ENERGY STAR® Program Requirements for Computers

Partner Commitments
Draft 3 Version 6.0

Following are the terms of the ENERGY STAR Partnership Agreement as it pertains to the manufacture and labeling of ENERGY STAR qualified products. The ENERGY STAR Partner must adhere to the following partner commitments:

Qualifying Products

1. **Comply with current ENERGY STAR Eligibility Criteria**, which define performance requirements and test procedures for Computers. A list of eligible products and their corresponding Eligibility Criteria can be found at www.energystar.gov/specifications.

2. **Prior to associating the ENERGY STAR name or mark with any product**, obtain written certification of ENERGY STAR qualification from a Certification Body recognized by EPA for Computers. As part of this certification process, products must be tested in a laboratory recognized by EPA to perform Computer testing. A list of EPA-recognized laboratories and certification bodies can be found at www.energystar.gov/testingandverification.

3. **Ensure that any model associated with the ENERGY STAR name or mark** meets the following standards:

   3.1. Product material requirements as defined in restriction of hazardous substances (RoHS) regulations, as generally accepted. This includes exemptions in force at the date of product manufacture, where the maximum concentration values tolerated by weight in homogeneous materials are: lead (0.1%), mercury (0.1%), cadmium (0.01%), hexavalent chromium (0.1%), polybrominated biphenyls (PBB) (0.1%), or polybrominated diphenyl ethers (PBDE) (0.1%). Batteries are exempt.

   3.2. The generally accepted attributes of a recyclable product at the date of product manufacture: where products shall be designed for ease of disassembly and recyclability where external enclosures, sub-enclosures, chassis and electronic subassemblies are easily removable with commonly available tools, by hand, or by a recycler's automated processes.

   Notes:

   - The explicit intention is to harmonize with EU RoHS.

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

> **Note**: The recyclability and toxicity requirements have been revised for consistency with other ENERGY STAR CE/IT specifications.

Using the ENERGY STAR Name and Marks

4. Comply with current ENERGY STAR Identity Guidelines, which define how the ENERGY STAR name and marks may be used. Partner is responsible for adhering to these guidelines and ensuring that its authorized representatives, such as advertising agencies, dealers, and distributors, are also in compliance. The ENERGY STAR Identity Guidelines are available at www.energystar.gov/logouse.

5. Use the ENERGY STAR name and marks only in association with qualified products. Partner may not refer to itself as an ENERGY STAR Partner unless at least one product is qualified and offered for sale in the U.S. and/or ENERGY STAR partner countries.

6. Provide clear and consistent labeling of ENERGY STAR qualified Computers.

    6.1. Partner shall adhere to the following product-specific commitments regarding use of the ENERGY STAR certification mark on qualified products:

        6.1.1. Partner must use the ENERGY STAR mark in one of the following ways:

            1) Via permanent or temporary label, on the top or front of the product. All temporary labeling must be affixed to the product with an adhesive or cling-type application; or

            2) Via electronic labeling. Electronic labeling must meet the following requirements:

                a. The ENERGY STAR mark in cyan, black, or white must appear at system start-up, and must display for a minimum of 5 seconds;

                b. The ENERGY STAR mark must be at least 4% of the screen by area, must not be smaller than 76 pixels x 78 pixels, and must be legible.

                EPA will consider alternative proposals for electronic labeling on a case-by-case basis.

        6.1.2. Partner must use the ENERGY STAR mark in product literature (i.e., user manuals, spec sheets, etc.).

        6.1.3. Partner must use the ENERGY STAR mark on product packaging for products sold at retail.

        6.1.4. Partner must use the ENERGY STAR mark on the manufacturer's Internet site where information about ENERGY STAR qualified models is displayed.

            1) If additional information about the ENERGY STAR program or other products is provided by the Partner on its website, Partner must comply with the ENERGY STAR Web Linking Policy, which can be found at www.energystar.gov/partners;

Verifying Ongoing Product Qualification

7. Participate in third-party verification testing through a Certification Body recognized by EPA for Computers, providing full cooperation and timely responses, EPA/DOE may also, at its discretion, conduct tests on products that are referred to as ENERGY STAR qualified. These products may be obtained on the open market, or voluntarily supplied by Partner at the government's request.

Providing Information to EPA

8. Provide unit shipment data or other market indicators to EPA annually to assist with creation of ENERGY STAR market penetration estimates, as follows:

    8.1. Partner must submit the total number of ENERGY STAR qualified Computers shipped in the calendar year or an equivalent measurement as agreed to in advance by EPA and Partner. Partner shall exclude shipments to organizations that rebrand and resell the shipments (unaffiliated private labelers).

    8.2. Partner must provide unit shipment data segmented by meaningful product characteristics (e.g., type, capacity, presence of additional functions) as prescribed by EPA.

    8.3. Partner must submit unit shipment data for each calendar year to EPA or an EPA-authorized third party, preferably in electronic format, no later than March 1 of the following year.

Submitted unit shipment data will be used by EPA only for program evaluation purposes and will be closely controlled. If requested under the Freedom of Information Act (FOIA), EPA will argue that the data is exempt. Any information used will be masked by EPA so as to protect the confidentiality of the Partner;

9. Report to EPA any attempts by recognized laboratories or Certification Bodies (CBs) to influence testing or certification results or to engage in discriminatory practices.

10. Notify EPA of a change in the designated responsible party or contacts within 30 days using the My ENERGY STAR Account tool (MESA) available at www.energystar.gov/mesa.

Training and Consumer Education

11. Partner shall agree to complete steps to educate users of their products about the benefits of power management by including the following information with each Computer (i.e., in the user manual or on a box insert):

    11.1. Energy saving potential;

    11.2. Financial saving potential;

    11.3. Environmental benefits;

    11.4. Information on ENERGY STAR and a link to www.energystar.gov; and

    11.5. ENERGY STAR logo (used in accordance with "The ENERGY STAR Identity Guidelines" available at www.energystar.gov/logos).

12. In addition, a link should be made available to www.energystar.gov/powermanagement from Computer product pages, product specifications, and related content pages.

13. At the manufacturer's request, EPA will supply suggested facts and figures related to the above criteria, template elements, or a complete template suitable for use in user guides or box inserts.

Performance for Special Distinction

In order to receive additional recognition and/or support from EPA for its efforts within the Partnership, the ENERGY STAR Partner may consider the following voluntary measures, and should keep EPA informed on the progress of these efforts:

- Provide quarterly, written updates to EPA as to the efforts undertaken by Partner to increase availability of ENERGY STAR qualified products, and to promote awareness of ENERGY STAR and its message.

- Consider energy efficiency improvements in company facilities and pursue benchmarking buildings through the ENERGY STAR Buildings program.

- Purchase ENERGY STAR qualified products. Revise the company purchasing or procurement specifications to include ENERGY STAR. Provide procurement officials' contact information to EPA for periodic updates and coordination. Circulate general ENERGY STAR qualified product information to employees for use when purchasing products for their homes.

- Feature the ENERGY STAR mark(s) on Partner website and other promotional materials. If information concerning ENERGY STAR is provided on the Partner website as specified by the ENERGY STAR Web Linking Policy (available in the Partner Resources section of the ENERGY STAR website), EPA may provide links where appropriate to the Partner website.

- Ensure the power management feature is enabled on all ENERGY STAR qualified displays and computers in use in company facilities, particularly upon installation and after service is performed.

- Provide general information about the ENERGY STAR program to employees whose jobs are relevant to the development, marketing, sales, and service of current ENERGY STAR qualified products.

- Provide a simple plan to EPA outlining specific measures Partner plans to undertake beyond the program requirements listed above. By doing so, EPA may be able to coordinate, and communicate Partner's activities, provide an EPA representative, or include news about the event in the ENERGY STAR newsletter, on the ENERGY STAR website, etc. The plan may be as simple as providing a list of planned activities or milestones of which Partner would like EPA to be aware. For example, activities may include: (1) increasing the availability of ENERGY STAR qualified products by converting the entire product line within two years to meet ENERGY STAR guidelines; (2) demonstrating the economic and environmental benefits of energy efficiency through special in-store displays twice a year; (3) providing information to users (via the website and user's manual) about energy-saving features and operating characteristics of ENERGY STAR qualified products; and (4) building awareness of the ENERGY STAR Partnership and brand identity by collaborating with EPA on one print advertorial and one live press event.

- Join EPA's SmartWay Transport Partnership to improve the environmental performance of the company's shipping operations. The SmartWay Transport Partnership works with freight carriers, shippers, and other stakeholders in the goods movement industry to reduce fuel consumption, greenhouse gases, and air pollution. For more information on SmartWay, visit www.epa.gov/smartway.

- Join EPA's Green Power Partnership. EPA's Green Power Partnership encourages organizations to buy green power as a way to reduce the environmental impacts associated with traditional fossil fuel-based electricity use. The partnership includes a diverse set of organizations including Fortune 500 companies, small and medium businesses, government institutions as well as a growing number of colleges and universities. For more information on Green Power, visit www.epa.gov/greenpower.

ENERGY STAR® Program Requirements
Product Specification for Computers

Eligibility Criteria
Draft 3 Version 6.0

1 Following is the Version 6.0 ENERGY STAR Product Specification for Computers. A product shall meet
2 all of the identified criteria if it is to earn the ENERGY STAR.

3 # 1   DEFINITIONS

4 A) <u>Product Types</u>:

5 1) <u>Computer</u>: 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) <u>Desktop Computer</u>: 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.

20 a) <u>Integrated Desktop Computer</u>: 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) <u>Notebook Computer</u>: 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 and are capable of being powered by an
31 integrated battery or other portable power source. In addition, most Notebooks use an external
32 power supply and have an integrated keyboard and pointing device. Notebook computers are
33 typically designed to provide similar functionality to Desktops, including operation of software
34 similar in functionality as that used in Desktops.

35 a) <u>Tablet Computer</u>: A Notebook Computer with a reversible touch-sensitive screen and an
36 integrated physical keyboard. For the purposes of this specification, Tablet Computers are
37 subject to all Notebook Computer requirements.

38 b) <u>Slate Computing Device</u>: Definition TBD as part of an update to Version 6.1.

39 | **Note**: EPA has amended the definition of Tablet Computer to make clear that the keyboard is an integral
40 | part of the product, not a separable accessory. This requirement is based on usage information relating to
41 | the portability of products. Those with integrated, physical keyboards are much more frequently used
42 | while plugged into an AC wall power outlet, approximating a usage pattern similar to that of notebooks.
43 | Those without integrated keyboards are more mobile and run heavily off batteries, giving them a different
44 | usage profile.

45 | EPA has also removed the previous definition of Slate Computing Device. EPA will work with
46 | stakeholders to develop an updated definition for these products so that they may be included in Version
47 | 6.1 of the specification. Development of this update will occur in early 2013, with the intention to provide a
48 | new definition and point to Version 2.0 of the Battery Charger specification to establish appropriate testing
49 | and efficiency requirements for Slate battery chargers. EPA welcomes input from stakeholders on an
50 | appropriate definition to consider in the future Version 6.1 of the specification.

51

52   c) <u>Mobile Thin Client</u>: A computer meeting the definition of a Thin Client, designed specifically
53   for portability, and also meeting the definition of a Notebook Computer. These products are
54   considered to be Notebook Computers for the purposes of this specification.

55 4) <u>Small-scale Server</u>: A computer that typically uses desktop components in a desktop form factor,
56   but is designed primarily to be a storage host for other computers. Small-scale Servers are
57   designed to perform functions such as providing network infrastructure services (e.g., archiving)
58   and hosting data/media. These products are not designed to process information for other
59   systems or run web servers as a primary function. A Small-scale Server has the following
60   characteristics:

61   a) Designed in a pedestal, tower, or other form factor similar to those of desktop computers
62   such that all data processing, storage, and network interfacing is contained within one
63   box/product;

64   b) Designed to operate 24 hours/day, 7 days/week, with minimal unscheduled downtime (on the
65   order of hours/year);

66   c) Capable of operating in a simultaneous multi-user environment serving several users through
67   networked client units; and

68   d) Designed for an industry accepted operating system for home or low-end server applications
69   (e.g., Windows Home Server, Mac OS X Server, Linux, UNIX, Solaris).

70 5) <u>Thin Client</u>: An independently-powered computer that relies on a connection to remote computing
71   resources (e.g., computer server, remote workstation) to obtain primary functionality. Main
72   computing functions (e.g., program execution, data storage, interaction with other Internet
73   resources) are provided by the remote computing resources. Thin Clients covered by this
74   specification are (1) limited to devices with no rotational storage media integral to the computer
75   and (2) designed for use in a permanent location (e.g. on a desk) and not for portability.

76   a) <u>Integrated Thin Client</u>: A Thin Client in which computing hardware and display are
77   connected to ac mains power through a single cable. Integrated Thin Client computers
78   come in one of two possible forms: (1) a system where the display and computer are
79   physically combined into a single unit; or (2) a system packaged as a single system
80   where the display is separate but is connected to the main chassis by a dc power cord
81   and both the computer and display are powered from a single power supply. As a subset
82   of Thin Clients, Integrated Thin Clients are typically designed to provide similar
83   functionality as Thin Client systems.

84   b) Ultra-thin Client: A computer with lesser local resources than a standard Thin Client that
85   sends raw mouse and keyboard input to a remote computing resource and receives back
86   raw video from the remote computing resource. Ultra-thin clients cannot interface with
87   multiple devices simultaneously nor run windowed remote applications due to the lack of
88   a user-discernible client operating system on the device (i.e., beneath firmware, user
89   inaccessible).

90   6) Workstation: A high-performance, single-user computer typically used for graphics, CAD,
91   software development, financial and scientific applications among other compute intensive tasks.
92   Workstations covered by this specification (a) are marketed as a workstation; (b) provide mean
93   time between failures (MTBF) of at least 15,000 hours (based on either Bellcore TR-NWT-
94   000332, issue 6, 12/97 or field collected data); and (c) support error-correcting code (ECC) and/or
95   buffered memory. In addition, a workstation meets three or more of the following criteria:

96   a) Provide supplemental power support for high-end graphics (e.g., PCI-E 6-pin 12V
97   supplemental power feed);

98   b) Wired for greater than x4 PCI-E on the motherboard in addition to the graphics slot(s) and/or
99   PCI-X support;

100   c) Do not provide support for Uniform Memory Access (UMA) graphics;

101   d) Provide 5 or more PCI, PCI-E, or PCI-X slots;

102   e) Provide multi-processor support for 2 or more processors (shall support physically separate
103   processor packages/sockets, i.e., requirement cannot be met with support for a single multi-
104   core processor); and/or

105   f) Qualification by 2 or more Independent Software Vendor (ISV) product certifications; these
106   certifications can be in process, but shall be completed within 3 months of qualification.

107 B) Product Category: A second-order classification or sub-type within a product type that is based on
108   product features and installed components. Product categories are used in this specification to
109   determine qualification and test requirements.

110 C) Computer Components:

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

115   2) Discrete Graphics Card (dGfx): One or more graphics processors (GPU) with a local memory
116   controller interface and local graphics-specific memory.

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

118 **Note**: To provide greater clarity in requirements and definitions throughout the remainder of the
119 specification, EPA has proposed a definition of GPU that captures the functionality of the graphics-
120 oriented processor package, as separate from the other functions that are part of the more general
121 Discrete Graphics Card. EPA welcomes feedback on this proposed definition to ensure it is consistent
122 with the definition generally used in the industry.

123   4) Display: A commercially-available product with a display screen and associated electronics, often
124   encased in a single housing, that as its primary function displays visual information from (1) a
125   computer, workstation or server via one or more inputs (e.g., VGA, DVI, HDMI, DisplayPort, IEEE
126   1394, USB), (2) external storage (e.g., USB flash drive, memory card), or (3) a network
127   connection.

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

| 130 | | (1) | A contrast ratio of at least 60:1 at a horizontal viewing angle of at least 85°, with or without a screen cover glass; |

| 130 | | (1) A contrast ratio of at least 60:1 at a horizontal viewing angle of at least 85°, with or
| 131 | | without a screen cover glass;

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

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

Note: The definitions for Display and Enhanced-performance Integrated Display have been revised for consistency with the Final Version 6.0 ENERGY STAR Displays Specification. This definition is referenced to allow for appropriate allocation of the Integrated Display adder for Desktop and Notebooks (see Table 10).

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5) External Power Supply (EPS): Also referred to as External Power Adapter. A component contained in a separate physical enclosure external to the computer casing, designed to convert line voltage ac input from the mains to lower dc voltage(s) in order to provide power to the computer. An external power supply shall connect to the computer via a removable or hard-wired male/female electrical connection, cable, cord or other wiring.

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

D) Operational Modes:

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

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

   a) Long Idle: The mode where the Computer has reached an Idle condition (i.e., 15 minutes after OS boot or after completing an active workload or after resuming from Sleep Mode) and the main Computer Display has entered a low-power state where screen contents cannot be observed (i.e., backlight has been turned off) but remains in the working mode (ACPI G0/S0). If power management features are enabled as-shipped in the scenario described in this definition, such features shall engage prior to evaluation of Long Idle (e.g., display is in a low power state, HDD may have spun-down), but the Computer is prevented from entering Sleep Mode. P_{LONG_IDLE} represents the average power measured when in the Long Idle Mode.

   b) Short Idle: The mode where the Computer has reached an Idle condition (i.e., 5 minutes after OS boot or after completing an active workload or after resuming from Sleep Mode), the screen is on and set to as-shipped brightness, and Long Idle power management features have not engaged (e.g. HDD is spinning and the Computer is prevented from entering sleep mode). P_{SHORT_IDLE} represents the average power measured when in the Short Idle mode.

179   3) <u>Off Mode</u>: The lowest power mode which cannot be switched off (influenced) by the user and that
180   may persist for an indefinite time when the appliance is connected to the main electricity supply
181   and used in accordance with the manufacturer's instructions. For systems where ACPI standards
182   are applicable, Off Mode correlates to ACPI System Level S5 state.

183   4) <u>Sleep Mode</u>: A low power mode that the computer enters automatically after a period of inactivity
184   or by manual selection. A computer with Sleep capability can quickly "wake" in response to
185   network connections or user interface devices with a latency of less than or equal to 5 seconds
186   from initiation of wake event to system becoming fully usable including rendering of display. For
187   systems where ACPI standards are applicable, Sleep Mode most commonly correlates to ACPI
188   System Level S3 (suspend to RAM) state.

189 E) <u>Networking and Additional Capabilities</u>:

190   1) <u>Additional Internal Storage</u>: Any and all internal hard disk drives (HDD) or solid state drives (SSD)
191   shipping with a computer beyond the first. This definition does not include external drives.

192   2) <u>Full Network Connectivity</u>: The ability of the computer to maintain network presence while in
193   Sleep Mode or another low power mode of equal or lower power consumption ("LPM") and
194   intelligently wake when further processing is required (including occasional processing required to
195   maintain network presence). Presence of the computer, its network services and applications, is
196   maintained even though the computer is in a LPM. From the vantage point of the network, a
197   computer with full network connectivity that is in LPM is functionally equivalent to an idle
198   computer with respect to common applications and usage models. Full network connectivity in
199   LPM is not limited to a specific set of protocols but can cover applications installed after initial
200   installation. Also referred to as "network proxy" functionality and as described in the *Ecma-393*
201   standard.

202   a) <u>Network Proxy - Base Capability</u>: To maintain addresses and presence on the network while
203   in LPM, the system handles IPv4 ARP and IPv6 NS/ND.

204   b) <u>Network Proxy - Full Capability</u>: While in LPM, the system supports Base Capability, Remote
205   Wake, and Service Discovery/Name Services.

206   c) <u>Network Proxy - Remote Wake</u>: While in LPM, the system is capable of remotely waking
207   upon request from outside the local network. Includes Base Capability.

208   d) <u>Network Proxy - Service Discovery/Name Services</u>: While in LPM, the system allows for
209   advertising host services and network name. Includes Base Capability.

210   3) <u>Network Interface</u>: The components (hardware and software) whose primary function is to make
211   the computer capable of communicating over one or more network technologies. Examples of
212   Network Interfaces are IEEE 802.3 (Ethernet) and IEEE 802.11 (Wi-Fi).

213   4) <u>Wake Event</u>: A user, scheduled, or external event or stimulus that causes the computer to
214   transition from Sleep Mode or Off Mode to an active state of operation. Examples of wake events
215   include, but are not limited to: movement of the mouse, keyboard activity, controller input, real-
216   time clock event, or a button press on the chassis, and in the case of external events, stimulus
217   conveyed via a remote control, network, modem, etc.

218   5) <u>Wake On LAN (WOL)</u>: Functionality which allows a computer to transition from Sleep Mode or Off
219   Mode to an Active State of operation when directed by a network Wake Event via Ethernet.

220   6) <u>Switchable Graphics</u>: Functionality that allows both integrated and discrete graphics to be used at
221   different times depending on the graphics rendering needs of the user.

222   <u>Note:</u> This functionality allows lower power and lower capability integrated GPUs to render the
223   display while on battery or when the output graphics are not overly complex while then allowing
224   the more power consumptive but more capable discrete GPU to provide rendering capability
225   when the user requires it.

226 F) <u>Marketing and Shipment Channels</u>:

227   1)   <u>Enterprise Channels</u>: Sales channels typically used by large and medium-sized business,
228   government, educational, or other organizations to purchase computers for use in managed
229   client/server environments.

230   2)   <u>Model Name</u>: A marketing name that includes reference to the computer model number, product
231   description, or other branding references.

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

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

241   1)   Color;

242   2)   Housing; and

243   3)   Electronic components other than the chassis/motherboard, such as the processor, memory,
244   GPU, etc.

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245 **Note:** For clarity and consistency with other ENERGY STAR specifications, EPA has condensed the
246 Product Family discussion in Section 4, Testing. The portions of Section 4 that previously described the
247 characteristics of a Product Family are summarized in the definition above, while the remainder have
248 been integrated into Section 4.2, Number of Units Required for Testing.

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249   2   SCOPE

250   2.1   Included Products

251   2.1.1   Products that meet the definition of a Computer <u>and</u> one of the following Product Type definitions,
252   as specified herein, are eligible for ENERGY STAR qualification, with the exception of products
253   listed in Section 2.2:

254   i.   Desktop Computers and Integrated Desktop Computers;

255   ii.   Notebook Computers and Tablet Computers;

256   iii.   Slate computing devices;

257   iv.   Workstations;

258   v.   Small-scale Servers that are marketed and sold for non-data center use; and

259   vi.   Thin Clients.

260   2.2   Excluded Products

261   2.2.1   Products that are covered under other ENERGY STAR product specifications are not eligible for
262   qualification under this specification. The list of specifications currently in effect can be found at
263   www.energystar.gov/products.

264   2.2.2   The following products are not eligible for qualification under this specification:

265   i.   Game Consoles;

266   ii.   Handheld Computers (including eReaders);

267	iii.	Handheld gaming devices, typically battery powered and intended for use with an integral display as the primary display;
268		
269	iv.	Mobile Thin Clients not meeting the definition of Notebook Computer;
270	v.	Personal Digital Assistant devices (PDAs);
271	vi.	Point of Sale (POS) products;
272	vii.	Small-scale Servers that are marketed and sold for use in data centers;
273	viii.	Smart Phones; and
274	ix.	Ultra-thin Clients.

275 **Note**: While Slate Computing Devices are in scope, they currently lack a definition, requirements, and test
276 procedure. The development of these items will take place in an update to this specification in early to
277 mid-2013, pending further development of the Battery Chargers Specification Version 2.0.

278 Also, Computer Servers have been removed from the list in Section 2.2.2 as they are within scope of
279 another ENERGY STAR program and will therefore be covered by the general exclusion in Section 2.2.1.

280 # 3   QUALIFICATION CRITERIA

281 ## 3.1   Significant Digits and Rounding

282 3.1.1   All calculations shall be carried out with directly measured (unrounded) values.

283 3.1.2   Unless otherwise specified, compliance with specification limits shall be evaluated using directly
284 measured or calculated values without any benefit from rounding.

285 3.1.3   Directly measured or calculated values that are submitted for reporting on the ENERGY STAR
286 website shall be rounded to the nearest significant digit as expressed in the corresponding
287 specification limit.

288 ## 3.2   Power Supply Requirements

289 3.2.1   Power supply test data and test reports from testing entities recognized by EPA to perform power
290 supply testing shall be accepted for the purpose of qualifying the ENERGY STAR product.

291 3.2.2   <u>Internal Power Supplies (IPS)</u>: Internal Power Supplies used in Computers eligible under this
292 specification must meet the following requirements when tested using the *Generalized Internal*
293 *Power Supply Efficiency Test Protocol, Rev. 6.5* (available at <u>www.efficientpowersupplies.org</u>).

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

296 ii.   IPS with maximum rated output power greater than or equal to 75 watts shall meet <u>both</u>
297 minimum efficiency requirements and minimum power factor requirements, as specified in
298 Table 1.

299   **Table 1: Requirements for Internal Power Supplies**

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

300 3.2.3 <u>External Power Supplies (EPS)</u>: EPSs shall meet the level V performance requirements under the
301   International Efficiency Marking Protocol and include the level V marking. Additional information
302   on the Marking Protocol is available at www.energystar.gov/powersupplies.

- 303   • Single-output EPS shall meet level V requirements when tested using the *Test Method*
- 304   *for Calculating the Energy Efficiency of Single-Voltage External Ac-Dc and Ac-Ac*
- 305   *Power Supplies, Aug. 11, 2004.*

- 306   • Multi-output EPS shall meet the level V requirements when tested using the *EPRI*
- 307   *Generalized Internal Power Supply Efficiency Test Protocol, Rev. 6.4.2.*

308 **Note**: In line with Draft 1 and Draft 2, EPA is proposing to maintain the Version 5.0 Power Supply
309 requirements in Version 6.0. EPA believes that keeping the levels unchanged from Version 5 will enable
310 market share to increase while safeguarding efficiency gains already made.

311 EPA is also proposing to adopt an optional allowance, based on a proposal from Natural Resources
312 Defense Council (NRDC) that is intended to incentivize the use of even more efficient power supplies.
313 Please see Section 3.5 Table 5 for more details about this proposal

314 **3.3 Power Management Requirements**

315 3.3.1 Products shall include power management features in their "as-shipped" condition as specified in
316   Table 2, subject to the following conditions:

317   i. For Thin Clients, the Wake-on-LAN (WOL) requirement shall apply for products designed to
318   receive software updates from a centrally managed network while in Sleep Mode or in Off
319   Mode. Thin Clients whose standard software upgrade framework does not require off-hours
320   scheduling are exempt from the WOL requirement.

321   ii. For Notebooks, WOL may be automatically disabled when the product is disconnected from
322   ac mains power.

323   iii. For all products with WOL, directed packet filters shall be enabled and set to an industry
324   standard default configuration.

325 **Table 2: Power Management Requirements**

Mode or Mode Transition	Requirement	Desktops	Integrated Desktops	Notebooks	Small-scale Servers	Thin Clients	Workstations
System Sleep Mode	(1) Sleep Mode shall be set to activate after no more than 30 minutes of user inactivity. (2) The speed of any active 1 Gb/s Ethernet network links shall be reduced when transitioning to Sleep Mode or Off Mode.	Yes	Yes	Yes	No	Yes[i]	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
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.	Yes	Yes	Yes	Yes	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	Yes	Yes

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

326 **Note**: After reviewing stakeholder comments, EPA has determined that the current 30 minute time
327 requirement for System Sleep Mode is appropriate for ensuring energy savings while avoiding
328 prematurely entering Sleep Mode and disrupting product usability. EPA welcomes any information or
329 feedback that highlights user experiences at different sleep mode timer settings for future revisions of this
330 specification.

331 **3.4   User Information Requirements**

332 3.4.1   Products shall be shipped with informational materials to notify customers of the following:

333   i.   A description of power management settings that have been enabled by default,

334   ii.   A description of the timing settings for various power management features, and

335   iii.   Instructions for properly waking the product from Sleep Mode.

336 3.4.2   Products shall be shipped with one or more of the following:

337   i.   A list of default power management settings.

338   ii.   A note stating that default power management settings have been selected for compliance
339   with ENERGY STAR (within 15 min of user inactivity for the display, within 30 min for the
340   computer, if applicable per Table 2), and are recommended by the ENERGY STAR program
341   for optimal energy savings.

342   iii.   Information about ENERGY STAR and the benefits of power management, to be located at
343   or near the beginning of the hard copy or electronic user manual, or in a package or box
344   insert.

345 3.4.3   Provisions 3.4.1 and 3.4.2 may be met through use of either electronic or printed product
346   documentation, provided it adheres to all of the following:

347   i.   Documentation is shipped with the product (e.g., in a printed manual or insert, on included
348   optical media, in a file installed with the software load shipped to the customer); and

349   ii.   Documentation is included either (a) only with ENERGY STAR qualified Computers; or (b) as
350   part of the standard documentation if and only if accompanied by EPA-approved customer
351   guidance on how to identify if their computer configuration is ENERGY STAR qualified.

352 **3.5   Requirements for Desktop, Integrated Desktop, and Notebook Computers**

353 3.5.1   Categories for TEC Criteria: Desktops and Integrated Desktops shall be evaluated according to
354   the categories described in Table 3, and Notebook Computers shall be evaluated in the
355   categories described in Table 4.

356   **Table 3: Categorization of Desktop and Integrated Desktop Computers**

Category	DT 0	DT 1	DT 2	DT 3
CPU Cores	Any	Cores ≤ 2	Cores ≥ 3	Cores ≥ 3
Channels of Memory	Channels = 1	Channels = 2	Channels ≥ 2	Channels ≥ 2
Base Memory	1 GB	2 GB	2 GB	4 GB
Base Graphics[ii]	Integrated Graphics	Integrated Graphics	Integrated Graphics	dGfx = G5
Graphics Adders[ii]	dGfx ≤ G7	dGfx ≤ G7	dGfx ≤ G7	G5 < dGfx ≤ G7

357

358   **Table 4: Categorization of Notebook Computers**

Category	NB 0	NB I1	NB I2	NB I3	NB D1	NB D2
Performance Score, P[iii]	$P ≤ 2$	$2 < P ≤ 5.2$	$5.2 < P ≤ 9$	$P > 9$	$2 < P ≤ 9$	$P > 9$
Base Memory	None	None			None	
Base Graphics[ii]	Any Graphics	Integrated Graphics			Discrete Graphics	
Graphics Adders[ii]	dGfx ≤ G7	N/A			dGfx ≤ G7	

359   **Note:** After a detailed analysis of both the new ECMA categories and the proposed ITI categorization
360   system, EPA proposes to use the ECMA categorization for Desktops and use the ITI categorization for
361   Notebooks. Notebook technologies have changed to a degree that these more mobile products require a
362   different approach to categorization, while Desktop technologies have evolved in a manner that lends
363   them more readily to the ECMA categorization system. The ITI approach simply multiplies the number of
364   CPU cores by the CPU clock speed (GHz) to arrive at a performance score. This more accurately
365   separates Notebooks into performance bins where they can then fairly compete on energy efficiency,
366   while Desktops are better represented by the ECMA categorization system.

367   After discussions with stakeholders and further analysis, EPA has added a new NB I3 category to the ITI
368   approach. This category is intended to contain most switchable graphics notebooks, as EPA has
369   specified that they are to be tested with their discrete graphics turned off and therefore subject to the
370   integrated graphics levels. However, notebooks with switchable graphics are often designed with more
371   powerful hardware to support the discrete portion of their graphics capabilities, so putting them into a
372   category that is dominated by integrated-only graphics systems would result in misleading efficiency
373   comparisons. The new NB I3 category enables them to compete with similar systems that have similar
374   end uses and the same target market segment of customers.

375

376   3.5.2   Calculated Typical Energy Consumption (E_{TEC}) per Equation 1 shall be less than or equal to the
377   maximum TEC requirement (E_{TEC_MAX}), as calculated per Equation 2, subject to the following
378   requirements:

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ii   Graphics capability is categorized based on frame buffer bandwidth, as shown in Table 10.
iii   P = [# of CPU cores] * [CPU clock speed (GHz)].

| 379 | | i. | The Additional Internal Storage adder allowance (TEC$_{STORAGE}$) shall be applied if there are more than one internal storage devices present in the product, in which case it shall only be applied once. |

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

382   ii.   The Integrated Display adder allowance (TEC$_{INT\_DISPLAY}$) applies only for Integrated Desktops
383   and Notebooks. For Enhanced-performance Integrated Displays, the adder is calculated as
384   presented in Table 10.

385   iii.   For a product to qualify for the Full Network Connectivity weightings, the following criteria
386   shall be satisfied:

- 387   Products shall meet a non-proprietary Full Network Connectivity standard such as
388   ECMA 393 or another standard that has been approved by EPA as meeting the goals
389   of ENERGY STAR. Such approval must be in place prior to submittal of product data
390   for qualification.

- 391   Products shall have the applied level of functionality enabled and configured by default
392   upon shipment. If Full Network Connectivity features are not enabled by default, the
393   system shall be tested and reported with Conventional TEC weightings.

394   iv.   For Desktops that lack a discrete System Sleep Mode but have a Long Idle State power level
395   less than or equal to 10.0 W, power in Long Idle (P$_{LONG\_IDLE}$) may be used in place of power in
396   Sleep (P$_{SLEEP}$) in Equation 1. In such instances, $(P_{SLEEP} \times T_{SLEEP})$, is replaced by
397               $(P_{LONG\_IDLE} \times T_{SLEEP})$; Equation 1 remains otherwise unchanged.

398   v.   Notebooks, Desktops, and Integrated Desktops with switchable graphics may not apply the
399   Discrete Graphics allowance, TEC$_{GRAPHICS}$, from Table 10 in Equation 2. However, for
400   Desktop and Integrated Desktop systems providing Switchable Graphics and enabling it in ac
401   mode, an allowance equal to 50% of the G1 graphics allowance for the platform type
402   (Desktop or Integrated Desktop) may be applied.

403

Equation 1: TEC Calculation (E$_{TEC}$) for Desktop, Integrated Desktop, Thin Client and Notebook Computers

$$E_{TEC} = \frac{8760}{1000} \times (P_{OFF} \times T_{OFF} + P_{SLEEP} \times T_{SLEEP} + P_{LONG\_IDLE} \times T_{LONG\_IDLE} + P_{SHORT\_IDLE} \times T_{SHORT\_IDLE})$$

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 6 (for Desktops, Integrated Desktops, and Thin Clients) or Table 7 (for Notebooks).*

Equation 2: E$_{TEC\_MAX}$ Calculation for Desktop, Integrated Desktop, and Notebook Computers

$$E_{TEC\_MAX} = (1+ALLOWANCE_{PSU}) \times (TEC_{BASE} + TEC_{MEMORY} + TEC_{GRAPHICS} + TEC_{STORAGE} + TEC_{INT\_DISPLAY})$$

Where:

420	▪ *ALLOWANCE$_{PSU}$ is an allowance provided to power supplies that*
421	*meet the optional more stringent efficiency levels specified in*
422	*Table 5; power supplies that do not meet the requirements receive*
423	*an allowance of 0;*
424	▪ *TEC$_{GRAPHICS}$ is the discrete graphics allowance as specified in*
425	*Table 10, with the exception of systems with integrated graphics,*
426	*which do not receive an allowance, or Desktops and Integrated*
427	*Desktops with switchable graphics enabled in ac mode, which*
428	*receive an allowance equal to 50% of the G1 graphics allowance*
429	*specified in Table 10; and*
430	▪ *TEC$_{BASE}$ is the Base allowance for Desktops and Integrated*
431	*Desktops (specified in Table 8 or, for Notebooks (specified in*
432	*Table 9),as appropriate; and,*
433	▪ *TEC$_{MEMORY}$, TEC$_{STORAGE,}$ and TEC$_{INT\_DISPLAY}$ are adder*
434	*allowances as specified in Table 10.*

435

Table 5: Power Supply Efficiency Allowance

Power Supply Type	Computer Type	Minimum Efficiency at Specified Proportion of Rated Output Current[iv]				Minimum Average Efficiency[v]	Allowance$_{PSU}$
		10%	20%	50%	100%		
IPS	Desktop	0.81	0.85	0.88	0.85	-	0.015
		0.84	0.87	0.90	0.87	-	0.03
	Integrated Desktop	0.81	0.85	0.88	0.85	-	0.015
		0.84	0.87	0.90	0.87	-	0.04
EPS	Notebook	0.83	-	-	-	0.88	0.075
		0.84	-	-	-	0.89	0.015
	Integrated Desktop	0.83	-	-	-	0.88	0.075
		0.84	-	-	-	0.89	0.015

436
437

438	**Note:** In response to stakeholder feedback from Draft 2, EPA proposes the above power supply
439	allowance to reward the use of higher efficiency PSUs while maintaining the PSU requirements found in
440	Version 5. This allowance also encourages power supply efficiency at 10% of rated output current, which
441	corresponds to the Idle Mode consumption of the computer connected to the power supply.

442

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iv   Single-output EPSs shall meet the specified requirements when tested using the *Test Method for Calculating the Energy Efficiency of Single-Voltage External Ac-Dc and Ac-Ac Power Supplies*, Aug. 11, 2004. Multi-output EPSs and IPSs shall meet the specified requirements when tested using the *EPRI 306 Generalized Internal Power Supply Efficiency Test Protocol, Rev. 6.6.*

v   Average efficiency is the arithmetic mean of efficiencies tested at 25%, 50%, 75%, and 100% of rated output current. Single-output EPSs shall meet the specified requirements when tested using the *Test Method for Calculating the Energy Efficiency of Single-Voltage External Ac-Dc and Ac-Ac Power Supplies*, Aug. 11, 2004. Multi-output EPSs shall meet the specified requirements when tested using the *EPRI 306 Generalized Internal Power Supply Efficiency Test Protocol, Rev. 6.6.*

443 **Table 6: Mode Weightings for Desktop, Thin Clients, and Integrated Desktop Computers**

Mode Weighting	Conventional	Full Network Connectivity			
		Base Capability	Remote Wake	Service Discovery/Name Services	Full Capability
T_{OFF}	45%	40%	30%	25%	20%
T_{SLEEP}	5%	15%	28%	36%	45%
T_{LONG_IDLE}	15%	12%	10%	8%	5%
$T_{SHORT\ IDLE}$	35%	33%	32%	31%	30%

444 **Table 7: Mode Weightings for Notebook Computers**

Mode Weighting	Conventional	Full Network Connectivity			
		Base Capability	Remote Wake	Service Discovery / Name Services	Full Capability
T_{OFF}	25%	34%	38%	46%	50%
T_{SLEEP}	35%	30%	28%	22%	20%
T_{LONG_IDLE}	10%	8%	7%	6%	5%
T_{SHORT_IDLE}	30%	28%	27%	26%	25%

445

Note: EPA has reviewed the TEC Weightings and believes that the foundation of the TEC model remains consistent with the data used in development of Version 5, which was drawn from a study of power state transitions in over 70,000 computers. The table below compares TEC weighting methods for Desktops and Notebooks in both Version 5 and Version 6. For Desktops, Version 6 gives slightly more emphasis to Idle States based on a smaller study done to determine the appropriate split for Long and Short Idle. For Notebooks, where power levels in Off and Sleep are similar, increased emphasis is also placed on higher power Idle States.

Desktop Computers		
	V5 (1)	V6, Draft 3 (2)
Off	55 %	45%
Sleep	5 %	5%
Long Idle	40 %	15%
Short Idle		35 %
Notebook Computers		
Off	60 %	25%
Sleep	10 %	35%
Long Idle	30 %	10%
Short Idle		30 %

Sources:
  (1) http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/computer/Microsoft_PowerTransitionReport.pdf?f0fe-40d2
  (2) Ecma-383, 3rd Edition, Annex B.

446
447

Table 8: Base TEC Allowances for Desktop and Integrated Desktop Computers

Product Category	TEC$_{BASE}$ (kWh)
DT 0	65.0
DT 1	115.0
DT 2	130.0
DT 3	205.0

448

Table 9: Base TEC Allowances for Notebook Computers

Product Category	TEC$_{BASE}$ (kWh)
NB 0	14.0
NB I1	22.0
NB I2	24.0
NB I3	28.0
NB D1	16.0
NB D2	18.0

449

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

Function			Desktop	Integrated Desktop	Notebook
TEC$_{MEMORY}$ (kWh) [vi]			0.8		
TEC$_{GRAPHICS}$ (kWh) [vii]	Graphics Category [viii]	**G1** *(FB_BW ≤ 16)*	36		11
		G2 *(16< FB_BW ≤ 32)*	51		18
		G3 *(32 < FB_BW ≤ 64)*	64		24
		G4 *(64 < FB_BW ≤ 96)*	83		32
		G5 *(96 < FB_BW ≤ 128)*	113		42
		G6 *(128 < FB_BW < 192)*	125		48
		G7 *(FB_BW ≥ 192)*	157		60
TEC$_{STORAGE}$ (kWh) [ix]			26		2.6
TEC$_{INT\_DISPLAY}$ (kWh) [x]			n/a	$8.76 \times T_{SHORT\_IDLE\_DESKTOP} \times (1+EP) \times (4 \times r + 0.05 \times A)$	$8.76 \times T_{SHORT\_IDLE\_NOTEBOOK} \times (1+EP) \times (2 \times r + 0.02 \times A)$

452
453
454
Note: Integrated Display Adder (**TEC$_{INT\_DISPLAY}$**): EPA has amended the formulas presented in Draft 2 to include the TEC conversion factor, $8.76 \times T_{SHORT\_IDLE}$ and clarified that the area is expressed in square inches.

455
456
457
Graphics Adders (TEC$_{GRAPHICS}$): In response to Draft 2, stakeholders commented on three assumptions contributing to the discrete graphics adders:
- Ac-dc conversion efficiency used to calculate the adders in kWh at the ac mains from dc data;

458 - The relationship between graphics power in Short Idle versus Long Idle Mode; and

459 - The relationship between graphics power in Notebooks versus Desktops.

460
461
462
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464
EPA reviewed this input, agreed with it, and adjusted the Draft 2 levels accordingly. Subsequent review of 2012 data and consultations with stakeholders has led EPA to take these adjusted levels and lower the graphics adders in some categories to account for more efficient technologies entering the market and to provide a better balance between Base TEC, Graphics, and other adders. This has resulted in updated base allowances in Table 8 and Table 9 and updated graphics adder allowances in Table 10.

---

vi   TEC$_{MEMORY}$ Adder: Applies per GB in excess of the Category Base Memory from Table 3 or Table 4, as appropriate to the product type.

vii   TEC$_{GRAPHICS}$ Adder: Applies for dGfx installed in the system in excess of the Category Base Graphics from Table 3 or Table 4, as appropriate to the product type.

viii FB_BW: Is the display frame buffer bandwidth in gigabytes per second (GB/s)

ix   TEC$_{STORAGE}$ Adder: Applies once if system has more than one Additional Internal Storage element.)

x   TEC$_{INT\_DISPLAY}$ Adder: TSHORT_IDLE is the Idle Mode weighting per Table 6 or Table 7; 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.

465 Base TEC Levels: Additionally, EPA reviewed data submitted by manufacturers in 2011 and a sampling
466 of data from the ENERGY STAR Qualified Products List submitted in 2012. Based on analysis of this data
467 plus the new graphics adders, EPA has revised the Base TEC levels to reflect up-to-date energy
468 consumption profiles.

469 The combination of revised Base TEC levels, the Display Adder, and revised Graphics Adders provides
470 significant energy savings while also delivering products and capabilities that meet consumer desires.
471 EPA sets overall levels to target top performers in energy efficiency and then fine-tunes the distribution of
472 these levels across the specific components of the levels (Base TEC and adders). As an example, if
473 Graphics Adders become larger, Base TEC levels will go down to compensate. Similar tradeoffs can be
474 found between other adders and the Base TEC levels, ensuring that movements in one area are
475 compensated by shifts in another area while ENERGY STAR works to provide the most accurate
476 portrayal of energy consumption possible through its adders and Base TEC levels.

477

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

479
$$EP = \begin{cases} 0, & No\ Enhanced\ Performance\ Display \\ 0.3, & Enhanced\ Performance\ Display, d < 27 \\ 0.75, & Enhanced\ Performance\ Display, d \geq 27 \end{cases}$$

480 *Where:*
481 ▪ *d is the diagonal of the screen, in inches;*

482

483 **Note**: The Enhanced-performance Display adder has been revised to harmonize with the Final Version
484 6.0 ENERGY STAR Displays specification.

485

486 ### 3.6 Requirements for Workstations

487 3.6.1 Weighted power consumption (P_{TEC}) as calculated per Equation 4 shall be less than or equal to
488 the maximum weighted power consumption requirement (P_{TEC_MAX}) as calculated per Equation 5.

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

490
$$P_{TEC} = P_{OFF} \times T_{OFF} + P_{SLEEP} \times T_{SLEEP} + P_{IDLE} \times T_{IDLE}$$

491 *Where:*
492 ▪ *P_{OFF} = Measured power consumption in Off Mode (W)*
493 ▪ *P_{SLEEP} = Measured power consumption in Sleep Mode (W)*
494 ▪ *P_{IDLE} = Measured power consumption in Idle Mode (W)*
495 ▪ *T_{OFF}, T_{SLEEP}, and T_{IDLE} are mode weightings as specified in Table*
496 *11*

497 **Table 11: Mode Weightings for Workstations**

T_{OFF}	T_{SLEEP}	T_{IDLE}
0.35	0.10	0.55

498

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

500
$$P_{TEC\_MAX} = 0.28 \times (P_{MAX} + N_{HDD} \times 5)$$

501		*Where:*
502		▪ P_{MAX} = *Measured maximum power consumption (W)*
503		▪ N_{HDD} = *Number of installed hard disk drives (HDD) or solid state*
504		*drives (SSD)*

505 3.6.2 <u>Desktop Workstations</u>: Products marketed as workstations may qualify for ENERGY STAR under
506 the Desktop requirements in Section 3.5 instead of the Workstation requirements in Section 3.6.1,
507 at the Partner's option. EPA will identify Workstations qualified as Desktops as "Desktops" in all
508 ENERGY STAR marketing materials, on qualified product lists, etc.

509 3.6.3 <u>Active State</u>: To qualify for ENERGY STAR, a Workstation must be submitted for qualification
510 with the following information disclosed in full:

511 i. Linpack results, time per test, total time of all tests, energy consumed per test, total energy
512 consumed over all tests;

513 ii. SPECviewperf results, time per test, total time of all tests, energy consumed per test, total
514 energy consumed over all tests;

515 iii. CINEBENCH results, time per test, total time for all tests, energy consumed per test, total
516 energy consumed over all tests; and

517 iv. SPEC CPU 2006 results, time per test, total time for all tests, energy consumed per test, total
518 energy consumed over all tests.

519 **Note**: EPA has revised the Active State testing requirement for Workstations from Draft 2. DOE has also
520 revised the Draft 3 Test Method to use Linpack, SPECviewperf, CINEBENCH, and SPEC CPU 2006, and
521 also seeks stakeholder feedback on other benchmarks appropriate for an additional partial load test.
522 Please note that the reporting values are not final and may change based on how these tests are setup in
523 the next draft of the test method.

524 ## 3.7 Requirements for Small-scale Servers

525 **Note**: EPA has retained the Draft 1 proposal for Small-scale Servers. EPA investigated taking an
526 alternative, TEC-based approach, but has not proposed a TEC approach as there is limited data available
527 on usage patterns needed to make use of a credible TEC approach. Further, in the absence of data, the
528 most common assumptions about usage are that they are run in idle mode almost 100% of the time.

529 3.7.1 Measured Off Mode power (P_{OFF}) shall be less than or equal to the Maximum Off Mode power
530 (P_{OFF_MAX}), as calculated per Equation 6, subject to the following requirements:

531 i. The Off Mode Wake-on-LAN (WOL) adder allowance (P_{OFF_WOL}) shall only be applied to
532 products that offer WOL enabled by default upon shipment.

533 **Equation 6: Calculation of P_{OFF_MAX} for Small-scale Servers**

$$P_{OFF\_MAX} = P_{OFF\_BASE} + P_{OFF\_WOL}$$

535 *Where:*
536 ▪ P_{OFF_BASE} *is the base allowance as specified in Table 12; and*
537 ▪ P_{OFF_WOL} *is the Wake-on-LAN allowance as specified in Table 12.*
538

539 **Table 12: Off Mode Power Allowances for Small-scale Servers**

P_{OFF_BASE} (watts)	P_{OFF_WOL} (watts)
1.0	0.4

540

541   3.7.2   Measured Idle State power (P_{IDLE}) shall be less than or equal to the Maximum Idle State Power
542   (P_{IDLE_MAX}), as calculated per Equation 7.

543   **Equation 7: Calculation of P_{IDLE_MAX} for Small-scale Servers**

$$P_{IDLE\_MAX} = P_{IDLE\_BASE} + (N - 1) \times P_{IDLE\_HDD}$$

545   *Where:*
546   ▪ *N is equal to the number of installed storage devices in the Small*
547   *Scale Server (either hard drives or solid state drives).*
548   ▪ *P_{IDLE_BASE} is the base allowance as specified in Table 13; and*
549   ▪ *P_{IDLE_HDD} is the hard drive allowance as specified in Table 13.*

550   **Table 13: Idle Mode Power Allowances for Small-scale Servers**

P_{IDLE_BASE} (watts)	P_{IDLE_HDD} (watts)
24.0	8.0

551   3.8   Requirements for Thin Clients

552   3.8.1   Calculated Typical Energy Consumption (E_{TEC}) per Equation 1 shall be less than or equal to
553   the maximum TEC requirement (E_{TEC_MAX}), as calculated per Equation 8, subject to the
554   following requirements.

555   i.   Allowances can only be applied if the corresponding adders are enabled by default.

556   ii.   Thin Clients can utilize the proxy weightings in Table 6 when calculating E_{TEC}.

557

558   **Equation 8: Calculation of E_{TEC_MAX} for Thin Clients**

$$E_{TEC\_MAX} = TEC_{BASE} + TEC_{GRAPHICS} + TEC_{WOL} + TEC_{INT\_DISPLAY}$$

560   *Where:*

561   ▪ *TEC_{BASE} is the Base Allowance specified in Table 14;*
562   ▪ *$TEC_{GRAPHICS}$ is the Discrete Graphics allowance specified in*
563   *Table 14;*
564   ▪ *TEC_{WOL} is the Wake-on-LAN allowance specified in Table 14;*
565   *and*
566   ▪ *$TEC_{INT\_DISPLAY}$ is the Integrated Display allowance for Integrated*
567   *Desktops specified in Table 10.*
568

569   **Table 14: Adder Allowances for Thin Clients**

Adder	Allowance (kWh)
TEC_{BASE}	55
$TEC_{GRAPHICS}$	36
TEC_{WOL}	2

570

571 **Note**: Based on feedback from stakeholders concerning the graphics requirements of Thin Clients, EPA
572 proposes that Thin Clients claim only the first category of graphics adders. The graphics adder is based
573 on that used for Desktops, as EPA understands that thin client systems with discrete graphics will
574 typically use Desktop-level cards.

575
576 Note: Products intended for sale in the US market are subject to minimum toxicity and recyclability
577 requirements. Please see ENERGY STAR® Program Requirements for Computers: Partner Commitments
578 for details.

579 **Note:** To ensure that product designers are aware of Partner Commitments specific to toxicity and
580 recyclability, EPA has inserted the above note.

581 ### 3.9 Requirements for Slate Computing Devices

582   3.9.1   TBD.

583 **Note:** This section will be developed in an update to this specification, bringing it to Version 6.1. Work on
584 this update will proceed during early and mid 2013, pending further development of the ENERGY STAR
585 Battery Charging Systems specification Version 2.0.

586 # 4 TESTING

587 ## 4.1 Test Methods

588 4.1.1   When testing Computer products, the test methods identified in Table 15 shall be used to
589   determine ENERGY STAR qualification.

590 **Table 15: Test Methods for ENERGY STAR Qualification**

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

591 ## 4.2 Number of Units Required for Testing

592 4.2.1   Representative Models shall be selected for testing per the following requirements:

593   i.   For qualification of an individual product configuration, the unique configuration that is
594   intended to be marketed and labeled as ENERGY STAR is considered the Representative
595   Model.

596   ii.   For qualification of a Product Family of all product types, with the exception of
597   Workstations, product configurations that represent the worst-case power consumption for
598   each product category within the family are considered Representative Models. When
599   submitting Product Families, manufacturers continue to be held accountable for any
600   efficiency claims made about their products, including those not tested or for which data
601   were not reported.

602　　　iii.　For systems that meet the definition for multiple categories (as defined in Section 1.B)
603　　　　　　depending on the specific configuration, manufacturers will have to submit the highest
604　　　　　　power configuration for each category under which they would like the system to qualify.
605　　　　　　For example, a system that could be configured as either a DT 0 or DT 1 Desktop would
606　　　　　　require a submittal of the highest power configuration for both categories in order to qualify
607　　　　　　as ENERGY STAR. If a product could be configured to meet all categories, it would then
608　　　　　　have to submit data for the highest power configuration in all categories.

609　　　iv.　For qualification of a Product Family of Workstations under the Workstation or Desktop
610　　　　　　product type, the product configuration that represents the worst-case power consumption
611　　　　　　with a single GPU within the family is considered the Representative Model. Note:
612　　　　　　Workstations that meet ENERGY STAR requirements with a single graphics device may
613　　　　　　also qualify a configuration with more than one graphics device, provided the additional
614　　　　　　hardware configuration is identical with the exception of the additional graphics device(s).
615　　　　　　The use of multiple graphics includes, but is not limited to, driving multiple displays and
616　　　　　　ganging for high performance, multi-GPU configurations (e.g. ATI Crossfire, NVIDIA SLI).
617　　　　　　In such cases, and until such time as SPECviewperf® supports multiple graphics threads,
618　　　　　　manufacturers may submit the test data for the workstation with the single graphics device
619　　　　　　for both configurations without retesting the system.

620　4.2.2　A single unit of each Representative Model shall be selected for testing.

621　**Note:** Results of verification testing performed by certification bodies, indicate that the Version 5.2
622　requirements for additional testing of units near the limit of eligibility criteria are no longer needed. EPA
623　has made similar changes across other CE/IT ENERGY STAR specifications.

624　4.2.3　All units/configurations for which a Partner is seeking ENERGY STAR qualification, must meet
625　　　　　the ENERGY STAR requirements. However, if a Partner wishes to qualify configurations of a
626　　　　　model for which non-qualifying alternative configurations exist, the Partner must assign the
627　　　　　qualifying configurations an identifier in the model name/number that is unique to ENERGY STAR
628　　　　　Qualified configurations. This identifier must be used consistently in association with the
629　　　　　qualifying configurations in marketing/sales materials and on the ENERGY STAR list of qualified
630　　　　　products (e.g. model A1234 for baseline configurations and A1234-ES for ENERGY STAR
631　　　　　qualifying configurations).

632　**Note:** There may be cases—as described in the paragraph above—where not all units/configurations will
633　meet ENERGY STAR requirements. If so, the worst-case configuration for test will be the worst-case
634　<u>qualifying</u> configuration, and not one of the presumably even higher-energy consuming non-qualifying
635　configurations.

636

4.3　International Market Qualification

638　4.3.1　Products shall be tested for qualification at the relevant input voltage/frequency combination for
639　　　　　each market in which they will be sold and promoted as ENERGY STAR.

4.4　Customer Software and Management Service Pre-Provisioning

641　4.4.1　If a manufacturing Partner is hired by a customer to load a custom image on an ENERGY STAR
642　　　　　qualified computer, the Partner shall take the following steps:

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

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

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

5   USER INTERFACE

649

650   5.1.1   Manufacturers are encouraged to design products in accordance with the user interface standard
651   IEEE 1621: Standard for User Interface Elements in Power Control of Electronic Devices
652   Employed in Office/Consumer Environments. For details, see http://eetd.LBL.gov/Controls.

6   EFFECTIVE DATE

653

654   6.1.1   Effective Date: The Version 6.0 ENERGY STAR Computers specification shall take effect
655   **October 1, 2013**. To qualify for ENERGY STAR, a product model shall meet the ENERGY STAR
656   specification in effect on its date of manufacture. The date of manufacture is specific to each unit
657   and is the date on which a unit is considered to be completely assembled.

658   6.1.2   Future Specification Revisions: EPA reserves the right to change this specification should
659   technological and/or market changes affect its usefulness to consumers, industry, or the
660   environment. In keeping with current policy, revisions to the specification are arrived at through
661   stakeholder discussions. In the event of a specification revision, please note that the ENERGY
662   STAR qualification is not automatically granted for the life of a product model.

7   CONSIDERATIONS FOR FUTURE REVISIONS

663

664   7.1.1   **Slates**: EPA will work with stakeholders to appropriately define Slates and other portable
665   products as well as develop appropriate ENERGY STAR requirements. These updates will be
666   finalized in Version 6.1 early in 2013.

667   7.1.2   **Dc-powered Computers:** EPA remains interested in including Dc-powered Computers in a
668   future specification revision.

669   7.1.3   **Additional Workloads for Workstation Testing:** EPA is considering using the Server
670   Efficiency Rating Tool (SERT, www.spec.org/sert) for future evaluation of workstations and
671   encourages development of Auxiliary Processing Accelerator (APA)/GPU functionality within
672   the SERT tool to measure the performance of these workstation components.

673

674 # APPENDIX A:
675 # Sample Calculations
676

677 **Note**: As in Version 5, this appendix will ultimately include sample calculations for reference in calculating
678 performance levels for products covered in this specification.

679