REVISED 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.:	**138-8067**
SRP Section:	**16.3.0 - LCO and SR Applicability**
Application Section:	**LCO 3.0.8**
Date of RAI Issue:	**08/07/2015**

Question No. 16-33

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 states that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose technical specifications (TS) prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for TS 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.

SRP Section 16.0, Part III.2.A states, in part, “when reviewing a difference between the proposed TS provision and the reference TS provision, verify that the applicant’s written technical or administrative reasoning in support of the difference is logical, complete, and clearly written."

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.

STS LCO 3.0.8 stipulates actions when one or more snubbers are unable to perform their intended support function. LCO 3.0.8 was developed as a risk-informed technical specification improvement and was designated TSTF-372. TSTF-372 included in its justification a generic risk evaluation applicable to operating plants. The applicant is requested to justify including TSTF-372 and LCO 3.0.8 in the proposed generic TS; the

technical basis for the justification needs to include the APR1400 design and an applicable generic risk evaluation.

This information is needed to ensure APR1400 DCD provides an adequate basis for including LCO 3.0.8, consistent with TSTF-372.

Response – (Rev. 1)

The APR1400 specific design information and generic risk assessment and management activities for snubbers be provided to justify the applicability of LCO 3.0.8 and TSTF-372 as attachment.

Impact on DCD

There is no impact on DCD.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report

There is no impact on any Technical, Topical, or Environment Reports.

Risk Evaluation to Support APR1400 Technical Specification LCO 3.0.8

1. Purpose

The purpose of this evaluation is to support that the plant risk by the delay time associated with the snubbers is sufficiently low in APR1400 standard design. In this evaluation, two analyses are performed; one is to support LCO 3.0.8.a and the other one is to support LCO .0.8.b.

According to APR1400 DCD chapter 16 Technical Specification, LCO 3.0.8 is as follows;

When one or more required snubbers are unable to perform their associated support function(s), any affected supported LCO(s) are not required to be declared not met solely for this reason if risk is assessed and managed, and:

a. The snubbers not able to perform their associated support function(s) are associated with only one train or subsystem of a multiple train or subsystem supported system or are associated with a single train or subsystem supported system and are able to perform their associated support function within 72 hours, or

b. The snubbers not able to perform their associated support function(s) are associated with more than one train or subsystem of a multiple train or subsystem supported system and are able to perform their associated support function within 12 hours.

At the end of the specified period, the required snubbers must be able to perform their associated support function(s), or the affected supported system LCO(s) shall be declared not met.

2. Risk evaluation to support LCO 3.0.8.a

The initiating event of concern is seismic induced loss of offsite power (LOOP). The piping system for which the snubber(s) is out of service is assumed to be failed by earthquake. Ceramic insulators used in power distribution system have a high confidence (95%) of low probability (5%) of failure (HCLPF) at an earthquake level of 0.09g. Thus,a 0.1g earthquake would be expected to have a 5% probability of causing a LOOP initiating event (TSTF-372, Rev.4)

The frequency of a 0.1g earthquake is approximately 1E-3/yr for an Eastern US plant, and approximately 1E-1/yr for a West Coast US plant (TSTF-372, Rev.4). In this analysis, the frequency of a 0.1g earthquake is assumed to be 1E-1/yr conservatively.

The frequency for earthquake induced LOOP = 1E-1/yr earthquake frequency × 5E-2 failure probability for insulators = 5E-3/yr.

According to APR1400 DCD Figure 19.1-31 “Level 1 event tree for LOOP”, the important systems with snubbers related to core damage are the aux. feedwater systems (AFWS), the safety injection systems (SIS), and the containment spray systems (CSS). Among them, AFWS is largest risk contributor because the core remains intact if AFWS is working properly according to APR1400 DCD Figure 19.1-31. Thus, the snubbers attached at the piping system of one train of

AFWS are assumed inoperable conservatively. And it is also assumed that the core is damaged if AFWS is failed conservatively.

In APR1400 design, AFWS has 4 independent trains, two turbine driven AFWPs and two motor operated AFWPs. If all trains of AFWS are failed due to LOOP, AFWS unavailability is 2.05E-04 (offsite power recovery not considered).

Therefore, CDF by earthquake induced LOOP is 1.025E-06/yr = (5E-3/yr earthquake induced LOOP frequency × 2.05E-04 AFWS unavailability).

For a 72 hour period, the incremental core damage probability (ICDP) is 1.025E-06/yr × 72 hours/(8760 hours/yr)= 8.425E-09

ICDP value is very small ($<10^{-8}$) that tracking should not generally be necessary.

3. Risk evaluation to support LCO 3.0.8.b

The frequency of a 0.1g earthquake is approximately 1E-3/yr for an Eastern US plant, and approximately 1E-1/yr for a West Coast US plant (TSTF-372, Rev.4). In this analysis, the frequency of a 0.1g earthquake is assumed to be 1E-1/yr conservatively.

The frequency for earthquake induced LOOP = 1E-1/yr (earthquake frequency) × 5E-2 (failure probability for insulators) = 5E-3/yr.

According to LCO 3.0.8b, all AFW pumps are assumed to fail. If SIS or other safety systems are working, code damage will be prevented according to APR1400 DCD Figure 19.1-31. In this analysis, however, SIS and other safety systems are assumed to fail conservatively.

In this case, the LOOP frequency is equal to the CDF, the delta-CDF for the west coast plant would be 5E-3/yr. For a 12-hours period, the incremental core damage probability (ICDP) would be:

5E-3/yr x 12 hours / (8760hours /yr) = 6.85E-6

ICDP may be considered as follows with respect to establishing risk management actions:

ICDP	
>E-5	- Configuration should not normally be entered voluntarily
E-6 ~ E-5	- Assess non quantification factors - establish risk management actions
<E-6	- normal work controls

This simplified and conservative analysis demonstrates that the provision of LCO 3.0.8b could be used cautiously for US plants. It is likely that a more sophisticated plant-specific seismic PRA performed for the plants would demonstrate even lower risk impact for the use of LCO 3.0.8.b.