ENERGY STAR® Program Requirements for Computer Servers

DRAFT 1: Partner Commitments

Commitment

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

- comply with current ENERGY STAR Eligibility Criteria, defining the performance criteria that must be met for use of the ENERGY STAR certification mark on computer servers and specifying the testing criteria for computer servers. EPA may, at its discretion, conduct tests on products that are referred to as ENERGY STAR qualified. These products may be obtained on the open market, or voluntarily supplied by Partner at EPA's request;

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

- qualify at least one ENERGY STAR computer server within one year of activating the computer servers' portion of the agreement. When Partner qualifies the product, it must meet the specification (e.g., Tier 1 or 2) in effect at that time;

- Provide clear and consistent labeling of ENERGY STAR qualified computer servers. The ENERGY STAR mark must be clearly displayed on the front or side of the product, in product literature (i.e., user manuals, spec sheets, etc.), on product packaging, and on the manufacturer's Internet site where information about ENERGY STAR qualified models is displayed;

- provide to EPA, on an annual basis, an updated list of ENERGY STAR qualifying computer server models. Once the Partner submits its first list of ENERGY STAR qualified computer servers, 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 computer servers 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. If requested under the Freedom of Information Act (FOIA), EPA will argue that the data is exempt. Any information used will be masked by EPA so as to protect the confidentiality of the Partner;

- notify EPA of a change in the designated responsible party or contacts for computer servers 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 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;

- feature the ENERGY STAR mark(s) on Partner Web site and in other promotional materials. If information concerning ENERGY STAR is provided on the Partner Web site as specified by the ENERGY STAR Web Linking Policy (this document can be found in the Partner Resources section on the ENERGY STAR Web site at www.energystar.gov), EPA may provide links where appropriate to the Partner Web site;

- 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 labeled 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 Computer Servers

DRAFT 1: Eligibility Criteria

Below is the product specification for ENERGY STAR qualified computer servers. A product must meet all of the identified criteria if it is to earn the ENERGY STAR.

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

   A. Computer Server: A computer that provides services and manages networked resources for client devices such as: desktop computers, notebook computers, thin clients, wireless devices, and other networked devices. Computer servers primarily respond to requests and are accessed via a network, and not through direct user input devices such as a keyboard, mouse, digitizer, etc. Computer servers include the following characteristics:

   - Reliability, Availability, Serviceability, and Manageability (RASM) features
   - Dedicated management controller, such as Baseboard Management Controller (BMC) or service processor
   - Certification for use with enterprise-class server Operating Systems
   - Designed and capable of having dual processor or more capability (i.e., two or more microprocessor sockets on board)
   - Support for $\geq$ 16 GBytes error-correcting code (ECC) and/or buffered memory.
   - Multiple LAN and/or WAN networking ports, such as Ethernet
   - Designed and placed on the market as a Class A product as per EN55022:1994 under the EMC Directive 89/336.

   Blade Server: A computer consisting of, at minimum, a processor, memory and hard drive that relies on certain shared resources, contained in a blade chassis, such as power supply(s), cooling, networking, system management, and storage. Blade servers are incapable of operating independent of the blade chassis.

   Blade Chassis: A collection of shared resources (such as power supply(s), cooling, networking, system management, and storage) contained in a form factor specific to certain blade servers. Blade chassis contain multiple slots which can be populated with a number of blade servers.

   > **Note:** Based on comments received on the Draft Framework document, there is no existing, industry accepted standard definition of a computer server. Stakeholders instead submitted feedback on the key operating characteristics that might define these products, and the proposed definition above reflects these comments. EPA's intention is to create a definition that clearly differentiates servers from the equipment types covered by the existing ENERGY STAR computer specification (i.e., desktop-derived servers and workstations).
   >
   > Blade servers, and the supporting blade chassis, are specifically defined due to differences in functionality and design (i.e., resource sharing components) compared to other computer servers. EPA is interested in learning more about these product types and how they might be addressed by this specification.
   >
   > Stakeholders are encouraged to comment on whether there are any additional server types that should be considered under this specification. It will also be important to identify and define those product types not covered by the specification.

Note: EPA would like this specification to be as inclusive as possible but also understands that some of the more complex or niche server types and applications may not be easily addressed under this specification. Several stakeholders have suggested that the specification focus on "volume" servers. However, the term "volume" is used to classify server types based more on price than function. For purposes of this specification, a computer server definition should be specific enough to clearly delineate based on intended application, hardware/software, and/or operational requirements. Understanding that references to specific hardware components might be limiting as technologies progress, EPA is interested in manufacturer input regarding the product descriptions below and whether any of these elements can be used to define the classes of servers eligible for this specification.

Small Floor Standing or Rack Mounted:
- 2 to 4 Processor Sockets, up to 16 processor cores
- 2 to 16 DIMMs
- 1 to 6 internal disks
- 2-4 integrated network adaptors
- 4-8 option slots for adapters to expansion units or networks
- 1 to 5U of rack space. [1]

Medium Floor Standing or Rack Mounted:
- $\leq$16 processor sockets
- $\leq$ 64 processor cores
- $\leq$ 64 DIMMs
- $\leq$ 16 internal disks
- 2-8 integrated network adapters
- 10-30 option slots for adapters
- Typically can address upwards of 2000 disks in expansion units

Floor-Standing and Multiplex Large Scale Servers:
- $\leq$ 128 processor sockets
- $\leq$ 1024 processor cores
- $\leq$ 1024 DIMMs
- $\geq$ 16 internal disks
- 2-8 integrated network adapters
- More than 20 option slots for adapters
- Can address upwards of > 2,000 disks
- Ability to chain many systems together to present a single system environment (multiplex)

Some stakeholders commented that servers should be classified by their intended workloads, and not by particular hardware elements. EPA remains open to this approach and encourages stakeholders to submit additional proposals on how to classify servers in this specification.

Several stakeholders supported the idea of including storage equipment in this specification, assuming that the performance metrics developed are applicable (e.g. power supply efficiency), while others believe this equipment type would be better served under a separate specification. EPA is continuing to have discussions with members of the storage industry to determine next steps regarding this storage products category and the most appropriate technical approach and timeline.

B. <u>Computer Server Power Supply</u>: A component designed to convert ac voltage to lower voltage dc voltage(s) for the purpose of powering the server. A server power supply must be separable from the main system and must connect to the system via a removable or hard-wired male/female electrical connection, cable, cord or other wiring. Dc-to-dc converters internal to the product used to convert a single dc voltage into other dc voltages for use by the server are not considered computer server power supplies under this specification.

C. <u>Single-Voltage Power Supply</u>: A power supply designed to convert ac input into only one single lower dc voltage output.

D. <u>Multi-Voltage Power Supply</u>: A power supply designed to convert ac input simultaneously into multiple different lower dc voltage outputs.

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

> **Note:** Stakeholders are encouraged to assist in the development of definitions for idle power and computer server power supplies, proposed above. These definitions could be based hardware, software and or functionality requirements.

2) Qualifying Products: Computer servers must meet the definitions provided in Section 1, above, to be eligible for ENERGY STAR. **Note:** Dc-powered servers are not eligible for ENERGY STAR under this specification. EPA may consider additional product categories in subsequent versions of this specification based on stakeholder interest, available test procedures, clear definitions, performance data, model differentiation, and ease of implementation.

> **Note:** EPA recognizes the potential energy savings from using dc-powered servers. However, including these server types under this Tier 1 specification poses a challenge based on several factors: (1) dc-powered servers are a new and emerging technology with few models currently available in the marketplace; (2) some industry concern has been expressed regarding the lack of an industry standard for connecting dc power to servers; and (3) there is no clear approach for comparing dc power supply efficiency, especially given that there is no existing industry standard test method available for measuring the efficiency of dc power supplies. In general, EPA recognizes that there are many methods for converting high power as it enters the building to the dc power required by server components. While the lack of established standards does not by itself absolutely preclude EPA from addressing these products, it does complicate and make more difficult the inclusion of dc-powered servers. EPA's intention is to explore the inclusion of dc-powered servers under the Tier 2 approach assuming that over time these server types represent a larger portion of the market and are supplemented by well defined industry standards.

3) Efficiency Requirements for Qualifying Products: Computer servers must meet the all the requirements provided below to qualify as ENERGY STAR.

Tier 1 Requirements: Effective TBD

A. Power Supply Efficiency Requirements

Server power supplies must meet the minimum efficiency requirements contained in Table 1, below. Power supply efficiency must be tested and reported at 230 VAC/60Hz.

Table 1: Efficiency Requirements for Computer Server Power Supplies

Percentage of Rated Power Output	10%	20%	50%	100%
Minimum Efficiency Requirement – Single Voltage	TBD	TBD	TBD	TBD
Minimum Efficiency Requirement – Multi-Voltage	TBD	TBD	TBD	TBD
Power Factor	TBD	TBD	TBD	0.9

Note: Based on comments submitted in response to the Draft Framework document, stakeholders support EPA's proposal to address power supply efficiency under a Tier 1 specification. Over the next several months, EPA will be working toward building a robust data set to determine a proposal for performance requirements in the next Draft 2 specification. In addition, EPA intends to work with other programs addressing server power supply efficiency such as 80 PLUS and the Climate Savers Computing Initiative, to harmonize test procedures and levels, where appropriate and supported by data. Stakeholders are encouraged to share information and data regarding currently used power supply models and efficiencies for consideration in the Draft 2 specification.

EPA's proposed approach is to develop separate requirements for single and multi-voltage power supplies based on differences in functionality and required circuitry resulting in inherently lower efficiencies for multi-voltage designs. EPA also recognizes that efforts are being made by the Climate Savers Computing Initiative to define a measurement protocol for measuring motherboard conversion efficiency, which will include dc-dc converters, and could lead to a more holistic view of end-to-end conversion efficiency in servers. EPA is interested in proposals or different approaches to determining the overall conversion efficiency within computer servers.

Efficiency will be measured at several loading points. Since many of these power supplies are used in redundant configurations, EPA felt it was important to include lower loading points, such as 10% and 20% of rated output. Similarly, EPA is interested in addressing power factor at these loads in addition to the 100% load. While a power factor of 0.9 is reasonable at 100% load this level may prove more challenging at lower loading points. EPA will be reviewing available data over the next few months to determine whether separate power factor requirements are needed at 10%, 20%, and 50% loads.

Based on several industry discussions EPA found that few, if any, redundant systems operate with one power supply carrying the full load while the other(s) resides in a "no load" state until needed (e.g., failure of the primary supply). In addition, testing has revealed that many server power supplies require minimal loading to operate, which has been difficult to emulate during testing and is not representative of a true "no load" scenario. Based on this information EPA is inclined <u>not</u> to include a "no load" requirement but encourages stakeholders to provide feedback on this criterion.

Additional Power Supply Types
EPA is interested in learning more about any additional power supply types with unique efficiency characteristics (e.g., supplies specifically designed for redundant applications, phase shedding supplies, etc.) and how they might be addressed in this specification. For example, given that many blade servers share power supplies, how might power supply efficiency need to be measured differently for these systems?

Addressing Power Supply Sizing and Redundancy
EPA is also looking at alternative approaches for addressing power supplies that could result in even more energy savings by ensuring power supplies are running at high efficiency on their load curve (e.g., >20% load). One option under consideration is to specify a maximum allowable power consumption of the supply(s) when tested during actual operation. The second option under consideration is to use the power supply test procedure to extrapolate, and specify, the efficiency of the supply at the actual load conditions it would see in the server (e.g., idle and maximum power). EPA feels that these approaches would allow manufacturers greater flexibility to effectively match servers and power supplies to achieve greater efficiencies and save a significant amount of energy. EPA is interested in receiving stakeholder input on these approaches and/or any additional proposals on how EPA could include the effects of power supply sizing and redundancy in this specification.

Power Supply Cooling Fans
Some stakeholders have expressed concern with the method used to account for cooling fans in the server power supply test procedure (Section 4). The current procedure requires that the power used by any integrated cooling fans be factored into the calculation of conversion efficiency. These stakeholders commented that this approach creates a disadvantage for combined power and cooling modules designed to cool not only the power supply itself, but also contribute to the cooling load for the entire system. The goal of including cooling load in the efficiency calculation is to recognize energy saving cooling solutions that can further improve the efficiency of the power supply system. However, EPA is open to considering stakeholder proposals for identifying and addressing power supplies that contribute to the cooling and overall efficiency of system components to ensure that these products are not unfairly penalized under this specification.

Voltage Testing Requirement
Industry comments suggest that EPA identify and require one line voltage for testing power supply efficiency. EPA is proposing that all power supplies be tested at the single test condition of 230 VAC/ 60Hz with the understanding that most servers covered under this specification will operate in enterprise environments, which typically operate at voltages in excess of standard US mains voltage (120V 60Hz). In addition, this voltage is commonly used in the European Union and other countries. EPA is interested in stakeholder input on this requirement, and whether this will adequately reflect real world usage and efficiencies of the products covered by this specification.

B. Idle Power

Maximum Idle Power Requirement: TBD

Note: This Draft 1 attempts to put forth a framework that layers several criteria on top of one another to recognize existing server models that are efficient without sacrificing performance or reliability. At present, EPA is suggesting a focus on efficient conversion of power, which will save energy in all modes of operation compared to a conventional model. In addition, this draft attempts to go further by recognizing servers that can seamlessly enter into successive lower power states at predetermined times when computing is not required without direction from the user and without detriment in performance (i.e., Section 3E: Power Management and Virtualization Requirements). Some stakeholders have argued that the mere presence of idle and/or sleep modes for extended periods of time are an indication of low server utilization and poor efficiency. Therefore, EPA would like to explore how to encourage higher rates of utilization, with the understanding that this could not be a specification requirement due to how workloads are typically managed in various environments.

With the exception of super computing and or other high performance computing environments, which are typically characterized by very high compute utilization rates, it is EPA's understanding that servers typically spend a significant amount of time in an *idle* condition. The idle state may occur at any time of the day, but may be particularly prevalent for extended periods during off-peak hours, when servers are consuming what could be considered high amounts of power while waiting for client requests. EPA believes that to the extent that the idle state for servers will persist due to numerous factors in terms of how datacenter workloads are managed, there exists the opportunity within this specification to recognize those servers that idle at lower power consumption levels. EPA is interested in receiving stakeholder feedback on the inclusion of this requirement as well as the potential use of the SPECPower test procedure and output for purposes of evaluating idle performance.

It is important to note that there have also been discussions around the idea that the ENERGY STAR specification should recognize those models that power down to a much lower power consumption state beyond idle. This lower power state would be functionally synonymous with *sleep* yet world be implemented such that latency was not considered a significant performance detriment. However, it is recognized that at this time, the use of a very low power consuming levels for servers is minimal due to various performance and/or reliability concerns. More discussion is needed with regard to what is technically feasible with existing technology, usage patters and user expectations, and what type of behavior should be encouraged with this specification.

C. Standard Information Reporting Requirements

Manufacturers must provide a standardized power and performance data sheet with each ENERGY STAR qualified computer server that includes the following information:

TBD

This data sheet must be posted on manufacturer's Web site where information for the qualified model is posted.

Note: Based on significant support from many industry members, EPA is proposing that manufacturers provide standardized power and performance data with each ENERGY STAR qualified server model. The purpose of this data is to provide consistent information regarding additional power and performance characteristics for use by IT end users and other stakeholders. EPA intends this data to be collected in a standardized manner and displayed in a yet to be defined standardized format by the server manufacturer.

In addition to some core characteristics, the data sheet will also provide manufacturers an opportunity to indicate unique power saving features such as power management or virtualization capability. Where possible, EPA is interested in requiring reporting based on SPECpower_ssj2008 and/or other industry-accepted benchmarks, where feasible. More information on the SPECpower benchmark can be found at: http://www.spec.org/benchmarks.html.

Possible information fields under consideration may include the following:
1. Server manufacturer, model name and number
2. Configuration Information
    – Form factor (e.g., 1u, 2u, blade chassis, etc.)
    – Available processor sockets
    – Processor information (model number, speed, # of cores, etc.)
    – Memory information (memory types, # Dimms, Dimm Size, etc.)
    – Power supply information (#, size, efficiency)
    – NIC information (# and speed)
    – Hard drive information (#, speed, size)
    – Installed operating systems or those used for testing
    – Other hardware features / accessories
3. Available Power Management Features
4. Virtualization Capability
5. Power and Performance Data
    – Idle power from SPECpower output
    – Maximum power and throughput (using manufacturer selected benchmark)
    – Estimated yearly kWh and $ consumed (based on an agreed upon set of assumptions)

Stakeholders are encouraged to submit suggestions for the format and contents of this data sheet. Based on stakeholder feedback, EPA will present a Draft data sheet with the next Draft 2 specification for review and comment.

D. Power and Temperature Measurement Requirements

Standardized Data Measurement: All servers must have the ability to provide real time data on ac power consumption, inlet air temperature, and processor utilization during server operation.

> **Note:** The intent of a standardized data measurement requirement is to recognize those servers that give data center operators expanded tools to monitor power and temperature readings in real time. Requiring the information be delivered using an industry accepted, standardized method ensures that data center operators can easily and consistently collect this information across all ENERGY STAR servers regardless of the hardware vendor. Based on discussions with several stakeholders, EPA is investigating the work by the Distributed Management Task Force (DMTF). Specifically, EPA is reviewing the applicable elements of DMTF's DSP0217 specification, as well as relevant prerequisite specifications and welcomes any suggestions or comments on referencing this or other standards. Stakeholders are encouraged to review these DMTF specifications at http://www.dmtf.org/standards/mgmt/smash/). EPA is also interested in feedback on what additional data could be specified for this requirement and information on how to ensure that reported data is calibrated with acceptable accuracy.

E. Power Management and Virtualization Requirements

ENERGY STAR qualified computer servers must come equipped with hardware power management and virtualization capabilities.

> **Note:** While industry stakeholders support the inclusion of power management and virtualization in this specification, EPA received mixed feedback regarding actual requirements. In addition to including information on power management and virtualization on the standardized data sheet, EPA is also interested in learning more about specific characteristics that could be cited in this specification to ensure additional savings when enabling these technologies. The list of characteristics should focus on server capabilities as opposed to specific technologies, which could become outdated or inadvertently might exclude new emerging technologies.

Tier 2 Requirements: Effective TBD

TBD

> **Note:** EPA intends to develop a Tier 2 specification that would take the place of Tier 1 after it expires (see Section 5: Effective Date). The hope is that Tier 2 could utilize an industry accepted performance benchmark(s) to determine a metric that takes into account both computing capability and energy use. While SPECpower can currently be used to report this type of information, it is only representative of one type of workload (i.e., Java). It is EPA's hope that over the next year, additional energy and computing performance benchmarks can be developed to address the typical workloads handled by computer servers. Once these benchmarks are made available, EPA will work with manufacturers to review, test, and analyze server performance to develop a Tier 2 proposal.

4) **Test Criteria:** Manufacturers are required to perform standardized tests to determine ENERGY STAR compliance for a given product model. The results of those tests may be self-certified by the ENERGY STAR Partner, or by a third-party laboratory on behalf of the manufacturer, and must be reported to EPA using the ENERGY STAR Computer Server QPI form. When testing computer servers, the partner agrees to use the following test procedures to determine ENERGY STAR compliance:

- Draft Test Protocol for Measuring the Energy Efficiency of Server Power Supplies, 80 PLUS Program, Revision 1.2 found at www.80plus.org/servers.

> **Note:** EPA intends on adopting the test procedure above for purposes of evaluating power supply efficiency under this specification. This test protocol has been well vetted with industry stakeholders and is currently being used by the 80 PLUS program. Several stakeholders commented that one line voltage needs to be identified for testing purposes. In response, EPA is proposing a 230 VAC/60 Hz requirement in Section 3, above. Stakeholders are encouraged to comment on the use of this test procedure and proposed line voltage requirement.

5) **Effective Date:** The date that manufacturers may begin to label and promote qualifying products as ENERGY STAR will be defined as the *effective date* of the agreement.

   A. Tier 1 Requirements: The first phase of this specification will commence on **TBD**.

   B. Tier 2 Requirements: The second phase of this specification, Tier 2, will commence on **TBD**. All products, including models originally qualified under Tier 1, with a **date of manufacture** on or after **TBD**, must meet the Tier 2 requirements in order to qualify for ENERGY STAR.

> **Note:** Typically, new ENERGY STAR specifications become effective immediately after finalization. This allows all manufacturers the option to immediately qualify and promote their existing models that meet the specification. EPA intends that Tier 1 will have a limited specified lifetime in the final specification and will be replaced by Tier 2 at a predetermined date. The tiered structure is intended to give product vendors and purchasers a longer-term roadmap for planning purposes. EPA has already initiated discussions with stakeholders regarding the development of a Tier 2 and will continue this effort in parallel with Tier 1. Moreover, EPA hopes that the specifics of Tier 2 could be completed well before the expiration of Tier 1 to allow for a smooth transition to the new requirements.
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> EPA is working toward finalizing Tier 1 requirements before the end of this year. Various stakeholders and end users have expressed a need for this information in the marketplace as soon as possible. It is not EPA's intention to design a specification that will allow the majority of models to qualify at the time of completion. When developing specifications EPA's approach is to recognize approximately the top 25% of the marketplace in terms of energy efficiency. EPA hopes that over time, the percentage of qualified products will increase as ENERGY STAR penetrates the market.
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> In the event a Tier 2 cannot be developed, EPA reserves the right to: (1) sunset the specification; (2) extend the existing Tier 1 requirements; or (3) extend and modify the existing Tier 1 requirements. Any changes to the specification will be done in consultation with industry stakeholders. When Tier 2 commences, all server models qualified under Tier 1 must either meet the new requirements to remain ENERGY STAR qualified or no longer be designated or promoted as such (i.e., discontinue association of ENERGY STAR with these products). A plan to allow the seamless transition to Tier 2 will be developed with stakeholder input to allow manufacturers sufficient time to re-qualify products and phase out marketing materials for products that no longer qualify.

6) **Future Specification Revisions:** ENERGY STAR reserves the right to change the specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through industry discussions. In the event of a specification revision, please note that the ENERGY STAR qualification is not automatically granted for the life of a product model. To qualify with the energy and water efficiency criteria of ENERGY STAR, a product model must meet the ENERGY STAR specification in effect on the date of manufacture.