

**U.S. Department of Energy Rooftop Package Unit Challenge
Frequently Asked Questions**

1. Do any manufacturers make these units now at 18 IEER?

We are not aware of any manufacturers that currently make a drop-in 10-ton RTU that meets or exceeds 18 IEER.

2. What are the conditions at which the IEER of 18 is rated -- all return air, minimum outside air, or 100% outdoor air?

The air condition on the evaporator coil and air condition on the condenser coil are established in ANSI/AHRI Standard 340/360 2007 for the full and part load tests. The evaporator coil always sees 80°F DB / 67°F WB while the condenser coil changes.

3. Fan efficiency and VAV were mentioned as being key contributors to achieving 18 IEER. Does DOE have any testing data that shows how IEER is affected by these features?

DOE currently does not have tested data showing how fan, motor, and belt efficiency affects IEER.

4. Will there be any EER requirement or only the 18 IEER?

There will not be an EER requirement. As RTUs perform very infrequently under AHRI rated conditions, the focus is entirely on IEER which is more indicative of how an RTU will operate in the field. This specification aims to motivate units that perform across the range of performance conditions. If you are interested in understanding how that works, look to the AHRI rating methodology for more information.

5. Have there been any considerations during development of the specification for different climates and/or regions?

By focusing on the IEER rating, the RTU Challenge is geared to be climate independent. Upon submission of an RTU for lab testing and validation that it meets the challenge, the intention is to also conduct a performance map of the unit. The performance map will allow simulation in any U.S. climate to determine value to end-users based on their various operations. However, the buyers of the equipment are the ultimate decision makers. If they see enough value in climate specific performance, they will indicate that with their purchase order.

6. Will DOE consider aiding manufacturers on improved designs of larger than 10-ton units? Are these tonnages gross or sensible only?

The 10-ton unit will provide a large benefit for many retail alliance members, and was provided as a size in an effort to focus this particular specification. If you have a 15- or 20-ton unit, the alliances might also consider buying it, as long as it meets the specification and buyers' criteria. Additionally, the rated tonnage is according to ANSI/AHRI Standard 340/360 2007, which is net cooling which includes fan heat. DOE will also consider aiding manufacturers of larger tonnage units.

7. What proportion of latent load can these high efficiency units manage? With a 10 ton coil, providing minimum fresh air input, operating at low or part load, will humidity become a problem in high humidity climates?

The latent load will be a function of the flow speed across the evaporator coil (i.e. cfm/ton) and air condition on the evaporator coil. The RTU Challenge specification stipulates that "Indoor-coil airflow rate not to exceed 37.5 SCFM per 1000 Btu/h of rated capacity". Additionally, the air

condition on the evaporator coil is constantly 80°F DB / 67°F WB and therefore the OA ratio and OA.

8. What type of upgrades to the existing RTUs will improve the efficiencies to an 18 IEER?

Improvements may include advanced compressor technologies (e.g. variable speed or other modulating techniques), high efficiency fans and motors, improved heat exchangers, and advanced controls.

9. Will there be any requirements for duct tests for the new units?

There are currently no requirements concerning the ductwork on the return or supply side of the RTU.

10. Why doesn't the specification focus on improving heat exchanger efficiencies?

The specification does not stipulate which components can or cannot be improved. However, improved heat exchangers are one of the options for increasing system efficiencies. DOE does not wish to prescribe how best to improve system efficiency, as different manufacturers may wish to use different approaches.

11. What is the potential coverage from a service offering for standalone units not tied in to a BMS network through IP or BACnet? Thermostat only? Are there any thoughts to bring the added value information through some type of new requirements based on a 4G network?

While DOE encourages manufacturers and service providers to provide coverage for standalone units that are not operationally integrated with a building management system, there is no requirement at this time for the manufacturers to provide coverage for standalone units based on 4G or any long distance communications.

12. Are DDC-based systems required? I'm concerned about the increased complexity and higher cost of DDC systems versus the thermostat controls more widely used with RTUs.

Yes, direct digital controls are required. The purpose of the controls and diagnostics are to connect to centralized systems, providing insight to equipment owners and operators so that they can make sure the RTUs are maintained over their lifetimes. DDCs provide capabilities for failure mode and for maintaining the performance of the equipment. Many systems have DDCs embedded in controllers, but collection of this information at a central location is valuable, either through existing automation systems or enhanced service contracts.

13. Certain manufacturers have high efficiency drop-in RTUs available today that are 10% or more efficient than DOE minimum standards. What portion of the market (and of CBEA members) actually purchases these high efficiency RTUs instead of purchasing RTUs with the minimum efficiency?

We don't know the breakdown of the efficiency of RTU sales; however, it is known that some of the largest Retail Energy Alliance (REA) members do buy the highest efficiency units available on the market.

14. Has DOE actually built a unit that meets the 18 IEER? Can you share any physical data on that unit?

DOE and the national labs have not built an RTU capable to achieving 18 IEER.

15. What type of wireless communication is expected (cellular, WLAN, etc.)?

It is up to the manufacturers to decide what type of wireless communication to support. The wired/wireless control/monitoring capability requirement is to send and receive data and control signals using BACnet compatible communication protocol.

16. Are specifics available for the energy saving technologies that were referenced to achieve the 50% savings?

The near 50% savings seen from the EnergyPlus model results were based on the improved performance of the combined supply fan, motor, and belt drive and efficiency improvement of the refrigeration circuit.

17. You showed a picture of the SMDS microprocessor. Will you show us the required sensors and wireless transmitters?

The sensors used with smart monitoring and diagnostics systems (SMDS) are all wired sensors. However, the diagnostics data from the SMDS is transmitted to a remote network operations center using a paging wireless network. The list of sensors required will depend on the diagnostics that the RTU supports.

18. If you have an air mover that achieves 60% static efficiency in this application would you please send me the information on it so that I may review?

A fan manufacturer will need to be contacted to determine what type of fans will meet the 60% minimum static efficiency.

19. It seems that you are driving for improvement with mechanical equipment. We believe a lot can be achieved with controls and can be fitted as a retrofit to existing units. Can this specification apply to existing units on a retrofit basis? Will you develop specs for retrofits?

A separate specification geared toward retrofits is a possibility but will be significantly different from the current RTU Challenge spec. However, if a manufacturer can physically demonstrate that a retrofit technology can achieve all the requirements of the specification (including manufacturers' warranties), buyers may consider this option.

20. As the specification does not include an EER element, is there any portion of the specification that is intended to address demand reduction?

None of the performance requirements of the RTU directly address demand reduction, although the improved controls on the RTU will enable greater control over turning down or shutting off units during utility peak power billing periods.

21. Do makers of "drop-in" desiccant-based or evaporative cooling systems also get technical support if they can show the possibility of producing 18 IEER equivalent performance?

If the equipment achieves the performance characteristics and satisfies the operational and implementation requirements, then we will provide support. It is important to bring these concepts forward first, since we haven't specifically discussed them with buyers, to ascertain the level of interest.

22. Are there field tests of the technology?

It is DOE's intention that RTUs that meet the Challenge will be monitored in the field and compared against a baseline to determine performance improvements including efficiency, controllability, and operations & maintenance.

23. Do you know of any resources besides DEER with up to date cost information for rooftop units of standard efficiency and high efficiency?

RSMeans handbooks provide some information on rooftop unit costs. Feedback from the alliance partners indicates that the cost difference customers pay can widely vary. Therefore, any cost information available through DEER or RSMeans should be considered very rough estimates.

24. Are there key technologies to this unit succeeding over others in the market besides variable fan speed?

Many technologies may be implemented in these units including advanced compressors, high efficiency fans and motors, improved heat exchangers, and advanced controls. Each manufacturer may find a different combination of technologies to be most cost effective in their particular product platform.

25. Where can I view all available new technologies and patents?

Unfortunately there is no central repository for the latest technologies and patents for RTUs. California Energy Commission (CEC) publications on advancing RTU performance provide a starting point.

26. What is the process for validation?

RTUs that meet all of the prescriptive requirements of the specification, particularly control requirements, will be tested in a DOE-approved lab to determine the IEER.

27. How can I determine the energy savings for an 18 IEER rooftop unit in my location?

DOE's [RTU Comparison Calculator](#) (RTUCC) allows evaluation of RTUs incorporating climate zone and some lifecycle cost components. The RTUCC has two levels of input. The first level uses EER for calculations. The second input level allows uploading of part load performance data to calculate the unit's energy consumption, operating costs and life cycle cost.

28. Is SMDS available now for existing units? If so, can you provide purchasing information?

Yes, SMDS is available now for existing units. The box is a prototype, but the algorithms, code and requirements of that diagnostician are available and would be licensed from PNNL, the National Lab that designed it. If you are interested in getting SMDS today, even for existing units, send an email to George Hernandez (National Lab that designed it. If you are interested in getting SMDS today, even for existing units, send an email to George Hernandez (National Lab that designed it. If you are interested in getting SMDS today, even for existing units, send an email to George Hernandez (

29. Do you have the capabilities to test solar assisted units?

We have the capability for this type of testing as long as the RTU does not exceed 10 tons.

30. Are there any results from DOE modeling that can be shared with manufacturers?

We have detailed performance data on a 10-ton Lennox RTU, but it is an older unit that uses R-22. We are currently conducting a performance map of a 5-ton RTU that will be made publically available when completed. In addition, the energy modeling used for the analysis of this project will be made available.

31. If we wanted to develop a field demonstration test, where would we start?

We have extensive field monitoring experience to develop a standard method for field performance monitoring of RTUs.

32. What role can utility energy efficiency programs play in helping advance the program?

Utility energy efficiency programs may provide additional incentives for these high efficiency units, which would enhance the market potential further. However, this is independent of the DOE effort. We would welcome utilities who want to provide incentives for these products and will provide guidance in developing such programs.

33. How can manufacturers of motors and economizers give assistance to the research?

The most viable option would be to partner with system manufacturers to assist them in meeting the efficiency targets set out in the specification.

34. How can R&D and product development companies participate in the program?

The most viable option would be to partner with system manufacturers because we expect to be in commercial production with these units in a relatively short period of time.