



ENERGY STAR® Program Requirements Product Specification for Light Commercial HVAC

Eligibility Criteria Draft 1 Version 3.0

Following is the Draft 1 **Version 3.0** product specification for ENERGY STAR qualified light commercial HVAC equipment. A product shall meet all of the identified criteria if it is to earn the ENERGY STAR.

1) Definitions: Below are the definitions of the relevant terms in this document.

- A. Commercial Package Air-Conditioning and Heating Equipment¹: Electrically operated, unitary central air conditioners and central air-conditioning heat pumps used for commercial applications.
 - a) Central Air Conditioner: A central air conditioner includes an evaporator or cooling coil(s), compressor(s), and condenser(s), provides the function of air-cooling, and may include the functions of air circulation, air cleaning, dehumidifying, or humidifying.
 - b) Heat Pump²: A heat pump consists of one or more assemblies and utilizes an indoor conditioning coil, compressor, and refrigerant-to-outdoor air heat exchanger to provide air heating. A heat pump may also provide air cooling, dehumidifying, humidifying circulating, and air cleaning.
- B. Gas/Electric Package Unit: A single package unit with gas heating and electric air conditioning that is often installed on a slab or a roof.
- C. Variable Refrigerant Flow Multi-Split Air Conditioner¹: A unit of commercial package air-conditioning and heating equipment that is configured as a split system air conditioner incorporating a single refrigerant circuit, with one or more outdoor units, at least one variable-speed compressor or an alternate compressor combination for varying the capacity of the system by three or more steps, and multiple indoor fan coil units, each of which is individually metered and individually controlled by an integral control device and common communications network and which can operate independently in response to multiple indoor thermostats. Variable refrigerant flow implies three or more steps of capacity control on common, inter-connecting piping.
- D. Variable Refrigerant Flow Multi-Split Heat Pump¹: A unit of commercial package air-conditioning and heating equipment that is configured as a split system heat pump that uses reverse cycle refrigeration as its primary heating source and which may include secondary supplemental heating by means of electrical resistance, steam, hot water, or gas. The equipment incorporates a single refrigerant circuit, with one or more outdoor units, at least one variable-speed compressor or an alternate compressor combination for varying the capacity of the system by three or more steps, and multiple indoor fan coil units, each of which is individually metered and individually controlled by a control device and common communications network and which can operate independently in response to multiple indoor thermostats. Variable refrigerant flow implies three or more steps of capacity control on common, inter-connecting piping.
- E. Basic Model²: All units of a given type of covered product (or class thereof) manufactured by one manufacturer and which have the same primary energy source and, which have essentially identical electrical, physical, or functional (or hydraulic) characteristics that affect energy

¹ 10 CFR part 431, Subpart F, §431.92

² 10 CFR part 430, Subpart A, § 430.2 Definitions

consumption, energy efficiency, water consumption or water efficiency

- F. Cooling Capacity: The cooling capacity is the quantity of heat in Btu (British Thermal Units) that an air conditioner or heat pump is able to remove from an enclosed space during a one-hour period.
- G. Energy Efficiency Ratio (EER)¹: The ratio of the produced cooling effect of an air conditioner or heat pump to its net work input, expressed in Btu/watt-hour.
- H. Coefficient of Performance (COP)¹: The ratio of the produced cooling effect of an air conditioner or heat pump (or its produced heating effect, depending on the mode of operation) to its net work input, when both the cooling (or heating) effect and the net work input are expressed in identical units of measurement.
- I. Integrated energy efficiency ratio (IEER)¹: A weighted average calculation of mechanical cooling EERs determined for four load levels and corresponding rating conditions, as measured in appendix A of this subpart, expressed in Btu/watt-hour.

Note: Several definitions have been updated to align with 10 CFR part 431, Subpart F §431.92 and part 430 Subpart A, § 430.2. EPA has also replaced the Product Family definition with the DOE definition for Basic Model. In accordance with the proposed scope change (see note below), definitions for SEER and HSPF have been removed.

2) Scope:

- A. Included Products: Air-cooled, three-phase, split system (i.e., a system with components located both inside and outside of a building) and single package (i.e., a system that has all components completely contained in one unit) air-source central air conditioners, air-source heat pumps, gas/electric package units, and VRF multi-split systems with capacity rated at or above 65,000 Btu/h and below 240,000 Btu/h that meet the definitions specified herein are eligible for ENERGY STAR qualification, with the exception of products listed in Section 2.B.
- B. Excluded Products: Products with cooling capacity ratings below 65,000 Btu/h and products covered by other ENERGY STAR specifications. Note that single-phase products may be certified as ENERGY STAR under the CAC/ASHP specification. Water-cooled, evaporatively-cooled, and water source commercial products are not eligible under this specification.

Note: EPA has clarified that only air-cooled products are eligible for ENERGY STAR certification under this specification. In this Draft 1, EPA also proposes to exclude products below 65,000 Btu/h under the Version 3.0 specification. While the AHRI directory includes higher efficiency units that offer substantial energy savings, EPA was not able to identify a level that provided reasonable payback to the consumer, based on the installed cost and energy used in the latest DOE TSD, as updated with feedback from the ASRAC working group members in 2014. According to this information, levels that provide sufficient differentiation (in line with CEE Tier 2 levels) would not allow purchasers to recoup the additional up front cost for more than 20 years. EPA seeks stakeholder feedback on this proposal and in particular, whether higher efficiency unit prices are expected to fall in response to new DOE minimum efficiency standards.

3) Qualification Criteria:

- A. Energy Efficiency Requirements:

Table 1: Criteria for ENERGY STAR Certified Light Commercial Air Conditioners

Equipment Type	Size Category	Heating Section Type	Minimum Energy Efficiency Criteria
Air-Source Central Air Conditioner	≥65,000 Btu/h – <135,000 Btu/h	Electric Resistance (or None)	12.2 EER; 14.8 IEER
		All other	12.0 EER; 14.6 IEER
Air-Source Central Air Conditioner	≥135,000 Btu/h – <240,000 Btu/h	Electric Resistance (or None)	12.2 EER; 14.2 IEER
		All other	12.0 EER; 14.0 IEER

Table 2: Criteria for ENERGY STAR Certified Light Commercial Heat Pumps

Equipment Type	Size Category	Heating Section Type	Minimum Energy Efficiency Criteria
Air-Source Heat Pump	≥65,000 Btu/h – <135,000 Btu/h	Electric Resistance (or None)	11.8 EER; 14.1 IEER; 3.4 COP*
		All other	11.6 EER; 13.9 IEER; 3.4 COP*
Air-Source Heat Pump	≥135,000 Btu/h – <240,000 Btu/h	Electric Resistance (or None)	10.9 EER; 13.5 IEER; 3.3 COP*
		All other	10.7 EER; 13.3 IEER; 3.3 COP*

*Note: COP rated at 47° F.

Table 3: Criteria for ENERGY STAR Certified Light Commercial VRF Multi-Split Systems

Equipment Type	Size Category	Heating Section Type	Minimum Energy Efficiency Criteria
Air-Source Central Air Conditioner	≥65,000 Btu/h – <135,000 Btu/h	All	20 IEER, 13 EER
Air-Source Central Air Conditioner	≥135,000 Btu/h – <240,000 Btu/h	All	18.5 IEER, 12 EER
Air-Source Heat Pump	≥65,000 Btu/h – <135,000 Btu/h	Without Heat Recovery	20 IEER, 13.0 EER, 3.7 COP*
		With Heat Recovery	19.8 IEER, 12.8 EER, 3.7 COP*
Air-Source Heat Pump	≥135,000 Btu/h –	Without Heat Recovery	18.5 IEER, 12.0 EER, 3.5 COP*

Equipment Type	Size Category	Heating Section Type	Minimum Energy Efficiency Criteria
	<240,000 Btu/h	With Heat Recovery	18.3 IEER, 11.8 EER, 3.5 COP*

*Note: COP rated at 47° F.

Note: EPA is revising the LC HVAC specification due to: 1) new federal minimum standards that will go into effect on January 1, 2017, for less than 65,000 Btu/h 3-phase products and on January 1, 2018, for greater than or equal to 65,000 Btu/h products; and 2) broad availability of high efficiency products in the marketplace for larger units. In an effort to continue to distinguish the most energy-efficient products available that provide significant energy and cost savings to the consumer while also providing excellent performance, EPA proposes the following changes to the requirements:

One of the key changes in the upcoming federal standards is the shift in metric used to evaluate performance of products greater than or equal to 65,000 Btu/h, from EER to IEER. EPA understands that LC HVAC products spend most of their time operating in part-load conditions and therefore agrees that the IEER metric is a more realistic indicator of annual energy savings in most climates. However, peak load performance remains important to many stakeholders, so EPA proposes to add IEER and also retain EER requirements.

The levels proposed provide a balance between consumer savings, reasonable payback, and differentiation between standard and high efficiency products. Based on the Air-Conditioning, Heating and Refrigeration Institute (AHRI) Certified Products Directory, these levels offer the best combination of product availability and energy savings. The proposed levels are in alignment with 2023 DOE standards.

Currently there are no ENERGY STAR certified VRF products, even though the majority of these products meet the ENERGY STAR criteria. In discussions with stakeholders, EPA learned that a contributing factor is lack of differentiation among VRF products themselves. Based on this feedback, EPA is proposing separate performance requirements for VRF products with the goal of recognizing the best performers within the VRF market. The proposed levels for VRF products offer consumers significant energy savings and a reasonable payback, and represent the top 28-38% of performers among VRF products listed in the AHRI directory. The chosen levels balance product availability, differentiation, and recognition that VRF products in general are more efficient than unitary ones. EPA considered adoption of CEE levels for VRF products, but judge they would not provide sufficient differentiation.

EPA proposes in this Draft 1, a COP criteria rated at 47F. Utilities have often expressed a desire to have access to performance data at additional, lower temperatures. The CEE high efficiency air-conditioning and heat pump initiative includes a COP criteria at 17F. EPA supports the aim of identifying products with exceptional low temperature performance but, recognizing the burden of an additional certified metric, proposes including the metric exclusively as a reporting requirement. Energy efficiency program sponsors (EEPS) who include COP in their requirements can easily use EPA's provided API to automatically display a current list of ENERGY STAR certified products that meet this additional requirement as well. The lower temperature test at 17F is one of the test conditions in the federal test method, and the data point is published in the AHRI directory, so the reporting requirement should not be an additional burden on manufacturers.

Stakeholders are encouraged to provide feedback on the above proposed criteria.

B. Gas/Electric Package Units: To qualify for ENERGY STAR, a gas/electric package unit shall meet the appropriate air conditioner specification requirements in Tables 1 and 2, above.

C. Significant Digits and Rounding:

- a. All calculations shall be carried out with actual measured (unrounded) values.
- b. Unless otherwise specified in this specification, compliance with specification limit shall be evaluated using directly measured or calculated values without any benefit from rounding.
- c. COP shall be expressed in multiples of the nearest 0.01.
- d. IEER shall be expressed in multiples of the nearest 0.1.
- e. Capacity shall be expressed as mentioned in Table 4, below.

Table 4: Rounding Requirements for Capacity

Capacity Ratings, Btu/h	Multiples, Btu/h
65,000 up to 135,000 [19,000 up to 39,600]	1,000 [300]
136,000 up to 400,000 [39,800 up to 117,000]	2,000 [600]
above 400,000 [above 117,000]	5,000 [1,500]

Note: EPA added the IEER rounding requirement (3.C.e), which aligns with the DOE test method, 10 CFR Part 431 Subpart F §431.96.

4) Test Requirements:

- A. One of the following sampling plans shall be used for purposes of testing for ENERGY STAR certification
 - 1) A single unit is selected, obtained, and tested. The measured performance of this unit and of each subsequent unit manufactured must be equal to or better than the ENERGY STAR specification requirements. Results of the tested unit may be used to certify additional individual model variations within a basic model group as long as the definition for basic model group provided in Section 1, above, is met; or
 - 2) Units are selected for testing and results calculated according to the sampling requirements defined in 10 CFR Part 429, Subpart B § 429.43. The certified rating must be equal to or better than the ENERGY STAR specification requirements. Results of the tested unit may be used to certify additional model variations within a basic model group as long as the definition for basic model group provided in Section 1, above, is met. Further, all individual models within a basic model group must have the same certified rating based on the applicable sampling criteria this rating must be used for all manufacturer literature, the qualified product list, and certification of compliance to DOE standards.

Note: The testing requirements section above has been updated to be consistent with other ENERGY STAR HVAC categories that are also covered by federal minimum standards. Under the multi-sample option, the products shall be selected for testing per the DOE sampling requirements in 10 CFR Part 429, Subpart B § 429.43.

- B. When testing light commercial HVAC equipment, the following test methods shall be used to determine ENERGY STAR certification:

Table 3: Test Methods for ENERGY STAR Certification	
ENERGY STAR Requirement	Test Method Reference
IEER, EER, and COP	10 CFR Part 431 Subpart F §431.96

Note: EPA has updated the test method reference in Table 3 to the DOE test method, 10 CFR Part 431 Subpart F §431.96, which references the industry test standards listed in the current Version 2.2 specification including: AHRI 340/360 and 1230 standards for 65,000 Btu/h to 240,000 Btu/h capacity and VRF products, respectively.

5) Effective Date: This ENERGY STAR Light Commercial HVAC Specification shall take effect on **TBD**. To qualify for ENERGY STAR, a product model shall meet the ENERGY STAR specification in effect on the date of manufacture. The date of manufacture is specific to each unit and is the date on which a unit is considered to be completely assembled.

Note: EPA expects to finalize this Version 3.0 specification in fall 2016. As the specification process nears completion, EPA will establish the effective date, which will allow transition time for manufacturers to update product literature and other marketing materials for those products that no longer meet ENERGY STAR requirements.

6) Future Specification Revisions: EPA reserves the right to change the specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through and open, transparent stakeholder process. In the event of a specification revision, please note that the ENERGY STAR qualification is not automatically granted for the life of a product model.