ENERGY STAR® Program Requirements for Computers

DRAFT 2

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Commitment

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

59

60 • comply with current <u>ENERGY STAR Eligibility Criteria,</u> defining the performance criteria that must be
61 met for use of the ENERGY STAR certification mark on computers and specifying the testing criteria
62 for computers. EPA may, at its discretion, conduct tests on products that are referred to as ENERGY
63 STAR qualified. These products may be obtained on the open market, or voluntarily supplied by
64 Partner at EPA's request;

65

66 • comply with current <u>ENERGY STAR Identity Guidelines,</u> describing how the ENERGY STAR marks
67 and name may be used. Partner is responsible for adhering to these guidelines and for ensuring that
68 its authorized representatives, such as advertising agencies, dealers, and distributors, are also in
69 compliance;

70

71 • qualify at least one ENERGY STAR computer model within one year of activating the computers
72 portion of the agreement. When Partner qualifies the product, it must meet the specification (e.g., Tier
73 1 or 2) in effect at that time;

74

75 • provide clear and consistent labeling of ENERGY STAR qualified computers. The ENERGY STAR
76 mark must be clearly displayed on the top/front of the product, in product literature (i.e., user manuals,
77 spec sheets, etc.), on product packaging, and on the manufacturer's Internet site where information
78 about ENERGY STAR qualified models is displayed;

79

80   – If information concerning ENERGY STAR is provided on the Partner Web site as specified by
81   the ENERGY STAR Web Linking Policy (this document can be found in the Partner
82   Resources section on the ENERGY STAR Web site at www.energystar.gov), EPA may
83   provide links where appropriate to the Partner Web site;

84

85 <u>Electronic Labeling Option</u>: Manufacturers have the option of using an alternative electronic labeling
86 approach in place of the product labeling requirement above, as long it meets the following
87 requirements:

88

89   – The ENERGY STAR mark in cyan, black, or white (as described in "The ENERGY STAR
90   Identity" available at www.energystar.gov/logos), appears at system start-up. The electronic
91   mark will display for a minimum of 10 seconds, unless the product turn-on process does not
92   allow this. In this case the mark should show for as much time as possible, but for no less
93   than 5 seconds.
94   – The ENERGY STAR mark must be at least 10% of screen size, may not be smaller than 76
95   pixels x 78 pixels, and must be legible.

96

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

98

> **Note:** EPA received a number of comments regarding product labeling, including making it a voluntary requirement and eliminating the requirement. One of the purposes of including the ENERGY STAR mark on the product is to increase ENERGY STAR brand recognition and to assure the consumer that by purchasing this product they are taking steps to save energy and help the environment. EPA feels that offering an electronic labeling approach meets EPA's goals while also considering manufacturer design restraints and preferences. EPA is interested in hearing manufacturer feedback on the proposed electronic labeling requirements.

- provide to EPA, on an annual basis, an updated list of ENERGY STAR qualified computer models. Once the Partner submits its first list of ENERGY STAR qualified computer models, the Partner will be listed as an ENERGY STAR Partner. Partner must provide annual updates in order to remain on the list of participating product manufacturers;

- provide to EPA, on an annual basis, unit shipment data or other market indicators to assist in determining the market penetration of ENERGY STAR. Specifically, Partner must submit the total number of ENERGY STAR qualified computers shipped (in units by model) or an equivalent measurement as agreed to in advance by EPA and Partner. Partner is also encouraged to provide ENERGY STAR qualified unit shipment data segmented by meaningful product characteristics (e.g., capacity, size, speed, or other as relevant), total unit shipments for each model in its product line, and percent of total unit shipments that qualify as ENERGY STAR. The data for each calendar year should be submitted to EPA, preferably in electronic format, no later than the following March and may be provided directly from the Partner or through a third party. The data will be used by EPA only for program evaluation purposes and will be closely controlled. Any information used will be masked by EPA so as to protect the confidentiality of the Partner;

- notify EPA of a change in the designated responsible party or contacts for computers within 30 days.

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)

147   demonstrate the economic and environmental benefits of energy efficiency through special in-store
148   displays twice a year; (3) provide information to users (via the Web site and user's manual) about
149   energy-saving features and operating characteristics of ENERGY STAR qualified products: and (4)
150   build awareness of the ENERGY STAR Partnership and brand identity by collaborating with EPA on
151   one print advertorial and one live press event;
152
153   • provide quarterly, written updates to EPA as to the efforts undertaken by Partner to increase
154   availability of ENERGY STAR qualified products, and to promote awareness of ENERGY STAR and
155   its message.
156

ENERGY STAR® Program Requirements for Computers

Eligibility Criteria
DRAFT 2

162

163

164   Below is the **DRAFT 2** Version 4.0 product specification for ENERGY STAR qualified computers. A
165   product must meet all of the identified criteria to earn the ENERGY STAR.

166

167   **1)** <u>**Definitions:**</u> Below are the definitions of the relevant terms in this document.

168

169   A.   <u>Computer</u>: A device which performs logical operations and processes data. Computers are
170   composed of, at a minimum: (1) a central processing unit (CPU) to perform operations; (2) user
171   input devices such as a keyboard, mouse, digitizer or game controller; and (3) a display screen to
172   output information. For the purposes of this specification, computers include both stationary and
173   portable units, including desktop computers, gaming consoles, integrated computers, notebook
174   computers, tablet PCs, desktop-derived servers and workstations.

> **Note:** The definition for "computer" has been rewritten to be more specific to functionality and capability in addition to form factor and product types.

175

176   **Components**

177

178   B.   <u>Display</u>: A commercially-available, electronic product with a display screen and its associated
179   electronics encased in a single housing, or within the computer housing (e.g., notebook or
180   integrated computer), that is capable of displaying output information from a computer via one or
181   more inputs, such as a VGA, DVI, and/or IEEE 1394. Examples of display technologies are the
182   cathode-ray tube (CRT) and liquid crystal display (LCD).

183

184   C.   <u>External Power Supply</u>: A component contained in a separate physical enclosure external to the
185   computer casing and designed to convert line voltage ac input from the mains to lower voltage dc
186   output for the purpose of powering the computer. An external power supply must connect to the
187   computer via a removable or hard-wired male/female electrical connection, cable, cord or other
188   wiring and have a nameplate output power less than or equal to 250 watts.

189

190   D.   <u>Internal Power Supply:</u> A component internal to the computer casing and designed to convert ac
191   voltage from the mains to dc voltage(s) for the purpose of powering the computer components.
192   For the purposes of this specification, an internal power supply must be contained within the
193   computer casing but be separate from the main computer board. The power supply must connect
194   to the mains through a single cable with no intermediate circuitry between the power supply and
195   the mains power. In addition, all power connections from the power supply to the computer
196   components must be internal to the computer casing (i.e., no external cables running from the
197   power supply to the computer or individual components). Internal dc to dc converters used to
198   convert a single dc voltage from an external power supply into multiple voltages for use by the
199   computer are not considered internal power supplies.

> **Note:** The external power supply definition has been expanded to provide further clarification and to be consistent with the ENERGY STAR external power supply specification. Unlike the external power supply specification, both single voltage and multiple voltage power supplies are covered by this computer specification. In the case where a computer comes with a multiple voltage external power supply, manufacturers will be required to use the loading requirements provided in the internal power supply test procedure for ENERGY STAR qualification (refer to Section 4, Testing). Finally, an internal power supply is further defined as "separate from the main computer board" to support the requirements of the Internal Power Supply Test Protocol.

200 **Computer Types**
201
202 E. <u>Desktop Computer</u>: A computer where the main unit is intended to be located in a permanent
203 location often on a desk or on the floor. Desktops are not designed for portability and utilize an
204 external monitor, keyboard, and mouse. Desktops are designed for a broad range of home and
205 office applications including, email, web browsing, word processing, standard graphics
206 applications, gaming, etc.
207
208 F. <u>Desktop-Derived Server</u>: A desktop-derived server is a computer that typically uses desktop
209 components in a tower form factor, but is designed explicitly to be a host for other computers or
210 applications. For the purposes of this specification, a computer must be marketed as a server and
211 have the following characteristics to be considered a desktop-derived server:
212
213 • Designed and placed on the market as a Class B product per EuroNorm EN55022:1998 under
214 the EMC Directive 89/336/EEC and has no more than single processor capability (1 socket on
215 board).
216
217 • Designed in a pedestal, tower, or other form factor similar to those of desktop computers such
218 that all data processing, storage, and network interfacing is contained within one box/product.
219
220 • Designed to operate in a high-reliability, high-availability application environment where the
221 computer must be operational 24 hours/day and 7 days/week, and unscheduled downtime is
222 extremely low (on the order of hours/year).
223
224 • Capable of operating in a simultaneous multi-user environment serving several users through
225 networked client units.
226
227 • Shipped with an industry accepted operating system for standard server applications (e.g.,
228 Windows NT, Windows 2003 Server, Mac OS X Server, OS/400, OS/390, Linux, Unix and
229 Solaris).
230
231 Desktop-derived servers are designed to perform functions such as processing information for
232 other systems, providing network infrastructure services (e.g., archiving), data hosting and running
233 web servers.
234
235 This specification does not cover mid-range or large servers, defined for purposes of this
236 specification as:
237
238 • Designed and placed on the market as a Class A product per EuroNorm EN55022:1998 under
239 the EMC Directive 89/336/EEC <u>and</u> designed and capable of having a single or dual
240 processor capability (1 or greater sockets on board).
241
242 • Designed and placed on the market as a Class B product per EuroNorm EN55022:1998 under
243 the EMC Directive 89/336/EEC and designed and capable of having a *minimum* dual
244 processor capability (2 sockets on board).
245
246 G. <u>Game Consoles:</u> Stand alone computers whose primary use is to play video games. For the
247 purposes of this specification, game consoles must use a hardware architecture based on typical
248 computer components (e.g., processors, system memory, video architecture, optical and/or hard
249 drives, etc.).   The primary input for game consoles are special hand held controllers rather than
250 the mouse and keyboard used by conventional computer types. Game consoles are also
251 equipped with audio visual outputs for use with televisions as the primary display, rather than an
252 external monitor or integrated display. These devices do not typically use a conventional
253 operating system, but often perform a variety of multimedia functions such as: DVD/CD playback,
254 digital picture viewing, and digital music playback.

255
256   H.   <u>Integrated Computer System</u>: A desktop system in which the computer and display are combined
257   into a single unit. Integrated computers must meet all of the following criteria: (1) it is not possible
258   to measure the power consumption of the two components separately by disconnecting external
259   cables or using mechanical switches; and (2) the system receives its ac power through a single
260   cable. As a subset of desktop computers, integrated computers are typically designed to provide
261   similar functionality as desktop systems.
262
263   I.   <u>Notebook and Tablet Computers</u>: A computer designed specifically for portability and to be
264   operated for extended periods of time without a direct connection to an ac power source.
265   Notebooks and tablets must utilize an integrated monitor and be capable of operation off an
266   integrated battery or other portable power source. In addition, most notebooks and tablets use an
267   external power supply and have an integrated keyboard and pointing device, though tablets use
268   touch sensitive screens. Notebook and tablet computers are typically designed to provide similar
269   functionality to desktops except within a portable device. For the purposes of this specification,
270   docking stations are considered accessories and, therefore, the performance levels associated
271   with notebooks presented in Table 1, below, do not include them.
272
273   J.   <u>Workstation</u>: For the purposes of this specification, to qualify as a workstation, a computer must:
274   (1) ship with Error-Correcting Code (ECC) memory; (2) ship with buffered or registered DIMMs; (3)
275   be marketed as a workstation; (4) be equipped with multiple graphics cards or at least 256 MB of
276   video RAM; and (5) meet the minimum number of criteria indicated in the categories listed below:
277
278   **Performance** (must meet minimum of 3)
279
280   Ships with:
281   •   2 or more qualified Independent Software Vendor (ISV) products on the system

282   •   A striped RAID configuration

283   •   SCSI or SAS disks and controllers

284   •   3 or more serial IDE/SATA drives

285   •   Stereoscopic video output (e.g., 3-dimensional display)

286   •   Multi-graphical processing unit (GPU) (ex: SLI or CrossFire)

287   •   Dual Gigabit Ethernet

288   •   Capable of shipping with 2 or more processor packages, or 4 or more cores

289
290   **Reliability** (must meet minimum of 1)
291
292   Ships with:
293   •   Configurations with calculated system Mean Time Between Failures (MTBF) of 25,000 hours
294   or more

295   •   A mirrored RAID hard drive configuration

296
297   **Availability** (must meet minimum of 1)
298
299   Ships with:
300   •   Grid resource management software
301
302   •   Remote management clients like SNMP, SRS, etc., installed
303
304
305

> **Note:** In response to concerns regarding the blurred line between high capability desktops and workstations, the definition for workstations has been tightened to include the following required, instead of optional, characteristics as proposed in the previous draft version: Error-Correcting Code memory; buffered or registered DIMMs; marketed as a workstation; and equipped with advanced graphics. Availability requirements were also added in response to industry comments that this feature is important and unique to workstations.
>
> EPA also received a suggestion to include the use of a minimum 450 rated watts power supply in the workstation definition. Recognizing that computers overall are becoming more powerful and that power supply oversizing is a concern in desktop designs, EPA is reluctant to include this as a characteristic of a workstation.

Operational Modes

K. <u>Idle State</u>: 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.

L. <u>Sleep Mode</u>: 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.

M. <u>Standby Level (Off Mode)</u>: 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, Standby correlates to ACPI System Level S4 or S5 states, where applicable.

Networking and Power Management

N. <u>Network Interface</u>: The components (hardware and software) whose primary function is to make the computer capable of communicating over one or more network technologies. For purposes of testing to this specification, Network Interface refers to the IEEE 802.3 wired Ethernet interface.

O. <u>Wake Event</u>: A user, programmed, or external event or stimulus that causes the computer to transition from Sleep or Standby 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.

P. <u>Wake-On LAN (WOL)</u>: Functionality which allows a computer to wake from Sleep or Standby when directed by a network request.

> **Note:** The definition for network interface was modified to indicate that this refers to a wired Ethernet connection as specified by IEEE 802.3. In addition, a definition for WOL was added to clarify that, for the purposes of this specification, this term is used for both Sleep and Standby. The wake event definition was also modified to reflect this clarification.

2) **Qualifying Products:** Computers must meet the computer definition as well as one of the product type definitions provided in Section 1, above, to qualify as ENERGY STAR. **Please note that EPA will explore additional computer types, such as thin clients, for potential Tier 2 requirements.** The following table provides a list of the types of computers that are (and are not) eligible for ENERGY STAR.

343

Products Covered by Version 4.0 Specification	Products Not Covered by Version 4.0 Specification
- Desktop Computers - Game Consoles - Integrated Computer Systems - Notebook Computers/Tablet PCs - Desktop-Derived Servers - Workstations	- Mid-Range and Large Servers (as defined in Section 1F) - Thin Clients/Blade PCs - Handhelds and PDAs

344

Note: EPA has removed specific references to clamshell and multimedia computers from this draft. In order to qualify for ENERGY STAR, these product types will be required to meet the definitions provided in Section 1, which are now more heavily weighted by functionality and capability as opposed to product type and form factor. EPA may revisit multimedia computers based on growth of this product category and sufficient evidence provided by manufacturers that these computers possess unique characteristics that require further separation from the desktop computer category.

EPA has not included power allowances for thin clients for Tier 1 for the following reasons: (1) limited data and/or interest on behalf of manufacturers for these products; (2) small market penetration within the U.S.; and (3) dependency on a central server system for computing power. This product category continues to be of interest to international partners of the ENERGY STAR program, such as the European Union, and therefore, EPA will continue to monitor market growth and begin researching thin clients for consideration under Tier 2.

345

346 **3) Energy Efficiency and Power Management Criteria:** Computers must meet the
347 requirements below to qualify as ENERGY STAR. Proposed effective dates for Tier 1 and Tier 2 are
348 covered in Section 5 of this specification.
349
350 **A) Tier 1 Requirements - Effective July 1, 2007**
351
352 **(1) Power Supply Efficiency Requirements**
353
354 **Computers Using an Internal Power Supply:** 80% minimum efficiency at 20%, 50%, and 100% of
355 rated output and Power Factor $\geq$ 0.9 at 100% of rated output.
356
357 **Computers Using an External Power Supply:** Must be ENERGY STAR qualified or meet the no-
358 load and active mode efficiency levels provided in the ENERGY STAR Program Requirements for
359 Single Voltage Ac-Ac and Ac-Dc External Power Supplies. The ENERGY STAR specification and
360 qualified product list can be found at www.energystar.gov/powersupplies. Note: This performance
361 requirement also applies to multiple voltage output external power supplies as tested in accordance to
362 the Internal Power Supply test method referenced in Section 4, below.
363

Note: EPA is proposing that all computers (i.e., desktop-derived servers and workstations) meet the Tier 1 80% efficient internal power supply requirement. Manufacturers of desktop-derived servers and workstations that have concerns regarding the inclusion of these product categories under this requirement are encouraged to provide comments and data that supports the need to separate out their requirements.

It was brought to EPA's attention that some computers may be designed with a multi-voltage external power supply. To address these product types, EPA is requiring that computers equipped with multi-voltage external power supplies meet the ENERGY STAR external power supply performance levels at no-load and active mode, using the load requirements provided in the Internal Power Supply Test Procedure.

364 **(2) Operational Mode Efficiency Requirements**
365
366 For the purposes of determining Idle state levels, desktops and integrated computers must qualify
367 under Category A or Category B as defined below:
368
369 **Category A:** Category A represents desktops with a significant level of increased capability. In
370 order to qualify as Category A, a desktop must meet at least 4 of the following characteristics:

371 • Multiple processors installed

372 • 4 or more cores on a single processor

373 • 2 or more graphics processing units (GPUs) or a single GPU with > 128 MB RAM

374 • HDTV capable video outputs

375 • TV tuner

376 • 2 or more internal hard disk drive

377 • 2 GB or more of installed RAM

378
379 **Category B:** Category B is the default category for all desktops. All desktop computers that do
380 not meet the requirements of Category A above will be considered under Category B for ENERGY
381 STAR qualification. Desktops in Category B often share the following set of common features:

382 • One processor with one or two cores

383 • One hard drive

384 • Maximum of one optical drive

385 • 1 GB of RAM or less

386 • A GPU with a single monitor output and ≤ 128 MB dedicated video memory, often integrated
387 on the motherboard

> **Note:** In an attempt to further delineate desktop computers based on capability, EPA has developed two
> categories of products: Category A, which is meant to cover computers designed specifically for increased
> capabilities and Category B, which is meant to cover all other desktop computers. Further justification and data
> supporting the proposed Idle power allowances associated with these categories of products are provided in the
> rationale document titled *"Rationale for Data Analysis of Idle Power Levels for the Draft 2 ENERGY STAR
> (Version 4.0) Computer Specification"*.
>
> EPA is continuing to have discussions with the Standard Performance Evaluation Corporation (SPEC) to
> determine if an existing or future benchmark can be used to delineate desktops for purposes of Idle. However,
> at the time of the completion of this draft specification, EPA and SPEC are still exploring means for resolving
> concerns related to access to the tool by all wishing to qualify products for ENERGY STAR. As such, EPA has
> included the much more refined product delineation approach noted above which reflects the input of numerous
> manufacturers. EPA will update stakeholders on discussions with SPEC, as appropriate.

388
389 The following tables indicate the required power allowances for the Tier 1 specification. Table 1 gives
390 the baseline requirements, while Table 2 gives additional power allowances for WOL and increased
391 system memory. For those products that meet the WOL and memory requirements, a model must
392 meet the energy level provided in Table 1 summed with the appropriate allowances from Table 2.
393 **Note: Products whose Sleep levels meet the Standby power requirements do not need to have**
394 **a distinct Off mode, and may qualify for this specification using only Sleep mode.**

395

Table 1: Tier 1 Energy Efficiency Requirements

Product Type	Tier 1 Requirements
Desktops, Integrated Computers, Gaming Consoles, and Desktop Derived Servers	**Standby (Off Mode):** ≤ 2 W **Sleep Mode:** ≤ 4 W **Idle State:** Category A: ≤ 75 W Category B: ≤ 50 W *Note: Game consoles and desktop-derived servers: (1) are exempt from the Sleep level above and (2) must meet the Category A Idle requirement. Only Game consoles that meet the required characteristics for Category A may qualify for ENERGY STAR at this time.*
Notebooks	**Standby (Off Mode):** ≤ 1.75 W **Sleep Mode:** ≤ 3 W **Idle State:** ≤ 20 W
Workstations	**Standby (Off Mode):** ≤ 2 W **Sleep Mode:** ≤ 7 W **Idle State:** ≤ 115 W

396

Table 2: Tier 1 Capability Adders for Sleep and Standby

Capability	Power Allowance
WOL from Sleep and/or Standby	.7 Watts
System Memory from Sleep	.2 Watts per memory module greater than two

397

398 **Qualifying computers with or without WOL enabled**: The following requirements should be
399 followed when determining whether models should be qualified with or without WOL:

400

401 **Standby:** Computers should be tested and reported as shipped for Standby. Models which will be
402 shipped with WOL enabled should be tested with WOL enabled and will qualify using the extra
403 allowance for Standby found in Table 2.

404

405 **Sleep:** Computers should be tested and reported as shipped for Sleep. Models sold through
406 enterprise channels, as defined in the Tier 1 Power Management Requirements (Section 3.A.3),
407 shall be tested, qualified, and shipped WOL enabled, while products going directly to consumers
408 through normal retail channels may be tested, qualified, and shipped with WOL disabled. Those
409 models sold both through enterprise channels and directly to consumers must test and meet both
410 the levels with and without WOL.

411

Note:

Capability Adders: In response to stakeholder comments about Sleep and Standby levels, EPA has included two increased power allowances for WOL functionality and installed system memory. Enabling of WOL functionality is no longer universally required for Sleep or Standby, but rather is now required for S3 or Sleep for units destined for enterprise settings. WOL enabling is not required for units being shipped directly to residential customers. In revising the requirement as reflected in this draft, EPA believes that the specification will further power management in the most efficient manner. After further testing and the analysis of data submitted by manufacturers, EPA has determined the above level as an appropriate additional power allowance for WOL functionality.

Stakeholders also commented that the power consumption in Sleep is heavily dependant on the amount of RAM installed in the system. For this reason, EPA studied the available data and found that the increase in power is related to the number of RAM modules. Thus, EPA has included a capability adder for extra memory modules over two installed in the system.

Power Levels: EPA has carefully analyzed available data, including additional data provided by manufacturers, and has proposed modified power levels for Sleep and Standby. This analysis included the removal of platforms which will no longer be available once the specification becomes effective. Where feasible, EPA has consolidated and rounded power levels to help simplify the requirements proposed by this specification. With the addition of the capability adders for WOL and additional memory, EPA believes that these new levels are reasonable and achievable based on presently available data.

Further analysis, using the new desktop delineation and industry supplied data, supported the inclusion in this draft of previous Idle levels for notebooks and desktops. Though a 75 watt idle level appears to be defensible for Category A systems, more data are needed on the Idle power consumption of systems that include those features. EPA asks that stakeholders share data with EPA relevant to products with Category A features as soon as possible.

Desktop-Derived Servers: EPA has received limited data on this product type and, as such, this specification treats them as advanced capability computers with special functionality. Desktop-derived servers are now required to meet the same power supply, Idle, and Standby requirements as desktops under the Category A designation. Since desktop-derived servers are intended for a high-availability application environment, a Sleep level requirement is not applicable. EPA may reconsider these levels if stakeholders provide additional data to show alternate levels that are more appropriate for these product types.

Game Consoles: Over the last several weeks, EPA has tested previous and current generation gaming systems to determine which operational modes and efficiency levels to propose for these products. Component specifications for current generation game consoles are most similar to those found in advanced capability systems (Category A), as defined by this specification. EPA may consider delineating game consoles similar to desktops if sufficient data and information supporting this need is submitted for consideration. Only game consoles that meet the required characteristics for Category A products may qualify for ENERGY STAR at this time. This proposed Tier 1 requirement is based on data for the newest products available at the time of the development of this draft. EPA would like feedback on the treatment of these products reflected in this draft. EPA also expects to include a more refined approach to this product category in Tier 2 of this computer specification.

Integrated Computers: After further testing and review, EPA has determined that additional power allowances for integrated computers are unnecessary. EPA believes that these products can meet the appropriate levels for desktops for the following reasons: (1) the monitor remains asleep during all testing and data collection; (2) integrated computers often use a single power supply for both the computer and display; and (3) because their typically closed form factor eliminates the need to account for future upgrades (e.g., increased memory, aftermarket GPU, etc.); and 4) limited data shared by stakeholders does not support additional allowances. EPA is open to considering additional power allowances if sufficient data is provided to show the need for such allowances.

Notebook Computers and Tablets: Some stakeholders expressed a need for notebooks to be categorized by performance in a similar manner to desktops. EPA's current data set shows that notebook Idle levels are much more consistent than desktop levels, as manufacturers use the most advanced technology to reduce energy consumption and extend the battery life of portable units. For this reason, EPA believes it is appropriate to maintain this single level which is achievable for models at a variety of capability levels.

Workstations: Some manufacturers had initial concerns with the levels proposed in the previous version being too stringent and responded with data supporting their claims. Upon closer review, and the elimination from the data set of platforms that likely will no longer be available once the specification becomes effective, the data supports the previously proposed Standby levels and the modestly increased Sleep levels proposed above.

WOL Enabling for Qualification: EPA's intent is to have products tested in a way that is consistent with their use in the market. To this end, all computers must be tested "as shipped". With WOL no longer required for Standby and only required for enterprise channels for Sleep, as defined in the Tier 1 Power Management Requirements found in section 3.A.3 below, EPA feels the above requirements give manufacturers the required flexibility to test and report units as they are intended to be configured in their particular market. For those computers that are targeted and shipped to enterprise customers, manufacturers will be required to test and qualify the models with WOL enabled. In those cases where a particular model is shipped to both the consumer and enterprise channels, EPA is requiring that it be tested and qualified with and without WOL enabled. For Standby power, manufacturers are not required to enable WOL and may elect to test with or without WOL enabled, as determined by how the product is shipped. EPA seeks feedback on the viability of above the proposed testing approach.

412
413 **(3) Power Management Requirements**
414
415   **Shipment Requirement:**
416   Products must be shipped with the display's Sleep mode set to activate within 15 minutes of user
417   inactivity. Products must be shipped with the computer's Sleep mode set to activate within 30 minutes
418   of user inactivity. Products may have more than one low power mode but these proposed criteria
419   address Sleep mode as defined in this specification. Computers shall reduce the speed of any active
420   Ethernet network links to the lowest speed supported by both ends of the link when transitioning to
421   Sleep or Standby.
422
423   All computers, regardless of distribution channel, shall have the ability to enable and disable WOL for
424   Sleep mode. Systems shipped through enterprise channels must have Wake On LAN (WOL) enabled
425   from the Sleep mode. For the purpose of this specification, "enterprise channels" are defined as sales
426   channels normally used by large and medium-sized business, government organizations, and
427   educational institutions, with the intent of identifying machines that will be used in managed client/
428   server environments. With WOL enabled, any directed packet filters shall be enabled and set to an
429   industry standard default configuration.
430
431   All machines shipped to enterprise customers shall be capable of both remote and scheduled wake
432   events from Sleep mode and manufacturers shall ensure that these settings, where the manufacturer
433   has control (i.e., configured through hardware settings rather than software settings), can be managed
434   centrally with tools provided by the manufacturer.

Note: Network card speed scaling is already present in the market and should be readily accomplished by simple coordination with the BIOS. The most common example of this will be to drop 1 Gb/s NICs (operating at 1 Gb/s or 100 Mb/s) to 10 Mb/s. Systems will generally revert to full speed when returning from Sleep or Standby. While present Ethernet standards lead to a several second transition time for these link rate changes, this should be masked by system transition time and so should not impair user experience.

EPA recognizes that there are emerging technologies such as Out-Of-Bound (OOB) client management tools that are more sophisticated than WOL. These emerging technologies are expected to aid in power management but are also expected to increase power consumption when turned on. EPA further understands that many such technologies are and will continue to be disabled when shipped. It is EPA's intent to require products be tested as shipped for purposes of qualifying for ENERGY STAR. Due to a lack of data and information on these emerging technologies, EPA has chosen not to specifically address these technologies under Tier 1 of this specification. EPA will reinvestigate these capabilities in development of Tier 2 of this specification, if needed.

User Education Requirement: In order to ensure that purchasers/users are properly educated 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.
- A package or box insert on ENERGY STAR and the benefits of power management.

Either option must include the following information:

- Notice that the computer has been shipped enabled for power management and what the time settings are
- How to properly wake the computer from Sleep mode
- Energy saving benefits
- Money saving benefits
- Environmental benefits
- Some information on ENERGY STAR and a link to www.energystar.gov
- ENERGY STAR logo

In addition, the manufacturer will have similar information with a link to www.energystar.gov/powermanagement on the company Web site, readily accessible from computer product pages, product specifications, and related content pages.

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

EPA's goal is to achieve a 40% enabling rate nationally by 2010; 60% by 2012; and $\geq$ 80% by 2014. EPA recognizes the importance of documenting enabling rates and encourages industry to develop a collective strategy for securing and funding this research, and sharing findings with EPA and the public.

(B) Tier 2 Requirements - Effective January 1, 2009

(1a) Tier 2 Capability Benchmark: All computers will be required to meet the following minimum performance per unit energy metric.

       Performance Benchmarking Software and Associated Levels: **TBD**

- OR -

(1b) Provisional Tier 2 Idle State Requirements: If an energy efficiency performance or capability benchmark, and associated performance levels, are not ready to go into effect **by January 1, 2009**, a provisional Tier 2 specification will automatically go into effect and will remain in effect until such a benchmark is established. This provisional Tier 2 will include revised Idle state levels for all computer types (those included in Tier 1 as well as others as appropriate [e.g., thin clients]) with the intention of capturing the top 25% energy performers.

Additional topics, including the following, will also be re-examined under a provisional Tier 2:

- Idle levels for notebooks and integrated computers that incorporate the energy use of the displays.

- Quantitative distinctions between desktop categories (e.g., Mb of video memory, number of processor cores, Mb of system memory) to make sure these distinctions remain current.

- Sleep levels for game consoles and desktop-derived servers.

490
491   • Allowances for Out-Of-Bound (OOB) client management tools in Sleep and Standby that may aid
492   in the adoption of computer power management.
493
494   In the case of the implementation of a provisional Tier 2, EPA will re-examine these new topics and
495   finalize new levels at least six months prior to the effective date for Tier 2.
496

> **Note:** EPA will be sharing with stakeholders additional information on the planned process and timing for the development of a Tier 2 Capability Benchmark in the coming weeks.

497
498   **(2) Power Management Requirements:** In addition to the requirements provided under Tier 1,
499   above, ENERGY STAR qualified computers must retain full network connectivity while in Sleep mode,
500   according to a platform-independent industry standard. All computers shall reduce their network link
501   speeds during times of *low data traffic* levels in accordance with any industry standards that provides
502   for quick transitions among link rates.

> **Note:** Proposed levels for the provisional Tier 2 Idle requirements have been removed so that EPA can review performance data that is representative of products found in the marketplace prior to Tier 2 taking effect. It is EPA's intention to achieve significant power savings from Tier 2, thus levels established in a provisional Tier 2 will represent the top 25% of computers across all product types.
>
> A dynamic link scaling requirement has been added because the great majority of network links are used at low percentages of their data transmission capability. There is discussion in the Ethernet community about developing the ability to seamlessly switch link rates quickly to assure no impairment of user experience. With such capabilities in place, reduced link rates are expected to be heavily used on Tier 2 computers, and have the potential for significant savings.

503
504   **C) Voluntary Requirements**
505
506   **User Interface:** Although not mandatory, manufacturers are strongly recommended to design
507   products in accordance with the Power Control User Interface Standard — IEEE 1621 (formally known
508   as "Standard for User Interface Elements in Power Control of Electronic Devices Employed in
509   Office/Consumer Environments"). Compliance with IEEE 1621 will make power controls more
510   consistent and intuitive across all electronic devices. For more information on the standard see
511   http://eetd.LBL.gov/Controls.
512
513
514 4) **Test Procedures:** Manufacturers are required to perform tests and self-certify those models that
515   meet the ENERGY STAR guidelines.
516
517   ▪ In performing these tests, partner agrees to use the test procedures provided in Table 2, below.
518
519   ▪ The test results must be reported to EPA using the Computer Version 4.0 Qualifying Product
520   Information (QPI) Form.
521
522   **Models Capable of Operating at Multiple Voltage/Frequency Combinations:** Manufacturers shall
523   test their products based on the market(s) in which the models will be sold and promoted as ENERGY
524   STAR qualified. For products that are sold as ENERGY STAR in multiple international markets and,
525   therefore, rated at multiple input voltages, the manufacturer must test at and report the required power
526   consumption or efficiency values at all relevant voltage/frequency combinations. For example, a
527   manufacturer that is shipping the same model to the United States and Europe must measure, meet
528   the specification, and report test values at both 115 Volts/60 Hz and 230 Volts/50 Hz in order to qualify
529   the model as ENERGY STAR in both markets. If a model qualifies as ENERGY STAR at only one

530 voltage/frequency combination (e.g., 115 Volts/60 Hz), then it may only be qualified and promoted as
531 ENERGY STAR in those regions that support the tested voltage/frequency combination (e.g., North
532 America and Taiwan).
533

Table 3: Test Procedures for Measuring Operational Modes

Specification Requirement	Test Protocol	Source
Standby (Off Mode), Sleep Mode, Idle State	ENERGY STAR Computer Test Method (Version 4.0)	Appendix A
Power Supply Efficiency	IPS: Draft Internal Power Supply Efficiency Protocol EPS: ENERGY STAR Test Method for External Power Supplies	IPS: www.efficientpowersupplies.org EPS: www.energystar.gov/powersupplies

534

> **Note:** In response to a number of industry requests that the test procedures be streamlined, EPA has
> consolidated the Standby, Sleep, and Idle test procedures into one document. It is EPA's hope that
> this will facilitate and expedite the ENERGY STAR testing process. Stakeholders are encouraged to
> review this new test procedure in Appendix A of this specification.

535
536 **5) Effective Date:** The date that manufacturers may begin to qualify products as ENERGY STAR,
537 under this Version 4.0 specification, will be defined as the *effective date* of the agreement. Any
538 previously executed agreement on the subject of ENERGY STAR qualified computers shall be
539 terminated effective June 30, 2007.
540
541 1. Qualifying Products Under Tier 1 of the Version 4.0 Specification: The first phase of this
542 specification is proposed to commence on **July 1, 2007**. All products, including models originally
543 qualified under Version 3.0, with a **date of manufacture** on or after **July 1, 2007**, must meet the
544 new (Version 4.0) requirements in order to qualify for ENERGY STAR. The **date of manufacture**
545 is specific to each unit and is the date (e.g., month and year) of which a unit is considered to be
546 completely assembled.
547
548 2. Qualifying Products Under Tier 2 of the Version 4.0 Specification: The second phase of this
549 specification, Tier 2, is proposed to commence on **January 1, 2009**. All products, including
550 models originally qualified under Tier 1, with a **date of manufacture** on or after **January 1, 2009**,
551 must meet the Tier 2 requirements in order to qualify for ENERGY STAR.
552
553 3. Elimination of Grandfathering: EPA will not allow grandfathering under this Version 4.0 ENERGY
554 STAR specification. **ENERGY STAR qualification under previous Versions is not**
555 **automatically granted for the life of the product model.** Therefore, any product sold,
556 marketed, or identified by the manufacturing partner as ENERGY STAR must meet the current
557 specification in effect at the time of manufacture of the product.
558

Note: On February 24, 2006, EPA announced a new Tier I effective date of July 1, 2007. This extension is intended to allow manufacturers time to meet the proposed Tier 1 80% internal power supply requirement. Based on discussions with both computer manufacturers and suppliers of efficient power supplies, EPA feels confident that an 80% efficiency requirement is achievable on or before July 1, 2007. Additionally, EPA appreciates that numerous manufacturers seek finality on this matter for product planning purposes. Thus, this draft specification is intended to forecast clearly that EPA intends to include this requirement, as stated in Draft 2, in the Final Computer Specification. In conjunction with the new Tier 1 effective date, EPA is now proposing a new Tier 2 effective date of January 1, 2009.

559

560　**6) <u>Future Specification Revisions:</u>** EPA reserves the right to revise the specification should
561　technological and/or market changes affect its usefulness to consumers or industry or its impact on
562　the environment. In keeping with current policy, revisions to the specification will be discussed with
563　stakeholders. In the event of a specification revision, please note that ENERGY STAR qualification is
564　not automatically granted for the life of a product model. To qualify as ENERGY STAR, a product
565　model must meet the ENERGY STAR specification in effect on the model's date of manufacture.

566 **APPENDIX A**
567 **ENERGY STAR Test Procedure for Determining the**
568 **Power Use of Computers in Standby, Sleep, and Idle**
569
570 The following protocol should be followed when measuring power consumption levels of computers for
571 compliance with the Standby, Sleep, and Idle levels provided in the ENERGY STAR Version 4.0
572 Computer Specification. Partners must measure a representative sample of the configuration that it ships
573 to the customer. However, the Partner does not need to consider power consumption changes that may
574 result from component additions made by the computer user after sale of product. *This procedure is*
575 *intended to be followed in order and the mode being tested is labeled where appropriate.*

Note: In response to stakeholder comments, EPA has created a consolidated test method for this draft
specification. The creation of this consolidated test method involved the following major changes:

- Appendices A and B were combined into a single Test Procedure appendix to include a unified test
  method for all three power modes.
- The technical details related to selecting a power meter have been removed. The Approved meter
  requirements remain unchanged and have mostly been harmonized with 62301 Ed 1.0:
  Measurement of Standby power.
- Power mode definitions removed in favor of those used in the specification.
- Test procedure now clearly allows for testing at multiple voltages based on intended market.

Stakeholders are encouraged to provide feedback on this proposed test method.

576
577 I. **Definitions**
578
579 Unless otherwise specified, all terms used in this document are consistent with the definitions
580 contained in the Version 4.0 ENERGY STAR Eligibility Criteria for Computers.
581
582 **UUT**
583 UUT is an acronym for "unit under test," which in this case refers to the computer being tested.
584
585 **UPS**
586 UPS is an acronym for "Uninterruptible Power System," which refers to a combination of converters,
587 switches and energy storage means, for example batteries, constituting a power system for
588 maintaining continuity of load power in case of input power failure.
589
590
591 II. **Testing Requirements**
592
593 **Approved Meter**
594 Approved meters will include the following attributes[1]:
595
596 • Power resolution of 1 mW or better;
597 • An available current crest factor of 3 (or more) at its rated range value;
598 • Minimum current range of 10mA (or less).
599
600 EPA also suggests the following attributes in addition to those above:
601
602 • Frequency response of at least 3 kHz;
603 • Calibrated with a standard that is traceable to the U.S. National Bureau of Standards (NBS).
604

---

1 Characteristics of approved meters taken from IEC 62301 Ed 1.0: Measurement of Standby Power

605 It is also desirable for measurement instruments to be able to average power accurately over any user
606 selected time interval (this is usually done with an internal math's calculation dividing accumulated
607 energy by time within the meter, which is the most accurate approach). As an alternative, the
608 measurement instrument would have to be capable of integrating energy over any user selected time
609 interval with an energy resolution of less than or equal to 0.1 mWh and integrating time displayed with
610 a resolution of 1 second or less.
611
612 **Accuracy**
613 Measurements of power of 0.5 W or greater shall be made with an uncertainty of less than or equal to
614 2 % at the 95 % confidence level. Measurements of power of less than 0.5 W shall be made with an
615 uncertainty of less than or equal to 0.01 W at the 95 % confidence level. The power measurement
616 instrument shall have a resolution of:
617
618 • 0.01 W or better for power measurements of 10 W or less;
619 • 0.1 W or better for power measurements of greater than 10 W up to 100 W;
620 • 1 W or better for power measurements of greater than 100 W.
621
622 All power figures should be in watts and rounded to the second decimal place. For loads greater than
623 or equal to 10 W, three significant figures shall be reported.
624
625 **Test Conditions**
626 • Line Impedance: < 0.25 ohm
627 • Total Harmonic Distortion: < 5%
628 • Ambiant Temperature: 25 degrees C +/- 3 degrees C
629 • For products to be qualified in markets using 100V / 120V input:
630 – Input AC Voltage: 115 VAC RMS +/- 5V RMS
631 – Input AC Frequency: 60 Hz +/- 3 Hz
632 • For products to be qualified in markets using 230V input:
633 – Input AC Voltage: 230 VAC RMS +/- 5V RMS
634 – Input AC Frequency: 50 Hz +/- 3 Hz
635
636 **Test Configuration**
637 Power consumption of a computer shall be measured and tested from an AC source to the UUT.
638
639 The UUT must be connected to an Ethernet network switch capable of the UUT's maximum network
640 speed. The network connection must be live during all tests.
641
642
643 III. **Test Procedure**

644 Measurement of ac power consumption of a computer should be conducted as follows:
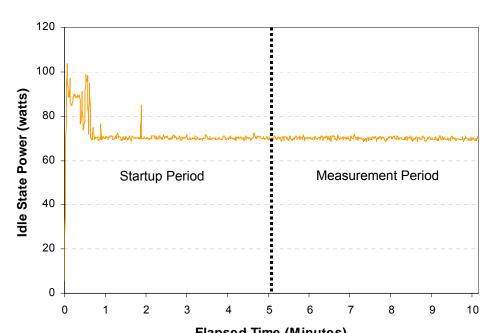645
646 **UUT Preparation**
647 1. Record the manufacturer and model name of the UUT.
648 2. Ensure that the UUT is connected to a live Ethernet (IEEE 802.3) network switch as specified in
649 Section II., "Test Configuration," above, and that the connection is live. The computer must
650 maintain this live connection to the switch for the duration of testing, disregarding brief lapses
651 when transitioning between link speeds
652 3. Connect an approved meter capable of measuring true power to an ac line voltage source set to
653 the appropriate voltage/frequency combination for the test.
654 4. Plug the UUT into the measurement power outlet on the meter. No power strips or UPS units
655 should be connected between the meter and the UUT. For a valid test to take place the meter
656 should remain in place until all Standby, Sleep, and Idle power data is recorded.
657 5. Record the ac voltage.
658 6. Boot computer and wait until the operating system has fully loaded.

659　　　　7.　Record basic information about the computer's configuration – computer type, operating system
660　　　　　　name and version, processor type and speed, front side bus speed, L2 Cache size, and total and
661　　　　　　available physical memory.[2]
662　　　　8.　Record basic information about the video card, including video card name, resolution, amount of
663　　　　　　onboard memory, and bits per pixel.[3]
664　　　　9.　Ensure that the UUT is configured as shipped including all accessories, power management
665　　　　　　settings, WOL enabling and software shipped by default. UUTs should also be configured using
666　　　　　　the following requirements for all tests:
667　　　　　　　　a.　Desktop systems (including workstations and desktop-derived servers) shipped without
668　　　　　　　　　　accessories should be configured with a standard mouse, keyboard and external monitor.
669　　　　　　　　b.　Notebooks and tablets should include all accessories shipped with the system, and need
670　　　　　　　　　　not include a separate keyboard or mouse when equipped with an integrated pointing
671　　　　　　　　　　device or digitizer.
672　　　　　　　　c.　Notebooks and tablets should have the batteries removed for all tests.
673　　　　10.　For computers with integrated monitors (notebooks, tablets and integrated systems), use the
674　　　　　　power management settings to set the monitor to power down after 1 minute (adjust no other
675　　　　　　power management settings).
676　　　　11.　Shut down the computer.
677
678　　**Standby (Off Mode) Testing**
679　　　　12.　With the UUT shut down and in Standby, set the meter to begin accumulating true power values at
680　　　　　　an interval of 1 reading per second. Accumulate power values for 5 additional minutes and record
681　　　　　　the average (arithmetic mean) value observed during that 5 minute period.[4] Record the Standby
682　　　　　　power.
683

Idle State Power After Start Up

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

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

4 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.

Idle Mode Testing

13. Switch on the computer and begin recording elapsed time. After the operating system has fully loaded, close any windows that may be open. Exactly 5 minutes after the computer was switched on, set 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. The data-recording period should not be more than 5 minutes so as to prevent potential data collection after additional power management settings have taken effect.

Sleep Mode Testing

14. 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. Record the Sleep power.

15. If testing both WOL enabled and WOL disabled for Sleep, reboot the computer and change the WOL from Sleep setting through the operating system settings or by other means. Place the computer back in Sleep mode and repeat step 16, recording Standby power for this alternate configuration.

Reporting Test Results

16. The test results must be reported to EPA using the Computer Version 4.0 Qualifying Product Information (QPI) Form, taking care to ensure that all required information has been included.

IV. **Continuing Verification**

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