June 30, 2017

MEMORANDUM TO: Michael D. McCoppin, Chief
Licensing Branch (LB2)
Division of New Reactor Licensing
Office of New Reactors

FROM: Tomeka L. Terry, Project Manager **/RA/**
Licensing Branch (LB2)
Division of New Reactor Licensing
Office of New Reactors

SUBJECT: AUDIT REPORT FOR FOLLOW-UP AUDIT ON DESIGN SPECIFICATIONS AS PART OF THE ADVANCED POWER REACTOR 1400 DESIGN CONTROL DOCUMENT

As part of its review of the design certification application for the Advanced Power Reactor 1400 (APR1400) submitted by Korea Electric Power Corporation (KEPCO and Korea Hydro & Nuclear Power Co., Ltd. (KHNP), the U.S. Nuclear Regulatory Commission (NRC) staff conducted an audit on the electronic reading room at the NRC Headquarters, in Rockville, Maryland, held July 18, 2016 through August 30, 2016. The purpose of the follow-up audit is to verify that design and procurement specifications follow the American Society of Mechanical Engineers Boiler and Pressure Vessel Code and are consistent with the descriptions in the APR1400 design control document (DCD).

The audit plan can be found in the Agencywide Document Access and Management System under Accession No. ML16187A113 dated July 7, 2016. Enclosure 1 is the audit report with the list of attendees and list of audited documents. Enclosure 2 is the Table 1 lists the detailed audit findings and planned resolution on APR1400 DCD.

Docket No: 52-046

Enclosures:
1. Audit Report
2. Audit Observations Table

cc w/encl: See next page

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301-415-1488

SUBJECT: AUDIT REPORT FOR FOLLOW-UP AUDIT ON DESIGN SPECIFICATIONS AS PART OF THE ADVANCED POWER REACTOR 1400 DESIGN CONTROL DOCUMENT DATE: June 30, 2017

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SUMMARY AUDIT REPORT OF APR1400 DESIGN SPECIFICATIONS FOLLOW-UP AUDIT

1.0 BACKGROUND

Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, Section 47, "Contents of applications; technical information," states that:

> The application must contain a level of design information sufficient to enable the Commission to judge the applicant's proposed means of assuring that construction conforms to the design and to reach a final conclusion on all safety questions associated with the design before the certification is granted. The information submitted for a design certification must include performance requirements and design information sufficiently detailed to permit the preparation of acceptance and inspection requirements by the [U. S. Nuclear Regulatory Commission] NRC, and procurement specifications and construction and installation specifications by an applicant. The Commission will require, before design certification, that information normally contained in certain procurement specifications and construction and installation specifications be completed and available for audit if the information is necessary for the Commission to make its safety determination.

In conducting the review of the APR1400 design certification (DC) application, the U.S. Nuclear Regulatory Commission (NRC) staff requested that the applicant make available the design and procurement specifications, as well as design documentation of equipment seismic qualification and component quality group classification (e.g., piping and instrumentation diagrams and equipment classification documents) for the NRC staff to confirm the implementation of the provisions in the APR1400 design control document (DCD) for the design and qualification of these components.

During August 24 through 27, 2015, staff members from the Mechanical Engineering Branch of the Division of Engineering, Infrastructure, and Advanced Reactors in the NRC Office of New Reactors conducted a regulatory audit of APR1400 design and procurement specifications for American Society of Mechanical Engineers (ASME) *Boiler & Pressure Vessel Code* (BPV Code) components, including valves, pumps, component supports, dynamic restraints, equipment seismic qualifications, and component classifications. Based on this audit, the NRC staff had audit findings that are listed in the Summary Audit Report of APR1400 Design Specifications dated April 20, 2016 (ML15350A057). Subsequently, the NRC staff performed a follow-up audit in 2016 to confirm that the August 2015 audit findings were incorporated into the APR1400 design documents.

During this follow-up audit, the NRC staff reviewed the changes of individual design and procurement specifications for ASME BPV Code components, including valves, pumps, component supports, dynamic restraints, equipment seismic qualifications and component classifications. These changes and their resolutions are listed in Table 1 of this audit report.

NRC Audit Team:

Tuan D. Le, Mechanical Engineer, Audit Lead
Thomas G. Scarbrough, Sr. Mechanical Engineer
Yuken Wong, Sr. Mechanical Engineer
James M. Strnisha, Mechanical Engineer
Nicholas J. Hansing, Mechanical Engineer
John A. Vera, Project Manager

2.0 AUDIT RESULTS

During this follow-up audit, the NRC staff found that the design and procurement specifications incorporated the marked-up changes for the design and procurement specifications that were identified in the findings of the August 2015 audit report (ML15350A057). However, the NRC staff identified additional changes to the design and procurement specifications as well as changes to the APR1400 DCD that are necessary for the NRC staff to reach its safety finding on the adequacy of the APR1400 design and procurement specifications in support of the APR1400 DC review.

As a result of this follow-up audit, the NRC staff will prepare a request for additional information (RAI) to request that KHNP notify the NRC of the specific changes planned to the APR1400 DCD, and submit a letter to confirm that the document changes are completed and signed by a Professional Engineer (PE). Following the response by KHNP to the planned RAI, the staff will confirm that the changes are incorporated into the APR1400 design and procurement specifications, and in the next revision of the APR1400 DCD.

The attached Table 1 of this report lists the detailed audit findings and planned resolution by the APR1400 DC applicant.

DOCUMENTS REVIEWED

- Design Specification 9-431-Z-S-404-C0, “Design Specification for the Integrated Head Assembly,” Revision 02, dated 05-15-2015

- Design Specification 9-431-Z-S-404-10, “Design Specification for Reactor Vessel Assembly,” Revision 03, dated 05-26-2015

- Design Specification 9-431-Z-S-404-30, “Design Specification for RTD Thermowells,” Revision 02, dated 07-29-2015

- Design Specification 9-431-Z-S-404-20, “Design Specification for PR Assembly,” Revision 02, dated 05-29-2015

- Design Specification 9-450-Z-S-404-11, “Design Specification for Pressurizer Pilot Operated Safety Valves,” Revision 02, dated 03-04-2015

- Design Specification 9-431-Z-S-404-91, “Design Specification for Reactor Coolant Pumps,” Revision 02, dated 03-16-2015
- Design Specification 9-431-Z-S-404-40, “Design Specification for Steam Generator,” Revision 03
- Document No. 94/2Z-S-490-20, “Design Data for the Hydraulic Loads on Reactor Internals during Normal Operation,” Revision 01, dated 09-12-2013
- Purchase Specification 9-447-N206, “IRWST Sump Strainers,” Revision 1, dated 08-27-2009
- Purchase Specification 9-135-M231, “Safety Related Strainers,” Revision 01, dated 09-18-2008
- Design Specification 9-441-Z-S-404-32, “Design Specification for Shutdown Cooling Pump Miniflow Heat Exchanger,” Revision 03, dated 02-25-2015
- Design Specification 9-451-Z-S-404-41, “Design Specification for Volume Control Tank”
- Design Specification 9-412-Z-S-404-10, “Design Specification for Reactor Vessel Core Support and Internal Structures,” Revision 02, dated 05-07-2015
- Design Specification 9-410-Z-S-404-11, “Design Specification for Control Element Drive Mechanisms and CEA Extension Shaft,” Revision 03, dated 05-26-2015
- Design Specification 9-159-M273, “Flow Restriction Elements and Venturies,” Revision 2, dated 10-15-2008
- Purchase Specification 9-133-N204, “Safety Related Heat Exchangers,” Revision 2
- Design Specification 9-144-P202A, “Safety Related Shop Fabricated Piping,” Revision 2, dated 10-22-2008
- Design Specification 9-145-P207, “Safety & Non-Safety Related Manual Steel Gate, Globe & Check Valves, 2” and Smaller,” Revision 1, dated 02-27-2008
- Design Specification 9-147-C215A, “Safety Related Shop Fabricated Pipe Supports,” Revision 2, dated 04-11-2008
- Design Specification 1-521-M407-001, “PSDS-Main Steam System,” Revision 0, dates 06-26-2015
- Design Specification 1-037-N407-001, “Piping System Design Specification for General,” Revision 1, dated 12-29-2014
- Design Specification 1-431-N407-001, “Reactor Coolant System (RC),” Revision 0, dated 02-28-2012

- Design Specification 1-441-N407-001, “Safety Injection/Shutdown Cooling System (SI),” Revision 1, dated 12-30-2014

- Design Specification 1-451-N407-001, “Chemical and Volume Control System (CV),” Revision 0, dated 02-28-2012

- Design Specification 9-451-Z-S-404-72, “Design Specification for Letdown Heat Exchanger,” Revision 2, dated 03-02-2015

- Design Specification 9-451-Z-S-404-50, “Design Specification for Orifices,” Revision 1, dated 03-03-2015

- Design Specification 9-431-Z-S-404-80, “Design Spec for Reactor Coolant Pipe and Fittings,” Revision 4, dated 06/17/2015”

- Design Specification 9-728-Z-S-404-22, “Design Specification for Heated Junction Thermocouple Probe Assemblies,” Revision 2, dated 02-25-2015

- Design Specification 9-431-Z-S-404-A1, “Design Specification for Reactor Coolant Pump Supports,” Revision 2, dated 05-19-2015

- Purchase Specification Appendix 4I, “Dynamic Qualification Requirements for Nuclear Safety-Related Equipment,” Revision 2, dated December 2006

- Purchase Specification 9-145-P206C, “Safety Related Controlled Closure Check Valves,” Revision 2, dated 01-24-2008

- Purchase Specification 9-521-M243, “Main Steam Isolation Valves and Main Feedwater Isolation Valves,” Revision 2, dated 07-22-2009

- Design Specification 9-441-Z-S-404-11, ”Design Specification for Safety Injection Pump,” Revision 3, dated 03-02-2015

- Design Specification 9-441-Z-S-404-11, ”Design Specification for Safety Injection Pump,” Revision 4, dated 12-4-2015

- Design Specification 9-450-Z-S-404-11, “Design Specification for Pressurizer Pilot Operated Safety Valves,” Revision 3, dated 02-1-2016

- Design Specification 9-450-Z-S-404-00, “Design Specification for Check Valves Greater than Two Inches,” Revision 5, dated 12-9-2015

- Design Specification 9-450-Z-S-404-14, “Design Specification for Motor Operated Valves,” Revision 4, dated 12-17-2015

- Design Specification 9-450-Z-S-404-13, “Design Specification for Pneumatic Operated Valves,” Revision 4, dated 12-8-2015

- Design Specification 9-450-Z-S-404-16, “Design Specification for Manual Valves,” Revision 5, dated 12-14-2015

- Design Specification 9-450-Z-S-404-19, “Design Specification for Miscellaneous Safety and Relief Valves,” Revision 5, dated 12-14-2015

- Design Specification 9-431-Z-S-404-A2, “Design Specification for Reactor Coolant Pump Hydraulic Snubbers,” Revision 2

- Design Specification 9-431-Z-S-404-62, “Design Specification for Steam Generator Upper Support Snubber,” Revision 2

- Design Specification 9-450-Z-S-404-18, “Design Specification for Solenoid Operated Valves,” Revision 4, dated 12-9-2015

- Purchase Specification 9-194-J237A, “Main Steam Safety Valves,” Revision 2

- Purchase Specification 9-184-J233, “Butterfly Valves for Nuclear Service,” Revision 1

- Purchase Specification 9-184-J237B, “Safety/Relief Valves,” Revision 2

- Purchase Specification 9-542-M206, “Auxiliary Feedwater Pumps and Drivers,” Revision 2

- Purchase Specification 9-442-N203, “Containment Spray Pumps,” Revision 2

- Purchase Specification 9-132-N202, “Safety-Related Centrifugal Pumps,” Revision 2

- Purchase Specification 9-132-N201, “Essential Service Water Pumps and Screen Wash Pumps,” Revision 2

- Purchase Specification 9-145-P206A, “Safety-Related Gate and Globe Valves with Actuator,” Revision 2

- Purchase Specification 9-145-P206D, “Safety and Non-Safety Related Tilting Disc Check Valves,” Revision 2

- Purchase Specification 9-145-P204, “Safety Related Manual Steel Gate, Globe, and Check Valves, 2-1/2” and Larger,” Revision 1

KHNP Quality Assurance Program Description (QAPD) for the APR1400 DC, APR1400-K-Q-TR-11005-NP, Revision 5.

APR1400 DCD Tier 2 Marked-up of APR1400 design spec audit report response update 20160830

3.0 CONCLUSION

Based on this follow-up audit, the NRC staff has the following conclusions:

1) KHNP is developing design and procurement specifications for ASME Class 1, 2, and 3 components, component supports, and core support structures that meet the ASME

BPV Code, Section III, NCA-3250 requirements and are consistent with the methodology and criteria described in the APR1400 DCD Tier 1 and 2.

2) KHNP is developing design and procurement specifications for pumps, valves, and dynamic restraints, and equipment qualification that are consistent with the provisions in the APR1400 DCD Tier 1 and 2.

3) The equipment classifications are consistent with the APR1400 DCD and regulatory guidance.

4) KHNP is developing design and procurement specifications for seismic qualification of mechanical and electrical equipment that meet the provisions in IEEE 344-2004, “IEEE Standard for Seismic Qualification of Equipment for Nuclear Power Generating Stations” and ASME QME-1-2007, “Qualification of Active Mechanical Equipment Used in Nuclear Power Plants,” and are consistent with the methodology and criteria described in the APR1400 DCD Tiers 1 and 2.

In response to an RAI, KHNP will notify the NRC of the planned changes to the APR1400 DCD to address the audit findings, and submit a letter to confirm that the planned changes to the APR1400 design and procurement specifications have been completed and signed by a PE and are available in the electronic reading room for verification by the NRC staff, where appropriate.

Table 1: Audit Observations - ASME Class 1, 2, and 3 Components, Component Supports, and Core Support

Structures on 8/31/2016

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
Document No. 9-441-Z-S-404-11, Design Specification for Safety Injection Pump					
1	Section 4.2.3.1, SI and CS Pump Evaluations," of Technical Report APR1400-E-N-NR-14001-P, "Design Features to Address GSI-191," Rev. 0 dated December 2014 states, "[T]he SI and CS pumps and associated mechanical seals will be qualified to operate with the post-LOCA fluids for at least 30 days, using the qualification guidance of ASME QME-1-2007 endorsed by RG1.100 Revision 3. As part of the qualification process, the pump vendor, at a minimum, will fulfill the following pump criteria." The technical report lists specific test criteria to be performed by the pump vendor. Why doesn't the SI pump design specification list the qualification criteria specified in Section 4.2.3.1 of the technical report?	Strnisha	The pump qualification criteria of Test Report (APR1400-E-N-NR-14001-P, Section 4.2.3.1) are described in the design specification. The criteria for SI pump are described in the following sections: Section 6.2.2 (performance requirements), 6.4.1.9 (mechanical evaluation (vibration)), 6.4.4.2 (mechanical shaft seal assembly), 6.5.2 (pump operability) and 7.1.6 (hydraulic performance).	Specification revised to require qualification by test or a combination of test and analysis in accordance with ASME QME-1 in Section 8.3.7.	**Confirmatory**
2	Section 7.2, "Water Chemistry Requirements," of the SI pump design specification states that, "The pumps shall operate satisfactorily while handling water of dissolved chemistry as shown below. A small percentage of foreign particles may be present in the pumped fluid during long term operation. The limit of foreign particle size is assured by a vertical screen with a 0.090 inch clear opening in the in-containment refueling water storage tank." This section of the specification also describes the suspended solids as "0-2.0 ppm with a particle size < 0.09 inch diameter)." However, this does not appear to be consistent with the post-LOCA fluids constituents as described in Section 4.2.2.4, "Post-LOCA Fluid Constituents," and Table 4.2.5, "Post-LOCA Fluid constituents Downstream of IRWST Sump Strainer,' of Technical Report APR1400-E-N-NR-14001-P. Technical report states the strainer hole size as 0.094 inch and the total post-LOCA debris concentration as 235.6 ppm. Why doesn't the SI pump design specification describe the post-LOCA fluids constituents as specified in technical report?	Strnisha	Document alignment pertaining to the strainer hole size needs to be investigated and an RAI to complete this is requested. Section 7.2 of the SI pump design specification is for ensuring acceptability during normal operating conditions. Design specification (9-441-Z-S-404-11) for the SI pump currently describes several requirements to resolve GSI-191, including: hydraulic performance (Section 7.1.6), mechanical shaft seal assembly (Section 6.4.4.2), and pump mechanical evaluation (vibration) (Section 6.4.1.9). Additional post-LOCA condition requirements for the SI pumps do not appear necessary.	The design specification does not translate SI pump design criteria from Technical Report APR1400-E-N-NR-14001-P. The design specification needs to reference Technical Report APR1400-E-N-NR-14001-P or include applicable design information in the specification as specified in Section 4.2.3.1 of the technical report.	**Open**

3	APR1400 DCD Section 3.11, Environmental Qualification of Mechanical and Electrical Equipment," states the qualification of nonmetallic parts in mechanical equipment such as pumps (including mechanical seals), valves and dynamic restraints is performed by test or a combination of test and analysis in accordance with Appendix QR-B, "Guide for Qualification of Nonmetallic Parts," of ASME QME-1-2007 as accepted by RG 1.100 (Revision 3). Appendix QR-B of ASME QME-1-2007 also includes documentation requirements for the nonmetallics. Why doesn't the SI pump design specification describe the environmental qualification of nonmetallic parts as specified in the APR1400 DCD?	Strnisha	Section 6.5.2 states that the equipment shall be qualified in accordance with ASME QME-1-2007. The requirement will be added as follows; "The nonmetallic parts which are critical in performing the safety function shall be environmentally qualified in accordance with QR-B of ASME QME-1-2007."	Specification revised to state qualification of nonmetallic parts in accordance with Appendix QR-B to ASME QME-1 in Section 6.5.2.	**Confirmatory**
4	Why does Appendix F, "Acceptable Lubricants," in Specification 9-441-Z-S-404-11 list Neolube Number 1 when this lubricant is unacceptable for high temperature applications? This question should apply to all pump, valve, and dynamic restraint specifications.	Strnisha	It will be noted in the design specification Appendix F that Neolube 1260 should be used for high temperature applications.	Specification revised to delete "Neolube Number 1."	**Confirmatory**
5	Safety Injection Pump Data Sheet in Design Specification 9-441-Z-S-404-11 lists the NPSH Available (including bypass) to be 20 feet at runout flow. Table 3.6-1, "$NPSR_r$ for SI pump and CS Pump," of Technical Report APR1400-E-N-NR-14001-P, "Design Features to Address GSI-191," describe provisions for determining uncertainties associated with $NPSH_r$. Do the design and procurement specifications for the SI and CS pumps consider NPSH uncertainties? Are uncertainties associated with $NPSH_r$ considered for all safety-related pumps? Staff Notes: 1. As specified in SECY-11-0014, uncertainties associated with $NPSH_r$ are to be addressed for ECCS pumps in postulated accidents (i.e., SI and CS pumps).	Strnisha		. Section 4.05.9 of Purchase Specification 9-442-N203 for the containment spray pump was revised to address NPSHr (with uncertainty). The Safety Injection Pump Data Sheet in Design Specification 9-441-Z-S-404-11 was revised to specify NPSH (available) of 22 ft. to be consistent with Technical Report APR1400-E-N-NR-14001-P.	**Confirmatory**
6	Section 4.2.3.2.2 "Wear Rate Evaluation for Valves, Orifices and Pipes," of Technical Report APR1400-E-N-NR-14001-P, "Design Features to Address GSI-191, states that, "[T]he wear rate of SI and CSS valves [included in the flowpath during an LBLOCA] will be provided by the vendor. Vendor(s) will also provide tests and/or analyses to support acceptable wear rates of pipes and orifices. The applicable design and procurement specifications do not specify wear rate evaluations by the vendor for SI and CS valves, orifices, and pipes?	Strnisha	Based on telecom dated 10/24/2016, the wear rate evaluation for valves, pipes, and orifices has been performed by KHNP and will not be required by the vendor in the specifications. KHNP will revise Section 4.2.3.2.2 of Technical Report APR1400-E-N-NR-14001-P to address the wear rate for valves, it will not need to be addressed in the	Response acceptable. Need to confirm revision to Section 4.2.3.2.2 of Technical Report APR1400-E-N-NR-14001-P.	**Confirmatory**

			specifications. The wear rate for orifices and pipes is specified in Table 4.2-7 of the technical report.		
7	Section 4.2.3.3.2 “Heat Exchanger Performance and Wear,” of Technical Report APR1400-E-N-NR-14001-P, “Design Features to Address GSI-191, states that the vendor will provide test and/or analysis to confirm that the heat exchanger tube material will not degrade significantly (i.e., “eroded” tube thickness > minimum tube thickness required to retain pressure) in post-LOCA fluid over the 30 day mission time. Do the applicable design and procurement specifications contain the above information for the CS heat exchangers?	Strnisha	The APR1400 procurement specifications of CS Hx. will be prepared at the stage of COL application. The COL applicant is to incorporate the requirements into the procurement specifications for the vendor. Additional Response: Specification of CS HX and CSP MFHX will be revised to include the requirements for wear rate evaluation	Procurement specifications prepared by COL applicant to include requirements for wear rate. The specifications for heat exchangers were not included in the design specification audit scope. .	**Closed**
8	Section 8.3.7 of Design Specification 9-441-Z-S-404-12 for the Shutdown Cooling Pump states that the functional qualification shall be demonstrated in accordance with Reference 3.3.3 (ASME QME-1). However, the staff approved methodology for functional qualification of pumps is by test or a combination of test and analysis in accordance with ASME QME-1. All applicable pump design and procurement specifications should be revised to clarify the functional qualification shall be performed by test or a combination of test and analysis in accordance with ASME QME-1.	Strnisha	The shutdown cooling pump design specification will be revised to clarify functional qualification which is to be demonstrated by test or a combination of test and analysis in accordance with ASME QME-1 in accordance with the NRC comment. Additional Response: DS412, Section 8.3.7 has been updated to specify as follows: “The functional qualification shall be demonstrated by test or a combination of test and analysis in accordance with Reference 3.3.3 (QME-1-2007).	Specification revised in section 8.3.7 to specify functional qualification shall be demonstrated by test or a combination of test and analysis in accordance with Reference 3.3.3 (QME-1-2007).	**Confirmatory**
9	Section 3.2.1 of Design Specification Appendix 4F for the Environmental Qualification Requirements for Nuclear Safety-Related Equipment states the qualification of the equipment shall be achieved by testing, analysis, including similarity or a combination of both. However, the staff approved methodology for environmental qualification of nonmetallic parts of mechanical equipment is by test or a combination of test and analysis. The EQ and other applicable specifications should be revise to clarify that environmental the qualification of nonmetallic parts in mechanical equipment such as pumps (including mechanical seals), valves and	Strnisha	The NSSS safety related equipment shall be qualified in accordance with ASME QME-1-2007. In addition, non-metallic parts are to be qualified in accordance with Appendix QR-B of ASME QME-1-2007 which will be added to the design specification, where applicable.	Specification revised to require Appendix QR-B to ASME QME-1 in Section 6.5.2.	**Confirmatory**

	dynamic restraints is performed by test or a combination of test and analysis in accordance with Appendix QR-B, "Guide for Qualification of Nonmetallic Parts," of ASME QME-1-2007 as accepted by RG 1.100 (Revision 3).				
10	The scope of Design Specification Appendix 4F for the Environmental Qualification Requirements for Nuclear Safety-Related Equipment includes active safety-related mechanical equipment in a harsh environment. However, mechanical equipment located in a mild environment may be subject to severe internal service conditions. What methodology is used to ensure that nonmetallic parts of safety-related mechanical equipment located in a mild environment will perform their safety related function?	Strnisha	The non-metallic parts of NSSS safety related mechanical equipment located in a mild environmental shall be qualified in accordance with ASME QME-1-2007. In addition, non-metallic parts are to be qualified in accordance with Appendix QR-B of ASME QME-1-2007 and will be added to the design specification, where applicable.	Specification revised to require Appendix QR-B to ASME QME-1 in Section 6.5.2.	**Confirmatory**
11	Applicable design and procurement specifications should be revised to incorporate RAI responses and the provisions for design, qualification (functional & environmental) and inservice testing as described in APR1400 DCD sections 3.9.6 and 3.11 and Technical Reports APR1400-E-N-NR-14001-P, "Design Features to Address GSI-191," and APR1400-E-X-NR-14001-P, "Equipment Qualification Program."	Strnisha	Design and procurement specifications will be revised to incorporate RAI response, where applicable.	The design specification provides appropriate requirements.	**Closed**
12	RG 1.100, Revision 3, states that ASME QME-1-2007 is an NRC staff approved methodology for the qualification of pumps and valves, and when a licensee commits to the use of QME-1-2007 (including Appendices) for qualification of pumps, valves, and dynamic restraints, the criteria and procedures become part of the basis for the qualification program. The applicable design and procurement specifications reference RG 1.100, however, based on past experience, vendor qualification programs have not included all testing, inspection and documentation provisions in QME-1-2007. Will the design and procurement specifications include clarification that the criteria and procedures in ASME QME-1-2007 (including Appendices) become part of the basis for the qualification programs?	Strnisha	The functional qualification of pumps, valves, and dynamic restraints will be required in accordance with ASME QME-1. It is believed that this level detail design is within the vendor's scope to determine and in specifying an undesirable details in the specification may cause unnecessary limitations. Additional Response: DS411, Section 3.3.3 has been updated to specify as follows: "ASME QME-1-2007 as accepted in USNRC Regulatory Guide 1.100 (Rev.03), Qualification of Active Mechanical Equipment used in Nuclear Power Plants."	Specification revised to require ASME QME-1 in Section 3.3.3.	**Closed**
13	Section 8.2.10 of Design Specification 9-451-Z-S-404-31 for the centrifugal charging pumps states that test methods, definitions, and	Strnisha	ASME QME-1 describes the requirement and guidelines for	Response acceptable - the pumps do not perform a	**Closed**

	reporting of test results shall be in accordance with references 3.3.6 (IEEE 112-2004), 3.3.8 (NEMA MG-1-2009) and 3.3.13(ANSI/HI) Pump Standards). The specification does not appear to reference ASME QME-1-2007 for functional qualification of the pumps. Is functional qualification of the centrifugal charging pumps performed in accordance with the staff approved methodology in ASME QME-1 2007? If not, explain the qualification methodology that will be used.		qualifying active mechanical equipment. However, the centrifugal charging pumps do not perform a safety function so are not classified as active components according to the definition of active pumps described in APR1400 DCD section 3.9.3.3.1.	safety function. Therefore, QME-1-2007 testing is not required.	
14	All applicable design and procurement specifications for pumps, valves, heat exchangers, EQ, etc., should be reviewed and revised to incorporate comments 1 – 13 above.	Strnisha	All applicable design specifications will be revised to incorporate the applicable comment resolution results of No. 1 to No. 13.	The design specification were revised. Procurement specifications will be revised by the COL applicant as applicable.	**Closed**
15	Section 6.5.2 states that the pump and motor assembly shall be seismically qualified and certified for five (5) of ½ SSE and one (1) SSE in accordance with References 3.3.12 and 3.4.5 (in case of conflict, the most restrictive standard shall be applied). Reference 3.3.3 (ASME QME-1-2007) is for seismic qualification of active mechanical equipment, and should be included in the statement.	Wong	KHNP will include the ASME QME-1 for seismic qualification of active mechanical equipment in the design specification.	Marked up change is acceptable.	**Confirmatory**
16	Section 3.2 does not reference the OM Code. While Section 6.2.1 specifies that periodic testing shall be in accordance with Reference 3.2.2 (ASME BPV Code, Section XI). The OM Code should be referenced for periodic testing.	Scarbrough	KHNP will address the ASME OM for periodic testing of SI pumps in the design specification.	Specification revised in Sections 3.2.4 and 6.2.1 to specify ASME OM Code.	**Confirmatory**
Document No. 9-450-Z-S-404-11, Design Specification for Pressurizer Pilot Operated Safety Relief Valves (POSRVs)					
1	Why does specification not reference NRC Regulatory Guide 1.100 (Revision 3) for the application of ASME Standard QME-1-2007?	Scarbrough	Reference to the RG will be incorporated into the specification.	Specification revised to reference RG 1.100 in Section 3.3.2.	**Confirmatory**
2	Why are IEEE 344 for seismic qualification, and NRC regulatory guides for various IEEE standards, not referenced (such as RG 1.73 for use of IEEE 382-2006 for environmental qualification)?	Scarbrough	IEEE 344 for seismic qualification is referenced in Section 3.1.10 of the Design Specification. The Design Specification will be revised to incorporate NRC Regulatory Guide 1.73 (Revision 1).	Specification revised to reference RG 1.73 in Section 3.3.3.	**Confirmatory**

3	Section 6.4.17.1 states that the safety-related function shall be qualified by “analysis and/or test.” Why does the specification not use the language in Paragraph QV-7100 of ASME QME-1-2007 that Section QV provides for qualification of a valve assembly by a combination of testing and analysis?	Scarbrough	The wording will be revised and incorporated into the specification.	Specification revised to specify combination of testing and analysis in Section 6.4.17.1	**Confirmatory**
4	Section 6.4.20 states that the upper portion of the main valve shall not permit the disc to be mechanically locked in the closed position. Does this mean that the main valve will be designed to open directly from pressurizer pressure without pilot operation?	Scarbrough	No that is not the meaning. The main valve will be designed to open with the pilot operation. The requirement of this section means that the main valve will open automatically without the device mechanically locked. The controlled main valve is an indirectly acting pressure relief device. The main valve is own-medium-controlled and operates according to the relief principle. In the case of standard operating conditions the disc piston of the main valve is loaded by the own medium and pressed into a leak tight position. When the load is removed, the main valve opens. In order to control the relief, a control device is provided which consists of the pilot valves as well as measurement and control devices. When exceeding an inadmissible pressure, a pilot valve responds and opens the control line to the main valve so that the pressure in the releasing chambers of the main valve will be decreased. In doing so, a pressure difference will be created at the disc piston of the main valve. The higher pressure below the disc piston opens the valve seat of the main valve towards the exhaust line. If the pilot valve blocks the control line again after a corresponding pressure decrease, the pressure in the releasing chambers of the main valve will build up again, and the	Qualification will be addressed by ASME QME-1-2007.	**Closed**

			main valve will close the exhaust line.		
5	Section 6.4.28 specifies motor operator requirements. The following questions apply to motor operator qualification: a. Why does Section 6.4.28.3 only specify "maximum differential pressure" for MOV sizing and not also flow conditions? b. Why does Section 6.4.28.6.2 specify the application of "limit switch and/or torque switch" because a limit switch will always be needed for position indication regardless of whether the MOV has a torque switch? c. Why does Section 6.4.28.7 state that the motor will stall upon failure of the limit or torque switch without specifying requirements for thermal overload protection? d. Why does Section 6.4.28.25 only specify valve minimum thrust requirements based on differential pressure load, stem rejection load, and packing load, when these loads do not address flow conditions (such as identified in the EPRI MOV Performance Prediction Program)? e. Why does Section 6.4.28 not address actuator requirements, such as degraded voltage, temperature effects, load sensitive behavior, and stem friction coefficient assumptions? f. Why does Section 6.4.28 not address any limitations for the use of magnesium rotors in motors? g. Why does Section 6.4.28 not address design provisions for periodic verification of design-basis capability, such as specifying the use of valves within the test scope of the Joint Owners Group Program for MOV Periodic Verification? h. Why does Section 6.4.28 not address design provisions for pressure locking and thermal binding? i. Why does Section 6.4.28 not address design requirements for valve instrumentation (such as stem strain gauges) for thrust and torque measurements to allow diagnostic testing? j. Why does Section 6.4.28 not specify that internal clearances, dimensions, and radii for the valve internals shall be inspected to verify that the valve will perform in a predictable manner, such as discussed in EPRI TR-106563, "Application Guide for Motor-Operated Valves in Nuclear Power Plants," Volume 1, Revision 1: Gate and Globe Valves? k. Why does Section 6.4.28 not include "weak link" calculations with applicable conservative assumptions, such as 110% voltage and 0.1 stem friction coefficient?	Scarbrough	a. Comment will be incorporated into specification. b. Agree with comment; however, it is necessary to provide the specification of the NEMA Type and the rating condition with the power in the requirements of this section. c. Comment will be incorporated into specification. d. The minimum valve thrust for operator sizing depends on the differential pressure not flow rate. The flow condition necessary for valve sizing is in the data sheet. It is understood that differential pressure is the sufficient information for calculating the minimum thrust requirements for operator sizing. See Comment Number 10 of MOV Specification. e. Comment will be incorporated into specification. f. Comment will be incorporated into specification. g. MOV periodic verification is not within the scope of the vendor, but is with the utility. Therefore, it is not necessary to address the periodic verification requirement in the design specification. See Comment Number 13 of MOV Specification. h. The design provisions for pressure locking and thermal binding are necessary for the gate valves. The POSRV valve type is not a gate valve. i. Instrumentation such as stem strain gauges is not within the scope of the vendor, but is with the utility. Therefore, it is not necessary to address the instrumentation for	a. Specification revised to include flow conditions in Section 6.4.28.3. b. Response acceptable. c. Specification revised to include thermal overload protection in Section 6.4.28.7. d. Specification includes reference to EPRI PPM in Section 6.4.28.28. e. Specification revised to include degraded voltage, temperature effects, load sensitive behavior, and stem friction coefficient assumptions in Section 6.4.28.27 through 6.4.28.30. f. Specification revised to include prohibition of magnesium rotors in motors in Section 6.4.28.14. g. Response acceptable. h. Response acceptable. i. Response acceptable. j. Specification revised to include valve internal design information in Table 4. k. Specification revised to include weak link analysis in Sections 6.4.28.27 through 6.4.28.30, and new Appendix N.	**Confirmatory**

			periodic verification in the design specification. See Comment Number 14 of MOV Specification. j. Comment will be incorporated into specification. k. Comment will be incorporated into specification.		
6	Section 6.5.1.2.2 states that a single axis seismic load may be applied in a "conservative manner." Why does this section not specify that the seismic load be applied along the least rigid axis (unless a more critical axis can be determined) consistent with ASME QME Case QME-007?	Scarbrough	The approach that the seismic load may be applied along the least rigid axis is one of the methods considered as a conservative manner.	Specification reference to QME-1 resolves comment.	**Closed**
7	Why does Appendix B, "Valve Environmental Requirements," specify "not applicable" for vibration in light of testing and operating experience for safety relief valves that reveals potential impact of vibration on valve degradation and performance?	Scarbrough	The vibration parameter in this appendix considers the external environmental conditions excluding seismically induced mechanical stresses. The external vibration for the POSRVs comes only from the pressurizer because they are installed on the pressurizer and isolated from other components. The pressurizer is installed in a system which may experience vibratory excitation generated by the reactor coolant pumps, however, the effect of pressurizer vibratory excitation is negligible on the POSRVs. Therefore, it is reasonable to state that the vibration is not applicable in Appendix B of the specification.	Response acceptable.	**Closed**
8	Why does Appendix D, Table 1, "Acceptable Lubricants," list Neolube Number 1 when this lubricant is unacceptable for high temperature applications (whereas Neolube Number 1260 is specified by a supplier for reactor containment conditions)?	Scarbrough	Appendix D, Table 1 provides a list of various acceptable lubricants for the plant. Neolube Number 1 will be deleted in the specification because the list provides acceptable lubricants for high temperature applications.	Specification revised to remove reference to Neolube Number 1 in Appendix D, Table 1.	**Confirmatory**
9	Why does the specification not address the use of Appendix QR-B, "Guide for Qualification of Nonmetallic Parts," for environmental qualification of nonmetallic parts?	Scarbrough	The specification will be revised to incorporate the use of QR-B for qualification of nonmetallic parts as follows: "The nonmetallic parts which are critical in performing the safety	Specification revised to specify Appendix QR-B of ASME QME-1 in Section 6.3.3.	**Confirmatory**

			function shall be environmentally qualified in accordance with QR-B of ASME QME-1-2007 if applicable."		
10	As editorial comment, Section 10.4.2.3.1 refers to a "stoke" test rather than a stroke time.	Scarbrough	Stoke will be changed to stroke.	Specification revised to correct spelling of "stroke" in Section 10.4.2.3.1.	**Confirmatory**
11	Section 6.5.1.1.2.3, Faulted Condition, in section B) stated "Jet impingement load on POSRV body due to spray line break need not be considered for POSRV outlet flange design". In general, impingement forces on the valve would create bending moments at valve flange to pipe connection. Provide the bases of impingement loads on POSRV body due to spay line break was not considered for POSRV outlet flange design.	Le	Appendix H of the Design Specification provides the BLPB loads at the POSRV outlet flanges. The jet impingement load due to a pressurizer spray line break was considered in the BLPB loads.	Specification Section 6.5.1.1.2.3 "Faulted Condition", section B) sentence to be revised to indicate that Appendix H of the Design Specification provides the BLPB loads at the POSRV outlet flanges. Response: DS 701, section 6.5.1.1.2.3 B) has been updated to indicate that Appendix H of the Design Specification provides the BLPB loads at the POSRV outlet flanges.	**Confirmatory**
Document No. 9-431-Z-S-404-10, Design Specification for Reactor Assembly					
1	Section 3.1.1.1 referenced ASME Code Section III 2007 edition with 2008 addenda to be used in APR1400 design. However, Section 3.1.2.1 referenced ASME-B16.5 "Pipe Flanges and Flanged Fitting", 2009 edition. Provide a clarification if ASME-B16.5 2009 edition used in lieu of ASME Section III 2007 edition.	Le	There is a flange at the end of the vent pipe that connects with the A/E pipe. This flange is ASME B 16.5 and, therefore, both ASME III and B16.5 are referenced in Section 3.1.2.1.	Response acceptable.	**Closed**
2	Section 3.1.3.5, reference showed incorrect the revision date of RG 1.92. Revise the revision date of Oct. 2012 to be Sept. 2012.	Le	Oct. 2012 is shown in the first page of RG 1.92. However, Sept. 2012 is shown on the NRC web site which lists the number, title, publication data, and revision for each regulatory guide. The first page of RG 1.92 was used in Section 3.1.3.5 since it was taken to be the most accurate.	Response acceptable.	**Closed**
3	Section 5.2.1.2 stated that the maximum allowable load criteria shall be defied in terms of axial (Fa), shear (Fv), moment (Mb) and torsional (Mt) loadings at the nozzles end based on a maximum allowable stress of	Le	The criterion of 10% of yield strength is an engineering judgment. It is impossible for no piping	The use of a maximum allowable stress of 10% of yield for ASME Class 1	**Closed**

	10% of yield for ASME Class 1 component at the critical section where the nozzle is welded to the component. Provide the justification where the criteria of10% of yield comes from.		reactions in partial penetration nozzles such as sampling and instrumentation nozzles. To control the piping loads in partial penetration nozzles, the system designer uses the criterion of 10% of yield strength.	component at the critical section where the nozzle is welded to the component does not clearly define the design of nozzle. The staff requests the applicant provides the stress analysis of these nozzles to address the staff's question. Response: The design specification has not been revised because the criterion of 10% yield strength will be confirmed in the design report or interface requirement. Response acceptable.	
4	Revise Table 4 to include the additional loads in the load combinations. Table 4 Load Combination did not include the following loads: a. Dynamic system loadings associated with service levels B and C. Dynamic fluid loads due to asymmetric blowdown (NUREG-0609), or safety/relief valve thrust, steam hammer, and water hammer associated with service level B. Dynamic system loadings associated with the emergency condition associated with service level C. b. LOCA loadings associated with service level D. Table 1 of SRP Section 3.9.3 showed LOCA loadings applied with service level D.	Le	a. As stated in Table 4 of the Design Specification for Reactor Vessel Assembly, the service level B loads provided in conjunction with upset condition transients provided in Table 5 of the specification will be applied to stress analysis of reactor vessel assembly. Table 5 provides the Post-Accident Operation of reactor coolant gas vent system (RCGVS) which would induce dynamic fluid load such as water hammer associated with service level B. Therefore, dynamic system loadings/dynamic fluid loads associated with service level B condition are already considered in stress analysis of reactor vessel assembly. Other than RCGVS Post-Accident Operation transient, there is no upset condition transients inducing any dynamic fluid load associated with service level B. As specified in Table 5 of the	<u>Part a:</u> Confirm these loads (safety relief valve thrust, quick valve open/close) are included in the load combination. Response: The design specification has not been revised because the load combination will be confirmed in the design report. Response acceptable.	**Part a: Closed** **Part b: Closed**

			specification, there is no emergency condition transient considered to design. Accordingly, there is no dynamic system loading associated with emergency condition and service level C. b. As stated in Section 3.6.3 of the APR1400 SSAR, Leak-Before-Break (LBB) analyses are applied to the piping systems of the main coolant loop (hot and cold legs), surge line, direct vessel injection line and shutdown cooling line. Therefore, dynamic loads resulted from large break LOCA are eliminated by LBB application, but dynamic loads resulted from pipe breaks in piping systems not eliminated by LBB application are applied to structural integrity evaluation for reactor vessel assembly as defined as branch line pipe break (BLPB) loads. The load tables in the design specification for reactor vessel assembly provide BLPB loads associated with service level D condition.		
5	Appendix S of 10 CFR Part 50, “Earthquake Engineering Criteria for Nuclear Power Plants,” requires that if the OBE is defined as greater than one-third of the SSE, paragraph IV.(a) (2) requires analysis and design to demonstrate that SSCs remain functional and within applicable stress, strain, and deformation limits. If the OBE is defined as one-third or less of the SSE, explicit response or design analyses are not required. Therefore, OBE should not include in load combination. Discuss or specify in Table 4 that OBE is defined as one-third or less of the SSE; therefore OBE should not include in load combinations.	Le	As stated in Section 3.2.1a., Seismic Category I, of the APR1400 SSAR, OBE is defined as one-third of the SSE. Therefore, OBE loads should not be included in the load combinations.	Response acceptable.	**Closed**
6	Provide the following reference documents: 11A60-ME-DS220-11 11A60-RE-DD214-00 11A60-ME-DS240-00 E-11A60-232-002	Le	Supplied during the audit; no further action necessary.	Response acceptable.	**Closed**
Document No. 9-450-Z-S-404-00, Design Specification for Check Valves Greater than Two Inches					
1	The specification only mentions swing check valves. Are any other check valve designs planned (such as lift check or nozzle check valves)	Scarbrough	The design specification for NSSS check valves describes the general	Response acceptable.	**Closed**

	for the APR1400?		requirements applicable to all kinds of check valves including swing check valves and lift check valves. The APR1400 design is to include only swing check valves and spring loaded lift check valves.		
2	Section 6.3.1.1 states that a single axis seismic load may be applied in a "conservative manner." Why does this section not specify that the seismic load be applied along the least rigid axis (unless a more critical axis can be determined) consistent with ASME QME Case QME-007?	Scarbrough	The approach that the seismic load may be applied along the least rigid axis is one method that is considered a conservative manner. Therefore, the current specification of section 6.3.1.1 includes the requirement that the seismic load shall be applied along the least rigid axis.	Resolved based on POSRV Question 6	**Closed**
3	Section 6.4.3.2 states that the check valve function shall be demonstrated by analysis, by test, or a combination of both per QME-1-2007. Why does the specification not use the language in Paragraph QV-7100 of ASME QME-1-2007 that Section QV provides for qualification of a valve assembly by a combination of testing and analysis?	Scarbrough	Section 6.4.3.2 will be revised as the NRC commented. "The check valve functions shall be demonstrated by a combination of testing and analysis."	Specification revised to require a combination of testing and analysis in Section 6.4.3.2.	**Confirmatory**
4	Why does the specification not address the use of Appendix QR-B, "Guide for Qualification of Nonmetallic Parts," in ASME QME-1-2007 for environmental qualification of nonmetallic parts?	Scarbrough	The following will be added to the requirements in the design specification for valves. "The nonmetallic parts which are critical in performing the safety function shall be environmentally qualified in accordance with QR-B of	Specification revised to require Appendix QR-B to ASME QME-1 in Section 6.4.3.2.2.	**Confirmatory**

			ASME QME-1-2007 if applicable.		
Document No. 9-450-Z-S-404-14, Design Specification for Motor Operated Valves					
1	Section 6.1.6 states that the orientation of valve stem shall be upright vertical. Why does the specification not address motor and spring pack locations (both horizontal) and limit switch compartment location (above the gear box)?	Scarbrough	It is believed that this level detail design is within the vendor's scope to determine and in specifying an undesirable details in the specification may cause unnecessary limitations. We believe the vendor will determine the proper motor and spring pack locations and limit switch compartment location even though the design specification does not address this kind of detail location.	Response acceptable.	**Closed**
2	Section 6.3.1.1 states that a single axis seismic load may be applied in a "conservative manner." Why does this section not specify that the seismic load be applied along the least rigid axis (unless a more critical axis can be determined) consistent with ASME QME Case QME-007?	Scarbrough	The approach that the seismic load may be applied along the least rigid axis is one method that is considered a conservative manner. Therefore, the current specification of section 6.3.1.1 includes the requirement that the seismic load shall be applied along the least rigid axis.	Resolved based on POSRV Question 6	**Closed**
3	Section 6.4.3.2 states that the safety-related function shall be demonstrated by analysis, by test, or a combination of both per QME-1-2007. Why does the specification not use the language in Paragraph QV-7100 of ASME QME-1-2007 that Section QV provides for qualification of a valve assembly by a combination of testing and analysis?	Scarbrough	Section 6.4.3.2 will be revised to address the NRC comment by stating the following: "The motor operated valve functions shall be demonstrated by a combination of testing and analysis."	Specification revised to require a combination of testing and analysis in Section 6.4.3.2.	**Confirmatory**
4	Section 6.4.3.5 states that the valve motor operators are qualified in accordance with IEEE 382-2006 and RG 1.73 (Revision 1). Why does this section not specify that the motor operators also be qualified in accordance with ASME QME-1-2007 as accepted in RG 1.100 (Revision 3)?	Scarbrough	Section 6.4.3.5 requires the valve motor operator to be qualified separately in accordance with IEEE 382 and RG 1.73. The operator shall also be evaluated for functional qualification of the valve assembly in accordance with ASME QME-1-2007 as stated in sections 6.4.3.2 and 6.4.9 a). Therefore, the functional qualification of the motor operator and valve assembly in accordance with ASME	Response acceptable.	**Closed**

			QME-1-2007 is specified in sections 6.4.3.2 and 6.4.9 a).		
5	Section 6.4.9 specifies that the supplier shall perform a list of tests and calculations (such as functional qualification testing per QME-1). Where does the specification address other aspects of valve qualification in QME-1-2007 (such as uncertainties, internal evaluations, extrapolation of qualification, and production valve demonstration)? For example, the Design Specification for Pneumatic Operated Valves 9-450-Z-S-404-13 specifies internal chamfer and radii limits for gate valves.	Scarbrough	It is understood that there is no need to specify the detailed requirements of the vendor's scope which are already addressed in ASME QME-1-2007. However, we will review and incorporate the requisite requirements for qualifying functional capability in accordance with ASME QME-1-2007 if applicable.	Specification revised to require QME-1 in Section 6.4.9 and consideration of gate valve internal edges and chamfer and radii in Section 6.4.9.1.	**Confirmatory**
6	Why does Section 6.4.14 and Appendix I for "weak link" calculations not include specific conservative assumptions, such as 110% voltage and 0.1 stem friction coefficient?	Scarbrough	We will include the requirement to specify the appropriate conservative assumptions.	Specification revised to include weak link calculations in Section 6.4.14 and Appendix I.	**Confirmatory**
7	Section 6.4.15 specifies the contents of the Database Package, including information for degraded voltage calculations and EPRI PPM Analysis. Where is the application of the EPRI PPM Analysis addressed in the specification?	Scarbrough	The database package required by Section 6.4.15 is used for preparing the input for performing the EPRI PPM analysis which will be performed by KHNP rather than the vendor. The EPRI PPM analysis is not within the scope of the vendor. Therefore, it is not necessary to address the application of EPRI PPM analysis in the design specification.	Specification references EPRI PPM in Section 6.4.15.	**Confirmatory**
8	Why does Section 6.4.19.2 only specify "differential pressure" for MOV sizing and not also flow conditions?	Scarbrough	Section 6.4.19.2 provides the requirements for operator sizing. Operator sizing is dependent on the differential pressure not flow rate. The flow condition necessary to consider for valve sizing is in the data sheet. We understand that differential pressure is the sufficient information for operator sizing.	Specification revised to include flow requirement in Section 6.4.19.2.	**Confirmatory**
9	Why does Section 6.4.19.13 state that the motor will stall upon failure of the limit or torque switch without specifying requirements for thermal overload protection?	Scarbrough	Section 6.4.19.13 will be revised as follows: "torque switch, and the failure of thermal overload protection."	Specification revised to include thermal overload protection in Section 6.4.19.13.	**Confirmatory**

10	Why does Section 6.4.19.32 only specify valve minimum thrust requirements based on differential pressure load, stem rejection load, and packing load, when these loads do not address flow conditions (such as identified in the EPRI MOV Performance Prediction Program)?	Scarbrough	The valve minimum thrust for operator sizing is dependent on the differential pressure, not flow rate. The flow condition necessary for valve sizing is provided in the data sheet.	Specification revised to incorporate flow conditions in Section 6.4.19.33(b) and (c).	**Confirmatory**
11	Where does the specification address actuator sizing, such as degraded voltage, temperature effects, load sensitive behavior, and stem friction coefficient assumptions?	Scarbrough	The next revision will consider these kinds of factors such as degraded voltage, temperature effects, load sensitive behavior, and stem friction coefficient assumptions in actuator sizing.	Specification revised to include these factors in Sections 6.4.15, 6.4.19.35, and 6.4.19.36.	**Confirmatory**
12	Why does the specification not address any limitations for the use of magnesium rotors in motors?	Scarbrough	Limitations for the use of magnesium rotors in motors will be incorporated into the specification as given in the NRC information communication.	Specification revised to prohibit magnesium rotors in motors in Section 6.4.19.21.	**Confirmatory**
13	Why does the specification not address design provisions for periodic verification of design-basis capability, such as specifying the use of valves within the test scope of the Joint Owners Group Program for MOV Periodic Verification?	Scarbrough	It is understood that the MOV periodic verification is not within the vendor's scope, but within the utility's scope. Therefore, it is not necessary to address the periodic verification in the design specification.	Response acceptable.	**Closed**
14	Where does the specification address design requirements for valve instrumentation (such as stem strain gauges) for thrust and torque measurements to allow diagnostic testing?	Scarbrough	It is understood that instrumentation, such as stem strain gauges, is not the scope of vendor, but the scope of the utility. Therefore, it is not necessary to address the instrumentation for periodic verification in design specification.	Response acceptable.	**Closed**
15	Where does the specification address vibration effects in light of testing and operating experience for valves that reveals potential impact of vibration on valve degradation and performance?	Scarbrough	Section 6.3.1.1 d) addresses vibration effects in light of testing and operation of valves that results in the potential impact of vibration on valve degradation and performance.	Startup Initial Test Program will monitor vibration.	**Closed**
16	Why does the specification not address the use of Appendix QR-B, "Guide for Qualification of Nonmetallic Parts," in ASME QME-1-2007 for environmental qualification of nonmetallic parts?	Scarbrough	The following requirements will be addressed in the design specification for valves:	Specification revised to require Appendix QR-B to ASME QME-1 in Section	**Confirmatory**

			"The nonmetallic parts which are critical in performing the safety function shall be environmentally qualified in accordance with QR-B of ASME QME-1-2007 if applicable."	6.3.1.2.	
Document No. 9-450-Z-S-404-13, Design Specification for Pneumatic Operated Valves					
1	Where is OM Code specified in list of codes in Section 3.2?	Scarbrough	ASME OM code will be addressed in section 3.2 in the next revision.	Specification revised to require ASME OM Code 2004 Edition with 2005 and 2006 Addenda in Section 3.2.5.	**Confirmatory**
2	Section 6.3.1 states that a single axis seismic load may be applied in a "conservative manner." Why does this section not specify that the seismic load be applied along the least rigid axis (unless a more critical axis can be determined) consistent with ASME QME Case QME-007?	Scarbrough	The approach that the seismic load may be applied along the least rigid axis is one method that is considered a conservative manner. Therefore, the current specification of section 6.3.1.1 includes the requirement that the seismic load shall be applied along the least rigid axis.	Resolved based on POSRV Question 6	**Closed**
3	Section 6.4.3.2 states that the function shall be demonstrated by analysis, by test, or a combination of both per QME-1-2007. Why does the specification not use the language in Paragraph QV-7100 of ASME QME-1-2007 that Section QV provides for qualification of a valve assembly by a combination of testing and analysis?	Scarbrough	Section 6.4.3.2 will be revised as per the NRC commented. "The pneumatic operated valve functions shall be demonstrated by a combination of testing and analysis."	Specification revised to require combination of testing and analysis in Section 6.4.3.2.	**Confirmatory**
4	Why does Section 6.4.11.1.1 only specify "differential pressure" for sizing and not also flow conditions? Similarly, Section 8.2.1.5 specifies testing against differential pressure. Where is testing against flow conditions addressed?	Scarbrough	Section 6.4.11.1.1 provides the requirements for operator sizing. Operator sizing is dependent on the differential pressure not flow rate. The flow condition necessary to consider for valve sizing is in the data sheet. We understand that differential pressure is the sufficient information for operator sizing. Section 8.2.1.5 specifies the valve testing to demonstrate the capability of both opening and closing. The	Specification revised to include flow conditions in Section 8.2.1.5.	**Confirmatory**

			differential pressure is the main factor in demonstrating the capability of valve opening and closing at the design flow rate and that the flow rate is determined upon the differential pressure. Section 8.2.1.5 will be revised to state the following: Valve operation shall be tested against the differential pressure at the design flowrate shown on the data sheets under "OPEN CLOS AGNS DP and FLOW RATE" for both opening and closing.		
5	Section 6.4.13 specifies that the supplier shall perform a list of tests and calculations (such as functional qualification testing). Where does the specification address other aspects of valve qualification in QME-1-2007 (such as extrapolation of qualification, and production valve demonstration)?	Scarbrough	It is understood that there is no need to specify the detailed requirements of the vendor's scope which are already addressed in ASME QME-1-2007. However, we will review and incorporate the requisite requirements for qualifying functional capability in accordance with ASME QME-1-2007 if applicable.	Specification references QME-1-2007 in Section 3.3.14 and RG 1.100 (Revision 3) in Section 3.4.5, with technical requirements in Sections 5.6.4.14 and 6.4.13(1).	**Confirmatory**
6	Where does the specification address design requirements for valve instrumentation (such as stem strain gauges) for diagnostic testing?	Scarbrough	It is understood that instrumentation, such as stem strain gauges, is not the scope of vendor, but the scope of the utility. Therefore, it is not necessary to address the instrumentation for periodic verification in design specification.	Response acceptable.	**Closed**
7	Why does the specification not address the use of Appendix QR-B, "Guide for Qualification of Nonmetallic Parts," in ASME QME-1-2007 for environmental qualification of nonmetallic parts?	Scarbrough	We will address the following requirements in the design specification for valves: "The nonmetallic parts which are critical in performing the safety function shall be environmentally qualified in accordance with QR-B of ASME QME-1-2007 if applicable."	Specification revised to require Appendix QR-B to ASME QME-1 in Section 6.3.2.	**Confirmatory**
Document No. 9-450-Z-S-404-18, Design Specification for Solenoid Operated Valves					
1	Section 6.3.1 states that a single axis seismic load may be applied in a "conservative manner." Why does this section not specify that the seismic load be applied along the least rigid axis (unless a more critical axis can be determined) consistent with ASME QME Case QME-007?	Scarbrough	The approach that the seismic load may be applied along the least rigid axis is one method that is considered a conservative manner.	Resolved based on POSRV Question 6	**Closed**

			Therefore, the current specification of section 6.3.1.1 includes the requirement that the seismic load shall be applied along the least rigid axis.		
2	Section 6.4.1.2 states that the function shall be demonstrated by analysis, by test, or a combination of both per QME-1-2007. Why does the specification not use the language in Paragraph QV-7100 of ASME QME-1-2007 that Section QV provides for qualification of a valve assembly by a combination of testing and analysis?	Scarbrough	Section 6.4.1.2 will be revised as per the NRC comment. "The solenoid operated valve functions shall be demonstrated by a combination of testing and analysis."	Specification revised to require combination of testing and analysis in Section 6.4.1.2.	**Confirmatory**
3	Section 8.2.1.3 specifies testing against differential pressure. Where is testing against flow conditions addressed?	Scarbrough	Section 8.2.1.3 provides the requirements for operator sizing. Operator sizing is dependent on the differential pressure not flow rate. The flow condition necessary to consider for valve sizing is in the data sheet. We understand that differential pressure is the sufficient information for operator sizing. Section 8.2.1.3 specifies the valve testing to demonstrate the capability of both opening and closing. The differential pressure is the main factor in demonstrating the capability of valve opening and closing at the design flow rate and that the flow rate is determined upon the differential pressure. Section 8.2.1.3 will be revised to state the following: Valve operation shall be tested against the differential pressure at the design flowrate shown on the data sheets under "OPEN CLOS AGNS DP and FLOW RATE" for both opening and closing.	Specification revised to include flow conditions in Section 8.2.1.3.	**Confirmatory**
4	Where does the specification address other aspects of valve qualification in QME-1-2007 (such as extrapolation of qualification, and production valve demonstration)?	Scarbrough	Section 8.2.1.3 specifies the valve testing to demonstrate the capability of both opening and capability. We understand that the differential pressure is the main factor to demonstrate the capability of opening and closing at design	Specification references ASME QME-1-2007 in Section 3.3.9 and RG 1.100 (Revision 3) in Section 3.4.4.	**Confirmatory**

			flowrate and flow rate is determined upon the differential pressure. Section 8.2.1.3 will be revised to state clearly as following; Valve operation shall be tested against the differential pressure at design flowrate shown on the data sheets under “OPEN CLOS AGNS DP and FLOW RATE” for both opening and closing.		
5	Why does the specification not address the use of Appendix QR-B, “Guide for Qualification of Nonmetallic Parts,” in ASME QME-1-2007 for environmental qualification of nonmetallic parts?	Scarbrough	The following requirement will be addressed in the design specification for valves. “The nonmetallic parts which is critical in performing the safety function shall be environmentally qualified in accordance with QR-B of ASME QME-1-2007 if applicable”	Specification revised to require Appendix QR-B to ASME QME-1-2007 in Section 6.3.2.	**Confirmatory**
Document No. 9-450-Z-S-404-16, Design Specification for Manual Valves					
1	Why is the OM Code not included in the list of applicable codes in Section 3.2?	Scarbrough	The ASME OM Code will be addressed in the list of applicable codes in Section 3.2.	Specification revised to reference ASME OM Code 2004 Edition with 2005 and 2006 Addenda in Section 3.2.4.	**Confirmatory**
2	Why is ASME Standard QME-1-2007 not included in the list of standards in Section 3.3 when RG 1.100 (Revision 3) is listed in Section 3.4?	Scarbrough	ASME Standard QME-1-2007 is not applicable because manual valves are not within the scope of ASME QME-1-2007. Functional capability of SI-803 (designated as an active valve) is demonstrated by test in accordance with the approved testing procedure based on other than ASME QME-1-2007.	Specification revised in Section 3.3.10 to specify QME-1.	**Confirmatory**
3	Section 6.1.5 specifies that the valve will be designed for suitable operation regardless of orientation. Why does the section not include guidance for manual valves with a gearbox and limit switch compartment?	Scarbrough	Manual valves are not normally equipped with gear boxes and limit switches similar to MOVs. It is believed that this level detail design is within the vendor’s scope to determine and in specifying an undesirable details in the	Response acceptable.	**Closed**

			specification may cause unnecessary limitations. We believe the vendor will determine the proper motor and spring pack locations and limit switch compartment location even though the design specification does not address this kind of detail location.		
4	Section 6.3.1.3 states that a single axis seismic load may be applied in a “conservative manner.” Why does this section not specify that the seismic load be applied along the least rigid axis (unless a more critical axis can be determined)?	Scarbrough	The approach that the seismic load may be applied along the least rigid axis is one method that is considered a conservative manner. Therefore, the current specification of section 6.3.1.1 includes the requirement that the seismic load shall be applied along the least rigid axis.	Resolved based on POSRV Question 6	**Closed**
5	Section 6.4 includes design requirements. Where are provisions for sizing and qualifying the manual valve for its functional capability?	Scarbrough	Provisions for sizing will be clearly addressed in section 6.1 in next revision. The requirement for qualifying the active manual valve is addressed in data sheet note.	Specification revised to include functional capability requirements in Sections 6.1.2 and 6.1.2.1.	**Confirmatory**
6	Section 8.2 specifies testing requirements for manual valves. Where is testing against flow conditions addressed?	Scarbrough	Testing against flow conditions is addressed in the data sheets for active valves only. The testing against flow condition is not required for non-active valves.	Specification revised in Section 8.2.9 to include flow conditions.	**Confirmatory**
7	Where does the specification address other aspects of valve qualification (such as extrapolation of qualification, and production valve demonstration)?	Scarbrough	ASME Standard QME-1-2007 was not applicable for manual valve because manual valves are not the scope of ASME QME-1-2007. The functional capability of active valve will be demonstrated by the test as required by the data sheet note.	Specification revised in Section 8.2.9 to clarify functional capability.	**Confirmatory**
8	Why does the specification not address environmental qualification of nonmetallic parts?	Scarbrough	It is understood that the nonmetallic parts which are critical in performing the safety function is not included for manual valves. Therefore, environmental qualification of non-metallic parts is not required for	Response acceptable.	**Closed**

			manual valves.		
9	Why does Appendix F, "Acceptable Lubricants," list Neolube Number 1 (without conditions) when this lubricant is unacceptable for high temperature applications?	Scarbrough	It will be noted in the specification Appendix F that Neolube 1260 should be used for high temperature applications.	Specification revised to delete Neolube 1 from Appendix F.	**Confirmatory**
Document No. 9-450-Z-S-404-19, Design Specification for Miscellaneous Safety and Relief Valves					
1	Why is the OM Code not included in the list of applicable codes in Section 3.2?	Scarbrough	The ASME OM Code will be addressed in the list of applicable codes in Section 3.2.	Specification revised to reference ASME OM Code 2004 Edition with 2005 and 2006 Addenda in Section 3.2.4.	**Confirmatory**
2	Why are IEEE 323-2003 (2008) and RG 1.89 not included in the list of standards and guides in Sections 3.3 and 3.4?	Scarbrough	The nonmetallic parts of the safety and relief valves are not qualified in accordance with IEEE 323-2003, but in accordance with ASME QME-1-2007, if applicable.	Response acceptable.	**Closed**
3	Section 6.3.3 states that a single axis seismic load may be applied in a "conservative manner." Why does this section not specify that the seismic load be applied along the least rigid axis (unless a more critical axis can be determined)?	Scarbrough	The approach that the seismic load may be applied along the least rigid axis is one method that is considered a conservative manner. Therefore, the current specification of section 6.3.1.1 includes the requirement that the seismic load shall be applied along the least rigid axis.	Resolved based on POSRV Question 6	**Closed**
4	Why does Appendix E, "Acceptable Lubricants," list Neolube Number 1 (without conditions) when this lubricant is unacceptable for high temperature applications?	Scarbrough	It will be noted in the specification Appendix E that Neolube 1260 should be used for high temperature applications.	Specification revised to remove Neolube 1 from Appendix E.	**Confirmatory**
5	Why does the specification not address environmental qualification of nonmetallic parts?	Scarbrough	The specification will be revised to incorporate the use of QR-B for qualification of nonmetallic parts follows: "The nonmetallic parts which are critical in performing the safety function shall be environmentally qualified in accordance with QR-B of	Specification revised to require Appendix QR-B to QME-1 in Section 6.3.4.	**Confirmatory**

			ASME QME-1-2007 if applicable."		
APR1400 Purchase Specification 9-184-J237A Main Steam Safety Valves					
1	Section 4.03 lists codes and standards that are not the latest versions or have no year indicated (such as BPV 1995 Edition through 1997 Addenda, OM Code – no year, QME-1 – no year, IEEE 323-1983, IEEE 344-1987, and IEEE 382-1996). Also, RG 1.100 is listed without a revision number. Has a design specification been prepared to update the qualification codes and standards for the main steam safety valves?	Scarbrough	No; The procurement specifications for the APR1400 have not been prepared. The procurement specifications uploaded in ERR were prepared for the reference plant (Shin-Kori NPP Units 3&4) which have different code year from that of APR1400. A design summary will be provided that provides the current APR1400 code and standards; however, the purchase specification for this equipment will be prepared based on the codes and standards and RGs stated in APR1400 DCD by the COL applicant.	Purchase Specification revised to include Attachment 1.01 that lists standards and codes in effect as of 12-31-2010, such as ASME BPV Code (2007 Edition with 2008 Addenda), ASME OM Code (2004 Edition through 2006 Addenda), and ASME QME-1-2007. The specification also includes Attachment 3.01 with environmental qualification parameters. KHNP referenced QAPD for COL applicant to prepare purchase specification based on design specifications. Response acceptable. KHNP indicated that the COL applicant will be responsible for preparing plant-specific purchase specifications based on the design specifications as required by the KHNP Quality Assurance Program Description for the APR1400 Design Certification (APR1400-K-Q-TR-11005-NP, Revision 5). In addition, 10 CFR 52.63(c) provides for an audit of procurement specifications being prepared by the COL applicant if determined to be necessary to make a safety determination by the NRC during the review of a COL application. This finding also applies to other purchase	**Closed**

				specifications.	
2	The purchase specification references the codes and standards for design and qualification. Has a design specification been prepared to provide more specific requirements for design and qualification of main steam safety valves?	Scarbrough	Yes; This specification states the design and operating conditions such as operating pressure and temperature, set pressure, etc. in Subsection 4.05.B and the data sheets. The design requirements in Subsection 4.05.C specify the requirements for dynamic qualification of the valves.	Response acceptable.	**Closed**
3	Where does the purchase specification (or a design specification) address environmental qualification of main steam safety valves?	Scarbrough	The environmental design requirements are stated in Subsection 4.05.D.	Response acceptable.	**Closed**
Document No. 9-431-Z-S-404-20, Design for Pressurizer Assembly					
1	Section 6.4.3.4.2 stated "All partial penetration nozzles shall be designed with a nozzle to shell clearance which limits the maximum stress to 10% of the yield stress for ASME Class 1 component at the critical section where the nozzles is welded to the components". Provide the references or bases of where the 10% of the yield stress comes from.	Le	Partial penetration welds are allowed only for substantially no piping reaction loads per ASME BPV Code Sec.Ⅲ, NB-3337.3. For confirming the meaning of 'substantially no piping reaction', this limiting stress 10% of yield stress is used as evaluation criteria from conservative engineering judgment.	Response: The design specification was not revised related to this issue because the criterion of 10% yield strength will be confirmed in the design report.	**Closed**
2	Section 6.5.1, the section specified the loads for to be used in PR stress analysis. However, there is not description and definition of the loads. Provide description and definition of the loads listed in the section 6.5.1.	Le	This response will be provided by September 4, 2015	Response: The design specification has been revised to provide description and definition of the loads listed in Tables 5 and 7 instead of section 6.5.1.	**Confirmatory**
3	Table 5 did not include the following loads: • Dynamic system loading associated with level B and C (e.g. POSRV thrust, steam hammer, or water hammer) • LOCA Loading associates with level D.	Le	Table 5 includes the following loads : 1) The POSRV actuation envelopes all dynamic system loading related to POSRV actions which are considered as Level B. There is no Level C load for pressurizer in our design basis events. 2) The BLPB loading in Table 5 is for the breaks of pipe lines to which the LBB concept is not	Response: 1) The connected piping is also designed and arranged not to cause the steam hammer or water event in the pressurizer. 2) For Level C, There is no Level C load for the pressurizer in our design basis events.	**Closed**

			applied. The BLPBs for the PZR includes the breaks of the spray and POSRV lines, (i.e., the surge line is excluded from the postulation of the pipe breaks) owing to the application of the LBB concept. The breaks include the primary side breaks that can result in LOCA.	DBPB (Design Basis Pipe Break) is defined in SRP 3.9.3, Table II. This includes postulated pipe breaks in Class 1 branch lines that result in the loss of reactor coolant at a rate less than or equal to the capability of the reactor coolant makeup system. For APR1400, the makeup flow system can compensate for the loss of coolant from a break with a diameter of less than one inch. Therefore, postulated breaks in one-inch nominal diameter piping and smaller piping, in accordance with the guidance in BTP 3-4, do not require the analysis of the dynamic mechanical loadings from the ruptured pipe on components. Breaks of piping exceeding a nominal pipe size of one inch are considered as Level D. 3) The BLPB loading in Table 5 is for breaks of pipe lines to which the LBB concept is not applied. The BLPBs for the PZR includes breaks of the spray and POSRV inlet lines, (i.e., the surge line is excluded from the postulation of pipe breaks) in accordance with to the application of the LBB concept. The breaks include the primary side breaks such as the spray and POSRV inlet lines that can result in LOCA.	
4	Provide description and definition of the loads listed in Tables 5, 7 and 8	Le	This response will be provided by	The design specification has	

<table>
<tr><td></td><td></td><td></td><td>September 4, 2015.</td><td>been revised to provide description and definition of the loads listed in Tables 5 and 7. Table 8 refers to the definitions of Tables 5 and 7.</td><td>Confirmatory</td></tr>
<tr><td colspan="6">Document No. 9-133-N204, Safety Related Heat Exchangers</td></tr>
<tr><td>1</td><td>Section 4.03-Quality Standards states, “All other codes and standards except KEPIC shall be the edition in the effect as of December 31, 2001, unless indicated otherwise.” The ASME Section III version cited as applicable for compliance is ASME Section III (’95 Ed. Through ’97 Add.) The year of the code specified in the spec does not correspond with the applicable heat exchangers in Table 3.2-1 in the DCD. In Table 3.2-1 the following are stated:
<table>
<tr><td>Item #</td><td>Principal SSC</td><td>Codes & Standards</td></tr>
<tr><td>II.9.a</td><td>CCW heat exchangers</td><td>ASME Sec. III ND 2007 with 2008 addenda</td></tr>
<tr><td>II.18.b</td><td>Containment spray heat exchangers</td><td>ASME Sec. III NC 2007 with 2008 addenda</td></tr>
<tr><td>II.18.c</td><td>Containment spray miniflow heat exchangers</td><td>ASME Sec. III NC 2007 with 2008 addenda</td></tr>
<tr><td>II.34.a</td><td>Spent fuel pool cooling heat exchangers</td><td>ASME Sec. III ND 2007 with 2008 addenda</td></tr>
</table>
Why is there a difference in the version of the code being used?</td><td>Hansing</td><td>The APR1400 procurement specifications for the “Safety Related Heat Exchangers” will be prepared at the stage of COL application. The procurement specification uploaded in ERR, 9-133-N204, was prepared for the reference plant (Shin-Kori NPP Units 3&4) which have different code year from that of APR1400.
A design summary will be provided that provides the current APR1400 code and standards; however, the purchase specification for the safety related heat exchangers is issued at the stage of COL application and will be prepared based on the codes and standards and RGs stated in APR1400 DCD by the COL applicant.</td><td>Response acceptable</td><td>Closed</td></tr>
<tr><td colspan="6">Document No. 9-728-Z-S-404-22, Design Specification for Heated Junction Thermocouple Probe Assembly</td></tr>
<tr><td>1</td><td>Section 4.2.1-Safety Classification states that safety classification of the HJTC components are Safety Class 3 except for the seal plug which is Safety Class 1. For line item II.78.d Heated junction thermocouple probe assembly in Table 3.2-1 of the DCD, the safety class column shows “SC-1/SC-3” and has a remark stating “SC-3: seal plug” which seems to imply that the HJTC components are Safety Class 1 and the seal plug is Safety Class 3, not the opposite as stated in the spec. Identify the correct safety classes for the HJTC components and seal plug.</td><td>Hansing</td><td>“SC-3: Seal plug” in Table 3.2-1 of the DCD will be revised to “SC-1: Seal plug” as stated in the HJTC design specification.</td><td>Confirm that the DCD changes of safety category for HJTC components and seal plug match the design specification.
Response:
Since this is a DCD error, there is no change needed in the HJTC design</td><td>Confirmatory</td></tr>
</table>

				specification.	
Document No. 9-521-M243, Main Steam Isolation Valves and Main Feedwater Isolation Valves					
1	What is the date of Revision 2 to this purchase specification?	Scarbrough	The issue date of M243 is July 22, 2009.	Response acceptable.	**Closed**
2	Section 4.03 lists codes and standards that are not the latest versions or have no year indicated (such as BPV 1995 Edition through 1997 Addenda, OM Code – not listed, QME-1-1998, IEEE 323, IEEE 344, and IEEE 382). Also, RG 1.100 is listed without a revision number. Has a design specification been prepared to update the qualification codes and standards for the main steam isolation valves and main feedwater isolation valves?	Scarbrough	No; The procurement specifications for the APR1400 have not been prepared. The procurement specifications uploaded in ERR were prepared for the reference plant (Shin-Kori NPP Units 3&4) which have different code year from that of APR1400. A design summary will be provided that provides the current APR1400 code and standards; however, the purchase specification for this equipment will be prepared based on the codes and standards and RGs stated in APR1400 DCD by the COL applicant.	Purchase Specification revised to include Attachment 13.01 that lists standards and codes in effect as of 12-31-2010, such as ASME BPV Code (2007 Edition with 2008 Addenda), ASME OM Code (2004 Edition through 2006 Addenda), and ASME QME-1-2007. The specification also includes Attachment 7.01 with environmental qualification parameters. KHNP referenced QAPD for COL applicant to prepare purchase specification based on design specifications. Response acceptable.	**Closed**
3	Section 4.06 states that the actuators shall be “self-contained gas hydraulic type or equivalent.” Has a design specification been prepared to provide more specific requirements for the actuator type?	Scarbrough	No, not at this time.	Response acceptable.	**Closed**
4	The purchase specification references the codes and standards for design and qualification. Has a design specification been prepared to provide more specific requirements for design and qualification of main steam isolation valves and main feedwater isolation valves?	Scarbrough	Yes: This purchase specification states the design and operating conditions such as flow rate, design pressure and temperature, pressure drop, closing time, etc. in Subsection 4.05.B and the dynamic design requirements in Subsection 4.05.C as the specific requirements for design and qualification of the MSIVs and MFIVs.	Response acceptable.	**Closed**
5	Where does the purchase specification (or a design specification) address environmental qualification of main steam isolation valves and main feedwater isolation valves?	Scarbrough	The environmental design requirements are stated in Subsection 4.05.D (page 4-23).	Response acceptable.	**Closed**

6	ASME QME-1 states that active mechanical qualification should include operating loads such as nozzle loads. Where are the nozzle loads defined?	Wong	This procurement specification does not include the nozzle loads for in-line components. There is a requirement in Subsection 4.05.A.9 (page 4-15).	Response acceptable.	**Closed**
7	ASME QME-1-2007, Section QR-A8200, "Seismic Qualification Specification Requirements" states that active mechanical equipment mounting or support details, including all interface connections, shall be described. It is not clear how the valves are supported.	Wong	MSIVs and FMIVs are in-line components that are connected to the pipe.	Response acceptable.	**Closed**
Document No. 9-184-J233, Butterfly Valves for Nuclear Service					
1	Section 4.03 lists codes and standards that are not the latest versions or have no year indicated (such as BPV 1995 Edition through 1997 Addenda, OM Code – no date, QME-1 – no date, IEEE 323, IEEE 344, and IEEE 382-1996). Also, RG 1.100 is not listed. Has a design specification been prepared to update the qualification codes and standards for the butterfly valves?	Scarbrough	No; The procurement specifications for the APR1400 have not been prepared. The procurement specifications uploaded in ERR were prepared for the reference plant (Shin-Kori NPP Units 3&4) which have different code year from that of APR1400. A design summary will be provided that provides the current APR1400 code and standards; however, the purchase specification for this equipment will be prepared based on the codes and standards and RGs stated in APR1400 DCD by the COL applicant.	Purchase Specification revised to include Attachment 1.01 that lists standards and codes in effect as of 12-31-2010, such as ASME BPV Code (2007 Edition with 2008 Addenda), ASME OM Code (2004 Edition through 2006 Addenda), and ASME QME-1-2007. The specification also includes Attachment 4.01 with environmental qualification parameters. KHNP referenced QAPD for COL applicant to prepare purchase specification based on design specifications. Response acceptable.	**Closed**
2	The purchase specification references the codes and standards for design and qualification. Has a design specification been prepared to provide more specific requirements for design and qualification of butterfly valves?	Scarbrough	Yes; This purchase specification states the design and operating conditions such as design pressure and temperature, differential pressure, etc. in Subsection 4.05.B and the data sheets. The dynamic design requirements in Subsection 4.05.C specify the requirements for dynamic qualification of the valves.	Response acceptable.	**Closed**
3	Where does the purchase specification (or a design specification)	Scarbrough	The environmental design	Response acceptable.	**Closed**

	address environmental qualification of butterfly valves?		requirements are stated in Subsection 4.05.D.		
Document No. 9-184-J237B, Safety/Relief Valves					
1	Section 4.03 lists codes and standards that are not the latest versions or have no year indicated (such as BPV 1995 Edition through 1997 Addenda, NQA-1 1994 Edition and 1995 Addenda, QME-1 - no date, and IEEE 323 and IEEE 344 – no dates). Also, the OM Code is not listed. Has a design specification been prepared to update the qualification codes and standards for safety/relief valves?	Scarbrough	No; The procurement specifications for the APR1400 have not been prepared. The procurement specifications uploaded in ERR were prepared for the reference plant (Shin-Kori NPP Units 3&4) which have different code year from that of APR1400. A design summary will be provided that provides the current APR1400 code and standards; however, the Purchase specification for this equipment will be prepared based on the codes and standards and RGs stated in APR1400 DCD by the COL applicant.	Purchase Specification revised to include Attachment 1.01 that lists standards and codes in effect as of 12-31-2010, such as ASME BPV Code (2007 Edition with 2008 Addenda), ASME OM Code (2004 Edition through 2006 Addenda), and ASME QME-1-2007. The specification also includes Attachment 2.01 with environmental qualification parameters. KHNP referenced QAPD for COL applicant to prepare purchase specification based on design specifications. Response acceptable.	**Closed**
2	The purchase specification references the codes and standards for design and qualification. Has a design specification been prepared to provide more specific requirements for design and qualification of safety/relief valves?	Scarbrough	Yes; This purchase specification states the design and operating conditions such as design pressure and temperature, differential pressure, etc. in Subsection 4.05.B and the data sheets. The dynamic design requirements in Subsection 4.05.C specify the requirements for dynamic qualification of the valves.	Response acceptable.	**Closed**
3	Where does the purchase specification (or a design specification) address environmental qualification of safety/relief valves?	Scarbrough	The environmental design requirements are stated in Subsection 4.05.D.	Response acceptable.	**Closed**
Document No. 9-184-J239, Solenoid Valves					
1	Section 4.03 lists codes and standards that are not the latest versions or have no year indicated (such as BPV 1995 Edition through 1997 Addenda, QME-1 - no date, RG 1.100 – no date, IEEE 323-1983, and IEEE 344-1987). Also, the OM Code is not listed. Has a design specification been prepared to update the qualification codes and	Scarbrough	No; The procurement specifications for the APR1400 have not been prepared. The procurement specifications uploaded in ERR were prepared for the reference plant	Purchase Specification update not available but will follow other components. Response acceptable.	**Closed**

	standards for the solenoid valves?		(Shin-Kori NPP Units 3&4) which have different code year from that of APR1400. A design summary will be provided that provides the current APR1400 code and standards; however, the purchase specification for this equipment will be prepared based on the codes and standards and RGs stated in APR1400 DCD by the COL applicant.		
2	The purchase specification references the codes and standards for design and qualification. Has a design specification been prepared to provide more specific requirements for design and qualification of solenoid valves?	Scarbrough	Yes; This purchase specification states the design and operating conditions such as design pressure and temperature, differential pressure, etc. in Subsection 4.05.B and the data sheets. The dynamic design requirements in Subsection 4.05.C specify the requirements for dynamic qualification of the valves.	Response acceptable.	**Closed**
3	Where does the purchase specification (or a design specification) address environmental qualification of solenoid valves?	Scarbrough	The environmental design requirements are stated in Subsection 4.05.D.	Response acceptable.	**Closed**
Document No. 9-184-J232B, Control Valves for Safety Related and Severe Service					
1	What is the date of Revision 2 to this purchase specification?	Scarbrough	The date of revision is addressed in sign sheet as 11/18/2009.	Response acceptable.	**Closed**
2	Section 4.03 lists codes and standards that are not the latest versions or have no year indicated (such as BPV 1995 Edition through 1997 Addenda, OM Code – no date, QME-1 - no date, IEEE 323-1983, IEEE 344-1987, and IEEE 382-1996). Also, RG 1.100 is listed without a revision number. Has a design specification been prepared to update the qualification codes and standards for the control valves?	Scarbrough	No; The procurement specifications for the APR1400 have not been prepared. The procurement specifications uploaded in ERR were prepared for the reference plant (Shin-Kori NPP Units 3&4) which have different code year from that of APR1400. A design summary will be provided that provides the current APR1400 code and standards; however, the purchase specification for this equipment will be prepared based on the codes and standards and RGs stated in APR1400 DCD by the COL applicant.	Purchase specification update not available but will follow other components. Response acceptable.	**Closed**

			Therefore a COL Item will be added to the DCD.		
3	The purchase specification references the codes and standards for design and qualification. Has a design specification been prepared to provide more specific requirements for design and qualification of control valves?	Scarbrough	Yes; This purchase specification states the design and operating conditions such as design pressure and temperature, differential pressure, etc. in Subsection 4.05.B and the data sheets. The dynamic design requirements in Subsection 4.05.C specify the requirements for dynamic qualification of the valves	Response acceptable.	**Closed**
Document No. 9-145-P207, Safety & Non-Safety Related Manuel Steel Gate, Globe & Check Valves, 2" and Smaller					
1	Section 4.03-Quality Standards identifies ASME Section III ('95 Ed. Through '97 Add.) as the ASME Section III code year to be used. Most of the valves identified in Table 3.2-1 of the DCD specify ASME Section III code year 2007 with 2008 addenda. Ensure the correct code year to be used for the valves is identified.	Hansing	The correct code year is 2007 with 2008 addenda as noted. Reference document 9-145-P207 was a specification used for the Shin-Kori NPP units 3&4 in South Korea and the effective ASME III is 1995 edition through 1997 addenda for the NPP. It should be noted that 9-145-P207 is a reference only document.	Response acceptable.	**Closed**
Document No. 1-037-N407-001, General Piping Design Specification					
1	Article 202 states that the standards used are as referenced in Section 4 of 9-144-P202A, 9-144-P251, and 9-144-P252. While 9-144-P251 and 9-144-P252 are not in the ERR, 9-144-P202A is, "Safety Related Shop Fabricated Piping." Section 4, Article 201.2.a identifies ASME Section III ('95 Ed. Through '97 Add.) as the code and standard to be used. Article 303 on the next page of the spec states that the effective code editions and addenda for construction of piping systems for APR1400 DC are the ASME BPV Code, Section III, Division 1 (2007 Edition with 2008 Addenda). What is the difference between the Standards of Article 202 and the Effective Code Editions called out in Article 303? Does Article 303 override 202? Clarify the correct year to be using.	Hansing	The APR1400 procurement specifications for the "Safety Related Shop Fabricated Piping" will be prepared at the stage of COL application. The specifications uploaded in the ERR for audit is the one issued for SKN 3&4 NPP which is the reference plant of the APR1400. This is the reason why there is a difference between the Standards of Article 202 and the Effective Code years stated in Article 303. The COL applicant is to incorporate the codes & standards as described in Article 303 "Effective Code Edition" when APR1400 procurement specification "Safety Related Shop Fabricated Piping" is issued at the stage of COL application.	Response acceptable	**Closed**

Document No. 1-431-N407-001, Reactor Coolant System Piping Design Specification					
1	Please reference the questions from 1-037-N407-001, “General Piping Design Specification”. Article 202 states that the standards uses are as listed in Article 202 of Design Specification 1-037-N407-001. Article 303 says the effective Code editions, addenda & Code Cases to be used for construction of the RC system are given in Article 303 of Design Specification of 1-037-N407-001. These lead to two different code years. How will the vendor know which code year to use?	Hansing	The COL applicant is to incorporate the Effective Code Editions, Addenda & Code Cases as stated in Article 303 of Design Specification of 1-037-N407-001 when APR1400 procurement specifications are issued at the stage of COL application.	Response acceptable	**Closed**
Document No. 9-431-Z-S-404-91, Design Specification for Reactor Coolant Pump					
1	Section 8.5.5.3 stated “Pump coastdown curves showing decay of speed and flow versus time after motor is de-energized and with test loop at normal operating temperature and pressure”. There is no coastdown curve specifies in this RCP design specification. Add coastdown curves into the specification or reference the coastdown curve from APR1400 DCD.	Le	The acquiring pump coastdown curves stated in Section 8.5.5.2 are with a test loop and are for reference purpose only. The coastdown characteristics with test loop and with the actual plant loop are different from each other in terms of loop configuration and coolant inertia. The pump supplier must meet the coastdown curves as one of the acceptance criteria during shop testing if they are specified in the design specification. However, accurate coastdown curves with a test loop are difficult to develop because they depend on the characteristics of the test loop. It is reasonable that the acceptance criteria for coastdown with a test loop are not specified in the design specification. The verification for pump coastdown curves with the actual plant loop is performed at the site along with the RCS flow rate verification tests during the plant startup tests. DCD Tier 2 Subsection 14.2.12.2.3, Post-Core Reactor Coolant System Flow Measurements, indicates the acceptance criteria: Measured RCS flow coastdown is conservative with respect to the coastdown used in the safety analysis.	Delete Section 8.5.5.3. Response: The statement to acquire coastdown curves has been deleted in Section 8.5.5.2.	**Confirmatory**

2	Appendix II, Section II, RCP load combinations did not include the locked rotor load. Add RCP locked rotor load into the load combination; or provide the bases of not include this load.	Le	Appendix II, Section II, RCP load combinations includes Level D transients, meaning the faulted events (Level D) described in Table 1 of Appendix II. Faulted Event 3, "Decrease in Reactor Coolant System Flow Rate" includes the "Reactor coolant pump rotor seizure." The description for the Reactor coolant pump rotor seizure (i.e., locked rotor) can be found in Subsection 3.9.1.1.4 of DCD Tier 2.	"Decrease in Reactor Coolant System Flow Rate" was not clear. Add a statement to clarify explicitly that the load of RCP rotor seizure is included in the RCP load combinations. Response: Section II.2.5.g of Appendix II has been revised to read "Level D Transients (includes the load of RCP rotor seizure) – Appendix II" to clarify explicitly that the load of an RCP rotor seizure is included in the RCP load combinations.	**Confirmatory**
3	Design Specification for RCP Support, Doc. # 9-431-Z-S-404-A1, Rev. 2 Table 1, Section 5, service level D does not include the locked rotor load. Add RCP locked rotor load associated with service level D into the load combination; or provide the bases of not include this load.	Le	This appears to be an incomplete question since it only lists a specification number. The RCP locked rotor load is negligible whether it is included or not in service level D load combination with SSE, BLPB & IRWST loads. Therefore, there is no impact on APR1400 RCP support integrity.	Add a note below Table 1, indicates that RCP locked rotor load is negligible Response: The following note below Table 1 in the design specification has been revised "* RCP locked rotor load is negligible."	**Confirmatory**
Document No. Appendix 4I, Dynamic Qualification Requirements for Nuclear Safety-Related Equipment					
1	Section 2.0, "Definitions" limits the scope of the dynamic qualification program to safety-related equipment and any equipment that is not designed as safety related but could degrade the integrity of the safety-related component. The mechanical and electrical equipment that should be seismically qualified should be consistent with those defined in NUREG-800, Section 3.10. SRP Section 3.10 indicates that the following mechanical and electrical equipment should be seismically qualified: equipment associated with systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, containment and reactor heat removal or are otherwise essential in preventing significant release of radioactive material to the environment, and instrumentation that is needed to assess plant and environmental conditions during and after an accident, as described in RG 1.97. Also covered by SRP Section 3.10 is equipment (1) that performs the above functions automatically, (2) that is used by the operators to perform these functions manually, and (3) whose failure can prevent the satisfactory accomplishment of one or more of the	Wong	The response to this Action Item will be provided in the referred to RAI.	Issue is resolved in RAI 81-8000, Question 3.10-4.	**Closed**

	above safety functions. The equipment within the scope of seismic qualification may contain more than the safety-related equipment as defined in 10 CFR 50.2. As an example, the instrumentation that is needed to assess plant and environmental conditions during and after an accident may not be included in the safety-related equipment as defined in 10 CFR 50.2. Note that an RAI was issued for APR1400 DCD, Tier 2, Section 3.10 on this issue.				
2	APR1400 DCD Tier 2, Section 3.10.1.1 states that experience-based qualification will not be used for any equipment until it is endorsed by NRC RG 1.100; however, Section, 4.0, "Qualification requirements," Section 5.4, "Qualification by the use of experience data," and Section 11.0, "Experience Data" list the option for experience-based qualification method. Revise Appendix 4I to be consistent with the DCD.	Wong	As responded to in the RAI, the use of experience data will be deleted by the COL applicant.	Issued is closed based on commitment to update the document by a COL applicant.	**Confirmatory**
3	ASME QME-1-2007, Section QR-A8300, "Qualification Report" lists information to be included in the qualification report; however, the following information is not found in Section 15.0, "Format of the Dynamic Qualification Reports" of the Appendix 4I: a. If analysis is used to qualify the active mechanical equipment, the failure modes used to determine functional adequacy shall be clearly identified and computed margins to failure presented. b. If an anomaly is experienced during any test, it shall be documented in the report. This section goes on to state that if the active mechanical equipment is not modified to eliminate the anomaly, then the final user shall justify the use of the active mechanical equipment and file this justification with the Seismic Qualification Report. Any active mechanical equipment refurbishment that is performed during seismic testing shall be documented in the test report and reconciled by the active mechanical equipment supplier. c. All documents used in generating the Seismic Qualification Report shall be identified and referenced.	Wong	Appendix 4I has been marked up to reflect the documentation requirement in QME-1 -2007 for active mechanical equipment.	Marked up change is acceptable.	**Confirmatory**
4	ASME QME-1 is not included as a reference.	Wong	A revised Appendix 4I has been uploaded in the ERR and adds QME-1 as a reference.	Marked up change is acceptable.	**Confirmatory**
5	The SRP references listed in Section 16.0, "References" should be "NUREG-0800 (SRP 3.7, 3.9 and 3.10)."	Wong	A revised Appendix 4I has been uploaded in the ERR to correct the references.	Marked up change is acceptable.	**Confirmatory**
6	RG 1.199, "Anchoring Components and Structural Supports in Concrete" endorses ACI 349 01, "Code Requirements for Nuclear Safety Related Concrete Structures," Appendix B with conditions. Table III, "Strength Limits for Anchor Bolts in Building Structure" references ACI 349-01 Appendix B for the design of equipment anchoring to building structure. RG 1.199 should be listed as a reference in Section 16.0, "References," and a note should be added to Table III to indicate	Wong	A revised Appendix 4I has been uploaded in the ERR and adds RG 1.199 as a reference.	Marked up change is acceptable.	**Confirmatory**

	that the conditions in RG 1.199 will be followed.				
7	The notes for Table III should be consistent with those for Technical Report APR1400-E-X-NR-14001-P, "Equipment Qualification Program," Rev. 0, Part 2, "Seismic Qualification Program," Table 3, "Stress Limits for Bolting to Steel Building Structure."	Wong	A revised Appendix 4I has been uploaded in the ERR and modifies and updates the notes to Table 3.	Marked up change is acceptable.	**Confirmatory**
	Generic Comments				
1	Are there any ISO drawings available that show the piping and component supports and their seismic category and quality group?	Hansing	The ISO drawings have been prepared for some Class 1 piping subsystems and MS, FW piping. However, the drawing doesn't show supports and their seismic category and quality group. The seismic category and quality group are addressed in P&ID drawings. The pipe support locations are shown in the ISO drawings for pipe stress analysis.	Response acceptable.	**Closed**
2	The NRC staff has provided comments on several sampled design and purchase specifications as part of the APR1400 design specification audit. In addition to the specific sampled design specifications, KHNP is requested to review and update other applicable design specifications to be consistent with the KHNP responses to the NRC staff comments on the audited specifications.	Scarbrough	KHNP will review and update the other applicable design specifications to be consistent with the KHNP response to the NRC staff comments on the audited specifications.	Response acceptable.	**Closed**
	APR1400 Balance of Plant (BOP) Safety-Related Pumps and Valves				
1	The design specifications included in the Electronic Reading Room apply to pumps and valves within the APR1400 Nuclear Steam Supply System (NSSS). The NRC staff has prepared a sample list of safety-related pumps and valves in APR1400 Balance of Plant (BOP) Systems. The staff requests that KHNP make available design specifications (or information to be provided in design specifications) for the following sample list of safety-related pumps and valves in the identified APR1400 BOP Systems: **Auxiliary Feedwater System (AF)** AF Turbine-Driven Pump PP01B AF Motor-Driven Pump PP02A AFW Discharge Check Valve V1004B AFW Containment Isolation MOVs V043 and V046 **Containment Spray System (CSS)** Containment Spray Pump Containment Spray Isolation Valve MOV V003 Containment Spray Check Valve V1007 Containment Spray Relief Valve CS-1005 **Component Cooling Water System (CCWS)**	Scarbrough	There are several specifications and information to be provided for NRC audit. The supporting documents to show the interfaces between the specifications and design documents will be prepared by the end of September.	The following purchase specifications were included in the ERR and reviewed: 9-542-M206, AFW Pumps and Drivers 9-442-N203, Containment Spray Pumps 9-132-N202, Safety-Related Centrifugal Pumps 9-132-N201, ESW Pumps and Screen Wash Pumps 9-145-P206D, Safety and Non-Safety Related Tilting Disc Check Valves 9-145-P204, Safety Related Manual Steel Gate, Globe, and Check Valves, 2-1/2" and Larger	**Closed**

	CCW Pump PP02B MOVs V143 and V191 CCW Pump Discharge Check Valve V1003 **Essential Service Water System (ESWS)** ESW Pump PP02A ESW Pump Discharge Check Valve V1004 ESW MOV V0045 **Spent Fuel Pool Cooling and Cleanup System (SFPCCS)** SFP Cooling Pump PP01B SFP Cooling Pump Discharge Check Valve V1005 SFP Containment Isolation Valve V1144 **Essential Chilled Water System (ECWS)** ECW Pump PP02A ECW Discharge Check Valve V1010A **Main Steam and Feedwater Systems** Main Steam Safety Valve MS-V1301 Main Steam Isolation Valve MS-V011 Main Feedwater Isolation Valve FW-V121			9-145-P206A, Safety-Related Steel Gate and Globe Valves with Actuator Purchase specifications include updated codes and standards, and environmental parameters. Response acceptable.	
Document No. APR1400 Design Specification for Check Valves Greater than Two Inches					
1	APR1400 DCD Tier 1, Figure 2.4.6-1, "Chemical and Volume Control System," on page 24.-95 indicates Check Valve CV-433 in the injection line for the charging pumps. APR1400 Design Specification 9-450-Z-S-404-00 includes check valves in the CVCS with a CH- identification. Is CVCS check valve 433 included in this design specification?	Scarbrough	CH-433 is a CVCS check valve with a size less than 2 inches. Check valves less than 2 inches are not included in the NSSS design specification, but will be included in the BOP procurement specification.	KHNP will discuss CVCS Check Valve CH-433 specification at next call. During the follow-up audit, KHNP provided an updated markup of Purchase Specification 9-145-P207, "Safety & Non-Safety Related Manual Steel Gate, Globe and Check Valves, 2" & Smaller," which included attachments specifying recent codes and standards, and environmental qualification parameters. As noted for Purchase Specification 9-184-J237A, "Main Steam Safety Valves," the COL applicant will be responsible for preparing plant-specific purchase specifications based on the design specifications.	**Closed**

Document No. 9-431-Z-S-404-A2 Design Specification for Reactor Coolant Pump Hydraulic Snubbers					
1	Section 6.3.4.3 states that the snubber system shall remain functional for 24 months without maintenance. Why does Section 6.3.4.3 only require the snubber to remain functional for 24 months when the design life is specified as 60 years in Section 6.3.4.5?	Scarbrough	This requirement is for the snubber's in-service inspection. The snubber system shall maintain their function for more than the 18 month plant refueling cycle and the performance can be inspected and tested during every plant refueling outage.	Response acceptable.	**Closed**
2	Section 10.0 specifies testing of the snubber in accordance with Reference 3.1.2.5 (ASME QME-1-2007). Where does the specification require that the other qualification provisions in ASME QME-1-2007 be satisfied?	Scarbrough	The related requirements are specified in the Sections 4.2.2, 4.2.3, 5.2, 6.4.1, and 6.2, 8.2 of Appendix A.	Response acceptable.	**Closed**
3	Table 2 specifies the environmental data for the snubbers. Where is the environmental qualification method addressed in the design specification?	Scarbrough	The related requirements are specified in the Sections 4.2.3 and 6.2.	Response acceptable.	**Closed**
4	Appendix C, "Fastener Lubricants," lists Neolube Number 1 without conditions for its use in high temperature applications.	Scarbrough	Since the maximum temperature of the environmental condition, including MSLB & LOCA, for the snubber is less than 400ºF, (as shown in Table 2 of design specification), there is not a problem to use Neolube Number 1 in this application. Alternative lubricants for higher temperature applications are listed in Appendix C, "Fastener Lubricants."	Response acceptable.	**Closed**
Document No. 9-431-Z-S-404-62 Design Specification for Steam Generator Upper Support Snubber					
1	Section 6.3.4.3 states that the snubber system shall remain functional for 24 months without maintenance. Why does Section 6.3.4.3 only require the snubber to remain functional for 24 months when the design life is specified as 60 years in Section 6.3.4.5?	Scarbrough	This requirement is for the snubber's in-service inspection. The snubber system shall maintain their function for more than the 18 month plant refueling cycle and the performance can be inspected and tested during every plant refueling outage.	Response acceptable.	**Closed**
2	Section 10.0 specifies testing of the snubber in accordance with Appendix D of the specification. Where does the specification require that the qualification provisions of ASME QME-1-2007 be satisfied?	Scarbrough	The related requirements are specified in the Sections 4.2.2, 4.2.3, 5.2, 6.4.1, and 3.5, 8.2 of Appendix A.	Response acceptable.	**Closed**
3	Table 2 specifies the environmental data for the snubbers. Where is the environmental qualification method addressed in the design specification?	Scarbrough	The related requirements are specified in the Sections 4.2.3 and 6.2.	Response acceptable.	**Closed**

4	Appendix C, “Fastener Lubricants,” lists Neolube Number 1 without conditions for its use in high temperature applications.	Scarbrough	Since the maximum temperature of the environmental condition, including MSLB & LOCA, for the snubber is less than 400ºF, (as shown in Table 2 of design specification), there is not a problem to use Neolube Number 1 in this application. Alternative lubricants for higher temperature applications are listed in Appendix C, “Fastener Lubricants.”	Response acceptable.	**Closed**
Document No. 9-145-P206A Safety Related Steel Gate and Globe Valves with Actuator					
1	Section 4.03 references KEPIC MN Code (2000 Edition) rather than the ASME BPV and OM Codes, and QME-1 Standard and RG 1.100 (Revision 3). Please explain this reference to the KEPIC MN Code rather than ASME codes and standards in the purchase specification.	Scarbrough	KEPIC is a translated version of the ASME Codes and there is no basic difference between the codes. KEPIC is mandatory for Korean domestic suppliers and the ASME code is applicable to overseas suppliers.	Response acceptable.	**Closed**
2	The valve-specific design specifications that are developed based on this purchase specification will need to be updated consistent with the NRC staff comments on other design specifications (such as the use of QME-1-2007 for valve qualification, and flow considerations in sizing valve actuators).	Scarbrough	The valve specific design specification should be updated per NRC comments by COL applicant.	Purchase Specification P-145-P206A includes codes and standards, dynamic design requirements, environmental design requirements, and the attachments for updated codes and standards and environmental parameters. KHNP referenced QAPD for COL applicant to prepare purchase specification based on design specifications. Response acceptable.	**Closed**
Document No. 9-542- M206, Auxiliary Feedwater Pumps and Drivers					
1	Section 4.05.A.19, “CGI Dedication,” of Specification 9-542-H206, “Auxiliary Feedwater Pumps and Drivers,” Rev. 2 states, “The CGI dedication items listed in Attachment 4-1 shall be qualified as nuclear grade items based on guidelines of EPRI NP-5652, NP-6406, TR 106439 and GL 91-05. The dedication plan/program, reports and	Strnisha	ASME QME-1-2007 will be incorporated into this purchase specification in accordance with APR1400 DCD by the COL applicant.	Response acceptable – The referenced documents provide sufficient guidance and in addition ASME QME-1-2007 as accepted by RG	**Closed**

	certificate of conformance for dedicated item shall be submitted." NRC Information Notice 2014-11, "Recent Issues Related to the Qualification and Commercial Grade Dedication of Safety-Related Components," provides examples where vendors had not implemented sufficient controls to verify that safety-related equipment supplied for use in nuclear power plants was qualified to meet it design requirements. Inadequate implementation of the commercial grade dedication process might result in commercial grade items (CGIs) not being properly qualified to perform their safety functions. Therefore, IN 2014-11 states that NRC staff has accepted ASME Standard QME-1-2007 in RG 100 (revision 3) for the qualification of mechanical equipment used in nuclear power plants. The qualification process described in ASME QME-1-2007 as accepted in RG 1.100 (revision 3) should be used for the qualification of mechanical equipment (including nonmetallic parts) regardless of the equipment's origin as a safety-related component or a CGI. Will the qualification process described in ASME QME-1-2007 as accepted in RG 1.100 (Revision 3) be used for the qualification of mechanical equipment (including nonmetallic parts) regardless of the equipment's origin as a safety-related component or a CGI? If not, please describe the qualification process. Will NRC Information Notice 2014-11, "Recent Issues Related to the Qualification and Commercial Grade Dedication of Safety-Related Components," be added as a reference to Section 4.05.A.19, "CGI Dedication," of Specification 9-542-H206?Also, please provide Attachment 4-1 for staff review. This is a generic comment that should be applied to all design and procurement specifications.		NRC IN 2014-11 will be incorporated into this purchase specification in accordance with APR1400 DCD by the COL applicant. KHNP understands that Attachment 4-1 is not necessary for the audit because Attachment 4-1 is for SKN 3&4 and that of APR1400 may be changed according to the supplier of this purchase specification.	1.100 Revision 3 and NRC IN 2014-11 will be incorporated into this purchase specification in accordance with APR1400 DCD by the COL applicant.	
2	Section 4.05.C.11 of Purchase Specification 9-542- M206, "Auxiliary Feedwater Pumps and Drivers," states, that "the supplier shall prove by test and/or analysis the operability of the equipment before, during and after an accident in accordance with Appendix I and ASME QME-1." Will this pump (including mechanical seal) testing be performed by test or a combination of test and analysis? This should be consistent throughout the specification.	Strnisha	The requirement of Section 4.05.C.11 is for providing the qualification method for the operability of equipment to the supplier (e.g., the test, analysis or test and analysis combination is available).	The safety-related Auxiliary Feedwater Pumps shall be qualified in accordance with ASME QME-1-2007. The COL applicant will revise the procurement specification based on the APR1400 DCD.	**Closed**
3	Purchase Specification 9-542- M206, "Auxiliary Feedwater Pumps and Drivers," addresses both motor driven and turbine driven auxiliary feedwater pumps. Sections 4.05.C.8, 4.05.C.10, and 4.05.C.11 of the specification describe QME-1-2007 testing for pumps and valves. However, the specification does not specifically address ASME QME-1-		COL applicant will conform to the ASME QME-1-2007 based on the APR1400 DCD.	The COL applicant will revise the procurement specification based on the APR1400 DCD.	**Closed**

	2007 qualification for auxiliary feedwater turbine drivers. Will the feedwater turbine drivers be qualified in accordance with ASME QME-1-2007? If not, please describe the qualification process.				
Document No. 9-442-N023 Containment Spray Pumps					
1	Section 4.05.A 6 states that the "the pumps shall be designed, constructed, tested and stamped in accordance with the requirements of the KEPIC MNC (Class 2 components) and this specification. The suppliers shall prepare pump design report in accordance with the requirements of the Code and submit it to the buyer for review." Do KEPIC MNC (Class 2 components) and this specification include all design and testing (functional, environmental and seismic) requirements specified in the pump technical specifications document and the APR1400 DCD? Is a copy of KEPIC MNC be available for staff review?	Strnisha	KEPIC MNC code is based on ASME Code Section III, NC, and if any conflict exists between the two codes, ASME codes take precedence. Therefore, NRC can refer to the ASME Section III NC Code instead of KEPIC MNC. Yes, the code and the specification include all requirements for performance, design and testing, and information is described in APR1400 DCD.	The response is acceptable - this section applies to ASME Section III testing, not QME-1.	**Closed**
Document No. 9-132-N202 Safety Related Centrifugal Pumps					
1	Section 4.05.A 5 states that the "the pumps shall be designed, constructed, tested and stamped in accordance with the requirements of the KEPIC MNC (Class 2 components) and this specification. The suppliers shall prepare pump design report in accordance with the requirements of the Code and submit it to the buyer for review." Do KEPIC MNC (Class 2 components) and this specification include all design and testing (functional, environmental and seismic) requirements specified in the pump technical specifications document and the APR1400 DCD? Is a copy of KEPIC MNC be available for staff review?	Strnisha	KEPIC MNC code is based on ASME Code Section III, NC, and if any conflict exists between the two codes, ASME codes take precedence. Therefore, NRC can refer to the ASME Section III NC Code instead of KEPIC MNC. Yes, the code and the specification include all requirements for performance, design and testing, and information is described in APR1400 DCD.	The response is acceptable - this section applies to ASME Section III testing, not QME-1.	**Closed**
Document No. 9-9-447-N206132-N202 Safety Related Centrifugal Pumps					
1	In Section 4.05 Design Conditions, Subsection 22 stated that the strainers shall be cap[able of withstanding the force of full debris loading, inertial effects of water in IRAST, hydrodynamic loads induced by the discharge of water, air, and single and two-phase steam due to the opening of the pressurizer POSRV into the IRAWST without collapse or structural deformation, in conjunction with all design basis conditions including seismic. To confirm this design condition of the strainers meeting the RG 1.82 and GSI-191, the staff requests the applicant provides the structure analysis reports (or stress analysis reports) of the IRWST strainers for the staff's review.	Le	Debris loads, inertial effects of water in IRWST, and hydrodynamic are considered in the IRWST sump strainer stress analysis which is described in APR1400-E-N-NR-14002-NP, Rev.0, IRWST Sump Strainer and Trash Rack Structural Analysis.	Response acceptable.	**Closed**
2	In Section 4.05 Design Conditions, Subsection 23 stated that the strainers are designed to have a design life of 40 years of normal	Le	The design life for RCS main components and Class 1 piping is 60	Response acceptable.	**Closed**

	operation plus one (1) year of accident operation at the specified conditions. In general, the components are designed to 60 years. The staff requests the applicant provides the bases of the strainers that are designed to 40 years life of normal operation plus one year of accident operation at the specified conditions.		years, and the design life for Class 2 and 3 piping and other components except RCS main components is 40 years. (Refer DCD Table 3.9-1, Transients Used in Stress Analysis)		
3	In Section 4.05 Design Conditions, Subsection B "Operating and Design Conditions" specified strainer allowable head loss of 1.5 (ft-water). Provide a clarification if the allowable head loss of 1.5 (ft-water) was based on the strainer with a maximum post -LOCA debris.	Le	While the allowable head loss of 1.5 ft-water is for the reference plants, SKN 3&4, the allowable head loss for APR1400 is 2 ft-water which is indicated in Section 3.5 and 3.6 of APR1400-E-N-NR-14001-P, Rev. 0, Design Features to Address GSI-191. Response: A COL item has been added for the COL applicant to confirm that the IRWST sump strainer head loss is less than the allowable head loss of 2 ft-water as indicated in Attachment #4.	From J. Vera email of 8/26/2016: KHNP proposed to have a mark-up for COLA to specify head loss of 2.0 (ft-water) for the sump strainer. A mark-up of this COLA will be provided to the staff review. Therefore, it is an open item of the audit. The NRC staff reviewed the mark-up for COLA to specify head loss of 2.0 (ft-water) for sump strainer and found it is acceptable. Until the formal DCD revision is issued, this item is considered Confirmatory item.	**Confirmatory**
Document No. 9-135-P216 Safety Related Strainers, 9-441-Z-S-404-32 Heat Exchangers, 9-451-Z-S-404-41 Design Specification for Volume Control Tank					
1	Similar to question #2 from page 41 of this table, other equipment: Safety Related Strainers, Spec. # 9-135-P216; Design Specification for Shutdown Cooling Pump Miniflow Heat Exchanger, Spec # 9-441-Z-S-404-32, Design Specification for Volume Control Tank, Spec. 9-451-Z-S-404-41 are designed to 40 years life. Provide the bases of the equipment designed to 40 years life.	Le	The other equipment including the volume control tank is safety class 2 or 3 and located outside the reactor coolant pressure boundary (RCPB). The above-stated equipment is replaceable after design life. The equipment which is safety class 2, or 3, located outside the RCPB and replaceable are designed to a design life of 40 years for APR1400.	Response acceptable.	**Closed**

Closed:

This indicates that the KHNP response is acceptable, and no further NRC staff action is necessary related to the review of the design and procurement specifications for the APR1400 DC application.

Confirmatory:

This indicates that the revised markup of the design specification includes an acceptable modification to resolve the audit finding. KHNP will notify the NRC when the applicable revision to the design specification has been signed and dated, and is available in the electronic reading room for verification by the NRC staff where appropriate.

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