

# IEEE P650 Status



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# Purpose of Standard IEEE 650

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- ∞ To qualify inverters, battery chargers and ancillary equipment to meet the requirements for 1-E equipment.
- ∞ It is specific to mild environments outside of the containment.
- ∞ Addresses potential electrical, mechanical and environmental extremes.
- ∞ To prove that the battery chargers and inverters perform their safety function under specified service conditions.



# Major changes to existing std.

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The updates are not considered a change in direction, they are to be considered adjustments, to align to industry needs and parent standard updates.



# **Change to Document Title**

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**Standard for Qualification of Class 1E Static  
Battery Chargers, Inverters and  
Uninterruptible Power  
Supply (UPS) Systems for Nuclear Power  
Generating Stations**



# Change to Scope Statement

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**This standard describes methods for qualifying, static battery chargers, inverters and uninterruptible power supply (UPS) systems for Class 1E installations outside containment in nuclear power generating stations.**



# References

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- ⌚ All references to be updated to latest revisions.
- ⌚ Several new references will be added.



# Add Section 3.10

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- ⌚ **3.10 Uninterruptible Power Supply (UPS):** a system designed to provide power automatically, without delay or transients during any period when the normal power supply is incapable of performing acceptably [IEEE Standards Dictionary]. The UPS may consist of and not limited to the following modules/sections:



## Add Section 3.10 (continued)

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- ∞ **Inverter**
- ∞ **Battery charger**
- ∞ **Rectifier**
- ∞ **Static transfer switch**
- ∞ **Maintenance bypass switch**
- ∞ **Battery power source**
- ∞ **Line regulating transformer**





## Environment (4.3)

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- ⌚ Need to consider additional EMI/RFI relaxation limits for voltages above (400 v) those addressed in MIL 461 and high power equipment.



# Figure 1

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Ω Will be updated to cover new items and changes within the body of the standard



# ADD Section 5.1.?

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Add section requiring Digital Computers (micro's, FPGA's and programmable devices) Qualification and Software Analysis

Hardware Qualification to IEEE 7-4.3.2

“Software Verification and Validation shall be performed as defined in IEEE 1012

# ADD Section 5.3.1.?

## Transient Test

- ⌚ The equipment shall be subject to a transient test on the AC input lines. The test shall incorporate a transient to verify that the critical loads are not affected by a disturbance on the input AC lines
- ⌚ If the equipment design is such that a suspend operations is encountered, the equipment must restart and resume normal operation without intervention



# Transient test Cont.

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- ⌚ The transient shall be in accordance with figure X and the levels presented are to be considered minimum levels for the test
- ⌚ For high kva rated equipment where a variable input source is not attainable, the test may be performed on a identical design system of lower kva rating to verify functional compatibility



# Addition of Annex G

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- ⌚ Considering adding an informative annex on power quality and reliability



# Plans for completion

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- ∩ Present to SC-2 at 15-2
- ∩ Incorporate SC-2 Comments
- ∩ Final Presentation and Review at SC-2 16-1 Meeting
- ∩ Present to NPEC at 16-2
- ∩ Submit for Ballot upon Approval from NPEC