ENERGY STAR
Imaging Equipment
Version 2.0 Kickoff

April 13, 2011
Christopher Kent

US Environmental Protection Agency
ENERGY STAR Program

Learn more at energystar.gov
Agenda

• Introduction
• Status of Current Version 1.2 ENERGY STAR Imaging Equipment Specification
• Proposed Timeline
• Walk through the 26 issues raised in Framework Document
• Next Steps
ENERGY STAR

- Started in 1992; Voluntary program
- GOAL: Reduce greenhouse gas (GHG) emissions through large win-win-win-win opportunities with today’s energy efficient technologies and practices
- Achieve 30% savings possible in many buildings, homes, and facilities
- Provide credible information to buyers
- Work with the marketplace to capitalize on motivations of individual actors
2011 Program Priorities

• Addressing new challenges and opportunities
  – Third-party certification across all product types
  – Verification program
• Maintaining strong brand is priority
  – More frequent reviews / updates to ENERGY STAR criteria
    o Appliances to be reviewed at a minimum every 3 years OR when market share for ENERGY STAR qualifying products reaches about 35%
    o Consumer electronics will be updated about every 2 years, including the use of out-year criteria that anticipate improved efficiency based on market trends
• Rolling out Top Tier
• Engaging with consumers via social media campaigns
• Reinforcing international partnerships
Current Specification

• For office equipment, specifications (new and revised) are developed jointly between EPA and the European Commission

• Version 1.1 ENERGY STAR specification for imaging equipment was published on October 1, 2008, and became effective on July 1, 2009
  – Version 1.2 was published on January 1, 2011, to incorporate ENERGY STAR Third-party Certification requirements and other necessary changes

• The current list of products includes Printers, Copiers, Digital Duplicators, Fax Machines, Mailing Machines, Scanners, and Multi-function Devices (MFDs)
Current Market penetration

• High market penetration in 2009
  – 47% for MFDs
  – 67% for printers
  – 78% for copiers
  – 97% for scanners
  – But only 7% for fax machines

• Significant energy savings for revising specifications for TEC printers and MFDs
  – 51 kWh/year average per-unit savings
  – 380 GWh/year cumulative savings
TEC Qualified Models by Year

- **TEC 1**
- **TEC 2**
- **TEC 3**
- **TEC 4**

Graphs show the relationship between TEC (kWh/wk) and product speed (IPM) for different years (2007, 2008, 2009, 2010) and ENERGY STAR Level.
TEC Qualified Models by Year

TEC 1

TEC 2

TEC 3

TEC 4
Anticipated Timeline

• Timeline may be adjusted depending on any major changes to test methods:

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
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<tbody>
<tr>
<td>Framework Document Published</td>
<td>March 11, 2011</td>
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<tr>
<td>Deadline for Written Comments on Scope and Test Method Issues</td>
<td>April 1, 2011</td>
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<tr>
<td>Imaging Equipment Webinar</td>
<td>April 13, 2011</td>
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<tr>
<td>Revision of Test Method (If Necessary)</td>
<td>Q2 2011</td>
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<td>Dataset Assembly In Accordance with New Test Method (If Necessary)</td>
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<td>Draft 1 Version 2.0 Specification and Stakeholder In-Person Meeting</td>
<td>Q3 2011</td>
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<td>Additional Draft Version 2.0 Specifications and Stakeholder Webinars</td>
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<td>Final Version 2.0 Specification</td>
<td>Q4 2011</td>
</tr>
<tr>
<td>Version 2.0 Specification Effective</td>
<td>Q3 2012</td>
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Framework Document

- EPA launched the specification revision by publishing a discussion document
  - Identified test method questions/issues
  - Highlighted many questions received since Version 1.1 went into effect
    - Questions posed by partners, certification bodies, others
- Comment period ended 4/1/11
  - Received 11 sets of comments
Issue 1: Non-Qualified Models

- EPA seeks to expand its data set to include current non-qualified models
  - Improve energy savings estimate
  - Help set revised specification levels
  - Complement shipment / market penetration numbers (only half the story)
- To date, EPA has received limited data from 3 manufacturers
- Spec development is a data-driven process,
  - Lacking new data from mfrs., EPA will rely on qualified product data and catalog information
Issues 2 & 3: Faxes and Scanners

- Very low market penetration of fax machines (7%)
- Very high market penetration of scanners (97%)
  - Latest draft of the Industry Voluntary Agreement of Lot 4 EuP directive does not include these equipment types
  - Does the ENERGY STAR label provide differentiation in the market for these two types?
  - What could be some consequences of removing these equipment types from the program?
Issues 2 & 3 - Fax Machines

- Manufacturers are not releasing new fax models—only MFDs
- Options (from comments):
  - Suggest separate category
  - Remove standby requirement
  - Remove from scope
Issues 2 & 3 - Scanners

• Several commenters asked that scanners be included despite low shipments:
  – In particular, large format and high-quality graphics scanners
  – May be subject to government procurement policies

• Others expressed support for removing scanners from the specification
Issue 4 - Comments

• Suggested removing copiers as they have reached maximum possible efficiency and are now being mostly offered as part of an MFD

• Several noted that all products should stay within the scope due to government procurement policies
Issues 5 & 6: New Product Types for Potential Inclusion

• New products:
  – High-performance ink jet (IJ) printers with width \( \leq 8 \) inches (small format)
    o Contrast with standard format high-performance ink jet (included in scope)
  – Impact MFDs

• EPA needs current and potential market and performance data on these new product types, if there is interest in including them
Issue 8: IEC Standard 62301 Ed. 2.0

  - Commenters expressed concern with definitions
  - E.g., Standby is now Off Mode in Ed. 2.0
Issue 8 - Comments

• Doubted that IEC standard could improve test method
  – Low-power testing of imaging already well-developed

• Proposed modifications to the test method in light of IEC standard include:
  – Measurement uncertainty and frequency limits
  – Power measurement methods (sampling, averaging, or direct meter reading, depending on conditions)

• Any specific problems with referencing Ed. 2.0?
Issue 9: Energy Consumption of Color Printing

• Color TEC products are becoming more popular
  – Impact of color printing was evaluated in 2005
  – Test image was a text document modified to include color—what about images?

• Stakeholders commented that fusing process is the same for monochrome and parallel color devices (dominant type) with little difference in energy consumption
Issue 10: Prevalence of Color v. Monochrome printing

• Shipments of color printers have surpassed monochrome

• Energy consumption might still be impacted by color images
  – Color usage and image density remains low
    o Commenters recommend continuing to use text as test image
Issue 11: Energy Storage in a Power Buffer

• Possible to store energy in a “Power Buffer” prior to Job 1 during TEC test
  – Energy consumed would not be measured
  – Could be used later in the test, potentially leading to lower apparent energy consumption
Issue 11 (cont.)

- Power Buffer charged
- Power Buffer discharged
- Potential Power Buffer Recharge

Mode:
- Off
- Active/Ready
- Sleep
- Active/Ready
- Active/Ready
- Active/Ready
- Active/Ready
- Ready/Sleep
- Auto-Off

Time (min.):
- 5+
- variable
- 60
- 15
- 15
- 15
- 15
- variable
- 5+ (copiers only)

Step:
- 1
- 2, 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

Not Measured
Issue 11 - Comments

• Several were skeptical of the power buffer
  – Current test methods and third-party certification is sufficient

• Not prevalent in the market and is only expected to decline
  – Nonetheless, some concerned about accounting for all energy consumed
Issue 12: Print Driver Settings

- Driver settings are currently unspecified
  - Could be changed to decrease printing time, thereby decreasing the measured energy use
- Stakeholders generally commented that current “as shipped” rules are sufficient
  - Nonetheless, could be specified explicitly (current rules apply only to device)
  - Specify simplex, default quality, etc.
- Suggest use “drivers installed as shipped”
Issue 13: Additional Test Method Edits

- The TEC test method requires measurements of both energy and time in sleep and auto-off modes
  - Values are later used in the specification to calculate power

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

- May be simpler to measure the power directly, if stable (e.g., per IEC 62301)
Issue 13 - Comments

- TEC products with duplexing capability should be tested in duplex mode.
- Several acknowledged the ambiguity in waiting for a unit to enter the final sleep mode and suggested:
  - Specifying the power level of the final sleep mode, or
  - Using the declared default delay time to stop the measurement.
Issue 13 - Comments

- Off Mode should be measured after a user has manually switched off the device
  - Measuring right at plug-in may capture initialization activities
- Clarify Default Delay Time definition
- Measure Sleep and Fax Modes for TEC products
Issue 14: TEC Assumptions

- TEC usage assumptions may be too intensive and not representative of actual paper usage and energy consumption
- Commenters noted:
  - Modifying the TEC usage profile would invalidate existing data without providing a more accurate representation of usage
  - Developing a more accurate usage profile could be time intensive and add little additional value
Issue 15: Recovery Time Discrepancy

![Graph showing discrepancy in recovery time between Active1 and Active0 modes. The graph plots Active 0 Time (Print Time from Ready Mode) in log scale against Active 1 Time (Recovery Time from Auto-off or Final Sleep Mode) in log scale. There is a notable discrepancy highlighted by a red circle, indicating that Active 0 Time is generally greater than Active 1 Time.]
Issue 15 - Comments

• Apparent discrepancy between Active1 time and Active0 time
  – [Active1 time (print time from sleep) should always be greater]
  – Some acknowledged ambiguities in the test method
  – Others disagreed or suggested individual intervention rather than test method changes are needed

• Curious about relationship btw. recovery time and energy consumption
Issue 16: Recovery Time for OM Products

• EPA interested in similar measurement of Active1 time and Active0 time for large and small format MFDs/printers/copiers covered under OM

• Commenters noted
  – Irrelevant to non-EP OM products
    o (No heater = No recovery time issues)
  – Alternatively, copiers and large non-ink jet devices may benefit from this measurement
Issue 17: Recovery Time Requirements

- EPA received comments on setting a specific maximum recovery time and a default recovery time:
  - Need supporting data to justify the energy savings associated with specifying a recovery time requirement
Issue 17 - Comments

- Recovery time depends on manufacturers’ patented technologies and should therefore not be standardized
- Specifying recovery time may over-constrain TEC measurement
- Manufacturers can already ensure user satisfaction—no need to specify recovery time
  - Others disagree
Issue 18: Digital Front End (DFE) Energy Consumption

Figure 5: Distribution of DFE power in Ready Mode for ENERGY STAR qualified products.
Issue 18 (cont.)

• Options for reducing DFE energy consumption:
  – Qualification as a server or small-scale server
  – Treating as functional adders
  – Incenting or requiring a sleep mode for DFEs
  – Considering the DFE an integral component of imaging product

• Manufacturers commented that DFEs differ from other computers and servers
  – Disagree on best approach from above
• Reducing sleep mode energy
  – DFEs already matched to capabilities of imaging product—not much time spent in active mode outside of printing
  – Goal is to enter sleep mode immediately and remain there

• Could be enabled by efficient networking
  – ECMA-393 ProxZzzy and IEEE 802.3az standards
  – Concerns that components are unavailable
Issue 19: Number of Network Connections

- New certification and verification program requires clarity on number, order, and activity of network connections
  - Impact energy consumption

- EPA proposed specifying that only one network/data connection be used during testing

- Although some commenters agreed that such a change would remove ambiguity, others noted:
  - It should remain at the manufacturers’ discretion
  - It would not be reflective of reality (E.g., multiple PCs connected over the network)
Issue 20: Order of Network Connections

• Specifying the type of network connection used during testing, in order of preference
  – (E.g., USB, Ethernet, WiFi, other wired, other wireless)

• Some commenters supported a specific order (dependent on application)

• Others promoted manufacturer discretion
  – Potential compromise could involve testing highest-power interface, as specified by mfr.
Issue 21: Network Activity

- EPA also welcomes comment on specifying network activity during testing
  - As network activity may affect device energy consumption, specifying this would improve repeatability and representativeness
Issue 21 - Comments

• Some commenters were opposed
  – Too difficult to specify
  – Requires revisions as network standards are revised

• One commenter was supportive
  – “Send an SNMP packet at least once every 10 minutes” through a network-connected PC
Issue 22: Connection to Telephone Line

- EPA welcomes comment on specifying that any fax function, if available, be enabled and connected to the phone line during testing
  - Fax Machines
  - MFDs
- Two stakeholders opposed to requiring connection to the telephone line
  - Would not significantly alter energy consumption
Issue 23: Default Delay Time to Sleep for TEC Products

- EPA only specifies default delay time to sleep for OM products
  - Should delay times be measured/specified for TEC products?
- Most commenters concerned with over-constraining:
  - Specifying both total kWh and modal limits (delay times)
  - Also, delay time measurement would impose additional burden—just require declaration
Issue 25: Testing Some OM Products in Active Mode

- Proposal to apply the TEC test method or on-mode measurement to some OM products that spend significant time in active mode
  - (E.g., receipt printers, ink jet printers for business)
- One commenter in favor; others opposed
  - One commenter noted that products without heaters (i.e., non-EP) would not benefit from active mode testing
  - Neither would most large-format devices
  - Should only be implemented for applications with standardized usage
Issue 26: Life Cycle Analyses

- EPA seeks clarification on sources of high GHG emissions in the imaging equipment life cycle and supporting data.
- One commenter noted impacts of paper use on the life-cycle energy consumption of imaging equipment:
  - Greater than electricity use, materials, or consumables.
All ENERGY STAR Products Screened

- Economic Input-Output Life Cycle Assessment (EIO LCA) method performed on all ENERGY STAR product categories
  - Maps economic data against environmental data for industries to estimate GHG emissions associated with products during specific stages of lifecycle.
  - Based on Comprehensive Env. Data Archive (CEDA)
- Case by case, check unintended consequences (e.g. from incandescent to fluorescent/SSL)
- Flag products for additional analysis
- Also include end of life GHG emissions for select products (outside the scope of EIO LCA method)
EIO Background

• Takes an aggregate view of economic sectors producing all goods and services in the U.S.
  – Relies on U.S. Department of Commerce input-output table that divides U.S. economy into 500 sectors
  – Calculates production from each sector that goes into each other sector ($ per $)
  – Final output (to consumers) from a sector can then be used to calculate inputs from every economic sector

• Advantages: Avoids the need to draw boundaries since it covers the entire economy; cheap and quick; relies on publically available data

• Disadvantages: Product assessments contain aggregate data, need to link monetary values with physical values, data issues (e.g., incomplete, aggregated, imports may not be current)
More about EIO

- Researchers (e.g. Sangwon Suh) calculate GHG intensity (GHG/$) of each sector
- Final production in a given sector can then also be used to calculate total emissions
  - Can be used to estimate relative contributions to an “average” product
  - More expensive products automatically emit more, which may not reflect reality
The product (for instance, a room AC) is associated with a sector, in this case 333415: Air conditioning, refrigeration, and warm air heating equipment. Each sector has GHG/$ associated with it. It also has $/$ input from each other sector, each of which has its own GHG/$.

The EIO tables allow direct inputs and indirect inputs (full depth) information.

Direct inputs

Indirect inputs (Tier 2)

Indirect inputs (Tier 3, 4, 5, …)
Issue 26 - Comments

• Majority of commenters were opposed to LCA:
  – Expensive and burdensome
  – Distracts from ENERGY STAR brand
  – Large margin of error/uncertainty
  – Lack of standards governing LCA

• Similarly, stakeholders commented that ENERGY STAR should not cover substance restrictions / toxicity
Conclusion and Next Steps

• EPA will carefully weigh the potential benefit of any changes to the test method
  – Aware that significant changes will incur retesting burden
  – Will ensure any changes provide a net benefit

• Potential revised draft test method published in May
  – Followed by a webinar/meeting

• Otherwise, Draft 1 specification in June–July
Contact Information

• Please send any additional comments to imagingequipment@energystar.gov or contact:

Christopher Kent
Kent.Christopher@epa.gov

Matt Malinowski
MMalinowski@icfi.com