



# THE GREEN GRID RESPONSE TO THE ENERGY STAR VERIFICATION AND TESTING PROGRAM

We within The Green Grid appreciate the opportunity to express our position on the topic. We acknowledge and appreciate the responsibility the Energy Star program bears with respect to integrity of the brand.

The Green Grid Position:

The Enhanced Testing and Verification announced by the Energy Star program should allow the OEM's or manufacturer's of Server, Storage, UPS and Data Center equipment to self certify from approved laboratory environments, including in-house laboratories. Approved laboratory environments may require a third party certification of that environment such as NVLAP, ISO 17025 or others.



## EXECUTIVE OVERVIEW

The ENERGY STAR server requirements have been in place for less than 12 months, and verification work for the qualified products is just getting underway. As such, it is important that EPA does not hurry into a solution for the verification process for servers (Storage, UPS and other enterprise components) as the server program is just beginning the verification phase. The Green Grid is interested in working with EPA to design a high integrity approach to the qualification and verification of systems which takes into account the cost of systems, and the multitude of configurations that can be created for a single product family and the complexities and expense involved with setting up and executing testing on these systems. Servers, storage (future), UPS (future) and network (future) products are significantly more complex than most of the products EPA deals with in the ENERGY STAR program due to their multitude of configurations, their varied fulfillment chains, and the fact that these products are not available fully configured on retail shelves.

One of the goals of ENERGY STAR is to increase the quantity of energy efficient products available for purchase by increasing the number of options available. Additionally, another goal is to provide these more efficient products at the most attractive pricing possible, to promote adoption. The current enhanced testing and verification proposal works against both of these goals.

Continuation of qualification in manufacturers' facilities (with accreditation and/or witness) provides the best opportunity for the industry to help the program achieve both purposes.

## IMPACT TO THE INDUSTRY

Testing and enhanced verification activities could be prohibitively expensive for manufacturers for several reasons. Systems or equipment used to perform compliance testing may not be resold as new. Each test can take a day to complete when including set-up time, so if multiple tests are required there is extensive time and resource required to do the test. In most cases, set-up will require experienced hardware, software and electrical technicians. Many of the systems are bulky or large systems sometimes transported in racks and in the case some systems are stand alone. Some systems are also very heavy (UPS systems) and the expense of transport to a laboratory for measurement would also be very expensive.

The span of storage products expected to be included in the ENERGY STAR specifications for Data Center Storage range in price, when populated with disks, from \$7,000 to over \$500,000. The span of server products expected to be included in the Energy Star specification for data center server Tier 2, range in price ranging from \$2,500 to \$300,000 each. A cost comparisons of these products range as very expensive to prohibitively expensive when compared to most Consumer Electronics or IT equipment intended for individual or small office use ranging from \$80 to \$1,200.

The industry recognizes and the EPA has acknowledged that products at these cost points need to be



handled differently from the rest of the sector. TGG, with its membership spanning IT equipment providers and purchasers, would welcome the opportunity to work with the EPA to develop appropriate testing and verification protocols. The approach for enterprise products would also need to provide for multiple degrees of configuration complexity prevalent in storage products, including, but not limited to, media type, speeds of operation of different media, capacity variability within each class of media, overall system capacity and client connectivity modes. A similar degree of complexity is observed for compute servers, especially with 4 processor socket server modules when considering the total range of storage, I/O, and memory systems that can be configured into the product.

Given the degrees of flexibility, along with the range of configurations that might appear in any given product family, the complexity of configuring a data center server or storage system for test is significant and requires substantial training and experience as well as operating systems and systems management equipment. The test equipment fixtures for achieving the proposed energy measurements are likewise complex and require expertise in set up and tuning of the workloads for the servers and/or storage systems. All of this means that server and storage manufacturers would need to send personnel along with equipment to any independent facility to assemble, configure and install the server and storage systems, as well as to set up and tune the test environments. This is time consuming as well as painstaking, and is not an easily acquired skill set. As with servers, all of the storage products within the scope of the proposed specification are built to order, and require the customer specify the exact configuration of components.

## APPROVED LABORATORY ENVIRONMENTS

Manufacturers should be allowed to test and verify enterprise level IT equipment in their in-house labs. This is an established process for the product safety and EMC requirements. There are laboratory certification standards that could be used to establish a lab's credentials and they are:

*System Manufacturing Test Qualified Laboratory (Product Safety)* - Programs are in place that audit the laboratory to ISO/IEC 17025. This standard includes requirements for equipment calibration, test environments, training, test processes, test procedures, etc. In the end, the test data is accepted by the agencies for inclusion in a CB report that is used in the Declaration of Conformity for the CE mark.

*NVLAP (National Voluntary Laboratory Accreditation Program)* - NVLAP accredits public and private laboratories based on evaluation of their technical qualifications and competence to carry out specific tests or calibrations. This certification is used for EMC and safety testing on many products.

## THE CASE FOR IN-HOUSE TESTING

1. Manufacturers routinely test their equipment for various product safety and benchmark requirements. They are familiar with set-up requirements for both the hardware and the supporting software. Especially on more complex servers, there is a significant amount of work involved in properly setting up and configuring the system. The systems need to be connected to a hardware management console (HMC) which manages the server and validates change management to ensure the system meets the configuration rules.
2. The hardware would need to be accompanied by at least two engineers from the manufacturer. At a minimum, a Software Engineer - The Initial Program Load (IPL) typically takes a server to a standby mode where logical partitions need to be configured and started. A Hardware Engineer - The physical hardware configuration needs to be changed for minimum, typical, and maximum tests. If it is desired to have a witness at the test, it would be more efficient to have the test witnessed by a third party at the OEM's test facility.



3. If systems are shipped to a third party lab, remote settings and adjustments will be required for performance measurements. Benchmarks need to be installed and configured to match the processor, memory, and other platform configurations.
  
4. For qualification testing, hardware is typically very limited and companies do not want systems being released to third parties for competitive and market introduction reasons. Also, shipping servers to 3rd party testing locations typically requires 3rd party agency approvals which are not solidified until one month prior to the product announcement. This does not leave enough time to incorporate ENERGY STAR into the announce literature if the product is qualified as intended. The facility would also have to provide the power (ex. three-phase, X Amps @ Y voltage and varied worldwide) and cooling environments to drive the systems to their min and max power consumption. Note the inlet air temp will have an effect on power consumption of the unit under test. (could also be put within item #6 below)
  
5. There is also the training and cost of external testing. A third party lab will not be as proficient in the testing procedures or the features of various products, resulting in inefficiencies and extra costs. In-house testing will allow incorporation of the ENERGY STAR testing work with other product qualification and testing that has to be completed for a new product.
  
6. Consumer electronics are usually produced and shipped in large volumes, arriving from many different vendors, and are manufactured in limited product configurations. Additionally, most consumer electronics devices do not require any special environment for testing and can simply be attached to any standard electrical outlet for measuring purposes. These devices are usually preconfigured and stand alone systems. To contrast; data center equipment is produced and shipped in small volumes, arriving from comparatively few vendors, and vary widely in the number of configurations available for a single piece of equipment. The equipment is then configured on site before it can be integrated to the larger IT fabric.  
  
 What's more, in order to measure the power draw with precision from a single piece of data center equipment you must emulate the data center environment because the power draw of each device is dependent upon multiple factors, such as compute load, network load, acoustics, ambient temperature, etc. Therefore, very expensive and tightly controlled test environments are necessary to ensure standardized power measurements across multiple product configurations and product families.
  
7. Residential usage of equipment provides non-technical observations of a product meeting its promised value. In the IT world these commitments are taken much more seriously and users are much more likely to test a product to its manufactures claims.  
  
 Additionally, data center equipment vendors have experience and competence in operating in-house testing facilities and maintaining the extensive documentation that is required for audits and verification from third party organizations that certify our products, such as Underwriter's Laboratory, the Federal Communications Commission and others.
  
8. As previously stated data center products are complex and have a wide variability of configurations per product. Any third party that proposes to provide the measurements necessary to certify these products as Energy Star compliant will require an extensive amount of time to develop the competence and maturity required to test multiple product configurations and product families in an efficient and accurate manner.

This is especially true due to the fact that data center products change rapidly in terms of the technology they employ and the features they offer. Thus, testing data center equipment in third-party facilities is expected to become a lengthy, drawn-out, platform specific, expensive proposition.

Furthermore, the capital costs of setting up a test environment that simulates a real data center, coupled with the relatively few vendors requiring this service, might not make the testing market economically viable for third party testing houses.



9. Since independent test facilities will be faced with testing more than one manufacturer's or OEM's products simultaneously, these facilities would need to demonstrate isolation of each manufacturer or OEM's product from each others, and assure no cross-contamination of personnel was present, so that information on unreleased products would not accidentally be transferred to the support team of another vendor as required by anti-trust law. This is as true for software features as for hardware features.

10. In the industry's experience of third party labs as for-profit entities, the independent labs are often capacity constrained, and there will be a limited number available. As such, a manufacturer's or OEM's may find that at any point in time, the qualification testing needed for a new product will not be possible without an adverse impact on the release schedule. These impacts will undoubtedly have adverse economic impact on the company by either preventing a new product from appearing on the ENERGY STAR list at release, limiting its appeal, or causing the product to enter the market later than desired, limiting the available market for the new product.

**Verification process:** As noted above, ENERGY STAR's proposed 3rd party off-the-shelf sampling method is nearly-impossible and impractical to accomplish for this product category. TGG recommends the verification process be conducted at in-house or qualified sites, with the TGG proposed product sampling selection criteria. This process reduces the complexity, cost, and logistical overhead, in addition to providing on-going compliance information.

The Green Grid believes that because of the small number of vendors in the data center equipment industry, and because of the established practice among data center IT vendors to perform competitive evaluations of each other's equipment, there already exists a culture of self-monitoring and self-policing in this industry. There is no history among data center IT equipment vendors of fraudulent claims of Energy Star compliance, and any compliance that is incorrectly claimed by one vendor is immediately flagged by other vendors. History has shown that when such incorrect claims are discovered, the impacted vendor either corrects the claim immediately or withdraws it.

As such, the Green Grid believes there is no need to formalize challenge testing for the data center IT equipment industry. The nature of competitive practices in the industry has had the effect of informally institutionalizing challenge testing already.

**Sample Verification Product Selection Criteria:** We encourage EPA to set specific criteria for selecting IT products that selects configurations that are being requested by customers. We recommend that the selection program manager request the last 12 months of sales data for the ENERGY STAR model and select from the top ten configurations that are shipped to customers. The specific mechanism to identify those higher volume groupings would need to be worked out, but should help to simplify the process and test the configurations being used by customers in the field.