ENERGY STAR® Program Requirements
Product Specification for Light Commercial HVAC

Eligibility Criteria
Final Draft Version 3.0

Following is the **Version 3.0** ENERGY STAR product specification for 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 Equipment[1]: 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 Conditioner[1]: 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 Pump[1]: 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 Model[1]:

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 Capacity[2]: 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 network 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 network input, when both the cooling (or heating) effect and the network 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 430, expressed in Btu/watt-hour.

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) central air conditioners, 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 certification, 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 CAC/ASHP specification.

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

3) Certification 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; 3.2 COP at 47°F; 2.1 COP at 17°F
		All other	10.7 EER; 11.8 IEER; 3.2 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
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
		With Heat Recovery	11.6 EER; 17.2 IEER; 3.4 COP at 47°F
VRF Air-Cooled Heat Pump	≥135,000 Btu/h – <240,000 Btu/h	Without Heat Recovery	10.9 EER; 16.4 IEER; 3.2 COP at 47°F
		With Heat Recovery	10.7 EER; 16.2 IEER; 3.2 COP at 47°F

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

Note: Comments received on Draft 2 were generally in support of the proposed levels, with a few exceptions.

First, for large unitary heat pumps, commenters expressed confusion that the proposed level for COP47 (3.3) was slightly different from the CEE level (3.2). This arose because the level in V2.2 is 3.25, and while EPA moved to rounding to tenths, it did not want to have a lower value than in the current specification. Upon further reflection, EPA agrees that the market influence of shared specifications is more important than a slight decrease in one of four metrics, and has adopted 3.2 for COP47.

A commenter also expressed concerns about the IEER requirement for large and small unitary heat pumps, pointing out that the differential between air conditioner and heat pump requirements in the Draft 2 proposal was larger than that in similar high efficiency equipment and building specifications. While acknowledging this point, EPA maintains the Draft 2 IEER proposals in this Final Draft. EPA's analysis shows that about a quarter of models on the market meet these requirements, indicating sufficient availability. Ultimately, this is what the ENERGY STAR levels seek to identify, rather than a specific set of technologies.

Stakeholders had conflicting comments about the VRF proposals in Draft 2. Manufacturers pointed out the difference in IEER requirements between unitary and VRF levels in the Draft 2 proposal are larger than in other specifications for efficient equipment and buildings. However, another commenter pointed out that large VRF systems do not share the static pressure disadvantage in testing that large unitary systems have in comparison to small unitary systems, and there is therefore no reason they should need lower IEER requirements. EPA acknowledges both points, but maintains the Draft 2 IEER proposals in this Final Draft, based on its analysis of product availability as published on September 22, 2016.

In addition, manufacturers recommended eliminating the requirements for EER and COP17 for VRF units, claiming that with the relatively small number of models of VRF systems, it was difficult to find models at every capacity that meet all four requirements. They argue that IEER and COP47 are sufficient to capture seasonal energy use and savings. Given the relative novelty of these products in the market, and their great potential for energy savings, EPA has chosen to eliminate the COP17 requirement for this version. As VRF products become more common, EPA would expect to include COP17 requirements in

future specification versions. Similarly to COP47 for large unitary heat pumps, EPA has chosen to adopt a COP47 of 3.2 for VRF Heat Pumps greater than or equal to 135,000 Btu/h and less than 240,000 Btu/h. This too will allow for better alignment with shared specifications.

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

4) Test Requirements:

A. One of the following sampling plans shall be used for purposes of testing for ENERGY STAR certification

a. 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

b. 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: Commenters were generally supportive of EPA's clarification in Draft 2 and intention to develop alternative guidance on unit availability for testing that would apply to LC HVAC units that are custom built specifically for testing.

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]

5) Effective Date: The Version 3.0 ENERGY STAR Light Commercial HVAC Specification shall take effect on **January 1, 2018**. To be certified to 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.

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 certification 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.