



ENERGY STAR® Specification Framework for Enterprise Computer Servers

Document Overview

This framework document presents some key “building blocks” that make up an ENERGY STAR specification. These building blocks are found in all ENERGY STAR product specifications. The purpose of each building block is explained below along with preliminary thoughts on a potential approach for developing a specification for computer servers. At the end of each section are a series of questions aimed at generating discussion among industry stakeholders regarding EPA’s approach. Please note that these questions are not meant to be comprehensive but rather serve as a starting point in EPA’s efforts to learn more about this product category.

Stakeholders are encouraged to provide input on this document to Rebecca Duff, ICF International, at rduff@icfi.com by **August 31, 2007**. EPA intends to hold an industry stakeholder meeting following this comment period to allow for continued discussions and information sharing. EPA encourages open dialogue throughout the specification development process and stakeholders will have a number of opportunities to formally submit comments.

Building Block #1: Definitions

- I) Purpose: Establish a set of definitions to explicitly describe which products are covered by the specification. Definitions are also used to describe operational modes, key components, or sub-classes of product, all of which may factor into the testing and/or energy efficiency performance of any given model. Where possible, EPA uses existing, industry accepted definitions. However, in the case where these are not available, EPA will work with industry stakeholders to develop and modify definitions, as needed, to ensure clarity.

- II) Preliminary Approach: EPA’s intent is to cover computer servers used in enterprise environments and typically found in data centers. Specifically, a computer server definition needs to be developed that will distinguish these products from other equipment types already covered by the ENERGY STAR computer specification (i.e., desktops, notebooks, desktop-derived servers, workstations). Additional characteristics such as key components, hardware/software requirements, or work loads may need to be specified in this definition if doing so would assist EPA in further delineating these product types. For example, a computer may fit a loose definition of a server and be marketed as such but then not be fairly represented by the performance criteria. A tight and robust definition that addresses intended use or hardware/software requirements specific to high capacity computing environments could effectively exclude these more ambiguous product types from the specification.

- III) Questions for Discussion:
 - Are there any industry standard definitions for enterprise computer servers that should be reviewed and considered by EPA?
 - Are there hardware, software, and/or functionalities specific to enterprise servers and therefore should be included in the definition to help delineate these product types from other computers?
 - Are there any new technologies or functionalities (e.g. power saving modes that are not disruptive to continued uptime) on the horizon that should be considered while developing these definitions?

- Given that many blade server systems are able to share key components, how might EPA address and define these product types in the specification?
- Should desktop derived servers be addressed in this specification?
- Are there certain characteristics in storage or networking equipment that would allow for inclusion under this specification?

Building Block #2: Eligible Product Categories

- I) Purpose: Identify specific product categories covered by the specification based on the agreed upon definitions developed for the first building block. This is particularly important in the case where a “one size fits all” specification is not appropriate based on varying degrees of product capabilities. It is also important to identify and clearly define those product types that are not eligible for ENERGY STAR qualification. This may be due to a number of reasons including: proprietary technologies; limited availability of data; lack of differentiation with regards to product performance; or niche markets.
- II) Preliminary Approach: Servers come in a range of different form factors (e.g., rack mount, blade, tower, etc.). These form factors may also represent a range of computing capabilities and thus, varying energy requirements to do useful work. While EPA would ideally develop a single specification to cover all these products, this may not be possible without adversely affecting product performance. It may be necessary to identify key product categories within this sector for purposes of developing fair performance levels that tie to intended use and computing performance. In this case, a list of sub-classes of products that can and cannot qualify for ENERGY STAR may need to be included in the specification.

One example is the desktop-derived server, which is currently covered under the ENERGY STAR Version 4.0 computer specification. Stakeholder feedback received during the computer specification development process indicated that desktop-derived servers are more similar to desktop computers in regards to form and function. If stakeholders agree with this assumption then these product types will need to be clearly defined and explicitly excluded from this specification.

III) Questions for Discussion:

- What subcategories are needed to further differentiate server types and varying capabilities? Are there any industry standard subcategories which could be adopted?
- It is EPA's understanding that current categorizations are often separated on price point (e.g., high-end, midrange, volume servers). Are these categories helpful for purposes of this specification? Are there more concrete differentiators available based on inherent design, key components, or specific work load that could be used to identify these sub-classes of products?
- Are there other product types that could be covered?

Building Block #3: Energy Efficiency Criteria and Test Procedures

- I) Purpose: Once it is determined which products will be covered by the specification, the next step is to then identify potential metrics for energy efficiency performance. Metrics may be representative of key components, operational modes, and/or whole system energy efficiency. The chosen metrics need to be supported by industry accepted test procedures. These test procedures will then be used to test products and build a consistent data set for purposes of developing minimum energy efficiency criteria.

- II) Preliminary Approach: EPA intends to adopt or develop a test procedure that captures the energy consumed by the computer server system during a realistic workload. Ideally, EPA would use an industry standard procedure, but if none exists EPA would work with stakeholders to develop an effective test procedure. This test procedure, and subsequent data submitted by stakeholders, would inform the establishment of a performance specification for these products.

Because of the complexity of these products, EPA is considering using a two-step approach involving the development of Tier 1 and Tier 2 requirements. Tier 1 would go into effect first and later be replaced by the Tier 2 requirements. For example, the Tier 1 specification could focus on shorter term active mode savings through power supply efficiency. While EPA typically does not write specifications around a specific component, power supplies have provided a significant savings opportunity in other ENERGY STAR specifications and are worthy of consideration for this product category. A test procedure that measures computer server power supply efficiency is close to being finalized under the California Energy Commission's PIER program and is available at www.efficientpowersupplies.org. EPA will review the test procedure to determine its technical merit and potential inclusion in the specification. Other possible short term energy saving features that may be considered include: dynamic power management and/or network speed scaling. Longer term, a more comprehensive Tier 2 specification could then focus on energy consumed by the computer server as a whole using an industry accepted benchmark. EPA is monitoring work currently being done by Standard Performance Evaluation Corporation (SPEC)¹ with the hope that it could serve as the basis for a potential ENERGY STAR server performance metric.

EPA took a similar approach in developing the new ENERGY STAR Version 4.0 Computer specification. Tier 1 requirements, which include minimum efficiency levels for sleep, standby/off, and idle operational modes, went into effect on July 20, 2007. These levels are based on the computing capability of the computer categorizing models based product type (e.g., notebook, desktop) and key components such as system and GPU memory, processor type, and disk drives. Several test procedures were adapted to support the various operational modes. Work on a Tier 2 system energy efficiency performance metric has begun and may be based on benchmark development work currently being lead by ECMA, depending on technical merit and relevancy to the specification.

III) Questions

- Does a two-tiered approach, with an immediate specification potentially based on power supply efficiency followed by a system energy efficiency benchmark, seem reasonable? If not, what are some alternate approaches?
- Does the above referenced power supply efficiency test procedure address all conceivable computer server power supplies? Are there other characteristics of power supplies that should be considered while developing a specification (e.g., power factor, redundancy)?
- Are there other energy efficiency requirements or energy consumption information that EPA should consider under Tier 1? For example, EPA may consider requiring the reporting of power data for servers meeting the ENERGY STAR specification.
- Do other benchmarks or test procedures exist relative to computer server energy efficiency that could be helpful in developing this specification?

¹ Information available at <http://www.spec.org/specpower/>