

## **DOE Rooftop package unit (RTU) Challenge**

### **SUMMARY**

The Offeror shall provide a detailed description of the rooftop unit (RTU) model offered for sale in response to this Solicitation.

- A. Model capacity 120,000 - 240,000 Btu/h of capacity.
- B. Meet all of the minimum specification requirements.
- C. Comply with all applicable federal and state standards, regulations and laws governing these types of air conditioners. This includes compliance with all applicable safety and environmental standards.
- D. Heating capability is recommended for marketing purposes but is not required to meet the challenge.

### **SYSTEM DESCRIPTION, PERFORMANCE REQUIREMENTS:**

- A. Refrigerant must have a global warming potential (gwp) no more than 2100 per ASHRAE Fundamentals 2009.
- B. Cooling Performance:
  - 1. Unit(s) shall have a minimum IEER of 18.0.
  - 2. Unit(s) shall be in accordance with and independently tested to ANSI/AHRI Standard 340/360.
  - 3. The IEER shall be reported along with the EER and supply air conditions for each of the ANSI/AHRI Standard 340/360 2007 test conditions shown in Appendix A.
  - 4. Unit(s) shall additionally be tested following the ANSI/AHRI Standard 340/360 with a 30% outdoor air ratio and test conditions shown in Appendix A.
  - 5. For all the test conditions, the supply fan will experience 0.7 in H<sub>2</sub>O external static pressure.
  - 6. Testing will occur at the manufacturer's or a third-party facility approved by the DOE under observation by a DOE third party representative. Required performance metrics based on the testing will be calculated by a DOE third party representative.
- C. Fan performance:
  - 1. Fan efficiency shall be a minimum of 60% in accordance with ANSI/AMCA 210.
  - 2. Fan shall be variable volume or multi-stage operation capability with, at minimum, a speed for heating mode, ventilation mode, and each stage of cooling.
- D. Economizer and Outdoor Air Damper:
  - 1. Unit(s) shall have differential economizing capability using either dry-bulb or enthalpy with a minimum condition lock out.

### **CONTROLS AND DIAGNOSTICS:**

- A. RTU shall have a stand-alone Direct Digital Control (DDC) based unit control system and be compatible with remote energy management control and diagnostic systems.
  - 1. DDC unit control system shall include all required input/output boards, main microprocessor, software and operator interface for stand-alone operation and for communication with an external third-party device, network or EMS.
  - 2. DDC unit control system shall perform all unit control functions including scheduling, thermostat control mode, unit diagnostics and safeties.
  - 3. The DDC controller shall be stand-alone, not dependent on communications with any on-site or remote master control panel when operating in zone temperature/humidity control mode.

4. DDC controller shall accept virtual thermostat inputs from an external BACnet third party device or network (e.g., an Energy Management System<sup>1</sup> (EMS)) when operating in thermostat control mode. DDC controller shall be capable of switching from external EMS (or other) control mode to zone temperature or non-EMS-based thermostat control mode.
5. DDC controller shall support full bi-directional communication with external compatible third-party devices, networks, or EMS using standard BACnet open protocol. The DDC controller shall have communication capability with an external BACnet compliant third-party device (e.g. an EMS) to read all sensor data and all signal and status information including the fault/diagnostic codes and messages.
- B. The DDC unit control system shall have the ability to communicate with an external third-party network or device through both a direct wired and wireless BACnet communication connection. Wireless communication from unit controller to an external device or network shall use BACnet MS/TP (Master-Slave/Token-Passing) or BACnet/IP.
- C. DDC unit controller must support both differential dry-bulb and enthalpy economizer controls.
- D. DDC unit controller shall have a complete set of diagnostic routines.
- E. DDC unit controller shall provide a service test mode. This operating mode shall allow a service contractor to force RTU into all operating sequences for local troubleshooting control and for independent testing and verification of the unit in the field during start-up commissioning.
- F. All operational and diagnostic capabilities shall be automatically executed at equipment start-up to ensure proper operation and assist in commissioning.
- G. RTU shall output the following performance metrics at least once every 15 minutes:
  1. Overall efficiency of the unit (e.g., as COP or EER) averaged over the time interval between measurements.
  2. Electricity use in kWh over the time interval between measurements
  3. Measured cooling (in Btu) delivered to the supply air over the time interval between measurements.

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<sup>1</sup> Some EMS systems are also referred to as Energy Management and Control Systems or Building Automation Systems.