

KHNPDCDRAIsPEm Resource

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Sent: Monday, July 27, 2015 9:22 AM
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Cc: Strnisha, James; Clark, Theresa; Betancourt, Luis; Lee, Samuel
Subject: APR1400 Design Certification Application RAI 115-8066 (03.11 - Environmental Qualification of Mechanical and Electrical Equipment)
Attachments: APR1400 DC RAI 115 MEB 8066.pdf; image001.jpg

KHNP

The attachment contains the subject request for additional information (RAI). This RAI was sent to you in draft form. Your licensing review schedule assumes technically correct and complete responses within 30 days of receipt of RAIs. However, KHNP requests, and we grant, the following days to respond to the RAI's questions. We may adjust the schedule accordingly.

03.11-3: 30 days
03.11-4: 90 days
03.11-5: 90 days
03.11-6: 60 days
03.11-7: 90 days
03.11-8: 60 days

Please submit your RAI response to the NRC Document Control Desk.

Thank you,

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REQUEST FOR ADDITIONAL INFORMATION 115-8066

Issue Date: 07/27/2015

Application Title: APR1400 Design Certification Review – 52-046

Operating Company: Korea Hydro & Nuclear Power Co. Ltd.

Docket No. 52-046

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

Application Section:

QUESTIONS

03.11-3

APR1400 DCD Tier 2, Section 3.11.2, "Qualification Tests and Analysis," states at the bottom of p. 3.11-5 that safety-related active mechanical equipment is listed in APR1400 DCD Tier 2, Table 3.11-3, "Equipment Qualification Equipment List." This DCD section also states in a later paragraph (second paragraph on p. 3.11-6) that safety-related mechanical equipment is specified in APR1400 DCD Tier 2, Table 3.11-3. Based on this, it is not clear to the staff whether the scope of mechanical equipment included in the environmental qualification program includes safety-related mechanical equipment or safety-related active mechanical equipment. Therefore, staff has the following questions to support a finding under acceptance criterion 14 of SRP Section 3.11, which relates to the applicant's identification of safety-related mechanical equipment located in harsh environment areas (and, therefore, the need to define the scope of the program).

a) Staff requests the applicant to describe the scope of mechanical equipment listed in APR1400 DCD Tier 2, Table 3.11-3 and Part 1 of Technical Report APR1400-E-X-NR-14001-P, Table 3, "Equipment Qualification Equipment List," and the basis for determining the mechanical equipment included in the environmental qualification program. Also, the applicant is requested to identify any nonsafety related mechanical equipment included in the environmental qualification program.

b) Staff requests the applicant to clarify in the DCD and technical report the environmental qualification methodology for safety-related active mechanical equipment and safety-related mechanical equipment

03.11-4

DCD Tier 2, Section 3.11.1.3, "Equipment Operability Times," identifies the time during which equipment is required to operate in the accident environment as continuous, short-term, intermittent, and varies. These operating times vary from a few seconds to 6 months. DCD Tier 2, Table 3.11-3, "Equipment Qualification Equipment List" and Part 1 of Technical Report APR1400-E-X-NR-14001-P, Table 3, "Equipment Qualification Equipment List" also list the equipment in the environmental qualification program and specify the required operating time as continuous, short-term, intermittent, and varies. Section 4 of Technical Report APR1400-E-X-NR-14001-P states that APR1400 procurement specifications contain the equipment operating times required under accident conditions. To address the acceptance criteria in SRP 3.11 for identification of equipment operating times, the staff requests the applicant to identify the specific operating time for each component in DCD Tier 2, Table 3.11-3 and Technical Report APR1400-E-X-NR-14001-P, Table 3 or to describe provisions for ensuring that the procurement specifications contain the specific equipment operating times.

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03.11-5

APR1400 DCD Tier 2, Section 3.11 and Part 1 of Technical Report APR1400-E-X-NR-14001-P address both active and passive mechanical equipment. Active components are defined in Section 2, "Definitions," of Technical Report APR1400-E-X-NR-14001-P as any component characterized by a change in state, or by mechanical motion, to perform an automatic safety function such as safe shutdown of the reactor, or mitigation of the consequences of a postulated pipe break in the reactor coolant system. For passive components, APR1400 DCD Tier 2, Section 3.11.2.2, "Environmental Qualification during and after a Design Basis Accident," states that passive pressure boundary components inside containment are designed for the appropriate temperature and pressure environment in accordance with the applicable code to which the component is constructed and that environmental qualification testing is not necessary for such components. Staff has the following questions regarding environmental qualification of passive mechanical equipment.

a) The DCD and technical report describe an approach for environmental qualification of nonmetallic parts of active mechanical equipment. However, the applicant does not describe the APR1400 approach for identification or environmental qualification of nonmetallic parts of passive mechanical equipment. The guidance in SRP Section 3.11 speaks to nonmetallic parts of safety-related mechanical equipment without differentiating between active and passive equipment. The applicant is requested to describe in the DCD and technical report the APR1400 approach for identification of nonmetallic parts of mechanical equipment, as well as the environmental qualification or alternate provision to ensure capability of the nonmetallic parts of passive mechanical equipment.

b) The applicant states that passive pressure boundary components inside containment are designed for the appropriate temperature and pressure environment in accordance with the applicable code to which the component is constructed and that environmental qualification testing is not necessary for such components. However, the staff considers that passive ASME Class 1, 2, and 3 pressure boundary mechanical components (as referenced in 10 CFR 50.55a) are not limited to passive components inside containment as stated in DCD Tier 2, Section 3.11.2.2, but should include all passive safety-related pressure boundary mechanical components, as SRP Section 3.11 does not make a distinction between safety-related mechanical equipment inside and outside containment. Therefore, staff requests the applicant to clarify in the DCD the basis for stating that the passive pressure boundary mechanical components that are qualified in accordance with applicable codes are limited to passive components inside containment, but do not include all passive ASME Class 1, 2, and 3 safety-related pressure boundary mechanical components.

03.11-6

Section 3.11.2, "Qualification Tests and Analysis," Section 3.11.3.2, "Mechanical Equipment," and Section 3.11.6, "Qualification of Mechanical Equipment," of APR1400 DCD Tier 2, and Section 5.6, "Qualification of Safety-Related Active Mechanical Equipment," of Part 1 of Technical Report APR1400-E-X-NR-14001-P describe the APR1400 method for environmental qualification of mechanical equipment. These DCD and technical reports sections describe the environmental qualification of mechanical equipment as ASME QME-1-2007 and at other times specify Appendix QR-B, "Guide for Qualification of Non-Metallic Parts," of ASME QME-1-2007. Therefore, the proposed methodology to evaluate the environmental effects on non-metallic components is not clear to the staff. The NRC staff requests that the APR1400 DCD applicant revise these DCD and technical reports sections such that they are consistent with the provisions of ASME QME-1-2007 as accepted by RG 1.100 (Revision 3) and clarify the environmental qualification methodology. The following are examples where clarification of the DCD and technical report sections is requested.

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a) Appendix QR-B of ASME QME-1-2007 describes a methodology for the qualification of nonmetallic parts. ASME-QME-1-2007 describes a methodology for the functional qualification of mechanical equipment that is much broader scope than qualification of nonmetallic parts of mechanical equipment. The applicant is requested to clarify in the DCD and technical report the environmental qualification of mechanical equipment with regard to specifying ASME QME-1-2007 and at other times specifying Appendix QR-B of ASME QME-1-2007.

b) These DCD and technical report sections do not consistently describe the methodology and documentation for environmental qualification of non-metallic parts of mechanical equipment. The staff-approved methodology for the environmental qualification of nonmetallic parts of mechanical equipment is in accordance with Appendix QR-B, "Guide for Qualification of Nonmetallic Parts," of ASME QME-1-2007, as accepted in Revision 3 of RG 1.100 using tests or a combination of tests and analysis. Also, documentation for qualification of non-metallic parts in mechanical equipment should be in accordance with Appendix QR-B of ASME QME-1-2007 and 10 CFR 50, Appendix B. The staff notes that qualification by test or a combination of test and analysis is consistent with ASME QME-1-2007 as accepted by RG 1.100 (Revision 3) and should be consistently applied in the DCD and technical report.

c) These DCD and technical report sections do not clearly describe the method used to demonstrate environmental qualification for nonmetallic parts of mechanical equipment located in a mild environment. It is not clear whether the applicant intends to demonstrate environmental qualification for nonmetallic parts of mechanical equipment located in a mild environment in accordance with Appendix QR-B of ASME QME-1-2007 or an alternate methodology. Therefore, the applicant is requested to describe in the DCD and technical report the method that will be used to demonstrate environmental qualification for nonmetallic parts of mechanical equipment located in mild environment.

d) APR1400 DCD Tier 2, Section 3.11.2, "Qualification Tests and Analysis," and Part 1 of Technical Report APR1400-E-X-NR-14001-P, Section 5.6, "Qualification of Safety-Related Active Mechanical Equipment," state that nonmetallic parts (e.g., seals, gaskets, lubricant) may be changed by the equipment supplier. The staff does not understand the applicant's intent of this statement. The staff requests the applicant to explain the intent of this statement and its implication on the environmental qualification of nonmetallic parts of mechanical equipment.

03.11-7

Maintenance and surveillance programs, in conjunction with preventive maintenance programs, provide assurance that the environmental design and qualification status of mechanical equipment will be maintained during the operational life of the plant. These programs are the responsibility of the COL applicants. APR1400 DCD Tier 2, Section 3.11.2.2, "Environmental Qualification during and after a Design Basis Accident," states that the COL applicant is to address aspects for maintaining the environmental qualification status of components after initial qualification. However, this COL item is not listed in APR1400 DCD Tier 2, Section 3.11.7, "Combined License Information." For completeness and consistency within the DCD, the staff requests the applicant to address this COL item in DCD Tier 2, Section 3.11.7.

In addition, the SRM dated September 11, 2002, for Commission paper SECY-02-0067, "Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) for Operational Programs (Programmatic ITAAC)," stated that ITAAC for an operational program are unnecessary if the program and its implementation are fully described in a COL application and found to be acceptable by the NRC. To facilitate the full description of the environmental qualification program by COL applicants referencing the APR1400 design, the staff suggests that the DCD and technical report be revised to specify that this COL item includes the following aspects for the COL applicant to address development of the operational program to maintain the environmental qualification status of components, consistent with SRP Section 3.11:

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- evaluation of environmental qualification results throughout design life to establish activities that support continued environmental qualification
- determination of surveillance and preventive maintenance activities based on environmental qualification results and operating experience
- consideration of environmental qualification maintenance recommendations from equipment vendors
- evaluation of operating experience in updating surveillance and preventive maintenance activities for specific equipment
- development of plant procedures that specify individual equipment identification, appropriate references, installation requirements, surveillance and maintenance requirements, post-maintenance testing requirements, condition monitoring requirements, replacement part identification, and applicable design changes and modifications
- development of plant procedures for reviewing equipment performance and environmental qualification operational activities, trending the results, and incorporating lessons learned through appropriate modifications to the environmental qualification operational program
- development of plant procedures for the control and maintenance of environmental qualification records

03.11-8

The SRM dated September 11, 2002, for Commission Paper SECY-02-0067, "Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) for Operational Programs (Programmatic ITAAC)," stated that ITAAC for an operational program are unnecessary if the program and its implementation are fully described in a COL application and found to be acceptable by the NRC. In its SRM dated May 14, 2004, for SECY-04-0032, "Programmatic Information Needed for Approval of a Combined License without Inspections, Tests, Analyses and Acceptance Criteria," dated February 26, 2004, the Commission defined "fully described" as when the program is clearly and sufficiently described in terms of the scope and level of detail to allow a reasonable assurance finding of acceptability. However, APR1400 DCD Tier 2, Section 3.11.7 does not include a COL item for the COL applicant to provide a full description of the environmental qualification of mechanical and electrical equipment program. Therefore, the NRC staff requests the APR1400 DCD applicant to include in the DCD a COL item for a full description of the environmental qualification program.

