

Climate Savers Computing Initiative

Feedback on Draft 2 Server Energy Star® Specification

Background

This is the Climate Savers Computing Initiative (CSCI) feedback on the proposed power supply requirements defined in the draft 2 Server Energy Star® specification. The feedback is from the following companies in the CSCI AC/DC workgroup; Acer, AMD, Dell, Delta, HP, Hitachi, Intel, LiteOn, Microsoft, Sun, and Supermicro. All feedback in this document was voted on and approved unanimously by the AC/DC workgroup.

This feedback is divided into 5 areas;

1. Use of a 1000W threshold to determine different efficiency and power factor requirements
2. Power monitoring requirements
3. Light load power factor requirements
4. 10% load requirements
5. EPA data set

1. 1000W Threshold for setting requirements

CSCI is concerned about setting a 1000W threshold. This adds complexity to the specification and opportunity for a loophole to meet the Energy Star requirements. This may have unintended consequences to future system designs. CSCI members agree there is no technical reason that > 1000W power supplies should be more efficient than ≤ 1000W power supplies. We suspect the reason the data leads to this conclusion is due to cost or power density reasons, not technical capabilities reasons.

To help describe CSCI complexity and loophole concerns two examples are provided.

Complexity example

Sun has power supplies that can be fitted to 900W and 1200W systems. The change in PF requirements from 0.8 to 0.9 at 20% load would mean Sun has to develop new power supplies for the >1000W criteria. This is an estimated \$250K to change the power supply which seems an unnecessary cost. The leap from 0.8 to 0.9 infers that at 999W the PSU can pass with 0.8, but at 1001W the power supply has to achieve 0.9 to pass.

If EPA uses this same criteria in the tier 2 specification; a new rated power threshold may be determined. This creates a situation that under the tier 1 specification a power supply may pass, but under tier 2 specification the same power supply may fail only due to this rated power threshold changing. This doesn't seem right.

Loop hole example

Intel has a 1570W power supply used in a 4 socket system in a 1+1 redundant configuration. If the server Energy Star specification was in effect at the start of developing this system; we would likely have targeted a 2+2 redundant power system using a 785W power supply. This changes the system design for no benefits other than to take advantage of the 1000W threshold criteria.

CSCI recommends the following options;

- 1) Move the power requirements threshold from 1000W to 1200W. This is a more natural cutoff point since there are few power supplies in the 1200W to 1500W range. When using the 1000W threshold; there are many power supplies just above the 1000W threshold (in the 1000W to 1200W range) that get caught needing to meet the higher efficiency requirements for no discernable technical reason.

2) Set the requirements at the draft 2 $\leq 1000W$ levels across any power supply rating for the tier 1 specification, then project the tier 2 specification will target gold efficiency levels. Refer to the section below on data set analysis to see why we think this may be an option and still come close to meeting the EPA requirements of top 25% of systems passing Energy Star requirements.

2. Power monitoring requirements

If the power monitoring requirements are kept in the specification; additional requirements should be defined as well as allowances for lower end systems to not support this requirement.

Accuracy requirements over load range and input voltages ratings should be included. We have not had time to determine final accuracy requirements; but a good starting point would be the following.

+/-5% accuracy at 50% and 100% load
+/-10% accuracy at 20% load

Averaging should be roughly defined to make sure this is done over at least one cycle of the AC power input.

The requirement of power monitoring should not be included for all types of server systems. There are some segments of servers that do not use applications to monitor and track a system's power consumption. CSCI recommends this requirement be excluded from systems that will not make use of the monitoring feature in the power supplies. These include pedestal systems, single socket systems, and systems with non-redundant power supply capability.

3. Light load power factor requirement

CSCI is concerned about including light load power factor requirements in the tier 1 specification without fully understanding trade offs between power factor and efficiency at these lighter loads. Requiring 0.9 PF at 20% load will have an effect on the power supply design that will decrease potential improvements of efficiency above the Energy Star or CSCI requirements.

CSCI recommends the following options.

1) Reserving light load power factor requirements to the tier 2 specification so these trade offs can be understood better at the system, data center, and utility power levels.

2) If EPA sees a need to include PF requirements at 20% and 10% loads, CSCI recommends making the PF requirements the same for $\leq 1000W$ power supplies and $> 1000W$ power supplies by changing the PF requirements for the $> 1000W$ power supplies to 0.8 at 20% load and 0.65 at 10% load.

4. 10% load requirements

CSCI continues to believe that the majority of server systems shipped next year will operate above 10% load and it would be best to remove the 10% load requirements.

If EPA believes the 10% load option needs to be included, CSCI proposes adding an exemption to meeting 10% load requirements if a manufacturer can show in their shipped system configuration the power supply loading does not drop below 20% of the rating of the power supply at 230VAC.

5. EPA data set analysis

CSCI had a chance to analyze the EPA data set on single output power supplies. Below is a table summarizing the data sets we considered, requirements, and associated passing percentage.

We considered the affect of adding a passing margin of 1% efficiency and 0.05 PF. Since the data set is base on a single tested power supply we assume a nominal PSU was tested. Manufacturers will need to have margin above requirements to allow for manufacturability. CSCI data has shown a margin of 0.8% to 2% efficiency will be needed when comparing a typical PSU to the requirement to make sure all manufactured power supplies meet Energy Star requirements. No analysis has been done on power factor, so we propose using a margin of 0.05 PF for analysis purposes at this point.

For the above reason stated in #1; we considered changing the threshold to 1200W.

CSCI members questioned whether some of the power supplies are valid to base requirements on. There are 4 power supplies with higher than 94% efficiency at 50% load, and two of these have higher than 92% efficiency at 20% load. Can EPA verify these PSUs are production ready, will be used in high volume production, will they be used in a systems that meet the industry cost points (i.e. will customer buy the system), and does the manufacturer think they can meet these efficiency requirements on a manufacturing line? Another request; can EPA get a sample (or samples) of these power supplies to verify their efficiency levels? For analysis; CSCI removed these 4 PSUs from the data set to see the effects.

Data set	Requirements	# of PSUs	% Passing	% Passing w/ margin
Full data set	Draft 2	61	20%	11%
Full data set	≤ 1000W across any PSU	61	43%	31%
Full data set	≤ 1200W threshold	61	30%	18%
Removed 4 PSUs, manufacturer H	Draft 2	57	18%	11%
Removed 4 PSUs, manufacturer H	≤ 1000W across any PSU	57	42%	30%
Removed 4 PSUs, manufacturer H	≤ 1200W threshold	57	28%	16%

Using the full data set and the proposed draft 2 requirement; 20% of the power supplies pass. If we apply the 1% efficiency and 0.05 PF margin then only 11% of the PSUs will pass. Both are less than the target of top 25%.

If we change the requirements threshold to 1200W, 18% of the power supplies passed with enough margin for manufacturability. This seems that EPA could consider changing the threshold to 1200W and still meet their top 25% rule.

Using the ≤ 1000W requirements across all power supply rating; 31% of the power supplies pass with enough margin for manufacturability. Using this criteria; we think EPA could consider using the ≤ 1000W efficiency and PF requirements for all rated power supplies. This eliminates the loop hole and complexity issues associated with the threshold. If this is done, CSCI also recommends including guidance for the tier 2 Energy Star specification to the CSCI Gold level. This will motivate the industry to plan for these higher efficiency requirements in future products.

After removing the 4 power supplies from manufacturer H where we question the validity of this data; we see that the passing percentages are close to allowing EPA to consider the ≤ 1000W requirements across any PSU rating since 30% of power supplies pass with enough margin for manufacturability.