
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 478-8568
SRP Section: 16 – Technical Specification
Application Section: 16.3.8.1
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Question No. 16-141

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility. NUREG-1432, "Standard Technical Specifications-Combustion Engineering Plants," Rev. 4, provides NRC guidance on format and content of technical specifications as one acceptable means to meet 10 CFR 50.36 requirements. Staff needs to evaluate all technical differences from standard TS (STS) NUREG-1432, STS Combustion Engineering Plants, Rev. 4, which is referenced by the DC applicant in DCD Tier 2 Section 16.1, and the docketed rationale for each difference because conformance to STS provisions is used in the safety review as the initial point of guidance for evaluating the adequacy of the generic TS to ensure adequate protection of public health and safety, and the completeness and accuracy of the generic TS Bases.

This request stems from discussion at the February 2016 meeting with the applicant.

1. The applicant is requested to discuss consistent use of divisions, channels, subsystems, and trains (Deviation Report [DR] Section III.4.2.3); for example, the following seem inconsistent.
 - (DR Section III.4.1.2) "Class 1E 125 Vdc system consists of four independent subsystems, trains A, B, C, and D, each corresponding to one of the four reactor protection instrumentation channels A, B, C, and D ..."
 - (DR Section III.4.1.3) "The Class 1E 120 Vac I&C power system is separated into four subsystems, trains A, B, C, and D that supply power to the plant protection system channels A, B, C, and D."

The applicant is requested to revise the DCD where appropriate to consistently use the terms divisions, channels, subsystems, load groups, and trains to prevent incorrect interpretations of generic TS and Bases that could occur if these terms are used inconsistently.

2. The applicant is requested to state for each of the following safety systems the minimum number of trains needed to perform the safety function, assuming the limiting design basis event and the associated worst case single failure, and for each system, what constitutes redundancy.
 - Safety Injection System
 - Containment Spray System
 - Essential Service Water System
 - Component Cooling Water System
 - Auxiliary Feedwater System (for each SG)

The staff needs this information to understand how generic TS 3.8.1 Required Actions A.2 and B.2 are intended to be implemented; these actions state:

REQUIRED ACTION	COMPLETION TIME
A.2 Declare required feature(s) with no offsite power available inoperable when its redundant required feature(s) is inoperable.	24 hours from discovery of no offsite power to one division concurrent with inoperability of redundant required feature(s)
B.2 Declare required feature(s) supported by the inoperable EDG(s) inoperable when its redundant required feature(s) is inoperable.	4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s)

Response

The following responses correspond to each of the staff's requests.

1. The terms divisions, channels, subsystems, load groups, and trains have been used in Regulatory Guide 1.206 (Combined license applications for nuclear power plants ; LWR edition, 2007) and NUREG-1432 (Rev. 4.0, 2012)

The meanings and rationales for the terms 'division', 'train', 'channel', 'subsystem', and 'load group' used in the generic Technical Specifications of APR1400 are as follows:

- **Division:** A division is a set of trains, performing various safety functions, separated both mechanically and electrically from another division. The separation between the divisions is provided geographically or by physical barrier. As stated in DCD Tier 2, Subsections 8.3.1.1.2.1 and 8.3.2.1.2.3, the Class 1E onsite power system consists of two redundant divisions (Division I and Division II) and each division is

further broken down into Trains A and C for Division I and Trains B and D for Division II.

- Train: A train is defined as a subset of a system. It is a set of components providing totally or partially one or several function(s) of a system. A train is redundant to, one or more similar train(s), each with the same capability to provide the specified function(s).
- Channel: According to IEEE Std. 603, a channel is an arrangement of components and modules as required to generate a single protective action signal when required by a generating station condition. In the STS (NUREG-1432) as well as the generic Technical Specifications of APR1400, the term 'channel' is used in plant control and protection systems such as the Reactor Protection System (RPS) and Engineered Safety Features Actuation System (ESFAS).
- Load group: According to IEEE Std. 308, a load group is an arrangement of buses, transformers, switching equipment, and loads fed from a common power supply within a division. In APR1400, the Class 1E onsite power system consists of redundant load groups (Division I and Division II) as stated in DCD Tier 2 Subsections 8.1.2 and 8.3.1.1.2.1. In some instances, a load group refers to a small load group (a train) as necessary in the DCD texts.
- Subsystem: According to IEEE Std. 804, a subsystem is a portion of a system containing two or more interrelated components which may be isolated for design, test, or maintenance. In the APR1400 DCD, the term 'subsystem' is used to represent a smaller set within a complete system. In comparison to STS, the terms 'subsystem(s)' in the generic Technical Specifications of APR1400 have been replaced as necessary by the term 'division(s)' or 'train(s)' to avoid ambiguity in the meaning.

KHNP believes that the terms 'division', 'train', 'channel', 'load group' and 'subsystem' used in the generic Technical Specifications of APR1400 and the Deviation Report Sections III 4.1.2 and 4.1.3 are appropriately used and consistent throughout the DCD and the generic Technical Specifications, and therefore, a revision to the DCD is not needed for further clarification.

2. With respect to the safety systems mentioned in Question 2, the minimum number of trains needed to perform the safety function, assuming the limiting design basis event and the associated worst case single failure, and redundant trains, are described in the Table on the following page.

Table: Minimum required train(s) and redundancy of the safety systems

System	Designation of trains in the system	Minimum required trains needed to perform the safety function	Redundancy	References	Remark
Safety Injection System (SIS)	A, B, C, and D	2 trains : Trains A and C (Division I) or Trains B and D (Division II)	Division I (Trains A & C) and Division II (Trains B & D)	DCD Tier 2 Subsections 6.3.1.4 and 6.3.2.1.2 TS Section 3.5.2 and 3.5.3	
Containment Spray System (CSS)	C and D	1 train : Train C or Train D	Train C and Train D	DCD Tier 2 Subsections 6.2.2 and 6.5.2 TS Section 3.6.6	
Essential Service Water System (ESWS)	A, B, C, and D	1 train : Train A or Train C (for Division I) or Train B or Train D (for Division II)	Division I (Trains A & C) and Division II (Trains B & D)	DCD Tier 2 Subsection 9.2.1 TS Section 3.7.8	
Component Cooling Water System (CCWS)	A, B, C, and D	<u>For safe shutdown</u> 1 train: Train A or Train B <u>For accident mitigation</u> 1 train: Train C or Train D	<u>For safe shutdown</u> Train A and Train B <u>For accident mitigation</u> Train C and Train D	DCD Tier 2 Subsection 9.2.2 and Table 9.2.2-6 TS Section 3.7.7	
Auxiliary Feedwater System (AFWS)	Trains A and C (for SG 1), Trains B and D (for SG 2)	1 train (for both SGs) : Train A or Train C (Division I for SG 1) or Train B or Train D (Division II for SG 2)	Division I (Trains A & C) and Division II (Trains B & D)	DCD Tier 2 Subsection 10.4.9 TS Section 3.7.5	Trains A and B of AFWS utilize motor driven pumps and Train C and D utilize turbine driven pumps. For each division corresponding to each SG, the different type of pumps constitutes diversity.

Impact on DCD

There is no impact on the DCD.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.