

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 27-7944

SRP Section: 03.11 - Environmental Qualification of Mechanical and Electrical Equipment

Application Section:

Date of RAI Issued: 06/15/2015

Question No. 03.11-1

In DCD Tier 2, Revision 0, Section 3.11.2 states that, "Environmental qualification of Class 1E equipment is in accordance with the requirements of 10 CFR 50.49, NRC RG 1.89 (Reference 2), and IEEE Std. 323 (Reference 3)." In Section 3.11.8, Reference 3 is given as IEEE Std. 323-2003, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations." DCD, Tier 2, Section 1.9, Table 1.9-1, "APR1400 Conformance with Regulatory Guides," states that, "IEEE Standard 323-2003 is applied instead of IEEE Standard 323-1974 because NRC RG 1.209 endorses the current national qualification standard (IEEE Standard 323-2003)."

The NRC staff has not endorsed IEEE Std. 323-2003 for environmental qualification of Class 1E electrical equipment in the harsh environment, with the exception of safety-related computer based I&C systems located in a mild environment as addressed in RG 1.209, March 2007. RG 1.89, Revision 1, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants," endorses IEEE Std. 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations." The procedures described by IEEE Std. 323-1974 are acceptable to meet the requirements in 10 CFR 50.49, "Environmental qualification of electric equipment important to safety for nuclear power plants," to ensure that the Class 1 equipment can perform its safety functions in harsh environments.

Since IEEE Std. 323-1974 remains the current standard of record and is endorsed by Regulatory Guide 1.89 for environmental qualification, provide the justification why IEEE Std. 323-2003 is acceptable for qualification of Class 1E electrical equipment in the harsh environment. Otherwise, Section 3.11 of the DCD Tier 2, Revision 0 needs to be modified to reflect the change from IEEE Std. 323-2003 to IEEE Std. 323-1974.

Response

KEPCO/KHNP agrees that IEEE Std.323-1974 is still endorsed by Regulatory Guide 1.89, Rev. 1 for environmental qualification. However, SRP 3.11 says in its acceptance criteria that if a referenced standard has not been endorsed by regulatory guide, licensees and applicants may consider and use the information in the referenced standard, if appropriately justified, consistent with current regulatory practice.

Based on the SRP's statement above and through the justification for the use of IEEE Std.323-2003, KEPCO/KHNP determined to apply the 2003 edition of the standard for environmental qualification.

Specifically, the justifications are;

1. Conformance to 10CFR 50.49

NRC states "the procedures described by IEEE Std. 323-1974 are acceptable to meet the requirements in 10CFR 50.49." IEEE Std. 323-2003 also conforms to 10CFR 50.49's requirements. Consequently, the procedures specified in IEEE Std. 323-2003 are considered to be applicable for the implementation of environmental qualification.

2. The qualification requirements

When compared to IEEE Std. 323-1974, IEEE Std. 323-2003 has virtually the same qualification requirements and no technical differences except for several additional issues. Refer to the following Table 1 for the comparison of IEEE Std. 323-1974 and 323-2003. Furthermore, since the additional issues are mainly related to better clarification and supplementation of the qualification, IEEE Std.323-2003 imposes no new critical requirements and its application does not affect environmental qualification.

For example, the additional issues noted in IEEE Std.323-2003 are:

- Condition Monitoring, Qualified Condition and Condition-Based Qualification for user's surveillance & maintenance of operating nuclear power plants
- EMI/RFI and Surges
- Clarification for Test margin
- Clarification for mild environment
- Clarification for the DBE terms

3. Reflection for current practices

IEEE Std. 323-2003 reflects current practices and lessons from the implementation of the previous editions. So, it is desirable that the current edition be applied to the environmental qualification.

Currently most nuclear power plants being constructed are applying IEEE Std.323-2003 as an environmental qualification standard and KEPCO/KHNP has also decided to use this

edition for the APR 1400. Additionally, it is KEPCO/KHNP's position that equipment qualified per IEEE Std.323-2003 is an acceptable alternative to IEEE Std. 323-1974.

	IEEE Std. 323-1974	IEEE Std. 323-2003	Remark
1. General details	<i>There is no mention of Environmental Qualification equipment located in mild environment.</i>	<i>The qualified life of the equipment located in Mild environment. “A qualified life is not required for equipment located in a mild environment and which has no significant aging mechanisms.” - Refer to Sec. 4.1.</i>	<i>- IEEE Std. 323-2003 is also utilized for the qualification of equipment in mild environments. - No impact on environmental qualification</i>
	Documentation <i>Description of the documentation requirement according to Qualification Methods (Type Test, Operating Experience & Analysis)</i>	Documentation <i>Divided documentation requirement into mild and harsh environment, more specific than 1974 Edition, putting emphasis on the equipment located in Harsh environment. - Refer to Sec. 7.0.</i>	<i>- IEEE Std. 323-2003 has more rigorous documentation requirements than 1974 Edition. (Temperature, Pressure, Radiation, Related humidity, Environment of EMI/RFI & Power Surges, Operating cycles, Seismic and DBE test result etc.)</i>
2. Simulated Test Margin	<i>The initial transient and the dwell at peak temperature shall be applied at least twice.</i>	<i>The performance of two transients is no longer recommended. Margins may not be applied to age conditioning. - Refer to Introduction & Sec. 6.3.1.2. & 6.3.1.6.</i>	<i>- Since quantitative margin can be adequately identified by increases in temperature, pressure, radiation, and operating time, the performance of two transients is no longer recommended. - IEEE 323-2003 more clarifies the requirement of the margin.</i>
3. Definition	-	<i>Added terms - Refer to Sec 3.</i>	<i>To define new terms</i>

	IEEE Std. 323-1974	IEEE Std. 323-2003	Remark
4. EMI/RFI & Power Surges	<i>There is no mention about EMI/RFI & Power Surges.</i>	<p><i>Added EMI/RFI and power surge tests as qualification program.</i></p> <p><i>- Refer to Sec. 6.1.5</i></p> <p><i>Test sequence includes EMI/RFI & Power Surges.</i></p> <p><i>Information on susceptibility testing for EMI/RFI and surge voltages is given Annex B of IEEE Std. 603-1998 and Annex C of IEEE Std. 7-4.3.2-2003.</i></p> <p><i>EMI/RFI susceptibility testing may be performed on a separate test specimen.</i></p> <p><i>- Refer to Sec. 6.3.1.7 & Sec.7.2</i></p>	<p><i>- IEEE 323-2003 states that new digital systems and new advanced analog systems may require susceptibility testing for EMI/RFI and power surges, if the environments are significant to the equipment being qualified.</i></p> <p><i>- IEEE 323-2003 reflects current practices.</i></p>
5. Addition of Qualification Methods or changes	There are five types of qualification methods in 1974 Edition. Type Testing, Operating Experience, Analysis, Combined Method and On-Going Qualification.	<p><i>In addition to five types of qualification, Condition-based Qualification and Condition Monitoring as Qualification Method were added.</i></p> <p><i>- Refer to Sec.5.3 and 6.3.6</i></p>	<p>- Condition monitoring is new type of On-going Qualification that can be used in place of a qualified life to determine if qualified equipment is suitable for further service. Also, Condition Based Qualification is one of type tests based on one or more condition indicators of equipment, components and materials.</p> <p>- IEEE 323-2003 adds user's surveillance & maintenance of operating nuclear power plants</p>

[Table 1] Comparison of IEEE Std. 323-1974 and IEEE Std. 323-2003

Impact on DCD

There is no impact on the DCD.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical and Environmental Reports.