ENERGY STAR® Program Requirements for Computers

Partner Commitments

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

Certified 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.

> **Note:** EPA received comments from stakeholders asking to revisit the above requirement (3.2) in light of the inclusion of slate/tablet devices, which may be designed and disposed of differently than notebooks or desktops. EPA is open to stakeholder suggestions for appropriate standards to reference or alternative language (with references) that would be more suitable for these products.

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 certified nor during subsequent verification testing. Rather, EPA reserves the right to request supporting documentation at any time.

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 certified products. Partner may not refer to itself as an ENERGY STAR Partner unless at least one product is certified and offered for sale in the U.S. and/or ENERGY STAR partner countries.

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

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

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

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

            a. The label shall be on the top or front of the product if the top or front of the product has a contiguous, coplanar surface area not used for touch input or display that is greater than or equal to 0.625 in square;

            b. Otherwise, the label shall be on the reverse side of the screen; or

         2) Via electronic labeling displayed on the screen such that the ENERGY STAR mark must be at least 4% of the screen by area; must be greater than or equal to 76 pixels x 78 pixels; must be legible; must be in cyan, black, or white; and either

            a. Must appear at system start-up, and must display for a minimum of 5 seconds; or

            b. Must appear within the system power settings dialog window. EPA will consider alternative proposals for electronic labeling on a case-by-case basis.

   Note: EPA received stakeholders comments concerning the applicability of the above labeling requirements to slate/tablet devices, since these devices are not typically turned on/off that much and have much less room for a physical label on their surface. Option 6.1.1.2).b above allows for electronic labeling within the system power settings dialog window, but EPA has made exceptions on a case-by-case basis. EPA proposes to keep the above language but for slate/tablets to either (a) create case-by-case changes on a per stakeholder basis or (b) create a set of "standard exceptions" based on OS type which stakeholders may opt for, while still retaining the ability to create individual exceptions as needed.

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

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

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

      6.4.1.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 certified. 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 certified 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 certified 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 certified 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 certified 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 certified 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 certified 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 certified 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 certified 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
Version 6.1

Following is the Version 6.1 ENERGY STAR Product Specification for Computers. A product shall meet all of the identified criteria if it is to earn the ENERGY STAR.

1 DEFINITIONS

A) Product Types:

1) Computer: A device which performs logical operations and processes data. For the purposes of this specification, computers include both stationary and portable units, including Desktop Computers, Integrated Desktop Computers, Notebook Computers, Small-Scale Servers, Thin Clients, and Workstations. Although computers are capable of using input devices and displays, such devices are not required to be included with the computer upon shipment. Computers are composed of, at a minimum:

    a) A central processing unit (CPU) to perform operations. If no CPU is present, then the device must function as a client gateway to a server which acts as a computational CPU;

    b) User input devices such as a keyboard, mouse, or touchpad; and

    c) An Integrated Display screen and/or the ability to support an external display screen to output information.

2) Desktop Computer: A computer whose main unit is designed to be located in a permanent location, often on a desk or on the floor. Desktop computers are not designed for portability and are designed for use with an external display, keyboard, and mouse. Desktop computers are intended for a broad range of home and office applications, including point of sale applications.

    a) Integrated Desktop Computer: A Desktop Computer in which the computing hardware and display are integrated into a single housing, which is typically connected to ac mains power through a single cable. Integrated Desktop Computers are permitted to operate with a battery without a direct connection to ac main power source for limited relocation purposes. Integrated Desktop Computers come in one of two possible forms: (1) a system where the display and computer are physically combined into a single unit which does not resemble a clam shell form factor; or (2) a system packaged as a single system where the display is separate but is connected to the main chassis by a dc power cord and both the computer and display are powered from a single power supply. As a subset of Desktop Computers, Integrated Desktop Computers are typically designed to provide similar functionality as Desktop systems.

Note: EPA received several examples from manufacturers of integrated desktop computer products which contain a battery that allows limited portability for movement from room to room. EPA is proposing to allow these products to qualify as Integrated Desktop Computers so long as they meet all of the form factor requirements within the Integrated Desktop Computer definition. EPA welcomes stakeholder feedback on these changes.

3) <u>Notebook Computer</u>: A computer designed specifically for portability and to be operated for extended periods of time both with and without a direct connection to an ac mains power source. Notebook Computers include an Integrated Display, a non-detachable, mechanical keyboard (using physical, moveable keys), and pointing device.

Note: Notebook computers are typically designed to provide similar functionality to Desktops, including operation of software similar in functionality as that used in Desktops. For purposes of this specification, Notebook Computers include models with touch-sensitive screens.

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

b) <u>Two-In-One Notebook</u>: A computer which resembles a traditional Notebook Computer with a clam shell form factor, but has a detachable display which can act as an independent Slate/Tablet when disconnected. The keyboard and display portions of the product must be shipped as an integrated unit.

Note: EPA received stakeholder feedback on the proposed Two-In-One Computer definition in the Version 6.1 Discussion Document expressing desire to allow processing to occur in either the display or keyboard portion of the product, rather than being required in the keyboard portion for all products. EPA is proposing to allow processing to occur in either the detachable display or keyboard portion of the product, so long as the two portions of the product are shipped as an integrated unit. Futhermore, EPA is proposing to remove the distinction of requiring processing typically found in a notebook computer as it is challenging to define what this is due to the convergence of software and hardware in notebook computers and slates/tablets. As a result, EPA has relocated the Two-In-One category to a subcategory of notebook computers. Note that Two-in-One Computers will be recorded as Two-in-Ones in the EPA database, allowing them to be distinguished from traditional notebooks for future data analyses. EPA welcomes stakeholder feedback on these changes.

4) <u>Slate/Tablet</u>: A computing device designed for portability that meets all of the following criteria:

a) Includes an integrated display with a diagonal size greater than 6.5 inches;

b) Lacking an integrated, physical attached keyboard in its as-shipped configuration;

c) Includes and primarily relies on touchscreen input; (with optional keyboard);

d) Includes and primarily relies on a wireless network connection (e.g., Wi-Fi, 3G, etc.); and

e) Includes and is primarily powered by an internal battery (with connection to the mains for battery charging, not primary powering of the device).

Note: EPA is proposing to maintain the Slate/Tablet definition from the Version 6.1 Discussion Document, with the exception of the removal of the "marketed as" language as there are products which are not marketed as slates/tablets but are in fact slates/tablets by definition (e.g. iPad). Stakeholders provided feedback stating that there may be phone based products which exceed the 6.5 inch display size requirement. Rather than remove this requirement, EPA has proposed revisions to the scope exclusion Section 2.2 below to address any slate/tablet products which contain cellular voice capability.

5) <u>E-Reader</u>: A device designed for display and consumption of static images. The display is characterized by a low refresh rate and a display made of bistable materials where no energy is needed to maintain a visible image, only to alter the image.

Note: EPA is proposing a definition of E-Reader to clearly differentiate between E-Readers and Slates/Tablets for the purpose of excluding E-Readers from scope in Section 2.2.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

C) Computer Components:

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

2) Discrete Graphics (dGfx): A graphics processor (GPU) with a local memory controller interface and local graphics-specific memory.

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

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

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

(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;

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

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

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

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 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.

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

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

E) Networking and Additional Capabilities:

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

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

3) Full Network Connectivity: The ability of the computer to maintain network presence while in Sleep Mode or an alternative low power mode (LPM) with power less than or equal to 10 watts and intelligently wake when further processing is required (including occasional processing required to maintain network presence). Presence of the computer, its network services and applications, is maintained even though the computer is in a LPM. From the vantage point of the network, a computer with full network connectivity that is in LPM is functionally equivalent to an idle computer with respect to common applications and usage models. Full network connectivity in LPM is not limited to a specific set of protocols but can cover applications installed after initial installation. Also referred to as "network proxy" functionality and as described in the *Ecma-393* standard.

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

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

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

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

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

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

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

7) <u>Switchable Graphics</u>: Functionality that allows Discrete Graphics to be disabled when not required in favor of Integrated Graphics..

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

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

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

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

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

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

1) Color;

2) Housing; and

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

2 SCOPE

2.1 Included Products

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

i.   Desktop Computers and Integrated Desktop Computers;

ii. Notebook Computers;

      iii.   Slates/Tablets;

      iv.   Workstations;

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

      vi.   Thin Clients.

> **Note**: EPA is proposing to add Slates/Tablets to the scope of Version 6.1 and welcomes stakeholder feedback on this proposal.

2.2   Excluded Products

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

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

      i.   Docking Stations;

      ii.   Game Consoles;

      iii.   E-Readers;

      iv.   Handheld gaming devices, typically battery powered and intended for use with an integral display as the primary display;

      v.   Mobile Thin Clients not meeting the definition of Notebook Computer;

      vi.   Personal Digital Assistant devices (PDAs);

      vii.   Point of Sale (POS) products that do not use internal components common to Notebook, Desktop, or Integrated Desktop Computers, including a processor, motherboard, and memory;

      viii.   Small-scale Servers that are marketed and sold for use in data centers;

      ix.   Handheld Computers which contain cellular voice capability;

      x.   Ultra-thin Clients.

> **Note**: Due to the large variation in terms used to identify smart phone devices, EPA is proposing to remove the specific exclusion of smartphones found in Version 6.0 and replace that exclusion with any handheld computing device which contains cellular voice capability. This exclusion will serve the same purpose, while making clear that smartphones which are marketed with different terms (e.g. Phablet etc.) are also excluded. EPA welcomes stakeholder feedback on this change.

3   CERTIFICATION CRITERIA

3.1   Significant Digits and Rounding

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

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

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

3.2 General Requirements

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

3.2.2 <u>Internal Power Supply (IPS) Requirements</u>: IPSs used in Computers eligible under this specification must meet the following requirements when tested using the *Generalized Internal Power Supply Efficiency Test Protocol, Rev. 6.6* (available at http://www.plugloadsolutions.com/docs/collatrl/print/Generalized_Internal_Power_Supply_Efficiency_Test_Protocol_R6.6.pdf).

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

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

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

3.2.3 <u>External Power Supply</u> (EPS) Requirements: Single- and Multiple-voltage EPSs shall meet the Level V performance requirements under the International Efficiency Marking Protocol when tested according to the Uniform Test Method for Measuring the Energy Consumption of External Power Supplies, Appendix Z to 10 CFR Part 430.

  • Single-voltage EPSs shall include the Level V marking.

  • Additional information on the Marking Protocol is available at www.energystar.gov/powersupplies

3.3 Power Management Requirements

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

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

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

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

  iv. Products that do not support Sleep Mode by default are only subject to the Display Sleep Mode requirement.

Mode or Mode Transition	Requirement	Desktops	Integrated Desktops	Notebooks	Small-scale Servers	Slates/Tablets	Thin Clients	Workstations
System Sleep Mode[i]	(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	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)[i]	(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	N/A	Yes	Yes
Wake Management[i]	(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

Note: EPA has revised Table 2 to include new Slate/Tablet product types.

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

3.4 User Information Requirements

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

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

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

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

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

    i. A list of default power management settings.

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

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

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

    i. Documentation is shipped with the product (e.g., in a printed manual or insert, on included optical media, in a file installed with the software load shipped to the customer) or available electronically on the manufacturer's website. In the latter case, instructions for accessing the information on the website shall be provided in the product package or on the Desktop or home screen; and

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

3.5 Requirements for Desktop, Integrated Desktop, and Notebook Computers

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

    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.

    ii. The Integrated Display adder allowance ($TEC_{INT\_DISPLAY}$) applies only for Integrated Desktops and Notebooks and may be applied for each display. For Enhanced-performance Integrated Displays, the adder is calculated as presented in Table 7 and Equation 3.

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

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

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

- Products shall be capable of Sleep Mode or alternative low power modes with power less than or equal to 10 watts.

Note: Full Network Connectivity is a manufacturer-reported parameter. On Mac computers, "Wake for network access" enabled within the Energy Saver/Power Adapter Preferences signifies Base Capability or better. On Windows computers, "ARP Offload" or "NS Offload" or similar enabled within the Advanced Properties of the Network Interface Card (accessed through the Device Manager) signifies Base Capability or better. For systems with a dual Network Interface Card (NIC) configuration, only one NIC configuration needs to comply. The manufacturer can provide further guidance on how to confirm Proxy Support.

iv. For Notebooks, Desktops, and Integrated Desktops that use an alternative low power mode in place of System Sleep Mode, power in Long Idle (P_{LONG_IDLE}) may be used in place of power in Sleep (P_{SLEEP}) in Equation 1 if the alternative low power mode is less than or equal to 10 watts. In such instances, ($P_{SLEEP} \times T_{SLEEP}$), is replaced by ($P_{LONG\_IDLE} \times T_{SLEEP}$); Equation 1 remains otherwise unchanged.

v. Notebooks, Desktops, and Integrated Desktops with switchable graphics may not apply the Discrete Graphics allowance, $TEC_{GRAPHICS}$, from Table 7 in Equation 2. However, for Desktop and Integrated Desktop systems providing Switchable Graphics and enabling it by default, an allowance equal to 50% of the G1 graphics allowance for the platform type (Desktop or Integrated Desktop) may be applied. The switchable graphics incentive only applies to automated switching that is enabled by default. This capability is manufacturer-declared.

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 3 (for Desktops, Integrated Desktops, and Thin Clients) or Table 4 (for Notebooks).*

Table 3: 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%

Table 4: Mode Weightings for Notebook Computers

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

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

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

Where:
- *$ALLOWANCE_{PSU}$ is an allowance provided to power supplies that meet the optional more stringent efficiency levels specified in Table 5; power supplies that do not meet the requirements receive an allowance of 0;*
- *TEC_{BASE} is the Base allowance specified in Table 6; and,*
- *$TEC_{GRAPHICS}$ is the discrete graphics allowance as specified in Table 7, with the exception of systems with integrated graphics, which do not receive an allowance, or Desktops and Integrated Desktops with switchable graphics enabled by default, which receive an allowance through $TEC_{SWITCHABLE}$; and*
- *TEC_{MEMORY}, $TEC_{STORAGE}$, $TEC_{INT\_DISPLAY}$, $TEC_{SWITCHABLE}$, and TEC_{EEE} are adder allowances as specified in Table 7.*

Table 5: Power Supply Efficiency Allowance

Power Supply Type	Computer Type	Minimum Efficiency at Specified Proportion of Rated Output Current[ii]				Minimum Average Efficiency[iii]	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 or Desktop**	0.83	-	-	-	0.88	0.015
		0.84	-	-	-	0.89	0.03
	Integrated Desktop	0.83	-	-	-	0.88	0.015
		0.84	-	-	-	0.89	0.04

Table 6: Base TEC (TEC$_{BASE}$) Allowances

Category Name	Graphics Capability[iv]	Desktop or Integrated Desktop		Notebook	
		Performance Score, P[v]	**Base Allowance**	**Performance Score, P[v]**	**Base Allowance**
0	**Any Graphics** dGfx ≤ G7	$P \le 3$	69.0	$P \le 2$	14.0
I1	**Integrated or Switchable Graphics**	$3 < P \le 6$	112.0	$2 < P \le 5.2$	22.0
I2		$6 < P \le 7$	120.0	$5.2 < P \le 8$	24.0
I3		$P > 7$	135.0	$P > 8$	28.0
D1	**Discrete Graphics** dGfx ≤ G7	$3 < P \le 9$	115.0	$2 < P \le 9$	16.0
D2		$P > 9$	135.0	$P > 9$	18.0

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ii   EPSs shall meet the specified requirements when tested using the *Uniform Test Method for Measuring the Energy Consumption of External Power Supplies, Appendix Z to 10 CFR Part 430.* IPSs shall meet the specified requirements when tested using the *EPRI 306 Generalized Internal Power Supply Efficiency Test Protocol, Rev. 6.6.*

iii   Average efficiency is the arithmetic mean of efficiencies tested at 25%, 50%, 75%, and 100% of rated output current. EPSs shall meet the specified requirements when tested using the *Uniform Test Method for Measuring the Energy Consumption of External Power Supplies, Appendix Z to 10 CFR Part 430.*

iv   Discrete Graphics capability is categorized based on frame buffer bandwidth, as shown in Table 7.

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

Table 7: 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		14
		G2 *(16< FB_BW ≤ 32)*	51		20
		G3 *(32 < FB_BW ≤ 64)*	64		26
		G4 *(64 < FB_BW ≤ 96)*	83		32
		G5 *(96 < FB_BW ≤ 128)*	105		42
		G6 *(FB_BW > 128; Frame Buffer Data Width < 192 bits)*	115		48
		G7 *(FB_BW > 128; Frame Buffer Data Width ≥ 192 bits*	130		60
TEC$_{SWITCHABLE}$ (kWh)[ix]			0.5 × G1		N/A
TEC$_{EEE}$ (kWh)[x]			8.76 × 0.2 × (0.15 + 0.35)		8.76 × 0.2 × (0.10 + 0.30)
TEC$_{STORAGE}$ (kWh)[xi]			26		2.6
TEC$_{INT\_DISPLAY}$ (kWh)[xii]			N/A	8.76 × 0.35 × (1+EP) × (4×r + 0.05×A)	8.76 × 0.30 × (1+EP) × (2×r + 0.02×A)

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

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

Where:
- *d is the diagonal of the screen, in inches;*

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vi   TEC$_{MEMORY}$ Adder: Applies per GB installed in the system.
vii   TEC$_{GRAPHICS}$ Adder: Applies to only the first dGfx installed in the system, but not Switchable Graphics.
viii   FB_BW: Is the display frame buffer bandwidth in gigabytes per second (GB/s). This is a manufacturer declared parameter and should be calculated as follows: (Data Rate [Mhz] × Frame Buffer Data Width [bits]) / (8 × 1000)
ix   TEC$_{SWITCHABLE}$ Incentive: Applies to automated switching that is enabled by default in Desktops and Integrated Desktops.
x   TEC$_{EEE}$: Applies per IEEE 802.3az-compliant (Energy Efficient Ethernet) Gigabit Ethernet port.
xi   TEC$_{STORAGE}$ Adder: Applies once if system has more than one Additional Internal Storage element.
xii   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.

3.6 Requirements for Slates/Tablets

3.6.1 Slates/Tablets 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 4.

  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.

Note: EPA is proposing that slates/tablets meet all existing notebook computer requirements from Version 6.0 in Section 3.5 above.

EPA received stakeholder requests to create separate mode weightings for slates/tablets, rather than use the existing notebook computer weightings. While EPA recognizes that usage of slates/tablets may differ from notebook computer users, maintaining conformance with Version 6.0 notebook mode weightings is currently the fairest option for handling the range of capabilities currently found in slate/tablet devices. EPA proposes that slate/tablet products use the existing notebook computer mode weightings, with products which do not have a distinct sleep mode using long idle in its place per Section 3.5.1.iv.

EPA also received stakeholder requests to allow slate/tablet products to apply base TEC allowances based on their calculated performance score, rather than automatically being classified in the "0" notebook category. EPA agrees with stakeholder statements that this categorization eliminates the need to define notebook level processing, which is a challenging task given the short development period of Version 6.1 and quickly evolving product types. As such, EPA is proposing to apply the base TEC allowances to tablets/slates in the same manner they are applied to notebook computers.

Section 3.6 was created to avoid the need to list all four products types (desktop computer, integrated desktop computer, notebook computer, slate/tablet) repeatedly in Section 3.5. This solution requires minimal revisions to the existing language from Version 6.0, while achieving the same goal. EPA welcomes stakeholder feedback on this approach.

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}
35%	10%	15%	40%

Equation 5: P_{TEC_MAX} Calculation for Workstations

$$P_{TEC\_MAX} = 0.28 \times (P_{MAX} + N_{HDD} \times 5)$$
$$+ 8.76 \times P_{EEE} \times (T_{SLEEP} + T_{LONG\_IDLE} + T_{SHORT\_IDLE})$$

Where:
- *P_{MAX} = Measured maximum power consumption (W)*
- *N_{HDD} = Number of installed hard disk drives (HDD) or solid state drives (SSD)*
- *P_{EEE} is an EEE allowance of 0.2 W per IEEE 802.3az-compliant (Energy Efficient Ethernet) Gigabit Ethernet port.*

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

i.   Linpack benchmark test results, compiler optimizations, and total energy consumed over the duration of the test; and

ii. SPECviewperf benchmark test results, configuration options, total duration of the test, and total energy consumed over the duration of the test.

3.7.3   Desktop Workstations: Products marketed as workstations may be ENERGY STAR certified under the Desktop requirements in Section 3.5 instead of the Workstation requirements in Section 3.6, at the Partner's option. EPA will identify Workstations certified as Desktops as "Desktops" in all ENERGY STAR marketing materials, on certified product lists, etc.

3.8   Requirements for Small-scale Servers

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

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

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

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

Where:
- *P_{OFF_BASE} is the base allowance as specified in Table 9; and*
- *P_{OFF_WOL} is the Wake-on-LAN allowance as specified in Table 9.*

Table 9: Off Mode Power Allowances for Small-scale Servers

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

3.8.2 Measured Long Idle State power (P_{LONG_IDLE}) shall be less than or equal to the Maximum Idle State Power Requirement (P_{IDLE_MAX}), as calculated per Equation 7.

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

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

Where:
- *N is equal to the number of installed storage devices in the Small Scale Server (either hard disk drives or solid state drives);*
- *P_{IDLE_BASE} is the base allowance as specified in Table 10;*
- *P_{IDLE_HDD} is the hard drive allowance as specified in Table 10; and*
- *P_{EEE} is an EEE allowance of 0.2 W per IEEE 802.3az-compliant (Energy Efficient Ethernet) Gigabit Ethernet port.*

Table 10: Idle Mode Power Allowances for Small-scale Servers

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

3.9 Requirements for Thin Clients

3.9.1 Calculated Typical Energy Consumption (E_{TEC}) per Equation 1 shall be less than or equal to the Maximum TEC Requirement (E_{TEC_MAX}), as calculated per Equation 8, subject to the following requirements.

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

   ii. Thin Clients can utilize the proxy weightings in Table 3 when calculating E_{TEC}.

   iii. For Thin Clients that lack a discrete System Sleep Mode, Long Idle State power (P_{LONG_IDLE}) may be used in place of Sleep Mode Power (P_{SLEEP}) in Equation 1 so long as the system meets the Thin Client TEC allowance. In such instances, ($P_{SLEEP} \times T_{SLEEP}$), is replaced by ($P_{LONG\_IDLE} \times T_{SLEEP}$); Equation 1 remains otherwise unchanged.

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

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

Where:

- *TEC_{BASE} is the Base Allowance specified in Table 11;*
- *$TEC_{GRAPHICS}$ is the Discrete Graphics allowance specified in Table 11 if applicable;*
- *TEC_{WOL} is the Wake-on-LAN allowance specified in Table 11 if applicable;*
- *$TEC_{INT\_DISPLAY}$ is the Integrated Display allowance for Integrated Desktops specified in Table 7 if applicable; and*
- *TEC_{EEE} is the Energy Efficiency Ethernet incentive for Desktops specified in Table 7 if applicable, per IEEE 802.3az-compliant (Energy Efficient Ethernet) Gigabit Ethernet port.*

Table 11: Adder Allowances for Thin Clients

Adder	Allowance (kWh)
TEC_{BASE}	60
$TEC_{GRAPHICS}$	36
TEC_{WOL}	2

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

4 TESTING

4.1 Test Methods

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

Table 12: Test Methods for ENERGY STAR Qualification

Product Type or Component	Test Method
All	ENERGY STAR Test Method for Computers, Rev. Oct-2013**

**Note: Please note that an updated ENERGY STAR Computers Draft Test Method is not included here but will be forthcoming in early April. The U.S. Department of Energy (DOE) has been supporting EPA on its ENERGY STAR Computer specification development by considering whether changes are warranted to accommodate slate/tablet and two-in-one computers in the ENERGY STAR computers test method. DOE plans to consider comments received from public comment on its proposed coverage determination regarding computers and backup battery systems (79 FR 11345) to better inform its next steps for both its regulatory program and the ENERGY STAR program. Thus, DOE expects to issue a revised test method for computers in early April 2014, if warranted, to address slate/tablet and two-in-one computers. DOE has previously received comments, via the ENERGY STAR process, that modifications may be needed to provide further guidance on luminance settings, how to display the images used for testing, and the configuration of cellular and Bluetooth functionality when testing a slate/tablet or two-in-one computer.

4.2 Number of Units Required for Testing

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

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

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

iii.   For systems that meet the definition for multiple categories (as defined in Section 1.B) depending on the specific configuration, manufacturers will have to submit the highest power configuration for each category under which they would like the system to be ENERGY STAR certified. For example, a system that could be configured as either a Category 0 or 1 Desktop, as defined in Table 6 would require submittal of the highest power configuration for both categories in order to be ENERGY STAR certified. If a product could be configured to meet all categories, it would then have to submit data for the highest power configuration in all categories.

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

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

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

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

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

4.3 International Market Qualification

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

4.4   Customer Software and Management Service Pre-Provisioning

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

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

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

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

5   USER INTERFACE

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

6   EFFECTIVE DATE

6.1.1   Effective Date: The Version 6.1 ENERGY STAR Computers specification shall take effect **June 2, 2014**. To be ENERGY STAR certified, a product model shall meet the ENERGY STAR specification in effect on its date of manufacture. The date of manufacture is specific to each unit and is the date on which a unit is considered to be completely assembled.

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

7   CONSIDERATIONS FOR FUTURE REVISIONS

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

7.1.2   **New Benchmark for Workstation Testing:** EPA expects to work with stakeholders to develop a workstation benchmark in time for the future ENERGY STAR Computers Version 7.0.

7.1.3   **TEC for Alternative Low Power Modes**: EPA anticipates that modal limits for the alternative low power modes will eventually be removed and those modes will be integrated into the TEC formula in a future revision of the spec.

APPENDIX A:
Sample Calculations

I. **Desktop, Integrated Desktop, Notebook Computers:** Below is a sample TEC calculation intended to show how levels for compliance are determined based on functional adders and operational mode measurements.

Following is a sample E_{TEC} evaluation for a 2.0 GHz, dual core Notebook with Switchable Graphics, 8 GB Memory, Energy Efficient Ethernet (EEE), and 1 hard disk drive (HDD).

A) Measure values using the ENERGY STAR Computers Test Method:

   1) Off Mode = 1.0 W

   2) Sleep Mode = 1.7 W

   3) Long Idle State = 8.0 W

   4) Short Idle State = 10.0 W

B) Determine the proxy support provided by the operating system and network card. This is a manufacturer-reported parameter.

   1) On Mac computers, "Wake for network access" enabled within the Energy Saver/Power Adapter Preferences signifies Base Capability or better.

   2) On Windows computers, "ARP Offload" or "NS Offload" or similar enabled within the Advanced Properties of the Network Interface Card (accessed through the Device Manager) signifies Base Capability or better. OEM can provide further guidance on how to confirm Proxy Support

C) Calculate E_{TEC} from power measurements and mode weightings—this example assumes no Proxy Support/Conventional Weightings:

T_{OFF}	25%
T_{SLEEP}	35%
T_{LONG_IDLE}	10%
T_{SHORT_IDLE}	30%

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

   2) $E_{TEC} = \frac{8760}{1000} \times (1.0 \text{ W} \times 25\% + 1.7 \text{ W} \times 35\% + 8.0 \text{ W} \times 10\% + 10.0 \text{ W} \times 30\%)$

   3) E_{TEC} = 40.7 kWh / year

D) Determine which Base TEC allowance applies based on graphics capability and performance score: *P = [# of CPU cores] × [CPU clock speed (GHz)] = 2×2 GHz = 4.*

Table 6: Base TEC (TEC_BASE) Allowances

| Category Name | Graphics Capability | Notebook | |
		Performance Score, *P*	Base Allowance
I1	Integrated or Switchable Graphics	2 < *P* ≤ 5.2	22.0

E) Determine which Functional Adder Allowances apply:

1) Memory: *8 GB installed, so a TEC$_{MEMORY}$ allowance of* $8\text{ GB} \times 0.8\frac{\text{kWh}}{\text{GB}} = 6.4\text{ kWh}$ *applies*

2) Discrete Graphics? *No, therefore TEC$_{GRAPHICS}$ allowance does not apply.*

3) Switchable Graphics? *Yes, but TEC$_{SWITCHABLE}$ allowance does not apply to Notebooks.*

4) Energy Efficient Ethernet (EEE)? *Yes, and assuming one EEE-compliant Ethernet port, a TEC$_{EEE}$ allowance of* 8.76 × 0.2 × (0.10 + 0.30) = 0.7 kWh *applies*

5) Storage? *No, the notebook has only one hard disk drive, so no storage allowance applies.*

6) Integrated Display? *Yes, and assuming a non-enhanced performance, 14 inch display with an area of 83.4 square inches and a resolution of 1.05 megapixels, a TEC$_{INT\_DISPLAY}$ allowance of* 8.76 ×*0.30* × (1+*EP*)× (2×*r* + 0.02×*A*) = 8.76 ×*0.30* × (2×*1.05* MP+ 0.02×83.4 in^2) = 9.9 kWh *applies.*

F) Calculate E$_{TEC\_MAX:}$

1) E$_{TEC\_MAX}$ = 22.0 kWh + 6.4 kWh + 0.7 kWh + 9.9 kWh

2) E$_{TEC\_MAX}$ = 39.0 kWh/yr

G) Compare E$_{TEC}$ to the E$_{TEC\_MAX}$ to determine if the model qualifies:

40.7 kWh/yr > 39.0 kWh/yr

Therefore, the Notebook does not meet ENERGY STAR requirements.

II. **Workstations:** Below is a sample P$_{TEC}$ calculation for a Workstation with 2 hard drives and no Energy Efficient Ethernet capability.

A) Measure values using the ENERGY STAR Computers Test Method:

1) Off Mode = 2 W

2) Sleep Mode = 4 W

3) Long Idle State = 50 W

4) Short Idle State = 80 W

5) Max Power = 180 W

A) Note number of Hard Drives installed: Two hard drives installed during test.

B) Calculate P$_{TEC}$ from power measurements and mode weightings using Equation 4:

T$_{OFF}$	T$_{SLEEP}$	T$_{LONG\_IDLE}$	T$_{SHORT\_IDLE}$
35%	10%	15%	40%

1) *P$_{TEC}$* = (35% × *P$_{OFF}$* + 10% × *P$_{SLEEP}$* + 15% × *P$_{LONG\_IDLE}$* + 40% × *P$_{SHORT\_IDLE}$*)

2) *P$_{TEC}$* = (35% × 2 W + 10% × 4 W + 15% × 50 W + 40% × 80 W)

3) P_{TEC} = 40.6 W

C) Calculate the P_{MAX} requirement using Equation 5:

1) $P_{TEC\_MAX} = 0.28 \times (P_{MAX} + N_{HDD} \times 5) + 8.76 \times P_{EEE} \times (T_{SLEEP} + T_{LONG\_IDLE} + T_{SHORT\_IDLE})$

2) $P_{TEC\_MAX} = 0.28 \times (180 + 2 \times 5) + 8.76 \times 0 \times (T_{SLEEP} + T_{LONG\_IDLE} + T_{SHORT\_IDLE})$

3) $P_{TEC\_MAX} = 53.2 + 0$

D) Compare P_{TEC} to the ENERGY STAR levels to determine if the model qualifies:

40.6 W ≤ 53.2 W

Therefore, the Workstation meets ENERGY STAR requirements.