DEPARTMENT OF ENERGY

10 CFR Parts 429 and 431

[EERE–2017–BT–TP–0018]

RIN 1904–AD93

Energy Conservation Program: Test Procedure for Dehumidifying Direct Expansion-Dedicated Outdoor Air Systems

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

ACTION: Notice of proposed rulemaking and request for comment.

SUMMARY: The U.S. Department of Energy (DOE) is proposing to establish definitions for ''direct expansion-dedicated outdoor air systems'' (DX–DOAS or DX–DOASes) and ''dehumidifying direct expansion-dedicated outdoor air systems'' (DDX–DOAS or DDX–DOASes). DX–DOASes are a category of small, large, and very large commercial package air conditioning and heating equipment under the Energy Policy and Conservation Act (EPCA), as amended. In addition, DOE is proposing to establish a test procedure to measure the energy efficiency of DDX–DOASes, which aligns with the most recent version of the relevant industry consensus test standards for DDX–DOASes, with certain minor modifications. Lastly, DOE is proposing to add supporting definitions, energy efficiency metrics for dehumidification and heating modes, and provisions governing public representations as part of this rulemaking. DOE welcomes written comment from the public on any subject within the scope of this document (including topics not specifically raised in this proposal), as well as the submission of data and other relevant information.

DATES: Comments: DOE will accept written comments, data, and information regarding this notice of proposed rulemaking (NOPR) on or before September 7, 2021. See section V, ''Public Participation,'' for details.

Meeting: DOE will hold a webinar on Monday, August 2, 2021 from 10:00 a.m. to 4:00 p.m. See section V, ''Public Participation,'' for webinar registration information, participant instructions, and information about the capabilities available to webinar participants.

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at 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:

1. *Federal eRulemaking Portal: www.regulations.gov.*
2. *Email:* to *CommACHeatingEquipCat2017TP0018@ee.doe.gov.* Include docket number EERE–2017–BT–TP–0018 in the subject line of the message.

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

Although DOE has routinely accepted public comment submissions through a variety of mechanisms, including postal mail and hand delivery/courier, the Department has found it necessary to make temporary modifications to the comment submission process in light of the ongoing Covid–19 pandemic. DOE is currently accepting only electronic submissions at this time. If a commenter finds that this change poses an undue hardship, please contact Appliance Standards Program staff at (202) 586–1445 to discuss the need for alternative arrangements. Once the Covid–19 pandemic health emergency is resolved, DOE anticipates resuming all of its regular options for public comment submission, including postal mail and hand delivery/courier.

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

The docket web page can be found at: *www.regulations.gov/#docketDetail;D=EERE-2017-BT-TP-0018*. The docket web page contains instructions on how to access all documents, including public comments, in the docket. See section V (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) 586–5827. Email: *Eric.Stas@hq.doe.gov*.

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

SUPPLEMENTARY INFORMATION: DOE proposes to incorporate by reference the following industry standards into title 10 of the Code of Federal Regulations (CFR) part 431:

Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 920–2020 (I–P), ''2020 Standard for Performance Rating of Direct Expansion-Dedicated Outdoor Air System Units,'' approved February 4, 2020.

American National Standards Institute (ANSI)/AHRI Standard 1060–2018, ''2018 Standard for Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment,'' approved 2018.

Copies of AHRI Standard 920–2020 (I–P), and ANSI/AHRI Standard 1060–2018 can be obtained from the Air-conditioning, Heating, and Refrigeration Institute, 2311 Wilson Blvd., Suite 400, Arlington, VA 22201, (703) 524–8800, or online at: *www.ahrinet.org*.

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

ANSI/ASHRAE Standard 41.1–2013, ''Standard Method for Temperature Measurement,'' ANSI approved January 30, 2013.

ANSI/ASHRAE Standard 41.6–2014, ''Standard Method for Humidity Measurement,'' ANSI approved July 3, 2014.

ANSI/ASHRAE Standard 198–2013, ''Method of Test for Rating DX-Dedicated Outdoor Air Systems for Moisture Removal Capacity and Moisture Removal Efficiency,'' ANSI approved January 30, 2013.

Copies of ANSI/ASHRAE Standard 37–2009, ANSI/ASHRAE Standard 41.1–2013, ANSI/ASHRAE Standard 41.6–2014, and ANSI/ASHRAE Standard 198–2013 can be obtained from the American Society of Heating, Refrigerating and Air-Conditioning Engineers, 180 Technology Parkway, Peachtree Corners, GA 30092, (404) 636–8400, or online at: *www.ashrae.org.*

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

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I. Authority and Background

Small, large, and very large commercial package air conditioning and heating equipment are included in the list of ''covered equipment'' for which DOE is authorized to establish and amend energy conservation standards and test procedures. (42 U.S.C. 6311(1)(B)–(D)) As defined by the Energy Policy and Conservation Act, as amended (EPCA), ''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. (42 U.S.C. 6311(8)(A)) Industry standards generally describe unitary central air conditioning equipment as one or more factory-made assemblies that normally include an evaporator or cooling coil and a compressor and condenser combination. Units equipped to also perform a heating function are included as well.[1] Direct expansion-dedicated outdoor air systems (DX–DOASes) provide conditioning of outdoor ventilation air using a refrigeration cycle consisting of a compressor, condenser, expansion valve, and evaporator,[2] and therefore, DOE has initially concluded that DX–DOASes are a category of commercial package air conditioning and heating equipment subject to EPCA. An industry consensus test standard has been established for a subset of DX–DOASes (*i.e.,* dehumidifying DX–DOASes (DDX–DOASes)), which are the subject of this test procedure proposal. The following sections discuss DOE's authority to establish test procedures for DDX–DOASes, as well as relevant background information regarding DOE's proposed adoption of the industry consensus test standard, and proposed clarifications to the industry test procedure for this equipment.

A. Authority

EPCA,[3] as amended, among other things, authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. Title III, Part C[4] of EPCA, Public Law 94–163 (42 U.S.C. 6311–6317, as codified), added by Public Law 95–619, Title IV, § 441(a), established the Energy Conservation Program for Certain Industrial Equipment, which sets forth a variety of provisions designed to improve energy efficiency. This covered equipment includes small, large, and very large commercial package air conditioning and heating equipment. (42 U.S.C. 6311(1)(B)–(D)) DOE has initially determined that commercial package air conditioning and heating equipment includes DX–DOASes. As discussed in section I.B of this document, DX–DOASes had not previously been addressed in DOE rulemakings and are not currently subject to Federal test procedures or energy conservation standards.

Under EPCA, DOE's 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 EPCA specifically include definitions (42 U.S.C. 6311), energy conservation standards (42 U.S.C. 6313), test procedures (42 U.S.C. 6314),

[1] *See* American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1, ''Energy Standard for Buildings Except Low-Rise Residential Buildings.''

[2] Other types of dedicated outdoor air systems are available that do not utilize direct expansion (*e.g.,* units that use chilled water, rather than refrigerant, as the heat transfer medium); these are discussed in section III.B.3.e.v. of this document.

[3] All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Public Law 116–260 (Dec. 27, 2020).

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

labeling provisions (42 U.S.C. 6315), and the authority to require information and reports from manufacturers (42 U.S.C. 6316).

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

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

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

EPCA requires that the test procedures for 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). (42 U.S.C. 6314(a)(4)(A)) Further, if such an industry test procedure is amended, DOE must update its test procedure to be consistent with the amended industry test procedure, unless DOE determines, by rule published in the **Federal Register** and supported by clear and convincing evidence, that such amended test procedure would not meet the requirements in 42 U.S.C. 6314(a)(2) and (3), related to representative use and test burden. (42 U.S.C. 6314(a)(4)(B))

EPCA also requires that, at least once every seven years, DOE evaluate test procedures for each type of covered equipment, including commercial package air conditioning and heating equipment to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures not to be unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle. (42 U.S.C. 6314(a)(1)–(3)) In addition, if DOE determines that a test procedure amendment is warranted, it must publish proposed test procedures in the **Federal Register** and afford interested persons an opportunity (of not less than 45 days duration) to present oral and written data, views, and arguments on the proposed test procedures. (42 U.S.C. 6314(b)) If DOE determines that test procedure revisions are not appropriate, DOE must publish in the **Federal Register** its determination not to amend the test procedures. (42 U.S.C. 6314(a)(1)(A)(ii))

As discussed in section I.B of this document, a test procedure for a subset of DX–DOASes (*i.e.,* DDX–DOASes), was first specified by ASHRAE Standard 90.1 in the 2016 edition (ASHRAE Standard 90.1–2016). Pursuant to 42 U.S.C. 6314(a)(4)(B), and following updates to the relevant test procedures which were referenced in ASHRAE Standard 90.1, DOE is publishing this NOPR proposing to establish a test procedure for DDX–DOASes in satisfaction of its aforementioned obligations under EPCA.

B. Background

From a functional perspective, DX–DOASes operate similarly to other categories of commercial package air conditioning and heat pump equipment, in that they provide conditioning using a refrigeration cycle consisting of a compressor, condenser, expansion valve, and evaporator. DX–DOASes provide ventilation and conditioning of 100-percent outdoor air to the conditioned space, whereas for typical commercial package air conditioners that are central air conditioners, outdoor air makes up only a small portion of the total airflow (usually less than 50 percent). DX–DOASes are typically installed in addition to a local, primary cooling or heating system (*e.g.,* commercial unitary air conditioner, variable refrigerant flow system, chilled water system, water-source heat pumps)—the DX–DOAS conditions the outdoor ventilation air, while the primary system provides cooling or heating to balance building shell and interior loads and solar heat gain. According to ASHRAE, a well-designed system using a DX–DOAS can ventilate a building at lower installed cost, reduce overall annual building energy use, and improve indoor environmental quality.[5]

On October 26, 2016, ASHRAE published ASHRAE Standard 90.1–2016, which for the first time specified a test standard and efficiency standards for DX–DOASes. ASHRAE Standard 90.1–2016 (and the subsequent 2019 edition) defines DX–DOAS as a type of air-cooled, water-cooled, or water-source factory assembled product that dehumidifies 100% outdoor air to a low dew point and includes reheat that is capable of controlling the supply dry-bulb temperature of the dehumidified air to the designed supply air temperature. This conditioned outdoor air is then delivered directly or indirectly to the conditioned spaces. It may precondition outdoor air by containing an enthalpy wheel, sensible wheel, desiccant wheel, plate heat exchanger, heat pipes, or other heat or mass transfer apparatus.

Although ASHRAE Standard 90.1–2016 uses the term ''DX–DOAS,'' the definition of this term provided therein describes a subset of DX–DOASes, specifically DDX–DOASes. The ASHRAE definition of ''DX–DOAS'' is generally equivalent to the equipment DOE is proposing to define as DDX–DOAS and for which DOE is proposing to adopt the industry consensus standard. DDX–DOASes dehumidify air to a low dew point. When operating in humid conditions, the dehumidification load from the outdoor ventilation air is a much larger percentage of the total cooling load for a DDX–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 DDX–DOAS at design conditions (*i.e.,* the warmest/most humid expected summer conditions), and a DDX–DOAS is designed to accommodate greater variation in entering air temperature and humidity (*i.e.,* a typical commercial air conditioner would not be able to dehumidify 100-percent outdoor ventilation air to the levels achieved by

[5] From the June 2018 ASHRAE eSociety Newsletter (Available at: *www.ashrae.org/news/esociety/what-s-new-in-doas-and-refrigerant-research*) (Last accessed May 24, 2021).

a DDX–DOAS). Not all DX–DOASes have this dehumidification capability, which is why DOE is proposing a separate definition. (See section III.B.2.a of this NOPR for further details.)

The amendment to ASHRAE Standard 90.1 to specify an industry test standard for equipment that DOE calls DDX–DOAS triggered DOE's obligations vis-à-vis test procedures under 42 U.S.C. 6314(a)(4)(B), as outlined previously. On July 25, 2017, DOE published a request for information (RFI) (the July 2017 ASHRAE TP RFI) in the **Federal Register** to collect information and data to consider new and amended DOE test procedures for commercial package air conditioning and heating equipment, given the test procedure updates included in ASHRAE Standard 90.1–2016. 82 FR 34427. As part of the July 2017 ASHRAE TP RFI, DOE requested comment on several aspects regarding test procedures for DDX–DOASes in consideration of adopting a new DOE test procedure for this equipment, including: Incorporation by reference of the relevant industry test standard(s); efficiency metrics and calculations, and additional topics that may inform DOE's decisions in a future test procedure rulemaking.[6] 82 FR 34427, 34435–34439 (July 25, 2017). On October 25, 2019, ASHRAE published an updated version of ASHRAE Standard 90.1 (*i.e.,* ASHRAE Standards 90.1–2019), which maintained the DDX–DOAS provisions as first introduced in ASHRAE Standard 90.1–2016 without revisions.

DOE received a number of comments from interested parties in response to the July 2017 ASHRAE TP RFI, which covered multiple categories of equipment. Table I–1 lists the commenters relevant to DDX–DOASes, along with each commenter's abbreviated name used throughout this NOPR. DOE considered these comments in the preparation of this NOPR. Discussion of the relevant comments, and DOE's responses, are provided in the appropriate sections of this document.

TABLE I–1—INTERESTED PARTIES PROVIDING DX–DOAS-RELATED COMMENTS ON THE JULY 2017 ASHRAE TEST PROCEDURE RFI

Name	Abbreviation	Type[1]
Air-Conditioning, Heating, and Refrigeration Institute	AHRI	IR
Appliance Standards Awareness Project (ASAP), Alliance to Save Energy (ASE), American Council for an Energy-Efficient Economy (ACEEE), Northwest Energy Efficiency Alliance (NEEA), and Northwest Power and Conservation Council (NPCC).	Joint Advocates	EA
Carrier Corporation, part of United Technologies Climate, Controls & Security (CCS) business	Carrier	M
Goodman Global, Inc	Goodman	M
The Greenheck Group	Greenheck	M
Ingersoll Rand	Ingersoll Rand	M
Lennox International, Inc	Lennox	M
Mitsubishi Electric Cooling & Heating[2]	Mitsubishi	M
National Comfort Institute	NCI	IR
Pacific Gas and Electric Company (PG&E), Southern California Gas Company (SoCalGas), San Diego Gas and Electric (SDG&E), and Southern California Edison (SCE), collectively referred to as California Investor-Owned Utilities (CA IOUs).	CA IOUs	U

[1] EA: Efficiency/Environmental Advocate; IR: Industry Representative; M: Manufacturer; U: Utility.
[2] Mitsubishi commented that it fully supports all of the comments submitted by AHRI on DX–DOAS issues.

On February 14, 2020, DOE published a final rule updating its procedures for consideration of new and amended energy conservation standards at 10 CFR part 430, subpart C, appendix A, ''Procedures, Interpretations, and Policies for Consideration of New or Revised Energy Conservation Standards and Test Procedures for Consumer Products and Certain Commercial/Industrial Equipment'' (the Process Rule). 85 FR 8626. As part of the update, the Process Rule now applies explicitly to commercial and industrial equipment. 10 CFR 431.4. The updated Process Rule also includes provisions specific to the consideration of new and amended energy conservation standards and test procedures for covered equipment subject to the ASHRAE provisions of EPCA. *See* Process Rule, 10 CFR part 430, subpart C, appendix A, sections 2 and 9.

With respect to DOE's consideration of changes to the relevant industry consensus test procedure(s) for covered ASHRAE equipment, the Process Rule now provides that DOE will do so only if it can meet a very high bar to demonstrate the ''clear and convincing evidence'' threshold. 10 CFR part 430, subpart C, appendix A, section 9(b). Clear and convincing evidence would exist only where the specific facts and data made available to DOE regarding a particular ASHRAE amendment demonstrates that there is no substantial doubt that that the industry test procedure does not meet the EPCA requirements. *Id.* DOE will make this determination only after seeking data and information from interested parties and the public to help inform DOE's views. DOE will seek from interested stakeholders and the public data and information to assist in making this determination, prior to publishing a proposed rule to adopt a different test procedure. *Id.*

II. Synopsis of the Notice of Proposed Rulemaking

In this NOPR, DOE is proposing to establish a definition for DX–DOAS as a category of commercial package air conditioning and heating equipment and adopt a new test procedure for a subset of DX–DOASes (*i.e.,* DDX–DOASes), consistent with the industry consensus test standard as specified in ASHRAE Standard 90.1–2019. The proposed test procedure applies to all DDX–DOASes for which ASHRAE 90.1–2019 specifies standards, with the exception of ground-water-source DDX–DOASes, as discussed in section III.A.1 of this NOPR. More specifically, DOE proposes to update 10 CFR 431.96, ''Uniform test method for the measurement of energy efficiency of commercial air conditioners and heat pumps,'' to adopt a new test procedure for DDX–DOASes as follows: (1) Incorporate by reference AHRI Standard 920–2020 (I–P), ''Performance Rating of

[6] In the July 2017 ASHRAE TP RFI, DOE referred to DDX–DOASes simply as ''DOASes.''

Direct Expansion-Dedicated Outdoor Air System Units'' (AHRI 920–2020), the most recent version of the test procedure recognized by ASHRAE Standard 90.1 for DDX–DOASes, and the relevant industry standards referenced therein; (2) establish the scope of coverage for the DDX–DOAS test procedure; (3) add definitions for DX–DOASes and DDX–DOASes, as well as additional terminology required by the test procedure; (4) adopt the integrated seasonal moisture removal efficiency, as measured according to the most recent applicable industry standard (ISMRE2), and integrated seasonal coefficient of performance (ISCOP2), as measured according to the most recent applicable industry standard, as energy efficiency descriptors for dehumidification and heating mode, respectively; and (5) establish representation requirements. DOE proposes to add a new Appendix B to Subpart F of Part 431, titled ''Uniform test method for measuring the energy consumption of dehumidifying direct expansion-dedicated outdoor air systems,'' (Appendix B) that would include the new test procedure requirements for DDX–DOASes. In conjunction, DOE proposes to amend Table 1 in 10 CFR 431.96 to identify the newly added Appendix B as the applicable test procedure for testing DDX–DOASes. DOE has tentatively determined that the proposed test procedure would not be unduly burdensome to conduct.

DOE's proposed actions are summarized in Table II.1 and addressed in detail in section III of this document.

TABLE II.1—SUMMARY OF PROPOSED TEST PROCEDURE FOR DDX–DOASES

Proposed test procedure	Attribution
Incorporates by reference AHRI 920–2020 and other relevant industry test standards referenced by that standard. AHRI 920–2020 includes: —test methods for DDX–DOAS with and without ventilation energy recovery systems (VERS); —test operating conditions, including Standard Rating Conditions, simulated ventilation air conditions for optional test methods for DDX–DOASes with VERS, supply air target conditions, supply and return airflow rates, and external static pressure; —testing instrumentation and apparatus instructions; —test operating and condition tolerances [7]; —a list of components that must be present for testing; and —provisions for testing units with certain optional features.	Adopt industry test procedure.
Defines DX–DOASes as covered equipment which meet the EPCA definition for small, large, or very-large commercial package air conditioning and heating equipment.	Establish equipment coverage.
Defines the scope of coverage of the test procedure, including defining DDX–DOASes to distinguish them from other kinds of equipment and a capacity limit based on moisture removal capacity (MRC).	Clarify scope of test procedure.
Adopts ISMRE2 and ISCOP2 as the seasonal efficiency descriptors for dehumidification and heating mode, respectively, as specified in AHRI 920–2020.	Adopt industry test procedure.
Provides minor corrections and additional instruction consistent with AHRI 920–2020 by: —specifying the external head pressure requirements for DDX–DOASes with integral water pumps; —specifying general control setting requirements; —correcting a typographical error in the calculation of the degradation coefficient; and —providing a missing definition necessary for the interpretation of the airflow setting instructions.	Clarify instructions in the industry test procedure.
Specifies representation requirements, including a basic model definition, sampling plan requirements, and use of alternative energy-efficiency determination methods (AEDMs).	Provide for representations of energy efficiency consistent with other commercial air conditioner/heat pump equipment.

III. Discussion

The following sections discuss DOE's proposal to define DX–DOASes as a category of small, large and extra-large commercial package air conditioning and heating equipment and to adopt a new test procedure for DDX–DOASes, a subset of DX–DOASes, and address relevant comments received in response to specific issues DOE raised in the July 2017 ASHRAE TP RFI. Commenters' references to ''DX–DOASes'' or ''DOASes'' have been changed to ''DDX–DOASes'' where DOE understands the commenters to be specifically discussing DX–DOASes that would meet the dehumidification performance criterion as proposed.

A. Scope of Applicability

1. Equipment Coverage

As discussed, DOE has initially determined that DX–DOASes are a category of small, large, and very large commercial package air conditioning and heating equipment and, therefore, are covered equipment under EPCA. (42 U.S.C. 6311(1)(B)–(D)) DX–DOASes operate similarly to more typical commercial package air conditioning equipment in that they provide conditioning of outdoor ventilation air using a refrigeration cycle consisting of a compressor, condenser, expansion valve, and evaporator. However, DX–DOASes are designed to provide ventilation and conditioning of 100-percent outdoor air, while outdoor air makes up only a small portion of the total airflow for typical commercial package air conditioning and heating equipment (*e.g.,* usually less than 50 percent).

As discussed further in section III.A.4 of this document, industry provides several definitions for DX–DOASes, but DOE notes that the industry definitions for ''DX–DOAS'' specifically refer to the DDX–DOASes that are covered by the scope of those industry test standards, which does not include non-dehumidifying (*i.e.,* sensible-only) DX–DOASes that exist on the market.

In this NOPR, DOE is proposing to define ''direct expansion-dedicated outdoor air system, or DX–DOAS,'' as a category of small, large, or very large commercial package air conditioning and heating equipment which is capable of providing ventilation and conditioning of 100-percent outdoor air or marketed in materials (including but not limited to, specification sheets, insert sheets, and online materials) as having such capability. This proposed definition is based, in part, on the definition in section 3.6 of AHRI 920–

[7] ''Test operating tolerance'' refers to the maximum permissible range that a measurement may vary over a specified test interval. ''Test condition tolerance'' refers to the maximum permissible difference between the average value of the measured test parameter and the specified test condition.

2020, as discussed in section III.A.4 of this document.

The proposed definition of DX–DOAS would include all air-cooled, air-source heat pump, and water-cooled equipment subcategories specified in ASHRAE Standard 90.1. For water-source heat pump equipment, ASHRAE Standard 90.1 includes three configurations—ground-source, closed loop; ground-water-source; and water-source. The EPCA definition for ''commercial package air conditioning and heating equipment'' specifically excludes ground-water-source equipment (42 U.S.C. 6311(8)(A)), so in proposing to define (at 10 CFR 431.92) DX–DOAS as a category of small, large, or very large commercial package air conditioning and heating equipment, ground-water-source DX–DOASes would be excluded from coverage under EPCA.

Issue–1: DOE requests comment on the proposed definition for ''direct expansion-dedicated outdoor air system.'' DOE also requests comment on any additional characteristics not yet considered that could help to distinguish DX–DOASes from other commercial package air conditioning and heating equipment.

2. Scope of Test Procedure

DOE is proposing to establish a test procedure for a subset of DX–DOASes (*i.e.,* DDX–DOASes). When operating in humid conditions, the dehumidification load is a much larger percentage of the total cooling load for a DDX–DOAS than for a typical commercial package air conditioning system. DDX–DOASes in particular handle a significantly higher amount of total cooling (both sensible and latent) per pound of air at design conditions (*i.e.,* the warmest or most humid expected summer conditions), and a DDX–DOAS is designed to accommodate greater variation in entering air temperature and humidity, because outdoor conditions can vary much more than typical indoor conditions. As discussed, not all DX–DOASes are designed to dehumidify outdoor air at the most humid expected summer conditions to a level consistent with comfortable indoor conditions, such as a dew point temperature less than 55 °F (*e.g.,* sensible-only cooling [8] DX–DOASes). AHRI stated that sensible-only 100-percent outdoor air units should not be covered by ANSI/AHRI 920–2015 because they are not intended to dehumidify the ventilation air. (AHRI, No. 11 at pp. 10–11) [9]

Because DOE is aware of sensible-only DX–DOASes, DOE aims to further delineate those DX–DOASes that would be subject to the proposed test procedure (*i.e.,* DDX–DOASes). Section 2.2 of AHRI 920–2020 explicitly excludes ''Sensible-only 100% Outdoor Air Units'' from the scope of its test standard. Accordingly, DOE proposes to define DDX–DOASes (the subject of this proposed test procedure) in 10 CFR 431.92 as those DX–DOASes specifically having the capability to dehumidify air to a dew point of 55 °F when operating under Standard Rating Condition A as specified in Table 4 or Table 5 of AHRI 920–2020 with a barometric pressure of 29.92 in Hg. The 55 °F dew point is specified in ANSI/AHRI 920–2015 and AHRI 920–2020 as the maximum dew point temperature for the supply air for the dehumidification mode tests.[10] This maximum dew point temperature requirement for DDX–DOASes provides a key differentiator from other DX–DOASes, which typically cannot dehumidify 100-percent outdoor air to a dew point this low. This element is consistent with the definition in AHRI 920–2020.

AHRI 920–2020 does not specify at what airflow the dehumidification element is to be evaluated. DOE proposes to include within the proposed definition of DDX–DOAS that the DDX–DOAS be capable of providing the specified dehumidification capability for any portion of the range of air flow rates advertised in manufacturer materials. This provision would provide additional specificity to the definition found in AHRI 920–2020 to account for manufacturers that may specify a range of airflows for a given model.

As proposed, the test procedure would apply to DDX–DOASes within the capacity limits as discussed in the following section.

Issue–1: DOE requests comment on the proposed definition for ''dehumidifying direct expansion-dedicated outdoor air system.'' Specifically, DOE requests comment on the proposed criteria for distinguishing a ''dehumidifying direct expansion-dedicated outdoor air system'' from a ''direct expansion-dedicated outdoor air system'' more generally. DOE also requests comment on any additional characteristics not yet considered that could help to distinguish DDX–DOASes from DX–DOASes more generally.

3. Capacity Limit

As stated, EPCA defines as covered equipment small, large, and very large commercial package air conditioning and heating equipment. (42 U.S.C. 6311(1)(B)–(D)) EPCA defines ''small commercial package air conditioning and heating equipment'' as commercial package air conditioning and heating equipment that is rated below 135,000 Btu per hour (cooling capacity). (42 U.S.C. 6311(8)(B)) The term ''large commercial package air conditioning and heating equipment'' means commercial package air conditioning and heating equipment that is rated—(i) at or above 135,000 Btu per hour; and (ii) below 240,000 Btu per hour (cooling capacity). (42 U.S.C. 6311(8)(C)) The term ''very large commercial package air conditioning and heating equipment'' means commercial package air conditioning and heating equipment that is rated—(i) at or above 240,000 Btu per hour; and (ii) below 760,000 Btu per hour (cooling capacity). (42 U.S.C. 6311(8)(D))

In response to the July 2017 ASHRAE TP RFI, AHRI commented that DOE's regulations for DDX–DOASes should be capped at a reasonable capacity, similar to the 760,000 Btu/h limit for commercial packaged air conditioning equipment. AHRI stated that laboratory limitations may limit testing using ANSI/AHRI 920–2015 to 300 lbs. of moisture per hour at Standard Rating Condition A and to units not physically larger than more typical commercial package air conditioning and heating equipment with a capacity of 760,000 Btu/h. The commenter also stated that the market for these larger, typical commercial package air conditioning equipment and DDX–DOAS units (with a capacity greater than 760,000 Btu/h, or equivalent) is very small and customized. AHRI stated that the customization helps customers minimize energy consumption for their application. (AHRI, No. 11 at p. 20)

As discussed, DOE has tentatively concluded that DX–DOASes meet the EPCA definition for ''commercial package air conditioning and heating equipment,'' and, thus, are to be considered as a category of that covered equipment. (42 U.S.C. 6311(8)(A)) The upper capacity limit of commercial

[8] ''Sensible cooling'' refers to the process of cooling air by reducing its dry bulb temperature without changing its moisture content.

[9] A notation in the form ''AHRI, No. 11 at pp. 10–11'' identifies a written comment: (1) Made by AHRI; (2) recorded in document number 11 that is filed in the docket of this test procedure rulemaking (Docket No. EERE–2017–BT–TP–0018) and available for review at *www.regulations.gov;* and (3) which appears on pages 10 through 11 of document number 11.

[10] AHRI 920–2020 acknowledges the influence of barometric pressure on humidity ratio for the inlet air conditions specified in terms of dry bulb and wet bulb temperature, allowing an upward adjustment of the maximum supply air dew point temperature that must be achieved, such that the moisture removal rate matches that which would occur at standard barometric pressure when supplying 55 °F dew-point supply air—this maximum supply air dew point increases linearly as barometric pressure decreases, up to 57.3 °F at the minimum-allowed 13.7 psia test pressure.

package air conditioning subject to the DOE test procedures is 760,000 Btu per hour, based on the definition of ''very large commercial package air conditioning and heating equipment.'' (42 U.S.C. 6311(8)(D))

For DDX–DOASes specifically, AHRI 920–2020 does not provide a method for determining capacity in terms of Btu per hour, but instead, it specifies a determination of capacity in terms of moisture removal capacity (MRC). DOE proposes to translate the upper capacity for coverage of commercial package air conditioning and heating units established in EPCA (*i.e.,* 760,000 Btu per hour) from Btu per hour to MRC for DDX–DOASes. Specifically, DOE is proposing, consistent with section 6 of AHRI 920–2020, to translate the upper limit from Btu per hour to MRC of the DDX–DOAS when delivering dehumidified supply air at a 55 °F dew point. Manufacturers would use their tested value of MRC to determine if a DDX–DOAS is subject to the test procedure.

To translate Btu per hour to MRC, DOE calculated the maximum airflow that could be supplied at a 55 °F dewpoint for Standard Rating Condition A as specified in Table 4 and Table 5 of AHRI 920–2020 by cooling and dehumidifying it with an evaporator with a refrigeration capacity of 760,000 Btu per hour. DOE calculated this based on air entering the evaporator at Standard Rating Condition A (95 °F dry-bulb temperature and 78 °F wet-bulb temperature) and air exiting the evaporator at 55 °F dew point and 95-percent relative humidity at a standard barometric pressure of 29.92 in Hg. DOE then calculated the MRC that corresponds to those conditions. Based on these calculations, DOE is proposing to limit the scope of this proposed test procedure to DDX–DOAS units with a MRC less than 324 lbs. per hour based on Standard Rating Condition A as specified in Table 4 or Table 5 of AHRI 920–2020.

Issue–2: DOE seeks comment on its translation of Btu per hour to MRC and specifically its proposal to translate the upper capacity limit for DDX–DOASes such that a model would be considered in scope if it has an MRC less than 324 lbs. per hour.

4. Industry Terminology

As stated, DOE is proposing definitions for DX–DOAS and DDX–DOAS following a review of industry standards and consistent with the applicability of the relevant industry testing standard. Both ANSI/AHRI 920–2015 and ANSI/ASHRAE 198–2013 include definitions for ''DX-Dedicated Outdoor Air System Units.'' Section 3.3 of ANSI/AHRI 920–2015 defines ''DX-Dedicated Outdoor Air System Units'' as a type of air-cooled, water-cooled, or water-source factory assembled product which dehumidifies 100-percent outdoor air to a low dew point, and includes reheat that is capable of controlling the supply dry-bulb temperature of the dehumidified air to the designed supply air [11] temperature. This conditioned outdoor air is then delivered directly or indirectly to the conditioned space(s). It may pre-condition outdoor air by containing an enthalpy wheel, sensible wheel, desiccant wheel, plate heat exchanger, heat pipes, or other heat or mass transfer apparatus. This is the same definition used in ASHRAE Standard 90.1–2019.

Section 3 of ANSI/ASHRAE 198–2013 defines a ''DX Dedicated Outdoor Air Systems Unit (DX–DOAS)'' as a type of air-cooled, water-cooled, or water-source factory-assembled product that is capable of dehumidifying 100-percent outdoor air to a low dew point and may be capable of controlling the dry-bulb temperature of the dehumidified air to the designed supply air temperature. This conditioned outdoor air may be delivered directly or indirectly to the conditioned space(s). It may pre-condition outdoor air prior to direct expansion cooling by incorporating an enthalpy wheel, sensible wheel, desiccant wheel, plate heat exchanger, heat pipes, or other heat or mass transfer apparatus. The product may also include a supplementary heating system for use when outdoor air requires heating beyond the capability of the refrigeration system and/or other heat transfer apparatus.

As part of the July 2017 ASHRAE TP RFI, DOE requested comment on certain aspects of these two industry definitions of dedicated outdoor air systems. 82 FR 34427, 34435–34436 (July 25, 2017). On February 4, 2020, AHRI published AHRI 920–2020, which made changes to the definition of ''Dedicated Outdoor Air System Unit'' as compared to the definition in ANSI/AHRI 920–2015 (and ASHRAE Standard 90.1–2019). Section 3.6 of AHRI 920–2020 defines ''Dedicated Outdoor Air System Unit'' as a type of air-cooled, evaporatively-cooled, or water-cooled air-conditioner, or an air-source or water source heat pump, that is a factory assembled product designed and marketed and sold to provide ventilation and dehumidification of 100% outdoor air, is capable of dehumidifying air to a 55 °F dew point when operating under Standard Rating Condition A as specified in Table 4 or Table 5 of this test standard with a barometric pressure of 29.92 in Hg, and may include reheat. It may include pre-conditioning of outdoor air using an enthalpy wheel, sensible wheel, desiccant wheel, plate heat exchanger, heat pipes, or other heat or mass transfer apparatus. Heating components are optional and may include electrical resistance, steam, hot water, or gas heat. In addition, it may provide for air cleaning or may include mixing box or economizer dampers to allow return air to be intermittently used as allowed by the controls.

[11] ''Supply air'' for a DDX–DOAS refers to conditioned air that is supplied to the conditioned space.

Both ANSI/AHRI 920–2015 and ANSI/ASHRAE 198–2013 address equipment that dehumidifies (or is capable of dehumidifying) 100-percent outdoor air to a low dew point. As discussed, in its review of available equipment, DOE found units marketed as ''dedicated outdoor air systems,'' and other units marketed for ''100-percent outdoor air'' applications, both of which can also operate with less than 100-percent outdoor air. Such units have a return air damper that allows modulating the amount of return air that is recirculated from the conditioned space and mixed with the incoming outdoor air before the mixed air is conditioned. More typical commercial package air conditioning equipment also often incorporates a similar damper to mix return air and outdoor air. Additionally, like the industry definitions for dedicated outdoor air systems, which DOE notes would be DDX–DOASes as that term is proposed to be defined, some categories of commercial package air conditioning equipment can dehumidify 100-percent outdoor air, although typically not to a dew point as low as the industry specification for DDX–DOASes.

As part of the July 2017 ASHRAE TP RFI, DOE requested information on the range of the maximum percentage of return air intake relative to total airflow of models of equipment that DOE generally referred to as ''DOASes'' in order to determine whether the maximum return air percentage is an important distinguishing feature of DDX–DOASes. DOE also requested information on the difference in dehumidification capabilities of more typical commercial package air conditioning equipment and equipment that DOE referred to as DOASes when operating with 100-percent outdoor air. 82 FR 34427, 34435 (July 25, 2017).

Ingersoll Rand and Carrier commented that there are not one or two features or criteria that definitively distinguish DDX–DOASes from more typical commercial package air conditioning equipment. (Ingersoll Rand, No. 12 at p. 2; Carrier, No. 6 at p. 2) AHRI and Carrier commented that there may be several potential applications for DDX–DOASes, some of which may not be 100-percent outdoor air. (AHRI, No. 11 at p. 9; Carrier, No. 6 at p. 2) AHRI and Ingersoll Rand stated, for example, that DDX–DOASes may be supplied with recirculation dampers that allow them to efficiently dehumidify recirculated air when the building is unoccupied. AHRI stated that, as a result, it is not possible to select a specific crossover percentage of return air intake relative to total airflow that would differentiate DDX–DOASes from more typical commercial package air conditioning equipment. (AHRI, No. 11 at p. 9; Ingersoll Rand, No. 12 at p. 2) Goodman supported AHRI's position, adding that when the return air intake relative to the total airflow is less than 10–30 percent, ANSI/AHRI 920–2015 is more appropriate than ANSI/AHRI 340/360 [12] in non-western climates. (Goodman, No. 14 at p. 2)

As discussed, not all DX–DOASes are designed to provide dehumidification (to a low dew point) over larger variation in entering air temperature and humidity. As such, DOE is proposing to define DDX–DOAS to distinguish such equipment from DX–DOAS more generally, as provided in the previous sections. The DDX–DOAS definition is consistent with the definition in section 3.6 of AHRI 920–2020 for the equipment subject to the scope of that industry test standard.

DOE noted in the July 2017 ASHRAE TP RFI that one difference between the definitions in ANSI/ASHRAE 198–2013 and ANSI/AHRI 920–2015 (and now AHRI 920–2020) is related to reheat. ANSI/AHRI 920–2015 specifies that a Direct Expansion-Dedicated Outdoor Air System Unit includes reheat, which is used to raise the temperature of cooled and dehumidified air to a design supply air temperature. The ANSI/ASHRAE 198–2013 definition provides that a DX Dedicated Outdoor Air Systems Unit, as defined by that industry standard, may have reheat but does not require reheat. DOE requested comment on whether and how reheating functionality should be included in the DDX–DOAS definition. 82 FR 34427, 34435–34436 (July 25, 2017).

In response to the July 2017 ASHRAE TP RFI, AHRI and Greenheck commented that while capturing reheat performance in the test procedure for DDX–DOAS equipment is an important aspect to many installations, some building HVAC designs incorporating DDX–DOAS equipment operate without any reheat capabilities. AHRI and Greenheck suggested that the definition of DDX–DOAS should not require reheat, as it is important for owners and designers to be able to select 100-percent outdoor air units with varying amounts of reheat or no reheat. (AHRI, No. 11 at pp. 10–11, 20–21; Greenheck, No. 13 at p. 2) AHRI further commented that DDX–DOAS design and optimum efficiency varies with climate and application, and that the design is often customized to accommodate the different needs of different applications. AHRI asserted that regulations must allow for these differences to avoid increasing energy consumption for a given project. (AHRI, No. 11 at p. 20–21) Greenheck commented that the supplementary heat penalty included in ANSI/AHRI 920–2015 unfairly penalizes units without reheat, and Greenheck suggested two options for rating units without reheat. (Greenheck, No. 13 at pp. 2–3). Carrier also commented that reheat functionality is an application issue and is not applicable to the definition in a test standard. (Carrier, No. 6 at p. 3)

DOE recognizes that the optimum-efficiency DDX–DOAS design varies with climate and application. DOE also understands that the supplementary heat penalty in ANSI/AHRI 920–2015 is not representative of the way that units without reheat are used in the field. As is discussed in section III.B.2.a of this document, as part of AHRI 920–2020, AHRI modified the ISMRE metric to remove the supplementary heat penalty in recognition that some installation conditions may not require reheating. As is discussed in section III.B.1 of this document, this metric was re-designated in AHRI 920–2020 as ISMRE2. AHRI 920–2020 also includes a separate application rating metric, ISMRE270, to account for installations where reheating is required. Moreover, the updated definition in AHRI 920–2020 recognizes that there are units without reheat. As such, DOE is not proposing to include a reheat requirement in the DX–DOAS or DDX–DOAS definition, consistent with AHRI 920–2020.

Because of the difference in terminology between the proposed DOE test procedure and the relevant industry standards, DOE proposes to include a section 2.3(a) in its proposed Appendix B indicating that the different synonymous terms all refer to dehumidifying direct expansion-dedicated outdoor air system as defined in 10 CFR 431.92.

Issue–3: DOE requests comment on its proposal to clarify what terms are synonymous with DDX–DOAS.

B. Test Procedure for Dehumidifying Dedicated Outdoor Air Systems

Pursuant to EPCA, in response to the DDX–DOAS-related updates to ASHRAE 90.1–2016 (maintained in ASHRAE 90.1–2019) and updates to the industry test standard referenced in ASHRAE 90.1, DOE proposes to adopt a test procedure for DDX–DOASes that incorporates by reference the latest applicable industry consensus test standards.

In the following sections, DOE presents analysis and discussion of several test procedure issues and proposes a test procedure for DDX–DOASes. As discussed in more detail in the following sections, DOE has initially determined that the proposed test procedure for DDX–DOASes would be representative of an average use cycle and not be unduly burdensome to conduct.

DOE is adopting the generally accepted industry testing procedures for DDX–DOASes developed by AHRI (*i.e.,* AHRI 920–2020) and referenced by ASHRAE Standard 90.1, with the following modifications as discussed in this NOPR:

- Using the nomenclature DDX–DOAS, rather than DX–DOAS, to define the equipment subject to the test procedure;
- Defining an upper limit of capacity consistent with EPCA's definition of very large commercial package air conditioning and heating equipment;
- Defining ''non-standard low-static fan motor,'' in order to determine the appropriate airflow setting procedure;
- Specifying the external head pressure requirements for testing DDX–DOASes with integral water pumps;
- Requiring that control settings remain unchanged for all Standard Rating Conditions once system set-up has been completed prior to testing;
- Specifying requirements for testing equipment available with multiple refrigerant options; and
- Correcting a typographical error within one of the equations.

1. Industry Consensus Test Standards

As first established in ASHRAE 90.1–2016, ASHRAE Standard 90.1–2019 specifies separate equipment classes for DDX–DOASes [13] and sets minimum

[12] ANSI/AHRI Standard 340/360, ''Performance Rating of Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment'' (Available at: *www.ahrinet.org/*) (Last accessed April 19, 2021).

[13] As discussed, the term DX–DOAS as defined by ASHRAE 90.1–2019 is equivalent to the term DDX–DOAS as defined by DOE in this NOPR.

efficiency levels using the integrated seasonal moisture removal efficiency (ISMRE) metric for all DDX–DOAS classes and also the integrated seasonal coefficient of performance (ISCOP) metric for air-source heat pump and water-source heat pump DDX–DOAS classes. ASHRAE Standard 90.1–2019 specifies that both metrics are to be measured in accordance with ANSI/AHRI Standard 920–2015, ''Performance Rating of DX-Dedicated Outdoor Air System Units'' (ANSI/AHRI 920–2015). ANSI/AHRI 920–2015 specifies the method for testing DDX–DOASes, in part, through a reference to ANSI/ASHRAE Standard 198–2013, ''Method of Test for Rating DX-Dedicated Outdoor Air Systems for Moisture Removal Capacity and Moisture Removal Efficiency'' (ANSI/ASHRAE 198–2013).

ANSI/AHRI 920–2015 specifies Standard Rating Conditions (*i.e.,* instructions on setting air and liquid flow rates, and equations for calculating ISMRE and ISCOP). Table 2 and Table 3 of ANSI/AHRI 920–2015 provide outdoor and return air conditions for four Standard Rating Conditions for the dehumidification test and two Standard Rating Conditions for the heating test for heat pump DDX–DOASes. These tables also provide condenser cooling water temperatures (for both cooling tower and chilled water condensers) for water-cooled (cooling-only) DDX–DOASes and water temperatures for water-source, ground-source closed-loop, and ground-water source [14] heat pump DDX–DOASes.

ANSI/ASHRAE 198–2013 includes requirements on instrumentation, test set-up, tolerances, method of test, and calculations for moisture removal capacity (MRC), moisture removal efficiency (MRE), heating capacity (*qhp*) and heating coefficient of performance (COP). The MRE for the dehumidification test is calculated for Standard Rating Conditions [15] A, B, C, and D of Table 2 or Table 3 of ANSI/AHRI 920–2015 for air-cooled, water-cooled, and water-source heat pump DDX–DOASes. Similarly, COP is calculated for the heating mode test for Standard Rating Conditions E and F of Table 2 or Table 3 of ANSI/AHRI 920–2015 for heat pump DDX–DOASes. The MRE and COP values are subsequently used to calculate ISMRE and ISCOP using weights that correspond to temperature bin data for representative cities in the United States.

DOE notes that AHRI recently revised AHRI 920 and published an updated version on February 4, 2020, AHRI Standard 920–2020 (I–P), ''Performance Rating of Direct Expansion Dedicated Outdoor Air System Units'' (AHRI 920–2020). AHRI 920–2020, which continues to reference ANSI/ASHRAE 198–2013, includes revisions that DOE has initially determined improve the representativeness, repeatability, and reproducibility of the test methods while also reducing test burden. These revisions include, among other things, the following: (1) Expanded scope of coverage of the test procedure by no longer imposing an upper limit of 97 lbs/hr on DDX–DOAS MRC, thereby making the test procedure applicable to all DDX–DOASes subject to standards under ASHRAE Standard 90.1; (2) revised outdoor air dry-bulb temperature conditions, external static pressures, humidity conditions, and weighting factors for ISMRE and ISCOP, which were redesignated as ISMRE2 and ISCOP2, respectively; (3) revised calculations for achieving the target supply air conditions for units with staged capacity control; (4) added a supplementary cooling penalty when the supply air dry-bulb temperature is greater than 75 °F in dehumidification mode; (5) removed a supplementary heat penalty for the efficiency metric ISMRE2 when the supply air dry-bulb temperature is less than 70 °F in dehumidification mode; [16] (6) revised condenser water conditions for water-cooled and water-source heat pump DDX–DOASes; (7) added requirements for supply air dew point temperature; [17] (8) added requirements for outdoor coil liquid flow rate; (9) provided additional test unit, test facility, instrumentation, and apparatus set-up provisions; (10) revised test methods for DDX–DOASes equipped with VERS; (11) added requirements for relief-air-cooled DDX–DOASes and DDX–DOASes equipped with desiccant wheels; and (12) included requirements for secondary capacity tests.

DOE carefully reviewed both ANSI/AHRI 920–2015 and ANSI/ASHRAE 198–2013, as well as the latest changes in AHRI 920–2020, in consideration of this NOPR. In the following sections, DOE discusses the proposed definition for DDX–DOASes, scope of the test procedure, efficiency metrics, test methods (including the updates to AHRI 920 in the 2020 version listed in the prior paragraph), and sampling requirements. Generally, DOE incorporates industry standards into the regulations by reference to the standard. In this NOPR, DOE has proposed to incorporate by reference AHRI 920–2020.

DOE is also proposing to incorporate by reference several industry standards that are referenced by AHRI 920–2020, as shown in Table III–1.

TABLE III–1—ADDITIONAL INDUSTRY STANDARDS PROPOSED TO BE INCORPORATED BY REFERENCE

Industry standard	Section(s) in AHRI 920–2020 that reference this industry standard
ANSI/ASHRAE 198–2013.	Section 5; Section 6; Appendix C.
ANSI/ASHRAE 37–2009.	Section 5; Section 6; Appendix C.
ANSI/ASHRAE 1060–2018.	Section C4.
ANSI/ASHRAE 41.1–2013.	Section C3.3.1.
ANSI/ASHRAE 41.6–2014.	Section C3.1.3.2.

In response to the July 2017 ASHRAE TP RFI, AHRI commented that the ISMRE and ISCOP levels specified for DDX–DOASes in ASHRAE 90.1–2016 will need adjustment if changes to the test procedure negatively impact these values (AHRI, No. 11 at p. 20).

This NOPR proposes to incorporate by reference the latest version of the industry test procedure for DDX–DOASes which is recognized by ASHRAE Standard 90.1: AHRI 920 (the latest version being AHRI 920–2020). When the test procedures referenced in ASHRAE Standard 90.1 are updated, EPCA requires DOE to amend the Federal test procedures for such covered ASHRAE equipment (which manufacturers are required to use in order to certify compliance with energy

[14] As discussed in section III.A.1 of this NOPR, the EPCA definition for ''commercial package air conditioning and heating equipment'' specifically excludes ground-water-source equipment (42 U.S.C. 6311(8)(A)). Accordingly, DOE is proposing to exclude this equipment from the scope of applicability of the test procedure.

[15] Standard Rating Conditions in the AHRI 920 test procedure represent full-load and part-load operating conditions for testing DX–DOASes. Standard Rating Condition A represents full-load operation in dehumidification mode, whereas Standard Rating Conditions B–D represent part-load operation in dehumidification mode. Standard Rating Condition F represents full-load operation in heat pump mode at low temperatures, and Standard Rating Condition E represents full-load operation in heat pump mode at high temperatures.

[16] As discussed in section III.B.3.a of this NOPR, AHRI 920–2020 additionally provides a method for calculating $ISMRE2_{70}$, an application metric for the dehumidification efficiency with the inclusion of the supplementary heat penalty. The subscript ''70'' indicates the inclusion of energy use from any supplementary heat that is required to raise the supply air dry bulb temperature to 70 °F.

[17] Dew point is the temperature below which water begins to condense from the water vapor state in humid air into liquid water droplets. Dew point varies with humidity (*e.g.,* a low dew point indicates low humidity and vice versa) and is, therefore, used to specify the humidity of the supply air.

conservation standards mandated under EPCA) to be consistent with the amended industry consensus test procedure. (42 U.S.C. 6314(a)(4)(B))

The energy efficiency standards specified in ASHRAE Standard 90.1 are based on ANSI/AHRI 920–2015 and ANSI/ASHRAE 198–2013. However, the amendments adopted in AHRI 920–2020 result in changes to the measured efficiency metrics as compared to the results under ANSI/AHRI 920–2015. As discussed, DOE has not established in its regulations energy conservation standards specifically for DDX–DOASes. DOE will address any potential differences in the measured energy efficiency under the most recent industry test procedure as compared to the industry test procedure on which the ASHRAE Standard 90.1 levels are based at such time as DOE evaluates the ASHRAE Standard 90.1 levels for DDX–DOASes (*i.e.,* by developing an appropriate crosswalk, as necessary). Specifically, DOE intends to request that DDX–DOAS manufacturers provide any data and/or analysis that indicates whether and how much the measured rating of DDX–DOASes would be expected to change under the most recent version of the industry consensus test standard.

Issue–4: DOE requests comment and data on the development of a crosswalk from the efficiency levels in ASHRAE Standard 90.1 based on ANSI/AHRI 920–2015 to efficiency levels based on AHRI 920–2020. DOE is specifically seeking data on how dehumidification and heating efficiency ratings for a given DDX–DOAS model are impacted when measured using AHRI 920–2020 as compared to ANSI/AHRI 920–2015.

2. Efficiency Metrics

a. Dehumidification Metric

ASHRAE 90.1–2016 adopted a dehumidification efficiency metric for DDX–DOASes. Specifically, ASHRAE 90.1–2016 uses ISMRE, as presented in section 3.10 of ANSI/AHRI 920–2015, as a seasonal efficiency metric calculated as a weighted average of MRE for four different dehumidification rating conditions. MRE for each test condition is the MRC for that condition divided by electric power input, including consideration of electric resistance reheat if needed to raise supply air temperature to 70 °F (*i.e.,* ''supplementary heat''). MRC represents the rate at which the DDX–DOAS removes humidity from the air in pounds of moisture per hour. As discussed further in section III.B.2.c of this document, AHRI indicated that the seasonal weighting factors for determining ISMRE, as specified in ANSI/AHRI 920–2015, were developed based on climate data from a sample of twelve cities chosen to be representative of a wide range of climatic data in the United States.

The primary function of DDX–DOASes is to provide conditioned (cooled and dehumidified, or heated) outdoor air. In the cooling/dehumidifying season, these units provide sensible cooling that reduces the temperature of the outdoor air in addition to dehumidifying. DOE noted in the July 2017 ASHRAE TP RFI that the ISMRE metric specified in ANSI/AHRI 920–2015 does not include any provisions to measure the sensible cooling contribution provided by the DDX–DOAS. 82 FR 34427, 34436 (July 25, 2017). For Standard Rating Conditions A and B in Table 2 and Table 3 of ANSI/AHRI 920–2015, conditioning the air to a space temperature (70 °F) requires sensible cooling as well as latent cooling. In the July 2017 ASHRAE TP RFI, DOE requested comment on whether the DDX–DOAS efficiency metric should account for this sensible cooling. 82 FR 34427, 34436 (July 25, 2017).

In response to the July 2017 ASHRAE TP RFI, AHRI commented that DDX–DOASes operate with a separate, sensible-cooling-only interior cooling system, and that adding sensible cooling to the metric for DDX–DOAS would skew efficiency values toward the non-primary function of the DDX–DOAS. AHRI also stated that the capacity for sensible cooling varies between DDX–DOAS designs, so the use of space-neutral air [18] gives a worst-case efficiency to be used as comparison. (AHRI, No. 11 at p. 12) Carrier expressed concern that the current metric focuses on latent capacity and that a shortcoming of the test procedure is that it does not consider sensible capacity. Carrier also stated that considering only latent capacity would be acceptable if the unit delivers space-neutral air, but some DDX–DOASes can provide sensible cooling. (Carrier, No. 6 at p. 3)

As discussed in section III.B.2.c of this NOPR, DOE proposes to incorporate by reference the dehumidification metrics contained in the updated version of the industry consensus standard, AHRI 920–2020. DOE notes that the revised dehumidification metric in AHRI 920–2020, ISMRE2, does not include provisions to determine the sensible cooling contribution in the metric. However, as discussed in section III.B.1 of this document, the ISMRE2 metric, which is specified in AHRI 920–2020 as the required rating metric for dehumidification efficiency, removes the supplementary heat penalty to avoid penalizing DDX–DOAS units that provide sensible cooling below 70 °F.

DOE recognizes that the sensible cooling provided by a DDX–DOAS unit may be valuable in many applications because it reduces the cooling that must be provided by interior cooling systems, especially at high outdoor temperatures. However, for certain applications it may be important to reheat the supply air to balance the building's sensible cooling load.[19] DOE may consider in a future rulemaking whether the efficiency metric should be revised to include sensible cooling, if information is made available to support such a change.

ASHRAE Standard 90.1–2016 uses ISMRE (using ANSI/AHRI 920–2015) as the metric for the specified minimum efficiencies for DDX–DOAS. As discussed in section III.B.1 of this NOPR, DOE is aware that updates to the industry test procedure in AHRI 920–2020 using ISMRE2 could impact the measured efficiencies of DDX–DOASes as compared to ISMRE measured in accordance with ANSI/AHRI 920–2015, thereby necessitating use of an appropriate crosswalk analysis. Therefore, DOE will address these potential impacts on the measured efficiencies in a separate standards rulemaking.

b. Heating Metric

ASHRAE 90.1–2016 adopted ISCOP, as presented in ANSI/AHRI 920–2015, as the heating efficiency metric, and it also set minimum ISCOP efficiency levels for both air-source and water-source heat pump DDX–DOASes. ISCOP is a seasonal energy efficiency metric and is calculated as the seasonal weighted average of heating COPs determined for two heating Standard Rating Conditions specified in Table 2 and Table 3 of ANSI/AHRI 920–2015.

In the July 2017 ASHRAE TP RFI, DOE noted that although the Department has identified air-source heat pump DDX–DOASes available on the market, section 3.9 of ANSI/AHRI 920–2015 defines ISCOP as an energy efficiency metric only for water-source heat pump DDX–DOASes. 82 FR 34427, 34436 (July 25, 2017). DOE also noted

[18] Space-neutral air, or neutral air, refers to air leaving an air conditioner being at the target conditions for the occupied space in the building (without the need for subsequent sensible or latent cooling).

[19] As discussed in section III.B.1 of this document, AHRI 920–2020 include separate application metrics (*i.e.,* ISMRE270) to be used for additional representations and that are calculated with a supplementary heat penalty based on raising the supply air dry-bulb temperature up to 70 °F.

in the July 2017 ASHRAE TP RFI that equations in section 10.9 of ANSI/ASHRAE 198–2013 for calculating the COP are labeled for application to water-source heat pump DDX–DOASes, although DOE once again noted that they could be applied to air-source heat pump DDX–DOASes. *Id.* As part of the July 2017 ASHRAE TP RFI, DOE requested comment on the calculation procedure for COP for air-source heat pumps, including whether the equations in ANSI/ASHRAE 198–2013 are applicable to air-source heat pumps. *Id.* DOE did not receive any comments on this topic. Because ASHRAE Standard 90.1–2016 specifies minimum efficiency levels for both air-source and water-source heat pump DDX–DOASes using ANSI/AHRI 920–2015, DOE considers the ISCOP and COP calculations to be applicable to the minimum efficiency levels in ASHRAE Standard 90.1–2016 for both equipment classes.

In further clarification, AHRI 920–2020 revised the definition of ''Direct Expansion-Dedicated Outdoor Air System Units'' and the heating efficiency metric (designated as ISCOP2) to include both air-source and water-source heat pump DDX–DOASes. The ISCOP2 metric specified in section 3.13 of AHRI 920–2020 also includes revisions to the outdoor air conditions, weighting factors, and treatment of heating capacity calculations. DOE is proposing to adopt ISCOP2 as the heating efficiency metric for DDX–DOASes under the DOE test procedure, expressed in Watts (W) of heating capacity per W of power input. As discussed in section III.B.1 of this NOPR, updates to the industry consensus test procedure in AHRI 920–2020 using ISCOP2 could impact the measured heating efficiencies of DDX–DOASes as compared to ISCOP measured in accordance with ANSI/AHRI 920–2015, thereby necessitating use of an appropriate crosswalk analysis. Therefore, DOE will address these potential impacts on the measured heating efficiencies in a separate standards rulemaking.

ISCOP2 is calculated using COPISCOP values for Standard Rating Conditions E and F that apply a supplementary heat penalty to the total power input if the supply air dry-bulb temperature is less 70 °F. Section 6.11 of AHRI 920–2020 includes additional application rating heating metrics, COP_{full} and $COP_{DX-DOAS}$, for additional representations. $COP_{DX-DOAS}$ is calculated without a supplementary heat penalty, while COP_{full} is used for manufacturer-specified outdoor conditions. DOE is proposing in section 2.2.2 of Appendix B to allow COP_{full} and $COP_{DX-DOAS}$ to be used by manufacturers for voluntary representations.

c. ISMRE2 and ISCOP2 Weighting Factors

As part of the July 2017 ASHRAE TP RFI, DOE requested information about analysis of climate data relevant to the development of the ISMRE and ISCOP test conditions and weighting factors. 82 FR 34427, 34436 (July 25, 2017). AHRI commented that the values and weightings for both the dehumidification and heating points in ANSI/AHRI 920–2015 were developed based on climatic data for a sample of twelve cities [20] chosen to be representative of a wide range of climatic conditions in the United States. According to AHRI, the climatic bin data were based on 24-hour operation per day due to the variety of applications where DDX–DOASes are installed and provide a reasonable standard for assessing the part-load situations that will be encountered. (AHRI, No. 11 at p. 12) DOE notes that these test conditions in ANSI/AHRI 920–2015 were established to represent specific regions of the psychrometric chart, as shown in the following Table III–2 and Table III–3.

In the development of AHRI 920–2020, DOE provided input on weather data, and AHRI also reviewed Typical Meteorological Year (TMY) 2 [21] weather data from the National Renewable Energy Laboratory. Based, in part, on this input and data, AHRI 920–2020 specifies the ISMRE2 and ISCOP2 test conditions and weighting factors, which represent the number of hours per year for each test condition. Accordingly, Table III–2 and Table III–3 also show the Standard Rating Conditions and weighting factors included in sections 6.1, 6.12, and 6.13 of AHRI 920–2020. DOE is proposing to adopt the weighting factors for the ISMRE2 (including the test conditions specific for $ISMRE2_{70}$) and ISCOP2 metrics, as specified in AHRI 920–2020.

TABLE III–2—ANSI/AHRI 920–2015 AND AHRI 920–2020 DEHUMIDIFICATION MODE STANDARD RATING CONDITIONS AND ISMRE/ISMRE2/$ISMRE2_{70}$ WEIGHTING FACTORS

Standard rating condition	Psychrometric chart region represented	ANSI/AHRI 920–2015		AHRI 920–2020	
		Representative condition (dry-bulb temperature/wet-bulb temperature)	ISMRE weighting factor	Representative condition (dry-bulb temperature/wet-bulb temperature)	ISMRE2 and $ISMRE2_{70}$ weighting factor
A	Above 55 °F dew point, Above 75 °F wet-bulb	95 °F/78 °F	12	95 °F/78 °F	14
B	Above 55 °F dew point, >69 °F and ≤75 °F wet-bulb.	80 °F/73 °F	28	80 °F/73 °F	34
C	Above 55 °F dew point, >62 °F and ≤69 °F wet-bulb.	68 °F/66 °F	36	70 °F/66 °F	39
D	Above 55 °F dew point, >56 °F and ≤62 °F wet-bulb.	60 °F/58 °F	24	63 °F/59 °F	13

[20] The sample of 12 cities analyzed were: New York City, Atlanta, Chicago, El Paso, Houston, Kansas City, Miami, Minneapolis, Nashville, New Orleans, Norfolk, and Tucson.

[21] TMY stands for ''typical meteorological year'' and is a widely used type of data available through the National Solar Radiation Database. TMYs contain one year of hourly data that best represents median weather conditions over a multiyear period. The datasets have been updated occasionally, thus TMY, TMY2, and TMY3 data are available. See *nsrdb.nrel.gov/about/tmy.html* (last accessed 4/28/21).

TABLE III–3—ANSI/AHRI 920–2015 AND AHRI 920–2020 HEATING MODE STANDARD RATING CONDITIONS AND ISCOP/ISCOP2 WEIGHTING FACTORS

Standard rating condition	Psychrometric chart region represented	ANSI/AHRI 920–2015		AHRI 920–2020	
		Representative condition (dry-bulb temperature/ wet-bulb temperature)	ISCOP weighting factor	Representative condition (dry-bulb temperature/ wet-bulb temperature)	ISCOP2 weighting factor
E	Below 55 °F dew point, >23 °F and ≤64 °F dry-bulb.	35 °F/29 °F	77	47 °F/43 °F	91
F	Below 55 °F dew point, ≤23 °F dry-bulb	16 °F/12 °F	23	17 °F/15 °F	9

3. Test Method

This section discusses the various issues that DOE identified in the industry consensus test standards applicable to DDX–DOASes, including those raised in the July 2017 ASHRAE TP RFI and considered as part of DOE's review of AHRI 920–2020. These issues include: (1) Definitions for certain terms used in the DDX–DOAS test procedure; (2) optional break-in period for DDX–DOASes; (3) test facility, instrumentation, and apparatus set-up issues; (4) DDX–DOAS unit set-up; (5) test operating conditions; (6) requirements for water-cooled and water-source heat pump DDX–DOASes; (7) defrost energy use; (8) test methods for DDX–DOASes equipped with VERS; (9) tolerances; and (10) secondary verification tests for dehumidification and heating tests.

Table 1 to 10 CFR 431.96 specifies the applicable industry test procedure for each category of commercial package air conditioning and heating equipment and specifies any additional testing requirements that may also apply. In this NOPR, DOE is proposing to add test procedure requirements for DDX–DOASes in a separate appendix in subpart F to 10 CFR part 431 (*i.e.,* proposed Appendix B). Accordingly, DOE proposes to include DDX–DOASes in Table 1 to 10 CFR 431.96 and to reference Appendix B for the DDX–DOASes test procedure.

a. Definitions

Section 3 of AHRI 920–2020 and section 3 of ANSI/ASHRAE 198–2013 define terms used in the industry consensus test standards for DDX–DOASes. DOE reviewed these sections and is proposing generally to adopt the definitions in section 3 of AHRI 920–2020 (as enumerated in section 2.2.1(a) of proposed Appendix B). As discussed, DOE is proposing definitions in the test procedure provisions for ''direct expansion-dedicated outdoor air system, or DX–DOAS'' as a category of commercial package air conditioning and heating equipment, and ''dehumidifying direct expansion-dedicated outdoor air system, or DDX–DOAS,'' as a subset of DX–DOAS.

As discussed in the following paragraphs DOE is also proposing to define ''integrated seasonal coefficient of performance 2, or ISCOP2,'' ''integrated seasonal moisture removal efficiency 2, or ISMRE2,'' and ''ventilation energy recovery system, or VERS.'' In section 1.1 of Appendix B, DOE proposes to provide that where any definitions conflict between AHRI 920–2020 (or any of the industry standards referenced) and the CFR, the CFR provisions control.

DOE notes that 10 CFR 431.92 includes definitions for the efficiency metrics used for commercial package air conditioners and heat pumps. Consistent with this approach, DOE is proposing definitions at 10 CFR 431.92 for ''integrated seasonal coefficient of performance 2, or ISCOP2'' and ''integrated seasonal moisture removal efficiency 2, or ISMRE2'' that are consistent with the definitions for these metrics defined in sections 3.12 and 3.13 of AHRI 920–2020 and that specifically reference the DDX–DOAS test procedure in proposed Appendix B.

A ''ventilation energy recovery system'' (VERS) pre-conditions the outdoor air before it enters the conditioning coil, thereby reducing the cooling, dehumidification, or heating load on the refrigeration system of the DDX–DOAS. ASHRAE Standard 90.1–2019 specifies separate equipment classes and minimum efficiency levels for DDX–DOASes with VERS equipment. DOE notes that neither a definition for a VERS nor a different term for this system is included in the previous test standards ANSI/AHRI 920–2015 and ANSI/ASHRAE 198–2013. However, AHRI 920–2020 does include a definition for VERS. DOE proposes, consistent with AHRI 920–2020, to define a VERS as a system that preconditions outdoor ventilation air entering the equipment through direct or indirect thermal and/or moisture exchange with the exhaust air, which is defined as the building air being exhausted to the outside from the equipment.

A VERS may also be used by commercial air-conditioning equipment other than DDX–DOASes. However, for commercial air-conditioning equipment other than DDX–DOASes, neither ASHRAE Standard 90.1–2019 nor the DOE energy conservation standards establish equipment classes based on the presence of VERS. Under the DOE test procedures for commercial package air conditioners and heat pump equipment other than DDX–DOASes, VERS is a feature that is not installed for testing. Because an understanding of VERS may be relevant to commercial package air conditioners and heat pumps other than the proposed DDX–DOAS category of equipment, DOE is proposing to establish a definition of VERS, consistent with AHRI 920–2020, in 10 CFR 431.92 so that it is broadly applicable when used in reference to both DDX–DOASes as well as other commercial package air conditioning and heat pump equipment.

Additionally, DOE is proposing to amend the definition of ''commercial HVAC & WH product'' at 10 CFR 431.2 to explicitly include DDX–DOAS.

Issue–5: DOE requests comment on the terminology DOE proposes to use for DDX–DOASes, including ''integrated seasonal coefficient of performance 2, or ISCOP2;'' ''integrated seasonal moisture removal efficiency 2, or ISMRE2;'' and ''ventilation energy recovery system, or VERS.''

In the July 2017 ASHRAE TP RFI, DOE sought clarification on the difference between a reheat system and supplementary heat in ANSI/AHRI 920–2015 and ANSI/ASHRAE 198–2013. 82 FR 34427, 34436 (July 25, 2017). The definition for supplementary heat provided in section 3.21 of ANSI/AHRI 920–2015 does not state whether it includes heat provided by reheat systems such as wrap-around heat pipes and wrap-around vapor compression systems.

In response to the July 2017 ASHRAE TP RFI, AHRI suggested a revised definition for ''supplementary heat'' that excludes heat provided by the vapor compression cycle or a sub-system that transfers heat from one part of the unit to another (*e.g.,* wrap-around heat pipe, wrap-around vapor compression system). (AHRI, No. 11 at p. 11)

DOE notes that section 3.25 of AHRI 920–2020 has clarified this issue by defining ''supplementary heat'' to exclude a system that transfers heat from the outdoor air to the supply air. The AHRI 920–2020 definition distinguishes reheat provided by a vapor compression cycle that is driving the dehumidification process from common supplementary heat options such as fuel-fired heating, steam or hot water heating coils, and electric resistance. Further, section 3.25 of AHRI 920–2020 also states that reheat provided by secondary heat pumps, wrap around heat pumps, or wrap around heat pipes are not considered as supplementary heat. As discussed, DOE proposes to adopt the definition for ''supplementary heat'' provided in section 3.25 of AHRI 920–2020, as enumerated in section 2.2.1(a) of the proposed Appendix B, which references section 3 of AHRI 920–2020.

b. Break-In Period

As part of the DOE test procedures for other commercial package air conditioners and heat pumps, DOE provides the option for a ''break-in'' period, not to exceed 20 hours, with no ambient temperature requirements, prior to performing a test. *See* 10 CFR 431.96(c). This is intended to allow the unit to achieve optimal performance prior to the test. Neither ANSI/AHRI 920–2015 nor ANSI/ASHRAE 198–2013 specify a break-in period for testing DDX–DOASes. In response to the July 2017 ASHRAE TP RFI, AHRI commented that proper compressor break-in must be allowed to provide a fair and accurate test. AHRI also stated that it had previously submitted comments that 16 hours is not sufficient. (AHRI, No. 11 at p. 20)

DOE addressed comments previously submitted by AHRI that DOE should require a minimum 16-hour break-in period for all commercial air conditioning equipment as part of the rulemaking finalized in a May 16, 2012 final rule for energy conservation standards and test procedures for commercial heating, air-conditioning, and water-heating equipment. 77 FR 28928, 28943. As part of that final rule, DOE determined that adopting a minimum break-in period of 16 hours would unnecessarily increase testing costs for manufacturers of equipment that can achieve stability in less than 16 hours. In recognition that different equipment will require different amounts of break-in time to achieve optimal performance and that break-in periods of longer than 16 hours may be required for some equipment, DOE adopted an optional break-in period up to a maximum period of 20 hours to allow the unit to achieve optimal performance before testing for commercial air conditioning and heating equipment. 77 FR 28928, 28943–28944 (May 16, 2012). Section 5.6 of AHRI 920–2020 incorporates the same break-in period provision, not to exceed 20 hours. Therefore, DOE proposes to adopt the optional break-in period up to a maximum of 20 hours for DDX–DOASes specified in AHRI 920–2020 (section 5.6 *Break-in*), as enumerated in section 2.2.1(b) of the proposed Appendix B, which references section 5 of AHRI 920–2020.

c. Airflow-Measuring Apparatus

Figures 1 and 2 of ANSI/ASHRAE 198–2013 present the typical test set-up for DDX–DOASes with and without energy recovery. The figures show airflow and condition measuring apparatus at both the inlet and the outlet ends of each airflow path (*i.e.,* the outdoor/supply and return/exhaust paths). DOE stated in the July 2017 ASHRAE TP RFI that it is not clear whether airflow-measuring apparatus are required for both entering and leaving air of each airflow path. 82 FR 34427, 34439 (July 25, 2017). DOE requested comment on whether it is beneficial or necessary to use two airflow-measuring apparatus per airstream when testing DDX–DOAS equipment. *Id.*

AHRI and Carrier both commented that using two airflow devices per airstream would be difficult and costly due to challenges with space constraints, additional physical barriers that can increase temperature stratification in the test chamber, and issues associated with meeting the specified design conditions due to fan reheat energy in the airflow measuring stations. (AHRI, No. 11 at p. 19; Carrier, No. 6 at p. 7) AHRI further commented that while additional airflow measuring stations have the benefit of monitoring cross-leakage or general leakage in the cabinet, it makes testing difficult, if not impossible, to perform. (AHRI, No. 11 at p. 19) None of the commenters indicated that use of two airflow-measuring apparatus per airflow path is necessary to obtain accurate measurements.

Based on comments from AHRI and Carrier, DOE tentatively concludes that requiring two airflow-measuring apparatus per airflow path may be unduly burdensome for certain manufacturers. However, DOE also recognizes that the additional measurements may provide an indication of crossflow and/or leakage. DOE has tentatively concluded that AHRI 920–2020 offers a more suitable approach to airflow measurement, for the reasons that follow. Section C2.2 of AHRI 920–2020 requires just one airflow-measuring apparatus per airflow path. To provide a check for general cabinet leakage, section C5.1 of AHRI 920–2020 specifies a methodology for performing a secondary capacity measurement that does not require a second airflow-measuring apparatus (rather, the methodology for verifying dehumidification capacity is based on a measurement of the weight of collected condensate). The requirement for just one airflow-measuring apparatus per airflow path is consistent with the DOE test procedures for all other commercial and residential air-conditioning and heating systems and limits the testing costs and burden on manufacturers.

Regarding the commenters' concern that the fan heat of the airflow-measuring apparatus might affect the controlled air conditions, DOE recognizes that this could affect the temperature of the return air entering the DDX–DOAS under test. A similar issue could occur when duct-inlet booster fans are used for moving outdoor air either to the outdoor ventilation air inlet from a separate room, or when moving desiccant regeneration air from another room. On this topic, section C3.2.2 of AHRI 920–2020 specifies that in such circumstances, the air conditions are to be measured downstream of the fan and that the sampled air used for the air condition measurement be returned: (a) To a location between the flow nozzles and the fan of a return airflow-measuring apparatus, or (b) to the separate room from which air is drawn when a boost fan is used in the inlet duct. Accordingly, in this NOPR, DOE is proposing to adopt the provisions for the airflow-measuring apparatus specified in AHRI 920–2020 section C2.2, ''*Use of a Single Airflow Rate Measuring Apparatus per Airflow Path*'' in Appendix C of AHRI 920–2020 (rather than the dual measurement apparatus specifications in Figures 1 and 2 of ANSI/ASHRAE 198–2013), as enumerated in section 2.2.1(f) of the proposed Appendix B, which references Appendix C of AHRI 920–2020.

d. Test Operating Conditions

Through incorporation by reference of AHRI 920–2020, DOE is proposing to adopt the test operating conditions specified in AHRI 920–2020 for DDX–DOAS units. These include: (1) Standard Rating Conditions (Tables 4 and 5 of section 6 of AHRI 920–2020, as enumerated in section 2.2.1(c) of the proposed Appendix B, which references section 6 of AHRI 920–2020 omitting sections 6.1.2 and 6.6.1); (2) simulated ventilation air conditions for testing under Option 2 for DDX–DOASes with VERS (section 5 of AHRI 920–2020 (which includes section 5.4.1.2 *Option 2*), as enumerated in section 2.2.1(b) of the proposed Appendix B, which references section 5 of AHRI 920–2020); (3) atmospheric pressure (section 5 of AHRI 920–2020 (which includes section 5.10 *Atmospheric Pressure*), as enumerated in section 2.2.1(b) of the proposed Appendix B); (4) target supply air conditions (section 6 of AHRI 920–2020 (which includes section 6.1.3 *Supply Air Dewpoint Temperature* and section 6.1.4 *Supply Air Dry Bulb Temperature*), as enumerated in section 2.2.1(c) of the proposed Appendix B); (5) external static pressure (section 6 of AHRI 920–2020 (which includes section 6.1.5.6 *External Static Pressure*), as enumerated in section 2.2.1(c) of the proposed Appendix B); and (6) target supply and return airflow rates (section 6 of AHRI 920–2020 (which includes section 6.1.5 *Supply and Return Airflow Rates*), as enumerated in section 2.2.1(c) of the proposed Appendix B).

DOE received comments from interested parties regarding target supply and return airflow rates and target supply air conditions in response to the July 2017 ASHRAE TP RFI, and the following section discusses these specific issues.

i. Target Supply and Return Airflow Rates

Section 5.2.2 of ANSI/AHRI 920–2015 and section 8.1 of ANSI/ASHRAE 198–2013 require the supply airflow rate to be set in accordance with manufacturer specifications. In the July 2017 ASHRAE TP RFI, DOE observed that many DDX–DOAS models are capable of operating over a range of airflow rates. 82 FR 34427, 34437 (July 25, 2017). DOE expects these models to have supply air fans that can be configured with a range of speeds to accommodate the airflow range and the variation in duct length in field installations. *Id.* The performance of these models may also vary significantly from the low end to the high end of the specified airflow range. As part of the July 2017 ASHRAE TP RFI, DOE sought comments on how manufacturers select the airflow rate for testing, given the large range of airflows that are typical of DDX–DOAS units. *Id.*

In response to this issue, AHRI commented that the optimum-efficiency airflow varies with each application and that the manufacturer should specify the design airflow rate as long as it achieves the 55 °F dew point temperature. (AHRI, No. 11 at pp. 13–14) The approach described by AHRI is consistent with the approach of AHRI 920–2020, which stipulates the use of the manufacturer-specified airflow in section 6.1.5 of that document. This section of AHRI 920–2020 also addresses how to set the airflow when it is not specified by the manufacturer and the case where the dehumidification provided is not consistent with DDX–DOAS performance (*i.e.,* provision of supply air at 55 °F or lower dew point, when using the manufacturer-specified airflow).[22]

As discussed, DOE is proposing to adopt the provisions in section 6.1.3 and 6.1.5 of AHRI 920–2020, which specify that the target supply airflow rate be the manufacturer-specified airflow rate and that, for Standard Rating Condition A, achieves dehumidification consistent with providing a 55 °F dew point temperature in standard atmospheric pressure conditions. In cases where supply airflow is not specified by the manufacturer, or supply air dew point exceeds the maximum when using the manufacturer-specified airflow, AHRI 920–2020 requires setting airflow for Standard Rating Condition A such that the supply air dew point does not exceed the maximum.

ii. Units With Cycle Reheat Functions

As part of the July 2017 RFI, DOE noted that provisions regarding reheat and the supplementary heat penalty specified in ANSI/AHRI 920–2015 and ANSI/ASHRAE 198–2013 were unclear. 82 FR 34427, 34436 (July 25, 2017). Most of the DDX–DOAS models that are equipped with the capability to reheat dehumidified air to space-neutral conditions use hot refrigerant gas discharged by the compressor to reheat the dehumidified air leaving the evaporator coil. Other approaches can also be used to transfer heat from one part of the DDX–DOAS to another. (Section 3.21.1 of AHRI 920–2020 defines all of these methods as ''cycle reheat.'') Reheat may also be provided by supplementary heat sources, such as a gas furnace or an electric resistance heater, but these are not considered cycle reheat. A discussion of cycle reheat capability with respect to the scope of this test procedure is provided in section III.A.4 of this document, and a discussion of the supplementary heat penalty is provided in section III.B.3.a of this document.

ANSI/AHRI 920–2015 requires that supply air dew point temperature be 55 °F or lower, which generally means (*i.e.,* for a DDX–DOAS that removes moisture by latent cooling without the use of desiccants) that the air must be cooled to a temperature that is, at most, a few degrees above 55 °F. Section 6 of ANSI/AHRI 920–2015 does not explicitly require testing with reheat turned on, but note 3 to Table 2 and note 3 to Table 3 of that industry standard require the DDX–DOAS to condition supply air to a minimum dry-bulb temperature of 70 °F for all dehumidification and heating tests—and this would have to be accomplished with active reheat (as discussed in the following paragraphs). Further, for units unable to meet this minimum threshold, section 6.1.3.1 of ANSI/AHRI 920–2015 specifies the application of a supplementary heat penalty to represent the power input that would be required to heat the supply air to the 70 °F target using electric resistance heating.

DOE noted in the July 2017 RFI that ANSI/ASHRAE 198–2013 includes two dehumidification tests, one with cycle reheat functions turned on and the other with cycle reheat functions turned off (sections 8.3.1.1 and 8.3.1.2, respectively). DOE further noted that ANSI/AHRI 920–2015 does not, however, specify which of these values is used in the calculation of ISMRE. 82 FR 34427, 34436 (July 25, 2017).

As part of the July 2017 ASHRAE TP RFI, DOE requested comment on whether the dehumidification test with cycle reheat on or off should be used to calculate ISMRE, and how and when the supplementary heat penalty is applied. 82 FR 34427, 34436 (July 25, 2017). AHRI commented that the dehumidification efficiency metrics specified in ANSI/AHRI 920–2015 are based on supply air at a dry-bulb temperature of 70 °F, and if the unit requires reheat to be on (as described in ANSI/ASHRAE 198–2013) for supply air temperature control, then this reheat-on test is needed to determine dehumidification capacity and efficiency. (AHRI, No. 11 at p. 11) DOE understands AHRI's comment to mean that ANSI/AHRI 920–2015 effectively requires cycle reheat to be activated during dehumidification tests in order to meet both the supply air dew point and dry-bulb temperature requirements.

In contrast to ANSI/AHRI 920–2015, AHRI 920–2020 more explicitly

[22] Section 6.1.3 of AHRI 920–2020 includes an adjustment for maximum supply air dew point temperature to increase linearly as barometric pressure decreases, up to 57.3 °F at the minimum-allowed 13.7 psia test pressure.

addresses the use of cycle reheat for dehumidification tests and provides more information on when the supplementary heat penalty should be used. As discussed in section III.B.2.a of this NOPR, DOE is proposing to adopt the revised MRE and ISMRE2 metrics specified in AHRI 920–2020, which do not include a supplementary heat penalty. Section 6.1.4.2 of AHRI 920–2020 specifies that when determining MRE and ISMRE2, the manufacturer shall specify whether cycle reheat is to be activated for the test. As discussed in section III.B.2.a of this document, AHRI 920–2020 provides separate application metrics (*i.e.,* MRE_{70} and $ISMRE2_{70}$) which may be used for representations and which require a supply air dry-bulb temperature above 70 °F (and below 75 °F). For these separate application metrics, if cycle reheat cannot achieve 70 °F, a supplementary heat penalty is applied based on raising the supply air dry-bulb temperature up to 70 °F (see section 6.1.4.1 of AHRI 920–2020). DOE has tentatively determined that these provisions in AHRI 920–2020 clarify the requirements for cycle reheat and the supplementary heat penalty, so the Department is proposing to adopt these provisions in this NOPR (section 6 of AHRI 920–2020, as enumerated in section 2.2.1(c) of the proposed Appendix B).

iii. Target Supply Air Dry-Bulb Temperature

As discussed, in the July 2017 ASHRAE TP RFI, DOE noted that ANSI/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. In that document, DOE further noted that ANSI/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. As part of the July 2017 ASHRAE TP RFI, DOE requested comment on the difference in target supply air temperature requirements between ANSI/AHRI 920–2015 and ANSI/ASHRAE 198–2013, and the appropriate supply air temperature for use in the DOE test procedure for DDX–DOASes. 82 FR 34427, 34438 (July 25, 2017).

AHRI and Goodman commented that the minimum supply air temperature should be 70 °F. AHRI added that ANSI/ASHRAE 198–2013, which was developed based on previous versions of AHRI 920 that required a supply air temperature of 75 °F, is being updated to reflect the new value of 70 °F. (AHRI, No. 11 at p. 17; Goodman, No. 14 at p. 2)

As discussed in the previous subsection, DOE proposes to incorporate by reference the provisions in section 6.1.4 of AHRI 920–2020, which specifies setting the supply air dry-bulb temperature to within a range of 70–75 °F for tests to determine dehumidification metrics. For all dehumidification tests, 75 °F represents the maximum supply air dry-bulb temperature above which a supplementary cooling penalty must be applied. As noted in section III.B.3.d.ii of this NOPR, a supplementary heat penalty must be applied for ISCOP2 calculations when the minimum supply air dry-bulb temperature of 70 °F cannot be met in heating mode.

iv. Target Supply Air Dew-Point Temperature

Note 5 to Table 2 and note 6 to Table 3 in ANSI/AHRI 920–2015 state that the maximum dew point for Standard Rating Conditions A through D shall be 55.0 °F. The industry consensus standard does not specify whether these conditions apply to the outdoor air, supply air, or return air. DOE interprets these requirements to apply to the supply air because the humidity levels for outdoor air and return air are already specified in the same tables.

Furthermore, although ANSI/AHRI 920–2015 specifies a maximum dew point temperature, the industry test standard does not include requirements to ensure that the dew-point temperature is maintained at the same level while testing at the different Standard Rating Conditions specified in ANSI/AHRI 920–2015. Many DDX–DOASes are equipped with modulating/variable capacity compressors, thereby allowing control for a given supply air dew point temperature. Allowing a lower dew point temperature for Standard Rating Conditions B, C, and D specified in ANSI/AHRI 920–2015 could give a better MRE rating for those test points, but the unit would use more energy to the extent it provides unnecessary excess dehumidification if operated in that manner. DOE also recognizes that the conditioned space latent cooling requirements for Standard Rating Condition A specified in ANSI/AHRI 920–2015 represent the worst-case scenario, so there would be no need to deliver a lower dew point (*i.e.,* excess dehumidification) for Standard Rating Conditions B, C, and D. AHRI 920–2020 revises the supply air dew point requirements. Section 6.1.3 of AHRI 920–2020 requires that the average supply air dew point for Standard Rating Condition B, C, and D must be within 0.3 °F of the Standard Rating Condition A dew point value.

Accordingly, in this NOPR, DOE proposes to adopt the relevant provisions found in section 6.1.3 in AHRI 920–2020, which explicitly state that the supply air dew point temperature shall be 55.0 °F or below for all Standard Rating Conditions A through D when operated at a barometric pressure of 29.92 in Hg, and that the supply air dew point temperature for Standard Rating Conditions B, C, and D must be within 0.3 °F of the measured supply air dew point temperature for Standard Rating Condition A, as noted above.

v. Units With Staged Capacity Control

During testing, DDX–DOAS units with modulating compressors may be able to achieve supply air conditions within the proposed tolerances of the target conditions for Standard Rating Conditions B, C, and D. However, units with staged capacity will not likely be able to do this because they control capacity in larger increments. DDX–DOAS units with staged capacity or reheat control unable to maintain stable operation at the proposed dry-bulb and dew-point temperature targets within proposed tolerances would have to cycle between two stages (or cycle between the compressor(s) being on and off) to deliver average conditioning consistent with the target.

Neither ANSI/AHRI 920–2015 nor ANSI/ASHRAE 198–2013 have provisions to address units that cycle. In response to the July 2017 ASHRAE TP RFI, AHRI commented that the time average testing method suggested by DOE in its initial review section 6.6 of ANSI/AHRI 920–2015 would prevent credit for over-dehumidifying at Standard Rating Conditions B, C, and D, but is excessively complex. Instead, AHRI recommended a calculated adjustment that does not credit moisture removal in excess of the Standard Rating Condition A design dew-point temperature. (AHRI, No. 11 at p. 20)

This issue has now largely been addressed in AHRI 920–2020. Specifically, section 6 of AHRI 920–2020 prescribes a method to address DDX–DOASes with staged capacity control that is consistent with the aforementioned method of DOE's initial review. It differs from DOE's suggested method in that it applies the weighted averaging on the basis of the supply air humidity ratio rather than the dew point, and that it applies any applicable supplementary cooling or heat penalty to operation at each particular stage rather than after determination of a weighted average supply air dry-bulb temperature. Given the development of defined test requirements and equations addressing over-dehumidification, DOE initially concludes that the method in AHRI 920–2020 is not excessively complex. AHRI 920–2020 requires that when testing DDX–DOASes with staged capacity control in a dehumidification test condition having a supply condition dew point target (*e.g.,* Conditions B, C, or D), if the dew point temperature cannot be controlled within the specified test tolerances for a given part-load condition, a weighted average of the results of two tests that bracket the target dew point temperature will be used. In this NOPR, DOE is proposing to adopt the provisions in section 6 of AHRI 920–2020 for achieving the target supply air conditions for units with staged capacity control.

Staging of compressor capacity may also affect operation in heating mode. Section 6 of AHRI 920–2020 prescribes methods for determining COP to account for cycling between compressor stages, or for operation when the lowest-capacity compressor stage provides more capacity than required to heat the supply air to 75 °F. These methods are similar to the AHRI 920–2020 method for addressing staged compressor capacity for dehumidification. Accordingly, DOE proposes to adopt the provisions in AHRI 920–2020 for staged capacity heat pump DDX–DOASes in heating mode.

e. Water-Cooled and Water-Source Heat Pump DX–DOAS Equipment

i. Test Conditions for Multiple-Inlet Water Sources

As discussed in the July 2017 ASHRAE TP RFI, the inlet water temperatures in ANSI/AHRI 920–2015 Table 2 for testing water-cooled DDX–DOASes differ from the water-source heat pump inlet temperature conditions specified in Table 3 for water-source heat pump DDX–DOASes tested using the ''water source'' test conditions. DOE requested comment on the need for different dehumidification test conditions for a water-cooled DDX–DOAS as compared to a water-source heat pump DDX–DOAS using the closed water loop test conditions. 82 FR 34427, 34438 (July 25, 2017). In the July 2017 ASHRAE TP RFI, DOE also pointed out that Tables 2 and 3 in ANSI/AHRI 920–2015 include two application configurations [23] for water-cooled DDX–DOASes and three application configurations for water-source heat pump DDX–DOASes. *Id.* DOE notes that ASHRAE 90.1–2016 established different standards for each of these five application configurations.

In response to the July 2017 ASHRAE TP RFI on this issue, AHRI commented that the two sets of water temperatures for water-cooled DDX–DOASes and water-source heat pump DDX–DOASes should be identical and that the differences would be resolved in an update to ANSI/AHRI 920–2015. (AHRI, No. 11 at p. 17) AHRI also commented that in almost all cases, a single design is used for water-cooled equipment used with cooling tower water and chilled water, and, similarly, a single design is used for all of the water-source applications, adding that for each of these cases, a single set of water conditions can be used for testing. AHRI recommended that the various entering water and inlet fluid conditions remain as presented in the ANSI/AHRI 920–2015 standard, but any regulated products are to be tested to the ''Chilled Water Entering Condenser Temperature'' column values in Table 2 and the ''Water Source Heat Pumps'' column values in Table 3. (AHRI, No. 11 at p. 17)

In response, DOE notes that AHRI 920–2020 still provides separate inlet fluid rating conditions for the different water-cooled and water-source heat pump DDX–DOAS applications but now identifies some as optional application rating conditions. In light of the retention of these separate inlet fluid rating conditions in AHRI 920–2020, DOE surmises that AHRI's and industry's original position on these conditions, as set forth in the comments in response to the July 2017 ASHRAE TP RFI, changed during the course of developing that industry consensus standard. Table 4 of AHRI 920–2020 continues to include separate inlet fluid rating conditions for water-cooled cooling tower and water-cooled chilled water DDX–DOASes, but Note 3 to Table 4 of AHRI 920–2020 indicates that the water-cooled chilled water condition is the optional application rating condition, contrary to AHRI's recommendation in response to the July 2017 ASHRAE TP RFI. Table 5 of AHRI 920–2020 includes separate inlet fluid rating conditions for water-source and ground-source closed-loop heat pump DDX–DOASes but identifies the ground-source closed-loop conditions as the optional application rating condition. Tables 4 and 5 of AHRI 920–2020 also revise the inlet temperatures of the rating conditions for water-cooled cooling tower, water-source heat pump, and water-source ground-source closed-loop heat pump DDX–DOASes. In this NOPR, DOE is proposing to adopt the water/fluid rating conditions provided in AHRI 920–2020 (section 6 of AHRI 920–2020, which includes Table 4 and Table 5, as enumerated in section 2.2.1(c) and 2.2.2 of the proposed Appendix B), including the chilled water and ground-source closed-loop conditions specified as optional in AHRI 920–2020 so as to allow for voluntary representations for those applications. In any future energy conservation standards rulemaking for DDX–DOASes, DOE would consider establishing standards and the corresponding certification requirements in the context of the inlet fluid temperature conditions specific for water-cooled cooling towers and for water-source heat pumps provided in Table 4 and Table 5 of AHRI 920–2020, respectively.

ii. Condenser Liquid Flow Rate

In the July 2017 ASHRAE TP RFI, DOE noted that ANSI/AHRI 920–2015 provides instructions for setting the condenser liquid flow rate in section 6.1.4 and condenser liquid entering temperature in Tables 2 and 3 when conducting the dehumidification test for water-cooled and water-source heat pump DDX–DOASes. 82 FR 34427, 34437 (July 25, 2017). Section 6.1.4 of ANSI/AHRI 920–2015 indicates to use the liquid flow rates ''specified by the manufacturer.'' The manufacturer must specify a single liquid flow rate for tests at all Standard Rating Conditions as defined in ANSI/AHRI 920–2015, unless the unit is equipped with automatic control of the liquid flow rate.

In the July 2017 ASHRAE TP RFI, DOE noted that ANSI/AHRI 340/360–2007 and ANSI/AHRI 210/240–2008, which are incorporated by reference as DOE's test procedures for rating water-cooled commercial air-conditioning equipment, specify inlet and outlet water temperature requirements rather than relying on manufacturers to determine water flow rate. Further, both of these industry consensus standards specify that the full-load water flow rate determined for the Standard Rating Conditions should also be used for part-load rating conditions. DOE further stated in the July 2017 ASHRAE TP RFI that these test methods reflect the typical design temperature differential for cooling towers serving water-cooled equipment, and they are very common for control of condenser water pumps; hence, it is not clear to DOE why the same test method would not be adopted for water-cooled DDX–DOAS. 82 FR 34427, 34437 (July 25 2017). As part of the July 2017 ASHRAE TP RFI, DOE requested information on how

[23] In the context of ANSI/AHRI 920–2015, an application configuration specifies test conditions based on the expected application of the DDX–DOAS.

condenser water flow rates are set in the field, how they are controlled at part-load, and whether the relevant provisions in ANSI/AHRI 920–2015 provide sufficient guidance regarding how to set up water flow for DDX–DOASes with automatic water flow control systems. *Id.*

AHRI and Carrier commented that the condenser water flow rates should be set by the manufacturer or the installation instructions, consistent with ANSI/AHRI 920–2015. (AHRI, No. 11 at p. 15; Carrier, No. 6 at p. 5) Carrier added that for part-load conditions, setting the condenser water flow rate will depend on what is needed for head pressure control, and that this should be defined in the installation instructions and followed for the test. Carrier stated that some equipment may require no control and that others may use head pressure flow regulating valves. (Carrier, No. 6 at p. 5) AHRI argued that any variation in flow rate that occurs automatically based on the operation and the equipment design will be measured during testing, with the pressure drop at that flow rate also being measured. AHRI indicated that the pumping penalty accounts for different manufacturer specifications of flow rates and pressure drop at each of the test conditions. (AHRI, No. 11 at p. 15)

As part of its update to the industry consensus test standard for DDX–DOASes, AHRI added additional requirements for liquid flow rate. More specifically, while section 6.1.6.1 of AHRI 920–2020 continues to provide that the water flow rate be specified by the manufacturer, the test method now adds that it must deliver a liquid temperature rise no less than 8 °F when testing under Standard Rating Condition A. Section 6.1.6.2 of AHRI 920–2020 requires that the flow rate set under Standard Rating Condition A be used for testing at the remaining Standard Rating Conditions (B through F), unless automatic adjustment of the liquid flow rate is provided by the equipment. Section 6.1.6.2 of AHRI 920–2020 also requires that if condenser water flow rate is modulated under part-load conditions, the flow rate must not exceed the flow rate set for Condition A.

DOE has tentatively concluded that the addition of a minimum temperature differential in AHRI 920–2020 better reflects control strategies for cooling towers serving water-cooled equipment and for condenser water pumps while still leaving flexibility for manufacturers to specify full-load flow rate and to implement options for modulating flow rate at part-load conditions. The Department notes that the provision allowing for automatic adjustment of the liquid flow rate for part-load tests accounts for manufacturer control strategies, such as condenser head pressure control, and is also accounted for in the water pump effect (discussed in the following section). DOE has tentatively concluded that these provisions would be representative of flow rates during an average use cycle and would not be unduly burdensome to conduct. Therefore, DOE is proposing to adopt the liquid flow requirements in AHRI 920–2020 for water-cooled and water-source heat pump DDX–DOASes (section 6 of AHRI 920–2020, which includes section 6.1.6 *Liquid Flow Rates for Water-Cooled, Water-Source Heat Pump, and Ground-Source Heat Pump*), as enumerated in section 2.2.1(c) of the proposed Appendix B.

iii. Water Pump Effect

As part of the July 2017 ASHRAE TP RFI, DOE noted that ANSI/AHRI 920–2015 includes an equation for calculating the ''water pump effect,'' which is an estimate of the energy consumption of non-integral water pumps (*i.e.,* pumps that are not part of the DDX–DOAS unit and whose power consumption would, therefore, not already be part of the measured power). 82 FR 34427, 34438 (July 25 2017). DOE noted that section 6.1.3 of ANSI/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 DDX–DOAS. *Id.*

In the July 2017 ASHRAE TP RFI, DOE requested confirmation that the ''refrigerant-to-liquid heat recovery device'' cited in section 6.1.3 of ANSI/AHRI 920–2015 is intended to include heat exchangers used for heat rejection during the dehumidification cycle, and comment on whether Equation 1 of this section for estimating the energy use of water pumps is appropriate for DDX–DOASes with water-cooled condensers. *Id.* In its comments, AHRI confirmed that the term ''refrigerant-to-liquid heat recovery device'' is intended to include liquid-to-refrigerant heat exchangers used in the dehumidification cycle and heating cycle. (AHRI, No. 11 at p. 16)

The revisions to the industry consensus testing standard in AHRI 920–2020 clarify this matter and are consistent with the public comments received. Section 6.1.6.4 of AHRI 920–2020 provides the water pump effect equation, and section 11.1 of AHRI 920–2020 states within the definition of symbol $P_{E,x}$ that the water pump effect applies to all water-cooled and water-source units without integral water pumps. Thus, DOE is proposing to adopt the water pump effect provisions in sections 6.1.6.4 and 11.1 of AHRI 920–2020 to account for the energy use of water pumps for water-cooled condensers, as enumerated in section 2.2.1(c) and section 2.2.1(d) of the proposed Appendix B, which reference sections 6 and 11 of AHRI 920–2020, respectively.

In further clarification, the total pump effect does not need to be calculated for pumps that are integral to the DDX–DOAS, because the power for these pumps would be measured as part of the main DDX–DOAS power measurement. Currently, the number of DDX–DOAS models on the market with integral pumps is very limited. However, AHRI 920–2020 does not explicitly state the amount of external head pressure [24] to use when testing DDX–DOASes with integral pumps, a necessary parameter. DOE notes that the calculation of the water pump effect for DDX–DOASes without integral pumps specified AHRI 920–2020 includes a fixed adder of 25 Watts per gallon per minute based on 20 feet of water column of external head pressure, a value which the Department reasons could be suitably applied to DDX–DOASes with integral pumps. Accordingly, DOE is proposing to include additional specifications in section 2.2.1(c)(ii) of proposed Appendix B that DDX–DOASes with integral pumps be configured with an external head pressure equal to 20 feet of water column (*i.e.,* the same level of external head pressure used in the calculation of the pump effect for DDX–DOASes without integral pumps).

DOE has initially determined that the proposal to specify the same external head pressure for integral pumps as the external head pressure used in the calculation of the pump effect for DDX–DOASes without integral pumps is consistent with the industry consensus test procedure. The proposed requirement would provide additional direction for treatment of integral pumps consistent with the treatment of non-integral pumps and would provide for the representative comparability of results between DDX–DOASes with and without integral pumps. To the extent the industry test procedure does not specify an external head pressure for DDX–DOASes with an integral pump,

[24] ''External head pressure'' reflects the pump power output, in that it represents the height to which the pump can raise the water if the water were being moved opposite the force of gravity.

the industry test procedure would not ensure that measured results are comparative, and due to the potential variation resulting from the absence of the specification, the industry test procedure would not ensure that the results reflect the equipment's representative average energy efficiency or energy use. As such, DOE has initially determined, supported by clear and convincing evidence, that in the absence of a specification for the external head pressure for an integrated pump, the industry test procedure would not meet the statutory requirements of 42 U.S.C. 6314(a)(2)–(3) and is, therefore, proposing the supplemental specification.

In addition, DOE is proposing a condition tolerance of up to 1 foot of water column greater than the 20-foot requirement (which equates to 5 percent), which is equivalent to the condition tolerance on air side external static pressure in Table 9 of AHRI 920–2020 (Test Operating and Test Condition Tolerances); namely, the provision in that table provides for up to 0.05 inch of water column greater than the target external static pressure, which is around 1 inch of water column. Similarly, DOE is proposing an operating tolerance of up to 1 foot of water column, which is equivalent to the operating tolerance on air side external static pressure in Table 9 of AHRI 920–2020; namely, the provision in that table provides for 0.05 inch of water column. To the extent the industry test procedure does not specify a condition tolerance and operating tolerance for the water column, the industry test procedure would not ensure consistent and comparable results and would not ensure that the results reflect the equipment's representative average energy efficiency or energy use. As such, DOE has initially determined, supported by clear and convincing evidence, in the that absence of such tolerances for the water column, the industry test procedure would not meet the statutory requirements of 42 U.S.C. 6314(a)(2)–(3) and is, therefore, proposing the supplemental specification.

Issue–6: DOE requests comment on the proposal to require that water-cooled and water-source DDX–DOASes with integral pumps be set up with an external pressure rise equal to 20 feet of water column with a condition tolerance of −0/+1 foot and an operating tolerance of 1 foot.

iv. Energy Consumption of Heat Rejection Fans and Chillers

Neither ANSI/AHRI 920–2015 nor ANSI/ASHRAE 198–2013 address accounting for the energy consumption of heat rejection fans (*e.g.,* cooling tower fans) for water loops serving the condensers of water-cooled DDX–DOASes. 82 FR 34427, 34438 (July 25, 2017). DOE noted that section 6.1 of AHRI 340/360–2007, which is used for rating certain water-cooled commercial package air conditioning and heat pump equipment, provides a power consumption adjustment for both the cooling tower fan and the circulating water pump (it is assumed that the pump is external to the air conditioning equipment). *Id.* In addition, neither ANSI/AHRI 920–2015 nor ANSI/ASHRAE 198–2013 address accounting for the energy consumption of chiller systems used to provide chilled water to DDX–DOASes with chilled-water-cooled condensers. In the July 2017 ASHRAE TP RFI, DOE requested comment on accounting for the energy consumption for heat-rejection fans and chiller systems employed in water-cooled or water-loop DDX–DOASes. *Id.*

AHRI commented that the AHRI test standard for certain commercial package air conditioning and heat pump equipment includes the cooling tower fan and pump energy as part of a flat rate adjustment, but that the International Organization for Standardization (ISO) test standard for water-source heat pumps does not account for cooling tower fan energy use at this time. AHRI stated that the minimum efficiency values for DDX–DOASes specified in ASHRAE 90.1–2016 were based on the current ANSI/AHRI 920–2015 standard that does not account for the energy consumption of heat-rejection fans or the chiller system, although it does account for the additional water pumping energy (see the discussion of the water pump effect in section III.B.3.e.iii of this document). AHRI stated that, as a result, DOE should not account for this energy in the efficiency metric for DDX–DOASes because doing so introduces unknown impacts on the design and costs associated with meeting the minimum efficiency requirements. (AHRI, No. 11 at pp. 16–17) Carrier also commented that heat-rejection fans are not part of a water-cooled unit but are part of the cooling tower rating and are covered by Table 6.8.1.7 in ASHRAE 90.1–2016. (Carrier, No. 6 at p. 5) Carrier commented that chiller system energy use should not be included in the efficiency metric because this is not a system rating and is only a component rating method for the DDX–DOAS itself. (Carrier, No. 6 at p. 6)

The revised AHRI 920–2020 also does not include energy use of the heat-rejection fans and chiller systems employed in water-cooled or water-loop DDX–DOASes. DOE observes that accounting for this energy use is not a consistent industry practice, as evidenced by the differences between the AHRI 340/360–2007 approach for more typical commercial package air conditioning equipment and the ISO approach for water-source heat pumps. The heat rejection fan addition for more typical water-cooled commercial package air conditioning equipment is a modest energy adder (around 10 percent of unit power).[25] Furthermore, including the energy of the heat rejection fan and chiller systems would not help to distinguish between models of different efficiency, since the adder would be identical for two same-capacity models with different efficiencies. For these reasons, and consistent with AHRI 920–2020, DOE is not proposing in this NOPR to include any energy consumption associated with heat rejection fans, cooling towers, or chiller systems used to cool the water loops of water-cooled or water-source DDX–DOASes.

v. Chilled Water Coil Exclusion

In the July 2017 ASHRAE TP RFI, DOE noted that section 2 of ANSI/ASHRAE 198–2013 specifically excludes equipment with water coils that are supplied by a chiller located outside of the unit. 82 FR 34427, 34438 (July 25 2017). However, Table 2 in ANSI/AHRI 920–2015 includes operating conditions for which a water-cooled condenser is supplied with chilled water, and ASHRAE 90.1–2016 established standard levels for DDX–DOASes that operate with chilled water as the condenser cooling fluid. As part of the July 2017 ASHRAE TP RFI, DOE requested confirmation that the ANSI/ASHRAE 198–2013 chiller exclusion applies to cooling coils rather than condenser coils. *Id.*

In response to the July 2017 ASHRAE TP RFI, AHRI commented that both ANSI/AHRI 920–2015 and ANSI/ASHRAE 198–2013 were designed for units that contain vapor compression cycle-based cooling and dehumidification with direct expansion coils. AHRI stated that direct application of chilled water coils to cool and dehumidify is outside the scope of the standard, as the energy for cooling is expended at an external source of chilled water. (AHRI, No. 11 at p. 18) Carrier commented that chillers should

[25] For example, for a minimally-compliant 120,000 Btu/h water-cooled unit with gas heat having a 12.5 EER (*see* 10 CFR 431.97 Table 1), the total electricity use is 120,000 Btu/h ÷ 11.9 Btu/Wh = 10,084 W, and the heat rejection fan adder is 120,000 Btu/h × (10 W per 1,000 Btu/h) = 1,200 W.

only be used for cooling coils and not for condenser heat rejection unless there is heat reclaim, and that this should be addressed through a building efficiency standard such as ASHRAE 90.1. (Carrier, No. 6 at p. 7)

AHRI 920–2020 did not make a change to the exclusion of DOASes with water coils that are supplied by a chiller located outside of the unit; AHRI's comment explains that the exclusion exists because chilled water coil units that use the chilled water for cooling are not DX units, and the industry test procedures are only for DOASes with DX cooling. ASHRAE Standard 90.1 does not include standards for non-DX DOASes such as those with chilled water coils used for cooling. Based on AHRI 920–2020, and ANSI/ASHRAE 198–2013 as referenced, and the comments received, DOE did not consider DOAS units that use chilled water coils directly for cooling and dehumidifying. However, the comments provided in response to the July 2017 ASHRAE TP RFI, as discussed in section III.B.3.e.i of this document, indicate that DX–DOASes and DDX–DOASes may still use chilled water for condenser coils. (AHRI, No. 11 at p. 17)

f. Defrost Energy Use for Air-Source Heat Pump

In the July 2017 ASHRAE TP RFI, DOE noted 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 addressed in ANSI/ASHRAE 198–2013. 82 FR 34427, 34436 (July 25 2017). DOE stated that 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. *Id.* Hence, DOE noted that consideration of defrost could provide a more field-representative measurement of performance. DOE requested comment on whether testing for test condition E of ANSI/AHRI 920–2015 Table 2 (*i.e.,* 35 °F dry-bulb/29 °F wet-bulb) should consider energy use associated with defrost. *Id.*

On this issue, AHRI commented that, due to the constant volume nature of the airflow in DDX–DOASes, the addition of defrost to DDX–DOASes presents challenges, and it is not in a position to present a proper solution at this time. AHRI also stated that it is aware of manufacturers that disable the heat pump operation in cold temperatures to avoid this issue. (AHRI, No. 11 at p. 13) The Joint Advocates, Goodman, and Carrier commented that defrost should be accounted for in the test procedure to provide a more representative measurement of field energy use. (Joint Advocates, No. 9 at p. 4; Goodman, No. 14 at p. 2; Carrier, No. 6 at p. 4) Carrier added that DOE should use the T-test[26] defined in ANSI/AHRI 340/360 and ANSI/AHRI 210/240. (Carrier, No. 6 at p. 4) Goodman indicated that it will be very difficult to precisely capture defrost in the DDX–DOASes test procedure. (Goodman, No. 14 at p. 2)

DOE understands that AHRI is referring to challenges in field operation defrosting for air-source heat pump DDX–DOASes. Preventing cold outdoor air from being brought into the supply air stream during a defrosting sequence (when the DDX–DOAS cannot operate as a heat pump) would require interruptions to the supply airflow, which is inconsistent with building code requirements to provide a continuous supply of ventilation air for most DDX–DOAS applications. DOE is aware of only a limited number of air-source heat pump DDX–DOAS units. DOE understands that these units may not continue heat pump operation during potential frosting conditions as a result of these challenges in field operation. Given these factors, DOE is not aware of test data (*e.g.,* from T-tests) for such heat pumps during extended heating mode operation to understand better the level of frost accumulation and associated defrost energy expenditure. DOE also notes that AHRI 920–2020 does not include any provisions for testing or calculating the defrost energy of DDX–DOAS air-source heat pumps. However, AHRI 920–2020 arguably addresses this issue in another fashion, namely by providing in section 5.5 that defrost control settings specified by the manufacturer in installation instructions may be set prior to heating mode tests in order to achieve steady-state conditions during the heating mode tests. As discussed in section III.B.3.d of this document, DOE is proposing to adopt the provisions of AHRI 920–2020 section 5.5, Defrost Controls for Air-Source Heat Pump during Heating Mode, as enumerated in section 2.2.1(b) of the proposed Appendix B. If these settings fail to prevent frost accumulation during the heating mode tests (resulting in unsteady conditions), then the manufacturer would need to seek a waiver from the test procedure to obtain an alternate method of test from DOE pursuant to 10 CFR 431.401. However, section 5.5 of AHRI 920–2020 also specifies that the Standard Rating Condition F heating mode test (which represents low temperature environmental conditions where frosting is likely) is optional to conduct, and if the Standard Rating Condition F test is not conducted, a default COP of 1.0 (corresponding to electric resistance heating) is assigned at this rating point instead. Therefore, the manufacturer may choose to not conduct a test at Standard Rating Condition F instead of seeking a waiver. DOE has tentatively concluded that the test method set forth in section 5.5 of AHRI 920–2020 for defrost controls for air-source heat pump DDX–DOASes during heating mode offers a reasonable and workable approach, so the Department proposes to adopt such approach into the Federal test procedure.

Due to the lack of sufficient information on how air-source heat pump DDX–DOAS units operate under frosting conditions, DOE is not proposing to include any provisions for including the defrost energy of DDX–DOAS air-source heat pumps.

g. General Control Setting Requirements

Requirements for adjustment of unit controls during set-up for testing of a DDX–DOAS are addressed in specific sections of AHRI 920–2020. Some examples include the following. Section 5.2, ''Equipment Installation,'' requires that units be installed per manufacturer's installation instructions (MII). Section 5.4.3, ''Deactivation of VERS,'' indicates that operation of the VERS may be deactivated for Standard Rating Conditions C or D if the VERS is capable of being deactivated. Section 5.5, ''Defrost Controls for Air-Source Heat Pump during Heating Mode,'' provides instructions for setting of defrost controls.

However, DOE notes that the test standard provides no general requirements indicating whether control settings can be adjusted as the test transitions through the four Standard Rating Conditions used for testing. Manual readjustment of control settings would not generally occur in field operation of DDX–DOASes as outdoor air conditions change (*i.e.,* in the field, controls are configured at the time of installation and would not be actively adjusted on an ongoing basis in response to changes in outdoor temperature or humidity). Hence, to further ensure the representativeness of the test procedure, DOE is proposing

[26] The T-test is a non-steady-state (transient) test that includes measurement of both the heating energy use as the outdoor coil accumulates frost and the defrost energy use as the unit undergoes multiple defrost cycles, as referenced in section 8.8.3 of ANSI/ASHRAE 37–2009.

inclusion of a general requirement that control settings remain fixed and that there be no further manual adjustment thereof, once set initially for the first of the Standard Rating Conditions (Standard Rating Condition A). Absent such instruction, the controls could be adjusted as the test transitions through the four Standard Rating Conditions used for testing, which as discussed, would not be representative of the operation of the unit in the field. As such, DOE has initially determined, supported by clear and convincing evidence, that absent instruction for the control settings to be fixed during testing, the industry test procedure would not meet the statutory requirements of 42 U.S.C. 6314(a)(2)–(3) and is, therefore, proposing such instruction.

Notwithstanding this proposal, DOE recognizes that some manual intervention, as permitted by AHRI 920–2020, and as specified in supplemental test instructions (STI),[27] may be necessary as the test transitions through Standard Rating Conditions. However, such manual interventions are only permitted in limited and specific instances as identified in the test standard or STI. An example of such an allowed intervention is the use of the manual setting of compressor capacity staging for tests using the ''Weighted average method,'' as described in section 6.9.1 of AHRI 920–2020. In field operation, a DDX–DOAS set per the manufacturer's installation instructions would attempt to achieve the target supply air dew point over the average of a time period with cycling (unsteady) operation between two compressor stages; to address this, the test standard calls for manual intervention, using two steady-state tests, one using each stage, and calculating a weighted average of the results. (This provision is discussed in depth in section III.B.3.d.v of this NOPR.)

Thus, DOE is proposing to require that all control settings are to remain unchanged for all Standard Rating Conditions once system set-up has been completed, and component operation shall be controlled by the unit under test once the provisions in section 6 of AHRI 920–2020 (Rating Requirements) are met, except as specifically allowed by the test standard or STI (*see* section 2.2.1(b)(i) of the proposed Appendix B).

Issue–7: DOE requests comment on the proposed general control setting requirement for DDX–DOASes.

h. Ventilation Energy Recovery Systems

As discussed in section III.A.1 of this NOPR, the industry definition of ''DX-Dedicated Outdoor Air System Units'' is inclusive of units that provide pre-conditioning of outdoor air by direct or indirect transfer with return/exhaust air using an enthalpy wheel, sensible wheel, desiccant wheel, plate heat exchanger, heat pipes, or other heat or mass transfer apparatus. These pre-conditioning features are broadly referred to as ventilation energy recovery systems (''VERS'', or ''energy recovery''). ASHRAE Standard 90.1–2016 defines separate equipment classes and efficiency levels for DDX–DOASes with VERS.

Section 5.4 of AHRI 920–2020 specifies testing requirements for DDX–DOASes equipped with VERS. Section 5.4.1 of AHRI 920–2020 specifies that units equipped with VERS can be tested using either one of two options: ''Option 1'' or ''Option 2''. Option 1 requires operating the DDX–DOAS unit with VERS as it would operate in the field, maintaining the appropriate return air and outdoor air conditions for airflows entering the unit, and operating the VERS to provide energy recovery during the test (*see* section 5.4.1.1 of AHRI 920–2020).[28] In addition to specifying the outdoor air dry-bulb temperature and humidity conditions, Table 4 and Table 5 of AHRI 920–2020 specify return air inlet conditions that are applicable to DDX–DOASes with VERS. Section C2.4 in Appendix C of AHRI 920–2020 also specifies that the return air be ducted into the unit from a separate test room maintaining the required return air inlet conditions.

Option 2 involves setting the conditions of the air entering the unit so as to simulate the conditions that would be provided by the VERS in operation (*see* section 5.4.1.2 of AHRI 920–2020). Option 2 uses energy recovery device performance ratings based on ANSI/AHRI 1060–2018 to calculate the air dry-bulb temperature and humidity conditions that would be provided by the energy recovery device. ANSI/AHRI 1060–2018 references ANSI/ASHRAE 84–2013, ''Method of Testing Air-to-Air Heat/Energy Exchangers,'' (ANSI/ASHRAE 84–2013) (approved by ASHRAE on January 26, 2013) for conducting the test. These industry test standards provide a method for rating the performance of VERS in terms of sensible and latent effectiveness. DOE also notes that the performance ratings for energy recovery devices certified using ANSI/AHRI 1060–2018 are listed in AHRI's directory of certified product performance.[29]

The operating conditions specified in ANSI/AHRI 1060–2018 may be different than the operating conditions specified for testing DDX–DOAS (*i.e.,* airflow rate, which subsequently affects factors such as transfer/leakage airflow[30]). Hence, section C4 of AHRI 920–2020 provides methods to adjust, for the DDX–DOAS operating conditions, the effectiveness values for sensible and latent transfer measured using ANSI/AHRI 1060–2018. Section C4 of AHRI 920–2020 also provides default values for sensible effectiveness and latent effectiveness. These can be used in cases where performance rating information based on ANSI/AHRI 1060–2018 is not available for a VERS, or the rotational speed for an energy recovery wheel has been changed from the speed used to determine performance ratings using ANSI/AHRI 1060–2018.

The Option 2 approach would reduce test burden for most test laboratories by reducing the number of test rooms required as compared to conducting tests using Option 1. Because the outdoor ventilation air and return air would be maintained at the same conditions, there would be no transfer of heat or moisture in the VERS, nor any change of VERS-outlet supply air conditions associated with transfer or leakage of return air to the supply air plenum. In addition, testing using Option 2 is conducted with all components operating (*e.g.,* with an energy recovery wheel rotating, or with the pump of a glycol-water runaround loop activated), such that all measurements would be representative

[27] ''STI'' is defined in AHRI 920–2020 as additional instructions provide by the manufacturer and certified to the U.S. DOE. As explained in section III.C.1 of this document, this NOPR does not propose certification requirements for DDX–DOAS—such requirements will instead be proposed in a separate Energy Conservation Standard rulemaking. Consistent with certification provisions for other commercial packaged air-conditioning and heating equipment, manufacturers include STI as part of the certification (*see* 10 CFR 429.43(b)(4)). DOE is proposing that manufacturers must adhere to the provisions of this test procedure starting on the compliance date for the related energy conservation standard rulemaking. Hence, this approach does not require that STI exist earlier than the date it must be certified to DOE.

[28] The Option 1 test method includes additional specificity to the test room configuration for testing DDX–DOAS with energy recovery by allowing use of the three-chamber approach in addition to the example configuration provided in the current industry consensus test standard, in which the outdoor room is conditioned to both the required outdoor dry-bulb and humidity conditions.

[29] AHRI's directory of certified product performance for air-to-air energy recovery ventilators can be found at *www.ahridirectory.org/ahridirectory/pages/erv/defaultSearch.aspx.*

[30] As discussed in section III.B.4.g.i of this NOPR, DDX–DOASes with energy recovery wheel VERS may experience air transfer and leakage from the outdoor air path to the exhaust air (outdoor air transfer and leakage) and return air to the supply air (return air transfer and leakage).

of the pressure drops and power consumption associated with the VERS. This approach avoids separate testing to measure power input of auxiliary components or of the exhaust air fan.

Option 2 is applicable for DDX–DOASes for which a VERS provides the initial outdoor ventilation air treatment. DDX–DOAS units with VERS that provide conditioning downstream of the conditioning coil could not be tested using Option 2, since this option addresses VERS pre-conditioning only upstream of the conditioning coil. Such units would need to be tested using Option 1.

In response to the July 2017 ASHRAE TP RFI, AHRI commented that testing of DDX–DOAS units with VERS would generally require a facility with three adjacent test chambers, which is not available in the known stock of existing laboratory spaces. (AHRI, No. 11 at p. 14) AHRI stated that the test facility arrangement for testing of DDX–DOASes with energy recovery presented in ANSI/ASHRAE 198–2013,[31] as referenced by AHRI 920–2020, is not adequate because laboratories cannot maintain both the required dry-bulb temperature and high humidity conditions in the outdoor room, since removing the high condenser heat load using a conventional conditioning system also excessively dehumidifies the chamber. The commenter also argued that capacity and stratification are significant issues with the existing test arrangement. AHRI surmised that a separate, third test room to provide conditioned outdoor air for the entering air to the energy recovery device would be required to provide adequate stability for testing. AHRI further asserted that because it is not feasible to adequately test units with VERS, DOE should limit the scope of the Federal test procedure at this time to DDX–DOAS units without VERS. (AHRI, No. 11 at p. 15)

Based on DOE's review of the test requirements and equipment available on the market, DOE is aware of test facilities capable of testing using Option 1 for smaller DDX–DOAS units. Test facilities with similar configurations used for testing variable refrigerant flow multi-split air-conditioning and heat pump equipment would be large enough and equipped with enough controlled test rooms to meet the DDX–DOAS test procedure requirements. DDX–DOAS units with physical dimensions under 10 feet by 10 feet (typically less than 100 lbs. per hour MRC at Standard Rating Condition A), which represent more than 50 percent of equipment models available on the market, could be tested in these existing test facilities.

Option 2 allows existing test facilities to test all DDX–DOAS units, including units larger than those that can be tested using Option 1. As discussed, Option 2 requires neither a separate third test room to condition the outdoor ventilation air to the required temperature and humidity conditions, nor that the outdoor room in which the unit is located be conditioned to both the required dry-bulb and humidity conditions, because it does not require use of an air stream at outdoor air conditions. Aside from the chamber in which the test unit is installed, it requires only a second chamber at the simulated conditions. The inclusion of Option 2 in AHRI 920–2020 reduces testing burden compared to the ANSI/AHRI 920–2015, which only provides test set-up and provisions that are mostly equivalent to the Option 1 method in AHRI 920–2020 discussed previously. For these reasons, DOE tentatively concludes that existing test facilities would be capable of using the proposed test procedure for testing DDX–DOASes both with and without VERS.

DOE is required under EPCA to adopt a Federal test procedure that is consistent with the applicable test procedure specified in the amended ASHRAE Standard 90.1 unless DOE determines, supported by clear and convincing evidence, that to do so would result in a test procedure that is not designed to produce test results which reflect the energy efficiency of DDX–DOASes in a representative average-use cycle or would be unduly burdensome to conduct. (42 U.S.C. 6314(a)(4)(B); 42 U.S.C. 6314(a)(2) and (3)) In this NOPR, DOE is proposing to adopt the two options (*i.e.,* Option 1 and Option 2) for testing DDX–DOASes with energy recovery, as provided in section 5.4.1 of AHRI 920–2020 (as enumerated in section 2.2.1(b) of the proposed Appendix B). As discussed further in section III.B.3.a of this NOPR, DOE is proposing to define a ''ventilation energy recovery system'' as a feature that provides pre-conditioning of outdoor ventilation air entering the equipment through direct or indirect thermal and/or moisture exchange with the exhaust air leaving the unit.

In addition, DOE notes that the relevant industry test standards (AHRI 920–2020 and ASHRAE 198–2013) in some cases use synonymous but different terms to denote VERS. DOE proposes to include a section 2.3(b) in its proposed Appendix B indicating that the different synonymous terms all refer to VERS as defined in 10 CFR 431.92.

The following subsections address specific aspects of the proposed test procedure pertaining to DDX–DOASes with VERS.

i. Exhaust Air Transfer and Leakage

DOE is aware that DDX–DOASes with energy recovery wheel VERS may experience air transfer and leakage from the outdoor air path to the exhaust air (outdoor air transfer and leakage) and return air to the supply air (return air transfer and leakage). Some of this air is leakage past the diametral seals that separate the outdoor and exhaust plenums on one side of the wheel and the return and supply plenums on the other side. Additional leakage from outdoor to exhaust or return to supply could be due to loose cabinet construction of the DDX–DOAS itself. Depending on the geometry of the energy recovery wheel media (*e.g.,* whether the sheets of media making up the energy recovery wheel core are oriented parallel to this leakage flow direction), the air may pass through a portion of the media near the diametral seal. In addition, as a portion of the wheel passes from one side of the seal to the other, the air within that portion reverses direction—this represents either return air transferred to the supply side or outdoor air transferred to the exhaust side. The exhaust air transfer ratio (EATR) is defined in section 3.8 of AHRI 920–2020 as the fraction of airflow leaving the VERS that transfers or leaks from the return air inlet rather than passing through the VERS from the outdoor air inlet.

The return air that transfers and leaks to the supply air side of an energy recovery wheel did not enter the DDX–DOAS as outdoor ventilation air. Therefore, the amount of fresh outdoor air delivered by the DDX–DOAS is less than the supply airflow and is equal to the supply airflow multiplied by the factor (1–EATR). In addition, the return air is already at neutral space conditions. Hence, the energy recovery wheel does not provide any meaningful conditioning for this air. When calculating MRC for a DDX–DOAS with an energy recovery wheel, section 10.5 of ANSI/ASHRAE 198–2013 indicates that the calculation is based on the full supply airflow. DOE notes that any transfer or leakage air would increase the apparent dehumidification provided by the DDX–DOAS unit, since this air is already at space-neutral conditions—thus, a high EATR would boost the efficiency rating without providing any real benefit (for VERS other than energy recovery wheels, the EATR is considered to be equal to 0, under the assumption that cabinet air leakage

[31] See section 6.1.1.2 and Figure 2 of ANSI/ASHRAE 198–2013.

through the VERS is negligible, so this issue would not affect these other VERS). ANSI/AHRI 920–2015 includes tracer gas tests for measuring EATR in its standard rating requirements (see section 5.1). As part of the July 2017 ASHRAE TP RFI, DOE raised this issue, while recognizing that such leakage may be low enough in most energy recovery wheels that the EATR measurement could represent an unnecessary addition to test burden. 82 FR 34427, 34437 (July 25 2017). DOE requested comment on whether EATR should be included in the test procedure for DDX–DOASes and, if so, how it should be used in determining DX–DOAS ratings. *Id.*

In response to the RFI, on this issue, AHRI commented that the intent of the DOE test procedure for DDX–DOASes should not be to quantify energy recovery performance. AHRI pointed out that the AHRI certification directory publishes EATR values based on AHRI 1060. (AHRI, No. 11 at p. 15) In addition, AHRI argued that test laboratories of sufficient size for testing DDX–DOASes are not currently equipped with tracer gas test equipment, as specified in ANSI/ASHRAE 84–2013. (AHRI, No. 11 at p. 14) No other comments were received on this issue.

Since the July 2017 ASHRAE TP RFI, further refinements were made to the industry consensus test standard which have bearing on this matter. Specifically, sections 6 and C4 of AHRI 920–2020 were revised to include methods to estimate EATR without requiring a tracer gas measurement, and to account for EATR's impact on DDX–DOAS performance, using calculations tailored for testing under either Option 1 or Option 2. These include using an EATR value that is based on testing in accordance with ANSI/AHRI 1060–2018 with zero purge angle,[32] zero return-to-supply pressure differential, and 100-percent of nominal energy recovery wheel supply airflow, and adjusting the EATR value for the DDX–DOAS supply airflow rate based on an assumption that the leakage/transfer flow is not affected by the supply and return air flow rates. The adjusted value of EATR is then used in the calculation of DDX–DOAS performance. Specifically, the MRC calculations in section 6.9 of AHRI 920–2020 take into account the conditioning of the air that leaked or transferred from the return plenum to the supply plenum (equal to adjusted EATR multiplied by supply airflow) only from return conditions to supply conditions to reflect the fact that this air did not enter the DDX–DOAS unit at outdoor air conditions. In cases where EATR rating information based on ANSI/AHRI 1060–2018 is not available, or if, for an energy recovery wheel, the rotational speed has been changed from the speed used to determine performance ratings using ANSI/AHRI 1060–2018, sections 6.5 and C4 of AHRI 920–2020 provide a default value of EATR that would be used to rate the DDX–DOAS.

DOE has tentatively determined that the use of default or certified values for EATR in AHRI 920–2020 (instead of tracer gas tests) has addressed AHRI's comments on quantifying energy recovery performance. Accordingly, DOE is proposing to adopt these changes made by AHRI 920–2020 (section 6.5 *Determination of EATR*), as enumerated in section 2.2.1(c) of the proposed Appendix B; and Appendix C of AHRI 920–2020 (which includes section C4 *Simulated Ventilation Air Conditions for Testing Under Option 2*), as enumerated in section 2.2.1(f) of the proposed Appendix B).

ii. Purge Angle Setting

Section 6.6 of ANSI/ASHRAE 198–2013 requires that for any DDX–DOAS equipped with an energy recovery wheel, the purge angle of such feature must be set to zero when testing the DDX–DOAS unit. As part of the July 2017 ASHRAE TP RFI, DOE requested comment on whether all purge devices are adjustable to zero purge and whether it is always clear how to set them to zero purge. 82 FR 34427, 34439 (July 25, 2017). DOE also requested comment 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 other standard setting. *Id.*

None of the comments on the RFI indicated that there are purge devices that are not adjustable to zero angle, nor that it is unclear how to adjust purge angle to zero. Carrier commented that for the short period of time required for a performance test, it should not be a problem to set the purge angle to zero. (Carrier, No. 6 at p. 8) As discussed previously, AHRI stated that there are no independent laboratories capable of testing DDX–DOAS units with VERS. As a result, AHRI argued that this issue does not need to be addressed at this time. However, AHRI stated, if in the future laboratories are able to test DDX–DOASes equipped with VERS, then manufacturers should be allowed to specify the purge setting for testing, as is done in AHRI 1060. (AHRI, No. 11 at p. 20)

DOE has tentatively concluded that a zero purge angle aligns with the selection that manufacturers would generally make (*i.e.,* a zero purge angle), because non-zero purge prevents the purge portion of the wheel from contributing to energy recovery effectiveness (since outdoor ventilation air passing through it is ejected out of the unit to the exhaust rather than becoming part of the supply airflow). Also, the purge section restricts the flow area for the remaining outdoor air that becomes supply air, thus increasing pressure drop and fan power. For these reasons, energy recovery wheel performance (and likewise DDX–DOAS performance and efficiency) will be reduced when operating with a non-zero purge angle. Furthermore, basing DDX–DOAS performance ratings on a zero purge angle provides greater consistency in testing. DOE notes that section C4.1 of AHRI 920–2020—the industry consensus test standard—includes a requirement for testing DDX–DOAS units using zero purge angle, whether testing using Option 1 or Option 2 (through inclusion of $EATR_0$, which is defined in section 11 of AHRI 920–2020 as being determined using zero purge angle). For these reasons, DOE is proposing to adopt the requirement in AHRI 920–2020 to use a zero purge angle for testing DDX–DOAS with energy recovery wheels (section C4.1 of Appendix C of AHRI 920–2020), as enumerated in section 2.2.1(f) of the proposed Appendix B.

iii. Return Air External Static Pressure Requirements

ANSI/ASHRAE 198–2013 specifies testing DDX–DOASes with VERS with return air passing into the unit and exiting at the exhaust air connection. DOE noted in the July 2017 ASHRAE TP RFI that ANSI/AHRI 920–2015 does not address setting the external static pressure (ESP) for the return airflow. 82 FR 34427, 34437 (July 25, 2017). DDX–DOAS units are typically installed and operated in the field with return air ducting. Therefore, when in operation, the return air fans consume additional energy to overcome the static pressure imposed by the return air ducts. As part of the July 2017 ASHRAE TP RFI, DOE requested comment on the ESP levels that should be used for return airflow. *Id.*

In response, AHRI stated that Table 4 of ANSI/AHRI 920–2015 was intended to represent ESP of both supply and return airflow. AHRI also stated that

[32] A purge mechanism cleans the portion of the wheel that has had contact with return air before it is used to precondition outdoor air. The cleaning is provided by outdoor air that passes through this portion of the wheel and is diverted into the return plenum to be discharged through the exhaust blower. Most purge mechanisms allow adjustment of the angle of the wheel sector that is subject to this cleaning function. At zero purge angle, there is no purge cleaning provided.

revisions to ANSI/AHRI 920–2015 will refer to the same table for return airflow ESP. (AHRI, No. 11 at p. 15) DOE received no other comments on this issue.

Consistent with the AHRI comment, section 6.1.5.6 of AHRI 920–2020 does include different ESP requirements for supply and return airflow, thereby resolving the identified issue. Accordingly, DOE is proposing to adopt the ESP requirements set forth in AHRI 920–2020 (section 6.1.5 *Supply and Return Airflow Rates*), as enumerated in section 2.2.1(c) of the proposed Appendix B).

iv. Target Return Airflow Rate

In the July 2017 ASHRAE TP RFI, DOE noted that for testing DDX–DOAS units equipped with VERS, Tables 2 and 3 in ANSI/AHRI 920–2015 provide return airflow temperature conditions and indicate that the temperature conditions apply to units with energy recovery at balanced airflow. 82 FR 34427, 34437 (July 25, 2017). It is unclear from ANSI/AHRI 920–2015 what airflow streams should be balanced, how to determine if they are balanced, and within what tolerances they should be balanced. In the July 2017 ASHRAE TP RFI, DOE requested comments on which airflow streams should be balanced and whether balanced airflow is representative of field use. *Id.*

On this topic, AHRI raised a number of issues with testing DDX–DOAS equipped with VERS generally, as previously discussed. AHRI also stated that using balanced airflows is consistent with the test procedure for rating VERS described in ANSI/AHRI 1060–2018. AHRI further commented that in field operation, unbalanced flows may be needed to maintain positive building pressure; however, most equipment selection is done at or near balanced airflows. (AHRI, No. 11 at pp. 14–15)

Subsequent updates to the industry consensus test standard at AHRI 920–2020 shed further light on this issue. Specifically, section 6.1.5 of AHRI 920–2020 specifies the return airflow rate must be within 3 percent of the measured supply airflow rate. Based on DOE's review of DDX–DOAS product literature and consideration of the AHRI comment, it has become apparent that there is no clear optimal ratio of supply airflow to return airflow for DDX–DOAS testing to be representative of field use. Therefore, DOE has tentatively concluded that the provision in AHRI 920–2020 is appropriate.

i. Demand-Controlled Ventilation

DDX–DOAS units are often used in demand-controlled ventilation (DCV) operation, which regulates the building ventilation requirement based on parameters such as building occupancy. Typically, a DCV system monitors the concentration of carbon dioxide (CO_2) in the return air or in the building and regulates the supply airflow rate accordingly. During periods of non-occupancy, which could represent a significant portion of field-use, the DCV system controls the unit to operate at a low airflow rate, thereby reducing the unit's overall energy use. DDX–DOASes using DCV systems are typically equipped with variable-speed supply fans that can be adjusted to meet changing ventilation needs. In the July 2017 ASHRAE TP RFI, DOE sought comments on whether to include operation under DCV conditions (*i.e.,* low supply airflow conditions) to be included as part of DOE's test procedure. 82 FR 34427, 34437 (July 25, 2017).

In response to this issue, the Joint Advocates encouraged DOE to adopt an efficiency metric that captures the benefits of DCV. The Joint Advocates stated that adopting such a metric could provide more field-representative equipment ratings and better inform consumers when purchasing equipment. Further, the Joint Advocates argued that capturing the benefits of DCV would promote adoption of variable speed fans, provide more flexibility in building operation, and reduce energy use. (Joint Advocates, No. 9 at p. 2, 4) AHRI and Carrier commented that the performance of the DX–DOAS under DCV operation must be characterized prior to developing a test procedure and that adopting provisions to address DCV operation could significantly increase the cost and complexity of testing. AHRI further stated that DCV operation is primarily controlled by building operators. Carrier stated that performance would depend highly on the building type, occupancy, and site requirements for demand ventilation. (AHRI, No. 11 at p. 14; Carrier, No. 6 at p. 4)

DOE reviewed the comments and considered whether to adopt testing conditions to account for the energy use profiles of models with low supply airflow rates that are typically experienced by units with DCV. Incorporation of the airflow modulation that would be enabled by DCV might provide more representative efficiency ratings, help in consumer decision making, and potentially promote the market penetration of variable speed fans. However, DOE is not aware of representative field data regarding the typical DDX–DOAS duty cycle when operating with DCV and, thus, agrees with the comments of AHRI and Carrier that characterization of DCV performance would be an important first step in integrating this control feature into the test procedure. DOE further agrees that adopting additional testing requirements to capture the effect of DCV could significantly increase testing cost and complexity, as noted in comments provided by AHRI and Carrier. Given the lack of data on in-field performance and the anticipated additional testing burden of such a test, DOE has tentatively decided not to include performance under DCV operation in its proposed test procedure for DDX–DOASes at this time.

j. Tolerances for Supply and Return Airflow and External Static Pressure

DOE noted in the July 2017 ASHRAE TP RFI that Table 1 of ANSI/ASHRAE 198–2013 includes operating and condition tolerances of 5 percent for airflow rate. 82 FR 34427, 34439 (July 25, 2017). It includes a test operating tolerance for ESP equal to 0.05 in H_2O and a test condition tolerance for ESP of 0.02 in H_2O. As provided in section 5.2.2 of ANSI/AHRI 920–2015, the airflow rate and ESPs are set at Standard Rating Condition C dry-bulb temperatures without the refrigeration systems and energy recovery (if applicable) in operation. ANSI/AHRI 920–2015 states in section 5.2.2.4 that once the airflow rate is set, the fan speeds shall not be adjusted for the remaining tests. DDX–DOAS units that are for use with air ducting are required by the industry test standard to be set up with ESP requirements in Table 4 of ANSI/AHRI 920–2015, and units tested as if they would be installed without ducts are tested with 0 in H_2O ESP.

DOE notes that while operating in dehumidification mode, the airflow rates and ESPs may fluctuate more than for ''dry'' operation as condensate accumulates and then drains from the cooling coil. In addition, for dehumidification and heating tests, the density of supply air may be different, which may change fan performance, and, thus, the ESP. These factors could cause the supply air ESP to fluctuate more than the operating tolerances specified in Table 1 of ANSI/ASHRAE 198–2013, and/or to deviate from the specified ESP by more than the test condition tolerance. Likewise, the airflow rates could fluctuate more than the specified operating tolerances, and the average airflows could deviate by more than the test condition tolerances from their target values. If this occurs, it is not clear how manufacturers would correct the issue without being able to adjust the fan speed and ESP, since such action is precluded by section 5.2.2.4 of ANSI/AHRI 920–2015.

In the July 2017 ASHRAE TP RFI, DOE noted that the 5-percent condition tolerance on airflow rate is less stringent than the 3-percent condition tolerance adopted in DOE's test procedure for more typical commercial package air equipment. 82 FR 344271, 34439 (July 25, 2017). On August 6, 2015, DOE published a test procedure NOPR that proposed to apply a ±5-percent condition tolerance on cooling full-load indoor airflow rate for more typical commercial package air conditioning equipment. 80 FR 46870, 46873. In response to the proposed tolerance for more typical commercial package air conditioning equipment, DOE received several comments suggesting that a 5-percent tolerance would result in too much variation in the measurement of energy efficiency ratio and cooling capacity. After considering stakeholder comments, DOE adopted a 3-percent tolerance in a final rule published on December 23, 2015. 80 FR 79655, 79659–79660. As part of the July 2017 ASHRAE TP RFI, DOE expressed concern that that the 5-percent condition tolerance on airflow in ANSI/ASHRAE 198–2013 may result in too much test variability for DDX–DOASes and requested comment on whether this airflow tolerance is acceptable. 82 FR 34427, 34439 (July 25, 2017).

AHRI commented in response to the July 2017 ASHRAE TP RFI that manufacturers who have performed testing have stated that meeting the tolerances specified in ANSI/AHRI 920–2015 and ASHRAE 198–2013 is not feasible due to how the testing is performed. Once the refrigeration system is engaged for determining ISMRE and ISCOP ratings, changes in moisture present on the cooling coil and air density affect the standard airflow and associated ESP. AHRI recommended that the ±0.05 in H_2O ESP tolerance and a 3-percent airflow tolerance be observed during the airflow and fan speed setting at Standard Rating Condition C without the refrigeration system operating. AHRI also stated that during the Standard Rating Condition tests, the DDX–DOAS fan speeds and airflow-measuring apparatus fan speeds shall not be adjusted, consistent with airflow setting and operation in the field. Nevertheless, AHRI stated that the average measured airflows should be required to be within 5 percent of the manufacturer's rated standard airflow during all rating tests and that the average measured ESPs should be within 15 percent of the required ESP to indicate a valid test, but the commenter did not indicate whether the fans of the test unit or the airflow-measuring apparatus should be adjusted to maintain these tolerances. (AHRI, No. 11 at p. 18)

DOE notes that AHRI 920–2020 revised the test condition and operating tolerances for airflow and ESP. Section 6.1.5 of AHRI 920–2020 specifies airflow test condition tolerances of ±3 percent of the manufacturer-provided airflow rate for all DDX–DOASes when setting the airflow, provided that this airflow rate meets the supply air dew point temperature requirement, as discussed in section III.B.4.d.i of this NOPR. For setting the return airflow rate, section 6.1.5 of AHRI 920–2020 specifies the same test condition tolerances as for supply airflow rate, except that for return airflow rate, the target is equal to the measured supply airflow rate. This specification ensures that supply and return airflows remain balanced, as discussed in section III.B.3.h.iv of this NOPR. These test condition tolerances for airflow and ESP are only required when setting the airflow. Once the airflow rate is set, the dehumidification and heating tests are then conducted without further adjustments to the supply fan, return fan, or airflow measuring apparatus. Section 6.1.5 and Table 9 of AHRI 920–2020 indicate that the supply and return airflow and ESP condition tolerances are not required to be maintained during the dehumidification and heating tests. While these provisions are contrary to AHRI's recommendation in response to the July 2017 ASHRAE TP RFI to impose a 5-percent airflow condition tolerance and a 15-percent ESP condition tolerance during dehumidification and heating tests, DOE believes these changes in AHRI 920–2020 address AHRI's concerns about testing problems associated with the tolerances in ANSI/AHRI 920–2015 and ASHRAE 198–2013.

AHRI 920–2020 additionally includes a list of test operating tolerances, including those for external static pressure and airflow nozzle differential pressure. AHRI 920–2020 does not include changes to the test operating tolerance for ESP (0.05 in $H2O$ total observed range, specified in Table 9 of AHRI 920–2020). Whereas ANSI/ASHRAE 198–2013 provides a 5-percent operating tolerance directly on the airflow rate, Table 9 of AHRI 920–2020 provides a 5-percent operating tolerance for airflow rate in the form of airflow nozzle differential pressure. DOE has initially determined that the airflow operating tolerance approach in AHRI 920–2020 is preferable because the airflow nozzle differential pressure provides a more direct indication of the airflow variation, since airflow is calculated based on this value. Additionally, other industry test standards such as ANSI/ASHRAE 37–2009 include an operating tolerance on the nozzle pressure drop rather than directly on airflow. DOE believes that these operating tolerances, in addition to the condition tolerances for setting airflow, would maintain repeatable and reproducible results while ensuring that testing is representative of field use. Accordingly, DOE is proposing to adopt the test condition and operating tolerances for airflow and ESP specified in AHRI 920–2020 (section 6.1.5 *Supply and Return Airflow Rates* and section 6.6.2 *Test Measurement Tolerances*, which contains Table 9), as enumerated in section 2.2.1(c) of the proposed Appendix B).

k. Secondary Dehumidification and Heating Capacity Tests

Commercial package air-conditioners and heat pumps with cooling capacity less than 135,000 Btu/h are required to undergo a secondary test to verify the cooling or heating capacity and energy efficiency results (see, *e.g.,* ANSI/ASHRAE 37–2009 section 7.2.1, which is referenced by appendix A to subpart F of 10 CFR part 431). Neither ANSI/AHRI 920–2015 nor ANSI/ASHRAE 198–2013 specify a secondary test method for verifying the dehumidification and heating capacity of DDX–DOAS, but section 6.7 of AHRI 920–2020 does specify secondary tests. The measurement of dehumidification and heating performance of DDX–DOASes is based on measurements of airflow rate, temperature, and humidity, which have uncertainties associated with them. Thus, a secondary test method may be essential to confirm the accuracy of the primary test method.

As part of the July 2017 ASHRAE TP RFI, DOE requested comment on the need for a secondary test method requirement for DDX–DOAS testing. 82 FR 34427, 34439 (July 25, 2017). AHRI commented that condensate measurement would be appropriate as a secondary method, if energy recovery units are excluded from the test procedure. (AHRI, No. 11 at p. 19)

Section C5.1 of AHRI 920–2020 includes a condensate-based test method as a secondary measure of dehumidification capacity. The method measures the weight of the condensate (*i.e.,* water vapor in the outdoor ventilation air that condenses on the conditioning coil and is removed from the air) collected during the dehumidification test and uses it to calculate a secondary measure of MRC. This secondary measure of MRC is then compared to the primary MRC measurement, which is based on supply and outdoor ventilation airflow and air condition measurements.

AHRI 920–2020 requires this secondary measure of MRC for all dehumidification tests, and comparison to the primary measure of MRC at Standard Rating Condition A. This requirement is for all DDX–DOAS units that: (a) Do not use condensate collected from the dehumidification coil to enhance condenser cooling or include a secondary dehumidification process for which the moisture removed from the supply air stream is not collectable in liquid form, and (b) either are not equipped with VERS or are equipped with VERS and tested using Option 2 (see section C5.1 of AHRI 920–2020). AHRI 920–2020 does not require a secondary dehumidification capacity measurement for DDX–DOAS units equipped with VERS that are tested using Option 1. DOE understands that this is because: (a) No viable method has been developed and validated that appropriately accounts for the water vapor that transfers between air streams of an energy recovery wheel, and (b) the test burden of accounting for moisture in the exhaust air stream would be excessive. DOE is proposing to adopt the secondary capacity test measurements specified in AHRI 920–2020 (section C5.1 *Dehumidification Capacity Verification*), as enumerated in section 2.2.1(f) of the proposed Appendix B), including the cooling condensate secondary test measurement discussed previously.

For DDX–DOAS units with energy recovery tested using Option 2, as discussed in section III.B.3.h of this NOPR, the test is conducted by setting the conditions of the air entering the unit (at both the outdoor air inlet and return air inlet) to simulate the conditions that would be provided by the energy recovery device in operation. As a result, the moisture removal (in dehumidification mode) or heating (in heating mode for heat pump DDX–DOAS) measured during the Option 2 primary and secondary capacity tests reflects only the moisture removed or heating by the conditioning coil. The MRC or qhp for the DDX–DOAS is calculated by adjusting the measured moisture removal or heating for the primary test to account for the total moisture removal or heating by the energy recovery device and the conditioning coil. Because the moisture removal or heating capacity measured for the primary and secondary tests are based on the simulated test conditions, sections 6.9 and 6.10 of AHRI 920–2020 use these measured values for the secondary capacity verification under Option 2. DOE is proposing to adopt these requirements specified in AHRI 920–2020 (section 6.9 *Moisture Removal Efficiency Ratings* and section 6.10 *Heating Capacity*), as enumerated in section 2.2.1(c) of the proposed Appendix B).

a. Corrections

In addition to substantive changes, AHRI 920–2020 also provides minor corrections to instructions in ANSI/AHRI 920–2015. However, in its review of AHRI 920–2020, DOE identified an error and an omission in the latest industry test procedure. Specifically, DOE notes that section 6.9.2 of AHRI 920–2020 provides erroneous instruction for the calculation of the degradation coefficient, and sections 6.1.5.2.3 and 6.1.5.2.4 of AHRI 920–2020 refer to the term ''non-standard low-static motor'' without providing a definition or explanation of this term. DOE proposes to correct the calculation instruction and define the term ''non-standard low-static motor,'' as discussed further in the following paragraphs. DOE also notes a correction made by AHRI 920–2020 to address an error in the calculation of supplementary heat penalty in ANSI/AHRI 920–2015.

i. Calculation of the Degradation Coefficient

As mentioned in section III.B.3.d.v of this NOPR, AHRI 920–2020 includes provisions for cases where the unit provides excess dehumidification or heating capacity when operating at its lowest-capacity compressor stage. A degradation coefficient is applied to the MRE and MRE_{70} when the supply air dew point temperature measured when operating the unit at its lowest-capacity compressor stage is lower than the target supply air dew point temperature in excess of the specified test condition tolerance. This degradation coefficient accounts for the re-evaporation of condensate which occurs during cycling operation (*i.e.,* when the compressor cycles on and off to achieve the target supply air dew point temperature). DOE understands that the degradation is more pronounced for DDX–DOASes equipped with VERS for latent energy recovery (or total energy recovery), and, thus, the degradation coefficient should be greater for DDX–DOASes operating total energy recovery VERS. Equation 20 in section 6.9.2 of AHRI 920–2020 appears to incorrectly attribute the lower degradation coefficient to DDX–DOASes operating with VERS. As such, DOE has initially determined, supported by clear and convincing evidence, that absent a correction, the degradation coefficient as applied in AHRI 920–2020 would not meet the statutory requirements of 42 U.S.C. 6314(a)(2)–(3) because it would not produce representative results. DOE proposes to correct Equation 20 by specifying that it is to be used for DDX–DOASes ''*without* VERS, with deactivated VERS (see section 5.4.3 of AHRI 920–2020), or with sensible-only VERS tested under Standard Rating Conditions other than D'' (emphasis added) because DDX–DOASes with total energy recovery VERS or with sensible-only VERS tested under Standard Rating Condition D are considered separately in Equation 21, which calculates a greater degradation coefficient. This correction would be implemented in section 2.2.1(c)(iii) of proposed Appendix B.

ii. Non-Standard Low-Static Motor

As mentioned in section III.B.3.d.i of this NOPR, section 6.1.5 of AHRI 920–2020 includes instructions for setting the supply airflow rate for testing. In particular, sections 6.1.5.2.1 through 6.1.5.2.5 of AHRI 920–2020 provide directions for adjusting the fans should an initial attempt at setting the airflow be unsuccessful.

Section 6.1.5.2.3 of AHRI 920–2020 specifies that if a fan's maximum speed is too low to satisfy the airflow and external static pressure requirements within tolerance (*i.e.,* the motor speed is at the highest setting, a larger compatible off-the-shelf sheave is not available, or increased speed would overload the motor or motor drive) and the motor is not a ''non-standard low-static motor,'' the tests are to be conducted at the fan's maximum speed with the external static pressure satisfying the requirements in Table 7. However, if the motor is a ''non-standard low-static motor,'' section 6.1.5.2.4 of AHRI 920–2020 specifies that the maximum available speed should be used but the supply and return airflow rates should satisfy aforementioned tolerance requirements (implying that the external static pressure requirements in Table 7 need not be met). AHRI 920–2020 does not define ''non-standard low-static motor'' in order to determine which of the two methods is appropriate. Without a definition of ''non-standard low-static motor,'' manufacturers may not apply the ''maximum speed'' provisions consistently, and the potential for variation risks results that do not reflect the equipment's representative average energy efficiency or energy use. As such, DOE has initially determined, supported by clear and convincing evidence, that in the absence of a definition of ''non-standard low-static motor,'' the industry test procedure would not meet the statutory requirements of 42 U.S.C. 6314(a)(2)–(3).

DOE understands that a non-standard low-static fan motor may be used for DDX–DOASes where the application requires less ductwork, which results in a lower external static pressure when operating at the same nominal supply or return airflow rate. This motor would be distributed in commerce as part of an individual model within the same basic model of DDX–DOAS that is also distributed in commerce with a motor that can meet the external static pressure required by AHRI 920–2020. A parallel situation occurs for Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment, for which section D3 in Appendix D of AHRI Test Standard 340/360–2019, ''*Performance Rating of Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment*'' (AHRI 340/360–2019) defines ''non-standard motor'' as an indoor fan motor that is not the standard indoor fan motor and that is distributed in commerce as part of an individual model within the same Basic Model. The same section D3 defines ''standard indoor fan motor'' as the motor specified by the manufacturer for testing and shall be distributed in commerce as part of a particular model. In both cases, the non-standard motor has a horsepower level that is not compatible with the external static pressure rating condition—for DDX–DOAS, the issue arises when the non-standard motor does not have sufficient power to deliver the required external static pressure. Therefore, in the proposed Appendix B in section 2.2.1(a)(i), DOE is proposing to define ''non-standard low-static fan motor'' as a supply fan motor that cannot maintain external static pressure as high as specified in Table 7 of AHRI 920–2020 when operating at a manufacturer-specified airflow rate and that is distributed in commerce as part of an individual model within the same basic model of a DDX–DOAS that is distributed in commerce with a different motor specified for testing that can maintain the required external static pressure.

Issue–8: DOE is requesting comment on the proposed definition of ''non-standard low-static fan motor'' and whether the proposed definition reflects stakeholder understanding of the term.

iii. Calculation of Supplementary Heat Penalty

Section 6.1.3.1 of ANSI/AHRI 920–2015 includes a supplementary heat penalty for units that are unable to achieve the minimum supply air dry-bulb temperature of 70 °F while testing at each Standard Rating Condition specified in Table 2 and Table 3 of ANSI/AHRI 920–2015. The supplementary heat penalty calculates the difference in enthalpy from the delivered supply air and air at the minimum supply air temperature (70 °F). After reviewing the equations, DOE noted in the July 2017 ASHRAE TP RFI that the term for supply airflow rate is missing from the supplementary heat penalty equations. 82 FR 34427, 34436 (July 25, 2017).

In response to the July 2017 ASHRAE TP RFI, AHRI confirmed that the supplementary heat formula in ANSI/AHRI 920–2015 is missing the airflow term, QSA, in section 6.1.3.1, and the organization committed to include such term in the next revision of the test standard. (AHRI, No. 11 at p. 11) DOE notes that this change has been included in AHRI 920–2020, thereby resolving the problem. Accordingly, DOE proposes to adopt the revised supplementary heat penalty equation contained in AHRI 920–2020 that includes the supply airflow rate term (section 6.1.3.1 *Initial Standard Rating Condition A Dehumidification Test*), as enumerated in section 2.2.1(c) of the proposed Appendix B).

In the July 2017 ASHRAE TP RFI, DOE further noted that section 6.1.3.1 of ANSI/AHRI 920–2015 calls for a supplementary heat penalty if the supply air temperature is less than 70 °F, but the incorporation of this penalty into the MRE and COP equations is not clearly described. DOE also noted that it is not clear whether the ANSI/ASHRAE 198–2013 test method considers this penalty. 82 FR 34427, 34436–34437 (July 25, 2017).

AHRI commented that the supplementary heat penalty should be added if the minimum 70 °F temperature is not met, and that this value is added to the measured power input, which is represented as PT in section 10.6 of ANSI/ASHRAE 198–2013. (AHRI, No. 11 at p. 11) DOE notes that this clarification is included in section 6.9 of AHRI 920–2020 in the calculation of MRE_{70}, which incorporates the energy impact of heating the supply air to 70 °F. As discussed in section III.B.2 of this NOPR, DOE is proposing to adopt the ISMRE2 metric specified in section 6.13 of AHRI 920–2020 that does not include the supplementary heat penalty as the regulated metric for DDX–DOAS, while the MRE_{70} (and $ISMRE2_{70}$) metric that incorporates the supplementary heat penalty may be used for representations. As a result, the supplementary heat penalty would only be added to the total power input for the calculation of the optional MRE_{70} ratings.

With regards to the COP calculation, AHRI commented that the intent was that the supplementary heat penalty would be added to the numerator as additional heat capacity and the denominator as additional power consumed to calculate a COP indicative of running an electric heater to meet a supply air temperature of 70 °F. (AHRI, No. 11 at p. 13) DOE notes that this clarification was included in section 6.11.2 of AHRI 920–2020 in the renamed COPISCOP metric, and accordingly, DOE is proposing to adopt the revised COPISCOP calculation (section 6.11.2 of AHRI 920–2020), as enumerated in section 2.2.1(c) of the proposed Appendix B).

2. Determination of Represented Values

a. Basic Model

To determine the energy efficiency of a basic model, DOE's certification requirements generally require manufacturers to test a sample of units of that basic model to represent its performance. (10 CFR 429.11) The basic model may include multiple individual models having similar performance features and characteristics. Typically, DOE provides a definition of a basic model for each type of covered equipment. In this NOPR, DOE proposes a definition for DDX–DOAS basic model derived from the basic model definition for other commercial packaged air conditioning and heating equipment set forth at 10 CFR 431.92. Specifically, DOE replaced the criterion to have common nominal cooling capacity with common nominal MRC. DOE is also proposing to include the common nominal MRC in the definition of a basic model for small, large and very large air-cooled or water-cooled commercial package air conditioning and heating equipment, which includes DDX–DOASes. The proposed definition of basic model of a DDX–DOAS also specifies that a basic model must include units with similar VERS equipment. DOE is proposing in this specification to reflect that ASHRAE Standard 90.1 delineates DDX–DOAS equipment classes, in part, based on VERS, and the proposed test procedure considers the conditioning contribution of the VERS equipment.

DOE is proposing that a basic model for a DDX–DOAS means all units manufactured by one manufacturer within a single equipment class; with the same or comparably performing compressor(s), heat exchangers, ventilation energy recovery system(s) (if present), and air moving system(s), and with a common ''nominal'' moisture removal capacity. This proposed definition of a basic model of a DDX–DOAS would be included in the regulatory text in 10 CFR 431.92.

Issue–9: DOE seeks comment on the proposed definition of basic model of a DDX–DOAS.

b. Sampling Plan Requirements

DOE is proposing sampling requirements to determine the represented values for DDX–DOAS (*i.e.,* dehumidification and heating efficiencies and MRC). More specifically, by proposing to define (at 10 CFR 431.92) DDX–DOAS as a subset of DX–DOAS, and to define DX–DOAS as a category of small, large, or very large commercial package air conditioning and heating equipment, the proposal would apply the same sampling requirements to DDX–DOASes as applicable to other commercial package air conditioning and heating equipment under 10 CFR 429.43, *Commercial heating, ventilating, air conditioning (HVAC) equipment*.

In response to DOE's request for general comment on issues associated with adopting the industry test procedures for certain commercial package air conditioning and heat pump equipment in the July 2017 ASHRAE TP RFI (82 FR 34427, 34445 (July 25, 2017)), Lennox recommended that DOE harmonize the certification criteria for commercial HVAC equipment in 10 CFR 429.43 with those for central air conditioners, a consumer product, in 10 CFR 429.16. In particular, Lennox stated that commercial equipment currently has a more stringent confidence limit of 95 percent, but the commenter argued that current testing technology does not support this level of precision. (Lennox, No. 8 at p. 6) As DOE is proposing to apply the sampling requirements of 10 CFR 431.43 to DDX–DOASes, Lennox's comment regarding the confidence limit for represented values of energy efficiency, energy consumption, and capacity is relevant to DDX–DOASes.

Other manufacturers did not raise concerns regarding the confidence limit required for sampling more typical commercial package air conditioning and heat pump equipment, and Lennox has not provided data regarding variability of units in production and testing. Absent more specific information or data regarding the stringency of the confidence level, DOE is not proposing a change.[33]

Issue–10: DOE requests comment on the sampling plan proposed for DDX–DOASes. DOE specifically requests information and data regarding the proposed confidence level and whether variability of testing of DDX–DOASes would require a less stringent level, and if so, what that level should be.

c. Multiple Refrigerants

DOE recognizes that some commercial package air conditioning and heating equipment may be sold with more than one refrigerant option (*e.g.,* R–410A or R–407C). Typically, manufacturers specify a single refrigerant in their literature for each unique model, but in its review, DOE has identified at least one commercial package air conditioning and heating equipment manufacturer that provides two refrigerant options under the same model number. The refrigerant chosen by the customer in the field installation may impact the energy efficiency of a unit. For this reason, DOE is proposing representation requirements specific for models approved for use with multiple refrigerants.

Use of a refrigerant that requires different hardware (such as R–407C as compared to R–410A) would represent a different basic model, and according to the current CFR, separate representations of energy efficiency are required for each basic model. On the other hand, some refrigerants (such as R–422D and R–427A) would not require different hardware, and a manufacturer may consider them to be the same basic model. In the latter case of multiple refrigerant options, DOE proposes to add a new paragraph at 10 CFR 429.43(a)(3) specifying that a manufacturer must determine the represented values for that basic model based on the refrigerant(s)—among all refrigerants listed on the unit's nameplate—that result in the lowest ISMRE2 and ISCOP2 efficiencies, respectively. For example, the dehumidification performance metric ISMRE2 must be based on the refrigerant yielding the lowest ISMRE2, and the heating performance metric ISCOP2 (if the unit is a heat pump DDX–DOAS) must be based on the refrigerant yielding the lowest ISCOP2. These represented values would apply to the basic model for all refrigerants specified by the manufacturer as appropriate for use, regardless of which one may actually be used in the field, where only one set of values is reported.

DOE notes that this proposal reflects the proposed definition of basic model for DDX–DOASes as discussed in section III.B.4.a of this NOPR. Units within a basic model of DDX–DOAS must have the same or comparably performing compressor(s), heat exchangers, ventilation energy recovery system(s) (if present), and air moving system(s), and with a common ''nominal'' moisture removal capacity.

Issue–11: DOE requests comment on its proposal regarding representations for models approved for use with multiple refrigerants.

d. Alternative Energy-Efficiency Determination Methods

DOE proposes to allow DDX–DOAS manufacturers to use alternative energy-efficiency determination methods (AEDMs) for determining the ISMRE2 and ISCOP2 (if applicable) in accordance with 10 CFR 429.70. By proposing to define (at 10 CFR 431.92) DDX–DOAS as a subset of DX–DOAS, and to define DX–DOAS as a category of small, large, or very large commercial package air conditioning and heating equipment, the provisions of 10 CFR 429.43 authorizing use of an AEDM for commercial HVAC equipment would apply to DDX–DOAS. DOE notes that the proposed requirements for use of AEDMs to determine DDX–DOAS represented values are consistent with AEDM requirements for all other categories of commercial package air-conditioning and heating equipment.

DOE proposes to create four validation classes of DDX–DOASes within the *Validation classes* table at 10 CFR 429.70(c)(2)(iv): Air-cooled/air-source and water-cooled/water-source, each with and without VERS. The separation into air-cooled/air-source and water-cooled/water source validation classes is the same approach used for other categories of commercial package air-conditioning and heating equipment. For DDX–DOASes, the additional class separation by presence of energy recovery reflects ASHRAE Standard 90.1 delineating equipment classes, in part, based on the presence of VERS and the significant differences in the test methods required with energy recovery. These differences in the test procedures include the potential need for a third test chamber for the Option 1 approach for testing DDX–DOASes with energy recovery, and the

[33] DOE notes that it has previously requested data regarding the variability of units of small, large, and very large air-cooled commercial package air conditioning and heating equipment in production and testing to enable DOE to review and make any necessary adjustments to the specified confidence levels. *See* 80 FR 79655, 79659 (Dec. 23, 2015). However, DOE did not receive any relevant data in response to that request.

requirement to account for the performance of the energy recovery device for the Option 2 approach (see section III.B.3.g of this NOPR).

DOE proposes to require testing of two basic models to validate the AEDMs for each validation class—this is identical to the requirements for other categories of commercial package air-conditioning and heating equipment. Finally, DOE proposes to specify in the table at 10 CFR 429.70(c)(5)(vi) a tolerance of 10 percent for DDX–DOAS verification tests for ISMRE2 and ISCOP2 when comparing test results with certified ratings. Again, this is identical to the tolerances for ''integrated'' ratings for other categories of commercial package air-conditioning and heating equipment.

Issue–12: DOE requests comment on its proposals for AEDM requirements for DDX–DOAS equipment. DOE requests comment specifically on whether the proposed 10-percent tolerance for comparison of test results with rated values is appropriate. If the 10-percent tolerance is not appropriate, DOE requests comment on why it is not appropriate, as well as comment indicating an appropriate tolerance.

e. Rounding

Sections 6.1.2.1 through 6.1.2.8 of AHRI 920–2020 specify rounding for DDX–DOAS performance metrics. DOE proposes to adopt these rounding requirements as part of the DOE test procedure, as enumerated in section 2.2.1(c)(iv) of the proposed Appendix B.

Issue–13: DOE requests comment on its proposal to adopt the rounding requirements for key metrics as specified in sections 6.1.2.1 through 6.1.2.8 of AHRI 920–2020.

3. Configuration of Unit Under Test

DOE recognizes that DDX–DOASes are distributed in commerce in a variety of configurations consisting of different combinations of components. DOE proposes in section 2.2.1(g) of Appendix B to adopt the requirements of appendix F to AHRI 920–2020, which includes a list of components that must be present for testing DDX–DOASes and a list of components that are optional for testing. Appendix F in AHRI 920–2020 also includes explicit instructions on how representations can be made for equipment that include these optional components. AHRI 920–2020 specifies the following list of components that must be present for testing:

- Supply air filter(s);
- Compressor(s);
- Outdoor coil(s) or heat exchanger(s);
- Outdoor coil fan(s)/motor(s) (for air-cooled and air-source systems only);
- Conditioning coil(s);
- Refrigerant expansion device(s);
- Supply/outdoor ventilation fan(s)/motor(s), and
- System controls.

AHRI 920–2020 also specifies that for supply air filters, the filter shall have a ''minimum efficiency reporting value'' (MERV) specification no less than MERV 8. For individual models that use filters with efficiency higher than MERV 8 (which generally have higher pressure drop and could reduce relative tested efficiency), section F2.4 of AHRI 920–2020 allows manufacturers the option of testing these individual models as a separate basic model or combined into a basic model with other individual models that meet the basic model definition and are tested with a MERV 8 filter. Adopting Appendix F of AHRI 920–2020 without changes would allow manufacturers to provide efficiency representations based on either testing option for individual models that use filters with efficiency higher than MERV 8.

DOE notes that the list of components that are optional for testing specified in section F2.4 of AHRI 920–2020 includes features that may reduce tested efficiency but may also in certain applications: (a) Maintain or improve field efficiency or (b) be required for safety. Given the potential benefits, DOE does not want to penalize equipment with such components, because that might disincentivize their adoption. By proposing to adopt Appendix F of AHRI 920–2020 without changes, the following instructions from AHRI 920–2020 would specify how to make representations for individual models of equipment that include these optional features:

- Individual models with features designated as ''optional'' may be represented separately as a unique basic model or certified within the same basic model as otherwise identical individual models without the feature pursuant to the definition of ''basic model'' in § 431.92.
- If an otherwise identical model (within the same basic model) without the feature is distributed in commerce, test the otherwise identical model.
- If an otherwise identical model (within the same basic model) without the feature is not distributed in commerce, conduct tests with the feature present but configured and de-activated so as to minimize (partially or totally) the impact on the results of the test. Alternatively, the manufacturer may indicate in the supplemental testing instructions that the test shall be conducted using a specially-built otherwise identical unit that is not distributed in commerce and does not have the feature.

This approach ensures that equipment distributed in commerce with additional components outside the list of required components are still within the scope of the test procedure. The proposed approach also provides instruction on how to make representations for all component combinations (including those with optional components). In addition, this approach allows manufacturers the flexibility to make representations of equipment with components designated as ''optional'' based on testing otherwise identical individual models without the feature.

C. Other Comments

In response to the July 2017 ASHRAE TP RFI, DOE received several general comments not specific to any one equipment category or test procedure. This section addresses those comments.

NCI recommended that DOE follow the development of ASHRAE 221P, ''Test Method to Measure and Score the Operating Performance of an Installed Constant Volume Unitary HVAC System,'' and consider where it may be appropriately applied within EPCA test procedures. (NCI, No. 4 at pp. 1–2) NCI stated that it has collected data indicating that typical split systems and packaged units serving residential and small commercial buildings typically deliver 50 percent to 60 percent of the rated capacity to the occupied zone, thereby making laboratory tests unrepresentative of field performance. (*Id.*)

As noted in section I.A of this document, EPCA prescribes that the test procedures for commercial package air conditioning and heating equipment must be those generally accepted industry testing procedures or rating procedures developed or recognized by industry as referenced in ASHRAE Standard 90.1. (42 U.S.C. 6314(a)(4)(A)) DOE notes that ASHRAE Standard 90.1 does not reference ANSI/ASHRAE Standard 221–2020, ''Test Method to Field-Measure and Score the Cooling and Heating Performance of an Installed Unitary HVAC System'' [34] (ASHRAE 221–2020) as the applicable test procedure corresponding to industry standards. NCI also did not provide data on field performance or any correlations between field performance and laboratory test performance for DX–DOASes or DDX–DOASes for DOE to

[34] Available at: *webstore.ansi.org/tandards/ASHRAE/ANSIASHRAEStandard2212020* (Last accessed April 19, 2021).

consider. Furthermore, ASHRAE 221–2020 does not provide a method to determine the dehumidification efficiency and heating efficiency of DDX–DOASes, as AHRI 920–2020 does. As discussed in section II of this document, DOE is proposing to incorporate by reference AHRI 920–2020 (*i.e.,* the test procedure recognized by ASHRAE Standard 90.1 for DDX–DOASes) and the relevant industry standards referenced therein, consistent with EPCA requirements.

The CA IOUs commented that while the July 2017 ASHRAE TP RFI expressed interest in reducing burden to manufacturers, DOE already took steps to reduce burden by allowing alternative energy efficiency or energy use determination methods (AEDMs). (CA IOUs, No. 7 at pp. 1–2) The CA IOUs stated that there are no further opportunities to streamline test procedures to limit testing burden. (*Id.*) Additionally, the CA IOUs emphasized the importance of accurate efficiency ratings for its incentive programs and customer knowledge, pointing to the statutory provision that test procedures must produce results that are representative of the product's energy efficiency. (*Id.*)

Lennox stated that it generally supports DOE meeting the statutory requirements to design test procedures to measure energy efficiency during an average use cycle but requested that DOE also consider overall impacts to consumers and manufacturers. (Lennox, No. 8 at pp. 1–2) The commenter stated that in commercial applications, predicting actual energy use from a single metric is difficult and that a metric better serves as a point of comparison. (*Id.*) Lennox suggested that DOE strike a balance between evaluating equipment in a meaningful way without introducing regulatory burden from overly complex test procedures or calculations that provide little value to consumers. (*Id.*)

In response to the CA IOUs and Lennox, DOE notes that its approach to test procedures is largely dictated by the requirements of EPCA. As discussed, EPCA prescribes that the test procedures for commercial package air conditioning and heating equipment must be those generally accepted industry testing procedures or rating procedures developed or recognized by industry as referenced in ASHRAE Standard 90.1. (42 U.S.C. 6314(a)(4)(A)) If such relevant industry test procedure is amended, DOE must update its test procedure to be consistent with the amended industry consensus test procedure, unless DOE determines, by rule published in the **Federal Register** and supported by clear and convincing evidence, that the amended test procedure would not meet the requirements in 42 U.S.C. 6314(a)(2) and (3) related to representative use and test burden. (42 U.S.C. 6314(a)(4)(B) and (C)) In establishing or amending its test procedures, DOE must develop test procedures that are reasonably designed to produce test results which reflect energy efficiency, energy use, and estimated operating costs of a type of industrial equipment during a representative average use cycle and that are not unduly burdensome to conduct. (42 U.S.C. 6314(a)(2)) DOE's considerations of these requirements in relation to individual test method issues are discussed within the relevant sections of this NOPR.

The Joint Advocates stated that there are a number of ambiguities in industry test procedures and that DOE should address these ambiguities in order to provide a level playing field for manufacturers and to ensure that any verification or enforcement testing is consistent with manufacturers' own testing. (Joint Advocates, No. 9 at p. 2) In the context of a test procedure for DDX–DOASes, DOE addresses the potential for ambiguity as applicable, in the previous sections of this document.

D. Test Procedure Costs, Harmonization, and Other Topics

1. Test Procedure Costs and Impact

EPCA requires DOE to adopt test procedures for small, large and very large commercial package air conditioning and heating equipment consistent with the amended industry test procedures developed or recognized AHRI as referenced in ASHRAE Standard 90.1, unless the Secretary determines that, supported by clear and convincing evidence, to do so would not meet the requirements for test procedures to be reasonably designed to produce results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle and not be unduly burdensome to conduct. (42 U.S.C. 6314(a)(4)(B)) In this NOPR, DOE proposes to establish a test procedure for DDX–DOASes, which belong to a category of small, large, and very large commercial package air conditioning and heating equipment. DOE is proposing to establish a test procedure that incorporates by reference the applicable industry consensus test methods (including the energy efficiency descriptors) and that establishes representation requirements. DOE has tentatively determined that these proposed new test procedures would be representative of an average use cycle and would not be unduly burdensome for manufacturers to conduct. To the extent that DOE is proposing modifications to the industry consensus test procedure, DOE has tentatively determined that the proposed modifications are consistent with the industry consensus standard, and as explained in the prior sections, they are supported by clear and convincing evidence, because absent such modifications, the industry test procedure would not meet the requirements in 42 U.S.C. 6314(a)(2) and (3) related to representative use and test burden. (42 U.S.C. 6314(a)(4)(B) and (C)). Further, DOE has tentatively determined that the proposed modifications would be unlikely to significantly increase burden, given that DOE is referencing the prevailing industry test procedure. So, presuming widespread usage of that test standard, its adoption as part of the Federal test procedure would be expected to result in little additional cost, even with the minor modifications proposed here. DOE has tentatively determined that the test procedure, if finalized as proposed, would not require manufacturers to redesign any of the covered equipment, would not require changes to how the equipment is manufactured, and would not impact the utility of the equipment.

When the industry test procedure or rating procedure for a category of small, large, and very large commercial package air conditioning and heating equipment recognized in ASHRAE Standard 90.1 is amended, DOE is required to amend the Federal test procedure for the relevant category of small, large, and very large commercial package air conditioning and heating equipment consistent with the industry update, unless DOE determines by clear and convincing evidence that to do so would result in a test procedure that does not meet the EPCA requirements regarding representativeness and testing burden. (42 U.S.C. 6314(a)(4)(B)) As discussed, ASHRAE Standard 90.1–2016 established energy efficiency levels for DDX–DOASes (but written as ''DX–DOASes'' in ASHRAE Standard 90.1) as a category of commercial package air conditioning and heating equipment and recognized ANSI/AHRI 920–2015 as the industry test procedure for these equipment. Subsequent to the establishment of standards and a test procedure for DDX–DOASes in ASHRAE Standard 90.1–2016, ANSI/AHRI 920–2015 was updated. The 2020 version of AHRI 920 (*i.e.,* AHRI 920–2020) is the most recent version of the industry test procedure for DDX–

DOASes (still referred to in AHRI 920–2020 as simply ''DX–DOASes'').

DOE is proposing to incorporate by reference the revised industry test standard, AHRI 920–2020, with certain modifications that are consistent with the industry test standard. DOE has tentatively concluded that the proposed test procedure in this NOPR would not add undue industry test burden, and that the proposed test procedure for this equipment is consistent with the industry test procedure update. Further discussion of the cost impacts of the proposed test procedure are presented in the following paragraphs.

As noted previously, currently DOE does not prescribe test procedures for DDX–DOASes, and AHRI 920–2020 is the most recent version of the industry test procedure applicable to DDX–DOASes. DOE has tentatively determined that the proposal to incorporate by reference AHRI 920–2020 is consistent with current industry practice, and, therefore, manufacturers would not be expected to incur any additional costs if the proposal were finalized. Importantly, the proposals in this NOPR, if finalized, would not require manufacturers to certify ratings to DOE. DOE would address certification as part of any rulemaking to address energy conservation standards for DDX–DOASes.

With that said, DOE is proposing to define ''dehumidifying direct expansion-dedicated outdoor air system'' (DDX–DOAS) based on the definition provided in AHRI 920–2020. The differences in the proposed definition as compared to the definition in AHRI 920–2020 are to provide clarity and use terminology consistent with DOE's test procedures for other categories of commercial package air conditioning and heating equipment.

DOE is proposing to limit the applicability of the proposed test procedure to DDX–DOASes with any MRC less than 324 lbs. of moisture per hour, whereas the scope of AHRI 920–2020 is not limited based on MRC. In a comment provided in response to the July 2017 ASHRAE TP RFI, AHRI stated that laboratory limitations may limit testing using ANSI/AHRI 920–2015 to 300 lbs. of moisture per hour at Standard Rating Condition A and to units not physically larger than more typical commercial package air conditioning equipment with a capacity of 760,000 Btu per hour. (AHRI, No. 11 at p. 20) As discussed in section III.A.3 of this document, DOE's proposal to limit the coverage of DDX–DOASes to 324 lbs. of moisture per hour in the DDX–DOAS definition is a direct conversion from the maximum cooling capacity limit of 760,000 Btu per hour (which AHRI notes would be the upper limit for laboratory capabilities), and it is similar to the suggestion made by AHRI. Hence the definitional modifications to the industry standard will not change the scope of coverage of the proposed test procedure as compared to the industry standard, and if made final, would not result in any increase in test burden as compared to AHRI 920–2020.

AHRI 920–2020 does not explicitly state the amount of external head pressure to use when testing water-cooled and water-source DDX–DOASes with integral pumps. As noted, there are a very limited number of DDX–DOAS models with integral pumps on the market. DOE is proposing to require such units be tested with an external head pressure equal to 20 −0/+1 feet of water column, which is the same level of external head pressure used in the calculation of the pump effect for DDX–DOASes without integral pumps. As such, DOE considers this proposal to be consistent with industry test procedure because it ensures that integral pumps are treated in the same way as non-integral pumps, and as such would not increase testing burden as compared to current industry practice.

AHRI 920–2020 also does not explicitly provide directions for setting up the unit's control settings at each Standard Rating Condition. As discussed in section III.B.3.g of this document, DOE is proposing a general requirement for all control settings to remain unchanged for all Standard Rating Conditions once system set up has been completed, and that component operation shall be controlled by the unit under test once the provisions for rating requirements are met. This is likely how DDX–DOASes would be tested as per the existing instructions in AHRI 920–2020, but DOE is providing the additional specificity in order to ensure that the results of the testing are representative, repeatable, and reproducible, and as such would not increase testing burden as compared to current industry practice.

AHRI 920–2020 incorrectly indicates that Equation 20 should be used to calculate the degradation coefficient for DDX–DOASes with VERS (because Equation 21 is indicated to apply for DDX–DOASes with VERS). This is discussed in further detail in section III.B.3.l.ii of this document. DOE is proposing to correct this statement to instead use this equation for DDX–DOASes without VERS, with deactivated VERS, or with sensible-only VERS tested under Standard Rating Conditions other than D. DOE considers this proposal to be consistent with the intent of the industry test procedure and would not increase testing burden as compared to AHRI 920–2020.

DOE's proposal to provide a definition for ''non-standard low-static fan motor'' also serves to provide clarity to the instructions present in AHRI 920–2020 without affecting the scope of coverage or testing burden. Absent this definition, as discussed in section III.B.3.l.iii of this document, it is not possible to determine the appropriate airflow setting procedure in section 6.1.5.2 of AHRI 920–2020.

AHRI 920–2020 does not provide instruction for testing a DDX–DOAS for which a manufacturer recommends more than one refrigerant option. DOE is proposing to require testing of such a unit with each recommended refrigerant if the different refrigerants require different hardware. This proposal is consistent with the treatment of basic models of commercial packaged air conditioners and heating equipment under 10 CFR 430.92, and, as such, it would be reflective of industry practice for commercial packaged air conditioner and heating equipment generally. Therefore, this proposed addition to the procedure laid out by AHRI 920–2020 would not increase testing burden as compared current industry practice.

DOE is also proposing sampling requirements for making representations of ISMRE2 and ISCOP2, as applicable. AHRI 920–2020 does not contain comparable provisions. The sampling requirements proposed are consistent with the DOE sampling requirements generally for commercial packaged air conditioners and heating equipment, and, if made final, would be reflective of industry practice. Therefore, the proposed sampling requirements, if made final, would not increase testing burden as compared to the current industry practice.

Issue–14: DOE requests comment on its understanding of the impact of the test procedure proposals in this NOPR, specifically DOE's initial conclusion that manufacturers would not incur any additional costs due to this proposal, if finalized, compared to current industry practice, as indicated by AHRI 920–2020.

4. Harmonization With Industry Standards

DOE proposes to incorporate by reference the provisions in AHRI 920–2020, including definitions, test methods, and rating requirements, with certain modifications previously discussed. Throughout this NOPR, DOE discusses adopting this most recent relevant industry consensus testing standard for DDX–DOAS equipment, as required in 42 U.S.C. 6314 and discussed in section III.B of this NOPR.

Issue–15: DOE seeks comment on the degree to which the DOE test procedure should consider and be harmonized further with the most recent relevant industry consensus testing standards for DDX–DOASes and whether there could be modifications to the industry test method that would provide additional benefits to the public. DOE also requests comment on the benefits and burdens of adopting any industry/voluntary consensus-based or other appropriate test procedure, without modification.

5. Other Test Procedure Topics

In addition to the issues identified earlier in this document, DOE welcomes comment on any other aspect of the proposed test procedures for DDX–DOASes not already addressed by the specific areas identified in this document. DOE particularly seeks information that would ensure that the test procedure measures energy efficiency during a representative average use cycle, as well as information that would help DOE create a procedure that is not unduly burdensome to conduct.

E. Compliance Date

EPCA prescribes that, if DOE amends a test procedure, all representations of energy efficiency and energy use, including those made in the context of certification and on marketing materials and product labels, must be made in accordance with that amended test procedure, beginning 360 days after publication of such a test procedure final rule in the **Federal Register**. (42 U.S.C. 6314(d)(1))

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

The Office of Management and Budget (OMB) has determined that this test procedure rulemaking does not constitute a ''significant regulatory actions'' under section 3(f) of Executive Order 12866, ''Regulatory Planning and Review,'' 58 FR 51735 (Oct. 4, 1993). Accordingly, this action was not subject to review under the Executive Order by the Office of Information and Regulatory Affairs (OIRA) in OMB.

B. Review Under the Regulatory Flexibility Act

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

The following sections detail DOE's IRFA for this test procedure rulemaking.

1. Description of Reasons Why Action Is Being Considered

DOE is undertaking this test procedure rulemaking to establish a DOE test procedure for DDX–DOASes in response to updates to the relevant industry consensus standard, American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1, *Energy Standard for Buildings Except Low-Rise Residential Buildings*, which, with its 2016 publication, both added efficiency standards and specified a test procedure for this equipment (*i.e.,* AHRI 920–2015). Subsequently, the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) updated its test procedure with the publication of AHRI 920–2020. The Energy Policy and Conservation Act (EPCA)[35] requires that each time the test procedure referenced by ASHRAE Standard 90.1 is updated, DOE must update the Federal test procedure consistent with the industry update, unless there is clear and convincing evidence that the update would not be representative of an average use cycle or would be unduly burdensome to conduct.

2. Objectives of, and Legal Basis for, Rule

EPCA, as amended, among other things, authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. Title III, Part C[36] of EPCA, Public Law 94–163 (42 U.S.C. 6311–6317, as codified), added by Public Law 95–619, Title IV, § 441(a), established the Energy Conservation Program for Certain Industrial Equipment, which sets forth a variety of provisions designed to improve energy efficiency. This covered equipment includes small, large, and very large commercial package air conditioning and heating equipment. (42 U.S.C. 6311(1)(B)–(D)) DOE has initially determined that commercial package air conditioning and heating equipment includes DX–DOASes. As discussed in section I.B of the NOPR document, DX–DOASes had not previously been addressed in DOE rulemakings and are not currently subject to Federal test procedures or energy conservation standards.

Under EPCA, DOE's 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 EPCA specifically 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).

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

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

Under 42 U.S.C. 6314, the statute also sets forth the criteria and procedures DOE is required to follow when prescribing or amending test procedures for covered equipment. Specifically, EPCA requires that any test procedure prescribed or amended shall be reasonably designed to produce test results which measure energy

[35] All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Public Law 116–260 (Dec. 27, 2020).

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

efficiency, energy use, or estimated annual operating cost of covered equipment during a representative average use cycle and requires that test procedures not be unduly burdensome to conduct. (42 U.S.C. 6314(a)(2))

EPCA requires that the test procedures for 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). (42 U.S.C. 6314(a)(4)(A)) Further, if such an industry test procedure is amended, DOE must update its test procedure to be consistent with the amended industry test procedure, unless DOE determines, by rule published in the **Federal Register** and supported by clear and convincing evidence, that such amended test procedure would not meet the requirements in 42 U.S.C. 6314(a)(2) and (3), related to representative use and test burden. (42 U.S.C. 6314(a)(4)(B))

EPCA also requires that, at least once every seven years, DOE evaluate test procedures for each type of covered equipment, including commercial package air conditioning and heating equipment to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures not to be unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle. (42 U.S.C. 6314(a)(1)–(3)) In addition, if DOE determines that a test procedure amendment is warranted, it must publish proposed test procedures in the **Federal Register** and afford interested persons an opportunity (of not less than 45 days duration) to present oral and written data, views, and arguments on the proposed test procedures. (42 U.S.C. 6314(b)) If DOE determines that test procedure revisions are not appropriate, DOE must publish in the **Federal Register** its determination not to amend the test procedures. (42 U.S.C. 6314(a)(1)(A)(ii))

A test procedure for a subset of DX–DOASes (*i.e.,* DDX–DOASes), was first specified by ASHRAE Standard 90.1 in the 2016 edition (ASHRAE Standard 90.1–2016). Pursuant to 42 U.S.C. 6314(a)(4)(B), and following updates to the relevant test procedures which were referenced in ASHRAE Standard 90.1, DOE is publishing this NOPR proposing to establish a test procedure for DDX–DOASes in satisfaction of its aforementioned obligations under EPCA.

3. Description and Estimate of Small Entities Regulated

For manufacturers of small, large, and very large air-conditioning and heating equipment (including DDX–DOASes), commercial warm-air furnaces, and commercial water heaters, the Small Business Administration (SBA) has set a size threshold which defines those entities classified as ''small businesses'' for the purposes of the statute. DOE used the SBA's small business size standards to determine whether any small entities would be subject to the requirements of this rule. *See* 13 CFR part 121. The equipment covered by this rule are classified under North American Industry Classification System (''NAICS'') code 333415,[37] ''Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing.'' In 13 CFR 121.201, the SBA sets a threshold of 1,250 employees or fewer for an entity to be considered as a small business for this category.

In reviewing the DDX–DOAS market, DOE used company websites, marketing research tools, product catalogues, and other public information to identify companies that manufacture DDX–DOASes. DOE identified 16 manufacturers of DDX–DOASes affected by this rulemaking. Out of these 16 manufacturers, DOE determined that three are domestic small businesses. DOE used subscription-based business information tools to determine headcount and revenue of the small businesses.

Issue–16: DOE invites comment on the number of domestic small businesses producing DDX–DOASes for the U.S. market.

4. Description and Estimate of Compliance Requirements

EPCA requires DOE to adopt test procedures for small, large, and very large commercial package air conditioning and heating equipment consistent with the amended industry test procedures developed or recognized by AHRI as referenced in ASHRAE Standard 90.1, unless the Secretary determines that, supported by clear and convincing evidence, to do so would not meet the requirements for test procedures to be reasonably designed to produce results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle and not be unduly burdensome to conduct. (42 U.S.C. 6314(a)(4)(B)) In this NOPR, DOE proposes to establish a test procedure for DDX–DOASes, which belong to a category of small, large, and very large commercial package air conditioning and heating equipment. DOE is proposing to establish a test procedure that incorporates by reference the applicable industry consensus test methods (including the energy efficiency descriptors) and that establishes representation requirements. Although AHRI 920–2020 is not yet referenced as the applicable test procedure in ASHRAE Standard 90.1, it provides revised test methods that update ANSI/AHRI 920–2015, which is the referenced industry test standard. For these reasons, DOE has tentatively concluded that the methods in AHRI 920–2020 reflect the intention for prevalent industry practice: It is likely that manufacturers will use AHRI 920–2020 in the future.

In its review of AHRI 920–2020, DOE estimated the cost for third-party lab testing of basic models to range from $10,000 to $23,500 depending on validation class, equipment capacity, and equipment configuration. However, manufactures are not required to perform laboratory testing on all basic models. DOE proposes to allow DDX–DOAS manufacturers to use alternative energy-efficiency determination methods (AEDMs) for determining the ISMRE2 and ISCOP2 (if applicable) in accordance with 10 CFR 429.70. An AEDM is a computer modeling or mathematical tool that predicts the performance of non-tested basic models. These computer modeling and mathematical tools, when properly developed, can provide a relatively straight-forward and reasonably accurate means to predict the energy usage or efficiency characteristics of a basic model of a given covered product or equipment and reduce the burden and cost associated with testing.

DOE researched manufacturer DDX–DOAS offerings and estimated the cost to rate basic models according to the proposed DOE test procedure (which is not expected to have any additional cost over AHRI 920–2020 [38]). Using

[37] The size standards are listed by NAICS code and industry description and are available at *www.sba.gov/document/support--table-size-standards* (Last accessed on April 20, 2021).

[38] DOE has tentatively determined that the proposed modifications to AHRI 920–2020 would be unlikely to significantly increase burden, given that DOE is referencing the prevailing industry test procedure. So, presuming widespread usage of AHRI 920–2020, its adoption as part of the Federal

Continued

information collected on small business equipment offerings and the upper threshold of third-party testing costs, DOE estimates an average expense of approximately $200,000 per small manufacturer. These testing expenses would be less than 1% of revenue for each small business. DOE tentatively concludes that the estimate costs would not present a significant burden to small manufacturers.

The testing of DDX–DOASes would not be required until such time as DOE establishes DDX–DOAS energy conservation standards and manufacturers are required to comply with those energy conservation standards. As such, small manufacturers will have a substantial timeframe to prepare for the testing detailed in this NOPR. Additionally, small manufacturers already testing to AHRI 920–2020 would incur no additional costs as a result of this proposed test procedure.

Issue–17: DOE invites comment on the testing costs and timing of testing costs described in this IRFA.

5. Duplication, Overlap, and Conflict With Other Rules and Regulations

DOE is not aware of any rules or regulations that duplicate, overlap, or conflict with the proposed rule being considered in this action.

6. Significant Alternatives to the Rule

DOE proposes to reduce burden on manufacturers, including small businesses, by allowing alternative energy efficiency or energy use determination methods (AEDMs) in lieu of physical testing all basic models. An AEDM is a computer modeling or mathematical tool that predicts the performance of non-tested basic models. The use of computer modeling is more time-efficient than physical testing. Without AEDMs, the average cost to rate all basic models would exceed $29 million per small manufacturer, as compared to the $200,000 per small manufacturer in the current proposal.

Additionally, DOE considered alternative test methods and modifications to the test procedure for DDX–DOASes, and the Department has tentatively determined that there are no better alternatives than the modifications and test procedures proposed in this NOPR, in terms of both meeting the agency's objectives and reducing burden. DOE examined relevant industry test standards, and the Department incorporated these standards in the proposed test procedures whenever appropriate to reduce test burden to manufacturers. Specifically, this NOPR proposes that DOE establish a test procedure for DDX–DOASes through incorporation by reference of AHRI 920–2020 with modifications that are not expected to increase test burden.

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

test procedure would be expected to result in little additional cost, even with the minor modifications proposed by DOE.

C. Review Under the Paperwork Reduction Act of 1995

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

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

D. Review Under the National Environmental Policy Act of 1969

DOE is analyzing this proposed regulation in accordance with the National Environmental Policy Act of 1969 (NEPA) and DOE's NEPA implementing regulations (10 CFR part 1021). DOE anticipates that this rulemaking qualifies for categorical exclusion A6 because it is a procedural rulemaking and meets the requirements for application of a categorical exclusion. 10 CFR part 1021, subpart D, Appendix A, section A6; *See* 10 CFR 1021.410. DOE will complete its NEPA review before issuing the final rule.

E. Review Under Executive Order 13132

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

F. Review Under Executive Order 12988

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

G. Review Under the Unfunded Mandates Reform Act of 1995

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

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

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

I. Review Under Executive Order 12630

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

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

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516 note) provides for agencies to review most disseminations of information to the public under guidelines established by each agency pursuant to general guidelines issued by OMB. OMB's guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE's guidelines were published at 67 FR 62446 (Oct. 7, 2002). DOE has reviewed this proposed rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

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

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

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

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

The proposed test procedure for DDX–DOASes incorporate the following applicable industry consensus standards: AHRI 920–2020, ANSI/AHRI 1060–2018, ANSI/ASHRAE 37–2009, ANSI/ASHRAE 41.1–2013, ANSI/ASHRAE 41.6–2014, and ANSI/ASHRAE 198–2013. DOE has evaluated these standards and is unable to conclude whether they fully comply with the requirements of section 32(b) of the FEAA (*i.e.,* whether they were developed in a manner that fully provides for public participation, comment, and review). DOE will consult with both the Attorney General and the Chairman of the FTC concerning the impact of these test procedures on competition, prior to prescribing a final rule.

M. Description of Materials Incorporated by Reference

In this NOPR, DOE proposes to incorporate by reference the following test standards:

(1) The test standard published by AHRI, titled ''2020 Standard for Performance Rating of DX-Dedicated Outdoor Air System Units,'' AHRI Standard 920–2020 (I–P). AHRI Standard 920–2020 (I–P) is an industry-accepted test procedure for measuring the performance of DX-dedicated outdoor air system units. AHRI Standard 920–2020 (I–P) is available on AHRI's website at: *www.ahrinet.org/App_Content/ahri/files/STANDARDS/AHRI/AHRI_Standard_920_I-P_2020.pdf.*

(2) The test standard published by AHRI, titled ''2018 Standard for Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment,'' ANSI/AHRI Standard 1060–2018. ANSI/AHRI Standard 1060–2018 is an industry-accepted test procedure for measuring the performance of air-to-air exchangers for energy recovery ventilation equipment. ANSI/AHRI Standard 1060–2018 is available on AHRI's website at: *www.ahrinet.org/App_Content/ahri/files/STANDARDS/AHRI/AHRI_Standard_1060_I-P_2018.pdf.*

(3) The test standard test standard published by ASHRAE, titled ''Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment,'' ANSI/ASHRAE Standard 37–2009. ANSI/ASHRAE Standard 37–2009 is an industry-accepted test procedure for measuring the performance of electrically driven unitary air-conditioning and heat pump equipment. ANSI/ASHRAE Standard 37–2009 is available on ASHRAE's website (in partnership with Techstreet) at: *www.techstreet.com/ashrae/standards/ashrae-37-2009?product_id=1650947.*

(4) The test standard published by ASHRAE, titled ''Standard Method for Temperature Measurement,'' ANSI/ASHRAE Standard 41.1–2013. ANSI/AHRAE Standard 41.1–2013 is an industry-accepted test procedure for measuring temperature. ANSI/ASHRAE Standard 41.1–2013 is available on ASHRAE's website (in partnership with Techstreet) at: *www.techstreet.com/ashrae/standards/ashrae-41-1-2013?product_id=1853241.*

(5) The test standard published by ASHRAE, titled ''Standard Method for Humidity Measurement,'' ANSI/ASHRAE Standard 41.6–2014. ANSI/AHRAE Standard 41.6–2014 is an industry-accepted test procedure for measuring humidity. ANSI/ASHRAE Standard 41.6–2014 is available on ASHRAE's website (in partnership with Techstreet) at: *www.techstreet.com/ashrae/standards/ashrae-41-6-2014?product_id=1881840.*

(6) The test standard published by ASHRAE, titled ''Method for Test for Rating DX-Dedicated Outdoor Air Systems for Moisture Removal Capacity and Moisture Removal Efficiency,'' ANSI/ASHRAE Standard 198–2013. ANSI/ASHRAE Standard 198–2013 is an industry-accepted test procedure for measuring the performance of DX-dedicated outdoor air system units. ANSI/ASHRAE Standard 198–2013 is available on ASHRAE's website (in partnership with Techstreet) at: *www.techstreet.com/ashrae/standards/ashrae-198-2013?product_id=1852612.*

V. Public Participation

A. Participation in the Webinar

The time and date of the webinar are listed in the **DATES** section at the beginning of this document. Webinar registration information, participant instructions, and information about the capabilities available to webinar participants will be published on DOE's website: *www.energy.gov/eere/buildings/public-meetings-and-comment-deadlines.* Participants are responsible for ensuring their systems are compatible with the webinar software. Additionally, you may request an in-person meeting to be held prior to the close of the request period provided in the **DATES** section of this document. Requests for an in-person meeting may be made by contacting Appliance and Equipment Standards Program staff at (202) 287–1445 or by email: *Appliance_Standards_Public_Meetings@ee.doe.gov.*

B. Procedure for Submitting Prepared General Statements for Distribution

Any person who has an interest in the topics addressed in this notice, or who is representative of a group or class of persons that has an interest in these issues, may request an opportunity to make an oral presentation at the webinar/public meeting. Such persons may submit requests to speak via email to the Appliance and Equipment Standards Program at: *ApplianceStandardsQuestions@ee.doe.gov.* Persons who wish to speak should include with their request a computer file in WordPerfect, Microsoft Word, PDF, or text (ASCII) file format that briefly describes the nature of their interest in this rulemaking and the topics they wish to discuss. Such persons should also provide a daytime telephone number where they can be reached.

Persons requesting to speak should briefly describe the nature of their interest in this rulemaking and provide a telephone number for contact. DOE requests persons selected to make an oral presentation to submit an advance copy of their statements at least two weeks before the webinar/public meeting. At its discretion, DOE may permit persons who cannot supply an advance copy of their statement to participate, if those persons have made advance alternative arrangements with the Building Technologies Office. As necessary, requests to give an oral presentation should ask for such alternative arrangements.

C. Conduct of the Webinar

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

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

At the end of all prepared statements on a topic, DOE will permit participants to clarify their statements briefly and comment on statements made by others. Participants should be prepared to answer questions by DOE and by other participants concerning these issues.

DOE representatives may also ask questions of participants concerning other matters relevant to this rulemaking. The official conducting the webinar/public meeting will accept additional comments or questions from those attending, as time permits. The presiding official will announce any further procedural rules or modification of the above procedures that may be needed for the proper conduct of the webinar/public meeting.

A transcript of the webinar/public meeting will be included in the docket, which can be viewed as described in the *Docket* section at the beginning of this NOPR. In addition, any person may buy a copy of the transcript from the transcribing reporter.

D. Submission of Comments

DOE will accept comments, data, and information regarding this proposed rule no later than the date provided in the **DATES** section at the beginning of this proposed rule.[39] Interested parties may submit comments using any of the methods described in the **ADDRESSES** section at the beginning of this document.

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

However, your contact information will be publicly viewable if you include it in the comment 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. Persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

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

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

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

Include contact information each time you submit comments, data, documents, and other information to DOE. No telefacsimiles (faxes) will be accepted.

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

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

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

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

E. Issues on Which DOE Seeks Comment

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

Issue–1: DOE requests comment on the proposed definition for ''direct expansion-dedicated outdoor air system.'' DOE also requests comment on any additional characteristics not yet considered that could help to distinguish DX–DOASes from other commercial package air conditioning and heating equipment.

Issue–2: DOE requests comment on the proposed definition for ''dehumidifying direct expansion-dedicated outdoor air system.'' Specifically, DOE requests comment on the proposed criteria for distinguishing a ''dehumidifying direct expansion-dedicated outdoor air system'' from a ''direct expansion-dedicated outdoor air system'' more generally. DOE also requests comment on any additional characteristics not yet considered that could help to distinguish DDX–DOASes from DX–DOASes more generally.

Issue–3: DOE seeks comment on its translation of Btu per hour to MRC and specifically its proposal to translate the upper capacity limit for DDX–DOASes such that a model would be considered

[39] DOE has historically provided a 75-day comment period for test procedure NOPRs pursuant to the North American Free Trade Agreement, U.S.-Canada-Mexico (''NAFTA''), Dec. 17, 1992, 32 I.L.M. 289 (1993); the North American Free Trade Agreement Implementation Act, Public Law 103–182, 107 Stat. 2057 (1993) (codified as amended at 10 U.S.C.A. 2576) (1993) (''NAFTA Implementation Act''); and Executive Order 12889, ''Implementation of the North American Free Trade Agreement,'' 58 FR 69681 (Dec. 30, 1993). However, on July 1, 2020, the Agreement between the United States of America, the United Mexican States, and the United Canadian States (''USMCA''), Nov. 30, 2018, 134 Stat. 11 (*i.e.,* the successor to NAFTA), went into effect, and Congress's action in replacing NAFTA through the USMCA Implementation Act, 19 U.S.C. 4501 *et seq.* (2020), implies the repeal of E.O. 12889 and its 75-day comment period requirement for technical regulations. Thus, the controlling laws are EPCA and the USMCA Implementation Act. Consistent with EPCA's public comment period requirements for consumer products, the USMCA only requires a minimum comment period of 60 days. Consequently, DOE now provides a 60-day public comment period for test procedure NOPRs.

in scope if it has an MRC less than 324 lbs. per hour.

Issue–4: DOE requests comment on its proposal to clarify what terms are synonymous with DDX–DOAS.

Issue–5: DOE requests comment and data on the development of a crosswalk from the efficiency levels in ASHRAE Standard 90.1 based on ANSI/AHRI 920–2015 to efficiency levels based on AHRI 920–2020. DOE is specifically seeking data on how dehumidification and heating efficiency ratings for a given DDX–DOAS model are impacted when measured using AHRI 920–2020 as compared to ANSI/AHRI 920–2015.

Issue–6: DOE requests comment on the terminology DOE proposes to use for DDX–DOASes, including ''integrated seasonal coefficient of performance 2, or ISCOP2;'' ''integrated seasonal moisture removal efficiency 2, or ISMRE2;'' and ''ventilation energy recovery system, or VERS.''

Issue–7: DOE requests comment on the proposal to require that water-cooled and water-source DDX–DOASes with integral pumps be set up with an external pressure rise equal to 20 feet of water column with a condition tolerance of −0/+1 foot and an operating tolerance of 1 foot.

Issue–8: DOE requests comment on the proposed general control setting requirement for DDX–DOASes.

Issue–9: DOE is requesting comment on the proposed definition of ''non-standard low-static fan motor'' and whether the proposed definition reflects stakeholder understanding of the term.

Issue–10: DOE seeks comment on the proposed definition of basic model of a DDX–DOAS.

Issue–11: DOE requests comment on the sampling plan proposed for DDX–DOASes. DOE specifically requests information and data regarding the proposed confidence level and whether variability of testing of DDX–DOASes would require a less stringent level, and if so, what that level should be.

Issue–12: DOE requests comment on its proposal regarding representations for models approved for use with multiple refrigerants.

Issue–13: DOE requests comment on its proposals for AEDM requirements for DDX–DOAS equipment. DOE requests comment specifically on whether the proposed 10-percent tolerance for comparison of test results with rated values is appropriate. If the 10-percent tolerance is not appropriate, DOE requests comment on why it is not appropriate, as well as comment indicating an appropriate tolerance.

Issue–14: DOE requests comment on its proposal to adopt the rounding requirements for key metrics as specified in sections 6.1.2.1 through 6.1.2.8 of AHRI 920–2020.

Issue–15: DOE requests comment on its understanding of the impact of the test procedure proposals in this NOPR, specifically DOE's initial conclusion that manufacturers would not incur any additional costs due to this proposal, if finalized, compared to current industry practice, as indicated by AHRI 920–2020.

Issue–16: DOE seeks comment on the degree to which the DOE test procedure should consider and be harmonized further with the most recent relevant industry consensus testing standards for DDX–DOASes and whether there could be modifications to the industry test method that would provide additional benefits to the public. DOE also requests comment on the benefits and burdens of adopting any industry/voluntary consensus-based or other appropriate test procedure, without modification.

Issue–17: DOE invites comment on the number of domestic small businesses producing DDX–DOASes for the U.S. market.

Issue–18: DOE invites comment on the testing costs and timing of testing costs described in this IRFA.

VI. Approval of the Office of the Secretary

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

List of Subjects

10 CFR Part 429

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

10 CFR Part 431

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

Signing Authority

This document of the Department of Energy was signed on June 23, 2021, by Kelly Speakes-Backman, Principal Deputy Assistant Secretary and Acting Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the **Federal Register**.

Signed in Washington, DC, on June 23, 2021.

Treena V. Garrett,

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

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

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

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

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

■ 2. Amend § 429.43 by adding paragraph (a)(3) to read as follows:

§ 429.43 Commercial heating, ventilating, air conditioning (HVAC) equipment.

(a) * * *

(3) *Refrigerants:* For dehumidifying direct expansion-dedicated outdoor air systems (DDX–DOASes), if a basic model is distributed in commerce for which the manufacturer specifies the use of more than one refrigerant option, the ISMRE2 and ISCOP2, as applicable, are determined for that basic model using the refrigerant that results in the lowest ISMRE2 and the refrigerant that results in the lowest ISCOP2, as applicable. For example, the dehumidification performance metric ISMRE2 must be based on the refrigerant yielding the lowest ISMRE2, and the heating performance metric ISCOP2 (if the unit is a heat pump DDX–DOAS) must be based on the refrigerant yielding the lowest ISCOP2. A refrigerant is considered approved for use if it is listed on the nameplate of the single package unit or outdoor unit. Pursuant to the definition of ''basic model'' in § 431.92 of this chapter, specification of an additional refrigerant option that requires use of different hardware (*i.e.,* compressors, heat exchangers, or air moving systems that are not the same or comparably performing), results in a different basic model.

* * * * *

■ 3. Amend § 429.70 by revising the tables in paragraphs (c)(2)(iv) and (c)(5)(vi)(B) to read as follows:

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

* * * * *

(c) * * *

(2) * * *

(iv) * * *

Validation class	Minimum number of distinct models that must be tested per AEDM
Air-Cooled, Split and Packaged Air Conditioners (ACs) and Heat Pumps (HPs) less than 65,000 Btu/h Cooling Capacity (3-Phase).	2 Basic Models.
(A) Commercial HVAC Validation Classes	
Air-Cooled, Split and Packaged ACs and HPs greater than or equal to 65,000 Btu/h Cooling Capacity and Less than 760,000 Btu/h Cooling Capacity.	2 Basic Models.
Water-Cooled, Split and Packaged ACs and HPs, All Cooling Capacities	2 Basic Models.
Evaporatively-Cooled, Split and Packaged ACs and HPs, All Capacities	2 Basic Models.
Water-Source HPs, All Capacities	2 Basic Models.
Single Package Vertical ACs and HPs	2 Basic Models.
Packaged Terminal ACs and HPs	2 Basic Models.
Air-Cooled, Variable Refrigerant Flow ACs and HPs	2 Basic Models.
Water-Cooled, Variable Refrigerant Flow ACs and HPs	2 Basic Models.
Computer Room Air Conditioners, Air Cooled	2 Basic Models.
Computer Room Air Conditioners, Water-Cooled	2 Basic Models.
Dehumidifying Direct Expansion-Dedicated Outdoor Air Systems, Air-cooled or Air-source Heat Pump, Without Ventilation Energy Recovery Systems.	2 Basic Models.
Dehumidifying Direct Expansion-Dedicated Outdoor Air Systems, Air-cooled or Air-source Heat Pump, With Ventilation Energy Recovery Systems.	2 Basic Models.
Dehumidifying Direct Expansion-Dedicated Outdoor Air Systems, Water-cooled, Water-source Heat Pump, or Ground Source Closed-loop Heat Pump, Without Ventilation Energy Recovery Systems.	2 Basic Models.
Dehumidifying Direct Expansion-Dedicated Outdoor Air Systems, Water-cooled, Water-source Heat Pump, or Ground Source Closed-loop Heat Pump, With Ventilation Energy Recovery Systems.	2 Basic Models.
(B) Commercial Water Heater Validation Classes	
Gas-fired Water Heaters and Hot Water Supply Boilers Less than 10 Gallons	2 Basic Models.
Gas-fired Water Heaters and Hot Water Supply Boilers Greater than or Equal to 10 Gallons	2 Basic Models.
Oil-fired Water Heaters and Hot Water Supply Boilers Less than 10 Gallons	2 Basic Models.
Oil-fired Water Heaters and Hot Water Supply Boilers Greater than or Equal to 10 Gallons	2 Basic Models.
Electric Water Heaters	2 Basic Models.
Heat Pump Water Heaters	2 Basic Models.
Unfired Hot Water Storage Tanks	2 Basic Models.
(C) Commercial Packaged Boilers Validation Classes	
Gas-fired, Hot Water Only Commercial Packaged Boilers	2 Basic Models.
Gas-fired, Steam Only Commercial Packaged Boilers	2 Basic Models.
Gas-fired Hot Water/Steam Commercial Packaged Boilers	2 Basic Models.
Oil-fired, Hot Water Only Commercial Packaged Boilers	2 Basic Models.
Oil-fired, Steam Only Commercial Packaged Boilers	2 Basic Models.
Oil-fired Hot Water/Steam Commercial Packaged Boilers	2 Basic Models.
(D) Commercial Furnace Validation Classes	
Gas-fired Furnaces	2 Basic Models.
Oil-fired Furnaces	2 Basic Models.
(E) Commercial Refrigeration Equipment Validation Classes [1]	
Self-Contained Open Refrigerators	2 Basic Models.
Self-Contained Open Freezers	2 Basic Models.
Remote Condensing Open Refrigerators	2 Basic Models.
Remote Condensing Open Freezers	2 Basic Models.
Self-Contained Closed Refrigerators	2 Basic Models.
Self-Contained Closed Freezers	2 Basic Models.
Remote Condensing Closed Refrigerators	2 Basic Models.
Remote Condensing Closed Freezers	2 Basic Models.

[1] The minimum number of tests indicated above must be comprised of a transparent model, a solid model, a vertical model, a semi-vertical model, a horizontal model, and a service-over-the counter model, as applicable based on the equipment offering. However, manufacturers do not need to include all types of these models if it will increase the minimum number of tests that need to be conducted.

* * * * *

(5) * * *

(vi) * * *

(B) * * *

Equipment	Metric	Applicable tolerance
Commercial Packaged Boilers	Combustion Efficiency	5% (0.05)
	Thermal Efficiency	5% (0.05)
Commercial Water Heaters or Hot Water Supply Boilers	Thermal Efficiency	5% (0.05)
	Standby Loss	10% (0.1)
Unfired Storage Tanks	R-Value	10% (0.1)
Air-Cooled, Split and Packaged ACs and HPs less than 65,000 Btu/h Cooling Capacity (3-Phase).	Seasonal Energy-Efficiency Ratio	5% (0.05)
	Heating Season Performance Factor	5% (0.05)
	Energy Efficiency Ratio	10% (0.1)
Air-Cooled, Split and Packaged ACs and HPs greater than or equal to 65,000 Btu/h Cooling Capacity and Less than 760,000 Btu/h Cooling Capacity.	Energy Efficiency Ratio	5% (0.05)
	Coefficient of Performance	5%
	Integrated Energy Efficiency Ratio	10% (0.1)
Water-Cooled, Split and Packaged ACs and HPs, All Cooling Capacities	Energy Efficiency Ratio	5% (0.05)
	Coefficient of Performance	5% (0.05)
	Integrated Energy Efficiency Ratio	10% (0.1)
Evaporatively-Cooled, Split and Packaged ACs and HPs, All Capacities	Energy Efficiency Ratio	5% (0.05)
	Coefficient of Performance	5% (0.05)
	Integrated Energy Efficiency Ratio	10% (0.1)
Water-Source HPs, All Capacities	Energy Efficiency Ratio	5% (0.05)
	Coefficient of Performance	5% (0.05)
	Integrated Energy Efficiency Ratio	10% (0.1)
Single Package Vertical ACs and HPs	Energy Efficiency Ratio	5% (0.05)
	Coefficient of Performance	5% (0.05)
Packaged Terminal ACs and HPs	Energy Efficiency Ratio	5% (0.05)
	Coefficient of Performance	5% (0.05)
Variable Refrigerant Flow ACs and HPs	Energy Efficiency Ratio	5% (0.05)
	Coefficient of Performance	5% (0.05)
	Integrated Energy Efficiency Ratio	10% (0.1)
Computer Room Air Conditioners	Net Sensible Coefficient of Performance	5% (0.05)
Dehumidifying Direct Expansion-Dedicated Outdoor Air Systems	Integrated Seasonal Coefficient of Performance 2.	10% (0.1)
	Integrated Seasonal Moisture Removal Efficiency 2.	10% (0.1)
Commercial Warm-Air Furnaces	Thermal Efficiency	5% (0.05)
Commercial Refrigeration Equipment	Daily Energy Consumption	5% (0.05)

* * * * *

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

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

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

■ 5. Amend § 431.2 by revising the definition of ''Commercial HVAC & WH product'' to read as follows:

§ 431.2 Definitions.

* * * * *

Commercial HVAC & WH product means any small, large, or very large commercial package air-conditioning and heating equipment (as defined in § 431.92), packaged terminal air conditioner (as defined in § 431.92), packaged terminal heat pump (as defined in § 431.92), single package vertical air conditioner (as defined in § 431.92), single package vertical heat pump (as defined in § 431.92), computer room air conditioner (as defined in § 431.92), variable refrigerant flow multi-split air conditioner (as defined in § 431.92), variable refrigerant flow multi-split heat pump (as defined in § 431.92), direct expansion-dedicated outdoor air system (as defined in § 431.92), commercial packaged boiler (as defined in § 431.82), hot water supply boiler (as defined in § 431.102), commercial warm air furnace (as defined in § 431.72), instantaneous water heater (as defined in § 431.102), storage water heater (as defined in § 431.102), or unfired hot water storage tank (as defined in § 431.102).

* * * * *

■ 6. Amend § 431.92 by:

■ a. Revising the definition of ''Basic model''; and

■ b. Adding, in alphabetical order, the definitions for ''Dehumidifying direct expansion-dedicated outdoor air system, or DDX–DOAS,'' ''Direct expansion-dedicated outdoor air system, or DX–DOAS,'' ''Integrated seasonal coefficient of performance 2, or ISCOP2,'' ''Integrated seasonal moisture removal efficiency 2, or ISMRE2,'' and ''Ventilation energy recovery system, or VERS''.

The revision and additions read as follows:

§ 431.92 Definitions concerning commercial air conditioners and heat pumps.

* * * * *

Basic model includes:

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

(2) *Dehumidifying direct expansion-dedicated outdoor air system* means all units manufactured by one manufacturer, having the same primary energy source (*e.g.,* electric or gas), within a single equipment class; with the same or comparably performing compressor(s), heat exchangers, ventilation energy recovery system(s) (if

present), and air moving system(s) that have a common ''nominal'' moisture removal capacity.

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

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

(5) *Small, large, and very large air-cooled or water-cooled commercial package air conditioning and heating equipment* means all units manufactured by one manufacturer within a single equipment class, having the same or comparably performing compressor(s), heat exchangers, and air moving system(s) that have a common ''nominal'' cooling capacity.

(6) *Small, large, and very large water source heat pump* means all units manufactured by one manufacturer within a single equipment class, having the same primary energy source (*e.g.,* electric or gas), and which have the same or comparable compressors, same or comparable heat exchangers, and same or comparable ''nominal'' capacity.

(7) *Variable refrigerant flow systems* means all units manufactured by one manufacturer within a single equipment class, having the same primary energy source (*e.g.,* electric or gas), and which have the same or comparably performing compressor(s) that have a common ''nominal'' cooling capacity and the same heat rejection medium (*e.g.,* air or water) (includes VRF water source heat pumps).

* * * * *

Dehumidifying direct expansion-dedicated outdoor air system, or DDX–DOAS, means a direct expansion-dedicated outdoor air system that is capable of dehumidifying air to a 55 °F dew point—when operating under Standard Rating Condition A as specified in Table 4 or Table 5 of AHRI 920–2020 (incorporated by reference, see § 431.95) with a barometric pressure of 29.92 in Hg—for any part of the range of airflow rates advertised in manufacturer materials, and has a moisture removal capacity of less than 324 lb/h.

Direct expansion-dedicated outdoor air system, or *DX–DOAS,* means a category of small, large, or very large commercial package air-conditioning and heating equipment which is capable of providing ventilation and conditioning of 100-percent outdoor air or marketed in materials (including but not limited to, specification sheets, insert sheets, and online materials) as having such capability.

* * * * *

Integrated seasonal coefficient of performance 2, or *ISCOP2,* means a seasonal weighted-average heating efficiency for heat pump dedicated outdoor air systems, expressed in W/W, as measured according to appendix B of this subpart.

Integrated seasonal moisture removal efficiency 2, or *ISMRE2,* means a seasonal weighted average dehumidification efficiency for dedicated outdoor air systems, expressed in lbs. of moisture/kWh, as measured according to appendix B of this subpart.

* * * * *

Ventilation energy recovery system, or *VERS,* means a system that pre-conditions outdoor ventilation air entering the equipment through direct or indirect thermal and/or moisture exchange with the exhaust air, which is defined as the building air being exhausted to the outside from the equipment.

* * * * *

■ 7. Section 431.95 is amended by:
■ a. Revising paragraph (a) and the introductory text to paragraph (b);
■ b. Redesignating paragraphs (b)(6) and (7) as (b)(8) and (9);
■ c. Adding new paragraphs (b)(6) and (7);
■ d. Revising the introductory text to paragraph (c) and paragraph (c)(2);
■ e. Redesignating paragraphs (c)(3) and (4) as (c)(5) and (6); and
■ f. Adding new paragraphs (c)(3) and (4), and paragraph (c)(7).

The revisions and additions read as follows:

§ 431.95 Materials incorporated by reference.

(a) Certain material is incorporated by reference into this subpart with the approval of the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. To enforce any edition other than that specified in this section, DOE must publish a document in the **Federal Register** and the material must be available to the public. All approved material is available for inspection at the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, 6th Floor, 950 L'Enfant Plaza SW, Washington, DC 20024, (202) 586–1445, or go to: *www.energy.gov/eere/buildings/appliance-and-equipment-standards-program,* and may be obtained from the other sources in this section. It is also available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, email: *fedreg.legal@nara.gov,* or go to: *www.archives.gov/federal-register/cfr/ibr-locations.html.*

(b) *AHRI.* Air-Conditioning, Heating, and Refrigeration Institute, 2311 Wilson Blvd., Suite 400, Arlington, VA 22201, (703) 524–8800, or go to: *www.ahrinet.org.*

* * * * *

(6) AHRI Standard 920–2020 (I–P), (''AHRI 920–2020''), ''2020 Standard for Performance Rating of *DX-Dedicated Outdoor Air System Units,*'' approved February 4, 2020, IBR approved for appendix B to this subpart.

(7) AHRI Standard 1060–2018, (''ANSI/AHRI 1060–2018''), ''2018 Standard for *Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment,*'' approved 2018, (ANSI/AHRI 1060–2018), IBR approved for appendix B to this subpart.

(c) *ASHRAE.* American Society of Heating, Refrigerating and Air-Conditioning Engineers, 180 Technology Parkway, Peachtree Corners, Georgia 30092, (404) 636–8400, or go to: *www.ashrae.org.*

* * * * *

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

(3) ANSI/ASHRAE Standard 41.1–2013, (''ANSI/ASHRAE 41.1–2013''), ''Standard Method for Temperature Measurement,'' ANSI approved January 30, 2013, IBR approved for appendix B to this subpart.

(4) ANSI/ASHRAE Standard 41.6–2014, (''ANSI/ASHRAE 41.6–2014''), ''Standard Method for Humidity Measurement,'' ANSI approved July 3, 2014, IBR approved for appendix B to this subpart.

* * * * *

(7) ANSI/ASHRAE Standard 198–2013, (''ANSI/ASHRAE 198–2013''),

''Method of Test for Rating DX-Dedicated Outdoor Air Systems for Moisture Removal Capacity and Moisture Removal Efficiency,'' approved by ANSI on January 30, 2013, IBR approved for appendix B to this subpart.

* * * * *

■ 8. Amend § 431.96 by:

■ a. Revising paragraph (a) and Table 1 in paragraph (b)(2); and

■ b. Designating the table in paragraph (d) as Table 2 to paragraph (d).

The revisions read as follows:

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

(a) *Scope.* This section contains test procedures for measuring, pursuant to EPCA, the energy efficiency of any small, large, or very large commercial package air-conditioning and heating equipment, packaged terminal air conditioners and packaged terminal heat pumps, computer room air conditioners, variable refrigerant flow systems, single package vertical air conditioners and single package vertical heat pumps, and dehumidifying direct expansion-dedicated outdoor air systems.

(b) * * *

(2) * * *

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

Equipment type	Category	Cooling capacity or moisture removal capacity	Energy efficiency descriptor	Use tests, conditions, and procedures [1] in	Additional test procedure provisions as indicated in the listed paragraphs of this section
Small Commercial Package Air-Conditioning and Heating Equipment.	Air-Cooled, 3-Phase, AC and HP.	<65,000 Btu/h	SEER and HSPF	AHRI 210/240–2008 (omit section 6.5).	Paragraphs (c) and (e).
	Air-Cooled AC and HP.	≥65,000 Btu/h and <135,000 Btu/h.	EER, IEER, and COP	Appendix A to this subpart.	None.
	Water-Cooled and Evaporatively-Cooled AC.	<65,000 Btu/h	EER	AHRI 210/240–2008 (omit section 6.5).	Paragraphs (c) and (e).
		≥65,000 Btu/h and <135,000 Btu/h.	EER	AHRI 340/360–2007 (omit section 6.3).	Paragraphs (c) and (e).
	Water-Source HP	<135,000 Btu/h	EER and COP	ISO Standard 13256–1 (1998).	Paragraph (e).
Large Commercial Package Air-Conditioning and Heating Equipment.	Air-Cooled AC and HP.	≥135,000 Btu/h and <240,000 Btu/h.	EER, IEER and COP	Appendix A to this subpart.	None.
	Water-Cooled and Evaporatively-Cooled AC.	≥135,000 Btu/h and <240,000 Btu/h.	EER	AHRI 340/360–2007 (omit section 6.3).	Paragraphs (c) and (e).
Very Large Commercial Package Air-Conditioning and Heating Equipment.	Air-Cooled AC and HP.	≥240,000 Btu/h and <760,000 Btu/h.	EER, IEER and COP	Appendix A to this subpart.	None.
	Water-Cooled and Evaporatively-Cooled AC.	≥240,000 Btu/h and <760,000 Btu/h.	EER	AHRI 340/360–2007 (omit section 6.3).	Paragraphs (c) and (e).
Packaged Terminal Air Conditioners and Heat Pumps.	AC and HP	<760,000 Btu/h	EER and COP	Paragraph (g) of this section.	Paragraphs (c), (e), and (g).
Computer Room Air Conditioners.	AC	<65,000 Btu/h	SCOP	ASHRAE 127–2007 (omit section 5.11).	Paragraphs (c) and (e).
		≥65,000 Btu/h and <760,000 Btu/h.	SCOP	ASHRAE 127–2007 (omit section 5.11).	Paragraphs (c) and (e).
Variable Refrigerant Flow Multi-split Systems.	AC	<65,000 Btu/h (3-phase).	SEER	AHRI 1230–2010 (omit sections 5.1.2 and 6.6).	Paragraphs (c), (d), (e), and (f).
		≥65,000 Btu/h and <760,000 Btu/h.	EER	AHRI 1230–2010 (omit sections 5.1.2 and 6.6).	Paragraphs (c), (d), (e), and (f).
Variable Refrigerant Flow Multi-split Systems, Air-cooled.	HP	<65,000 Btu/h (3-phase).	SEER and HSPF	AHRI 1230–2010 (omit sections 5.1.2 and 6.6).	Paragraphs (c), (d), (e), and (f).
		≥65,000 Btu/h and <760,000 Btu/h.	EER and COP	AHRI 1230–2010 (omit sections 5.1.2 and 6.6).	Paragraphs (c), (d), (e), and (f).
Variable Refrigerant Flow Multi-split Systems, Water-source.	HP	<760,000 Btu/h	EER and COP	AHRI 1230–2010 (omit sections 5.1.2 and 6.6).	Paragraphs (c), (d), (e), and (f).
Single Package Vertical Air Conditioners and Single Package Vertical Heat Pumps.	AC and HP	<760,000 Btu/h	EER and COP	AHRI 390–2003 (omit section 6.4).	Paragraphs (c) and (e).

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

Equipment type	Category	Cooling capacity or moisture removal capacity	Energy efficiency descriptor	Use tests, conditions, and procedures [1] in	Additional test procedure provisions as indicated in the listed paragraphs of this section
Dehumidifying Direct Expansion-Dedicated Outdoor Air Systems.	All	<324 lbs. of moisture removal/hr.	ISMRE2 and ISCOP2	Appendix B of this subpart.	None.

[1] Incorporated by reference; see § 431.95.
[2] Moisture removal capacity is determined according to appendix B of this subpart.

* * * * *

■ 9. Add Appendix B to subpart F of part 431 to read as follows:

Appendix B to Subpart F of Part 431—Uniform Test Method for Measuring the Energy Consumption of Dehumidifying Direct Expansion-Dedicated Outdoor Air Systems

Note: Beginning [date 360 days after publication of a test procedure final rule], representations with respect to energy use or efficiency of dehumidifying direct expansion-dedicated outdoor air systems must be based on testing conducted in accordance with this appendix. Manufacturers may elect to use this appendix early.

1. Referenced materials.

1.1. Incorporation by reference.

DOE incorporated by reference in § 431.95, the entire standard for AHRI 920–2020, ANSI/AHRI 1060–2018; ANSI/ASHRAE 37–2009, ANSI/ASHRAE 41.1–2013, ANSI/ASHRAE 41.6–2014, and ANSI/ASHRAE 198–2013. However, only enumerated provisions of AHRI 920–2020, ANSI/ASHRAE 37–2009, ANSI/ASHRAE 41.6–2014, and ANSI/ASHRAE 198–2013, as set forth in paragraphs (a) through (d) of this section are applicable. To the extent there is a conflict between the terms or provisions of a referenced industry standard and the CFR, the CFR provisions control.

(a) AHRI 920–2020:

(i) Section 3—Definitions, as specified in section 2.2.1(a) of this appendix;

(ii) Section 5—Test Requirements, as specified in section 2.2.1(b) of this appendix;

(iii) Section 6—Rating Requirements, as specified in section 2.2.1(c) of this appendix, omitting section 6.1.2 (but retaining sections 6.1.2.1–6.1.2.8) and 6.6.1;

(iv) Section 11—Symbols and Subscripts, as specified in section 2.2.1(d) of this appendix;

(v) Appendix A—References—Normative, as specified in section 2.2.1(e) of this appendix;

(vi) Appendix C—ANSI/ASHRAE Standard 198 and ANSI/ASHRAE Standard 37 Additions, Clarifications and Exceptions—Normative, as specified in section 2.2.1(f) of this appendix, and

(vii) Appendix F—Unit Configuration for Standard Efficiency Determination—Normative, as specified in section 2.2.1(g) of this appendix.

(b) ANSI/ASHRAE 37–2009:

(i) Section 5.1—Temperature Measuring Instruments (excluding sections 5.1.1 and 5.1.2), as specified in sections 2.2.1(b) and (f) of this appendix;

(ii) Section 5.2—Refrigerant, Liquid, and Barometric Pressure Measuring Instruments, as specified in section 2.2.1(b) of this appendix;

(iii) Sections 5.3—Air Differential Pressure and Airflow Measurements, as specified in section 2.2.1(b) of this appendix;

(iv) Sections 5.5(b)—Volatile Refrigerant Measurement, as specified in section 2.2.1(b) of this appendix;

(v) Section 6.1—Enthalpy Apparatus (excluding 6.1.1 and 6.1.3 through 6.1.6), as specified in section 2.2.1(b) of this appendix;

(vi) Section 6.2—Nozzle Airflow Measuring Apparatus, as specified in section 2.2.1(b) of this appendix;

(vii) Section 6.3—Nozzles, as specified in section 2.2.1(b) of this appendix;

(viii) Section 6.4—External Static Pressure Measurements, as specified in section 2.2.1(b) of this appendix;

(ix) Section 6.5—Recommended Practices for Static Pressure Measurements, as specified in section 2.2.1(f) of this appendix;

(x) Section 7.3—Indoor and Outdoor Air Enthalpy Methods, as specified in section 2.2.1(f) of this appendix;

(xi) Section 7.4—Compressor Calibration Method, as specified in section 2.2.1(f) of this appendix;

(xii) Section 7.5—Refrigerant Enthalpy Method, as specified in section 2.2.1(f) of this appendix;

(xiii) Section 7.6—Outdoor Liquid Coil Method, as specified in section 2.2.1(f) of this appendix;

(xiv) Section 7.7—Airflow Rate Measurement (excluding sections 7.7.1.2, 7.7.3, and 7.7.4), as specified in section 2.2.1(b) of this appendix;

(xv) Table 1—Applicable Test Methods, as specified in section 2.2.1(f) of this appendix;

(xvi) Section 8.6—Additional Requirements for the Outdoor Air Enthalpy Method, as specified in section 2.2.1(f) of this appendix;

(xvii) Table 2b—Test Tolerances (I–P Units), as specified in sections 2.2.1(c) and 2.2(f) of this appendix; and

(xviii) Errata sheet issued on October 3, 2016, as specified in section 2.2.1(f) of this appendix.

(c) ANSI/ASHRAE 41.6–2014:

(i) Section 4—Classifications, as specified in section 2.2.1(f) of this appendix;

(ii) Section 5—Requirements, as specified in section 2.2.1(f) of this appendix;

(iii) Section 6—Instruments and Calibration, as specified in section 2.2.1(f) of this appendix;

(iv) Section 7.1—Standard Method Using the Cooled-Surface Condensation Hygrometer as specified in section 2.2.1(f) of this appendix; and

(v) Section 7.4—Electronic and Other Humidity Instruments. as specified in section 2.2.1(f) of this appendix.

(d) ANSI/ASHRAE 198–2013:

(i) Section 4.4—Temperature Measuring Instrument, as specified in section 2.2.1(b) of this appendix;

(ii) Section 4.5—Electrical Instruments, as specified in section 2.2.1(b) of this appendix;

(iii) Section 4.6—Liquid Flow Measurement, as specified in section 2.2.1(b) of this appendix;

(iv) Section 4.7—Time and Mass Measurements, as specified in section 2.2.1(b) of this appendix;

(v) Section 6.1—Test Room Requirements, as specified in section 2.2.1(b) of this appendix;

(vi) Section 6.6—Unit Preparation, as specified in section 2.2.1(b) of this appendix;

(vii) Section 7.1—Preparation of the Test Room(s), as specified in section 2.2.1(b) of this appendix;

(viii) Section 7.2—Equipment Installation, as specified in section 2.2.1(b) of this appendix;

(ix) Section 8.2—Equilibrium, as specified in section 2.2.1(b) of this appendix, and

(x) Section 8.4—Test Duration and Measurement Frequency, as specified in section 2.2.1(b) of this appendix.

1.2. Informational materials.

DOE refers to the following provision of AHRI 920–2020, for informational purposes only:

(a) Appendix E—Typical Test Unit Installations—Informative, as specified in section 2.2.1(g) of this appendix.

(b) Reserved.

2. Test Method.

2.1. Capacity.

Moisture removal capacity (in pounds per hour) and supply airflow rate (in standard cubic feet per minute) are determined according to AHRI 920–2020 (incorporated by reference; see § 431.95) as specified in section 2.2 of this appendix.

2.2. Efficiency.

2.2.1. Determine the ISMRE2 for all DDX–DOASes and the ISCOP2 for all heat pump

DDX–DOASes in accordance with the following sections of AHRI 920–2020.

(a) Section 3—Definitions, including the references to ANSI/AHRI 1060–2018 (incorporated by reference; see § 431.95);

(i) *Non-standard Low-static Fan Motor.* A supply fan motor that cannot maintain external static pressure as high as specified in Table 7 of AHRI 920–2020 when operating at a manufacturer-specified airflow rate and that is distributed in commerce as part of an individual model within the same basic model of a DDX–DOAS that is distributed in commerce with a different motor specified for testing that can maintain the required external static pressure.

(b) Section 5—Test Requirements, including the references to sections 5.1, 5.2, 5.3, 5.5, 6.1, 6.2, 6.3, 6.4, and 7.7 (not including sections 7.7.1.2, 7.7.3, and 7.7.4) of ANSI/ASHRAE 37–2009 (incorporated by reference; see § 431.95), and sections 4.4, 4.5, 4.6, 4.7, 5.1, 6.1, 6.6, 7.1, 7.2, 8.2, and 8.4 of ANSI/ASHRAE 198–2013 (incorporated by reference; see § 431.95);

(i) All control settings are to remain unchanged for all Standard Rating Conditions once system set up has been completed, except as explicitly allowed or required by AHRI 920–2020 or as indicated in the supplementary test instructions (STI). Component operation shall be controlled by the unit under test once the provisions in section 2.2.1(c) of this appendix are met.

(c) Section 6—Rating Requirements (omitting sections 6.1.2 and 6.6.1), including the references to Table 2b of ANSI/ASHRAE 37–2009, and ANSI/ASHRAE 198–2013.

(i) For water-cooled DDX–DOASes, the ''Condenser Water Entering Temperature, Cooling Tower Water'' conditions specified in Table 4 of AHRI 920–2020 shall be used. For water-source heat pump DDX–DOASes, the ''Water-Source Heat Pumps'' conditions specified in Table 5 of AHRI 920–2020 shall be used.

(ii) For water-cooled or water-source DDX–DOASes with integral pumps, set the external head pressure to 20 ft. of water column, with a −0/+1 ft. condition tolerance and a 1 ft. operating tolerance.

(iii) When using the degradation coefficient method as specified in section 6.9.2 of AHRI 920–2020, Equation 20 applies to DDX–DOAS without VERS, with deactivated VERS (see section 5.4.3 of AHRI 920–2020), or sensible-only VERS tested under Standard Rating Conditions other than D.

(iv) Rounding requirements for representations are to be followed as stated in sections 6.1.2.1 through 6.1.2.8 of AHRI 920–2020;

(d) Section 11—Symbols and Subscripts, including references to ANSI/ASHRAE 1060–2018;

(e) Appendix A—References—Normative;

(f) Appendix C—ANSI/ASHRAE 198–2013 and ANSI/ASHRAE 37 Additions, Clarifications and Exceptions—Normative, including references to sections 5.1, 6.5, 7.3, 7.4, 7.5, 7.6, 8.6, Table 1, Table 2b, and the errata sheet of ANSI/ASHRAE 37–2009, ANSI/ASHRAE 41.1–2013 (incorporated by reference; see § 431.95), sections 4, 5, 6, 7.1, and 7.4 of ANSI/ASHRAE 41.6–2014 (incorporated by reference; see § 431.95), and ANSI/ASHRAE 1060–2018;

(g) Appendix E—Typical Test Unit Installations—Informative, for information only;

(h) Appendix F—Unit Configuration for Standard Efficiency Determination—Normative.

2.2.2. *Optional Representations.* Test provisions for the determination of the metrics indicated in paragraphs (a) through (d) of this section are optional and are determined according to the applicable provisions in section 2.2.1 of this appendix. For water-cooled DDX–DOASes, these optional representations may be determined using either the ''Condenser Water Entering Temperature, Cooling Tower'' or the ''Condenser Water Entering Temperature, Chilled Water'' conditions specified in Table 4 of AHRI 920–2020. For water-source heat pump DDX–DOASes, these optional representations may be determined using either the ''Water-Source Heat Pumps'' or ''Water-Source Heat Pump, Ground-Source Closed Loop'' conditions specified in Table 5 of AHRI 920–2020. The following metrics in AHRI 920–2020 are optional:

(a) $ISMRE_{70}$;

(b) $COP_{Full,x}$:

(c) $COP_{DOAS,x}$: and

(d) ISMRE2 and ISCOP2 for water-cooled DDX–DOASes using the ''Condenser Water Entering Temperature, Chilled Water'' conditions specified in Table 4 of AHRI 920–2020 and for water-source heat pump DDX–DOASes using the ''Water-Source Heat Pump, Ground-Source Closed Loop'' conditions specified in Table 5 of AHRI 920–2020.

2.3. Synonymous terms.

(a) Any references to Dedicated Outdoor Air System Unit (DOAS Unit), Dedicated Outdoor Air System (DOAS), and Direct Expansion Dedicated Outdoor Air System (DX–DOAS) in AHRI 920–2020 and ANSI/ASHRAE 198–2013 shall be considered synonymous with Dehumidifying Direct Expansion-Dedicated Outdoor Air System (DDX–DOAS) as defined in § 431.92.

(b) Any references to energy recovery or energy recovery ventilator (ERV) in AHRI 920–2020 and ANSI/ASHRAE 198–2013 shall be considered synonymous with ventilation energy recovery system (VERS) as defined in § 431.92.

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