ENERGY STAR® for UPSs Draft 3
APC by Schneider Electric Comments

Jim Spitaels – November 22, 2011

Introduction

Thank you for allowing APC by Schneider Electric to provide input into the ENERGY STAR for UPS specification development process. This document summarizes our responses to EPA's requests for comments on the Eligibility Criteria Draft 3 Version 1.0 and the corresponding Test Method. In general our comments elaborate on and refine the points we made during the stakeholder meeting held on November 8, 2011. We look forward to continued productive dialog with EPA on the specification, the test method and the PPDS.

Comments

1. **Loading assumptions ≤ 1500W are biased against Commercial UPSs**
   Commercial UPSs exist at power levels ≤ 1500W, yet the loading assumptions found in Table 1 are based on consumer usage patterns. Because commercial UPSs are optimized for use at higher loads, we believe that commercial VI and VFI UPSs rated ≤ 1.5 kW should have the same weighting factors as (commercial) 1.5 kW to 10 kW UPSs, as shown in this updated version of Table 1.

Output Power	Input Dependency	Proportion of Time Spent at Specified Proportion of Reference Test Load, t_n%			
		25%	50%	75%	100%
P ≤ 1.5 kW	VFD	0.2	0.2	0.3	0.3
	VI or VFI	0	0.3	0.4	0.3
1.5 kW < P ≤ 10 kW	VFD, VI or VFI	0	0.3	0.4	0.3
P > 10 kW	VFD, VI or VFI	0.25	0.5	0.25	0

2. **The efficiency requirements are still too high for VFD and VI UPSs ≤ 1500W**
   - VFD and VI UPSs rated ≤ 1.5kW need more margin (at least 0.5%) to cover unit to unit variations and test site to site variations.
   - As we've indicated in prior correspondence, 120V UPSs are inherently less efficient than higher voltage UPSs and smaller UPSs are inherently less efficient that larger UPSs. Rather than complicating the specification with different requirements for each voltage and additional size bins below 1500W, we suggest the following changes to Table 2:

Output Power	Input Dependency		
	VFD	VI	VFI
P ≤ 1.5 kW	0.965	0.96	$0.0099 \times \ln(P) + 0.805$
1.5 kW < P ≤ 10 kW	0.97	0.96	
P > 10 kW	0.97	0.95	

3. **Multiple-normal-mode UPSs that could qualify as single-normal-mode UPSs when operating in their lowest input dependency mode should not have to ship in their highest input dependency mode**
   Only UPSs that qualify because of Equation 2 should have to ship in their highest input dependency mode.

- For example, a multiple-normal-mode UPS with VFI performance sufficient to qualify by Equation 1, should have to test and report both VFI and VFD performance, but should not have to ship in VFD mode.
- All supported normal modes should be listed on PPDS, including modes not tested.
- Efficiency at each load step, for every tested normal mode, should appear on the PPDS.
- If this change is not accepted, some vendors may remove high efficiency normal modes rather than put their customers' business critical systems at risk, due to unintentional operation in a higher input dependency mode.

4. **Manufacturers should be allowed to define the minimum and maximum system configurations for modular UPSs**
    - Manufacturers shouldn't have to test configurations they don't sell (small configurations tend not to be cost effective, hence they aren't sold).
    - Because VFI requirements increase with system capacity, it's possible that smaller configurations would pass while larger ones would not.
    - Modular VFD and VI products could span Table 2 requirements boundaries, creating situations where larger configurations would pass while smaller ones would not.
    - It is unreasonable to disqualify an entire product family because some members don't qualify.
    - While we appreciate EPA's desire to ensure that a product with an ENERGY STAR label will be compliant in every configuration, this requirement isn't imposed on other IT devices and even if was retained for UPSs, it wouldn't ensure compliance.
        - A UPS could qualify at a given voltage and then be operated at another voltage which doesn't deliver a qualifying level of efficiency
        - A multiple-normal-mode UPS could have its high efficiency normal mode disabled, resulting in a non-qualifying level of efficiency
    - If this requirement is retained, it could force manufacturers to reconfigure their chassis and/or their firmware to prevent non-compliant configurations from operating.
        - Perhaps an electronic ENERGY STAR logo that appears on the display only when the configuration is compliant is an answer.

5. **Power Factor requirements should be clarified**
    - We suggest the following requirement: Input power factor with 100% resistive load shall be greater than or equal to 0.90 in every tested normal mode.
    - To prevent confusion with displacement power factor, the definition of power factor from IEC 62040-3 (i.e. |P| / S) should be included in the specification.

6. **Metering Credits should be extended**
    - We support the 2% metering credit for UPSs rated > 10 kW
    - Because metering is useful to operators of UPSs of all sizes, we suggest a 1% metering credit for UPSs rated ≤ 10 kW as shown in this revised version of Table 3:

Output Power	Input Dependency		
	VFD	VI	VFI
P ≤ 1.5 kW	0.955	0.95	$0.0099 \times \ln(P) + 0.795$
1.5 kW < P ≤ 10 kW	0.96	0.95	
P > 10 kW	0.95	0.93	$0.0099 \times \ln(P) + 0.785$

7. **Metering requirements should be clarified**
    - Many stakeholders mistakenly believe that the purpose of metering is to report UPS efficiency in real time whereas the true purpose is to report output energy to facilitate calculation of PUE and reduction of energy consumed by the IT load.
    - We therefore suggest that the specification be clarified to indicate that metering of the UPS's output energy, in all non-failure modes where the UPS is supplying power to the load (e.g. normal, bypass and stored energy modes), is required to qualify for the credit.
    - We further suggest that it be explicitly stated that metering of the UPS's input(s) is not required.
    - We recommend an energy metering accuracy of ± 5% of the maximum system rating at loads above 10%.
    - We also recommend that UPS rated > 10 kW must locally display output energy and communicate it via at least one of the following methods:
        - Modbus RTU
        - Modbus TCP
        - SNMP (v1, 2 or 3)
    - For UPSs rated ≤ 10 kW, we recommend that either a local display or a software based interface be acceptable to earn the credit.
    - Due to the variability of installation when the energy meter is not an integral part of the UPS, we recommend that only the meter itself must be supplied to earn the credit (i.e. voltage and current transducers and other accessories are not required to be supplied with the UPS).
    - We recommend that all metering related capabilities and accuracies be documented on the PPDS (e.g. parameters measured along with their related accuracies, display and communications capabilities, etc.)

8. **The proposed test method appears to be a workable compromise**
    - While the proposed ENERGY STAR procedure isn't identical to IEC 62040-3 Ed. 2 Annex J, it should still be possible to measure and collect data in accordance with both specifications during a single test run. However, due to procedural differences, a small possibility of differing results remains.
    - To ensure repeatability by third parties, we strongly recommend that the battery part number(s) and quantities, along with their connection status during testing should be documented on the PPDS.
    - Given the volume of information necessary to accurately reproduce these measurements, we recommend that vendors be allowed to provide guidance on how to perform testing on particular UPS models in publically available documents other than the user manuals. Ideally we would be able to provide links to such documents on the PPDS.
    - When certain UPS settings are determined by the user at initial startup (i.e. they don't have default values), we recommend that test procedure allow selection of the most efficient choices when configuring a unit for test and that these choices be recorded in the vendor supplied test guidance document and/or the PPDS.
    - When a UPS is tested with its energy storage device (e.g. battery) disconnected, we recommend that procedure explicitly allow all necessary actions to suppress related alarms, indications and fault detection mechanisms that result, provided that the controls necessary to do so are natively present on the UPSs itself (i.e. no special software or tools are necessary). These actions would also be recorded in the vendor supplied test guidance document and/or the PPDS.
    - Average power measurement should be defined in step 5A:
        - P_{avg} = Energy / Time
        - The energy integration rate/interval should be specified
    - Efficiency calculation method should be defined in step 5B:
        - Efficiency = Output Average Power / Input Average Power

9. **We believe that further work on the data reporting forms and PPDS is required**
   These documents should continue to evolve until a few products are piloted through the CB test and submittal processes and EPA's proposed electronic comparison tool is at least prototyped.

Conclusion

Thank you again for allowing APC by Schneider Electric to provide input into the ENERGY STAR UPS specification. We look forward to continuing to working closely with EPA on this important work.

Please contact Jim Spitaels via email at jspitael@apcc.com with any questions or concerns you may have regarding these comments or any of our earlier presentations or correspondence.