KHNPDCDRAIsPEm Resource

From:	Ciocco, Jeff
Sent:	Monday, February 22, 2016 8:35 AM
To:	apr1400rai@khnp.co.kr; KHNPDCDRAIsPEm Resource; Andy Jiyong Oh; Steven Mannon
Cc:	Som, Swagata; Zimmerman, Jacob; Steckel, James; Lee, Samuel
Subject:	APR1400 Design Certification Application RAI 413-8529 (08.03.01 - AC Power Systems (Onsite))
Attachments:	APR1400 DC RAI 413 EEB 8529.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, 60 days to respond to this RAI. We may adjust the schedule accordingly.

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

Thank you,

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Options
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REQUEST FOR ADDITIONAL INFORMATION 413-8529

Issue Date: 02/22/2016
Application Title: APR1400 Design Certification Review – 52-046
Operating Company: Korea Hydro & Nuclear Power Co. Ltd.
Docket No. 52-046
Review Section: 08.03.01 - AC Power Systems (Onsite)
Application Section: 08.03.01

QUESTIONS

08.03.01-22

By letter dated January 15, 2016, the applicant provided a response to RAI 8104, Question 08.03.01-13, regarding “Electrical Power System calculations”. The RAI response attached a Technical Report (TeR) APR1400-E-E-NR-14001-P Rev 1.

The staff reviewed the TeR and requests the following information/clarifications:

1. Emergency Diesel Generator (EDG) Loading Scenario:

   In Section 4.3 of the TeR, various plant operating modes and source conditions are categorized, except that the EDG scenarios and modeling assumptions are not described here. Please discuss if any of the loading categories stated in the TeR include EDG. Discuss the scenario(s) when power is supplied from the EDG, with EDG loading based upon a loss of offsite power (LOOP) simultaneous with loss of coolant accident (LOCA). Discuss the EDG electrical transient analyzer program (ETAP) results in terms of bus voltages at the Class 1E buses.

2. Cable Sizes and Impedances:

   In Section 5.1.9, the applicant states that cable sizes and assumed lengths are based on the reference plant to facilitate model updates. Please provide a summary as how the cables (MV and LV) are modeled with design assumptions. Describe how the sizing (loading), derating, cable spacing, tolerance of lengths, ambient temperature, cable operating temperatures and other anticipated correction factors are determined in the ETAP model.

3. Motor Loading in ETAP:

   In Section 5.2.7 of the TeR, the motor loading capacities in horse power (HP) are provided for various loading scenarios. Please discuss the assumptions for service factor, rated motor slip, motor efficiency and power factors in general for large and low voltage motors (as per National Electrical Manufacturers Association (NEMA) MG 1) in the ETAP model. Also discuss the assumptions on the motor locked rotor current and locked rotor power factor, as modeled.

4. Tolerance in %Z:

In Section 5.2.3 of the TeR, the %Z and the tolerance values for transformers are provided. The tolerance for Unit Auxiliary Transformer (UAT) and Station Auxiliary Transformer (SAT) are assumed as ± 20%. The applicant indicated that the tolerances are in accordance with the IEEE Std. C57.12.00 as the reference guidance. IEEE Std. C57.12.00 (Liquid-Immersed Distribution, Power and Regulating Transformers), Section 9.2, states that the impedance of a transformer having three or more windings shall have a tolerance of ± 10%. Please provide a clarification as how the tolerance was determined for UAT and SAT at ± 20%, which is not as per the IEEE guidance.

5. Winding Temperature Rise:

In Section 5.2.3 of the TeR, the average winding temperature rise for UAT and SAT is provided as 55 ◦C. The guidance in IEEE Std. C57.12.00), Section 5.11, states that the average winding temperature rise above ambient temperature shall not exceed 65 ◦C, at rated kVA. Please provide a clarification as to why the temperature rise is selected at 55 ◦C at rated KVA. Please discuss further if the UAT and SAT also have a 65 ◦C rise with increased rating at rated KVA at ambient of 30 ◦C. Also provide the temperature rise value for Main Transformer (MT). Please explain the difference.

6. Main Generator and Main Transformer Rating:

In Sections 5.2.2, and 5.2.3 of the TeR, the MG and MT ratings are indicated as 1690 MVA, and 1670 MVA respectively. Please explain the difference in these ratings and how these ratings have been determined (accounting for losses, Unit aux loads etc.) and verified.

7. Cooling Class:

In Sections 5.2.3, and 5.2.6 of the TeR, the Cooling Class designations are provided as AA, or AA/FA for Load Center Transformers. Are these dry type or oil-filled transformers? According to C57.12.00, these designations (AA, AA/FA) are previous designations and have been updated. Please provide the present designation of the cooling scheme as per C57.12.00, Table 2, if these are oil-filled transformers. Provide the Cooling Class designation of the Main Transformer, UAT and SAT.

8. Tap Bus rating:

In Section 5.2.6 of the TeR, the Isolated Phase Main Bus rating is provided. Please provide the Tap Bus (Main bus to UAT) continuous current rating and short-time current rating. Explain how the tap-bus rating has been determined and verified for the adequacy of the rating.


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