ENERGY STAR Medical Imaging Equipment Discussion Guide
November 2022

Please send comments to medicalimaging@energystar.gov no later than January 20, 2023.

Introduction

The U.S. Environmental Protection Agency (EPA) is developing a new ENERGY STAR® specification for medical imaging equipment, which may include, but is not limited to magnetic resonance imaging (MRI) machines, x-ray machines, computed tomography (CT) machines, mammography machines, sonogram devices, and nuclear imaging. Interest in energy efficient medical imaging equipment has grown in recent years, with major hospital systems, including Kaiser Permanente, University of Michigan Hospital System, Vanderbilt University, University of California San Francisco, the Ohio Hospital Association, and others demanding energy efficient equipment as they look to realize their sustainability and climate goals. With this in mind, EPA seeks to recognize equipment that uses less energy with the ENERGY STAR label. EPA is focused on energy savings achieved through efficiencies in ready to scan mode and an automated power down to an energy saving low power state when it has not been in use for an extended time. Interviews with manufacturers and radiology departments indicate that select products may have these capabilities already while others may not. Further, when the functionality does exist, it is often not being actualized.

This document represents a first step to developing a specification, laying out what the Agency has learned and identifying potential definitions, test methods, and potential pathways for criteria. This category encompasses products that are common in most hospitals and clinics and are critical components of medical care. However, data suggest that these products have long periods of inactivity at many sites, which is where the Agency sees energy savings potential.

ENERGY STAR Program and Process Overview

ENERGY STAR is the government-backed symbol for energy efficiency, providing simple, credible, and unbiased information that consumers and businesses rely on to make well-informed decisions. Thousands of industrial, commercial, utility, state, and local organizations—including more than 40 percent of the Fortune 500®—rely on their partnership with the U.S. Environmental Protection Agency (EPA) to deliver cost-saving energy efficiency solutions. Ninety-percent of American households recognize the ENERGY STAR, making it one of the most widely recognized consumer symbols in the nation. Together, since 1992, ENERGY STAR and its partners have helped save American families and businesses more than $450 billion and over 3.5 trillion kilowatt-hours of electricity while also achieving broad emissions reductions—all through voluntary action.

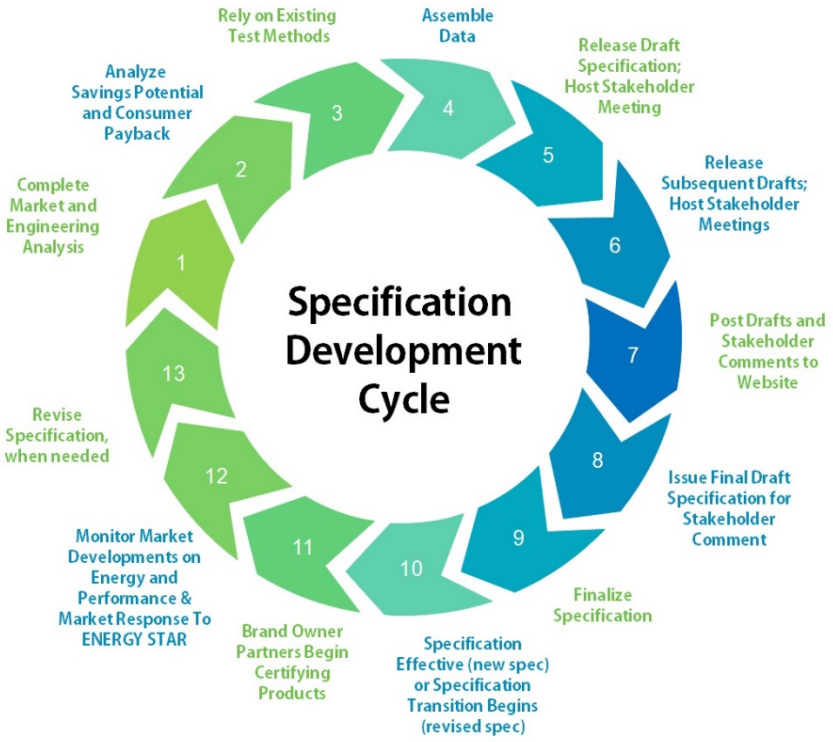
About three-fourths of U.S. households report the ENERGY STAR label as influential in their purchasing decisions and 71% of purchasers would recommend ENERGY STAR products to a friend. More than 700 utilities, state and local governments, and nonprofits leverage ENERGY STAR in their efficiency programs, reaching roughly 90% of households in all 50 states. Nationwide, utilities invested $8.4 billion in energy efficiency programs in 2019. In 2019 alone, Americans purchased more than 300 million ENERGY STAR certified products plus more than 300 million certified light bulbs for cumulative totals exceeding 7 billion products. The estimated annual market value of ENERGY STAR product sales is more than $100 billion.

EPA sets definitions of efficiency leadership for more than 75 residential and commercial product categories. Currently more than 75,000 product models have earned the ENERGY STAR based on these rigorous criteria. In establishing or revising an ENERGY STAR product performance specification, EPA employs a set of six key principles. It is important to note that these principles are not applied as a strict checklist per se. The ultimate viability and environmental impact of an ENERGY STAR specification in the marketplace depends upon many factors. The principles are used as guidance during an iterative process to achieve the desired balance among the principles, using the best available market information. The success of a specification can be more reasonably assured through the application of these principles.

These Guiding Principles are:

1. Significant energy savings can be realized on a national basis.
2. Product performance can be maintained or enhanced with increased energy efficiency.
3. Purchasers will recover their investment in increased energy efficiency within a reasonable period of time.
4. Energy efficiency can be achieved through one or more technologies such that qualifying products are broadly available and offered by more than one manufacturer.
5. Product energy consumption and performance can be measured and verified with testing.
6. Labeling would effectively differentiate products and be visible for purchasers.

The EPA uses a systematic framework: (1) to assess the feasibility for applying the label to a product category; (2) to develop performance specifications that must be met in order to earn the label; and (3) to reassess performance specifications as market conditions change. This process relies on rigorous market, engineering, and pollution savings analyses as well as input from other programs in EPA, industry, and other stakeholders. The process that EPA uses to develop a specification is outlined in the below figure. It is anticipated that this process, from an initial specification launch would take 6-12 months to complete at which point the specification would be immediately effective. The Standard Operating Procedure Revising or Establishing an ENERGY STAR Product Specification, can be found here.



Discussion Guide for Medical Imaging Equipment

For new product categories or significant changes in approach to existing product specifications, EPA often begins the specification development process with a discussion guide. This document allows the Agency to get early stakeholder input prior to formulating a formal draft proposal. The discussion guide presents the EPA's preliminary thoughts about approach, scope, definitions, and testing and seeks stakeholder feedback on specific questions associated with each of these topics and others key to the development of an effective specification. More specifically, this discussion guide identifies the product types that could be covered by a Version 1.0 ENERGY STAR Medical Imaging Equipment specification, provides an overview of energy efficiency considerations and testing, a summary of the proposed program structure, and presents questions for discussion. EPA is providing this document to spur discussion and thoughtful commentary on the scope and structure of the potential medical imaging equipment specification[1]. Further information regarding the ENERGY STAR process may be found at the end of this document.

The ENERGY STAR process is designed to be a transparent process with significant input from stakeholders. Stakeholder feedback indicated that there was strong interest from a variety of parties in developing an ENERGY STAR specification for medical imaging equipment to highlight the most energy efficient product offerings that also deliver on performance.

[1] An ENERGY STAR specification includes all relevant definitions, scope, energy efficiency criteria, and appropriate test method(s).

Stakeholders are encouraged to provide feedback on the concepts presented in this document, as well as to share their knowledge of topics not addressed here that they believe important to the development of a specification. Communication between EPA and stakeholders is critical to the success of the ENERGY STAR program. To that end, EPA is sharing this discussion guide and hosting a meeting on December XX, 2022, to discuss the questions outlined in this document. Readers can register for the webinar here. EPA will consider stakeholder input on all aspects of this document as the Agency considers drafting a Draft 1 specification. ENERGY STAR representatives are available for additional technical discussions with interested parties at any time during the specification development process.

Please contact me at Fogle.Ryan@epa.gov or 202-343-9153 or John Clinger at John.Clinger@icf.com or 215-967-9407 with questions or concerns. For any other medical imaging equipment related questions, please contact medicalimaging@energystar.gov.

In each section below, EPA has developed questions for discussion and appreciates any additional information, studies, or data to supplement any answers provided.

Proposed Scope

EPA is considering including the following medical imaging product types in scope of a Version 1.0 ENERGY STAR medical imaging specification. These are product types that have garnered interest from radiology departments for their energy use and the potential for additional energy savings from improved lower power mode states. These products are also sold in great enough numbers, or potentially save enough per unit, to make them of interest to purchasers.

- Magnetic Resonance Imaging (MRI)
- Computed Tomography (CT/ CAT scan)
- General Radiography (X-ray)
    - Cyberknife
    - Fluoroscope
    - Linear Accelerator
- Mammography Equipment
- Nuclear Imaging
- Ultrasound Imaging/Sonography

In addition, EPA recognizes the existence of additional medical imaging related solutions listed below but does not anticipate covering them in a Version 1.0 program. EPA does not have access to energy performance data for these products and relatedly, neither the ENERGY STAR test method nor COCIR, the foundation for the ENERGY STAR method, cover these products:

- Contrast Media Injectors
- C-arms
- Bone Densitometers
- Angio Suites
- Endoscopy
- Photoacoustic Imaging
- Thermography

Questions:

1. Are there products listed within the included scope above that should not be included in the scope of Version 1.0, and if so, why?
2. Are there products either listed out of scope or not listed at all that should be considered in scope, and if so, why?
3. As part of its previous work on the test method, EPA defined many of these products. However, EPA seeks stakeholder feedback on if this set of definitions is acceptable or if there is a separate set of definitions used and accepted by industry.

Ready to Scan and Auto-Power Down Mode

For this specification, EPA is interested in reducing the energy consumption of medical imaging equipment in ready to scan and low power modes. Based on information gathered from users of medical imaging equipment, some departments are shutting down certain pieces of medical imaging equipment manually during periods of non-use. EPA would like to incentivize manufacturers to automate this process, making it significantly more likely that the product will reach a low power mode and deliver energy savings.

In addition to maximizing time in a product's lowest power modes through automation, EPA is also interested in finding ways to drive innovation in reducing ready to scan power when the product is not fully powered down but is also not actively scanning or performing notable ancillary image processing.

Questions:

4. Which of the product types proposed for inclusion in this specification possess auto-power down functionality?
5. If auto-power down functionality is present, is it enabled by default when the unit is shipped and/or configured for customers on-site?
6. What challenges, if any, complicate the use of auto-power down or lower power modes in the product types proposed for inclusion?
7. Are there any other non-active/scan energy requirements besides focusing on ready to scan and low-power modes that EPA should consider in a Version 1.0 specification to help highlight best energy practices and/or new energy features present in these products?

Potential Savings Impact

EPA's focus on ready to scan, low power mode, and auto-power down is driven by the significant reduction in energy use of these modes compared to their active/scan state energy consumption. Data below shows that CTs, MRIs and X-ray all use substantially less energy when they can be powered down on average. MRIs alone show a reduction of 50% below the idle energy used when powered down.

Table 1: Electrical Energy Consumption of Modalities

Modality	Kilowatts/Hour
CT Scan (operating)	21
CT Scan (off)	1.7
MRI (operating)	33
MRI (ready)	16
MRI (off)	8
X-ray (operating)	5
X-ray (off)	2

Sources: "+" – Nakota, 2010 , "*" – TIAX, LLC, 2006, 2010 power estimates

Based on the table above, a single MRI machine that spends 6 hours overnight on average in off mode vs. one that never enters off mode could save over 17,500 kWh/year in energy use and over $2,000/year in electricity costs simply by powering down to a base maintenance / off state in clinical and other setting where overnight utilization is minimal. Additional savings can also be realized through a reduction in HVAC needs during those periods of lower energy consumption.

Questions:

8. Can stakeholders share measured product energy data, ideally measured using the ENERGY STAR draft method or the COCIR test method to help EPA better understand energy usage both ready to scan and low power modes for the different product types proposed to be in-scope for Version 1.0?
9. Are there specific technologies and/or functionalities that EPA should highlight that drive lower energy use during non-active state operation of these various product types?

Stakeholder Support for Energy Efficiency Features

EPA has spoken with numerous medical facilities regarding how they use their medical imaging equipment and most of these have expressed their interest in being able to identify those products that are more energy efficient. These stakeholders as well as ENERGY STAR share the desired goal of the best patient care possible, but also agree that there is room to save energy when the products are not in use for long periods of time. Medical facilities, including, but not limited to Kaiser Permanente, UC San Francisco, UC Davis, Vanderbilt University, University of Michigan, Memorial Herrman Health System are supporting of energy efficiency in these products:

Testing Considerations

The current ENERGY STAR Draft Medical Imaging Equipment was developed in partnership with the U.S. Department of Energy (DOE) and is based on the existing COCIR2 test method for medical imaging equipment. This test method has been used to generate data for the EU's medical imaging self-regulatory initiative over the past decade and can be used to generate data on a ready to scan mode and low power modes. EPA and DOE share a goal in harmonizing test methodology across the product types proposed for coverage in Version 1.0,

[2] European Coordination Committee of the Radiological Electromedical and Healthcare IT Industry

and COCIR's test method provides a great opportunity to achieve that goal. EPA and DOE welcome and feedback on the current draft test method and whether any important modifications need to be made.

Questions:

10. Are there any recent or upcoming updates to the COCIR test method that EPA and DOE should consider making for possible adjustments to the current ENERGY STAR draft test method?

Potential Program Structure / Process

An ENERGY STAR specification for medical imaging equipment, would follow the layout shown below:

- Definitions
- Scope
- General Requirements
- Energy Efficiency Requirements
- Testing Considerations

In addition, DOE will finalize the accompanying test method for use to certify equipment to the ENERGY STAR specification. The development process for the specification will likely follow the following milestones:

- Discussion Guide (now)
- Draft 1 specification
- Draft 2 specification
- Final Draft specification and test method
- Final Specification and test method

Within each of these steps, EPA will follow the specification development cycle above, releasing proposed criteria, hosting webinars, collecting stakeholder verbal and written feedback, and iterating until the specification is finalized. The process between Draft 1 and the final specification typically takes 6 – 12 months but will depend on the type of feedback received during the development process.