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STANDARD PERFORMANCE EVALUATION CORPORATION

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May 8, 2009

To: Rebecca Duff - ICF International
Cc: Andrew Fanara - United States Environmental Protection Agency
Re: SPEC's Response to the Final Draft of ENERGY STAR Program Requirements for Computer Servers

Dear members of the EPA and ICF Consultants,

SPEC welcomes this opportunity to review the final draft of the ENERGY STAR Program Requirements for Computer Servers and is proudly looking forward to continuing our long-standing association with the EPA ENERGY STAR Product Development Team. The development of ENERGY STAR standards is an essential component in the ongoing effort to reduce worldwide energy consumption. We applaud the EPA for its goal to drive toward greater energy efficiency in IT Equipment, and SPEC considers the EPA ENERGY STAR Program as an industry partner in this effort. During a series of review discussions among the SPEC membership, we identified several shortcomings in the final draft and compiled a list of these deficiencies and possible solutions. SPEC understands that Tier 1 will have a limited scope and several flaws but believes that with the following improvements it will be a step forward to educating its target audience.

- SPEC continues to believe that performance is a necessary part of an energy-efficiency metric. Therefore the system idle-power-only criteria for enterprise servers will not effectively inform buyers identifying the most energy efficient Computer Servers in the marketplace. Also we need to point out that number of sockets, number of processor chips, and number of cores are all considered poor indicators of performance.
- It is also our opinion that comparing servers powered by AC against servers powered by DC is not fair, since the AC-DC conversion losses are not included in DC-powered server. We would recommend creating a separate category for DC-powered servers.
- We regret the change of excluding blade servers and recommend adding back in by treating them the same as 3S and 4S for Tier 1.
- Regarding the requested thermal flow rates of servers (Total Power Dissipation; Delta T at Exhaust at Peak Temperature; Airflow at Maximum Fan Speed at Peak Temperature; Airflow at Minimum Fan Speed at Peak Temperature). SPEC recommends deleting this requirement in order to enable smaller companies to become an ENERGY STAR partner as well.
- We would like to remind the EPA that different benchmark and stress tools will yield a different "Full Load (100%) Power". Therefore we would recommend creating a list of 2-5 acceptable benchmarks / stress tools; one might be the free SPECjvm2008 (<http://www.spec.org/jvm2008/>) benchmark.
- The latest version of the ENERGY STAR® Power and Performance Data Sheet includes only a "Product family" sheet and seems to exclude "Individual Configurations". Again, this will further increase the cost for Energy Partner's especially for smaller companies.

The following comments are in order of the line numbers of the final draft:

- 111 Performance for Special Distinction
 - SPEC agrees and recommends additional recognition for voluntary measures. We would recommend describing the form this additional recognition would take.



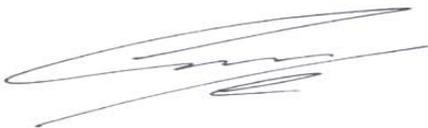
- 191 The addition of the hard drive requirement will further limit the scope of this specification and legislate how companies sell their servers. SPEC recommends requiring at least one drive for the measurements but the exclusion of drive(s) from the "as shipped" requirement.
- 232-233 The expressions "capability" and "management controller" needs to be defined.
- 341 Product Family
 - Good further improvement in the final draft, nevertheless we believe it is still a poor choice of words since EPA's definition of a Product Family is even more restrictive than a product model.
- 367 We applaud that the EPA took the misleading performance aspect out of the specification
- 382 The definition of "Typical" is not clear enough and leaves this specification open for manipulation
- 471 Table 3: Base System Idle Power Requirements
 - The Category B limits seem inconsistent and rather low when comparing A->B 10W and B->D 85W.
- 475 Table 4: Additional Power Allowances for Extra Components
 - The 8 Watt per drive allowance leaves the specification open for manipulation, a vendor can off-set high power consumption of system by using several additional SSD drives.
 - A definition of active is necessary. Is a connection without traffic considered active?
 - It might be a better approach for now to remove the additional allowance for IO cards altogether and state that an Energy Star qualified server will not change their status when an additional IO card is installed.
- 587 Regarding the addition in draft 4 to the reporting requirements; the thermal flow rates of servers (Total Power Dissipation; Delta T at Exhaust at Peak Temperature; Airflow at Maximum Fan Speed at Peak Temperature; Airflow at Minimum Fan Speed at Peak Temperature). We believe that a unified reporting of the thermal flow rate across the industry could help facility managers to plan datacenters better with the additional thermal load of the servers in mind. Unfortunately, the volumetric flow depends on the configuration of the server and the EPA's concept of Product Family could not be used. Also we believe that the guideline described is not strict enough to ensure unified measurements and reporting across the industry and the additional cost for each partner needs to be considered as well. In order to qualify a server, a volumetric airflow bench (neither a simple wind tunnel nor an anemometer) is necessary (Cost ~\$5000) as well as a temperature chamber (Cost ~\$5000). We estimate the time spent to produce these results is around 8 hours for each configuration. SPEC recommends deleting this requirement in order to enable smaller companies to become an ENERGY STAR partner as well.
- 606 Clarification needed:
 - "... or other out-of-band technology shipped with the Computer Server ..."
 - Do the Temperature Sensor and Power Analyzer need to be part of the system or are add on devices allowed?
- 637 Processor Utilization
 - How does the EPA plan to verify accuracy?
- 667 1a.Tier2
 - SPEC is currently working on several additional power and performance benchmarks (various application areas) with release dates around mid and end 2009. We are confident that enough benchmarks will be available for Tier 2.
- 726 accredited, independent laboratory
 - It seems that is a huge burden (cost) on each partner, especially smaller companies. We recommend not implementing this requirement.
- 905 Frequency response
 - What exactly is meant by "frequency response", it is generally not a part of a power analyzer specification? Do you mean the Current and Voltage Bandwidth?
- 904 An available current crest factor of 3 or more at its rated range value;
 - SPEC recommends the following as replacement: "Crest Factor – The analyzer must provide a current crest factor of a minimum value of 3. For Analyzers that do not specify the crest factor, the analyzer must be capable of measuring an amperage spike of at least 3 times the maximum amperage measured during any 1-second sample."
- 917 Accuracy



- Wording suggestions for 1251-1256 since power analyzer vendors describe uncertainty in terms of "% of reading" or "% of range".
- Measurements must be reported by the analyzer with an overall uncertainty of 1% or better for the ranges measured. Overall uncertainty means the sum of all specified analyzer uncertainties for the measurements made.
- Examples:
 - An analyzer with a vendor-specified uncertainty of +/- 0.5% of reading +/- 4 digits, used in a test with a maximum wattage value of 200W, would have "overall" uncertainty of $((0.5\% * 200W) + 0.4W) = 1.4W / 200W$ or 0.7% at 200W.
 - An analyzer with a power range 20-400W, with a vendor-specified uncertainty of +/- 0.25% of range +/- 4 digits, used in a test with a maximum wattage value of 200W, would have "overall" uncertainty of $((0.25\% * 400W) + 0.4W) = 1.4W / 200W$ or 0.7% at 200W.
- 934 Supply Voltage
 - In order to use a voltage within a 1% difference, an extra voltage source is needed. This will increase the cost for the partner, especially smaller companies.
 - SPEC recommends the adoptions of the following AC Line Voltage Source Standard. It covers data centers as well as households world wide and has been proven over the last year.
 - The AC Line Voltage Source needs to meet the following characteristics:
 - Frequency: (50Hz or 60Hz) \pm 1%
 - Voltage: (100V, 110V, 120V, 208V, 220V, or 230V) \pm 5%
- 954 "Power consumption of the UUT shall be measured and tested from an external AC or DC source to the UUT."
 - For external DC sources the losses of the AC to DC conversion is not included; therefore, it shouldn't be compared with AC nor put in the same category.
- 979 It seems that only a single power analyzer is allowed, it is our belief that some configurations may require multiple power analyzers and therefore should be allowed.
- 992 How can a partner record the measurements? Manual only or is an automatic form of recording allowed as well?
- "1001 b. Only power management features that are shipped enabled may be enabled during testing, and all power management features used must be reported."
 - How does a partner handle the case where the OS has no default setting and only a selection of options?
- 1007 Clarification: Can the system be monitored via BMC as well?
- 1011 In cases where the spin-down drive is default, must the default be adjusted?
 - Also is booting from external storage allowed?
- 1019-1032
 - We believe this is too ambitious and should be simplified.
 - Why not just measure the energy for over 5 minutes and divide by 300 seconds?
 - Also: Is it allowed that a server go into a sleep state during the measurement?

A successful ENERGY STAR for Servers program has the potential to harmonize energy efficiency programs worldwide. Therefore SPEC is looking forward to the next revision and is confident that the EPA will include our comments in order to create a good, well-written, comprehensive ENERGY STAR Program specification that can be easily implemented by partners without huge investments.

By Order of the Board of Directors,



Klaus-Dieter Lange, Director, SPEC

