



ENERGY STAR® Program Requirements Product Specification for Computers

Eligibility Criteria Draft 2, Version 8.0

1 Following is the **Draft 2, Version 8.0** ENERGY STAR Product Specification for Computers. A product
2 shall meet all of the identified criteria if it is to earn the ENERGY STAR.

3 **1 DEFINITIONS**

4 A) Product Types:

- 5 1) Computer: A device which performs logical operations and processes data. For the purposes of
6 this specification, computers include both stationary and portable units, including Desktop
7 Computers, Integrated Desktop Computers, Notebook Computers, Small-Scale Servers, Thin
8 Clients, and Workstations. Although computers are capable of using input devices and displays,
9 such devices are not required to be included with the computer upon shipment. Computers are
10 composed of, at a minimum:
- 11 a) A central processing unit (CPU) to perform operations. If no CPU is present, then the device
12 must function as a client gateway to a server which acts as a computational CPU;
 - 13 b) User input devices such as a keyboard, mouse, or touchpad; and
 - 14 c) An Integrated Display screen and/or the ability to support an external display screen to output
15 information.
- 16 2) Desktop Computer: A computer whose main unit is designed to be located in a permanent
17 location, often on a desk or on the floor. Desktop computers are not designed for portability and
18 are designed for use with an external display, keyboard, and mouse. Desktop computers are
19 intended for a broad range of home and office applications, including point of sale applications.
- 20 a) Integrated Desktop Computer: A Desktop Computer in which the computing hardware and
21 display are integrated into a single housing, and which is connected to ac mains power
22 through a single cable. Integrated Desktop Computers come in one of two possible forms: (1)
23 a system where the display and computer are physically combined into a single unit; or (2) a
24 system packaged as a single system where the display is separate but is connected to the
25 main chassis by a dc power cord and both the computer and display are powered from a
26 single power supply. As a subset of Desktop Computers, Integrated Desktop Computers are
27 typically designed to provide similar functionality as Desktop systems.
- 28 3) Notebook Computer: A computer designed specifically for portability and to be operated for
29 extended periods of time both with and without a direct connection to an ac mains power source.
30 Notebook Computers include an Integrated Display, a non-detachable, mechanical keyboard
31 (using physical, moveable keys), and pointing device.
- 32 a) Mobile Thin Client: A computer meeting the definition of a Thin Client, designed specifically
33 for portability, and meeting the definition of a Notebook Computer. These products are
34 considered to be Notebook Computers for the purposes of this specification.
 - 35 b) Two-In-One Notebook: A computer which resembles a traditional Notebook Computer with a
36 clam shell form factor, but has a detachable display which can act as an independent
37 Slate/Tablet when disconnected. The keyboard and display portions of the product must be
38 shipped as an integrated unit. Two-In-One Notebooks are considered Notebooks in the
39 remainder of this specification and are therefore not referenced explicitly.
 - 40 c) Mobile Workstation: A computer which meets the definition of Notebook Computer but also
41 meets all of the following criteria:

- 42 (1) Has a mean time between failures (MTBF) of at least 13,000 hours (based on either
43 Telcordia SR-332, Issue X or field collected data);
- 44 (2) Certification by 2 or more Independent Software Vendor (ISV) product certifications;
45 these certifications can be in process, but partner shall ensure they are completed
46 within 3 months of certification;
- 47 (3) Supports at least 32 gigabytes of system memory; and
- 48 (4) Supports either:
- 49 (a) At least one integrated or discrete GPU with frame buffer bandwidth of 96
50 gigabytes per second or greater; or
- 51 (b) A total of 4 gigabytes or more of system memory with a bandwidth of 134
52 gigabytes per second or greater and an integrated GPU.
- 53 d) Multi-Screen Notebook: A computer which resembles a traditional Notebook Computer with a
54 clam shell form factor but has a secondary display with touch and/or pen capability that can
55 be used as a touch screen keyboard in place of a traditional mechanical keyboard. These
56 products are considered to be Notebook Computers for purposes of this specification.
- 57 4) Slate/Tablet: A computing device designed for portability that meets all of the following criteria:
- 58 a) Includes an integrated display with a diagonal size greater than 6.5 inches and less than 17.4
59 inches;
- 60 b) Lacking an integrated, physical attached keyboard in its as-shipped configuration;
- 61 c) Includes and primarily relies on touchscreen input; (with optional keyboard);
- 62 d) Includes and primarily relies on a wireless network connection (e.g., Wi-Fi, 3G, etc.); and
- 63 e) Includes and is primarily powered by an internal battery (with connection to the mains for
64 battery charging, not primary powering of the device).
- 65 5) Portable All-In-One Computer: A computing device designed for portability that meets all of the
66 following criteria:
- 67 a) Includes an integrated display with a diagonal size greater than or equal to 17.4 inches;
- 68 b) Lacking keyboard integrated into the physical housing of the product in its as-shipped
69 configuration;
- 70 c) Includes and primarily relies on touchscreen input; (with optional keyboard);
- 71 d) Includes wireless network connection (e.g. Wi-Fi, 3G, etc.); and
- 72 e) Includes an internal battery
- 73 6) E-Reader: A device designed for display and consumption of static images. The display is
74 characterized by a low refresh rate and a display made of bistable materials where no energy is
75 needed to maintain a visible image, only to alter the image.
- 76 7) Small-scale Server: A computer that typically uses desktop components in a desktop form factor,
77 but is designed primarily to be a storage host for other computers. Small-scale Servers are
78 designed to perform functions such as providing network infrastructure services (e.g., archiving)
79 and hosting data/media. These products are not designed to process information for other
80 systems or run web servers as a primary function. A Small-scale Server has the following
81 characteristics:
- 82 a) Designed in a pedestal, tower, or other form factor similar to those of desktop computers
83 such that all data processing, storage, and network interfacing is contained within one
84 box/product;
- 85 b) Designed to operate 24 hours/day, 7 days/week, with minimal unscheduled downtime (on the
86 order of hours/year);

- 87 c) Capable of operating in a simultaneous multi-user environment serving several users through
88 networked client units; and
- 89 d) Designed for an industry accepted operating system for home or low-end server applications
90 (e.g., Windows Home Server, Mac OS X Server, Linux, UNIX, Solaris).
- 91 8) Thin Client: An independently-powered computer that relies on a connection to remote computing
92 resources (e.g., computer server, remote workstation) to obtain primary functionality. Main
93 computing functions (e.g., program execution, data storage, interaction with other Internet
94 resources) are provided by the remote computing resources. Thin Clients covered by this
95 specification are (1) limited to devices with no rotational storage media integral to the computer
96 and (2) designed for use in a permanent location (e.g. on a desk) and not for portability.
- 97 a) Integrated Thin Client: A Thin Client in which computing hardware and display are
98 connected to ac mains power through a single cable. Integrated Thin Client computers
99 come in one of two possible forms: (1) a system where the display and computer are
100 physically combined into a single unit; or (2) a system packaged as a single system
101 where the display is separate but is connected to the main chassis by a dc power cord
102 and both the computer and display are powered from a single power supply. As a subset
103 of Thin Clients, Integrated Thin Clients are typically designed to provide similar
104 functionality as Thin Client systems.
- 105 b) Ultra-thin Client: A computer with lesser local resources than a standard Thin Client that
106 sends raw mouse and keyboard input to a remote computing resource and receives back
107 raw video from the remote computing resource. Ultra-thin clients cannot interface with
108 multiple devices simultaneously nor run windowed remote applications due to the lack of
109 a user-discernible client operating system on the device (i.e., beneath firmware, user
110 inaccessible).
- 111 9) Workstation: A high-performance, single-user computer typically used for graphics, CAD,
112 software development, financial and scientific applications among other compute intensive tasks.
113 Workstations covered by this specification (a) are marketed as a workstation; (b) do not support
114 altering frequency or voltage beyond the CPU and GPU manufacturers' as shipped operating
115 specifications; and (c) has system hardware that supports error-correcting code (ECC) that
116 detects and corrects errors with dedicated circuitry on and across the CPU, interconnect, and
117 system memory. In addition, a workstation meets two or more of the following criteria:
- 118 a) Supports one or more discrete GPU or discrete compute accelerators
- 119 b) Supports four or more slots of PCI-express, other than discrete GPU, connected to accessory
120 expansion slots or ports where each lane has a bandwidth of 8 gigabits per second (Gb/s) or
121 more.
- 122 c) Provide multi-processor support for two or more physically separate processor packages or
123 sockets. (this requirement cannot be met with support for a single multi-core processor);
124 and/or
- 125 d) Certification by 2 or more Independent Software Vendor (ISV) product certifications; these
126 certifications can be in process, but partner shall ensure they are completed within 3 months
127 of certification.
- 128 10) Rack-mounted Workstation: A workstation that is designed to be natively rack mounted as
129 described in IEC 60297-3-101:2004. The rack-mounted workstation may be accessed locally by
130 direct connection to the workstation and display or accessed remotely across a network by one or
131 more users.
- 132 B) Product Category: A second-order classification or sub-type within a product type that is based on
133 product features and installed components. Product categories are used in this specification to
134 determine certification and test requirements.

135 C) Computer Components:

136 1) Graphics Processing Unit (GPU): An integrated circuit, separate from the CPU, designed to
137 accelerate the rendering of either 2D and/or 3D content to displays. A GPU may be mated with a
138 CPU, on the system board of the computer or elsewhere to offload display capabilities from the
139 CPU.

140 2) Discrete Graphics (dGfx): A graphics processor (GPU) which must contain a local memory
141 controller interface and local graphics-specific memory.

142 3) Integrated Graphics (iGfx): A graphics solution that does not contain Discrete Graphics.

143 4) Display: A commercially-available product with a display screen and associated electronics, often
144 encased in a single housing, that as its primary function displays visual information from (1) a
145 computer, workstation or server via one or more inputs (e.g., VGA, DVI, HDMI, DisplayPort, IEEE
146 1394, USB), (2) external storage (e.g., USB flash drive, memory card), or (3) a network
147 connection.

148 a) Enhanced-performance Integrated Display: An integrated Computer Display that has all
149 of the following features and functionalities:

150 (1) A contrast ratio of at least 60:1 at a horizontal viewing angle of at least 85°, with or
151 without a screen cover glass;

152 (2) A native resolution greater than or equal to 2.3 megapixels (MP); and

153 (3) A color gamut of at least sRGB as defined by IEC 61966-2-1. Shifts in color space
154 are allowable as long as 99% or more of defined sRGB colors are supported.

155 5) External Power Supply (EPS): Also referred to as External Power Adapter. An external power
156 supply circuit that is used to convert household electric current into dc current or lower-voltage ac
157 current to operate a consumer product.

158 6) Internal Power Supply (IPS): A component internal to the computer casing and designed to
159 convert ac voltage from the mains to dc voltage(s) for the purpose of powering the computer
160 components. For the purposes of this specification, an internal power supply shall be contained
161 within the computer casing but be separate from the main computer board. The power supply
162 shall connect to the mains through a single cable with no intermediate circuitry between the
163 power supply and the mains power. In addition, all power connections from the power supply to
164 the computer components, with the exception of a DC connection to a display in an Integrated
165 Desktop Computer, shall be internal to the computer casing (i.e., no external cables running from
166 the power supply to the computer or individual components). Internal dc-to-dc converters used to
167 convert a single dc voltage from an external power supply into multiple voltages for use by the
168 computer are not considered internal power supplies.

169 7) System Memory Bandwidth: The rate at which data can be read or stored into computer system's
170 memory, expressed in gigabytes per second (GB/s).

171 D) Operational Modes:

172 1) Active State: The power state in which the computer is carrying out useful work in response to a)
173 prior or concurrent user input or b) prior or concurrent instruction over the network. Active State
174 includes active processing, seeking data from storage, memory, or cache, including Idle State
175 time while awaiting further user input and before entering low power modes.

176 2) Idle State: The power state in which the operating system and other software have completed
177 loading, a user profile has been created, activity is limited to those basic applications that the
178 system starts by default, and the computer is not in Sleep Mode. Idle State is composed of two
179 sub-states: Short Idle and Long Idle.

- 180 a) Long Idle: The mode where the Computer has reached an Idle condition (i.e., 15 minutes
181 after OS boot or after completing an active workload or after resuming from Sleep Mode)
182 and the main Computer Display has entered a low-power state where screen contents
183 cannot be observed (i.e., backlight has been turned off) but remains in the working mode
184 (ACPI G0/S0). If power management features are enabled as-shipped in the scenario
185 described in this definition, such features shall engage prior to evaluation of Long Idle
186 (e.g., display is in a low power state, HDD may have spun-down), but the Computer is
187 prevented from entering Sleep Mode. P_{LONG_IDLE} represents the average power measured
188 when in the Long Idle Mode.
- 189 b) Short Idle: The mode where the Computer has reached an Idle condition (i.e., 5 minutes
190 after OS boot or after completing an active workload or after resuming from Sleep Mode),
191 the screen is on, and Long Idle power management features have not engaged (e.g.
192 HDD is spinning and the Computer is prevented from entering sleep mode). P_{SHORT_IDLE}
193 represents the average power measured when in the Short Idle Mode.
- 194 3) Off Mode: The lowest power mode which cannot be switched off (influenced) by the user and that
195 may persist for an indefinite time when the appliance is connected to the main electricity supply
196 and used in accordance with the manufacturer's instructions. For systems where ACPI standards
197 are applicable, Off Mode correlates to ACPI System Level S5 state.
- 198 4) Sleep Mode: A low power mode that the computer enters automatically after a period of inactivity
199 or by manual selection. A computer with Sleep capability can quickly "wake" in response to
200 network connections or user interface devices from initiation of wake event to a readable display..
201 For systems where ACPI standards are applicable, Sleep Mode most commonly correlates to
202 ACPI System Level S3 (suspend to RAM) state. P_{SLEEP} represents the average power measured
203 when in the Sleep Mode.

204 **Note:** After significant discussion with stakeholders in response to Draft 1, EPA is proposing move the
205 resume time from sleep terminology from the Sleep Mode definition and include it Section 3.5.1. Revised
206 resume time requirements for both Sleep Mode and Alternative Low Power Mode are now proposed in
207 Section 3.5.1.

- 208 5) Alternative Low Power Mode (ALPM): A low power mode that the computer enters automatically
209 after a period of inactivity or by manual selection that is defined by the display turning off and the
210 computer entering a state of reduced functionality. A computer with Alternative Low Power Mode
211 must maintain immediate responsiveness to network connections or user interface devices. P_{ALPM}
212 represents the average power measured when in the Alternative Low Power Mode.
- 213 E) Networking and Additional Capabilities:
- 214 1) Additional Internal Storage: Any and all internal hard disk drives (HDD) or solid state drives (SSD)
215 installed beyond the primary storage device where the operating system is installed in the
216 products as shipped state. This definition does not include external drives.

217 **Note:** EPA has clarified that additional storage devices are HDDs or SSDs, beyond the primary storage
218 device. The the operating system is installed on the primary storage device for the purposes of this
219 specification.

- 220 2) Energy Efficient Ethernet (EEE): A technology which enables reduced power consumption of
221 Ethernet interfaces during times of low data throughput. Specified by IEEE 802.3az.

- 222 3) Full Network Connectivity: The ability of the computer to maintain network presence while in
 223 Sleep Mode or an Alternative Low Power Mode (ALPM) with power demand of less than or equal
 224 to 10 watts and intelligently wake when further processing is required (including occasional
 225 processing required to maintain network presence). Presence of the computer, its network
 226 services and applications, is maintained even though the computer is in an ALPM. From the
 227 vantage point of the network, a computer with full network connectivity that is in ALPM is
 228 functionally equivalent to an idle computer with respect to common applications and usage
 229 models. Full network connectivity in ALPM is not limited to a specific set of protocols but can
 230 cover applications installed after initial installation. Also referred to as “network proxy”
 231 functionality and as described in the *Ecma-393* standard.
- 232 a) Network Proxy - Base Capability: To maintain addresses and presence on the network while
 233 in Sleep Mode or ALPM, the system handles IPv4 ARP and IPv6 NS/ND.
- 234 b) Network Proxy - Full Capability: While in Sleep Mode or ALPM, the system supports Base
 235 Capability, Remote Wake, and Service Discovery/Name Services.
- 236 c) Network Proxy - Remote Wake: While in Sleep Mode or ALPM, the system is capable of
 237 remotely waking upon request from outside the local network. Includes Base Capability.
- 238 d) Network Proxy - Service Discovery/Name Services: While in Sleep Mode or ALPM, the
 239 system allows for advertising host services and network name. Includes Base Capability.
- 240 4) Constant Network Connectivity: A capability that allows the wake of system operating system or
 241 software to facilitate communication and downloads from the network (e.g. instant messaging,
 242 email, management and maintenance tasks, etc.)

243 **Note:** EPA is proposing the definition above to more clearly define what constant network connectivity
 244 means in the context of the full network proxy requirements in Section 3.5.2 below.

- 245 5) Network Interface: The components (hardware and software) whose primary function is to make
 246 the computer capable of communicating over one or more network technologies. Examples of
 247 Network Interfaces are IEEE 802.3 (Ethernet) and IEEE 802.11 (Wi-Fi).
- 248 6) Wake Event: A user, scheduled, or external event or stimulus that causes the computer to
 249 transition from Sleep Mode or Off Mode to an active state of operation. Examples of wake events
 250 include, but are not limited to: movement of the mouse, keyboard activity, controller input, real-
 251 time clock event, or a button press on the chassis, and in the case of external events, stimulus
 252 conveyed via a remote control, network, modem, etc.
- 253 7) Wake On LAN (WOL): Functionality which allows a computer to transition from Sleep Mode or Off
 254 Mode to an Active State of operation when directed by a network Wake Event via Ethernet.
- 255 8) Switchable Graphics: Functionality that allows Discrete Graphics to be disabled when not
 256 required in favor of Integrated Graphics.
- 257 Note: This functionality allows lower power and lower capability integrated GPUs to render the
 258 display while on battery or when the output graphics are not overly complex while then allowing
 259 the more power consumptive but more capable discrete GPU to provide rendering capability
 260 when required.
- 261 F) Marketing and Shipment Channels:
- 262 1) Enterprise Channels: Sales channels typically used by large and medium-sized business,
 263 government, educational, or other organizations to purchase computers for use in managed
 264 client/server environments.
- 265 2) Model Name: A marketing name that includes reference to the computer model number, product
 266 description, or other branding references.
- 267 3) Model Number: A unique marketing name or identification reference that applies to a specific
 268 hardware and software configuration (e.g., operating system, processor type, memory, GPU), and
 269 is either pre-defined or selected by a customer.

270 G) Product Family: A high-level description referring to a group of computers sharing one
271 chassis/motherboard combination that often contains hundreds of possible hardware and software
272 configurations. Product models within a family differ from each other according to one or more
273 characteristics or features that either (1) have no impact on product performance with regard to
274 ENERGY STAR certification criteria, or (2) are specified herein as acceptable variations within a
275 product family. For Computers, acceptable variations within a product family include:

- 276 1) Color;
- 277 2) Housing; and
- 278 3) Electronic components other than the chassis/motherboard, such as the processor,
279 memory, GPU, etc.

280 **2 SCOPE**

281 **2.1 Included Products**

282 2.1.1 Products that meet the definition of a Computer and one of the following Product Type definitions,
283 as specified herein, are eligible for ENERGY STAR certification, with the exception of products
284 listed in Section 2.2:

- 285 i. Desktop Computers and Integrated Desktop Computers;
- 286 ii. Notebook Computers;
- 287 iii. Slates/Tablets;
- 288 iv. Portable All-In-One Computers;
- 289 v. Workstations; and
- 290 vi. Thin Clients.

291 **2.2 Excluded Products**

292 2.2.1 Products that are covered under other ENERGY STAR product specifications are not eligible for
293 certification under this specification. The list of specifications currently in effect can be found at
294 www.energystar.gov/products.

295 2.2.2 The following products are not eligible for certification under this specification:

- 296 i. Docking Stations;
- 297 ii. Game Consoles;
- 298 iii. E-Readers;
- 299 iv. Handheld gaming devices, typically battery powered and intended for use with an integral
300 display as the primary display;
- 301 v. Mobile Thin Clients not meeting the definition of Notebook Computer;
- 302 vi. Personal Digital Assistant devices (PDAs);
- 303 vii. Point of Sale (POS) products that do not use internal components common to Notebook,
304 Desktop, or Integrated Desktop Computers, including a processor, motherboard, and
305 memory;
- 306 viii. Slate/Tablet based POS products;
- 307 ix. Handheld Computers and Slates/Tablets which contain cellular voice capability;
- 308 x. Ultra-thin Clients; and
- 309 xi. Small-scale Servers.

310 **3 CERTIFICATION CRITERIA**

311 **3.1 Significant Digits and Rounding**

- 312 3.1.1 All calculations shall be carried out with directly measured (unrounded) values.
- 313 3.1.2 Unless otherwise specified in this specification, compliance with specification limits shall be
314 evaluated using directly measured or calculated values without any benefit from rounding.
- 315 3.1.3 Directly measured or calculated values that are submitted for reporting on the ENERGY STAR
316 website shall be rounded to the nearest significant digit as expressed in the corresponding
317 specification limit.

318 **3.2 General Requirements**

- 319 3.2.1 Power supply test data and test reports from testing entities recognized by EPA to perform power
320 supply testing shall be accepted for the purpose of certifying the ENERGY STAR product.
- 321 3.2.2 Internal Power Supply (IPS) Requirements: IPSs used in Computers eligible under this
322 specification must meet the following requirements when tested using the *Generalized Internal*
323 *Power Supply Efficiency Test Protocol, Rev. 6.6* (available at
324 http://www.plugloadsolutions.com/docs/collatrl/print/Generalized_Internal_Power_Supply_Efficiency_Test_Protocol_R6.6.pdf).
325
- 326 i. IPS with maximum rated output power less than 75 watts shall meet minimum efficiency
327 requirements as specified in Table 1.
- 328 ii. IPS with maximum rated output power greater than or equal to 75 watts shall meet both
329 minimum efficiency requirements and minimum power factor requirements, as specified in
330 Table 1 and Table 2 as applicable.

331 **Table 1: Requirements for Internal Power Supplies with Rated Output of 500 Watts and Below**

Loading Condition (Percentage of Nameplate Output Current)	Minimum Efficiency	Minimum Power Factor
10%	0.80	
20%	0.82	-
50%	0.85	0.90
100%	0.82	-

332

333 **Table 2: Requirements for Internal Power Supplies with Rated Output Above 500 Watts**

Loading Condition (Percentage of Nameplate Output Current)	Minimum Efficiency	Minimum Power Factor
10%	0.80	
20%	0.87	-
50%	0.90	0.90
100%	0.87	-

334

335 **Note:** EPA received feedback from multiple stakeholders recommending that EPA maintain the existing
336 IPS requirements from Version 7.1 at 20%, 50%, and 100% loads, but also introduce new requirements
337 at the 10% load to address operation in Sleep and Long Idle Modes. EPA has reviewed the data and
338 feedback submitted in response to Draft 1 and agrees with this approach, setting a level of 0.80 at the
339 10% load. Nearly 84% of power supplies meet this criterion. In addition, stakeholder feedback
340 demonstrated that moving to 80Plus Gold or equivalent for those products with a nameplate rating of 500
341 watts or below offered limited additional savings at an unpalatable cost. As such, the Agency has
342 maintained the Version 7.1 levels. EPA has reverted to two separate tables to address power supplies
343 with nameplate power rating at or below 500 watts and above 500 watts, with the 10% load requirement
344 applicable to both categories.

345 3.2.3 External Power Supply (EPS) Requirements: Single- and Multiple-voltage EPSs shall meet the
346 Level VI or higher performance requirements under the International Efficiency Marking Protocol
347 when tested according to the Uniform Test Method for Measuring the Energy Consumption of
348 External Power Supplies, Appendix Z to 10 CFR Part 430.

- 349 i. Single-voltage EPSs shall include the Level VI or higher marking.
- 350 ii. Multiple-voltage EPSs meeting Level VI or higher shall include the Level VI or higher
351 marking.
- 352 iii. Additional information on the Marking Protocol is available
353 at <http://www.regulations.gov/#!documentDetail;D=EERE-2008-BT-STD-0005-0218>

354 3.2.4 Energy Efficient Ethernet (EEE) Requirements: All products which contain one or more Ethernet
355 ports with a bandwidth of 1Gb/s or higher shall have EEE supported in each of these ports in their
356 as-shipped configuration.

357 **Note:** EPA received stakeholder feedback showing that nearly one third of products capable of meeting
358 the proposed Version 8.0 energy efficiency requirements do not ship with EEE enabled. EPA did not
359 intend to remove this many products from ENERGY STAR eligibility with this proposal, particularly
360 notebook computers, for which requirements are not being revised at this time. As such, EPA is
361 proposing to require that all Ethernet ports with a speed of 1 Gb/s or greater *support* EEE in Version 8.0,
362 and has also added language in the considerations for future revisions section at the end of the
363 specification to clearly note the intent to require that EEE is enabled on all ports in Version 9.0.

364 3.3 Power Management Requirements

365 3.3.1 Products shall include power management features in their “as-shipped” condition as specified in
366 Table 3, subject to the following conditions:

- 367 i. For Thin Clients, the Wake-on-LAN (WOL) requirement shall apply for products designed to
368 receive software updates from a centrally managed network while in Sleep Mode or in Off
369 Mode. Thin Clients whose standard software upgrade framework does not require off-hours
370 scheduling are exempt from the WOL requirement.
- 371 ii. For Notebooks, WOL may be automatically disabled when the product is disconnected from
372 ac mains power.
- 373 iii. For all products with WOL, directed packet filters shall be enabled and set to an industry
374 standard default configuration.
- 375 iv. Products that do not support Sleep Mode by default are only subject to the Display Sleep
376 Mode requirement.

Table 3: Power Management Requirements

Mode or Mode Transition	Requirement	Desktops	Integrated Desktops	Portable All-In-Ones	Notebooks	Slates/Tablets	Thin Clients	Workstations
System Sleep/Alternative Low Power Mode	(1) Sleep/Alternative Low Power Mode shall be set to activate after no more than 30 minutes of user inactivity. (2) The speed of any active 1 Gb/s or faster Ethernet network links shall be reduced when transitioning to Sleep Mode or Off Mode. Or the links shall enter Energy Efficient Ethernet state when transitioning to Alternative Low Power Mode	Yes	Yes	Yes	Yes	N/A	Yes	Yes
Display Sleep Mode	(1) Display Sleep Mode shall be set to activate after no more than 15 minutes of user inactivity.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wake on LAN (WOL)	(1) Computers with Ethernet capability shall provide users with an option to enable and disable WOL for Sleep Mode. (2) Computers with Ethernet capability that are shipped through enterprise channels shall either: (a) be shipped with WOL enabled by default for Sleep Mode, when the computer is operating on ac mains power; or (b) provide users with the ability to enable WOL that is accessible from both the client operating system user interface and over the network ⁱⁱ .	Yes	Yes	Yes	Yes	N/A	Yes	Yes
Wake Management	(1) Computers with Ethernet capability that are shipped through enterprise channels shall: (a) be capable of both remote (via network) and scheduled (via real-time clock) wake events from Sleep Mode, and (b) provide clients with the ability to centrally manage (via vendor tools) any wake management settings that are configured through hardware settings if the manufacturer has control over such features.	Yes	Yes	Yes	Yes	N/A	Yes	Yes

379 **3.4 User Information Requirements**

380 3.4.1 Products shall be shipped with informational materials to notify customers of the following:

- 381 i. A description of power management settings that have been enabled by default,
- 382 ii. A description of the timing settings for various power management features, and
- 383 iii. Instructions for properly waking the product from Sleep Mode.

384 3.4.2 Products shall be shipped with one or more of the following:

- 385 i. A list of default power management settings.
- 386 ii. A note stating that default power management settings have been selected for compliance
387 with ENERGY STAR (within 15 min of user inactivity for the display, within 30 min for the
388 computer, if applicable per Table 3), and are recommended by the ENERGY STAR program
389 for optimal energy savings.
- 390 iii. Information about ENERGY STAR and the benefits of power management, to be located at
391 or near the beginning of the hard copy or electronic user manual, or in a package or box
392 insert.

393 3.4.3 Provisions 3.4.1 and 3.4.2 may be met through use of either electronic or printed product
394 documentation, provided it adheres to all of the following:

- 395 i. Documentation is shipped with the product (e.g., in a printed manual or insert, on included
396 optical media, in a file installed with the software load shipped to the customer) or available
397 electronically on the manufacturer's website. In the latter case, instructions for accessing the
398 information on the website shall be provided in the product package or on the Desktop or
399 home screen; and
- 400 ii. Documentation is included either (a) only with ENERGY STAR certified Computers; or (b) as
401 part of the standard documentation if and only if accompanied by EPA-approved customer
402 guidance on how to identify if their computer configuration is ENERGY STAR certified.

403 **3.5 Requirements for Desktop, Integrated Desktop, and Notebook Computers**

404 3.5.1 Resume Time Requirement: Notebook computers are required to wake from sleep or an
405 alternative low power mode with a latency of less than or equal to 5 seconds from initiation of
406 wake event to system becoming fully usable including rendering of display. Desktop and
407 Integrated Desktop Computers shall meet this same requirement, but with a latency of less than
408 or equal to 10 seconds. Manufacturers shall self-declare that the product can meet this
409 requirementⁱⁱⁱ.

410 **Note:** As noted in the note box above under the Sleep Mode definition, EPA has moved the Resume
411 Time to wake requirement to this section and is proposing that Notebook Computers continue to meet the
412 existing 5 second requirement, while Desktop and Integrated Desktop Computers meet a 10 second
413 requirement. Manufacturers will self-declare that their product fulfills the requirement (i.e. it will not
414 reviewed as part of the certification process).

415 3.5.2 Calculated Typical Energy Consumption (E_{TEC}) for Desktop, Integrated Desktop, and Notebook
416 Computers per Equation 1 shall be less than or equal to the maximum TEC requirement
417 (E_{TEC_MAX}) per Equation 2, subject to the following requirements:

ⁱ Where Sleep Mode is supported by the UUT by default and Sleep Mode power is used as part of the TEC equation for qualification.

ⁱⁱ Option (b) is not permitted for systems that use WOL in order to meet the definition of Full Network Connectivity to claim the Full Capability mode weighting.

ⁱⁱⁱ For purposes of ENERGY STAR third-party certification, these requirements shall not be reviewed when products are initially certified nor during subsequent verification testing. Rather, EPA reserves the right to request supporting documentation at any time.

418 i. The Additional Internal Storage adder allowance ($TEC_{STORAGE}$) shall be applied if there are
419 more than one internal storage devices present in the product, in which case it shall only be
420 applied once.

421 ii. The Integrated Display adder allowance ($TEC_{INT_DISPLAY}$) applies only for Integrated Desktops
422 and Notebooks and may be applied for each display. For Enhanced-performance Integrated
423 Displays, the adder is calculated as presented in Table 10 and Equation 3.

424 iii. For a Notebook Computer product to certify for the Full Network Connectivity mode
425 weightings, one of the following sets of criteria shall be satisfied:

426 • Option 1:

427 - Products shall meet a non-proprietary Full Network Connectivity standard such as
428 ECMA 393 or another solution that has been approved by EPA as meeting the
429 goals of ENERGY STAR.

430 - Products shall have the applied level of functionality in Table 5 enabled and
431 configured by default upon shipment.

432 • Option 2:

433 - Products shall be capable of Sleep Mode or an Alternative Low Power Mode which
434 maintains constant network connectivity with energy consumption less than or
435 equal to 2.5 watts in order to qualify for the Full Capability mode weighting.

436 **Note:** If a Notebook Computer product does not comply with Option 1 or 2 above, the product
437 shall be tested and reported with Conventional mode weightings shown in Table 5. Full
438 Network Connectivity is a manufacturer-reported parameter. On Mac computers, “Wake for
439 network access” enabled within the Energy Saver/Power Adapter Preferences signifies Base
440 Capability or better. On Windows computers, “ARP Offload” or “NS Offload” or similar enabled
441 within the Advanced Properties of the Network Interface Card (accessed through the Device
442 Manager) signifies Base Capability or better. For systems with a dual Network Interface Card
443 (NIC) configuration, only one NIC configuration needs to comply. The manufacturer can
444 provide further guidance on how to confirm Proxy Support.

445 **Note:** EPA received stakeholder feedback stating that more desktop manufacturers can succeed at
446 achieving Option 2 above if the energy limit is set at 3 watts as opposed to the existing 2 watt approach
447 introduced in Version 7.0. Given the new full network proxy allowance being proposed below
448 ($ALLOWANCE_{PROXY}$), and the Agency’s desire to drive down energy use in long idle operation, EPA is
449 proposing to raise this limit to 2.5 watts. EPA chose 2.5 watts as it represents the point where there is
450 sufficient energy savings potential to warrant an incentive. Products using an alternative low power mode
451 will save more energy from converting the long idle energy consumption to the alternative low power
452 mode than energy lost by reduced time in sleep mode (For example, the 2.5 watts in alternative low
453 power mode would replace both sleep (which is generally less than 1 watt) and long idle (which is a
454 higher wattage, such as 19).

455 iv. For Notebooks, Desktops, and Integrated Desktops that use an Alternative Low Power Mode
456 in place of System Sleep Mode and Long Idle Mode, power in Alternative Low Power Mode
457 (P_{ALPM}) may be used in place of both the power in Sleep (P_{SLEEP}) and the power in Long Idle
458 (P_{LONG_IDLE}) in Equation 1 if the Alternative Low Power Mode measured power is less than or
459 equal to 10 watts. In such instances, $(P_{SLEEP} \times T_{SLEEP})$ and $(P_{LONG_IDLE} \times T_{LONG_IDLE})$
460 are replaced by $(P_{ALPM} \times T_{SLEEP})$ and $(P_{ALPM} \times T_{LONG_IDLE})$; Equation 1 remains
461 otherwise unchanged.
462

463 v. Notebooks, Desktops, and Integrated Desktops with switchable graphics may not apply the
 464 Discrete Graphics allowance, $TEC_{GRAPHICS}$, from Table 10 in Equation 2. However, for
 465 Desktop and Integrated Desktop systems providing Switchable Graphics and enabling it by
 466 default, an allowance equal to 14.4 watts (Desktop or Integrated Desktop) may be applied.
 467 The switchable graphics incentive only applies to automated switching that is enabled by
 468 default. This capability is manufacturer-declared.

469 **Note:** EPA has revised the switchable graphics allowance from 18 watts to 14.4 watts to align with the
 470 functional adder changes proposed in Table 10 below.

471
 472 **Equation 1: TEC Calculation (E_{TEC}) for Desktop, Integrated Desktop, Thin Client
 473 and Notebook Computers**

474
$$E_{TEC} = \frac{8760}{1000} \times (P_{OFF} \times T_{OFF} + P_{SLEEP} \times T_{SLEEP} + P_{LONG_IDLE} \times T_{LONG_IDLE}$$

 475
$$+ P_{SHORT_IDLE} \times T_{SHORT_IDLE})$$

- 476 *Where:*
- 477 ▪ P_{OFF} = Measured power consumption in Off Mode (W);
 - 478 ▪ P_{SLEEP} = Measured power consumption in Sleep Mode (W);
 - 479 ▪ P_{LONG_IDLE} = Measured power consumption in Long Idle Mode
 480 (W);
 - 481 ▪ P_{SHORT_IDLE} = Measured power consumption in Short Idle Mode
 482 (W); and
 - 483 ▪ T_{OFF} , T_{SLEEP} , T_{LONG_IDLE} , and T_{SHORT_IDLE} are mode weightings as
 484 specified in Table 4 (for Desktops, Integrated Desktops, and Thin
 485 Clients) or Table 5 (for Notebooks).

486 **Table 4: Mode Weightings for Desktops and Integrated Desktop Computers**

Mode Weighting	Conventional
T_{OFF}	15%
T_{SLEEP}	45%
T_{LONG_IDLE}	10%
T_{SHORT_IDLE}	30%

487
 488 **Table 5: Mode Weightings for Notebook Computers**

Mode Weighting	Conventional	Full Network Connectivity			
		Base Capability	Remote Wake	Service Discovery / Name Services	Full Capability
T_{OFF}	25%	25%	25%	25%	25%
T_{SLEEP}	35%	39%	41%	43%	45%
T_{LONG_IDLE}	10%	8%	7%	6%	5%
T_{SHORT_IDLE}	30%	28%	27%	26%	25%

489 **Equation 2: E_{TEC_MAX} Calculation for Desktop, Integrated Desktop, and Notebook Computers**

490
$$E_{TEC_MAX} = (1 + ALLOWANCE_{PSU} + ALLOWANCE_{PROXY}) \times (TEC_{BASE} + TEC_{MEMORY} + TEC_{GRAPHICS} +$$

491
$$TEC_{STORAGE} + TEC_{INT_DISPLAY} + TEC_{SWITCHABLE} + TEC_{MOBILEWORKSTATION})$$

492 *Where:*

- 493 *▪ ALLOWANCE_{PSU} is an allowance provided to power supplies that*
- 494 *meet the optional more stringent efficiency levels specified in*
- 495 *Table 6; power supplies that do not meet the requirements*
- 496 *receive an allowance of 0;*
- 497 *▪ ALLOWANCE_{PROXY} is an allowance of 0.12 provided only to*
- 498 *desktops which implement a full capability - full network proxy*
- 499 *solution meeting Option 1 or Option 2 in Section 3.5.2 above.*
- 500 *This allowance does not apply to integrated desktops.*
- 501 *▪ TEC_{BASE} is the Base allowance specified in Table 7, Table 8, or*
- 502 *Table 9; and,*
- 503 *▪ TEC_{GRAPHICS} is the discrete graphics allowance as specified in*
- 504 *Table 10, with the exception of systems with integrated graphics,*
- 505 *which do not receive an allowance, or Desktops and Integrated*
- 506 *Desktops with switchable graphics enabled by default, which*
- 507 *receive an allowance through TEC_{SWITCHABLE}; and*
- 508 *▪ TEC_{MEMORY}, TEC_{STORAGE}, TEC_{INT_DISPLAY}, TEC_{SWITCHABLE}, and*
- 509 *TEC_{MOBILEWORKSTATION} are added allowances as specified in Table*
- 510 *10.*

511 **Note:** Based on a recommendation from stakeholders, EPA is proposing to add the *ALLOWANCE_{PROXY}* to
512 Equation 2, providing a 12% allowance to desktop products which meet either Option 1 or Option 2 in
513 Section 3.5.2 above. EPA has historically incentivized network connected low power modes and believes
514 this new allowance will help drive innovation of new, very low power network connected alternative low
515 power modes (Option 2), as well as continuing to reduce energy use in existing traditional sleep
516 approaches which maintain a network connection (Option 1). EPA is not offering this incentive to
517 notebook computers as progress on network connected low power modes in that product subtype is more
518 mature than in the desktop category. Additionally, EPA is not offering this incentive for integrated
519 desktops. These products typically use notebook components and when assessing the benefit compared
520 to the energy cost, found that there was not enough benefit to justify the incentive.

521

522

Table 6: Internal Power Supply Efficiency Allowance

Power Supply Type	Computer Type	Minimum Efficiency at Specified Proportion of Rated Output Current				Allowance _{PSU}
		10%	20%	50%	100%	
IPS	Desktop	0.86	0.90	0.92	0.89	0.015
		0.90	0.92	0.94	0.90	0.03
	Integrated Desktop	0.86	0.90	0.92	0.89	0.015
		0.90	0.92	0.94	0.90	0.04

523

524

Table 7: Base TEC (TEC_{BASE}) Allowances for Desktops

Category Name	Graphics Capability ^{iv}	Desktop	
		Performance Score, P^v	Base Allowance
I1	Integrated or Switchable Graphics	$P \leq 8$	25.0
I2		$P > 8$	45.0
D1	Discrete Graphics	$P \leq 8$	32.0
D2		$P > 8$	42.0

525

526

527

Note: In response to Draft 1 comments and the availability of additional data, EPA has made the following edits in the latest [data package](#):

528

- Populated missing FB_BW data for D1 desktop products

529

- Used ITI provided storage formula to estimate storage adders for products for which sufficient storage data was not available in Draft 1

530

531

- Incorporated ITI categorization corrections into ITI submitted data set

532

- Included new ES products certified since Draft 1

533

- Included existing certified products which were previously missing data fields important for analysis that was provided to CBs prior to the latest data set pull (May 22, 2019)

534

535

536

The resulting data set showed justification for separating base allowances for desktops and integrated desktops into two separate tables (Table 7 and Table 8 respectively). Additionally, the P-score boundaries for both categories have been revised slightly, and the base allowances have changed due to both the separation of desktops and integrated desktops as well as the changes to the functional adders described below Table 10. EPA found that these changes will result in pass rates similar to those proposed in Draft 1, ranging from 25-26%. In addition, breaking out integrated desktops and updating the adders below to reflect the actual energy consumption of those features using the new mode weightings, allowed the Agency to slightly increase the base allowances for products. This gives more flexibility for lightly configured products to meet the ENERGY STAR requirements as they do not gain the extra energy consumption from the adders, but have a slightly larger energy budget via the base allowance to obtain ENERGY STAR certification. The estimated savings from this proposal range from 17 to 76 kWh/year, with a weighted average of 40 kWh/year.

548

549

550

iv Discrete Graphics capability is categorized based on frame buffer bandwidth, as shown in Table 10.

v $P = [\# \text{ of CPU cores}] \times [\text{CPU clock speed (GHz)}]$, where # of cores represents the number of physical CPU cores and CPU clock speed represents the Max TDP core frequency, not the turbo boost frequency.

551 while providing a bit more flexibility for lightly configured products to meet ENERGY STAR requirements
552 due to the changes to the functional adders below.

553 **Table 8: Base TEC (TEC_{BASE}) Allowances for Integrated Desktops**

Category Name	Integrated Desktop	
	Performance Score, P^{iv}	Base Allowance
1	$P \leq 8$	9.0
2	$P > 8$	22.0

554
555

556 **Table 9: Base TEC (TEC_{BASE}) Allowances for Notebooks**

Category Name	Notebook	
	Performance Score, P^{iv}	Base Allowance
0	$P \leq 2$	6.5
1	$2 < P < 8$	8.0
2	$P \geq 8$	14.0

557

558
559

Table 10: Functional Adder Allowances for Desktop, Integrated Desktop, Thin Client, and Notebook Computers

Function		Desktop	Integrated Desktop	Notebook
TEC_{MEMORY} (kWh)^{vi}			$1.7 + (0.24 \times GB)$	$2.4 + (0.294 \times GB)$
TEC_{GRAPHICS} (kWh)^{vii, viii}			$50.4 \times \tanh(0.0038 \times FB_BW - 0.137) + 23$	$29.3 \times \tanh(0.0038 \times FB_BW - 0.137) + 13.4$
TEC_{SWITCHABLE} (kWh)^{ix}			14.4	N/A
TEC_{STORAGE} (kWh)^x	3.5" HDD		21	26
	2.5" HDD		2.1	2.6
	Hybrid HDD/SSD		0.8	1.0
	SSD (including M.2 port solutions)		0.4	0.5
TEC_{INT_DISPLAY} (kWh)^{xi}	$A < 190$	N/A	$[(3.43 \times r) + (0.148 \times A) + 1.30] \times (1 + EP)$	$8.76 \times 0.30 \times (1+EP) \times (0.43 \times r + 0.0263 \times A)$
	$190 \leq A < 210$		$[(3.43 \times r) + (0.018 \times A) + 26.1] \times (1 + EP)$	
	$210 \leq A < 315$		$[(3.43 \times r) + (0.078 \times A) + 13.2] \times (1 + EP)$	
	$A \geq 315$		$[(3.43 \times r) + (0.156 \times A) - 11.3] \times (1 + EP)$	
TEC_{MOBILEWORKSTATION} (kWh)^{xii}			N/A	4.0
TEC_{10GLAN} (kWh)^{xiii}			18.0	N/A

560

- vi **TEC_{MEMORY} Adder:** GB applies per GB installed in the system.
- vii **TEC_{GRAPHICS} Adder:** Applies to only the first dGfx installed in the system, but not Switchable Graphics.
- viii **FB_BW:** Is the display frame buffer bandwidth in gigabytes per second (GB/s). This is a manufacturer declared parameter and should be calculated as follows: (Data Rate [Mhz] × Frame Buffer Data Width [bits]) / (8 × 1000)
- ix **TEC_{SWITCHABLE} Incentive:** Applies to automated switching that is enabled by default in Desktops and Integrated Desktops.
- x **TEC_{STORAGE} Adder:** Applies once if system has an Additional Internal Storage device.
- xi **TEC_{INT_DISPLAY} Adder:** EP is the Enhanced Performance Display allowance calculated per Equation 3; r is the Screen resolution in megapixels; and A is viewable screen area in square inches. This adder may be applied for each display if there are multiple displays in the system which are enabled as-shipped and in testing.
- xii **TEC_{MOBILEWORKSTATION} Adder:** Applies once if the system meets the full Mobile Workstation definition in Section 1.
- xiii **TEC_{10GLAN} Adder:** Applies once if the system contains a 10Gb/s Ethernet port.

561 **Equation 3: Calculation of Allowance for Enhanced-performance Integrated Displays**

562
$$EP = \begin{cases} 0, & \text{No Enhanced Performance Display} \\ 0.3, & \text{Enhanced Performance Display, } d < 27 \\ 0.75, & \text{Enhanced Performance Display, } d \geq 27 \end{cases}$$

563 *Where:*
564

- *d is the diagonal of the screen, in inches*

565 **Note:** EPA received feedback from multiple stakeholders recommending that all of the desktop and
566 integrated desktop functional adders be adjusted to account for the new desktop mode weightings. ITI
567 performed analysis and, in some cases, such as memory, component level measurements, to provide
568 recommendations on reduced adder values.. EPA agrees with the ITI analysis and measurements, and
569 therefore is proposing adjustments in line with the ITI recommendations in Draft 2. This reduction in
570 adder values is balanced by an increase in the base allowances across the categories in Table 7 and
571 Table 8.

572 Additionally, EPA received feedback requesting new adders for 2.5Gb/s and 10Gb/s Ethernet ports. EPA
573 is proposing an adder for 10Gb/s Ethernet ports as they are an established technology that has been
574 available in enterprise products for quite some time and are well understood. Additionally, they are
575 expected to be used in very high-end content creation scenarios.

576 EPA is not proposing an adder for 2.5Gb/s Ethernet ports. EPA has not observed these products on the
577 market yet.. Further, in most cases, the consumer has an available WAN bandwidth that is typically below
578 1 Gb/s. EPA encourages manufacturers to consider power scaling approaches used in 1Gb/s to arrive at
579 similar energy use levels.

580

581 **3.6 Requirements for Slates/Tablets and Portable All-In-One Computers**

582 3.6.1 Slates/Tablets and Portable All-In-One Computers shall follow **all** of the requirements for
583 Notebook Computers in Section 3.5 above, including calculations of the following:

- 584 i. Calculated Typical Energy Consumption (E_{TEC}), using Equation 1 with the Notebook
585 Computer Mode Weightings from Table 5.
- 586 ii. Calculated Maximum Allowed Typical Energy Consumption (E_{TEC_MAX}), using Equation 2 with
587 the appropriate base Notebook Computer allowance from Table 9, and applicable Notebook
588 Computer functional adder allowances from Table 10.

589 **3.7 Requirements for Workstations**

590 3.7.1 Weighted power consumption (P_{TEC}) as calculated per Equation 4 shall be less than or equal to
591 the maximum weighted power consumption requirement (P_{TEC_MAX}) as calculated per Equation 5.

592 **Equation 4: P_{TEC} Calculation for Workstations**

593
$$P_{TEC} = P_{OFF} \times T_{OFF} + P_{SLEEP} \times T_{SLEEP} + P_{LONG_IDLE} \times T_{LONG_IDLE}$$

594
$$+ P_{SHORT_IDLE} \times T_{SHORT_IDLE}$$

595 *Where:*
596

- P_{OFF} = Measured power consumption in Off Mode (W);
- 597 - P_{SLEEP} = Measured power consumption in Sleep Mode (W);
- 598 - P_{LONG_IDLE} = Measured power consumption in Long Idle Mode
599 (W);
- 600 - P_{SHORT_IDLE} = Measured power consumption in Short Idle Mode
601 (W); and

637 Where:

- 638 ▪ TEC_{BASE} is the Base Allowance specified in Table
- 639 ▪ Table 13;
- 640 ▪ $TEC_{GRAPHICS}$ is the Discrete Graphics allowance specified in
- 641 Table 13 if applicable;
- 642 ▪ TEC_{WOL} is the Wake-on-LAN allowance specified in Table
- 643 ▪ Table 13 if applicable;
- 644 ▪ $TEC_{INT_DISPLAY}$ is the Integrated Display allowance for Integrated
- 645 Desktops specified in Table 10 if applicable; and

646 **Table 13: Adder Allowances for Thin Clients**

Adder	Allowance (kWh)
TEC_{BASE}	31
$TEC_{GRAPHICS}$	36
TEC_{WOL}	2

647

648

649 **Note:** Products intended for sale in the US market are subject to minimum toxicity and recyclability

650 requirements. Please see ENERGY STAR® Program Requirements for Computers: Partner Commitments

651 for details.

652 4 TESTING

653 4.1 Test Methods

654 4.1.1 When testing Computer products, the test methods identified in Table 14 shall be used to

655 determine ENERGY STAR certification.

656 **Table 14: Test Methods for ENERGY STAR Certification**

Product Type or Component	Test Method
All	ENERGY STAR Draft Test Method for Computers, Rev. July 2019

657 **Note:** The test method reference has been updated to reflect the date for the current draft test method.

658 4.2 Number of Units Required for Testing

659 4.2.1 Representative Models shall be selected for testing per the following requirements:

- 660 i. For certification of an individual product configuration, the unique configuration that is
- 661 intended to be marketed and labeled as ENERGY STAR is considered the Representative
- 662 Model.
- 663 ii. For certification of a Product Family of all product types, with the exception of Workstations,
- 664 product configurations that represent the worst-case power consumption for each product
- 665 category within the family are considered Representative Models. When submitting Product
- 666 Families, manufacturers continue to be held accountable for any efficiency claims made
- 667 about their products, including those not tested or for which data were not reported. This
- 668 includes ensuring that all models shipped as ENERGY STAR certified within the product
- 669 family maintain the same power management settings when testing the Representative
- 670 Model(s).

671 iii. For systems that meet the definition for multiple categories (as defined in Section 1.B)
672 depending on the specific configuration, manufacturers will have to submit the highest power
673 configuration for each category under which they would like the system to be ENERGY STAR
674 certified. For example, a system that could be configured as either a Category 0 or 1
675 Desktop, as defined in Table 7 would require submittal of the highest power configuration for
676 both categories in order to be ENERGY STAR certified. If a product could be configured to
677 meet all categories, it would then have to submit data for the highest power configuration in
678 all categories.

679 iv. For certification of a Product Family of Workstations under the Workstation or Desktop
680 product type, the product configuration that represents the worst-case power consumption
681 with a single GPU within the family is considered the Representative Model.
682

683 Note: Workstations that meet ENERGY STAR requirements with a single graphics device
684 may also have a configuration with more than one graphics device be ENERGY STAR
685 certified, provided the additional hardware configuration is identical with the exception of the
686 additional graphics device(s). The use of multiple graphics includes, but is not limited to,
687 driving multiple displays and ganging for high performance, multi-GPU configurations (e.g.
688 ATI Crossfire, NVIDIA SLI). In such cases, and until such time as SPECviewperf® supports
689 multiple graphics threads, manufacturers may submit the test data for the workstation with
690 the single graphics device for both configurations without retesting the system.

691 4.2.2 A single unit of each Representative Model shall be selected for testing.

692 4.2.3 All units/configurations for which a Partner is seeking ENERGY STAR certification, must meet the
693 ENERGY STAR requirements. However, if a Partner wishes to certify configurations of a model
694 for which non-ENERGY STAR certified alternative configurations exist, the Partner must assign
695 the certified configurations an identifier in the model name/number that is unique to ENERGY
696 STAR certified configurations. This identifier must be used consistently in association with the
697 certified configurations in marketing/sales materials and on the ENERGY STAR list of certified
698 products (e.g. model A1234 for baseline configurations and A1234-ES for ENERGY STAR
699 certified configurations).

700 **Note:** There may be cases—as described in the paragraph above—where not all
701 units/configurations will meet ENERGY STAR requirements. If so, the worst-case configuration
702 for test will be the worst-case certified configuration, and not one of the presumably even higher-
703 energy consuming non-certified configurations.

704 **4.3 International Market Certification**

705 4.3.1 Products shall be tested for certification at the relevant input voltage/frequency combination for
706 each market in which they will be sold and promoted as ENERGY STAR.

707 **4.4 Customer Software and Management Service Pre-Provisioning**

708 4.4.1 If a manufacturing Partner is hired by a customer to load a custom image on an ENERGY STAR
709 certified computer, the Partner shall take the following steps:

710 i. Inform the customer that their product may not meet ENERGY STAR with the custom image.
711 A sample notification letter is available on the ENERGY STAR Web site.

712 ii. Encourage the customer to test the product for ENERGY STAR compliance.

713 iii. Encourage the customer, should the product no longer meet ENERGY STAR, to make use of
714 EPA's free technical assistance that can assist with Power Management performance, which
715 can be found at www.energystar.gov/fedofficeenergy.

716 **5 USER INTERFACE**

717 5.1.1 Manufacturers are encouraged to design products in accordance with the user interface standard
718 IEEE 1621: Standard for User Interface Elements in Power Control of Electronic Devices
719 Employed in Office/Consumer Environments. For details, see <http://eetd.LBL.gov/Controls>.

720 **6 EFFECTIVE DATE**

721 6.1.1 Effective Date: The Version 8 ENERGY STAR Computers specification shall take effect TBD. To
722 be ENERGY STAR certified, a product model shall meet the ENERGY STAR specification in
723 effect on its date of manufacture. The date of manufacture is specific to each unit and is the date
724 on which a unit is considered to be completely assembled.

725 **Note:** EPA anticipates completing the Version 8.0 process in Q3/Q4 2019 with an effective date no later
726 than July 2020.

727

728 6.1.2 Future Specification Revisions: EPA reserves the right to change this specification should
729 technological and/or market changes affect its usefulness to consumers, industry, or the
730 environment. In keeping with current policy, revisions to the specification are arrived at through
731 stakeholder discussions. In the event of a specification revision, please note that the ENERGY
732 STAR certification is not automatically granted for the life of a product model.

733 **7 CONSIDERATIONS FOR FUTURE REVISIONS**

734 7.1.1 **Active Mode**: EPA will continue to monitor developments in test methodology that addresses
735 active mode, where the computer is actively performing tasks, and assess whether these
736 measurements warrant inclusion into the ENERGY STAR Computers specification.

737 7.1.2 **Energy Efficient Ethernet**: EPA intends to require that EEE is enabled as-shipped for all 1Gb/s
738 or faster Ethernet ports provided in computer products in the next revision of the ENERGY STAR
739 Computers specification.

740