

KHNPDCDRAIsPEm Resource

From: Ciocco, Jeff
Sent: Thursday, January 28, 2016 8:29 AM
To: apr1400rai@khnp.co.kr; KHNPDCDRAIsPEm Resource; Harry (Hyun Seung) Chang; Andy Jiyong Oh; Erin Wisler
Cc: Haider, Syed; Segala, John; Umana, Jessica; Lee, Samuel
Subject: APR1400 Design Certification Application RAI 378-8442 (06.02.01.01.A - PWR Dry Containments, Including Subatmospheric Containments)
Attachments: APR1400 DC RAI 378 SCVB 8442.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.

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

Thank you,

Jeff Ciocco
New Nuclear Reactor Licensing
301.415.6391
jeff.ciocco@nrc.gov



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From: Ciocco, Jeff

Created By: Jeff.Ciocco@nrc.gov

Recipients:

"Haider, Syed" <Syed.Haider@nrc.gov>
Tracking Status: None
"Segala, John" <John.Segala@nrc.gov>
Tracking Status: None
"Umana, Jessica" <Jessica.Umana@nrc.gov>
Tracking Status: None
"Lee, Samuel" <Samuel.Lee@nrc.gov>
Tracking Status: None
"apr1400rai@khnp.co.kr" <apr1400rai@khnp.co.kr>
Tracking Status: None
"KHNPDCDRAIsPEm Resource" <KHNPDCDRAIsPEm.Resource@nrc.gov>
Tracking Status: None
"Harry (Hyun Seung) Chang" <hyunseung.chang@gmail.com>
Tracking Status: None
"Andy Jiyong Oh" <jiyong.oh5@gmail.com>
Tracking Status: None
"Erin Wisler " <erin.wisler@aecom.com>
Tracking Status: None

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REQUEST FOR ADDITIONAL INFORMATION 378-8442

Issue Date: 01/28/2016

Application Title: APR1400 Design Certification Review – 52-046

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

Docket No. 52-046

Review Section: 06.02.01.01.A - PWR Dry Containments, Including Subatmospheric Containments

Application Section: 6.2.1.1 Containment Structure

QUESTIONS

06.02.01.01.A-9

Containment Peak Pressure/Temperature Analyses for APR1400

General Design Criteria (GDC) 50, "Containment design basis", and GDC 16, "Containment design", of Appendix A to 10 CFR Part 50, "ECCS Evaluation Models" require, in part, that the reactor containment structure and associated heat removal system shall be designed with sufficient margin to accommodate the calculated pressure and temperature conditions resulting from any loss-of-coolant accident (LOCA). GDC 38, "Containment heat removal," of Appendix A to 10 CFR Part 50 requires, in part, that the containment heat removal system shall rapidly reduce the containment pressure following any LOCA, lessening the challenge to the containment integrity. In this context, the staff seeks the following additional information to gain safety insights into the applicant's limiting peak pressure/temperature analyses for the containment. The applicant is also requested to update the APR1400 DCD accordingly.

NUREG-0800, SRP Section 6.2.1.1A, "PWR Dry Containments, including Subatmospheric Containments," Acceptance Criterion No. 1 specifies that the containment design pressure should provide at least a 10% margin above the accepted peak calculated containment pressure following a LOCA, or a steam line or feedwater line break, to satisfy the GDC 16 and 50 requirements for sufficient design margin. The calculations referenced in DCD Tier 2, Section 6.2.1.1 show a greater than 10% margin to the containment design pressure (60 psig) for all LOCA and main steam line break (MSLB) cases analyzed. However, preliminary confirmatory calculations performed by the staff for the limiting double-ended discharge leg slot break (DEDLSB) LOCA case using a multi-node MELCOR model yield a peak pressure higher than the value (51.09 psig) calculated by the applicant's single-node GOTHIC model for the containment atmosphere region, such that the resulting margin to the design pressure is significantly less than 10%. The staff's multi-node confirmatory calculations also resulted in a much higher (380.9 °F) peak containment temperature for the limiting MSLB case, as compared to 333.41 °F from the applicant's single-node model, as documented in DCD Tier 2 Table 6.2.1-2. DCD Tier 2 Section 6.2.1.1.3.3 acknowledges that the MSLB containment temperature exceeds the containment design temperature (290.0 °F) for a period prior to containment spray (CS) actuation. Figures 6.2.1-6 through 6.2.1-15 show that the containment temperature exceeds the containment design temperature for a couple of minutes for all MSLB cases analyzed.

In order for the staff to understand the discrepancies in the calculated pressure and temperature and reconcile the differences between the two models, please provide a full accounting of the input data, sensitivity coefficients (inertial lengths, loss coefficients, etc.), assumptions used to capture the heat transfer correlations used in containment or mass and energy release, in addition to any other assumptions or uncertainties not listed in Section 6.2.1.1 that could adversely impact the design margins in the containment peak pressure or temperature. Also address any potential impact of excessive heating on the containment integrity and equipment qualifications for other safety-related systems.

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06.02.01.01.A-10

NUREG-0800, SRP Section 6.2.1.1.A Acceptance Criterion No. 2 specifies that the containment pressure should be reduced to less than 50% of the peak calculated pressure for the design basis LOCA within 24 hours after the postulated accident, to satisfy the GDC 38 requirements for the containment as the final barrier against the release of radioactivity to the environment. DCD Tier 2 Table 1.9-2, "APR1400 Conformance with the Standard Review Plan," states that the APR-1400 conforms to SRP Section 6.2.1.1.A Acceptance Criterion No. 2. DCD Tier 2 Section 6.2.1.1.3.2 states that "*The calculated containment pressure at 24 hours, 1.795 kg/cm²G (25.54 psig), is 42.35 percent of the peak calculated pressure for the limiting LOCA and thus meets the requirements of GDC 38.*" Using the values provided in the DCD, the staff calculates the pressure of 40.24 psia at 24 hours to be equal to 61.2% of the peak calculated pressure of 65.79 psia. Therefore, the applicant is requested to justify how the calculated containment pressure at 24 hours, 40.24 psia (25.54 psig), is reduced to less than 50% of the peak calculated pressure, 65.79 psia (51.09 psig).



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