

Energy Star Uninterruptible Power Supply Specification Framework (Feedback)

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Topics:

1. Definitions of UPS
2. Classification of UPS
3. Modular UPS Units Concern
4. Longevity of Key Components
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Topic 1 – Definitions of UPS

The NFPA 70B Recommended Practice for Electrical Equipment Maintenance 2006 is the baseline for UPS supplemental to the NEC 2008, (NFPA 70: National Electric Code International Electrical Code Series). Chapter 25 Uninterruptible Power Supply (UPS) Systems commencing page 87 defines and gives testing requirements.

Department of Energy, Berkeley Labs provided a report on December 2005 called “High Performance Buildings: Data Centers Uninterruptible Power Supplies (UPS).” This document can be located at http://hightech.lbl.gov/documents/UPS/Final_UPS_Report.pdf and within this report gives an overview & assessment of the various UPS Topologies. The crux of this report is to provide UPS efficiency results from their testing. They provide proposed efficiency specifications and labeling requirements commencing on page 33.

Department of the Army on December 26, 2007, released the Technical Manual 5-693 “Uninterruptible Power Supply System Selection, Installation, and Maintenance for Command, Control, Communications, Computer, Intelligence, Surveillance, and Reconnaissance (C4ISR) Facilities.” This document can be located at http://www.army.mil/usapa/eng/DR_pubs/dr_a/pdf/tm5_693.pdf and it contains a clear explanation and definition of the entire UPS system & operation.

Topic 2 – Classification of UPS

The Energy Star framework for Uninterruptible Power Supply has to have a clear separation and distinction in classification of UPS units. This is because the purchase of large UPS systems is an infrastructure purchase with a life expectancy of greater than 12 years. There should be at a minimum 3 classifications:

Classification 1: UPS rated 20 KVA or less

Classification 2: UPS rated 21 to 160 KVA

Classification 3: UPS rated >161 or Multi-Module

These three classifications enable a separation between home and commercial use. Classification 1 will incorporate all home use and desktop UPS systems that are considered short-term units that are expected to be replaced within 5 to 6 years. Classification 2 and 3 will focus on the large infrastructure

purchases that have a long-term life expectancy of 12 to 25 years. These particular units have components that require replacements due to age in order to maintain operations and efficiencies. Classification 3 incorporates Multi-Module systems because of load sharing and its required distinction.

Topic 3 – Modular UPS Concerns

There is a tie between Modular UPS units and Proprietary Software. Modular UPS units are software driven and when there are failures they can be catastrophic requiring the replacement of multiple components and the use of the associated Proprietary Software. Per the Framework Conference Call Energy Star labeling will require that there is no Proprietary Software. This will eliminate the need for an Energy Star certification.

Topic 4 - Longevity of Key Components

UPS units that are an infrastructure purchase require key components to be replaced. If these components are not replaced the units do not operate in an efficient manner and can potentially fail. There has been a recent change in the industry by the manufactures that the longevity of key components has been reduced. The internal components of concern are the Capacitors and Fans which generally should be replaced every 5 to 6 years. This would mean during the life of UPS unit there are at a minimum of two replacement cycles. These should be taken into consideration of the total cost of ownership.

An example of this can be found with the Liebert brand UPS units. At the Emerson Network Power White Papers <http://www.emersonnetworkpower-partner.com/consultant-zone-white-papers/default.aspx> in the Power Section there is a document called “Longevity of Key Components in Uninterruptible Power Systems.” This document lays out the specific timeframes for Key Components so that the UPS units will maintain efficient and reliable operations.

Topic 5 - Energy Start Re-Certification Requirement

Topic 5 is tied to Topic 2 & 4. UPS units that are long-term infrastructure purchases require Energy Star re-certifications otherwise the operational efficiencies will be degraded overtime if the UPS units are not properly maintained. Re-Certification requires that the Key Components have been properly replacement and the UPS unit is being utilized in an energy efficient manner with its loading. Re-certification should be required every 6 years from the date of the start-up of the unit.

Topic 6 - Reactive Loading Concerns of Efficiency Erosion (Pf Cost)

Reactive Load concerns are a silent and majorly unknown culprit in efficiency and power losses. This is something that needs to be noted in the Energy Star of Uninterruptable Power Supply Specification so that owners can understand how efficiencies are impacted.

Reactive loading impacts the UPS unit on its input and output. It makes the UPS unit less efficient and reduces the life of the UPS unit and its Key Components. This increases costs and energy usage.

The Department of Energy discusses this in “Reducing Power Factor Cost” which can be located at <http://www1.eere.energy.gov/industry/bestpractices/pdfs/mc60405.pdf>

In Topic 1, the Department of Energy Berkeley Labs and Department of the Army discuss Reactive Loading starting page 17 and 2-25 respectively.

The Australian Government Department of Defence has created requirements for Uninterruptible Power Systems which can be located at <http://www.defence.gov.au/im/policy/technical/ups/ups.pdf> and commencing on page 36 Reactive Loading and Harmonics are discussed.

NFPA 70: National Electrical Code 2008 discusses reactive loading with Voltage Drop. This is discussed in Article 210 Branch Circuits Fine Print Note No. 4 & Article 215 Feeders Fine Print Note No. 2 and Chapter 9 Table 9 Alternating-Current Resistance and Reactance for 600 Volt Cables, 3-Phase, 75 C (167 F) – Three Single Conductors in Conduit.

The key item for this Topic is NFPA 70B Recommended Practice for Electrical Maintenance 2006 Edition Chapter 26 System Studies. 26.4 Load-Flow Studies (page 91) should be a part of Topic 5. In order for a UPS unit to obtain re-certification of Energy Star requires a system load study to be completed and all sections of 26.4 completed.

Topic 7 - Building Block Responses

Building Block #1

Question 1: See Topic 1

Question 2A: Topic 1

Question 2B: There should be an additional state of “Maintenance Bypass State.”

Question 3: The Eaton Powerware “Advance Battery Management” charging system may want to be evaluated to see how it fits into this “eco-mode” strategy.

Question 4A: Department of Energy, Berkeley Labs provided a report on December 2005 called “High Performance Buildings: Data Centers Uninterruptible Power Supplies (UPS).”

Question 4B: Department of Energy, Berkeley Labs provided a report on December 2005 called “High Performance Buildings: Data Centers Uninterruptible Power Supplies (UPS).”

Question 5A: NFPA 70B and IEEE Std 446

Question 5B: Department of Energy, Berkeley Labs provided a report on December 2005 called “High Performance Buildings: Data Centers Uninterruptible Power Supplies (UPS).”

Question 6: The method that must be utilized is the tracking, documentation, and the ability to audit battery recycling to an EPA approved smelter.

Building Block #2

Question 1A: Topic 2

Question 1B: Department of Energy, Berkeley Labs provided a report on December 2005 called “High Performance Buildings: Data Centers Uninterruptible Power Supplies (UPS).”

Question 2: Topic 2, Classification # 2 & 3

Question 3: The direction of the OEM moving towards UPS inputs that do not require an input transformer.

Building Block #3

Question 1A: Normal & Stored Energy

Question 1B: Normal & Stored Energy

Question 2: Department of Energy, Berkeley Labs provided a report on December 2005 called “High Performance Buildings: Data Centers Uninterruptible Power Supplies (UPS).”

Question 3: Department of Energy, Berkeley Labs provided a report on December 2005 called “High Performance Buildings: Data Centers Uninterruptible Power Supplies (UPS).”

Question 4: This is difficult because of the proprietary software.

Question 5: Yes, Topic 5 & 6

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Question 6A: The addition of NFPA 70B is needed

Question 6B: Same as 6A

Question 7A: Department of Energy, Berkeley Labs provided a report on December 2005 called "High Performance Buildings: Data Centers Uninterruptible Power Supplies (UPS)."

Question 7B: Yes, multi-module UPS units may have system control cabinets and there are options like input filters that can be added

Question 8A: VARs play a major role.

Question 8B: VARs have a great impact on system efficiency based on the product and options that they sell.

Building Block #4

Question 1A: None

Question 1B: None, something that needs to be added is the life expectancy of the unit and Topic 4 & 5

Question 2A: Topic 6

Question 2B: This is just starting to happen because a potential connection with Topic 4.

Question 3: Topic 2, 4, & 6

Question 4: This is dependent on the OEM and if they have proprietary software.

Question 5A: Currently this is by KVA and does not take into account Topic 6.

Question 5B: Topic 6 looking at the KVA, Pf, KW, and Load Flow Study Requirements.