



ENERGY STAR® Imaging Equipment Version 3.0 Test Method Discussion Document

February 2017

I. Overview

The U.S. Environmental Protection Agency (EPA) is sharing this ENERGY STAR Imaging Equipment Test Method Discussion Document, Version 3.0 to invite stakeholder input on key elements in advance of a Draft 1, Version 3.0 specification. **EPA will host a webinar on March 1, 2017 from 12-2 PM Eastern Time** to engage with stakeholders on the content included in this discussion guide. Please send feedback and relevant data on this topic to imagingequipment@energystar.gov by March 22.

The topics that EPA feels are of particular importance for discussion prior to a Draft 1, Version 3.0 release are:

- Effect of network traffic on energy consumption
- Paper usage assumptions
- Consideration of maintenance mode and standby power
- Scope considerations

As always, stakeholder engagement is a vital ingredient in the success of the ENERGY STAR program, and EPA looks forward to working with all parties to develop the ENERGY STAR Version 3.0 Imaging Equipment specification and test method.

II. Network Activity

1) Background

As EPA launches the ENERGY STAR Imaging Equipment Version 3.0 Specification development process, one of the key issues to be addressed is the effect of network traffic on energy consumption. Several stakeholders have noted a disparity between Typical Energy Consumption (TEC) calculations and real-world energy use, as the current test method involves connection to a single computer used only for testing. This set-up potentially does not mimic real-world use, as in a typical office there is additional network activity. From discussions with stakeholders, it is EPA's understanding that some imaging equipment is capable of managing common network activity without waking from sleep. EPA proposes that the test method be revised so that calculated TEC values are more representative.

Common network protocols associated with typical office network activity, which disturbs the sleep mode in some sensitive products, are not currently considered by the test method. Multiple stakeholders have indicated that Simple Network Management Protocol (SNMP) requests are the most common source of this issue. While SNMP requests, frequently generated by print drivers and administrator requests, are more difficult for products to address without waking the device, stakeholders have indicated that this can be managed. Other data packets that can be managed without waking from sleep mode include simple service discovery protocol (SSDP), address resolution protocol (ARP), and web services dynamic discovery (WS-Discovery). Therefore, EPA is proposing a revision to the imaging equipment test method to differentiate those products that perform well in these conditions. The following options have been identified and considered by EPA for the test method revision. EPA would like to solicit stakeholder feedback on these options.

2) Potential Test Method Revisions

EPA believes that addressing network traffic will be done most effectively by revising the sleep mode portion of the TEC Test Procedure (i.e. Steps 5 and 6). Any changes to the test procedure are intended to have little to no effect on products that are designed to properly handle network traffic as a typical consumer of an ENERGY STAR product would expect. The test results will reflect the extra power consumption of products that do not properly handle network traffic.

EPA has identified three test method revision alternatives to account for the effects of a networking environment on sleep mode power:

A) Testing typical user requests

In addition to the normal sleep mode portion of the testing sequence, the tester will send a pre-determined set of requests to the device through the network. Network requests will include common user actions that are thought to be the source of sleep mode disturbance (e.g., network discovery and toner level check). The tester will run these prescribed network requests during the sleep mode portion of the testing sequence. Any negative impacts of network traffic will be reflected in a higher measured sleep mode power.

The tester will also have a second computer, connected to the same network, boot up during this process to ensure that the imaging equipment is not woken by the presence of new devices that announce themselves on the network and/or inquire on the status of the imaging equipment product when booting.

B) Testing certain data packet types

Printer proxy systems (sub-systems that manage network traffic) should be capable of handling broadcast data packets and similar types of network traffic that do not directly involve a print job. During the test method, the connected computer will be required to send certain types of data packets (e.g., SNMP or SSDP) across the network. Any resultant increases to the sleep mode power will count against the imaging equipment.

This option would require test labs to install a program that can create or simulate SNMP requests. Options range from simple GUI tools (e.g., OiDVIEW¹) to more complex network monitoring software (e.g., Spiceworks²).

C) Simulating a network environment

Testers would be required to connect the device to a certain number of computers or a simulated number of computers (via network cards) to account for the effects of increased network traffic. Unlike options A and B, this option does not specify certain types of user behavior or data packet types to test against. The imaging equipment would simply be subjected to an increased volume of network traffic, from more than one computer.

3) Proposed ENERGY STAR Approach

EPA believes that the most viable method of testing for the effects of network traffic is Option A. Option A is believed to be a simple addition to the test method that, in a representative manner, checks against unwanted behavior with the lowest testing burden for manufacturers.

Option B may have varied effects across different manufacturers. Network protocols are complex and it is not clear how common they are in an enterprise environment or how they are deployed on a network. It is also possible that user behavior may not be well represented.

Option C runs the risk of being too broad and potentially unsuitable for test labs. In addition, it will be difficult to assess whether the network is representative of real-world use.

¹ <http://www.oidview.com/snmp-mibwalker.html>

² <https://www.spiceworks.com/free-network-monitoring-management-software/>

Discussion Questions

1. What is the easiest, most effective way to generate representative Simple Network Management Protocol (SNMP) requests?
2. Does an increase in the number of devices on the network result in more “wake ups”? If so, by what specific mechanism(s)? EPA requests data in support of any responses to this question.
3. What computer or network behaviors negatively impact the imaging equipment’s ability to remain asleep?
4. Will there be any adverse impact on measurements for products with digital front ends (DFEs) if one of the proposed test method revision options is adopted?
5. What specific user actions should be prescribed in option A to ensure that product behavior is tested against SNMP and other relevant data packet types?
6. If option B is chosen, how can testers ensure that the required types of data packets are transmitted? Can this process be done without special software?
7. What proportion of the market can we expect to be impacted by the proposed test method revision options?

III. Paper Usage Assumptions

In the Version 2.0 test method and specification, ENERGY STAR utilized paper usage assumptions based on the number of jobs per day and the speed of the of the product. These formulas are shown in Equation 2 below. The formula results in a current usage assumption that increases with the square of the product speed as shown in Figure 1. One stakeholder claims that these paper usage assumptions, which were developed in 2000, in the TEC calculation process are outdated. This stakeholder has pointed out that since the speed of imaging equipment has increased³, the relationship included in the test method would imply that paper usage has also increased. However, industry data⁴ shows that paper production has been slightly declining for more than a decade. This indicates that despite increased speeds, the amount of pages being printed has not increased as much as the Version 2.0 usage assumption would suggest.

Equation 2: Calculation of Number of Images per Job

$$N_{IMAGES} = \begin{cases} 1 & s < 4 \\ \text{int} \left[\frac{(0.5 \times s^2)}{N_{JOBS}} \right] & s \geq 4 \end{cases}$$

Table 7: Number of Jobs per Day (N_{JOBS})

Monochrome Product Speed, s (ipm)	Jobs per Day (N_{JOBS})
$s \leq 8$	8
$8 < s < 32$	s
$s \geq 32$	32

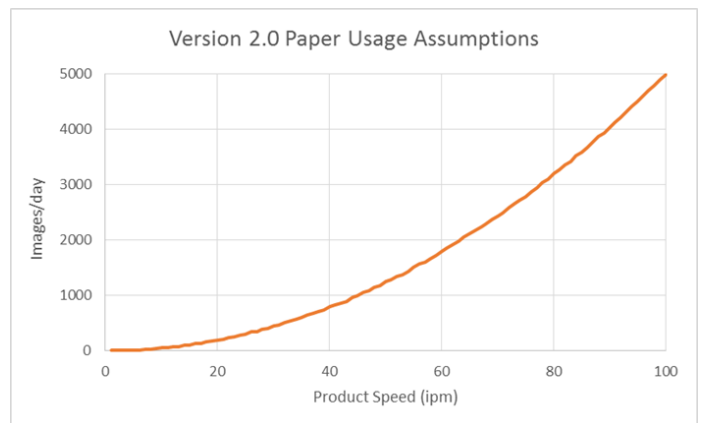


Figure 1 – TEC Usage Assumptions

This stakeholder suggests reducing the assumed number of print jobs per day so that TEC values can be recalculated without re-testing imaging equipment. While the primary objective for ENERGY STAR is to differentiate products, it is important that the values are representative of real-world energy consumption. ENERGY STAR is therefore interested in updating its assumptions.

³ The stakeholder states that in 2000 average product speed was 12-16 ipm, and in 2016 average product speed was 50-60 ipm.

⁴ American Forest & Paper Association, “2014 AF&PA Sustainability Report”, p.19. http://www.afandpa.org/docs/default-source/one-pagers/2014_sustainabilityreport_final.pdf.

Discussion Questions

8. EPA seeks feedback on the validity of this stakeholder's claim and how this usage assumption should be calculated. Data to support claims of other usage assumptions is encouraged.
9. EPA seeks any data on the relationship between product speed and paper usage.
10. If enough data is provided to support updating the usage assumptions, EPA is considering updating Equation 5 to account for this change. Are there other approaches that EPA can consider to incorporate updating usage assumptions into the specification?

IV. Other Items for Consideration

1) Maintenance Modes

The current test method states that UUTs shall never be in service/maintenance modes, including color calibration, during testing.

- 1) *Service/Maintenance modes shall be disabled prior to testing.*
- 2) *Manufacturers shall provide instructions detailing how to disable service/maintenance modes if this information is not included in the product documentation packaged with the UUT or is not readily available online.*
- 3) *If service/maintenance modes cannot be disabled and a service/maintenance mode occurs during a job other than the first job, the results from the job with the service/maintenance mode shall be replaced with results from a substitute job. In this case, the substitute job shall be inserted into the test procedure immediately following Job 4 and the inclusion of the substitute job shall be reported. Each job period shall be 15 minutes.*

One stakeholder has informed EPA of a product that enters a maintenance mode once every 5 minutes and operates at 50 W for a significant period of time, increasing the average power by 2.5 W. If maintenance modes like this are common across the market, EPA will consider limiting the frequency, duration, and power consumption of such operations to ensure that the ENERGY STAR label continues to recognize products that exhibit real-world energy efficiency.

Discussion Questions

11. EPA requests feedback from stakeholders on the prevalence of this issue and encourages any available data on the frequency, duration, and power consumption of typical maintenance modes.

2) Standby Power Definition

Another stakeholder has suggested that under Operational Modes (OM) definitions (1.C.4.) and OM power consumption requirements (3.4.5), "Standby" and "Standby Power Consumption" should be replaced. EPA proposes removing the definition for "Standby" and renaming "Standby Power Consumption" with "Lowest Power Consumption." Stakeholder feedback indicates that this change would more accurately reflect the test condition (which encompasses different modes in different products) and eliminate confusion with Off Mode. While this proposal would change the name of Standby Power Consumption Mode, none of the definitions would change. EPA does have concerns that this potential change may hinder international harmonization.

For reference, the Version 2.0 definitions are:

- 1.C.4. *Standby: The lowest power consumption state which cannot be switched off (influenced) by the user and that may persist for an indefinite time when the product is connected to the main electricity supply and used in accordance with the manufacturer's instructions. Standby is the product's minimum power state. For Imaging Equipment products addressed by this specification, the "Standby" Mode usually corresponds to Off Mode, but may correspond to Ready State or Sleep Mode. A product cannot exit Standby and reach a lower power state unless it is physically disconnected from the main electricity supply as a result of manual manipulation.*

3.4.5 Standby Power Consumption: Standby Mode power, which is the lesser of the Ready State Power, Sleep Mode Power, and Off Mode Power, as measured in the test procedure, shall be less than or equal to the Maximum Standby Power specified in Table 9, subject to the following condition.

i. The Imaging Equipment shall meet the Standby Power requirement independent of the state of any other devices (e.g., a host PC) connected to it.

Discussion Questions

12. Do stakeholders believe that this change would add clarity to the ENERGY STAR specification?
13. To what extent, does making this change impact international harmonization?

3) Professional Products

Previously, stakeholders have raised concerns over the applicability of ENERGY STAR requirements to professional products. Professional products refer to those models used for production printing, which typically print on thicker, coated paper. In order to better identify professional products from commercial products, stakeholders have proposed the following as criteria for professional products (must have a, b, c and at least 4 of the optional items):

<u>Item</u>	<u>Required Contents</u>	<u>May be sold as accessory unit</u>	<u>Required / Optional</u>
a. Output	Print outputs are distributed or sold	No	Required
b. Print Speed	Monochrome Product : $\geq 86\text{ipm}$ Color Product : $\geq 50\text{ipm}$ (Color Print)	No	Required
c. Paper Weight	Basis Paper weight : $\geq 141\text{g/m}^2$	No	Required
d. Paper Capacity	$\geq 8,000\text{Sheets}$	Yes	Optional
e. Paper Size	$\geq \text{SRA3}$	No	Optional
f. DFE	Meet DFE requirement under ENERGY STAR Ver. 2.0	Yes	Optional
g. Hole Punch	Selectable from 2hole punch and other hole punch	Yes	Optional
h. Finishing	Case binding or Ring binding	Yes	Optional
i. Print job management	Job management function (Ex. Change of the print option, Change of the print order, Showing of preview, save/retrieve of detailed print job.)	Yes	Optional
j. Data memory	Retrieve post-print job (1,000+ documents/5,000+ pages of setting information--- folding/punch/finishing etc.)	Yes	Optional
k. Color Certification	Obtain third party certification (US, EU, or JP) in color products.	Yes	Optional
l. Paper compatibility	Coated paper	No	Optional

In 2016, there were 38 professional products currently certified as ENERGY STAR Imaging Equipment. However, EPA has concerns whether the current ENERGY STAR criteria effectively highlight the most energy efficient products in the professional space. In addition, professional products are expected to operate at a higher duty cycle than commercial products, making the TEC usage assumptions less applicable. For these reasons, EPA is currently considering excluding these products from the ENERGY STAR Version 3.0 scope. EPA is aware of an International Standards Organization (ISO) test method standard for these products, which is currently under development.⁵ Once this test method is finalized EPA may reconsider these products for inclusion in the ENERGY STAR scope.

Discussion Questions

- 14. Does the proposal effectively differentiate professional products from commercial products for the purposes of the ENERGY STAR scope?
- 15. What data are stakeholders able to share related to the duty cycle of professional products?
- 16. Are there any other initiatives that EPA should consider that would allow ENERGY STAR to continue including these products within the scope of the program?

4) Wi-Fi Connection Priority

The current ENERGY STAR Test Method requires network-capable products to be connected to only one network for the duration of the test according to the following order of preference:

Table 6: Network or Data Connections for Use in Test

Order of Preference for Use in Test (if Provided by UUT)	Connections for all Products
1	Ethernet – 1 Gb/s
2	Ethernet – 100/10 Mb/s
3	USB 3.x
4	USB 2.x
5	USB 1.x
6	RS232
7	IEEE 1284 ²
8	Wi-Fi
9	Other Wired – in order of preference from highest to lowest speed
10	Other Wireless – in order of preference from highest to lowest speed
11	If none of the above, test with whatever connection is provided by the device (or none)

Wi-Fi is eighth on this list. However, one stakeholder pointed out that from 2009 to 2015, the percentage of their products with a wireless connection had risen from 27% to 80%. Considering ease of use and increasing

⁵ http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=68836

prevalence in imaging equipment, EPA is considering giving higher preference to Wi-Fi connection, above USB, to reflect Wi-Fi's wider use in home and small office application.

17. EPA appreciates any feedback and relevant data on this topic, including whether the current set of OM networking allowances are appropriate for current hardware implementations.

5) Scope and Additional Considerations

EPA continues to work towards ensuring that the products covered in imaging equipment represent those products that are the most relevant in the market. This includes consideration of additional product categories that could potentially fall under the imaging specification and removing those products from scope that can no longer be differentiated or are no longer relevant in the market for ENERGY STAR purposes. Therefore, as noted in the Version 2.0 specification, EPA is interested in the potential for incorporating products that print on media other than paper under the ENERGY STAR scope (i.e., 3D printers). EPA believes that there may be an opportunity to develop a specification for 3D printers and encourage their energy efficient use. Conversely, EPA has received feedback that standalone fax machines, standalone copiers, digital duplicators and mailing machines may no longer be relevant for inclusion in the ENERGY STAR scope.

EPA also continues to be interested in encouraging the adoption or expansion of energy-efficient and sustainable practices. This interest includes the potential to encourage the use of refillable ink tanks for toner, the potential to incorporate a notification to users if a change in settings would result in increased energy consumption, or a limit on the maximum machine delay time for TEC products, which would be similar to the limit found for OM products.

ENERGY STAR is interested in additional stakeholder feedback on the following items:

18. Is there stakeholder interest in ENERGY STAR expanding the category to include 3D printing within the scope of the specification? If so, EPA would be interested in the following topics:
 - Is there a test method for 3D printers that could be used to test for idle and active power? Or can the existing test method for printers be amended to incorporate the appropriate elements to test 3D printers?
 - Is there data available on the energy consumption of these products?
 - If not, would stakeholders be willing to provide data to develop a baseline for these products to allow ENERGY STAR to develop a dataset to differentiate models?
 - Are there challenges or limitations that ENERGY STAR should be aware of when assessing this product category?
 - What is the size of the 3D market and what are the best estimates for the growth of this market in the future?
 - Are there other environmental considerations in this space that ENERGY STAR could encourage that stakeholders would be interested in?
19. EPA is interested in stakeholder feedback on the potential to exclude standalone fax machines, standalone copiers, digital duplicators, and mailing machines within the ENERGY STAR product scope, particularly additional data regarding the market for these products, the potential for innovation in this space, and other considerations that EPA should take into account.
20. EPA is aware of products on the market today that no longer utilize a cartridge, but rather refillable ink tanks, which are believed to reduce waste and be more sustainable. EPA is interested in learning more about these products as well as potential ways that EPA could encourage or highlight the adoption of these products.
21. Are there other best practices that ENERGY STAR could encourage or adopt within the imaging specification, such as alerts for users and/or limiting the maximum machine delay time for TEC products?

V. Request for Feedback

EPA appreciates feedback on these and any other related issues **by March 22**. Please send comments to imagingequipment@energystar.gov. Registration for the Imaging Equipment Program Discussion Guide: Version 3.0 webinar on **March 1, 2017**, is available [here](#). For any questions, please contact Ryan Fogle, EPA, at Fogle.Ryan@epa.gov or (202) 343-9153, or Matt Malinowski, ICF, at Matt.Malinowski@icf.com or (202) 862-2693.