



ENERGY STAR® Program Requirements Product Specification for Computers

Eligibility Criteria Draft 2, Version 9.0

1 Following is the **Draft 2, Version 9** ENERGY STAR Product Specification for Computers. A product shall
2 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 and is
41 designed for use in professional workflows such as architecture, engineering, computer aided
42 drafting, product development, financial applications, scientific applications, and/or content
43 creation. It must also meet all of the following criteria:
- 44 (1) Has a mean time between failures (MTBF) of at least 13,000 hours;
- 45 (2) Certification by 4 or more Independent Software Vendor (ISV) product certifications in
46 professional workflows (see examples above). These certifications can be in process,
47 but partner shall ensure they are completed within 6 months of the date the product
48 becomes available on the market;
- 49 (3) Supports at least 32 gigabytes of system memory; and
- 50 (4) Supports either:
- 51 (a) At least one integrated or discrete GPU with frame buffer bandwidth of 96
52 gigabytes per second or greater; or
- 53 (b) A total of 4 gigabytes or more of system memory with a bandwidth of 134
54 gigabytes per second or greater and an integrated GPU.
- 55 d) Multi-Screen Notebook: A Computer which resembles a traditional Notebook Computer with a
56 clam shell form factor but has a secondary display with touch and/or pen capability that can
57 be used as a touch screen keyboard in place of a traditional mechanical keyboard. These
58 products are considered to be Notebook Computers for purposes of this specification.
- 59 4) Slate/Tablet: A computing device designed for portability that meets all of the following criteria:
- 60 a) Includes an integrated display with a diagonal size greater than 7.0 inches and less than 17.4
61 inches;
- 62 b) Lacking an integrated, physical attached keyboard in its as-shipped configuration;
- 63 c) Includes and primarily relies on touchscreen input; (with optional keyboard);
- 64 d) Includes and primarily relies on a wireless network connection (e.g., Wi-Fi, 3G, etc.); and
- 65 e) Includes and is primarily powered by an internal battery (with connection to the mains for
66 battery charging, not primary powering of the device).
- 67 5) Portable All-In-One Computer: A computing device designed for portability that meets all of the
68 following criteria:
- 69 a) Includes an integrated display with a diagonal size greater than or equal to 17.4 inches;
- 70 b) Lacking keyboard integrated into the physical housing of the product in its as-shipped
71 configuration;
- 72 c) Includes and primarily relies on touchscreen input; (with optional keyboard);
- 73 d) Includes wireless network connection (e.g. Wi-Fi, 3G, etc.); and
- 74 e) Includes an internal battery
- 75 6) E-Reader: A device designed for display and consumption of static images. The display is
76 characterized by a low refresh rate and a display made of bistable materials where no energy is
77 needed to maintain a visible image, only to alter the image.
- 78 7) Small-scale Server: A Computer that typically uses desktop components in a desktop form factor
79 but is designed primarily to be a storage host for other computers. Small-scale Servers are
80 designed to perform functions such as providing network infrastructure services (e.g., archiving)
81 and hosting data/media. These products are not designed to process information for other
82 systems or run web servers as a primary function. A Small-scale Server has the following
83 characteristics:

- 84 a) Designed in a pedestal, tower, or other form factor similar to those of desktop computers
85 such that all data processing, storage, and network interfacing is contained within one
86 box/product;
- 87 b) Designed to operate 24 hours/day, 7 days/week, with minimal unscheduled downtime (on the
88 order of hours/year);
- 89 c) Capable of operating in a simultaneous multi-user environment serving several users through
90 networked client units; and
- 91 d) Designed for an industry accepted operating system for home or low-end server applications
92 (e.g., Windows Home Server, Mac OS X Server, Linux, UNIX, Solaris).
- 93 8) Thin Client: An independently-powered Computer that relies on a connection to remote
94 computing resources (e.g., computer server, remote workstation) to obtain primary functionality.
95 Main computing functions (e.g., program execution, data storage, interaction with other Internet
96 resources) are provided by the remote computing resources. Thin Clients covered by this
97 specification are (1) limited to devices with no rotational storage media integral to the computer
98 and (2) designed for use in a permanent location (e.g. on a desk) and not for portability.
- 99 a) Integrated Thin Client: A Thin Client in which computing hardware and display are
100 connected to ac mains power through a single cable. Integrated Thin Client computers
101 come in one of two possible forms: (1) a system where the display and computer are
102 physically combined into a single unit; or (2) a system packaged as a single system
103 where the display is separate but is connected to the main chassis by a dc power cord
104 and both the computer and display are powered from a single power supply. As a subset
105 of Thin Clients, Integrated Thin Clients are typically designed to provide similar
106 functionality as Thin Client systems.
- 107 b) Ultra-thin Client: A Computer with lesser local resources than a standard Thin Client that
108 sends raw mouse and keyboard input to a remote computing resource and receives back
109 raw video from the remote computing resource. Ultra-thin clients cannot interface with
110 multiple devices simultaneously nor run windowed remote applications due to the lack of
111 a user-discernible client operating system on the device (i.e., beneath firmware, user
112 inaccessible).
- 113 9) Workstation: A high-performance, Computer used for professional workflows such as
114 architecture, engineering, computer aided drafting, product development, financial applications,
115 scientific applications and/or content creation. Workstations covered by this specification (a) are
116 marketed as a workstation; (b) do not support altering frequency or voltage beyond the CPU and
117 GPU manufacturers' as-shipped operating specifications; and (c) have system hardware that
118 supports an error-correcting mechanism that detects and corrects data errors with dedicated
119 circuitry on and across the CPU, interconnect, and system memory. In addition, a workstation
120 must have 4 or more Independent Software Vendor (ISV) product certifications in professional
121 workflows (see examples above). These certifications can be in process, but partner shall ensure
122 they are completed within 6 months of the date the product becomes available on the market.
- 123 10) Rack-mounted Workstation: A Workstation that is designed to be natively rack mounted as
124 described in IEC 60297-3-101:2004. The rack-mounted workstation may be accessed locally by
125 direct connection to the workstation and display or accessed remotely across a network by one or
126 more users.
- 127 B) Product Category: A second-order classification or sub-type within a product type that is based on
128 product features and installed components. Product categories are used in this specification to
129 determine certification and test requirements.

- 130 C) Computer Components:
- 131 1) Central Processing Unit (CPU): A central processing unit, also called a central processor, main
 132 processor or just processor, is the electronic circuitry that executes, including but not limited to,
 133 floating point or integer-based instructions comprising a computer program. Many processors
 134 contain multiple Cores to perform these instructions.
- 135 2) Core: A single functional unit of a CPU that handles software instructions such as arithmetic,
 136 floating point, and other data manipulation.
- 137 3) System on Chip (SoC): An integrated circuit that integrates most or all components (CPU,
 138 memory, IO, graphics, storage) of a full computer system or other electronic system on a single
 139 silicon substrate or package.
- 140 4) Graphics Processing Unit (GPU): An integrated circuit, separate from the CPU, designed to
 141 accelerate the rendering of either 2D and/or 3D content to displays. A GPU may be mated with a
 142 CPU, on the system board of the computer or elsewhere to offload display capabilities from the
 143 CPU.
- 144 5) Discrete Graphics (dGfx): A graphics processor (GPU) which must contain a local memory
 145 controller interface and local graphics-specific memory.
- 146 6) Integrated Graphics (iGfx): A graphics solution that does not contain Discrete Graphics.
- 147 7) Display: A commercially-available product with a display screen and associated electronics, often
 148 encased in a single housing, that as its primary function displays visual information from (1) a
 149 computer, workstation or server via one or more inputs (e.g., VGA, DVI, HDMI, DisplayPort, IEEE
 150 1394, USB), (2) external storage (e.g., USB flash drive, memory card), or (3) a network
 151 connection.
- 152 a) Enhanced-performance Integrated Display: An integrated Computer Display that has all
 153 of the following features and functionalities:
- 154 (1) A contrast ratio of at least 60:1 at a horizontal viewing angle of at least 85°, with or
 155 without a screen cover glass;
- 156 (2) A native resolution greater than or equal to 2.3 megapixels (MP); and
- 157 (3) A color gamut of at least sRGB as defined by IEC 61966-2-1. Shifts in color space
 158 are allowable as long as 99% or more of defined sRGB colors are supported.
- 159 8) External Power Supply (EPS): Also referred to as External Power Adapter. An external power
 160 supply circuit that is used to convert household electric current into dc current or lower-voltage ac
 161 current to operate a consumer product.
- 162 9) Internal Power Supply (IPS): A component internal to the computer casing and designed to
 163 convert ac voltage from the mains to dc voltage(s) for the purpose of powering the computer
 164 components. For the purposes of this specification, an internal power supply shall be contained
 165 within the computer casing but be separate from the main computer board. The power supply
 166 shall connect to the mains through a single cable with no intermediate circuitry between the
 167 power supply and the mains power. In addition, all power connections from the power supply to
 168 the computer components, with the exception of a DC connection to a display in an Integrated
 169 Desktop Computer, shall be internal to the computer casing (i.e., no external cables running from
 170 the power supply to the computer or individual components). Internal dc-to-dc converters used to
 171 convert a single dc voltage from an external power supply into multiple voltages for use by the
 172 computer are not considered internal power supplies.
- 173 10) System Memory Bandwidth: The rate at which data can be read or stored into computer system's
 174 memory, expressed in gigabytes per second (GB/s).

175 D) Operational Modes:

- 176 1) Active State: The power state in which the computer is carrying out useful work in response to a)
177 prior or concurrent user input or b) prior or concurrent instruction over the network. Active State
178 includes active processing, seeking data from storage, memory, or cache, including Idle State
179 time while awaiting further user input and before entering low power modes.
- 180 2) Idle State: The power state in which the operating system and other software have completed
181 loading, a user profile has been created, activity is limited to those basic applications that the
182 system starts by default, and the computer is not in Sleep Mode. Idle State is composed of two
183 sub-states: Short Idle and Long Idle.
- 184 a) Long Idle: The mode where the computer has reached an Idle condition (i.e., 15 minutes
185 after OS boot or after completing an active workload or after resuming from Sleep Mode)
186 and the main Computer Display has entered a low-power state where screen contents
187 cannot be observed (i.e., backlight has been turned off) but remains in the working mode
188 (ACPI G0/S0). If power management features are enabled as-shipped in the scenario
189 described in this definition, such features shall engage prior to evaluation of Long Idle
190 (e.g., display is in a low power state, HDD may have spun-down), but the Computer is
191 prevented from entering Sleep Mode. P_{LONG_IDLE} represents the average power measured
192 when in the Long Idle Mode.
- 193 b) Short Idle: The mode where the computer has reached an Idle condition (i.e., 5 minutes
194 after OS boot or after completing an active workload or after resuming from Sleep Mode),
195 the screen is on, and Long Idle power management features have not engaged (e.g.
196 HDD is spinning and the Computer is prevented from entering sleep mode). P_{SHORT_IDLE}
197 represents the average power measured when in the Short Idle Mode.
- 198 3) Off Mode: The lowest power mode which cannot be switched off (influenced) by the user and that
199 may persist for an indefinite time when the appliance is connected to the main electricity supply
200 and used in accordance with the manufacturer's instructions. For systems where ACPI standards
201 are applicable, Off Mode correlates to ACPI System Level S5 state.
- 202 4) Sleep Mode: A low power mode that the computer enters automatically after a period of inactivity
203 or by manual selection. A computer with Sleep capability can quickly "wake" in response to
204 network connections or user interface devices from initiation of wake event to a readable display.
205 For systems where ACPI standards are applicable, Sleep Mode most commonly correlates to
206 ACPI System Level S3 (suspend to RAM) state or, for workstations without resume-time limits,
207 ACPI System Level S4 (hibernate). P_{SLEEP} represents the average power measured when in the
208 Sleep Mode.

209 **Note:** The EPA received feedback requesting clarification that resume-time requirements are not
210 applicable to workstations and that workstations are capable of ACPI System Level S4 for their sleep
211 mode. This has been clarified in the sleep mode definition above.

- 212 5) Alternative Low Power Mode (ALPM): A low power mode that the computer enters automatically
213 after a period of inactivity or by manual selection that is defined by the display turning off and the
214 computer entering a state of reduced functionality. A computer with Alternative Low Power Mode
215 must maintain immediate responsiveness to network connections or user interface devices. P_{ALPM}
216 represents the average power measured when in the Alternative Low Power Mode.

217 E) Networking and Additional Capabilities:

- 218 1) Additional Internal Storage: Any and all internal hard disk drives (HDD) or solid-state drives (SSD)
219 installed beyond the primary storage device where the operating system is installed in the
220 products as-shipped state. This definition does not include external drives.
- 221 2) Energy Efficient Ethernet (EEE): A technology which enables reduced power consumption of
222 Ethernet interfaces during times of low data throughput. Specified by IEEE 802.3az.

223 3) Full Network Connectivity: The ability of the computer to maintain network presence while in
224 Sleep Mode or an Alternative Low Power Mode (ALPM) with power demand of less than or equal
225 to 10 watts and intelligently wake when further processing is required (including occasional
226 processing required to maintain network presence). Presence of the computer, its network
227 services and applications, is maintained even though the computer is in an ALPM. From the
228 vantage point of the network, a computer with full network connectivity that is in ALPM is
229 functionally equivalent to an idle computer with respect to common applications and usage
230 models. Full network connectivity in ALPM is not limited to a specific set of protocols but can
231 cover applications installed after initial installation. Also referred to as “network proxy”
232 functionality and as described in the *Ecma-393* standard.

233 a) Network Proxy - Base Capability: To maintain addresses and presence on the network while
234 in Sleep Mode or ALPM, the system handles IPv4 ARP and IPv6 NS/ND.

235 b) Network Proxy - Full Capability: While in Sleep Mode or ALPM, the system supports Base
236 Capability, Remote Wake, and Service Discovery/Name Services.

237 c) Network Proxy - Remote Wake: While in Sleep Mode or ALPM, the system is capable of
238 remotely waking upon request from outside the local network. Includes Base Capability.

239 d) Network Proxy - Service Discovery/Name Services: While in Sleep Mode or ALPM, the
240 system allows for advertising host services and network name. Includes Base Capability.

241 4) Constant Network Connectivity: A capability that allows the wake of system operating system or
242 software to facilitate communication and downloads from the network (e.g. instant messaging,
243 email, management and maintenance tasks, etc.)

244 5) Network Interface: The components (hardware and software) whose primary function is to make
245 the computer capable of communicating over one or more network technologies. Examples of
246 Network Interfaces are IEEE 802.3 (Ethernet) and IEEE 802.11 (Wi-Fi).

247 6) Wake Event: A user, scheduled, or external event or stimulus that causes the computer to
248 transition from Sleep Mode or Off Mode to an active state of operation. Examples of wake events
249 include, but are not limited to: movement of the mouse, keyboard activity, controller input, real-
250 time clock event, or a button press on the chassis, and in the case of external events, stimulus
251 conveyed via a remote control, network, modem, etc.

252 7) Wake On LAN (WOL): Functionality which allows a computer to transition from Sleep Mode or Off
253 Mode to an Active State of operation when directed by a network Wake Event via Ethernet.

254 8) Switchable Graphics: Functionality that allows Discrete Graphics to be disabled when not
255 required in favor of Integrated Graphics.

256 Note: This functionality allows lower power and lower capability integrated GPUs to render the
257 display while on battery or when the output graphics are not overly complex while then allowing
258 the more power consumptive but more capable discrete GPU to provide rendering capability
259 when required.

260 F) Marketing and Shipment Channels:

261 1) Enterprise Channels: Sales channels typically used by large and medium-sized business,
262 government, educational, or other organizations to purchase computers for use in managed
263 client/server environments.

264 2) Model Name: A marketing name that includes reference to the computer model number, product
265 description, or other branding references.

266 3) Model Number: A unique marketing name or identification reference that applies to a specific
267 hardware and software configuration (e.g., operating system, processor type, memory, GPU), and
268 is either pre-defined or selected by a customer.

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

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

279 **2 SCOPE**

280 **2.1 Included Products**

281 2.1.1 Products that meet the definition of a Computer and one of the following Product Type definitions,
282 as specified herein, are eligible for ENERGY STAR certification, with the exception of products
283 listed in Section 2.2:

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

290 **2.2 Excluded Products**

291 2.2.1 Products that are covered under other ENERGY STAR product specifications are not eligible for
292 certification under this specification. The list of specifications currently in effect can be found at
293 www.energystar.gov/products.

294 2.2.2 The following products are not eligible for certification under this specification:

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

309 xii. Small-scale Servers.

310

311 3 CERTIFICATION CRITERIA

312 3.1 Significant Digits and Rounding

313 3.1.1 All calculations shall be carried out with directly measured (unrounded) values.

314 3.1.2 Unless otherwise specified in this specification, compliance with specification limits shall be
315 evaluated using directly measured or calculated values without any benefit from rounding.

316 3.1.3 Directly measured or calculated values that are submitted for reporting on the ENERGY STAR
317 website shall be rounded to the nearest significant digit as expressed in the corresponding
318 specification limit.

319 3.2 General Requirements

320 3.2.1 Power supply test data and test reports from testing entities recognized by EPA to perform power
321 supply testing shall be accepted for the purpose of certifying the ENERGY STAR product.

322 3.2.2 Internal Power Supply (IPS) Requirements: IPSs used in Computers eligible under this
323 specification must meet the following requirements when tested using the *Generalized Internal*
324 *Power Supply Efficiency Test Protocol, Rev. 6.7.1* (available at
325 https://www.plugloadsolutions.com/docs/collatrl/print/Generalized_Internal_Power_Supply_Efficiency_Test_Protocol_R6.7.1.pdf).
326

327 i. IPS with maximum rated output power less than 75 watts shall meet minimum efficiency
328 requirements as specified in Table 1.

329 ii. IPS with maximum rated output power greater than or equal to 75 watts shall meet both
330 minimum efficiency requirements and minimum power factor requirements, as specified in
331 Table 1 and Table 2 as applicable.

332 **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	-

333

334 **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	-

335 **Note:** The EPA received verbal and written feedback explaining that many smaller IPSs below 500 watts
336 cannot meet 80Plus Silver requirements but are more efficient at 10% loading point than products listed
337 as 80Plus Bronze, which is not a loading point addressed by the 80Plus program. As such, industry has
338 requested that the EPA maintain the 80Plus bronze equivalent requirements for the 20%-100% loading
339 points for these smaller power supplies while industry continues to focus on improving efficiency at the
340 10% loading point which is a more relevant operating range for many lower power products in daily use.

341 As such, the EPA has reverted the IPS requirements below 500 watts to 80Plus bronze equivalent while
342 retaining the existing additional 10% load point requirement and encourages partners to continue their
343 innovation on low load efficiency in smaller power supplies to minimize loss in lower power modes.

344 3.2.3 External Power Supply (EPS) Requirements: Single- and Multiple-voltage EPSs shall meet the
345 Level VI or higher performance requirements under the International Efficiency Marking Protocol
346 when tested according to the Uniform Test Method for Measuring the Energy Consumption of
347 External Power Supplies, Appendix Z to 10 CFR Part 430.

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

352 3.2.4 Energy Efficient Ethernet (EEE) Requirements: All products which contain one or more Ethernet
353 ports with a bandwidth of 1Gb/s or higher shall have EEE enabled as-shipped in each of these
354 ports in their as-shipped configuration.

355

356 **3.3 Power Management Requirements**

357 3.3.1 Products shall include power management features in their “as-shipped” condition as specified in
358 Table 3, subject to the following conditions:

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

371 **3.4 User Information Requirements**

372 3.4.1 Products shall be shipped with informational materials to notify customers of the following:

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

376 3.4.2 Products shall be shipped with one or more of the following:

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

385 3.4.3 Provisions 3.4.1 and 3.4.2 may be met through use of either electronic or printed product
386 documentation, provided it adheres to all of the following:

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

395 **3.5 Requirements for Desktop, Integrated Desktop, and Notebook Computers**

396 3.5.1 Resume Time Requirement: Notebook computers are required to wake from sleep or an
397 alternative low power mode with a latency of less than or equal to 5 seconds from initiation of
398 wake event to system becoming fully usable including rendering of display. Desktop and
399 Integrated Desktop Computers shall meet this same requirement, but with a latency of less than
400 or equal to 10 seconds. Manufacturers shall self-declare that the product can meet this
401 requirementⁱⁱⁱ. Resume time requirements do not apply to mobile workstations, workstations, or
402 thin clients.

403 **Note:** The EPA has clarified that resume time requirements do not apply to mobile workstations,
404 workstations or thin clients. This was always the case, but the EPA received stakeholder feedback
405 requesting that this be explicitly stated to avoid any potential confusion during the certification process.

406 3.5.2 Calculated Annual Typical Energy Consumption (E_{TEC}) for Desktop, Integrated Desktop, and
407 Notebook Computers per Equation 1 shall be less than or equal to the maximum TEC
408 requirement (E_{TEC_MAX}) per Equation 2, subject to the following requirements:

ⁱ Where Sleep Mode is supported by the unit under test 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.

- 409 i. The Additional Internal Storage adder allowance ($TEC_{STORAGE}$) shall be applied if there are
 410 more than one internal storage devices present in the product, in which case it shall only be
 411 applied once.
- 412 ii. The Integrated Display adder allowance ($TEC_{INT_DISPLAY}$) applies only for Integrated Desktops
 413 and Notebooks and may be applied for each display. For Enhanced-performance Integrated
 414 Displays, the adder is calculated as presented in Table 7 and Equation 3.
- 415 iii. For Notebooks, Desktops, and Integrated Desktops that use an Alternative Low Power Mode
 416 in place of System Sleep Mode and Long Idle Mode, power in Alternative Low Power Mode
 417 (P_{ALPM}) may be used in place of both the power in Sleep (P_{SLEEP}) and the power in Long Idle
 418 (P_{LONG_IDLE}) in Equation 1 if the Alternative Low Power Mode measured power is less than or
 419 equal to 10 watts. In such instances, $(P_{SLEEP} \times T_{SLEEP})$ and $(P_{LONG_IDLE} \times T_{LONG_IDLE})$
 420 are replaced by $(P_{ALPM} \times T_{SLEEP})$ and $(P_{ALPM} \times T_{LONG_IDLE})$; Equation 1 remains
 421 otherwise unchanged.
- 422 iv. Notebooks, Desktops, and Integrated Desktops with switchable graphics may not apply the
 423 Discrete Graphics allowance, $TEC_{GRAPHICS}$, from Table 7 in Equation 2. However, for Desktop
 424 and Integrated Desktop systems that provide automated Switchable Graphics enabled by
 425 default, an allowance equal to 7 watts (Desktop or Integrated Desktop) may be applied. This
 426 capability is manufacturer-declared.

427 **Note: The EPA has removed the Full Network Connectivity mode weightings and incentives, as**
 428 **they are no longer present in the proposed updated mode weightings. Equation 1: TEC**
 429 **Calculation (E_{TEC}) for Desktop, Integrated Desktop,**
 430 **and Notebook Computers**

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

433 *Where:*

- 434 ▪ P_{OFF} = Measured power consumption in Off Mode (W);
- 435 ▪ P_{SLEEP} = Measured power consumption in Sleep Mode (W);
- 436 ▪ P_{LONG_IDLE} = Measured power consumption in Long Idle Mode
 437 (W);
- 438 ▪ P_{SHORT_IDLE} = Measured power consumption in Short Idle Mode
 439 (W); and
- 440 ▪ T_{OFF} , T_{SLEEP} , T_{LONG_IDLE} , and T_{SHORT_IDLE} are mode weightings as
 441 specified in Table 4 (for Desktops, Integrated Desktops) or
 442 Table 5 (for Notebooks).

443 **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%

444
445

Table 5: Mode Weightings for Notebook Computers

Mode Weighting	Conventional
T _{OFF}	10%
T _{SLEEP}	60%
T _{LONG_IDLE}	10%
T _{SHORT_IDLE}	20%

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

447
$$E_{TEC_MAX} = (TEC_{BASE} + TEC_{MEMORY} + TEC_{GRAPHICS} + TEC_{STORAGE} + TEC_{INT_DISPLAY} + TEC_{SWITCHABLE} +$$

 448
$$TEC_{MOBILEWORKSTATION} + TEC_{>1G\ to\ <10GLAN} + TEC_{10GLAN})$$

449 *Where:*

- 450 ▪ *TEC_{BASE} is the Base allowance specified in Table 6; and,*
- 451 ▪ *TEC_{GRAPHICS} is the discrete graphics allowance as specified in*
 452 *Table 7, with the exception of systems with integrated graphics,*
 453 *which do not receive an allowance, or Desktops and Integrated*
 454 *Desktops with switchable graphics enabled by default, which*
 455 *receive an allowance through TEC_{SWITCHABLE}; and*
- 456 ▪ *TEC_{MEMORY}, TEC_{STORAGE}, TEC_{INT_DISPLAY}, TEC_{SWITCHABLE},*
 457 *TEC_{MOBILEWORKSTATION}, TEC_{>1G to <10GLAN} and TEC_{10GLAN} are*
 458 *adder allowances as specified in Table 7.*

459 **Table 6: Base TEC (TEC_{BASE}) Allowances for Notebooks, Desktops, and Integrated Desktops**

Category	Base Allowance
Notebook	6.3
Integrated Desktop	6.8
Desktop	32

461

462 **Note:** The EPA has worked with the Information Technology Industry Council (ITI) over the past couple
 463 months to address several data quality issues and also significantly expand the size of the EPA data set
 464 for Draft 2. These changes to the data set, in conjunction with several largely downward changes to
 465 functional adders in Table 7, have yielded new proposed base allowance values for notebooks, integrated
 466 desktops and desktops in Table 6 above. The revised data set not only captures a much larger number of
 467 non-certified models, but also a greater variety of configuration types for both certified and non-certified
 468 models available on the market.

469 These base allowances, combined with the functional adder allowance changes below, result in product
 470 pass rates of roughly 25% in each category in Table 6 above.

471
472

473 **Table 7: Functional Adder Allowances for Desktop, Integrated Desktop, Thin Client, and Notebook**
 474 **Computers**

Function		Desktop	Integrated Desktop	Notebook
TEC_{MEMORY} (kWh)^{iv}			$0.17 \times GB$	$0.08 \times GB$
TEC_{GRAPHICS} (kWh)^{v,vi}			$29.4 \times \tanh(0.008 \times FB_BW - 0.03) + 11 + (0.011 \times FB_BW)$	$14.7 \times \tanh(0.008 \times FB_BW - 0.03) + 5.5 + (0.0055 \times FB_BW)$
TEC_{SWITCHABLE} (kWh)^{vii}			7.0	N/A
TEC_{STORAGE} (kWh)^{viii}	3.5" HDD		16.5	N/A
	2.5" HDD		2.1	
	Hybrid HDD/SSD		0.8	
	SSD (including M.2 port solutions)		0.4	
TEC_{INT_DISPLAY} (kWh)^{ix}	$A < 190$	N/A	$[(3.43 \times r) + (0.148 \times A) + 1.30] \times (1 + EP)$	$8.76 \times 0.20 \times (1+EP) \times (0.43 \times r + 0.0263 \times A)$
	$190 \leq A < 210$		$[(3.43 \times r) + (0.018 \times A) + 26.1] \times (1 + EP)$	
	$210 \leq A < 315$		$[(3.43 \times r) + (0.078 \times A) + 13.2] \times (1 + EP)$	
	$A \geq 315$		$[(3.43 \times r) + (0.156 \times A) - 11.3] \times (1 + EP)$	
TEC_{MOBILEWORKSTATION} (kWh)^x			N/A	7.1
TEC_{>1G to <10GLAN} (kWh)^{xi}			4.0	N/A
TEC_{10GLAN} (kWh)^{xii}			18.0	N/A

475

476 **Note:** As part of the effort to update the data set, ITI also provided feedback suggesting modifications to
 477 several existing functional adders to more closely align with current technology offerings. The EPA has
 478 proposed to include these revised adders and has adjusted the base allowances in Table 6 to account for
 479 the adder changes. In particular:

480 - The memory adder has been reintroduced in notebooks, and both memory adders have been simplified
 481 and reduced in magnitude.

iv **TEC_{MEMORY} Adder:** GB applies per GB installed in the system.
 v **TEC_{GRAPHICS} Adder:** Applies to only the first dGfx installed in the system, but not Switchable Graphics.
 vi **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)
 vii **TEC_{SWITCHABLE} Incentive:** Applies to automated switching that is enabled by default in Desktops and Integrated Desktops.
 viii **TEC_{STORAGE} Adder:** Applies once if system has an Additional Internal Storage device.
 ix **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.
 x **TEC_{MOBILEWORKSTATION} Adder:** Applies once if the system meets the full Mobile Workstation definition in Section 1.
 xi **TEC_{>1G to <10GLAN} Adder:** Applies once if system contains an Ethernet port with rated throughput greater than 1Gb/s but less than 10 Gb/s.
 xii **TEC_{10GLAN} Adder:** Applies once if the system contains a 10 Gb/s Ethernet port.

- 482 - The switchable graphics adder for desktops and integrated desktops has been cut by more than half.
- 483 - The integrated display adder for notebooks has been revised to align with the new notebooks mode
- 484 weightings in Version 9, resulting in a smaller adder for these products.
- 485 - The mobile workstation adder has been increased in accordance with the changes to the dataset,
- 486 notebook base allowance and changes to functional adders in Table 7.

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

$$EP = 0.3 \text{ for all Enhanced Performance Displays}$$

Note: The EPA has received stakeholder feedback recommending simplification of the Enhanced Performance Display Adder to align with currently display technology trends and has revised Equation 3 accordingly based on this feedback.

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

- 3.6.1 Slates/Tablets and Portable All-In-One Computers shall follow **all** of the requirements for Notebook Computers in Section 3.5 above, including calculations of the following:
- i. Calculated Typical Energy Consumption (E_{TEC}), using Equation 1 with the Notebook Computer Mode Weightings from Table 5.
 - ii. Calculated Maximum Allowed Typical Energy Consumption (E_{TEC_MAX}), using Equation 2 with the appropriate base Notebook Computer allowance from Table 6, and applicable Notebook Computer functional adder allowances from Table 7.

3.7 Requirements for Workstations

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

Equation 4: P_{TEC} Calculation for Workstations

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

Where:

- P_{OFF} = Measured power consumption in Off Mode (W);
- P_{SLEEP} = Measured power consumption in Sleep Mode (W);
- P_{LONG_IDLE} = Measured power consumption in Long Idle Mode (W);
- P_{SHORT_IDLE} = Measured power consumption in Short Idle Mode (W); and
- T_{OFF} , T_{SLEEP} , T_{LONG_IDLE} , and T_{SHORT_IDLE} are mode weightings as specified in Table 8.

Table 8: Mode Weightings for Workstations

T_{OFF}	T_{SLEEP}	T_{LONG_IDLE}	T_{SHORT_IDLE}
10%	35%	20%	35%

520 **Equation 5: P_{TEC_MAX} Calculation for Workstations**

521
$$P_{TEC_MAX} = 0.28 \times (P_{MAX} + N_{HDD} \times 5)$$

522 *Where:*

- 523 ▪ *P_{MAX} = Measured maximum power consumption (W)*
- 524 ▪ *N_{HDD} = Number of installed hard disk drives (HDD) or solid-state*
- 525 *drives (SSD)*

526 3.7.2 Active State Benchmark: To be ENERGY STAR certified, a Workstation must be submitted for
527 certification with the following information disclosed in full:

- 528 i. LINPAC benchmark test results, compiler optimizations, and total energy consumed over the
529 duration of the test; and
- 530 ii. SPECviewperf benchmark test results, configuration options, total duration of the test, and
531 total energy consumed over the duration of the test.

532 3.7.3 Desktop Workstations: Products marketed as workstations may be ENERGY STAR certified
533 under the Desktop requirements in Section 3.5 instead of the Workstation requirements in
534 Section 3.7, at the Partner’s option. EPA will identify Workstations certified as Desktops as
535 “Desktops” in all ENERGY STAR marketing materials, on certified product lists, etc.

536 **3.8 Requirements for Thin Clients**

537 3.8.1 Calculated Typical Energy Consumption (E_{TEC}) per Equation 1 shall be less than or equal to the
538 Maximum TEC Requirement (E_{TEC_MAX}), as calculated per Equation 6, subject to the following
539 requirements.

- 540 i. Allowances can only be applied if the corresponding adders are enabled by default.
- 541 ii. Thin Clients shall utilize the mode weightings in Table 9 when calculating E_{TEC}.
- 542 iii. For Thin Clients that lack a discrete System Sleep Mode, Long Idle State power (P_{LONG_IDLE})
543 may be used in place of Sleep Mode Power (P_{SLEEP}) in Equation 1 so long as the system
544 meets the Thin Client TEC allowance. In such instances, (P_{SLEEP} × T_{SLEEP}), is replaced by
545 (P_{LONG_IDLE} × T_{SLEEP}); Equation 1 remains otherwise unchanged.

546 **Table 9: Mode Weightings for Thin Clients**

T _{OFF}	T _{SLEEP}	T _{LONG_IDLE}	T _{SHORT_IDLE}
45%	5%	15%	35%

548 **Equation 10: Calculation of E_{TEC_MAX} for Thin Clients**

549
$$E_{TEC_MAX} = TEC_{BASE} + TEC_{GRAPHICS} + TEC_{WOL} + TEC_{INT_DISPLAY}$$

550 *Where:*

- 551 ▪ *TEC_{BASE} is the Base Allowance specified in Table*
- 552 ▪ *Table 11;*
- 553 ▪ *TEC_{GRAPHICS} is the Discrete Graphics allowance specified in*
- 554 *Table 11 if applicable;*
- 555 ▪ *TEC_{WOL} is the Wake-on-LAN allowance specified in Table*
- 556 ▪ *Table 11 if applicable;*
- 557 ▪ *TEC_{INT_DISPLAY} is the Integrated Display allowance for Integrated*
- 558 *Desktops specified in Table 7 if applicable; and*

559 **Table 11: Adder Allowances for Thin Clients**

Adder	Allowance (kWh)
TEC _{BASE}	31
TEC _{GRAPHICS}	36
TEC _{WOL}	2

560
561
562 **Note:** Products intended for sale in the US market are subject to minimum toxicity and recyclability
563 requirements. Please see ENERGY STAR® Program Requirements for Computers: Partner Commitments
564 for details.

565 4 TESTING

566 4.1 Test Methods

567 4.1.1 When testing Computer products, the test methods identified in Table 12 shall be used to
568 determine ENERGY STAR certification.

569 **Table 12: Test Methods for ENERGY STAR Certification**

Product Type or Component	Test Method
All	ENERGY STAR Test Method for Computers, Rev. May 2022

570 **Note:** The EPA has updated the test method reference to the latest version of the ENERGY STAR Test
571 Method for Computers – May 2022.

572 4.2 Number of Units Required for Testing

573 4.2.1 Representative Models shall be selected for testing per the following requirements:

- 574 i. For certification of an individual product configuration, the unique configuration that is
575 intended to be marketed and labeled as ENERGY STAR is considered the Representative
576 Model.
- 577 ii. For certification of a Product Family of all product types, with the exception of Workstations,
578 product configurations that represent the worst-case power consumption for each product
579 category within the family are considered Representative Models. When submitting Product
580 Families, manufacturers continue to be held accountable for any efficiency claims made
581 about their products, including those not tested or for which data were not reported. This
582 includes ensuring that all models shipped as ENERGY STAR certified within the product
583 family maintain the same power management settings when testing the Representative
584 Model(s).

585 4.2.2 Note: EPA has removed the language which was previously labeled subsection 4.2.1.iii from
586 Version 8 which covered systems that met multiple performance categories and how those
587 should be tested and certified, as EPA has proposed the removal of performance categories in
588 the Version 9 specification. For certification of a Product Family of Workstations under the
589 Workstation or Desktop product type, the product configuration that represents the worst-case
590 power consumption with a single GPU within the family is considered the Representative Model.

591
592 Note: Workstations that meet ENERGY STAR requirements with a single graphics device may
593 also have a configuration with more than one graphics device be ENERGY STAR certified,
594 provided the additional hardware configuration is identical with the exception of the additional
595 graphics device(s). The use of multiple graphics includes, but is not limited to, driving multiple
596 displays and ganging for high performance, multi-GPU configurations (e.g. ATI Crossfire, NVIDIA
597 SLI). In such cases, and until such time as SPECviewperf® supports multiple graphics threads,
598 manufacturers may submit the test data for the workstation with the single graphics device for
599 both configurations without retesting the system

600 4.2.3 A single unit of each Representative Model shall be selected for testing.

601 4.2.4 All units/configurations for which a Partner is seeking ENERGY STAR certification, must meet the
602 ENERGY STAR requirements. However, if a Partner wishes to certify configurations of a model
603 for which non-ENERGY STAR certified alternative configurations exist, the Partner must assign
604 the certified configurations an identifier in the model name/number that is unique to ENERGY
605 STAR certified configurations. This identifier must be used consistently in association with the
606 certified configurations in marketing/sales materials and on the ENERGY STAR list of certified
607 products (e.g. model A1234 for baseline configurations and A1234-ES for ENERGY STAR
608 certified configurations).

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

613 4.3 International Market Certification

614 4.3.1 Products shall be tested for certification at the relevant input voltage/frequency combination for
615 each market in which they will be sold and promoted as ENERGY STAR.

616 **Note:** Partner must ensure that all configurations certified as ENERGY STAR continue to meet
617 the certification criteria through subsequent firmware, software, or other changes to the certified
618 product.

619 4.4 Customer Software and Management Service Pre-Provisioning

620 4.4.1 If a manufacturing Partner is hired by a customer to load a custom image on an ENERGY STAR
621 certified computer, the Partner shall take the following steps:

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

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

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

628 **5 USER INTERFACE**

629 5.1.1 Manufacturers are encouraged to design products in accordance with the user interface standard
630 IEEE 1621: Standard for User Interface Elements in Power Control of Electronic Devices
631 Employed in Office/Consumer Environments. For details, see <http://eetd.LBL.gov/Controls>.

632 **6 EFFECTIVE DATE**

633 6.1.1 Effective Date: The Version 9 ENERGY STAR Computers specification shall take effect on TBD.
634 To be ENERGY STAR certified, a product model shall meet the ENERGY STAR specification in
635 effect on its date of manufacture. The date of manufacture is specific to each unit and is the date
636 on which a unit is considered to be completely assembled.

637 **Note:** The EPA intends to finalize the Version 9 specification in late Q3 or early Q4 of 2024 with a TBD
638 effective date sometime in early Q2 2025, nine months following the finalization of the specification.

639 6.1.2 Future Specification Revisions: EPA reserves the right to change this specification should
640 technological and/or market changes affect its usefulness to consumers, industry, or the
641 environment. In keeping with current policy, revisions to the specification are arrived at through
642 stakeholder discussions. In the event of a specification revision, please note that the ENERGY
643 STAR certification is not automatically granted for the life of a product model.

644 **7 CONSIDERATIONS FOR FUTURE REVISIONS**

645 7.1.1 **Active Mode**: EPA will continue to monitor developments in test methodology that addresses
646 active mode, where the computer is actively performing tasks, and assess whether these
647 measurements warrant inclusion into the ENERGY STAR Computers specification.