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 3.0.9**
Date of RAI Issue:	**08/07/2015**

Question No. 16-34

10 CFR 50.36 requires that each operating license issued by the Commission contain technical specifications (TS) that set forth the limits, operating conditions, and other requirements imposed upon facility operation for the protection of public health and safety. 10 CFR 52.47(a)(11) provides that a design certification (DC) applicant is to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a.
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.

On July 22, 1993, the NRC issued its Final Policy Statement (58 FR 39132) on Technical Specifications improvements, expressing the view that satisfying the guidance in the policy statement also satisfies Section 182a of the Atomic Energy Act and 10 CFR 50.36. In the final policy statement, the NRC stated its “intent that the wording and Bases of the improved STS be used in the Technical Specification related submittal to the extent practicable.” Encouraging and maintaining standardization of TS requirements, such as contained in the STS, is therefore the policy of the NRC. In the final policy statement, the NRC encouraged “all licensees who submit Technical Specification related submittals based on this Policy Statement to emphasize human factors principles.”

STS LCO 3.0.9 stipulates actions when one or more barriers are unable to perform their intended support function. LCO 3.0.9 was developed as a risk-informed technical specification improvement and was designated TSTF-427. TSTF-427 included in its justification a generic risk evaluation applicable to operating plants. The applicant is rerquested to justify including TSTF-427 and LCO 3.0.9 in the proposed generic TS; the technical basis for the justification needs to include the APR1400 design and an applicable

generic risk evaluation. Since STS LCO 3.0.9 is risk-informed, it is inappropriate to remove the requirement to ensure “risk is assessed and managed” and omit the associated Reviewer’s Note when adopting STS LCO 3.0.9 in the generic TS.

This information is needed to ensure APR1400 DCD provides an adequate basis for including LCO 3.0.9, consistent with TSTF-427.

Response – (Rev. 1)

For LCO 3.0.9 pertaining to barriers and supported system operability, the requirement to ensure that the risk is assessed and managed and the Reviewer’s note will be added into the TS and Bases respectively, however those requirements pertain to requriements of the operating facility. The justification for the inclusion of LCO 3.0.9 (consistent with TSTF-427) for the APR1400 is provided as attachment 2.

Impact on DCD

Same as changes described in the impact on Technical Specifications section.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

Technical Specification 3.0.9 and the associated Bases will be changed as shown in the Attachment1.

Impact on Technical/Topical/Environmental Report

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

138-8067 - Q 16-34_Rev.0

3.0 LCO Applicability

LCO 3.0.9 When one or more required barriers are unable to perform their related support function(s), any supported system LCO(s) are not required to be declared not met solely for this reason for up to 30 days provided that at least one train or subsystem of the supported system is OPERABLE and supported by barriers capable of providing their LCO related support function(s), and risk is assessed and managed

This specification may be concurrently applied to more than one train or subsystem of a multiple train or subsystem supported system provided at least one train or subsystem of the supported system is OPERABLE and the barriers supporting each of these trains or subsystems provide their related support function(s) for different categories of initiating events.

If the required OPERABLE train or subsystem becomes inoperable while this specification is in use, it must be restored to OPERABLE status within 24 hours or the provisions of this specification cannot be applied to the trains or subsystems supported by the barriers that cannot perform their related support function(s).

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

138-8067 - Q 16-34_Rev.0

BASES

LCO 3.0.9

LCO 3.0.9 establishes conditions under which systems described in the TS are considered to remain OPERABLE when required barriers are not capable of providing their related support function(s).

Barriers are doors, walls, floor plugs, curbs, hatches, installed structures or components, or other devices, not explicitly described in TS, that support the performance of the safety function of systems described in the TS. This LCO states that the supported system is not considered to be inoperable solely due to required barriers not capable of performing their related support function(s) under the described conditions. LCO 3.0.9 allows 30 days before declaring the supported system(s) inoperable and the LCO(s) associated with the supported system(s) not met. A maximum time is placed on each use of this allowance to ensure that as required barriers are found or are otherwise made unavailable, they are restored.

However, the allowable duration may be less than the specified maximum time based on the risk assessment.

If the allowed time expires and the barriers are unable to perform their related support function(s), the supported system's LCO(s) must be declared not met and the Conditions and Required Actions entered in accordance with LCO 3.0.2.

This provision does not apply to barriers which support ventilation

----------REVIEWER'S NOTE----------
Adoption of LCO 3.0.9 requires the licensee to make the following commitments:
1. [LICENSEE] commits to the guidance of NUMARC 93–01, Revision 3, Section 11, which provides guidance and details on the assessment and management of risk during maintenance.
2. [LICENSEE] commits to the guidance of NEI 04–08, "Allowance for Non Technical Specification Barrier Degradation on Supported System OPERABILITY (TSTF–427) Industry Implementation Guidance," March 2006.

Risk Evaluation for APR1400 Technical Specification LCO 3.0.9

The evaluation is prepared using methods and assumptions based on TSTF-427.

When one or more trains or subsystems of a multiple train or subsystem Technical Specification system is made inoperable solely due to the inability of one or more barriers to perform its related support function (as described below), the supported system may be considered OPERABLE and the supported system's LCO(s) are not required to be declared not met for up to 30 days.

Barriers are defined as doors, walls, floor plugs, curbs, hatches, installed structures or components, or other devices, not explicitly described in Technical Specifications, which are designed to provide for the performance of the safety function for the Technical Specification system after the occurrence of one or more initiating events.

In determining the acceptability of this allowance, the following low frequency initiators were considered:

a. Loss of coolant accidents

b. High energy line breaks

c. Feedwater line breaks

d. Internal or external flooding

e. Turbine missile ejection accident

f. Tornados or high winds

<u>Risk impact of 30 day allowance for barriers</u>.

In order to estimate the risk impact of conditions created by a barrier, the following simplified risk analysis is provided based on TSTF-472.

The ΔCDP or the Incremental Core Damage Probability (ICDP) can be estimated by TSTF-472:

$$\text{ICDP} = \left\lfloor \frac{T_c}{8766} \times \frac{IE_i}{IE_T} \right\rfloor \times \left\lfloor \left(RAW_j \times CDF_{base}\right) - CDF_{base} \right\rfloor$$

where RAW_j is the risk achievement worth for the Technical Specification equipment (train, subsystem, or component) that normally would be protected from the effect of the initiating event (with frequency IE_i) by the affected barrier.

Regarding the initiating event frequency, IE_i:

The relevant initiating events consist of floods (internal and external), high energy line breaks (HELBs), feedwater line breaks, small, medium, and large loss of coolant accidents (LOCAs),

tornados, and turbine missiles. Initiating event frequencies for APR1400 are provided in APR1400 DCD Tier 2 Rev.1, Table 19.1-6.

The initial event for very small LOCA in the APR1400 PRA is not separately modeled based on the definition of very small LOCA in generic industry information NUREG/CR-6928 (ML16302A484). The RCP seal LOCA frequency is included in the small LOCA frequency in the APR1400 PRA. Internal flood frequency in the below table is the sum of the internal flooding initiating event frequencies. The detailed process of internal event analysis for internal flood PRA is documented in the APR1400 DCD Tier 2 Rev.1, Section 19.1.5.3.1.5.

The initiating event frequencies of turbine missiles, tornados and external flooding were based on TSTF-472 or EPRI NSAC-60.

A summary of the initiating event frequencies is provided in the table below:

Initiating Event	APR1400 or Other Reference	Mean frequency per Reactor year
Large LOCA	APR1400 DCD, Table 19.1-6	1.26E-06
Medium LOCA	APR1400 DCD, Table 19.1-6	4.85E-04
Small LOCA	APR1400 DCD, Table 19.1-6	1.99E-03
Large secondary side breaks downstream of MSIV (Steam line break/leak outside containment)	APR1400 DCD, Table 19.1-6	7.32E-03
Main feedwater line break	APR1400 DCD, Table 19.1-6	1.74E-03
Internal flooding	APR1400 DCD, Table 19.1-63	1.83E-02
External flooding	TSTF-472	2.8E-05
Turbine missile	TSTF-472	1.82E-04
Tornados	See above	1.9E-04

As can be seen, internal flooding is the bounding case for this application. This initiating event frequency is given as 1.83E-02 per reactor-calendar-year (APR1400 DCD, Rev.1, Table 19.1-63).

The frequency of the equipment functional failure is assumed to equal the bounding initiating event frequency of 1.83E-02.

The risk impact is a function of the baseline CDF (and large early release frequency (LERF)) and the RAW value for the systems normally protected by the affected barrier. Baseline internal events CDF varies over a range of approximately 1E-4 to 1E-6 for existing plants. Baseline LERF values are generally at least an order of magnitude lower.

The following tables show the result of the sensitivity analysis conservatively assuming all initiating events result in the failure of the primary function of the equipment protected by the affected barrier. (TC is set to 30 days (720 hours), for a range of RAW values, with ratio IE_i/IE_T

estimated to be 1.83E-02):

RAW	ICDP	ILERP
2	1.95E-09	1.95E-10
10	1.76E-08	1.76E-09
50	9.57E-08	9.57E-09
100	1.93E-07	1.93E-08

Comparison with the Maintenance Rule, 10 CFR 50.65 (a)(4) guidance

ICDP and ILERP, for a specific planned configuration, may be considered as follows with respect to establishing risk management actions:

ICDP		ILERP
$>10^{-5}$	- Configuration should not normally be entered voluntarily	$>10^{-6}$
$10^{-6} \sim 10^{-5}$	- Assess non quantification factors - establish risk management actions	$10^{-7} \sim 10^{-6}$
$<10^{-6}$	- normal work controls	$<10^{-7}$

Conclusion:

The ICDP and ILERP values for the range of CDF and RAW values from the above tables are still within the "normal work controls" range for all but the most limiting (i.e., most conservative) case of RAW=100 and baseline CDF=1E-4, and even then, the values are just above the thresholds for establishment of risk management actions. Risk management actions for the above sensitivity study case also remain within the range of "establish risk management actions" of the NUMARC 93-01 table, even for large RAW values.

It is recognized that the above values are calculated using the internal events PRA. Consideration should also be given to the CDF and LERF contribution from external events. Since these metrics are not quantified, or integrated with internal events at many plants, it is reasonable to provide some margin to account for their contribution. If the barrier(s) in question protects against an external event (e.g., tornado, external flood, etc.) that is not modeled in the PRA, the use of LCO 3.0.9 at a given time should be limited to a single barrier protecting against such an unmodeled external initiating event.

This evaluation's result is to provide the feasibility of using LCO 3.0.9. The COL applicant will prepare the detailed evaluation.