NATURAL RESOURCES DEFENSE COUNCIL

NRDC Comments on

ENERGY STAR Program Requirements for Computer Servers Draft 1 Version 2.0
and Data Center Storage Draft 1 Version 1.0

Submitted by:

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On behalf of the Natural Resources Defense Council (NRDC) and our more than 1.2 million members and on-line activists, we respectfully submit these comments on EPA's draft Energy Star specifications for computer servers 2.0 and data storage systems 1.0.

As noted by EPA in its 2007 Report to Congress on Server and Data Center Energy Efficiency, data centers represent one of the fastest growing end uses of electricity in the U.S., and are projected to account for more than 100 billion kWh by 2011, representing approximately 50 million tons of CO2 equivalent and a $7.4 billion annual electricity cost.

NRDC recognizes that the development of Energy Star specifications for certain data center appliances is only one component of the integrated approach required to effectively tap into the energy efficiency opportunities available in data centers. Others include data center infrastructure efficiency (eg. data center layout, HVAC systems, etc.), server utilization and application optimization. However NRDC believes that Energy Star specifications for servers and data storage systems are essential to make it easier for buyers of data center appliances, from large enterprise data center operators to small and medium business owners, to save energy and money by choosing energy efficient servers and data storage systems.

In summary, NRDC is very supportive of the direction EPA is taking with the Server 2.0 and Storage 1.0 specifications. NRDC's comments are intended to increase the effectiveness of the specifications to curb the growth in energy end use by data centers in the U.S. without any sacrifice in data center capacity growth or performance.

Based on NRDC estimates, if the entire installed stock of servers in the U.S. met the power supply efficiency and idle mode power limits recommended by NRDC, energy use by data

centers would be reduced by approximately 15%, yielding the following benefits:

- 1.1 billion dollars in lower electric bills for U.S. businesses each year
- 7.6 million tons of CO2 emission reductions each year.

These numbers clearly show the massive opportunity for Energy Star to accelerate the transition of the market towards higher efficiency servers, in a way that reduces energy costs and CO2 emissions of U.S. businesses, making the U.S. economy more competitive and environmentally sustainable.

Servers 2.0 Specification

Power Supply Efficiency

The 80-PLUS[1] web site shows several power supplies available on the market today with 94% efficiency (at 50% load) for single output and 90% efficiency (at 50% load) for multi output. NRDC's research indicates that these high efficiency power supplies come at a modest cost premium of approximately 20% of the cost of the power supply over standard models (e.g. $6 for a $30 450W internal power supply). This cost premium would be paid back in less than 3 months, saving $30 annually and $150 over a 5-year lifetime in electricity costs per server. In addition, we expect the increase in sales volume of these power supplies to quickly reduce the cost premium of these high efficiency power supplies.

We believe this is an opportunity for Energy Star to accelerate market adoption of high efficiency power supplies given that they are already available and cost-effective today. We propose to raise the 2.0 requirement for servers to Platinum for single output and Gold for multi-output server power supplies, per 80-Plus and Climate Savers Computing Initiatives definitions.

Idle Mode

Data from the Consortium for Energy Efficiency (CEE) indicates that "on average servers typically run at 5-15% utilization rates, and still draw between 60% and 90% of their peak power at these utilization rates"[2]. This implies that over half of server annual energy use is spent in idle mode or at less than 15% utilization. While virtualization reduces this issue, NRDC recognizes that adoption of virtualization technology only reaches a minor portion of the server market today, and will likely take many years to have a major impact on the majority of the market. In the meantime, NRDC believes that the reduction of idle power must be a critical component of an effective Energy Star specification for servers. We therefore strongly support requirements and incentives that will drive towards a linear relationship between power consumption and workload performance, with a near-zero consumption at idle. At a minimum, Version 2.0 should tighten the Version 1.0 idle power limits.

[1] www.80plus.org
[2] Data Center and Servers Initiative, CEE, June 2007

NRDC estimates that a tightening of Version 1.0 idle limits by 10%, coupled with our recommended Platinum and Gold power supply efficiency requirements, applied to all servers currently in use in the U.S., would save over 15.2 billion kWh and $1.1 billion to the U.S. economy.

A data center operating 1,000 servers using an average power of 200W each would save over $50,000 annually in electricity costs.

These figures are based on power supply efficiency and idle mode limits measures alone, other cost-effective measures would increase energy and financial savings further.

Blade Systems

Blade systems are inherently more energy efficient than their rack mounted and pedestal counterparts[3], which presents an opportunity to increase energy efficiency of U.S. data centers by accelerating market transition towards the most efficient and cost-effective solutions. NRDC believes Energy Star should aim to transform the server market towards the most efficient solutions in a technology and form factor neutral manner. Therefore NRDC recommends that blade servers compete directly with other server types for similar uses, such as rack-mount servers, and count when appropriate towards the 25% most efficient data center server models when setting the Energy Star qualification threshold. While test methods need to be specific to certain form factors, performance requirements should be common across server types intended for data center use, so as to encourage the transformation of the overall server market rather than incentivize energy efficiency within each form factor category. A separate category may be required for pedestal servers which are often used for small applications where rack and blade systems are not always appropriate.

The modularity of blade systems presents a unique challenge for Energy Star labeling: unlike traditional servers, blade servers employ a modular design whereby certain functions such as power, cooling and networking are located outside the blade server in an enclosure, or chassis. In many cases blades and enclosures are sold separately, however energy efficiency of the overall blade system depends on the combination of blades and enclosure. The ability to qualify blades for Energy Star independently of which enclosure they are tested in creates a potential loophole: blades could be tested connected to an ultra-efficient enclosure, not representative of installation conditions. They would meet Energy Star criteria in their testing configuration, but potentially not while in use by customers. To address this issue, NRDC suggests that:

1) Customers be clearly informed of the importance of both blade and enclosure efficiency in meeting Energy Star efficiency requirement at the blade system level,
2) Enclosures used to qualify blades for Energy Star receive their own Energy Star qualification, in order to help customers select high efficiency enclosures,
3) Enclosures selected for blade system testing be intended to be sold with the blades under test. This could be verified after the fact by EPA based on sales volumes of enclosures used for qualification,

[3] HP Response to Preliminary Draft 1 of the Tier 2 specification for servers, October 2009

4) Conversely, individual blades selected to qualify an enclosure for Energy Star be intended to be sold with the enclosure under test.

Effective Date

NRDC strongly supports EPA's objective to implement the disclosure phase of active mode efficiency as early as possible, even if this means using a temporary benchmark until the new SPEC power rating tool is available. Active mode efficiency disclosure does not require immediate design changes by manufacturers, while it provides significant value to customers as well as informs the active mode benchmark development process.

Data Center Storage 1.0 Specification

There have been comparatively less studies on data storage systems than on servers and as a result there is less information publicly available to provide inputs on this specification. In order to allow NRDC and other stakeholders to provide meaningful inputs into the process, we encourage EPA to release the data it has collected as soon as possible.

In particular, we are looking for:

- Typical duty cycle information: typical storage systems load profiles in different applications
- Current shipment volumes of storage systems by type of system
- Current energy use of storage systems, by type, per unit and in aggregate
- Storage system efficiency ranges
- Cost premium for high efficiency technologies