KHNPDCDRAIsPEm Resource

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Sent: Tuesday, January 05, 2016 6:01 AM
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Cc: Goel, Raj; Segala, John; Umana, Jessica; Lee, Samuel
Subject: APR1400 Design Certification Application RAI 357-8344 (06.02.04 - Containment Isolation System)
Attachments: APR1400 DC RAI 357 SCVB 8344.pdf

KHNP,

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

06.02.04-1: 30 days
06.02.04-2: 30 days
06.02.04-3: 30 days
06.02.04-4: 45 days
06.02.04-5: 45 days
06.02.04-6: 45 days
06.02.04-7: 60 days
06.02.04-8: 45 days
06.02.04-9: 60 days
06.02.04-10: 60 days
06.02.04-11: 45 days
06.02.04-12: 45 days

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

Thank you,

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REQUEST FOR ADDITIONAL INFORMATION 357-8344

Issue Date: 01/05/2016
Application Title: APR1400 Design Certification Review – 52-046
Operating Company: Korea Hydro & Nuclear Power Co. Ltd.
Docket No. 52-046
Review Section: 06.02.04 - Containment Isolation System
Application Section:

QUESTIONS

06.02.04-1

Provide justification for systems with single valve isolation - Safety Injection (SI) pump and Containment Spray (CS) pump suction line

General Design Criteria (GDC) 56, "Primary containment isolation," requires in part that each line that penetrates containment be provided with two containment isolation valves (one inside and one outside containment) unless it can be demonstrated that the containment isolation provisions for a specific class of lines, such as instrument lines, are acceptable on some "other defined basis." Standard Review Plan (SRP) Section 6.2.4, Regulatory Guide (RG) 1.141, and ANSI N271-1976 provide guidance for implementation of the "other defined basis" statement in GDC 56.

In DCD Tier 2, Section 6.2.4.2, the applicant stated that containment isolation provisions are listed in Table 6.2.4-1 and the appropriate valve arrangements are shown in Figure 6.2.4-1. Table 6.2.4-1 lists GDC 55 and 56 systems with single valve isolation and provides justification for use of single valve protection. Each of the four SI Pump suction lines including two CS pump suction lines consists of single remote motor operated valve located outside containment (Table 6.2.4-1 Sheet 5 and Figure 6.2.4-1 Sheet 4).

Additional justification is needed in order to demonstrate that the configurations meet ANSI N271-1976 regarding the “other defined basis” requirement in GDC 56.

For the SI pump suction and CS pump suction line valves (Figure 6.2.4-1 Sheet 4), the applicant provides a discussion that the SI system (SIS) is shown to be more reliable with this single valve configuration, a discussion that a single active failure can be accommodated with only one valve in the line, a discussion of how leak testing will be performed on that portion of the SIS outside of containment, and a discussion of how it can be shown that system integrity can be maintained during normal plant operations.

ANSI N271-1976, Section 3.6.4 defines the basis for lines consisting of a single valve and a closed system which are both located outside containment. Pursuant to this section of the standard, provide a discussion in the DCD of the design of any protective or leak tight or controlled leakage housing that encloses the single valve and the piping between the containment and the valve.

06.02.04-2

Clarify design requirements that prevent debris from interfering with valve closure.

Pursuant to RG 1.206 Section C.I.6.2.4.2 guidance, provide a discussion in the DCD on the design requirements of the containment isolation barriers as they pertain to provision taken to ensure that closure of any containment isolation valves is not prevented by debris that could become entrained in escaping fluid. Specifically discuss the following penetrations: Item Nos. 24, 25, 26, 27 (Safety injection pump and Containment spray pump suction line).

06.02.04-3

Clarify design requirements for relief valves used as containment isolation barriers.

Per ANSI N271-1976 Section 4.74 (endorsed by RG 1.141), when relief valves that discharge into containment are also used for containment isolation barriers, the discharge side of the valve should be designed to withstand and be tested at the containment design pressure.

The two shutdown cooling system (SCS) pump suction lines (Table 6.2.4-1, Sheet 4, item #18 and 19) rely on relief valves for such purpose. Pursuant to the guidance in Sections 3.6.6 and 4.74 of ANSI N271-1976, state in the DCD that the discharge side of the relief valves in the SCS pump suction lines are designed to withstand and be tested at the containment design pressure.

06.02.04-4

Clarify if all power operated containment isolation valves (CIVs) have position indication in the main control room (MCR) and have station blackout (SBO) considerations for indication and closure.

Pursuant to the RG 1.141 and ANSI N271-1976, Section 4.2.3 guidance, provide a description in the DCD that states that all power operated isolation valves have position indication in the MCR. In addition, pursuant to RG 1.155 Section C.3.2.7, indicate in the DCD if provisions are provided, independent of the preferred and blacked out unit's onsite emergency ac power supplies, for valve position indication and closure for containment isolation valves that may be in the open position at the onset of a SBO.

06.02.04-5

Justify containment isolation valve fail-as-is (open poisition) upon loss of power

General Design Criteria (GDC) 56 requires in part that upon the loss of actuating power the automatic containment isolation valves (CIVs) should take the position of greater safety.

1. Item No. 31 and No. 32, component cooling water (CCW) supply to and return from letdown heat exchanger isolation valves

As described in Table 6.2.4-1 Sheet 6, the two motor operated CIVs, CC-0296 and CC-0297 associated with CCW supply to letdown heat exchanger, and two motor operated containment isolation valves, CC-031 and CC-302 associated with CCW return from letdown heat exchanger fails-as-is (open position), upon loss of power, however, their post accident position is closed. Pursuant to the requirement of GDC 56, explain how a failed-open position of MOVs, as shown in Figure 6.2.4-1 Sheet 5, is the position of greater safety upon loss of power.

2. Item No. 33 and No 34, CCW supplyt o and return from RCP coolers isolation valves

As described in Table 6.2.4-1 Sheet 6, the motor operated CIV, CC-231 associated with CCW supply to RCP coolers, and two motor operated containment isolation valves CC-025 and CC-0249 associated with CCW return from RCP coolers fails-as-is (open position), upon loss of power, however, their post accident position is closed. Pursuant to the requirement

of GDC 56, explain how a failed open position of MOVs, as shown in Figure 6.2.4-1 Sheet 2 and 5, is the position of greater safety upon loss of power.

3. Item No. 69 and No. 70, containment radiation monitor inlet and out let isolation valves

As described in Table 6.2.4-1 Sheet 10, the two motor operated CIVs, PR-432 and PR-431 associated with containment radiation monitor (inlet) and the motor operated containment isolation valve, PR-434 associated with Containment radiation outlet , fails-as-is (open position), upon loss of power, however, their post accident position is closed. Pursuant to the requirement of GDC 56, explain how a failed-open position of MOVs, as shown in Figure 6.2.4-1 Sheet 7 and 2 is the position of greater safety upon loss of power.

06.02.04-6

Justify containment isolation valve fail-as-is (open poisition) upon loss of power

General Design Criteria (GDC) 56 requires in part that upon the loss of actuating power the automatic containment isolation valves (CIVs) should take the position of greater safety.

1. Item No. 35, CVCS IRWST boron recovery return isolation valve

As described in Table 6.2.4-1 Sheet 6, the motor operated CIV, CV-509 associated with CVCS IRWST boron recovery return fails-as-is (open position), upon loss of power, however, its post accident position is closed. Pursuant to the requirement of GDC 56, explain how a failed-open position of MOV, as shown in Figure 6.2.4-1 Sheet 2, is the position of greater safety upon loss of power.

2. Item No. 68, PCW return from containment ventilation units isolation valve

As described in Table 6.2.4-1 Sheet 10, the motor operated CIV, WI-0015 associated with PCW return from containment ventilation units fails-as-is (open position), upon loss of power, however, its post accident position is closed. Pursuant to the requirement of GDC 56, explain how a failed-open position of MOV, as shown in Figure 6.2.4-1 Sheet 9, is the position of greater safety upon loss of power.

3. Item No. 77, Reactor drain tank gas space to GWMS isolation valve

As described in Table 6.2.4-1 Sheet 10, the motor operated CIV, GW-0001 associated with Reactor drain tank gas space to GWMS fails-as-is (open position), upon loss of power, however, its post accident position is closed. Pursuant to the requirement of GDC 56, explain how a failed-open position of MOV, as shown in Figure 6.2.4-1 Sheet 8, is the position of greater safety upon loss of power.

06.02.04-7

Clarify administrative controls and leak testing provisions for flanged closures, personnel airlock, equipment hatch, and fuel transfer tube

Pursuant to requirements in General Design Criteria (GDC) 54 as it relates to the design of piping systems penetrating containment having the capability to periodically test the operability of the isolation valves and associated apparatus and pursuant to guidance in RG 1.141 (ANSI N271-1976, paragraph

4.10), state in the DCD that the flanged closures, personnel airlock, equipment hatch and fuel transfer tube will be under administrative controls similar to manual valves and have provisions for containment leak testing in accordance with ANSI N271-1976, paragraph 5.3.

In addition, provide descriptions in the DCD of the accommodations for leakage testing that are provided for flanged closures, airlock design, equipment hatch and fuel transfer tube designs.

06.02.04-8

Provide information on provisions to alert the operator to isolate remote manual containment isolation systems.

In order to evaluate if requirements of General Design Criteria (GDC) 54 ,as it relates to reliable isolation capability systems utilizing remote manual containment isolation valves (CIVs), have been met for the APR1400, more information is needed. For each containment penetration listed in DCD Tier 2, Table 6.2.4-1 that is equipped with remote manual CIVs, provide details in the DCD as to what provisions are provided to alert the operator of the need to isolate fluid systems equipped with remote manual isolation valves. Such provisions may include instruments to measure flow rate, sump water level, temperature, pressure, and radiation level. For each penetration and provision (instrument(s)) listed, provide a description of how an operator in the main control room would use the provision or instrument to identify the line and to determine when to isolate the fluid system.

06.02.04-9

Provide a table describing the provisions for individual leakage rate testing of the isolation barrier.

In order to evaluate if requirements of General Design Criteria (GDC) 54, as it relates to the ability to test the operability of isolation barriers, are met and to determine if valve leakage is within acceptable limits, for each containment isolation barrier, provide a table in the DCD describing the provisions (test connection etc) for individual leakage rate testing of the barrier.

06.02.04-10

Clarify use of resilient seals on containment vent and purge valves and accommodations for seal replacement if supplied.

In order to evaluate if requirements of General Design Criteria (GDC) 54, as it relates to the ability to test the operability of isolation barriers, are met and to determine if valve leakage is within acceptable limits, specify in the DCD (or state where in the DCD it is specified) if the containment purge and vent valves will be supplied with resilient seals. If supplied, specify in the DCD what accommodations are provided for resilient seal replacement when required by leakage rate testing or manufacturer recommendation.

06.02.04-11

Describe inspections, tests, analyses and acceptance criteria (ITAAC) for verification of containment isolation valve (CIV) placement.

10 CFR 52.47(b)(1) requires that a DC application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification.

DCD Tier 1, Table 2.11.3-2 “Containment Isolation System ITAAC”, provides the ITAAC for the CIVs. How will this ITAAC, as written, ensure that the supplied as-built piping distances from the outer CIV to the containment will be such that the valves are located as close to containment as practical? (i.e. describe any inspections, tests, or acceptance criteria which will confirm that the as built piping distances will not exceed those listed in DCD Tier 2, Table 6.2.4-1).

In addition, indicate the associated containment penetration numbers in DCD Tier 1, Table 2.11.3-1 "Containment Isolation System Component List."

06.02.04-12

Clarify containment isolation provisions meet the intent of Regulatory Guides (RGs) 1.11 and 1.141

DCD Tier 2, Section 6.2.4.1 indicates that instrument and control (I&C) sensing lines that penetrate the containment are provided with containment isolation provisions that meet the intent of NRC RGs 1.11 and 1.141. Please clarify in the DCD what is meant by “meet the intent of RG 1.11 and RG 1.141”. If the containment isolation provisions for some I&C sensing lines meet the isolation guidelines on some other defined bases not indicated in RGs 1.11 and 1.141, please clearly state and justify the reasons in the DCD.


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