
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.: 498-8595
SRP Section: 16 – Technical Specifications
Application Section: 16.3.3, 16.3.7.5, 16.3.7.6
Date of RAI Issue: 06/30/2016

Question No. 16-154

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.

In response to Question 16-131 (444-8530/29114) KHNP made many changes to Subsections 3.7.5 and 3.7.6 which need to be modified:

1. In Specification 3.7.5, the phrase "AFW trains" is proposed to be replaced with "AFW flow paths." Staff finds this confusing, and recommends not using "flow paths" as a synonym for "trains." Staff also recommends not using "AFW division inoperable" by itself to mean "one AFW division with both trains inoperable." With changes denoted by markup of generic TS 3.7.5 Rev. 0 (not a markup of TS 3.7.5 as revised in the Question 16-131 response), staff recommends:

- a) Revising LCO 3.7.5:

Two ~~Four independent~~ auxiliary feedwater (AFW) ~~trains~~ divisions, each with one motor driven train and one turbine driven train, shall be OPERABLE.

And LCO 3.7.5 Note:

Only ~~one AFW train, which includes a~~ the motor driven ~~pump,~~ train of one AFW division is required to be OPERABLE in MODE 4.

The recommended changes improve the LCO statement and the modifying Note by highlighting the distinguishing design details of the APR1400 AFW system, which by use of consistent phrasing enables stating the action requirements unambiguously

b) Revising generic TS 3.7.5 Action A:

A. One ~~turbine driven~~-AFW division with one train inoperable ~~due to associated inoperable steam supply in MODE 1, 2, or 3. OR NOTE—Only applicable if MODE 2 has not been entered following refueling.—One turbine driven AFW pump inoperable in Mode 3 following refueling.~~ | A.1 Restore ~~affected equipment~~ train to OPERABLE status. | 7 days

Staff expects that the justification in the Action A.1 Bases for the 7 day completion time will address why 7 days is an acceptable period to be vulnerable to a main steam line break (MSLB) or feed line break (FLB) in the unaffected AFW division's steam generator, assuming no additional single failures. In such a scenario, core heat removal would need to rely on the remaining train in the affected AFW division using the unfaulted steam generator, assuming one AFW train (turbine or motor driven) is capable of maintaining the unit in MODE 3. Usual STS practice for a loss of redundancy in a two division system, is to require restoring redundancy within 72 hours.

c) Revising generic TS 3.7.5 Action B (Suggest renumbering Action B and Action C as Action C and Action B, respectively, since relabeled Action B is recommended to have a completion time less than 72 hours):

CB. One AFW division with two trains inoperable in MODE 1, 2, or 3 ~~for reasons other than Condition A.~~ | CB.1 Restore one AFW train of affected AFW division to OPERABLE status. | ~~72 hours~~ 24 hours

In KHNP's proposed revised Action B ("B. One AFW division inoperable in MODE 1, 2, or 3. | B.1 Restore AFW division to OPERABLE status. | 72 hours"), it is unclear whether KHNP had intended to require one or both trains to be made operable within 72 hours. STS convention would dictate restoring one train within 72 hours, with the restoration time for the remaining inoperable train governed by the Required Action A.1 completion time and Specification 1.3.

This recommendation clarifies that one of the inoperable trains in the affected division must be restored to operable status within 24 hours, because this AFW configuration is more equivalent to STS 3.7.5 Condition C ("*Turbine driven AFW train inoperable due to one inoperable steam supply. AND One motor driven AFW train inoperable.*"). However, the completion time of less than 72 hours needs to be justified consistent with the Reviewer's Note in the Bases for Required Actions C.1 and C.2 of Specification 3.7.5 of NUREG-1432, Revision 4. If the note's criteria for allowing a 48 hour completion time

are not satisfied, then a 24 hour completion time should be specified. But, if the note's criteria for allowing a 24 hour completion time are also not satisfied, then an even shorter completion time, perhaps 12 hours or 6 hours, should be specified. The applicant may refer to TSTF-412-A, Rev. 3 (Accession No. ML070100363) and the associated model safety evaluation (ML071230105) for additional background information regarding the origin of STS 3.7.5 Action A.

Staff expects that the justification in the Action B.1 (or C.1 as relabeled) Bases for a 48 hour, 24 hour, or shorter completion time will address why the time is an acceptable period to be vulnerable to a main steam line break (MSLB) or feed line break (FLB) in the unaffected AFW division's steam generator, assuming no additional single failures. In such a scenario, AFW function would be lost. Core heat removal would need to initially rely on nonsafety-related secondary heat sink systems using the unfaulted steam generator, but would soon have to rely on the safety injection system and the pressurizer pilot operated safety relief valves (POSRVs), and the incontainment refueling water storage tank cooling mode of the shutdown cooling system or the containment spray system heat exchangers.

Normally, with a loss of redundancy in a two division system, where the limiting postulated accident would make the remaining division inoperable, redundancy must be restored within a short time period; that is, a period of less than 72 hours. In this case, a period of 24 hours or less seems appropriate, but must to be justified.

- d) Revising generic TS 3.7.5 Action C (Suggest renumber as Action B):

~~BC. Two AFW divisions with one One turbine driven AFW train inoperable due to associated inoperable steam supply in MODE 1, 2, or 3. AND One motor driven AFW train inoperable. | BC.1 Restore two steam supply to turbine driven trains of one AFW division to OPERABLE status. | 48 hours 72 hours OR C.2 Restore motor driven AFW train to OPERABLE status. | 48 hours~~

In KHNP's proposed revised Required Action C.1, KHNP had proposed a completion time of 72 hours; in the following quotation of the proposed revised Required Action C.1 staff inserts "[train]" to highlight the intended meaning of "flow path":

C. One AFW flow path [train] in each division inoperable in MODE 1, 2, or 3. | C.1 Restore affected AFW flow path [train] to OPERABLE status. | 72 hours

In KHNP's proposed revised Required Action C.1, it is unclear whether KHNP had intended to require one or both inoperable trains to be made operable within 72 hours. This recommendation clarifies that one of the inoperable trains must be restored to operable status within 72 hours. However, the 72 hour completion time needs to be justified.

Staff expects that the justification in the Action C.1 (or B.1 as relabeled) Bases for the 72 hour completion time will address why that time is an acceptable period to be vulnerable to a main steam line break (MSLB) or feed line break (FLB) faulting one steam generator, assuming no additional single failures. In such a scenario, core heat removal would need to rely on the remaining train in one AFW division using the

unfaulted steam generator, assuming one AFW train (turbine or motor driven) is capable of maintaining the unit in MODE 3. Usual STS practice for a loss of redundancy in a two division system is to require restoring redundancy within 72 hours.

In the event of a worst case SLB or FLB postulated accident with the unit in Condition A or Condition C (or B as relabeled), with no additional single failures not caused by the event, one intact steam generator with one turbine or motor driven AFW train will remain operable to mitigate the event by enabling core heat removal using the intact steam generator. Consequently, since AFW function would be maintained, a 72 hour completion time is acceptable for both Required Action A.1 and Required Action C.1 (or B.1 as relabeled).

e) Revising Action D:

D. Required Action and associated Completion Time of Conditions A, B, or C not met with at least one motor driven train OPERABLE. OR ~~Three~~ One AFW division with both trains inoperable and the other AFW division with the turbine driven train inoperable in MODE 1, 2, or 3. | D.1 Be in MODE 3. | 6 hours AND D.2 Be in MODE 4. | 18 hours

This recommendation clarifies that entering MODE 4 from MODE 3 requires having one motor driven train operable. The applicant is requested to confirm that 18 hours is an appropriate time to cool down to MODE 4 for the APR1400 design using (1) two AFW trains and their associated steam generator, or (2) one motor driven train for one steam generator and one turbine driven train for the other steam generator.

f) Inserting a new Action E:

E. Required Action and associated Completion Time of Condition B not met with both motor driven AFW trains inoperable. OR One AFW division with both trains inoperable and the other AFW division with the motor driven train inoperable in MODE 1, 2, or 3. | E.1 Initiate action to restore one motor driven train to OPERABLE status. | Immediately AND E.2 Be in MODE 3. | 6 hours AND E.3 Be in MODE 4. | 18 hours after restoring at least one motor driven train to OPERABLE status

This recommendation accounts for the need to avoid cooling down to MODE 4 without an operable motor driven train.

g) Revising the previous Action E as Action F:

F. NOTE—LCO 3.0.3 and all other LCO Required Actions requiring MODE changes are suspended until one AFW train is restored to OPERABLE status. ~~Four~~ Two AFW divisions with two trains inoperable in MODE 1, 2, or 3. | F.1 Initiate action to restore one AFW train to OPERABLE status. | Immediately

Maintaining this Condition for just MODES 1, 2, and 3 allows returning control of unit status to Action D upon restoration of a motor driven train or Action E upon restoration

of a turbine driven train. This Condition should not be merged with a separate Condition for MODE 4.

- h) Revising the previous Action F as Action G:

G. NOTE—LCO 3.0.3 and all other LCO Required Actions requiring MODE changes are suspended until one AFW motor driven train is restored to OPERABLE status. Required AFW motor driven train inoperable in MODE 4. | G.1 Initiate action to restore one AFW motor driven train to OPERABLE status. | Immediately

Specifying Action G to separately address non-compliance with the motor driven train operability requirement of the Note to LCO 3.7.5 improves its clarity.

- i) Revising SR 3.7.5.1 for clarity and consistency in phrasing:

Verify each ~~AFW~~ manual, power-operated, and automatic valve in the flow path of each AFW train and in ~~each the~~ steam supply flow path ~~to the of each AFW turbine driven turbine-driven~~ pumps, that is not locked, sealed, or otherwise secured in position, is in the correct position.

- j) Revising SR 3.7.5.2 Note for consistency in phrasing:

-----NOTE-----

Not required to be performed ~~for the turbine driven~~ AFW turbine driven pumps until 24 hours after reaching 69.25 kg/cm2G (985 psig) ~~985 psig~~ in steam generators.

- k) Revising Note “a” of SR 3.7.5.3 and SR 3.7.5.4 for consistency in phrasing:

-----NOTE-----

a. Not required to be performed for ~~turbine driven~~ AFW turbine driven pumps until 24 hours after reaching 69.25 kg/cm2G (985 psig) ~~985 psig~~ in steam generators.

...

- l) Revising SR 3.7.5.3 for consistency in phrasing:

Verify each AFW automatic valve that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.

m) Revising SR 3.7.5.5: for clarity and consistency in phrasing:

Verify proper alignment of required ~~AFW~~ flow paths of each train of each AFW division by verifying flow from the associated auxiliary feedwater storage tank to ~~each~~ the associated steam generator.

Prior to entering MODE 2 whenever ~~a~~ the unit has been in MODE 5, ~~6~~, or 6, or defueled for a cumulative period of > 30 days.

2. The applicant is requested to confirm that automatic actuation of the required AFW motor driven train on Steam Generator Level - Low is not required in MODE 4, which is consistent with Table 3.3.5-1 for AFAS-1 and AFAS-2 ESFAS Functions. Based on this, deletion of the phrase “when in MODE 1, 2, or 3” from the end of the surveillance statement for SR 3.7.5.4, as shown on page 4 of the attachment to the response to RAI 444-8530 - Question 16-131, is acceptable. Staff notes, however, that this change was not in the scope of Question 16-131.
3. The applicant is requested to revise Revision 0 of the Bases of generic TS 3.7.5 to be fully descriptive of and consistent with the suggested changes, stated in Sub-question 1, that the applicant decides to adopt.
4. The applicant is requested to revise Revision 0 of the LCO statement of generic TS 3.7.6, “Auxiliary Feedwater Storage Tank (AFWST),” and the Bases for SR 3.7.6.1 (“Verify each AFWST level is \geq 1,524,165 L (400,000 gal). | 12 hours”), for clarity, as follows:

~~One~~ Two AFWSTs shall be OPERABLE.

This SR verifies that ~~the~~ ~~each~~ AFWST of each AFW division contains the required volume of cooling water. (This level is greater than or equal to 1,524,165 L (400,000 gal).) The ~~12-hour~~ 12 hour Frequency is based on operating experience and the need for operator awareness of unit evolutions that could affect the AFWST inventory between checks. The ~~12-hour~~ 12 hour Frequency is considered adequate in view of other indications in the MCR, including alarms, to alert the operator to abnormal AFWST level deviations.

5. In consideration of the vulnerability of the APR1400 design to a FLB on the steam generator of the unaffected AFW division when both trains in the other AFW division are inoperable (such as when there is insufficient water in the other AFW division’s AFWST), and to justify a 7-day restoration completion time, the staff recommends specifying additional compensatory measures for Condition A (“One AFWST inoperable.”) of generic TS 3.7.6, as follows:

REQUIRED ACTION	COMPLETION TIME

<p>A.1 <u>Verify OPERABILITY of backup water supply for affected AFW division.</u></p> <p><u>AND</u></p>	<p><u>4 hours</u></p> <p><u>AND</u></p> <p><u>Once per 12 hours thereafter</u></p> <p>4 hours</p>
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REQUIRED ACTION	COMPLETION TIME
<p>A.24 Verify OPERABILITY of AFWST of unaffected AFW division.</p> <p><u>AND</u></p> <p>A.32 Restore AFWST to OPERABLE status.</p>	<p><u>AND</u></p> <p>Once per 12 hours thereafter</p> <p>7 days</p>

The applicant is requested to describe in the Bases the backup water supply for each AFW division, including valve position changes necessary to make each backup water supply operable.

6. The applicant is requested to explain why the 24-hour Completion Time of generic TS 3.7.6 Required Action B.2 is an appropriate time period, given the APR1400 design, to place the unit in MODE 4 without reliance on steam generator for heat removal in the event a Required Action and associated Completion Time of Condition A are not met. This unit cool down would appear to be based on one AFW division with two operable trains and one steam generator.

However, if two AFWSTs are inoperable, LCO 3.0.3 must be entered. By LCO 3.0.6, LCO 3.7.5 would not be entered, but 13 hours are permitted by LCO 3.0.3 to reach MODE 4 and 37 hours are permitted to reach MODE 5.

Response – (Rev. 1)

1. In Specification 3.7.5, the phrase “flow path” will be replaced with “train” as proposed. For changes denoted by markup of generic TS 3.7.5 Rev.0 (not a markup of TS 3.7.5 as revised in the Question 16-131 response) as staff’s recommendation, KHNP will revise TS 3.7.5 as follows:

- a) LCO 3.7.5 and Note will be revised according to staff’s recommendations.

Revised LCO 3.7.5 Note, “Only the motor driven train of one AFW division is required to be OPERABLE in MODE 4.” means that one motor driven AFW train shall be operable before entering Mode 4 from Mode 5.

Also, one turbine driven AFW train of the unaffected AFW division can be operable to supply the required AFW flow by using the steam from the unaffected steam generator only when the decay heat removal from steam generator is required from Mode 3 to the shutdown cooling system entry condition of Mode 4.

- b) KHNP will revise condition A as proposed, “One AFW division with one train inoperable in MODE 1, 2, or 3”.

In APR1400 Standard Design, AFWS consists of two divisions. Each division consists of two 100% motor driven pumps and two 100% turbine driven pumps, one 100% AFWST. For condition A, three 100% pumps and corresponding trains remain to supply feedwater to the steam generators.

The Completion Time (CT) of Required Action A.1 is reasonable based on the redundancy of the AFWS division, and availability of a redundant operable AFW train within each division of AFWS. The B 3.7.5 Applicable Safety Analyses (as shown in the attachment markup) specifies “AFWS design is such that it can perform its function following an FWLB between the main feed water isolation valve (MFIV) and containment, combined with a loss of offsite power following turbine trip, and single active failure of the turbine driven train in the AFWS division of the intact SG”. Thus, postulating a FWLB in the other available division, OUTSIDE the containment, there

will be still be one operable train left to fulfill the redundancy requirement, because the auxiliary feedwater line has a common header (6 inch pipe) inside containment. The MSLB (30 inch pipe) has a very low probability of line break.

Thus, KHNP will use the CT for Required Action A.1 as in the attached markup of TS 3.7.5. The Completion Time Required for Action A.1 will be determined by COL Applicant.

- c) KHNP will change the current condition B to condition C. The revised condition C and required action C.1 will be revised as recommended by NRC staff.

The CT of Required Action C.1_ is reasonable based on the redundant capabilities afforded by the AFWS, the time needed for repairs, and low probability of a DBA event occurring during this period.

The AFWS consists of two divisions. Each division has one motor driven pump and one turbine driven pump. Each pump provides 100% of AFW flow capacity to its respective steam generator as assumed in the accident analysis.

The CT of Required Action C.1 is reasonable based on the redundancy of the AFWS division, and availability of a redundant operable AFW train within each division of AFWS. The B 3.7.5 Applicable Safety Analyses (as shown in the attachment markup) specifies "AFWS design is such that it can perform its function following an FWLB between the main feed water isolation valve (MFIV) and containment, combined with a loss of offsite power following turbine trip, and single active failure of the turbine driven train in the AFWS division of the intact SG". Thus, postulating a FWLB in the other available division, OUTSIDE the containment, there will be still be one operable train left to fulfill the redundancy requirement, because the auxiliary feedwater line has a common header (6 inch pipe) inside containment. The MSLB (30 inch pipe) has a very low probability of line break.

The LCO 3.7.5 Condition C for standard TS (NUREG-1432, Rev.4) has only a single train operable so it is a totally different Condition C than that stated for APR1400. Because, if one AFW division is inoperable, another division which has two 100% AFW trains with diversity is still operable as the redundancy. Also, any 100% AFW pump (motor-driven pump or turbine-driven pump) train can supply the AFW required to the unaffected steam generator until the shutdown cooling system entry condition (Mode 4). In case of the reference plant of APR1400, Shin Kori Nuclear Power Plant 3&4, KHNP uses the CT of Condition C based on operating experience for this condition.

Thus, KHNP will revise the CT for Required Action C.1 as in the attached markup of TS 3.7.5 for clarification of NRC staff's comment. The Completion Time Required for Action C.1 will be determined by COL Applicant.

- d) KHNP will change the current condition C to condition B. Also, the revised condition B and required action B.1 will be revised to avoid misunderstanding as follows:
- Condition B, "Two AFW divisions with one train inoperable in MODE 1, 2, or 3."
 - Required Action B.1. "Restore two trains of an AFW division to OPERABLE status."

The CT of Required Action B.1 is reasonable based on one 100% train of each division operable. Therefore, each steam generator can be supplied the AFW from one 100% train of each division during this period.

- e) One 100% turbine-driven train can supply the AFW required to the unaffected steam generator until the shutdown cooling system entry condition (Mode 4). Therefore, one operable motor-driven train may not be required to enter the shutdown cooling system entry condition of (Mode 4).

The CT of Required Action D.2 is reasonable based on operating experience in Korea by KHNP, to reach the unit condition from MODE 3 to MODE 4 in an orderly manner and without challenging unit systems.

Condition D will be revised as follows:

D. Required Action and associated Completion Time of Condition A, B, or C not met. OR Three AFW trains inoperable in MODE 1, 2, or 3. | D.1 Be in MODE 3. | 6 hours AND D.2 Be in MODE 4. | 18 hours

- f) As described in the response to Sub-question 1.e), one 100% turbine-driven train can supply the AFW required to the unaffected steam generator until the shutdown cooling system entry condition (Mode 4). Therefore, new Action E proposed by staff is not required.
- g) Renumbering is not reflected according to the response to Sub-question 1.f). Condition E will be revised using the phrases proposed by staff.
- h) Renumbering is not reflected according to the response to Sub-question 1.f). The proposed condition does not specify which motor driven train is required. Since the condition does not mean an accident condition, the proposed phrase "Required AFW motor driven train" is not appropriate. Because the requirement of the Note to LCO 3.7.5 is for "only the motor driven train of one AFW division", the proposed condition for "required one motor driven train inoperable" will not be adopted. The Note of Condition F will be revised to improve its clarity.
- i) SR 3.7.5.1 will be revised for clarity and consistency in phrasing.
- j) SR 3.7.5.2 Note will be revised for consistency in phrasing.
- k) Note "a" and "b" of SR 3.7.5.4 will be revised for consistency in phrasing and numbering. Note "a" of SR 3.7.5.3 will be deleted as following reason:

The purpose of Note "a" of SR 3.7.5.3 understands that AFW turbine-driven pumps shall be performed for the surveillance test after the pressure of steam generator is stable condition. The SR 3.7.5.3 is for to verify each AFW automatic valve actuates to the correct position on an actuation signal. This surveillance test is not related with Note a.

- l) SR 3.7.5.3 will be revised for consistency in phrasing.

m) SR 3.7.5.5 will be revised for clarity and consistency in phrasing.

2. APR1400 NSSS designer confirms that an AFAS is automatically initiated by the steam generator level-low signal in Mode 4.

If necessary, please refer to the response of RAI 498-8595, Question No. 16-153 (2 & 3.g).

3. Revision 0 of the Bases of generic TS 3.7.5 is revised to be consistent with the changes stated in the response to Sub-question 1.
4. Revision 0 of the LCO statement of generic TS 3.7.6 is revised as proposed by NRC staff.
5. The 7 day completion time is reasonable, based on an OPERABLE AFWST being available and the low probability of an event requiring the use of the water from the AFWST occurring during this period.

APR1400 has one 100% AFWST for each division, also a cross connection is provided between the AFWSTs so that either tank can manually supply either division of the AFWS by opening the L.C. (Lock Closed) valves. To verify operability of water supply from the AFWST (which is a safety and seismic Category I system, SUS lined reinforced concrete structure) of the unaffected AFW division is more administrative than to verify operability of backup water supply, such as from two condensate storage tanks (CSTs) (which are a non-safety and non-seismic system, and each CST holds 230,000 gallons of demineralized water) for the affected AFW division.

KHNP definitely agrees that verifying the availability of backup water source significantly enhances the justification of LCO Required Actions and CT for AFWSTs, when CST is available. KHNP understands that the addition of the description for the non-safety backup water supply provision on the TS is not appropriate. The detailed procedure for verification of OPERABILITY of non-safety related components such as CST should be provided by the plant operating entity not TS.

But, to address regulatory concerns for justification of Completion Time of Required Action KHNP will use Required Action A.1 as in the attached TS 3.7.6 markup.

6. This condition B means the failure to restore the affected AFWST to operable status within 7 days.

APR1400 consists of one 100% AFWST of each division and also a cross connection is provided between the AFWSTs so that either tank can manually supply either division of the AFWS. The 24 hour completion time is reasonable based on operating experience in Korea by KHNP, to transit from Mode 1, 2 or 3 to Mode 4 in an orderly manner and without challenging the safety function.

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 original response indicated future incorporation of Technical Specification changes, these proposed changes have already been incorporated into Revision 1 of the Technical Specifications. Therefore only the applicable changes to Revision 1 of the DCD for this revision are included in the Attachment.

DCD Table 16-1 of Chapter 16, TS 3.7.5, 3.7.6, and Bases for TS 3.7.5 and TS 3.7.6 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.

A

List of COL Action Items

Item No.	TS Section	Description	Resolution
COL 16-3.6(1)	3.6.7	Containment Penetrations – Shutdown Operations	The COL applicant is to provide the minimum number of bolt, completion time, and surveillance frequency for shutdown operations. The value will be determined based on plant specific Shutdown Evaluation Report to satisfy the 10 CFR 50.34 dose limits.
COL 16-3.7(1)	3.7.9	Ultimate Heat Sink	The COL applicant is to provide the completion time, and surveillance frequency for ultimate heat sink. Ultimate heat sink design value varies depending on site characteristics.
COL 16-3.7(2)	3.7.11	Control Room Habitability Area option for design features to protect occupant exposures to toxic gases	The COL applicant is to provide the details of specific toxic chemicals of mobile and stationary sources and evaluate the MCR habitability based on the recommendation in RG 1.78. The specific toxic gas concentrations in the air intakes will vary depending on site. If the applicant determines that the maximum concentrations in the MCR for a given toxic gases do not exceed the toxicity limits from RG 1.78, toxic gas detector is not required and the bracketed phrases are deleted.
COL 16-3.8(1)	3.8.1	SR 3.8.1.4, Day Tank Capacity	The COL applicant is to provide the specific value in accordance with EDG manufacture’s specific design characteristics.
COL 16-3.8(2)	3.8.1	SR 3.8.1.8, Offsite Power Transfer Test SR 3.8.1.9, EDG Single Largest Load Rejection Test SR 3.8.1.10, EDG Full-Load Rejection Test SR 3.8.1.12, EDG ESF Actuation Test SR 3.8.1.13, EDG Bypassed Trip Signal Test	The COL applicant is to determine plant operation MODES which allow the Surveillance depend on the plant operation and surveillance policy. The MODES restrictions may be deleted if the COL applicant demonstrates that the plant safety is maintained or enhanced when the surveillance is performed in restricted MODES
COL 16-3.8(3)	3.8.1	SR 3.8.1.9, EDG Single Largest Load Rejection Test SR 3.8.1.10, EDG Full-Load Rejection Test SR 3.8.1.14, EDG Endurance and Load Test	The COL applicant is to determine EDG power factor as applicable to the tests. EDG operation power factor depends on plant specific EDG Class 1E loads and offsite power condition.
COL 16-3.8(4)	3.8.3	Actions E, SR 3.8.3.4 Starting Air Receiver Pressure	The COL applicant is to provide the specific value in accordance with EDG manufacturer’s specific design recommendation.

COL 16-3.7(1)	3.7.5	Auxiliary Feedwater System (AFWS)
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The COL applicant may either use the completion time for required action for Condition A & C or provide a risk-informed justification to increase the completion time.

Insert 'C' in the next page before COL 16-3.6(1)

2

3

C

COL 16-3(1)	B3.0.9 B3.7.11 B3.7.12 B3.8.1 B3.9.3	LCO Applicability Control Room HVAC System Auxiliary Building Controlled Area Emergency Exhaust System AC Sources - Operating Containment Penetrations	Applicability of Reviewer's Note is to be determined by the COL applicant. Once the COL applicant has dispositioned the Review's Note, the Note can be removed from the Bases.
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B.3.7.5 Auxiliary Feedwater System (AFWS)

D

COL 16-5(1)	5.1 5.2.2 5.3 5.5.3 5.5.9 5.5.11 5.5.17 5.5.19 5.6.4	Responsibility Unit Staff Unit Staff Qualifications Post-Accident Sampling Steam Generator(SG) Program Ventilation Filter Testing Program Battery Monitoring and Maintenance Program Setpoint Control Program Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT(PTLR)	Applicability of Reviewer's Note is to be determined by the COL applicant. Once the COL applicant has dispositioned the Review's Note, the Note can be removed from the Bases.
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B

Item No.	Description
COL 16-3.6(1)	The COL applicant is to provide the minimum number of bolt, completion time, and surveillance frequency for shutdown operations. The value will be determined based on plant specific Shutdown Evaluation Report to satisfy the 10 CFR 50.34 dose limits.
COL 16-3.7(1) 2	The COL applicant is to provide the completion time, and surveillance frequency for ultimate heat sink. Ultimate heat sink design value varies depending on site characteristics.
COL 16-3.7(2) 3	The COL applicant is to provide the details of specific toxic chemicals of mobile and stationary sources and evaluate the MCR habitability based on the recommendation in RG 1.78. The specific toxic gas concentrations in the air intakes will vary depending on site. If the applicant determines that the maximum concentrations in the MCR for a given toxic gases do not exceed the toxicity limits from RG 1.78, toxic gas detector is not required and the bracketed phrases are deleted.
COL 16-3.8(1)	The COL applicant is to provide the specific value in accordance with EDG manufacturer's specific design characteristics.
COL 16-3.8(2)	The COL applicant is to determine plant operation MODES which allow the Surveillance depend on the plant operation and surveillance policy. The MODES restrictions may be deleted if the COL applicant demonstrates that the plant safety is maintained or enhanced when the surveillance is performed in restricted MODES
COL 16-3.8(3)	The COL applicant is to determine EDG power factor as applicable to the tests. EDG operation power factor depends on plant specific EDG Class 1E loads and offsite power condition.
COL 16-3.8(4)	The COL applicant is to provide the specific value in accordance with EDG manufacturer's specific design recommendation.
COL 16-3.9(1)	The COL applicant is to provide the minimum number of bolt for equipment hatch. The value will be determined based on plant specific Shutdown Evaluation Report to satisfy the 10 CFR 50.34 dose limits.
COL 16-4.1(1)	Information on site location is to be provided by the COL applicant
COL 16-5.3(1)	The requirement for unit staff qualification shall be determined by COL applicant based on latest NRC RG 1.8 and ANSI standard acceptable to NRC staff.
COL 16-5.4(1)	The COL applicant will determine the modification of core protection calculator (CPC) addressable constants based on plant specific data.
COL 16-5.5(1)	Information on licensee is to be provided by the COL applicant
COL 16-5.5(2)	Information on plant is to be provided by the COL applicant
COL 16-5.5(3) 1	Information on plant specific allowable penetration equation is to be provided by the COL applicant
COL 16-5.5(4) 2	The methodology for gaseous radioactivity quantities and the liquid radwaste quantities is to be provided by the COL applicant
COL 16-5.5(5)	The FSAR reference on setpoint control document is to be specified by the COL applicant
COL 16-5.6(1)	A single submittal of reporting on multiple unit stations is to be determined in COL stage.
COL 16-5.6(2)	The COL applicant will determine the format of the table. Either format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979, or use another format that is acceptable to NRC
COL 16-5(1)	Applicability of Reviewer's Note is to be determined by the COL applicant.
COL 16-3(1)	Applicability of Reviewer's Note is to be determined by the COL applicant.

Insert
"COL
16-3.7(1)"
in the next
page

Insert
"COL
16-5.6(3)"
in the next
page

COL 16-3.7(1)	The COL applicant is to provide the completion time for required action for condition A&C or provide a risk-informed justification to increase the completion time.
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COL 16-5.6(3)	The COL applicant is to provide repair method utilized and number of tubes repaired by each repair method.
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3.7 PLANT SYSTEMS

3.7.5 Auxiliary Feedwater System (AFWS)

LCO 3.7.5 Two auxiliary feedwater (AFW) divisions, each with one motor driven train and one turbine driven train, shall be OPERABLE.

----- NOTE -----
 Only the motor driven train of one AFW division is required to be OPERABLE in MODE 4.

APPLICABILITY: MODES 1, 2, and 3,
 MODE 4 when a steam generator is relied upon for heat removal.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One AFW train inoperable in MODE 1, 2, or 3.	A.1 Restore train to OPERABLE status. [division with one]	7 days [3]
B. A train of each AFW division inoperable in MODE 1, 2, or 3.	B.1 Restore two trains of an AFW division to OPERABLE status. [Two AFW divisions with one train]	72 hours
C. One AFW division with two trains inoperable in MODE 1, 2, or 3.	C.1 Restore one train of affected AFW division to OPERABLE status.	72 hours [24]
D. Required Action and associated Completion Time of Condition A, B, or C not met. <u>OR</u> One AFW division with both trains inoperable and a train of other AFW division inoperable in MODE 1, 2, or 3.	D.1 Be in MODE 3. <u>AND</u> D.2 Be in MODE 4. [Three AFW trains]	6 hours 18 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>E. Two AFW divisions with two trains inoperable in MODE 1, 2, or 3.</p> <p>Four AFW</p>	<p>----- NOTE -----</p> <p>LCO 3.0.3 and all other LCO Required Actions requiring MODE changes are suspended until one AFW train is restored to OPERABLE status.</p> <p>E.1 Initiate action to restore one train of an AFW division to OPERABLE status.</p> <p>AFW</p>	<p>Immediately</p>
<p>F. Two AFW trains, each of which includes a motor driven train inoperable in Move 4.</p> <p>MODE</p> <p>S</p>	<p>----- NOTE -----</p> <p>LCO 3.0.3 and all other LCO Required Actions requiring MODE changes are suspended until one AFW motor driven train is restored to OPERABLE status.</p> <p>F.1 Initiate action to restore one AFW motor driven train to OPERABLE status.</p>	<p>Immediately</p>

3.7 PLANT SYSTEMS

3.7.6 Auxiliary Feedwater Storage Tank (AFWST)

LCO 3.7.6 Two AFWST shall be OPERABLE.



APPLICABILITY: MODES 1, 2, and 3,
MODE 4 when a steam generator is relied upon for heat removal.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One AFWST inoperable.	A.1 Verify OPERABILITY of other AFWST. <u>backup water supply and the other</u>	4 hours <u>AND</u> Once per 12 hours thereafter
	<u>AND</u> A.2 Restore AFWST to OPERABLE status.	7 days
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours
	<u>AND</u> B.2 Be in MODE 4 without reliance on steam generator for heat removal.	24 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.6.1	Verify each AFWST level is $\geq 1,524,165$ L (400,000 gal).	12 hours

B 3.7 PLANT SYSTEMS

B 3.7.5 Auxiliary Feedwater System (AFWS)

BASES

BACKGROUND

The AFWS automatically supplies feedwater to the ^{the} steam generators to remove decay heat from the Reactor Coolant System upon the loss of normal feedwater supply. The two auxiliary feedwater (AFW) pumps in each mechanical division take suction from a respective common auxiliary feedwater storage tank (AFWST) (Limiting Condition for Operation (LCO) 3.7.6), each pump with a respective discharge header, and discharge to a respective steam generator secondary side through a common AFW discharge header, which connects to the steam generator downcomer main feedwater (MFW) piping inside containment. The steam generator functions as a heat sink for core decay heat. The heat load is dissipated by releasing steam to the atmosphere from the steam generators via the main steam safety valves (MSSVs) (LCO 3.7.1) or main steam atmospheric dump valves (MSADVs) (LCO 3.7.4). ~~If the main condenser is available, steam may be released to the main condenser via the turbine bypass valves.~~

steam generators (SGs)

(delete)

Auxiliary Feedwater pump, whether turbine or motor driven, provides 100% of the required AFW flow

The AFWS is configured into two separate mechanical divisions, each with one motor driven train and one turbine driven train. ~~Each motor driven pump provides 100% of AFW flow capacity and each turbine driven pump provides 100% of the required capacity to its respective steam generator as assumed in the accident analysis. The pumps are equipped with independent recirculation lines to prevent pump operation against close system.~~

SG

The two AFW pumps in each mechanical division take suction from a respective common auxiliary feedwater storage tank (LCO 3.7.6).

Each motor driven AFW pump is powered from an independent Class 1E power supply, and feeds one steam generator. ~~One pump at full flow is sufficient to remove decay heat and cool the unit to Shutdown Cooling System (SCS) entry conditions.~~

~~Each division has two trains which are the motor driven train and the turbine driven train, respectively. Each division supplies AFW to the dedicated steam generator.~~

e

Each turbine driven AFW pump receives steam from an independent main steam line, upstream of the main steam isolation valve (MSIV).

(delete)

~~Each of the steam feed lines will supply 100% of the requirements of the turbine driven AFW pump. The turbine driven AFW pump supplies feedwater to the steam generator which provides driving steam, with direct current (DC) powered control valves actuated by the auxiliary feedwater actuation signal (AFAS).~~

The AFWS is designed to have sufficient capacity to remove decay heat and cool the unit to the Shutdown Cooling System (SCS) entry condition (MODE 4).

BASES

BACKGROUND (continued)

~~The AFWS supplies feedwater to the steam generators upon the loss of normal feedwater supply.~~

~~The AFWS is designed to supply sufficient water to the steam generators to remove decay heat with steam generator pressure at the setpoint of the MSSVs.~~

~~Subsequently, the AFWS supplies sufficient water to cool the unit to Shutdown Cooling System entry conditions, and steam is released through the MSADVs.~~

~~The AFWS actuates automatically on low steam generator level by the AFAS as described in LCO 3.3.5, "Engineered Safety Features Actuation System (ESFAS) Instrumentation." The AFAS logic is designed to feed its respective steam generators with low levels. The AFAS automatically actuates the AFW turbine driven pump and associated DC-operated valves and control when required, to ensure an adequate feedwater supply to the steam generators. DC-operated valves are provided for each AFW line to control the AFW flow to each steam generator.~~

The AFWS is discussed in FSAR, Subsection 10.4.9 (Ref. 1).

During operation of the AFWS for RCS heat removal, SG level is automatically maintained within normal limits by the DC-powered solenoid-operated flow control (modulating) valve in the AFW pump discharge line of each AFW train in operation

APPLICABLE SAFETY ANALYSES

The AFWS mitigates the consequences of any event with a loss of normal feedwater. The design basis of the AFWS is to supply water to the steam generator to remove decay heat and other residual heat, by delivering at least the minimum required flow rate to the steam generators at pressure of 87.2 kg/cm²A (1,240 psia).

The limiting design basis accidents (DBAs) and transients for the AFWS are as follows:

- a. Feedwater line break (FWLB) and
- b. Loss of normal feedwater.

In addition, the minimum available AFW flow and system characteristics are serious considerations in the analysis of a small break loss of coolant accident.

Each auxiliary feedwater actuation signal (AFAS) is generated to supply feedwater to its respective SG. As described in LCO 3.3.1, "Reactor Protection System (RPS) Instrumentation - Operating", and LCO 3.3.5, "Engineered Safety Features Actuation System (ESFAS) Instrumentation", if two-out-of-four SG wide range level instruments sense low level in their respective SG, an AFAS signal is generated to actuate the associated division of AFW (the motor driven train and turbine driven train are started simultaneously). An AFAS signal for either SG also generates a start signal to all four emergency diesel generators (EDGs).

BASES

APPLICABLE SAFETY ANALYSES (continued)

main feedwater isolation valve (MFIV)

The AFWS design is such that it can perform its function following an FWLB between the main feed water isolation valve and containment, combined with a loss of offsite power following turbine trip, and a single active failure of the turbine driven train. The AFW flow to the faulted steam generator is terminated manually by the operator action. Sufficient flow would be delivered to the intact steam generator by the redundant AFW train.

(delete)

SG

remaining OPERABLE AFW motor driven train. The AFW flow to the faulted SG is terminated manually by the operator within 30 minutes.

train in the AFWS division of the intact SG.

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

LCO

accompanied

AFW division

through the AFW steam supply line connected to one of the two main steam lines of the associated SG, a source upstream of and therefore

The LCO requires that two AFW divisions, each with one motor driven train and one turbine driven train be OPERABLE to ensure that the AFWS will perform the design safety function to mitigate the consequences of accidents that could result in overpressurization of the reactor coolant pressure boundary. Four independent AFW trains, in two divisions, 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 a motor driven pump in each division from independent emergency buses. The remainder of the AFW pumps in each division is powered by a diverse means, a steam driven turbine supplied with steam from an independent source not isolated by the closure of the MSIVs.

other

pump

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 dedicated steam generators which provides driving steam. The piping, valves, instrumentation, and controls in the required flow paths shall also be OPERABLE.

motor driven

turbine driven

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 on an initiating event, the turbine driven pump and the motor driven pump in that mechanical division are also not OPERABLE due to the respective inoperable steam generator. Concurrent with the initiating event, a single active component failure is considered for the turbine driven pump or the motor driven pump in the other mechanical division. One AFW pump and the associated SG would remain OPERABLE to provide reactor cooling because of the AFW

BASES

LCO (continued)

The capability to withstand a single failure

motor driven

turbine driven

two 100 percent capacity turbine driven pumps each powered by an independent

, which is a diverse means of motive power

System design that provides redundant capacity, and motive power that is both independent and diverse. The two 100 percent capacity motor driven pumps are powered from independent emergency buses and each of the two 100 percent capacity turbine driven pumps are powered from steam supplied by the respective SG, which provides diversity. This is accomplished by powering two 100 percent capacity motor driven pumps from independent emergency buses and by a diverse means of steam supply for the two 100 percent capacity turbine driven pumps.

motor driven

only the motor driven train of one AFW division

requirements (such as when conducting a unit startup with a low core decay heat input), and

The LCO is modified by a Note indicating that one AFW flow path, which includes a motor driven pump, is required to be OPERABLE in MODE 4 when a steam generator is relied upon for heat removal. This is because of reduced heat removal requirements, the short period of time in MODE 4 during which AFW is required, and the insufficient steam supply available in MODE 4 to power the turbine driven AFW pump.

may be insufficient to

a

also

APPLICABILITY

of a loss of adequate main feedwater flow to one or both SGs.

maintain SG levels within normal limits as SG secondary side inventory volume contracts

In MODES 1, 2, and 3, the AFWS is required to be OPERABLE and to function in the event that the main feed water is lost. In addition, the AFWS is required to supply enough makeup water to replace steam generator secondary inventory lost as the unit cools to MODE 4 conditions.

In MODE 4, the AFWS may be used for heat removal via a steam generator.

In MODES 5 and 6, the steam generators are not normally used for decay heat removal, and the AFWS is not required.

ACTIONS

A.1

inoperable, functional diversity is lost and

If one AFW train is inoperable, action must be taken to restore the flow path to an OPERABLE status within 7 days. The 7 day Completion Time is reasonable based on the following reasons:

specified

train

the [3] day Completion Time of Condition A.

- a. Redundancy of the AFWS division and
- b. Availability of redundant OPERABLE AFW train within each division of AFWS.

Replaced in the next page

- a. Redundancy and independence of the two AFW divisions,
- b. Redundancy and diversity of the two AFW trains in each AFW division,
- c. Availability of one OPERABLE AFW train in the affected AFW division, assuming an event renders both trains of the other AFW division inoperable,
- d. Low probability of such an event occurring within the Completion Time period, and
- e. Each SG can be supplied the required feedwater flow by at least one AFW train of the associated AFW division during this period.

[----- REVIEWER'S NOTE-----]
The COL applicant should use the stated Completion Time for Required Action A.1 unless a longer Completion Time can be justified using risk insights in accordance with RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" and RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications."

BASES

ACTIONS (continued)

an AFW train of each AFW division is inoperable in MODE 1, 2, or 3, functional redundancy is lost and

B.1

If a train of each AFW division is inoperable in MODES 1, 2, and 3, action must be taken to restore two trains of an AFW division to OPERABLE status within 72 hours. The 72 hour Completion Time is reasonable based on the redundant capabilities afforded by the AFWS. Each steam generator can be supplied the AFW flow by one 100% train of each division during this period.

One AFW train in each division remains to supply feedwater to the steam generators.

In addition, during the 72 hour period, one OPERABLE AFW train in each division remains available to supply feedwater to its respective SG.

C.1

With one of the required AFW division (pump or flow path) inoperable, action must be taken to restore OPERABLE status within 72 hours. The 72-hour Completion Time is reasonable based on the redundant capabilities afforded by the AFWS, the time needed for repairs, and the low probability of a DBA event occurring during this period.

Two AFW pumps and flow paths remain to supply feedwater to the steam generators.

In addition, during the Completion Time period, for most events, two OPERABLE AFW trains would remain available to supply feedwater to the associated SG

D.1 and D.2

When Required Action A.1, B.1, or C.1 cannot be completed within the required Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and MODE 4 within 18 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.

Insert before D.1 and D.2:

[----- REVIEWER'S NOTE -----]
The COL applicant should use the stated Completion Time for Required Action C.1 unless a longer Completion Time can be justified using risk insights in accordance with RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" and RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications."

the reasons stated in items a, b, and e for Required Action A.1; and on the availability of one OPERABLE AFW train in one affected AFW division, assuming an event renders the remaining train of the other affected AFW division inoperable.

With both AFW trains inoperable in one AFW division, the AFW function would be lost for events that render both trains of the unaffected AFW division inoperable. Action must be taken to restore one train of the affected AFW division to OPERABLE status within the Completion Time of Required Action C.1. The [24 hour] Completion Time is based on the redundancy and diversity of the two OPERABLE AFW trains in the remaining AFW division, the time needed for repairs, and the low probability of such an event occurring during this period.

BASES

ACTIONS (continued)

E.1

Required Action E.1 is modified by a Note indicating that all required MODE changes or power reductions are suspended until one AFW train is restored to OPERABLE status.

four AFW trains (two AFW divisions) inoperable in MODE

With ~~two AFW divisions inoperable in MODES~~ 1, 2, or 3, the unit is in a seriously degraded condition with no safety related means for conducting a cooldown, and only limited means for conducting a cooldown with non-safety grade equipment. In such a condition, the unit should not be perturbed by any action, including a power change, that may result in a ~~trip~~. The seriousness of this condition requires that action be started immediately to restore one AFW ~~flow path~~ to OPERABLE status.

reactor trip.

LCO 3.0.3 is not applicable ~~as~~ it could force the unit into a less safe condition.

train

because

F.1

Required Action F.1 is modified by a Note indicating that all required MODE changes or power reductions are suspended until one AFW motor driven train is restored to OPERABLE status.

With two AFW motor driven trains inoperable in MODE 4, action must be started immediately to restore the one required AFW motor driven train to OPERABLE status.

~~With two AFW trains, each of which includes a motor driven train inoperable in MODE 4, action must be taken to immediately restore the inoperable train to OPERABLE status or to immediately verify, by administrative means, the OPERABILITY of a required AFW train.~~

LCO 3.0.3 is not applicable, ~~as~~ it could force the unit into a less safe condition.

because

BASES

SURVEILLANCE
REQUIREMENTSSR 3.7.5.1

Verifying the correct alignment for manual, power operated, and automatic valves in the AFW water and steam flow paths provides assurance that the proper flow paths exist for AFW operation. This SR does not apply to valves which are locked, sealed, or otherwise secured in position, since these valves are verified to be in the correct position prior to locking, sealing, or securing. This SR also does not apply to valves that cannot be inadvertently misaligned, such as check valves. This Surveillance does not require any testing or valve manipulations. Rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position.

The 31 day Frequency is based on engineering judgment, is consistent with the procedural controls governing valve operation and ensures correct valve positions.

SR 3.7.5.2

Verifying that each AFW pump's developed head at the flow test point is greater than or equal to the required developed head ensures that AFW pump performance has not degraded during the cycle. Flow and differential head are normal tests of pump performance required by the ASME Operations and Maintenance (OM) Code (Ref. 2). Because it is undesirable to introduce cold AFW into the steam generators while they are operating, this testing is performed on recirculation flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such in-service tests confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance. Performance of in-service testing, discussed in the ASME OM Code (Ref. 2), at 3 month intervals satisfies this requirement.

This SR is modified by a Note indicating that the SR should be deferred until suitable test conditions are established. This deferral is required because there is an insufficient steam pressure to perform the test.

feedwater can be delivered by each AFW train to its respective SG

SR 3.7.5.3

This SR ensures that AFW can be delivered to the appropriate steam generator in the event of any accident or transient that generates an AFAS signal, by demonstrating that each automatic valve in the flow path actuates to its correct position on an actual or simulated actuation signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls.

BASES

APPLICABILITY In MODE 1, 2, and 3, and in MODE 4, when a steam generator is relied upon for heat removal, the AFWST is required to be OPERABLE.

In MODES 5 and 6, the AFWST is not required because the AFW System is not required.

ACTIONS

A.1 and A.2

backup water supply and the

If one AFWST is not OPERABLE, the OPERABILITY of the other AFWST must be verified by administrative means within 4 hours and once every 12 hours thereafter.

The backup water supply is the affected division's condensate storage tank (CST), and its OPERABILITY verification requires checking the CST water volume, and the CST supply line, including the manual isolation valve, to the affected division's AFW pump suction lines.

OPERABILITY of the other AFWST must include verification of the OPERABILITY of flow paths from the tank to the AFW pumps, and availability of the required volume of water. The AFWST must be returned to OPERABLE status within 7 days. The 4 hour Completion Time is reasonable, based on operating experience, to verify the OPERABILITY of the other AFWST. Additionally, verifying the OPERABILITY of the other AFWST every 12 hours is adequate to ensure the AFW supply continues to be available. The 7 day Completion Time is reasonable, based on an OPERABLE AFWST being available and the low probability of an event requiring the use of the water from the AFWST occurring during this period.

backup water supply and the

backup water supply and the

B.1 and B.2

If the AFWST cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 4, without reliance on steam generators for heat removal, within 24 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.

the affected division's AFWST supply line to the affected division's AFW pump suction lines, the necessary volume of water in the other division's AFWST, and the connection line between the two AFWSTs