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Ticket No: G20120984

1729

**General Information**

Assigned Office: NRO
OEDO Due Date: 01/23/2013
Other Assignees:
SECY Due Date:
Date Response Requested by Originator:

Other Parties:

Subject: Chapter 9 of the Safety Evaluation Report with Open Items for the US-APWR Design Certification Application

Description:

CC Routing: OGC

ADAMS Accession Numbers - Incoming:
Response / Package:

**Other Information**

Cross Reference No:
SRM\Other: No

**Process Information**

Action Type: Letter
OEDO Concurrence: No
Signature Level: EDO
OCM Concurrence: No
Special Instructions:
OCA Concurrence: No

Please prepare response to ACRS for the signature of the EDO. Add the Commission and SECY as cc's. Also, include RidsAcrsAcnw_MailCTR to your distribution on the concurrence page. USE SUBJECT LINE IN RESPONSE.

**Document Information**

Originator Name: J. Sam Armijo
Date of Incoming: 12/20/2012
Originator Org: ACRS
Document Received by OEDO Date: 12/26/2012

Addressee: R. W. Borchardt, EDO
Incoming Task: Letter
OEDO POC: Dan Merzke

Template: EDO-001

E-RIDS: EDO

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

December 20, 2012

Mr. R. W. Borchardt
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: RESPONSE TO THE EDO OCTOBER 26, 2012, LETTER REGARDING CHAPTER 9 OF THE SAFETY EVALUATION REPORT WITH OPEN ITEMS FOR THE US-APWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Borchardt:

In our September 18, 2012, letter report on this subject, the second item under Recommendation 2 indicated that the staff should reconsider their justification for omission of the essential chilled water system (ECWS) from the US-APWR Technical Specifications. While we understand the staff's rationale as explained in your response, we are not convinced that it is prudent to omit this safety-related cooling water system from explicit treatment in the Technical Specifications. Table 7.4-1 in Revision 3 of the US-APWR Design Control Document confirms that the ECWS equipment is credited for safe shutdown of the plant.

Your response indicates that the ECWS operability requirements can be effectively determined through application of the "OPERABLE-OPERABILITY" definition in Section 1.1 of the Technical Specifications:

> A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).

Your response also notes one aspect of the US-APWR design that introduces an element of complexity in this operability determination. In fact, operability of safety systems depends on ECWS in complex and possibly confusing ways. An Appendix to this letter contains a brief description of these complexities. The possibility of safety system failure is influenced by cascaded effects from ventilation systems that are cooled by ECWS, and there are asymmetric dependencies of safety system operability on specific ECWS trains.

An important role of the Technical Specifications is to provide clear and concise criteria that alert licensed operators, supervisors, planners, and maintenance personnel to the operability requirements for systems, structures, and components (SSCs) that affect the availability of plant safety functions. Direct functional relationships between safety-related frontline equipment and such support systems as AC power, DC power, and directly-connected cooling water supplies (e.g., component cooling water or essential service water) are readily apparent. In principle, the operability requirements for each of these safety-related support systems could be determined through the definitions in Technical Specification Section 1.1. However, to provide assurance that these requirements are clearly delineated, the US-APWR Technical Specifications contain explicit criteria for operability and periodic surveillance of each support system, and they describe the required actions if that equipment is inoperable.

Experience from the current operating fleet has shown that plant personnel are often less familiar with the effects from cascaded dependencies such as ECWS cooling for pump room ventilation systems, unless those functional relationships are clearly delineated in fundamental references such as the Technical Specifications. Considering this experience and the complexities of the ECWS dependencies, we recommend that the US-APWR Technical Specifications explicitly delineate the ECWS operability and surveillance requirements. Lack of clear specification of these requirements will needlessly complicate plant operators' ability to manage the safety consequences from inoperability of ECWS equipment.

Sincerely,

***/RA/***

J. Sam Armijo
Chairman

**REFERENCES**

1. Letter to Mr. R. W. Borchardt, Executive Director for Operations, U.S. Nuclear Regulatory Commission, "Chapter 9 of the Safety Evaluation Report with Open Items for the US-APWR Design Certification Application," September 18, 2012 (ML12261A356)

2. Letter to Dr. J. Sam Armijo, Chairman, Advisory Committee on Reactor Safeguards, "Chapter 9 of the Safety Evaluation Report with Open Items for the US-APWR (Advanced Pressurized Water Reactor) Design Certification Application," October 26, 2012 (ML12269A398)

# APPENDIX

The operability of Class 1E electric power and frontline safety-related mechanical systems depends on the availability of cooling from specific essential chilled water system (ECWS) trains in an asymmetric and complex manner that is not readily apparent without careful examination of these interactions.

Either ECWS Train A or Train B has sufficient capacity to cool both Train A and Train B of the Class 1E electrical rooms through their shared ventilation systems. Thus, inoperability of only ECWS Train A or only ECWS Train B would not affect the functional operability of Class 1E electric power. However, combined inoperability of ECWS Train A and Train B would functionally disable cooling for Train A and Train B Class 1E electric power. Inoperability of ECWS Train C and Train D would similarly disable cooling for Train C and Train D Class 1E electric power. However, inoperability of any other combination of two ECWS trains (i.e., A and C, A and D, B and C, or B and D) would not affect the functional operability of Class 1E electric power.

According to our understanding of the US-APWR design, each ECWS train also provides cooling for individual equipment rooms in its respective safety division. For example, ECWS Train A provides cooling for the Train A component cooling water (CCW) pump room, the Train A emergency feedwater (EFW) pump room, and the Train A safeguard component area, which includes the safety injection (SI) pump room and the containment spray / residual heat removal (CS/RHR) pump room. Thus, inoperability of ECWS Train A functionally disables Train A equipment in the CCW, EFW, SI, and CS/RHR systems, despite the fact that the Train A electric power supplies remain operable. Because of these equipment room cooling dependencies, inoperability of any two ECWS trains would place the plant in a Limiting Condition for Operation Completion Time condition. Furthermore, other combinations of ECWS and frontline equipment inoperability would have similar consequences (e.g., inoperability of ECWS Train A and other equipment in Train B, Train C, or Train D of the CCW, EFW, SI, or CS/RHR systems).