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.:	**120-7977**
SRP Section:	**16 – Technical Specifications**
Application Section:	**16.3.7**
Date of RAI Issue:	**07/27/2015**

Question No. 16-24

1. APR1400 TS Table 3.7.1-2 contains a Note that allows the "as-left" tolerance for the lift setting to be +3%. In the NUREG-1432, this allowance is discussed in the TS Bases for SR 3.7.1.1, with the +3% placed in brackets indicating further supporting information to meet ASME Code, Section III, NC 7000 requirements. ASME Code, Section III, NC 7512.2, “Set Pressure Tolerance,” states, in part, “ … The set pressure tolerance plus or minus shall not exceed the following: 2 psi (15 kPa) for pressures up to and including 70 psi (480 kPa), 3% for pressures from 70 psi (480 kPa) to 300 psi (2 MPa), 10 psi (70 kPa) for pressures over 300 psi (2 MPa) to 1,000 psi (7 MPa), and 1% for pressures over 1,000 psi (7 MPa). The set pressure tolerance shall apply unless a greater tolerance is established as permissible in the Overpressure Protection Report (NC-7200) and in the safety valve Design Specification (NCA-3250).” The applicant is requested to provide a reference to the applicable documents in the TS Bases.

2. APR1400 TS 3.7.5 provision are the same as NUREG-1432 with minor editorial changes to reflect the 4 AWF pumps versus 3 AFW pumps in the CE PWR design. However, because of the major differences in the arrangement of steam supply source to the turbine-driven pumps, the NUREG-1432 Condition A regarding the steam supply source is not applicable to the APR1400 design and should be removed. The applicant is requested to revise Condition A and the remaining Conditions accordingly, including adjustment to the TS Bases, as appropriate.

3. LCO 3.7.5 states "Four independent auxiliary feedwater (AFW) trains shall be OPERABLE." On Page B 3.7.5-1, in the "Background" section of the TS Bases, the 1st paragraph states, in part, " ... The auxiliary feedwater (AFW) pumps take suction through separate and independent suction lines from the auxiliary feedwater storage tanks (AFWSTs) (LCO 3.7.6) and pump to the steam generator secondary side via a separate and independent connection to the main feedwater (MFW) piping inside containment." DCD Subsection 10.4.9.2.1, "General Description" states, in part, " ... One motor-driven pump and one turbine-driven pump are configured into one mechanical division and joined together inside

containment to feed their respective SG through a common auxiliary feedwater (AFW) header, which connects to the SG downcomer feedwater line." Also, DCD Subsection 10.4.9.1.1, "Functional Requirements," states, in part, " ... The AFWS has two 100 percent capacity auxiliary feedwater storage tanks (AFWSTs)," and in DCD Figure 10.4.9-1, a common suction header from each tank is shown to be shared by two pumps in one mechanical division as stated above. In addition, the staff noted that in DCD Table 10.4.9-2, the AFW flow modulating valve in the turbine-driven train is powered from Class 1E division than the one for other controls for that train. The applicant is requested to clarify the inconsistency between the supporting information in the TS Bases and the system description in the DCD.

4. The SR 3.7.5.4 Note b. is not necessary, and should be removed. It is clearly implied by the SR description.

5. On Page B 3.7.5-2, in the "Background" section of the TS Bases, the 8th paragraph states, in part, " ... The AFAS logic is designed to feed its respective steam generators with low levels, but the AFW flow to the ruptured steam generator is terminated manually by operator action within 30 minutes after the secondary side pipe rupture event." In DCD Chapter 15, credits for "operator actions" are allowed only after 30 minutes from the start of the initial event. The applicant is requested to address this inconsistency.

6. On Page B 3.7.5-2, add "DCD" to "Subsection 10.4.9 (Reference 1)", use "AFWS" in place of "AF system."

7. On Page B 3.7.5-3, in the "LCO" section of the TS Bases, the applicant does not include a discussion on why four 100% capacity pumps are required to be OPERABLE for the AFWS. The applicant is requested to revise the TS Bases to include such information.

8. On Page 3.7.8-2, correct editorial error in SR 3.7.8.1: Replace “CCW” with “ESW” in the Note.

9. The applicant combines two LCOs in NUREG-1432 for Control Room Air Cleanup System (LCO 3.7.11) and Control Room Air Temperature Control System (LCO 3.7.12) into one APR1400 LCO 3.7.11, Control Room HVAC System (CRHS). Although the combined provisions are more conservative for a Condition with one Air Temperature Control train inoperable (e.g., specified CT of 7 days instead of 30 days), it is unclear how the provisions of Condition A with one division of CRHS inoperable are applied to case where one or two of the four 100% capacity air handling units (AHUs) are inoperable. The applicant is requested to use the format provided in NUREG-1432 so that inoperability of individual AHU can be clearly addressed and required action can be implemented effectively.

10. The use of the term “division” in TS 3.7.11 is confusing and not consistent with its use throughout the APR1400 TS. In most cases, the term “subsystem” is the correct term that is consistent with terminology in the STS.

11. Modes 5 and 6 are listed in the scope of LCO 3.7.11 applicability. The staff could not find a discussion in the Bases that supports the need for LCO 3.7.11 in Modes 5 and 6.

12. APR1400 TS 3.7.11 does not have provision to address control room personnel protection against toxic gases release events.

13. SR 3.7.11.5 states “verify each CRSRS division has the capacity to remove design heat load” with 18-month Frequency. Each division has 2X100% AHUs. The applicant should provide further details on how all AHUs available in a division will be tested (e.g., using staggered-test-basis to test both AHUs).

14. LCO 3.7.16 states “The combination of initial enrichment and burnup of each spent fuel assembly stored in Region II shall be within the acceptable burnup domain of Figure 3.7.16-1 or in accordance with Specification 4.3.1.1.”

    The equivalent STS LCO 3.7.18 states “The combination of initial enrichment and burnup of each fuel assembly stored in [Region 2] shall be within the acceptable [burnup domain] of Figure 3.7.18-1 [or in accordance with Specification 4.3.1.1].”

    The APR1400 TS 3.7.16 provisions and their associated supporting information in the TS Bases are not consistent with guidance in the STS in that complete information regarding NRC-approved documents for the high-density (Region II) storage of the spent fuel assemblies is not provided in either the TS Bases or TS 4.3 provisions. The applicant is requested to address this missing information.

15. On Page 3.7.17-1, correct editorial error in LCO Note 1: Replace “103” with “10^3.”

Response – (Rev. 1)

1. The “as-left” tolerance for the lift setting to be ±3% in the APR1400 TS Table 3.7.1-2 is described in “I-1350 Test Frequency, Classes 2 and 3 Pressure Relief Valves” of ASME OM code (Reference 4) and in “Part 1 1.3.4.1 Pressure Relief Valves“ of ANSI/ASME OM-1-1987 (Reference 5).

2. In the APR1400, the AFW system consists of two mechanical divisions. Each mechanical division is consists of one 100 percent capacity motor-driven pump, one 100 percent capacity turbine-driven pump, one 100 percent auxiliary feedwater storage tank, associated valves, one cavitating flow-limiting venture, and instrumentation. There is no cross-connection between the two mechanical divisions except for the cross-connection capability of the auxiliary feedwater storage tanks. So, two AFW pumps are configured into each mechanical division.

    Therefore, condition A for turbine-driven pumps is needed in APR1400 Standard Design.

3. In the APR1400, the AFW system consists two mechanical divisions. Each mechanical division is consists of one 100 percent capacity motor-driven pump, one 100 percent capacity turbine-driven pump, one 100 percent auxiliary feedwater storage tank, valves, one cavitating flow-limiting venturi, and instrumentation. There is no cross-connection between the two mechanical divisions, except for the cross-connection of the auxiliary feedwater storage tanks.

The background section of the TS Bases for 3.7.5 will be revised as follows:

Current description:

> “The auxiliary feedwater (AFW) pumps take suction through separate and independent suction lines from the auxiliary feedwater storage tanks (AFWSTs) (LCO 3.7.6) and pump to the steam generator secondary side via a separate and independent connection to the main feedwater (MFW) piping inside containment. ”

Revised description:

> “The auxiliary feedwater (AFW) pumps in each mechanical division take suction from a respective auxiliary feedwater storage tank (AFWST) and have a respective discharge header (LCO 3.7.6) and pump to a respective steam generator secondary side through a common AFW header, which connects to the steam generator downcomer main feedwater (MFW) piping inside containment. ”

In addition, after the AFW system is actuated, the AFW modulating valves control the flow to the SG(s) to control the SG normal water level. If an AFW modulating control valve (powered from C or D vital bus) becomes inoperable, SG level can be controlled using the AFW isolation valve (powered from a different Class 1E division)by a signal based on SG high and low level.

4. Note b. will be deleted from TS 3.7.5.4 and the associated Bases since it is not necessary.

5. There is no design requirement in the APR1400 for manual isolation of a ruptured steam generator within 30 minutes from the start of the event. Therefore, this statement will be deleted in background of the Bases for TS 3.7.5 and will be revised to be consistent with the STS Bases.

6. The Bases for 3.7.5 (Page B 3.7.5-2) will be revised to clarify that the reference to Subsection 10.4.9 is to the DCD subsection. Also a review of TS Bases 3.7.5 has been performed and AF System and AFW system will be revised to AFWS for consistency as defined in the header of the Bases section.

7. In APR1400, the AFWS consists two mechanical divisions. Each mechanical division is consists of one 100 percent capacity motor-driven pump, one 100 percent capacity turbine-driven pump, one 100 percent auxiliary feedwater storage tank, valves, one cavitating flow-limiting venture, and instrumentation. There is no cross-connection between two mechanical divisions except for the cross-connection of the auxiliary feedwater storage tanks.

   Assuming a postulated pipe failure concurrent with a single active component failure, four 100 percent capacity pumps are required to be OPERABLE for the AFW system. If one steam generator is not OPERABLE for reactor cooling as initiating event, the turbine-driven pump and the motor-driven pump in that mechanical division is not OPERABLE due to the respective steam generator. In concurrence with initiating event, single active component failure is considered for the turbine-driven pump or the motor-driven pump in the other mechanical division. This is accomplished by powering two 100 percent capacity motor-driven pumps from independent emergency buses and by a diverse means for two 100 percent capacity turbine-driven pumps.

Associated information is provided at 1st and 2nd paragraph in the “LCO” section of the TS Bases on DCD Tier 2, Page B 3.7.5-3 as follows:

> “Four independent AFW pumps, in four diverse trains, ensure availability of residual heat removal capability for all events accomplished by a loss of offsite power and a single failure. This is accomplished by powering two pumps from independent emergency buses. The third and fourth AFW pumps are powered by a diverse means, two steam driven turbines supplied with steam from an independent source not isolated by the closure of the MSIVs.”
>
> “The AFWS is considered to be OPERABLE when the components and flow paths required to provide AFW flow to the steam generators are OPERABLE. This requires that the two motor driven AFW pumps be OPERABLE in two diverse paths, each supplying AFW flow to a separate steam generator. Two turbine driven AFW pumps shall be OPERABLE with steam supplies from the main steam lines upstream of the MSIVs, and each capable of supplying AFW flow to the steam generators which provides driving steam. The piping, valves, instrumentation, and controls in the required flow paths shall also be OPERABLE.”

8. The editorial error in referring to CCW and CCWS in the Note for SR 3.7.8.1 will be corrected to ESWS.

9. The CRHS requires two OPERABLE CREACS divisions and two OPERABLE AHUs to satisfy the design requirements of LCO 3.7.11. LCO 3.7.11 will be revised to clarify the relationship of the AHUs to the OPERABILITY of CRSRS and CRHS by stating that “The CRHS shall be OPERABLE with : a. Two CREACS divisions OPERABLE, and b. Two AHUs OPERABLE.”. The Actions will be revised to separate Condition A into Condition A and Condition B to address Condition A for inoperability of a CREACS division and to address Condition B for inoperability of individual AHUs. Condition A will state that with one CREACS division inoperable for reasons other than Condition C, the CREACS division must be restored to operable status within 7 days. Condition B will state that with three AHUs inoperable, at least one AHU should be restored to operable status within 7 days. KHNP will maintain the current combined LCO 3.7.11 for CREACS and CRSRS since they are closely related and can be more effectively addressed in a single LCO.

10. The term “division” or “train” is used throughout the APR1400 design and licensing documents, including DCD and TS to represent a system consisting of redundant equipment. In LCO 3.7.11 and LCO 3.7.12 of STS, the term “train” is used rather than the term “subsystem”. KHNP believes that the term “division” is appropriate to be consistent with the design and licensing documents and that the term “subsystem” if used, would cause confusion to those users that are familiar with the APR1400 design, such as operations personnel.

11. The applicability of the Bases for LCO 3.7.11 will be revised to add a statement that in MODES 5 and 6, the CRHS is also required to cope with a failure of the Gaseous Radwaste System. MODES 5 and 6 in LCO 3.7.11 and the Bases 3.7.11 will be revised to

be bracketed to provide flexibility to the COL Applicant to delete MODES 5 and 6 in the applicability if the radiological consequence analysis concludes that the CRHS is not required to be operable in MODES 5 and 6 to cope with a failure of the Gaseous Radwaste System.

12. TS 3.7.11 and the associated Bases for 3.7.11 will be revised to add the toxic gas detector and the toxic gas isolation mode as a provision against toxic gases release events. The added wording related to toxic gas detection and isolation will be bracketed to provide flexibility to the COL Applicant to delete them if the COL Applicant concludes that these features of the CRHS are not needed based on the toxic gas analysis results. Reviewer's notes will also be added to the Bases for 3.7.11 that states the need for toxic gas isolation mode will be determined by the COL applicant. The reviewer's notes will be revised to be enclosed in brackets and the term "toxic gases" will be revised to "toxic gas" following NRC staff's requests.

13. The CRSRS AHUs are tested one at a time within the 18-month frequency to verify each CRSRS division has the capacity to remove the design heat load. First, one AHU of a specific division is tested and then the other AHU of the same division is tested after the prior test is completed. After the tests of both AHUs of one division are completed, the AHUs of the other division are tested sequentially. Since each AHU is tested individually, the remaining three AHUs are operable during any one test. Therefore, the test will not affect system operability.

14. Only the Region I spent fuel storage racks are designed to store fuel with a discharge burnup in the "unacceptable domain" of Figure 3.7.16-1. Since TS 3.7.16 and its associated Bases reference Specification 4.3.1.1, TS 4.3.1.1.f will be revised to limit new or partially spent fuel assemblies with discharge burnup in the "unacceptable domain" of Figure 3.7.16-1 to only be stored in Region I spent fuel racks.

15. Technical Specification 3.7.17 will be revised to correct ≤ 3.7 x 103 Bq/g to ≤ 3.7 x 10^3 Bq/g.

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

The changes that were proposed in the original response to this RAI have been incorporated into Revision 1 of the DCD; therefore, only the pages containing proposed changes as a result of Revision 1 of this response are included in the Attachment.

12. The Bases for 3.7.11 will be revised as indicated in the Attachment.

Impact on Technical/Topical/Environmental Reports

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

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B 3.7 PLANT SYSTEMS

B 3.7.11 Control Room HVAC System (CRHS)

BASES

BACKGROUND

The CRHS consists of Control Room Emergency Makeup Air Cleaning System (CREACS) and Control Room Supply and Return System (CRSRS).

The CREACS provides a protected environment from which occupants can control the unit following an uncontrolled released of radioactivity, [toxic ~~gases~~ gas,] or smoke. The CRSRS provides air temperature control for the control room.

The CREACS consists of two independent, redundant emergency outside air makeup ducts, isolation dampers, and two air cleaning units (ACUs) that recirculate and filter the air in the control room envelope (CRE). Each ACU consists of a moisture separator, two electric heating coils, a prefilter, a high efficiency particulate air (HEPA) filter, an activated carbon adsorber section for removal of gaseous activity (principally iodine), a postfilter, and two fans for filtering the outside makeup air and part of recirculated CRE air. Ductwork, dampers, and instrumentation also form part of the system. The prefilters and moisture separator remove any large particles in the air, and any entrained water droplets present to prevent excessive loading of the HEPA filters and carbon adsorbers. Continuous operation of each ACU for at least 15 minutes per month with the heaters on reduces moisture buildup on the HEPA filters and adsorbers. Both the moisture separator and heater are important to the effectiveness of the carbon adsorbers. Postfilter follows the adsorber section to collect carbon fines and provides backup in case of failure of the main HEPA filter bank.

The CRSRS consists of dual outside air intakes, normal outside makeup duct, isolation dampers, and four air handling units (AHUs) that provides cooling and heating of recirculated CRE air. Each AHU consists of a heating coil, a cooling coil, a fan, and instrumentation and controls to provide for control room temperature control.

The CRE is the area within the confines of the CRE boundary that contains the spaces that control room occupants inhabit to control the unit during normal and accident conditions. This area encompasses the control room and other non-critical areas to which frequent personnel access or continuous occupancy is not necessary in the event of an accident. The CRE is protected during normal operation, natural events, and accident conditions. The CRE boundary is the combination of walls, floor, roof, ducting, doors, penetrations and equipment that physically form the CRE.

BASES

BACKGROUND (continued)

The OPERABILITY of the CRE boundary must be maintained to ensure that the inleakage of unfiltered air into the CRE will not exceed the inleakage assumed in the licensing basis analysis of design basis accident (DBA) consequences to CRE occupants.

The CRE and its boundary are defined in the Control Room Envelope Habitability Program.

The CRHS operation to maintain the control room temperature is discussed in FSAR, Subsection 9.4.1 (Ref. 1). Upon receipt of the actuating signal(s), normal makeup air supply to the AHU is isolated, and the stream of ventilation air is recirculated through the filter trains of the CREACS.

[

----------------------------------REVIEWER'S NOTE----------------------------------
The need for toxic gas isolation mode will be determined by the COL applicant.

]

Actuation of the CRHS places the system into the emergency mode for protection from radiation [or the toxic gas isolation mode for protection from toxic gas, depending on the initiation signal]. Upon receipt of actuation signal of the emergency mode of operation, the unfiltered normal makeup air path is isolated, exhaust isolation dampers are closed, and CREACS of the operating division is automatically started. The emergency mode initiates pressurization and filtered ventilation of the air supply to the CRE.

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Outside air is filtered, and then added to the air being recirculated from the CRE. Pressurization of the CRE minimizes infiltration of unfiltered air through the CRE boundary from all the surrounding areas adjacent to the CRE boundary.

[Upon detection of a toxic gas, the toxic gas detector will initiate complete closure of outside intake isolation dampers to the CRE.]

The air entering the CRE is continuously monitored by radiation [and toxic gas] detectors. One detector output above the setpoint causes actuation of the emergency mode [or the toxic gas isolation mode] as required. [The actions of the toxic gas isolation mode take precedence, and will override the action of the emergency mode.]

The CRHS operating at a flow rate of 6,286 cmh (3,700 cfm) pressurizes the control room to about 3.175 mm (0.125 in) water gauge relative to external areas adjacent to the CRE boundary. The CRHS operation in maintaining the CRE habitable is discussed in FSAR, Section 6.4 (Ref. 2).

BASES

BACKGROUND (continued)

Normally open isolation dampers are arranged in series pairs so that the failure of one damper to shut will not result in a breach of isolation. The CRHS is designed in accordance with seismic Category I requirements.

The CRHS is designed to maintain a habitability environment in the CRE for 30 days of continuous occupancy after a DBA without exceeding a 50 mSv (5 rem) whole body dose or its equivalent to any part of the body.

APPLICABLE SAFETY ANALYSES

The CRHS components are arranged in redundant safety-related ventilation divisions. The CRHS provides airborne radiological protection for the CRE occupants, as demonstrated by the CRE occupant dose analyses for the most limiting DBA fission product release presented in FSAR, Chapter 15 (Ref. 3).

The location of components and ducting within the CRE ensures an adequate supply of filtered air to all areas requiring access.

The CRHS provides protection from smoke ~~[and~~ gas toxic ~~gases~~ gas] to the CRE occupants. [The analysis of toxic ~~gases~~ gas releases demonstrates that the toxicity limits are not exceeded in the CRE following a toxic gas release (Ref. 2).] The evaluation of a smoke challenge demonstrates that it will not result in the inability of the CRE occupants to control the reactor either from the control room or from the remote shutdown room (Ref. 4).

The worst case single active failure of a component of the CRHS, assuming a loss of offsite power, does not impair the ability of the system to perform its design function.

The CRHS satisfies Criterion 3 of 10 CFR 50.36 (c)(2)(ii).

LCO

Two independent and redundant divisions of the CRHS are required to be OPERABLE to ensure that one division is available during an event requiring the CRHS, if a single failure disables the other division. An OPERABLE CRHS division requires the emergency makeup air cleaning unit (ACU) in the associated CRSRS division and one of the two air handling units (AHUs) in the associated CRSRS division to be OPERABLE. The outside air intake isolation dampers, the ACU inlet isolation damper, the ACU return air isolation damper, the emergency makeup ACU fan, and the ACU discharge airflow control damper, which are associated with the required AHU flow path, are also required to be OPERABLE for OPERABILITY of the CRHS division.

BASES

LCO (continued)

Each CREACS division is considered OPERABLE when the individual components necessary to limit CRE occupant exposure are OPERABLE. A CREACS division is considered OPERABLE when the associated:

a. One of two fans is OPERABLE.

b. One of two electric heating coils is OPERABLE.

c. HEPA filter and carbon adsorber are not excessively restricting flow and are capable of performing their filtration functions.

d. Moisture separator, ductwork, and dampers are OPERABLE and air circulation can be maintained.

In order for the CREACS divisions to be considered OPERABLE, the CRE boundary must be maintained such that the CRE occupant dose from a large radioactive release does not exceed the calculated dose in the licensing basis consequence analyses for DBAs, and that CRE occupants are protected from [toxic ~~gases~~ gas and] smoke.

The Limiting Condition for Operation (LCO) is modified by a Note allowing the CRE boundary to be opened intermittently under administrative controls. This Note only applies to openings in the CRE boundary that can be rapidly restored to the design condition, such as doors, hatches, floor plugs, and access panels. For entry and exit through doors, the administrative control of the opening is performed by the person(s) entering or exiting the area. For other openings, these controls should be proceduralized and consist of stationing a dedicated individual at the opening who is in continuous communication with the operators in the CRE.

This individual will have a method to rapidly close the opening and to restore the CRE boundary to a condition equivalent to the design condition when a need for CRE isolation indicated.

APPLICABILITY

In MODES 1, 2, 3, 4, [5, and 6] and during movement of irradiated fuel assemblies, the CRHS must be OPERABLE to ensure that the CRE will remain habitable during and following a DBA and ensure that the control room temperature will not exceed equipment operational requirements following isolation of the control room.

[In MODES 5 and 6, the CRHS is also required to cope with a failure of the Gaseous Radwaste System.]

During movement of irradiated fuel assemblies, the CRHS must be OPERABLE to cope with the radioactivity release from a fuel handling accident.

BASES

ACTIONS

A.1

With one CREACS division inoperable for other than an inoperable CRE boundary, action must be taken to restore the division to OPERABLE status within 7 days. In this condition, the remaining OPERABLE CREACS division is adequate to perform the CRE occupant protection function. However, the overall reliability is reduced because a single failure in the OPERABLE CREACS division could result in loss of the CREACS function. The 7 day Completion Time is based on the low probability of a DBA occurring during this time period, and the ability of the remaining division to provide the required capabilities.

B.1

With one CRSRS division inoperable, action must be taken to restore the division to OPERABLE status within 7 days. In this condition, the remaining OPERABLE CRSRS division is adequate to maintain the control room temperature and relative humidity within limits. However, the overall reliability is reduced because a single failure in the OPERABLE CRSRS division could result in loss of the CRSRS function. The 7 day Completion Time is based on the low probability of a DBA occurring during this time period and the ability of the remaining AHU of the OPERABLE CRSRS division to provide the required capabilities.

C.1, C.2 and C.3

If the unfiltered inleakage of potentially contaminated air past the CRE boundary and into the CRE can result in CRE occupant radiological dose greater than the calculated dose of the licensing basis analyses of DBA consequences (allowed to be up to 50 mSv (5 rem) whole body or its equivalent to any part of the body), or inadequate protection of CRE occupants from [toxic ~~gases~~ gas or] smoke, the CRE boundary is inoperable. Actions must be taken to restore an OPERABLE CRE boundary within 90 days.

During the period that the CRE boundary is considered inoperable, action must be initiated to implement mitigating actions to lessen the effect on CRE occupants from the potential hazards of a radiological [or toxic gas] event or challenge from ~~the~~ smoke. Actions must be taken within 24 hours to verify that in the event of a DBA, the mitigating actions will ensure that CRE occupant radiological exposures will not exceed the calculated dose of the licensing basis analyses of DBA consequences, and that CRE occupants are protected from [toxic ~~gases~~ gas and] smoke. These mitigating actions (i.e., actions that are taken to offset the consequences of the inoperable CRE boundary) should be preplanned for implementation upon entry into the condition, regardless of whether entry is intentional or unintentional. The 24 hour Completion Time is reasonable based on the low probability of a DBA occurring during

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ACTIONS (continued)

this time period and the use of mitigating actions. The 90 day Completion Time is reasonable based on the determination that the mitigating actions will ensure protection of CRE occupants within analyzed limits while limiting the probability that CRE occupants will have to implement protective measures that could adversely affect their ability to control the reactor and maintain it in a safe shutdown condition in the event of a DBA. In addition, the 90 day Completion Time is a reasonable time to diagnose, plan, and possibly repair and test most problems with the CRE boundary.

D.1 and D.2

In MODE 1, 2, 3, or 4, if the inoperable CREACS or CRSRS division or the CRE boundary cannot be restored to OPERABLE status within the required Completion Time, the unit must be placed in a MODE that minimizes the accident risk. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and MODE 5 within 36 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

E.1 and E.2

Required Action E.1 is performed manually.

[In MODE 5 or 6, or] [During] movement of irradiated fuel assemblies, if Required Action A.1 or B.1 cannot be completed within the required Completion Time, the CREACS and CRSRS of the OPERABLE CRHS division must be immediately placed in the emergency MODE of operation. This action ensures that the remaining division is OPERABLE, that no failures preventing automatic actuation will occur, and that any active failure will be readily detected.

An alternative to Required Action E.1 is Required Action[s] E.2[.1 and E.2.2] to immediately suspend activities that could result in a release of radioactivity that may require isolation of CRE. This places the unit in a condition that minimizes the accident risk.

This does not preclude the movement of fuel assemblies to a safe position.

[

----------------------------------REVIEWER'S NOTE----------------------------------
The need for toxic gas isolation mode will be determined by the COL applicant.

]

BASES

ACTIONS (continued)

that requires placing the

[Required Action E.1 is modified by a Note ~~indicating to place~~ CRHS in the toxic gas isolation mode if the automatic toxic gas isolation mode is inoperable.]

F.1 [and F.2]

[In MODE 5 or 6, or] during movement of irradiated fuel assemblies with two CREACS divisions inoperable or two CRSRS divisions inoperable, or with one or two CREACS divisions inoperable due to an inoperable CRE boundary, Required Action[s] F.1 [ands F.2] must be taken immediately to suspend activities that could result in a release of radioactivity that may require isolation of CRE. This places the unit in a condition that minimizes the accident risk. This does not preclude the movement of fuel to a safe position.

G.1

If both CREACS divisions are inoperable in MODE 1, 2, 3, or 4 for reasons other than an inoperable CRE boundary (i.e., Condition C) or both CRSRS divisions are inoperable in MODE 1, 2, 3, or 4, the CRHS may not be capable of performing the intended functions and the unit is in a condition outside the accident analyses. Therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE REQUIREMENTS

SR 3.7.11.1

Standby systems should be checked periodically to ensure that they function properly. Since the environment and normal operating conditions on this system are not severe, testing each ACU once every month provides an adequate check on this system.

Monthly heater operations dry out any moisture accumulated in the charcoal from humidity in the ambient air. Systems with heaters must be operated for ≥ 15 minutes with the heaters energized. The 31 day Frequency is based on the known reliability of the equipment and the two train redundancy available.

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BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.11.2

This SR verifies that the required CRHS testing is performed in accordance with the ventilation filter testing program (VFTP). The testing is performed in accordance with Nuclear Regulatory Commission (NRC) Regulatory Guide (RG) 1.52 (Ref. 5). The VFTP includes testing HEPA filter performance, carbon adsorber efficiency, minimum system flow rate, and the physical properties of the activated carbon (general use and following specific operations). Specific test frequencies and additional information are discussed in detail in the VFTP.

SR 3.7.11.3

This SR verifies active components in each CREACS division start and operate on an actual or simulated actuation signal. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. The 18 month Frequency is based on operating experience and design reliability of the equipment.

SR 3.7.11.4

This SR verifies the OPERABILITY of the CRE boundary by testing for unfiltered air inleakage past the CRE boundary and into the CRE. The details of the testing are specified in the Control Room Envelope Habitability Program.

The CRE is considered habitable when the radiological dose to CRE occupants calculated in the licensing basis analyses of DBA consequences is no more than 50 mSv (5 rem) whole body or its equivalent to any part of the body and the CRE occupants are protected from [toxic ~~gases~~ gas and] smoke. This SR verifies that the unfiltered air inleakage into the CRE is no greater than the flow rate assumed in the licensing basis analyses of DBA consequences. When unfiltered air inleakage is greater than the assumed flow rate, Condition C must be entered. Required Action C.3 allows time to restore the CRE boundary to OPERABLE status provided mitigating actions can ensure that the CRE remains within the licensing basis habitability limits for the occupants following an accident. Compensatory measures are discussed in NRC RG 1.196, Section C.2.7.3, (Ref. 6) which endorses, with exceptions, NEI 99-03, Section 8.4 and Appendix F (Ref. 7). These compensatory measures may also be used as mitigating actions as required by Required Action C.2. Temporary analytical methods may also be used as compensatory measures to restore OPERABILITY (Ref. 8). Options for restoring the CRE boundary to OPERABLE status