



# ENERGY STAR® Program Requirements for Computers

Version 5.0  
**DRAFT 1**

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6 **Note:** EPA has changed the reference from Tier 2 to Version 5.0 to reflect the structural changes in  
7 desktop/notebook evaluation, in consideration of Thin Clients for the first time, and to align with EPA's past  
8 versioning conventions regarding tiered specifications.

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# ENERGY STAR® Program Requirements for Computers

## Partner Commitments

### Version 5.0

### DRAFT 1

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#### Commitments

The following are the terms of the ENERGY STAR Partnership Agreement as it pertains to the manufacturing of ENERGY STAR qualified computers. The ENERGY STAR Partner must adhere to the following program requirements:

57

- 58 • comply with current ENERGY STAR Eligibility Criteria, defining the performance criteria that must be  
59 met for use of the ENERGY STAR certification mark on computers and specifying the testing criteria  
60 for computers. EPA may, at its discretion, conduct tests on products that are referred to as ENERGY  
61 STAR qualified. These products may be obtained on the open market, or voluntarily supplied by  
62 Partner at EPA's request;
- 63
- 64 • comply with current ENERGY STAR Identity Guidelines, describing how the ENERGY STAR marks  
65 and name may be used. Partner is responsible for adhering to these guidelines and for ensuring that  
66 its authorized representatives, such as advertising agencies, dealers, and distributors, are also in  
67 compliance;
- 68
- 69 • work with resellers of Partner's products to help ensure that these products remain in compliance with  
70 ENERGY STAR requirements. Any party within the distribution channel of an ENERGY STAR  
71 qualified computer product that alters the power profile of a product after its date of manufacture  
72 through hardware or software modifications must ensure that the product continues to meet the  
73 ENERGY STAR requirements before delivering this product to the end customer. If the product no  
74 longer meets the requirements, it may not bear the ENERGY STAR mark;
- 75
- 76 • qualify at least one ENERGY STAR computer model within one year of activating the computers  
77 portion of the agreement. When Partner qualifies the product, it must meet the specification (e.g., Tier  
78 1 or 2) in effect at that time;
- 79
- 80 • provide clear and consistent labeling of ENERGY STAR qualified computers. The ENERGY STAR  
81 mark must be clearly displayed:
  - 82 1. On the top or front of the product. Labeling on the top or front of the product may be permanent or  
83 temporary. All temporary labeling must be affixed to the top or front of the product with an  
84 adhesive or cling-type application;

85

Electronic Labeling Option: Manufacturers have the option of using an alternative electronic labeling approach in place of this product labeling requirement, as long it meets the following requirements:

86

- 87
- 88
- 89 – The ENERGY STAR mark in cyan, black, or white (as described in "The ENERGY STAR  
90 Identity Guidelines" available at [www.energystar.gov/logos](http://www.energystar.gov/logos)) appears at system start-up. The  
91 electronic mark must display for a minimum of 5 seconds;
- 92 – The ENERGY STAR mark must be at least 10% of the screen by area, may not be smaller  
93 than 76 pixels x 78 pixels, and must be legible.

94

EPA will consider alternative proposals regarding approach, duration, or size for electronic

95

96 labeling on a case-by-case basis.  
97  
98 2. In product literature (i.e., user manuals, spec sheets, etc.);  
99 3. On product packaging for products sold at retail; and  
100 4. On the manufacturer's Internet site where information about ENERGY STAR qualified models is  
101 displayed:

- 102 – If information concerning ENERGY STAR is provided on the Partner Web site, as specified by  
103 the ENERGY STAR Web Linking Policy (this document can be found in the Partner  
104 Resources section on the ENERGY STAR Web site at [www.energystar.gov](http://www.energystar.gov)), EPA may  
105 provide links where appropriate to the Partner Web site;

- 106 • agree to complete steps to educate users of their products about the benefits of power management  
107 by including the following information, in addition to that described in the User Information  
108 Requirements found in the ENERGY STAR Eligibility Criteria (Section 3.C), with each computer (i.e.,  
109 in the user manual or on a box insert):  
110  
111 1. Energy saving potential;  
112 2. Financial saving potential;  
113 3. Environmental benefits  
114 4. Information on ENERGY STAR and a link to [www.energystar.gov](http://www.energystar.gov); and  
115 5. ENERGY STAR logo (used in accordance with "The ENERGY STAR Identity Guidelines"  
116 available at [www.energystar.gov/logos](http://www.energystar.gov/logos)).

118 In addition, a link should be made available to [www.energystar.gov/powermanagement](http://www.energystar.gov/powermanagement) from computer  
119 product pages, product specifications, and related content pages.  
120

121 At the manufacturer's request, EPA will supply suggested facts and figures related to the above  
122 criteria, template elements, or a complete template suitable for use in user guides or box inserts.  
123

124 **Note:** The two paragraphs above have been reworded to clearly note Partner commitments related to power  
125 management user information. There are no further proposed changes to the partner commitments section (pages  
126 2-4) in this draft.  
127

- 128 • provide to EPA, on an annual basis, an updated list of ENERGY STAR qualified computer models.  
129 Once the Partner submits its first list of ENERGY STAR qualified computer models, the Partner will be  
130 listed as an ENERGY STAR Partner. Partner must provide annual updates in order to remain on the  
131 list of participating product manufacturers;  
132
- 133 • provide to EPA, on an annual basis, unit shipment data or other market indicators to assist in  
134 determining the market penetration of ENERGY STAR. Specifically, Partner must submit the total  
135 number of ENERGY STAR qualified computers shipped (in units by model) or an equivalent  
136 measurement as agreed to in advance by EPA and Partner. Partner is also encouraged to provide  
137 ENERGY STAR qualified unit shipment data segmented by meaningful product characteristics (e.g.,  
138 capacity, size, speed, or other as relevant), total unit shipments for each model in its product line, and  
139 percent of total unit shipments that qualify as ENERGY STAR. The data for each calendar year  
140 should be submitted to EPA, preferably in electronic format, no later than the following March and may  
141 be provided directly from the Partner or through a third party. The data will be used by EPA only for  
142 program evaluation purposes and will be closely controlled. Any information used will be masked by  
143 EPA so as to protect the confidentiality of the Partner;  
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- 145 • notify EPA of a change in the designated responsible party or contacts for computers within 30 days.  
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## **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:

- consider energy efficiency improvements in company facilities and pursue the ENERGY STAR mark for buildings;
- purchase ENERGY STAR qualified products. Revise the company purchasing or procurement specifications to include ENERGY STAR. Provide procurement officials' contact information to EPA for periodic updates and coordination. Circulate general ENERGY STAR qualified product information to employees for use when purchasing products for their homes;
- ensure the power management feature is enabled on all ENERGY STAR qualified monitors and computers in use in company facilities, particularly upon installation and after service is performed;
- provide general information about the ENERGY STAR program to employees whose jobs are relevant to the development, marketing, sales, and service of current ENERGY STAR qualified product models;
- 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, communicate, and/or promote Partner's activities, provide an EPA representative, or include news about the event in the ENERGY STAR newsletter, on the ENERGY STAR Web pages, etc. The plan may be as simple as providing a list of planned activities or planned milestones that Partner would like EPA to be aware of. For example, activities may include: (1) increase the availability of ENERGY STAR qualified products by converting the entire product line within two years to meet ENERGY STAR guidelines; (2) demonstrate the economic and environmental benefits of energy efficiency through special in-store displays twice a year; (3) provide information to users (via the Web site and user's manual) about energy-saving features and operating characteristics of ENERGY STAR qualified products; and (4) build awareness of the ENERGY STAR Partnership and brand identity by collaborating with EPA on one print advertorial and one live press event;
- provide quarterly, written updates to EPA as to the efforts undertaken by Partner to increase availability of ENERGY STAR qualified products, and to promote awareness of ENERGY STAR and its message.



# ENERGY STAR® Program Requirements for Computers

## Eligibility Criteria (Version 5.0)

**DRAFT 1**

189  
190 Below is the Version 5.0 product specification for ENERGY STAR qualified computers. A product must  
191 meet all of the identified criteria to earn the ENERGY STAR.  
192

193 **1) Definitions:** Below are the definitions of the relevant terms in this document.

- 194  
195 A. Computer: A device which performs logical operations and processes data. Computers are  
196 composed of, at a minimum: (1) a central processing unit (CPU) to perform operations; (2) user  
197 input devices such as a keyboard, mouse, digitizer or game controller; and (3) a display screen to  
198 output information. For the purposes of this specification, computers include both stationary and  
199 portable units, including desktop computers, gaming consoles, integrated computers, notebook  
200 computers, tablet PCs, desktop-derived servers, thin clients, and workstations. Although  
201 computers must be capable of using input devices and displays, as noted in numbers 2 and 3  
202 above, computer systems do not need to include these devices on shipment to meet this  
203 definition.  
204

205  
206 **Components**

- 207  
208 B. Display: A display screen and its associated electronics encased in a single housing, or within the  
209 computer housing (e.g., notebook or integrated computer), that is capable of displaying output  
210 information from a computer via one or more inputs, such as a VGA, DVI, and/or IEEE 1394.  
211 Examples of display technologies are the cathode-ray tube (CRT) and liquid crystal display (LCD).  
212

213 **Note:** The Version 4.1 ENERGY STAR computer monitor specification is currently under revision. If applicable,  
214 EPA intends to align the 'display' definition provided in the final Version 5.0 computer specification with the  
215 definition provided in the revised computer monitor specification.  
216

- 217 C. External Power Supply: A component contained in a separate physical enclosure external to the  
218 computer casing and designed to convert line voltage ac input from the mains to lower dc  
219 voltage(s) for the purpose of powering the computer. An external power supply must connect to  
220 the computer via a removable or hard-wired male/female electrical connection, cable, cord or  
221 other wiring.  
222  
223 D. Internal Power Supply: A component internal to the computer casing and designed to convert ac  
224 voltage from the mains to dc voltage(s) for the purpose of powering the computer components.  
225 For the purposes of this specification, an internal power supply must be contained within the  
226 computer casing but be separate from the main computer board. The power supply must connect  
227 to the mains through a single cable with no intermediate circuitry between the power supply and  
228 the mains power. In addition, all power connections from the power supply to the computer  
229 components must be internal to the computer casing (i.e., no external cables running from the  
230 power supply to the computer or individual components). Internal dc-to-dc converters used to  
231 convert a single dc voltage from an external power supply into multiple voltages for use by the  
232 computer are not considered internal power supplies.  
233

234  
235 **Computer Types**  
236

- 237 E. Desktop Computer: A computer where the main unit is intended to be located in a permanent  
238 location, often on a desk or on the floor. Desktops are not designed for portability and utilize an  
239 external monitor, keyboard, and mouse. Desktops are designed for a broad range of home and  
240 office applications.  
241
- 242 F. Desktop-Derived Server: A desktop-derived server is a computer that typically uses desktop  
243 components in a tower form factor, but is designed explicitly to be a host for other computers or  
244 applications. For the purposes of this specification, a computer must be marketed as a server and  
245 have the following characteristics to be considered a desktop-derived server:  
246
- 247 • Designed and placed on the market as a Class B product per the appropriate national RF  
248 Emissions requirements to the country of operation and has no more than single processor  
249 capability (1 socket on board);  
250
  - 251 • Designed in a pedestal, tower, or other form factor similar to those of desktop computers such  
252 that all data processing, storage, and network interfacing is contained within one box/product;  
253
  - 254 • Designed to operate in a high-reliability, high-availability application environment where the  
255 computer must be operational 24 hours/day and 7 days/week, and unscheduled downtime is  
256 extremely low (on the order of hours/year);  
257
  - 258 • Capable of operating in a simultaneous multi-user environment serving several users through  
259 networked client units; and  
260
  - 261 • Shipped with an industry accepted operating system for standard server applications (e.g.,  
262 Windows NT, Windows 2003 Server, Mac OS X Server, OS/400, OS/390, Linux, UNIX and  
263 Solaris).  
264

265 Desktop-derived servers are designed to perform functions such as processing information for  
266 other systems, providing network infrastructure services (e.g., archiving), data hosting and running  
267 web servers.  
268

269 This specification does not cover server computers as defined in the ENERGY STAR Version 1.0  
270 computer server specification.  
271

272 **Note:** The definition for Desktop-Derived Servers is updated to clarify the relationship between EPA's current work  
273 on a draft Computer Server Specification and reflect a stakeholder comment regarding updates to EuroNorm  
274 EN55022:1998 and the EMC Directive 89/336/EEC.  
275

276 EPA and the EC are considering further revisions to the Desktop-Derived Server Definition in Version 5.0. To date  
277 there have not been any Desktop-Derived Servers qualified under Version 4.0. EPA and the EC intend to  
278 investigate possible barriers to qualification that might be addressed under Version 5.0.  
279

280 EPA and the EC intend to begin data collection for this product category prior to the release of Draft 2.  
281 Stakeholders are encouraged to provide comments on the viability of this product area and definition, barriers to  
282 qualification under Version 4.0, and data supporting revisions to operational mode power levels (if applicable).  
283

- 284 G. Game Console: A stand-alone computer whose primary use is to play video games. For the  
285 purposes of this specification, game consoles must use a hardware architecture based on typical  
286 computer components (e.g., processors, system memory, video architecture, optical and/or hard  
287 drives, etc.). The primary input for game consoles are special hand held controllers rather than  
288 the mouse and keyboard used by more conventional computer types. Game consoles are also  
289 equipped with audio visual outputs for use with televisions as the primary display, rather than an  
290 external monitor or integrated display. These devices do not typically use a conventional  
291 operating system, but often perform a variety of multimedia functions such as: DVD/CD playback,

- 292 digital picture viewing, and digital music playback.
- 293 H. Integrated Computer: A desktop system in which the computer and display function as a single
- 294 unit which receives its ac power through a single cable. Integrated computers come in one of two
- 295 possible forms: (1) a system where the display and computer are physically combined into a
- 296 single unit; or (2) a system packaged as a single system where the display is separate but is
- 297 connected to the main chassis by a dc power cord and both the computer and display are
- 298 powered from a single power supply. As a subset of desktop computers, integrated computers
- 299 are typically designed to provide similar functionality as desktop systems.
- 300
- 301 I. Thin Client: An independently-powered computer that relies on a connection to a server to obtain
- 302 primary functionality. Main computing (i.e. program execution, data storage, interaction with other
- 303 Internet resources, etc.) takes place using centralized server resources.

304 **Note:** EPA noted in the Version 4.0 Specification that Thin Clients would be investigated for inclusion under a

305 future tier of the program. Accordingly, and based on stakeholder interest in this product area, EPA has added Thin

306 Clients for consideration as a separate product category under Version 5.0. Further details on this proposal are

307 included in Section 3.d of this draft. EPA and the EC intend to begin data collection for this product category prior

308 to the release of Draft 2.

309

310 The definition above is intended to describe thin clients on the market and adequately separate thin clients from

311 the traditional desktop and notebook product categories. EPA welcomes stakeholder feedback on the effectiveness

312 of this definition in meeting these goals and if applicable, component characteristic information supporting

313 suggested modifications to this definition.

314

- 315 J. Notebook and Tablet Computers: A computer designed specifically for portability and to be
- 316 operated for extended periods of time without a direct connection to an ac power source.
- 317 Notebooks and tablets must utilize an integrated monitor and be capable of operation off an
- 318 integrated battery or other portable power source. In addition, most notebooks and tablets use an
- 319 external power supply and have an integrated keyboard and pointing device, though tablets use
- 320 touch-sensitive screens. Notebook and tablet computers are typically designed to provide similar
- 321 functionality to desktops except within a portable device. For the purposes of this specification,
- 322 docking stations are considered accessories and therefore, the performance levels associated
- 323 with notebooks presented in Section 3, below, do not include them.

- 324
- 325 K. Workstation: For the purposes of this specification, to qualify as a workstation, a computer must:
- 326
- Be marketed as a workstation;
  - Have a 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
  - Support error-correcting code (ECC) and/or buffered memory.

327

328

329

330 In addition, a workstation must meet three of the following six optional characteristics:

- 331
- Have supplemental power support for high-end graphics (i.e., PCI-E 6-pin 12V supplemental power feed);
  - System is wired for greater than x4 PCI-E on the motherboard in addition to the graphics slot(s) and/or PCI-X support;
  - Does not support Uniform Memory Access (UMA) graphics;
  - Includes 5 or more PCI, PCIe or PCI-X slots;
  - Capable of multi-processor support for two or more processors (must support physically separate processor packages/sockets, i.e., not met with support for a single multi core processor); and/or
  - Be qualified by at least 2 Independent Software Vendor (ISV) product certifications; these certifications can be in process, but must be completed within 3 months of qualification.
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**Note:** EPA welcomes comments on the above definition for workstations. In particular EPA seeks input on any revisions to the noted characteristics that will help ensure continued applicability through the timeframe of this Version 5.0 specification.

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## Operational Modes

- L. Off Mode: The power consumption level in 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 purposes of this specification, Off Mode correlates to ACPI System Level S4 or S5 states, where applicable.
- M. Sleep Mode: A low power state that the computer is capable of entering 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. For the purposes of this specification, Sleep mode correlates to ACPI System Level S3 (suspend to RAM) state, where applicable.
- N. Idle State: For purposes of testing and qualifying computers under this specification, this is the state in which the operating system and other software have completed loading, the machine is not asleep, and activity is limited to those basic applications that the system starts by default.
- O. Active State: The state in which the computer is carrying out useful work in response to a) prior or concurrent user input or b) prior or current instruction over the network. This state includes active processing, seeking data from storage, memory, or cache, not precluding idle state time while awaiting further user input and before entering low power modes. For the purposes of testing and qualifying computers under this specification, this is the state in which the EEPA workload is running, thereby automating the state as described above.

**Note:** This Version 5.0 specification extends assessment of active efficiency from the solely the idle state to a holistic view that includes energy consumed while the computer is delivering functionality to the user. The definition above has been added accordingly and EPA encourages comments and suggestions on this proposal.

## Networking and Power Management

- P. Network Interface: The components (hardware and software) whose primary function is to make the computer capable of communicating over one or more network technologies. For purposes of testing to this specification, Network Interface refers to the IEEE 802.3 wired Ethernet interface.
- Q. Wake Event: A user, programmed, or external event or stimulus that causes the computer to transition from Sleep or Off to active mode of operation. Examples of wake events include, but are not limited to: movement of the mouse, keyboard activity, or a button press on the chassis, and in the case of external events, stimulus conveyed via a remote control, network, modem, etc.
- R. Wake On LAN (WOL): Functionality which allows a computer to wake from Sleep or Off when directed by a network request.

## Energy Efficiency Performance Assessment

**Note:** The following definitions have been added to Version 5.0 to address concepts related to implementation of the Energy Efficiency Performance Assessment.

- S. Energy Efficiency Performance Assessment (EEPA): An evaluation of a computer's effectiveness in translating energy into desired work output based on the following test elements: performance data/score, power required to achieve this performance, and system characteristics.
- T. EEPA Tool: Benchmark software that automates processes required for a computer to complete a workload and collect data on how the computer performs in addressing this workload. The EEPA tool has the following outputs required for evaluation under this specification: workload energy



398 use, workload duration, modal power levels, and capability enumerations.  
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401 U. Workload: a defined set of computational activities to be performed over a period of time.  
402  
403

#### 404 **Shipment Channels**

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406 V. Enterprise Channels: Sales channels normally used by large and medium-sized business,  
407 government organizations, and educational institutions, with the intent of identifying machines that  
408 will be used in managed client/server environments  
409

410 **Note**: This definition was included in Version 4.0 under the Power Management section. The definition remains  
411 consistent with Version 4.0 and was moved for better organization.  
412

413 **2) Qualifying Products**: Computers must meet the computer definition as well as one of the  
414 product type definitions provided in Section 1, above, to qualify as ENERGY STAR. The following  
415 table provides a list of the types of computers that are (and are not) eligible for ENERGY STAR.  
416

Products Covered by Version 5.0 Specification	Products Not Covered by Version 5.0 Specification
<ul style="list-style-type: none"><li>• Desktop Computers</li><li>• Integrated Computer Systems</li><li>• Notebook Computers/Tablet PCs</li><li>• Workstations</li><li>• Game Consoles</li><li>• Desktop-Derived Servers</li><li>• Thin Clients</li></ul>	<ul style="list-style-type: none"><li>• Computer Servers (as defined in Version 1.0 computer server specification)</li><li>• Handhelds and PDAs</li></ul>

417  
418 **Note**: As referenced in Section 1), EPA has added thin clients as a product category with a proposed initial  
419 approach for Thin Clients in section 3.B.5, below. In addition, the scope of servers not covered by this Version 5.0  
420 Specification has been revised to reference the Computer Server Specification currently under development.  
421  
422

423 **3) Energy Efficiency and Power Management Criteria**: Computers must meet the  
424 requirements below to qualify as ENERGY STAR. The Version 5.0 effective date is covered in  
425 Section 5 of this specification.  
426

#### 427 **(A) Power Supply Efficiency Requirements**

428  
429 **Computers Using an Internal Power Supply**: 85% minimum efficiency at 50% of rated output and  
430 82% minimum efficiency at 20% and 100% of rated output, with Power Factor  $\geq$  0.9 at 100% of rated  
431 output.  
432

433 **Note**: EPA received stakeholder comments after the December meeting requesting alignment with the Climate  
434 Savers Computing Initiative (CSCI). EPA supports continuing improvements in power supply efficiency but  
435 maintains the goal of maximizing energy savings along with cost effectiveness of the program's specifications.  
436

437 CSCI has posted internal power supply efficiency tiers for desktop PCs, the first of which is equal to the ENERGY  
438 STAR Tier 1 levels. The proposed levels in this draft align with the second tier of CSCI requirements, with a 0.9  
439 power factor requirement maintained from the ENERGY STAR Version 4.0 specification. Stakeholders are  
440 encouraged to comment on these levels and relations to the overall goal of maximizing energy savings.  
441  
442

443 **Computers Using an External Power Supply**: Must be ENERGY STAR qualified or meet the no-

load and active mode efficiency levels provided in the ENERGY STAR Program Requirements for Single Voltage External Ac-Ac and Ac-Dc Power Supplies, Version 2.0. The ENERGY STAR specification and qualified product list can be found at [www.energystar.gov/powersupplies](http://www.energystar.gov/powersupplies). Note: This performance requirement also applies to multiple voltage output external power supplies as tested in accordance to the Internal Power Supply test method referenced in Section 4, below.

**Note:** External Power Supply (EPS) requirements in this draft have been updated to directly reference ENERGY STAR Version 2.0 EPS requirements; a Final Draft of this Specification was released on February 19, 2008. The version 2.0 EPS requirements will take effect in 2008 and EPA believes that appropriate supplies will be available in the market in advance of the July 1, 2009 effective date of this Version 5.0 Specification for Computers.

**(B) Efficiency and Performance Requirements:**

**1) Desktop, Integrated Computer, Notebook, and Tablet PC Levels:**

**Note:** The Energy Efficiency Performance Assessment is intended to evaluate computers holistically across modes of operation. Two other active initiatives, the EU’s EuP Directive preparatory studies and Federal Energy Management Program (FEMP) each call for Off Mode power limits. EPA, the EC, and FEMP will consult on modal requirements for computers and the next draft of this specification will include a proposal based on these discussions.

**Energy Efficiency Performance Assessment and Associated Levels:** Table 1 below lists annual energy consumption requirements for Version 5.0. Annual energy consumption will be determined using the formula below:

$$E_{\text{annual}} = 8760 * (P_{\text{off}} * T_{\text{off}} + P_{\text{sleep}} * T_{\text{sleep}} + P_{\text{idle}} * T_{\text{idle}}) + E_{\text{active}} * N_{\text{active}}$$

where all  $P_x$  are power values in watts, all  $T_x$  are Time values in % of year,  $E_{\text{active}}$  is the energy above Idle measured when a computer runs the benchmark workload once (in kWh), and  $N_{\text{workload}}$  is the number of times each year the workload is assumed to typically run.

**Table 1: Annual Energy Consumption**

Product Category	Maximum Annual Energy Consumption (kWh)
Desktops and Integrated Computers	TBD
Notebook and Tablet Computers	TBD

**Table 2: Capability Adders**

Type	Desktops and Integrated Computers (kWh)	Notebook and Tablet Computers (kWh)
Memory (each GB above a base value)	TBD	TBD
Network Interfaces (Ethernet, WiFi, etc.)	TBD	TBD

**Note:** Draft 1 Version 5.0 incorporates an Energy Efficiency Performance Assessment (EEPA) approach to evaluating Desktop, Integrated Computer, Notebook, and Tablet PC product categories. This approach was introduced in the Version 4.0 Specification as and “Energy Efficiency Performance Software” evaluation.

Under this approach, a software tool automates and standardizes the process for computers to run a consensus “workload” of real-world applications and computing tasks. Upon completion of these tasks, information about energy required to run the workload, static operational mode power measurements, workload performance score, and system characteristics are used in combination to evaluate a computer’s effectiveness in translating energy consumed into performance. At a minimum, the EEPA tool would output the following: power measured in Off Mode, Sleep Mode, and Idle State, Energy, Performance Rating, and Time to run the workload, and system characteristics/capability enumerations. EPA distributed a usage scenario data collection effort in conjunction with this draft to aid development of a realistic workload.

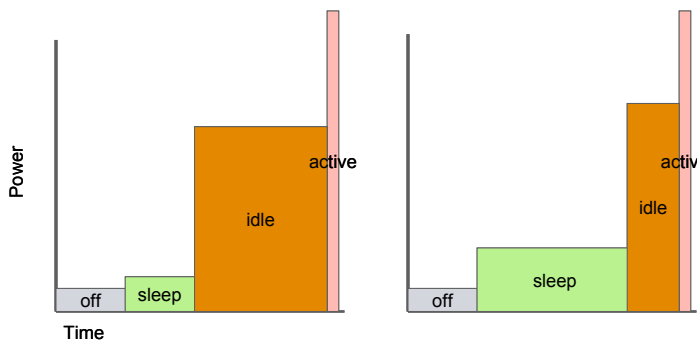
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**Note:**

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Draft 1 presents the structure of this EEPA approach including EEPA tool measurement outputs and formulas to calculate estimated annual energy consumption based on these outputs. The graphic below represents the goals of this approach – reduction of the total energy consumption of computers through better use of low power modes, reduction of idle power, or other methods to reduce the total energy consumption. Levels for qualification are to be determined. EPA intends to refine definitions and structural elements of the specification prior to EEcoMark availability in June, then focus on testing, data collection, and qualification level development once the tool is ready for EPA’s use.



In addition to allowing evaluation of computers as they actively complete tasks, EPA believes that the EEPA approach has the benefits of allowing the Computer Specification to more effectively scale its efficiency metrics to the performance and functionality of a given product, simplify testing, and provide greater longevity and stability to the ENERGY STAR Computer Specification.

EPA is working with BAPCo (Business Applications Performance Corporation) as they develop EEcoMark, a software tool designed to meet both EPA’s requirements for use in Version 5.0 and an energy benchmark standard being developed by the TC38-TG2 working group of Ecma International. Both BAPCo and the aforementioned Ecma working group are composed of representatives from the Computer Industry. THE EPA AND EC technical team is also significantly involved in this effort. EEcoMark is scheduled to be finalized for use with Windows and MacOS systems in June 2008. Should it meet EPA and the EC’s requirements for use in Version 5.0, EPA and the EC intend to commence data collection using the finalized tool immediately upon its availability.

As referenced in the Version 4.0 specification, EPA will pursue a provisional Idle State requirement as an interim or alternative measure should EPA, the EC, and industry not be able to finalize a specification based on a completed EEPA tool by October 2008, such that the specification can go into effect in July 2009. However, EPA and the EC continue to expect to be able to make use of the Ecma standard and EEcoMark software tool based on current progress of these projects.

**2) Workstation Levels: TBD**

**Note:** In a December Stakeholder call to review the Tier 2 Discussion Guide, it was brought up that the EEcoMark EEPA tool would not be applicable to Workstations along with Desktop and Notebook related product categories, largely due to a workload based on applications not applicable to Workstations.

Related to this discussion, EPA has been in discussions with the Standard Performance Evaluation Corporation SPEC Graphics & Workstation Performance Group (SPEC GWPG) to use a simplified version of BAPCo’s EEcoMark in which the workloads will be more appropriate to workstations. EPA and SPEC have agreed that such an approach is viable for Version 5.0 and this currently unnamed benchmark is in development. EPA intends to include further details on this benchmark progress as well as invite use of the benchmark and sharing of the resulting data with EPA in the near future.

540 **3) Game Console Levels: TBD**

541 **Note:** EPA introduced game consoles in Tier 1 to encourage greater energy efficiency as consoles become  
 542 increasingly present in home entertainment configurations. EPA has discussed the feasibility of developing  
 543 console-specific ENERGY STAR requirements with leading console manufacturers that reflect the market and  
 544 system capabilities.

545  
 546 EPA intends to evaluate Game Consoles as a separate product from computers based on initial discussions and  
 547 feedback from these manufacturers, differing usage patterns between the two product areas, and the realities of  
 548 the game console market. Potential areas for evaluation include Auto-Power Down, TV/Display Auto-Off, and  
 549 power supply efficiency. Power supply efficiency overlaps with current ENERGY STAR Computer requirements for  
 550 external power supplies; to this point, Version 4.0 included provisions for testing both single and multiple output  
 551 external power supplies.

552  
 553 EPA is continuing to work with these manufacturers to collect power consumption data and prospective areas for  
 554 energy savings both in the short term (Version 5.0) and in future generations of game consoles. EPA intends to  
 555 include proposed structure and levels in future drafts of this Specification.  
 556

557  
 558 **4) Desktop-Derived Server Levels:**  
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**Table 3: Desktop-Derived Server Efficiency Requirements**

Desktop-Derived Server Operational Mode Power Requirements	
<b>Off:</b> ≤ X W (TBD)	
<b>Idle State:</b> ≤ X W (TBD)	
Capability	Additional Power Allowance
Wake On LAN (WOL)	+ 0.7 W for Sleep + 0.7 W for Off

560 **Note:** To date, there have not been any Desktop-Derived Servers qualified with ENERGY STAR. In the absence of  
 561 further data, EPA proposes to maintain a Tier 1 Operational Mode approach, but is open to stakeholder comments  
 562 and supporting data on possible barriers the Version 4.0 levels and requirements provided to qualification of  
 563 Desktop-Derived Servers for ENERGY STAR.  
 564

565  
 566 **5) Thin Client Levels**  
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**Table 4: Thin Client Efficiency Requirements**

Thin Client Operational Mode Power Requirements
<b>Off Mode:</b> ≤ 1 W
<b>Sleep Mode:</b> ≤ X W (TBD)
<b>Idle State:</b> ≤ X W (TBD)

568 **Note:** Stakeholders have suggested to EPA that the market share for thin clients may be increasing and that these  
 569 products represent an energy savings due to low per-client consumption. EPA stated in the Tier 1 Specification  
 570 that Thin Clients would be investigated for possible inclusion in Tier 2. Accordingly, Thin Clients were included in  
 571 the Tier 2 Discussion Guide presented during the online stakeholder meeting on December 6, 2007, and numerous  
 572 comments were received by EPA in response. Responses were mixed regarding evaluation of these products  
 573 against products in the Desktop and Notebook categories.  
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**Note:** (Continued from previous page)

EPA proposes inclusion of Thin Clients as a unique product category in Version 5.0 as well as a separate Thin Client evaluation based on Tier 1 Operational Mode efficiency requirements due to the following factors: 1) Thin Client reliance on server resources to complete EEPA tasks which might vary significantly between testing and real-world implementations, 2) Thin Clients' existence in the market as a separate solution from traditional desktops and notebooks that is dependant on remote servers to run applicable workloads, and 3) presence of proprietary or non-standard operating systems that will not function with initial iterations of EEcoMark, the EEPA tool under discussion. EPA believes that the Version 4.0 Test Procedure, included in Appendix A of this Draft, will be appropriate to evaluate Thin Clients and welcomes stakeholder comment on this approach or others worth consideration.

**(C) Power Management Requirements:** Products must meet the power management requirements detailed in Table 5, below, and be tested as shipped.

**Table 5: Power Management Requirements**

**Note:** Power Management for Game Consoles is under discussion as part of the effort listed in Section 3.B.3. The table below will be updated as appropriate to account for Consoles in future drafts.

Specification Requirement		Applicable to
<b>Shipment Requirements</b>		
Sleep Mode	Shipped with a Sleep mode which is set to activate within 30 minutes of user inactivity	Desktop Computers, Integrated Computers, Notebook Computers/Tablet PCs, Workstations, and Thin Clients
Display Sleep Mode	Shipped with the display's Sleep mode set to activate within 15 minutes of user inactivity	All Computers
<b>Network Requirements for Power Management</b>		
Ethernet	All Ethernet network interfaces shall comply with IEEE 802.3az – "Energy Efficient Ethernet"	All Computers
Wake on LAN (WOL)	Computers shall have the ability to enable and disable WOL for Sleep mode	Desktop Computers, Integrated Computers, Notebook Computers/Tablet PCs, Workstations, Desktop-Derived Servers, and Thin Clients
	Computers must be shipped with Wake On LAN (WOL) enabled from the Sleep mode when operating on ac power (i.e. notebooks may automatically disable WOL when disconnected from the mains)	Computers <i>shipped through enterprise channels</i> of the following types:  Desktop Computers, Integrated Computers, Notebook Computers/Tablet PCs, Workstations, Desktop-Derived Servers, and Thin Clients
Network Connectivity	Computers must maintain full network connectivity while in Sleep mode, according to a platform-independent industry standard.	Desktop Computers, Integrated Computers, Notebook Computers/Tablet PCs, and Thin Clients. Applies only to systems in the categories above that are shipped through Enterprise Channels.

Wake Management	<p>Computers shall be capable of both remote and scheduled wake events from Sleep mode.</p> <p>Manufacturers shall ensure, where the manufacturer has control (i.e., configured through hardware settings rather than software settings), that these settings can be managed centrally, as the client wishes, with tools provided by the manufacturer.</p>	All Computers <i>shipped to Enterprise Channels</i>
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For all computers with WOL enabled, any directed packet filters shall be enabled and set to an industry standard default configuration. Until one (or more) standards are agreed upon, partners are asked to provide their direct packet filter configurations to EPA for publication on the Website to stimulate discussion and development of standard configurations.

**Qualifying Computers with Power Management Capabilities:** The following requirements should be followed when determining whether models should be qualified with or without WOL:

**Off:** Computers should be tested and reported as shipped for Off. Models that will be shipped with WOL enabled for Off should be tested with WOL enabled. Likewise, products shipped with WOL disabled for Off must be tested with WOL disabled.

**Sleep:** Computers should be tested and reported as shipped for Sleep. Models sold through enterprise channels, as defined in Section 1V, shall be tested, qualified, and shipped WOL enabled. Products going directly to consumers through normal retail channels only are not required to be shipped with WOL enabled from Sleep, and may be tested, qualified, and shipped with WOL either enabled or disabled.

**Customer Software and Management Service Pre-Provisioning:** TBD

**Note:** EPA included the following language related to pre-provisioning of customer-requested additional management services late in the specification development process for Version 4.0 to account for service processors and management controllers:

*Systems where any additional management services are, at the customer's request, pre-provisioned by the manufacturer, do not need to test the systems with these functions in an active state providing the function is not actually activated until there is specific action by the end user (i.e., manufacturer should test in pre-provisioned state and does not have to consider the power use after full provisioning occurs on site).*

EPA has not been made aware of the prevalence of such components in qualified products and thus intends to remove this allowance for Version 5.0. Stakeholders may provide comments and supporting data on savings potential, energy/functionality information, market prevalence, and applicability to targeted product types for EPA consideration.

**User Information Requirement:** In order to ensure that purchasers/users are properly informed on the benefits of power management, the manufacturer will include with each computer, one of the following:

- Information on ENERGY STAR and the benefits of power management in either a hard copy or electronic copy of the user manual. This information should be near the front of the user guide; or
- A package or box insert on ENERGY STAR and the benefits of power management.

632 Either option must at least include the following information:  
633

- 634 • Notice that the computer has been shipped enabled for power management and what the time  
635 settings are; and
- 636 • How to properly wake the computer from Sleep mode.

637  
638 **Note:** The first draft of the ENERGY STAR Computer Server specification, available at  
639 [http://www.energystar.gov/index.cfm?c=new\\_specs.enterprise\\_servers](http://www.energystar.gov/index.cfm?c=new_specs.enterprise_servers), introduces the idea of a standardized  
640 information datasheet for customer use in differentiating products. The Version 4.0 user information requirement  
641 focuses on power management only; EPA encourages comments if stakeholders believe that a standardized  
642 datasheet with additional information would be beneficial for ENERGY STAR computers and if so, what should be  
643 included (i.e. EEPA score, component details, etc.).  
644

645  
646 **Note:** EPA has received significant interest related to the ENERGY STAR program considering a broader mix  
647 energy and safety-related impacts. As such, EPA is evaluating means of addressing this interest in a way that  
648 aligns with our guiding principles and fully expects to provide for significant stakeholder engagement during the  
649 process.  
650

#### 651 **(D) Voluntary Requirements**

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653 **User Interface:** Although not mandatory, manufacturers are strongly recommended to design  
654 products in accordance with the Power Control User Interface Standard — IEEE 1621 (formally known  
655 as “Standard for User Interface Elements in Power Control of Electronic Devices Employed in  
656 Office/Consumer Environments”). Compliance with IEEE 1621 will make power controls more  
657 consistent and intuitive across all electronic devices. For more information on the standard see  
658 <http://eetd.LBL.gov/Controls>.  
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#### 661 **4) Test Procedures:** Manufacturers are required to perform tests and self-certify those models that 662 meet the ENERGY STAR guidelines. 663

- 664 • In performing these tests, partner agrees to use the test procedures provided in Table 6, below.
- 665 • The test results must be reported to EPA or the European Commission, as appropriate.

666  
667 Additional testing and reporting requirements are provided below.  
668

- 669 A. **Models Capable of Operating at Multiple Voltage/Frequency Combinations:** Manufacturers shall  
670 test their products based on the market(s) in which the models will be sold and promoted as  
671 ENERGY STAR qualified.  
672

673 For products that are sold as ENERGY STAR in multiple international markets and, therefore,  
674 rated at multiple input voltages, the manufacturer must test at and report the required power  
675 consumption or efficiency values at all relevant voltage/frequency combinations. For example, a  
676 manufacturer that is shipping the same model to the United States and Europe must measure,  
677 meet the specification, and report test values at both 115 Volts/60 Hz and 230 Volts/50 Hz in order  
678 to qualify the model as ENERGY STAR in both markets. If a model qualifies as ENERGY STAR  
679 at only one voltage/frequency combination (e.g., 115 Volts/60 Hz), then it may only be qualified  
680 and promoted as ENERGY STAR in those regions that support the tested voltage/frequency  
681 combination (e.g., North America and Taiwan).  
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**Table 6: Test Procedures**

Product Category	Specification Requirement	Test Protocol	Source
Desktop, Integrated, Notebook, and Tablet PCs	Annual Energy Consumption	ENERGY STAR Energy Efficiency Performance Assessment for Computers	TBD
	Power Supply Efficiency	IPS: Internal Power Supply Efficiency Protocol EPS: ENERGY STAR Test Method for External Power Supplies	IPS: <a href="http://www.efficientpowersupplies.org">www.efficientpowersupplies.org</a> EPS: <a href="http://www.energystar.gov/powersupplies">www.energystar.gov/powersupplies</a>
Workstations	TBD	TBD	TBD

**Note:** As referenced in Section 3.B.2, EPA intends to work with SPEC to develop a SPEC benchmark for workstation testing for use with Version 5.0.

Game Consoles	TBD	TBD	TBD
Desktop-Derived Servers	Off Mode and Idle State	ENERGY STAR Computer Test Method (Version 5.0)	Appendix A
Thin Clients	Off Mode, Sleep Mode, and Idle State	ENERGY STAR Computer Test Method (Version 5.0)	Appendix A

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B. **Qualifying Families of Products:** Models that are unchanged or that differ only in finish from those sold in a previous year may remain qualified without the submission of new test data assuming the specification remains unchanged. If a product model is offered in the market in multiple configurations or styles, as a product “family” or series, the partner may report and qualify the product under a single model number, as long as all of the models within that family or series meet either of the following requirements:

- Computers that are built on the same platform and are identical in every respect except for housing and color may be qualified through submission of test data for a single, representative model.
- If a product model is offered in the market in multiple configurations, the partner may report and qualify the product under a single model number that represents the highest power configuration available in the family, rather than reporting each and every individual model in the family; there must not be higher consuming configurations of the same product model than the representative configuration. In this case, the highest configuration would consist of: the highest power processor, the maximum memory configuration, the highest power GPU, etc. For desktop systems which meet the definition for multiple desktop categories (as defined in



707 section 3.A.2) depending on the specific configuration, manufacturers will have to submit the  
708 highest power configuration for each category under which they would like the system to  
709 qualify. For example, a system that could be configured either as a Category A or a Category  
710 B desktop would require a submittal of the highest power configuration for both categories in  
711 order to qualify as ENERGY STAR. If a product could be configured to meet all three  
712 categories, it would then have to submit data for the highest power configuration in all  
713 categories. Manufacturers will be held accountable for any efficiency claims made about all  
714 other models in the family, including those not tested or for which data was not reported.  
715

716 **Note:** As mentioned in a clarification memorandum for the Version 4.0 released on November 20, 2007,  
717 configurations submitted as the highest-consuming configuration of a particular model must represent the highest  
718 possible consuming configuration of the model, not only the highest-consuming configuration that meets ENERGY  
719 STAR. The language above has been modified to clarify this point.  
720

721 **5) Effective Date:** The date that manufacturers may begin to qualify products as ENERGY STAR  
722 will be defined as the *effective date* of the agreement. The ENERGY STAR Version 5.0 Computers  
723 Specification effective date is July 1, 2009. All products, including models originally qualified under  
724 Version 4.0, with a **date of manufacture** on or after **July 1, 2009**, must meet the Version 5.0  
725 requirements in order to qualify for ENERGY STAR. Any previously executed agreement on the  
726 subject of ENERGY STAR qualified computers shall be terminated effective June 30, 2009.  
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729 **6) Future Specification Revisions:** EPA reserves the right to revise the specification should  
730 technological and/or market changes affect its usefulness to consumers or industry or its impact on  
731 the environment. In keeping with current policy, revisions to the specification will be discussed with  
732 stakeholders. In the event of a specification revision, please note that ENERGY STAR qualification is  
733 not automatically granted for the life of a product model. To qualify as ENERGY STAR, a product  
734 model must meet the ENERGY STAR specification in effect on the model's date of manufacture.

**Note:** EPA anticipates updating Version 5.0 as the EEPAs tool is updated as well as to consider the  
appropriateness of levels, definitions, and other aspects of the specification as the market evolves. Unless called  
for, EPA intends to retain the overall structure of 5.0 in future iterations of this specification. As is the case for all  
ENERGY STAR specification revision efforts, EPA will work with stakeholders throughout the revision process.  
The first revision to the Version 5.0 Specification is expected to occur two years after the effective date of Version  
5.0 (2011), in conjunction with an anticipated update to the EEPAs tool.

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## APPENDIX A

### ENERGY STAR Test Procedure for Determining the Power Use of Computers in Off, Sleep, Idle and Maximum Power

739 The following protocol should be followed when measuring power consumption levels of computers for  
740 compliance with the Off, Sleep, and Idle levels provided in the ENERGY STAR Version 5.0 Computer  
741 Specification. Partners must measure a representative sample of the configuration as shipped to the  
742 customer. However, the Partner does not need to consider power consumption changes that may result  
743 from component additions, BIOS and/or software settings made by the computer user after sale of  
744 product. *This procedure is intended to be followed in order and the mode being tested is labeled where*  
745 *appropriate.*

746  
747 **I. Definitions**

748  
749 Unless otherwise specified, all terms used in this document are consistent with the definitions  
750 contained in the Version 5.0 ENERGY STAR Eligibility Criteria for Computers.

751  
752 **UUT**

753 UUT is an acronym for “unit under test,” which in this case refers to the computer being tested.

754  
755 **UPS**

756 UPS is an acronym for “Uninterruptible Power Supply,” which refers to a combination of converters,  
757 switches and energy storage means, for example batteries, constituting a power supply for  
758 maintaining continuity of load power in case of input power failure.

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760  
761 **II. Testing Requirements**

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763 **Approved Meter**

764 Approved meters will include the following attributes<sup>1</sup>:

- 765  
766
- 767 • Power resolution of 1 mW or better;
  - 768 • An available current crest factor of 3 or more at its rated range value; and
  - 769 • Lower bound on the current range of 10mA or less.

770 The following attributes in addition to those above are suggested:

- 771  
772
- 773 • Frequency response of at least 3 kHz; and
  - 774 • Calibration with a standard that is traceable to the U.S. National Institute of Standards and  
775 Technology (NIST).

776 It is also desirable for measurement instruments to be able to average power accurately over any user  
777 selected time interval (this is usually done with an internal math’s calculation dividing accumulated  
778 energy by time within the meter, which is the most accurate approach). As an alternative, the  
779 measurement instrument would have to be capable of integrating energy over any user selected time  
780 interval with an energy resolution of less than or equal to 0.1 mWh and integrating time displayed with  
781 a resolution of 1 second or less.

782  
783 **Accuracy**

784 Measurements of power of 0.5 W or greater shall be made with an uncertainty of less than or equal to  
785 2% at the 95% confidence level. Measurements of power of less than 0.5 W shall be made with an

<sup>1</sup> Characteristics of approved meters taken from IEC 62301 Ed 1.0: Measurement of Standby Power

786 uncertainty of less than or equal to 0.01 W at the 95% confidence level. The power measurement  
 787 instrument shall have a resolution of:

- 788
- 789 • 0.01 W or better for power measurements of 10 W or less;
  - 790 • 0.1 W or better for power measurements of greater than 10 W up to 100 W; and
  - 791 • 1 W or better for power measurements of greater than 100 W.

792

793 All power figures should be in watts and rounded to the second decimal place. For loads greater than  
 794 or equal to 10 W, three significant figures shall be reported.

795

796 **Test Conditions**

<b>Supply Voltage:</b>	North America/Taiwan:	115 (± 1%) Volts AC, 60 Hz (± 1%)
	Europe/Australia/New Zealand:	230 (± 1%) Volts AC, 50 Hz (± 1%)
	Japan:	100 (± 1%) Volts AC, 50 Hz (± 1%)/60 Hz (± 1%)
<i>Note: For products rated for &gt; 1.5 kW maximum power, the voltage range is ± 4%</i>		
<b>Total Harmonic Distortion (THD) (Voltage):</b>	< 2% THD (< 5% for products which are rated for > 1.5 kW maximum power)	
<b>Ambient Temperature:</b>	23°C ± 5°C	
<b>Relative Humidity:</b>	10 – 80 %	

(Reference IEC 62301: Household Electrical Appliances – Measurement of Standby Power, Sections 3.2, 3.3)

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799

800 **Test Configuration**

801 Power consumption of a computer shall be measured and tested from an ac source to the UUT.

802

803 The UUT must be connected to an Ethernet network switch capable of the UUT’s highest and lowest  
 804 network speeds. The network connection must be live during all tests.

805

806

807 **III. Test Procedure for Off, Sleep and Idle for All Products**

808 Measurement of ac power consumption of a computer should be conducted as follows:

809

810 **UUT Preparation**

- 811 1. Record the manufacturer and model name of the UUT.
- 812 2. Ensure that the UUT is connected to a live Ethernet (IEEE 802.3) network switch as specified in  
 813 Section II., “Test Configuration,” above, and that the connection is live. The computer must  
 814 maintain this live connection to the switch for the duration of testing, disregarding brief lapses  
 815 when transitioning between link speeds.
- 816 3. Connect an approved meter capable of measuring true power to an ac line voltage source set to  
 817 the appropriate voltage/frequency combination for the test.
- 818 4. Plug the UUT into the measurement power outlet on the meter. No power strips or UPS units  
 819 should be connected between the meter and the UUT. For a valid test to take place the meter  
 820 should remain in place until all Off, Sleep, and Idle power data is recorded.
- 821 5. Record the ac voltage.
- 822 6. Boot computer and wait until the operating system has fully loaded.
- 823 7. If necessary, run the initial operating system setup and allow all preliminary file indexing and other  
 824 one-time/periodic processes to complete.

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8. Record basic information about the computer's configuration – computer type, operating system name and version, processor type and speed, and total and available physical memory, etc.<sup>2</sup>
  9. Record basic information about the video card - video card name, resolution, amount of onboard memory, and bits per pixel.<sup>3</sup>
  10. Ensure that the UUT is configured as shipped including all accessories, power management settings, WOL enabling and software shipped by default. UUT should also be configured using the following requirements for all tests:
    - a. Desktop systems (including workstations and desktop-derived servers) and thin clients shipped without accessories should be configured with a standard mouse, keyboard and external monitor.
    - b. Notebooks and tablets should include all accessories shipped with the system, and need not include a separate keyboard or mouse when equipped with an integrated pointing device or digitizer.
    - c. Notebooks and tablets should have the battery pack(s) removed for all tests. For systems where operation without a battery pack is not a supported configuration, the test may be performed with fully charged battery pack(s) installed, making sure to report this configuration in the test results.
    - d. Power to wireless radios should be turned off for all tests. This applies to wireless network adapters (e.g., 802.11) or device-to-device wireless protocols.
  11. The following guidelines should be followed to configure power settings for displays (adjusting no other power management settings):
    - a. For computers with external displays (most desktops): use the monitor power management settings to prevent the monitor from powering down to ensure it stays on for the full length of the Idle test as described below.
    - b. For computers with integrated monitors (notebooks, tablets and integrated systems): use the power management settings to set the monitor to power down after 1 minute.
  12. Shut down the computer.

### 853 Off Mode Testing

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13. With the UUT shut down and in Off, set the meter to begin accumulating true power values at an interval of 1 reading per second. Accumulate power values for 5 additional minutes and record the average (arithmetic mean) value observed during that 5 minute period.<sup>4</sup>

### 858 Idle Mode Testing

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14. Switch on the computer and begin recording elapsed time, starting either when the computer is initially switched on, or immediately after completing any log in activity necessary to fully boot the system. Once logged in with the operating system fully loaded and ready, close any open windows so that the standard operational desktop screen or equivalent ready screen is displayed. Exactly 15 minutes after the initial boot or log in, set the meter to begin accumulating true power values at an interval of 1 reading per second. Accumulate power values for 5 additional minutes and record the average (arithmetic mean) value observed during that 5 minute period.

### 867 Sleep Mode Testing

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871
15. After completing the Idle measurements, place the computer in Sleep mode. Reset the meter (if necessary) and begin accumulating true power values at an interval of 1 reading per second. Accumulate power values for 5 additional minutes and record the average (arithmetic mean) value observed during that 5 minute period.

<sup>2</sup> On Windows-based machines, much of this information can be found by selecting the following window: Start / Programs / Accessories / System Tools / System Information.

<sup>3</sup> On Windows-based machines, this can be found by selecting the following window: Start / Programs / Accessories / System Tools / Components / Display.

<sup>4</sup> Laboratory-grade, full-function meters can integrate values over time and report the average value automatically. Other meters would require the user to capture a series of changing values every 5 seconds for a five minute period and then compute the average manually.

872 16. If testing both WOL enabled and WOL disabled for Sleep, wake the computer and change the  
873 WOL from Sleep setting through the operating system settings or by other means. Place the  
874 computer back in Sleep mode and repeat step 14, recording Sleep power necessary for this  
875 alternate configuration.

876  
877 **Reporting Test Results**

878 17. The test results must be reported to EPA or the European Commission, as appropriate, taking  
879 care to ensure that all required information has been included.

880  
881 **IV. Continuing Verification**

882  
883 This testing procedure describes the method by which a single unit may be tested for compliance. An  
884 ongoing testing process is highly recommended to ensure that products from different production runs  
885 are in compliance with ENERGY STAR.  
886