

Revision 1: 01/07/2016

Schedule - 14

Laptop/ Notebook Computers

1. SCOPE

- (1) This standard specifies the energy labeling requirements for Desktops, Integrated Desktops and notebook/ laptop computers, manufactured, imported, or sold in India for household/office and similar use.
- (2) The products shall meet all the requirements specified in this schedule for the purpose of labeling.
- (3) This Standard has been prepared on the basis of Energy Star specification for computers developed by US Environment Protection Agency. In the absence of BIS standard for laptops and notebooks this standard follows the version 6.1¹ - Energy Star program requirements Product specification for computers.

2. DEFINITIONS: The definitions of the various terms used in this schedule are as follows:

- A. **Computer:** A device which performs logical operations and processes data. For the purposes of this schedule, computers include both stationary and portable units, including Notebook Computers, 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:
- i. 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;
 - ii. User input devices such as a keyboard, mouse, or touchpad; and
 - iii. An Integrated Display screen and/or the ability to support an external display screen to output information.
- B. **Notebook Computer:** 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. For purposes of this schedule, Notebook Computers include models with touch-sensitive screens.

¹ http://www.energystar.gov/index.cfm?c=computers.pr_crit_computers

C. Components:

- a. **Computer 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.
 - b. **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.
 - c. **Discrete Graphics Processing Unit (dGfx):** A graphics processor with a local memory controller interface and a local, graphics-specific memory.
 - d. **Integrated Graphics (iGfx):** A graphics solution that does not contain Discrete Graphics.
- D. **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.
- E. **Internal Power Supply:** 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 must be contained within the computer casing but be separate from the main computer board. The power supply must 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 computer 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.

3. 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. PLONG_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). PSHORT_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.

4. NETWORKING AND ADDITIONAL CAPABILITIES:

A) 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.

B) 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.

C) 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.

Table 1: Network Proxy

| | |
|---------------------------------|---|
| Base Capability | To maintain addresses and presence on the network while in LPM, the system handles IPv4 ARP and IPv6 NS/ND. |
| Full Capability | While in LPM, the system supports Base Capability, Remote Wake, and Service Discovery/Name Services. |
| Remote Wake | While in LPM, the system is capable of remotely waking upon request from outside the local network. Includes Base Capability. |
| Service Discovery/Name Services | While in LPM, the system allows for advertising host services and network name. Includes Base Capability. |

D) Network Interface: 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).

E) Wake Event: 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.

F) Wake On LAN (WOL): 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.

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

Note: 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.

5. FAMILY OF MODELS: 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 star label qualification criteria, or (2) are specified herein as acceptable variations within a product family. For Computers, acceptable variations within a product family include:

- a. Color;
- b. Housing; and
- c. Electronic components other than the chassis/motherboard, such as the processor, memory, GPU, etc.

6. EXCLUDED PRODUCTS

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 centres;
- ix. Handheld Computers which contain cellular voice capability;
- x. Ultra-thin Clients.

7. QUALIFICATION CRITERIA:

7.1 General Requirements

- 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.
- Internal Power Supply (IPS) Requirements: 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](http://www.plugloadsolutions.com/docs/collatrl/print/Generalized%20Internal%20Power%20Supply%20Efficiency%20Test%20Protocol%20R6.6.pdf)).
 - (i) IPS with maximum rated output power less than 75 watts shall meet minimum efficiency requirements as specified in Table 2.
 - (ii) IPS with maximum rated output power greater than or equal to 75 watts shall meet both minimum efficiency requirements and minimum power factor requirements, as specified in Table 2.

Table 2: Requirements of Internal Power Supplies

| Loading Conditions (Percentage of Nameplate output current) | Minimum Efficiency | Minimum Power Factor |
|---|--------------------|----------------------|
| 20% | 0.82 | - |
| 50% | 0.85 | - |
| 100% | 0.82 | 0.90 |

- External Power Supply (EPS) Requirements: Single- and Multiple-voltage EPSs shall meet the Level V or greater 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.
 - i. Single-voltage EPSs shall include the Level V (or greater) marking.
 - ii. Additional information on the Marking Protocol is available at www.energystar.gov/powersupplies.

7.2 Power Management Requirements

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

- 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.

- For Notebooks, WOL may be automatically disabled when the product is disconnected from ac mains power.
- For all products with WOL, directed packet filters shall be enabled and set to an industry standard default configuration.
- Products that do not support Sleep Mode by default are only subject to the Display Sleep Mode requirement.

Table 3: Power Management Requirements

| Mode or Mode Transition | Requirement | Desktops | Integrated Desktops | Portable All-in-Ones | Notebooks | Small-scale Servers | Slates/Tablets | Thin Clients | Workstations |
|--------------------------------------|---|----------|---------------------|----------------------|-----------|---------------------|----------------|--------------|--------------|
| System Sleep Mode¹ | (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 | Yes | No | N/A | Yes | Yes |
| Display Sleep Mode | (1) Display Sleep Mode shall be set to activate after no more than 15 minutes of user inactivity. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Wake on LAN (WOL)¹ | (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 | N/A | Yes | Yes |
| Wake Management¹ | (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 | N/A | Yes | Yes |

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.

7.3 User Information Requirements

- a) 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.
- b) 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 3), 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.
- c) Provisions a) and b) may be met through use of either electronic or printed product documentation, provided it adheres to all 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.

7.4 Requirements for Notebook Computers

Calculated Typical Energy Consumption (E_{TEC}) for 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.

- For Notebooks 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 ($P_{LONG_IDLE} \times T_{LONG_IDLE}$); Equation 1 remains otherwise unchanged.
- Notebooks 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 Calculations (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 4 (for Notebooks).

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 | $P ≤ 3$ | 69.0 | $P ≤ 2$ | 14.0 |
| I1 | Integrated or Switchable Graphics | $3 < P ≤ 6$ | 112.0 | $2 < P ≤ 5.2$ | 22.0 |
| I2 | | $6 < P ≤ 7$ | 120.0 | $5.2 < P ≤ 8$ | 24.0 |
| I3 | | $P > 7$ | 135.0 | $P > 8$ | 28.0 |
| D1 | Discrete Graphics dGfx ≤ G7 | $3 < P ≤ 9$ | 115.0 | $2 < P ≤ 9$ | 16.0 |
| D2 | | $P > 9$ | 135.0 | $P > 9$ | 18.0 |

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

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

| Function | | Desktop | Integrated Desktop | Notebook |
|--|-----------------------------------|--|--|--|
| $TEC_{MEMORY} \text{ (kWh)}^{vi}$ | | 0.8 | | |
| $TEC_{GRAPHICS} \text{ (kWh)}^{vii}$ | Graphics Category ^{viii} | G1 ($FB_BW \leq 16$) | 36 | 14 |
| | | G2 ($16 < FB_BW \leq 32$) | 51 | 20 |
| | | G3 ($32 < FB_BW \leq 64$) | 64 | 26 |
| | | G4 ($64 < FB_BW \leq 96$) | 83 | 32 |
| | | G5 ($96 < FB_BW \leq 128$) | 105 | 42 |
| | | G6 ($FB_BW > 128$; Frame Buffer Data Width < 192 bits) | 115 | 48 |
| | | G7 ($FB_BW > 128$; Frame Buffer Data Width \geq 192 bits) | 130 | 60 |
| $TEC_{SWITCHABLE} \text{ (kWh)}^{ix}$ | | $0.5 \times G1$ | | N/A |
| $TEC_{EEE} \text{ (kWh)}^x$ | | $8.76 \times 0.2 \times (0.15 + 0.35)$ | | $8.76 \times 0.2 \times (0.10 + 0.30)$ |
| $TEC_{STORAGE} \text{ (kWh)}^{xi}$ | | 26 | | 2.6 |
| $TEC_{INT_DISPLAY} \text{ (kWh)}^{xii}$ | | N/A | $8.76 \times 0.35 \times (1+EP) \times (4 \times r + 0.05 \times A)$ | $8.76 \times 0.30 \times (1+EP) \times (2 \times r + 0.02 \times A)$ |

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

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

Where:

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

^{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:

$$(\text{Data Rate [Mhz]} \times \text{Frame Buffer Data Width [bits]}) / (8 \times 1000)$$

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.

8. TESTING GUIDELINES:

8.1 Test Methods: When testing Computer products, the test methods as specified in Energy Star Test method for computers (Rev.August – 2014) shall be used to determine the endorsement star label qualification.

8.2 Number of Units Required for Testing

8.2.1 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.

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

8.2.3 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.

8.3 International Market Qualification

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 Star Label.

8.4 Customer Software and Management Service Pre-Provisioning

If a manufacturing Partner is hired by a customer to load a custom image on Star Label certified computer, the Partner shall take the following steps:

- I. Inform the customer that their product may not meet Star Label with the custom image. A sample notification letter is available on the Star Label Web site.

- II. Encourage the customer to test the product for Star Label compliance.
- III. Encourage the customer, should the product no longer meet Star Label, 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.

9. USER INTERFACE: 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>.

10. TOLERANCE LIMITS: There is **no negative tolerance in the energy consumption criteria** for obtaining the BEE endorsement label. All tested products must meet the minimum threshold including manufacturing tolerance and other variations.

11. MANNER OF DISPLAY: All the manufacturers are required to affix the label both on carton and on products (in software or affixed on the machine).



12. FEES

1. Application fee payable on application for assignment of the authority to affix label is INR 2000/- (Rupees Two thousand only)
2. Application fee payable on application for renewal of authority to affix labels is INR 500/- (Rupees Five hundred only).
3. Labelling fee for affixation of label on each piece of laptop/notebook computer is INR 10/- (Rupees Ten only)-

13. FUTURE SPECIFICATION REVISIONS

BEE reserves the right to revise the specification should technological and/or market changes affect its usefulness to consumers or industry or its impact on the environment. In keeping with current policy, revisions to the specification will be discussed with stakeholders. In the event of a specification revision, please note that BEE qualification is not automatically granted for the life of a product model. To qualify as Star labeled product, a product model must meet the BEE's specification in effect on the model's date of manufacture.

ANNEXURE

Format for reporting the test results

Test Report No:

Date:

A.Product Details:

- (i) **Manufacturer/Brand:**
- (ii) **Type (Laptop/Notebook) :**
- (iii) **Model Name:**
- (iv) **Model Number:**
- (v) **Product Configuration:**

| Processor Make and Common Model Name | Processor Number of CPU Cores | Total System Memory (GB) | Frame Buffer Width | No.of storage Devices. | Type of Power Supply |
|--------------------------------------|-------------------------------|--------------------------|--------------------|------------------------|----------------------|
| | | | | | |

- (vi) **Rated Typical Energy Consumption (E-TEC_{MAX}):**

B. Test Summary:

- (i) **Manufacturer/ Laboratory Name & Address:**
- (ii) **Date of receipt of sample:**
- (iii) **Name of Testing personnel:**
- (iv) **Testing Standards:**

| S.No. | Tests | Relevant Standards |
|-------|-------|--------------------|
| | | |
| | | |

- (v) **Typical Energy Consumption**
(Copy of report for all the tests conducted for laptops & adapters to be submitted)

C. Observations:

Mode: Conventional/Base Capability/Remote Wake/Service Discovery/Full capability

| S.No. | Parameters | Observations |
|-------|--|--------------|
| 1. | P_{off} | |
| 2. | P_{Long-idle} | |
| 3. | P_{Short-idle} | |
| 4. | P_{sleep} | |
| 5. | Performance Score, P | |
| 6. | Graphics Category/ Frame buffer bandwidth | |
| 7. | Diagonal of Screen (in inches) | |
| 8. | Enhanced Performance Display | |

D. Calculations & Results

| S.No. | Parameter | Calculated Value | Rated Value |
|---|----------------------------------|------------------|-------------|
| 1. | Allowance PSU | | |
| 2. | TEC_{BASE} | | |
| 3. | TEC_{MEMORY} | | |
| 4. | TEC_{GRAPHICS} | | |
| 5. | TEC_{STORAGE} | | |
| 6. | TEC_{INT_DISPLAY} | | |
| 7. | TEC_{SWITCHABLE} | | |
| 8. | TEC_{EEE} | | |
| Typical Energy Consumption (E-TEC_{MAX}) | | | |