

ENERGY STAR® for Computer Servers Tier 2 Draft 1 Recommendations (October 2009)

**Introduction**

The Climate Savers Computing Initiative (CSCI) is a nonprofit group of eco-conscious consumers, businesses and conservation organizations working to cut the energy consumption of computers in half. As participants in the Initiative, manufacturers commit to producing energy-efficient PCs, servers and software, and members commit to using computer power management and purchasing energy-efficient computers. The Initiative is also a resource for consumers and IT personnel who want to learn more about reducing the power footprint of their computers—without any resulting loss of productivity.

**Summary**

ENERGY STAR's Tier 2 Version 1.0 Computer Server specification was the first draft in an iterative process to develop the final ENERGY STAR Tier 2 Computer Server specification. Below Climate Savers Computing Initiative (CSCI) has highlighted recommendations and justifications for changes to the Version 1.0 Tier 2 Computer Server specification.

**Power Supply Requirements**

**ENERGY STAR proposal**

Power supply efficiency testing and reporting provide useful metrics for users to evaluate power supply performance and encourage improvements in power supply design. ENERGY STAR has indicated that they will not pursue the Net Power Loss approach for measuring power supply performance. Rather the Tier 2 Computer Server specification will continue "to address power supply requirements in terms of efficiency and power factor....This combined approach supports industry's continued work to develop and market more efficient power supplies for servers."

**CSCI Recommendation**

CSCI supports EPA's conclusion that net power loss only be included in the *Power and Performance Datasheet*. CSCI supports ENERGY STAR's decision to maintain power supply efficiency and power factors as useful metrics for determining a power supply's energy efficiency. CSCI believes the proposed efficiency requirement along with server idle requirements adequately ensure proper power supply sizing for Energy Star enterprise servers. The Tier 2 power supply efficiency specifications for single and multi O/P PSUs align with CSCI's planned specifications for gold level requirements for single O/P PSUs and silver level requirements for multi O/P PSUs. In addition, the planned ENERGY STAR power factor requirements align with CSCI's power factor requirements. CSCI also supports ENERGY STAR's decision to eliminate the power factor requirement for PSUs operating below 75W as well as adopt the latest EPRI PSU testing protocol. Finally, CSCI is collecting data to explore the impact of harmonic distortion when increasing PF at light loads. CSCI hopes to have data for Draft 2 Tier 2 comments.

**Table 2: Power Factor Requirements for Computer Server Power Supplies**

Power Supply Type	Rated Output Power	10% Load	20% Load	50% Load	100% Load
DC-DC (All)	All Output Levels	N/A	N/A	N/A	N/A
AC-DC Multi-Output	All Output Levels	N/A	0.80	0.90	0.95
AC-DC Single-Output	≤ 500 watts	N/A	0.80	0.90	0.95
	> 500 - 1,000 watts	0.65	0.80	0.90	0.95
	> 1,000 watts	0.80	0.90	0.90	0.95

CSCI proposes that the net power loss for a given test be estimated based on the input power to the server. The server manufacturer can estimate the power lost in the power supply by using known efficiency curves



for the installed power supply solution. Measuring the net power loss in any other way will significantly alter the operation of the server and risk affecting the usefulness of the rest of the power data.

### **AC Power Reporting Accuracy and Monitoring Requirements**

#### **ENERGY STAR Proposal**

In the Tier 2 server specification, ENERGY STAR specifies that "the Accuracy requirements for input power measurements on a system level be  $\pm 5\%$  accuracy with a cutoff of  $\pm 5$  watts...through the operating range from idle to full power". Furthermore this specification is required for all servers covered by the specification and does not exclude pedestal or low-end servers. ENERGY STAR has also indicated that their intention for the accuracy requirements was to "allow easy and vendor neutral access to information on the operating conditions of the Computer Server. Giving data center operators easier access to this information will help operators better manage their data centers for increased energy savings."

#### **CSCI Recommendation**

CSCI recognizes the need for monitoring requirements for data center efficiency and operation. CSCI is concerned about the proposed rigorous direction of these requirements as well as the inclusion of these requirements for all servers regardless of whether their intended operations are in data center racks, offices, or other application specific environments. Additionally, many datacenters are monitoring and managing power through smart power distribution units (PDU). The power monitoring requirements for all servers can lead to overlapping of features with the PDU products.

CSCI AC-DC working group members have investigated The ENERGY STAR for Servers Tier 2 system power reporting accuracy requirement. ENERGY STAR's initial accuracy proposal is " $\pm 5\%$  with a maximum error of 5W". This proposal is aggressive but sets a reasonable goal for systems at **higher** loads or for systems with a **single** power supply. However as the load decreases, the ability to measure the power accurately becomes problematic and achieving  $\pm 5$  watts accuracy is impractical. In addition, when more than one power supply is used, either for redundancy purposes, increased power capability, or in blade enclosures, a fixed maximum system error becomes a more significant issue.

Specialized power metering solutions with increased accuracy do exist, however tradeoffs associated with those solutions are counter to the ENERGY STAR goals of saving energy and money for end users.

- The specialized power metering solutions require more power losses to accurately measure input power
- The specialized power metering solutions are on the order of several dollars more expensive than less accurate solutions

Based on these two items, CSCI recommends the Tier 2 system power reporting accuracy be based on a **per** power supply maximum limit of  $\pm 10W$ . CSCI's proposed recommendation to the Tier 2 specification is as follows:

Accuracy requirements for power measurements will be  $\pm 5\%$  accuracy with a cutoff of  $\pm 10$  watt per power supply (i.e. accuracy is never required to be better than  $\pm 10$  watts per power supply). For single supply system, the error would be  $\pm 5\%$  or no more than 10W. Likewise, a six power supply system shall be  $\pm 5\%$  or no more than 60W (6x10W). These accuracy levels will only apply at system operating loads and will have to be met only over the operating range of the Computer Server (i.e. measurements ranging from Idle to full load power).

Following the guiding principle of Energy Star Server Program to improving the efficiency of servers and data centers, CSCI also proposes that any power reporting requirement should be applicable only to rack mounted server products or managed servers. Pedestal servers should be excluded because they are not being deployed in the datacenters and are used mainly in small business environments. Small business owners do not have IT resources or expertise in-house to monitor power and/or temperatures.

Putting aside the accuracy issue; CSCI does not understand the intention of including the power monitoring capabilities in an energy efficiency specification. We understand that monitoring capability is a feature desired by some customers, but does not belong in a specification seeking to improve energy efficiency. Monitoring features are used to reduce capital expenditures or to help with co-located billing. This monitoring capability distracts system manufacturers away from the important task of improving power supply efficiency.

#### **Sampling Rate**

##### **ENERGY STAR proposal**

In the draft 1.0 Tier 2 Computer Server Specification, ENERGY STAR has specified that "Data must be averaged on a rolling basis over a time period of  $\leq 30$  seconds."

##### **CSCI Recommendation**

CSCI recommends the following as opposed to simply a requirement specifying less than 30 seconds. Requiring a rolling average must include two parameters; a sampling rate and an averaging window. Otherwise a 30-second rolling average could be made up of as little as two data points to as many as 1000 or more data points. The important aspect for sampling rates is to have accurate power data; as opposed to a rapid power data change over the designated period. Rolling averages highlight early signs of power changes during the time interval. Whereas a simple non-rolling average signals power averages once the designated sampling period is reached. At the data center level each system will be polled maybe as slow as once every 15 minutes. Consequently, the data center does not have need for a specified rolling average or a maximum average over 30 seconds. The current specification of  $\leq 30$ sec is too short. It would be better to specify that averaging power data must be reported with a possible averaging window of 15 minutes. More information may be needed from industry to understand this minimum averaging period capability.

#### **Active Mode Efficiency Rating Tool**

##### **ENERGY STAR proposal**

ENERGY STAR has expressed their intent to adopt a "means to measure the overall efficiency of the server while it is performing actual computing *work*."

##### **CSCI Recommendation**

CSCI supports the industry efforts, primarily from The Green Grid and SpecPower, to develop tools and metrics to assess the performance-to-energy metric for computer server operations. Including an active power requirement in the Tier 2 specification is a great step towards ensuring consumers receive the necessary information to make sound purchasing decisions and further affirms ENERGY STAR as an invaluable certification for enterprise servers.