KHNPDCDRAIsPEm Resource

From:	Ciocco, Jeff
Sent:	Tuesday, February 21, 2017 6:37 AM
To:	apr1400rai@khnp.co.kr; KHNPDCDRAIsPEm Resource; Jungho Kim (jhokim082 @gmail.com); Andy Jiyong Oh; Steven Mannon; Seokhwan Hur (shhur3658 @gmail.com)
Cc:	Otto, Ngola; Zimmerman, Jacob; Wunder, George; McCoppin, Michael
Subject:	APR1400 Design Certification Application RAI 539-8730 (08.01 - Electric Power - Introduction)
Attachments:	APR1400 DC RAI 539 EEB 8730.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, 45 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,

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

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Hearing Identifier: KHNP_APR1400_DCD_RAI_Public
Email Number: 598

Mail Envelope Properties (0e73f2d742a64100a5a5bbb9936f7341)

Subject: APR1400 Design Certification Application RAI 539-8730 (08.01 - Electric Power - Introduction)
Sent Date: 2/21/2017 6:36:57 AM
Received Date: 2/21/2017 6:37:16 AM
From: Ciocco, Jeff

Created By: Jeff.Ciocco@nrc.gov

Recipients:
"Otto, Ngola" <Ngola.Otto@nrc.gov>
Tracking Status: None
"Zimmerman, Jacob" <Jacob.Zimmerman@nrc.gov>
Tracking Status: None
"Wunder, George" <George.Wunder@nrc.gov>
Tracking Status: None
"McCoppin, Michael" <Michael.McCoppin@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
"Jungho Kim (jhokim082@gmail.com)" <jhokim082@gmail.com>
Tracking Status: None
"Andy Jiyong Oh" <jiyong.oh5@gmail.com>
Tracking Status: None
"Steven Mannon" <steven.mannon@aecom.com>
Tracking Status: None
"Seokhwan Hur (shhur3658@gmail.com)" <shhur3658@gmail.com>
Tracking Status: None

Post Office: R4PWMSMRS03.nrc.gov

Files	**Size**	**Date & Time**
MESSAGE	608	2/21/2017 6:37:16 AM
APR1400 DC RAI 539 EEB 8730.pdf	91737	
image003.jpg	5023	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

REQUEST FOR ADDITIONAL INFORMATION 539-8730

Issue Date: 02/21/2017
Application Title: APR1400 Design Certification Review – 52-046
Operating Company: Korea Hydro & Nuclear Power Co. Ltd.
Docket No. 52-046
Review Section: 08.01 - Electric Power - Introduction
Application Section:

QUESTIONS

08.01-21

Compliance with 10 CFR Part 50, GDC 17 requires that onsite and offsite electrical power be provided to support functioning of systems, structures, and components (SSCs) important to safety. Standard Review Plan (SRP) 8.2 and 8.3 explains that the GDC 17 requirements for the interface between the onsite and offsite electric power system in evolutionary advance light water reactor (ALWRs) designs are documented in SECY-91-078. In SECY-91-078, "Chapter 11 of the Electric Power Research Institute's (EPRI's) Requirements Document and Additional Evolutionary Light Water Reactor (LWR) Certification Issues," the staff concluded that feeding the safety buses from the offsite power sources through non-safety buses or from a common transformer winding with non-safety loads increases the difficulty in properly regulating voltage at the safety buses, subjects the safety loads to transients caused by the non-safety loads, and adds additional failure points between the offsite power sources and safety loads.

The APR1400 design includes non-safety and safety buses being fed from a common 4.16kV transformer winding of the unit auxiliary transformers (UATs) and standby auxiliary transformer (SATs). The staff's concerns related to the APR1400 design where the non-safety and safety buses are being fed from a common transformer winding are (1) voltage regulation at the safety buses, (2) transients from the non-safety loads or system impacting the safety loads or system, and (3) the creation of a failure point between the offsite power and the safety buses.

The applicant's response to RAI 8426, Question 08.01-14, to address the staff's concerns associated with the non-safety and safety buses being fed from a common transformer winding is discussed below.

(1) The on-load tap changers (OLTCs) at the primary side of the UATs and SATs ensure that the voltage regulation at the medium voltage (MV) safety buses is maintained in an acceptable range, and voltage regulation study was performed.

(2) There is a potential for transients at the safety buses caused by accident or operating occurrences on the non-safety buses such as (a) large motor starting, (b) motor re-acceleration during a bus transfer condition, or a (c) short circuit.

a) A large motor starting study has been performed and the results of the study demonstrate that voltage variation at the safety buses is maintained within acceptable limits during the non-safety large motor starting condition.

b) The transient effect of re-acceleration of non-safety motors during a bus transfer is assessed by the fast bus transfer study and the result of the study concludes that the

re-acceleration of non-safety motors do not hinder the re-acceleration of the safety motors.

c) During a short circuit on the non-safety bus, the design allows the safety bus to remain connected, or to be transferred to the alternate power supply.

(3) The UAT (or SAT) relays are able to detect an electric fault at a connection point between safety or non-safety buses. Power is then transferred to the alternate PPS or to the EDG power source, to eliminate the failure point between the offsite power source and the safety buses.

The applicant also explained that a failure mode effects analysis (FMEA) was performed and demonstrates that the APR1400 offsite power system retains its ability to feed the safety loads of both divisions through both (normal and alternate) PPS upon a single failure on the non-safety bus.

The staff finds the response acceptable and requests that the applicant incorporate in the DCD, its justification to support that the APR1400 design is in compliance with GDC 17, and in conformance with SECY-91-078, such that

(1) Voltage regulation at the medium voltage (MV) safety buses is maintained in an acceptable range,

(2) Potential transients caused by accident or operating occurrences on the non-safety buses such as (a) large motor starting, (b) motor re-acceleration during a bus transfer condition, or a (c) short circuit will not impact the safety buses, and

(3) Power is transferred to the alternate PPS or to the EDG power source, to eliminate the failure point between the offsite power source and the safety buses, when there is a fault at the connection point between the safety and non-safety at the common 4.16kV transformer winding.

The staff requests that the applicant explain how (e.g. COL Item, ITAAC) they will verify that transients on the non-safety buses will not impact the safety buses as described in the APR1400 design.


U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment