ENERGY STAR®

Draft 1 Imaging Equipment Test Procedure Webinar

August 24, 2017

Webinar Details

- Webinar slides and related materials will be available on the Imaging Equipment Product Development Web page:
  - www.energystar.gov/revisedspecs
  - *Follow link to "Version 3.0 is in Development" under "Imaging Equipment"*

- Audio provided via teleconference:

  Call in: +1 (877) 423-6338 (U.S.)
  +1 (571) 281-2578 (International)
  Code: **198-920** #

  - Phone lines will remain open during discussion
  - Please mute line unless speaking
  - Press *6 to mute and *6 to un-mute your line

Webinar Agenda

1. Introductions and Recap of ENERGY STAR Process
2. Draft 1 Test Method
   – Network Testing
   – Print Speed
   – Paper Usage Assumptions
   – Wi-Fi Prioritization
3. Timeline and Open Discussion

Introductions

Time	Topic
12:00–12:15	**Introductions and Specification Development Recap**
12:15–12:50	Network Testing
12:50–1:10	Print Speed
1:10–1:35	Paper Usage Assumptions
1:35–1:45	Wi-Fi Prioritization
1:45–2:00	Timeline and Open Discussion

Introductions

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ENERGY STAR Guiding Principles

- ENERGY STAR criteria are designed to balance these foundational principles:
    - Significant energy and/or water savings
    - Product performance maintained or enhanced
    - Purchasers can recover investment in increased efficiency within a reasonable time period
    - Efficiency can be achieved without proprietary technology
    - Energy/water consumption can be measured and verified with testing
    - Label provides meaningful differentiation

ENERGY STAR Specification Development Process

Specification Development Cycle

1. Stakeholder Notification
2. Energy & Environmental Analysis
3. Market, Industry & Design Research
4. Test Methodology Development (as necessary)
5. Release Draft Specification
6. Stakeholder Meetings
7. Release Subsequent Drafts with Interim Decision Memos (as necessary)
8. Post Drafts and Stakeholder Comments to Web Site
9. Finalize Specification
10. Final Decision Memorandum
11. Specification Takes Effect
12. Manufacturers Join Program as Partners and Begin Labeling Products
13. Officially Launch Specification with Industry and Stakeholders
14. Monitor Market Penetration
15. Open Specification for Revisions (as necessary)

Milestones to Date

Milestone	Date
Specification Launch and Discussion Document	February 22
Launch Webinar	March 1
Draft 1 Test Method	August 14
Draft 1 Test Method Webinar	Today, August 24

Objectives for Test Method Revision

- **Increase representativeness of the test method**
  - Ensure that tested results are representative of real-world performance.

- **Minimize burden**
  - Wherever possible, make changes without requiring re-testing, to minimize burden on partners.

Network Testing

Time	Topic
12:00–12:15	Introductions and Specification Development Recap
12:15–12:50	**Network Testing**
12:50–1:10	Print Speed
1:10–1:35	Paper Usage Assumptions
1:35–1:45	Wi-Fi Prioritization
1:45–2:00	Timeline and Open Discussion

Introduction

- Stakeholder feedback indicates disparity exists between TEC test calculations and real-world energy use, due to typical office network activity causing wake-ups from sleep mode in some products.

- Stakeholders report that certain types of common network activity should not cause wake-ups.

- Therefore, to test the behavior of imaging equipment under this common network activity an addition to the test method is needed.

Summary of Feedback

Software versus manual action

- Strong consensus from stakeholders that 3rd party open source software is preferable to manual user actions for triggering network activity.

  – Response: commonly available, dedicated software was incorporated into the test method proposal.

Summary of Feedback

Number of devices on network during testing

- Two stakeholders argued that more devices increase wake-up frequency, while three stakeholders disagreed.

- One stakeholder noted the importance of quiet network for conducting network testing.

- Response: no change to current set-up of one computer connected to unit.
  - This maintains a quiet network.
  - Test results could be scaled, if necessary, to represent multiple devices.

Summary of Feedback

Selection of Network Protocols for Testing

- EPA worked with stakeholders to identify packets typically sent by equipment and programs over the network
- Protocols which cause unavoidable wake-ups and those which do not require a response were excluded
- Out of 27 packet types reviewed, two were chosen:
  - Simple Network Management Protocol (SNMP)
  - NetBIOS Name Service (NBNS)
- These two are the common network protocols which the product should respond to without waking up; including them will make the TEC test closer to real-life conditions

Proposal – Network Activity Test

- Proposed addition to TEC test, to be placed after Step 10, after unit has entered Sleep Mode

6	Sleep	Zero meter and timer. Print one job (calculated above). Measure energy and time. Record time to first sheet exiting unit. Measure energy over 15 minutes from job initiation. The job must finish within the 15 minutes.	Job1 energy, E_{JOB1}	Watt-hours (Wh)	Recovery, Active, Ready, Sleep
			Active1 time	Minutes (min)	
7	Ready (or other)	Repeat Step 6.	Job2 energy, E_{JOB2}	Watt-hours (Wh)	Same as above
			Active2 time	Minutes (min)	
8	Ready (or other)	Repeat Step 6 (without Active time measurement).	Job3 energy, E_{JOB3}	Watt-hours (Wh)	Same as above
9	Ready (or other)	Repeat Step 6 (without Active time measurement).	Job4 energy, E_{JOB4}	Watt-hours (Wh)	Same as above
10	Ready (or other)	Zero meter and timer. Measure energy and time until meter and/or unit shows that unit has entered Sleep Mode or the final Sleep Mode for units with multiple Sleep modes, or the time specified by the manufacturer, if provided. Record energy and time.	Final energy, E_{FINAL}	Watt-hours (Wh)	Ready, Sleep
			Final time, t_{FINAL}	Minutes (min)	

Insert Here

Notes:
- Steps 4 and 10: For those units that do not indicate when they have entered the Final Sleep Mode, manufacturers shall specify the time to Final Sleep Mode for testing purposes.

Summary of Network Activity Test

1. Download and configure all necessary software
   - *Acceptable Software Programs are any which can successfully communicate by SNMP or NBNS with the unit. Examples:*

Software Program Name	Protocols Covered
OiDVIEW SNMP MIB Walker	SNMP
Nbtstat Windows command	NBNS

2. Zero meter and timer
3. Measure energy and time over 1 hour
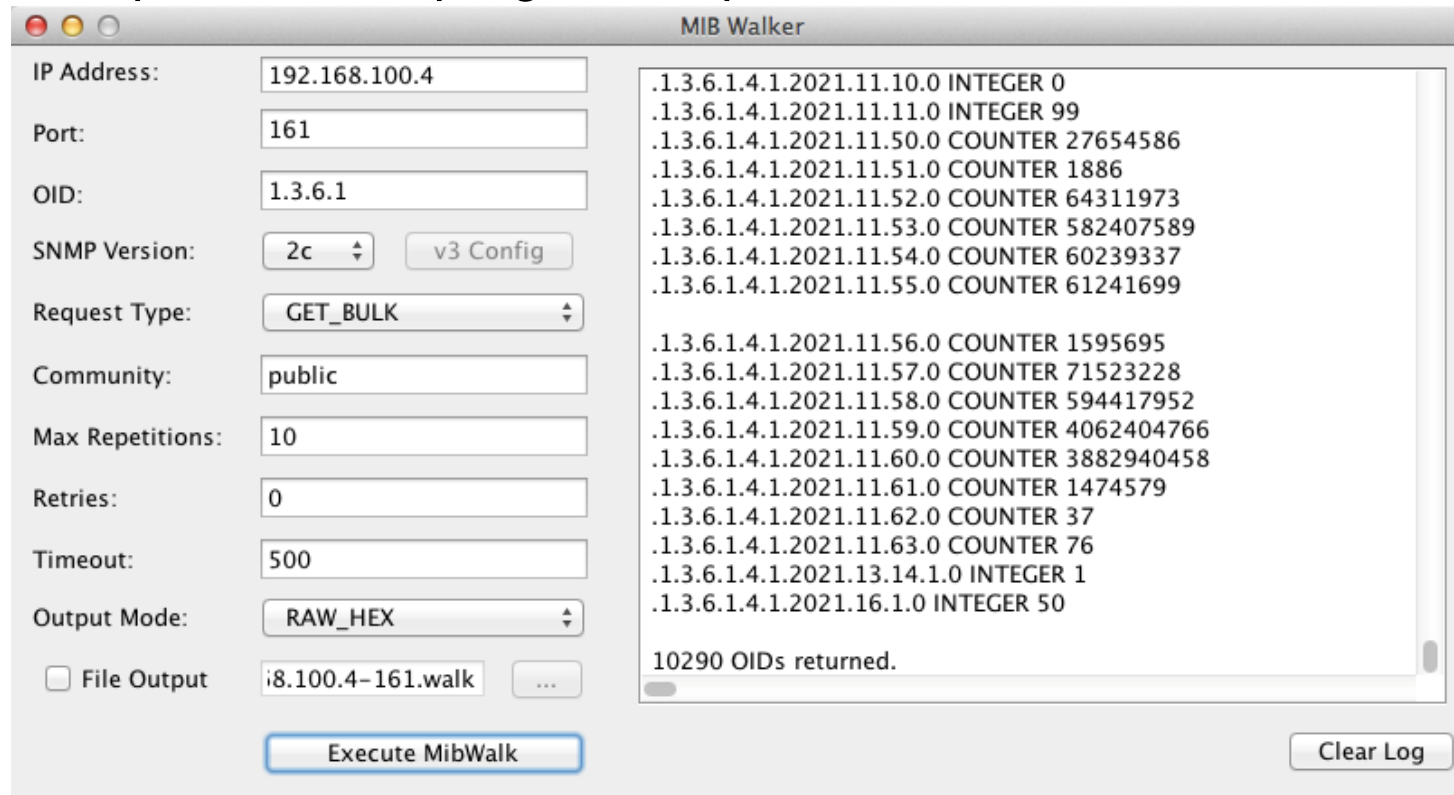4. Within 1st minute of the hour, communicate with unit via SNMP and NBNS using software programs
5. Record energy, time, and packet captures
6. Report results

Proposal – Network Activity Test

- Sample software program output:

Proposal – Sample Reporting Template

Test` Requirement	Units/ Data Type	Data
Manufacturer		
Model Number		
Average Sleep Mode Power for comparison		
Average sleep mode power without any network activity (if possible) or without intentional network activity (Step 5 of TEC Test in	watts	
SNMP packets captured bi-directionally via Wireshark?	Y/N	
SNMP program output	Text or Screen-shot	
SNMP Software Program output well-formed and complete?	Y/N	
NBNS packets captured bi-directionally via Wireshark?	Y/N	
NBNS program output	Text or Screen-shot	
NBNS Software Program output well-formed and complete?	Y/N	
Average sleep mode power over the hour including and following network tests	watts	

Minimizing Impact

- Separate test, so no TEC re-test required.

- No change to existing TEC test set-up of one computer connected to unit.

- User-friendly, easily-accessible software for testing.

- ENERGY STAR working with CalPlug to validate test results for replicability and reliability.

Discussion

- EPA appreciates any feedback and relevant data on this topic, including any questions to clarify any aspect of the proposed network testing addition to the TEC test.

Print Speed

Time	Topic
12:00–12:15	Introductions and Specification Development Recap
12:15–12:50	Network Testing
12:50–1:10	**Print Speed**
1:10–1:35	Paper Usage Assumptions
1:35–1:45	Wi-Fi Prioritization
1:45–2:00	Timeline and Open Discussion

Introduction

- One stakeholder commented that EPA should require tested rather than reported print speed
- Currently:

2) For all products, the product speed shall be based on:

    a) The highest manufacturer-claimed monochrome print speed, unless the product cannot print, in which case,

    b) The highest manufacturer-claimed monochrome copy speed, unless the product cannot print or copy, in which case,

    c) The manufacturer-claimed scan speed.

    a) Product Speed for Testing: The product shall be tested with speed settings in their default as-shipped configuration.

The Blue Angel

- The Blue Angel specification requires the use of print speed as measured according to international standards:
  - ISO/IEC 24734 for products that print
  - ISO/IEC 24735 for products that copy and have an automatic document feeder (ADF)
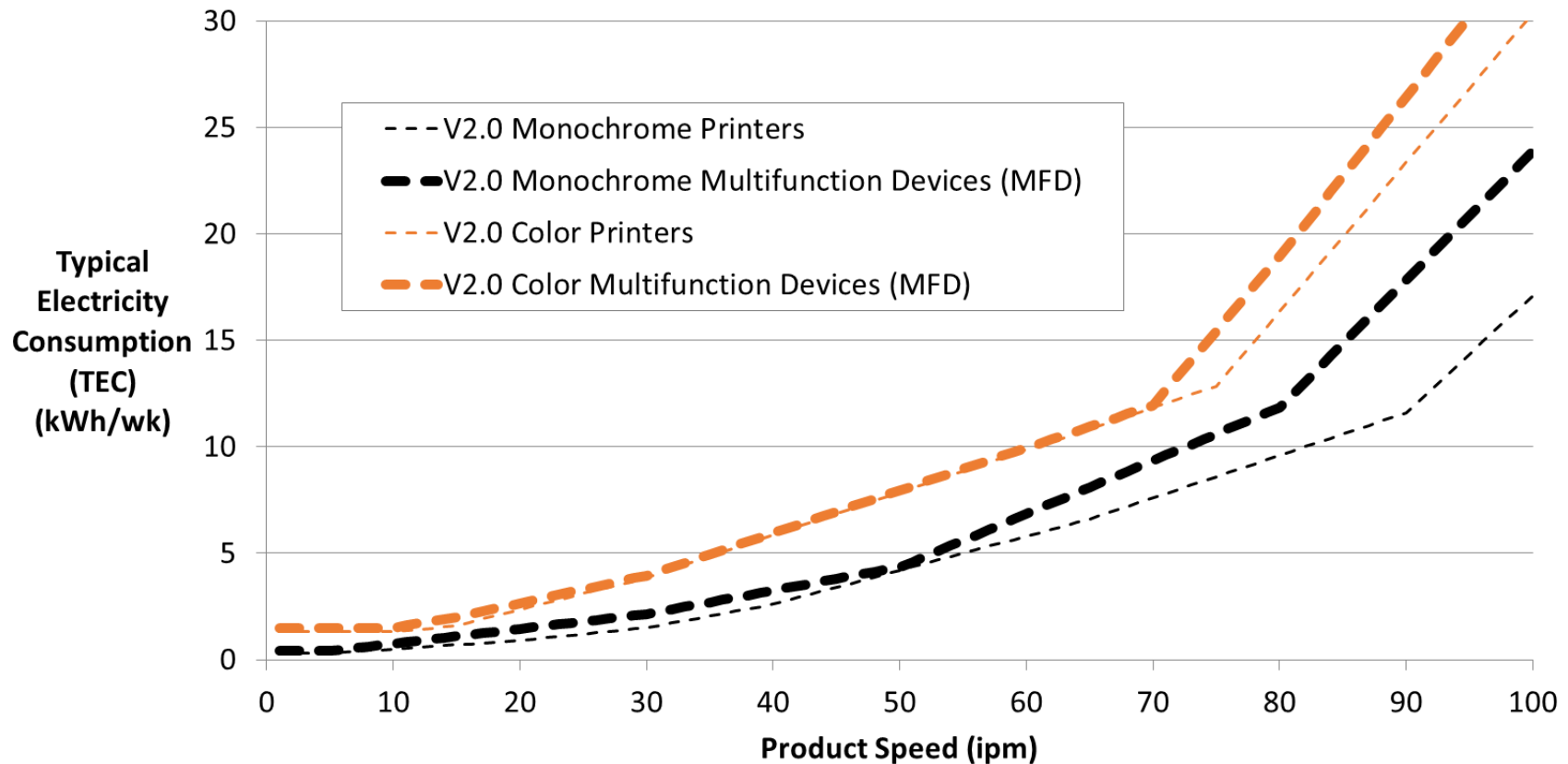 - ISO/IEC 29183 for product that copy but do not have an ADF

Manufacturer Data

- EPA reviewed manufacturer reports of tested print speed and compared it to that reported to ENERGY STAR
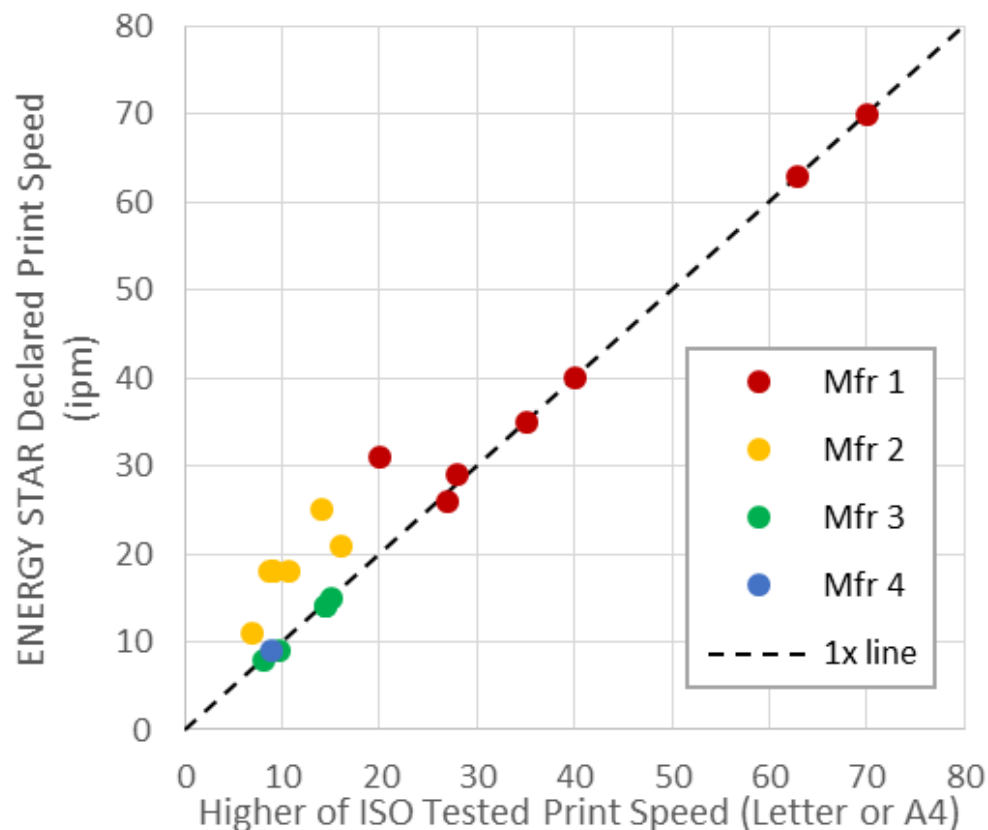
TEC Requirement Increases with Print Speed

Proposal

2) For all products, the product speed shall be based on:

a) The manufacturer-claimed monochrome print speed based on International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) Standard 24734 Estimated Saturated Throughput (ESAT), unless the product cannot print, in which case,

b) The manufacturer-claimed monochrome copy speed based on ISO/IEC Standard 24735 Estimated Saturated Throughput (ESAT), unless the product does not have an automatic document feeder, in which case,

c) The manufacturer-claimed monochrome copy speed based on ISO/IEC Standard 29183 Estimated Saturated Throughput (sESAT), unless the product cannot print or copy, in which case,

Discussion

- EPA welcomes feedback on this proposal

Paper Usage Assumptions

Time	Topic
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Introduction

- In the TEC test method and equation, the paper use scales with the square of the product speed.

- However, even as product speed has increased from 12–16 ipm in 2000 to 50–60 ipm today, paper use has declined.

Version 2.0 Paper Usage Assumptions
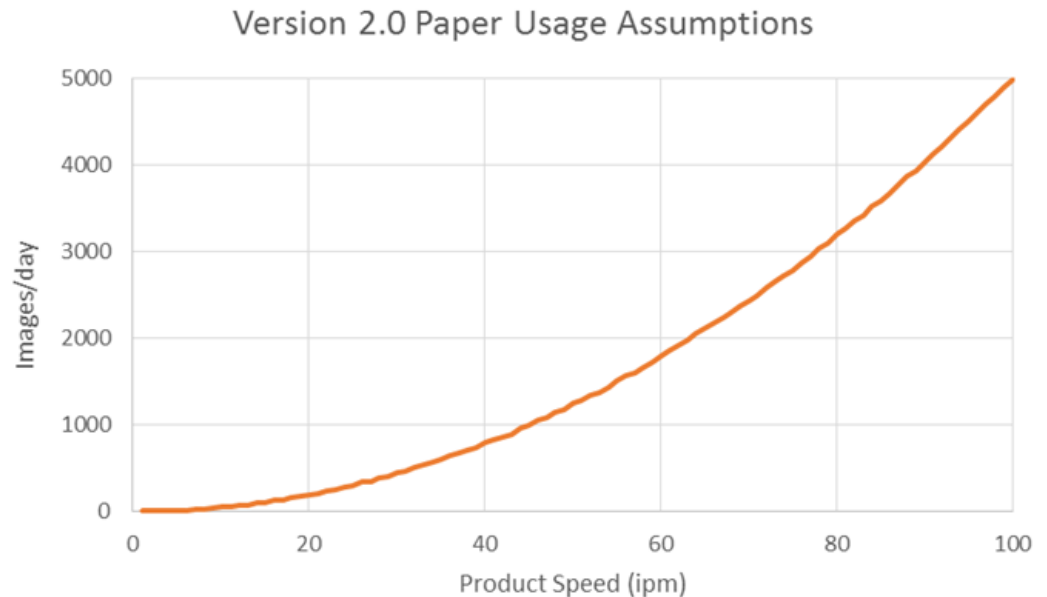
Summary of Feedback

- One stakeholder noted that TEC is a ranking metric such that absolute usage is secondary.

- Four others countered that TEC values are often used in life-cycle analyses and should be as accurate as possible.

- Another stakeholder noted that although stakeholders may not agree on a new usage assumption, they can agree that the current one is inaccurate.

Manufacturer Data

- Two manufacturers provided confidential data based on monitoring of models in the field. Each data point represents the average for each model.
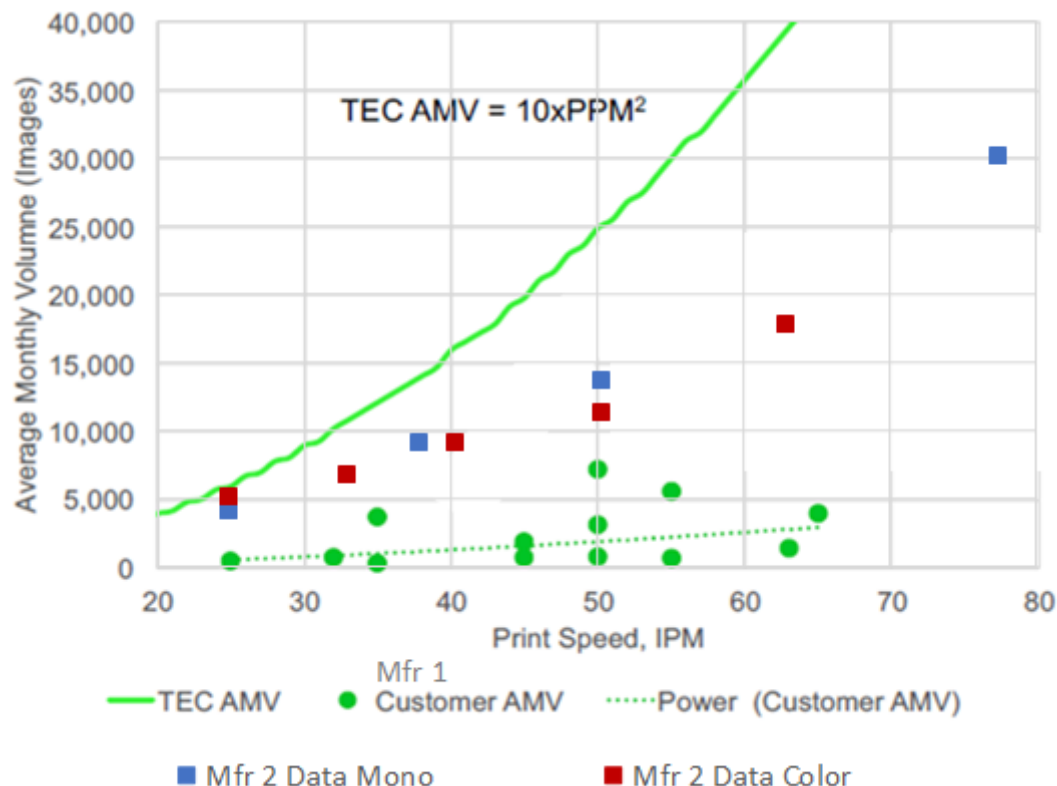
Proposal
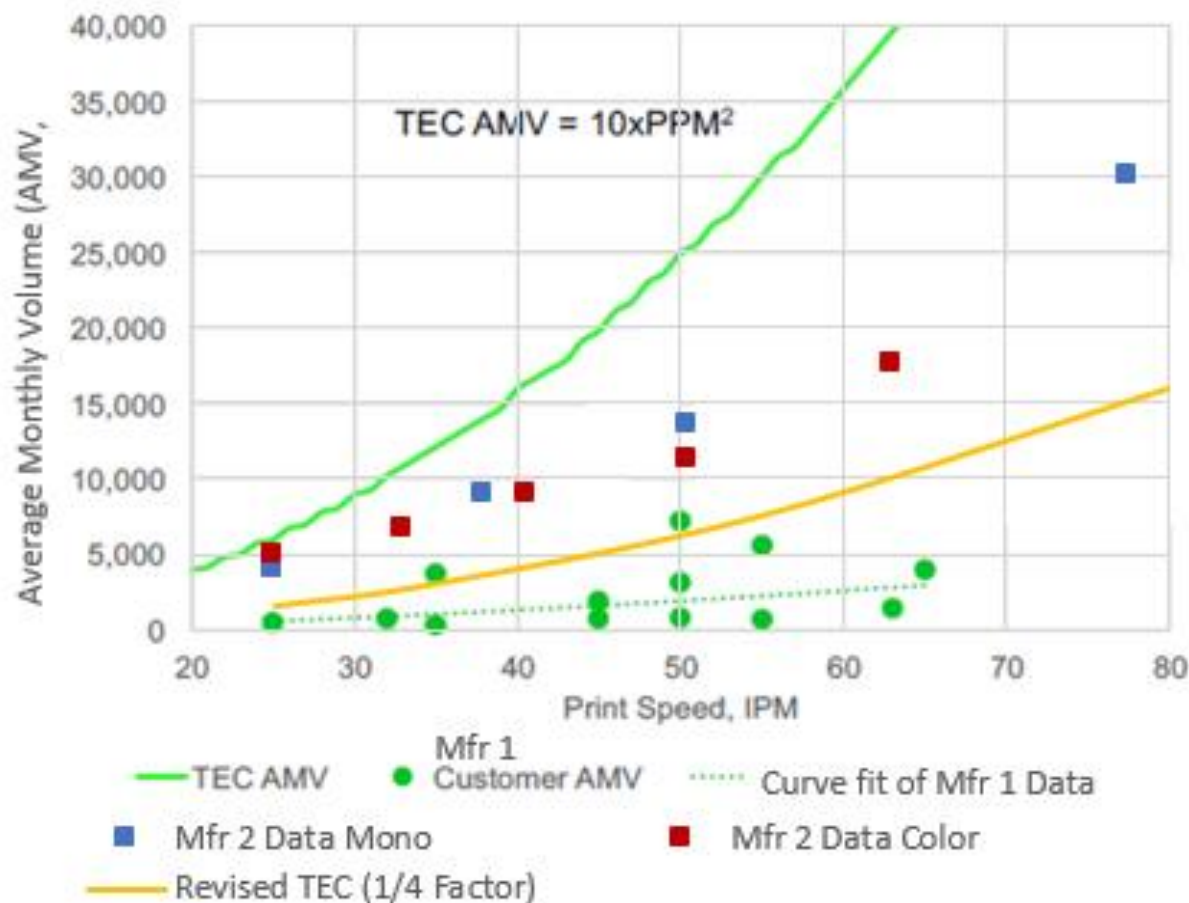
No Impact on Test Method

- Calculations in the test method would remain the same

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

Monochrome Product Speed, s (ipm)	Jobs per Day (N_{JOBS})
s ≤ 8	8
8 < s < 32	s
s ≥ 32	32

Equation 2: Calculation of Number of Images per Job

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

Where:
- N_{IMAGES} is the number of images per job, rounded down (truncated) to the nearest integer,
- s is the product speed in images per minute (ipm), calculated in section 6.1.B), of this test procedure, and
- N_{JOBS} is the number of jobs per day, as calculated per Table 7.

No Impact on Test Method

- TEC result in the spec would decrease by ~4x

Equation 3: TEC Calculation for Printers, Fax Machines, Digital Duplicators with Print Capability, and MFDs with Print Capability

$$TEC = 5 \times \left[E_{JOB\_DAILY} + (2 \times E_{FINAL}) + \left[24 - (N_{JOBS} \times 0.25) - (2 \times t_{FINAL}) \right] \times \frac{E_{SLEEP}}{t_{SLEEP}} \right] + 48 \times \frac{E_{SLEEP}}{t_{SLEEP}},$$

Where:

- *TEC is the typical weekly energy consumption for printers, fax machines, digital duplicators with print capability, and MFDs with print capability, expressed in kilowatt-hours (kWh) and rounded to the nearest 0.1 kWh for reporting;*
- E_{JOB_DAILY} *is the daily job energy, as calculated per Equation 5, in kWh;*
- E_{FINAL} *is the final energy, as measured in the test procedure, converted to kWh;*
- N_{JOBS} *is the number of jobs per day, as calculated in the test procedure,*
- t_{FINAL} *is the final time to Sleep, as measured in the test procedure, converted to hours;*
- E_{SLEEP} *is the Sleep energy, as measured in the test procedure, converted to kWh; and*
- t_{SLEEP} *is the Sleep time, as measured in the test procedure, converted to hours.*

No Impact on Test Method

- TEC result in the spec would decrease by ~4x

Equation 3: TEC Calculation for Printers, Fax Machines, Digital Duplicators with Print Capability, and MFDs with Print Capability

$$TEC_3 = 5 \times \left[\frac{E_{JOB\_DAILY}}{4} + (2 \times E_{FINAL}) + \left[24 - (N_{JOBS} \times 0.25) - (2 \times t_{FINAL}) \right] \times \frac{E_{SLEEP}}{t_{SLEEP}} \right] + 48 \times \frac{E_{SLEEP}}{t_{SLEEP}},$$

Where:

- TEC_3 *is the typical weekly energy consumption for printers, fax machines, digital duplicators with print capability, and MFDs with print capability, expressed in kilowatt-hours (kWh) and rounded to the nearest 0.1 kWh for reporting;*
- E_{JOB_DAILY} *is the daily job energy, as calculated per Equation 5, in kWh;*
- E_{FINAL} *is the final energy, as measured in the test procedure, converted to kWh;*
- N_{JOBS} *is the number of jobs per day, as calculated in the test procedure,*
- t_{FINAL} *is the final time to Sleep, as measured in the test procedure, converted to hours;*
- E_{SLEEP} *is the Sleep energy, as measured in the test procedure, converted to kWh; and*
- t_{SLEEP} *is the Sleep time, as measured in the test procedure, converted to hours.*

Discussion

- EPA welcomes feedback on this proposal.

Wi-Fi Prioritization

Time	Topic
12:00–12:15	Introductions and Specification Development Recap
12:15–12:50	Network Testing
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1:45–2:00	Timeline and Open Discussion

Introduction and Summary of Feedback

- A growing number of consumer and small office printers have Wi-Fi and are primarily accessed through Wi-Fi.
- Three stakeholders agreed with EPA's proposal to prioritize Wi-Fi over USB.

Proposal

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	Wi-Fi
4	USB 3.x
5	USB 2.x
6	USB 1.x
7	RS232
8	IEEE 1284[2]
9	Other Wired – in order of preference from highest to lowest speed

. . .

Minimizing Impact

- Should not affect TEC products, which are primarily accessed through Ethernet, as Ethernet remains at the top of the table

Discussion

- EPA welcomes feedback on this proposal.

Timeline and Open Discussion

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1:45–2:00	**Timeline and Open Discussion**

Timeline

- Q4 2017: Draft 2 Test Method and Draft 1, V3.0 specification.
- Q4 2017/Q1 2018: Final Draft Test Method and Draft 2, Version 3.0 specification.
- Q1/Q2 2018: Final Version 3.0 specification
- Q1 2019: Version 3.0 specification effective

Final Questions or Comments

Written Comment Submission

Please send any data and written feedback on the discussion document to imagingequipment@energystar.gov no later than **September 11, 2017**

Unless marked as confidential, comments will be posted on the Imaging Equipment Version 3.0 product development page at https://www.energystar.gov/products/spec/imaging_equipment_specification_version_3_0_pd

also accessible through www.energystar.gov/revisedspecs

Thank You!

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