

Response from The Green Grid to:

ENERGY STAR Uninterruptible Power Supply Draft 2 Version 1.0 August 11, 2011

The Green Grid Association, a consortium of industry leading companies welcomes the opportunity to comment on the Draft 2 ENERGY STAR® for Uninterruptible Power Supplies (UPS). Some member companies of The Green Grid Association may be providing additional considerations highlighted by their industry or company's particular perspective. In addition, the UPS OEM members may have also provided their inputs through NEMA.

Introduction

A consortium of information technology providers, consumers and other stakeholders, The Green Grid Association seeks to improve the energy efficiency of data centers around the globe. The organization takes a holistic and comprehensive approach to data center efficiency and understands that addressing this challenge requires a high-level view of the entire data center and cooperation among a wide range of industry principals. Participants in The Green Grid include such diverse companies as major server and storage equipment manufacturers, leading infrastructure manufacturers, major software providers, and large end-users / data center owners.

Overall

We are delighted with the progress made by the EPA on this specification and greatly appreciate the attention to, and incorporation of, many of the industry's comments on previous outlines and drafts. The Green Grid's feedback is generally referenced against the section numbers listed in the framework document with specific line numbers where practical. We believe the current Draft 2 is relatively close to becoming a final specification. However, we would appreciate the release of a Draft 3 document with perhaps a short industry review period in order to ensure complete industry transparency to the process.

The Green Grid membership remains keenly interested in the development of this new ENERGY STAR specification as we believe it will help data center owners, operators, developers, architects and engineers, and purchasing organizations make improved and informed decisions that will help EPA and The Green Grid in our mutual efforts towards reducing total energy consumption per unit of IT workload.

Recommendations and Discussion: ENERGY STAR for UPS Draft 2

Section 1 Definitions

UPS Applications

We suggest that this section be titled UPS Classes. Lines 24 – 26, Consumer UPS: and/or Lines 27 – 30 Commercial UPS, we believe there is a category of Commercial UPS that are intended for use with rack-mount servers and/or other network, storage, communication devices with power ratings below 1.5 kW. These tend to be VFI in nature and not likely to qualify under the Consumer rating. We therefore propose the following class definitions:

Consumer UPS – AC-output UPS with an output power rating of less than or equal to 1.5 kW and complying with Class B emissions limits (per 47 CFR 15 or EN 55022).

Commercial UPS - AC-output UPS with an output power rating of less than or equal to 10 kW and not complying with Class B emissions limits (per 47 CFR 15 or EN 55022).

Data Center UPS – AC-output UPS with an output power rating greater than 10 kW.

Redundancy / Modular

Lines 58 – 63, as further clarification to Redundancy and testing of Modular UPS. We believe that a modular UPS, with a ‘frame’ capable of holding multiple modules either for total capacity or capacity with some level of redundancy, should be tested in two configurations. A, the minimum frame configuration declared by the manufacturer (assumed to be 1 module) and B, the maximum continuous output power configuration as declared by the manufacturer. If the UPS passes in both configurations than all intermediate sizes are deemed to have passed. At no time should a ‘redundant’ (not required to provide any portion of the load under test) module be required as part of the test. Note that these qualifying configurations may not represent the actual min and max configurations supported by the UPS.

We support EPA’s decision to test UPSs capable of parallel operation as standalone products.

Further consideration – when testing modular and/or redundant capable UPSs we would like to ensure that redundant components other than converters (i.e.: fans, controllers, etc.) can be removed or disabled during testing provided that the tested configuration still represents a fully functional UPS.

Bypass Mode

Lines 75, 76, we have a concern over Bypass Mode being confused with one or more ECO-modes of operation. We prefer the addition of the following second sentence to the definition: Note: Automatic transfer to Stored Energy Mode is not possible from Bypass Mode.

Single-mode UPS / Multi-mode UPS

Lines 86 – 88, We prefer the following terms for clarity: Single Normal-Mode UPS and Multiple Normal-Mode UPS

Reference Test Load

Lines 104, 105 and Note 5, we recommend the EPA include a reference to the ENERGY STAR test specification document. Note, The Green grid encourages the broad adoption of energy saving and ‘green’ concepts, such as back-feeding power to the local building or utility when able to do so safely and within local code restrictions, however the utility and/or building do not qualify as a viable nor reliable, repeatable load for testing purposes.

Section 2 Scope

Remanufactured and Refurbished Units

Lines 141 – 149, additional comments, we are concerned that one or more third-party firms already in the UPS battery replacement and UPS service business (who aren’t necessarily ENERGY STAR Partners) may begin to market refurbished UPSs that originally qualified for ENERGY STAR, and are so labeled, without retesting / certifying them to the latest standard and without removing the originally applied ENERGY STAR rating or logo. Accordingly we suggest that, similar to all other information technology ENERGY STAR programs, all requirements regarding refurbishment be removed from the specification. That is to say, if a product complies when it is manufactured, it is ENERGY STAR compliant for its entire service life.

Section3 Qualification Criteria

Table 1: AC-output UPS Loading ...

Line 187, we recommend the removal of the Output Power column, as load profiles relate only to UPS Class.

Note UPS loads

Lines 189 – 213, The Green Grid would be willing to engage with the EPA and perhaps partner with another industry organization, like NEMA, to conduct a market survey to better determine real-world UPS loading models. We also suggest the EPA consider a UPSEfficiency.gov type website modeled off of the fuleconomy.gov website wherein end-users could anonymously report the actual UPS data such as UPS model size, power rating, actual load, and any reported efficiency information.

It may also be possible to create an industry-wide software plug-in or downloadable application that will enable those UPSs with self-reporting capabilities to periodically report loading information to an EPA/Green Grid portal.

Table 2: AC-output UPS Efficiency Requirements

Line 215, we recommend the removal of the UPS Class column, as UPS efficiency depends only on Output Power and Input Dependency. We further recommend applying a formula for VFI UPSs of all sizes and slightly lowering the requirements for VI and VFD UPSs rated less than or equal to 1.5kW to provide more margin against testing and unit to unit variances. Our suggested Table 2 is as follows:

Minimum Average Efficiency Requirement (Eff_{AVG_MIN}), Where:			
<ul style="list-style-type: none"> • P is the Output Power in watts (W), and • ln is the natural logarithm. 			
Output Power	Input Dependency		
	VFD	VI	VFI
$P \leq 1,500\text{ W}$	0.965		$0.0099 \times \ln(P) + 0.80$
$1,500\text{ W} < P \leq 10,000\text{ W}$	0.97	0.96	$0.0099 \times \ln(P) + 0.80$
$P > 10,000\text{ W}$	0.97	0.95	$0.0099 \times \ln(P) + 0.80$

Equation 2: ...Average Efficiency...

Lines 234 – 251, in principle we support the EPA's desire to encourage market recognition for, and the use of, ECO-mode operation where possible. One concern, a UPS may be grossly inefficient, relative to the ENERGY STAR requirements, in VFI mode and highly efficient, say 99%, in VFD (ECO-mode) and with an aggressive weighting factor still qualify for ENERGY STAR. We therefore suggest that any multi normal-mode UPS be required to qualify for ENERGY STAR either with the blended efficiency as noted, but with no more than 25% weighting for ECO-mode operation or under the most protective mode of operation. We do not believe a multi-mode UPS should ever be qualified for ENERGY STAR under the least protective mode of operation only. Such a UPS should be sold as a single normal-mode UPS and qualify within the appropriate category.

Related to the broader market acceptance for and use of ECO-mode operation, The Green Grid is prepared to work with the EPA to develop educational content aimed at developing a better understanding of local and regional grid power quality and the viability / applicability of ECO-mode operation UPSs. At this time the Green Grid is working on a paper to help address this multi-mode UPS (or "eco mode") operation and adoption considerations, and specifically this "weighted" operation of 25% in VFD and 75% in VFI mode as function of utility grid reliability.

DC Output UPS – we expect individual member companies will respond under their own letterhead.

Toxicity

Lines 269 – 290, At this time we believe that a RoHS requirement would arbitrarily exclude the majority of UPSs from participation in the ENERGY STAR program. We therefore request that RoHS not be a mandatory part of ENERGY STAR for UPS version 1, but rather that it be an optional declaration on the PPDS. IEC is developing standard 62040-4 concerning UPS environmental issues and we suggest that EPA wait until this standard is released and in general use before adding environmental related requirements to this program. Furthermore, The Green Grid is working with the industry and NGOs to develop a recycling/e-Waste guide specific to data centers that would capture UPSs and related system components.

Communication and Measurement Requirements

Lines 331 – 365, The Green Grid supports and encourages the broader market adoption and reporting of PUE. However there are numerous factors associated with mandating UPS output energy (kWh) metering, especially at a level precise enough to provide statistically valid information. In fact, many of today's UPSs when operating on ECO-mode could, and will occasionally, report energy conversion efficiency in excess of 100%. Hence, we do not believe it is appropriate to burden the UPS with such a meter when costs and market conditions do not warrant it. Further, there are four categories for reporting PUE; Level 0 – power only, Level 1 – UPS energy, Level 2 - PDU output, and Level 3 – ICT device energy (available from in-rack PDUs/power strips). It is unreasonable to place the entire burden for measuring PUE on the UPS when data center operators have numerous other, and technically better, choices available.

Note: we recognize the EPA plans to host another web conference specific to this topic. We plan to support that meeting as best as possible and may follow-up thereafter with a separate response based upon the scope of that call.

Section 4 testing

Table 4 – DC-Output UPS/Rectifiers

We believe there is a need for clarification here as the ATIS test specification calls out efficiency testing at a system level, rectifier, controller, backplane, chassis, etc. whereas the current EPA specification conducts testing at the individual module level. Since DC applications are generally 'system' type we believe it makes sense to test at that level. System level testing will also enable comparisons of AC UPS systems to DC UPS systems.

Number of Units Required for Testing

Lines 379 – 393, we believe there will be variation in UPS tested efficiency driven by both component efficiency variation (rectifiers/inverters, etc.) and test uncertainty/variation. There will need to be clarity on whether average/mean or minimum efficiency out of statistically relevant sample size will be used by EPA for passing the Energy Star program criteria. Also, statistically relevant sample size needs additional clarification. We support the current requirement that qualification can be established on the basis of testing a single unit.

Recommendations and Discussion: ENERGY STAR® for UPS Test Specification Document, Draft 2

Section 2 Applicability

Line 9 – we recommend the removal of any reference to phase as this may be confusing. Should read: UPSs for home, small and medium business, and data center use

Section 3 Test Setup

Table 1 Input Power Requirements

We recommend the restoration of the Frequency column as published in Table 1 of the Draft 1 Test Method.

AC Output Power

Line 31 – 32, Not all UPSs have sinusoidal outputs. We recommend removal of all output waveform requirements as IEC 62040-3 has none.

Table 2 DC Output Power ...

Line 40, we recommend the addition of a 575V DC with Nominal Voltage of 575V DC, Voltage for Test 595V DC, and Tolerance of +/- 1%. Subject to verification with ETSI requirements for similar voltage.

Section 4 Test Conduct

UPS Operating Mode Conditions

Line 45 – 50, we support the spirit of the current language but are concerned that technology may quickly introduce new modes of operation within a single 'normal-mode' configuration. Meaning a VI normal-mode UPS may be able to achieve VI with several internally driven changes all of which fit the broad definition of VI. We therefore recommend the addition of language to specify that the UPS must be tested in the highest efficiency sub-modes of each tested normal mode.

Section 4.2 ...Guidance for Implementation...

Line 56, Figure 1

We appreciate the inclusion of a reference diagram. We recommend a few modifications and additions.

1. Stronger language that this is intended as a guide only and not a required test set-up
2. It is more in keeping with industry practice to show the power flow from left to right
3. The Analog Data outputs should be identified as 1 and 2 or A and B only, delete the use of Channel as this may imply a relationship to phase (s)
4. The Voltage Regulator Power Conditioner should have a footnote that states – representative only, may not be required when input power characteristics are within IEC/EPA specifications and/or the VRPC may be another UPS.

Line 67 is missing (Hz)

Line 69, we believe that the reference test load should conform exactly to IEC 62040-3 Ed. 2 Annex J, Section 2.2.2 in its entirety..

Section 5 Test Procedures

We strongly feel that all procedures and measurement techniques and calculations must exactly follow IEC 62040-3 Annex J. Any divergence will necessitate duplicate testing which is very costly, time consuming and burdensome. As vendors declare data measured to IEC 62040-3 already, having a different procedure for ENERGY STAR could lead to the publication of differing efficiency data in various locations possibly leading to customer confusion.

Line 148 should reference Input Power Factor (2 places)

Additional Discussion Challenge Test Process

The Green Grid is committed to driving energy efficiency improvements within the business computing ecosystem and to that end encourage the industry to use ENERGY STAR rated devices that best fit the user's unique business requirements whenever appropriate and commercially available. We share the EPA's concern that when such items are purchased that they perform within a reasonable and statistically viable level that falls within real-world expectations for specification compliance.

When an ENERGY STAR logo marked device fails to meet both the ENERGY STAR and the OEM's published specifications, subject to certain real-world test / deployment considerations, we believe there should be a formal "Challenge Process" to verify the OEM's devices are indeed compliant with the applicable ENERGY STAR specification.

We would like to see more industry dialog on this topic as UPSs, those in the 100kW and larger category and especially when configured in multi-module systems in excess of 1 MW total capacity, are not easily removed, are expensive, subject to long lead times, and due to the intricacies associated with installation, site variances, field configuration, etc. may be subject to third-party induced issues that reduce overall system efficiency.

The Green grid would like to see a Challenge Process that is inclusive of the OEMs and includes test and verification at the specific reference site that identified the performance issue. As part of the Challenge Process, we recommend a "loser pays" clause subject to certain financial limits, time, materials, etc.

CONCLUSION

This document is a consensus document that was subject to peer review and comment within the more than 200 member companies of the Green Grid who are stakeholders in data center efficiency. Our members collectively own, operate, or manage over 2,000 data centers globally and as such have a vested interest in the adoption of an internationally recognized standard for UPS energy efficiency. Again, we believe the EPA has made huge strides in the development of this specification and look forward to what we believe may well be an almost final document with Draft 3.

We trust that EPA will seriously consider our comments and recommendations and incorporate them in the next draft. We look forward to working further with EPA on energy conservation measures that will benefit all stakeholders.