



ENERGY STAR® Product Specification for Imaging Equipment

Eligibility Criteria Draft 1, Version 3.0

1 Following is the Draft 1, Version 3.0 ENERGY STAR Product Specification for Imaging Equipment. A
2 product shall meet all of the identified criteria if it is to earn the ENERGY STAR.

3 **1 DEFINITIONS**

4 A) Product Types:

5 1) Printer: A product whose primary function is to generate paper output from electronic input. A
6 printer is capable of receiving information from single-user or networked computers, or other input
7 devices (e.g., digital cameras). This definition is intended to cover products that are marketed as
8 printers and printers that can be field-upgraded to meet the definition of an MFD.

9 2) Scanner: A product whose primary function is to convert paper originals into electronic images
10 that can be stored, edited, converted, or transmitted, primarily in a personal computing
11 environment. This definition is intended to cover products that are marketed as scanners.

12 3) Copier: A product whose sole function is to produce paper duplicates from paper originals. This
13 definition is intended to cover products that are marketed as copiers, and upgradeable digital
14 copiers (UDCs).

15 4) Facsimile (Fax) Machine: A product whose primary functions are (1) to scan paper originals for
16 electronic transmission to remote units, and (2) to receive electronic transmissions for conversion
17 to paper output. A fax machine may also be capable of producing paper duplicates. Electronic
18 transmission is primarily over a public telephone system, but may also be via a computer network
19 or the Internet. This definition is intended to cover products that are marketed as fax machines.

20 5) Multifunction Device (MFD): A product that performs the core functions of a Printer and Scanner.
21 An MFD may have a physically integrated form factor, or it may consist of a combination of
22 functionally integrated components. MFD copy functionality is considered to be distinct from
23 single-sheet convenience copying functionality sometimes offered by fax machines. This
24 definition includes products marketed as MFDs and “multi-function products” (MFPs).

25 **Note:** EPA proposes the above simplified definition for MFDs as a combination of Printer and Scanner to
26 reflect the disappearance of standalone copiers from the market as well as the proposal, in Section 3.4.3
27 to include the OM scanner adder allowance directly in the MFD base allowance.

28 6) Digital Duplicator: A product sold as a fully-automated duplicator system through the method of
29 stencil duplicating with digital reproduction functionality. This definition is intended to cover
30 products that are marketed as digital duplicators.

31 7) Mailing Machine: A product whose primary function is to print postage onto mail pieces. This
32 definition is intended to cover products that are marketed as mailing machines.

33 8) Professional Imaging Product: A printer or MFD marketed as intended for producing deliverables
34 for sale, with the following features:

35 a) Supports paper with basis weight greater than or equal to 141 g/m²;

- 36 b) A3-capable;
- 37 c) Monochrome product speed equal to or greater than 86 ipm;
- 38 d) Color product speed equal to or greater than 50 ipm (if product is color capable);
- 39 e) Print resolution of 600 × 600 dots per inch or greater for each color; and
- 40 Three of the following additional features, included standard with the Imaging Equipment product
41 or as an accessory:
- 42 f) Paper capacity equal to or greater than 8,000 sheets;
- 43 g) Digital front-end (DFE);
- 44 h) Hole punch;
- 45 i) Case binding or ring binding;
- 46 j) Memory storage equal to or greater than 1,024 MB.
- 47 k) Third-party color certification (e.g., GRACol®, Japan Color Digital Printing Certification; if
48 product is color capable); and
- 49 l) Coated paper compatibility.

50 **Note:** EPA proposes the above definition for Professional Imaging Products based on industry
51 recommendations to differentiate heavy-duty products which are intended to produce copies for sale.
52 EPA proposes to use tailored test and energy requirements for these products. EPA further clarified the
53 industry definition by listing examples of color certification and expressing the memory requirement in
54 terms of megabytes. More than 80% of currently ENERGY STAR certified Professional Imaging Products
55 have internal memory greater than 1,024 MB, compared to 22% of all ENERGY STAR certified Imaging
56 Equipment. EPA believes that this definition better differentiates these heavy-duty products than that
57 presented in the Discussion Document, which stakeholders indicated could encompass some non-
58 professional products.

59 B) Marking Technologies:

- 60 1) Direct Thermal (DT): A marking technology characterized by the burning of dots onto coated print
61 media that is passed over a heated print head. DT products do not use ribbons.
- 62 2) Dye Sublimation (DS): A marking technology characterized by the deposition (sublimation) of dye
63 onto print media as energy is supplied to heating elements.
- 64 3) Electro-photographic (EP): A marking technology characterized by the illumination of a
65 photoconductor in a pattern representing the desired output image via a light source,
66 development of the image with particles of toner using the latent image on the photoconductor to
67 define the presence or absence of toner at a given location, transfer of the toner to the final print
68 media, and fusing to cause the output to become durable. For purposes of this specification,
69 Color EP products simultaneously offer three or more unique toner colors, while Monochrome EP
70 products simultaneously offer one or two unique toner colors. This definition includes Laser, Light
71 Emitting Diode (LED), and Liquid Crystal Display (LCD) illumination technologies.
- 72 4) Impact: A marking technology characterized by the formation of the desired output image by
73 transferring colorant from a “ribbon” to the print media via an impact process. This definition
74 includes Dot Formed Impact and Fully Formed Impact.

- 75 5) Ink Jet (IJ): A marking technology characterized by the deposition of colorant in small drops
76 directly to the print media in a matrix manner. For purposes of this specification, Color IJ products
77 offer two or more unique colorants at one time, while Monochrome IJ products offer one colorant
78 at a time. This definition includes Piezo-electric (PE) IJ, IJ Sublimation, and Thermal IJ. This
79 definition does not include High Performance IJ.
- 80 6) High Performance IJ: An IJ marking technology that includes nozzle arrays that span the width of
81 a page and/or the ability to dry ink on the print media via supplemental media heating
82 mechanisms. High-performance IJ products are used in business applications usually served by
83 electro-photographic marking products.
- 84 7) Solid Ink (SI): A marking technology characterized by ink that is solid at room temperature and
85 liquid when heated to the jetting temperature. This definition includes both direct transfer and
86 offset transfer via an intermediate drum or belt.
- 87 8) Stencil: A marking technology characterized by the transfer of images onto print media from a
88 stencil that is fitted around an inked drum.
- 89 9) Thermal Transfer (TT): A marking technology characterized by the deposition of small drops of
90 solid colorant (usually colored waxes) in a melted/fluid state directly to print media in a matrix
91 manner. TT is distinguished from IJ in that the ink is solid at room temperature and is made fluid
92 by heat.
- 93 C) Operational Modes:
- 94 1) On Mode:
- 95 a) Active State: The power state in which a product is connected to a power source and is
96 actively producing output, as well as performing any of its other primary functions.
- 97 b) Ready State: The power state in which a product is not producing output, has reached
98 operating conditions, has not yet entered into any lower-power modes, and can enter Active
99 State with minimal delay. All product features can be enabled in this state, and the product is
100 able to return to Active State by responding to any potential inputs, including external
101 electrical stimulus (e.g., network stimulus, fax call, or remote control) and direct physical
102 intervention (e.g., activating a physical switch or button).
- 103 2) Off Mode: The power state that the product enters when it has been manually or automatically
104 switched off but is still plugged in and connected to the mains. This mode is exited when
105 stimulated by an input, such as a manual power switch or clock timer to bring the unit into Ready
106 State. When this state is resultant from a manual intervention by a user, it is often referred to as
107 Manual Off, and when it is resultant from an automatic or predetermined stimuli (e.g., a delay time
108 or clock), it is often referred to as Auto-off.¹
- 109 3) Sleep Mode: A reduced power state that a product enters either automatically after a period of
110 inactivity (i.e., Default Delay Time), in response to user manual action (e.g., at a user-set time of
111 day, in response to a user activation of a physical switch or button), or in response to external
112 electrical stimulus (e.g., network stimulus, fax call, remote control). For products evaluated under
113 the TEC test method, Sleep Mode permits operation of all product features (including
114 maintenance of network connectivity), albeit with a possible delay to transition into Active State.
115 For products evaluated under the OM test method, Sleep Mode permits operation of a single
116 active network interface, as well as a fax connection if applicable, albeit with a possible delay to
117 transition into Active State.

1 For the purposes of this specification “mains” or the “main electricity supply” refers to the input power source, including a dc power supply for products that operate solely off dc power.

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Note: To avoid confusion relating to the Standby power requirement and definition, EPA has redefined it as an Off Mode power requirement and proposes to remove the Standby definition. As before, products that do not have an Off Mode shall meet the Off requirement in Sleep Mode, and those that do not have Off mode or Sleep Mode shall meet the Off requirements in Ready State.

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D) Media Format:

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- 1) Large Format: Products designed for A2 media and larger, including those designed to accommodate continuous form media greater than or equal to 406 mm wide. Large-format products may also be capable of printing on standard-size or small-format media.

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- 2) Standard Format: Products designed for standard-sized media (e.g., Letter, Legal, Ledger, A3, A4, B4), including those designed to accommodate continuous form media between 210 mm and 406 mm wide. Standard-size products may also be capable of printing on small-format media.

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- a) A3-capable: Standard Format products with a paper path width equal to or greater than 275 mm.

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- 3) Small Format: Products designed for media sizes smaller than those defined as Standard (e.g., A6, 4"x6", microfilm), including those designed to accommodate continuous form media less than 210 mm wide.

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- 4) Continuous Form: Products that do not use a cut-sheet media format and that are designed for applications such as printing of bar codes, labels, receipts, banners, and engineering drawings. Continuous Form products can be Small, Standard, or Large Format.

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E) Additional Terms:

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- 1) Automatic Duplexing: The capability of an MFD or printer to produce images on both sides of an output sheet, without manual manipulation of output as an intermediate step. A product is considered to have automatic duplexing capability only if all accessories needed to produce a duplex output are included with the product upon shipment.

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- 2) Data Connection: A connection that permits the exchange of information between the Imaging Equipment and one external powered device or storage medium.

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- 3) Default Delay Time: The time set by the manufacturer prior to shipping that determines when the product will enter a lower-power mode (e.g., Sleep, Auto-off) following completion of its primary function.

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- 4) Recovery Time: The time it takes for a device to return from a Sleep or Off Mode to a Ready State.

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Note: A stakeholder requested that EPA require maximum recovery times from sleep, as long recovery times may encourage stakeholders to disable energy saving settings. The stakeholder also requested that EPA harmonize with Germany's Blue Angel in setting recovery time requirements. Therefore, EPA has defined recovery time as Blue Angel does and proposed equivalent requirements for Typical Electricity Consumption (TEC) products (in Section 3.3.4, below).

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- 5) Digital Front-end (DFE): A functionally-integrated server that hosts other computers and applications and acts as an interface to Imaging Equipment. A DFE provides greater functionality to the Imaging Equipment.

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- a) A DFE offers three or more of the following advanced features:

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- i. Network connectivity in various environments;
- ii. Mailbox functionality;
- iii. Job queue management;

- 161 iv. Machine management (e.g., waking the Imaging Equipment from a reduced power
162 state);
- 163 v. Advanced graphic user-interface (UI);
- 164 vi. Ability to initiate communication with other host servers and client computers (e.g.,
165 scanning to email, polling remote mailboxes for jobs); or
- 166 vii. Ability to post-process pages (e.g., reformatting pages prior to printing).
- 167 b) Type 1 DFE: A DFE that draws its dc power from its own ac power supply (internal or
168 external), which is separate from the power supply that powers the Imaging Equipment. This
169 DFE may draw its ac power directly from a wall outlet, or it may draw it from the ac power
170 associated with the Imaging Equipment's internal power supply. A Type 1 DFE may be sold
171 standard with the Imaging Equipment product or as an accessory.
- 172 c) Type 2 DFE: A DFE that draws its dc power from the same power supply as the Imaging
173 Equipment with which it operates. Type 2 DFEs must have a board or assembly with a
174 separate processing unit that is capable of initiating activity over the network and can be
175 physically removed, isolated, or disabled using common engineering practices to allow power
176 measurements to be made.
- 177 d) Auxiliary Processing Accelerator (APA): A computing expansion add-in card installed in a
178 general-purpose add-in expansion slot of the DFE (e.g., GPGPU installed in a PCI slot).
- 179 6) Network Connection: A connection that permits the exchange of information between the Imaging
180 Equipment and one or more external powered devices.
- 181 7) Functional Adder: A data or network interface or other component that adds functionality to the
182 marking engine of an Imaging Equipment product and provides a power allowance when
183 qualifying products according to the OM method.
- 184 8) Operational Mode (OM): For the purposes of this specification, a method of comparing product
185 energy performance via an evaluation of power (measured in watts) in various operating states,
186 as specified in Section 9 of the ENERGY STAR Imaging Equipment Test Method.
- 187 9) Typical Electricity Consumption (TEC): For the purposes of this specification, a method of
188 comparing product energy performance via an evaluation of typical electricity consumption
189 (measured in kilowatt-hours) during normal operation over a specified period of time, as specified
190 in Section 8 of the ENERGY STAR Imaging Equipment Test Method.
- 191 10) Marking Engine: The fundamental engine of an Imaging Equipment product that drives image
192 production. A marking engine relies upon functional adders for communication ability and image
193 processing. Without functional adders and other components, a marking engine cannot acquire
194 image data for processing and is non-functional.
- 195 11) Base Product: The most fundamental configuration of a particular Product Model, which
196 possesses the minimum number of functional adders available. Optional components and
197 accessories are not considered part of a base product.
- 198 12) Accessory: A piece of peripheral equipment that is not necessary for the operation of the Base
199 Product, but that may be added before or after shipment in order to add functionality. An
200 accessory may be sold separately under its own model number, or sold with a base product as
201 part of a package or configuration.
- 202 13) Product Model: An Imaging Equipment product that is sold or marketed under a unique model
203 number or marketing name. A product model may be comprised of a base product or a base
204 product plus accessories.

205 14) **Product Family:** A group of product models that are (1) made by the same manufacturer, (2)
 206 subject to the same ENERGY STAR qualification criteria, and (3) of a common basic design.
 207 Product models within a family differ from each other according to one or more characteristics or
 208 features that either (1) have no impact on product performance with regard to ENERGY STAR
 209 qualification criteria, or (2) are specified herein as acceptable variations within a product family.
 210 For Imaging Equipment, acceptable variations within a product family include:

- 211 a) Color,
- 212 b) Housing,
- 213 c) Input or output paper-handling accessories,
- 214 d) Electronic components not associated with the marking engine of the Imaging Equipment
 215 product, including Type 1 and Type 2 DFEs.

216 **2 SCOPE**

217 **2.1 Included Products**

218 2.1.1 Commercially-available products that meet one of the Imaging Equipment definitions in
 219 Section 1.A) and are capable of being powered from (1) a wall outlet, (2) a data or network
 220 connection, or (3) both a wall outlet and a data or network connection, are eligible for ENERGY
 221 STAR qualification, with the exception of products listed in Section 2.2.

222 2.1.2 An Imaging Equipment product must further be classified as either “TEC” or “OM” in Table 1,
 223 below, depending on the method of ENERGY STAR evaluation.

224 **Table 1: Evaluation Methods for Imaging Equipment**

Equipment Type	Media Format	Marking Technology	ENERGY STAR Evaluation Method
Digital Duplicator	Standard	Stencil	TEC
Mailing Machine	All	DT, EP, IJ, TT	OM
Multifunction Device (MFD)	Standard	High Performance IJ, DT, DS, EP, SI, TT	TEC
		IJ, Impact	OM
	Large	High Performance IJ, DT, DS, EP, IJ, SI, TT	OM
Printer	Standard	High Performance IJ, DT, DS, EP, SI, TT	TEC
		IJ, Impact	OM
	Large or Small	DT, DS, EP, Impact, IJ, SI, TT	OM
	Large	High Performance IJ	OM
	Small	High Performance IJ	TEC
Scanner	All	N/A	OM

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226 **2.2 Excluded Products**

227 2.2.1 Products that are covered under other ENERGY STAR product specifications are not eligible for
228 qualification under this specification. The list of specifications currently in effect can be found at
229 www.energystar.gov/products.

230 2.2.2 Products that satisfy one or more of the following conditions are not eligible for ENERGY STAR
231 qualification under this specification:

- 232 i. Products that are designed to operate directly on three-phase power;
- 233 ii. Professional Imaging Products
- 234 iii. Standalone Copiers; and
- 235 iv. Standalone Fax Machines.

236 **Note:** EPA received comment from multiple stakeholders supporting the proposal to add copiers and fax
237 machines to the list of excluded products and has therefore removed them from Table 1 above. EPA
238 noted that there has been a precipitous drop in shipments, which the Agency believes has reduced the
239 incentive for manufacturers to invest in efficiency in these product categories.
240

241 EPA is proposing a definition for Professional Imaging Products in this Draft 1 specification as well as test
242 method clarifications specific to Professional Imaging Products in the Draft 2 test procedure. However, as
243 the test data must still be collected to the new test method, EPA is maintaining the current scope in Draft
244 1. EPA intends this move to be temporary until International Organization for Standardization (ISO)
245 Standard 21632 “Graphic technology -- Determination of the energy consumption of digital printing
246 devices including transitional and related modes” is finalized along with recommended job structures that
247 can form a TEC metric for Professional Imaging Products.
248

249 EPA welcomes feedback on all the Professional Imaging Product proposals, including definition and test
250 method, as well as current data on their energy consumption using the latest draft of ISO 21632. Finally,
251 EPA welcomes feedback on the following questions pertaining to a job structure/usage profile that would
252 allow EPA to convert the modal results from the test method into an annual energy consumption metric
253 for evaluation against requirements.
254

255 EPA proposes including the following modes tested under ISO 21632 in the usage profile. Is there a
256 reason to exclude any of the below from the usage profile?

- 257 a. Startup (Test print);
- 258 b. Maintenance;
- 259 c. Active State (Production);
- 260 d. Idles State (Print-ready); or
- 261 e. Sleep Mode?
262

263 2. ISO 21632 requires testing two jobs, with a third one in case of inconsistency between Jobs 1 and 2.
264 Should EPA test additional jobs? Should EPA duplicate the results of Jobs 1, 2, or 3 to model
265 additional daily jobs without requiring additional testing of unique jobs?
266

267 3. ISO 21632 requires a minimum job duration of 5 minutes (e.g., 500 pages for a 100 ipm product).
268 Because the product achieves a steady-state power draw during this time, the energy measurements
269 results from these 5 minute jobs can be scaled to model the energy consumption of longer jobs. What
270 is the typical job/daily/monthly print volume? One group of stakeholders averaged monthly volumes
271 (AMV) across a group of products to estimate $AMV \approx 4.35s$ for monochrome and $AMV \approx 1.96s$ for
272 color, where s is the product speed in ipm. Weekly volume would equal $1004s$, while annual volume
273 would equal $52,200s$. To calculate Active State energy consumption over weekly and annual periods,
274 one would multiply the results from the 5-minute job by 200.8 and 10,440, respectively. EPA
275 welcomes comment on these assumptions.
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277 4. How many days per week and weeks per year are Professional Imaging Products typically operating?
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279 5. How should the best quality and best productivity combinations be factored into the test (e.g., should
280 the results be averaged, or should a product be required to meet the ENERGY STAR requirements
281 under each scenario?
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283 EPA welcomes stakeholder feedback on these issues, which will help inform a potential job
284 structure/usage profile.

285 **3 QUALIFICATION CRITERIA**

286 **3.1 Significant Digits and Rounding**

287 3.1.1 All calculations shall be carried out with directly measured (unrounded) values.

288 3.1.2 Unless otherwise specified, compliance with specification limits shall be evaluated using directly
289 measured or calculated values without any benefit from rounding.

290 3.1.3 Directly measured or calculated values that are submitted for reporting on the ENERGY STAR
291 website shall be rounded to the nearest significant digit as expressed in the corresponding
292 specification limit.

293 **3.2 General Requirements**

294 3.2.1 External Power Supply (EPS): Single- and Multiple-voltage EPSs shall meet the Level VI or
295 higher performance requirements under the International Efficiency Marking Protocol when tested
296 according to the Uniform Test Method for Measuring the Energy Consumption of External Power
297 Supplies, Appendix Z to 10 CFR Part 430.

- 298 i. Single-voltage EPSs shall include the Level VI or higher marking.
- 299 ii. Multiple-voltage EPSs meeting Level VI or higher shall include the Level VI or higher
300 marking.
- 301 iii. Additional information on the Marking Protocol is available
302 at <http://www.regulations.gov/#!documentDetail;D=EERE-2008-BT-STD-0005-0218>.
- 303 iv. The above requirements shall not apply to any EPSs shipped with a Digital Front End (DFE).

304 **Note:** EPA has revised the EPS requirement to Level VI, harmonizing with the increased stringency of
305 U.S. federal energy conservation standards for EPSs.

306 3.2.2 Additional Cordless Handset: Fax machines and MFDs with fax capability that are sold with
307 additional cordless handsets shall use an ENERGY STAR qualified handset, or one that meets
308 the ENERGY STAR Telephony specification when tested to the ENERGY STAR test method on
309 the date the Imaging Equipment product is qualified as ENERGY STAR. The ENERGY STAR
310 specification and test method for telephony products may be found at
311 www.energystar.gov/products.

312 3.2.3 Functionally Integrated MFD: If an MFD consists of a set of functionally integrated components
313 (i.e., the MFD is not a single physical device), the sum of the measured energy or power
314 consumption for all components shall be less than the relevant MFD energy or power
315 consumption requirements for ENERGY STAR qualification.

316 3.2.4 **DFE Requirements:** The Typical Electricity Consumption (TEC_{DFE}) of a Type 1 or Type 2 DFE
317 sold with an Imaging Equipment product at the time of sale shall be calculated using Equation 1
318 for a DFE without Sleep Mode or Equation 2 for a DFE with Sleep Mode. The resulting TEC_{DFE}
319 value shall be less than or equal to the maximum TEC_{DFE} requirement specified in Table 2 for the
320 given DFE type.

321 Note: EPA proposes to change all TEC requirements to Kilowatt-hours per Year (kWh/year) to
322 address issues with reporting accuracy and comparisons between other ENERGY STAR
323 products (which typically report in kWh/year).
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- 325 i. The TEC value or Ready State power of a DFE that meets the maximum TEC_{DFE}
326 requirements should be excluded or subtracted from the TEC energy and OM power
327 measurements of the Imaging Equipment product as appropriate.
- 328 ii. Section 3.3.2 provides further detail on subtracting TEC_{DFE} values from TEC products;
329 iii. Section 3.4.2 provides further detail for excluding DFEs from OM Sleep and Standby levels.
330 iv. DFEs that fail to meet these requirements will not only not have their power subtracted from
331 that of the Imaging Equipment product as a whole, but will disqualify the product from
332 ENERGY STAR. Therefore, such DFEs may not be sold with ENERGY STAR qualified
333 Imaging Equipment.

334 **Equation 1: TEC_{DFE} Calculation for Digital Front Ends without Sleep Mode**

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$$TEC_{DFE} = \frac{8736 \times P_{DFE_READY}}{1000}$$

336
337 *Where:*

- 338 • TEC_{DFE} is the typical yearly energy consumption for DFEs, expressed in
339 kilowatt-hours (kWh) and rounded to the nearest 0.1 kWh for reporting;
340 • P_{DFE_READY} is Ready State power measured in the test procedure in watts.

341 **Note:** EPA proposes to change all TEC requirements to kilowatt-hours per Year (kWh/year) to address
342 issues with reporting accuracy and comparisons between other ENERGY STAR products (which typically
343 report in kWh/year). EPA has therefore multiplied all existing requirements by 52, the number of weeks in
344 a year.

345 **Equation 2: TEC_{DFE} Calculation for Digital Front Ends with Sleep Mode**

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$$TEC_{DFE} = \frac{52 \times \left[(45 \times P_{DFE_READY}) + (123 \times P_{DFE_SLEEP}) \right]}{1000}$$

347
348 *Where:*

- 349 • TEC_{DFE} is the typical yearly energy consumption for DFEs, expressed in
350 kilowatt-hours (kWh) and rounded to the nearest 0.1 kWh for reporting;
351 • P_{DFE_READY} is the DFE Ready State power measured in the test procedure in
352 watts.
353 • P_{DFE_SLEEP} is the DFE Sleep Mode power measured in the test procedure in
354 watts.

Table 2: Maximum TEC_{DFE} Requirements for Type 1 and Type 2 DFEs

DFE Category	Category Description	Maximum TEC _{DFE} (kWh/year)	
		Type 1 DFE	Type 2 DFE
A	All DFEs that do not meet the definition of Category B will be considered under Category A for ENERGY STAR qualification.	364	156
B	To qualify under Category B DFEs must have: 2 or more physical CPUs or 1 CPU and ≥ 1 discrete Auxiliary Processing Accelerators (APAs)	624	156

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Note: EPA proposes to change all TEC requirements to kilowatt-hours per year (kWh/yr) to address issues with reporting accuracy and comparisons between other ENERGY STAR products (which typically report in kWh/yr).

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Moreover, EPA has proposed more stringent requirements for TEC Imaging Equipment products that are shipped with a DFE. The proposed requirements offer the best differentiation while reflecting the performance of a good selection of products from a range of partners. TEC_{DFE} values must fall below the maximum value in Table 2 for a product to qualify.

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3.2.5 Default Delay Time: Measured Default Delay Time to Sleep ($t_{DEFAULT}$) shall be less than or equal to the Required Default Delay Time to Sleep ($t_{DEFAULT_REQ}$) requirement specified in Table 3, subject to the following conditions:

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- i. When reporting data and qualifying products that can enter Sleep Mode in multiple ways, partners should reference a Sleep level that can be reached automatically. If the product is capable of automatically entering multiple, successive Sleep levels, it is at the manufacturer's discretion which of these levels is used for qualification purposes; however, the default-delay time provided must correspond with whichever level is used.
- ii. Default Delay Time does not apply to OM products that can meet Sleep Mode requirements in Ready State.
- iii. The Default Delay Time to Sleep may not be adjusted by the user to be greater than the Maximum Delay Times to Sleep Adjustable by the User, as specified in Table 4.

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Table 3: Required Default Delay Time to Sleep for OM and TEC Products

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Monochrome Product Speed, s , as Calculated in the Test Method (ipm or mppm)	Required Default Delay Time to Sleep, $t_{DEFAULT_REQ}$ for MFDs, Scanners, Mailing Machines, and Digital Duplicators with Copying Capability (minutes)*	Required Default Delay Time to Sleep, $t_{DEFAULT_REQ}$, for Printers and Digital Duplicators without Copying Capability (minutes)*
$s \leq 10$	15	5
$10 < s \leq 20$	30	15
$20 < s \leq 30$	45	30
$30 < s \leq 50$	45	45
$s > 50$	45	45

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*Measured Default Delay Time to Sleep (t_{SLEEP}) shall be less than or equal to the Required Default Delay Time to Sleep (t_{SLEEP_REQ}), as specified in Section 3.2.5.

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394 **Note:** EPA proposes to harmonize the default delay time requirements with those in the Blue Angel
 395 requirements, and extend them to all Imaging Equipment products (both TEC and OM). The Blue Angel
 396 requirements are equivalent to the current ENERGY STAR requirements for OM printers and MFDs at the
 397 lower print speeds, so most OM printers and MFDs would continue to meet the new requirements.
 398 However, the Blue Angel requirements are more stringent at the higher print speeds (45-minute maximum
 399 versus 60). Therefore, harmonizing with the Blue Angel requirements will strengthen the criteria for
 400 higher-speed products.

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 402 The Default Delay Time to Sleep was already reported for OM and TEC products through the Qualified
 403 Product Exchange (QPX), but EPA has made the collection of this parameter explicit in the Draft 2 test
 404 method. In the process, to avoid confusion, EPA has renamed the variable to $t_{DEFAULT}$ from t_{SLEEP} .

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406 **Table 4: Maximum Delay Times to Sleep Adjustable by the User**

All Devices with a Monochrome Product Speed, s	Maximum Delay Times for Sleep Mode Adjustable by the User (min)
$s \leq 30$	60
$s > 30$	120

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408 **Note:** The Version 2.0 specification has a 4-hour Maximum Machine Delay Time requirement for OM
 409 products only. To ensure additional energy savings, EPA proposes to apply a more stringent requirement
 410 to both OM and TEC products that is harmonized with Germany’s Blue Angel requirement of 1 or 2 hours
 411 depending on product speed. Also, EPA proposes to rename this requirement to “Maximum Delay Times
 412 to Sleep Adjustable by the User” to make the nature of this requirement clearer.

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414 **3.3 Requirements for Typical Electricity Consumption (TEC) Products**

415 3.3.1 Automatic Duplexing Capability:

- 416 i. For all MFDs and printers subject to the TEC test method, automatic duplexing capability
 417 shall be integral to the base product for products with speed equal to or greater than those
 418 specified in Table 5. Printers whose intended function is to print on special single-sided
 419 media for the purpose of single sided printing (e.g., release coated paper for labels, direct
 420 thermal media, etc.) are exempt from this requirement.

421 **Table 5: Automatic Duplexing Requirements for all TEC MFDs and Printers**

422

Product Type	Product Speed (ipm)
Color	16
Monochrome	11

423

424 **Note:** Most TEC products have duplexing capability, and for products that do not, manufacturers offer
 425 similar models with duplexing. Duplexing offers both environmental benefits and increased savings to the
 426 consumer via reduced paper consumption. EPA noted that 38% of monochrome products and 69% of
 427 color products on the ENERGY STAR certified product list at the affected speeds would meet this
 428 requirement.

429

430 EPA has also eliminated the option for products at some speeds to meet the requirement through an
 431 optional accessory, as an analysis of the certified products showed that less than 5% of products were
 432 complying through such an accessory.

433 3.3.2 Typical Electricity Consumption: Calculated Typical Electricity Consumption (TEC₂₀₁₇) per
 434 Equation 3 or Equation 4 shall be less than or equal to the Maximum TEC Requirement (TEC_{REQ})
 435 specified in Table 6.

436 **Note:** EPA is proposing to remove the A3 adder from the specification. With the reduced print volume
 437 assumed under the TEC₂₀₁₇ metric and corresponding contribution of sleep mode power, there no longer
 438 appears to be differentiation in performance between A3 and non-A3 models.

- 439 i. For Imaging Equipment with a Type 2 DFE that meet the Type 2 DFE maximum TEC_{DFE}
 440 requirement in Table 2, the measured energy consumption of the DFE shall be divided by
 441 0.80 to account for internal power supply losses and then excluded when comparing the
 442 product's measured TEC value to TEC_{MAX} and for reporting.
 443 ii. The DFE shall not interfere with the ability of the Imaging Equipment to enter or exit its lower-
 444 power modes.
 445 iii. The energy use of a DFE can only be excluded if it meets the Type 2 DFE definition in
 446 Section 1 and is a separate processing unit that is capable of initiating activity over the
 447 network.

448 **Example:** A printer's total TEC result is 1274 kWh/year and its Type 2 TEC_{DFE} value calculated in Section
 449 3.2.4 is 468 kWh/year. The TEC_{DFE} value is then divided by 0.80 to account for internal power supply
 450 losses with the Imaging Equipment in Ready State, resulting in 585 kWh/year. The power supply adjusted
 451 value is subtracted from the tested TEC value: 1274 kWh/year – 585 kWh/year = 689 kWh/year. This
 452 689 kWh/year result is then compared to the relevant TEC_{MAX} to determine qualification.

- 453
 454 iv. For printers, digital duplicators with print capability, and MFDs with print capability, TEC shall
 455 be calculated per Equation 3.

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

458
$$TEC_{2017} = 52 \times \left[5 \times \left(E_{JOB_DAILY} + (2 \times E_{FINAL}) \right) + \left[24 - \frac{N_{JOBS}}{16} - (2 \times t_{FINAL}) \right] \times \frac{E_{SLEEP}}{t_{SLEEP}} \right] + 48 \times \frac{E_{SLEEP}}{t_{SLEEP}},$$

- 459
 460 *Where:*
 461 • *TEC₂₀₁₇ is the typical yearly energy consumption for printers, fax machines,*
 462 *digital duplicators with print capability, and MFDs with print capability,*
 463 *expressed in kilowatt-hours (kWh) and rounded to the nearest 0.1 kWh for*
 464 *reporting;*
 465 • *E_{JOB_DAILY} is the daily job energy, as calculated per Equation 5, in kWh;*
 466 • *E_{FINAL} is the final energy, as measured in the test procedure, converted to*
 467 *kWh;*
 468 • *N_{JOBS} is the number of jobs per day, as calculated in the test procedure,*
 469 • *t_{FINAL} is the final time to Sleep, as measured in the test procedure, converted*
 470 *to hours;*
 471 • *E_{SLEEP} is the Sleep energy, as measured in the test procedure, converted to*
 472 *kWh; and*
 473 • *t_{SLEEP} is the Sleep time, as measured in the test procedure, converted to hours.*

474 **Note:** As noted in the Draft 1 test method, EPA has reviewed measured paper use shared by
 475 manufacturers which indicate that number of pages assumed in the test method is higher than real world
 476 use. EPA encourages stakeholders to provide any additional data that would support a more accurate
 477 gauge of average paper use. Using the data currently provided by stakeholders, EPA proposes to
 478 decrease the contribution of the On Mode in the TEC by a factor of 4, dividing the energy contributions
 479 from all jobs (E_{JOB_DAILY}) by a factor of 4 in Equation 5 and increasing the duration of Sleep Mode by
 480 reducing the assumed time spent in On Mode from $N_{JOBS}/4$ (as each job is assumed to take 15 minutes or
 481 $\frac{1}{4}$ hours) to $N_{JOBS}/16$ in Equation 3. This change will take into account the reduced paper consumption
 482 and the impact on other modes in the TEC calculations.

483 v. For digital duplicators without print capability and MFDs without print capability, TEC shall be
 484 calculated per Equation 4.

485 **Equation 4: TEC Calculation for Digital Duplicators without Print Capability**
 486 **and MFDs without Print Capability**

487
$$TEC_{2017} = 52 \times \left[5 \times \left(E_{JOB_DAILY} + (2 \times E_{FINAL}) \right) + \left[24 - \frac{N_{JOBS}}{16} - (2 \times t_{FINAL}) \right] \times \frac{E_{AUTO}}{t_{AUTO}} + 48 \times \frac{E_{AUTO}}{t_{AUTO}} \right],$$

488

489 *Where:*

- 490 • TEC is the typical yearly energy consumption for digital duplicators without
 491 print capability and MFDs without print capability, expressed in kilowatt-
 492 hours (kWh) and rounded to the nearest 0.1 kWh for reporting;
- 493 • E_{JOB_DAILY} is the daily job energy, as calculated per Equation 5, in kWh;
- 494 • E_{FINAL} is the final energy, as measured in the test procedure, converted to
 495 kWh;
- 496 • N_{JOBS} is the number of jobs per day, as calculated in the test procedure;
- 497 • t_{FINAL} is the final time to Sleep, as measured in the test procedure, converted
 498 to hours per year;
- 499 • E_{AUTO} is the Auto-off energy, as measured in the test procedure, converted to
 500 kWh; and
- 501 • t_{AUTO} is the Auto-off time, as measured in the test procedure, converted to
 502 hours per year.

503 vi. Daily Job Energy shall be calculated per Equation 5.

504 **Equation 5: Daily Job Energy Calculation for TEC Products**

505
$$E_{JOB_DAILY} = \frac{1}{4} \left[2 \times E_{JOB1} + (N_{JOBS} - 2) \times \frac{E_{JOB2} + E_{JOB3} + E_{JOB4}}{3} \right] \text{ Table 6,}$$

506 *Where:*

- 507 • E_{JOB_DAILY} is the daily job energy, expressed in kilowatt-hours (kWh);
- 508 • E_{JOBi} is the energy of the i^{th} job, as measured in the test procedure, converted
 509 to kWh; and
- 510 • N_{JOBS} is the number of jobs per day, as calculated in the test procedure.

511

Table 6: TEC Requirement

Color Capability	Monochrome Product Speed, s , as Calculated in the Test Method (ipm)	TEC _{REQ} (kWh/year, to the nearest 0.1 kWh/year for reporting)
Monochrome Non-MFD	$s \leq 20$	13.1
	$20 < s \leq 40$	$0.7 \times s - 1.6$
	$40 < s \leq 60$	$0.7 \times s - 1.6$
	$60 < s \leq 135$	$2.6 \times s - 117.5$
	$s > 135$	$10.2 \times s - 1151.1$
Monochrome MFD	$s \leq 20$	16.6
	$20 < s \leq 40$	$0.6 \times s + 4.0$
	$40 < s \leq 60$	$0.9 \times s - 8.3$
	$60 < s \leq 80$	$1.6 \times s - 51.0$
	$s > 80$	$3.8 \times s - 229.2$
Color Non-MFD	$s \leq 20$	13.9
	$20 < s \leq 40$	$0.9 \times s - 5.0$
	$40 < s \leq 60$	$0.4 \times s + 15.5$
	$s > 60$	$6.0 \times s - 326.1$
Color MFD	$s \leq 20$	14.8
	$20 < s \leq 40$	$0.9 \times s - 4.1$
	$40 < s \leq 60$	$0.6 \times s + 8.2$
	$60 < s \leq 80$	$2.2 \times s - 89.4$
	$s > 80$	$9.7 \times s - 696.9$

513 **Note:** EPA is proposing to revise the efficiency requirements to better reflect top performers in the
514 marketplace. The latest shipment data available to EPA estimate that the ENERGY STAR market
515 penetration is roughly 100%. The revised requirements ensure that the ENERGY STAR specification
516 continues to highlight highly efficient imaging equipment while ensuring a good selection of qualifying
517 products.

518
519 In developing the above efficiency requirements, EPA used a dataset comprised of the full ENERGY
520 STAR product list, which has been included in the data and analysis package accompanying this draft
521 specification. EPA analyzed each of the four categories individually, targeting the top quartile of the
522 market for each. Based on the current dataset, 25% of mono MFD products, 26% of color MFD, 24% of
523 mono printers, and 24% of color printers meet the proposed requirements. This includes a variety of
524 manufacturers. Scatterplots of the levels with the models in the dataset were also provided in the data
525 package for stakeholder reference. EPA has estimated that the average per product shipment weighted
526 savings of this proposal are 20 kWh/year.

527
528 In addition to considering the qualification rates of models within each of the four categories, EPA
529 reviewed the proposed levels to ensure that there would be qualifying product in the most common speed
530 bins (print speeds between 21 and 60 ipm). Within each bin, EPA found that the range of pass rates were
531 between 22 and 28%, which is in the top quartile range that ENERGY STAR targets when setting a
532 specification.

533

534 3.3.3 Additional Test Results Reporting Requirements:

- 535 i. DFE model name/number, Ready State power, Sleep Mode power, and TEC_{DFE} shall be
536 reported for any Type 1 DFE sold with an Imaging Equipment product, including those not
537 tested with the Imaging Equipment product as part of the highest energy using configuration
538 per Section 1.1.1iii.

539 3.3.4 Recovery Time: Recovery Time, t_R as calculated per Equation 6, shall be less than the Maximum
 540 Recovery Time, t_{R_MAX} , subject to the following requirements:

- 541 i. For models with a shorter Default Delay Time to Sleep as found in Table 7, t_{R_MAX} shall be
- 542 calculated per Equation 7.
- 543 ii. For models with a longer Default Delay Time to Sleep as found in Table 7, t_{R_MAX} shall be
- 544 calculated per Equation 8.
- 545 iii. For models with a Default Delay Time to Sleep greater than any found in Table 7, t_{R_MAX} shall
- 546 not be subject to a Recovery Time requirement.
- 547 iv. Recovery times from various modes (Active 0, Active 1, Active 2 times) shall be reported for
- 548 all products tested using the TEC test method.

549 **Equation 6: Recovery Time**

550
$$t_R = t_{Active1} - t_{Active2},$$

551 *Where:*

- 552 • t_R is Recovery Time;
- 553 • $t_{Active1}$ is the time from Sleep Mode to the first sheet exiting the unit, in
- 554 minutes, as measured per the test method; and
- 555 • $t_{Active2}$ is the time from Ready Mode to the first sheet exiting the unit, in
- 556 minutes, as measured per the test method.

557 **Table 7: Determination of Maximum Recovery Time (Minutes)**

Print Speed, s (ipm)	Maximum Default Delay Time to Sleep to Permit Applicability of Shorter Recovery Time in Equation 7 (min)	Maximum Default Delay Time to Sleep to Permit Applicability of Longer Recovery Time in Equation 8 (min)
$0 < s \leq 5$	5	10
$5 < s \leq 10$	10	15
$10 < s \leq 20$	10	20
$20 < s \leq 30$	10	45
$30 < s \leq 40$	10	45
$s > 40$	15	60

558 **Equation 7: Maximum Recovery Time for Models with Shorter Default Delay Times to Sleep, as**
 559 **Indicated in Table 4**

560
$$t_{R_MAX} = \min(0.42 \times s + 5, 30),$$

561 *Where:*

- 562 • t_{R_MAX} is Maximum Recovery Time, in seconds;
- 563 • s is the product speed; and
- 564 • \min is the minimum function (i.e., the Maximum Recovery Time shall be the
- 565 lesser of $0.42 \times s + 5$ or 30 seconds).

566 **Equation 8: Maximum Recovery Time for Models with Longer Default Delay Times to Sleep, as**
 567 **Indicated in Table 4**

568
$$t_{R_MAX} = \min(0.51 \times s + 15, 60),$$

569 *Where:*

- 570 • t_{R_MAX} is Maximum Recovery Time, in seconds;
- 571 • s is the product speed; and
- 572 • \min is the minimum function (i.e., the Maximum Recovery Time shall be the
- 573 lesser of $0.51 \times s + 15$ or 60 seconds).

Note: EPA is proposing a Recovery Time requirement consistent with Germany's Blue Angel, to help ensure that products have a quick wake-up from Sleep Mode, which will result in retention of the Default Delay Time to Sleep settings, and energy savings. The requirement is tiered such that products with a shorter Default Delay Time to Sleep, which are expected to go to sleep more often, must have a shorter Recovery Times. Products that have Default Delay Times to Sleep longer than any found in Table 7 are not subject to the Recovery Time requirement as they would be expected to be used infrequently enough or remain in Idle Mode long enough that longer Recovery Times would not be inconvenient.

EPA has found that most ENERGY STAR certified Imaging Equipment products already meet these Recovery Times. Therefore, EPA proposes a harmonized maximum recovery time requirement for both OM and TEC products.

3.4 Requirements for Operational Mode (OM) Products

3.4.1 Multiple Sleep Modes: If a product is capable of automatically entering multiple successive Sleep Modes, the same Sleep Mode shall be used to determine qualification under the Default Delay Time to Sleep requirements specified in Section 3.2.5 and the Sleep Mode power consumption requirements specified in Section 3.4.3.

3.4.2 DFE Requirements: For Imaging Equipment with a Type 2 DFE that relies on the Imaging Equipment for its power, and that meets the appropriate maximum TEC_{DFE} requirement found in Table 2, the DFE power shall be excluded subject to the following conditions:

i. Ready State power of the DFE, as measured in the test method, shall be divided by 0.60 to account for internal power supply losses.

▪ **Sleep Mode Requirements:** If the resultant power in Paragraph i, above, is less than or equal to the Ready State or Sleep Mode power of the Imaging Equipment product as a whole, then the power shall be excluded from the measured Ready State or Sleep Mode power of the Imaging Equipment product as a whole when comparing to the Sleep Mode requirements in Section 3.4.3, below, and for reporting.

Otherwise, the Sleep Mode power of the DFE, as measured in the test method, shall be divided by 0.60 and excluded from the Ready or Sleep Mode power of the Imaging Equipment for comparing to the requirements, and for reporting.

▪ **Standby Requirements:** If the resultant power in Paragraph i, above, is less than or equal to the Ready State, Sleep Mode, or Off Mode power of the Imaging Equipment as a whole, then the power shall be excluded from the Ready State, Sleep Mode, or Off Mode power of the Imaging Equipment product as a whole when comparing to the Standby requirements in Section 3.4.4, below, and for reporting.

Otherwise, the Sleep Mode power of the DFE, as measured in the test method, shall be divided by 0.60 and excluded from the Ready State, Sleep Mode, or Off Mode power of the Imaging Equipment for comparing to the requirements, and for reporting.

ii. The DFE must not interfere with the ability of the Imaging Equipment to enter or exit its lower-power modes.

iii. In order to take advantage of this exclusion, the DFE must meet the Type 2 DFE definition in Section 1 and be a separate processing unit that is capable of initiating activity over the network.

623 **Examples:** Product 1 is an Imaging Equipment product whose Type 2 DFE has no distinct sleep mode.
624 The Type 2 DFE has measured Ready State and Sleep Mode power both equal to 30 watts. The
625 measured Sleep Mode power of the product is 53 watts. When subtracting 50 watts (30 watts / 0.60) from
626 the measured Sleep Mode power of the product, 53 watts, the resulting 3 watts is the Sleep Mode power
627 of the product for use in the criteria limits below.

628
629 Product 2 is an Imaging Equipment product whose Type 2 DFE goes to sleep when the Imaging
630 Equipment goes to sleep during testing. The Type 2 DFE has measured DFE Ready State and Sleep
631 Mode power equal to 30 watts and 5 watts, respectively. The measured Sleep Mode power of the product
632 is 12 watts. When subtracting 50 watts (30 watts / 0.60) from the measured Sleep Mode power of the
633 product, 12 watts, the result is -38 watts. In this case, instead subtract 8.33 watts (5 watts / 0.60) from the
634 measured Sleep Mode power of the product, 12 watts, resulting in 3.67 watts which is used in the criteria
635 limits below.

636 3.4.3 Sleep Mode Power Consumption: Measured Sleep Mode power consumption (P_{SLEEP}) shall be
637 less than or equal to the maximum Sleep Mode power consumption requirement (P_{SLEEP_MAX})
638 determined per Equation 9, subject to the following conditions:

- 639 i. Only those interfaces that are present and used during the test, including any fax interface,
640 may be considered functional adders.
641 ii. Product functionality offered through a DFE shall not be considered a functional adder.
642 iii. A single interface that performs multiple functions may be counted only once.
643 iv. Any interface that meets more than one interface type definition shall be classified according
644 to the functionality used during the test.
645 v. For products that meet the Sleep Mode power requirement in Ready State, no further
646 automatic power reductions are required to meet Sleep Mode requirements.

647
648 **Equation 9: Calculation of Maximum Sleep Mode Power**
649 **Consumption Requirement for OM products**

650
$$P_{SLEEP_MAX} = P_{MAX_BASE} + \sum_1^n Adder_{INTERFACE} + \sum_1^m Adder_{OTHER}$$

651 *Where:*

- 652 • P_{SLEEP_MAX} is the maximum Sleep Mode power consumption requirement,
653 expressed in watts (W), and rounded to the nearest 0.1 watt for reporting;
654 • P_{MAX_BASE} is the maximum Sleep Mode power allowance for the base marking
655 engine, as determined per Table 8, in watts;
656 • $Adder_{INTERFACE}$ is the power allowance for the interface functional adders used
657 during the test, including any fax capability, and as selected by the
658 manufacturer from Table 9, in watts;
659 • n is the number of allowances claimed for interface functional adders used
660 during the test, including any fax capability, and is less than or equal to 2;
661 • $Adder_{OTHER}$ is the power allowance for any non-interface functional adders in
662 use during the test, as selected by the manufacturer from Table 8, in watts;
663 and
664 • m is the number of allowances claimed for any non-interface functional
665 adders in use during the test, and is unlimited.

Table 8: Sleep Mode Power Allowance for Base Marking Engine

Product Type	Media Format	Marking Technology				P _{MAX_BASE} (watts)
		Impact	Ink Jet	All Other*	Not Applicable	
Mailing Machine	N/A		x	x		5.0
MFD	Standard	x	x			1.1
	Large		x			5.4
				x		8.7
Printer	Small	x	x	x		4.0
	Standard	x	x			0.6
	Large	x		x		2.5
			x			4.9
Scanner	Any				x	2.5

* "All Other" category includes High Performance Ink Jet.

667

668

Note: EPA conducted a review of the OM product database and the associated savings possible with new, more rigorous levels. Based on a combination of factors, namely the modest improvement in efficiency that is possible, the small amount of energy use associated with these products, and the relatively low sales volume, EPA is not proposing new ENERGY STAR levels at this time. The only change made to the base allowances is the consolidation of the scanner adder within the base allowance for MFD products. This change is made in conjunction with the change to the MFD definition. Standalone copiers and fax machines were removed from the Table 8, due to the exclusion from scope.

Stakeholders have expressed interest in ENERGY STAR harmonizing with programs such as Germany's Blue Angel for other aspects of the imaging specification. EPA is aware that there are other efficiency related requirements in the European Union and is interested in stakeholder feedback regarding harmonizing with those requirements, specifically as they relate to OM products, in the interest of international harmonization.

669

Table 9: Sleep Mode Power Allowances for Functional Adders

Adder Type	Connection Type	Max. Data Rate, r (Mbit/second)	Details	Functional Adder Allowance (watts)
Interface	Wired	$r < 20$	Includes: USB 1.x, IEEE 488, IEEE 1284/Parallel/ Centronics, RS232	0.2
		$20 \leq r < 500$	Includes: USB 2.x, IEEE 1394/ FireWire/i.LINK, 100Mb Ethernet	0.4
		$r \geq 500$	Includes: USB 3.x, 1G Ethernet	0.5
		Any	Includes: Flash memory-card/smart-card readers, camera interfaces, PictBridge	0.2
	Fax Modem	Any	<u>Applies to Fax Machines and MFDs only.</u>	0.2
	Wireless, Radio-frequency (RF)	Any	Includes: Bluetooth, 802.11	2.0
	Wireless, Infrared (IR)	Any	Includes: IrDA.	0.1

Adder Type	Connection Type	Max. Data Rate, <i>r</i> (Mbit/second)	Details	Functional Adder Allowance (watts)
Cordless Handset	N/A	N/A	Capability of the Imaging Equipment to communicate with a cordless handset. Applied only once, regardless of the number of cordless handsets the product is designed to handle. Does not address the power requirements of the cordless handset itself.	0.8
Memory	N/A	N/A	Applies to the internal capacity available in the Imaging Equipment for storing data. Applies to all volumes of internal memory and should be scaled accordingly for RAM. This adder does not apply to hard disk or flash memory.	0.5/GB
Power Supply	N/A	N/A	Applies to both internal and external power supplies of Mailing Machines and Standard Format products using Inkjet and Impact marking technologies with nameplate output power (P_{OUT}) greater than 10 watts.	$0.02 \times (P_{OUT} - 10.0)$
Touch Panel Display	N/A	N/A	Applies to both monochrome and color touch panel displays.	0.2
Internal Disk Drives	N/A	N/A	Includes any high-capacity storage product, including hard-disk and solid-state drives. Does not cover interfaces to external drives.	0.15

670

Note: As noted above, the OM product requirements are not changed in the Draft 1, Version 3.0 specification and this is true for the adders as well. The adder for scanners has been layered into the base allowance for MFD products and has therefore been removed from Table 9 above.

In addition, EPA would like to solicit feedback on the applicability of maintaining the Cordless Handset and Internal Disk Drive adder. A search of the ENERGY STAR database did not identify products that use this adder, suggesting it is not needed within the specification. Further, regression analysis on the Internal Desk Drive adder did not identify a significant power need when this adder was present. If these adders are no longer applicable, EPA will remove them to simplify the specification.

671 3.4.4 Off Mode Power Consumption Off Mode power, as measured in the test procedure, shall be less
672 than or equal to the Maximum Off Mode power specified in Table 10, subject to the following
673 conditions.

- 674 i. For products that do not have an Off Mode, Sleep Mode power, as measured in the test
675 procedure, shall be less than or equal to the Maximum Off Mode power.
- 676 ii. For products that do not have an Off Mode or Sleep Mode, Ready State power, as measured
677 in the test procedure, shall be less than or equal to the Maximum Off Mode power.
- 678 iii. The Imaging Equipment shall meet the Off Mode Power requirement independent of the state
679 of any other devices (e.g., a host PC) connected to it.

680

Table 10: Maximum Off Mode Power Requirement

Product Type	Maximum Off Mode Power (watts)
All OM Products	0.3

681

Note: To avoid confusion relating to the Standby power requirement and definition, EPA has redefined it as an Off Mode power requirement and proposes to remove the Standby definition. As before, products that do not have an Off Mode shall meet the Off Mode requirement in Sleep Mode, and those that do not have Off mode or Sleep Mode, shall meet Off Mode in Ready State.

686

Furthermore, EPA proposes to revise this requirement in line with the 2019 mandatory requirement in the EU, 0.3 watts. The European Commission is conducting a review of its 2019 requirement

(<http://www.ecostandbyreview.eu>), and the draft conclusion is that a 0.3 W requirement is feasible.

Furthermore, the study reviewed large format printers, which are currently excluded from the 0.5-watt requirement, and found that most (71%) could meet a 0.3 W requirement.

692

Note: Products intended for sale in the US market are subject to minimum toxicity and recyclability requirements. Please see ENERGY STAR Program Requirements for Imaging Equipment: Partner Commitments for details.

4 TESTING

4.1 Test Methods

4.1.1 When testing Imaging Equipment products, the test methods identified in Table 11 shall be used to determine qualification for ENERGY STAR.

700

Table 11: Test Methods for ENERGY STAR Qualification

Product Type	Test Method
All Products	ENERGY STAR Imaging Equipment Test Method, Rev. March-2018

701

4.2 Number of Units Required for Testing

4.2.1 Representative Models shall be selected for testing per the following requirements:

i. For qualification of an individual product model, a product configuration equivalent to that which is intended to be marketed and labeled as ENERGY STAR is considered the Representative Model;

ii. For qualification of a product family that does not include a Type 1 DFE, the highest energy using configuration within the family shall be considered the Representative Model. Any subsequent testing failures (e.g., as part of verification testing) of any model in the family will have implications for all models in the family.

710

711 iii. For qualification of a product family that includes Type 1 DFE, the highest energy using
712 configuration of the Imaging Equipment and highest energy using DFE within the family shall
713 be tested for qualification purposes. Any subsequent testing failures (e.g., as part of
714 verification testing) of any model in the family and all Type 1 DFEs sold with the Imaging
715 Equipment, including those not tested with the Imaging Equipment product, will have
716 implications for all models in the family. Imaging Equipment products that do not incorporate
717 a Type 1 DFE may not be added to this product family for qualification and must be qualified
718 as a separate family without a Type 1 DFE.

719 4.2.2 A single unit of each Representative Model shall be selected for testing.

720 **4.3 International Market Qualification**

721 4.3.1 Products shall be tested for qualification at the relevant input voltage/frequency combination for
722 each market in which they will be sold and promoted as ENERGY STAR.

723 **5 USER INTERFACE**

724 5.1.1 Manufacturers are encouraged to design products in accordance with the user interface standard
725 IEEE 1621: Standard for User Interface Elements in Power Control of Electronic Devices
726 Employed in Office/Consumer Environments. For details, see <http://eta.LBL.gov/Controls>.

727 **6 EFFECTIVE DATE**

728 6.1.1 Effective Date: The Version 3 ENERGY STAR Imaging Equipment specification shall take effect
729 on **TBD**. To qualify for ENERGY STAR, a product model shall meet the ENERGY STAR
730 specification in effect on its date of manufacture. The date of manufacture is specific to each unit
731 and is the date on which a unit is considered to be completely assembled.

732 6.1.2 Future Specification Revisions: EPA reserves the right to change this specification should
733 technological and/or market changes affect its usefulness to consumers, industry, or the
734 environment. In keeping with current policy, revisions to the specification are arrived at through
735 stakeholder discussions. In the event of a specification revision, please note that the ENERGY
736 STAR qualification is not automatically granted for the life of a product model.

737 6.1.3 Items for Consideration in a Future Revision: