



ENERGY STAR® Program Requirements Product Specification for Light Commercial HVAC

Eligibility Criteria Draft 2 Version 3.0

Following is the Draft 2 **Version 3.0** product specification for ENERGY STAR certified 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. Small commercial package air-conditioning and heating equipment is rated below 135,000 Btu/h cooling capacity. Large commercial package air-conditioning and heating equipment is rated at or above 135,000 Btu/h and below 240,000 Btu/h cooling capacity.
 - a) Air Conditioner: An air conditioner model consists of one or more factory-made assemblies that normally include an evaporator or cooling coil(s), compressor(s), and condenser(s). Air conditioners provide the function of air cooling, and may include the functions of air circulation, air cleaning, dehumidifying, or humidifying.
 - b) Heat Pump: A heat pump model consists of one or more factory-made assemblies that normally include an indoor conditioning coil(s), compressor(s), and outdoor coil(s), including means to provide a heating function. Heat pumps shall provide the function of air heating with controlled temperature, and may include the functions of air cooling, air circulation, air cleaning, dehumidifying, or humidifying.
- B. Gas/Electric Package Unit: Single package commercial package air-conditioning and heating equipment 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.

¹ Based on 10 CFR part 431, Subpart F, §431.92. In case of conflict, the CFR shall be taken as authoritative.

E. Basic Model¹:

- a) Commercial Package Air-Conditioning and Heating Equipment: All units manufactured by one manufacturer within a single equipment class, having the same or comparably-performing compressor(s), heat exchangers, and air moving system(s) that have a common “nominal” cooling capacity.
- b) Variable Refrigerant Flow Multi-Split: All units manufactured by one manufacturer within a single equipment class, having the same primary energy source (e.g., electric or gas), and which have the same or comparably performing compressor(s) that have a common “nominal” cooling capacity and the same heat rejection medium (e.g. air or water).

F. Cooling Capacity²: The capacity associated with the change in air enthalpy between the air entering the unit and the air leaving the unit, which includes both the latent (change in humidity ratio) and sensible (change in dry-bulb temperature) capacities expressed in Btu/h and include the heat of circulation fan(s) and motor(s).

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 Subpart F of 10 CFR part 431, expressed in Btu/watt-hour.

Note: Several definitions have been updated to align with 10 CFR part 431, Subpart F §431.92 and AHRI Standard 340/360-2015. EPA has also replaced the Product Family definition with the DOE definitions for Basic Model.

2) Scope:

- A. Included Products: Air-cooled, three-phase, split system (i.e., any central air conditioner or central air conditioning heat pump in which one or more of the major assemblies are separate from the others) and single package (i.e., any central air conditioner or central air-conditioning heat pump in which all the major assemblies are enclosed in one cabinet) air-source central air conditioners, air-source heat pumps, gas/electric package units, and variable refrigerant flow (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: Water-cooled, evaporatively-cooled, and water source commercial products are not eligible under this specification. Products with cooling capacity ratings below 65,000 Btu/h and products covered by other ENERGY STAR specifications are not eligible under this specification. Note that single-phase products below 65,000 Btu/h may be certified as ENERGY STAR under the Residential Air Source Heat Pump and Central Air Conditioner Equipment specification.

² AHRI Standard 340/360-2015. *Performance Rating of Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment*

Note: Some Draft 1 comments advocated retaining inclusion of units below 65,000 Btu/h cooling capacity. In response, EPA reached out to stakeholders for cost and energy data that would support their inclusion, but no such data was provided. As such, EPA has excluded them in Draft 2 due to unfavorable payback.

3) Qualification Criteria:

A. Energy Efficiency Requirements:

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

Equipment Type	Cooling Capacity	Heating Section Type	Minimum Energy Efficiency Criteria
Small Air Cooled Central Air Conditioner	≥65,000 Btu/h – <135,000 Btu/h	Electric Resistance (or None)	12.2 EER; 14.0 IEER
		All other	12.0 EER; 13.8 IEER
Large Air Cooled Central Air Conditioner	≥135,000 Btu/h – <240,000 Btu/h	Electric Resistance (or None)	12.2 EER; 13.2 IEER
		All other	12.0 EER; 13.0 IEER

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

Equipment Type	Cooling Capacity	Heating Section Type	Minimum Energy Efficiency Criteria
Small Air Cooled Heat Pump	≥65,000 Btu/h – <135,000 Btu/h	Electric Resistance (or None)	11.8 EER; 12.8 IEER; 3.4 COP at 47°F; 2.4 COP at 17°F
		All other	11.6 EER; 12.6 IEER; 3.4 COP at 47°F; 2.4 COP at 17°F
Large Air Cooled Heat Pump	≥135,000 Btu/h – <240,000 Btu/h	Electric Resistance (or None)	10.9 EER; 12.0 IEER; 3.3 COP at 47°F; 2.1 COP at 17°F
		All other	10.7 EER; 11.8 IEER; 3.3 COP at 47°F; 2.1 COP at 17°F

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

Equipment Type	Cooling Capacity	Heating Section Type	Minimum Energy Efficiency Criteria
VRF Air Cooled Air Conditioner	≥65,000 Btu/h – <135,000 Btu/h	All	12.0 EER; 17.4 IEER
VRF Air Cooled Air Conditioner	≥135,000 Btu/h – <240,000 Btu/h	All	12.0 EER; 16.4 IEER

Equipment Type	Cooling Capacity	Heating Section Type	Minimum Energy Efficiency Criteria
VRF Air Cooled Heat Pump	≥65,000 Btu/h – <135,000 Btu/h	Without Heat Recovery	11.8 EER; 17.4 IEER; 3.4 COP at 47°F; 2.4 at 17°F
		With Heat Recovery	11.6 EER; 17.2 IEER; 3.4 COP at 47°F; 2.4 at 17°F
VRF Air Cooled Heat Pump	≥135,000 Btu/h – <240,000 Btu/h	Without Heat Recovery	10.9 EER; 16.4 IEER; 3.3 COP at 47°F; 2.1 COP at 17°F
		With Heat Recovery	10.7 EER; 16.2 IEER; 3.3 COP at 47°F; 2.1 COP at 17°F

* VRF models must meet these requirements in ducted, ductless and mixed configurations to be certified.

Note: Several comments received on Draft 1 expressed concern that the proposed levels were too stringent. Upon further study, EPA proposes updated efficiency criteria based on stakeholder feedback for air conditioners and heat pumps. These levels, which align with CEE Tier 2 for Air Conditioners, provide a balance between consumer savings, reasonable payback, and differentiation between standard and high efficiency products. The level for central air conditioners reflects the performance of 23 - 30% of models and leads to a payback period ranging from four to six years compared to the proposed 2018 federal minimum. The levels for Heat Pumps are based on the recommendations from stakeholders and represent 8 - 14% of models while providing payback in three to five years.

EPA has updated the proposed requirements for VRF products based on stakeholder comments on Draft 1, providing better comparison with unitary products while still maintaining some differentiation among VRF models. In doing so, EPA revised the analysis to distinguish ducted, ductless and mixed listings. The requirements explicitly apply to all configurations, but given that mixed and ductless configurations are generally higher efficiency, it is the ducted configurations that drive whether a model can be certified. Based on analyzing performance in ducted configurations, more than 35% of VRF models in the AHRI directory (depending on product type), from at least 10 brands, would meet this requirement.

For all products, EPA has revised the proposal so that the COP17 reporting requirement is instead a performance requirement. Several commenters suggested this, and all agreed that having it as a requirement imposes no significant additional burden.

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	1,000
136,000 up to 400,000	2,000

Note: EPA added the IEER rounding requirement (3.C.d), which aligns with ANSI/AHRI Standard 1230-2010, Section 6.1.2.2 for VRF and AHRI Standard 340/360-2015, Section 6.1.2 for Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment.

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 as long as the definition for basic model provided in Section 1, above, is met. Further, all individual models within a basic model 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: In Draft 1, EPA updated the sampling language to be consistent with that for other ENERGY STAR products that are subject to Federal standards. Several commenters pointed out that the current Version 3.0 specification does not include a multiple sample option, and that the provision of several units for testing as per the requirements proposed in Draft 1 constitutes a significant burden for manufacturers. EPA reached out to AHRI to better understand the requirements of their current verification testing program for these products. Given that models are generally custom-built in order to be tested for verification, EPA agrees that a modification of our typical approach (four units of the model to be tested must be available within ten business days of the test date) is reasonable. These procedures are not part of the specification, but reside in guidance documents issued to Certification Bodies (CB) for their reference in developing their verification testing programs. In parallel with this specification development, EPA will work with stakeholders and CBs to craft a modified approach that is reasonable for products that must be built to order for testing, and which still fulfills the integrity needs of the ENERGY STAR program.

In addition, EPA points out that manufacturers may continue to use the single sample option as before at their discretion.

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

Table 5: Test Methods for ENERGY STAR Certification	
ENERGY STAR Requirement	Test Method Reference
IEER, EER, and COP	10 CFR Part 431 Subpart F §431.96 ³

Note: EPA has updated the test method reference in Table 5 to the DOE test method, 10 CFR Part 431 Subpart F §431.96, which references the industry test standards listed in the current Version 3.0 specification including: AHRI 340/360 and 1230 standards for 65,000 Btu/h to 240,000 Btu/h capacity and VRF products, respectively. EPA understands that while it is not explicit in the CFR that IEER is tested in accordance with AHRI 1230, it is implied; therefore, the CFR is the sole reference for testing, with an explanatory note.

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 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. With the exclusion of units with cooling capacity below 65,000 Btu/h, we are considering alignment with the January 1, 2018 compliance date for the new DOE regulations.

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 industry discussions. 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.

³ As per the CFR, IEER shall be tested in accordance with AHRI 1230.