ENERGY STAR® Program Requirements Product Specification for Medical Imaging Equipment

Draft Test Method For Determining Medical Imaging Equipment Energy Use Rev. – April 2024

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1 OVERVIEW

The following test method shall be used for determining product compliance with requirements in the ENERGY STAR Eligibility Criteria for Medical Imaging Equipment (MIE).

2 APPLICABILITY

The proposed test method shall be used to determine the energy efficiency of all products under the ENERGY STAR Product Specification for Medical Imaging Equipment. At this time, the specification, and this test method, only covers magnetic resonance imaging (MRI) equipment.

3 DEFINITIONS

A) Acronyms and Units:

1) ac: Alternating Current
2) CT: Computed Tomography
3) dc: Direct Current
4) IEC: International Electrotechnical Commission
5) MIE: Medical Imaging Equipment
6) MRI: Magnetic Resonance Imaging
7) PET: Positron Emission Tomography
8) PSU: Power Supply Unit
9) RF: Radio Frequency
10) SPECT: Single Proton Emission Computed Tomography
11) UPS: Uninterruptible Power Supply
12) UUT: Unit Under Test
13) W: Watts

Note: DOE has removed the definition section from the previous draft of the test method as the accompanying Version 1.0 Draft 2 specification now includes all the previous defnitions housed in the test method with updates as well as a few necessary additional definitions.

4 TEST SETUP

A) General Testing Conditions: General testing conditions shall be as specified in Section 9 of International Electrotechnical Commission (IEC) 62354 Ed. 3.0.

B) Input Power: Input power shall be as specified in Section 10 of IEC 62354 Ed 3.0.

C) Ambient Temperature: Ambient temperature shall be within 23 °C ± 5 °C over the duration of the test.

D) Relative Humidity: Relative humidity shall be within 20% and 80%.

E) Power Meter: General requirements for power meters shall be as specified in Section 11.1 of IEC 62354 Ed. 3.0.

1) Accuracy: The accuracy of power meters shall be as specified in Section 11.2 of IEC 62354 Ed. 3.0.

2) Calibration: Power meter calibration shall be as specified in Section 11.4 of IEC 62354 Ed. 3.0.

3) Polyphase: Power meters shall be capable of measuring either single phase or polyphase voltage and current.

5 TEST CONDUCT

A) As-shipped Condition: Products shall be tested in their "as-shipped" configuration, which includes both hardware configuration and system settings, unless otherwise specified in this test method.

B) Measurement Location: All power measurements shall be taken at a point between the ac or dc power source and the Unit Under Test (UUT). For MIE devices that do not simply plug into a wall outlet, the power meter shall be installed onto the input to the main disconnect panel of the system to ensure that all energy consumption of the MIE is captured (e.g., cooling equipment, cryogen compressor, water heat exchanger, peripheral computer terminal).

C) Air Flow Management: Any air flow directly surrounding the UUT during testing shall only be generated by fans or cooling devices that are standard components of the UUT. The use of external fans or cooling devices to purposefully direct air at, or away from, the UUT during testing is prohibited.

D) Power Supplies: All power supply units (PSUs) must be connected and operational.

E) Power Management: All power management and/or power-saving features available on the UUT shall be disabled during testing

1) The entire Medical Imaging Equipment Test Method may be voluntarily repeated with power management and/or power-saving features enabled.

2) For the purposes of ENERGY STAR certification, testing with power management and/or power-saving features enabled is mandatory for data collected as part of the certification process. Data measured with power management and/or power-saving features disabled will not be collected as part of ENERGY STAR certification.

6 TEST PROCEDURES FOR ALL PRODUCTS

6.1 UUT Preparation

A) Record the UUT manufacturer, model name, and system configuration details.

B) The MIE system shall be installed and calibrated according to its specification, including all system-critical items needed to perform a basic scan (e.g., gradient amplifiers, Radio Frequency (RF) unit, reconstruction engine(s), gantry, X-ray generator and tube, power supplies, controllers,

console/computer, cryogen compressor, water heat exchanger, patient table, etc.).

Any equipment and accessories beyond the basic product offering that is not required for a basic scan (e.g., customer-provided equipment, optional supplier equipment, patient vital signs accessories, facility-provided cooling water equipment, hardware for advanced medical applications, etc.) shall not be included in the measurements below.

C) Connect the UUT to an appropriate ac or dc voltage source using the following guidelines:

1) No uninterruptible power supply (UPS) units shall be connected between the power meter and the UUT;

2) The power meter shall remain connected until all testing is complete;

3) Power values shall be recorded from the power meter in a way that is consistent with the requirements in Section 4.E) of this document.

D) Verify that the UUT is configured in its as-shipped configuration.

E) Power on the UUT, either by switching it on or connecting it to mains power.

F) Let the UUT stabilize for 15 minutes

6.2 Ready-to-scan Mode Testing

A) Ensure that the power meter is on and functioning.

B) Prescribe a patient and execute any scan to ensure that the UUT is functioning.

C) After the scan completes, wait 5 minutes, and then record the average power draw (rate of energy consumption), for a period of 12 minutes. Record this value, in kW.

6.3 Power Save Mode Testing

A) Ensure that the power meter is on and functioning.

B) Prescribe a patient and execute any scan to ensure that the UUT is functioning.

C) After the scan completes, wait 30 minutes, and then record the average power draw (rate of energy consumption), for a period of 12 minutes. Record this value, in kW.

Note: DOE is proposing an additional power save mode test which closely resembles the ready-to-scan test but allows sufficient time for required automatic power management to engage as required by the products in their as-shipped condition during operating hours.

6.4 Low-power Mode Testing

A) Ensure that the power meter is on and functioning.

B) Select the Low-power mode as specified in the user manual.

C) Wait to ensure that all applicable system elements of the UUT have adapted to this mode.

D) Measure the average power draw (rate of energy consumption), for a period of at least 10 minutes. If the system has a variable power usage in this mode, the measurement duration shall be amended to one complete power usage cycle, which shall be taken to be the cycle from minimum to maximum usage.

E) Record this value, in kW.

7 REFERENCES

A) IEC 62354 Ed. 3.0 (2014) – General testing procedures for medical electrical equipment.