[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 431

[EERE-2019-BT-STD-0042]

RIN 1904-AE59

Energy Conservation Program: Energy Conservation Standards for Air-Cooled Commercial Package Air Conditioning and Heating Equipment and Commercial Warm Air Furnaces

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

ACTION: Request for information.

SUMMARY: The U.S. Department of Energy (DOE) is initiating an effort to determine whether to amend the current energy conservation standards for air-cooled commercial package air conditioning and heating equipment (referred to as air-cooled commercial unitary air conditioners and heat pumps (ACUACs and ACUHPs) in this document), and commercial warm air furnaces (CWAFs). This request for information (RFI) solicits information from the public to help DOE determine whether amended standards for ACUACs, ACUHPs, and CWAFs, subsets of covered commercial equipment, would result in significant additional energy savings and whether such standards would be technologically feasible and economically justified. DOE welcomes written comments from the public on any subject within the scope of this document

(including those topics not specifically raised in this RFI), as well as the submission of data and other relevant information.

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

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *http://www.regulations.gov*. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE-2019-BT-STD-0042 and/or RIN 1904-AE59, by any of the following methods:

1. *Federal eRulemaking Portal*: *http://www.regulations.gov*. Follow the instructions for submitting comments.
2. *E-mail*: *PkgHVACFurnace2019STD0042@ee.doe.gov*. Include the docket number EERE-2019-BT-STD-0042 and/or RIN 1904-AE59 in the subject line of the message.
3. *Postal Mail*: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 287-1445. If possible, please submit all items on a compact disc (CD), in which case it is not necessary to include printed copies.
4. *Hand Delivery/Courier*: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW., 6th

Floor, Washington, DC, 20024. Telephone: (202) 287-1445. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

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

Docket: The docket for this activity, which includes *Federal Register* notices, comments, and other supporting documents/materials, is available for review at *PkgHVACFurnace2019STD0042@ee.doe.gov*. All documents in the docket are listed in the *http://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 webpage can be found at: *http://www.regulations.gov/docket?D=EERE-2019-BT-STD-0042*. The docket webpage contains instructions on how to access all documents, including public comments, in the docket. See section III for information on how to submit comments through *http://www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT: Dr. Stephanie Johnson and 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) 287-1445. E-mail: *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 20585-0121. Telephone: (202) 586-5827. E-mail: *Eric.Stas@hq.doe.gov*.

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

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I. Introduction

A. Authority and Background

The Energy Policy and Conservation Act, as amended (EPCA),[1] Public Law 94-163 (42 U.S.C. 6291-6317, as codified), among other things, authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. Title III, Part C[2] of EPCA (42 U.S.C. 6311-6317, as codified), added by Public Law 95-619, Title IV, section 441(a), established the Energy Conservation Program for Certain Industrial Equipment, which sets forth a variety of provisions designed to improve energy efficiency. This equipment includes ACUACs and ACUHPs, which are a category of small, large, and very large commercial package air conditioning and heating equipment, and CWAFs, all of which are the subject of this RFI. (42 U.S.C. 6311(B)-(D) and (J)) EPCA prescribed initial standards for this equipment. (42 U.S.C. 6313(a)(1)-(2) and (4))

Under EPCA, the energy conservation program consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of 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).

[1] All references to EPCA in this document refer to the statute as amended through America's Water Infrastructure Act of 2018, Public Law 115–270 (Oct. 23, 2018).
[2] For editorial reasons, upon codification in the U.S. Code, Part C was redesignated Part A-1.

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

In EPCA, Congress initially set mandatory energy conservation standards for certain types of commercial heating, air-conditioning, and water-heating equipment. (42 U.S.C. 6313(a)) Specifically, the statute sets standards for small, large, and very large commercial package air conditioning and heating equipment,[3] packaged terminal air conditioners (PTACs) and packaged terminal heat pumps (PTHPs), warm-air furnaces, packaged boilers, storage water heaters, instantaneous water heaters, and unfired hot water storage tanks. *Id*. In doing so, EPCA established Federal energy conservation standards at levels that generally corresponded to the levels in ASHRAE Standard 90.1, *Energy Standard for Buildings Except Low-Rise Residential Buildings*, as in effect on October 24, 1992 (*i.e.*, ASHRAE Standard 90.1-1989), for each type of covered equipment listed in 42 U.S.C. 6313(a).

In acknowledgement of technological changes that yield energy efficiency benefits, Congress further directed DOE through EPCA to consider amending the existing Federal energy conservation standard for each type of covered equipment listed, each time ASHRAE amends

[3] EPCA defines *commercial package air-conditioning and heating equipment* as meaning 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)) Commercial package air-conditioning and heating equipment includes ACUACs and ACUHPs.

Standard 90.1 with respect to such equipment. (42 U.S.C. 6313(a)(6)(A)) When triggered in this manner, DOE must undertake and publish an analysis of the energy savings potential of amended energy efficiency standards, and amend the Federal standards to establish a uniform national standard at the minimum level specified in the amended ASHRAE Standard 90.1, unless DOE determines that there is clear and convincing evidence to support a determination that a more-stringent standard level as a national standard would produce significant additional energy savings and be technologically feasible and economically justified. (42 U.S.C. 6313(a)(6)(A)(i)-(ii)) If DOE decides to adopt as a uniform national standard the minimum efficiency levels specified in the amended ASHRAE Standard 90.1, DOE must establish such standard not later than 18 months after publication of the amended industry standard. (42 U.S.C. 6313(a)(6)(A)(ii)(I)) However, if DOE determines, supported by clear and convincing evidence, that a more-stringent uniform national standard would result in significant additional conservation of energy and is technologically feasible and economically justified, then DOE must establish such more-stringent uniform national standard not later than 30 months after publication of the amended ASHRAE Standard 90.1[4]. (42 U.S.C. 6313(a)(6)(A)(ii)(II) and (B)(i))

In those situations where ASHRAE has not acted to amend the levels in Standard 90.1 for

[4] In determining whether a more-stringent standard is economically justified, EPCA directs DOE to determine, after receiving views and comments from the public, whether the benefits of the proposed standard exceed the burdens of the proposed standard by, to the maximum extent practicable, considering the following:
(1) The economic impact of the standard on the manufacturers and consumers of the products subject to the standard; (2) The savings in operating costs throughout the estimated average life of the product compared to any increases in the initial cost or maintenance expense; (3) The total projected amount of energy savings likely to result directly from the standard; (4) Any lessening of the utility or the performance of the products likely to result from the standard; (5) The impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from the standard; (6) The need for national energy conservation; and (7) Other factors the Secretary considers relevant. (42 U.S.C. 6313(a)(6)(B)(ii))

the equipment types enumerated in the statute, EPCA also provides for a 6-year-lookback to consider the potential for amending the uniform national standards. (42 U.S.C. 6313(a)(6)(C)) Specifically, pursuant to the amendments to EPCA under AEMTCA, DOE is required to conduct an evaluation of each class of covered equipment in ASHRAE Standard 90.1 "every 6 years" to determine whether the applicable energy conservation standards need to be amended. (42 U.S.C. 6313(a)(6)(C)(i)) DOE must publish either a notice of proposed rulemaking (NOPR) to propose amended standards or a notice of determination that existing standards do not need to be amended. (42 U.S.C. 6313(a)(6)(C)(i)(I)-(II)) In proposing new standards under the 6-year-lookback review, DOE must undertake the same considerations as if it were adopting a standard that is more stringent than an amendment to ASHRAE Standard 90.1. (42 U.S.C. 6313(a)(6)(C)(i)(II); 42 U.S.C. 6313(a)(6)(B)) This is a separate statutory review obligation, as differentiated from the obligation triggered by an ASHRAE Standard 90.1 amendment, as previously discussed.

While the statute continues to defer to ASHRAE's lead on covered equipment subject to Standard 90.1, it does allow for a comprehensive review of all such equipment and the potential for adopting more-stringent standards, where supported by the requisite clear and convincing evidence. That is, DOE interprets ASHRAE's not amending Standard 90.1 with respect to a product or equipment type as ASHRAE's determination that the standard applicable to that product or equipment type is already at an appropriate level of stringency, and DOE will not amend that standard unless there is clear and convincing evidence that a more-stringent level is justified. In those instances where DOE makes a determination that the standards for the equipment in question do not need to be amended, the statute requires the Department to revisit

that decision within three years to either make a new determination or propose amended standards. (42 U.S.C. 6313(a)(6)(C)(iii)(II))

In a direct final rule published on January 15, 2016, (January 2016 final rule), DOE adopted amended standards for ACUACs, ACUHPs, and CWAFs. 81 FR 2420. As part of the January 2016 final rule, DOE also adopted a definition and separate standards for a sub-category of ACUACs and ACUHPs – double-duct air conditioners and heat pumps (double-duct systems). 81 FR 2420, 2446. For ACUACs and ACUHPs (other than double-duct systems), DOE adopted two tiers of amended standards with staggered compliance dates, and changed the regulated cooling metric from energy efficiency ratio (EER) to integrated energy efficiency ratio (IEER).[5] *Id.* at 81 FR 2529, 2531-2533. The first tier of amended standards – with compliance date of January 1, 2018 – are equivalent to the IEER minimum efficiency levels for ACUACs and ACUHPs in ASHRAE 90.1-2016. The second tier of amended standards – with compliance date of January 1, 2023 – are more stringent than the levels in ASHRAE 90.1-2016. The January 2016 final rule also adopted CWAF standards for which compliance is required beginning on January 1, 2023. These CWAF standards adopted in the January 2016 final rule are more stringent than the minimum efficiency levels for CWAF in ASHRAE Standard 90.1-2016.

Since publication of the January 2016 final rule, ASHRAE published an updated version of ASHRAE Standard 90.1 (ASHRAE Standard 90.1-2019), which updated the minimum

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

efficiency levels for ACUACs and ACUHPs (other than double-duct systems) and CWAFs to align with those adopted by DOE in the January 2016 final rule (*i.e.*, specifying two tiers of minimum levels for ACUACs and ACUHPs, with a 2023 compliance date for the second tier).[6]

DOE established separate equipment classes for double-duct systems in the January 2016 final rule. The standard levels applicable to double-duct systems were not amended in the January 2016 final rule; therefore, the current EER standards for double-duct systems correspond to the levels in effect for all ACUACs and ACUHPs prior to the January 2016 final rule. 81 FR 2420, 2442, 2445-2446, 2532-2533 (Jan. 15, 2016). (ASHRAE 90.1-2019 does not specify efficiency requirements for double-duct systems.)

The current energy conservation standards for ACUACs, ACUHPs, and double-duct systems are codified in DOE's regulations at 10 CFR 431.97. Similarly, the energy conservation standards for CWAFs are codified at 10 CFR 431.77.

As a preliminary step in the process of reviewing the standards for ACUACs, ACUHPs, and CWAFs, DOE is publishing this RFI to request data and information pursuant to its 6-year-

[6] Table 6.8.1-5 of ASHRAE 90.1-2019 specifies a TE requirement of 80 percent for oil-fired warm-air furnaces ≥225,000 Btu/h applicable before January 1, 2023; however, the previous version of ASHRAE 90.1 (ASHRAE 90.1-2016) specifies a TE requirement of 81 percent for this class. DOE understands this 80 percent level in ASHRAE 90.1-2019 to be a typographical error, and understands that the TE requirement for oil-fired warm-air furnaces ≥225,000 Btu/h before January 1, 2023 should be 81 percent, aligning with ASHRAE 90.1-2016 and the current Federal standard. In any event, because this 80 percent level in ASHRAE 90.1-2019 is lower than the corresponding current Federal standard, DOE cannot consider adopting the ASHRAE 90.1-2019 level due to the "anti-backsliding" provision in EPCA, which prevents the Secretary from prescribing any amended standard that either increases the maximum allowable energy use or decreases the minimum required energy efficiency of a covered product. (42 U.S.C. 6313(a)(6)(B)(iii)(I)) Further, because the revised ASHRAE Standard 90.1 lowers the standard, as compared to the level specified by the national standard adopted pursuant to EPCA, DOE does not have the authority to conduct a rulemaking to consider a higher standard for that equipment pursuant to 42 U.S.C. 6313(a)(6)(A) (*i.e.,* DOE is not triggered). *See* 84 FR 3910, 3915 (Feb 13, 2019); *See also* 74 FR 36312, 36313 (July 22, 2009); 77 FR 28928, 28929 (May 16, 2012); 80 FR 42614, 42617 (July 17, 2015).

lookback review. (42 U.S.C. 6313(a)(6)(C)) Such information will help DOE inform its decisions, consistent with its obligations under EPCA.

B. Rulemaking Process

As discussed, DOE is required to conduct an evaluation of each class of covered equipment in ASHRAE Standard 90.1 every six years. (42 U.S.C. 6313(a)(6)(C)(i)) In making a determination of whether standards for such equipment need to be amended, DOE must follow specific statutory criteria. DOE must evaluate whether amended Federal standards would result in significant additional conservation of energy and are technologically feasible and economically justified. (42 U.S.C. 6313(a)(6)(C)(i) (*referencing* 42 U.S.C. 6313(a)(6)(A)(ii)(II)) To determine whether a potential proposed standard is economically justified, EPCA requires that DOE determine, after receiving comments on the proposed standard, whether the benefits of the standard exceed its burdens by considering, to the maximum extent practicable, the following seven statutory factors:

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

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

(3) The total projected amount of energy savings likely to result directly from the standard;

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

result from the standard;

(5) The impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from the standard;

(6) The need for national energy conservation; and

(7) Other factors the Secretary of Energy (Secretary) considers relevant.

(42 U.S.C. 6313(a)(6)(C)(i)(II), *referencing* 42 U.S.C. 6313(a)(6)(B)(ii)(I)-(VII))

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

Table I-1 EPCA Requirements and Corresponding DOE Analysis

EPCA Requirement	Corresponding DOE Analysis
Significant Energy Savings	• Shipments Analysis • National Impact Analysis • Energy and Water Use Determination
Technological Feasibility	• Market and Technology Assessment • Screening Analysis • Engineering Analysis
Economic Justification:	
1. Economic impact on manufacturers and consumers	• Manufacturer Impact Analysis • Life-Cycle Cost and Payback Period Analysis • Life-Cycle Cost Subgroup Analysis • Shipments Analysis
2. Lifetime operating cost savings compared to increased cost for the product	• Mark-ups for Product Price Determination • Energy and Water Use Determination • Life-Cycle Cost and Payback Period Analysis
3. Total projected energy savings	• Shipments Analysis • National Impact Analysis
4. Impact on utility or performance	• Screening Analysis • Engineering Analysis
5. Impact of any lessening of competition	• Manufacturer Impact Analysis
6. Need for national energy and water conservation	• Shipments Analysis • National Impact Analysis
7. Other factors the Secretary considers relevant	• Employment Impact Analysis • Utility Impact Analysis • Emissions Analysis • Monetization of Emission Reductions Benefits • Regulatory Impact Analysis

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

II. Request for Information and Comments

In the following sections, DOE has identified a variety of issues on which it seeks input to aid in the development of the technical and economic analyses regarding whether amended standards for ACUACs, ACUHPs, and CWAFs may be warranted. DOE also welcomes comments on other issues relevant to this data-gathering process that may not specifically be identified in this document.

In addition, as an initial matter, DOE seeks comment on whether there have been sufficient technological or market changes since the most recent standards update that may justify a new rulemaking to consider more-stringent standards. Specifically, DOE seeks data and information that could enable the agency to determine whether DOE should propose a "no new standard" determination because a more-stringent standard: (1) would not result in a significant additional savings of energy; (2) is not technologically feasible; (3) is not economically justified; or (4) any combination of foregoing.

A. Equipment Covered by This Process

This RFI covers equipment that meet the definitions that apply to ACUACs, ACUHPs, and CWAFs, as codified at 10 CFR 431.92 and 431.72. The definitions that apply to ACUACs and ACUHPs were most recently amended in the January 2016 final rule– specifically, as previously discussed, a definition was added for "double-duct air conditioner or heat pump". 81 FR 2420, 2446, 2529 (Jan. 15, 2016). The current definitions for CWAFs were established in a final rule published in the *Federal Register* on October 21, 2004. 69 FR 61916, 61939.

As established in 10 CFR 431.72 and 10 CFR 431.92, the definitions applicable to ACUACs, ACUHPs, and CWAFs include:

Commercial warm air furnace means a warm air furnace that is industrial equipment, and that has a capacity (rated maximum input) of 225,000 Btu per hour or more.

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.

Small commercial package air-conditioning and heating equipment means commercial package air-conditioning and heating equipment that is rated below 135,000 Btu per hour (cooling capacity).

Large commercial package air-conditioning and heating equipment means commercial package air-conditioning and heating equipment that is rated—(1) At or above 135,000 Btu per hour; and (2) Below 240,000 Btu per hour (cooling capacity).

Very large commercial package air-conditioning and heating equipment means commercial package air-conditioning and heating equipment that is rated—(1) At or above 240,000 Btu per hour; and (2) Below 760,000 Btu per hour (cooling capacity).

Double-duct air conditioner or heat pump means air-cooled commercial package air conditioning and heating equipment that—(1) Is either a horizontal single package or split-system unit; or a vertical unit that consists of two components that may be shipped or installed either connected or split; (2) Is intended for indoor installation with ducting of outdoor air from the building exterior to and from the unit, as evidenced by the unit and/or all of its components being non-weatherized, including the absence of any marking (or listing) indicating compliance with UL 1995, "Heating and Cooling Equipment," or any other equivalent requirements for outdoor use; (3)(i) If it is a horizontal unit, a complete unit has a maximum height of 35 inches; (ii) If it is a vertical unit, a complete unit has a maximum depth of 35 inches; and (4) Has a rated cooling capacity greater than or equal to 65,000 Btu/h and up to 300,000 Btu/h.

Issue 1: DOE requests comment on whether the definitions that apply to ACUACs and ACUHPs require any revisions – and if so, how those definitions should be revised. Please provide the rationale for any suggested change.

Issue 2: DOE requests comment on whether the definitions for CWAFs require any revisions – and if so, how those definitions should be revised. Please provide the rationale for any suggested change.

Issue 3: DOE requests comment on whether additional equipment definitions are necessary to close any potential gaps in coverage between

equipment types. DOE also seeks input on whether such models currently exist in the market or whether they are being planned for introduction.

B. Market and Technology Assessment

The market and technology assessment that DOE routinely conducts when analyzing the impacts of a potential new or amended energy conservation standard provides information about the ACUAC/ACUHP and CWAF industries that will be used in DOE's analysis throughout the rulemaking process. DOE uses qualitative and quantitative information to characterize the structure of the industry and market. DOE identifies manufacturers, estimates market shares and trends, addresses regulatory and non-regulatory initiatives intended to improve energy efficiency or reduce energy consumption, and explores the potential for efficiency improvements in the design and manufacturing of ACUACs, ACUHPs, and CWAFs. DOE also reviews equipment literature, industry publications, and company websites. Additionally, DOE considers conducting interviews with manufacturers to improve its assessment of the market and available technologies for ACUACs, ACUHPs, and CWAFs.

1. Equipment Classes

For ACUACs and ACUHPs, the current energy conservation standards specified in 10 CFR 431.97 are based on 24 equipment classes determined according to the following performance-related features that provide utility to the consumer: rated cooling capacity, equipment type (air conditioner versus heat pump), and supplementary heating type. Table II-1 lists the current 24 equipment classes for ACUACs and ACUHPs.

Table II-1 Current ACUAC and ACUHP Equipment Classes

Equipment Type	Cooling Capacity	Sub-Category	Heating Type
Small Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled)	≥65,000 Btu/h and <135,000 Btu/h	AC	Electric Resistance Heating or No Heating
			All Other Types of Heating
		HP	Electric Resistance Heating or No Heating
			All Other Types of Heating
Large Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled)	≥135,000 Btu/h and <240,000 Btu/h	AC	Electric Resistance Heating or No Heating
			All Other Types of Heating
		HP	Electric Resistance Heating or No Heating
			All Other Types of Heating
Very Large Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled)	≥240,000 Btu/h and <760,000 Btu/h	AC	Electric Resistance Heating or No Heating
			All Other Types of Heating
		HP	Electric Resistance Heating or No Heating
			All Other Types of Heating
Small Double-Duct Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled)	≥65,000 Btu/h and <135,000 Btu/h	AC	Electric Resistance Heating or No Heating
			All Other Types of Heating
		HP	Electric Resistance Heating or No Heating
			All Other Types of Heating
Large Double-Duct Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled)	≥135,000 Btu/h and <240,000 Btu/h	AC	Electric Resistance Heating or No Heating
			All Other Types of Heating
		HP	Electric Resistance Heating or No Heating
			All Other Types of Heating
Very Large Double-Duct Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled)	≥240,000 Btu/h and <300,000 Btu/h	AC	Electric Resistance Heating or No Heating
			All Other Types of Heating
		HP	Electric Resistance Heating or No Heating
			All Other Types of Heating

AC=Air conditioner; HP=Heat pump

For CWAFs, the current energy conservation standards specified in 10 CFR 431.77 are

based on two equipment classes determined according to fuel source (*e.g.*, oil-fired or gas-fired). The two CWAF equipment classes are gas-fired CWAFs and oil-fired CWAFs.

2. Technology Assessment

In analyzing the feasibility of potential new or amended energy conservation standards, DOE uses information about existing and past technology options and prototype designs to help identify technologies that manufacturers could use to meet and/or exceed a given set of energy conservation standards under consideration. In consultation with interested parties, DOE intends to develop a list of technologies to consider in its analysis. That analysis will likely include a number of the technology options DOE previously considered during its most recent rulemaking for ACUACs, ACUHPs, and CWAFs (*i.e.*, the January 2016 final rule). 81 FR 2420 (Jan. 15, 2016). A complete list of those prior options for ACUACs, ACUHPs, and CWAFs appear in Table II.2 and Table II.3 respectively.

Table II.2 Technology Options for ACUACs and ACUHPs Considered in the Development of the January 2016 Final Rule

Technology Options	
Compressor	High-Efficiency Compressors
	Multiple Compressor Staging
	Variable-Capacity or Multiple-Tandem Compressors
Heat Exchangers	Larger Heat Exchangers
	Microchannel Heat Exchangers
	Electro-Hydrodynamic Enhancement
	Subcoolers
Condenser Fans and Fan Motors	Larger Fan Diameter
	More-Efficient Fan Blades
	High-Efficiency Motors
	Variable-Speed Fans/Motors
	Larger Fan Diameter

Evaporator Fans and Fan Motors	More-Efficient Fan Blades
	High-Efficiency Motors
	Variable-Speed Fans/Motors
	Synchronous (Toothed Belts)
	Direct-Drive Fans
Expansion Valves	Thermostatic Expansion Valve
	Electronic Expansion Valve

Table II.3 Technology Options for CWAFs Considered in the Development of the January 2016 Final Rule

Technology Options	
Technology Options that Improve Thermal Efficiency	Condensing Secondary Heat Exchanger
	Increased Heat Exchanger Surface Area
	Heat Exchanger Enhancements
	Low-NO_X Premix Burners
	Burner De-rating
	Low Pressure, Air-Atomized Burner (Oil-fired CWAF Only)
	Concentric Venting
	Pulse Combustion
	High-static Flame-retention Head Oil Burner
Technology Options that Do Not Improve Thermal Efficiency*	Two-stage or Modulating Combustion
	Insulation Improvements
	Delayed-Action Oil Pump Solenoid Valve (Oil-fired CWAF Only)
	Off-Cycle Dampers
	Electronic Ignition

* Technology options that do not improve thermal efficiency are shown for informational purposes only, and will not be the basis for a decision regarding whether to amend standards because they do not affect the regulatory metric (*i.e.*, thermal efficiency).

Issue 4: DOE seeks information on the technologies listed in Table II.2 regarding their applicability to the current market and how these technologies may impact the efficiency of ACUACs and ACUHPs, including double-duct systems, as measured according to the DOE test procedure. DOE also seeks information on how these technologies may have changed since they were considered in the January 2016 final rule analysis. Specifically, DOE seeks

information on the range of efficiencies or performance characteristics that are currently available for each technology option.

Issue 5: DOE seeks information on the technologies listed in Table II.3 regarding their applicability to the current market and how these technologies may impact the efficiency of CWAFs as measured according to the DOE test procedure. DOE also seeks information on how these technologies may have changed since they were considered in the January 2016 final rule analysis. Specifically, DOE seeks information on the range of efficiencies or performance characteristics that are currently available for each technology option.

Issue 6: DOE seeks information on the technologies listed in Tables II.2 and II.3 regarding any changes in their market adoption, costs, and any concerns with incorporating them into equipment (*e.g.*, impacts on consumer utility, potential safety concerns, manufacturing/production/implementation issues), that may have occurred since the January 2016 final rule.

Issue 7: DOE seeks comment on other technology options that it should consider for inclusion in its analysis and if these technologies may impact equipment features or consumer utility.

C. Screening Analysis

The purpose of the screening analysis is to evaluate the technologies that improve

equipment efficiency to determine which technologies will be eliminated from further consideration and which will be passed to the engineering analysis for further consideration.

DOE determines whether to eliminate certain technology options from further consideration based on the following criteria:

(1) *Technological feasibility*. Technologies that are not incorporated in commercial equipment or in working prototypes will not be considered further.

(2) *Practicability to manufacture, install, and service.* If it is determined that mass production of a technology in commercial products and reliable installation and servicing of the technology could not be achieved on the scale necessary to serve the relevant market at the time of the compliance date of the standard, then that technology will not be considered further.

(3) *Impacts on equipment utility or equipment availability.* If a technology is determined to have significant adverse impact on the utility of the equipment to significant subgroups of consumers, or to result in the unavailability of any covered equipment type or class with performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as equipment generally available in the United States at the time, it will not be considered further.

(4) *Adverse impacts on health or safety.* If it is determined that a technology will have significant adverse impacts on health or safety, it will not be considered further.

(5) *Unique-pathway proprietary technologies*. If a design option utilizes proprietary technology that represents a unique pathway to achieving a given efficiency level, that technology will not be considered further.

See 10 CFR part 430, subpart C, appendix A, 6(e)(3) and 7(b).

Technology options identified in the technology assessment are evaluated against these criteria using DOE analyses and inputs from interested parties (*e.g.*, manufacturers, trade organizations, and energy efficiency advocates). Technologies that pass through the screening analysis are referred to as "design options" in the engineering analysis. Technology options that fail to meet one or more of the five criteria are eliminated from consideration.

Table II-4 and Table II-5 summarize the technology options that DOE screened out in the January 2016 final rule, and the applicable screening criteria.

Table II-4 Previously Screened Out ACUAC and ACUHP Technology Options from the January 2016 Final Rule

	EPCA Criteria (X = Basis for Screening Out)				
Screened Technology Option	**Technological Feasibility**	**Practicability to Manufacture, Install, and Service**	**Adverse Impact on Equipment Utility**	**Adverse Impacts on Health and Safety**	**Unique-Pathway Proprietary Technology**
Electro-hydrodynamic enhanced heat transfer	X	X			
Alternative refrigerants	X				
Sub-coolers	X				

Table II-5 Previously Screened Out CWAF Technology Options from the January 2016 Final Rule

	EPCA Criteria (X = Basis for Screening Out)				
Screened Technology Option	**Technological Feasibility**	**Practicability to Manufacture, Install, and Service**	**Adverse Impact on Equipment Utility**	**Adverse Impacts on Health and Safety**	**Unique-Pathway Proprietary Technology**
Pulse Combustion		X		X	
Low-NOX Premix Burner	X				
Low Pressure, Air-Atomized Burner (Oil-fired CWAF Only)	X				
Burner De-rating			X		

Issue 8: DOE requests feedback on what impact, if any, the five screening criteria described in this section would have on consideration of each of the technology options listed in Table II.2 with respect to ACUACs and ACUHPs. Similarly, DOE seeks information regarding how these same criteria would affect consideration of any other technology options not already identified in this document with respect to their potential use in ACUACs and ACUHPs, including double-duct systems.

Issue 9: DOE requests feedback on what impact, if any, the five screening criteria described in this section would have on consideration of each of the technology options listed in Table II.3 with respect to CWAFs. Similarly, DOE seeks information regarding how these same criteria would affect

consideration of any other technology options not already identified in this document with respect to their potential use in CWAFs.

Issue 10: With respect to the screened out ACUAC and ACUHP technology options listed in Table II-4, DOE seeks information on whether these options would, based on current and projected assessments regarding each of them, remain screened out under the five screening criteria described in this section. With respect to each of these technology options, what steps, if any, could be (or have already been) taken to facilitate the introduction of each option as a means to improve the energy performance of ACUACs/ACUHPs, and the potential to impact consumer utility of ACUACs/ACUHPs?

Issue 11: With respect to the screened out CWAF technology options listed in Table II-5, DOE seeks information on whether these options would, based on current and projected assessments regarding each of them, remain screened out under the five screening criteria described in this section. With respect to each of these technology options, what steps, if any, could be (or have already been) taken to facilitate the introduction of each option as a means to improve the energy performance of CWAFs, and the potential to impact consumer utility of CWAFs?

D. Engineering Analysis

The engineering analysis estimates the cost-efficiency relationship of equipment at different levels of increased energy efficiency (efficiency levels). This relationship serves as the

basis for the cost-benefit calculations for consumers, manufacturers, and the Nation. In determining the cost-efficiency relationship, DOE estimates the increase in manufacturer production cost (MPC) associated with increasing the efficiency of equipment above the baseline, up to the maximum technologically feasible (max-tech) efficiency level for each equipment class.

DOE historically has used the following three methodologies to generate incremental manufacturing costs and to establish efficiency levels (ELs) for analysis: (1) the design-option approach, which provides the incremental costs of adding to a baseline model design options that will improve its efficiency; (2) the efficiency-level approach, which provides the relative costs of achieving increases in energy efficiency levels, without regard to the particular design options used to achieve such increases; and (3) the cost-assessment (or reverse-engineering) approach, which provides "bottom-up" manufacturing cost assessments for achieving various levels of increased efficiency, based on detailed cost data for parts and materials, labor, shipping/packaging, and investment for models that operate at particular efficiency levels.

1. Baseline Efficiency Levels

As noted previously, the current standards for each ACUAC and ACUHP equipment class (excluding double-duct systems) are found in tables 3 and 4 of 10 CFR 431.97 and are based on the IEER cooling metric and the coefficient of performance (COP) heating performance metric. The current standards for double-duct systems (which are found in tables 5 and 6 of 10 CFR 431.97) are based on the EER cooling metric and the COP heating performance metric.

The current standards for each CWAF equipment class are found in 10 CFR 431.77 and are based on the thermal efficiency (TE) metric.

For each established equipment class, DOE selects a baseline model as a reference point against which any changes resulting from new or amended energy conservation standards can be measured. The baseline model in each equipment class represents the characteristics of common or typical equipment in that class. Typically, a baseline model is one that just meets the current minimum energy conservation standards and provides basic consumer utility.

If it determines that a rulemaking is necessary, consistent with this analytical approach, DOE tentatively plans to consider the energy conservations standards for which compliance is required beginning on January 1, 2023 for ACUACs and ACUHPs (other than double-duct systems) and CWAFs as the baseline efficiency levels for each equipment class. For double-duct systems, DOE tentatively plans to consider the current EER and COP energy conservation standards as the baseline efficiency levels.

Issue 12: DOE seeks comment on whether currently available models of ACUACs and ACUHPs (excluding double-duct systems) with efficiency ratings that meet or exceed the 2023 standard levels are representative of the designs and characteristics of models that would be expected to be on the market after the 2023 compliance date.

Issue 13: DOE seeks comment on whether currently available models of CWAFs with efficiency ratings that meet or exceed the 2023 standard levels

are representative of the designs and characteristics of models that would be expected to be on the market after the 2023 compliance date.

Issue 14: DOE requests feedback on whether the 2023 energy conservation standards for ACUACs and ACUHPs (other than double-duct systems) and the current standards for double-duct systems are appropriate baseline efficiency levels for DOE to apply to each equipment class in evaluating whether to amend energy conservation standards for this equipment.

Issue 15: DOE requests feedback on whether the 2023 energy conservation standards for CWAFs are appropriate baseline efficiency levels for DOE to apply to each equipment class in evaluating whether to amend the current energy conservation standards for this equipment.

Issue 16: DOE requests feedback on the appropriate baseline efficiency levels for any newly analyzed equipment classes that are not currently in place or for the contemplated combined equipment classes, as discussed in section II.B.1 of this document.

2. Max-Tech Efficiency Levels

As part of the January 2016 final rule, DOE determined max-tech efficiency levels for each equipment class of ACUACs and ACUHPs (excluding double-duct systems) and CWAFs. For ACUACs and ACUHPs (excluding double-duct systems), DOE used the AHRI Directory to identify levels on the market, and DOE used differentials/correlations consistent with ASRAC

Working Group recommendations to develop efficiency levels, including max-tech levels, for: (1) "all other types of heating" classes, (2) ACUHP IEER levels, and (3) ACUHP COP levels. (Docket No. EERE-2013-BT-STD-0007-0105 at pp. 5-17 – 5-19) For CWAFs, DOE used DOE's Compliance Certification Management System (CCMS) Database, manufacturers' websites, and discussions with manufacturers during manufacturer interviews to determine max-tech levels for each equipment class. (Docket No. EERE-2013-BT-STD-0021-0050 at pp 3-5, 5-4 – 5-5)

Table II.6 and Table II.7 present the max-tech levels by equipment class that were analyzed in the January 2016 final rule. As noted, the energy conservation standards for ACUACs and ACUHPs (excluding double-duct systems) and CWAFs were amended, with compliance required beginning in 2023. The markets are still responding in advance of that compliance date. Therefore, models at efficiency levels higher than the currently maximum available efficiency levels may be introduced in advance of the January 1, 2023 compliance date. DOE notes that, based on a review of the current market, the current max-tech levels for certain equipment classes are higher than those considered as part in the January 2016 final rule and listed in Table II.6 and Table II.7.

Table II.6 Max-Tech Efficiency Levels for ACUACs and ACUHPs Analyzed in the January 2016 Final Rule

Equipment Type	Cooling Capacity	Sub-Category	Heating Type	January 2016 Final Rule Max-Tech Levels
Small Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled)	≥65,000 Btu/h and <135,000 Btu/h	AC	Electric Resistance Heating or No Heating	21.5 IEER
			All Other Types of Heating	21.1 IEER
		HP	Electric Resistance Heating or No Heating	20.3 IEER 3.7 COP
			All Other Types of Heating	19.9 IEER 3.7COP
Large Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled)	≥135,000 Btu/h and <240,000 Btu/h	AC	Electric Resistance Heating or No Heating	20.1 IEER
			All Other Types of Heating	19.7 IEER
		HP	Electric Resistance Heating or No Heating	18.8 IEER 3.3 COP
			All Other Types of Heating	18.4 IEER 3.3 COP
Very Large Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled)	≥240,000 Btu/h and <760,000 Btu/h	AC	Electric Resistance Heating or No Heating	15.6 IEER
			All Other Types of Heating	15.3 IEER
		HP	Electric Resistance Heating or No Heating	14.3 IEER 3.2 COP
			All Other Types of Heating	14.0 IEER 3.2 COP

Table II.7 Max-Tech Levels for CWAFs Analyzed in the January 2016 Final Rule

Equipment Class	January 2016 Final Rule Max-Tech Levels
Gas-fired commercial warm air furnaces	92 percent TE
Oil-fired commercial warm air furnaces	92 percent TE

Issue 17: DOE requests comment on what efficiency levels should be considered as max-tech levels for ACUACs and ACUHPs, including double-duct systems, for the evaluation of whether amended standards are warranted.

Issue 18: DOE requests comment on what efficiency levels should be considered as max-tech levels for CWAFs, for the evaluation of whether amended standards are warranted.

3. Manufacturer Production Costs and Manufacturer Selling Price

As described at the beginning of this section, the main outputs of the engineering analysis are cost-efficiency relationships that describe the estimated increases in manufacturer production cost associated with higher-efficiency equipment for the analyzed equipment classes. For the January 2016 final rule, DOE developed the cost-efficiency relationships by estimating the costs associated with efficiency levels for each analyzed equipment class through reverse-engineering. 81 FR 2420, 2451-2452 (Jan. 15, 2016).

Issue 19: DOE requests feedback on how manufacturers would incorporate the technology options listed in Table II.2 to increase energy efficiency in ACUACs and ACUHPs (including double-duct systems) beyond the current levels. This includes information on the order in which manufacturers would incorporate the different technologies to incrementally improve the efficiencies of equipment. DOE also requests feedback on whether the increased energy efficiency would lead to other design changes that would not occur otherwise. DOE is also interested in information regarding any

potential impact of design options on a manufacturer's ability to incorporate additional functions or attributes in response to consumer demand.

Issue 20: DOE requests feedback on how manufacturers would incorporate the technology options listed in Table II.3 to increase energy efficiency in CWAFs beyond the current levels. This includes information on the order in which manufacturers would incorporate the different technologies to incrementally improve the efficiencies of equipment. DOE also requests feedback on whether the increased energy efficiency would lead to other design changes that would not occur otherwise. DOE is also interested in information regarding any potential impact of design options on a manufacturer's ability to incorporate additional functions or attributes in response to consumer demand.

Issue 21: DOE also seeks input on the increase in MPC associated with incorporating each particular design option and/or with reaching efficiency levels above the baseline. Specifically, DOE is interested in whether and how the costs estimated in the January 2016 final rule have changed since the time of that analysis. DOE also requests information on the investments necessary to incorporate specific design options, including, but not limited to, costs related to new or modified tooling (if any), materials, engineering and development efforts to implement each design option, and manufacturing/production impacts.

Issue 22: DOE requests comment on whether certain design options may not be applicable to (or incompatible with) specific equipment classes.

To account for manufacturers' non-production costs and profit margin, DOE applies a non-production cost multiplier (the manufacturer mark-up) to the MPC. The resulting manufacturer selling price (MSP) is the price at which the manufacturer distributes a unit into commerce. For small, large, and very large ACUACs and ACUHPs, DOE used a manufacturer mark-up of 1.3, 1.34, and 1.41 respectively in the January 2016 final rule. 81 FR 2420, 2488 (Jan. 15, 2016). For CWAFs, DOE used a manufacturer markup of 1.31 for gas-fired CWAFs and 1.28 for oil-fired CWAFs in the January 2016 final rule. *Id*. The manufacturer mark-ups from the January 2016 final rule were vetted by manufacturers in confidential interviews done at the time of that prior rulemaking and went through public notice and comment. As a result, DOE considers the manufacturer mark-ups from the January 2016 final rule to be the most robust product-specific estimate that is currently publicly available.

Issue 23: DOE requests feedback on whether manufacturer mark-ups determined in the January 2016 final rule are still appropriate for ACUACs and ACUHPs.

Issue 24: DOE requests feedback on whether manufacturer mark-ups determined in the January 2016 final rule are still appropriate for CWAFs.

E. Mark-ups and Distribution Channels

In generating end-user price inputs for the life-cycle cost (LCC) analysis and the national impact analysis (NIA), DOE must identify distribution channels (*i.e.*, how the equipment is moved from the manufacturer to the customer) and estimate relative sales volumes through each

channel. Additionally, DOE needs to determine the cost to the commercial customer of a baseline piece of equipment that satisfies the currently applicable standards, and the cost of the more-efficient piece of equipment the consumer would purchase under potential new and/or amended standards. By applying a multiplier called a "mark-up" to the MSP, DOE estimates the commercial customer's price. The appropriate mark-ups for determining the end-user equipment price depend on the distribution channels (*i.e.*, how equipment is moved form the manufacturer to the consumer), and estimated sales volume through each channel.

In the January 2016 final rule, DOE identified two primary distribution channels through which ACUACs, ACUHPs, and CWAFs move from manufacturers to customers, one involving distributors and contractors and another from manufacturer to customer via national accounts. In the first channel, the manufacturer sells the equipment to a wholesaler, who in turn sells it to either a small or large mechanical contractor, who in turn sells it to a general contractor, who in turns sells it to the commercial customer and performs the installation. In the second channel, the manufacturer sells the equipment directly to the customer through a national account. Within these two primary channels, DOE distinguished between new and replacement applications, as only new construction applications are expected to include a general contractor. DOE also distinguished between small and large mechanical contractors. 81 FR 2420, 2467 (Jan. 15, 2016). In summary, the two distribution channels for new construction and retrofits are:

New Construction:

Manufacturer → Wholesaler → Small or Large Mechanical Contractor → General Contractor→ Consumer

Manufacturer → National Account → Consumer

Retrofits:

Manufacturer→Wholesaler → Small or Large Mechanical Contractor → Consumer

Manufacturer→National Account→ Consumer

Issue 25: DOE requests information on distribution channels that describe how equipment moves from manufacturer to customer and the relative sales volume through each channel. DOE requests information on any other distribution channels that may occur for this equipment. If DOE should consider other distribution channels, DOE requests information and data on the percent of equipment that relies on such channels.

To develop mark-ups for each stage of the distribution channel in the January 2016 final rule, DOE utilized several data sources. To estimate the manufacturer mark-up, DOE relied on Securities and Exchange Commission (SEC) 10-K reports filed by publicly-traded manufacturers of small, large, and very large air-cooled commercial unitary air conditioners and heat pumps and CWAF manufacturers.[7] To estimate wholesaler mark-ups, DOE relied on data from the Heating, Air-condition & Refrigeration Distributers International (HARDI) Profit Report.[8] To estimate contractor mark-ups, DOE relied on data from the U.S. Census Bureau and the Air

[7] U.S. Securities and Exchange Commission, SEC 10-K Reports (Available at: http://www.sec.gov/) (Last accessed Feb. 19, 2020).
[8] Heating, Air-Conditioning & Refrigeration Distributors International, *2010 Profit Report* (2010)

Conditioning Contractors of America (ACCA).[9,10]

Issue 26: For ACUACs and ACUHPs, DOE seeks recent data, including publicly-available data, to establish mark-ups for each stage of the distribution channel.

Issue 27: For CWAFs, DOE seeks recent data, including publicly-available data, to establish mark-ups for each stage of the distribution channel.

F. Energy Use Analysis

As part of a typical rulemaking process, DOE conducts an energy use analysis to identify how equipment is used by consumers, and thereby determine potential energy and customer operating cost savings from energy efficiency improvements. The energy use analysis provides representative annual energy use estimates for the efficiency levels identified in the engineering analysis.

In the January 2016 final rule, DOE only developed unit energy consumption estimates for ACUAC equipment classes that had no heating or electric resistance heating. 81 FR 2420, 2469 (Jan. 15, 2016). For all other ACUAC equipment classes with heating, the incremental change in IEER for each efficiency level increases to maintain the same energy savings as was determined for the equipment classes with electric resistance heating or no heating within each equipment class and capacity range. DOE did not perform an energy use analysis for ACUHP

[9] U.S. Census Bureau, 2007 Plumbing, Heating, and Air-Conditioning Contractors. Sector 23: 238220, Construction: Industry Series, Preliminary Detailed Statistics for Establishments, 2007 (Available at: *https://www.census.gov/econ/isp/sampler.php?naicscode=238220&naicslevel=6*) (Last accessed March 12, 2020).
[10] Air Conditioning Contractors of America, Financial Analysis for the HVACR Contracting Industry (2005)

equipment classes because their cooling-side performance was nearly identical to that of ACUACs. Although DOE did not analyze ACUHPs in the energy use analysis in the January 2016 final rule, DOE did account for the aggregate energy savings of ACUHPs, in both cooling and heating modes, in the NIA. 81 FR 2420, 2484 (Jan. 15, 2016).

In the January 2016 final rule, DOE made use of building simulations conducted to develop a representative distribution of cooling loads for small, large, and very large ACUAC units. The simulation data consisted of a subset of 1,033 buildings from the 1995 Commercial Building Energy Consumption Survey (CBECS) that use CUAC equipment. 81 FR 2420, 2469 (Jan. 15, 2016) DOE made adjustments to the building sample to represent the building stock in the compliance year of the January 2016 final rule. The simulations data provided the hourly load profile for each building over the course of one year using typical meteorological year weather files to represent local weather. The annual energy use of each building in the sample was determined by matching the hourly load profile with equipment performance data for each representative capacity ACUAC. 81 FR 2420, 2469-2471 (Jan. 15, 2016). For more detail on the energy use analysis, please refer to Chapter 7 of the January 2016 final rule Technical Support Document for Small, Large, and Very Large Package Air Conditioning and Heating Equipment.[11]

If DOE determines a rulemaking is necessary, DOE intends to update its building loads from those used for the January 2016 final rule using simulations based on DOE reference buildings. DOE also intends to update CBECS building weights to reflect ACUAC equipment in

[11] Available at: *https://www.regulations.gov/document?D=EERE-2013-BT-STD-0007-0105.*

the compliance year based on the most recent release of CBECS microdata.

CWAF energy consumption includes the gas and oil fuel used for space heating and the auxiliary electrical energy use associated with the furnace electrical components. In the January 2016 final rule, DOE developed a representative sample of commercial and multi-family residential buildings with CWAFs as their primary space heating equipment using two data sources: the 2003 Commercial Building Energy Consumption Survey (CBECS 2003)[12] and the 2009 Residential Energy Consumption Survey (RECS 2009)[13]. Both CBECS 2003 and RECS 2009 reported the annual space heating energy consumption, and DOE used this value to estimate the heating load of each building. The heating load is the amount of heat required to keep the occupants of a building comfortable throughout an average year. The sample that was developed captures the variability in heating loads by building type, occupancy, vintage, and location. The heating loads were then adjusted for average weather conditions, existing CWAF equipment efficiency, and for projected improvements in building shell efficiency. 81 FR 2420, 2473-2474 (Jan. 15, 2016).

To calculate CWAF energy consumption, DOE used the equipment output capacity and the heating loads to calculate burner operating hours. DOE assigned the representative 250 kbtu/hr capacity for all CWAF efficiency levels. DOE used the same fan power values as used in the CUAC analysis. 81 FR 2420, 2473 (Jan. 15, 2016). For a more detailed description of the

[12] U.S. Department of Energy–Energy Information Administration, 2012 CBECS Survey Data (Available at: *https://www.eia.gov/consumption/commercial/data/2012/index.php?view=microdata*) (Last accessed March 12, 2020).
[13] U.S. Department of Energy–Energy Information Administration, *2009 RECS Survey Data* (Available at: *http://www.eia.gov/consumption/residential/data/2009/*) (Last accessed March 12, 2020).

energy use analysis, please refer to Chapter 7, Appendix 7A, and Appendix 7B of the January 2016 final rule Technical Support Document for Commercial Warm Air Furnaces.[14]

If DOE determines a rulemaking is necessary, DOE intends to use a similar approach to determine the energy consumption of CWAFs with updated data from the most recent Commercial Building Energy Consumption Survey and the most recent Residential Energy Consumption Survey.

Issue 28: DOE welcomes comment and feedback on the intended approach to estimate the energy use analysis of ACUAC and ACUHPs, including double-duct systems.

Issue 29: DOE requests comment on the proposed approach to calculate the energy consumption of CWAFs that is described above. DOE also requests any data related to field energy consumption of CWAFs, if available.

G. Life-Cycle Cost and Payback Analysis

DOE conducts the LCC and payback period (PBP) analysis to evaluate the economic effects of potential amended energy conservation standards for ACUACs, ACUHPs, and CWAFs on individual customers. For any given efficiency level, DOE measures the PBP and the change in LCC relative to an estimated baseline level (*i.e.*, the level that just meets the current

[14] Available at: *https://www.regulations.gov/document?D=EERE-2013-BT-STD-0021-0050.*

minimum energy conservation standards and provides basic consumer utility). The LCC is the total customer expense over the life of the equipment, consisting of purchase, installation, and operating costs (expenses for energy use, maintenance, and repair). Inputs to the calculation of total installed cost include the cost of the equipment—which includes MSPs, distribution channel mark-ups, and sales taxes—and installation costs. Inputs to the calculation of operating expenses include annual energy consumption, energy prices and price projections, repair and maintenance costs, equipment lifetimes, discount rates, and the year that compliance with new and amended standards is required.

Equipment lifetime is the age at which the equipment is retired from service. In the January 2016 final rule, DOE based equipment lifetime on a retirement function, which utilized a Weibull probability distribution calibrated to historical stock and shipments. 81 FR 2420, 2481 (Jan. 15, 2016). A Weibull distribution is a probability distribution function that is commonly used to measure failure rates. Its form is similar to an exponential distribution, which would model a fixed failure rate, except that it allows for a failure rate that changes over time. DOE estimated lifetime distributions for equipment classes based on equipment size with mean and median values as presented in Table II-8 and Table II-9. For more detail on the lifetime measurement, please refer to Chapter 9 of the January 2016 final rule Technical Support Document for Small, Large, and Very Large Package Air Conditioning and Heating Equipment and Appendix 8F of the January 2016 final rule Technical Support Document for Commercial Warm Air Furnaces.[15]

[15] Available at: *https://www.regulations.gov/document?D=EERE-2013-BT-STD-0007-0105.*

Table II-8 Mean and Median Equipment Lifetime by Equipment Size for ACUACs and ACUHPs as Developed for the January 2016 Final Rule

Equipment Size	Mean	Median
≥65,000 Btu/h and <135,000 Btu/h	21.0	21.0
≥135,000 Btu/h and <240,000 Btu/h	22.6	23.0
≥240,000 Btu/h and <760,000 Btu/h	33.7	34.0

Issue 30: For ACUACs and ACUHPs, DOE seeks comment on the approach of using Weibull probability distributions with mean and median values as presented in Table II-8. DOE also requests data or information which can be used to inform the equipment lifetime.

Table II-9 Mean and Median Equipment Lifetime for CWAFs as Developed for the January 2016 Final Rule

Equipment	Mean	Median
All CWAF	23.0	22.1

Issue 31: For CWAFs, DOE seeks comment on the approach of using a Weibull probability distribution with the mean and median value presented in Table II-9. DOE also requests data or information which can be used to inform the equipment lifetime.

DOE measures the life-cycle savings of an amended energy conservation standard relative to a no-new standards case that reflects the likely market in the absence of amended standards. DOE generally estimates the no-new-standards efficiency distribution using estimates for the current efficiency distribution and by projecting forward using current efficiency trends. However, as discussed in section I.A, ACUACs (not including double duct), ACUHPs (not including double duct), and CWAFs will be subject to higher stringency standards that take

effect on January 1, 2023. The current market does not fully reflect compliance with the future 2023 standards, making it less certain as to how the efficiency distribution of the market will be impacted in the years after 2023.

Issue 32: DOE requests information to how the standards for ACUACs, ACUHPs, and CWAFs set to take effect in 2023 will impact the market efficiency distribution in the years after 2023. DOE requests information and data on current trends that may predict market efficiency distribution following the January 2023 compliance date.

1. Repair and Maintenance Costs

In order to develop annual operating costs and savings for the LCC analysis, DOE estimates repair and maintenance costs over the lifetime of an ACUAC, ACUHP, and CWAF. In the January 2016 final rule, DOE identified two different types of repair costs for ACUACs and ACUHPs: non-compressor repairs and compressor repairs. 81 FR 2420, 2478-2479 (Jan. 15, 2016). Both the labor and material costs for non-compressor repair costs were developed using 2013 RS Means Facilities Maintenance & Repair Cost Data (RS Means 2013),[16] scaled with equipment price. DOE applied a one-time, non-compressor repair cost to all customers in the building sample in the seventh year of the equipment's lifetime. Compressor repair costs were developed using price information for compressors from a commercial and industrial supplier[17]

[16] RS Means, *Facilities Maintenance and Repair Cost Data 2013* (2012) (Available at:. *http://rsmeans.reedconstructiondata.com/60303.aspx*) (Last accessed April 10, 2013).
[17] W. W. Grainger, *Air Conditioner Compressors* (Available at: *http://www.grainger.com/category/air-conditioner-compressors/air-conditioners/hvacand-refrigeration/ecatalog/N-jo6#nav=%2Fcategory%2Fair-conditionercompressors%2Fair-conditioners%2Fhvac-and-refrigeration%2Fecatalog%2FN-jo6*) (Last accessed May 6, 2015).

and labor rates from RS Means 2013, scaled with equipment price. DOE applied a one-time compressor repair cost to 20 percent of customers in the thirteenth year of the equipment's lifetime. DOE used RS Means 2013 to calculate the maintenance costs for ACUACs and ACUHPs. For more detail on the repair and maintenance costs, please refer to Chapter 8 of the January 2016 final rule Technical Support Document for Small, Large, and Very Large Package Air Conditioning and Heating Equipment.[18]

For CWAFs, DOE developed its repair costs using RS Means 2013. For condensing furnaces, DOE included additional maintenance costs to inspect the condensate withdrawal system and to clean the secondary heat exchanger. For more detail on the repair and maintenance costs, please refer to Chapter 8 and Appendix 8E of the January 2016 final rule Technical Support Document for Commercial Warm Air Furnaces[19].

Issue 33: DOE requests feedback on the approach for repair and maintenance costs for ACUACs and ACUHPs used in the January 2016 final rule and proposed for use in this current rulemaking.

Issue 34: DOE requests feedback on its planned use of RS Means to develop repair and maintenance costs for CWAFs.

H. Shipments Analysis

[18] Available at: *https://www.regulations.gov/document?D=EERE-2013-BT-STD-0007-0105*.
[19] Available at: *https://www.regulations.gov/document?D=EERE-2013-BT-STD-0021-0050*.

DOE develops shipments forecasts of ACUACs, ACUHPs, and CWAFs to calculate the national impacts of potential amended energy conservation standards on energy consumption, net present value (NPV), and future manufacturer cash flows. DOE shipments projections are based on available historical data broken out by equipment class, capacity, and efficiency. Current sales estimates allow for a more accurate model that captures recent trends in the market.

In the January 2016 final rule, DOE relied on available historic data for ACUACs and ACUHPs spanning from 1969 to 2010. For the years 1980 through 2001, for small and large ACUAC and ACUHP, DOE used shipments data provided by the Air-Conditioning and Refrigeration Institute (ARI) in 2005.[20] For the remainder of years (1969-1979 and 2002-2010), for small and large ACUAC and ACUHP and all years for very large equipment, DOE relied upon the U.S. Census Bureau's Current Industrial Reports on Refrigeration, Air Conditioning, and Warm Air Heating Equipment.[21] The last five years of historical data used in the January 2016 final rule are presented in Table II-10.

Most gas-fired CWAF units are installed as part of a combined packaged cooling and heating unit. As separate shipments data for CWAFs did not exist, DOE based its CWAF shipments on ACUAC and ACUHP shipments in the January 2016 final rule National Impact Analysis Spreadsheet[22]. DOE estimated a ratio of gas-fired CWAFs to total ACUAC shipments to populate its shipments model for CWAFs. According to a report by the Pacific Northwest

[20] Air-Conditioning, Heating, and Refrigeration Institute. Commercial Unitary Air Conditioner and Heat Pump Unit Shipments for 1980-2001 (2005).
[21] U.S. Census Bureau, MA333M - Refrigeration, Air Conditioning, and Warm Air Heating Equipment (2010) (Available at: *https://www.census.gov/data/tables/time-series/econ/cir/ma333m.html*) (Last accessed Nov. 5, 2019).
[22] Available at: *https://www.regulations.gov/document?D=EERE-2013-BT-STD-0007-0107*.

National Laboratory, AHRI reported shipments of 164,300 CWAFs in 1994, which was 80 percent of the ACUAC shipments in that year. DOE also determined that 20 percent of ACUHPs have a CWAF, based on building data in CBECS 2003. The ratios of CWAF shipments to ACUAC shipments and CWAF shipments to ACUHP shipments did not change over time.

Table II-10 Historical Shipments of ACUACs and ACUHPs by Equipment Size from the January 2016 Final Rule

Year	ACUAC			ACUHP		
	Small	Large	Very Large	Small	Large	Very Large
2006	186,465	72,702	28,744	24,593	4,565	1,805
2007	191,877	72,811	31,758	26,144	4,853	2,117
2008	176,437	68,119	29,013	24,493	4,547	1,936
2009	123,152	43,356	17,745	17,673	3,280	1,343
2010	122,792	43,964	16,756	17,703	3,286	1,252

Issue 35: DOE requests 2019 annual sales data (*i.e.*, number of shipments) for ACUACs and ACUHPs disaggregated by equipment class and size. If disaggregated fractions of annual sales are not available at the equipment class level by equipment size, DOE requests more aggregated fractions of annual sales at the equipment category level.

Issue 36: If available, DOE requests the same information in Table II-10 for the previous eight years (2011-2018).

Issue 37: DOE requests historical data on double-duct ACUAC and ACUHP systems. If the absolute number of historical shipments for double-duct systems are not available, DOE requests information on the approximate

fraction of double-duct systems relative to the total shipments of ACUACs and ACUHPs.

Issue 38: DOE requests comment on its approach to develop CWAF shipments. If available, DOE requests available annual sales data (*i.e.*, number of shipments) for CWAFs for the years after 2010.

I. National Impact Analysis

The purpose of the NIA is to estimate the aggregate economic impacts of potential new or amended energy conservation standards at the national level. The NIA assesses the NES and the national NPV of total customer costs and savings that would be expected to result from new or amended standards at specific efficiency levels.

A key component of DOE's estimates of NES and NPV is the equipment energy efficiencies forecasted over time for the no-new-standards case and for standards cases. DOE generally analyzes trends in market efficiency to project the no-new-standards case efficiency over the NIA's 30-year analysis period. However, in the case of ACUAC (not including double ducted), ACUHP (not including double ducted), and CWAFs, the market is in the process of moving to compliance with the 2023 standards, which adds further uncertainty to projections of efficiency distribution over the NIA analysis period in the years following 2023 based on current trends.

Issue 39: DOE seeks information on the expected efficiency trends in the ACUAC and ACUHP markets, accounting for the impact of the 2023 standards on the ACUAC and ACUHP equipment classes. In particular, DOE

requests information on how current efficiency trends will be impacted by the 2023 standards.

Issue 40: DOE seeks information on the expected efficiency trend in double-duct ACUAC and ACUHP equipment classes.

Issue 41: DOE seeks information on expected efficiency trend in the CWAF market, accounting for the impact of the 2023 standards.

J. Manufacturer Impact Analysis

The purpose of the manufacturer impact analysis (MIA) is to estimate the financial impact of amended energy conservation standards on manufacturers of ACUACs, ACUHPs, and CWAFs, and to evaluate the potential impact of such standards on direct employment and manufacturing capacity. The MIA includes both quantitative and qualitative aspects. The quantitative part of the MIA primarily relies on the Government Regulatory Impact Model (GRIM), an industry cash-flow model adapted for each category of equipment in this analysis, with the key output being industry net present value (INPV). The qualitative part of the MIA addresses the potential impacts of energy conservation standards on manufacturing capacity and manufacturing employment, as well as factors such as equipment characteristics, impacts on particular subgroups of firms, and important market and equipment trends.

As part of the MIA, DOE intends to analyze impacts of amended energy conservation standards on subgroups of manufacturers of covered equipment, including small business manufacturers. DOE uses the Small Business Administration's (SBA) small business size

standards to determine whether manufacturers qualify as small businesses, which are listed by the applicable North American Industry Classification System (NAICS) code.[23] Manufacturing of ACUACs, ACUHPs, and CWAFs is classified under NAICS 335415, "Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing," and the SBA sets a threshold of 1,250 employees or less for a domestic entity to be considered as a small business. This employee threshold includes all employees in a business's parent company and any other subsidiaries.

One aspect of assessing manufacturer burden involves examining the cumulative impact of multiple DOE standards and the equipment-specific regulatory actions of other Federal agencies that affect the manufacturers of a covered product or equipment. While any one regulation may not impose a significant burden on manufacturers, the combined effects of several existing or impending regulations may have serious consequences for some manufacturers, groups of manufacturers, or an entire industry. Assessing the impact of a single regulation may overlook this cumulative regulatory burden. In addition to energy conservation standards, other regulations can significantly affect manufacturers' financial operations. Multiple regulations affecting the same manufacturer can strain profits and lead companies to abandon product lines or markets with lower expected future returns than competing products. For these reasons, DOE conducts an analysis of cumulative regulatory burden as part of its rulemakings pertaining to appliance efficiency.

[23] Available at: *https://www.sba.gov/document/support--table-size-standards*.

Issue 42: To the extent feasible, DOE seeks the names and contact information of any domestic or foreign-based manufacturers that distribute ACUACs, ACUHPs, and CWAFs in commerce in the United States.

Issue 43: DOE identified small businesses as a subgroup of manufacturers that could be disproportionally impacted by amended energy conservation standards. DOE requests the names and contact information of small business manufacturers (as defined by the SBA's size threshold) of ACUACs, ACUHPs, and CWAFs that distribute equipment in commerce in the United States. In addition, DOE requests comment on any other manufacturer subgroups that could be disproportionally impacted by amended energy conservation standards. DOE requests feedback on any potential approaches that could be considered to address impacts on manufacturers, including small businesses.

Issue 44: DOE requests information regarding the cumulative regulatory burden impacts on manufacturers of ACUACs, ACUHPs, and CWAFs associated with: (1) other DOE standards applying to different equipment that these manufacturers may also make and (2) equipment-specific regulatory actions of other Federal agencies. DOE also requests comment on its methodology for computing cumulative regulatory burden and whether there are any flexibilities it can consider that would reduce this burden while remaining consistent with the requirements of EPCA.

K. Other Energy Conservation Standards Topics

1. Market Failures

In the field of economics, a market failure is a situation in which the market outcome does not maximize societal welfare. Such an outcome would result in unrealized potential welfare. DOE welcomes comment on any aspect of market failures, especially those in the context of amended energy conservation standards for ACUACs, ACUHPs, and CWAFs.

2. Network Mode / "Smart" Technology

DOE published an RFI on the emerging smart technology appliance and equipment market. 83 FR 46886 (Sept. 17, 2018). In that RFI, DOE sought information to better understand market trends and issues in the emerging market for appliances and commercial equipment that incorporate smart technology. DOE's intent in issuing the RFI was to ensure that DOE did not inadvertently impede such innovation in fulfilling its statutory obligations in setting efficiency standards for covered products and equipment. DOE seeks comments, data, and information on the issues presented in that RFI as they may be applicable to energy conservation standards for ACUACs, ACUHPs, and CWAFs.

3. Other Issues

Additionally, DOE welcomes comments on any other aspect of energy conservation standards for ACUACs, ACUHPs, and CWAFs that may not specifically be identified in this document. In particular, DOE notes that under Executive Order 13771, "Reducing Regulation and Controlling Regulatory Costs," Executive Branch agencies such as DOE are directed to manage the costs associated with the imposition of expenditures required to comply with Federal

regulations. *See* 82 FR 9339 (Feb. 3, 2017). Consistent with that Executive Order, DOE encourages the public to provide input on measures DOE could take to lower the cost of its energy conservation standards rulemakings, recordkeeping and reporting requirements, and compliance and certification requirements applicable to ACUACs, ACUHPs, and CWAFs while remaining consistent with the requirements of EPCA.

III. Submission of Comments

DOE invites all interested parties to submit in writing by the date specified previously in the **DATES** section of this document, comments and information on matters addressed in this document and on other matters relevant to DOE's consideration of amended energy conservations standards for ACUACs, ACUHPs, and CWAFs. After the close of the comment period, DOE will review the public comments received and may begin collecting data and conducting the analyses discussed in this RFI.

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

However, your contact information will be publicly viewable if you include it in the comment or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Following such instructions, 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 *http://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 *http://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 *http://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 *http://www.regulations.gov* provides after you have successfully uploaded your comment.

Submitting comments via email, hand delivery/courier, or postal mail. Comments and documents submitted via email, hand delivery/courier, or postal mail also will be posted to *http://www.regulations.gov*. If you do not want your personal contact information to be publicly

viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information in a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments.

Include contact information each time you submit comments, data, documents, and other information to DOE. If you submit via postal mail or hand delivery/courier, please provide all items on a CD, if feasible, in which case it is not necessary to submit printed copies. No 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, postal mail, or hand delivery/courier two well-marked copies: one copy of the document marked "confidential" including all the information believed to be confidential, and one copy of the document marked "non-confidential" with the information believed to be confidential deleted. Submit these documents via email or on a CD, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

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

DOE considers public participation to be a very important part of the process for developing energy conservation standards. DOE actively encourages the participation and interaction of the public during the comment period in each stage of the rulemaking process. Interactions with and between members of the public provide a balanced discussion of the issues and assist DOE in the process.

Anyone who wishes to be added to the DOE mailing list to receive future notices and information about this process should contact Appliance and Equipment Standards Program staff at (202) 287-1445 or via e-mail at *ApplianceStandardsQuestions@ee.doe.gov*.

Signed in Washington, DC, on April 2, 2020

Alexander N. Fitzsimmons
Deputy Assistant Secretary for Energy Efficiency
Energy Efficiency and Renewable Energy