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This section of the FEDERAL REGISTER contains notices to the public of the proposed issuance of rules and regulations. The purpose of these notices is to give interested persons an opportunity to participate in the rule making prior to the adoption of the final rules.

DEPARTMENT OF ENERGY

10 CFR Parts 429 and 431

[EERE–2017–BT–TP–0018]

RIN 1904–AD93

Energy Conservation Program for Certain Commercial and Industrial Equipment: Test Procedure for Certain Categories of Commercial Air Conditioning and Heating Equipment

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy (DOE).

ACTION: Request for information (RFI).

SUMMARY: In response to statutory requirements to review its test procedures in response to any updates of the relevant industry test procedures, as referenced in the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1 (ASHRAE Standard 90.1), the U.S. Department of Energy (DOE) is initiating a data collection process to consider amendments to DOE's test procedures for commercial package air conditioning and heating equipment with test procedure updates included in ASHRAE Standard 90.1–2016—specifically, those evaporatively-cooled commercial unitary air conditioners (ECUACs), water-cooled commercial unitary air conditioners (WCUACs), and air-cooled commercial unitary air conditioners (ACUACs) which have a rated cooling capacity greater than or equal to 65,000 Btu/h and less than 760,000 Btu/h; and all classes of computer room air conditioners (CRACs); as well as to consider adopting a new test procedure for dedicated outdoor air systems (DOASes), equipment covered by ASHRAE Standard 90.1 for the first time. In response to other statutory requirements for DOE to review its test procedures at least once every seven years, DOE is also reviewing its test procedures for ECUACs and WCUACs with a rated cooling capacity less than 65,000 Btu/h, as well as all classes of variable refrigerant flow multi-split air conditioners and heat pumps (VRF multi-split systems) but excluding single-phase systems with a rated cooling capacity less than 65,000 Btu/h, which are covered as consumer products. To inform interested parties and to facilitate this process, DOE has gathered data and has identified several issues that might warrant modifications to the currently applicable Federal test procedures, topics on which DOE is particularly interested in receiving comment. In overview, the issues outlined in this document mainly concern incorporation by reference of the most recent version of the relevant industry standard(s); efficiency metrics and calculations; clarification of test methods; and any additional topics that may inform DOE's decisions in a future test procedure rulemaking, including methods to reduce regulatory burden while ensuring the procedures' accuracy. These topics (and others identified by commenters) are ones which may be addressed in proposed test procedure amendments in a subsequent notice of proposed rulemaking (NOPR). DOE welcomes written comments and data from the public on any subject related to the test procedures for this equipment, including topics not specifically raised in this RFI.

DATES: Written comments, data, and information are requested and will be accepted on or before August 24, 2017.

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *https://www.regulations.gov.* Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE–2017–BT–TP–0018, by any of the following methods:

- *Federal eRulemaking Portal: www.regulations.gov.* Follow the instructions for submitting comments.
- *Email: CommACHeatingEquipCat 2017TP0018@ee.doe.gov.* Include EERE–2017–BT–TP–0018 in the subject line of the message.
- *Postal Mail:* Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, Mailstop EE–5B, Test Procedure RFI for Commercial Package Air Conditioning and Heating Equipment, Docket No. EERE–2017–BT–TP–0018 and/or RIN 1904–AD93, 1000 Independence Avenue SW., Washington, DC 20585–0121. If possible, please submit all items on a compact disc (CD), in which case it is not necessary to include printed copies.
- *Hand Delivery/Courier:* Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW., 6th Floor, Washington, DC 20024. Telephone: (202) 586–6636. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

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

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

The docket Web page can be found at: *https://www.regulations.gov/docket?D=EERE-2017-BT-TP-0018.* The docket Web page will contain simple instructions on how to access all documents, including public comments, in the docket. See section III of this document, Public Participation, for information on how to submit comments through *www.regulations.gov.*

FOR FURTHER INFORMATION CONTACT: Ms. Catherine Rivest, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE–5B, 1000 Independence Avenue SW., Washington, DC 20585–0121. Telephone: (202) 586–7335. Email: *ApplianceStandardsQuestions@ee.doe.gov.*

Mr. Eric Stas, U.S. Department of Energy, Office of the General Counsel, GC–33, 1000 Independence Avenue SW., Washington, DC 20585. Telephone: (202) 586–9507. Email: *Eric.Stas@hq.doe.gov.*

For further information on how to submit a comment, or review other public comments and the docket, contact the Appliance and Equipment Standards Program staff at (202) 586–6636 or by email: *ApplianceStandardsQuestions@ee.doe.gov.*

SUPPLEMENTARY INFORMATION:

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I. Authority and Background

Title III, part C[1] of the Energy Policy and Conservation Act of 1975 (EPCA or the Act), Public Law 94–163 (42 U.S.C. 6311–6317, as codified), added by Public Law 95–619, title IV, section 441(a), established the Energy Conservation Program for Certain Industrial Equipment, which includes provisions covering the types of commercial heating and air conditioning equipment that are the subject of this notice.[2] This covered equipment includes small, large, and very large commercial package air conditioning and heating equipment, which specifically includes variable refrigerant flow multi-split air conditioners and heat pumps (VRF multi-split systems),[3] computer room air conditioners (CRACs), dedicated outdoor air systems (DOASes), evaporatively-cooled commercial unitary air conditioners (ECUACs) less than 760,000 Btu/h, water-cooled commercial unitary air conditioners (WCUACs) less than 760,000 Btu/h, and air-cooled commercial unitary air conditioners (ACUACs) greater than or equal to 65,000 Btu/h and less than 760,000 Btu/h, all of which are addressed in this document. (42 U.S.C. 6311(1)(B)–(D))

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

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

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 (see 42 U.S.C. 6316(b); 42 U.S.C. 6296), and (2) making representations about the efficiency of that equipment (42 U.S.C. 6314(d)). Similarly, DOE must use these test procedures to determine whether the equipment complies with relevant standards promulgated under EPCA.

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

EPCA requires 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 the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) or by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), as referenced in ASHRAE Standard 90.1, ''Energy Standard for Buildings Except Low-Rise Residential Buildings'' (ASHRAE Standard 90.1), and that 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

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

[2] All references to EPCA in this document refer to the statute as amended through the Energy Efficiency Improvement Act of 2015, Public Law 114–11 (April 30, 2015).

[3] Not including single-phase VRF less than 65,000 Btu/h.

supported by clear and convincing evidence, that the amended test procedure would not meet the requirements in 42 U.S.C. 6314(a)(2) and (3) related to representative use and test burden. (42 U.S.C. 6314(a)(4))

ASHRAE Standard 90.1 was updated on October 26, 2016,[4] and this update made changes to the test procedure references in ASHRAE Standard 90.1–2013 for CRACs, as well as ACUACs, ECUACs, and WCUACs with cooling capacity ≥65,000 Btu/h and <760,000 Btu/h.[5] Additionally, ASHRAE Standard 90.1–2016 added efficiency levels and a test procedure for DOAS. These changes on the part of ASHRAE trigger DOE's obligation to review these test procedures pursuant to the requirements of EPCA.

EPCA also requires that DOE conduct an evaluation of test procedures at least once every seven years for each class of covered equipment to determine if an amended test procedure would more accurately or fully comply with the requirements in 42 U.S.C. 6314(a)(2) and (3). (42 U.S.C. 6314(a)(1)(A)) After this evaluation, DOE must either prescribe amended test procedures or publish a notice in the **Federal Register** regarding its determination not to amend test procedures. (42 U.S.C. 6314(a)(1)(A)(i) and (ii)) In either case, if DOE determines that a test procedure amendment is warranted, it must publish proposed test procedures and offer the public an opportunity to present oral and written comments on them. (42 U.S.C. 6314(b)) To amend a test procedure, DOE must determine the extent to which the proposed test procedure would alter the equipment's measured energy efficiency. If DOE determines that the amended test procedure would alter the measured efficiency of the covered equipment, DOE must amend the applicable energy conservation standard accordingly. (42 U.S.C. 6314(a)(4)(C); 42 U.S.C. 6293(e))

Although ASHRAE Standard 90.1–2016 did not include revisions to the test procedures for VRF equipment or ECUACs and WCUACs with cooling capacity <65,000 Btu/h, DOE is including such equipment in this RFI under DOE's 7-year lookback authority. The test procedures under review in this RFI are shown in Table I.1.

TABLE I.1—COMMERCIAL AIR CONDITIONING AND HEATING EQUIPMENT INCLUDED IN THE RFI

Equipment included in RFI	Review test procedure due to amendments to industry test or rating procedure?	Last test procedure (final rule)	7-Year review due (final rule)
CRAC	Yes	77 FR 28928 (May 16, 2012)	May 16, 2019.
DOAS	Yes	N/A	N/A.
ECUAC	Yes (≥65,000 Btu/h only*)	77 FR 28928 (May 16, 2012)	May 16, 2019.
WCUAC	Yes (≥65,000 Btu/h only*)	77 FR 28928 (May 16, 2012)	May 16, 2019.
ACUAC ≥ 65,000 Btu/h**	Yes	80 FR 79655 (Dec. 23, 2015)	Dec. 23, 2022.
VRF (except single-phase <65,000 Btu/h***).	No	77 FR 28928 (May 16, 2012)	May 16, 2019.

* DOE is considering ECUAC and WCUAC with cooling capacity less than 65,000 Btu/h in this rulemaking notice under its 7-year lookback authority.

** DOE will be considering ACUAC with cooling capacity less than 65,000 Btu/h under its 7-year lookback authority in a separate test procedure rulemaking.

*** Single-phase VRF with rated cooling capacity less than 65,000 Btu/h are covered under DOE's consumer product regulations for central air conditioners.

Upon completion of this proceeding, DOE expects to satisfy for all the equipment categories listed in Table I.1, both the requirements of EPCA pertaining to DOE action prompted by amendments to industry test or rating procedures, as well as EPCA's 7-year review requirements. In support of its test procedures, DOE conducts in-depth technical analyses of publicly-available test standards and other relevant information. DOE continually seeks data and public input to improve its testing methodologies to more accurately reflect customer use and to produce repeatable results. In general, DOE is requesting comment and supporting data regarding representative and repeatable methods for measuring the energy use of the equipment that is the subject of this RFI. As such, DOE is interested in feedback on any aspect of the test procedures for the identified equipment, but it is especially interested in receiving comment and information on the specific topics discussed below.

II. Discussion

This RFI discusses each category of equipment under consideration in separate sections set forth below. DOE seeks input to aid in the development of the technical and economic analyses regarding whether amended test procedures for each category of equipment may be warranted. Specifically, DOE is requesting comment on any opportunities to streamline and simplify testing requirements for each category of equipment discussed in this notice.

Additionally, DOE welcomes comments on other issues relevant to the conduct of this rulemaking that may not specifically be identified in this document. In particular, DOE notes that under Executive Order 13771, ''Reducing Regulation and Controlling Regulatory Costs,'' Executive Branch agencies such as DOE are directed to manage the costs associated with the imposition of expenditures required to comply with Federal regulations. See 82 FR 9339 (Feb. 3, 2017). Pursuant to that Executive Order, DOE encourages the public to provide input on measures DOE could take to lower the cost of its regulations applicable to the commercial equipment addressed in this notice consistent with the requirements of EPCA.

Within each section, DOE raises relevant issues regarding scope, efficiency metric, and test method, with a focus on changes identified by review of the updated test procedures in ASHRAE Standard 90.1–2016. As required by statute, DOE is considering amendments to the current test procedures (and in the case of DOAS, adoption of a new test procedure) to be consistent with those specified in

[4] There is no publication date printed on ASHRAE Standard 90.1–2016, but ASHRAE issued a press release on October 26, 2016, which can be found at *https://www.ashrae.org/news/2016/ashrae-ies-publish-2016-energy-efficiency-standard.*

[5] For water-source heat pumps, ASHRAE Standard 90.1–2016 included reference to a reaffirmation of the existing test procedure, and as such, does not constitute a change requiring DOE action.

ASHRAE 90.1–2016, where possible. Further, DOE requests comment on the benefits and burdens of adopting the industry test procedures referenced in ASHRAE 90.1–2016, without modification.

A. Test Procedure for Computer Room Air Conditioners

DOE's test procedure for CRACs, set forth at 10 CFR 431.96, currently incorporates by reference ASHRAE 127–2007, ''Method of Testing for Rating Computer and Data Processing Room Unitary Air Conditioners'', (omit section 5.11), with additional provisions indicated in 10 CFR 431.96(c) and (e). The energy efficiency metric is sensible coefficient of performance (SCOP) for all CRAC equipment categories. ASHRAE 90.1–2016 updated its test procedure reference for CRACs from ASHRAE 127–2007 to AHRI 1360–2016, ''Performance Rating of Computer and Data Processing Room Air Conditioners'', which in turn references ASHRAE 127–2012. This update on the part of ASHRAE triggered DOE to review its test procedure for CRACs. In addition, DOE is aware that the ASHRAE 127 committee is working on an updated version of that standard, and DOE may consider the updated version when it is available.

In order to ensure that potential adoption of AHRI 1360–2016 as the DOE test procedure for CRACs would satisfy statutory requirements, the following sections consider issues related to the reduced scope of AHRI 1360–2016 relative to ASHRAE 127–2007, as well as updates in the industry test standards to the test method and rating conditions. DOE also explores other CRAC-related issues including definitions and the efficiency metric.

1. Scope

a. Computer Room Cooling Application

The definition for ''computer room air conditioner'' in DOE's regulations does not include physical design differences, component characteristics, or performance features that distinguish CRACs from other commercial package air conditioning and heating equipment (*e.g.,* CUACs) used for comfort cooling.[6] In March 2012, DOE published a supplemental notice of proposed rulemaking (SNOPR) refining its proposed definition of ''computer room air conditioner.'' 77 FR 16769, 16772–16773 (March 22, 2012). In response to this SNOPR, several stakeholders commented about differences in performance features between CRACs and CUACs. Carrier commented that CRACs are designed to handle different load characteristics, most notably by focusing on sensible load and not latent cooling. (EERE–2011–BT–STD–0029, Carrier, No. 28 at p. 1) Panasonic commented that CRACs have a different operating range and that they operate with tighter tolerances on temperature and relative humidity than do CUACs. (EERE–2011–BT–STD–0029, Panasonic, No. 20 at pp. 68–69) Despite these comments, DOE was unable to determine any specific requirements on sensible load that would consistently differentiate CRACs from CUACs and allow it to incorporate performance characteristics into the CRAC definition. Therefore, on May 16, 2012, DOE adopted the current definition for ''computer room air conditioner'' that distinguishes them from CUACs based on application differences. 77 FR 28928, 28947–28948 (May 16, 2012; ''May 2012 final rule'').

A review of 1000 CRAC models in DOE's Compliance Certification Management System (CCMS) shows that all of these models have a sensible heat ratio (SHR) above 80 percent. In contrast, commercial air conditioners used for comfort cooling generally have SHRs between 65 percent and 80 percent. DOE notes that the indoor air test condition for CUACs has a higher relative humidity than the test condition for CRACs. Therefore, the SHR for any air conditioner will be higher when tested using the CRAC test condition than when using the CUAC test conditions. However, DOE is considering whether a specific SHR (*e.g.,* 80 percent at the test condition of CRACs) would be sufficient to differentiate CRACs from other CUACs.

Issue CRAC–1: DOE requests comment on the extent to which models of commercial package air conditioners are marketed and/or installed for use in both comfort cooling and computer room cooling applications. DOE also seeks comment on whether there are models rated for energy efficiency ratio (EER) or seasonal energy efficiency ratio (SEER) and not SCOP that are used for computer room cooling—if so, DOE requests comment and data on the extent of the use of such equipment for computer room cooling.

Issue CRAC–2: DOE seeks comment and data on whether a specific sensible heat ratio could be selected that would effectively and consistently distinguish CRACs from other classes of commercial package air conditioners. DOE also seeks comment on any other design differences or performance features that would help resolve this issue.

b. Configurations

The following sections discuss configurations of CRACs that DOE has identified on the market and for which DOE is considering potential modifications to its current test procedure.

i. Airflow Direction and Mounting Location

DOE's minimum efficiency standards for CRACs in 10 CFR 431.97 apply to down-flow and up-flow units, which is terminology typically applied to floor-mounted units. However, DOE's test procedure for CRACs in 10 CFR 431.96 is not limited to floor-mounted units. On January 15, 2015, DOE published a final guidance document (''January 2015 Guidance Document'') to clarify the coverage of horizontal free-discharge CRACs under DOE's regulations for CRACs set forth in 10 CFR part 431.[7] In the January 2015 Guidance Document, DOE clarified that while horizontal free-discharge CRACs are not subject to the energy conservation standards for CRACs, the 2012 test procedure final rule did not have an exception for any specific airflow direction (*i.e.,* down-flow, up-flow or horizontal-flow) or mounting type (*i.e.,* floor-mount, ceiling-mount).[8] Therefore, any manufacturer making representations of the energy consumption of CRACs (including ceiling-mounted ducted or free-discharge units or horizontal free-discharge units and all other equipment that meets the CRAC definition) must base these representations on tests conducted according to the current DOE test procedure. A manufacturer may request a test procedure waiver for a

[6] DOE defines ''computer room air conditioner'' as a basic model of commercial package air-conditioning and heating equipment (packaged or split) that is: used in computer rooms, data processing rooms, or other information technology cooling applications; rated for sensible coefficient of performance (SCOP) and tested in accordance with 10 CFR 431.96, and is not a covered consumer product under 42 U.S.C. 6291(1)–(2) and 6292. A computer room air conditioner may be provided with, or have as available options, an integrated humidifier, temperature, and/or humidity control of the supplied air, and reheating function. 10 CFR 431.92.

[7] The January 2015 Guidance document can be found as Document Number 2 in Docket Number EERE–2014–BT–GUID–0022.

[8] On October 7, 2015, DOE published a draft guidance document (''October 2015 Guidance Document'') seeking comment concerning the coverage of ceiling-mount ducted and free-discharge CRACs. (The October 2015 Guidance document can be found as Document Number 3 in Docket Number EERE–2014–BT–GUID–0022.) DOE has not yet finalized this guidance with respect to ceiling-mounted ducted and free-discharge CRACs. The draft guidance also took the position that such CRACs were not subject to standards, but the test procedure did not have an exception for any specific airflow direction.

basic model if it contains design features that prevent testing according to the DOE test procedure, or such testing may generate results that are unrepresentative of the true energy consumption of the basic model. 10 CFR 431.401. To date, DOE has not received any such waiver requests.

DOE notes that the scope of AHRI Standard 1360–2016 (AHRI 1360–2016), ''2016 Standard for Performance Rating of Computer and Data Processing Room Air Conditioners'', the test procedure referenced in ASHRAE 90.1–2016, excludes ceiling-mounted units, only covering floor-mounted units. As stated in the October 2015 Guidance Document, ASHRAE 127–2007 can be used to test ceiling-mounted units. DOE understands that the ASHRAE 127 committee is considering additional provisions that would apply specifically to ceiling-mounted equipment, but a revised ASHRAE 127 standard is not yet available. For those CRACs not addressed by AHRI 1360–2016, DOE may consider continuing to reference ASHRAE 127–2007 or updating to a revised version of ASHRAE 127 when published, if appropriate.

Issue CRAC–3: DOE requests comment on the appropriate test procedure for ceiling-mounted CRACs, considering that AHRI 1360–2016 does not address them, and the test burden associated with any such procedure.

ii. Three-Phase Portable Units

Several manufacturers market portable units for commercial use in data centers and computer rooms. On June 1, 2016, under its authority for regulating consumer products, DOE published a final rule that established a test procedure for portable air conditioners. 81 FR 35242. In addition, DOE issued a final rule to establish energy conservation standards for portable air conditioners. In a final determination published on April 18, 2016, DOE established a definition for ''portable air conditioner'' that excludes units that use three-phase power as a means of differentiating the portable air conditioners that are consumer products (and thus determined to be covered products) from those that could normally not be used in residential applications. 81 FR 22514, 22519–22520. DOE identified several models of portable units that are marketed for commercial computer room cooling applications and use three-phase power instead of single-phase power. This equipment does not meet DOE's definition for ''portable air conditioner'' and is not subject to DOE's current test procedures or standards for portable air conditioners. DOE considers any portable unit marketed for computer room cooling that is rated with SCOP and is not a covered consumer product under 42 U.S.C. 6291(1)–(2) and 6292 to meet its definition of ''computer room air conditioner.'' DOE is considering amendments to its test procedure for computer room air conditioners to better reflect usage in the field of portable units used for computer room cooling that are not covered consumer products, as applicable.

Issue CRAC–4: DOE requests comments on whether any specific provisions should be considered to address how to test portable units used in computer room cooling applications, such as whether they are typically ducted and, if so, what a representative minimum external static pressure (ESP) and return air temperature would be.

iii. Single Package Non-Floor-Mounted Air Conditioners

DOE identified several manufacturers that produce single package non-floor-mounted air conditioners (other than portable units) that are marketed specifically for cooling computer rooms, telecommunication rooms, and data centers. DOE identified such air conditioners designed for both interior and exterior installation. Of the exterior-mount units DOE identified, some meet DOE's definition for ''single package vertical air conditioner'' (one type of single-package vertical unit (SPVU)), while others are rooftop units. All of these identified models appear to meet DOE's definition for computer room air conditioners. Therefore, DOE is considering whether amendments are needed in its test procedure for CRACs to better reflect the in-field energy use and installation practices of single-package non-floor-mounted air conditioners used for computer room cooling.

Issue CRAC–5: DOE seeks information on the extent to which single-package non-floor-mounted air conditioners are used in computer room applications.

Issue CRAC–6: DOE seeks comment on whether special test procedure provisions should be developed for different kinds of single package non-floor-mounted air conditioners that are used for computer room cooling, including: (1) Whether such units are typically installed with supply/return air ducting; and (2) whether the test set-up described in ANSI/ASHRAE 37–2009, ''Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment,'' (ASHRAE 37–2009) is appropriate and if any additional test set-up provisions would be needed.

Issue CRAC–7: DOE requests comment on whether there are other configurations of commercial package air conditioners that are marketed for computer room cooling applications and that meet DOE's definition for CRAC, beyond floor-mounted units (*i.e.,* up-flow, down-flow, and horizontal discharge), ceiling-mounted units, portable units, indoor single package units, rooftop units, and certain SPVUs.

2. Energy Efficiency Descriptor

When ASHRAE 90.1–2016 amended its energy efficiency levels, it also updated its test procedure from ASHRAE 127–2007 to AHRI 1360–2016. AHRI 1360–2016 defines standard rating configurations and conditions and provides additional requirements for testing CRACs, but does not include a method of test. Instead, AHRI 1360–2016 references ASHRAE 127–2012 as the method of test. This test procedure change also updated the ASHRAE 90.1 efficiency metric for CRACs from SCOP to net sensible coefficient of performance (NSenCOP). DOE's current efficiency metric for CRACs is SCOP. As compared with SCOP, the new metric NSenCOP specifies different operating conditions for water-cooled and glycol-cooled models and adjusts the efficiency to account for the energy use associated with the water or glycol pump. These changes presumably result in a more accurate representation of the energy use associated with the equipment. Because ASHRAE 90.1 changed the metric to NSenCOP, EPCA requires that DOE must consider updating to NSenCOP as well. For completeness, DOE reviews other issues related to efficiency metrics for CRACs in this section, including: (1) Integrated efficiency metrics; (2) part-load operation due to unit oversizing; and (3) operation modes other than standard cooling mode. If DOE ultimately decides to change its metric from SCOP to NSenCOP, DOE would need to develop a crosswalk analysis to translate DOE's existing standards—which are in terms of SCOP—to the NSenCOP metric.

a. Integrated Efficiency Metrics

ASHRAE 127–2007 includes the integrated efficiency metric, adjusted sensible coefficient of performance (ASCOP), which is calculated based on the SCOPs at four different rating conditions (A, B, C, and D), representing different ambient conditions, with weightings for the SCOP at each rating condition based on the climate at a specific location. ASHRAE 127–2012 and AHRI 1360–2016 include an updated integrated efficiency metric, integrated net sensible coefficient of performance iNSenCOP, instead of ASCOP. There are differences between ASCOP and iNSenCOP, similar to those between SCOP and NSenCOP, but both are weighted averages of sensible-capacity-based efficiencies measured for operation at different ambient conditions.

The ASCOP and iNSenCOP test methods in ASHRAE 127–2007, ASHRAE 127–2012, and AHRI 1360–2016 require units to maintain a constant sensible cooling capacity at lower ambient temperatures. However, it is not clear how the lower-ambient tests are to be conducted. As the ambient temperature decreases, the maximum cooling capacity of a CRAC will inherently increase. ASHRAE 127–2012 does not provide guidance regarding how the unit should be controlled in order to deliver the same amount of sensible cooling as its capacity increases for the lower-ambient tests.

Issue CRAC–8: DOE requests comment on whether DOE should consider adopting an integrated efficiency metric (*e.g.,* iNSenCOP). Also if so, DOE requests comment on how the requirement to maintain a constant sensible cooling capacity associated with the iNSenCOP test procedure should be implemented during testing.

b. Part-Load Operation Due to Unit Oversizing

CRACs typically operate at part-load (*i.e.,* less than designed full cooling capacity) in the field. Reasons for this may include, but are not limited to, redundancy in installed units to prevent server shutdown if a CRAC unit stops working, and server room designers building in extra cooling capacity to accommodate additional server racks in the future. At part-load, single-speed systems cycle on and off to match the cooling requirement, while variable speed systems might operate at a different speed, but both control strategies change performance as compared to full-load operation. While the DOE test procedure measures performance at full-load, DOE estimated in its May 2012 final rule analysis that CRAC units operate on average at a sensible load of 65 percent of the full-load sensible capacity. (EERE–2011–BT–STD–0029–0021, pp. 4–15, 4–16). This may indicate a difference between DOE test procedure operating requirements and typical field operation. Therefore, DOE is considering whether this practice of oversizing should be factored into a CRAC efficiency metric to the extent that it would better represent an average use cycle.

Issue CRAC–9: DOE requests information on the range of typical field load levels for CRACs at conditions close to or at the maximum ambient outdoor air temperature conditions specified in the DOE test procedure for various unit capacities. DOE seeks input on typical rules of thumb for oversizing and whether the issues of oversizing of this equipment should be addressed in the efficiency metric.

c. Operation Modes Other Than Standard Cooling Mode

Many CRACs operate in air circulation mode. DOE understands that redundant units are usually installed in the computer room, and some of the redundant units can be controlled to operate in air circulation mode for better air movement. In this mode, the direct expansion refrigerant system is shut down, and only evaporator blowers and controls are on. DOE is considering whether the energy consumption of air circulation mode should be considered in the CRAC energy efficiency metric.

Issue CRAC–10: DOE seeks comment on the conditions under which CRACs will operate in air circulation mode (*i.e.,* operating the indoor fan without actively cooling) in the field, whether each CRAC switches automatically between standard cooling mode and air circulation mode, and if so, the time percentage that CRACs operate in such circulation mode. DOE also seeks comment on what fan setting(s) is used for air circulation mode and whether DOE should consider this energy use in the CRAC efficiency metric.

3. Industry Test Standards

In its test procedure for CRACs, DOE currently incorporates by reference ASHRAE 127–2007 (omitting section 5.11). 10 CFR 431.96. As mentioned previously, ASHRAE published an updated version of this test standard in 2012, ASHRAE 127–2012. ASHRAE 127–2012 includes several modifications from ASHRAE 127–2007, which are discussed in the following sections. DOE is aware that ASHRAE is working to update ASHRAE 127–2012, and DOE may consider the newer version of the test standard if it is published during the course of this rulemaking. As discussed previously, DOE is also aware that the referenced industry test procedure in ASHRAE Standard 90.1–2016 has changed to AHRI 1360–2016. The scope of AHRI 1360–2016 covers only floor-mounted computer and data processing room air conditioners, including up-flow, down-flow, and horizontal-flow units. AHRI 1360–2016 defines standard configurations and provides rating conditions and additional requirements for testing CRACs, but does not include a method of test. Instead, AHRI 1360–2016 references ASHRAE 127–2012 to conduct the test. Consequently, DOE will consider adopting both industry test standards. In the following sections, DOE discusses specific test procedure-related issues and questions regarding ASHRAE 127–2012 and AHRI 1360–2016.

a. Standard Models and Application Classes in AHRI 1360–2016

Indoor floor-mounted CRACs can be installed in different configurations, which vary by direction of airflow and connections (*e.g.,* raised floor plenum, ducted, free air). Instead of specifying test conditions for all possible combinations, AHRI 1360–2016 includes the concept of ''standard models'' that characterize common configurations and specify standard rating conditions (*e.g.,* external static pressure, return air temperature) for each style of indoor floor-mounted CRAC. Table C.1 of Appendix C of AHRI 1360–2016 defines four different standard models: (1) Down-flow (with raised floor plenum discharge and free air return); (2) horizontal-flow (with free air discharge and free air return); (3) up-flow ducted (with ducted discharge and free air return); and (4) up-flow non-ducted (with free air discharge and free air return). AHRI 1360–2016 also specifies which of the four standard model test set-ups and standard rating conditions apply for down-flow, horizontal-flow, and up-flow CRACs. For example, down-flow units are tested with a raised floor plenum discharge and a free air return.

DOE notes that for up-flow CRACs, AHRI 1360–2016 includes two standard models with associated standard rating conditions, one for ducted discharge connections and one for free air discharge. However, connection variations are characteristics of installations. A given up-flow unit could be installed either with or without a duct. DOE's research has not revealed that up-flow CRACs have physical characteristics that clearly distinguish them as ducted or non-ducted models. Hence, it is not clear which of the AHRI 1360–2016 up-flow standard model requirements would be used for testing.

Issue CRAC–11: DOE requests comment on what equipment characteristics can be used to determine whether up-flow CRACs should be tested as ducted or non-ducted models. DOE also requests comments on whether up-flow units can be sold for both up-flow ducted and up-flow non-ducted applications and whether such models are currently tested using both ducted and non-ducted standard rating conditions.

DOE also notes that, in addition to the four standard models of floor-mounted CRACs, Table C.1 of AHRI 1360–2016 also includes many additional combinations of connections, referred to as application configurations, but does not provide standard rating conditions for these configurations.

Issue CRAC–12: DOE requests confirmation that, although floor-mounted CRACs may be sold to be installed in multiple configurations, all models are capable of being tested as one of the four standard models identified in Table C.1 of AHRI 1360–2016.

AHRI 1360–2016 does not include standard models or standard rating conditions for ceiling-mount or non-floor mount CRACs. The current DOE test procedure, which incorporates by reference ASHRAE 127–2007, specifies different test operating conditions (*e.g.,* different external static pressure) than AHRI 1360–2016.

Issue CRAC–13: DOE requests comment on whether the test requirements of ASHRAE 127–2007 are representative of average use cycles for ceiling-mount and other non-floor-mounted CRACs. If not, DOE requests comment on which, if any, of the test requirements of AHRI 1360–2016 would more appropriately represent average use cycles for such CRACs.

b. ASHRAE 37 and Secondary Method

ASHRAE 127–2007 references ANSI/ASHRAE 37–2005, ''Methods of Testing for Rating Unitary Air-Conditioning and Heat Pump Equipment'' (ASHRAE 37–2005), while 127–2012 and AHRI 1360–2016 reference the updated version, ASHRAE 37–2009. ASHRAE 37–2005 and the updated ASHRAE 37–2009 describe test methods for measuring cooling capacity, heating capacity, and electrical energy use of air conditioners and heat pumps. However, it is not clear whether the industry test standards for CRACs reference specific provisions or all of the provisions of ASHRAE 37–2005 or ASHRAE 37–2009.[9] No alternate methods for determining cooling capacity are included in ASHRAE 127 or AHRI 1360. Therefore, DOE expects that manufacturers do use the test methods of ASHRAE 37–2005 or ASHRAE 37–2009 to determine cooling capacity, sensible cooling capacity, and electric energy use of CRACs. DOE is considering updating the DOE test procedure to clarify that the test method is based on ASHRAE 37–2009, except as modified or adjusted by ASHRAE 127–2012 or AHRI 1360–2016.

Issue CRAC–14: DOE seeks comment on whether the test method of ASHRAE 37–2009 is appropriate for measuring capacity, sensible capacity, and electric energy use for all configurations of CRACs (including configurations for which DOE does not currently prescribe energy conservation standards).

Table 2b in section 8 of ASHRAE 37–2009 includes test operating tolerances (maximum allowable observed range) and condition tolerances (maximum variation of the average from a specified test condition) for several parameters, including air and fluid temperatures, in order to reduce the uncertainty of the measurement of cooling capacity, heating capacity, and/or energy use of air conditioners or heat pumps. However, this section of ASHRAE 37–2009 is not explicitly referenced by the CRAC industry test standards. Section 5.1 of ASHRAE 127–2007 and section 5.2.1 of ASHRAE 127–2012 only include an operation tolerance for the room temperature, and no versions of ASHRAE 127 or AHRI 1360 include any other tolerances. DOE considers the tolerances of Table 2b of ASHRAE 37–2009 to be relevant for CRACs and important to reduce variability of key CRAC performance measurements.

Issue CRAC–15: DOE requests comment on whether any operating or condition tolerances included in Table 2b in section 8 of ASHRAE 37–2009 are not appropriate for CRACs. If any are not appropriate, DOE requests an explanation as to why and suggestions on how the tolerances should be changed.

Section 7.2.1 of ASHRAE 37–2009 requires that when testing equipment with a total cooling capacity less than 135,000 Btu/h, simultaneous capacity tests using the indoor air enthalpy method and one other applicable method must be conducted. Specifically, these other test methods include the outdoor air enthalpy method, the compressor calibration method, the refrigerant enthalpy method, and the outdoor liquid coil method. Table 1 in section 7 of ASHRAE 37–2009 specifies which of these test methods are applicable for each equipment configuration and method of heat rejection in cooling mode. Section 10.1.2 of ASHRAE 37–2009 requires that the total cooling capacity calculated from the two simultaneously conducted methods agree within 6.0 percent.

For CRACs with cooling capacity less than 135,000 Btu/h, DOE is considering whether its test procedure should require a secondary test method and how agreement between the primary and secondary methods should be evaluated. DOE is also considering whether the primary and secondary tests should be based on total cooling capacity or sensible cooling capacity. Basing these tests on sensible cooling capacity may be more appropriate because it is the basis of the CRAC efficiency metric in both ASHRAE Standard 90.1 and the current Federal standard.

Issue CRAC–16: DOE seeks comment on whether a secondary test is appropriate for testing CRACs, for what range of cooling capacity such a requirement should apply for CRACs, how the requirement should be applied (given that most secondary test methods measure total rather than sensible capacity), and what level of agreement (in percent) should be required. DOE is also interested in detailed information on whether there would be a significant additional test burden resulting from a secondary test—and if so, the nature and extent of that burden.

Many CRACs have compressors housed in their indoor units. ASHRAE 37–2009 specifies modification of the indoor enthalpy method as depicted in its Figure 3, Calorimeter air enthalpy test method arrangement, for capturing the impact of compressor heat on the capacity measurement. However, none of the industry test standards explicitly call for using this test set-up for CRAC indoor units to take into consideration the cooling capacity reduction associated with compressor heat.

Issue CRAC–17: DOE requests comment on whether it is appropriate to incorporate the impact of compressor heat in sensible capacity measurements for CRACs with compressors housed in their indoor units. DOE requests that the comments provide an explanation as to why it is or is not appropriate, and whether the answer depends on the specific CRAC configuration.

c. Minimum External Static Pressure

ASHRAE 127–2007, ASHRAE 127–2012, and AHRI 1360–2016 all contain different minimum external static pressure (ESP) levels and categories, as indicated in Table II.1. In ASHRAE 127–2012, the minimum ESP levels are the same as for ASHRAE 127–2007, but ASHRAE 127–2012 defines ''ducted systems'' as ''air conditioners intended to be connected to supply and/or return ductwork'' instead of ''to supply and return ductwork,'' as specified in ASHRAE 127–2007.

[9] For example, in ASHRAE 127–2007, the reference to ASHRAE 37–2005 is located under a subsection 5.1.4.5.2 titled, ''Raised Floor Plenum Systems'' which is located under section 5.1.4.5 titled ''External Resistance, Ducted Connected, Floor Plenum and Free Air Discharge.''

TABLE II.1—EXTERNAL STATIC PRESSURE REQUIREMENTS

Test standard	CRAC Category	Minimum ESP (in. w.c.)
ASHRAE 127–2007 and ASHRAE 127–2012.	Ducted:	
	Net Sensible Capacity < 20 kW	0.8
	Net Sensible Capacity ≥ 20 kW	1.0
	Free Discharge	0.0
AHRI 1360–2016	Up-flow Ducted:	
	Net Sensible Capacity <65 kBtu/h	0.3
	Net Sensible Capacity ≥65 kBtu/h and <240 kBtu/h	0.4
	Net Sensible Capacity ≥240 kBtu/h and <769 kBtu/h	0.5
	Horizontal and Up-flow Non-ducted	0.0
	Down-flow	0.2

DOE is considering the test procedures and the ESP levels of AHRI 1360–2016, but seeks input on the significant difference in the ESP values of the different test standards. Additionally, AHRI 1360–2016 does not include minimum ESP requirements for ceiling-mounted units. AHRI–1360–2016 also made very significant changes to the ESPs for up-flow ducted and down-flow configurations compared to ASHRAE 127–2012. DOE received no data or information from ASHRAE indicating the rationale for the changes or why lower static pressures are more representative of field performance. Thus, DOE is particularly interested in any information regarding the static pressures that are likely representative of all CRACs.

Issue CRAC–18: DOE requests comment on whether the ESP levels required by AHRI 1360–2016 are representative of field operation for floor-mounted CRACs.

Issue CRAC–19: DOE requests information on whether the ESP levels required by ASHRAE 127–2012 are representative of field operation for ceiling-mounted CRACs and for other non-floor-mounted CRAC configurations, and if not, what a representative minimum ESP would be.

DOE's review of CRAC installation manuals suggests that some up-flow units are installed with a plenum box that redirects the airflow from the upwards direction to the front or rear.

Issue CRAC–20: DOE requests comment on the percentage of up-flow CRAC installations in which a plenum box that redirects air from the upward direction to the front or rear would be attached, and whether non-ducted units are tested with or without this plenum.

DOE identified several models of air-cooled CRACs that have an indoor condenser and, therefore, may require ducting of condenser air. Neither AHRI 1360–2016 nor ASHRAE 127–2013 address the possibility of condenser ducting, and accordingly, would call for testing such CRACs like others in free-inlet and free-discharge mode. However, this might not be representative of field operation. The condenser fan for a CRAC with a ducted condenser has to overcome the additional pressure drop of the ducts; thus, imposing a minimum ESP requirement for testing may better reflect field operating conditions than testing the unit with free air inlet and discharge. However, this could require attaching an apparatus to allow adjustment of ESP, which would add to test burden. Alternatively, if a well-defined air duct set-up for indoor condensers could be developed (*e.g.,* specific length and cross-sectional dimensions for the inlet and/or outlet air duct), a standardized airflow resistance could be imposed without requiring a similar connection and adjustment of the airflow and measurement apparatus as used for measurement of indoor airflow, which could significantly reduce test burden.

Issue CRAC–21: DOE seeks comment on how to set up the condenser air flow when testing CRACs manufactured with condenser air inlet and outlet connections and high-static condenser fans, which indicate that such units can be installed indoors with the condenser air ducted to and from the outdoors. Additionally, DOE requests comment on whether some CRACs can be installed with or without condenser ducting, and if so, how often these units are typically installed with condenser ducting. DOE also seeks comment on whether certain CRAC configurations are more likely to be installed with condenser ducting.

d. Setting Indoor Airflow

DOE currently requires manufacturers to certify the indoor airflow for CRACs. However, DOE's test procedure and industry test standards do not impose tolerances on achieving the certified airflow and/or the minimum ESP during testing. The performance of any air conditioner can be significantly affected by operation with indoor airflow that is very different from the intended airflow.

For ACUACs with capacity ≥65,000 Btu/h, DOE established a requirement that the full-load indoor airflow rate must be within ±3 percent of the certified airflow. 80 FR 79655, 79671 (Dec. 23, 2015; ''December 2015 CUAC TP final rule''). Tolerance for ESP in this test is −0.00/+0.05 in. w.c. In contrast, for consumer central air conditioners and heat pumps (CAC/HPs), the method for setting indoor air volume rate for ducted units without variable-speed constant-air-volume-rate indoor fans is a multi-step process that addresses the discrete-step fan speed control of these units. In this method, (a) the air volume rate during testing may not be higher than the certified air volume rate, but may be 10 percent less, and (b) the ESP during testing may not be lower than the minimum specified ESP, but may be higher than the minimum if this is required to avoid having the air volume rate overshoot its certified value. 81 FR 36992, 37026 (June 8, 2016; ''June 2016 CAC TP final rule'').

Issue CRAC–22: DOE seeks information on how certified airflow is achieved in laboratory testing of CRACs, both with indoor blowers that are continuously variable and for indoor blowers that are adjustable in discrete steps. DOE also seeks comments on whether the tolerances for setting airflow of commercial CUACs or of CAC/HPs are appropriate for CRACs, and what tolerances would be appropriate for airflow and ESP.

e. Refrigerant Charging Instruction

Neither the ASHRAE nor the AHRI testing standards for CRACs include specific instructions for refrigerant charging. The June 2016 CAC TP final rule provides a comprehensive approach for charging intended to improve test reproducibility. The approach indicates which set of installation instructions to use for charging, explains what to do if there are no instructions, indicates that target values of parameters are the centers of the ranges allowed by installation instructions, and specifies tolerances for the measured values. 81 FR 36992, 37030–37031. An approach that details methods such as these could improve the CRAC test method.

Issue CRAC–23: DOE requests comments on what refrigerant charging requirements should be considered to establish reproducible test results for CRACs, and whether the approach developed for CAC/HP products may be appropriate. Also, DOE seeks comments on the typical operating conditions at which the unit is charged in the field and/or what conditions should be used to set refrigerant charge for testing purposes.

Issue CRAC–24: DOE requests comments on any other issues related to the adoption of AHRI 1360–2016 as the test procedure for CRACs.

B. Test Procedure for Dedicated Outdoor Air Systems

DOASes appear to meet the EPCA definition for ''commercial package air conditioning and heating equipment,''[10] and could be considered as a category of that covered equipment. (42 U.S.C. 6311(8)(A)) However, DOE has tentatively concluded that if DOASes are a category of ''commercial package air conditioning and heating equipment,'' there are no existing DOE test procedures or energy conservation standards for that category of commercial package air conditioning and heating equipment. Specifically, DOE does not believe that DOAS are among the commercial ''central air conditioners and central air conditioning heat pumps'' for which EPCA originally established standards (42 U.S.C. 6313(a)(1)–(2), (7)–(9)), and for which the current test procedure and standards are codified in Table 1 to 10 CFR 431.96 and Tables 1–4 of 10 CFR 431.97 (as air conditioners and heat pumps).

Neither EPCA nor DOE defines commercial ''central air conditioners and central air conditioning heat pumps.'' DOASes operate similarly to commercial central air conditioners and central air conditioning heat pumps, in that they provide space conditioning using a refrigeration cycle consisting of a compressor, condenser, expansion valve, and evaporator. However, DOASes are designed to provide 100 percent outdoor air to the conditioned space, while outdoor air makes up only a small portion of the total airflow for typical commercial air conditioners, usually less than 50 percent. When operating in humid conditions, the dehumidification load is a much larger percentage of total cooling load for a DOAS than for a typical commercial air conditioner. Additionally, compared to a typical commercial air conditioner, the amount of total cooling (both sensible and latent) is much greater per pound of air for a DOAS at design conditions (*i.e.,* the warmest/most humid expected summer conditions), and a DOAS is designed to accommodate greater variation in entering air temperature and humidity. DOASes are typically installed in addition to a primary cooling system (*e.g.,* CUAC, VRF, chilled water system, water-source heat pumps)—the DOAS conditions the outdoor ventilation air, while the primary system provides cooling to balance building shell and interior loads and solar heat gain. DOE is considering whether there is a need for definitions of ''commercial central air conditioners and central air conditioning heat pumps'' and ''dedicated outdoor air systems'' to clarify this distinction. If DOE determines this necessary, it would do so through a future rulemaking proceeding.

ASHRAE 90.1–2016 created separate equipment classes for DOAS units and set minimum efficiency levels using the integrated seasonal moisture removal efficiency (ISMRE) metric for all DOAS classes and the integrated seasonal coefficient of performance (ISCOP) metric for air-source heat pump and water-source heat pump DOAS classes. Both metrics are measured in accordance with AHRI Standard 920–2015, ''Performance Rating of DX-Dedicated Outdoor Air System Units'' (AHRI 920–2015). AHRI 920–2015 references ASHRAE Standard 198–2013, ''Method of Test for Rating DX-Dedicated Outdoor Air Systems for Moisture Removal Capacity and Moisture Removal Efficiency'' (ASHRAE 198–2013), as the method of test for DOAS units.

DOE must adopt the industry standard designated by ASHRAE 90.1 unless it is not consistent with EPCA requirements. Accordingly, DOE is considering the test methods of AHRI 920–2015 and ASHRAE 198–2013, but may consider modifications of these test methods if necessary to fulfill the EPCA requirements. In the following sections, DOE reviews potential definitions and efficiency metrics for DOAS, as well as questions regarding the test method in the industry standards.

1. Definition

As stated previously, DOE is considering how to define ''dedicated outdoor air system.'' Both AHRI 920–2015 and ASHRAE 198–2013 include definitions for DOAS. DOE may adopt one of these definitions, but it may also adjust the definition to assure that it is clear and complete. The following sections address different aspects of the definitions provided in the industry test standards.

a. Air Intake Source and Dehumidification Capability

Both AHRI 920–2015 and ASHRAE 198–2013 define a DOAS as a product that dehumidifies 100-percent outdoor air to a low dew point. However, section 6.6 of ASHRAE 198–2013 provides requirements for dampers not used for introducing outdoor air, suggesting that some DOAS units take in some percentage of return air. Accordingly, DOE has identified models from multiple manufacturers that are advertised as DOASes, but which incorporate a damper-controlled return air inlet that allows return air to be mixed with outdoor air.

CUACs also often incorporate a damper to mix return air and outdoor air. Additionally, CUACs also can dehumidify 100-percent outdoor air, although generally not to a dew point as low as DOASes. Hence, DOE is concerned that the dehumidification capability and/or the range of percentage of return air flow may have to be quantified to distinguish DOASes and CUACs.

Issue DOAS–1: DOE requests information on the range of the maximum percentage of return air intake relative to total air flow of DOAS models in order to determine whether the maximum return air percentage is an important DOAS distinguishing feature.

Issue DOAS–2: DOE requests comment on the differences in dehumidification capabilities of CUACs and DOASes when operating with 100-percent outdoor air. Specifically, DOE seeks comment on whether a difference can be quantified to be a clear differentiating feature of DOASes—for example, can a specific dew point criterion for a given set of outdoor air conditions be established that can be achieved by any DOAS, but that no conventional CUAC can achieve?

b. Reheat

DOE is interested in determining how the ability to reheat dehumidified air should be incorporated into the definition of a DOAS. The AHRI 920–2015 definition requires that a DOAS

[10] Under the statute, ''commercial package air conditioning and heating equipment'' means air-cooled, water-cooled, evaporatively-cooled, or water-source (not including ground-water-source) electrically operated, unitary central air conditioners and central air conditioning heat pumps for commercial application.

include reheat ''capable of controlling the supply dry-bulb temperature of the dehumidified air to the designed supply air temperature,'' whereas the ASHRAE 198–2013 definition indicates only that DOASes may have this functionality. The ASHRAE 198–2013 definition indicates that the DOAS might also have a supplemental heat system ''for use when outdoor air requires heating beyond the capability of the refrigeration system and/or other heat transfer apparatus.'' Supplemental heating is also mentioned in the note below the AHRI 920–2015 definition.

Issue DOAS–3: DOE requests comment on whether and how reheating functionality should be included in the DOAS definition. If reheat should be required for a unit to be considered a DOAS, DOE requests comment on whether a minimum reheat capacity should be specified in the definition. DOE also requests information to clarify the difference between a reheat system and a supplementary heat system in a DOAS—for example, if reheat is required for a DOAS, can it be a supplementary reheat system (*i.e.,* one that uses a heat source other than warm refrigerant or heat recovered from the return air)?

2. Energy Efficiency Descriptors

a. Dehumidification Metric

ISMRE is a seasonal efficiency metric calculated based on moisture removal efficiency (MRE) at four different dehumidification rating conditions. The weighted values are derived from bin hour data (*i.e.,* temperature/humidity data for a selection of representative cities indicating the number of hours of occurrence of each ''bin'' representing a defined range of temperature and humidity) to represent seasonal operation. MRE is calculated as moisture removal capacity (MRC) divided by the total energy input, as described in ASHRAE 198–2013 section 10.6.

DOE is seeking clarification on the calculation procedure for ISMRE. ASHRAE 198–2013 indicates measuring MRE twice for each test condition, once with reheat on and once with reheat off. AHRI 920–2015 does not specify which of these values of MRE is used in the calculation of ISMRE. AHRI 920–2015 section 6.1.3.1 calls for a supplemental heat penalty if the supply air temperature is less than 70 °F, but the incorporation of this penalty into the MRE equation is not clearly described. It is also not clear whether the ASHRAE 198–2013 test method considers this penalty. Finally, the equation for the supplemental heat penalty in AHRI 920–2015 appears to be missing the supply air volume flow rate as a factor.

Issue DOAS–4: DOE requests information to clarify the calculation procedure for ISMRE. Specifically, DOE requests input on which dehumidification test MRE should be used (and why), how and when the supplementary heat penalty is applied, and the basis for the supplementary heat equation.

While the primary functions of DOASes are to provide ventilation and to dehumidify the outdoor air, the units also provide sensible cooling to the supplied air stream. However, the sensible cooling provided by the unit is not accounted for as part of the MRE or ISMRE efficiency metric. DOE is aware that the total sensible cooling provided may be significantly less than the latent cooling associated with removal of moisture—for example, conditions C and D of Tables 2 and 3 of AHRI 1360–2016 specify inlet air conditions already cooler than the target 70 °F supply temperature—but sensible cooling may be important enough to consider for the warmer test conditions.

Issue DOAS–5: DOE requests comment on whether the DOAS efficiency metric should also account for sensible cooling provided for ventilation air during the cooling/dehumidification season.

The ISMRE metric is based on testing at four different operating conditions, involving specification of both dry bulb and wet bulb outdoor temperature. A weighted average of the MRE measurements determined for the four conditions is calculated to obtain ISMRE. DOE test procedures must provide a measurement that is representative of an average use cycle for the tested equipment. (42 U.S.C. 6314(a)(2)) Among the considerations that might be relevant in defining the test conditions and weighting factors is the fact that ventilation air must be delivered to occupied spaces during occupied hours, which would put more emphasis on daytime hours for development of the metric.

Issue DOAS–6: DOE seeks information about analysis of climate data relevant to the development of the ISMRE test conditions and weighting factors in order to confirm that the metric provides a measurement that is representative of an average use cycle for DOAS equipment.

b. Heating Metric

ISCOP is a seasonal energy efficiency descriptor calculated as the weighted average of heating COP determined for two different heating rating conditions. DOE test procedures must provide a measurement that is representative of an average use cycle for the tested equipment. (42 U.S.C. 6314(a)(2)) Section 6.4 of AHRI 920–2015 indicates that the weighting factors for the COPs are derived from bin hour data to represent a full year of operation.

Issue DOAS–7: DOE seeks information about analysis of climate data relevant to the development of the ISCOP test conditions and weighting factors in order to allow confirmation that the metric provides a measurement that is representative of an average use cycle for DOAS heat pump equipment.

''Integrated seasonal coefficient of performance,'' as defined in AHRI 920–2015, is an energy efficiency metric for water-source heat pumps. However, DOE notes that ASHRAE 90.1–2016 includes ISCOP minimum efficiency levels for air-source heat pumps (heating mode) in Table 6.8.1–16 in addition to water-source heat pumps. ASHRAE 198–2013 section 10.9 claims that its equations for calculating COP are for water-source heat pumps, although the COP definition in ASHRAE 198–2013 does not exclude air-source heat pumps, and the equations should apply equally well for air-source heat pumps. Finally, DOE notes that tests conducted at 35 °F dry bulb temperature for consumer central air conditioning heat pumps (which are air-source) consider the impacts of defrosting of the outdoor coil in the energy use measurement (see section 3.9 of 10 CFR part 430, subpart B, appendix M), while defrost is not discussed at all in ASHRAE 198–2013. Defrost has a real impact on efficiency because of energy use associated with defrost and because a system cannot continue to provide heating during defrost operation, thereby reducing time-averaged capacity. Hence, consideration of defrost could provide a more field-representative measurement of performance.

Issue DOAS–8: DOE seeks input on the calculation procedure for the COP of air-source heat pump DOASes, including whether testing for test condition E of AHRI 920–2015 Table 2 (35 °F dry bulb/29 °F wet bulb) should consider energy use associated with defrost.

The COP equation of ASHRAE 198–2013 section 10.9 uses the term q_{hp} to represent the heating capacity in the COP calculation. This term does not appear in the nomenclature section, but the subscript ''hp'' suggests that this includes only heat provided by the heat pumping function of the DOAS unit. However, the equation defining q_{hp} is based on supply air temperature, suggesting that any of the possible additional methods for providing heat (*e.g.,* supplemental heat, heat recovery) may contribute to q_{hp} and thereby boost COP by increasing the numerator of the COP equation. The COP equation includes only electric power input in the denominator and does not include energy use that might be associated with fuel-fired supplemental heat. In addition, the supplemental heat penalty of AHRI 920–2015 section 6.1.3.1, which the section states applies to the heating test conditions as well as the dehumidification test conditions, seems to penalize the COP calculation excessively, because it does not indicate that the additional heating should be added to the q_{hp} of the COP equation.

Issue DOAS–9: DOE seeks input on the calculation for COP and how the supplemental heat penalty is included. DOE also seeks input on how the heating capacity and power/fuel consumption of various supplemental heating sources are accounted for as part of the COP equation and how DOAS manufacturers incorporate the impacts of these sources in their ISCOP calculations.

3. Test Method

a. Airflow

i. Supply Airflow

Section 5.2.2 of AHRI 920–2015 specifies instructions regarding supply airflow rate. Section 5.2.2.1 of that industry standard requires either use of the supply airflow that occurs at the minimum external static pressure of Table 4 or a manufacturer-specified lower leaving airflow rate that occurs with higher external static pressure. Section 5.2.2.3 of that industry standard further requires that the manufacturer specify a single airflow for all tests. However, many DOAS systems can operate over a range of airflow rates, and DOE expects that their indoor fans can be set up with a range of speeds to accommodate the airflow range and the variation in duct length in field installations. Further, some DOAS systems are employed for demand ventilation use, for which reduced airflow will likely be required for a significant portion of the unit's use. Such systems also are likely to have variable-speed indoor fans, whose speed settings for the test may also have to be defined clearly. The performance of the DOAS may vary significantly from the low end to the high end of the rated installation airflow range. DOE is concerned that the selected airflow rate may not provide a representative indication of field use, and that there may not be sufficient clarity regarding how to set up for testing a unit with multiple indoor fan speed options.

Issue DOAS–10: DOE requests input on the appropriate selection of the supply airflow rate for testing units that can operate with a range of airflow rates. DOE requests information regarding how manufacturers select the airflow rate for testing and any data demonstrating the variation of DOAS unit performance over a range of installed airflow rates.

Issue DOAS–11: DOE requests comment on whether it would be appropriate to develop a test that includes part-load (reduced ventilation air) test points to quantify the efficiency benefit of demand-controlled ventilation for DOASes that are capable of operating with this control.

ii. Return Airflow

For testing DOAS units with energy recovery,[11] Tables 2 and 3 in AHRI 920–2015 provide return airflow temperature conditions and indicate that they apply to units with energy recovery at balanced airflow (*i.e.,* tested with supply airflow equal to exhaust airflow). It is unclear what airflow streams should be balanced, how to determine if they are balanced, and within what tolerances they should be balanced. DOE is considering clarifying the return airflow set-up procedures.

Issue DOAS–12: DOE requests comment regarding how manufacturers who have tested heat recovery DOAS set up return airflow for testing DOAS units with energy recovery as prescribed by the AHRI 920–2015 test standard. Further, DOE requests comment on whether balanced airflow is representative of field installation, and what ESP levels should be set up for the return airflow.

iii. Exhaust Air Transfer Ratio

Exhaust air transfer ratio (EATR) is an indicator of the amount of air that leaks from the return air side of the energy recovery wheel to the supply air side. Such leakage could increase the apparent dehumidification provided by a DOAS unit because the return air is less humid than the outdoor air into which the return air could leak—thus, high leakage could boost the ISMRE rating without providing any real benefit. However, DOE recognizes that such leakage may be low enough in most energy recovery wheels that the EATR measurement would represent an unnecessary addition to test burden.

Issue DOAS–13: DOE seeks comments on whether EATR should be included in DOE's test procedure for DOAS, and, if so, how it should be used in determining DOAS ratings. DOE requests information on the range of return air leakage typical for energy recovery wheels used in DOASes.

b. Liquid Flow

i. Water Flow Rate for Water-Source DOASes

Neither AHRI 920–2015 nor ASHRAE 198–2013 provides requirements for outlet water temperature or water flow rate for water-cooled units. Instead, AHRI 920–2015 specifies a standard rating test water entering temperature in Table 2 and requires in section 6.1.4.3 that the manufacturer specify a water flow rate, unless it is controlled automatically by the device. However, ANSI/AHRI 340/360–2007 with addenda 1 and 2, ''Standard for Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment'' (AHRI 340/360–2007) and ANSI/AHRI 210/240–2008 with addenda 1 and 2, ''Standard for Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment'' (AHRI 210/240–2008), which cover performance rating for water-cooled commercial air-conditioning equipment, employ a different method. Both of these standards specify water inlet and outlet temperatures for the standard rating conditions, rather than relying on manufacturers to determine water flow rate. Further, both standards specify that the full-load water flow rate determined for the standard rating conditions should also be used for IEER part-load rating conditions. DOE believes that these approaches to testing reflect the typical design temperature differential for cooling towers serving water-cooled equipment, and a very common approach for control of condenser water pumps, and hence it is not clear why the same approach would not be adopted for water-cooled DOAS.

Issue DOAS–14: DOE requests information on how condenser water flow rates are set in the field and how they are controlled at part load. DOE also requests comment on whether the provisions of section 6.1.4.3 of AHRI 920–2015 provide sufficient guidance regarding how to set up water flow for DOASes with automatic water flow control systems.

[11] DOAS units with energy recovery take in and discharge exhaust air, using a device such as an energy recovery wheel that can transfer heat and moisture from the exhaust air to the outdoor air, thereby preconditioning the outdoor air and reducing the load required to cool, dehumidify, or heat the air to the desired supply conditions.

ii. Energy Consumption of Pumps and Fans for Water-Source Condensers

AHRI 920–2015 offers Equation 1 for calculating the total pump effect (PE), an estimate of the energy consumption of non-integral water pumps (*i.e.,* pumps that are not part of the DOAS unit and whose power consumption would, therefore, not already be part of the measured power). Section 6.1.3 of AHRI 920–2015 implies that this calculation applies solely to water pumps serving refrigerant-to-liquid heat recovery devices—no indication is given whether the equation also applies for pumps serving water-source or water-cooled condensers—although it is possible that the term ''refrigerant-to-liquid heat recovery device'' refers to the condenser of a water-source heat pump DOAS. Further, neither AHRI 920–2015 nor ASHRAE 198–2013 mention accounting for the energy consumption of heat recovery fans for water loops or water-cooled condensers. In contrast, AHRI 340/360–2007, which is used for rating water-cooled CUACs, provides in section 6.1 a power consumption allowance for both the cooling tower fan and the circulating water pump.

Issue DOAS–15: DOE requests confirmation that the ''refrigerant-to-liquid heat recovery device'' cited in section 6.1.3 of AHRI 920–2015 is intended to include heat exchangers used for rejection of refrigerant circuit heat during the dehumidification cycle, and comment on whether Equation 1 of this section for estimating the energy usage of water pumps is appropriate for DOASes with water-cooled condensers.

Issue DOAS–16: DOE requests comment on accounting for the energy consumption for heat-rejection fans employed in water-cooled or water-loop DOASes.

iii. Energy Consumption for the Chiller System for Liquid-Cooled DOAS Using Chilled Water for Condenser Cooling

One of the options for testing water-cooled DOAS is to provide condenser cooling water at 45 °F, replicating operation in which condenser cooling is provided by a chilled water system. When operating in this fashion, the chilled water system must expend additional energy to maintain the 45 °F supply water condition—it is not clear that this energy is considered in the ISMRE metric. Without this energy use contribution, the ratings for such equipment would appear to be have an unfair advantage in comparison to the ratings for DOAS rated using cooling tower water. The minimum efficiency levels in ASHRAE 90.1–2016 for both equipment classes certainly do reflect this advantage, with the ISMRE levels being 4.9 for water-cooled DOAS using cooling tower water and 6.0 for those using chilled water. Although the 6.0 ISMRE level for chilled-water-cooled operation appears to be much more efficient, it does not include the energy use associated with the chiller system required to deliver the chilled water at the specified 45 °F.

Issue DOAS–17: DOE requests comment on whether energy contributions should be considered for the chiller system of a water-cooled DOAS that is rated for use with chilled water for condenser cooling. If so, DOE requests comment on the appropriate representative value for the chiller system energy contribution.

c. Test Conditions

i. Supply Air Conditions

AHRI 920–2015 includes a requirement of minimum supply air temperature of 70.0 °F for all standard rating conditions and a maximum dew-point temperature of 55.0 °F for standard rating conditions for dehumidification. ASHRAE 198–2013 requires a supply air temperature of 75.2 °F or as close to this value as the controls will allow during testing.

Issue DOAS–18: DOE requests comment or clarification related to the difference in target supply air temperature requirements between AHRI 920–2015 and ASHRAE 198–2013. DOE requests comments as to the appropriate supply air temperature for use in the DOE test procedure for DOAS.

ii. Cooling Tower and Closed-Loop Water-Source Differences

The water entering temperature test conditions in AHRI 920–2015 Table 2 for testing water-cooled DOAS differ from the water-source heat pump inlet temperature conditions specified in Table 3 for water-source heat pump DOAS tested using the ''water source'' test conditions. Water-source water loops generally provide heat rejection using cooling towers. Hence, it is unclear that there is much value in having incremental differences for the dehumidification test conditions for these types of equipment.

Issue DOAS–19: DOE requests comment on the need for different dehumidification test conditions for a water-cooled DOAS as compared to a water-source heat pump DOAS using the closed water loop test conditions.

iii. Water-Cooled Condensing and Ground-Source Equipment

Tables 2 and 3 in AHRI 920–2015 include two categories for water-cooled DOASes and three categories for heat pump DOASes. The test standard specifies a different set of inlet water/fluid temperatures for each category. The different categories and their associated rating conditions could require some DOASes to be tested separately as different basic models. For example, water-cooled DOASes that can be operated with either chilled water or condenser water would have to be tested and rated in both configurations. Similarly, ASHRAE 90.1–2016 includes three rating subcategories for water-source heat pump DOASes—ground-source, closed loop; ground-water-source; and water-source. The EPCA definition for ''commercial package air conditioning and heating equipment'' does not include ground-water-source products (42 U.S.C. 6311(8)(A)), but ground-source and water-source heat pumps would be covered by DOE with two different rating conditions. DOE is considering whether such dual rating and certification is appropriate.

Issue DOAS–20: DOE requests comment on whether condenser cooling by cooling tower water versus chilled water demarcates two distinct equipment categories, or whether a single piece of equipment could operate in both applications. Likewise, DOE requests comments on whether ground-source closed-loop DOASes represent equipment that is distinct from water-source models. For each of these pairs of categories, if they do only represent different test conditions for the same equipment, DOE requests input on whether testing and rating equipment for two applications is preferable, or whether a single set of test conditions and rating would be sufficient.

Section 2 of ASHRAE 198–2013 specifically excludes DOASes with water coils that are supplied by a chiller located outside of the unit. However, AHRI 920–2015 Table 2 includes operating conditions for which a water-cooled condenser is supplied with chilled water, and ASHRAE 90.1–2016 established standard levels for DOASes that operate with chilled water as the condenser cooling fluid.

Issue DOAS–21: DOE seeks confirmation that the ASHRAE 198–2013 chiller exclusion applies to cooling coils rather than condenser coils.

d. Tolerances

Rating test tolerances for DOASes are listed in Table 1 of ASHRAE 198–2013. This table specifies tolerances for airflow rate and outdoor and return air dry-bulb and wet-bulb temperatures, but does not list any tolerances for supply airflow temperature. However, tolerances for supply temperature are included in other relevant test procedures, such as in Table 2b of ASHRAE 37–2009. DOE is considering adding operating tolerances for supply airflow dry-bulb and wet-bulb temperatures to the test procedure.

In addition, the operating and condition tolerances listed for airflow rate are 5 percent in Table 1 of ASHRAE 198–2013, which is looser than the airflow rate tolerance adopted for CUACs. In fact, DOE proposed to apply ± 5 percent condition tolerance on cooling full-load indoor airflow rate for CUACs (see 80 FR 46870, 46873 (August 6, 2015; ''August 2015 CUAC TP NOPR'')), but received several comments suggesting that a 5-percent tolerance would result in too much variation in the measurement of EER and cooling capacity. Therefore, DOE adopted a 3-percent tolerance in the December 2015 CUAC TP final rule, as suggested by stakeholder comments. 80 FR 79655, 79659–79660 (Dec. 23, 2015). DOE has concerns that the 5-percent condition tolerance on airflow in ASHRAE 198–2013 may result in too much test variability for DOASes.

Issue DOAS–22: DOE requests comment on whether to adopt the operating condition tolerances for supply air temperature listed in Table 2b of ASHRAE 37–2009 for DOAS testing. DOE also seeks input regarding whether a 5-percent airflow tolerance is acceptable. Further, DOE requests any information or data regarding tolerances for any other test operating parameters. Specifically, DOE requests comment on whether there are any parameters whose tolerances should be tightened or relaxed to ensure limited variation and high certainty for the ISMRE and ISCOP results with appropriate test burden.

e. Capacity Measurement

The air enthalpy method, as specified in section 6.1 of ASHRAE 198–2013, is the only capacity measurement method required in the test procedure. There is no mention of a secondary test method for capacity measurement verification in AHRI 920–2015 or ASHRAE 198–2013. In contrast, secondary capacity measurements are generally required for testing of air conditioners with capacity less than 135,000 Btu/h (see, *e.g.,* ASHRAE 37–2009 section 7.2.1). Measurement of air conditioning capacity is based on the measurements of air flow rate, temperature, and humidity, which can have an uncertainty range associated with them that makes use of a secondary method to check the primary method worthwhile to ensure accuracy. DOE is considering whether secondary measurements should be required for DOAS testing in order to ensure accuracy of measurements. Section 7 of ASHRAE 37–2009 describes several different test methods applicable to testing of unitary air-conditioning and heat pump equipment. The cooling condensate method may be particularly relevant as a secondary test method for measuring the dehumidification performance of a DOAS.

Issue DOAS–23: DOE requests comment on the need for a secondary test method requirement for DOAS testing. DOE seeks input regarding potentially applicable secondary test methods for the dehumidification and heating tests, and whether a secondary test method requirement and/or the secondary method allowed by the test procedure should depend on cooling (or dehumidification) capacity or airflow rate. DOE is also interested in detailed information on the test burden that would be associated with a secondary test method.

f. Test Set-Up

Figures 1 and 2 of ASHRAE 198–2013 show the typical test set-up for DOASes with and without energy recovery. The figures show airflow and condition measuring devices at both the inlet and the outlet of each airstream, but it is not clear in the test standard that both airflow measurement devices are required. DOE notes that typically only one airflow measuring device, which measures airflow downstream of the unit, is installed in air-conditioner and heat pump testing. ASHRAE 198–2013 provides no description of the use of two sets of airflow measurements per airstream, for example, for a tolerance check of the airflow calculation or determination of leakage between air streams when testing a DOAS with energy recovery.

Issue DOAS–24: DOE requests comments on whether it is beneficial or necessary to use two airflow measuring devices per airstream when testing DOAS equipment.

Section 6.6 of ASHRAE 198–2013, which deals with Unit Preparation, describes that any energy recovery devices that include a purge or other function that transfers air from supply or exhaust shall be disabled to set at zero position.

Issue DOAS–25: DOE seeks additional information on the purge function mentioned in section 6.6 of ASHRAE 198–2013. Specifically, are all purge devices adjustable to zero purge, and is it always clear how to set them to zero purge? Also, DOE requests feedback on whether it is appropriate to set purge to zero or whether it would be more appropriate to set purge to its highest setting or to some standard setting?

Issue DOAS–26: DOE requests any additional comments related to the adoption of AHRI 920–2015 as the test procedure for DOAS.

C. Test Procedure for Air-Cooled, Water-Cooled, and Evaporatively-Cooled Equipment

DOE's test procedures for ACUACs, ECUACs, and WCUACs are codified at 10 CFR 431.96. Table 1 at 10 CFR 431.96 incorporates by reference AHRI 340/360–2007 for WCUACs and ECUACs with cooling capacity ≥65,000 Btu/h, excluding section 6.3. For ACUACs with cooling capacity ≥65,000 Btu/h, Table 1 refers to appendix A to subpart F of part 431, which references sections 3, 4, and 6 of AHRI 340/360–2007, excluding section 6.3. Paragraphs (c) and (e) of 10 CFR 431.96 and appendix A to subpart F of part 431 contain additional test procedure provisions for WCUACs/ECUACs and ACUACs, respectively. ASHRAE 90.1–2016 updated its test procedure reference for this equipment to AHRI 340/360–2015, ''Performance Rating of Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment'' (AHRI 340/360–2015), which has triggered the requirement for DOE to review its test procedures for this equipment.

At 10 CFR 431.95 and Table 1 of 10 CFR 431.96, DOE incorporates by reference AHRI 210/240–2008 for testing of ACUACs, WCUACs, and ECUACs with cooling capacity <65,000 Btu/h, excluding section 6.5. While ASHRAE 90.1–2016 did not update its test procedure reference for this equipment, AHRI has made public a draft update of AHRI 210/240 (AHRI 210/240–2015–Draft) that was submitted to the docket for the test procedure for CAC/HPs on August 14, 2015 (Docket No. EERE–2009–BT–TP–0004). For this reason, and to comply with the statutory requirement to review test procedures at least once every seven years (42 U.S.C. 6314(a)(1)(A)), DOE is reviewing its test procedures for ECUACs and WCUACs with cooling capacity less than 65,000 Btu/h in this RFI. DOE will consider ACUACs with a cooling capacity less than 65,000 Btu/h in a separate RFI.

The following sections explore aligning the ECUAC and WCUAC metric with that of ACUAC, review updates in AHRI 340/360–2015 to determine if adopting that industry standard would meet EPCA requirements, and explore additional test procedure issues related to the subject equipment.

1. Energy Efficiency Descriptor

DOE's current energy efficiency descriptor for ECUACs and WCUACs is the energy efficiency ratio (EER). 10 CFR 431.96. The EER metric only captures performance at a single set of rating conditions with equipment operating at full-load, and it is calculated by dividing the full-load cooling capacity by the equipment power input. In contrast, DOE adopted integrated energy efficiency ratio (IEER) as an energy efficiency metric for ACUACs in the December 2015 CUAC TP final rule. 80 FR 79655 (Dec. 23, 2015). ASHRAE 90.1–2016 also provides minimum efficiency IEER levels (in addition to EER levels) for ECUACs and WCUACs.

AHRI 340/360–2007 includes a method for testing and calculating IEER for ECUACs and WCUACs. IEER is an energy efficiency descriptor that is calculated from test results at four sets of conditions including a full-load test at standard rating conditions and three part-load tests at different outdoor conditions for ECUACs and different entering water temperatures for WCUACs. IEER utilizes adjustment factors to account for cycling losses, when applicable, at part-load conditions. IEER also includes continuous indoor fan operation, during times when the compressor would be cycling to meet the required load, to account for fan operation during ventilation mode. After the measured efficiencies at the four test conditions are adjusted for cycling losses and continuous fan use, if applicable, the results are multiplied by weighting factors and added together to determine the IEER. The weighting factors used are as follows: 0.020 for the full-load test, 0.617 for the 75-percent load test, 0.238 for the 50-percent load test, and 0.125 for the 25-percent load test.

Issue CUAC–1: DOE seeks comment or data on whether the IEER part-load conditions and IEER weighting factors are representative of the operation of field-installed ECUACs and WCUACs. DOE also seeks comment or data regarding the typical cycling losses of field-installed ECUACs and WCUACs.

The Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) Commercial and Industrial Fans and Blowers Working Group developed recommendations regarding the energy conservation standards, test procedures, and efficiency metrics for commercial and industrial fans and blowers in a term sheet (Docket No. EERE–2013–BT–STD–0006–0179), which was the culmination of a negotiated rulemaking involving that equipment. As part of this term sheet, Recommendation #3 discussed the need for DOE's test procedures and related efficiency metrics to properly account for the energy consumption of fans embedded in regulated commercial air-conditioning equipment.

In addition, the working group agreed that in the next round of test procedure rulemakings, DOE should consider revising efficiency metrics that include energy use of supply and condenser fans to include the energy consumption during all relevant operating modes (*e.g.,* auxiliary heating mode, ventilation mode, and part-load operation). The working group included ACUACs, ECUACs, and WCUACs in its list of regulated equipment for which fan energy use should be considered. (Docket No. EERE–2013–BT–STD–0006–0179 at pp. 3–4, 16)

Consequently, DOE is considering what changes to its ACUAC, ECUAC, and WCUAC test procedures may more accurately represent fan energy use in field applications. DOE is aware that field-installed fan energy use will vary based on the use of the fan for ancillary functions (*e.g.,* economizers, ventilation, filtration, and auxiliary heat). In order to properly account for fan energy use, DOE is requesting information on how frequently field installations use the supply fan of the CUAC for various ancillary functions.

Issue CUAC–2: DOE requests information, including any available data, on how frequently CUAC supply fans are operated when there is no demand for heating or cooling (*i.e.,* for fresh air ventilation or air circulation/filtration), and what the typical operating schedules or duty cycles are for this function. Additionally, DOE requests data or information regarding how frequently and what forms of primary and auxiliary heating are installed with CUACs and whether their operation is dependent on the supply fan of the CUAC. DOE requests data or information regarding how frequently the systems are used with economizers, how the economizers are integrated with the systems, and what control logic is typically used on the economizers. DOE also seeks comment and information regarding the use of the indoor supply fan of CUACs for any ancillary functions not mentioned above. Please differentiate by ACUAC, ECUAC, or WCUAC, as necessary.

Another factor that influences fan energy use is the external static pressure that is required to overcome the air distribution system pressure drop. Both AHRI 210/240–2008 and AHRI 340/360–2007 specify minimum external static pressures for testing based on the rated unit capacity of ECUACs and WCUACs. DOE is interested in ensuring that the external static pressures in the test procedures are representative of those experienced in field installations. In the December 2015 CUAC TP final rule, DOE summarized stakeholder comments regarding the possibility that external static pressures as measured in the field may be higher than those found in the industry test standards. 80 FR 79655, 79664 (Dec. 23, 2015). Based on this information, DOE is examining the external static pressures specified in the test procedures for ECUACs and WCUACs.

Issue CUAC–3: DOE requests comment or data regarding the typical external static pressures in field installations of ECUACs and WCUACs and whether these field-installed external static pressures typically vary with capacity. DOE also seeks comment regarding whether the field applications of ECUACs and WCUACs are different from ACUACs with regards to the typical ducting installed on the system.

Another issue related to fan energy is the default fan power for ACUACs, ECUACs, and WCUACs with a coil-only configuration (*i.e.,* without an integral supply fan). Current test procedures for ACUACs, ECUACs, and WCUACs specify that indoor fan power of 365 Watts (W) per 1000 standard cubic feet per minute (scfm) be added to power input for coil-only units and that the corresponding heat addition be subtracted from measured cooling. This value has been used to account for the fan energy use associated with coil-only units for many years, and more-efficient motors and fans may be in use for which the current 365 W/1000 scfm fan power value is not representative. It is also possible that the value is not consistent with field-typical external static pressures.

Issue CUAC–4: DOE seeks comment or data on the prevalence of ACUACs, ECUACs, and WCUACs that are sold in coil-only configurations (*i.e.,* neither with an integral supply fan, nor with a designated air mover such as a furnace or modular blower).

Issue CUAC–5: DOE seeks comment or data on the typical efficiency or typical power use and flow of fans used with coil-only ACUACs, WCUACs, and ECUACs in field installations.

2. Addressing Changes to AHRI 340/360

As noted previously, ASHRAE 90.1–2016 updated its reference from AHRI 340/360–2007 to AHRI 340/360–2015. The updated AHRI 340/360–2015 includes significant changes from AHRI 340/360–2007 for ACUACs, ECUACs, and WCUACs, and DOE seeks comment on those changes as discussed in this section. Several changes are relevant to all three categories of equipment, while other changes are only relevant to one or two of the equipment categories. Table II.2 illustrates to which equipment category each change is relevant. In some cases, a change may not be relevant to ACUACs because the change has already been adopted in the December 2015 CUAC TP final rule.

TABLE II.2—AHRI 340/360–2015 CHANGES

Topic	ACUAC	ECUAC	WCUAC
Head Pressure Controls	X	X	X
Refrigerant Charging Requirements	X	X	X
Adjustment for Different Atmospheric Pressure Conditions	X	X	X
Measurement of Condenser Air Inlet Temperature	X	X	
Tolerance of Tested Airflow Relative to Rated Airflow		X	X
Vertical Separation of Indoor and Outdoor Units	X	X	X
Outdoor Entering Air Wet-Bulb Temperature		X	
Single-Zone Variable-Air-Volume and Multi-Zone Variable-Air-Volume	X	X	X

a. Head Pressure Controls

Condenser head pressure controls regulate the flow of refrigerant through the condenser and/or adjust operation of condenser fans to prevent condenser pressures from dropping too low during low-ambient operation. When employed, these controls ensure that the refrigerant pressure is high enough to maintain adequate flow through refrigerant expansion devices such as thermostatic expansion valves. AHRI 340/360–2007 provides minimal guidance on head pressure controls, only mentioning in note 2 of Table 6 that the condenser airflow should be adjusted as required by the unit controls for head pressure control. AHRI 340/360–2015 states that any head pressure controls shall be left at the manufacturer's settings and operated in automatic mode, but that, if this results in unstable operation exceeding the tolerances of ASHRAE 37–2009, the time-averaged head pressure control test described in section F7 of appendix F of AHRI 340/360–2015 shall be used. This test requires measuring performance using two one-hour test periods, first after approaching the target ambient condition from warmer temperatures, and once after approaching from lower temperatures. During these tests, the looser tolerance requirements from Table 2b of ASHRAE 37–2009 for the ''heat portion'' of the heat with defrost test must be met. This issue was reviewed by DOE for ACUACs in the December 2015 CUAC TP final rule. In that final rule, DOE clarified that head pressure controls must be active during the test, but DOE did not adopt the time-averaged head pressure control test specified in AHRI 340/360–2015, indicating that AHRI 340/360–2015 was a draft document at the time and that DOE would reconsider adoption of the provisions for testing units with head pressure control later. 80 FR 79655, 79660 (Dec. 23, 2015).

Issue CUAC–6: DOE seeks information and data regarding testing of CUACs with head pressure control that would require the special test provisions described in AHRI 340/360–2015. Specifically, can such units be tested in compliance with the relaxed stability requirements of these test provisions? Do the test results accurately represent field use? Is the test burden associated with these tests appropriate?

b. Refrigerant Charging Requirements

AHRI 340/360–2007 does not provide any specific guidance on setting the refrigerant charge of a unit.

The DOE test procedures for ACUACs, ECUACs, and WCUACs state that if the manufacturer specifies a range of superheat, sub-cooling, and/or refrigerant pressures in the installation or operation manual, any value within that range may be used to determine refrigerant charge, unless the manufacturer clearly specifies a rating value in its installation or operation manual, in which case the specified value shall be used. 10 CFR 431.96(e)(1); section (5)(i) of appendix A to subpart F of part 431.

AHRI 340/360–2015 states that equipment shall be charged with refrigerant at standard rating conditions (or conditions specified by the manufacturer in the installation instructions) in accordance with the manufacturer's installation instructions or label applied to the equipment. In contrast with the DOE test procedure, the industry test standard calls for the use of the average of ranges of sub-cooling or superheat specified in installation manuals.

As discussed in section II.A.3.e, the June 2016 CAC TP final rule provides a comprehensive approach for charging that improves test reproducibility. The approach indicates which set of installation instructions to use for charging, explains what to do if there are no instructions, indicates that target values of parameters are the centers of the ranges allowed by installation instructions, and specifies tolerances for the measured values. 81 FR 36992, 37030–37031. These methods could be considered as an example for the CUAC test method.

Issue CUAC–7: DOE seeks comment on whether it would be appropriate to adopt an approach for charging requirements for commercial CUACs similar or identical to the approach adopted in the June 2016 CAC TP final rule for residential products. DOE seeks comments regarding which parts of the approach should or should not be adopted, and for what reasons they might or might not be suitable for application to CUACs. DOE is also interested in receiving data that demonstrate how sensitive the performance of ACUACs, ECUACs, and WCUACs is relative to changes in the various charge indicators used for different charging methods, specifically the method based on sub-cooling.

c. Adjustment for Different Atmospheric Pressure Conditions

In order to address potential differences in measured results conducted at different atmospheric pressure conditions, AHRI 340/360–2015 introduced an adjustment for indoor supply fan power and corresponding fan heat. This adjusts the fan power based on the barometric pressure at the test site, multiplying the measured supply fan power by the square of the ratio of the measured air density (density of air at measured supply air temperature and humidity and measured atmospheric pressure) to the density of the supply air if it were at standard pressure (14.696 pounds per square inch). Consequently, the cooling capacity and efficiency are also impacted by this correction.

The outdoor air mass flow rate and fan power will also vary with atmospheric pressure; however, the outdoor fan speed is typically not adjustable, because most outdoor fans have single-speed direct-drive motors, and no rated outdoor air flow rate in scfm is set during the test for the majority of CUACs. To address the potential impact of barometric pressure on the outdoor fan air flow, AHRI 340/360–2015 imposed a minimum atmospheric pressure of 13.7 pounds per square inch absolute (psia) for testing equipment.

Issue CUAC–8: DOE requests test data that validate the supply fan power correction used in AHRI 340/360–2015. DOE is also interested in comments on whether the minimum atmospheric pressure of 13.7 psia will prevent any existing laboratories from testing equipment, and what burden, if any, is imposed by such a requirement. DOE also seeks any available test data showing the impact that variations in atmospheric pressure have on the performance (*i.e.,* capacity and component power use) of ACUACs, ECUACs, and WCUACs.

d. Measurement of Condenser Air Inlet Temperature (ACUAC and ECUAC)

A number of requirements have been added in Appendix C of AHRI 340/360–2015 to help ensure accurate and reproducible measurement of the condenser air inlet temperature. These requirements include specifications on the acceptable number, geometry, placement, and construction details of air sampling trees; specifications on the required accuracy of dry bulb, wet bulb, and thermopile measurement devices; requirements on the set-up and number of aspirating psychrometers; and criteria for assessing acceptable air distribution and control of air temperature.

Issue CUAC–9: DOE requests comment on whether any manufacturers have evaluated the condenser inlet air uniformity using the criteria in Appendix C of AHRI 340/360–2015 for ACUACs and ECUACs and if so, whether any alterations to the laboratory or test set-up were necessary to meet those requirements. Also, DOE requests comment on whether the requirements of Appendix C are sufficient to ensure reproducibility of results and/or any test data that demonstrate sufficient reproducibility.

Due to the different heat exchange process of ECUAC condensers when compared to ACUACs, ECUACs may have lower condenser airflow and in turn, smaller openings for the condenser inlet air when compared to ACUACs of similar capacity. Consequently, the air sampler tree and thermopile requirements in AHRI 340/360–2015 may not be appropriate for ECUACs.

Issue CUAC–10: DOE requests comments and data on the sizes of the smallest and largest openings for condenser inlet air on the sides of ECUACs. DOE seeks comment on whether the air sampler tree requirements in Appendix C of AHRI 340/360–2015, specifically the requirement of 10 to 20 branch tubes, and the thermopile requirement of having 16 thermocouples per air sampler tree, are feasible for all ECUACs. DOE also seeks information regarding any alternative methods or measurements for determining condenser inlet air uniformity that may be more suitable for ECUACs.

Issue CUAC–11: DOE requests comments and data regarding whether a method of measuring and specifications for uniformity of the outdoor inlet wet bulb temperature would benefit test reproducibility for ECUACs.

e. Tolerance of Tested Indoor Airflow Relative to Rated Indoor Airflow (ECUAC and WCUAC)

AHRI 340/360–2007 does not provide any tolerance on the tested indoor airflow relative to the rated airflow of the unit under test. AHRI 340/360–2015 has added a 3-percent tolerance for the tested airflow relative to the rated airflow (*i.e.,* the tested airflow is permitted to be 3 percent higher or 3 percent lower than the rated airflow). DOE adopted a 3 percent tolerance on indoor airflow for testing ACUACs in the December 2015 CUAC TP final rule to limit variation in EER and cooling capacity, based on test data and feedback provided by industry commenters. 80 FR 79655, 79659–79660 (Dec. 23, 2015).

Issue CUAC–12: DOE seeks comment or data showing whether variations in indoor airflow impact the measured efficiency or capacity of ECUACs and WCUACs more or less than ACUACs and whether the 3-percent tolerance provided in AHRI 340/360–2015 (and adopted for ACUACs in DOE's regulations) is appropriate for these other equipment categories.

f. Vertical Separation of Indoor and Outdoor Units

AHRI 340/360–2007 does not limit the vertical separation of indoor and outdoor units when testing split systems. However, AHRI 340/360–2015 adds a requirement that the maximum allowable vertical separation of the indoor and outdoor units be 10 feet, presumably because separation greater than 10 feet can adversely affect measured performance. If test facilities use indoor and outdoor environmental chambers that are stacked vertically, the limitation on vertical separation may make it impractical or impossible to test split systems.

Issue CUAC–13: DOE seeks comment regarding whether a maximum of 10 feet of vertical separation of indoor and outdoor units would limit the ability of existing facilities to test split-system ACUACs, ECUACs, or WCUACs. DOE also seeks comment on the impact that vertical separation of split systems has on efficiency and capacity.

g. Outdoor Entering Air Wet-Bulb Temperature (ECUAC)

AHRI 340/360–2007 provides the same outdoor entering air conditions (*i.e.,* 95.0 °F dry bulb and 75.0 14; °F wet bulb) for the standard rating condition (Table 3 of AHRI 340/360–2007) and the 100-percent-capacity test point used to calculate IEER (Table 6 of AHRI 340/360–2007) for ECUACs. While the outdoor entering air dry-bulb temperature is unchanged in AHRI 340/360–2015, the outdoor entering air wet-bulb temperature for the 100-percent-capacity test point used to calculate IEER was changed from 75.0 °F to 74.5 °F (Table 6 of AHRI 340/360–2015). This change suggests that two full-load tests may be required: One at the standard rating conditions for measuring the rated capacity and EER, and another at the 100-percent-capacity test point for the IEER test. Table 6 of AHRI 340/360–2015 also lists only entering air wet-bulb temperatures for ECUACs, with no corresponding dry-bulb temperatures.

Issue CUAC–14: DOE seeks comment regarding the slightly different air wet-bulb test conditions of AHRI 340/360–2015 for standard rating conditions as compared with the 100-percent-capacity test point for the IEER test, and whether the requirement should be 75.0 °F for both purposes.

Issue CUAC–15: DOE seeks comment on whether the air-cooled entering air dry-bulb temperatures in Table 6 of AHRI 340/360–2015 apply to evaporatively-cooled units. If any manufacturers have developed IEER ratings for ECUACs using AHRI 340/360–2015, DOE requests information about what outdoor entering air dry-bulb temperatures were used during the 100-percent and part-load tests.

h. Single-Zone Variable-Air-Volume and Multi-Zone Variable-Air-Volume

AHRI 340/360–2015 established different approaches for setting indoor air flow for the part-load test conditions for single-zone variable-air-volume (SZVAV) and multi-zone variable-air-volume (MZVAV) systems (see section 6.1.3.3). The test standard defines MZVAV as units ''designed to vary the indoor air volume and refrigeration capacity/staging at a controlled discharge air temperature and static pressure as a means of providing space temperature control to independent multiple spaces with independent thermostats.'' (AHRI 340/360–2015 section 3.14) It defines SZVAV as units with a ''control system designed to vary the indoor air volume and refrigeration capacity/staging as a means to provide zone control to a single or common zones, controlled by a single space thermostat input.'' The SZVAV definition further explains that, ''the capacity, as well as the supply air flow shall be controlled either through modulation, discrete steps or combinations of modulation and step control based on the defined control logic.'' (AHRI 340/360–2015 section 3.25)

Part of the focus of each definition is the number of zones and number of thermostats involved in a system served by a given variable-air-volume unit. However, the zones served and thermostats connected are part of the installation of a unit and not inherent attributes of a unit's characteristics. Another part of the definition addresses the variation of indoor air flow and capacity. For MZVAV, the air flow and capacity can be varied to provide a controlled discharge temperature and a controlled static pressure, which suggests, but does not clearly state, that such units have variable-capacity compressors, and that their indoor fan controls allow fully variable control of fan speed. In contrast, the SZVAV definition seems to allow modulation, steps, or a combination of steps and modulation for both fan and compressor capacity control. Based on these definitions, it seems that a unit with a variable-capacity compressor system and a variable-speed fan could meet both definitions. Also, it would appear that any unit with a variable-capacity compressor system that has SZVAV characteristics could be converted to a MZVAV system by changing the indoor fan motor controller or perhaps simply changing its settings.

Issue CUAC–16: DOE requests comment on whether a CUAC model that could be both SZVAV and MZVAV should be tested both ways, representing two separate basic models. If tested as one basic model, DOE requests information regarding how to determine which of the two test methods would apply. How frequently would such a model be installed in the field as a SZVAV as opposed to a MZVAV? DOE also requests comment on whether status as a proportionally controlled unit (see AHRI 340/360–2015 section 3.20) would be considered to be the appropriate indication of whether a CUAC can be used as a MZVAV unit, or whether some other characteristics regarding variable capacity control would have to be satisfied. Finally, for models that can be both SZVAV and MZVAV, how much do the efficiency ratings for the two configurations differ?

3. Additional Test Method Issues

In this section, DOE explores several additional issues related to the test procedures for CUACs. Most issues are relevant to only ECUACs, but a few are also relevant to WCUACs and/or ACUACs, as shown in Table II.3.

TABLE II.3—ADDITIONAL CUAC TEST METHOD ISSUES

Topic	ACUAC	ECUAC	WCUAC
Length of Refrigerant Line Exposed to Outdoor Conditions	X	X	X
Atmospheric Pressure Measurement	X	X	X
Consistency Among Test Procedures for Small and Large Equipment	....	X	X
Make-up Water Temperature	....	X	....
Secondary Measurement Method for Capacity	....	X	....
Piping Evaporator Condensate to Condenser Pump	....	X	....
Purge Water Settings	....	X	....
Condenser Spray Pumps	....	X	....
Additional Steps to Verify Proper Operation	....	X	....

a. Length of Refrigerant Line Exposed to Outdoor Conditions

AHRI 340/360–2007, AHRI 340/360–2015, AHRI 210/240–2008, and AHRI 210/240–2015–Draft all require at least 25 feet of interconnecting refrigerant line when testing split-systems. However, both versions of AHRI 340/360 require that at least 5 feet of the interconnecting refrigerant line must be exposed to outdoor test chamber conditions, while both versions of AHRI 210/240 require at least 10 feet be so exposed. DOE has estimated an upper bound of the capacity loss to be approximately 1 percent of the capacity of the unit for 10 feet of refrigerant line located in the outdoor chamber and approximately 0.5 percent for 5 feet.

Issue CUAC–17: DOE seeks comment or data regarding the typical length of refrigerant line that is exposed to outdoor conditions on split-system ACUAC, ECUAC or WCUAC installations and whether this length varies depending on the capacity of the unit. DOE also seeks comment or data on any measurements or calculations that have been made of the losses associated with refrigerant lines located in the outdoor chamber and whether the impact is larger or smaller than DOE's estimate of approximately 1 percent of capacity per 10 feet of refrigerant line located in the outdoor chamber.

b. Atmospheric Pressure Measurement

The accuracy of atmospheric pressure measurements required by section 5.2.2 of ASHRAE 37–2009 (which is referenced by AHRI 340/360–2015) is ±2.5 percent. This level of uncertainty can result in error when calculating the indoor entering and leaving air enthalpies and resulting cooling capacity. Under certain circumstances, atmospheric pressure measurements at the extremes of this tolerance result in capacity measurement errors of 1–2 percent.

Issue CUAC–18: DOE seeks comment on the typical accuracy of the atmospheric pressure sensors used by existing test laboratories.

c. Consistency Among Test Procedures for Small and Large ECUAC and WCUAC Equipment Classes

The current test procedure and referenced industry standard for ECUACs and WCUACs that have cooling capacities less than 65,000 Btu/h (AHRI 210/240–2008) reference the same test method (ASHRAE 37–2005) and contain the same efficiency metrics as those for units with capacities greater than or equal to 65,000 Btu/h (AHRI 340/360–2007). However, there are some differences that have been identified in this section. DOE is considering whether the consistency of test procedures could be improved by referencing a single industry standard for all cooling capacities of ECUACs and WCUACs. The updated industry standard for rating units with a capacity greater than or equal to 65,000 Btu/h (AHRI 340/360–2015) has significant changes that affect the testing of ECUACs and WCUACs. However, the industry standard for rating units with a cooling capacity less than 65,000 Btu/h is in the process of being updated and could potentially be finalized with better consistency with AHRI 340/360 for testing of this equipment.

Issue CUAC–19: DOE requests comment on whether there are differences between ECUACs and WCUACs that have cooling capacities less than 65,000 Btu/h and those that have cooling capacities greater than or equal to 65,000 Btu/h that justify the incorporation by reference of different industry test standards for the different cooling capacity ranges. If not, DOE seeks feedback on whether referencing a single industry standard for units of all cooling capacities would be beneficial and/or whether there could or should be better consistency between the test standards for testing of this equipment. Specifically, DOE requests comment on whether there are actual differences in field installations and field use of this equipment and on the extent to which these differences impact performance.

d. Make-Up Water Temperature (ECUAC)

Neither AHRI 340/360–2007 nor AHRI 340/360–2015 provide any requirements on the make-up water temperature for the standard rating condition or for the part-load IEER tests. Make-up water must be supplied to the sump of an ECUAC to replenish the evaporated water (or to spray nozzles for models without sumps). AHRI 210/240–2008 and AHRI 210/240–2015–Draft specify 85.0 °F for the full-load standard rating condition and 77.0 °F for the part-load tests. Cooler makeup water temperature could increase measured cooling capacity and vice versa, causing variation in measurements if specific temperatures are not required.

Issue CUAC–20: DOE seeks comment or data regarding the impact that the make-up water temperature has on the unit performance. DOE also seeks comment or data on whether the make-up water temperatures, including the temperatures for part-load conditions, specified in AHRI 210/240–2008 and AHRI 210/240–2015–Draft are representative of conditions experienced by field-installed ECUACs of all cooling capacities.

e. Secondary Measurement Method for Capacity (ECUAC)

ASHRAE 37–2009 requires the indoor air enthalpy method plus an additional secondary method for calculating the test equipment capacity for all units with less than 135,000 Btu/h rated capacity. The test standard lists applicable test methods in Table 1, but this table does not indicate that the outdoor air enthalpy method is applicable for any configuration of evaporatively-cooled equipment. Therefore, the secondary method for ECUACs is limited to use of the refrigerant enthalpy method or compressor calibration method for split systems and only the compressor calibration method for single-package equipment. DOE recognizes that the refrigerant enthalpy method and compressor calibration method can, in some circumstances, add burden to the testing procedure, so DOE examined the potential use of the outdoor air enthalpy method as a secondary method for ECUACs. During testing, DOE observed that the part-load test conditions produce an environment where condensation is likely in the outdoor unit supply duct, because the outdoor air dry bulb temperature cooling the duct walls can be lower than the dew point of the warm moist air leaving the outdoor unit. This condensation would be unaccounted for by the outdoor air enthalpy method, resulting in a calculated capacity less than the actual capacity. To consider another approach, DOE notes that it modified the CAC/HP test method to require a secondary capacity measurement only for full-load operation for cooling and heating, rather than for all tests in a January 5, 2017 final rule. 82 FR 1426, 1441. While this change was for central air conditioners and heat pumps, limiting the secondary method test to a single set of conditions, such as the full-load cooling (and heating, if applicable) test conditions, would eliminate or reduce the potential for condensation in the outdoor supply duct when testing ECUACs.

Issue CUAC–21: DOE seeks comment or test data on the difficulty of getting a match of primary and secondary capacity measurements when testing ECUACs with rated capacities less than 135,000 Btu/h and whether the difficulty level is higher, lower, or the same when testing the unit at full-load conditions as compared to part-load conditions. DOE also seeks comment and data on how often the primary capacity measurement results in an exceeded allowable percent difference between the primary and secondary capacity measurements.

Issue CUAC–22: DOE seeks comment on whether single-package ECUACs with a rated cooling capacity less than 135,000 Btu/h are currently sold.

Issue CUAC–23: DOE seeks comment on whether manufacturers would see a benefit in allowing the outdoor air enthalpy method as a secondary capacity measurement for ECUACs. If so, DOE is interested in feedback on methods to mitigate the risk of condensation in the outdoor unit supply duct and the outdoor supply wet-bulb sample station. DOE also asks if other alternative approaches could be considered for mitigating the potential test burden associated with the secondary test methods that ASHRAE 37–2009 specifies for evaporatively-cooled equipment.

f. Piping Evaporator Condensate to Condenser Pump (ECUAC)

Some split-system ECUACs provide the option for piping evaporator condensate to the condenser sump. This reduces the make-up water use of the unit and may provide some performance improvement. Neither DOE's current test procedures nor the industry ECUAC test standards address this potential variation, which could result in differences in test results depending on whether this feature was employed in a test.

Issue CUAC–24: DOE seeks comment on whether ECUACs that allow piping of evaporator condensate to the condenser sump present any complications (*e.g.,* maintaining proper slope in the piping from the evaporator to the outdoor unit and test repeatability issues) when testing in a laboratory. DOE also seeks comment or data indicating what kind of impact piping the evaporator condensate to the condenser sump has on the efficiency and/or capacity of ECUACs.

g. Purge Water Settings (ECUAC)

Some ECUACs require the sump water to be continuously or periodically purged in order to reduce mineral and scale build-up on the condenser heat exchanger. AHRI 340/360–2015 provides guidance to set up and configure the unit per the manufacturer's installation instructions, which would include setting the purge rate if specified.

Issue CUAC–25: DOE seeks comment on how the purge water rate should be set for laboratory testing if the manufacturer's installation instructions do not contain information on this topic.

h. Condenser Spray Pumps (ECUAC)

The rate that water is sprayed on the condenser coil may have an impact on the performance of an ECUAC. For units with sumps, this rate may be affected by the pump set-up, and, for units without sumps, the incoming water pressure may have an impact. Neither DOE's current test procedures nor the industry ECUAC test standards address these potential variations.

Issue CUAC–26: DOE requests comment on whether the pump flow can be adjusted on any ECUACs on the market that have circulation pumps. DOE also requests comment on whether ECUACs without a sump exist and, if so, whether there are requirements on the incoming water pressure to ensure proper operation of the spray nozzles. DOE also requests comments and/or data regarding the sensitivity of performance test results to these adjustments.

i. Additional Steps To Verify Proper Operation (ECUAC)

Some ECUACs may use spray nozzles with very small diameter openings that may become easily clogged, thereby reducing the effectiveness of the heat exchanger.

Issue CUAC–27: DOE requests comment on whether there are any additional steps that should be taken to verify proper operation of ECUACs during testing, such as ensuring nozzles are not blocked.

Issue CUAC–28: DOE requests comment on any additional issues associated with adopting AHRI 340/360–2015 for ACUACs, ECUACs, and WCUACs.

D. Test Procedure for Variable Refrigerant Flow Multi-Split Air Conditioners and Heat Pumps

DOE's commercial equipment regulations include test procedures and energy conservation standards that apply to air-cooled VRF multi-split air conditioners, air-cooled VRF multi-split heat pumps, and water-source VRF multi-split heat pumps, all with cooling capacity less than 760,000 Btu/h, except air-cooled, single-phase VRF multi-split air conditioners and heat pumps with cooling capacity less than 65,000 Btu/h (which are covered by DOE's consumer product regulations for central air conditioners [12]). 10 CFR 431.96 and 431.97.

DOE's test procedure for (commercial) VRF multi-split systems is codified at 10 CFR 431.96 and was established in the May 2012 final rule. 77 FR 28928 (May 16, 2012). DOE's current regulations require that manufacturers test VRF multi-split systems using AHRI 1230–2010 with addendum 1, except for sections 5.1.2 and 6.6. DOE's current test procedure also requires that manufacturers adhere to certain additional requirements listed in 10 CFR 431.96(c)–(f). Although ASHRAE 90.1–2016 did not update its test procedure reference for VRF (AHRI 1230–2010 with addendum 1), DOE is reviewing its test procedure in response to the seven-year-lookback statutory review requirement (see 42 U.S.C. 6314(a)(1)(A)), and in advance of its review of energy conservation standards for VRF in response to changes in ASHRAE 90.1–2016.

As part of its seven-year-lookback review, DOE is examining updated industry test standards, including Addendum 2 to AHRI 1230–2010 (approved June 2014) and a draft version of AHRI 1230 provided by AHRI for the docket that will supersede AHRI 1230–2010 (with Addendum 1 and 2) once published (''AHRI 1230-Draft,'' No. 1). DOE reviewed the AHRI 1230-Draft and discusses in the following sections specific issues regarding the draft and other items related to the VRF test procedure.

1. Energy Efficiency Descriptors

DOE currently prescribes energy conservation standards for air-cooled VRF multi-split systems with cooling capacity greater than or equal to 65,000 Btu/h and water-source VRF multi-split systems in terms of the EER metric for cooling-mode operation and in terms of the coefficient of performance (COP) metric for heating-mode operation.[13] DOE is considering whether to add or replace the existing cooling-mode efficiency descriptor (*i.e.,* EER) with a new cooling-mode energy-efficiency descriptor that better captures part-load performance, such as IEER.

IEER factors in the efficiency of operating at part-load conditions of 75-percent, 50-percent, and 25-percent of capacity, as well as the efficiency at full-load. The IEER metric provides a more representative measure of energy consumption in actual operation by weighting the full-load and part-load efficiencies with the average amount of time equipment spends operating at each load point. ASHRAE 90.1 has specified an IEER metric for commercial air conditioning and heat pump equipment since the 2008 Supplement to Standard 90.1–2007, effective January 1, 2010.[14 15] ASHRAE Standard 90.1–2013 included minimum efficiency levels for both the EER and IEER of air-cooled VRF multi-split systems and for the EER of water-source VRF multi-split systems. ASHRAE Standard 90.1–2016 added IEER levels for water-source VRF multi-split systems, including units with cooling capacity less than 65,000 Btu/h. DOE notes that in addition to ASHRAE 90.1, both the ENERGY STAR and Consortium for Energy Efficiency (CEE) programs use the IEER metric for VRF systems.[16 17]

On January 15, 2016, DOE published a direct final rule for energy conservation standards for small, large, and very large air-cooled commercial package air conditioners and heat pumps (CUACs and CUHPs), which amended the energy conservation standards for CUACs and CUHPs and changed the cooling efficiency metric from EER to IEER. 81 FR 2420. Except possibly for ventilation, VRF multi-split systems serve the same primary functions as CUACs and CUHPs (*i.e.,* space heating and cooling commercial buildings) and are used in a similarly wide range of climatic conditions.

Because the vast majority of cooling and heating loads do not demand operation at full-load, the full-season metric IEER may capture the efficiency of VRF multi-split systems operating in the field more realistically than does the full-load metric EER. DOE believes that the publication of IEER ratings for most units on the market (as in AHRI's *Directory of Certified Product Performance* for VRF multi-split systems), as well as the inclusion of minimum efficiency levels and test procedures for IEER of VRF multi-split systems in ASHRAE Standard 90.1–2016 and AHRI 1230–2010, respectively, demonstrate that IEER is an industry-accepted metric for measuring efficiency of VRF multi-split systems. For these reasons, DOE is considering replacing the current EER metric for VRF multi-split systems with

[12] See 10 CFR 430.32(c) and Appendix M and M1 to Subpart B of Part 430.

[13] DOE also prescribes energy conservation standards for three-phase air-cooled VRF multi-split systems with cooling capacity less than 65,000 Btu/h in terms of the SEER metric for cooling-mode operation and in terms of the heating seasonal performance factor (HSPF) metric for heating-mode operation.

[14] ASHRAE Standard 90.1 first specified a part-load performance metric in the 2007 edition, which used integrated part load value (IPLV).

[15] ASHRAE, ASHRAE Addenda (2008 Supplement) (Available at: *http://www.ashrae.org/File%20Library/docLib/Public/20090317_90_1_2007_supplement.pdf*).

[16] ENERGY STAR Program Requirements, Product Specifications for Light Commercial HVAC (Available at: *https://www.energystar.gov/sites/default/files/specs//private/LC_HVAC_V2.2.pdf*).

[17] Consortium for Energy Efficiency, CEE Commercial Unitary AC and HP Specification (Available at: *http://www.cee1.org/files/CEE_CommHVAC_UnitarySpec2012.pdf*).

the full-season IEER metric, or adding IEER in addition to EER. DOE's ultimate decision will be impacted by the separate energy conservation standards rulemaking considering the efficiency levels for VRF in ASHRAE 90.1–2016.

Issue VRF–1: DOE requests comment on issues DOE should consider regarding potentially using IEER as an efficiency metric for energy conservation standards for air-cooled VRF multi-split systems with a cooling capacity greater than or equal to 65,000 Btu/h and all water-source VRF multi-split systems, so as to capture efficiency in part-load operation.

2. Representativeness and Repeatability

Operation of VRF multi-split systems is inherently variable, and DOE notes that the control systems of VRF multi-split systems can be significantly more sophisticated than control systems in other commercial HVAC systems. In order to achieve steady-state operation, it is generally necessary for a manufacturer's representative that is knowledgeable about the control system to be present during testing in order to override the typical dynamic control and to set each individual component at a fixed position or speed. It may be possible to achieve ''full-load'' capacity and/or part-load operation in different ways, all of which may be consistent with the test procedure and manufacturer's installation instructions.

Issue VRF–2: DOE seeks comment on the settings required to be reported in order for third-party laboratories to reproduce unit performance in a rating test.

Section 6.3.4 of AHRI 1230–Draft requires that for air-cooled VRF multi-split systems with a cooling capacity less than 65,000 Btu/h, at least one indoor unit must be turned off for tests conducted at minimum compressor speed. DOE also established a similar requirement for CACs in the June 2016 CAC TP final rule. 81 FR 36992, 37038 (June 8, 2016). However, AHRI 1230-Draft does not include a corresponding requirement for equipment with a cooling capacity greater than or equal to 65,000 Btu/h or for water-source VRF multi-split systems. This requirement for equipment less than 65,000 Btu/h considers the wide range of loads that can occur in the field. However, DOE expects that load diversity would also be an issue for larger-capacity VRF multi-split systems used in commercial applications.

Issue VRF–3: DOE requests information and data on the field operating states of indoor units of VRF multi-split systems when operating at low compressor speeds (*i.e.,* near 25-percent load). Specifically, are there field data available that show operating states of VRF multi-split systems at different load levels? Such data might show what happens with indoor fan speeds and expansion devices of indoor units at low load percentages, including whether any indoor fans shut off, or whether any refrigerant flow control devices shut off refrigerant flow, and how this might be affected by the user-accessible control positions set for the indoor units. DOE is also interested in whether indoor unit operation at low compressor speeds is different in field application for VRF multi-split systems with cooling capacities less than 65,000 Btu/h than those with capacities greater than or equal to 65,000 Btu/h, and whether these trends follow at intermediate compressor speeds as well. Further, DOE requests data that would show the trends of total system capacity, total indoor air flow, and sensible heat ratio as a function of compressor speed (*e.g.,* percentage of full-speed revolutions per minute) for laboratory rating tests of typical VRF multi-split systems conducted either with one or no indoor unit shut off at the lowest load point.

3. Test Method

a. Transient Testing: Oil Recovery Mode

AHRI 1230-Draft refers to ASHRAE 37–2009 for provisions for transient tests, which are required when defrost interferes with steady-state operation sufficiently frequently to prevent completion of a steady-state test (see, for example, sections 8.8.2.5.1 and 8.8.2.5.2 of that test standard). Specific instructions are provided for how to determine an average heating capacity for the transient test, with different instructions depending on the number and completion of defrost cycles. Tables 2a and 2b of ASHRAE 37–2009 specify the test tolerances to be used when conducting a transient heating capacity test.

VRF multi-split systems may periodically operate in an oil recovery mode in order to return oil from the refrigeration loop to the compressor. Section 5.1.3 of AHRI 1230–Draft requires that if a manufacturer indicates that a VRF multi-split system is designed to recover oil more frequently than every two hours of continuous operation, the oil recovery mode shall be activated during testing, and the additional power shall be included in the efficiency calculations. However, there is no specific instruction in the AHRI 1230–Draft that indicates how the additional power should be incorporated into the efficiency metric. DOE expects that maintenance of steady-state conditions may be affected during oil recovery mode and that, as a result, some type of transient test procedure may be appropriate when oil recovery mode happens during testing. However, AHRI 1230-Draft does not specify use of the transient test for this case, and the ASHRAE 37–2009 description of the transient test does not mention oil recovery. DOE notes that VRF multi-split systems vary in the way they activate oil recovery mode; some may initiate oil recovery mode at a set time interval, and others may instead initiate oil recovery mode only when the system detects that the oil level in the compressor has reached a certain minimum level. DOE understands that unit performance may vary with the oil level. Consequently, DOE is considering requiring all measurements to be made within a certain time after the last oil recovery to ensure repeatability between tests.

Issue VRF–4: DOE requests comment on the impact of oil recovery mode, including power input and heating/cooling provided to space during oil recovery mode. DOE also requests comment on whether any VRF multi-split systems operate in oil recovery mode more frequently than every two hours of continuous operation. For such systems, DOE requests comment on whether the test method should be modified to address the transient operation occurring during and after oil recovery, and how this should be done. In addition, DOE requests comment on the performance variation associated with oil level and whether all measurements should be made within a certain time after the last oil recovery. Lastly, DOE requests comment on how the energy use of oil recovery mode might be addressed in the test procedure without imposing excessive test burden.

b. Airflow Setting and Minimum External Static Pressure

DOE notes AHRI 1230–Draft contains one set of instructions for setting the indoor air flow rates for systems with capacities less than 65,000 Btu/h (section 6.3.3.1) and another set for systems with capacities larger than 65,000 Btu/h (section 6.4.1). It is not clear why alternate approaches are required for different systems because the indoor units generally do not differ by system capacity.

Issue VRF–5: DOE requests comment on whether there should be a consistent approach for setting indoor airflow across all capacity ranges of VRF multi-split systems.

c. Condenser Head Pressure Controls

Condenser head pressure controls regulate the flow of refrigerant through the condenser and/or adjust operation of condenser fans to prevent condenser pressures from dropping too low during low-ambient operation. When employed, these controls ensure that the refrigerant pressure is high enough to maintain adequate flow through refrigerant expansion devices such as thermostatic expansion valves. In the December 2015 CUAC test procedure final rule, DOE required that CUACs and CUHPs equipped with head pressure controls have these controls activated during testing. 80 FR 79655, 79660 (Dec. 23, 2015). For VRF multi-split systems equipped with heat recovery, it is unclear whether the head pressure would be elevated when one of the indoor units calls for heating during cooling-based operation. It is also not clear how the head pressure differs during cool outdoor conditions between units with and without heat recovery function.

Issue VRF–6: DOE requests comment on the appropriateness of requiring head pressure control activation during testing of VRF multi-split systems. In addition, DOE requests comment on any methods to control VRF multi-split systems during testing to ensure stable operation with head pressure controls activated. Further, DOE requests comment on any methods that could be added to the test procedure for calculation of system efficiency of VRF multi-split systems if head pressure controls prevent stable operation at low-ambient, part-load conditions.

d. Air Volume Rate for Non-Ducted Indoor Units

DOE notes the following issues associated with testing multi-split systems with free discharge air flow from the indoor unit (*i.e.,* airflow provided directly from the indoor unit to the conditioned space without the use of ducts). In testing, if a common duct is used for the combined discharge airflow of multiple individual units, the airflow for each individual unit cannot be verified. Second, even if the ESP is set to zero—which is intended to replicate operation without ducting—based on a measurement of downstream pressure in a discharge duct, this does not always guarantee that flow is identical to free discharge conditions, due to sensitivity of such in-duct pressure measurements to the air movement in the duct. Finally, specification of unusually high air flows for testing of free discharge in indoor units may boost measured performance inconsistent with field operation. Section 6.3.3.1.1.3 of AHRI 1230–Draft added an upper limit on air flow per capacity for non-ducted units for systems with capacity less than 65,000 Btu/h—the rated air volume for each indoor unit must not exceed 55 scfm per 1,000 Btu/h.[18]

Issue VRF–7: DOE requests comment on how to confirm air flow for each indoor unit individually when there is a common duct for each unit and when there is potential deviation from free-discharge operation if a discharge duct is connected. DOE also requests comment on whether there should be an upper limit of air flow per capacity for non-ducted units, such as the 55 scfm per 1,000 Btu/h limit in the AHRI 1230–Draft.

e. Secondary Test Method

In AHRI 1230–Draft, ASHRAE 37–2009 is referenced as the test procedure for both air-cooled and water-cooled units across all capacities. Section 7.2.1 in ASHRAE 37–2009 requires a secondary test method in addition to the primary method (*i.e.,* indoor air enthalpy method) for units having a total cooling capacity less than 135,000 Btu/h. ASHRAE 37–2009 provides multiple options for the secondary test method. For units with a cooling capacity larger than 135,000 Btu/h, section 7.2.2 of ASHRAE 37–2009 only requires a single method, but provides multiple test method options.

Section 11.1.1.7 of AHRI 1230–Draft indicates the redundant measurement verification method as an alternative to refrigerant enthalpy method or outdoor enthalpy method when they cannot be performed. However, the draft does not provide guidance on how to determine whether the refrigerant enthalpy method or outdoor enthalpy method can or cannot be performed. DOE is considering whether there are other alternatives to the refrigerant enthalpy method or outdoor enthalpy method (other than the duplicate measurement method), such as the cooling condensate and indirect airflow measurement method.

Issue VRF–8: DOE requests comment on the methods generally used for measurement of capacity when testing VRF multi-split systems and whether the selection of methods differs between cooling and heating tests. DOE requests comment on how to determine whether the refrigerant enthalpy method or outdoor air enthalpy method (for units having a total cooling capacity less than 135,000 Btu/h) can or cannot be performed. DOE also requests comment on how to standardize the selection of test methods for measuring the capacity of VRF multi-split systems. Finally, DOE requests comment on whether there are issues with achieving heat balance in part-load tests for VRF multi-split systems, similar to those cited for variable speed CAC/HP, and if so, whether there is sufficient assurance of proper measurement for all test points of VRF multi-split systems if the heat balance is verified only for full capacity.

f. Heat Recovery

VRF multi-split systems with heat recovery include a heat recovery unit (sometimes referred to as a branch circuit controller) that controls refrigerant flow between indoor units, allowing for simultaneous cooling and heating operation. However, DOE believes that VRF multi-split systems with the heat recovery capability may be able to operate without the heat recovery unit attached, although in such case, simultaneous heating and cooling would not be possible. It is not clear in AHRI 1230–Draft whether VRF multi-split systems capable of heat recovery must be tested with the heat recovery unit attached in tests for determining EER, IEER, and COP. DOE seeks clarification on industry practice for testing VRF multi-split systems with the heat recovery feature because attachment of the heat recovery unit may affect test results.

Issue VRF–9: DOE seeks comment on whether VRF multi-split systems with the heat recovery feature can be operated without the heat recovery unit attached, and if so, whether such systems are typically tested for determining EER, IEER, and COP with the heat recovery unit attached. Additionally, DOE seeks data showing the difference in test results between having the heat recovery unit attached or not.

4. Representations

a. Tested Combination

AHRI specified requirements for tested combinations for systems with capacities more than 65,000 Btu/h in section 6.2.2 of the AHRI 1230–Draft. The AHRI requirement specifies selecting standard 4-way ceiling cassette indoor units with the smallest coil volume per nominal capacity for non-ducted indoor units and selecting mid-static units for ducted indoor units. DOE is aware that there is a range of ductless indoor unit styles, which may have a range of efficiency characteristics. In

[18] DOE notes that test methods associated with the indoor units of systems with capacity <65,000 Btu/h are relevant for testing of systems with capacity ≥65,000 Btu/h because the capacities of the indoor units are comparable.

addition, ducted systems may serve a range of external static pressures.

A report by the Cadeo Group [19] indicates that 4-way ceiling cassettes are the most prevalent non-ducted indoor units. On the other hand, while DOE notes that ducted units can be classified by the amount of static pressure they produce as either low-static, mid-static, or conventional-static units, DOE has no data indicating which ducted unit style or static pressure classification is the most prevalent.

Issue VRF–10: DOE requests comment and data on variation of system efficiency related to indoor unit styles (both for ducted and non-ducted indoor units). For example, for a system tested with non-ducted units, what is the potential range of EER and/or IEER comparing the most-efficient indoor units with the most energy-intensive indoor units? DOE requests comment on its assumption that 4-way ceiling cassettes are the most prevalent non-ducted indoor unit style. DOE also requests data on the most prevalent style and static pressure classification (low-static, mid-static, or conventional-static) of ducted units.

b. Determination of Represented Values

DOE recognizes that non-ducted indoor units and ducted indoor units operate at different levels of ESP and have different limitations on ESP. The ESP affects the power consumed by the indoor fan, and, therefore, also affects the measured efficiency of a VRF multi-split system. DOE is considering requiring separate ratings for different ESP levels to account for differences between ducted indoor units, non-ducted indoor units, and possibly other distinctions in indoor units.

Issue VRF–11: DOE requests comment on how many distinctly identifiable ESP levels are generally represented in a family of VRF multi-split systems and what ESP levels are typical for VRF multi-split systems. DOE also requests data that demonstrate how different ESP levels affect measured efficiency for the system, both in terms of EER and IEER.

Issue VRF–12: DOE requests comment on what specific topics pertaining to the test procedure for VRF multi-split air conditioners and heat pumps, in addition to the topics discussed previously, are not fully or appropriately addressed in the docketed AHRI–1230–Draft.

[19] Cadeo Report. See docket: EERE–2017–BT–TP–0018. No. 2. The report presents market share by VRF multi-split system equipment class, based on confidential sales data given in interviews with several major manufacturers of VRF multi-split equipment and DOE's CCMS database.

E. Other Test Procedure Topics

In addition to the issues identified earlier in this document, DOE welcomes comment on any other aspect of the existing test procedures for commercial package air conditioning and heating equipment that is the subject of this notice not already addressed by the specific areas identified in this document. DOE particularly seeks information that would improve the representativeness of the test procedures, as well as information that would help DOE create a procedure that would limit manufacturer test burden through streamlining or simplifying testing requirements. Comments regarding repeatability and reproducibility are also welcome.

DOE also requests feedback on any potential amendments to the existing test procedures that could be considered to address impacts on manufacturers, including small businesses. Regarding the Federal test methods, DOE seeks comment on the degree to which the DOE test procedures should consider and be harmonized with the most recent relevant industry standards for the commercial package air conditioning and heating equipment that is the subject of this notice, and whether there are any changes to the Federal test methods that would provide additional benefits to the public.

Additionally, DOE requests comment on whether the existing test procedures limit a manufacturer's ability to provide additional features to consumers on the commercial package air conditioning and heating equipment that is the subject of this notice. DOE particularly seeks information on how the test procedures could be amended to reduce the cost of new or additional features and make it more likely that such features are included on the equipment.

III. Submission of Comments

DOE invites all interested parties to submit in writing by August 24, 2017, comments, data, and information on matters addressed in this notice and on other matters relevant to DOE's consideration of amended test procedures for VRF multi-split systems, CRAC and DOAS equipment, and water-cooled, evaporatively-cooled, and air-cooled commercial unitary air conditioners (WCUACs, ECUACs, and ACUACs). These comments and information will aid in the development of a test procedure NOPR for the subject VRF multi-split systems, and CRAC, DOAS, WCUAC, ECUAC, and ACUAC equipment, if DOE determines that amended test procedures may be appropriate for these products.

Instructions: All submissions received must include the agency name and docket number and/or RIN for this rulemaking. No telefacsimilies (faxes) will be accepted.

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

A link to the docket Web page can be found at: *https://www.regulations.gov/docket?D=EERE-2017-BT-TP-0018.* This Web page contains a link to the docket for this notice on the *https://www.regulations.gov* Web site. The *https://www.regulations.gov* Web page contains instructions on how to access all documents, including public comments, in the docket.

For information on how to submit a comment, review other public comments and the docket, or participate in the public meeting, contact the Appliance Standards Program at (202) 586–6636 or by email: *ApplianceStandardsQuestions@ee.doe.gov*. DOE considers public participation to be a very important part of the process for developing test procedures and energy conservation standards. DOE actively encourages the participation and interaction of the public during the comment period at each stage of the rulemaking process. Interactions with and between members of the public provide a balanced discussion of the issues and assist DOE in the rulemaking process. Anyone who wishes to be added to the DOE mailing list to receive future notices and information about this rulemaking should contact Appliance and Equipment Standards Program staff at (202) 586–6636 or by email at *ApplianceStandardsQuestions@ee.doe.gov*.

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

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

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

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

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

Include contact information each time you submit comments, data, documents, and other information to DOE. If you submit via mail or hand delivery/courier, please provide all items on a CD, if feasible, in which case it is not necessary to submit printed copies.

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

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

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

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

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

DOE considers public participation to be a very important part of the process for developing test procedures and energy conservation standards. DOE actively encourages the participation and interaction of the public during the comment period in each stage of the rulemaking process. Interactions with and between members of the public provide a balanced discussion of the issues and assist DOE in the rulemaking process. Anyone who wishes to be added to the DOE mailing list to receive future notices and information about this rulemaking should contact Appliance and Equipment Standards Program staff at (202) 586–6636 or via email at *ApplianceStandardsQuestions@ee.doe.gov*.

Issued in Washington, DC, on July 11, 2017.

Kathleen B. Hogan,

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

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA–2017–0707; Directorate Identifier 2016–NM–014–AD]

RIN 2120–AA64

Airworthiness Directives; Airbus Airplanes

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: We propose to adopt a new airworthiness directive (AD) for certain Airbus Model A318 series airplanes; Model A319 series airplanes; Model A320–211, –212, –214, –231, –232, and –233 airplanes; and Model A321 series airplanes. This proposed AD was prompted by reports of fatigue damage in the structure for the door stop fittings on certain fuselage frames (FR). This proposed AD would require repetitive rototest inspections for cracking of the fastener holes in certain door stop fittings, and repair if necessary. We are proposing this AD to address the unsafe condition on these products.

DATES: We must receive comments on this proposed AD by September 8, 2017.

ADDRESSES: You may send comments, using the procedures found in 14 CFR 11.43 and 11.45, by any of the following methods:

- *Federal eRulemaking Portal:* Go to *http://www.regulations.gov*. Follow the instructions for submitting comments.