

IEEE P60780-323 Nuclear Facilities - Electrical Equipment Important To Safety - Qualification SC-2 Review

SC-2 Meeting October 27, 2014
Robert Konnik

Schedule

- Passed NPEC Vote With Comments
- MEC Has Been Completed
- Ballot Pool Being Formed (Started 1st Week in October): Should Be Complete Beginning of Nov
- IEEE Ballot Shortly Thereafter
- First Round Expected To Complete in December
- IEC Will Start Ballot in January 2015
- Reconcile Comments Mid April 2015 With JPT
- End Of May Decide if Need JPT Meeting

Schedule

- IEC Final Version Mid July
- Ballot Final IEC Version & Re-ballot IEEE
- Reconcile As Needed & Re-ballot
- Hopeful For Mid Year Completion
- Start Work on White Paper
- Start Discussion on New Items For Revision
- Standard Should Be Published By 2016
- PAR For Revision About Mid 2016

NPEC Comments

- The Following Are The Changes From The NPEC Meeting:

Equipment Important To Safety

- Present definition of equipment important to safety:
- **3.12**
- **equipment important to safety:**
- equipment that is part of a safety group and/or whose malfunction or failure could lead to undue radiation exposure of the site personnel or members of the public. Equipment including:
 - ☐ Those structures, systems and components that prevent anticipated operational occurrences from leading to accident conditions;
 - ☐ Those features that are provided to mitigate the consequences of malfunction or failure of structures, systems and components.
- [IAEA Safety Glossary, 2007]
- NOTE 1 – For usage consistent with IEC 61226, equipment important to safety are:
 - ☐ all I&C equipment performing Cat A to Cat C functions (in accordance with the IEC 61226 categorisation scheme),
 - ☐ all electrical equipment needed to ensure emergency energy supply to this equipment in case of a loss of normal power supply,
 - ☐ all electrical equipment needed to ensure ultimate energy supply in case of total loss of on-site power (if selected as beyond design basis accident to be mitigated).
- NOTE 2 – For usage consistent with USCFR, qualification is essential to the following for equipment important to safety:
 - 1. Equipment required during and following design basis events to ensure:
 - ☐ The integrity of the reactor coolant pressure boundary;
 - ☐ The capability to shut down the reactor and maintain it in a safe shutdown condition by ensuring residual heat removal;
 - ☐ The capability to prevent or mitigate the radiological consequences of accidents.
 - 2. Post-accident monitoring that affirms core sub-criticality, core cooling with respect to limit of load on cooling circuits and containment integrity (both in reactor and fuel pool building).
 - 3. Other systems that could fail to prevent safety function or confuse the operator

IEC Definition

- **3.12**
- **equipment important to safety:**
- equipment that is part of a safety group and/or whose malfunction or failure could lead to undue radiation exposure of the site personnel or members of the public. Equipment including:
 - ☐ Those structures, systems and components that prevent anticipated operational occurrences from leading to accident conditions;
 - ☐ Those features that are provided to mitigate the consequences of malfunction or failure of structures, systems and components.
- [IAEA Safety Glossary, 2007]
- For usage consistent with IEC 61226, equipment important to safety are:
 - ☐ all I&C equipment performing Cat A to Cat C functions (in accordance with the IEC 61226 categorisation scheme),
 - ☐ all electrical equipment needed to ensure emergency energy supply to this equipment in case of a loss of normal power supply,
 - ☐ all electrical equipment needed to ensure ultimate energy supply in case of total loss of on-site power (if selected as beyond design basis accident to be mitigated).

IEEE Definition

- **3.13**
- **equipment important to safety:**
- for usage consistent with other IEEE documents and a Class 1E categorisation, qualification is essential to the following for equipment important to safety:
 - ☐ The safety classification of the electric equipment and systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal, or are otherwise essential in preventing significant release of radioactive material to the environment.
 - ☐ Note: Users of this standard are advised that Class 1E is a functional term. Equipment and systems are to be classified Class 1E only if they fulfill the functions listed in the definition. Identification of systems or equipment as Class 1E based on anything other than their function is an improper use of the term and should be avoided.

Editorial

- Introduction: The documentation **and test** requirements are, however, more rigorous for equipment located in a harsh environment.
-
- Response: The introduction is not part of the standard. Agree to add “and test” as shown above.

Editorial

- Introduction C) For equipment ~~expected to undertake and manage~~ **relied upon for** design extension conditions, including severe accident conditions, this international standard shall be used by defining new DBE profile covering these scenarios. Conservatism taken into account to define this severe accident profile should nevertheless be adapted.
-
- Response: The introduction is not part of the standard. Agree to delete “expected to undertake and manage” and add “relied upon for” as shown above

Design Extension Condition

- In 3.9: Design extension condition should include severe accident conditions. Remove – could.
-
- Response: This is from IAEA SSR-2/1, This would require that design extension conditions be included. Suggested change is shown below. Note, also need to delete IAEA reference if change definition.
-
- design extension conditions
- accident conditions that are not considered for design basis accidents, but that are considered in the design process of the facility in accordance with best estimate methodology, and for which releases of radioactive material are kept within acceptable limits. Design extension conditions ~~could~~ include severe accident conditions.
- ~~[IAEA No. SSR-2/1, 2012]~~

Qualified Condition

- In 3.19: add “This could include certain post accident cooling and monitoring system that are expected to remain operational)”.
-
-
- ~~[IEEE 100]~~
-
- Response: Although I do not disagree with the above comment, I suggest leaving the definition alone since it is the same wording as in the 2003 edition. Proposed to change section 5.2 to add above words but agreed to change definition as follows:
-
- qualified condition
- the condition of equipment, prior to the start of a design basis event, for which the equipment was demonstrated to meet the design requirements for the specified service conditions. **This could include certain post accident cooling and monitoring system that are expected to remain operational.**

Design Extension Condition

- In 5.1: remove "that are not redundant", sentence needs work. DEC condition needs to have demonstrated evidence to function under applicable service conditions.
-
- Response: Propose to change as follows: For equipment, needed to cope with design extension conditions ~~that are not redundant, it has to be demonstrated that~~ **this** equipment installed and thus aged within the plant **shall have demonstrated evidence to be** ~~is~~ able to perform required function(s) under applicable service conditions, including design extension conditions.

Mounting

- In 6.1.1: Leave in mounting: mounting is needed eg If you mount MOV with motor downwards it has problem in LOCA. How you mount is important See 7.4.1.
-
- Response: Definition of interfaces includes mounting. Since this was missed at least two time it is suggest to leaving this in:
-
- The equipment is subsequently subjected to DBE testing that simulates and thereby establishes the tested configuration for installed equipment service, including **mounting**, orientation, interfaces, conduit sealing, and expected environments.

Operating Experience

- In 6.1.2: Modify - when qualification for mild environment is required. We do not have information from TMI or Fukushima to establish qualification for Harsh environment.
-
- Response: Suggest change to - **When qualification for mild environment is required** Performance data from equipment of similar design that has successfully operated under known service conditions may be used in qualifying other equipment to equal or less severe conditions.

Editorial

- In 6.3: add s after standard since more plural.
-
- Response: Change as follows:
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- NOTE: Methods for condition monitoring of electrical equipment important to safety in nuclear power plants are available in the IEC/IEEE 62582 series of standards.

Design Extension Conditions

- In 7.2.6.3: Remove the second sentence, Add the following: For such equipment a plant specific severe accident profile may be used of component specific qualification requirements. Remove this sentence: Design bases and DEC should be periodically reassessed in response events in region, shared international experience or finding.
-
- Response: Change to read as follows:
- Some equipment needs to be qualified for conditions that are beyond design basis of the plant (e.g., extended station black out, extreme natural hazards, and severe accident). ~~In the case where these situations are considered, they shall be taken into account to define accident conditions and test profile(s) used in initial qualification.~~ **For such equipment a plant specific severe accident profile may be used for component specific qualification requirements.** The list of these situations should be reassessed taking into account experience gained from plant design changes, changes in regulation, external events and plant events both regionally and internationally. **Design bases and design extension conditions should be periodically reassessed in response to events in the region, shared international experience or other findings.**

Corrosion

- In 7.3.3: remove corrosion, EQ testing proves adequacy of mechanical components. eg MOVs.
-
- Response: Change corrosion to oxidation that was originally in this sentence: Examples of significant ageing mechanisms include mechanical wear, ~~corrosion~~**oxidation** and degradation of material properties.

Natural Aging

- In 7.4.1.9.1: for equipment in the mild environment applications
-
- Response: Suggest change to - **For equipment in the mild environment applications**
nNatural ageing may be supplemented by analysis or age conditioning, or both, to account for differences between the specified service and the natural ageing conditions to justify the qualified life of the sample.

Accident Conditions Test

- In 7.4.1.10: Double peak was to address BWR- MSLB and LOCA for all plants. BWRs will have a high temperature rise quickly for the first peak, second peak is for LOCA. Suggest the following: The equipment have to be subjected to a profile that envelopes plant specific design bases for LOCA and MSLB as applicable. An alternate accident profile would be needed for qualification under DEC.
-
- Response: Suggest add: Test under accident conditions shall be performed on aged test sample(s) as applicable.
Equipment shall be subjected to a profile that envelopes plant specific or generic design bases for LOCA, HELB and MSLB as applicable. An alternate accident profile may be required for qualification under design extension conditions.

Inspection

- In 7.4.1.12: verification of performance condition.
-
- Response: Suggest to change as follows: Upon completion of type testing, the equipment shall be visually inspected, including those from disassembly when required, and a description of its physical **condition** and **verification of performance condition** shall be included in the qualification documentation.

Documentation

- In 7 Identification of the test sequence **and justification of the conservatism for the selected sequence in lieu of the concurrent thermal and radiation aging,**
-
- Response: Suggest change as follows: g)
Identification of the test sequence **and justification of the conservatism for the selected sequence in lieu of the concurrent thermal and radiation aging,**

MEC

- Mandatory Comment to Add IEEE Copyright Information
- Copyright © 2014 IEEE. All rights reserved. This is an unapproved IEEE Standards Draft, subject to change.

Legal: “Absolute” verbiage

- Please review the text for any explicit or implicit guarantees made within the document, especially those that are safety-related. Avoid making guarantees if there is a possibility of unforeseen situations or circumstances altering an outcome. For example, words such as “ensure,” “guarantee,” “maximize,” “minimize,” etc., should be modified, if they are inaccurate. Substitutions might include “reduce” or “improve.” For example, “to ensure safety” might be changed to “to improve safety” or “to prevent” might be changed to “to reduce.”

Trademarks or service marks

- Please review the use of trademarks in the draft, if applicable. References to commercial equipment or products in a standard shall be generic and shall not include trademarks or other proprietary designations. Where a sole source exists for essential equipment or materials, it is permissible to supply the name of the trademark owner in a footnote. The proper use guidelines for trademarks shall be determined by the trademark owner. Trademark owners must grant written permission before their trademarks may be referenced in a standard.

Registration objects

- If the draft contains a registration of objects (for additional information, visit the IEEE Standards Web site <<http://standards.ieee.org/regauth/index.html>>), the working group shall submit the document to the IEEE Registration Authority (IEEE-RA) for mandatory coordination (submit to a.n.thomas@ieee.org for review). The text containing the registration information should be highlighted in the draft and the clause should be noted in the email. If the working group believes that the draft may potentially contain a registration of objects or if the working group would like information about setting up a registration, contact the IEEE-RA as early as possible to prevent a delay in approval by the IEEE-SA Standards Board. Search on the following words: object identifier, unique identifier, and assignment of unique numbers.

General

- IEEE 100 is no longer an official publication. Please refer to IEEE Standards Dictionary Online instead. There is no need to list it in the bibliography.
 - Changed Under Definitions & Deleted in Bibliography

General

- I noticed that you referred to a withdrawn standard in the bibliography, IEEE Std 775TM - 1993. Consider removing this document from the bibliography since it is a withdrawn standard and therefore might contain outdated technology.
 - Deleted Since Not Used in Document

General

- Do you need both additions of IEEE Std 7-4.3.2? I noticed you make reference to the 2003 version in text; however, could this be updated to the 2010 version? Is Annex C the same in both publications? If so, update the internal year to 2010 and delete the 2003 version from the bibliography.
 - Left as is since took as Technical not Editorial, But If Someone Thinks Should Change Please Send in a Comment.

General

- In Clause 8, you have two lettered lists. I would avoid using the same lettering style for both list to avoid confusion in cross referencing list items. Perhaps use a dashed list for one of them?
 - Changed Second List To a Dashed List.

Definition

- **3.12**
- **equipment important to safety:**
- equipment that is part of a safety group and/or whose malfunction or failure could lead to undue radiation exposure of the site personnel or members of the public. Equipment including:
 - Those structures, systems and components that prevent anticipated operational occurrences from leading to accident conditions;
 - Those features that are provided to mitigate the consequences of malfunction or failure of structures, systems and components.
- [IAEA Safety Glossary, 2007]

Definition

- (A) For usage consistent with IEC 61226, equipment important to safety are:
 - all I&C equipment performing Cat A to Cat C functions (in accordance with the IEC 61226 categorisation scheme),
 - all electrical equipment needed to ensure emergency energy supply to this equipment in case of a loss of normal power supply,
 - all electrical equipment needed to ensure ultimate energy supply in case of total loss of on-site power (if selected as beyond design basis accident to be mitigated).

Definition

- (B) for usage consistent with other IEEE documents and a Class 1E categorisation, qualification is essential to the following for equipment important to safety:
 - electric equipment and systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal, or
 - electric equipment that are otherwise essential in preventing significant release of radioactive material to the environment.
- Note: Users of this standard are advised that Class 1E is a functional term. Equipment and systems are to be classified Class 1E only if they fulfill the functions listed in the definition. Identification of systems or equipment as Class 1E based on anything other than their function is an improper use of the term and should be avoided.

Definition

- Definition Is Still in Two Parts As Requested by NPEC
- Combining Definition Into One Will Be Taken As A Ballot Comment

QUESTIONS