provisions regarding representations of cooling capacity as originally proposed.

b. Verification of Cooling Capacity

DOE currently outlines product-specific enforcement provisions at 10 CFR 429.134(g) for ACUACs and ACUHPs, specifically that the mean of cooling capacity measurements during assessment or enforcement testing will be used to determine the applicable standards (which depend on cooling capacity) for purposes of compliance. First, DOE proposed in the August 2023 TP NOPR to expand the scope of this requirement to include ECUACs and WCUACs. 88 FR 56392, 56433 (August 17, 2023). Second, DOE proposed in the August 2023 TP NOPR for all CUACs and CUHPs that are the subject of this rulemaking that if the mean of the cooling capacity measurements exceeds by more than 5 percent the cooling capacity certified by the manufacturer, the mean of the measurement(s) will be used to select the applicable minimum ESP test condition from Table 7 of AHRI 340/360–2022 in appendix A or from Table 5 of the AHRI 1340–202X Draft in appendix A1.[30] *Id.*

In the August 2023 TP NOPR, DOE requested comment on its proposal related to the verification testing of cooling capacity. *Id.* In response, Carrier and Trane disagreed with DOE's proposal to establish a 5-percent tolerance on rated capacity for determining the applicable minimum ESP condition when conducting verification testing. (Carrier, No. 8 at p. 4; Trane, No. 14 at p. 5)

Trane asserted that this tolerance did not provide enough range for manufacturing, design, and testing variability. Trane also asserted that as a result of DOE's proposed 5-percent tested capacity limit above capacity ratings, in some cases, capacity ratings would be difficult to establish with the proposed approach because the tested capacity and ESP requirement continually impact each other in a way which would cause the tested capacity to be either too high or too low depending on the ESP applied. Trane provided an example illustrating the range of different capacities measured under different ESP conditions for the same model. Trane further asserted that there would be no benefit for manufacturers to conservatively rate units at lower ESPs due to capacity fluctuations because doing so could increase the minimum efficiency requirement and the resulting energy efficiency performance could be negatively impacted. (Trane, No. 14 at p. 5)

Carrier argued that if manufacturers use the 5-percent margin in the certified capacity rating as the proposed rule allows, it is likely that the tested capacity during assessment and enforcement testing could go above the 105 percent tolerance, and, therefore, Carrier recommended that a tolerance of 10-percent be applied to the tested capacity. (Carrier, No. 8 at p. 4)

Carrier also commented regarding an issue it found with the tolerance proposal due to the new ESP requirements in AHRI 1340. Carrier commented that the tested net capacity of a unit can decrease at higher static pressures due to heat loss from the electric motor operating against a higher static pressure. As such, Carrier commented that the tested capacity at lower static pressures could be above the test tolerance, but for the same unit at higher ESPs, the tested capacity could be below the test tolerances. Carrier requested further clarification from DOE as to which capacity should be used for ESP determination if this situation were to occur. (*Id.*)

After careful consideration of comments received, DOE has concluded that the proposed provision to use the measured cooling capacity during assessment and enforcement testing to determine the ESP test condition if the measured cooling capacity exceeds the certified cooling capacity by more than 5 percent is not necessary at this time. As stated in the August 2023 TP NOPR, the intent of this proposal was to ensure the unit is being tested to the appropriate ESP and being evaluated against the appropriate standard during assessment and enforcement testing. 88 FR 56392, 56433 (August 17, 2023). DOE has concluded that the adopted requirement (discussed in section III.G.1.a of this final rule) for the represented value of cooling capacity to be between 95 and 100 percent of the

[30] Table 5 of AHRI 1340–2023 includes the same ESP test conditions as Table 5 of the AHRI 1340–202X Draft.

mean of the total cooling capacities measured for the units in the sample (or between 95 and 100 percent of the AEDM-simulated cooling capacity) will ensure that the rated cooling capacity accurately reflects the cooling capacity for a basic model. Therefore, DOE has determined that maintaining the current policy of selecting the ESP requirement used for DOE testing based on the rated cooling capacity rather than the measured cooling capacity will provide a representative measure of the equipment's energy use. DOE acknowledges the issue raised by commenters, and notes that maintaining the current policy will prevent a situation in which the measured capacity iteratively affects the applicable ESP requirement, and will avoid any conflicts between DOE's enforcement provisions and DOE's adopted provisions allowing conservative rating of cooling capacity as low as 95 percent. As such, DOE is not adopting its proposal that the mean of measured capacities be used to select the applicable minimum ESP condition when it exceeds the rated cooling capacity of a basic model by more than 5 percent.

DOE did not receive comment regarding its proposal to expand the scope of the current product-specific enforcement requirements at 10 CFR 429.134(g) to ECUACs and WCUACs. DOE has determined that extending this provision to ECUACs and WCUACs will ensure that the unit is being evaluated against the appropriate standard. As such, DOE is expanding the scope of the requirement at 10 CFR 429.134(g) that the mean of cooling capacity measurements will be used to determine the applicable standards (which depend on cooling capacity) for purposes of compliance to apply to ECUACs and WCUACs.

2. AEDM Tolerance for IVEC and IVHE

As discussed previously, DOE's existing testing regulations allow the use of an AEDM, in lieu of testing, to simulate the efficiency of CUACs and CUHPs. 10 CFR 429.43(a). For models certified with an AEDM, results from DOE verification tests are subject to certain tolerances when compared to certified ratings. In the August 2023 TP NOPR, DOE proposed in table 2 to paragraph (c)(5)(vi)(B) at 10 CFR 429.70 to specify a tolerance of 10 percent for CUAC and CUHP verification tests for IVEC and IVHE. 88 FR 56392, 56434 (August 17, 2023). This tolerance is identical to the current tolerance specified for IEER (for ACUACs and ACUHPs) and for integrated metrics for other categories of commercial air conditioners and heat pumps (*e.g.,* integrated seasonal coefficient of performance 2 and integrated seasonal moisture removal efficiency 2 for DX–DOASes). DOE also proposed to specify a tolerance of 5 percent for CUAC and CUHP verification testing for the optional EER2 and COP2 metrics. This tolerance is identical to the current tolerances specified for EER and COP for CUACs and CUHPs. *Id.*

DOE did not receive any comments regarding this proposal. Therefore, DOE is adopting the AEDM tolerances applicable to IVEC, IVHE, EER2, and COP2 as proposed in the August 2023 TP NOPR.

3. Minimum Part-Load Airflow

As previously discussed in sections III.D.1 and III.D.2 of this document, the IVEC and IVHE metrics account for energy consumed (specifically that of the indoor fan) in mechanical cooling and heating, as well as modes other than mechanical cooling and heating (*e.g.,* economizer-only cooling, cooling season ventilation, heating season ventilation). IVEC and IVHE do not include separate tests or airflow rates for ventilation hours or economizer-only cooling (only applicable to IVEC). For example, for the economizer-only cooling hours in the D bin, the indoor fan power measured when operating at the lowest manufacturer-specified part-load airflow for a given load bin is applied for economizer-only cooling hours in that bin. Section 6.2.7 and 6.3.10 of the AHRI 1340–202X Draft require that the lowest indoor fan power measured for cooling or heating tests is applied for cooling-season ventilation hours in IVEC and heating-season ventilation hours in IVHE. AHRI 1340–2023 maintains these provisions. Therefore, considering mechanical cooling and heating, as well as other operating modes (*e.g.,* economizer-only cooling, ventilation), the indoor fan power measured at the lowest manufacturer-specified part-load cooling and heating airflow rates represents a significant fraction of the power included in the IVEC and IVHE metrics (*i.e.,* indoor fan power measured at these airflow rates is weighted by a significant number of hours), and differences in the lowest manufacturer-specified part-load airflow can significantly impact IVEC and IVHE ratings.

Based on examination of publicly-available product literature, DOE understands that many basic models of a CUAC or CUHP have controls that allow for modulation of the minimum airflow used across a wide range of airflow turndown. DOE's research suggests that many models are distributed in commerce with an ''as-shipped'' minimum airflow and/or a default minimum airflow setting recommended in manufacturer installation instructions. However, in many cases, DOE observed that the unit controls allow the installer to change this minimum airflow setting during installation to reflect any constraints specific to a particular installation. DOE understands that such constraints may include the duct distribution system, the thermostat the CUAC or CUHP is paired with, and the minimum ventilation rate for the conditioned space served by the CUAC or CUHP. To ensure that IVEC and IVHE ratings reflect indoor fan power that is generally representative of airflow rates that would be used in the field for a given basic model, DOE considered the following two options for requirements related to minimum part-load airflow used for representations of IVEC and IVHE in the August 2023 TP NOPR:

1. Representations of IVEC and IVHE (including IVHEc, as applicable) must be based on setting the lowest stage of airflow to the highest part-load airflow allowable by the basic model's system controls. For example, if fan control settings for a basic model allow its lowest stage of airflow to range from 40 to 60 percent, the basic model will need to be represented based on the lowest stage of airflow set to 60 percent of the full-load airflow.

2. Representations of IVEC and IVHE (including IVHEc, as applicable) must be determined using minimum part-load airflow that is no lower than the highest of the following: (1) the minimum part-load airflow obtained using the as-shipped system control settings; (2) the minimum part-load airflow obtained using the default system control settings specified in the manufacturer installation instructions (as applicable); and (3) the minimum airflow rate specified in section 5.18.2 of AHRI 1340–202X Draft.[31] 88 FR 56392, 56434–56435 (August 17, 2023).

In the August 2023 TP NOPR, DOE tentatively concluded that option 1, which requires representations based on the highest minimum part-load airflow allowable by system controls, may result in unrepresentatively high airflow rates in cases in which a basic model allows configuration of minimum airflow to a very high percentage to accommodate a small fraction of installations in which minimum part-load airflow must be high (*e.g.,* in applications with very high minimum ventilation rates). *Id.*

[31] Section 5.18.2 of AHRI 1340–2023 includes the same provisions as those specified in section 5.18.2 of the AHRI 1340–202X Draft.

Therefore, DOE proposed in the August 2023 TP NOPR to adopt option 2 and requested comment on its proposal, as well as any alternate options not listed that would ensure representations of IVEC and IVHE are based on minimum part-load airflow that is representative of field installations. *Id.*

AHRI, Carrier, Lennox, Rheem, and Trane opposed DOE's proposal and argued that the only restriction on minimum airflow rate should be what was agreed to in Recommendation #6 of the ACUAC and ACUHP Working Group TP Term Sheet (*i.e.,* limiting the minimum airflow rate to that specified in Section 5.18.2 of the AHRI 1340–202X Draft). (AHRI, No. 15 at pp. 6–7; Carrier, No. 8 at p. 5; Lennox, No. 9 at p. 3; Rheem, No. 12 at p. 2; Trane No. 14 at p. 6) Carrier commented that the ACUAC and ACUHP Working Group TP Term Sheet includes a requirement for manufacturers to certify the airflow that is used in the lowest-stage cooling test, and stated that this ensures that the unit is capable of running in application at the airflows that were used in the tests or AEDM. Carrier further stated that restricting the broad range of airflow settings in commercial equipment to only those that are default from the factory is not appropriate and recommended that no further restrictions be placed on tested airflows beyond what was agreed upon in the ACUAC and ACUHP Working Group TP Term Sheet. (Carrier, No. 8 at p. 5)

AHRI and Trane asserted that ratings are based on a representative average of many customer applications and that equipment built for stock has a default airflow and ESP with the expectation that customers will adjust and commission (*i.e.,* adjust sheaves, VFDs, discharge air temperature setpoints, or other parts of the equipment) for their specific applications, and made-to-order equipment is built per customer specifications for a given installation. (AHRI, No. 15 at pp. 6–7; Trane, No. 14 at p. 6) AHRI and Trane further stated that the default airflow and ESP may not align with the ESP requirements in the test procedure, and that considerable variation across installations does not align with a single rating point. (*Id.*) Trane further stated that equipment utilizing sheaves in the airflow system almost always require field adjustment up to and including different sheave components ordered as field-installed accessories to complete an equipment installation. (Trane, No. 14 at p. 6) AHRI and Trane further stated that supplemental test instructions submitted as part of certification ensure that the equipment is properly set up for any verification testing as per the test procedure. (AHRI, No. 15 at pp. 6–7; Trane, No. 14 at p. 6)

ASAP & ACEEE expressed support for DOE's proposal regarding determination of part-load airflow, stating that it improves representativeness by considering the default and as-shipped settings, and expressed concern that without DOE's proposal, manufacturers could rate models with airflows lower than would be representative. (ASAP & ACEEE, No. 11 at pp. 1–2)

Regarding the comments that DOE should impose no additional requirements on minimum part-load airflow and that the only requirements should be the ones in the ACUAC/HP Working Group TP Term Sheet, DOE has concluded that the minimum part-load airflow requirements proposed for 10 CFR 429.43 have a different purpose than, and do not deviate from or conflict with, the requirement regarding minimum airflow specified in Recommendation #6 of the ACUAC and ACUHP Working Group TP Term Sheet (which is the minimum part-load airflow specified in section 5.18.2 of the AHRI 1340–202X Draft and AHRI 1340–2023). In this final rule, DOE is adopting section 5.18.2 of AHRI 1340–2023 in the test procedure at appendix A1, consistent with Recommendation #6 of the ACUAC and ACUHP Working Group TP Term Sheet. This minimum part-load airflow requirement from the Term Sheet and AHRI 1340 represents the minimum airflow required to provide adequate ventilation in a typical building (based on an average of building types used to develop the IVEC metric, as discussed in section III.D.1 of this document). In other words, the requirement in the test procedure is a lower bound on minimum airflow for *any* CUAC/HP model serving the average building, but it is not necessarily representative of the minimum part-load airflow used in the field for a given CUAC or CUHP model. For example, for a model that is typically installed with a minimum part-load airflow of 67 percent of full-load airflow, the minimum airflow limit specified in section 5.18.2 of AHRI 1340–2023 would be far lower than that that representative minimum and would, therefore, fail to serve as a guardrail ensuring the minimum part-load airflow used for rating that model is representative of how the model is typically installed. DOE found in an examination of publicly-available product literature, the range of airflows, including minimum part-load airflow, can differ between models based on application, design of the unit, and manufacturer preferences.

As part of Working Group discussions regarding energy conservation standards, which occurred after the ACUAC and ACUHP Working Group TP Term Sheet was agreed to, it was discussed that minimum part-load airflow is one of the largest determinants of IVEC performance (*see* EERE–2022–BT–STD–0015–0092 at pp. 22–27). Specifically, during the course of the Working Group energy conservation standards negotiations, industry members in the ACUAC/HP Working Group provided a DOE contractor with a confidential, anonymized dataset that included simulated IEER and IVEC values for more than 100 models of CUACs and CUHPs currently available on the market. Analysis of this dataset indicated that the minimum part-load airflow is one of the most significant differentiators between models with lower and higher IVEC values. This is because, as discussed, the minimum part-load airflow is allocated to a large number of hours when calculating IVEC, so lower values of minimum part-load airflow are associated with higher values of IVEC. Given the Department's statutory obligation to ensure that ratings are based on a test procedure that is reasonably designed to produce test results which reflect energy efficiency during a representative average use cycle that is not unduly burdensome to conduct (42 U.S.C. 6314(a)(2)), DOE has concluded that provisions beyond those included in AHRI 1340–2023 are needed to ensure that the minimum part-load airflow used to determine IVEC is representative of how a given model is typically installed. Such provisions, when combined with the minimum airflow limit in AHRI 1340–2023 that DOE is also adopting in this final rule, would prevent use of an unrepresentatively low minimum part-load airflow that could boost efficiency ratings but not ultimately result in energy savings in the field. The provisions proposed by DOE address this issue by using the as-shipped or default values of minimum part-load airflow as indicators of the representative minimum part-load airflow used in the field. Although industry commenters objected to having additional requirements on the minimum part-load airflow, the objecting commenters apparently did not recognize the representativeness issue identified by DOE nor provide any alternate approaches to address the issue. In the absence of any suggested alternative approaches, DOE has determined that the proposed approach is appropriate to ensure that the minimum part-load airflow used to determine IVEC is representative of field operation.

Regarding comments from AHRI and Trane that ratings are based on a representative average of many customer applications and that considerable variation across installations does not align with a single rating point, DOE agrees that the test procedure is and should be based on a representative average of many applications. While this average rating inherently cannot perfectly represent every application, it should be representative of an average or typical installation. DOE disagrees that its proposed minimum part-load airflow provisions deviate from this ''representative average application'' approach underlying the test procedure. Without DOE's proposed provisions, there would be no mechanism constraining the certified minimum part-load airflow to be representative of how a given model is typically installed, and further, manufacturers would be incentivized to certify as low a minimum part-load airflow as possible in order to achieve a higher IVEC rating. DOE has concluded that the default or as-shipped minimum airflow setting is the best publicly-available proxy for what the most representative minimum part-load airflow is for a given model. DOE understands that many installers of CUACs and CUHPs do not change settings from their default and/or as-shipped values; therefore, DOE expects that manufacturers are incentivized to provide default and/or as-shipped minimum airflow values that are appropriate for and representative of a typical installation. DOE understands that that some applications may have lower minimum part-load airflows than provided by the default settings, but has concluded that the default or as-shipped minimum part-load airflow settings are representative of a typical installation. Additionally, the default airflow setting for a specific model is not a single rating condition for all models (such as an ESP requirement or test condition)—it instead reflects whatever model-specific considerations the manufacturer might use to determine the default or as-shipped minimum part-load airflow for the model.

Additionally, DOE notes that several of the concerns expressed by commenters do not apply to DOE's proposal. Specifically, concerns expressed regarding the adjustment of sheaves and whether the default airflow settings are compatible with the airflow and ESP requirements in the test procedure are not relevant to the proposal, because DOE's proposal only addresses *part-load* airflow. For CUACs and CUHPs with adjustable sheaves, the sheaves are adjusted when installing the unit to ensure the fan drive assembly is providing the appropriate airflow for a given installation. Similarly, sheaves are typically adjusted as part of test set-up for the full-load cooling test to meet the full-load airflow and ESP test requirements withing tolerance. However, sheaves are not adjusted between full-load and part-load operation, and are, therefore, not relevant to this proposal. Similarly, DOE recognizes that the default *full-load* airflow settings may not be compatible with the airflow and ESP requirements in the test procedure, but DOE has proposed no restrictions on the certified *full-load* airflow. In summary, DOE's proposal does not have any effect on the fan control settings used to achieve the full-load airflow and ESP used for testing. DOE's proposal only affects the minimum *part-load* airflow for testing, which is a percentage of the full-load airflow already achieved in the full-load cooling test, not an absolute value. Part-load airflow is typically reduced by lowering the power provided to the fan motor by a VFD (relative to the power provided for full-load cooling), an adjustment that it made automatically in field installations but can be manually programmed during test. Therefore, regardless of how different the fan control settings needed to achieve the full-load airflow and ESP used for testing may be from the default or as-shipped *full-load* airflow settings, DOE has concluded that the default or as-shipped minimum *part-load* airflow settings provide an appropriate and representative degree of airflow turndown that will allow for meeting all test tolerances.

Regarding comments by AHRI and Trane that supplemental test instructions indicate how units should be set up for test, DOE notes that supplemental test instructions are used to ensure that DOE testing is performed consistent with how the manufacturer rated the equipment. Supplemental test instructions do not ensure that manufacturer-specified settings are representative of field use for a basic model. Similarly, the manufacturer's certification of the minimum airflow used for ratings of a basic model (which was cited by Carrier) does not ensure that the certified airflow is representative of field use. The provisions proposed in 10 CFR 429.43 for minimum part-load airflow, however, are intended to ensure that manufacturer-specified and certified minimum part-load airflows are representative of field use.

For the reasons discussed in the previous paragraphs, DOE is adopting the proposed provisions for minimum airflow in 10 CFR 429.43. DOE is not amending certification requirements for CUACs and CUHPs in this rulemaking, but DOE will consider such amendments in a separate rulemaking for certification, compliance, and enforcement. As part of that rulemaking, DOE will consider certification requirements pertaining to this minimum airflow issue, such as requiring certification of the range of minimum part-load airflow allowed by system controls for each basic model.

H. Enforcement Procedure for Verifying Cut-In and Cut-Out Temperatures

Recommendation #10 of the ACUAC and ACUHP Working Group TP Term Sheet states that DOE will adopt product-specific enforcement provisions for ACUHPs that include a method to verify certified cut-out and cut-in temperatures based on the test method outlined in the Residential Cold-Climate Heat Pump Technology Challenge (''CCHP Challenge'').[32] The docketed AHRI 1340–202X Draft did not include test provisions for verifying cut-in and cut-out temperatures, but in the August 2023 TP NOPR, DOE proposed to adopt a method for verifying certified cut-out and cut-in temperatures at 10 CFR 429.134(g) consistent with Recommendation #10 of the ACUAC and ACUHP Working Group TP Term Sheet. 88 FR 56392, 56435 (August 17, 2023). Specifically, consistent with the CCHP Challenge method and the ACUAC and ACUHP Working Group TP Term Sheet, the proposed method specified gradually ramping down outdoor air temperature until the unit cuts out and gradually ramping back up outdoor air temperature until the unit cuts back on, with the temperature ramp-up and ramp-down conducted at 1.0 °F every 5 minutes. DOE did not receive any comments on its proposed method for verifying cut-in and cut-out temperatures.

Appendix H of AHRI 1340–2023 includes a procedure for verifying cut-in and cut-out temperatures that is generally consistent with the procedure proposed in the August 2023 TP NOPR. As such, and consistent with Recommendation #10 of the ACUAC and ACUHP Working Group TP Term Sheet, DOE is adopting this procedure for verifying certified cut-in and cut-out temperatures through reference to

[32] *See www.energy.gov/sites/default/files/2021-10/bto-cchp-tech-challenge-spec-102521.pdf.*

appendix H of AHRI 1340–2023 in DOE's product-specific enforcement provisions at 10 CFR 429.134(g). DOE will address certification requirements for CUACs and CUHPs, including the potential requirement for certification of cut-out and cut-in temperatures, in a separate rulemaking for certification, compliance, and enforcement.

I. Organization of the Regulatory Text for CUACs and CUHPs

In addition to the substantive changes discussed previously in this document, DOE proposed organizational changes to table 1 to 10 CFR 431.96(b) and tables 1 through 6 to 10 CFR 431.97 in the August 2023 TP NOPR that were not substantive and were intended to reflect terminology changes and to improve the overall readability of the tables. 88 FR 56392, 56435–56436 (August 17, 2023).

Specifically, in table 1 to 10 CFR 431.96(b) (regarding test procedures for commercial air conditioners and heat pumps), DOE proposed to revise terminology to reflect the proposed definition for ''commercial unitary air conditioners with a rated cooling capacity greater than or equal to 65,000 Btu/h (CUACs) and commercial unitary heat pumps with a rated cooling capacity greater than or equal to 65,000 Btu/h (CUHPs),'' discussed further in section III.B.1 of this final rule. *Id.*

Additionally, tables 1 through 5 to 10 CFR 431.97 currently specify cooling and heating standards for CUACs, CUHPs, and water-source heat pumps (''WSHPs''). DOE also proposed to revise this terminology to reflect the proposed definition for CUACs and CUHPs, remove outdated standards no longer in effect, combine cooling and heating standards into the same tables, and create separate tables for standards for ACUACs and ACUHPs (in Table 1), WCUACs (in Table 2), ECUACs (in Table 3), double-duct systems (in Table 4), and WSHPs (in Table 5). *Id.*

DOE did not receive comment in response to the August 2023 TP NOPR with respect to the proposed organization of regulatory text for CUACs and CUHPs. DOE has determined that these changes will improve the overall readability of the tables in 10 CFR 431.96 and 431.97 and are consistent with the other changes adopted in this final rule. However, as discussed in section III.B.1, DOE is not finalizing the proposed definition for CUAC and CUHP. As such, DOE is not implementing the proposed changes in 10 CFR 431.96 and 431.97 to reflect the proposed term for CUAC and CUHP. Other than these terminology changes, DOE is adopting its proposed reorganization of regulatory text for CUACs and CUHPs in this final rule.

J. Effective and Compliance Dates

The effective date for the adopted test procedure amendments will be 75 days after the date of publication of this final rule in the **Federal Register**. EPCA prescribes that all representations of energy efficiency and energy use, including those made on marketing materials and product labels, must be made in accordance with an amended test procedure, beginning 360 days after the date of publication of the final rule in the **Federal Register**. (42 U.S.C. 6314(d)(1)) To the extent the modified test procedure adopted in this final rule is required only for the evaluation and issuance of updated efficiency standards, compliance with the amended test procedure does not require use of such modified test procedure provisions until the compliance date of updated standards.

K. Test Procedure Costs and Impact

EPCA requires that the test procedures for commercial package air conditioning and heating equipment, which includes CUACs and CUHPs, be those generally accepted industry testing procedures or rating procedures developed or recognized by either AHRI or ASHRAE, as referenced in ASHRAE Standard 90.1. (42 U.S.C. 6314(a)(4)(A)) Further, if such an industry test procedure is amended, DOE must amend 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 such an amended test procedure would not meet the requirements in 42 U.S.C. 6314(a)(2)–(3) related to representative use and test burden. (42 U.S.C. 6314(a)(4)(B))

In this final rule, DOE is revising the existing test procedure for CUACs and CUHPs (consolidating for ACUACs and ACUHPs, ECUACs, and WCUACs) at appendix A and adopting an amended test procedure at appendix A1. These adoptions are discussed in the following sub-sections. DOE has also amended its representation and enforcement provisions for CUACs and CUHPs.

1. Appendix A

In this final rule, DOE has amended the existing Federal test procedure for CUACs and CUHPs (including double-duct systems), which is currently located at appendix A for ACUACs and ACUHPs and 10 CFR 431.96 for ECUACs and WCUACs. Specifically, DOE consolidated the test procedures for ACUACs and ACUHPs, ECUACs, and WCUACs at appendix A and updated the test procedure to incorporate by reference an updated version of the applicable industry test method, AHRI 340/360–2022. The revisions to appendix A retain the current efficiency metrics (*i.e.,* EER, IEER, and COP). The testing requirements in appendix A are generally consistent with those in AHRI 340/360–2022, which in turn references ANSI/ASHRAE 37–2009. This is generally consistent with the industry test procedures referenced in the latest version of ASHRAE Standard 90.1.

DOE has determined that the amendments to appendix A will improve the representativeness, accuracy, and reproducibility of the test results and will not be unduly burdensome for manufacturers to conduct or result in increased testing cost as compared to the current test procedure. The revisions to the test procedure in appendix A for measuring EER, IEER, and COP per AHRI 340/360–2022 will not increase third-party laboratory testing costs per unit relative to the current DOE test procedure. DOE estimates the current costs of physical testing to the current required metrics to be $10,500 for ACUACs, $12,000 for ACUHPs, $6,800 for double-duct air conditioners, $8,300 for double-duct heat pumps, and $6,800 for ECUACs and WCUACs. Further, DOE has concluded that the adopted revisions to the test procedure in appendix A will not change efficiency ratings for CUACs and CUHPs, and, therefore, will not require retesting solely as a result of DOE's adoption of this amendment to the DOE test procedure.[33]

2. Appendix A1

In the August 2023 TP NOPR, DOE proposed to amend the existing test procedure for CUACs and CUHPs (including double-duct equipment) by adopting a new appendix A1 that references AHRI 1340–202X Draft, including the IVEC and IVHE energy efficiency metrics. DOE noted that the proposed test procedure in appendix A1 would lead to an increase in test cost from the current Federal test procedure; therefore, DOE presented estimates of

[33] Manufacturers are not required to perform laboratory testing on all basic models. In accordance with 10 CFR 429.70, CUAC and CUHP manufacturers may elect to use AEDMs. An AEDM is a computer modeling or mathematical tool that predicts the performance of non-tested basic models. These computer modeling and mathematical tools, when properly developed, can provide a means to predict the energy usage or efficiency characteristics of a basic model of a given covered product or equipment and to reduce the burden and cost associated with testing.

the test costs associated with the proposed test procedure in appendix A1. 88 FR 56392, 56436–56437 (August 17, 2023). The proposed test cost estimates are presented in Table III–6. DOE requested comments regarding its tentative understanding of the impact of the proposals in the NOPR, particularly regarding DOE's initial estimate of the cost impacts associated with appendix A1. *Id.*

Carrier commented that the test cost estimates presented in the NOPR are likely incorrect, as there is a substantial difference in set-up time and the amount of energy required to test from the smallest systems to the largest. (Carrier, No. 8 at p. 5)

Trane expressed concerns regarding the cost estimate for the 5 °F optional test, and the commenter argued that testing to these low temperatures would require significant capital investment on the part of certification laboratories, as well as increased time to conduct testing at low temperature conditions due to the need for more frequent defrosting of the facility. (Trane, No. 14 at pp. 6–7) Specifically, Trane stated the test cost for the optional 5 °F test should be closer to $9,600 (representing four additional shifts in the test laboratory) rather than the $2,000–$4,000 additional cost estimated in the NOPR. *Id.*

In this final rule, DOE is amending the existing test procedure for CUACs and CUHPs (including double-duct equipment) by adopting a new appendix A1 that utilizes the most recent version of the applicable industry consensus test procedure, AHRI 1340–2023, including the IVEC and IVHE energy efficiency metrics. Should DOE adopt standards in a future energy conservation standards rulemaking denominated in terms of the new metrics, the test procedure in appendix A1 (which references AHRI 1340–2023) would be required.

In light of the comments received, DOE once again considered the estimated costs and burdens associated with the new appendix A1. For the reasons that follow, DOE determined these costs to have remained largely the same as those presented in the August 2023 TP NOPR, with just a few adjustments.

DOE has determined that these amendments will be representative of an average use cycle and will not be unduly burdensome for manufacturers to conduct. The test procedure in appendix A1 will lead to an increase in test cost from the current Federal test procedure, as discussed in the following paragraphs. The following paragraphs include estimates for increases in cost of testing at a third-party laboratory.

The change in ESP requirements discussed in section III.D.1 that apply to measuring the IVEC and IVHE metrics will require additional test set-up that DOE expects will increase test costs. DOE has concluded that metal ductwork will need to be fabricated for testing to withstand the higher ESP requirements (as compared to foamboard ductwork typically used for testing to the current test procedure). DOE estimates a test cost increase ranging from $500 to $1,500 per unit, depending on the unit size/cooling capacity, associated with this transition to metal ductwork. To meet the return/supply duct ESP requirement, DOE estimates an increase of $200 per unit for the time required to apply return duct restrictions. In combination, DOE estimates a total test cost increase of between $700 and $1,700 per unit to meet the new ESP requirements.

For determining IVEC, DOE has concluded that there will not be an increase in testing cost as compared to measuring IEER per the current Federal test procedure, beyond the costs associated with the new ESP requirements discussed previously.

For determining IVHE, there are two required heating tests and several additional optional heating tests. The required heating tests are full-load tests at 47 °F and 17 °F. The full-load test at 47 °F is already required for the current Federal test procedure for determining COP. The full-load test at 17 °F is currently required for the AHRI certification program. Because all identified CUHP manufacturers are AHRI members and participate in the AHRI certification program and because third-party laboratories currently have the capability to perform these tests, DOE expects that that the required heating tests for IVHE will not increase test cost as compared to testing that is typically already conducted, beyond the costs associated with the new ESP requirements discussed previously.

Optional heating tests for CUHPs will increase the cost of heating testing if conducted. The optional tests for IVHE are outlined in III.D.2 of this final rule, which include: (1) an additional full-load test at 5 °F; (2) part-load tests at 17 °F and 47 °F (including up to 2 part-load tests at each temperature); and (3) for variable-speed units, boost tests at 17 °F and 5 °F. DOE estimates that each optional test conducted will increase the cost of heating testing by $2,000 to $4,000 depending on the test condition.

Regarding Trane's comments on burden of the optional 5 °F test, DOE disagrees that conducting a heating test for CUHPs would cost as much as $9,600 at third-party laboratories. DOE expects Trane's estimate may be referring to test facilities that are not designed for low-temperature testing. However, DOE is aware of multiple third-party laboratories commonly used by the CUAC and CUHP industry for testing that have test chambers that can already achieve the 5 °F test condition in much less time than would warrant four shifts. Further, DOE notes that it has received a test quote from a third-party laboratory for conducting the 5 °F test that is within the range of test costs estimated in the August 2023 TP NOPR. Therefore, DOE maintains its estimate of $2,000 to $4,000 for each optional heating test. DOE reiterates that these tests are optional, and, thus, the test procedure adopted in this final rule will not require any manufacturers to conduct a 5 °F test.

For ECUACs, WCUACs, and double-duct systems, the current Federal test procedure requires testing to EER for cooling tests; testing to IEER is not currently required for ECUACs, WCUACs, or double-duct systems. Because measuring EER requires only a single test, DOE expects that measuring IVEC for ECUACs, WCUACs, and double-duct systems will increase the cost of cooling testing. Specifically, DOE estimates the cost of additional cooling tests to be $3,700 per unit. Further, the previously discussed costs associated with the new indoor air ESP requirements ($700 to $1,700 depending on unit size) will also apply to ECUACs, WCUACs, and double-duct systems. In addition, for double-duct systems DOE expects that testing to appendix A1 will require an additional $2,000 per unit for set-up to meet the non-zero outdoor air ESP requirement. Otherwise, DOE expects similar test burden for determining IVHE for double-duct systems as for determining IVHE for conventional ACUHPs, as discussed in the preceding paragraphs.

Regarding Carrier's comment about the burden of testing higher-capacity equipment, DOE acknowledges that there may be higher third-party laboratory test costs associated with test set-up for larger units than for smaller units. Accordingly, DOE estimates that up to an additional shift (which DOE estimates to cost approximately $2,600) may be necessary for test set-up for the largest covered basic models, and the Department has adjusted the upper bound of its estimated test cost range accordingly.

Table III–6 shows DOE's estimates for testing to the current Federal test procedure and the test procedure in appendix A1.

Table III-6 Test Cost Estimates for the Test Procedure in Appendix A1

Equipment Type	Test Cost for Current Federal Test Procedure	NOPR Estimated Test Cost for the Proposed Test Procedure in Appendix A1	Final Rule Estimated Test Cost for Adopted Test Procedure in Appendix A1
ACUACs	$10,500	$11,200 – $12,200	$11,200 – $14,800
ACUHPs	$12,000	$12,700 – $13,700 (plus $2,000 – $4,000 per optional heating test)	$12,700 – $16,300 (plus $2,000 – $4,000 per optional heating test)
Double-duct air conditioners	$6,800	$13,200 – $14,200	$13,200 – $16,800
Double-duct heat pumps	$8,300	$14,700 – $15,700 (plus $2,000 – $4,000 per optional heating test)	$14,700 – $18,300 (plus $2,000 – $4,000 per optional heating test
ECUACs and WCUACs	$6,800	$11,200 – $12,200	$11,200 – $14,800

In the August 2023 TP NOPR, DOE also estimated the cost to develop and validate an AEDM for determining IVEC (and IVHE as applicable) for CUACs and CUHPs (including double-duct systems) to be $19,000 per AEDM. Once the AEDM is developed, DOE estimated that it would take one hour of an engineer's time (calculated based upon an engineering technician wage of $41 per hour) to determine efficiency for each basic model using the AEDM. 88 FR 56392, 56437 (August 17, 2023).

AHRI, Carrier, Trane, and Rheem commented that the proposed cost to develop an AEDM to rate units to the new IVEC and IVHE metrics were greatly underestimated in the NOPR. (AHRI, No. 15 at p. 7; Carrier, No. 8 at p. 5; Trane, No. 14 at pp. 6–7; Rheem, No. 12 at p. 3) Carrier stated that to lower potential risk of failure or product availability associated with an AEDM issue, manufacturers typically test more than the minimum two units required for AEDM validation, and manufacturers develop multiple AEDMs to limit the number of basic models for which each AEDM was used to generate ratings. (Carrier, No. 8 at p. 5) AHRI and Trane stated that manufacturers may test significantly more units than the two required by DOE to validate an AEDM. (AHRI, No. 15 at p. 7; Trane, No. 14 at pp. 6–7) Rheem stated that the adoption of appendix A1 will require significant investment by manufacturers for product development, laboratory upgrades, and additional testing. (Rheem, No. 12 at p. 3)

In response, DOE notes that most CUAC/HP manufacturers have in-house testing capabilities and would principally use those resources for required testing. DOE expects in-house testing to be cheaper on a per-test basis than third-party testing. DOE is conservatively presenting costs associated with a scenario where a manufacturer does not have these in-house testing resources, or where those resources are otherwise occupied and the manufacturer has to rely on third-party testing. Apart from the optional heating tests, DOE has concluded that the amended test procedures adopted in this final rule would not require capital improvements to in-house testing facilities. (DOE once again notes that the 5 °F test, which some manufacturer's test chambers may need upgrades to conduct, is optional.) Further, the amended test procedures will not require manufacturers to undergo any new product development. Any burden associated with model redesign to meet amended energy conservation standards would be addressed in a separate standards rulemaking.

As discussed, DOE has concluded that that the potential adoption of amended energy conservation standards denominated in terms of IVEC and IVHE (and corresponding requirement to use the adopted test procedure in appendix A1) would alter the measured energy efficiency of CUACs and CUHPs. Consequently, manufacturers would not be able to rely on data generated under the current test procedure and would, therefore, be required to re-rate CUAC and CUHP models. In accordance with 10 CFR 429.70, however, CUAC and CUHP manufacturers may elect to use AEDMs to rate models, which significantly reduces costs to industry. DOE has updated its estimate of AEDM creation costs to reflect both the previously mentioned modest increase in labor time associated with testing of large units and the cost range of physical testing broadly. In this final rule, DOE estimates the total cost to develop and validate an AEDM for determining IVEC (and IVHE as applicable) for CUACs and CUHPs (including double-duct systems) to be between $26,400 and $40,600 per AEDM.[34] Once the AEDM is developed, DOE estimates that it will take one hour of an engineer's time (calculated based upon a fully burdened engineering technician wage of $41.52 per hour) to

[34] DOE estimates that a technician would need 80 hours to develop an AEDM and 16 hours to validate an AEDM based on testing, and that the tests of two basic models would be required per AEDM. At a fully burdened labor rate of $41.52 per hour, the cost to develop and validate an AEDM would be approximately $4,000 and the cost to carry out the testing would be between $11,200 and $18,300 for each basic model, depending on the equipment category of models tested. Therefore, DOE estimates that total AEDM creation costs would be between $26,400 and $40,600.

determine efficiency for each basic model using the AEDM.

In accordance with 10 CFR 429.70, manufacturers rating their CUAC and CUHP models with AEDMs must validate an AEDM with testing of a minimum of two basic models per validation class (*see* 10 CFR 429.70(c)(2)(iv)). DOE acknowledges that manufacturers may choose to test more models than the minimum required by DOE, but DOE has estimated burden associated with what would be required by its amended regulations, not including additional testing manufacturers might choose to undertake at their discretion. Accordingly, in this final rule, DOE maintains a cost estimate for AEDM development based on testing test two basic models for each AEDM.

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Orders 12866, 13563, and 14094

Executive Order (''E.O.'') 12866, ''Regulatory Planning and Review,'' 58 FR 51735 (Oct. 4, 1993), as supplemented and reaffirmed by E.O. 13563, ''Improving Regulation and Regulatory Review,'' 76 FR 3821 (Jan. 21, 2011), and E.O. 14094, ''Modernizing Regulatory Review,'' 88 FR 21879 (April 11, 2023), requires agencies, to the extent permitted by law, to: (1) propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify); (2) tailor regulations to impose the least burden on society, consistent with obtaining regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulations; (3) select, in choosing among alternative regulatory approaches, those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity); (4) to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt; and (5) identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public. DOE emphasizes as well that E.O. 13563 requires agencies to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible. In its guidance, the Office of Information and Regulatory Affairs (''OIRA'') in the Office of Management and Budget (''OMB'') has emphasized that such techniques may include identifying changing future compliance costs that might result from technological innovation or anticipated behavioral changes. For the reasons stated in the preamble, this final regulatory action is consistent with these principles.

Section 6(a) of E.O. 12866 also requires agencies to submit ''significant regulatory actions'' to OIRA for review. OIRA has determined that this final regulatory action does not constitute a ''significant regulatory action'' under section 3(f) of E.O. 12866, as amended by E.O. 14094. Accordingly, this action was not submitted to OIRA for review under E.O. 12866.

B. Review Under the Regulatory Flexibility Act

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

The following sections explain DOE's determination that this final rule does not have a ''significant economic impact on a substantial number of small entities,'' and that the preparation of a FRFA is not warranted.

1. Estimate of Small Entities Regulated

For manufacturers of CUACs and CUHPs, the Small Business Administration (''SBA'') has set a size threshold, which defines those entities classified as ''small businesses'' for the purposes of the statute. DOE used the SBA's small business size standards to determine whether any small entities would be subject to the requirements of the rule. *See* 13 CFR part 121. The equipment covered by this rule is classified under North American Industry Classification System (''NAICS'') code 333415,[35] ''Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing.'' In 13 CFR 121.201, the SBA sets a threshold of 1,250 employees or fewer for an entity to be considered as a small business for this category.

DOE reviewed the test procedures adopted in this final rule under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. DOE utilized DOE's Compliance Certification Database (''CCD'') [36] and manufacturer websites to identify potential small businesses that manufacture CUACs and CUHPs covered by this rulemaking. DOE identified 13 companies that are original equipment manufacturers (''OEMs'') of CUACs and CUHPs covered by this rulemaking. Next, DOE screened out companies that do not meet the definition of a ''small business'' or are foreign-owned and operated. Ultimately, for this final rule DOE identified two small, domestic OEMs for consideration. DOE's assessment indicates that of these two OEMs, one is an AHRI member, and one is not an AHRI member and does not certify their equipment in the AHRI Directory. DOE used subscription-based business information tools (*e.g.,* reports from Dun & Bradstreet) [37] to determine headcount and revenue of each small business.

2. Description and Estimate of Compliance Requirements

In this final rule, DOE is revising the existing test procedure for CUACs and CUHPs (consolidating for ACUACs and ACUHPs, ECUACs, and WCUACs) at appendix A of subpart F of part 431 (appendix A) by adopting sections of AHRI 340/360–2022. DOE is also amending the test procedure for CUACs and CUHPs by adopting a new appendix A1 to subpart F of part 431 (''appendix A1'') that references the industry test

[35] The size standards are listed by NAICS code and industry description and are available at *www.sba.gov/document/support--table-size-standards* (last accessed April 4, 2023).

[36] Certified equipment in the CCD is listed by equipment class and can be accessed at *www.regulations.doe.gov/certification-data/#q=Product_Group_s%3A** (last accessed Dec. 16, 2023).

[37] Market research is available through the Dun & Bradstreet Hoovers login page at: *app.dnbhoovers.com* (last accessed April 3, 2023).

standard AHRI 1340–2023. Additionally, this final rule amends the representation and enforcement provisions for CUACs and CUHPs in 10 CFR part 429 and certain definitions for CUACs and CUHPs in 10 CFR part 431. Specific cost and compliance associated with each appendix are discussed in the subsections that follow.

a. Cost and Compliance Associated With Appendix A

In appendix A, DOE has amended the existing test procedure for CUACs and CUHPs (relocated to appendix A for ECUACs and WCUACs, for which the current test procedure is located at 10 CFR 431.96) by incorporating by reference an updated version of the applicable industry test method, AHRI 340/360–2022, which includes the energy efficiency metrics IEER (required metric for ACUACs and ACUHPs), EER (required metric for ECUACs, WCUACs, and double-duct systems), and COP (required metric for ACUHPs and double-duct heat pumps) and maintaining an existing reference to industry test method ANSI/ASHRAE 37–2009. The adopted test procedure at appendix A does not change efficiency ratings as compared to the current Federal test procedure, and, therefore, will not require retesting nor increase third-party laboratory testing costs per unit solely as a result of DOE's adoption of this amendment to the test procedure. DOE estimates the current costs of physical testing to the current required metrics to be: $10,500 for ACUACs; $12,000 for ACUHPs; $6,800 for double-duct air conditioners; $8,300 for double-duct heat pumps; and $6,800 for ECUACs and WCUACs. In accordance with 10 CFR 429.70, CUAC and CUHP manufacturers may elect to use AEDMs to rate models, an approach which can significantly reduce costs to industry.

b. Cost and Compliance Associated With Appendix A1

In appendix A1, DOE is adopting the test conditions and procedures in AHRI 1340–2023 and ANSI/ASHRAE 37–2009. The test procedure in appendix A1 includes provisions for measuring CUAC and CUHP energy efficiency using the IVEC and IVHE metrics so as to be consistent with the updated industry test procedure. Should DOE adopt amended energy conservation standards in the future denominated in terms of IVEC and IVHE, the Department expects there would be an increase in third-party laboratory testing cost relative to the current Federal test procedure, as outlined in further detail in section III.K.2 of this document. Table IV–1 shows DOE's estimates for testing to the current Federal test procedure, the initial cost estimate associated with the NOPR, and this final rule's cost estimate for the adopted test procedure in appendix A1.

Table IV-1 Test Cost Estimates for the Test Procedure in Appendix A1

Equipment Type	Test Cost for Current Federal Test Procedure	NOPR Estimated Test Cost for the Proposed Test Procedure in Appendix A1	Final Rule Estimated Test Cost for the Adopted Test Procedure in Appendix A1
ACUACs	$10,500	$11,200 – $12,200	$11,200 – $14,800
ACUHPs	$12,000	$12,700 – $13,700 (plus $2,000 – $4,000 per optional heating test)	$12,700 – $16,300 (plus $2,000 – $4,000 per optional heating test)
Double-duct air conditioners	$6,800	$13,200 – $14,200	$13,200 – $16,300
Double-duct heat pumps	$8,300	$14,700 – $15,700 (plus $2,000 – $4,000 per optional heating test)	$14,700 – $16,800 (plus $2,000 – $4,000 per optional heating test
ECUACs and WCUACs	$6,800	$11,200 – $12,200	$11,200 – $14,800

If CUAC and CUHP manufacturers conduct physical testing to certify a basic model, two units are required to be tested per basic model. However, manufacturers are not required to perform laboratory testing on all basic models, as manufacturers may elect to use AEDMs, in accordance with 10 CFR 429.70. An AEDM is a computer modeling or mathematical tool that predicts the performance of non-tested basic models. These computer modeling and mathematical tools, when properly developed, can provide a means to predict the energy usage or efficiency characteristics of a basic model of a given covered product or equipment and reduce the burden and cost associated with testing.

Small businesses would be expected to have different potential regulatory costs depending on whether they are a member of AHRI. DOE understands that all AHRI members and all manufacturers currently certifying to the AHRI Directory will be testing their CUAC and CUHP models in accordance with AHRI 1340–2023, the industry test procedure DOE is adopting, and using AHRI's certification program.

The adopted test procedure amendments will not add any additional testing burden to manufacturers which are members of AHRI. As discussed, DOE identified one small, domestic OEM that is an AHRI member. Therefore, DOE has concluded that the adopted test procedure amendments will not add additional testing burden to one of the two identified small, domestic OEMs, as that AHRI member company will soon be using AHRI 1340–2023. DOE estimated the potential impacts for the one identified small, domestic OEM that is not an AHRI member and does not certify their equipment in the AHRI Directory. This small business would only incur additional costs if the company would not otherwise be using the AHRI 1340–2023 test procedure to rate their models of CUACs and CUHPs.

DOE estimates that this non-AHRI member company manufactures 14 basic models of ECUACs and WCUACs. To develop cost estimates for this small business, DOE considered the cost to develop an AEDM, the costs to validate the AEDM through physical testing, and the cost per model to determine ratings using the AEDM. DOE anticipates that this small OEM would avail itself of the cost-saving option which the AEDM provides. DOE estimated the cost to develop an AEDM for ECUACs or WCUACs to be $33,600 per AEDM, which includes the required physical testing of two basic models per validation class. Because ECUACs and WCUACs are separate validation classes (per 10 CFR 429.70), the manufacturer would require two AEDMs—one for ECUACs and one for WCUACs, for a total AEDM development cost of $67,200. Additionally, DOE estimated a cost of $41.52 per basic model for determining energy efficiency using the validated AEDM. The estimated cost to rate the 14 basic models with the AEDM would be approximately $600.

Therefore, total testing and rating costs expected for this small business, when and if DOE adopts amended energy conservation standards for ECUACs and WCUACs denominated in terms of the IVEC metric, would be approximately $67,800 for the two AEDMs along with the rating costs for 14 basic models. Market research tools report that company's annual revenue to be approximately $50.6 million. Accordingly, testing and AEDM costs to rate in accordance with appendix A1 could cause this small business manufacturer to incur costs significantly less than one percent of annual revenue for that small manufacturer.

3. Significant Alternatives to the Rule

DOE considered alternative test methods and modifications to the adopted test procedures in appendices A and A1 for CUACs and CUHPs, referencing AHRI 340/360–2022 and AHRI 1340–2023, respectively. However, DOE has determined that there are no better alternatives than the adopted test procedures, in terms of both meeting the agency's objectives and reducing burden on manufacturers. Therefore, DOE is amending the existing DOE test procedure for CUACs and CUHPs through incorporation by reference of AHRI 340/360–2022 in appendix A, and incorporation by reference of AHRI 1340–2023 in appendix A1.

As discussed previously, manufacturers, including small businesses, will have the option to implement AEDMs to certify their basic models—which will likely be more cost-effective than testing each basic model. This option is explained in further detail in section III.K.2 of this document.

In addition, individual manufacturers may petition for a waiver of the applicable test procedure. (*See* 10 CFR 431.401) Also, section 504 of the Department of Energy Organization Act, 42 U.S.C. 7194, provides authority for the Secretary to adjust a rule issued under EPCA in order to prevent ''special hardship, inequity, or unfair distribution of burdens'' that may be imposed on that manufacturer as a result of such rule. Manufacturers should refer to 10 CFR part 1003 for additional details.

4. Certification Statement

DOE identified 13 OEMs affected by this final rule, two of which would be considered small businesses. Of these two small businesses, one is a member of AHRI, and DOE has determined that the AHRI member company will already be testing to the updated industry test standard (*i.e.,* AHRI 1340–2023) in order to certify in the AHRI Directory. Consequently, DOE does not anticipate its amended test procedure will add to the testing burden for this AHRI member small business. Finally, DOE has determined that testing costs and burden will not increase substantially for the non-AHRI-member small business either. As discussed previously, the amendments to appendix A will result in zero costs to that small manufacturer. Further, the new appendix A1 will have no cost impact until and if amended energy conservation standards denominated in terms of the new metrics IVEC and IVHE are adopted. DOE has determined that if energy conservation standards are amended, the potential cost associated with this final rule is significantly less than one percent of revenue for the one non-AHRI-member small business. Thus, DOE concludes that this rulemaking does not significantly affect a substantial number of small entities.

Based on the limited number of small entities affected and the *de minimis* cost impacts, DOE certifies that this final rule does not have a ''significant economic impact on a substantial number of small entities,'' and accordingly, the Department has determined that the preparation of a FRFA is not warranted. DOE will transmit a certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the Small Business Administration for review under 5 U.S.C. 605(b).

C. Review Under the Paperwork Reduction Act of 1995

Manufacturers of CUACs and CUHPs must certify to DOE that their equipment complies with any applicable energy conservation standards. To certify compliance, manufacturers must first obtain test data for their equipment according to the DOE test procedures, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including CUACs and CUHPs. (*See generally* 10 CFR part 429.) The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (PRA). This requirement has been approved by OMB under OMB control number 1910–1400. Public reporting burden for the certification is estimated to average 35 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

DOE is not amending the certification or reporting requirements for CUACs and CUHPs in this final rule. Instead, DOE may consider proposals to amend the certification requirements and reporting for CUACs and CUHPs under a separate rulemaking regarding appliance and equipment certification. DOE will address changes to OMB Control Number 1910–1400 at that time, as necessary.

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

D. Review Under the National Environmental Policy Act of 1969

In this final rule, DOE adopts test procedure amendments that it expects will be used to develop and implement future energy conservation standards for CUACs and CUHPs. DOE has determined that this rule falls into a class of actions that are categorically excluded from review under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*) and DOE's implementing regulations at 10 CFR part 1021. Specifically, DOE has determined that adopting test procedures for measuring energy efficiency of consumer products and industrial equipment is consistent with activities identified in 10 CFR part 1021, subpart D, appendix A, sections A5 and A6. Accordingly, neither an environmental assessment nor an environmental impact statement is required.

E. Review Under Executive Order 13132

Executive Order 13132, ''Federalism,'' 64 FR 43255 (August 4, 1999), imposes certain requirements on agencies formulating and implementing policies or regulations that preempt State law or that have federalism implications. The Executive order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE examined this final rule and determined that it will not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of this final rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297(d)) No further action is required by Executive Order 13132.

F. Review Under Executive Order 12988

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

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (''UMRA'') requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Public Law 104–4, sec. 201 (codified at 2 U.S.C. 1531). For a regulatory action likely to result in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a ''significant intergovernmental mandate,'' and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect them. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820. DOE's policy statement is also available at *www.energy.gov/sites/prod/files/gcprod/documents/umra_97.pdf.* DOE examined this final rule according to UMRA and its statement of policy and determined that the rule contains neither an intergovernmental mandate, nor a mandate that may result in the expenditure of $100 million or more in any year, so these requirements do not apply.

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

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

I. Review Under Executive Order 12630

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

J. Review Under Treasury and General Government Appropriations Act, 2001

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

K. Review Under Executive Order 13211

Executive Order 13211, ''Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use,'' 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OIRA at OMB, a Statement of Energy Effects for any significant energy action. A ''significant energy action'' is defined as any action by an agency that promulgates or is expected to lead to promulgation of a final rule, and that: (1) is a significant regulatory action under Executive Order 12866, or any successor order, and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy, or (3) is designated by the Administrator of OIRA as a significant energy action. For any significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use if the regulation is implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

This regulatory action to amend the test procedure for measuring the energy efficiency of CUACs and CUHPs is not a significant regulatory action under Executive Order 12866. Moreover, it would not have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as a significant energy action by the Administrator of OIRA. Therefore, it is not a significant energy action, and, accordingly, DOE has not prepared a Statement of Energy Effects.

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

Under section 301 of the Department of Energy Organization Act (Pub. L. 95–91; 42 U.S.C. 7101), DOE must comply with section 32 of the Federal Energy Administration Act of 1974, as amended by the Federal Energy Administration Authorization Act of 1977. (15 U.S.C. 788; ''FEAA'') Section 32 essentially provides in relevant part that, where a proposed rule authorizes or requires use of commercial standards, the notice of proposed rulemaking must inform the public of the use and background of such standards. In addition, section 32(c) requires DOE to consult with the Attorney General and the Chairman of the Federal Trade Commission (''FTC'') concerning the impact of the commercial or industry standards on competition.

The modifications to the test procedure for CUACs and CUHPs adopted in this final rule incorporate testing methods contained in certain sections of the following commercial standards: AHRI 340/360–2022, AHRI 1340–2023, and ANSI/ASHRAE 37–2009. DOE has evaluated these standards and is unable to conclude whether they fully comply with the requirements of section 32(b) of the FEAA (*i.e.,* whether they were developed in a manner that fully provides for public participation, comment, and review). DOE has consulted with both the Attorney General and the Chairman of the FTC about the impact on competition of using the methods contained in these standards and has received no comments objecting to their use.

M. Congressional Notification

As required by 5 U.S.C. 801, DOE will report to Congress on the promulgation of this rule before its effective date. The report will state that the Office of Information and Regulatory Affairs has determined that this action is not a ''major rule'' under the criteria set forth in 5 U.S.C. 804(2).

N. Description of Materials Incorporated by Reference

In this final rule, DOE is incorporating by reference the following test standards:

AHRI 340/360–2022 is an industry-accepted test procedure for measuring the performance of air-cooled, evaporatively-cooled, and water-cooled unitary air-conditioning and heat pump equipment. AHRI 340/360–2022 is available from AHRI at *www.ahrinet.org/standards/search-standards.*

AHRI 1340–2023 is the most recent industry-accepted test procedure for measuring the performance of air-cooled, evaporatively-cooled, and water-cooled unitary air-conditioning and heat pump equipment. AHRI 1340–2023 is available from AHRI at *www.ahrinet.org/standards/search-standards.*

ANSI/ASHRAE 37–2009 is an industry-accepted test procedure for measuring the performance of electrically driven unitary air-conditioning and heat pump equipment. ANSI/ASHRAE 37–2009 is available from ASHRAE on ANSI's website at: *https://webstore.ansi.org/standards/ashrae/ansiashraestandard372009.*

V. Approval of the Office of the Secretary

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

List of Subjects

10 CFR Part 429

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Imports, Incorporation by reference, Intergovernmental relations, Reporting and recordkeeping requirements, Small businesses.

10 CFR Part 431

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

Signing Authority

This document of the Department of Energy was signed on April 12, 2024, by Jeffrey Marootian, 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 April 17, 2024.

Treena V. Garrett,

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

For the reasons stated in the preamble, DOE amends parts 429 and 431 of chapter II of title 10, Code of Federal Regulations as set forth below:

PART 429—CERTIFICATION, COMPLIANCE, AND ENFORCEMENT FOR CONSUMER PRODUCTS AND COMMERCIAL AND INDUSTRIAL EQUIPMENT

■ 1. The authority citation for part 429 continues to read as follows:

Authority: 42 U.S.C. 6291–6317; 28 U.S.C. 2461 note.

■ 2. Amend § 429.4 by:
■ a. Removing paragraph (c)(2);
■ b. Redesignating paragraphs (c)(3) through (5) as paragraphs (c)(2) through (4); and
■ c. Adding new paragraph (c)(5).

The addition reads as follows:

§ 429.4 Materials incorporated by reference.

* * * * *

(c) * * *

(5) AHRI Standard 1340–2023 (I–P) (''AHRI 1340–2023''), *2023 Standard for*

Performance Rating of Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment, approved November 16, 2023; IBR approved for §§ 429.43; 429.134.

* * * * *

■ 3. Amend § 429.43 by:
■ a. Removing paragraph (a)(1)(iv);
■ b. Removing and reserving paragraph (a)(2)(ii); and
■ c. Adding paragraph (a)(3)(vi).

The addition reads as follows:

§ 429.43 Commercial heating, ventilating, air conditioning (HVAC) equipment (excluding air-cooled, three-phase, small commercial package air conditioning and heating equipment with a cooling capacity of less than 65,000 British thermal units per hour and air-cooled, three-phase, variable refrigerant flow multi-split air conditioners and heat pumps with less than 65,000 British thermal units per hour cooling capacity).

(a) * * *

(3) * * *

(vi) *Commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h).* Before May 15, 2025, the provisions in 10 CFR 429.43, revised as of January 1, 2024, are applicable. On and after May 15, 2025, when certifying to energy conservation standards in terms of EER or IEER and (as applicable) COP, the provisions in paragraph (a)(3)(vi)(B) of this section apply. When certifying to energy conservation standards in terms of IVEC and (as applicable) IVHE, all provisions in this paragraph (a)(3)(vi) apply.

(A) For individual model selection when certifying to energy conservation standards in terms of IVEC and (as applicable) IVHE:

(*1*) Representations for a basic model must be based on the least-efficient individual model(s) distributed in commerce among all otherwise comparable model groups comprising the basic model, with selection of the least-efficient individual model considering all options for factory-installed components and manufacturer-supplied components for field installation, except as provided in paragraph (a)(3)(vi)(A)(*2*) of this section for individual models that include components listed in table 7 to paragraph (a)(3)(vi)(A) of this section. For the purpose of this paragraph (a)(3)(vi)(A)(*1*), ''otherwise comparable model group'' means a group of individual models distributed in commerce within the basic model that do not differ in components that affect energy consumption as measured according to the applicable test procedure specified at 10 CFR 431.96 other than those listed in table 7 to paragraph (a)(3)(vi)(A) of this section. An otherwise comparable model group may include individual models distributed in commerce with any combination of the components listed in table 7 (or none of the components listed in table 7). An otherwise comparable model group may consist of only one individual model.

(*2*) For a basic model that includes individual models distributed in commerce with components listed in table 7 to paragraph (a)(3)(vi)(A) of this section, the requirements for determining representations apply only to the individual model(s) of a specific otherwise comparable model group distributed in commerce with the least number (which could be zero) of components listed in table 7 to paragraph (a)(3)(vi)(A) included in individual models of the group. Testing under this paragraph (a)(3)(vi)(A)(*2*) shall be consistent with any component-specific test provisions specified in section 6 of appendix A1 to subpart F of 10 CFR part 431.

TABLE 7 TO PARAGRAPH (a)(3)(vi)(A)—SPECIFIC COMPONENTS FOR COMMERCIAL PACKAGE AIR CONDITIONING AND HEATING EQUIPMENT

[Excluding air-cooled equipment with a cooling capacity of less than 65,000 Btu/h]

Component	Description
Air Economizers	An automatic system that enables a cooling system to supply outdoor air to reduce or eliminate the need for mechanical cooling during mild or cold weather.
Desiccant Dehumidification Components	An assembly that reduces the moisture content of the supply air through moisture transfer with solid or liquid desiccants.
Evaporative Pre-cooling of Air-cooled Condenser Intake Air.	Water is evaporated into the air entering the air-cooled condenser to lower the dry-bulb temperature and thereby increase efficiency of the refrigeration cycle.
Fire/Smoke/Isolation Dampers	A damper assembly including means to open and close the damper mounted at the supply or return duct opening of the equipment.
Indirect/Direct Evaporative Cooling of Ventilation Air.	Water is used indirectly or directly to cool ventilation air. In a direct system, the water is introduced directly into the ventilation air, and in an indirect system, the water is evaporated in secondary air stream, and the heat is removed through a heat exchanger.
Non-Standard Ducted Condenser Fans (not applicable to Double-duct Systems).	A higher-static condenser fan/motor assembly designed for external ducting of condenser air that provides greater pressure rise and has a higher rated motor horsepower than the condenser fan provided as a standard component with the equipment.
Non-Standard High-Static Indoor Fan Motors.	The standard indoor fan motor is the motor specified in the manufacturer's installation instructions for testing and shall be distributed in commerce as part of a particular model. A non-standard motor is an indoor fan motor that is not the standard indoor fan motor and that is distributed in commerce as part of an individual model within the same basic model. For a non-standard high-static indoor fan motor(s) to be considered a specific component for a basic model (and thus subject to the provisions of paragraph (a)(3)(vi)(A)(*2*) of this section), the following provisions must be met: (1) Non-standard high-static indoor fan motor(s) must meet the minimum allowable efficiency determined per section D.3.1 of AHRI 1340–2023 (incorporated by reference, see § 429.4) for non-standard high-static indoor fan motors or per section D.3.2 of AHRI 1340–2023 for non-standard high-static indoor integrated fan and motor combinations. (2) If the standard indoor fan motor can vary fan speed through control system adjustment of motor speed, all non-standard high-static indoor fan motors must also allow speed control (including with the use of variable-frequency drive).
Powered Exhaust/Powered Return Air Fans.	A powered exhaust fan is a fan that transfers directly to the outside a portion of the building air that is returning to the unit, rather than allowing it to recirculate to the indoor coil and back to the building. A powered return fan is a fan that draws building air into the equipment.

TABLE 7 TO PARAGRAPH (a)(3)(vi)(A)—SPECIFIC COMPONENTS FOR COMMERCIAL PACKAGE AIR CONDITIONING AND HEATING EQUIPMENT—Continued

[Excluding air-cooled equipment with a cooling capacity of less than 65,000 Btu/h]

Component	Description
Process Heat recovery/Reclaim Coils/Thermal Storage.	A heat exchanger located inside the unit that conditions the equipment's supply air using energy transferred from an external source using a vapor, gas, or liquid.
Refrigerant Reheat Coils	A heat exchanger located downstream of the indoor coil that heats the supply air during cooling operation using high pressure refrigerant in order to increase the ratio of moisture removal to cooling capacity provided by the equipment.
Sound Traps/Sound Attenuators	An assembly of structures through which the supply air passes before leaving the equipment or through which the return air from the building passes immediately after entering the equipment for which the sound insertion loss is at least 6 dB for the 125 Hz octave band frequency range.
Steam/Hydronic Heat Coils	Coils used to provide supplemental heating.
Ventilation Energy Recovery System (VERS).	An assembly that preconditions outdoor air entering the equipment through direct or indirect thermal and/or moisture exchange with the exhaust air, which is defined as the building air being exhausted to the outside from the equipment.

(B) The represented value of total cooling capacity must be between 95 percent and 100 percent of the mean of the total cooling capacities measured for the units in the sample selected as described in paragraph (a)(1)(ii) of this section, or between 95 percent and 100 percent of the total cooling capacity output simulated by the AEDM as described in paragraph (a)(2) of this section.

(C) Representations of IVEC and IVHE (including $IVHE_c$, as applicable) must be determined using a minimum part-load airflow that is no lower than the highest of the following:

(*1*) The minimum part-load airflow obtained using the as-shipped system control settings;

(*2*) The minimum part-load airflow obtained using the default system control settings specified in the manufacturer installation instructions (as applicable); and

(*3*) The minimum airflow rate specified in section 5.18.2 of AHRI 1340–2023.

* * * * *

■ 4. Amend § 429.70 by revising table 2 to paragraph (c)(5)(vi)(B) to read as follows:

§ 429.70 Alternative methods for determining energy efficiency and energy use.

* * * * *

(c) * * *

(5) * * *

(vi) * * *

(B) * * *

TABLE 2 TO PARAGRAPH (c)(5)(vi)(B)

Equipment	Metric	Applicable tolerance
Commercial Packaged Boilers	Combustion Efficiency	5% (0.05)
	Thermal Efficiency	5% (0.05)
Commercial Water Heaters or Hot Water Supply Boilers	Thermal Efficiency	5% (0.05)
	Standby Loss	10% (0.1)
Unfired Storage Tanks	R-Value	10% (0.1)
Air-Cooled, Split and Packaged ACs and HPs Greater Than or Equal to 65,000 Btu/h Cooling Capacity and Less than 760,000 Btu/h Cooling Capacity.	Energy Efficiency Ratio	5% (0.05)
	Energy Efficiency Ratio 2	5% (0.05)
	Coefficient of Performance	5% (0.05)
	Coefficient of Performance 2	5% (0.05)
	Integrated Energy Efficiency Ratio	10% (0.1)
	Integrated Ventilation, Economizing, and Cooling	10% (0.1)
	Integrated Ventilation and Heating Efficiency	10% (0.1)
Water-Cooled, Split and Packaged ACs, All Cooling Capacities	Energy Efficiency Ratio	5% (0.05)
	Energy Efficiency Ratio 2	5% (0.05)
	Integrated Energy Efficiency Ratio	10% (0.1)
	Integrated Ventilation, Economizing, and Cooling	10% (0.1)
Evaporatively-Cooled, Split and Packaged ACs, All Capacities	Energy Efficiency Ratio	5% (0.05)
	Energy Efficiency Ratio 2	5% (0.05)
	Integrated Energy Efficiency Ratio	10% (0.1)
	Integrated Ventilation, Economizing, and Cooling	10% (0.1)
Water-Source HPs, All Capacities	Energy Efficiency Ratio	5% (0.05)
	Coefficient of Performance	5% (0.05)
	Integrated Energy Efficiency Ratio	10% (0.1)
Single Package Vertical ACs and HPs	Energy Efficiency Ratio	5% (0.05)
	Coefficient of Performance	5% (0.05)
Packaged Terminal ACs and HPs	Energy Efficiency Ratio	5% (0.05)
	Coefficient of Performance	5% (0.05)
Variable Refrigerant Flow ACs and HPs (Excluding Air-Cooled, Three-phase with Less Than 65,000 Btu/h Cooling Capacity).	Energy Efficiency Ratio	5% (0.05)
	Coefficient of Performance	5% (0.05)
	Integrated Energy Efficiency Ratio	10% (0.1)
Computer Room Air Conditioners	Sensible Coefficient of Performance	5% (0.05)
Direct Expansion- Dedicated Outdoor Air Systems	Integrated Seasonal Coefficient of Performance 2	10% (0.1)
	Integrated Seasonal Moisture Removal Efficiency 2	10% (0.1)

TABLE 2 TO PARAGRAPH (c)(5)(vi)(B)—Continued

Equipment	Metric	Applicable tolerance
Commercial Warm-Air Furnaces	Thermal Efficiency	5% (0.05)
Commercial Refrigeration Equipment	Daily Energy Consumption	5% (0.05)

* * * * *

■ 5. Amend § 429.134 by revising paragraph (g) to read as follows:

§ 429.134 Product-specific enforcement provisions.

* * * * *

(g) *Commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h).* Before May 15, 2025, the provisions in 10 CFR 429.134, revised as of January 1, 2024, are applicable. On and after May 15, 2025, the following provisions apply.

(1) *Verification of cooling capacity.* The cooling capacity of each tested unit of the basic model will be measured pursuant to the test requirements of appendix A or appendix A1 to subpart F of part 431. The mean of the cooling capacity measurement(s) will be used to determine the applicable standards for purposes of compliance.

(2) *Specific components.* For assessment and enforcement testing of models subject to energy conservation standards denominated in terms of IVEC and IVHE, if a basic model includes individual models with components listed at table 7 to § 429.43(a)(3)(vi)(A) and DOE is not able to obtain an individual model with the least number (which could be zero) of those components within an otherwise comparable model group (as defined in § 429.43(a)(3)(vi)(A)(*1*)), DOE may test any individual model within the otherwise comparable model group.

(3) *Verification of cut-out and cut-in temperatures.* For assessment and enforcement testing of models of commercial package air conditioning and heating equipment subject to energy conservation standards denominated in terms of IVHE, the cut-out and cut-in temperatures may be verified using the method in appendix H to AHRI 1340–2023 (incorporated by reference, see § 429.4). If this method is conducted, the cut-in and cut-out temperatures determined using this method will be used to calculate IVHE for purposes of compliance.

* * * * *

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

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

Authority: 42 U.S.C. 6291–6317; 28 U.S.C. 2461 note.

■ 7. Amend § 431.92 by:
■ a. Revising the definitions for ''Basic model'' and ''Coefficient of performance, or COP'';
■ b. Adding in alphabetical order a definition for ''Coefficient of performance 2, or COP2'';
■ c. Revising the definitions for ''Double-duct air conditioner or heat pump'' and ''Energy efficiency ratio, or EER'';
■ d. Adding in alphabetical order a definition for ''Energy efficiency ratio 2, or EER2'';
■ e. Revising the definition for ''Integrated energy efficiency ratio, or IEER''; and
■ f. Adding in alphabetical order definitions for ''Integrated ventilation and heating efficiency, or IVHE'' and ''Integrated ventilation, economizing, and cooling, or IVEC''.

The revisions and additions read as follows:

§ 431.92 Definitions concerning commercial air conditioners and heat pumps.

* * * * *

Basic model means:

(1) *For air-cooled, three-phase, small commercial package air conditioning and heating equipment with a cooling capacity of less than 65,000 Btu/h and air-cooled, three-phase, variable refrigerant flow multi-split air conditioners and heat pumps with a cooling capacity of less than 65,000 Btu/h.* All units manufactured by one manufacturer, having the same primary energy source, and, which have essentially identical electrical, physical, and functional (or hydraulic) characteristics that affect energy consumption, energy efficiency, water consumption, or water efficiency; where essentially identical electrical, physical, and functional (or hydraulic) characteristics means:

(i) For split systems manufactured by outdoor unit manufacturers (OUMs): all individual combinations having the same model of outdoor unit, which means comparably performing compressor(s) [a variation of no more than five percent in displacement rate (volume per time) as rated by the compressor manufacturer, and no more than five percent in capacity and power input for the same operating conditions as rated by the compressor manufacturer], outdoor coil(s) [no more than five percent variation in face area and total fin surface area; same fin material; same tube material], and outdoor fan(s) [no more than ten percent variation in airflow and no more than twenty percent variation in power input];

(ii) For split systems having indoor units manufactured by independent coil manufacturers (ICMs): all individual combinations having comparably performing indoor coil(s) [plus or minus one square foot face area, plus or minus one fin per inch fin density, and the same fin material, tube material, number of tube rows, tube pattern, and tube size]; and

(iii) For single-package systems: all individual models having comparably performing compressor(s) [no more than five percent variation in displacement rate (volume per time) rated by the compressor manufacturer, and no more than five percent variations in capacity and power input rated by the compressor manufacturer corresponding to the same compressor rating conditions], outdoor coil(s) and indoor coil(s) [no more than five percent variation in face area and total fin surface area; same fin material; same tube material], outdoor fan(s) [no more than ten percent variation in outdoor airflow], and indoor blower(s) [no more than ten percent variation in indoor airflow, with no more than twenty percent variation in fan motor power input];

(iv) Except that:

(A) For single-package systems and single-split systems, manufacturers may instead choose to make each individual model/combination its own basic model provided the testing and represented value requirements in 10 CFR 429.67 are met; and

(B) For multi-split, multi-circuit, and multi-head mini-split combinations, a basic model may not include both individual small-duct, high velocity (SDHV) combinations and non-SDHV combinations even when they include the same model of outdoor unit. The manufacturer may choose to identify specific individual combinations as additional basic models.

(2) *For commercial package air conditioning and heating equipment (excluding air-cooled, three-phase, commercial package air conditioning and heating equipment with a cooling capacity of less than 65,000 Btu/h).* All units manufactured by one manufacturer within a single equipment class, having the same or comparably performing compressor(s), heat exchangers, and air moving system(s) that have a common ''nominal'' cooling capacity.

(3) *For computer room air conditioners.* All units manufactured by one manufacturer within a single equipment class, having the same primary energy source (*e.g.,* electric or gas), and which have the same or comparably performing compressor(s), heat exchangers, and air moving system(s) that have a common ''nominal'' cooling capacity.

(4) *For direct expansion-dedicated outdoor air system.* All units manufactured by one manufacturer, having the same primary energy source (*e.g.,* electric or gas), within a single equipment class; with the same or comparably performing compressor(s), heat exchangers, ventilation energy recovery system(s) (if present), and air moving system(s) that have a common ''nominal'' moisture removal capacity.

(5) *For packaged terminal air conditioner (PTAC) or packaged terminal heat pump (PTHP).* All units manufactured by one manufacturer within a single equipment class, having the same primary energy source (*e.g.,* electric or gas), and which have the same or comparable compressors, same or comparable heat exchangers, and same or comparable air moving systems that have a cooling capacity within 300 Btu/h of one another.

(6) *For single package vertical units.* All units manufactured by one manufacturer within a single equipment class, having the same primary energy source (*e.g.,* electric or gas), and which have the same or comparably performing compressor(s), heat exchangers, and air moving system(s) that have a rated cooling capacity within 1500 Btu/h of one another.

(7) *For variable refrigerant flow systems (excluding air-cooled, three-phase, variable refrigerant flow air conditioners and heat pumps with a cooling capacity of less than 65,000 Btu/h).* All units manufactured by one manufacturer within a single equipment class, having the same primary energy source (*e.g.,* electric or gas), and which have the same or comparably performing compressor(s) that have a common ''nominal'' cooling capacity and the same heat rejection medium (*e.g.,* air or water) (includes VRF water source heat pumps).

(8) *For water-source heat pumps.* All units manufactured by one manufacturer within a single equipment class, having the same primary energy source (*e.g.,* electric or gas), and which have the same or comparable compressors, same or comparable heat exchangers, and same or comparable ''nominal'' cooling capacity.

* * * * *

Coefficient of performance, or *COP,* means the ratio of the produced cooling effect of an air conditioner or heat pump (or its produced heating effect, depending on the mode of operation) to its net work input, when both the cooling (or heating) effect and the net work input are expressed in identical units of measurement. For air-cooled commercial package air conditioning and heating equipment (excluding equipment with a cooling capacity less than 65,000 Btu/h), COP is measured per appendix A to this subpart.

Coefficient of performance 2, or *COP2,* means the ratio of the produced cooling effect of an air conditioner or heat pump (or its produced heating effect, depending on the mode of operation) to its net work input, when both the cooling (or heating) effect and the net work input are expressed in identical units of measurement. COP2 must be used with a subscript to indicate the outdoor temperature in degrees Fahrenheit at which the COP2 was measured (*e.g.,* $COP2_{17}$ for COP2 measured at 17 °F). For air-cooled commercial package air conditioning and heating equipment (excluding equipment with a cooling capacity less than 65,000 Btu/h), COP2 is measured per appendix A1 to this subpart.

* * * * *

Double-duct air conditioner or heat pump means air-cooled commercial package air conditioning and heating equipment that meets the following criteria—

(1) Is either a horizontal single package or split-system unit; or a vertical unit that consists of two components that may be shipped or installed either connected or split; or a vertical single package unit that is not intended for exterior mounting on, adjacent interior to, or through an outside wall;

(2) Is intended for indoor installation with ducting of outdoor air from the building exterior to and from the unit (*e.g.,* the unit and/or all of its components are non-weatherized);

(3) If it is a horizontal unit, the complete unit shall have a maximum height of 35 inches or the unit shall have components that do not exceed a maximum height of 35 inches. If it is a vertical unit, the complete (split, connected, or assembled) unit shall have components that do not exceed a maximum depth of 35 inches; and

(4) Has a rated cooling capacity greater than or equal to 65,000 Btu/h and less than 300,000 Btu/h.

* * * * *

Energy efficiency ratio, or *EER,* means the ratio of the produced cooling effect of an air conditioner or heat pump to its net work input, expressed in Btu/watt-hour. For commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h), EER is measured per appendix A to this subpart.

Energy efficiency ratio 2, or *EER2,* means the ratio of the produced cooling effect of an air conditioner or heat pump to its net work input, expressed in Btu/watt-hour. For commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h), EER2 is measured per appendix A1 to this subpart.

* * * * *

Integrated energy efficiency ratio, or *IEER,* means a weighted average calculation of mechanical cooling EERs determined for four load levels and corresponding rating conditions, expressed in Btu/watt-hour. IEER is measured:

(1) Per appendix A to this subpart for commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h);

(2) Per appendix C1 to this subpart for water-source heat pumps;

(3) Per appendix D1 to this subpart for variable refrigerant flow multi-split air conditioners and heat pumps (other than air-cooled with rated cooling capacity less than 65,000 Btu/h); and

(4) Per appendix G1 to this subpart for single package vertical air conditioners and single package vertical heat pumps.

* * * * *

Integrated ventilation and heating efficiency, or *IVHE,* means a sum of the space heating provided (Btu) divided by the sum of the energy consumed (Wh), including mechanical heating, supplementary electric resistance heating, and heating season ventilation operating modes. IVHE with subscript C ($IVHE_C$) refers to the IVHE of heat pumps using a cold-climate heating load line. For air-cooled commercial package air conditioning and heating equipment (excluding equipment with a cooling capacity less than 65,000 Btu/h), IVHE and $IVHE_C$ are measured per appendix A1 to this subpart.

Integrated ventilation, economizing, and cooling, or *IVEC,* means a sum of the space cooling provided (Btu) divided by the sum of the energy consumed (Wh), including mechanical cooling, economizing, and cooling season ventilation operating modes. For commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h), IVEC is measured per appendix A1 to this subpart.

* * * * *

■ 8. Amend § 431.95 by:
■ a. Revising paragraph (b)(4);
■ b. Redesignating paragraph (b)(11) as paragraph (b)(12);
■ c. Adding new paragraph (b)(11); and
■ d. Revising paragraph (c)(2).

The revision and addition read as follows:

§ 431.95 Materials incorporated by reference.

* * * * *

(b) * * *

(4) AHRI Standard 340/360–2022 (I–P) (''AHRI 340/360–2022''), *2022 Standard for Performance Rating of Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment,* approved January 26, 2022; IBR approved for appendix A to this subpart.

* * * * *

(11) AHRI Standard 1340–2023 (I–P) (''AHRI 1340–2023''), *2023 Standard for Performance Rating of Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment,* approved November 16, 2023; IBR approved for appendix A1 to this subpart.

* * * * *

(c) * * *

(2) ANSI/ASHRAE Standard 37–2009 (''ANSI/ASHRAE 37–2009''), *Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment,* approved June 24, 2009; IBR approved for § 431.96 and appendices A, A1, B, C1, D1, E1, F1, G, and G1 to this subpart.

* * * * *

■ 9. Amend § 431.96 by revising table 1 to paragraph (b) to read as follows:

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

* * * * *

(b) * * *

TABLE 1 TO PARAGRAPH (b)—TEST PROCEDURES FOR COMMERCIAL AIR CONDITIONERS AND HEAT PUMPS

Equipment	Category	Cooling capacity or moisture removal capacity [1]	Energy efficiency descriptor	Use tests, conditions, an procedures in	Additional test procedure provisions as indicated in the listed paragraphs of this section
Commercial Package Air Conditioning and Heating Equipment.	Air-Cooled, 3-Phase, AC and HP.	<65,000 Btu/h	SEER and HSPF	Appendix F to this subpart [2].	None.
Commercial Package Air Conditioning and Heating Equipment.	Air-Cooled, 3-Phase, AC and HP.	<65,000 Btu/h	SEER2 and HSPF2	Appendix F1 to this subpart [2].	None.
Commercial Package Air Conditioning and Heating Equipment.	Air-Cooled AC and HP (excluding double-duct AC and HP).	≥65,000 Btu/h and <760,000 Btu/h.	EER, IEER, and COP	Appendix A to this subpart [2].	None.
Commercial Package Air Conditioning and Heating Equipment.	Air-Cooled AC and HP (excluding double-duct AC and HP).	≥65,000 Btu/h and <760,000 Btu/h.	EER2, COP2, IVEC, and IVHE.	Appendix A1 to this subpart [2].	None.
Commercial Package Air Conditioning and Heating Equipment.	Double-duct AC and HP	≥65,000 Btu/h and <300,000 Btu/h.	EER, IEER, and COP	Appendix A to this subpart [2].	None.
Commercial Package Air Conditioning and Heating Equipment.	Double-duct AC and HP	≥65,000 Btu/h and <300,000 Btu/h.	EER2, COP2, IVEC, and IVHE.	Appendix A1 to this subpart [2].	None.
Commercial Package Air Conditioning and Heating Equipment.	Water-Cooled and Evaporatively-Cooled AC.	<760,000 Btu/h	EER and IEER	Appendix A to this subpart [2].	None.
Commercial Package Air Conditioning and Heating Equipment.	Water-Cooled and Evaporatively-Cooled AC.	<760,000 Btu/h	EER2 and IVEC	Appendix A1 to this subpart [2].	None.
Water-Source Heat Pumps.	HP	<760,000 Btu/h	EER and COP	Appendix C to this subpart [2].	None.
Water-Source Heat Pumps.	HP	<760,000 Btu/h	IEER and ACOP	Appendix C1 to this subpart [2].	None.
Packaged Terminal Air Conditioners and Heat Pumps.	AC and HP	<760,000 Btu/h	EER and COP	Paragraph (g) of this section.	Paragraphs (c), (e), and (g).
Computer Room Air Conditioners.	AC	<760,000 Btu/h	SCOP	Appendix E to this subpart [2].	None.
Computer Room Air Conditioners.	AC	<760,000 Btu/h or <930,000 Btu/h [3].	NSenCOP	Appendix E1 to this subpart [2].	None.
Variable Refrigerant Flow Multi-split Systems.	AC	<65,000 Btu/h (3-phase)	SEER	Appendix F to this subpart [2].	None.
Variable Refrigerant Flow Multi-split Systems.	AC	<65,000 Btu/h (3-phase)	SEER2	Appendix F1 to this subpart [2].	None.
Variable Refrigerant Flow Multi-split Systems, Air-cooled.	HP	<65,000 Btu/h (3-phase)	SEER and HSPF	Appendix F to this subpart [2].	None.
Variable Refrigerant Flow Multi-split Systems, Air-cooled.	HP	<65,000 Btu/h (3-phase)	SEER2 and HSPF2	Appendix F1 to this subpart [2].	None.

TABLE 1 TO PARAGRAPH (b)—TEST PROCEDURES FOR COMMERCIAL AIR CONDITIONERS AND HEAT PUMPS—Continued

Equipment	Category	Cooling capacity or moisture removal capacity [1]	Energy efficiency descriptor	Use tests, conditions, and procedures in	Additional test procedure provisions as indicated in the listed paragraphs of this section
Variable Refrigerant Flow Multi-split Systems, Air-cooled.	AC and HP	≥65,000 Btu/h and <760,000 Btu/h.	EER and COP	Appendix D to this subpart[2].	None.
Variable Refrigerant Flow Multi-split Systems, Air-cooled.	AC and HP	≥65,000 Btu/h and <760,000 Btu/h.	IEER and COP	Appendix D1 to this subpart[2].	None.
Variable Refrigerant Flow Multi-split Systems, Water-source.	HP	<760,000 Btu/h	EER and COP	Appendix D to this subpart[2].	None.
Variable Refrigerant Flow Multi-split Systems, Water-source.	HP	<760,000 Btu/h	IEER and COP	Appendix D1 to this subpart[2].	None.
Single Package Vertical Air Conditioners and Single Package Vertical Heat Pumps.	AC and HP	<760,000 Btu/h	EER and COP	Appendix G to this subpart[2].	None.
Single Package Vertical Air Conditioners and Single Package Vertical Heat Pumps.	AC and HP	<760,000 Btu/h	EER, IEER, and COP	Appendix G1 to this subpart[2].	None.
Direct Expansion-Dedicated Outdoor Air Systems.	All	<324 lbs. of moisture removal/hr.	ISMRE2 and ISCOP2	Appendix B to this subpart.	None.

[1] Moisture removal capacity applies only to direct expansion-dedicated outdoor air systems.
[2] For equipment with multiple appendices listed in this table, consult the notes at the beginning of those appendices to determine the applicable appendix to use for testing.
[3] For upflow ducted and downflow floor-mounted computer room air conditioners, the test procedure in appendix E1 to this subpart applies to equipment with net sensible cooling capacity less than 930,000 Btu/h. For all other configurations of computer room air conditioners, the test procedure in appendix E1 to this subpart applies to equipment with net sensible cooling capacity less than 760,000 Btu/h.

* * * * *

■ 10. Revise § 431.97 to read as follows:

§ 431.97 Energy efficiency standards and their compliance dates.

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

(b) Each commercial package air conditioning and heating equipment (excluding air-cooled equipment with cooling capacity less than 65,000 Btu/h) manufactured starting on the compliance date listed in tables 1 through 4 to this paragraph (b) must meet the applicable minimum energy efficiency standard level(s) set forth in tables 1 through 4.

TABLE 1 TO PARAGRAPH (b)—MINIMUM EFFICIENCY STANDARDS FOR AIR-COOLED COMMERCIAL PACKAGE AIR CONDITIONING AND HEATING EQUIPMENT WITH A COOLING CAPACITY GREATER THAN OR EQUAL TO 65,000 BTU/H
[Excluding double-duct air-conditioners and heat pumps]

Cooling capacity	Subcategory	Supplementary heating type	Minimum efficiency [1]	Compliance date: equipment manufactured starting on . . .
Air-Cooled Commercial Package Air Conditioning and Heating Equipment with a Cooling Capacity Greater Than or Equal to 65,000 Btu/h (Excluding Double-Duct Air Conditioners and Heat Pumps)				
≥65,000 Btu/h and <135,000 Btu/h	AC	Electric Resistance Heating or No Heating	IEER = 14.8	January 1, 2023.
≥65,000 Btu/h and <135,000 Btu/h	AC	All Other Types of Heating	IEER = 14.6	January 1, 2023.
≥65,000 Btu/h and <135,000 Btu/h	HP	Electric Resistance Heating or No Heating	IEER = 14.1 COP = 3.4	January 1, 2023.
≥65,000 Btu/h and <135,000 Btu/h	HP	All Other Types of Heating	IEER = 13.9 COP = 3.4	January 1, 2023.
≥135,000 Btu/h and <240,000 Btu/h	AC	Electric Resistance Heating or No Heating	IEER = 14.2	January 1, 2023.
≥135,000 Btu/h and <240,000 Btu/h	AC	All Other Types of Heating	IEER = 14.0	January 1, 2023.
≥135,000 Btu/h and <240,000 Btu/h	HP	Electric Resistance Heating or No Heating	IEER = 13.5 COP = 3.3	January 1, 2023.
≥135,000 Btu/h and <240,000 Btu/h	HP	All Other Types of Heating	IEER = 13.3 COP = 3.3	January 1, 2023.
≥240,000 Btu/h and <760,000 Btu/h	AC	Electric Resistance Heating or No Heating	IEER = 13.2	January 1, 2023.
≥240,000 Btu/h and <760,000 Btu/h	AC	All Other Types of Heating	IEER = 13.0	January 1, 2023.
≥240,000 Btu/h and <760,000 Btu/h	HP	Electric Resistance Heating or No Heating	IEER = 12.5 COP = 3.2	January 1, 2023.
≥240,000 Btu/h and <760,000 Btu/h	HP	All Other Types of Heating	IEER = 12.3 COP = 3.2	January 1, 2023.

[1] See section 3 of appendix A to this subpart for the test conditions upon which the COP standards are based.

TABLE 2 TO PARAGRAPH (b)—MINIMUM COOLING EFFICIENCY STANDARDS FOR WATER-COOLED COMMERCIAL PACKAGE AIR CONDITIONING EQUIPMENT

Cooling capacity	Supplementary heating type	Minimum efficiency	Compliance date: equipment manufactured starting on . . .
Water-Cooled Commercial Package Air Conditioning Equipment			
<65,000 Btu/h	All	EER = 12.1	October 29, 2003.
≥65,000 Btu/h and <135,000 Btu/h	No Heating or Electric Resistance Heating	EER = 12.1	June 1, 2013.
≥65,000 Btu/h and <135,000 Btu/h	All Other Types of Heating	EER = 11.9	June 1, 2013.
≥135,000 Btu/h and <240,000 Btu/h	No Heating or Electric Resistance Heating	EER = 12.5	June 1, 2014.
≥135,000 Btu/h and <240,000 Btu/h	All Other Types of Heating	EER = 12.3	June 1, 2014.
≥240,000 Btu/h and <760,000 Btu/h	No Heating or Electric Resistance Heating	EER = 12.4	June 1, 2014.
≥240,000 Btu/h and <760,000 Btu/h	All Other Types of Heating	EER = 12.2	June 1, 2014.

TABLE 3 TO PARAGRAPH (b)—MINIMUM COOLING EFFICIENCY STANDARDS FOR EVAPORATIVELY-COOLED COMMERCIAL PACKAGE AIR CONDITIONING EQUIPMENT

Cooling capacity	Supplementary heating type	Minimum efficiency	Compliance date: equipment manufactured starting on . . .
Evaporatively-Cooled Commercial Package Air Conditioning Equipment			
<65,000 Btu/h	All	EER = 12.1	October 29, 2003.
≥65,000 Btu/h and <135,000 Btu/h	No Heating or Electric Resistance Heating	EER = 12.1	June 1, 2013.
≥65,000 Btu/h and <135,000 Btu/h	All Other Types of Heating	EER = 11.9	June 1, 2013.
≥135,000 Btu/h and <240,000 Btu/h	No Heating or Electric Resistance Heating	EER = 12.0	June 1, 2014.
≥135,000 Btu/h and <240,000 Btu/h	All Other Types of Heating	EER = 11.8	June 1, 2014.
≥240,000 Btu/h and <760,000 Btu/h	No Heating or Electric Resistance Heating	EER = 11.9	June 1, 2014.
≥240,000 Btu/h and <760,000 Btu/h	All Other Types of Heating	EER = 11.7	June 1, 2014.

TABLE 4 TO PARAGRAPH (b)—MINIMUM EFFICIENCY STANDARDS FOR DOUBLE-DUCT AIR CONDITIONERS AND HEAT PUMPS

Cooling capacity	Subcategory	Supplementary heating type	Minimum efficiency [1]	Compliance date: equipment manufactured starting on . . .
Double-Duct Air Conditioners and Heat Pumps				
≥65,000 Btu/h and <135,000 Btu/h	AC	Electric Resistance Heating or No Heating	EER = 11.2	January 1, 2010.
≥65,000 Btu/h and <135,000 Btu/h	AC	All Other Types of Heating	EER = 11.0	January 1, 2010.
≥65,000 Btu/h and <135,000 Btu/h	HP	Electric Resistance Heating or No Heating	EER = 11.0 COP = 3.3	January 1, 2010.
≥65,000 Btu/h and <135,000 Btu/h	HP	All Other Types of Heating	EER = 10.8 COP = 3.3	January 1, 2010.
≥135,000 Btu/h and <240,000 Btu/h	AC	Electric Resistance Heating or No Heating	EER = 11.0	January 1, 2010.
≥135,000 Btu/h and <240,000 Btu/h	AC	All Other Types of Heating	EER = 10.8	January 1, 2010.
≥135,000 Btu/h and <240,000 Btu/h	HP	Electric Resistance Heating or No Heating	EER = 10.6 COP = 3.2	January 1, 2010.
≥135,000 Btu/h and <240,000 Btu/h	HP	All Other Types of Heating	EER = 10.4 COP = 3.2	January 1, 2010.
≥240,000 Btu/h and <300,000 Btu/h	AC	Electric Resistance Heating or No Heating	EER = 10.0	January 1, 2010.
≥240,000 Btu/h and <300,000 Btu/h	AC	All Other Types of Heating	EER = 9.8	January 1, 2010.
≥240,000 Btu/h and <300,000 Btu/h	HP	Electric Resistance Heating or No Heating	EER = 9.5 COP = 3.2	January 1, 2010.
≥240,000 Btu/h and <300,000 Btu/h	HP	All Other Types of Heating	EER = 9.3 COP = 3.2	January 1, 2010.

[1] See section 3 of appendix A to this subpart for the test conditions upon which the COP standards are based.

(c) Each water-source heat pump manufactured starting on the compliance date listed in table 5 to this paragraph (c) must meet the applicable minimum energy efficiency standard level(s) set forth in this paragraph (c).

TABLE 5 TO PARAGRAPH (c)—MINIMUM EFFICIENCY STANDARDS FOR WATER-SOURCE HEAT PUMPS (WATER-TO-AIR, WATER-LOOP)

Cooling capacity	Minimum efficiency	Compliance date: equipment manufactured starting on . . .
Water-Source Heat Pumps (Water-to-Air, Water-Loop)		
<17,000 Btu/h	EER = 12.2 COP = 4.3	October 9, 2015.
≥17,000 Btu/h and <65,000 Btu/h	EER = 13.0 COP = 4.3	October 9, 2015.
≥65,000 Btu/h and <135,000 Btu/h	EER = 13.0 COP = 4.3	October 9, 2015.

(d) Each non-standard size packaged terminal air conditioner (PTAC) and packaged terminal heat pump (PTHP) manufactured on or after October 7, 2010, must meet the applicable minimum energy efficiency standard level(s) set forth in table 6 to this paragraph (d). Each standard size PTAC manufactured on or after October 8, 2012, and before January 1, 2017, must meet the applicable minimum energy efficiency standard level(s) set forth in table 6. Each standard size PTHP manufactured on or after October 8, 2012, must meet the applicable minimum energy efficiency standard level(s) set forth in table 6. Each standard size PTAC manufactured on or after January 1, 2017, must meet the applicable minimum energy efficiency standard level(s) set forth in table 7 to this paragraph (d).

TABLE 6 TO PARAGRAPH (d)—MINIMUM EFFICIENCY STANDARDS FOR PTAC AND PTHP

Equipment type	Category	Cooling capacity	Efficiency level	Compliance date: products manufactured on and after . . .
PTAC	Standard Size	<7,000 Btu/h	EER = 11.7	October 8, 2012.[2]
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 13.8 − (0.3 × Cap [1])	October 8, 2012.[2]
		>15,000 Btu/h	EER = 9.3	October 8, 2012.[2]
	Non-Standard Size	<7,000 Btu/h	EER = 9.4	October 7, 2010.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 10.9 − (0.213 × Cap [1])	October 7, 2010.
		>15,000 Btu/h	EER = 7.7	October 7, 2010.
PTHP	Standard Size	<7,000 Btu/h	EER = 11.9 COP = 3.3	October 8, 2012.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 14.0 − (0.3 × Cap [1]) COP = 3.7 − (0.052 × Cap [1])	October 8, 2012.
		>15,000 Btu/h	EER = 9.5 COP = 2.9	October 8, 2012.
	Non-Standard Size	<7,000 Btu/h	EER = 9.3 COP = 2.7	October 7, 2010.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 10.8 − (0.213 × Cap [1]) COP = 2.9 − (0.026 × Cap [1])	October 7, 2010.
		>15,000 Btu/h	EER = 7.6 COP = 2.5	October 7, 2010.

[1] "Cap" means cooling capacity in thousand Btu/h at 95 °F outdoor dry-bulb temperature.
[2] And manufactured before January 1, 2017. See table 7 to this paragraph (d) for updated efficiency standards that apply to this category of equipment manufactured on and after January 1, 2017.

TABLE 7 TO PARAGRAPH (d)—UPDATED MINIMUM EFFICIENCY STANDARDS FOR PTAC

Equipment type	Category	Cooling capacity	Efficiency level	Compliance date: products manufactured on and after . . .
PTAC	Standard Size	<7,000 Btu/h	EER = 11.9	January 1, 2017.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 14.0 − (0.3 × Cap [1])	January 1, 2017.
		>15,000 Btu/h	EER = 9.5	January 1, 2017.

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

(e)(1) Each single package vertical air conditioner and single package vertical heat pump manufactured on or after January 1, 2010, but before October 9, 2015 (for models ≥65,000 Btu/h and <135,000 Btu/h), or October 9, 2016 (for models ≥135,000 Btu/h and <240,000 Btu/h), must meet the applicable minimum energy conservation standard level(s) set forth in this paragraph (e)(1).

TABLE 8 TO PARAGRAPH (e)(1)—MINIMUM EFFICIENCY STANDARDS FOR SINGLE PACKAGE VERTICAL AIR CONDITIONERS AND SINGLE PACKAGE VERTICAL HEAT PUMPS

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

(2) Each single package vertical air conditioner and single package vertical heat pump manufactured on and after October 9, 2015 (for models ≥65,000 Btu/h and <135,000 Btu/h), or October 9, 2016 (for models ≥135,000 Btu/h and <240,000 Btu/h), but before September 23, 2019, must meet the applicable minimum energy conservation standard level(s) set forth in this paragraph (e)(2).

TABLE 9 TO PARAGRAPH (e)(2)—MINIMUM EFFICIENCY STANDARDS FOR SINGLE PACKAGE VERTICAL AIR CONDITIONERS AND SINGLE PACKAGE VERTICAL HEAT PUMPS

Equipment type	Cooling capacity	Sub-category	Efficiency level	Compliance date: products manufactured on and after . . .
Single package vertical air conditioners and single package vertical heat pumps, single-phase and three-phase.	<65,000 Btu/h	AC	EER = 9.0	January 1, 2010.
		HP	EER = 9.0 COP = 3.0	January 1, 2010.
Single package vertical air conditioners and single package vertical heat pumps.	≥65,000 Btu/h and <135,000 Btu/h.	AC	EER = 10.0	October 9, 2015.
		HP	EER = 10.0 COP = 3.0	October 9, 2015.
Single package vertical air conditioners and single package vertical heat pumps.	≥135,000 Btu/h and <240,000 Btu/h.	AC	EER = 10.0	October 9, 2016.
		HP	EER = 10.0 COP = 3.0	October 9, 2016.

(3) Each single package vertical air conditioner and single package vertical heat pump manufactured on and after September 23, 2019, must meet the applicable minimum energy conservation standard level(s) set forth in this paragraph (e)(3).

TABLE 10 TO PARAGRAPH (e)(3)—UPDATED MINIMUM EFFICIENCY STANDARDS FOR SINGLE PACKAGE VERTICAL AIR CONDITIONERS AND SINGLE PACKAGE VERTICAL HEAT PUMPS

Equipment type	Cooling capacity	Sub-category	Efficiency level	Compliance date: products manufactured on and after . . .
Single package vertical air conditioners and single package vertical heat pumps, single-phase and three-phase.	<65,000 Btu/h	AC	EER = 11.0	September 23, 2019.
		HP	EER = 11.0 COP = 3.3	September 23, 2019.
Single package vertical air conditioners and single package vertical heat pumps.	≥65,000 Btu/h and <135,000 Btu/h.	AC	EER = 10.0	October 9, 2015.
		HP	EER = 10.0 COP = 3.0	October 9, 2015.
Single package vertical air conditioners and single package vertical heat pumps.	≥135,000 Btu/h and <240,000 Btu/h.	AC	EER = 10.0	October 9, 2016.
		HP	EER = 10.0 COP = 3.0	October 9, 2016.

(f)(1) Each computer room air conditioner with a net sensible cooling capacity less than 65,000 Btu/h manufactured on or after October 29, 2012, and before May 28, 2024 and each computer room air conditioner with a net sensible cooling capacity greater than or equal to 65,000 Btu/h and less than 760,000 Btu/h manufactured on or after October 29, 2013, and before May 28, 2024, must meet the applicable minimum energy efficiency standard level(s) set forth in this paragraph (f)(1).

TABLE 11 TO PARAGRAPH (f)(1)—MINIMUM EFFICIENCY STANDARDS FOR COMPUTER ROOM AIR CONDITIONERS

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

(2) Each computer room air conditioner manufactured on or after May 28, 2024, must meet the applicable minimum energy efficiency standard level(s) set forth in this paragraph (f)(2).

TABLE 12 TO PARAGRAPH (f)(2)—UPDATED MINIMUM EFFICIENCY STANDARDS FOR FLOOR-MOUNTED COMPUTER ROOM AIR CONDITIONERS

Equipment type	Downflow and upflow ducted			Upflow non-ducted and horizontal flow		
	Net sensible cooling capacity	Minimum NSenCOP efficiency		Net sensible cooling capacity	Minimum NSenCOP efficiency	
		Downflow	Upflow ducted		Upflow non-ducted	Horizontal flow
Air-Cooled	<80,000 Btu/h	2.70	2.67	<65,000 Btu/h	2.16	2.65
	≥80,000 Btu/h and <295,000 Btu/h.	2.58	2.55	≥65,000 Btu/h and <240,000 Btu/h.	2.04	2.55
	≥295,000 Btu/h and <930,000 Btu/h.	2.36	2.33	≥240,000 Btu/h and <760,000 Btu/h.	1.89	2.47
Air-Cooled with Fluid Economizer.	<80,000 Btu/h	2.70	2.67	<65,000 Btu/h	2.09	2.65
	≥80,000 Btu/h and <295,000 Btu/h.	2.58	2.55	≥65,000 Btu/h and <240,000 Btu/h.	1.99	2.55
	≥295,000 Btu/h and <930,000 Btu/h.	2.36	2.33	≥240,000 Btu/h and <760,000 Btu/h.	1.81	2.47
Water-Cooled	<80,000 Btu/h	2.82	2.79	<65,000 Btu/h	2.43	2.79
	≥80,000 Btu/h and <295,000 Btu/h.	2.73	2.70	≥65,000 Btu/h and <240,000 Btu/h.	2.32	2.68
	≥295,000 Btu/h and <930,000 Btu/h.	2.67	2.64	≥240,000 Btu/h and <760,000 Btu/h.	2.20	2.60
Water-Cooled with Fluid Economizer.	<80,000 Btu/h	2.77	2.74	<65,000 Btu/h	2.35	2.71
	≥80,000 Btu/h and <295,000 Btu/h.	2.68	2.65	≥65,000 Btu/h and <240,000 Btu/h.	2.24	2.60
	≥295,000 Btu/h and <930,000 Btu/h.	2.61	2.58	≥240,000 Btu/h and <760,000 Btu/h.	2.12	2.54
Glycol-Cooled	<80,000 Btu/h	2.56	2.53	<65,000 Btu/h	2.08	2.48
	≥80,000 Btu/h and <295,000 Btu/h.	2.24	2.21	≥65,000 Btu/h and <240,000 Btu/h.	1.90	2.18
	≥295,000 Btu/h and <930,000 Btu/h.	2.21	2.18	≥240,000 Btu/h and <760,000 Btu/h.	1.81	2.18
Glycol-Cooled with Fluid Economizer.	<80,000 Btu/h	2.51	2.48	<65,000 Btu/h	2.00	2.44
	≥80,000 Btu/h and <295,000 Btu/h.	2.19	2.16	≥65,000 Btu/h and <240,000 Btu/h.	1.82	2.10
	≥295,000 Btu/h and <930,000 Btu/h.	2.15	2.12	≥240,000 Btu/h and <760,000 Btu/h.	1.73	2.10

TABLE 13 TO PARAGRAPH (f)(2)—MINIMUM EFFICIENCY STANDARDS FOR CEILING-MOUNTED COMPUTER ROOM AIR CONDITIONERS

Equipment type	Net sensible cooling capacity	Minimum NSenCOP efficiency	
		Ducted	Non-ducted
Air-Cooled with Free Air Discharge Condenser	<29,000 Btu/h	2.05	2.08

TABLE 13 TO PARAGRAPH (f)(2)—MINIMUM EFFICIENCY STANDARDS FOR CEILING-MOUNTED COMPUTER ROOM AIR CONDITIONERS—Continued

Equipment type	Net sensible cooling capacity	Minimum NSenCOP efficiency	
		Ducted	Non-ducted
	≥29,000 Btu/h and <65,000 Btu/h	2.02	2.05
	≥65,000 Btu/h and <760,000 Btu/h	1.92	1.94
Air-Cooled with Free Air Discharge Condenser and Fluid Economizer.	<29,000 Btu/h	2.01	2.04
	≥29,000 Btu/h and <65,000 Btu/h	1.97	2
	≥65,000 Btu/h and <760,000 Btu/h	1.87	1.89
Air-Cooled with Ducted Condenser	<29,000 Btu/h	1.86	1.89
	≥29,000 Btu/h and <65,000 Btu/h	1.83	1.86
	≥65,000 Btu/h and <760,000 Btu/h	1.73	1.75
Air-Cooled with Fluid Economizer and Ducted Condenser.	<29,000 Btu/h	1.82	1.85
	≥29,000 Btu/h and <65,000 Btu/h	1.78	1.81
	≥65,000 Btu/h and <760,000 Btu/h	1.68	1.7
Water-Cooled	<29,000 Btu/h	2.38	2.41
	≥29,000 Btu/h and <65,000 Btu/h	2.28	2.31
	≥65,000 Btu/h and <760,000 Btu/h	2.18	2.2
Water-Cooled with Fluid Economizer	<29,000 Btu/h	2.33	2.36
	≥29,000 Btu/h and <65,000 Btu/h	2.23	2.26
	≥65,000 Btu/h and <760,000 Btu/h	2.13	2.16
Glycol-Cooled	<29,000 Btu/h	1.97	2
	≥29,000 Btu/h and <65,000 Btu/h	1.93	1.98
	≥65,000 Btu/h and <760,000 Btu/h	1.78	1.81
Glycol-Cooled with Fluid Economizer	<29,000 Btu/h	1.92	1.95
	≥29,000 Btu/h and <65,000 Btu/h	1.88	1.93
	≥65,000 Btu/h and <760,000 Btu/h	1.73	1.76

(g)(1) Each variable refrigerant flow air conditioner or heat pump manufactured on or after the compliance date listed in table 14 to this paragraph (g)(1) and prior to January 1, 2024, must meet the applicable minimum energy efficiency standard level(s) set forth in this paragraph (g)(1).

TABLE 14 TO PARAGRAPH (g)(1)—MINIMUM EFFICIENCY STANDARDS FOR VARIABLE REFRIGERANT FLOW MULTI-SPLIT AIR CONDITIONERS AND HEAT PUMPS

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

TABLE 14 TO PARAGRAPH (g)(1)—MINIMUM EFFICIENCY STANDARDS FOR VARIABLE REFRIGERANT FLOW MULTI-SPLIT AIR CONDITIONERS AND HEAT PUMPS—Continued

Equipment type	Cooling capacity	Heating type [1]	Efficiency level	Compliance date: equipment manufactured on and after . . .
		With Heat Recovery	9.8 EER, 3.9 COP	October 29, 2013.

[1] VRF multi-split heat pumps (air-cooled) with heat recovery fall under the category of ''All Other Types of Heating'' unless they also have electric resistance heating, in which case it falls under the category for ''No Heating or Electric Resistance Heating.''

(2) Each variable refrigerant flow air conditioner or heat pump (except air-cooled systems with cooling capacity less than 65,000 Btu/h) manufactured on or after January 1, 2024, must meet the applicable minimum energy efficiency standard level(s) set forth in this paragraph (g)(2).

TABLE 15 TO PARAGRAPH (g)(2)—UPDATED MINIMUM EFFICIENCY STANDARDS FOR VARIABLE REFRIGERANT FLOW MULTI-SPLIT AIR CONDITIONERS AND HEAT PUMPS

Equipment type	Size category	Heating type	Minimum efficiency
VRF Multi-Split Air Conditioners (Air-Cooled).	≥65,000 and <135,000 Btu/h	All	15.5 IEER.
	≥135,000 and <240,000 Btu/h	All	14.9 IEER.
	≥240,000 Btu/h and <760,000 Btu/h	All	13.9 IEER.
VRF Multi-Split Heat Pumps (Air-Cooled)	≥65,000 and <135,000 Btu/h	Heat Pump without Heat Recovery.	14.6 IEER, 3.3 COP.
		Heat Pump with Heat Recovery	14.4 IEER, 3.3 COP.
	≥135,000 and <240,000 Btu/h	Heat Pump without Heat Recovery.	13.9 IEER, 3.2 COP.
		Heat Pump with Heat Recovery	13.7 IEER, 3.2 COP.
	≥240,000 Btu/h and <760,000 Btu/h	Heat Pump without Heat Recovery.	12.7 IEER, 3.2 COP.
		Heat Pump with Heat Recovery	12.5 IEER, 3.2 COP.
VRF Multi-Split Heat Pumps (Water-Source).	<65,000 Btu/h	Heat Pump without Heat Recovery.	16.0 IEER, 4.3 COP.
		Heat Pump with Heat Recovery	15.8 IEER, 4.3 COP.
	≥65,000 and <135,000 Btu/h	Heat Pump without Heat Recovery.	16.0 IEER, 4.3 COP.
		Heat Pump with Heat Recovery	15.8 IEER, 4.3 COP.
	≥135,000 and <240,000 Btu/h	Heat Pump without Heat Recovery.	14.0 IEER, 4.0 COP.
		Heat Pump with Heat Recovery	13.8 IEER, 4.0 COP.
	≥240,000 Btu/h and <760,000 Btu/h	Heat Pump without Heat Recovery.	12.0 IEER, 3.9 COP.
		Heat Pump with Heat Recovery	11.8 IEER, 3.9 COP.

(h) Each direct expansion-dedicated outdoor air system manufactured on or after the compliance date listed in table 16 to this paragraph (h) must meet the applicable minimum energy efficiency standard level(s) set forth in this paragraph (h).

TABLE 16 TO PARAGRAPH (h)—MINIMUM EFFICIENCY STANDARDS FOR DIRECT EXPANSION-DEDICATED OUTDOOR AIR SYSTEMS

Equipment Category	Subcategory	Efficiency level	Compliance date: equipment manufactured starting on . . .
Direct expansion-dedicated outdoor air systems.	(AC)—Air-cooled without ventilation energy recovery systems.	ISMRE2 = 3.8	May 1, 2024.
	(AC w/VERS)—Air-cooled with ventilation energy recovery systems.	ISMRE2 = 5.0	May 1, 2024.
	(ASHP)—Air-source heat pumps without ventilation energy recovery systems.	ISMRE2 = 3.8 .... ISCOP2 = 2.05	May 1, 2024.
	(ASHP w/VERS)—Air-source heat pumps with ventilation energy recovery systems.	ISMRE2 = 5.0 .... ISCOP2 = 3.20	May 1, 2024.
	(WC)—Water-cooled without ventilation energy recovery systems.	ISMRE2 = 4.7	May 1, 2024.
	(WC w/VERS)—Water-cooled with ventilation energy recovery systems.	ISMRE2 = 5.1	May 1, 2024.

TABLE 16 TO PARAGRAPH (h)—MINIMUM EFFICIENCY STANDARDS FOR DIRECT EXPANSION-DEDICATED OUTDOOR AIR SYSTEMS—Continued

Equipment Category	Subcategory	Efficiency level	Compliance date: equipment manufactured starting on . . .
	(WSHP)—Water-source heat pumps without ventilation energy recovery systems.	ISMRE2 = 3.8 ISCOP2 = 2.13	May 1, 2024.
	(WSHP w/VERS)—Water-source heat pumps with ventilation energy recovery systems.	ISMRE2 = 4.6 ISCOP2 = 4.04	May 1, 2024.

(i) Air-cooled, three-phase, commercial package air conditioning and heating equipment with a cooling capacity of less than 65,000 Btu/h and air-cooled, three-phase variable refrigerant flow multi-split air conditioning and heating equipment with a cooling capacity of less than 65,000 Btu/h manufactured on or after the compliance date listed in tables 17 and 18 to this paragraph (i) must meet the applicable minimum energy efficiency standard level(s) set forth in this paragraph (i).

TABLE 17 TO PARAGRAPH (i)—MINIMUM EFFICIENCY STANDARDS FOR AIR-COOLED, THREE-PHASE, COMMERCIAL PACKAGE AIR CONDITIONING AND HEATING EQUIPMENT WITH A COOLING CAPACITY OF LESS THAN 65,000 BTU/H AND AIR-COOLED, THREE-PHASE, SMALL VARIABLE REFRIGERANT FLOW MULTI-SPLIT AIR CONDITIONING AND HEATING EQUIPMENT WITH A COOLING CAPACITY OF LESS THAN 65,000 BTU/H

Equipment type	Cooling capacity	Subcategory	Minimum efficiency	Compliance date: equipment manufactured starting on . . .
Commercial Package Air Conditioning Equipment.	<65,000 Btu/h	Split-System	13.0 SEER	June 16, 2008.[1]
Commercial Package Air Conditioning Equipment.	<65,000 Btu/h	Single-Package	14.0 SEER	January 1, 2017.[1]
Commercial Package Air Conditioning and Heating Equipment.	<65,000 Btu/h	Split-System	14.0 SEER 8.2 HSPF	January 1, 2017.[1]
Commercial Package Air Conditioning and Heating Equipment.	<65,000 Btu/h	Single-Package	14.0 SEER 8.0 HSPF	January 1, 2017.[1]
VRF Air Conditioners	<65,000 Btu/h		13.0 SEER	June 16, 2008.[1]
VRF Heat Pumps	<65,000 Btu/h		13.0 SEER 7.7 HSPF	June 16, 2008.[1]

[1] And manufactured before January 1, 2025. For equipment manufactured on or after January 1, 2025, see table 18 to this paragraph (i) for updated efficiency standards.

TABLE 18 TO PARAGRAPH (i)—UPDATED MINIMUM EFFICIENCY STANDARDS FOR AIR-COOLED, THREE-PHASE, COMMERCIAL PACKAGE AIR CONDITIONING AND HEATING EQUIPMENT WITH A COOLING CAPACITY OF LESS THAN 65,000 BTU/H AND AIR-COOLED, THREE-PHASE, SMALL VARIABLE REFRIGERANT FLOW MULTI-SPLIT AIR CONDITIONING AND HEATING EQUIPMENT WITH A COOLING CAPACITY OF LESS THAN 65,000 BTU/H

Equipment type	Cooling capacity	Subcategory	Minimum efficiency	Compliance date: equipment manufactured starting on. . .
Commercial Package Air Conditioning Equipment.	< 65,000 Btu/h	Split-System	13.4 SEER2	January 1, 2025.
Commercial Package Air Conditioning Equipment.	< 65,000 Btu/h	Single-Package	13.4 SEER2	January 1, 2025.
Commercial Package Air Conditioning and Heating Equipment.	< 65,000 Btu/h	Split-System	14.3 SEER2 7.5 HSPF2	January 1, 2025.
Commercial Package Air Conditioning and Heating Equipment.	< 65,000 Btu/h	Single-Package	13.4 SEER2 6.7 HSPF2	January 1, 2025.
Space-Constrained Commercial Package Air Conditioning Equipment.	≤ 30,000 Btu/h	Split-System	12.7 SEER2	January 1, 2025.
Space-Constrained Commercial Package Air Conditioning Equipment.	≤ 30,000 Btu/h	Single-Package	13.9 SEER2	January 1, 2025.
Space-Constrained Commercial Package Air Conditioning and Heating Equipment.	≤ 30,000 Btu/h	Split-System	13.9 SEER2 7.0 HSPF2	January 1, 2025.
Space-Constrained Commercial Package Air Conditioning and Heating Equipment.	≤ 30,000 Btu/h	Single-Package	13.9 SEER2 6.7 HSPF2	January 1, 2025.
Small-Duct, High-Velocity Commercial Package Air Conditioning.	< 65,000 Btu/h	Split-System	13.0 SEER2	January 1, 2025.

TABLE 18 TO PARAGRAPH (i)—UPDATED MINIMUM EFFICIENCY STANDARDS FOR AIR-COOLED, THREE-PHASE, COMMERCIAL PACKAGE AIR CONDITIONING AND HEATING EQUIPMENT WITH A COOLING CAPACITY OF LESS THAN 65,000 BTU/H AND AIR-COOLED, THREE-PHASE, SMALL VARIABLE REFRIGERANT FLOW MULTI-SPLIT AIR CONDITIONING AND HEATING EQUIPMENT WITH A COOLING CAPACITY OF LESS THAN 65,000 BTU/H—Continued

Equipment type	Cooling capacity	Subcategory	Minimum efficiency	Compliance date: equipment manufactured starting on. . .
Small-Duct, High-Velocity Commercial Package Air Conditioning and Heating Equipment.	< 65,000 Btu/h	Split-System	14.0 SEER2 6.9 HSPF2	January 1, 2025.
VRF Air Conditioners	< 65,000 Btu/h		13.4 SEER2	January 1, 2025.
VRF Heat Pumps	< 65,000 Btu/h		13.4 SEER2 7.5 HSPF2	January 1, 2025.

■ 11. Appendix A to subpart F of part 431 is revised to read as follows:

Appendix A to Subpart F of Part 431—Uniform Test Method for the Measurement of Energy Consumption of Commercial Package Air Conditioning and Heating Equipment (Excluding Air-Cooled Equipment With a Cooling Capacity Less Than 65,000 Btu/h)

Note: Prior to May 15, 2025, representations with respect to the energy use or efficiency of commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h), including compliance certifications, must be based on testing conducted in accordance with:

(a) The applicable provisions (appendix A to subpart F of part 431 for air-cooled equipment, and table 1 to § 431.96 for water-cooled and evaporatively-cooled equipment) as they appeared in subpart F of 10 CFR part 431, revised as of January 1, 2024; or

(b) This appendix.

Beginning May 15, 2025, and prior to the compliance date of amended standards for commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h) based on integrated ventilation, economizing, and cooling (IVEC) and integrated ventilation and heating efficiency (IVHE) (see § 431.97), representations with respect to energy use or efficiency of commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h), including compliance certifications, must be based on testing conducted in accordance with this appendix.

Beginning on the compliance date of amended standards for commercial package air conditioning and heating equipment (excluding equipment with a cooling capacity less than 65,000 Btu/h) based on IVEC and IVHE (see § 431.97), representations with respect to energy use or efficiency of commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h), including compliance certifications, must be based on testing conducted in accordance with appendix A1 to this subpart.

Manufacturers may also certify compliance with any amended energy conservation standards for commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h) based on IVEC or IVHE prior to the applicable compliance date for those standards (see § 431.97), and those compliance certifications must be based on testing in accordance with appendix A1 to this subpart.

1. Incorporation by Reference

DOE incorporated by reference in § 431.95, the entire standard for AHRI 340/360–2022 and ANSI/ASHRAE 37–2009. However, certain enumerated provisions of AHRI 340/360–2022 and ANSI/ASHRAE 37–2009, as set forth in this section 1 are inapplicable. To the extent there is a conflict between the terms or provisions of a referenced industry standard and the CFR, the CFR provisions control.

1.1. AHRI 340/360–2022:

(a) Section 1 Purpose is inapplicable,

(b) Section 2 Scope is inapplicable,

(c) The following subsections of Section 3 Definitions are inapplicable: 3.2 (Basic Model), 3.4 (Commercial and Industrial Unitary Air-conditioning Equipment), 3.5 (Commercial and Industrial Unitary Heat Pump), 3.7 (Double-duct System), 3.8 (Energy Efficiency Ratio (EER)), 3.12 (Heating Coefficient of Performance (COP_H)), 3.14 (Integrated Energy Efficiency Ratio (IEER)), 3.23 (Published Rating), 3.26 (Single Package Air-Conditioners), 3.27 (Single Package Heat Pumps), 3.29 (Split System Air-conditioners), 3.30 (Split System Heat Pump), 3.36 (Year Round Single Package Air-conditioners),

(d) Section 7 Minimum Data Requirements for Published Ratings is inapplicable,

(e) Section 8 Operating Requirements is inapplicable,

(f) Section 9 Marking and Nameplate Data is inapplicable,

(g) Section 10 Conformance Conditions is inapplicable,

(h) Appendix B References—Informative is inapplicable,

(i) Appendix D Unit Configuration for Standard Efficiency Determination—Normative is inapplicable,

(j) Appendix F International Rating Conditions—Normative is inapplicable,

(k) Appendix G Examples of IEER Calculations—Informative is inapplicable,

(l) Appendix H Example of Determination of Fan and Motor Efficiency for Non-standard Integrated Indoor Fan and Motors—Informative is inapplicable, and

(m) Appendix I Double-duct System Efficiency Metrics with Non-Zero Outdoor Air External Static Pressure (ESP)—Normative is inapplicable.

1.2. ANSI/ASHRAE 37–2009:

(a) Section 1 Purpose is inapplicable

(b) Section 2 Scope is inapplicable, and

(c) Section 4 Classifications is inapplicable.

2. General

Determine the applicable energy efficiency metrics (IEER, EER, and COP) in accordance with this appendix and the applicable sections of AHRI 340/360–2022 and ANSI/ASHRAE 37–2009.

Section 3 of this appendix provides additional instructions for testing. In cases where there is a conflict, the language of this appendix takes highest precedence, followed by AHRI 340/360–2022, followed by ANSI/ASHRAE 37–2009. Any subsequent amendment to a referenced document by the standard-setting organization will not affect the test procedure in this appendix, unless and until the test procedure is amended by DOE.

3. Test Conditions

The following conditions specified in Table 6 of AHRI 340/360–2022 apply when testing to certify to the energy conservation standards in § 431.97. For cooling mode tests for equipment subject to standards in terms of EER, test using the ''Standard Rating Conditions Cooling''. For cooling mode tests for equipment subject to standards in terms of IEER, test using the ''Standard Rating Conditions Cooling'' and the ''Standard Rating Part-Load Conditions (IEER)''. For heat pump heating mode tests for equipment subject to standards in terms of COP, test using the ''Standard Rating Conditions (High Temperature Steady State Heating)''.

For equipment subject to standards in terms of EER, representations of IEER made using the ''Standard Rating Part-Load Conditions (IEER)'' in Table 6 of AHRI 340/360–2022 are optional. For equipment subject to standards in terms of IEER, representations of EER made using the ''Standard Rating Conditions Cooling'' in Table 6 of AHRI 340/360–2022 are optional. Representations of COP made using the ''Standard Rating Conditions (Low Temperature Steady State Heating)'' in Table 6 of AHRI 340/360–2022 are optional and are not to be used as the basis for determining compliance with energy efficiency standards in terms of COP.

■ 12. Add appendix A1 to subpart F of part 431 to read as follows:

Appendix A1 to Subpart F of Part 431—Uniform Test Method for the Measurement of Energy Consumption of Commercial Package Air Conditioning and Heating Equipment (Excluding Air-Cooled Equipment With a Cooling Capacity Less Than 65,000 Btu/h)

Note: Prior to May 15, 2025, representations with respect to the energy use or efficiency of commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h), including compliance certifications, must be based on testing conducted in accordance with:

(a) The applicable provisions (appendix A to subpart F of part 431 for air-cooled equipment, and table 1 to § 431.96 for water-cooled and evaporatively-cooled equipment) as it appeared in subpart F of 10 CFR part 431, revised as of January 1, 2024; or

(b) Appendix A to this subpart.

Beginning May 15, 2025, and prior to the compliance date of amended standards for commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h) based on integrated ventilation, economizing, and cooling (IVEC) and integrated ventilation and heating efficiency (IVHE) (see § 431.97), representations with respect to energy use or efficiency of commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h), including compliance certifications, must be based on testing conducted in accordance with appendix A to this subpart.

Beginning on the compliance date of amended standards for commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h) based on IVEC and IVHE (see § 431.97), representations with respect to energy use or efficiency of commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h), including compliance certifications, must be based on testing conducted in accordance with this appendix.

Manufacturers may also certify compliance with any amended energy conservation standards for commercial package air conditioning and heating equipment (excluding air-cooled equipment with a cooling capacity less than 65,000 Btu/h) based on IVEC or IVHE prior to the applicable compliance date for those standards (see § 431.97), and those compliance certifications must be based on testing in accordance with this appendix.

1. Incorporation by Reference

DOE incorporated by reference in § 431.95, the entire standard for AHRI 1340–2023 and ANSI/ASHRAE 37–2009. However, certain enumerated provisions of AHRI 1340–2023 and ANSI/ASHRAE 37–2009, as listed in this section 1 are inapplicable. To the extent there is a conflict between the terms or provisions of a referenced industry standard and the CFR, the CFR provisions control.

1.1. AHRI 1340–2023:

(a) Section 1 Purpose is inapplicable,

(b) Section 2 Scope is inapplicable,

(c) The following subsections of section 3 Definitions are inapplicable: 3.2.2 (Barometric Relief Damper), 3.2.3 (Basic Model), 3.2.5 (Commercial and Industrial Unitary Air-conditioner and Heat Pump Equipment), 3.2.5.1 (Commercial and Industrial Unitary Air-Conditioning System), 3.2.5.2 (Commercial and Industrial Unitary Heat Pump System), 3.2.7 (Double-duct System), 3.2.9 (Desiccant Dehumidification Component), 3.2.10 (Drain Pan Heater), 3.2.11.1 (Air Economizer), 3.2.12 (Energy Efficiency Ratio 2), 3.2.13 (Evaporative Cooling), 3.2.13.1 (Direct Evaporative Cooling System), 3.2.13.2 (Indirect Evaporative Cooling System), 3.2.14 (Fresh Air Damper), 3.2.15 (Fire, Smoke, or Isolation Damper), 3.2.17 (Hail Guard), 3.2.19 (Heating Coefficient of Performance 2 ($COP2_H$)), 3.2.20 (High-Effectiveness Indoor Air Filtration), 3.2.22 (Indoor Single Package Air-conditioners), 3.2.23 (Integrated Ventilation, Economizing, and Cooling Efficiency (IVEC)), 3.2.34 (Integrated Ventilation and Heating Efficiency (IVHE)), 3.2.29 (Non-standard Ducted Condenser Fan), 3.2.31.2 (Boost2 Heating Operating Level (B2)), 3.2.34 (Power Correction Capacitor), 3.2.35 (Powered Exhaust Air Fan), 3.2.36 (Powered Return Air Fan), 3.2.37 (Process Heat Recovery, Reclaim, or Thermal Storage Coil), 3.2.38 (Published Rating), 3.2.41 (Refrigerant Reheat Coil), 3.2.42 (Single Package Air-conditioner), 3.2.43 (Single Package Heat Pumps), 3.2.44 (Single Package System), 3.2.45 (Sound Trap), 3.2.46 (Split System), 3.2.51 (Steam or Hydronic Heat Coils), 3.2.53 (UV Lights), 3.2.55 (Ventilation Energy Recovery System (VERS)), 3.2.56 (Year Round Single Package Air-conditioner), 3.2.57 (Year Round Single Package Heat Pump),

(d) Subsection 5.2 (Optional System Features) of section 5 Test Requirements is inapplicable,

(e) The following subsections of section 6 Rating Requirements are inapplicable: 6.4 (Rating Values), 6.5 (Uncertainty), and 6.6 (Verification Testing),

(f) Section 7 Minimum Data Requirements for Published Ratings is inapplicable,

(g) Section 8 Operating Requirements is inapplicable,

(h) Section 9 Marking and Nameplate Data is inapplicable,

(i) Section 10 Conformance Conditions is inapplicable,

(j) Appendix B References—Informative is inapplicable,

(k) Sections D.1 (Purpose) and D.2 (Configuration Requirements) of Appendix D Unit Configuration for Standard Efficiency Determination—Normative are inapplicable,

(l) Appendix F International Rating Conditions—Normative is inapplicable,

(m) Appendix G Example of Determination of Fan and Motor Efficiency for Non-standard Integrated Indoor Fan and Motors—Informative is inapplicable, and

(n) Appendix H Determination of Low-temperature Cut-in and Cut-out Temperatures—Normative is inapplicable.

1.2. ANSI/ASHRAE 37–2009:

(a) Section 1 Purpose is inapplicable

(b) Section 2 Scope is inapplicable, and

(c) Section 4 Classifications is inapplicable.

2. General

For air conditioners and heat pumps, determine IVEC and IVHE (as applicable) in accordance with this appendix and the applicable sections of AHRI 1340–2023 and ANSI/ASHRAE 37–2009. Representations of energy efficiency ratio 2 (EER2) and $IVHE_C$ may optionally be made. Representations of coefficient of performance 2 (COP2) at 5 °F, 17 °F, and 47 °F may optionally be made.

Sections 3 and 4 of this appendix provide additional instructions for testing. In cases where there is a conflict, the language of this appendix takes highest precedence, followed by AHRI 1340–2023, followed by ANSI/ASHRAE 37–2009. Any subsequent amendment to a referenced document by the standard-setting organization will not affect the test procedure in this appendix, unless and until the test procedure is amended by DOE.

3. Test Conditions

The following conditions specified in AHRI 1340–2023 apply when testing to certify to the energy conservation standards in § 431.97. For cooling mode, use the rating conditions in Table 7 of AHRI 1340–2023. For heat pump heating mode tests, use the rating conditions in Table 23 of AHRI 1340–2023 and the IVHE building load profile in Table 22 of AHRI 1340–2023.

Representations of EER2 made using the ''Cooling Bin A'' conditions in Table 7 of AHRI 1340–2023 are optional. Representations of $IVHE_C$ made using the $IVHE_C$ Cold Climate building load profile in Table 22 of AHRI 1340–2023 are optional. Representations of $COP2_{47}$, $COP2_{17}$, and $COP2_5$ are optional.

4. Tower Fan and Pump Power Rate (TFPPR)

Where equations 8, 10, 11, and 13 to AHRI 1340–2023 call for using the cooling tower fan and condenser water pump power rate (TFPPR) for the cooling bin specified in Table 7 to AHRI 1340–2023, instead use the TFPPR value for the cooling bin specified in table 1 to this appendix. Where equation 22 to AHRI 1340–2023 calls for using a value of 0.0094 W/(Btu/h) for TFPPR, instead use a value of 0.0102 W/(Btu/h).

TABLE 1—TOWER FAN AND PUMP POWER RATE

[TFPPR]

Cooling bin	Cooling Bin A	Cooling Bin B	Cooling Bin C	Cooling Bin D
Tower Fan and Pump Power Rate (TFPPR), W/(Btu/h)	0.0102	0.0099	0.0121	0.0430

5. Additional Heating Operating Level Provisions

5.1. Boost2 Heating Operating Level Definition

In place of the boost2 heating operating level definition in section 3.2.31.2 of AHRI 1340–2023, use the following definition: An operating level allowed by the controls at 5.0 °F outdoor dry-bulb temperature with a capacity at 5.0 °F outdoor dry-bulb temperature that is less than or equal to the maximum capacity allowed by the controls at 5.0 °F outdoor dry-bulb temperature and greater than the capacity of:

(a) The boost heating operating level at 5.0 °F outdoor dry-bulb temperature, if there is an operating level that meets the definition for boost heating operating level specified in section 3.2.31.1 of AHRI 1340–2023; or

(b) The high heating operating level at 5.0 °F outdoor dry-bulb temperature, if there is not an operating level that meets the definition for boost heating operating level specified in section 3.2.31.1 of AHRI 1340–2023.

5.2. Requirements for H5B2 Test in Table 23 to AHRI 1340–2023

In place of the third to last paragraph of section 6.3.6 of AHRI 1340–2023, use the following provisions.

Run the H5B2 test in Table 23 of AHRI 1340–2023 only if there is an operating level allowed by the controls at 5.0 °F that meets the definition of the boost2 heating operating level specified in section 5.1 of this appendix, and the H5B2 test is being used to determine the capacity at 5.0 °F outdoor dry-bulb temperature and/or $COP2_5$.

If the unit has a boost heating operating level, run the H5B2 test in Table 23 of AHRI 1340–2023 with an operating level allowed by the controls at 5.0 °F outdoor dry-bulb temperature that has a capacity at 5.0 °F outdoor dry-bulb temperature that is greater than the capacity of the boost heating operating level at 5.0 °F outdoor dry-bulb temperature and less than or equal to the maximum capacity allowed by the controls at 5.0 °F outdoor dry-bulb temperature.

If the unit does not have a boost heating operating level, run the H5B2 test in Table 23 of AHRI 1340–2023 with an operating level allowed by the controls at 5.0 °F outdoor dry-bulb temperature that has a capacity at 5.0 °F outdoor dry-bulb temperature that is greater than the capacity of the high heating operating level at 5.0 °F outdoor dry-bulb temperature and less than or equal to the maximum capacity allowed by the controls at 5.0 °F outdoor dry-bulb temperature. Use the indoor airflow that is used by the controls at 5.0 °F outdoor dry-bulb temperature when operating at the chosen operating level.

The H5B2 test shall not be used in the calculation of IVHE or $IVHE_C$.

5.3. Operating Level Requirements for COP2

Any references to $COP2_H$ in AHRI 1340–2023 shall be considered synonymous with COP2 as defined in § 431.92. In place of section 6.3.14.2 of AHRI 1340–2023, use the following provisions.

To determine $COP2_{47}$, use capacity and power determined for the H47H test.

To determine $COP2_{17}$, the following provisions apply. For units without a boost heating operating level, use capacity and power determined for the H17H test. For units with a boost operating level, use capacity and power determined for the H17B test.

To determine $COP2_5$, the following provisions apply. For units without a boost heating operating level and without a boost2 heating operating level, use capacity and power determined for the H5H test. For units with a boost heating operating level and without a boost2 heating operating level, use capacity and power determined for the H5B test. For units with a boost2 heating operating level, use capacity and power determined for the H5B2 test.

6. Set-Up and Test Provisions for Specific Components

When testing equipment that includes any of the features listed in table 2 to this appendix, test in accordance with the set-up and test provisions specified in table 2.

TABLE 2—TEST PROVISIONS FOR SPECIFIC COMPONENTS

Component	Description	Test provisions
Air Economizers	An automatic system that enables a cooling system to supply outdoor air to reduce or eliminate the need for mechanical cooling during mild or cold weather	For any air economizer that is factory-installed, place the economizer in the 100% return position and close and seal the outside air dampers for testing. For any modular air economizer shipped with the unit but not factory-installed, do not install the economizer for testing.
Barometric Relief Dampers	An assembly with dampers and means to automatically set the damper position in a closed position and one or more open positions to allow venting directly to the outside a portion of the building air that is returning to the unit, rather than allowing it to recirculate to the indoor coil and back to the building	For any barometric relief dampers that are factory-installed, close and seal the dampers for testing. For any modular barometric relief dampers shipped with the unit but not factory-installed, do not install the dampers for testing.
Desiccant Dehumidification Components	An assembly that reduces the moisture content of the supply air through moisture transfer with solid or liquid desiccants	Disable desiccant dehumidification components for testing.
Drain Pan Heaters	A heater that heats the drain pan to make certain that water shed from the outdoor coil during a defrost does not freeze	Disconnect drain pan heaters for testing.
Evaporative Pre-cooling of Air-cooled Condenser Intake Air.	Water is evaporated into the air entering the air-cooled condenser to lower the dry-bulb temperature and thereby increase efficiency of the refrigeration cycle	Disconnect the unit from a water supply for testing *i.e.,* operate without active evaporative cooling.

TABLE 2—TEST PROVISIONS FOR SPECIFIC COMPONENTS—Continued

Component	Description	Test provisions
Fire/Smoke/Isolation Dampers	A damper assembly including means to open and close the damper mounted at the supply or return duct opening of the equipment	For any fire/smoke/isolation dampers that are factory-installed, set the dampers in the fully open position for testing. For any modular fire/smoke/isolation dampers shipped with the unit but not factory-installed, do not install the dampers for testing.
Fresh Air Dampers	An assembly with dampers and means to set the damper position in a closed and one open position to allow air to be drawn into the equipment when the indoor fan is operating	For any fresh air dampers that are factory-installed, close and seal the dampers for testing. For any modular fresh air dampers shipped with the unit but not factory-installed, do not install the dampers for testing.
Hail Guards	A grille or similar structure mounted to the outside of the unit covering the outdoor coil to protect the coil from hail, flying debris and damage from large objects	Remove hail guards for testing.
High-Effectiveness Indoor Air Filtration	Indoor air filters with greater air filtration effectiveness than the filters used for testing	Test with the standard filter.
Power Correction Capacitors	A capacitor that increases the power factor measured at the line connection to the equipment	Remove power correction capacitors for testing.
Process Heat recovery/Reclaim Coils/Thermal Storage.	A heat exchanger located inside the unit that conditions the equipment's supply air using energy transferred from an external source using a vapor, gas, or liquid	Disconnect the heat exchanger from its heat source for testing.
Refrigerant Reheat Coils	A heat exchanger located downstream of the indoor coil that heats the supply air during cooling operation using high pressure refrigerant in order to increase the ratio of moisture removal to cooling capacity provided by the equipment	De-activate refrigerant reheat coils for testing so as to provide the minimum (none if possible) reheat achievable by the system controls.
Steam/Hydronic Heat Coils	Coils used to provide supplemental heating	Test with steam/hydronic heat coils in place but providing no heat.
UV Lights	A lighting fixture and lamp mounted so that it shines light on the indoor coil, that emits ultraviolet light to inhibit growth of organisms on the indoor coil surfaces, the condensate drip pan, and/other locations within the equipment	Turn off UV lights for testing.
Ventilation Energy Recovery System (VERS)	An assembly that preconditions outdoor air entering the equipment through direct or indirect thermal and/or moisture exchange with the exhaust air, which is defined as the building air being exhausted to the outside from the equipment	For any VERS that is factory-installed, place the VERS in the 100% return position and close and seal the outside air dampers and exhaust air dampers for testing, and do not energize any VERS subcomponents (*e.g.,* energy recovery wheel motors). For any VERS module shipped with the unit but not factory-installed, do not install the VERS for testing.

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